

**Sustainable high quality eucalypt sawlog supply
from Tasmania's Permanent Timber Production Zone Land**

Review No. 4

**Forestry Tasmania
March 2014**

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Summary

Forestry Tasmania models the sustainable yield from Permanent Timber Production Zone Land, and monitors actual production, to ensure that the harvesting of eucalypt native forests and eucalypt plantations is consistent with its statutory obligations and with its objectives for sustainable forest management.

Clause 98 of the Tasmanian Regional Forest Agreement requires a five yearly review of the sustainable yield of high quality eucalypt sawlogs from State forests (now Permanent Timber Production Zone Land). Previous reviews, in 1998, 2002 and 2007, incorporated the effects of successive changes in the resource base over that period. This review, due in 2012, was deferred to enable the outcomes of the 2012 Tasmanian Forest Agreement (formalised by the *Tasmanian Forests Agreement Act (Tas) 2013* and the *Forest Management Act (Tas) 2013*) to be incorporated.

This review confirms Forestry Tasmania's ability to supply at least 137,000 cubic metres per year of high quality eucalypt sawlogs from Permanent Timber Production Zone Land, for the next 90 years. In particular, this review confirms Forestry Tasmania's ability to supply the required quantity of high quality eucalypt sawlogs, and the required quantity of eucalypt peeler billets, from eucalypt native forests over the period to 30 June 2027. However, these yield predictions are generated from biologically based forest estate modelling of productive capacity, and do not imply supply based on economic criteria.

The predicted yields represent a significant reduction from the equivalent values reported in each of the three previous reviews, reflecting the outcomes of the Tasmanian Forest Agreement, *Tasmanian Forests Agreement Act (Tas) 2013* and *Forest Management Act (Tas) 2013*.

The predicted yields for arisings and biofuel from eucalypt native forests and from eucalypt plantations, and the predicted yields for eucalypt peeler billets from eucalypt plantations, represent an ongoing opportunity for a transition in supply from traditional markets for logs other than high quality eucalypt sawlogs to new markets comprising engineered wood products and bioenergy.

The yield described in this review is consistent with Forestry Tasmania's draft Forest Management Plan and draft assessment and management of High Conservation Value Forest, but will need to be confirmed once the Forest Management Plan and High Conservation Value Forest assessment have been finalised after due public consultation.

Introduction

This review is Forestry Tasmania's fourth review of the sustainable yield of high quality eucalypt sawlogs from public land in Tasmania. Conduct of this review is a requirement under Clause 98 of the 1997 Tasmanian Regional Forest Agreement (Commonwealth of Australia and State of Tasmania, 1997). The results of previous equivalent reviews were published by Forestry Tasmania in 1998, 2002 and 2007.

Clause 98 of the 1997 Tasmanian Regional Forest Agreement

Review of Sustainable High Quality Sawlog Supply Levels

98. The State agrees to undertake a review of sustainable high quality sawlog supply levels from public land to reflect the changes in the forest inventory and new intensive forest management initiatives concluded in this Agreement. The review will be completed and published during the first year of this Agreement, and thereafter will coincide with the 5 yearly reviews of this Agreement.

This review was due in 2012, but was deferred by agreement to ensure that its results reflected the outcomes of the Tasmanian Forest Agreement (Anon, 2012). Negotiations for the Tasmanian Forest Agreement commenced in mid 2010 and concluded in November 2012. Its relevant outcomes were formalised in the *Tasmanian Forests Agreement Act (Tas) 2013*, in June 2013, and the *Forest Management Act (Tas) 2013*, in November 2013.

This review also reports on the predicted yields of pulpwood and other products arising from the sustainable yield of high quality eucalypt sawlogs, as in previous reviews. In addition, the scope of this review has been expanded from previous reviews to include eucalypt peeler billets and biofuel. This reflects the growing significance of each of these products (noting, in particular, the significance given to future supply quantities for eucalypt peeler billets in the Tasmanian Forest Agreement).

This review is based on the detailed and complex analysis of large quantities of data. As in previous years, this report is an overview of the work that was done to conduct this review, and of its results. Forestry Tasmania welcomes feedback from the readers of this report, about the way in which it communicates the results of its reviews of sustainable yield. A feedback form is included at Appendix 1.

The glossary, included in this review, gives definitions for the various log products and other technical terms to which it refers.

The yield described in this review is consistent with Forestry Tasmania's draft Forest Management Plan. It is also consistent with Forestry Tasmania's draft assessment and management of High Conservation Value Forest on Permanent Timber Production Zone Land. Both documents are due for release in March 2014 and available for public comment. The yield reported in this review will need to be confirmed, once the Forest Management Plan and High Conservation Value Forest assessment have been finalised after due public consultation.

Background

Sustainable forest management has been defined as the integration of the commercial and non commercial values of forests to improve the material and non material welfare of society, whilst ensuring that the values of the forest as a resource for commercial use and for conservation are not lost or degraded for current or future generations (Commonwealth of Australia, 1992). Sustainable forest management is the underlying foundation of Forestry Tasmania's business.

Forestry Tasmania measures its performance of sustainable forest management against internationally agreed criteria, under the Australian Forestry Standard. Forestry Tasmania has also commenced the process to achieve certification under the proposed Forest Stewardship Council's Standard for Australia. This new standard is currently being developed, under the auspices of the international Forest Stewardship Council.

One of the criteria against which sustainable forest management is measured is the extent to which the productive capacity of the forest is maintained over time. The productive capacity of Tasmania's Permanent Timber Production Zone Land is measured against several indicators, one of which is the predicted long term yield of high quality eucalypt sawlogs. This indicator has been used in Tasmania as a primary indicator for at least 30 years.

This review reflects the outcomes of the Tasmanian Forest Agreement. In particular:

- (a) the area of the agreed new reserves of native forest (about 500,000 hectares) means that the area of State forest has reduced from about 1.5 million hectares (including about 200,000 hectares of Forest Reserves, not available for wood production) to about 800,000 hectares of Permanent Timber Production Zone Land (excluding Future Reserve Land); and
- (b) the minimum annual supply for high quality eucalypt sawlogs has been reduced from 300,000 to 137,000 cubic metres and, for the period to 30 June 2027, is to be supplied from native forests.

Section 16 of the *Forest Management Act (Tas) 2013*

16. Wood production supply

- (1) Each year the Forest Manager must make available –
 - (a) for the veneer and sawmilling industries, a minimum aggregate quantity of eucalypt veneer logs and eucalypt sawlogs, from permanent timber production zone land, that meets the prescribed specifications that are in force immediately before the commencement of this Act; and
 - (b) for a prescribed industry, the prescribed quantity, prescribed type and prescribed specification of other prescribed timber (including special species timber, as defined in section 19(1) of the *Tasmanian Forests Agreement Act 2013*).
- (2) In subsection (1)(a) –

minimum aggregate quantity means –

 - (a) 137 000 cubic metres of any combination of eucalypt veneer quality 1, eucalypt veneer quality 2, category 1 sawlogs, and category 3 sawlogs, as specified in Schedule 1 to the *Forestry Regulations 2009* ; or
 - (b) if another quantity is prescribed, the prescribed quantity.
- (3) The regulations may prescribe the time for which the quantity, type and specification of other timber is to be made available and the source of the other timber.

Where the Tasmanian Forest Agreement focuses on wood supply, it focuses on public eucalypt native forests¹. This review focuses on both public eucalypt native forests and public eucalypt plantation forests. Hence Forestry Tasmania's softwood plantation management is outside the scope of this review. Forestry Tasmania's management of special timbers is also largely outside the scope of the review because the resource is mainly from blackwood forests and rainforests. However some of the resource also occurs as mature eucalypt forest with an understorey rich in special timbers. The majority of such areas are now designated as reserves under the *Tasmanian Forests Agreement Act (Tas) 2013*, with the remaining available area being about 6000 hectares. Modelled yields from these forests continue to contribute to estimates of sustainable high quality eucalypt sawlog yield but the harvesting of these forests will be optimized to ensure maximum recovery and the continued representation of special timbers within the regenerated stands. Furthermore, under the Tasmanian Forest Agreement, the Special Council of signatories will review the required yield of special timbers from all forest types and has funding to prepare a special timbers management plan. Forestry Tasmania has been assisting the Special Council towards that objective, including by providing options, requirements and costs for a detailed assessment of the special timber resource on public forests.

¹ The yield estimates and methodology undertaken on behalf of the signatories to the Tasmanian Forest Agreement is described in Forestry Tasmania (2014).

This review of sustainable high quality eucalypt sawlog supply was undertaken by Forestry Tasmania's Wood Planning Branch. Its work has been audited independently, by Dr Mark Burgman and Dr Andrew Robinson, as part of the information gathering and consultation processes that led to the Tasmanian Forest Agreement. The independent auditor's full report can be downloaded from the Australian government's Department of the Environment website (Burgman and Robinson, 2012). Ferguson (2013) also provides a useful discussion on sustainability and on the calculation of sustainable yields, based on a case study of Forestry Tasmania's sustainable yield planning.

Resource base

This review coincides with a period of transition, arising from the ongoing implementation of the outcomes of the Tasmanian Forest Agreement. In particular, the changes in land tenure that arise under the *Tasmanian Forests Agreement Act (Tas) 2013* ("the TFA Act") have not yet been fully implemented by the Tasmanian government. However, the resource base for this review assumes that those land tenure changes have been fully implemented.

