

Audit of timber harvesting and forest regeneration in State forests in eastern Victoria

Department of Environment, Land, Water and Planning

Report on the 2016-17 Forest Audit Program

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Executive Summary

Audit scope and objectives

Environmental audits of timber harvesting operations in State forests (the Forest Audit Program; FAP) have been undertaken since 2002. The FAP has sought to assess compliance with the regulatory framework for those operations and identify and assess any risk of harm they pose to the environment. The program was initially managed by the Environment Protection Authority (EPA), but has been managed by the Department of Environment, Land, Water and Planning (DELWP) since 2010.

The 2016-17 FAP addressed mandatory compliance elements, based on the *Code of Practice for Timber Production* (the Code) and the *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State forests* 2014 (the MSPs). These were selected by DELWP's Timber Harvesting Compliance Unit and related to three themes:

- Protection of soil, water and biodiversity values from adverse impacts associated with harvesting and incoupe roading;
- · Design, construction, maintenance and closure of in-coupe roads;
- · Forest regeneration.

Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by DELWP to deliver the 2016-17 FAP. Compliance with the regulatory framework for harvesting and roading activities was assessed for 30 coupes

located in State forests within the Central, Central Gippsland, Dandenong and East Gippsland FMAs. Two of these coupes were located in Melbourne Water catchment areas. The component of the audit which considered forest regeneration included four coupes located in State forest within the Tambo FMA (Figure ES.1).

This report documents the approach to and findings of the 2016-17 FAP.

Audit approach

Prospective coupes for the audit of harvesting and roading activities were selected from a list of coupes included in VicForests' current *Timber Release Plan*. Selection was targeted towards coupes with high risk features (e.g. waterway crossings, long lengths of in-coupe road) or special values (e.g. rainforest,





Figure ES.1 Victorian Forest Management Areas

Leadbeater's Possum habitat). Regeneration coupes included in the audit were selected from a group of coupes in the Mount Delusion State forest for which DELWP held concerns about the success of regeneration.

As coupe selection was risk-based, audit findings cannot be taken as being statistically representative of VicForests' operations overall.

Audit criteria were based on mandatory requirements of Code compliance elements selected by DELWP's Timber Harvesting Compliance Unit. Most commonly they specifically referenced compliance elements from the MSPs and its Planning Standards which provide more detailed interpretations of Code requirements. Compliance criteria were grouped into three main compliance themes, with several sub-themes, as follows:



- *Environment:* which relate to compliance criteria drawing on Section 2.2 of the Code (*Environmental values in State forests*) and related compliance elements from the MSPs and PS. There were three environmental sub-themes: soil, water (incorporating flows, water quality and river health) and biodiversity. Some audit criteria related to more than one of the sub-themes.
- *Roading:* which relate to compliance criteria drawing on Section 2.4 of the Code (*Roading for timber harvesting operations*) and related compliance elements from the MSPs. There were four roading sub-themes: design, construction, maintenance and closure. Some of the roading compliance elements are also relevant to water and biodiversity sub-themes.
- *Regeneration:* which relate to compliance criteria drawing on Section 2.6 of the Code (*Forest regeneration and management*) and related compliance elements from the MSPs. There were no sub-themes for regeneration.

Audits of the 30 harvesting coupes considered up to 104 compliance criteria¹ across environmental and roading themes. For each coupe an audit workbook was completed and various details of the harvesting and roading activities examined. Where instances of non-compliance with the regulatory framework were detected, their potential environmental impact was assessed using a modified version of the FAP's environmental impact assessment (EIA) tool. Regeneration audits considered only seven criteria overall, but were mainly focussed on assessing post-regeneration stocking levels.

VicForests personnel accompanied the audit team on all coupe assessments. This enabled useful discussions about planning and management practices, applicable elements of the regulatory framework and of any non-compliances which were observed.

Field assessments for the audit were undertaken between June and October 2017.

Audit findings

Compliance with environmental and roading criteria for harvesting coupes

On average, the audited coupes fully complied with 86% of applicable environmental and roading criteria, with the level of compliance for individual coupes varying between 71% and 100%. The average level of compliance² ranged across audit themes, as follows:

Environmental compliance elements:

- Protection of forest soils: 83% (56-100%);
- Protection of water flows, water quality and river health: 85% (60-100%);
- Protection of biodiversity values: 90% (70-100%).

Roading compliance elements:

- Road design: 57% (0-100%);
- Road construction: 79% (0-100%);
- · Road maintenance and closure: 73% (0-100%).
- Some non-compliance "incidents" (e.g. an inappropriately constructed waterway crossing) may be assessed against several criteria and result in multiple non-compliances. The average number of individual non-compliance incidents was 1.4 per coupe, with actual number ranging between zero and five.

The amended EIA tool was used to assess the potential environmental impact associated with each (full) noncompliance incident. The assessed environmental impact ranged between negligible and major across the 43 recorded incidents, with moderate and major being the most common levels of potential impact. Noncompliances which were assessed to have major environmental impact were detected in eight of the 30 harvest coupes.

Most incidents with major potential environmental impact were associated with waterway crossings. The main issues associated with non-compliances were:

¹ Of the 104 potentially applicable audit criteria, only 84 were found to be applicable to the audited coupes.

² The lists below show the average level of compliance across all coupes, plus (in parentheses) the range in compliance levels for the group of audit criteria. Note that, as previously stated, the level of compliance is for the audited coupes (only) and cannot be considered to be representative of VicForests operations overall.



- · Management of road drainage on the entry to the waterway crossing;
- Failure to provide for the passage to fish and other aquatic fauna;
- · Erosion at the outlet of the culvert;
- · Rehabilitation following culvert removal.

Evidence from this and previous audits suggests that the design, construction and rehabilitation of waterway crossings by VicForests and its contractors' is consistently deficient and in need of improvement.

The other incident with assessed major potential environmental impact involved harvesting within 40 m of what was assessed by the auditors to be a warm temperate rainforest stand which exceeded 0.4 ha in area³. Harvesting occurred in a what was supposed to be an unharvested buffer but did not occur in the rainforest stand.

Stocking of regeneration coupes

The four coupes included in this component of the audit were all assessed by VicForests to be adequately regenerated and had been finalised and handed back to DELWP for on-going management. The audit found that stocking was adequate on only two of the four coupes. Regenerating eucalypts on the other two of the coupes had clearly been affected by grazing (by livestock, feral animals, fauna and insects) and competition from the dense grass cover in the nearly three years between the regeneration survey and this audit.

VicForests' responses to previous audit recommendations

Three separate audits were commissioned by DELWP as part of its 2015 FAP. Each audit had a specific compliance priority:

- · Construction and maintenance of in-coupe roads;
- · Construction and rehabilitation of waterway crossings;
- · Protection of mandatory exclusion areas from the impacts of harvesting.

Waterway crossings were considered in both the in-coupe road and waterway crossing audits.

The audits made a total of 35 recommendations to VicForests. While VicForests did not explicitly disagree with many of the recommendations, it proposed few specific actions in response. Responses to 12 of the recommendations were deferred until outcomes of an independent engineer's review of its roading documentation have been finalised. That process has not yet been completed. Most other recommendations were referred (appropriately) to DELWP, VicForests' routine practices (as per its *Utilisation* Procedures) or reviews during internal audit processes.

Recommendations

Findings of this audit have led to a series of recommendations for VicForests and DELWP (Table ES.1). Recommendations to VicForests address potential improvements in the management of timber harvesting and related roading activities and those to DELWP address potential improvements to the regulatory framework, including the Forest Audit Program.

The priority given to recommendations reflects either the potential environmental impact associated with the aspect of harvesting practice or the importance of the recommendation to the effectiveness of the regulatory framework.

³ Note that this finding is disputed by VicForests,



Table ES.1 Recommendations of the 2016-17 Forest Audit Program

Recommendations for VicForests	Recommendations for DELWP
High priority:	
V2: VicForests should thoroughly review its approach to the design, construction and rehabilitation of waterway crossings to significantly improve their compliance with regulatory requirements. This review should consider the suggestions included in Section 5.3.1.	D1: DELWP should revise the wording of the <i>Management</i> <i>Standards and Procedures</i> and their <i>Planning Standards</i> to provide consistent, unambiguous guidance on the requirements for providing unharvested buffers around rainforest stands equal to or larger than 0.4 ha in area, including those associated with rainforest sites of significance.
	D3: DELWP should develop a process for reviewing and acting on key findings and recommendations from each years' forest audit program.
Moderate priority:	
V1: VicForests should modify its coupe planning process to ensure that in East Gippsland FMA, areas with >25° slope in coupes which have granite-derived soils are specifically identified during coupe planning and excluded from harvesting. V3: VicForests should review its approach to the design and construction of large in-coupe road or landing embankments to reduce the incidence of failure during or following their use. This review should consider the suggestions included in Section	 D2: DELWP should develop a science basis for prescribing the provision of fish passage at waterway crossings and implement this in the next revision of the regulatory framework for timber harvesting. D4: DELWP should adopt the revised EIA tool developed for this years' audit program. D5: DELWP and VicForests should gather information on actual course attributes to support audit course selection rater than
5.3.2.	information from the coupe planning stage.
V4: VicForests should continue to review its approach to regeneration burns to identify and implement opportunities to reduce unintended impacts in unharvested buffer areas.	D6: DELWP should maintain a register of coupes included in the FAP.