Land and forest area

As at 30 June 2013, Forestry Tasmania managed a land base of 1.5 million hectares (Forestry Tasmania, 2013a, p. 4). About 200,000 hectares of the land base was Forest Reserves, unavailable for wood production, and a further 500,000 hectares was designated as Future Reserve Land under the TFA Act. In December 2013, the Forest Reserves and about 100,000 hectares of the Future Reserve Land were gazetted as reserves under the *Nature Conservation Act (Tas) 2002*. These areas are now managed by Tasmania's National Parks and Wildlife Service. Processes to establish the remaining 400,000 hectares of new reserves (currently Future Reserve Land) are underway at the date of this report. The new land base available for wood production, i.e. excluding the Future Reserve Land under the TFA Act, comprises about 800,000 hectares of Permanent Timber Production Zone Land. Figure 1 shows the intended transition from the land base at 30 June 2013 to the future land base.

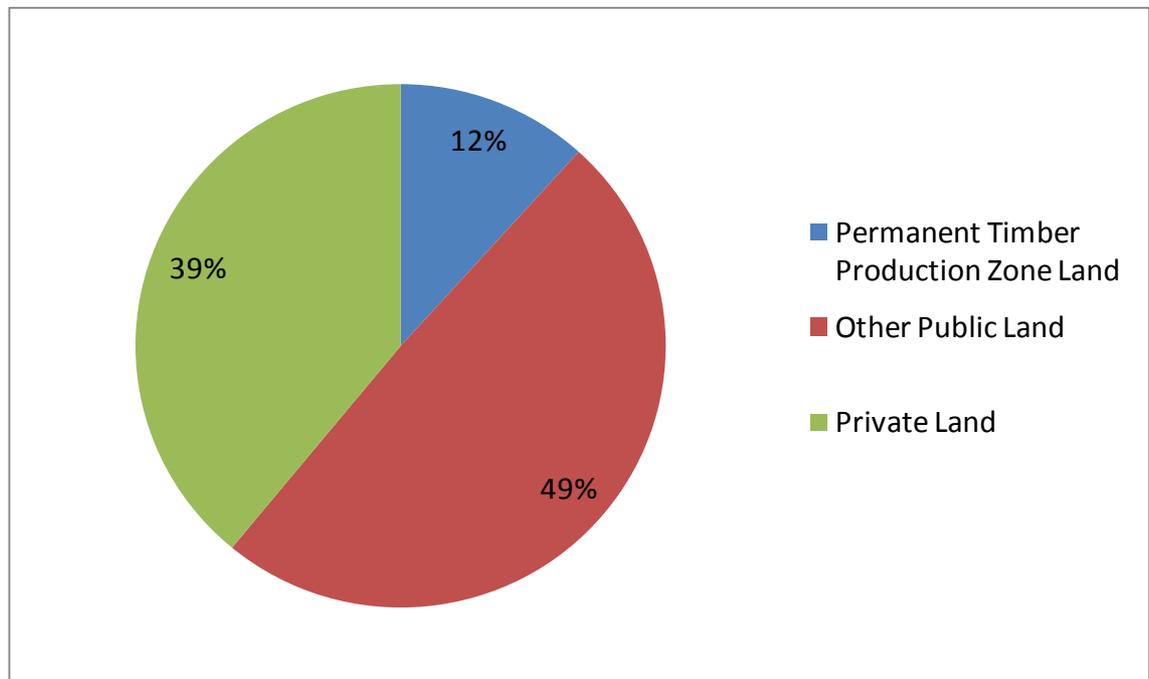
Figure 1 Changing status of land managed by Forestry Tasmania

(Green = land managed by Forestry Tasmania; Red = land managed by Parks & Wildlife Service)

30 June 2013	At the date of this report	Intended
Existing	Forest Reserves	0.2m ha
State forest 1.3m ha	New Reserves gazetted	0.1m ha
	Future Reserve Land 0.4m ha	New Reserves gazetted 0.4m ha
	Permanent Timber Production Zone Land 0.8m ha	Permanent Timber Production Zone Land 0.8m ha

The Permanent Timber Production Zone Land, excluding the Future Reserve Land, represents about twelve per cent of Tasmania's total land area (Figure 2).

Figure 2 Status of land in Tasmania



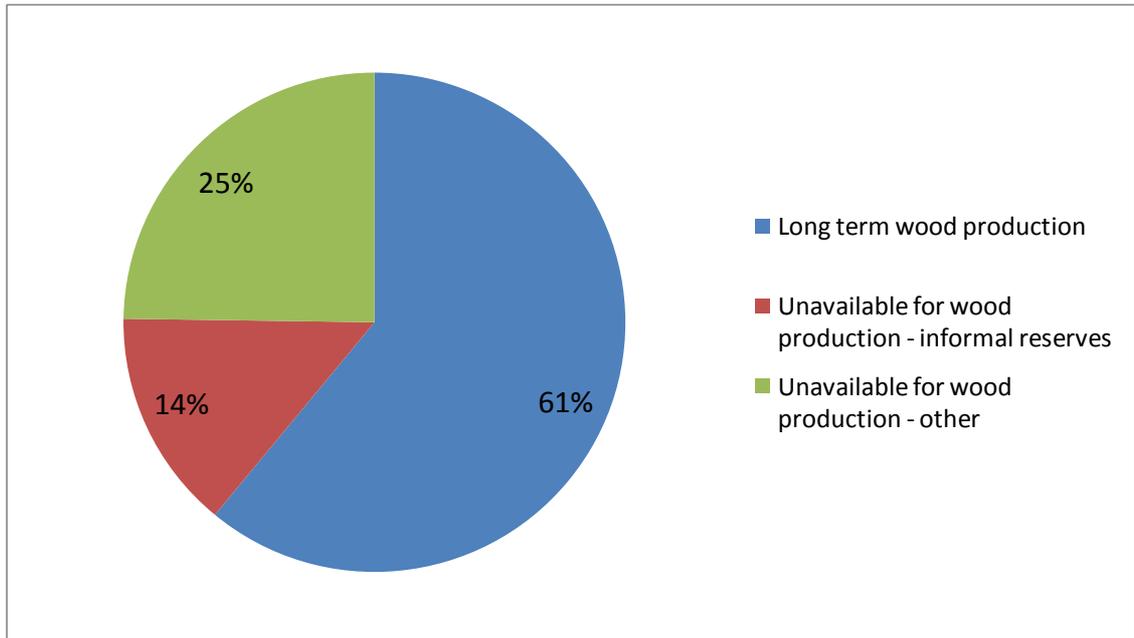
Permanent Timber Production Zone Land is categorised using a map based zoning system, known as Management Decision Classification (“MDC”), to delineate areas of forest that are to be managed for wood production and those that are to be managed for uses other than wood production (Forestry Tasmania, 2013b).

The basic operational unit for timber harvesting is a coupe. All forest that is within the Permanent Timber Production Zone Land and that has been classified as available for wood production under the MDC zoning system has been mapped into provisional coupes (as described in Forestry Tasmania, 2014, pp. 8-9).

Figure 3 shows the results of the classification of Permanent Timber Production Zone Land under the MDC zoning system and the subsequent mapping of wood production areas into provisional coupes. Of the 800,000 hectares of Permanent Timber Production Zone Land (excluding Future Reserve Land):

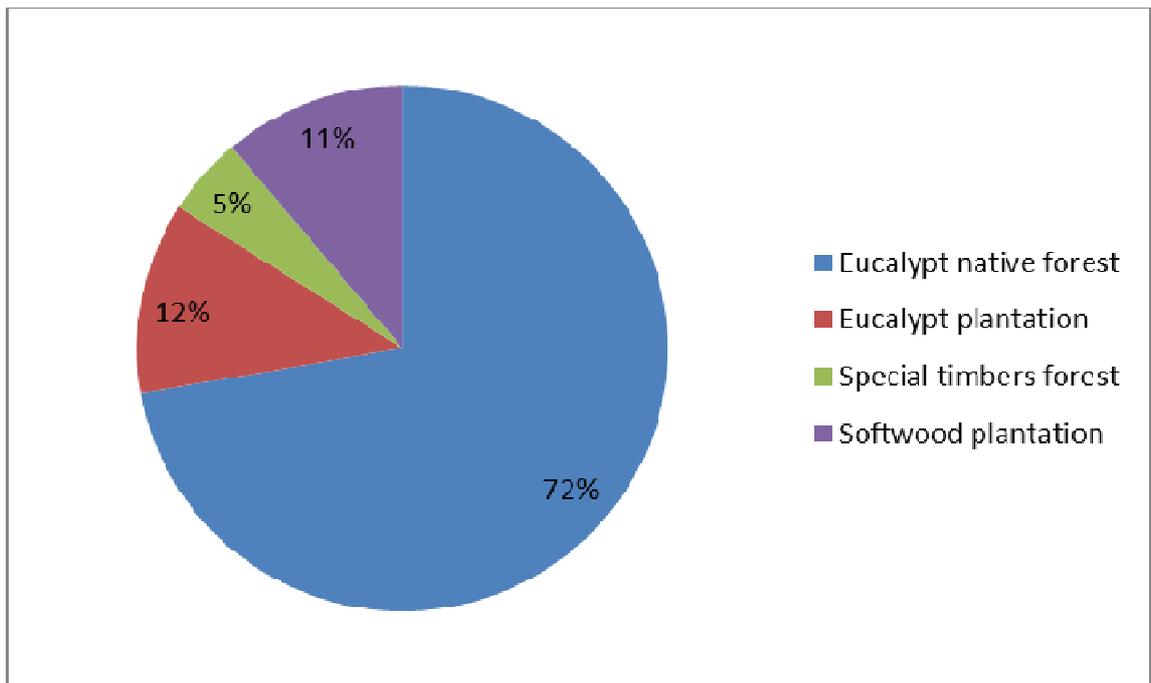
- (a) 61% is in provisional coupes, designated for long term wood production;
- (b) fourteen per cent is in reserves that form part of Tasmania's Comprehensive, Adequate and Representative Reserve System; and
- (c) the remainder, comprising 25%, is non forest or is inaccessible or is unavailable because of other management priorities (e.g. conservation), and is not intended to be used for wood production.

Figure 3 Land use classification of Permanent Timber Production Zone Land (excluding Future Reserve Land)



The area designated for long term wood production (i.e. the area within provisional coupes) can be further classified into broad forest management types (Figure 4). This review assumes that there is no change to the area within each classification. In particular, this reflects Forestry Tasmania's policy since 2007 that there be no significant areas of native forest converted to plantation.

Figure 4 Forest management classification of areas available for wood production



This review is based on the areas of eucalypt native forests and eucalypt plantations shown in Figure 4. These account for 84 per cent of the area available for wood production. This equates to about 50 per cent of the area of Permanent Timber Production Zone Land, or about six per cent of Tasmania's total land area.

Special timbers forests and softwood plantations are not included in this review.

Eucalypt forest management

Eucalypt forests are managed primarily on rotations that are of sufficient length to ensure that a reasonable proportion of the trees that are harvested are large enough to meet the specifications for high quality eucalypt sawlogs. For eucalypt native forests, the nominal rotation length is about 90 years (typically varying from about 60 years on highly productive sites to about 120 years on sites of low productivity)². For eucalypt plantations that are managed for sawlog production, the nominal rotation length is about 25 years. Actual rotation lengths for individual coupes vary according to local site conditions and to the requirement to avoid large variations in supply from one period to the next. Rotation lengths for eucalypt native forests and eucalypt plantations can also be reduced by thinning, to remove trees of lower quality or size and thereby accelerate the growth of the remaining trees. Thinning can also result in an interim harvest of logs (e.g. peeler billets, pulpwood, poles and posts or biofuel) that would otherwise be lost to natural mortality.

Eucalypt native forests are generally managed under either a partial felling regime or a clearfelling regime (with or without thinning). Forestry Tasmania applies partial felling wherever possible, particularly in highland eucalypt forests and lowland dry eucalypt forests. Adequate eucalypt regeneration in these forests can generally be achieved with low to moderate disturbance, i.e. there is no requirement for broad scale high intensity burning and sowing. Partial felling generally accounts for about half of the area of eucalypt native forest that is harvested each year. Clearfelling is applied in situations where the site conditions (e.g. topography and understorey) mean that adequate eucalypt regeneration cannot otherwise be achieved safely and reliably and at a reasonable cost. These conditions are typical of lowland wet eucalypt forests.

Forestry Tasmania continues to apply variable retention, wherever feasible, in some eucalypt native forests that might otherwise be managed by broad scale clearfelling, burning and sowing. Variable retention moderates the visual and ecological impacts of clearfelling, burning and sowing, by retaining strategically located areas of native forest within harvested coupes. Variable retention is used for stands that have particular social and / or ecological significance.

² Rotations of 200 years are assigned to the 6000 hectares of mature eucalypt forest designated for special timbers.

Eucalypt plantation forests (comprising either *Eucalyptus globulus* or, in areas susceptible to frost, *E. nitens*) are generally managed under a clearfelling regime, with pruning and thinning. Forestry Tasmania's strategic objective for eucalypt plantation management is to maximise the production of high quality (pruned) logs. Pruning is usually undertaken on about the first six metres of the tree in three stages. The timing and intensity of thinning depends on site productivity and wind risk. Thinning usually reduces the final stocking to about 300 stems per hectare at around age 10. However, on high quality sites value is maximized by conducting two thinning operations, at about age 8 and age 12, to a final stocking of about 200 stems per hectare. Trials of more radical thinning treatments, down to as low as 100 stems per hectare have been established and continue to be evaluated. Where the production of high quality (pruned) logs is not considered feasible, the production of alternative products (unpruned logs, peeler and pulp logs) is maximised.

Growing stock

The productive capacity of a forest over time can be measured by comparing the growing stock, i.e. the total "standing" quantity of merchantable wood, at the beginning and end of the planning horizon.

The total "standing" quantity of merchantable wood, within eucalypt forest areas available for wood production (i.e. those included in the forest estate models at the date of this review) is 41 million cubic metres.

Review method

This review incorporates the results of Forestry Tasmania's recent work to predict the yields of high quality eucalypt sawlogs and other products from public eucalypt native forests under the Tasmanian Forest Agreement (described in detail in Forestry Tasmania, 2014). In addition, this review incorporates the results of subsequent work to include predicted yields from public eucalypt plantations. The method used for eucalypt plantations is analogous to that which is used for native forests, but is based on data for eucalypt plantations.

In short, the main components of Forestry Tasmania's yield forecasting system are:

- (a) the area of each type of forest that is available for wood production, based on detailed mapping of forest types and provisional coupes;
- (b) allowances for each of the many factors that might reduce the area actually harvested, relative to the area available, based on field reconnaissance, detailed mapping and historical data;
- (c) predicted yields of each relevant forest product per hectare, for each of 95 identified forest classes, based on plot measurements, growth models and historical data; and
- (d) various constraints, based on sustainable yield principles, operational factors and supply targets over time for each relevant forest product.

The relevant data for (a) to (d) are used as inputs to a specialised forest estate modelling software system (the "Woodstock" module of the Remsoft Spatial Planning System). The outputs of each "run" are analysed, and the constraints are modified over successive iterations until an outcome that meets all relevant objectives is found.

Management strategy

Forestry Tasmania's current management strategy has evolved through the Tasmanian Forests and Forest Industry Strategy (Forests and Forest Industry Council, 1991), the Tasmanian Regional Forest Agreement (Commonwealth of Australia and State of Tasmania, 1997), the Tasmanian Community Forest Agreement (Commonwealth of Australia, 2005) and the Tasmanian Forest Agreement, *Tasmanian Forests Agreement Act (Tas) 2013* and *Forest Management Act (Tas) 2013*.

The impacts of the first three of these agreements have been documented in previous reviews of the sustainable yield of high quality eucalypt sawlogs from Tasmania's State forest (e.g. see Forestry Tasmania, 2007) and their relevant outcomes incorporated in those reviews (Forestry Tasmania, 1998, 2002 and 2007). The outcomes of the 2007 review, i.e. the then predicted yields of high quality eucalypt sawlogs, plantation solid wood and arisings from eucalypt native forests and eucalypt plantations on State forest are presented in Appendix 2, for information.

A key element of the management strategy over the period since 1991 has been to reduce progressively the harvesting of oldgrowth and mature native forest, replacing it with a harvest from regrowth native forest and plantations. However, experience in processing the produce of eucalypt plantations, especially those grown on longer sawlog rotations, is still quite limited. This means there is a substantial risk to the processors of eucalypt plantations pertaining to the cost, properties and market acceptability of the produce (Ferguson, 2013).

In 2012 the Forest Industries Association of Tasmania indicated that, based largely on overseas experience, it may be able to successfully process sufficiently-sized material from *E. globulus* plantations with existing technology (FIAT, 2012). Given the restrictions imposed by altitude, forest exposure and health issues the *E. globulus* estate represents sixteen percent of Forestry Tasmania's plantation estate (although this percentage will increase over time as Forestry Tasmania replants harvested plantations with *E. globulus* wherever climatically feasible). Processing trials on *E. nitens*, which represents the majority of the estate, have demonstrated that processing of this species with existing technology is problematic due to internal and surface checking and lower than optimal stiffness. At that time the industry did not believe that *E. nitens* was acceptable for traditional sawn timber products, nor for rotary peeled veneer products, but that more time and subsequent maturity of the resource may provide cause to review its position. Industry did however acknowledge and accept that plantation grown pruned logs can meet the existing definition of high quality eucalypt sawlog and should continue to be counted within the sustainable yield from Forestry Tasmania's estate, as prescribed under the Tasmanian Regional Forest Agreement.

Industry's concern has been addressed, to some extent, by recognising in the Tasmanian Forest Agreement that virtually no suitably sized sawlogs from plantations will become available before 2027 although this was sooner than industry's preferred position, which was that the plantation sawlog resource should be grown on to at least 2031 (FIAT, 2012).

The management strategy that has been applied in this review incorporates a number of significant changes that have arisen as a result of the Tasmanian Forest Agreement, *Tasmanian Forests Agreement Act (Tas) 2013* and *Forest Management Act (Tas) 2013*. These can be summarised as follows:

- (a) a reduction in the area managed by Forestry Tasmania, from 1.5 million hectares of State forest to 800,000 hectares of Permanent Timber Production Zone Land (excluding Future Reserve Land);
- (b) a reduction in the legislated minimum annual supply of high quality eucalypt sawlog, from 300,000 cubic metres to 137,000 cubic metres, and an intention that the new minimum quantity be supplied from native forest until at least 30 June 2027;
- (c) a reduction in the quantity of eucalypt peeler billets contracted for annual supply to Forestry Tasmania's relevant domestic customer, from 265,000 cubic metres to 157,000 cubic metres, until at least 30 June 2027;
- (d) the application of a "headroom factor", being a ten per cent discount to the modelled predicted yields of each relevant forest product, as a safety margin to account for the potential impact on harvest areas and yields of any future changes to the requirements for conservation under the Forest Practices Code (Forest Practices Board, 2000);
- (e) the inclusion of constraints to reflect current limitations on operational capacity (e.g. for cable harvesting); and
- (f) the inclusion of a constraint so that a yield of sawlogs from eucalypt plantations commences in 2027.