Glossary

Audit criteria	Criteria used to assess whether timber harvesting and related activities are consistent with mandatory requirements of the Code and MSP.
Code	The Code of Practice for Timber Production 2014, which lists mandatory actions for timber harvesting activities in native forests and plantations in Victoria.
Compliance	Compliance with audit criteria. Activities were assessed to comply (or fully comply), not comply or partly comply with audit criteria. Part compliance was determined where the actions did not fully comply with the compliance element, but no environmental impact assessment was required or applicable. Environmental Impact Assessment (EIA) ratings were applicable to instances of non-compliance.
Coupe	An individual management unit within forests and plantations where timber harvesting or thinning activities are planned and conducted. Under the <i>Sustainable Forests (Timber) Act</i> 2004, a coupe is a specific area of State forest identified for the purposes of timber harvesting and regeneration in a Timber Release Plan.
DELWP	Department of Environment, Land, Water and Planning: DELWP has responsibility for environmental regulation of timber production activities in State forests. DELWP were formerly known as the Department of Environment and Primary Industries (DEPI).
EIA rating tool	A tool developed for the FAP to provide a consistent basis for assessing the potential environmental implications of non-compliance with audit criteria.
FAP	Forest Audit Program – an annual program of environmental audits coordinated by DELWP to ensure that timber production operations in State forests provide for sustainable forest management.
Filter strip	A protective boundary around a drainage line, temporary stream or buffer strip. Trees may be harvested from within the filter strip, although they may not generally be entered by harvesting machines.
Forest coupe plan (FCP)	A plan that is prepared for each coupe that describes the biophysical character of the coupe and the nature of planned harvesting operations. The minimum content requirements of a FCP are specified in the Code. The FCP is contained within a coupe file that includes other information, including coupe monitoring records, traffic management provisions and silvicultural operations. The coupe file may also refer to information about the coupe and its operations that is held within a VicForests or DSE information management system.
Forest Management Area (FMA)	The basic regional unit for forest planning used for public land in Victoria. These forest planning units are not administrative units.
Incident	An event, action or lack of action on a coupe that gives rise to an assessment of non or partial compliance with an audit criterion. The nature of the audit criteria and various prescriptions mean that a single incident may result in multiple non-compliances.
In-coupe road	A temporary road constructed to provide access to landings and/or allow haulage of timber from the coupe.
Landing	An area within the coupe that is specifically developed to sort, process and/or load trees or parts of trees for transport from the forest. Top soil is removed before landings are developed. Landings must be rehabilitated at coupe closure unless they are to be used for an adjacent coupe.
MSP	Management standards and procedures for timber harvesting operations in Victoria's State forests 2014. They are designed to help interpret the Code for timber harvesting and related activities in State forests. They are a secondary source of mandatory prescriptions for forest management.
Rough heaping	A method of preparing coupes for regeneration, generally following failure of initial attempts. Remaining woody material is pushed into heaps and burnt. Soils, understorey and coupe infrastructure are disturbed to create a receptive seed bed.
Snig track	A track through a harvested coupe along which harvested logs are towed or winched, normally towards a landing.



Soil erosion hazard	Soil erosion hazard (or SEH) is a composite index of the potential for soil erosion to occur within a forest coupe. SEH is based on field assessments of soil texture, aggregate stability, structure, colour, organic content, mottling and stoniness. It also takes account of the erosivity of rainfall at the location, average slope, slope length, tree size and revegetation capacity. The method of calculation is described in the MSP (DEPI, 2014b). SEH is assessed for each coupe during harvest planning.
State forest	Publicly-owned and managed forest estate. Victoria has 3.4 million ha of State forest. State forest is managed for multiple beneficial uses, including conserving flora and fauna, protecting water catchments and water supply, providing timber for sustainable forestry, protecting landscape, archaeological and historic values, and providing recreational and educational opportunities.
Timber Release Plan (TRP)	Timber resources in State forests in eastern Victoria are allocated to VicForests for the purposes of harvesting and/or selling through the Allocation to VicForests Order 2004 (as amended). The Allocation Order specifies the extent and location of the forest stands to which VicForests has access under this Order. VicForests must prepare a Timber Release Plan for allocated areas.
	Timber Release Plans (TRPs) are publicly available documents that must include: a schedule of coupes selected for timber harvesting and associated access road requirements; details of the location and approximate timing of timber harvesting in the proposed coupes; and details of the location of any associated access roads. They are prepared by VicForests in accordance with Part 5 of the <i>Sustainable Forests (Timber) Act</i> 2004, and may be reviewed and changed in accordance with section 43.
UP	Utilisation Procedures for all Commercial Harvesting and Haulage Managed by VicForests. VicForests documentation which provides the basis for design and construction of in-coupe roads and contains other specifications for how VicForests manage timber harvesting operations in accordance with the mandatory requirements of the Code and MSP.



1. Introduction

1.1 Sustainable Forest Management in Victoria

The legislative framework for the harvesting and management of timber resources in Victoria's State forests is provided by the *Forests Act 1958*, the *Conservation, Forests and Lands Act 1987* (the CFL Act) and the *Sustainable Forests (Timber) Act 2004* (the SFT Act). The latter establishes the current regulatory framework for the sustainable harvesting of timber resources from State forests in Victoria.

Under the SFT Act, harvesting of timber from public land by VicForests is to be conducted in a manner which is consistent with the principles of ecologically sustainable development. The Act provides for the development of a Sustainability Charter (DSE, 2006), which sets out the State's objectives for sustainable forest management. These objectives are to:

- · Maintain and conserve biodiversity in State forests;
- · Maintain and improve the capacity of forest ecosystems to produce wood and non-wood products;
- · Promote healthy forests by actively managing disturbance;
- · Maintain and conserve the soil and water resources of State forests;
- Maintain and better understand the role of Victoria's State forests in global carbon cycles;
- · Maintain and enhance the socio-economic benefits of State forests to Victorian communities;
- Ensure Victoria's legal, institutional and economic frameworks effectively support the sustainable management of State forests.

The SFT Act requires VicForests and its contractors to comply with relevant Codes of Practice. Under the CFL Act, the Minister may make such Codes of Practice, including for sustainable forest management, to specify management standards and procedures. The SFT Act provides for the Minister to seek an audit of VicForests' compliance with relevant Codes of Practice. In reviewing VicForests' Allocation Order, the Minister will also have regard to VicForests' compliance with such Codes.

The regulatory framework for sustainable forest management requires organisations and individuals undertaking commercial timber harvesting on public land to comply with two Codes of Practice, the *Code of Practice for Timber Production 2014* (the Code; DEPI, 2014a) and the *Code of Practice for Bushfire Management on Public Land 2012*, as well as various management prescriptions and guidelines. These Codes of Practice are administered by the Department of Environment, Land, Water and Planning (DELWP) on behalf of the Minister for Energy, Environment and Climate Change.

1.2 Forest Audit Program

Since 2002, auditors (appointed under the *Environment Protection Act 1970*) have been engaged to undertake environmental audits of timber harvesting operations in State forests. These audits have assessed compliance with the Code and related standards and management procedures. This program of audits was initially administered by the Environment Protection Authority (EPA), but has been delivered by DELWP⁴ since 2010.

The Forest Audit Program (FAP) has undergone several major changes since it was first delivered by DELWP. This has reflected changes to the regulatory framework (including the revision of the Code and Management Standards and Procedures in 2014), as well as the adoption of a risk-based approach to the selection of audit compliance priorities. The 2015 FAP focussed on three compliance priorities: construction and maintenance of in-coupe roads; construction and rehabilitation of waterway crossings; and protection of mandatory exclusion areas from the impacts of harvesting. Separate audits were commissioned for each compliance element as part of the 2015 program.

⁴ The audits have been delivered by DELWP and its predecessor agencies, Department of Sustainability and Environment (DSE) and Department of Environment and Primary Industries (DEPI).



For its 2016-17 FAP, DELWP commissioned a single audit, which has considered a relatively broad suite of mandatory Code compliance elements, including parts of the following sections:

- Section 2.2. Environmental values in State forests: including values associated with waterways and soils (section 2.2.1), as well as biodiversity (section 2.2.2);
- Section 2.4. Roading for timber harvesting: including provisions relating to road design (section 2.4.2), construction (section 2.4.3), maintenance (section 2.4.4) and closure (section 2.4.6); and
- Section 2.6 Forest regeneration and management: specifically, section 2.6.1 on forest regeneration.

The first two sets of compliance elements cover a broadly similar scope and set of audit priorities to the 2015 FAP audits. Regeneration has not been considered in the audit program since 2013 (SKM, 2013).



2. Audit scope

2.1 Audit objectives

The FAP's objectives are to assess VicForests' compliance with the regulatory framework for timber harvesting activities in Victoria's State forests, as well as any risks these activities pose to the State's sustainable forest management objectives. Compliance elements considered by this audit mainly consider risks to soil, water and biodiversity values within timber harvesting coupes and surrounding forest and catchment areas.

2.2 Audit scope

The audit addresses mandatory compliance elements drawn from both the Code and *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State forests 2014* (MSPs⁵; DEPI, 2014b). The compliance elements selected by DELWP for the audit seek to ensure that harvesting and roading activities are conducted so that the range and quantity of environmental goods and services provided by State forests are maintained. The specific compliance elements which form the scope of this audit are listed in Appendix A.

Compliance with regulatory requirements for coupe harvesting and roading activities was assessed in 30 coupes located in State forests within the Central, Central Gippsland, Dandenong and East Gippsland Forest Management Areas (FMAs), where timber harvesting or associated activities had taken place during the 2015-16 financial year. The audit of forest regeneration considered four coupes located in State forest within the Tambo FMA. Locations of all 34 coupes included in the audit are shown in Figure 2.1.



Figure 2.1 Locations of coupes included in 2016-17 Forest Audit Program

⁵ This also includes the *Planning Standards for timber harvesting operations in Victoria's State forests* (DEPI, 2014c), which is published separately, but is Appendix 5 of the MSP.



2.3 Audit timing

DELWP requested that this audit be conducted in two phases, each with a field and reporting component:

- *Phase 1:* this phase was a field-based audit which considered a limited suite of compliance elements on a sub-set of the coupes to be included in the audit. An interim assessment of compliance with the regulatory framework was made and briefly reported (Jacobs, 2017). Phase 1 was undertaken in June 2017.
- Phase 2: a field-based audit which considered applicable compliance elements in 30 harvesting coupes and four regeneration coupes. The field component of this audit was carried out in September and October 2017. Assessments for the ten Phase 1 coupes were extended to consider all compliance elements included in Phase 2 of the audit. Phase 1 coupes were only revisited in Phase 2 if additional field-based assessments were required.