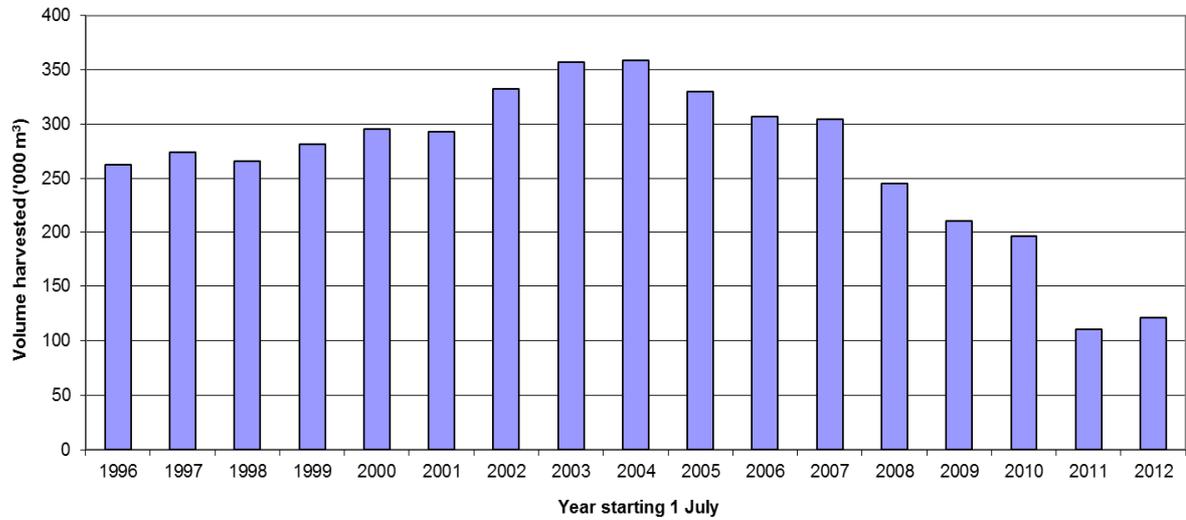
Past actual production

A look at the actual annual production for each relevant forest product over the preceding period (Figures 5 to 7) provides some context for the predicted yields that are reported in the following section. The data that are shown are sourced from Forestry Tasmania's annual reports over the period 1996/97 to 2012/13. No significant quantities of biofuel were supplied over that period.

Annual variations that are evident from the data that are shown generally represent changes in customer demand for the relevant forest products, rather than changes in Forestry Tasmania's capacity to harvest and supply those products.

Figure 5 shows the annual supply of eucalypt high quality sawlogs over the period 1996/97 to 2012/13. As with each previous review, the average actual supply for the past period, i.e. for the six years 2006/07 to 2011/12, (229,000 cubic metres per year) has been less than the quantity that was identified as being available over that period (320,000 cubic metres per year, identified in the 2007 review).

Figure 5 1996/97 to 2012/13 actual annual supply of high quality eucalypt sawlogs from State forest



Forestry Tasmania experienced a significant decline in the demand for high quality eucalypt sawlogs, from 2008/09 onwards. This decline resulted from the implementation, by its largest customer at the time, of a strategic decision to reduce the production of eucalypt sawn timber. Other customers for high quality eucalypt sawlogs continued to report strong demand for eucalypt sawn timber. However, in 2011/12, these customers also reduced their demand for high quality eucalypt sawlogs. This was because the market for their sawmill residues (i.e. for the by products of the milling process to produce sawn timber) practically ended when Forestry Tasmania's largest customer withdrew from most of its woodchip export operations. The sawlog demand has recovered somewhat since 2012, but the supply has been hampered by a number of factors including a transition out of roaded areas designated as new reserves under the Tasmanian Forest Agreement into alternative areas that required upgraded infrastructure, a weak demand for pulpwood, limited access to ports and disruptions in harvesting contractor capacity. Each of these issues is being actively addressed.

Figure 6 shows the annual supply of eucalypt peeler billets over the period 1996/97 to 2012/13. Supply to Forestry Tasmania's relevant customer commenced in mid 2007, with the commissioning of the first rotary peeled veneer mill in May of that year. Supply to the second rotary peeled veneer mill commenced in late 2008. Almost all supply has been from native forests. This reflects the requirements of the relevant customer's end markets for engineered wood products, in which strength, stiffness and hardness are key characteristics that cannot readily be met from peeler billets grown in young plantations.

Figure 6 1996/97 to 2012/13 actual annual supply of eucalypt peeler billets from State forest

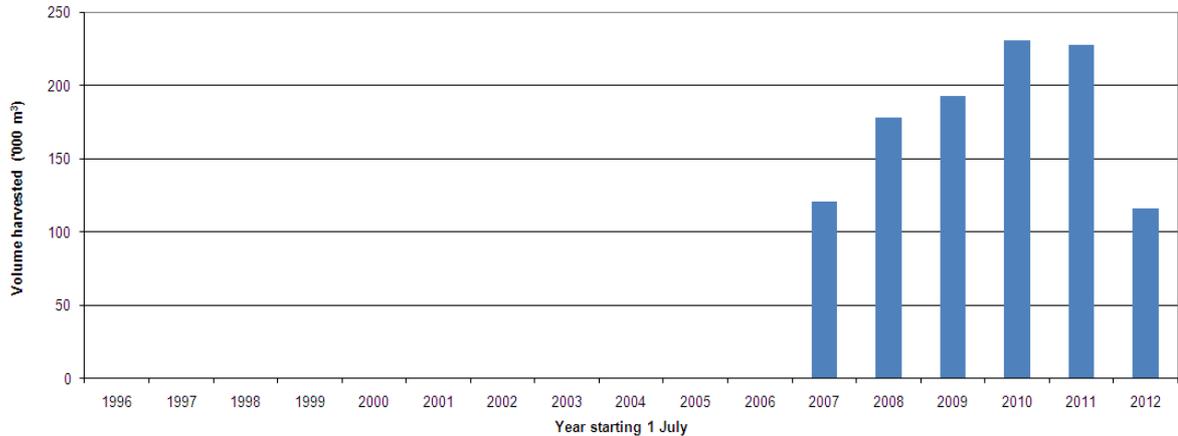
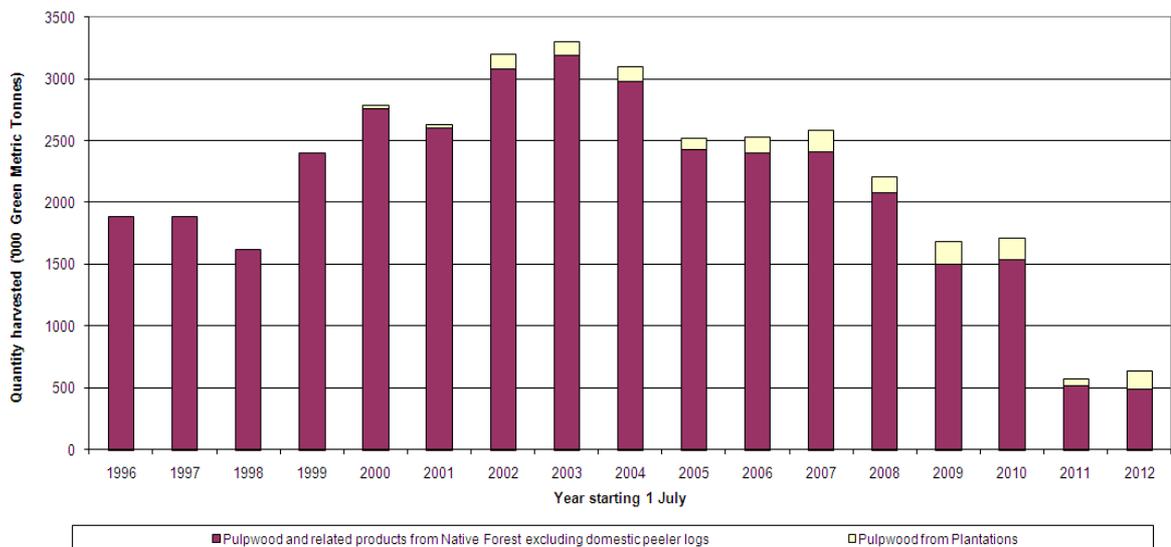


Figure 7 shows the annual supply of arisings over the period 1996/97 to 2012/13. The average supply over the period 1996/97 to 2010/11 was 2.4 million tonnes per year, ranging from 1.6 million tonnes in 1998/99 to 3.3 million tonnes in 2003/04. The average supply from 2006/07 is lower than the relevant quantities that were identified in the 2007 review, i.e. it is lower than the 2.7 million tonnes per year that was identified as available for the period 2006/07 to 2011/12 and the 2.8 million tonnes per year that was identified as available for the period 2012/13 to 2026/27 (Forestry Tasmania, 2007, p. 18).