This report is only concerned with the Phase 2 audits. Its findings supersede those documented in the Phase 1 report.

2.4 Audit team

DELWP engaged an audit team from Jacobs Group (Australia) Pty Ltd (Jacobs) to undertake this audit. That team comprised:

- Craig Clifton (Project Manager and Lead auditor): Craig is an EPA-appointed environmental auditor (natural resources). He developed the audit methodology, led the field assessments and their analysis and is lead author of this audit report. Craig is an experienced environmental auditor and has led audit teams undertaking five previous FAP audit projects. He has extensive experience with the regulatory framework for timber harvesting in Victoria's State forests.
- David Endersby (Project Director, audit team member and technical reviewer): David is a principal
 ecologist with extensive experience in ecological survey. He has participated in a previous FAP audit and
 assisted with field assessments in both Phases 1 and 2 of this audit. David acted as the internal technical
 reviewer for this report and also served as Jacobs' Project Director.
- Dr Drew King (Audit team member): Drew is an experienced senior ecologist with extensive ecological survey experience. He has previous experience in timber harvesting compliance investigations. Drew assisted with field assessments in both phases of the audit.
- *Mike Timms (Audit team member):* Mike is a graduate ecologist and assisted with field assessments in Phase 2 of the audit.
- Dr Simon Treadwell (Audit team member): Simon provide advice on the appropriateness of Code and MSP compliance elements relating to the provision of passage for fish and other aquatic fauna. Simon is a principal aquatic ecologist and has extensive experience in aquatic ecology and environmental water management.



3. Audit approach

3.1 Coupe selection

DELWP specified that the harvesting and roading components of this audit would include 30 coupes, distributed between East Gippsland FMA and the Central Highlands and Gippsland groups of FMA⁶. At least two of the 30 coupes were required to be located within Melbourne Water's water supply catchment areas. A further four (finalised) regeneration coupes were also to be included in the audit.

3.1.1 Timber harvesting coupes

Selection of the targets for the timber harvesting component of the audit was based on a list of operational coupes for the 2015-16 financial year, which was provided by VicForests to DELWP. The list (organised by VicForests region⁷ rather than FMA) included harvesting coupes in Central, Central Gippsland, Dandenong and East Gippsland FMAs (Figure 2.1). It also included data which supported coupe selection. This was from VicForests' coupe planning and referred to:

- . Inherent characteristics of the coupe: including slope, soil erosion hazard, forest type, coupe size;
- Protected environmental values located within or near the coupe: including the presence of (modelled) rainforest vegetation or high conservation value native fauna (e.g. Leadbeater's Possum, Long-footed Potoroo, Owls) and whether the coupes were located in a designated water supply catchment;
- Forest management zoning characteristics: including the presence and characteristics of any Special Protection or Special Management Zones (SPZ and SMZ, respectively); and
- *Planned coupe development activities:* including the planned length of in-coupe road, likely construction of waterway crossings, silvicultural system and marked harvest area.

Three main compliance themes were used to prioritise the selection of audit coupes:

- · Presence of rainforest;
- · Likely construction of waterway crossings; and
- · Planned length of in-coupe roads.

These themes represent issues with high potential for risk to water quality and biodiversity values. The bias in selecting audit targets towards coupes with these higher risk issues or values means that the audit findings are not statistically representative of VicForests' harvesting operations as a whole. However, the concentration of sampling on coupes with rainforests, waterway crossings and (longer) in-coupe roads provides a robust basis for identifying any consistent features (positive or negative) of VicForests' practice in relation to these issues.

A two-stage selection process was used. All coupes with rainforest and/or waterway crossings were included in a "long-list" of up to 16 coupes for each of the three VicForests regions for which data were provided. If there were not 16 coupes with either or both of these characteristics, additional coupes were included in the long-list, based on the length of in-coupe road. A "short-list" of 10 coupes were selected at random from the long-list, with three additional coupes nominated as reserve coupes in case it was not possible to access one or more of the target coupes during the audit field program⁸. The general locations of the 30 harvest coupes included in the audit are given in Figure 2.1.

⁶ As defined in the MSPs: Central Highlands FMAs refers to Central and Dandenong FMAs and parts of the Central Gippsland FMA referred to in the Central Highlands Forest Management Plan; Gippsland FMAs refers to parts of the Central Gippsland and North East FMAs referred to in the Gippsland Forest Management Plan and Tambo FMA.

⁷ The list included three VicForests regions: North East, West Gippsland and East Gippsland. North East region includes much of the Central FMA and other areas. West Gippsland region includes Dandenong and Central Gippsland FMAs and parts of Central FMA. East Gippsland region includes East Gippsland FMA and parts of Tambo FMA.

⁸ Only one of the reserve coupes was included in the audit. This Was required to replace a coupe (814-504-0003 Berylium) in East Gippsland FMA. The coupe was located in quite a remote area, beyond a locked gate. The road accessing the general area had not been cleared following 2017 winter and hence it was considered unlikely that the coupe could be reached. The coupe was substituted by 892-508-0006 Last Minute.



The harvested area within the 30 coupes included in the harvesting component of the audit (Table 3.1) ranged between 1.1 ha and 37.5 ha, with the average being 16.5 ha. All coupes were planned to have in-coupe roads, with the average planned length exceeding 400 m. In only eight of the 30 audited coupes, was the actual length of in-coupe road within ± 100 m of the planned length. The actual length of in-coupe road exceeded the planned length by 100 m in eight of the coupes and was at least 100 m shorter than the planned length in the remaining 14 coupes.

Table 3.1 Location and characteristics of audit coupes

#	Coupe ID	FMA ¹	Name	Area ²	ICR ³	WWX ⁴	RF⁵	Fauna ⁶	Soil EH ⁷	WSC ⁸
1	286-505-0021	СТ	Duke	25.6	50	Yes	Yes		Mod	
2	287-511-0003	СТ	Lift Off	25.5	500	Yes	Yes		Mod	
3	287-512-0025	СТ	Low Down	19.1	500	Yes	Yes		Mod	
4	288-516-0006	СТ	Hogsmeade	16.6	600	Yes	No		Mod	
5	288-518-0008	СТ	Giraffe	29.6	200	Yes	Yes		Mod	
6	288-518-0010	СТ	Zebra	23.3	800	Yes	Yes		Mod	
7	300-917-0005	СТ	Mosquito ^A	23.5	50	Yes	Yes		Mod	
8	309-512-0001	СТ	Lil Jon ^A	6.8	300	Yes	Yes		Mod	Yes
9	312-512-0003	СТ	Zombie ^A	20.4	500	Yes	Yes	LBP	Mod	Yes
10	317-508-0005	СТ	Swinglow	16.4	200	Yes	Yes	LBP	Mod	Yes
11	345-505-0006	DD	Hairy Hyde	2.6	900	Yes	Yes		Low	
12	348-515-0004	DD	Greendale ^A	18.4	100	No	Yes		Low	
13	350-503-0008	DD	Worlley Hill	20.9	380	No	Yes	LBP	Low	Yes
14	457-501-0026	CG	Craven Cottage ⁸	29.4	500	No	Yes	LBP	Mod	Yes
15	458-506-0006	CG	Makybe Diva	8.1	450	Yes	Yes	LBP	Low	Yes
16	459-504-0013	CG	Ghee	6.4	50	No	Yes	LBP	Mod	Yes
17	461-510-0013	CG	Srixon ^A	24.9	250	No	Yes		Mod	
18	462-506-0003	CG	Tropical ^A	9.2	250	Yes	Yes	LBP	Mod	Yes
19	463-505-0008	CG	Turkey Neck	15.5	150	Yes	Yes		Mod	
20	492-501-0004	CG	Shot ⁸	8.8	300	No	No		Mod	Yes
21	836-507-0007	EG	Net Set Go ⁹	1.1	300 ¹¹	No	Yes	LFP	Mod	
22	842-518-0035	EG	Bellman ^A	3.6	999	Yes	No		Mod	Yes
23	864-505-0011	EG	Epiphone ^A	16.4	300	Yes	Yes		Low	Yes
24	867-502-0007	EG	Take Me Home ^A	9.1	400	Yes	Yes		Mod	
25	885-515-0003	EG	Comp 515	16.8	999	No	Yes	LFP	Mod	Yes
26	892-508-0006	EG	Last Minute	21.8	550	No ¹⁰	Yes		Low	
27	894-505-0002	EG	Pollux	37.5	400	Yes	No		Mod	
28	894-505-0003	EG	Pan	11.5	600	Yes	No		Mod	
29	894-507-0001	EG	Cream Bun	8.2	645 ¹¹	Yes ¹⁰	No		Mod	
30	895-513-0016	EG	Ferny Track	18.1	200	Yes	No		Mod	

Key:

1. FMA – Forest Management Area: CG-Central Gippsland; CT–Central; DD-Dandenong; EG-East Gippsland.

2. Area – actual harvest area (ha).



- ICR planned length of in-coupe road (m). Shading code: green ICR >100 m shorter than planned; orange ICR>100 m longer than planned. 11 – No IR to coupe, but assessment carried out on either adjacent permanent road (Last Minute) or ICR to coupe to which logs were snigged (Cream Bun).
- 4. WWX planned waterway crossing. Blue shade indicates coupes where there was no WWX despite coupe planning. 10 Coupes where a WWX was assessed, either on an adjacent permanent road (Net Set Go) or on the ICR of the coupe to which logs were snigged to (Cream Bun).
- 5. RF (modelled) rainforest present within gross coupe areas.
- 6. Fauna protected mammals or birds flagged to be present on coupe: LBP Leadbeater's Possum, LFP Long-footed Potoroo
- 7. Soil EH highest soil erosion hazard (from FCP): low, moderate (mod) or high.
- 8. WSC coupe located in a designated water supply catchment. Blue shaded coupes located in Melbourne Water catchment area.
- 9. Net Set Go was a replacement coupe for 814-504-0003 Berylium.
- A Coupes included in both audit phases.

Twenty-one of the coupes included in the harvesting audit were planned to have waterway crossings, although crossings were only actually constructed on in-coupe roads accessing 17 of the coupes. Ecological Vegetation Class (EVC) modelling (by DELWP³) suggested that cool or warm temperate rainforest vegetation was present in 24 of the 30 harvest audit coupes. While rainforest species were present in many of these coupes, very few were found to have rainforest stands, as defined by the MSPs.

Records of high conservation value, threatened fauna (typically Leadbeater's Possum or Long-footed Potoroo) were known, at the time of coupe planning, to occur in nine of the 30 harvest audit coupes (Table 3.2). Soils in the harvest audit coupes were typically relatively stable, with the highest level of soil erosion hazard being low

or medium in all 30 coupes (Table 3.2). Eleven of the coupes were located in designated water supply catchments.

3.1.2 Regeneration coupes

Targets for the forest regeneration component of the audit were selected from a group of 11 coupes in the Mt Delusion State forest (Tambo FMA) which DELWP had identified as possibly having failed regeneration. Four of these 11 coupes, which had been finalised by VicForests and handed back to DELWP for on-going management, were selected for audit (see Figure 2.1 for locations). These were in two groups of two adjacent coupes and each had acceptable stocking rates (>65%), according to VicForests' regeneration surveys.



Tom's Track regeneration coupe (717-507-0013). Initial attempts to regenerate the coupe failed. The coupe was subsequently rough-heaped and replanted in a second attempt at regeneration.

3.2 Audit criteria and workbook

Audit criteria were based on mandatory requirements of the Code which were selected by DELWP's Timber Harvesting Compliance Unit (THCU). Most commonly they specifically referenced compliance elements from the MSPs and its Planning Standards (PS; *Planning standards for timber harvesting operations in Victoria's State forests 2014;* DEPI, 2014c) which provide more detailed interpretations of Code requirements. Compliance criteria were grouped into three main compliance themes, with several sub-themes, as follows:

• *Environment:* which relate to compliance criteria drawing on Section 2.2 of the Code (*Environmental values in State forests*) and related compliance elements from the MSPs and PS. There were three environmental

⁹ Source of data: https://www.data.vic.gov.au/data/dataset/native-vegetation-modelled-2005-ecological-vegetation-classes-with-bioregionalconservation-status



sub-themes: soil; water (incorporating flows, water quality and river health); and biodiversity. Some audit criteria related to more than one of the sub-themes.

- *Roading:* which relate to compliance criteria drawing on Section 2.4 of the Code (*Roading for timber harvesting operations*) and related compliance elements from the MSPs. There were four roading sub-themes: design; construction; maintenance; and closure. Some of the roading compliance elements are also relevant to water and biodiversity sub-themes.
- *Regeneration:* which relate to compliance criteria drawing on Section 2.6 of the Code (*Forest regeneration and management*) and related compliance elements from the MSPs. There were no sub-themes for regeneration.

The set of environmental and roading compliance criteria are given in Table A.1 in Appendix A. These were assessed, as applicable, for 30 harvest coupes across the Central, Central Gippsland, Dandenong and East Gippsland FMAs. Regeneration compliance criteria are given in Table A.2 in Appendix A. These were assessed for four regeneration coupes in Tambo FMA.

3.3 Field assessments

Phase 2 audit assessments were carried out in the field for each of the 34 selected coupes¹⁰. The field component of the audit comprised assessments of relevant coupe characteristics (Table 3.2) and completion of a workbook listing all of the criteria. Separate audit workbooks and field methods were developed for harvesting and regeneration coupes.

Attribute being assessed		Method
На	rvesting coupes	
1.	Waterway classification and correct provision of riparian filters and/or buffers.	Assessment of waterway as drainage line, temporary stream or permanent stream, based on Code definitions. Streams and widths of filters/buffers were assessed along up to 600 m of waterway per coupe, if present. Adequacy of filter and buffer widths were typically assessed with a range finder, supported by ground traverses to locate the centreline of the stream (if required).
2.	Extent to which harvesting was conducted on slopes >30° (or >25° in coupes with granite soils in East Gippsland FMA).	Visual observation, using a clinometer, if required.
3.	Adequacy of protection provided to soils, waterways and river health.	Visual observations and auditors' interpretations, based on the presence of excessive disturbance and/or activities which are not compliant with elements of the regulatory framework.
4.	Soil erosion hazard	Comparison of VicForests assessment of soil erosion hazard with observations of erosion within the coupe. Soil erosion hazard was assessed using MSP methods where evidence of soil erosion suggested to the auditor that the initial assessment many have been incorrect ¹¹ .
5.	Presence of in-coupe roads or snig tracks in riparian habitats.	Visual observations and auditors' interpretations of the reasonable practicability of alternative placements which avoided riparian areas.
6.	Waterway crossings and culverts.	Assessment of culverts, embankments and road drainage against MSP requirements. Observations and auditors' interpretation of crossings in which the culvert had been removed. Observations of sediment entry into the waterway.
7.	Habitat trees.	Assessment of the density and distribution of habitat trees, their location in relation to other habitat and their potential to develop hollows.

Table 3.2 Field assessment methods for harvesting and regeneration coupes

¹⁰ Phase 2 field assessments drew on the results of Phase 1 assessments. The latter were structured to minimise the need to revisit the coupes during the second phase of the audit.

¹¹ Soil erosion hazard was only assessed from soil samples for one coupe (864-505-0011 Epiphone). Erosion on the in-coupe road suggested to the auditor that the soil erosion hazard assessment was incorrect. However, the auditor's soil assessment confirmed VicForests' assessment for the coupe.



Attribute being assessed	Method
 If listed threatened fauna or flora are recorded as being present, whether prescribed management actions been followed. 	Comparison of observed coupe conditions with management actions specified in the PS and forest coupe plan (FCP).
 Road construction in or near heathland or montane riparian thicket (MRT). 	Confirmation of the presence of the vegetation community and observation of its proximity to in-coupe roads. Auditors' assessment as to the reasonable practicability of alternative road location if the road entered the protected vegetation community. This assessment only considered MRT vegetation; no heathlands were observed in the target coupes for this audit.
10. Rainforest buffers.	Identification of rainforest stands, as per MSP definitions. Assessment of provision of any required buffers as per MSP compliance requirements for up to 600 m length of buffer in each coupe.
11. Myrtle Wilt risk.	Observation of harvesting related damage to or wounding of Myrtle Beech trees, in applicable coupes.
12. In-coupe road clearing width.	For in-coupe roads through retained vegetation, assess whether clearing width was consistent with MSP requirements.
13. In-coupe road.	Compliance with MSP drain spacing requirements, based on soil erosion hazard and gradient, for full length of in-coupe road. Assessment of effectiveness of drainage and appropriateness of drainage disposal, considering Code and MSP requirements.
	Observation of any instances where road embankments covered the base of retained trees.
	Observation of the stability of road, waterway crossing and landing embankments.
	Observation and auditors' interpretation of the adequacy of road maintenance and any road closure works.
Regeneration coupes	
14. Coupe stocking	Assessment of coupe stocking rate, with acceptable seedlings, as defined by the MSPs. Stocking was assessed at 50 or 30 randomly located sampling points per coupe, depending on coupe size. Stocking rate was based on the percentage of "productive" sampling points which were stocked with acceptable seedlings. Non-productive sampling points were those dominated by rock or heaps of logging debris.

Each of the compliance criteria were assessed as to their applicability to the coupe in question. The assessment was based on documentary evidence in VicForests' coupe files or related records and observations by the field audit team. Coupes were assessed to either comply, partly comply or not comply with criterion, as per Table 3.3. The workbook was also used to capture the basis for the assessment and photographs of coupe features were taken, particularly where non-compliances were observed.

Table 3.3 Descriptors for assessments against audit compliance elements

Level of compliance	Complies	Partly complies	Does not comply
Description	All requirements of the compliance element are fully satisfied.	Not all requirements of the compliance element are fully satisfied, however there is no evidence or suggestion of risk of harm to the environment as a result.	The level of non-compliance with requirements is such that there is an assessable risk of harm to the environment (based on the Environmental Impact Assessment [EIA] tool, Appendix B).

For some coupes without in-coupe roads, roading assessments were carried out on the road into the landing from which logs from the audit target were loaded for carting (#5 Giraffe, #20 Shot, #29 Cream Bun). Although



the assessments considered adjacent coupes they were reported against the target coupe. In two other cases (#21 Net Set Go, #25 Last Minute) where there was no or minimal in-coupe road, the roading assessments were carried out on adjacent sections of DELWP's permanent road network.

3.4 Environmental impact assessment

The risk of harm to the environment resulting from observed non-compliances was assessed for each of the 30 harvesting coupes included in the audit. DELWP requested that this assessment be conducted using an environmental impact assessment (EIA) tool which had previously been developed for the FAP. Lack of detail on how to assess environmental risks associated with inadequate in-coupe road drainage and non-compliant waterway crossings resulted in the EIA tool being modified by the audit team. The revised tool assesses environmental risk based on:

- Extent and location of impact: an auditor's assessment based on one or more of several factors, namely
 - Proportion of the harvestable coupe area affected by the non-compliance;
 - Length of in-coupe road without compliant drainage;
 - The number and/or extent of incidences of unauthorised disturbance (i.e. disturbances which are not permitted by the regulatory framework for timber harvesting operations) to waterways and riparian buffers or filters;
 - The extent of disturbances to other exclusion areas within the gross coupe area or on adjacent land.
- *Duration of impact/recovery time:* an assessment by the auditor of the time required for the coupe to recover from any impact or disturbance associated with the non-compliance incident.
- Values affected: an assessment based on the value or environmental aspect experiencing or potentially experiencing an impact stemming from the non-compliance. General forest areas are valued less than riparian or rainforest buffers and SPZ, for example.