Figure 7 1996/97 to 2012/13 actual annual supply of arisings (excluding eucalypt peeler logs) from State forest



The demand for arisings tends to be dominated by overseas markets for pulpwood from eucalypt native forests. Year to year fluctuations in this demand over most of the reporting period relate to the fluctuating strength of overseas demand for printing and writing paper, e.g. in Japan, China, Taiwan and South Korea, as well as to variations in the relative strength of the Australian dollar and in the cost of ocean freight. More recently, i.e. from 2011/12, Forestry Tasmania has experienced a significant decline in the demand for pulpwood from eucalypt native forests. This decline resulted from the implementation, by its largest customer at the time, of a strategic decision to withdraw from most of its woodchip export operations.

Yield predictions

The revised yield predictions presented in Figures 8 to 10 are for a 90 year planning horizon, from 1 July 2013 to 30 June 2102. This period notionally represents a single rotation for eucalypt native forests. The yield predictions for biofuel in Figure 11 are for a 30 year planning horizon. This is because there is, as yet, insufficient data to predict the biofuel yields for forests that are currently in the younger regrowth age classes that will be harvested from about 2043/44 onwards³.

The yield predictions are generated from biologically based forest estate modelling of productive capacity, and do not imply supply based on economic criteria. For example, the yield predictions for eucalypt plantations can only be realised if there is continuing investment in future rotations that are pruned and thinned.

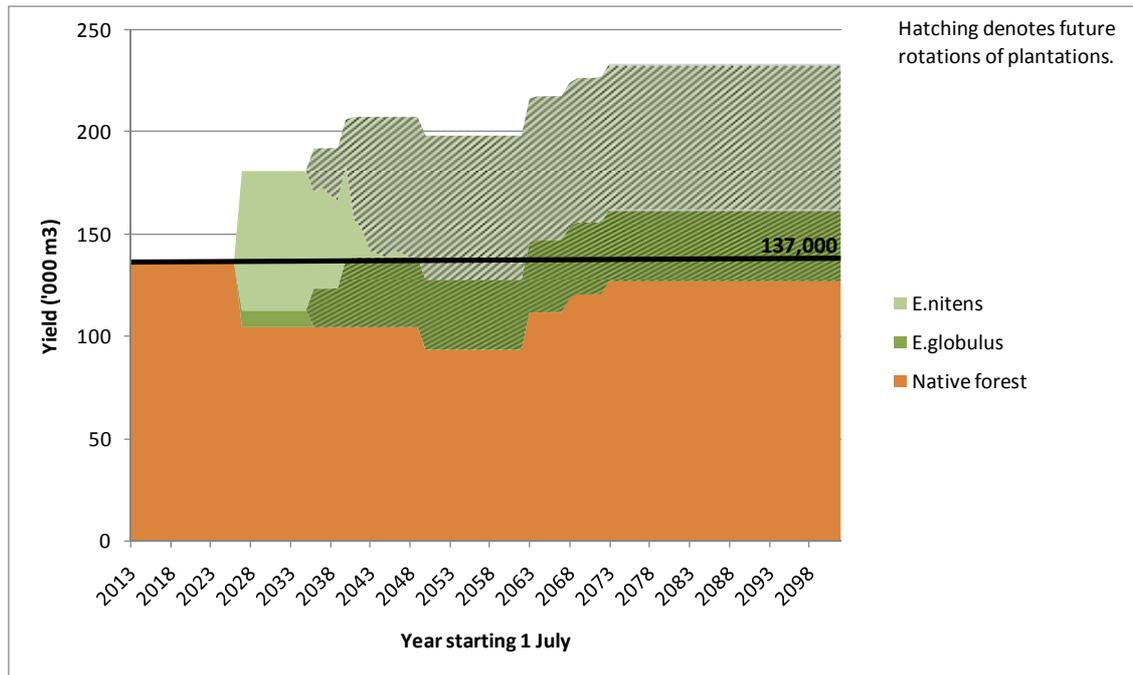
The yield predictions distinguish between production from eucalypt native forests and from eucalypt plantations and, in the case of high quality eucalypt sawlogs, eucalypt peeler billets and arisings from eucalypt plantations, between *Eucalyptus globulus* and *E. nitens*. These distinctions reflect advice from Forestry Tasmania's customers about variations in the suitability of native forest and plantation logs for various end products (e.g. sawn timber and engineered wood products).

High quality eucalypt sawlogs

The yield predictions for high quality eucalypt sawlogs, illustrated in Figure 8, indicate an ongoing sustainable yield of 137,000 cubic metres or more per year. In particular, over the period 2013/14 to 2026/27, the statutory minimum annual supply quantity of 137,000 cubic metres can be met from eucalypt native forests. Beyond that period, the predicted yield from eucalypt native forests fluctuates between about 90,000 and about 125,000 cubic metres per year, augmented by significant additional quantities of high quality eucalypt sawlogs from eucalypt plantations.

³ The dataset underlying the yield predictions for biofuel is the same as was recently provided for the TFA Residue Solutions Study (<http://www.forestsagreement.tas.gov.au/wp-content/uploads/Residues-Solutions-Study-Terms-of-Reference-Summary.pdf>).

Figure 8 Predicted yield of high quality eucalypt sawlogs from Permanent Timber Production Zone Land (excluding Future Reserve Land)

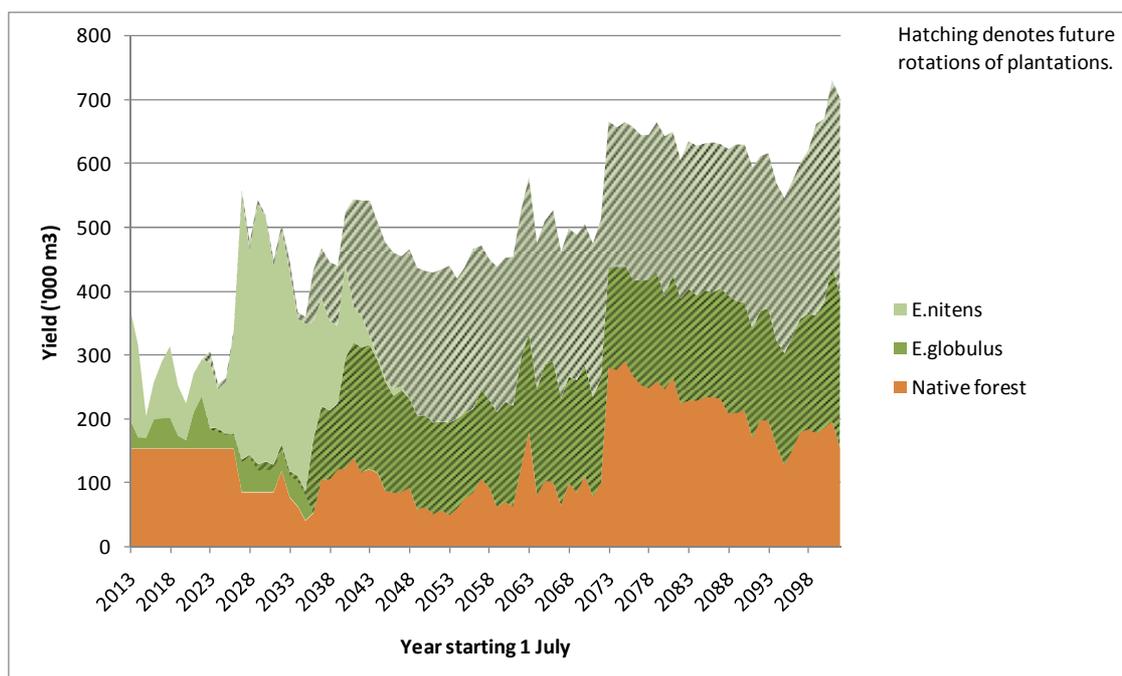


The predicted yield from plantations is separated according to the current rotation, i.e. trees currently growing, and future rotations. This assumes that plantation land will be replanted. Predicted yields of high quality eucalypt sawlogs from *E. nitens* plantations reach their predicted full capacity of about 70,000 cubic metres per year from about 2027/28. Predicted yields of high quality eucalypt sawlogs from *E. globulus* plantations reach their predicted full capacity of about 35,000 cubic metres per year from about 2041/42. These predictions assume that the proportion of *E. globulus* to *E. nitens* will be increased from a current level of sixteen percent to about 40 percent in future rotations. This is because *E. globulus* exhibits superior density, strength and pulp yield. However, *E. nitens* will continue to be the preferred species on higher altitude frost prone sites that are not suited to *E. globulus*.

Eucalypt peeler billets

The yield predictions for eucalypt peeler billets, illustrated in Figure 9, indicate that the target of 157,000 cubic metres per year can be met from eucalypt native forests throughout the relevant period, i.e. to 30 June 2027. Beyond that period, the predicted yield from eucalypt native forests fluctuates around an average of about 90,000 cubic metres per year until about 2072/73, after which the average predicted yield increases to about 215,000 cubic metres per year for the remainder of the planning horizon.

Figure 9 Predicted yield of eucalypt peeler billets from Permanent Timber Production Zone Land (excluding Future Reserve Land)



Predicted yields of eucalypt peeler billets from *E. nitens* plantations reach their long term predicted capacity of about 250,000 cubic metres per year from about 2027/28. Predicted yields of eucalypt peeler billets from *E. globulus* plantations reach their long term predicted capacity of about 165,000 cubic metres per year from about 2041/42.

In each case (i.e. for both *E. globulus* and *E. nitens*), the predicted yield of eucalypt peeler billets from eucalypt plantations over the period to 2026/27 represents significant potential to augment the predicted yield from eucalypt native forests over this period. However, this potential is subject to the suitability of plantation grown logs, particularly of *E. nitens*, for the relevant customers' end use requirements.