The revised EIA tool is described in Appendix B. Scoring for the revised tool follows that of the earlier EIA tool. Scores for each aspect are added and the total score compared against an overall five-point rating scale. Overall EIA ratings potentially range between negligible and severe. EIA ratings are only made where non-compliances are assessed as "does not comply", as per Table 3.3.



4. Audit findings

The following discussion of audit findings commences with overall findings for the 30 harvest coupes and thereafter follows the three main themes of the compliance elements it considered: environment, roading and regeneration (as per Section 3.2 and Appendix A).

4.1 Overall compliance findings: harvesting audit coupes

A total of 104 compliance criteria were identified from the various compliance elements applicable to timber harvesting coupes (Appendix A). Of these, 20 criteria did not actually apply to any of the selected coupes.

The overall level of compliance with applicable audit criteria ranged between 71% (#29 Cream Bun¹²) and 100% (#3 Low Down, #10 Swinglow), with the average being 86% (Figure 4.1). "Part" non-compliance, where there was no actual or potential environmental impact¹³, was assessed for a further 6% of applicable criteria. Of the 30 coupes included in this component of the audit, eight coupes had no non-compliances with potential for environmental impact.





a) Level of compliance with audit criteria and number of non-compliance incidents with assessable environmental impact.

b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.1 Overall compliance findings and assessed environmental impact for instances of non-compliance. The x-axis refers to the coupe numbers, as per Table 3.1

Some non-compliance "incidents" (e.g. an inappropriately constructed waterway crossing) may trigger noncompliances with multiple criteria. Figure 4.1 also shows the actual number of incidents resulting in non-

¹² Note that most non-compliance issues related to the in-coupe road leading into the adjacent Coffee Scroll coupe (894-507-0007). The landing and in-coupe road of Coffee Scroll were used during harvesting of Cream Bun coupe and hence were included in the audit.

¹³ Part non-compliance was assessed where there was: no direct environmental impact from the non-compliance (e.g. for criteria related to coupe planning or marking, road design); or no actual environmental impact resulting from the non-compliance (e.g. a culvert >750 mm diameter over a permanent stream which provided acceptable fish passage, but did not have a fish ladder as required by the MSP 6.2.5.9).



compliance in each of the audited coupes¹⁴. These ranged between zero (eight coupes, as above) and five (#6 Zebra), with an average of 1.4 incidents per coupe.

The (revised) EIA tool (Appendix B) was used to assess the potential environmental impact associated with each (full) non-compliance incident¹⁵. This ranged between negligible and major (Figure 4.1). Non-compliances which were assessed to have major environmental impact were detected in eight of the 30 harvest coupes. These mostly related to issues with waterway crossings.

4.2 Environmental compliance elements

The environmental theme included three main groups of compliance elements and audit criteria, those relating to soil, water and biodiversity values. Several roading compliance elements and criteria were also applicable to this theme.

4.2.1 Compliance elements related to the protection of forest soils

Compliance elements related to the protection of forest soils (Appendix A) relate to the avoidance of erosion or mass movement of soils and to minimising the risk of entry of sediments into waterways, should they be mobilised. These outcomes are achieved by:

- Assessing soil erosion hazard within the coupe;
- Not harvesting in excessively steep areas;
- Provision of riparian filters and buffers;
- Application of seasonal closures to reduce the risk of sediment mobilisation during wet weather in water supply catchments;
- Appropriate construction and maintenance of in-coupe roads, road drainage and waterway crossings.

A total of 21 audit criteria were considered to be relevant to the protection of forest soils, of which two were not applicable to any of the selected coupes. The average level of compliance with applicable criteria was found to be 83%, with the level of compliance ranging between 56% (#29 Cream Bun¹⁶) and 100% (eight coupes; Figure 4.2). The assessed environmental impact associated with non-compliances ranged between negligible and

major (Figure 4.2). All non-compliances assessed to have major environmental impact and most noncompliances assessed to have moderate environmental impact were associated with the movement of sediments into or within waterway crossings and are discussed in Section 4.2.2.

Most other non-compliances assessed to have moderate environmental impact were associated with drainage on in-coupe roads and are discussed in Section 4.3.

The audit found that risks associated with harvesting in steep areas was generally wellmanaged, with land with 20-30° slope and over 30° slope typically marked on the coupe operations



Compliant riparian buffer, #29 Cream Bun coupe.

map and/or noted in the forest coupe plan (FCP). Where required by the MSPs or dictated by practical constraints on harvesting, steep areas were generally found to have been excluded from harvesting. Riparian filters and buffers were typically applied conservatively, such that waterways were protected from sediment which could have been generated by harvesting by wider buffers (particularly) than the minimum provided for by the MSPs. In many cases, VicForests provided riparian buffers where only filters were specifically required.

¹⁴ In-coupes road with multiple incidences of trees covered by embankment materials and/or multiple incidences of non-conforming drainage structure spacings were counted as single incidences of non-compliances (in each case).

¹⁵ Which may have been recorded against multiple instances on non-compliance with audit criteria.

¹⁶ Note that most soils non-compliance issues related to the in-coupe road leading into the adjacent Coffee Scroll coupe (894-507-0007). The landing and in-coupe road of Coffee Scroll were used during harvesting in Cream Bun coupe and hence were included in the audit.



The audit identified a minor issue which has potential to inadvertently lead to harvesting in protected areas within East Gippsland FMA. The MSPs (3.4.1.3) require that harvesting is excluded from slopes over 25° in coupes with granite derived soils within that FMA. VicForests' coupe planning process (including its FCPs) identify higher slope areas (20-30° and >30°) and soil parent materials, however they do not explicitly call out the combination of >25° slope and granite soils. Hence it is possible that harvesting could inadvertently occur under such conditions (in East Gippsland FMA).

Several coupes with granite-derived soils were included in the audit, but no significant areas with over 25° slope were found to have been harvested and hence no relevant non-compliances were recorded.







a) Level of compliance with audit criteria.

b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.2 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the protection of forest soils. The x-axis refers to the coupe numbers, as per Table 3.1.

4.2.2 Compliance elements related to the protection of water flows, water quality and river health

Compliance elements relevant to this theme (Appendix A) seek to protect water flows, water quality and river health by:

- Classifying waterways present in the coupe and applying at least the minimum width of filters and/or buffers required;
- Application of seasonal closures to reduce the risk of sediment mobilisation during wet weather in water supply catchments;
- Appropriate design, construction and maintenance of in-coupe roads, road drainage and waterway crossings.



Many of the compliance requirements (and criteria) are also applicable to the protection of forest soils. A total of 39 audit criteria were considered to be relevant to this theme, of which two were not applicable to any of the selected coupes.

The average level of compliance with applicable criteria was found to be 85%, with the level of compliance ranging between 60% (#9 Zombie) and 100% (eight coupes; Figure 4.3). The assessed environmental impact associated with non-compliances ranged between negligible and major (Figure 4.3). Non-compliances which were assessed to have major environmental impact were identified on eight coupes. All of these related to waterway crossings. Most non-compliances assessed to have moderate environmental impact were also associated with defective waterway crossings.



Yes Part No



a) Level of compliance with audit criteria.

b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.3 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the protection of water quality, flows and river health. The x-axis refers to the coupe numbers, as per Table 3.1.

The key features of the waterway crossings which contributed to the non-compliances and assessments of environmental impact were:

- Management of road drainage on the entry to the waterway crossing: the MSPs (6.2.4.5, 6.2.4.6) require that roads crossing permanent or temporary streams are:
 - Drained approximately 20 m from the waterway to allow discharge onto undisturbed vegetation;
 - Constructed so that road drainage from the final 20 m of the road does not directly enter the waterway.

Several coupes were observed to be non-compliant in one or both respects (see Box 1 for an example of the former). This resulted from construction and/or maintenance failures. In some coupes, drainage from the in-coupe road significantly beyond 20 m from the waterway was allowed to drain directly into the waterway without filtering by vegetation or a sediment trap. In other coupes, construction of the drain allowed flows to accelerate and entrain more sediment as it approached the waterway or allowed road drainage to run over disturbed soil prior to entering the waterway. In such cases, sediment traps should have been used to reduce sediment inputs to the waterway, but were not.



Box 1: Examples of non-compliance issues with waterway crossings and associated road drainage.

Management of road drainage at entry to waterway crossing

The photograph shows the approach to a waterway crossing at #23 Epiphone coupe. A structure was constructed to intercept road drainage (arrow) and divert it to undisturbed vegetation. However, the drainage structure was not constructed as planned. Water was diverted to the left of the road, but instead of draining into vegetation (as intended and required by the MSPs), it returned to the road and drained directly to waterway.

Significant quantities of road sediment (from a more than 100 m section of road) had been deposited into and along the temporary stream (inset image).



Erosion at the outlet of waterway crossing culverts

This culvert forms part of a crossing of a permanent stream at #7 Mosquito coupe. The culvert exceeds 750 mm in diameter and does not include a fish ladder as is required by the MSPs. While the outlet only drops water only a few centimetres into the downstream bed, it poses a barrier to the movement of aquatic fauna. Flows through the culvert have also led to a small amount of erosion.



Provision of passage for fish and other aquatic fauna

This culvert was constructed to provide drainage for a crossing of a permanent stream at #4 Hogsmeade coupe. The culvert exceeded 750 mm diameter and its outlet dropped water 10-20 cm into the bed of the waterway.

While the culvert is stable and there is currently no erosion at the outlet, there is no fish ladder as required by the MSP. The culvert prevents all upstream movement of any fish or other aquatic fauna inhabiting the permanent stream.



Inadequate rehabilitation of waterway crossing sites following culvert removal

The photographs show a rehabilitated waterway crossing on the approach to #9 Zombie coupe. The site was inspected in Phase 1 of the audit (in June 2017, left) and again in Phase 2 (in September 2017, right). Much of the embankment was left in place after the culvert was removed. Winter flows along the waterway have mobilised sediment from the embankment and deposited it downstream of the crossing.

In the September photograph, a log is observed to define the left hand stream channel (arrow). This was not visible in the June photograph. While the provides some protection against further erosion, it is clear that a significant volume of soil have been eroded by the temporary stream.



Provision of fish passage and other aquatic fauna: the MSPs (6.2.5.9, 6.2.5.11) require that waterway crossings maintain passage for the movement of fish and other aquatic fauna up and down-stream. Where the crossing involves a permanent stream and includes a culvert greater than 750 mm in diameter, a fish ladder must be provided to facilitate the movement of aquatic fauna.

Several instances were observed where the outlet of a culvert in a waterway crossing was elevated above the downstream bed and prevented the upstream passage of fish and other aquatic fauna (see Box 1). This was only considered to pose a major environmental risk for permanent streams with significant prospect of providing habitat for aquatic fauna.

None of the waterway crossings with culverts of more than 750 mm diameter (four coupes) were constructed with fish ladders. This was assessed as having a major environmental impact, except where the culvert was horizontal, part-filled with sediment and appeared not to pose a barrier to the movement aquatic fauna (#29 Cream Bun).

Erosion at the outlet of a waterway crossing culvert: several waterway crossings were observed in which the culvert outlet was elevated above the bed of the waterway and posed some risk of erosion of the downstream bed during higher flow events (as well as preventing the passage of aquatic fauna in some permanent streams). For crossings of some temporary streams, this risk was managed through the use of a heavy plastic sleeve or chute to drop road drainage back to the level of the waterway (Figure 4.4). In

other instances, this risk was remained untreated and water dropped from the culvert to the bed of the stream (see Box 1). Although this was considered to be inconsistent with MSP 6.2.5.5, which requires culverts to be constructed to prevent erosion at the point of discharge, no instances were observed for waterway crossings where there had been significant erosion.

Inadequate rehabilitation of a crossing site following culvert removal: the culverts installed into waterway crossings on the entry to two of the audited coupes had been removed prior to the audit. In neither case was the embankment treated to reduce the entry of sediment into the waterway or to prevent sediment from being mobilised during higher flow events (see Box 1). This was considered to be inconsistent with the requirement (MSP 6.4.1.2, Code 2.2.1.7) to restrict soil movement and habitat disturbance following the removal of a culvert of log fill crossing and attracted a major environmental impact assessment.



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Figure 4.4 Waterway crossing culvert for temporary stream, #11 Hairy Hide coupe. The heavy duty plastic sleeve carries drainage flows to the waterway bed and minimises potential for erosion at the culvert outlet when this cannot be laid on the downstream bed of the waterway.

Similar issues were observed for a rehabilitated snig track crossing (#6 Giraffe), which had not been adequately treated to avoid sediment mobilisation during higher flow periods in the temporary stream which it crossed. This non-compliance was assessed to have moderate (rather than major) environmental impact.

There was a high incidence of non-compliance with waterway crossings, with eight of 17 coupes with crossings having non-compliances assessed as having major environmental impact. Harvesting practices relevant to other water-related compliance elements were typically better. The location of landings and path of in-coupe roads was typically selected to avoid the need for crossings, as evidenced by the four coupes for which crossings were planned, but did not need to be constructed (Table 3.1). As noted in Section 4.2.1, seasonal closure restrictions and slope restrictions were followed, where relevant. Riparian buffers were also conservatively marked, so that harvesting or harvesting machinery were generally excluded from a wider strip of land than is mandated by the MSPs.



4.2.3 Compliance elements related to the protection of biodiversity values

Compliance elements relevant to this theme (Appendix A) seek to protect biodiversity values by:

- Retaining trees and other habitat within the gross coupe and/or harvested area, including old growth elements and trees with or with potential to form hollows;
- Not undertaking harvesting activities or roading within sensitive vegetation communities (e.g. heathlands, montane riparian thickets, rainforest stands);
- · Identifying listed, threatened species of native flora and fauna which have been recorded within or adjacent to the coupe and applying the management measures prescribed by the MSPs and Planning Standards;
- Not harvesting in SPZ established to protect important native fauna habitats (e.g. for Leadbeater's Possum, Long-footed Potoroos, Owls).
- Maintaining passage for fish or other aquatic fauna along permanent streams; and
- Managing the risk of entry or spread of weeds and soil-borne or other diseases.

A total of 51 audit criteria were considered to be relevant to the protection of biodiversity values, of which 17 were not applicable to any of the selected coupes.

The average level of compliance with applicable criteria was found to be 90%, with the level of compliance ranging between 70% (#18 Tropical) and 100% (8 coupes; Figure 4.5¹⁷). A further eight coupes were assessed to have non-compliances without potential environmental impact.





a) Level of compliance with audit criteria.

b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.5 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the protection of biodiversity values. The x-axis refers to the coupe numbers, as per Table 3.1.

The assessed environmental impact associated with non-compliances ranged between minor and major (Figure 4.5), with the latter identified on eight coupes. Non-compliances on seven of these coupes related to

¹⁷ There were a further three coupes for which there were no



constructed waterway crossings, including four of which resulted from the culvert disrupting the potential passage of fish or other aquatic fauna (see Section 4.2.2, Box 1).

For #24 Take Me Home coupe, the assessed major environmental impact resulted from harvesting within 40 m of what was assessed to ben an over 0.4 ha warm temperate rainforest stand (c.f. MSP 4.4.9.1 d). The incursion of harvesting into the rainforest buffer extended along the boundary for about 60 m¹⁸.

The assessed severity of environmental impact reflects that the rainforest stand will have a diminished protective buffer for an extended period of time and not that there was a direct harvesting impact on the rainforest stand.

With the exception of this coupe, VicForests personnel were found to be very conservative in their identification and protection of rainforest vegetation. While rainforest buffers were provided within several other coupes, the auditors did not identify another coupe where this was specifically required (by the presence of rainforest stands >0.2 ha; MSPs 4.4.9.1).

The other instance with of non-compliances with an assessment of major environmental impact was observed in #9 Zombie coupe. This was caused by the construction of a new waterway crossing to allow for machinery to reenter the coupe to assist with preparations for regeneration burning. The crossing involved clearing a narrow path through the riparian buffer (Figure 4.6) and was used once each way. It was required because the culvert

in the waterway crossing by which the coupe was previously entered had been removed. The assessed environmental impact reflects the sensitivity of the location, rather than the actual level of disturbance.

This incident was considered to be inconsistent with the Code requirement (2.2.2.5) to protect areas excluded from harvesting from the impacts of timber harvesting operations.

VicForests personnel interrogate several key data sets to identify whether biodiversity values may be present or are modelled to be present within each coupe, including:

 Victorian Biodiversity Atlas (VBA): which includes records of listed, threatened species of native flora and fauna. The search period for records extended (at the time of planning for these coupes) back for 25 years for both flora and fauna species¹⁹. While appropriate for fauna,



Figure 4.6 Construction of a path and crossing on a temporary stream at the entry to #9 Zombie coupe. This occurred following the removal of the waterway crossing on the nearby in-coupe road.

this practice was found to result in VicForests personnel not identifying records of threatened flora in five of the audited coupes²⁰. While this was recorded as a non-compliance (against an audit criterion²¹ rather than an MSP prescription), no environmental impact was assessed as the records related to species for which the *Planning Standards* do not specify particular management actions and/or were from unharvested parts of the coupe.

Old growth forest modelling: modelled presence of old growth forest (OGF)²² spatial data is used to indicate the possible presence of OGF within the coupe. This is a trigger for site investigations to verify the presence of OGF and listed, threatened species, as well as the need for modifications to the planned harvest boundary to protect any biodiversity values which may be present. VicForests was found to use

¹⁸ This finding was disputed by VicForests' in discussions regarding the findings of this audit and in their subsequent written response to this report.

¹⁹ At the time of coupe planning, the search period for threatened fauna was 25 years, with the exception of Leadbeater's Possum for which only verified records from 1998 trigger the establishment of a 200 m radius SPZ (PS Table 3). This practice has subsequently been revised and no date limit is now set on VBA records.

²⁰ Hogsmeade: Wittstiennia vaccinacea; Giraffe and Zebra: Wittstiennia vaccinacea, Carex alsophila; Worrley Hill: Leionema bilobum ssp serrulatum; Cream Bun: Persoonia silvatica, Poa clivicola.

²¹ The assessment was against audit criterion 13.1, "Does the FCP correctly note record(s) of rare or threatened flora –based on the VBA - on the coupe?"

²² Available from <u>https://www.data.vic.gov.au/data/dataset/modelled-old-growth-forest-boundaries</u>



such data and follow up ecological surveys to set or adjust harvesting boundaries, as per the MSPs' requirements.

EVC modelling: modelled EVC spatial data²³ is used to flag the potential presence of vegetation communities which, if present, could influence in-coupe road locations and/or harvest boundaries. Applicable vegetation communities include heathland EVCs, montane riparian thicket (MRT) and cool and warm temperate rainforest. Buffers are required where rainforest vegetation forms stands as per the specifications in MSPs 4.4.8 and 4.4.9. VicForests was found to use this data in coupe planning and often provided rainforest buffers where no rainforest stand was present or where the stand was too small to require an unharvested buffer²⁴.

VicForests was found to comply with MSP requirements (4.5.1 and 4.5.2) to manage risks associated with pests, weeds and diseases. Harvesting and other machinery are washed down prior to relocation to new coupes²⁵, as per its *Noxious weeds, disease and pest management instruction* (VicForests, 2017) and relevant clauses of its *Utilisation Procedures* (VicForests, 2013). A weed assessment is undertaken as part of coupe marking and following regeneration, as required by MSP 4.5.2. No instances where a weed management plan was developed or required were identified in the course of this audit.