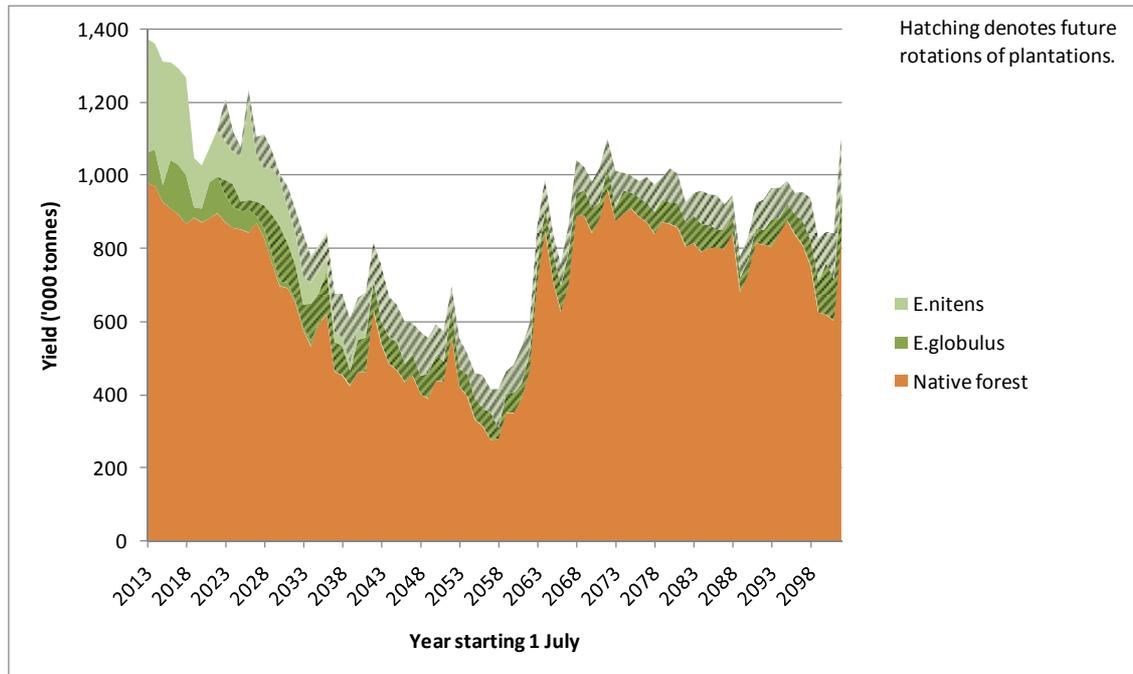
Arisings

The yield predictions for arisings, illustrated in Figure 10, indicate a steadily declining yield over the period to 2058/59, from about 1.4 million tonnes per year to about 400,000 tonnes per year. Of the initial 1.4 million tonnes per year, about one million tonnes is from eucalypt native forest (decreasing to about 300,000 tonnes per year over the period to 2058/59).

The main factor contributing to this trend is the continuation over this period of the transition, since the late 1980s, from eucalypt native forest in the mature age classes to eucalypt native forest in the older regrowth age classes. The former are generally beyond their optimum age for sawlog production, and contain a relatively higher proportion of trees with defects that make them unsuitable for high quality sawlogs, or that are too large for eucalypt peeler billets.

Beyond 2058/59, the predicted yield from eucalypt native forests increases again, to an average of about 800,000 tonnes per year. This reflects a further transition to eucalypt native forest in the younger regrowth age classes, in which the optimum age for the harvesting of trees to produce high quality eucalypt sawlogs (i.e. up to 90 years) is also characterised by the harvest of a relatively high number of other, smaller trees.

Figure 10 Predicted yield of arisings from Permanent Timber Production Zone Land (excluding Future Reserve Land)



The long term yield of arisings from eucalypt plantations is about 140,000 tonnes per year. The predicted yields during the initial period range from about 160,000 cubic metres per year to about 400,000 cubic metres per year, i.e. higher than the long term yield. This is a consequence of a marked difference in the composition of yields between many of the existing eucalypt plantations (i.e. the first rotation eucalypt plantations) and future rotations. The existing eucalypt plantation estate includes a high proportion of areas that have not been thinned or pruned under the more recently introduced silvicultural regimes that promote the growth of high quality eucalypt sawlogs and eucalypt peeler billets. The harvest of these plantations, forecast to occur over the next twenty years, is predicted to yield a relatively low proportion of high quality eucalypt sawlogs and eucalypt peeler billets, and a relatively high proportion of arisings. Future rotations, to be established following the harvest of the existing plantations, should yield a higher proportion of high quality eucalypt sawlogs and eucalypt peeler billets.

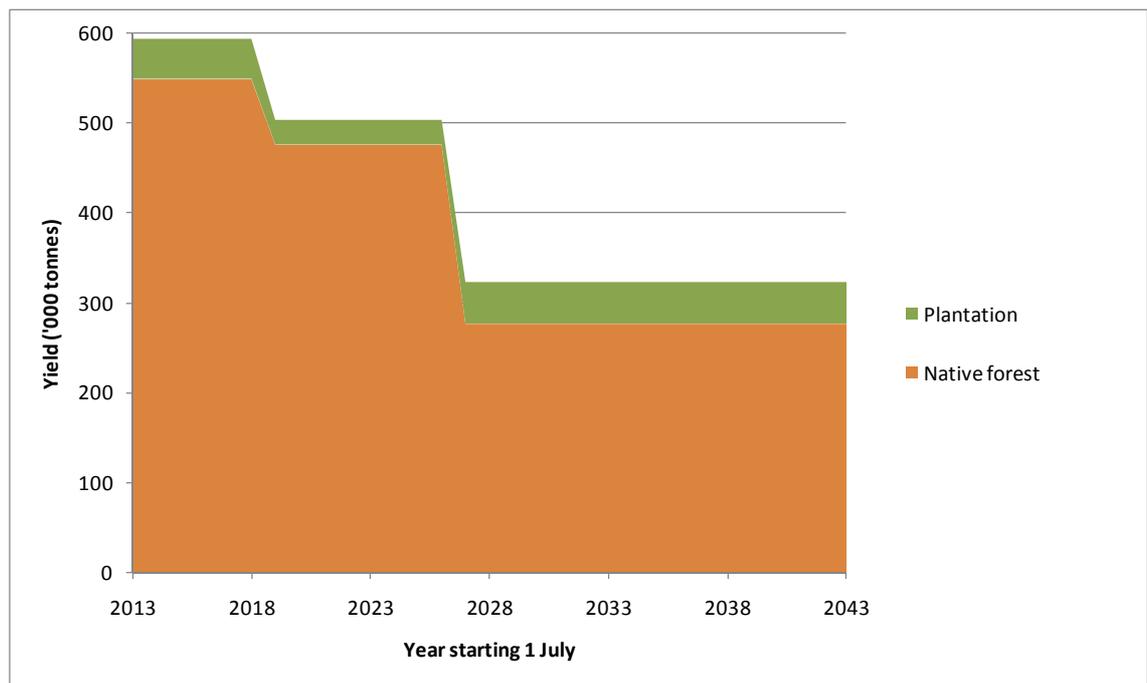
Biofuel

This review incorporates yield predictions for biofuel, illustrated in Figure 11, for the first time. The definition of biofuel is provided in the glossary, and includes logs that do not meet the specifications for a forest product of higher value. It is worth noting that such relative values are dependent on prices for the relevant products in domestic and international markets. If, for example, the price that could be achieved for biofuel were to exceed the equivalent price for pulpwood (as has occurred in Europe and North America in recent years), then the quantities of biofuel would be very much greater than is reported in this review.

For the purposes of this review, the definition excludes processing waste from veneer mills, sawmills and other wood manufacturing plants.

The predicted yield is about 600,000 tonnes per year, decreasing over the period shown to just over 300,000 tonnes per year. The decrease arises from eucalypt native forests, and relates to the continued transition from eucalypt native forest in the mature age classes to eucalypt native forest in the older regrowth age classes (as for arisings).

Figure 11 Predicted yield of biofuel from Permanent Timber Production Zone Land (excluding Future Reserve Land)



Predicted yields of biofuel from eucalypt plantations are stable throughout the period shown, at between 25,000 and 45,000 tonnes per year.

Maintaining growing stock

The predicted total “standing” quantity of merchantable wood, within eucalypt forest areas available for wood production at the end of the planning horizon (i.e. in 2102), is 50 million cubic metres. This compares with the current value of 41 million cubic metres.

This outcome meets a fundamental principle of sustainable yield, discussed recently by Ferguson (2013). This principle is that the forecast productive capacity of a forest at the end of a planning period is at least equivalent to, and preferably better than, the actual productive capacity at the start of the planning period.

Continuous Improvement

Forestry Tasmania seeks to continually improve the procedures and systems that inform planning and decision making and support the continuous improvement in our forest management, including by supporting relevant scientific research. This process is particularly relevant when predicting yields from Forestry Tasmania’s eucalypt plantation estate. For example, earlier reviews necessarily relied on very generic predictions of growth rates for recently established plantations whereas this review has largely been based on tree measurement inventory data, including where possible, information on actual stand densities and tree characteristics following final thinning. For this review, it must be acknowledged that there is minimal available data on actual versus predicted log product recoveries because very few plantations have yet been harvested for eucalypt sawlogs.

The next review of sustainable yield, due in 2017, is likely to incorporate additional information on log product recoveries as well as further use of LiDAR derived imagery, which is expected to further improve yield estimates.

Conclusion

This five yearly review was deferred from 2012, to allow the outcomes of the Tasmanian Forest Agreement to be incorporated.

This review confirms Forestry Tasmania’s ability to supply at least 137,000 cubic metres per year of high quality eucalypt sawlogs from Permanent Timber Production Zone Land, for the next 90 years. It is also evident, from the prediction of growing stock at the end of the planning horizon, that this supply level can be sustained thereafter.

In particular, this review confirms Forestry Tasmania’s ability to supply the required quantity of high quality eucalypt sawlogs, and the required quantity of eucalypt peeler billets, from eucalypt native forests over the period to 30 June 2027.

The predicted yields represent a significant reduction from the equivalent values reported in each of the three previous reviews. This reflects the outcomes of the Tasmanian Forest Agreement, *Tasmanian Forests Agreement Act (Tas) 2013* and *Forest Management Act (Tas) 2013*, by which Forestry Tasmania’s resource base was reduced by one third (i.e. about 500,000 hectares). In previous reviews, the impacts on predicted yields of reductions in the resource base have been offset by the assumed benefits of increased investment in intensive forest management. However, this review reflects a general consensus that there are very few, if any, opportunities to further increase the rate of investment in intensive forest management within the Permanent Timber Production Zone Land.

The predicted yields of high quality eucalypt sawlogs from eucalypt plantations indicate significant potential for increased supply in the future, subject to the suitability of the relevant logs for the relevant end products.

Even more so, the predicted yields of eucalypt peeler billets from eucalypt plantations indicate significant potential for increased supply in the future.

Taken together, the predicted yields for arisings and biofuel from eucalypt native forests and from eucalypt plantations, and the predicted yields for eucalypt peeler billets from eucalypt plantations, represent an ongoing opportunity for a transition in supply from traditional markets for logs other than high quality eucalypt sawlogs to new markets comprising engineered wood products and bioenergy.

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Glossary

The following definitions reflect the meanings that are given to the various terms in this review, and may not match exactly the equivalent meanings of those terms in other contexts.

Arisings

Forest products in log form, other than high quality eucalypt sawlogs, eucalypt peeler billets or biofuel, arising from the harvesting of eucalypt native forests and eucalypt plantations. Arisings may include pulpwood, export peeler logs, Category 8 sawlogs, Category 2 sawlogs and poles and posts. In the case of eucalypt native forests, arisings may include species other than eucalypt species (e.g. blackwood and silver wattle).

Biofuel

Eucalypt logs that do not meet the specifications for a forest product of higher value and that are suitable as feedstock for a biomass renewable energy plant. The quantities of biofuel reported in this review are additional to the reported quantities of other products (high quality eucalypt sawlogs, eucalypt peeler billets and arisings), but do not include processing residues from veneer mills, sawmills and other wood manufacturing plants.

Category 2 sawlogs

Eucalypt logs that meet the relevant specifications that are in common use by Forestry Tasmania, representing logs that are suitable for sawmilling but that do not meet the definition of high quality eucalypt sawlogs. In general terms, Category 2 sawlogs comprise eucalypt logs with a minimum small end diameter under bark of 30cm, a minimum length of 2.4m and external defect (according to various categories including internal decay, spiral grain, sweep, scars, limbs and bumps) that affects no more than one quarter of the log.

Category 8 sawlogs

Eucalypt logs that meet the relevant specifications that are in common use by Forestry Tasmania, representing logs that are suitable for sawmilling but that do not meet the definitions of high quality eucalypt sawlogs or of Category 2 sawlogs. In general terms, Category 8 sawlogs comprise eucalypt logs with a minimum small end diameter under bark of 30cm, a minimum length of 2.4m and external defect (according to various categories including internal decay, spiral grain, sweep, scars, limbs and bumps) that affects no more than one half of the log.

Clearfelling

A silvicultural management practice, applied in some eucalypt native forests and in plantations, in which all of the merchantable trees within a coupe are removed in a single harvest, generally followed by a broadacre, high intensity burn and aerial sowing (in eucalypt native forests) or planting (in plantations).

Engineered wood products

Panels and beams manufactured in larger dimensions than would be available from logs themselves, through various processes that involve peeling, slicing, sawing, chipping, crushing or grinding logs into smaller dimensions and then reconstituting them in larger dimensions with the aid of resins, presses and kilns. Examples include plywood, laminated veneer lumber, cross laminated panels, oriented strand board, medium density fibreboard, chipboard and hardboard.

Eucalypt native forests

Native forests in which eucalypt species are dominant.

Eucalypt peeler billets

Eucalypt logs that meet the relevant specifications under Forestry Tasmania's contract with its relevant domestic customer. These specifications exclude logs that meet the definition of high quality eucalypt sawlogs. In general terms, eucalypt peeler billets comprise sections of eucalypt logs, with diameter under bark of between 18cm and 70cm, a minimum length of 900mm, no internal decay and minimal other defect (according to various categories including spiral grain, sweep, scars, limbs and bumps).

Export peeler logs

Eucalypt logs that do not meet the definition of high quality eucalypt sawlogs or eucalypt peeler billets, or of another higher value product, but that are suitable for peeling to produce eucalypt structural veneer.

Forest Management Plan

This document is an overview of Forestry Tasmania's Forest Management System. It provides stakeholders with a high level description of how Forestry Tasmania conducts its business. In particular, it details Forestry Tasmania's approach to managing social, economic and environmental values while meeting log supply requirements from Permanent Timber Production Zone Land.

Future Reserve Land

This is a new land classification, established under the *Tasmanian Forest Agreement Act (Tas) 2013*. It applies to about 500,000 hectares of public land that is managed by Forestry Tasmania at the date of this review, but that is no longer available for forest harvesting. Management responsibilities for Future Reserve Land are to be transferred from Forestry Tasmania to another government agency, in the near future. Future Reserve Land is excluded from the forest estate on which the yield predictions in this review are based.

High Conservation Value Forest

Forests that possess one or more of the following attributes: concentrations of biodiversity values; regionally significant large landscape level forests; rare, threatened or endangered ecosystems; provide basic services of nature in critical situations; fundamental to meeting basic needs of local communities; and/or critical to local communities' traditional cultural identity.

High quality eucalypt sawlogs

Eucalypt logs that meet the relevant specifications for eucalypt “VQ1” or “VQ2” sliced veneer logs, Category 1 eucalypt sawlogs or Category 3 eucalypt sawlogs, each as defined in the *Forestry Regulations (Tas) 2009*. In general terms, high quality eucalypt sawlogs comprise eucalypt logs with a minimum small end diameter under bark of 30cm, a minimum length of 3.6m and minimal external defect (according to various categories including internal decay, spiral grain, sweep, scars, limbs and bumps).

Intensive forest management

Either eucalypt plantation management in general, or the thinning of eucalypt native forests.

LiDAR derived imagery

LiDAR stands for Light Detection And Ranging, and in this context describes data obtained from an instrument, flown in a plane above the forest, that plasters the landscape with laser strikes, and measures the distance from the instrument. The data collected enables profiles of the ground and forest canopy to be built as continuous surfaces. Coupled with tree measurements from ground-based inventory plots a continuous surface of log product yield estimates can be derived.

Native forests

Forests comprising tree species that are native to Tasmania, other than plantations.

Partial felling

A silvicultural management practice, applied in native forests, in which the merchantable trees within a coupe are removed in two or more successive harvests, generally separated by a period of at least five (and up to twenty or more) years. Partial felling may be followed by a low intensity burn and hand sowing.

Permanent Timber Production Zone Land

This is a new land classification, established under the *Forest Management Act (Tas) 2013*. For the purposes of this review, the definition excludes Future Reserve Land. It applies to the area of public land that is managed by Forestry Tasmania for wood production (about 800,000 hectares), and is the forest estate on which the yield predictions in this review are based.

Plantations

Forests established by planting seedlings in discrete rows, rather than by sowing seed. In Tasmania, plantations may be of hardwood species (i.e. *Eucalyptus nitens* or *E. globulus*) or of softwood species (generally *Pinus radiata*).

Pruning

A silvicultural management practice, applied in plantations, in which the branches on the lower section of selected trees are removed in one or more treatments. Pruning facilitates the growth of clearwood (i.e. knot free wood) that is required for high quality eucalypt sawlogs and for eucalypt peeler billets.

Pulpwood

Eucalypt logs that meet the relevant specifications that are in common use by Forestry Tasmania, representing logs that are suitable for the production of pulp and paper and that do not meet the relevant specifications for a forest product of higher value.

Rotary peeled veneer

Veneer that is produced by holding a log, rotated about its centre axis, against a large blade that peels the log in a continuous sheet. The veneer sheet is then clipped into panels that are dried and reassembled into plywood and other engineered wood products.

Rotation or rotation length

The period from the initial establishment of a forest to the final harvest of trees from that initial establishment, notionally about 90 years for eucalypt native forests that are not thinned, about 70 years for eucalypt native forests that are thinned and about 25 years for eucalypt plantations that are thinned and pruned.

Silviculture

The management of forests (in the same sense that “horticulture” means the management of plants). A silvicultural regime is a specific “recipe” for the management of an area or type of forest, comprising a schedule of treatments (e.g. establishment, pruning, thinning and harvest).

Solid wood (used in the 2007 review)

Logs from eucalypt plantations that do not meet the specifications for high quality eucalypt sawlogs, but that are potentially suitable for producing sawn boards, veneers and engineered wood products.