The MSPs (4.5.1.2) require actions to prevent the spread of Myrtle Wilt (where it is known to exist) among Myrtle Beech trees. These would typically only be required where an in-coupe road cuts through a gully with rainforest vegetation or (the uncommon situation) where scattered Myrtle Beech trees extend into or adjacent to the planned harvest area.

This latter situation was encountered in two coupes, #16 Ghee and #18 Tropical. Myrtle Beech trees adjacent to one of the coupe boundary tracks within #16 Ghee coupe were observed to have sustained damage which could enable Myrtle Wilt entry (e.g. damage to bark), although this was most likely due to damage from post-harvest windthrow and not harvesting (Figure 4.7). An area of Myrtle Beech trees within a riparian buffer on #18 Tropical coupe were killed by fire during the regeneration burn (Figure 4.7). While this is an unsatisfactory outcome, because the trees have been killed they are unlikely to host any outbreak of Myrtle Wilt. No non-compliance was recorded in either case.



#16 Ghee coupe – damage sustained by Myrtle Beech trees following harvesting



#18 Tropical coupe – damage caused by escaped regeneration burn.

Figure 4.7 Examples of damage sustained by Myrtle Beech trees following timber harvesting operations.

²³ Available from https://www.data.vic.gov.au/data/dataset/rainforests-native-vegetation-evcbcs_2005

 $^{^{24}}$ Note the exception of #24 Take Me Home coupe.

²⁵ Except where the coupe is adjacent or nearby.



4.3 **Roading compliance elements**

The roading theme included three main groups of compliance elements and audit criteria, those relating to; design; construction; and maintenance and closure. Several roading compliance elements and criteria were also considered under the environmental theme.

4.3.1 Road design

The 12 compliance elements relevant to this theme (Appendix A) seek largely to protect soil and water values from risks associated with the construction of road embankments and waterway crossings by appropriate design. Design is intended to ensure the stability of roads and road embankments, safe passage of high flow events through crossings and culverts and to prevent erosion of roads and crossings.

The average level of compliance with applicable criteria was found to be 57%, with the level of compliance ranging between 0% (for a single applicable criterion; #5, Giraffe) and 100% (three coupes; Figure 4.8). "Part" non-compliances were relatively common for this compliance element, reflecting the frequent lack of a direct connection between design non-compliance and environmental impact.

Common issues associated with part compliance included:

- Not recording the class of in-coupe road in the FCP (c.f. MSPs 6.1.1.4); and
- Having no recorded engineering basis for design for larger embankments or waterway crossings (e.g. MSPs 6.2.2.3, 6.2.5.4; Code 2.4.2.4).







b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.8 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the road design. The x-axis refers to the coupe numbers, as per Table 3.1.

The assessed environmental impact associated with (full) non-compliances ranged between negligible and major (Figure 4.8). Those assessed to have major environmental impact were identified on five coupes. All of these relate to the design (and construction) of waterway crossings. Non-compliance issues relate to barriers to



movement of aquatic fauna, absence of fish ladders in culverts greater than 750 mm in diameter and poor design of drainage in the vicinity of the crossing (see Section 4.2.2 for discussion and Box 1 for examples of the applicable non-compliance issues).

Sections of road or landing embankments on two coupes (#6 Zebra, #19 Turkey Neck) were found to be collapsing (Figure 4.9) at the time of the audit. It is not clear if this reflects a failure to develop a specific engineering design for the embankment or shortcomings in construction. As embankment failures were all located well away from sensitive riparian environments, the assessed environmental impact associated with non-compliances were negligible or minor.



#6 Zebra coupe: collapsing landing embankment. The landing is well removed from the nearest waterway.

Figure 4.9 Collapsing road and landing embankments.



#19 Turkey Neck coupe: collapsing road embankment. This section of in-coupe road is located well away from waterways.

Non-compliances associated with the length of in-coupe road between drainage structures is applicable to this compliance theme, but is discussed under road construction (Section 4.3.2).

4.3.2 Road construction

The 35 compliance elements relevant to this theme (Appendix A), like those for road design, seek largely to protect soil and water values from risks associated with the construction of road embankments and waterway crossings. The average level of compliance with applicable criteria was found to be 79%, with the level of compliance ranging between 0% (part compliance for a single applicable criterion; #30, Ferny Track) and 100% (six coupes; Figure 4.8). The level of assessed environmental impact associated with non-compliances ranged between negligible and major. Non-compliances with assessed major environmental impacts were identified on seven coupes and were all associated with waterway crossings (see discussion in Section 4.2.2, Box 1).

The potential environmental impact for non-compliance issues in 11 coupes was assessed as moderate. Issues leading to this level of impact, which have not been specifically discussed before include:

- In-coupe road embankment materials covering the base of live trees: MSP 6.2.2.1 specifies that fill batters should not cover the base of live trees²⁶. This requirement was not satisfied in two of the coupes included in the audit (#6 Zebra, #25 Comp515). In each of the observed cases, embankment materials only covered part of the base of the tree and was considered to be unlikely to result in its death.
- Poor non-waterway culvert construction: several examples of non-compliant non-waterway culvert construction were observed, which led to minor or moderate environmental impact being assessed. Two main issues were involved: not having the culvert outlet drain to ground level (as per MSP 6.2.5.11); and not stabilising the outlet against erosion (as per MSP 6.2.5.5). Figure 4.10 (#6 Zebra coupe) demonstrates both shortcomings. Use of a plastic sleeve, as per Figure 4.4 (#11 Hairy Hide) could have dropped water running through the culvert onto the downhill edge of the embankment without risk of erosion.

²⁶ This prescription is taken to apply only to trees which will be retained post-harvest.

Excessive distance between road drainage structures: in general, the spacing between drainage structures on in-coupe roads complied with requirements of the MSPs (Appendix 4, Table 20). However, this was not the case with five of the coupes. Moderate environmental impact was only assessed on two coupes (#21 Net Set Go, #26 Comp515), both of which had over 150 m of road which was incorrectly drained. Incorrect drainage on #21 Net Set Go was on a section of DELWP's permanent road network that was adjacent to the coupe and used for timber haulage.

- Failure to intercept snig track drainage: rehabilitation of one drainage line crossing on #24 Take Me Home coupe did not account for drainage along a snig track, with the result that it drained directly into the drainage line, depositing a significant quantity of sediment.
- Management of road drainage in the vicinity of waterway crossings: the MSP (6.2.4.7) require that steps are taken to manage sediment carried by road drainage within approximately 20 m of permanent or temporary streams. This includes draining sediment to



Figure 4.11 Use of a sediment trap to intercept road drainage prior to entry to a permanent stream, #6 Zebra coupe.



The outlet of the culvert drops water ~1.5 m onto unprotected embankment soil. Sediment from the eroding embankment does not reach a waterway.

Figure 4.10 Example of poor culvert construction, #6 Zebra coupe.

measures were observed on several coupes, but were uncommon.

On the two coupes whose crossings were removed (#9 Zombie, #23 Epiphane), drainage from the final section of the (former) in-coupe road ran over disturbed soil directly into the waterway (Figure 4.12) and most likely picked up further sediment. Despite the inappropriate drainage construction, sediment from both roads appeared to have mostly been intercepted by vegetation along the drainage line.



#9 Zombie coupe: drainage flows across highly disturbed soil before entering the temporary stream.



undisturbed

use of a

Such

sediment

pond or silt

trap (such as

Figure 4.11).

vegetation or

#23 Epiphone: the steep drain allows water to accelerate and increase in erosive power immediately before entering the temporary stream.

Figure 4.12 Examples of inappropriate drainage in the final approach to former waterway crossings.









b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.13 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the road construction. The x-axis refers to the coupe numbers, as per Table 3.1.

4.3.3 Road maintenance and closure

Only five compliance criteria relevant to road maintenance or closure were considered in this audit (Appendix A). Like compliance elements for road design and construction, they are largely concerned with protecting soil and water values from risks associated with the use of in-coupe roads and their closure following the completion of harvesting operations. The average level of compliance with applicable criteria was found to be 73%, with the level of compliance ranging between 0% (non-compliance for one or two applicable criteria) and 100% (Figure 4.14).

The level of assessed environmental impact associated with non-compliances ranged between negligible and major (three coupes). Non-compliances with assessed major environmental impacts were identified on three coupes (#4 Hogsmeade, #7 Mosquito, #9 Zombie) and were all related to waterway crossings. These resulted from non-compliance with the Code requirements to:

- Remove crossings using techniques that minimise soil and habitat disturbance (Code 2.2.1.7): as
 previously discussed (see Box 1), much of the embankment material was left in place after the culvert was
 removed from the crossing. This, combined with the level of disturbance to the in-coupe road in the
 immediate vicinity of the crossing (Figure 4.12), has contributed to sediment being mobilised into the
 temporary stream.
- Maintain roads in a manner that minimises erosion and protects water quality (Code 2.4.4.2): for all three coupes, at least one of the approaches to the crossing did not adequately divert in-coupe road drainage into undisturbed vegetation. As a result, at least one of the approaches to the crossings delivers significant quantities of sediment into the waterway. This deficiency should have been identified and rectified as part of road maintenance.

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a) Level of compliance with audit criteria.



b) Number of compliance criteria with assessable environmental impacts and the assessed level of impact for each instance of non-compliance.

Figure 4.14 Compliance findings and assessed environmental impact for instances of non-compliance for criteria applicable to the road maintenance and closure. The x-axis refers to the coupe numbers, as per Table 3.1.

Incidents associated with lesser (assessed) environmental impact included similar incidents to those described above, as well as excessive disturbance associated with the removal of log-fill crossings on snig tracks.

Some observed deficiencies with road construction on the permanent road network (e.g. excessive spacing between road drainage structures [e.g. #21 Net Set Go], failure to divert road drainage approximately 20 m from a waterway crossing [#25 Last Minute]) should have been detected and rectified during road maintenance.

4.4 Forest regeneration compliance elements

This component of the audit considered only four coupes and was targeted towards a group of coupes whose regeneration status was the subject of particular concerns by DELWP. As a result, the findings of this component cannot be considered to be representative of VicForests' operations overall.