Special timbers forests

Native forests in which eucalypt species are not dominant. These include rainforests, mixed species forests in which species other than eucalypts are dominant, blackwood forests and silver wattle forests.

State forest

Public land, managed by Forestry Tasmania, at the time of the 2007 review. Under the Tasmanian Forest Agreement, *Tasmanian Forests Agreement Act (Tas) 2013* and *Forest Management Act (Tas) 2013*, the 1.5 million hectares of land that was formerly described as State forest has either been reclassified as Permanent Timber Production Zone Land (about 800,000 hectares) or is in existing reserves (about 200,000 hectares) or is Future Reserve Land (about 500,000 hectares).

Sustainable yield

The level of commercial timber (or product mix) that can be maintained under a given management regime, without reducing the long-term productive capacity of the forest.

TFA Residue Solutions Study

A study recommended under the Tasmanian Forest Agreement to investigate economically viable and environmentally sustainable solutions for the use of timber residues, funded by the Tasmanian and Australian government.

Thinning

A silvicultural management practice, applied in eucalypt native forests and in plantations, in which the smaller and lower quality trees within a coupe are removed in one or more treatments. Thinning may result in an interim harvest of merchantable trees. Thinning assists to accelerate the growth of the most valuable (largest and best quality) trees.

Tonnes

Refers to green metric tonnes, i.e. to the weight in metric tonnes of logs immediately following harvest. Logs and timber tend to dry out (and to lose as much as 50% of their weight), when they are processed into final products. For eucalypt logs that are measured and reported in cubic metres, one cubic metre generally weighs between 1.05 and 1.10 green metric tonnes.

7. Are you?

a Forestry Tasmania employee a Customer a Supplier

A member of:

the community the government an NGO academia

Other (please specify)

Additional written comments can be directed to:

Senior Forest Resource Planner

Division of Forest Management, Wood Planning Branch

Forestry Tasmania

GPO Box 207

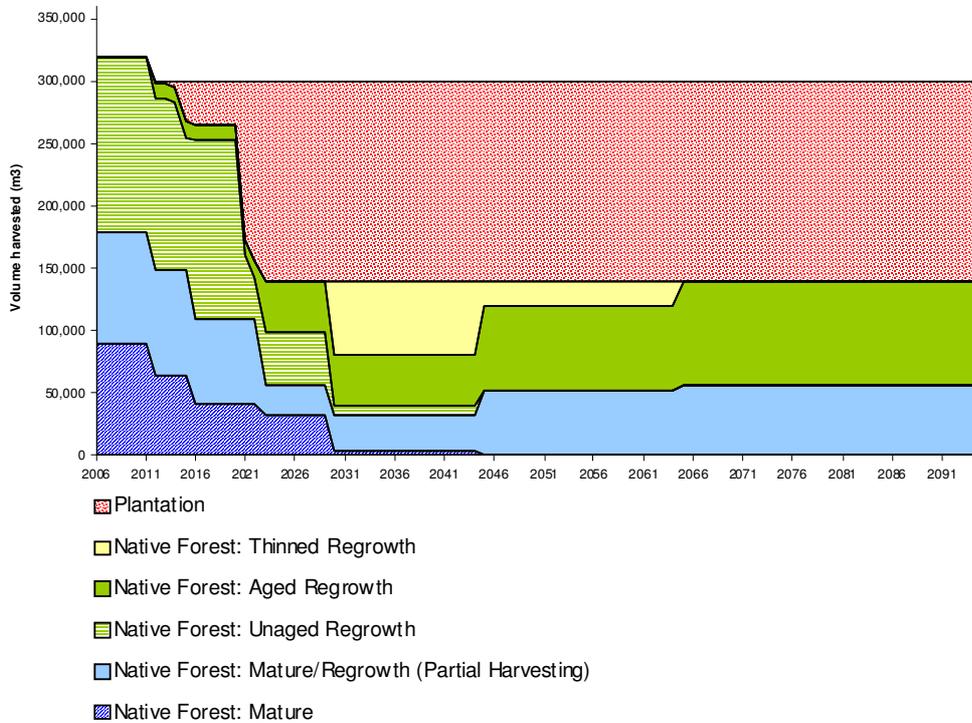
HOBART Tasmania 7001

e-mail: mike.mclarin@forestrytas.com.au

APPENDIX 2 Outcomes of the 2007 review

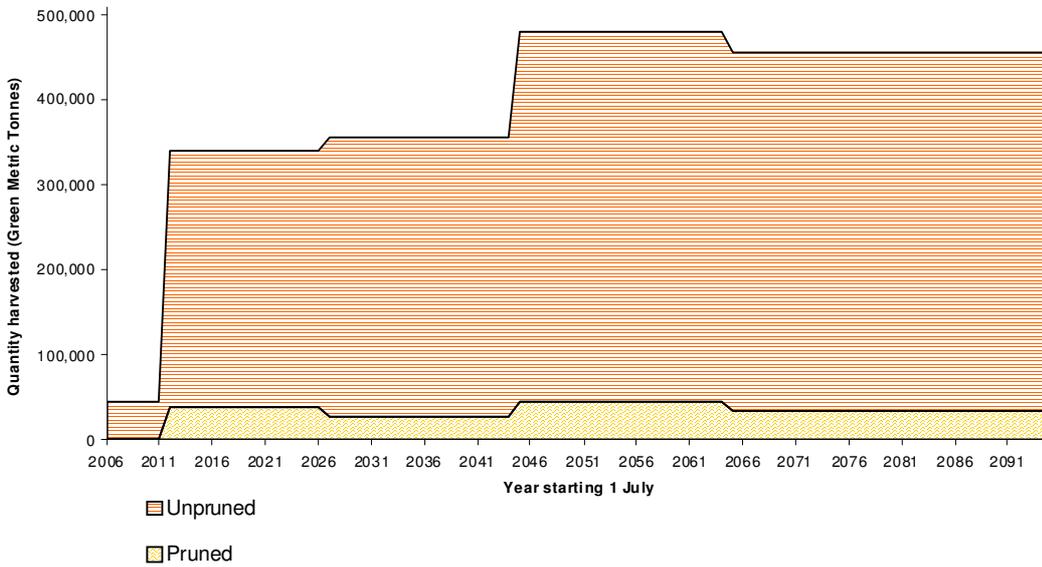
Figures A, B and C show the outcome of the 2007 review, i.e. the then predicted yields of high quality eucalypt sawlogs, plantation solid wood and arisings from eucalypt native forests and / or eucalypt plantations on State forest (Forestry Tasmania, 2007, pp. 15-18).

Figure A 2007 predicted yield of high quality eucalypt sawlogs from eucalypt native forests and eucalypt plantations on State forest



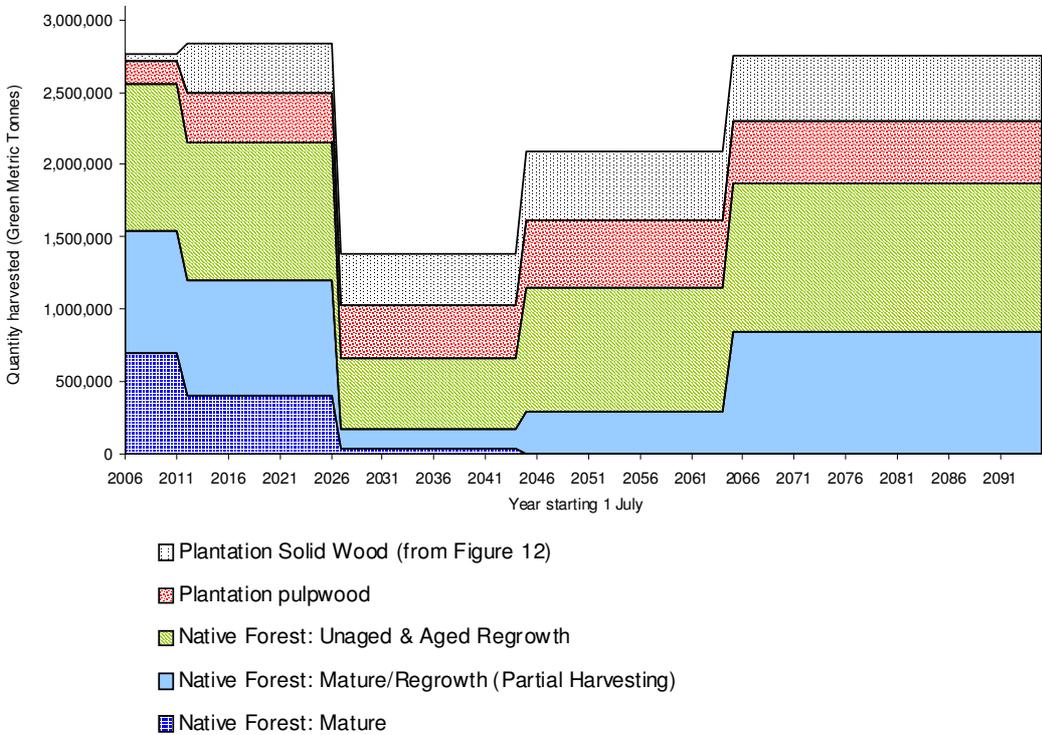
(Forestry Tasmania, 2007, p. 15)

Figure B 2007 predicted yield of solid wood from eucalypt plantations on State forest



(Forestry Tasmania, 2007, p. 17)

Figure C 2007 predicted yield of arisings from eucalypt native forests and eucalypt plantations on State forest



(Forestry Tasmania, 2007, p. 18)