This component of the audit only considered seven criteria (Appendix A, Table A.2), of which no more than three were applicable to any of the coupes (1.1, 1.2, 1.5). With the exception of the criterion relating to successful restocking (1.2), the other criteria were complied with where they were relevant to the coupe.

Results of the stocking surveys for each of the four coupes are given in Table 4.1. They show that two of the coupes (#31 Toms Track North and #32 Toms Track) were found to be adequately stocked and that the remaining two coupes were not (Figure 4.15). The audit stocking assessment is not consistent with VicForests' regeneration surveys, which found that #33 Saturday Night and #34 Saturday Morning had been successfully regenerated and were suitable for finalisation (Table 4.1).



Coupe	VicForests regeneration survey stocking rate ¹	Audit stocking rate ^{1,2}	# productive plots
#31 Toms Track North - 771-507-0013	78%	58%	29 of 30 sampling points
#32 Toms Track - 771-507-0013	71%	51%	45 of 50 sampling points
#33 Saturday Night - 771-507-0017	83%	94%	50 of 50 sampling points
#34 Saturday Morning - 771-507-0018	82%	88%	50 of 50 sampling points

Table 4.1 Results of the audit of regeneration success.

1. Stocking rate: number of stocked sampling points as percentage of productive sampling points.

2. Yellow shading reflects that the stocking rate is less than the 65% required by the MSPs (for a standard 80x20 m regeneration survey).

VicForests' regeneration surveys were undertaken in November 2014 and presumably reflected the stocking of the coupes at the time. Grazing by cattle, deer, insects and other herbivores, as well as competition from the dense grass cover has presumably reduced stocking since those surveys. The two understocked coupes had been rough heaped and hand seeded, indicating that the initial regeneration attempts were also unsuccessful.



#31 Toms Track North coupe, view across coupe towards #32 Toms Track coupe. Both coupes are dominated by alpine grasses and non-eucalypt regeneration



Eucalypt seedling, #32 Toms Track coupe. This seedling is <20 cm tall and is not "acceptable" for the purposes of a regeneration survey (MSP 9.1.1.5). Similar seedlings were distributed at relatively low density across coupes #31 and 32.

Figure 4.15 Views of #31 Toms Track North and #32 Toms Track regeneration audit coupes, Tambo FMA.



5. Discussion

5.1 Overall audit findings

The audit's objectives were to assess VicForests' compliance with selected elements of the regulatory framework for timber harvesting activities in State forests, as well as any environmental risks posed by non-compliances with the regulatory framework. This section provides a summary of the audit's overall findings in relation to these objectives.

5.1.1 Findings in relation to regulatory compliance: timber harvesting coupes

The audit of timber harvesting and roading compliance elements included 30 coupes, distributed between the Central, Central Gippsland, Dandenong and East Gippsland FMAs. The coupes were selected because they included higher risk constructed or natural features, such as waterway crossings and rainforest. This means that the audit findings are not necessarily statistically representative of VicForests' operations overall.

Overall compliance with audit criteria which were applicable to the respective coupes (Figure 5.1) was assessed to be 86%, with compliance for the various themes varying between 57% (road design) and 90% (biodiversity). Including criteria with "part" compliance – meaning all assessments were that there was no direct risk to the environment – the compliance rate increased to 92% overall and ranged between 75% for road maintenance and closure and 95% for biodiversity (Figure 5.1).

Non-compliances with direct potential for environmental impact were associated with 43 individual incidents on 32 coupes. Two of these were associated with sections of the permanent forest road network used in timber haulage.



Full – % applicable criteria for which full compliance was recorded; No env impact - % applicable criteria with full or part compliance and no direct risk of environmental impact. Compliance is referenced in the left y axis and EIA ratings are referenced on the right y axis.

Figure 5.1 Summary of overall audit findings for regulatory compliance and risk of environmental impact from non-compliance with the regulatory framework.

A total of 104 criteria were included in audit framework (Appendix A), of which 20 were not applicable to any of the 30 coupes inspected. For 46 of the criteria, all coupes to which the compliance element applied, were


assessed to be compliant. The compliance score was 90% or more for a further eight criteria. Part or non-compliance was recorded on more than 50% of applicable coupes for nine criteria (Table A.1, Appendix A).

While instances of non-compliance were identified from across the various themes, the main source was noncompliant waterway crossings. These typically had their origins in crossing construction and/or removal which did not comply with Code or MSP requirements. The auditors are unaware of a basis of design that was specific to any of the crossings other than generic Code and MSP requirements and so are unable to comment on whether construction did or did not follow design requirements.

As a result of non-compliant construction and/or removal, the crossings (or coupes in which they were located) were subsequently found not to comply with other audit criteria and regulatory framework requirements.

As discussed in Section 4.2.2 and illustrated in Box 1, the main issues contributing to the non-compliances with waterway crossings were:

- Management of road drainage on the entry to the waterway crossing: including not effectively diverting road drainage from beyond 20 m from the waterway into adjacent vegetation and not effectively managing the risk posed by sediments generated by road run-off within 20 m of the waterway.
- Provision of passage to fish and other aquatic fauna: several instances were observed where the outlets of waterway crossings were elevated above the downstream bed, meaning that they prevented upstream movement of fish or other aquatic fauna. None of the permanent stream crossings with culverts greater than 750 mm diameter had fish ladders, as required by MSP 6.2.5.9.
- *Erosion at the outlet of the culvert:* the elevation of outlets of many culverts above the downstream bed of the waterway creates the opportunity for erosion, particularly if the water drains directly onto an unprotected bed.
- Crossing rehabilitation following culvert removal: culverts had only been removed on the approaches to two of the coupes included in this audit. In neither case were the embankment materials fully excavated from the waterway or appropriately stabilised, with the result that sediment was mobilised during higher flow

events. Drainage from final approaches to the waterways was often not well constructed and resulted in either water accelerating towards the waterway or crossing disturbed soil. Both cases create the potential for sediment to be mobilised and deposited in the waterway.

The frequency of non-compliant waterway crossings was such that this is considered by the auditors to reflect a systematic issue or at least a consistent deficiency with VicForests' and/or their contractors' approach.

Two other consistent non-compliance issues were identified in the audit. While neither of these could be assessed as having direct environmental impact, they have some potential to do so. The issues are:

 Design of large road and landing embankments: the Code (2.4.2.3) requires that embankments are planned and designed to minimise erosion, mass



Sediment deposited into this temporary waterway results from non-compliant drainage of the in-coupe road and poor rehabilitation of the waterway crossing following removal of the culvert. Several non-compliance incidents were identified on this coupe with the crossing with moderate environmental impact.

Sediment in temporary stream on the entrance to #23 Epiphone coupe.

soil movement and water quality risk and the MSPs (6.2.2.3) require that engineer-approved methods are used in mechanically consolidating fill batters. While in coupe planning, VicForests and their contractors often successfully avoid constructing large embankments for in-coupe roads and landings or site them away from waterways, it is not apparent that there is any specific design for the embankments or any use of consolidation practices that are explicitly approved by an engineer.



As a result of the lack of a known and specific basis for design, large embankments (>2 m) were typically assessed to only partly comply with the regulatory framework. Instances of embankment failure (evident on two coupes; Figure 4.9) resulted in non-compliance with potential environmental impact being assessed.

Time limit on VBA threatened flora and fauna searches: VicForests advised the auditors that during coupe planning, their VBA searches only consider records from the last 25 years. Older records most likely relate to individual organisms (particularly fauna) which are no longer present within the coupe. However, it is not clear that they should be disregarded, particularly if there have been no more recent surveys.

Adopting a 25-year cut-off for VBA threatened flora and fauna records (at the time of coupe planning²⁷), meant that VicForests' personnel may be unaware of which species to look for or consider in coupe marking and planning. This may lead to surviving populations of such species inadvertently being threatened by harvesting operations.

While there were various other non-compliance issues identified, these were not considered by the auditor to be reflect systematic deficiencies in VicForests' approach to timber harvesting operations.

The audit assessed sections of the permanent forest road network adjacent to two of the selected coupes (#21 Net Set Go, #25 Last Minute). These roads were used to haul logs from these and nearby coupes. Drain spacings for the road adjacent to #21 Net Set Go were not compliant with MSP requirements (for the slope and soil erosion hazard). VicForests upgraded the road surface²⁸, but did not correct the drainage so that it was compliant with MSP requirements. Over 100 m of road drained directly into a drainage line waterway crossing adjacent to #21 Net Set Go. There was no sediment trap and as a result, significant quantities of sediment were deposited in the waterway (Figure 5.2).



Photograph shows sediment from a permanent road deposited in outlet of a drainage line waterway crossing. The culvert also did not comply with MSP requirements for diameter and cover (at inlet).

Figure 5.2 Waterway crossing, #25 Last Minute coupe.

The assessed level of potential environmental impact was moderate in both cases.

5.1.2 Findings in relation to environmental impact: timber harvesting coupes

Overall, environmental impacts were assessed for about 8% of the applicable criteria, with the majority of these rated as moderate or major (Figure 5.1). Waterway crossings were the main source of non-compliance incidents overall and the main source of those with assessments of major potential environmental impact. While this most likely overstates the severity of impact of many waterway crossing non-compliances, it highlights the sensitivity of the locations at which these non-compliances occurred.

The occurrence of non-compliances with potential environmental impact varied considerably between audit themes. About 5% of criteria applicable to the biodiversity theme recorded non-compliances with potential environmental impact. This increased to 22% of criteria applicable to road maintenance and closure, although there were significantly fewer criteria included in the latter theme (five criteria, compared with 52 for biodiversity). Most of these non-compliances were assessed to have moderate or major potential environmental impact (Figure 5.1)

Three types of non-compliance incident identified in this audit were assessed as posing a risk of major environmental impact:

- Failure to provide passage for fish or aquatic fauna through waterway crossings on permanent streams;

²⁷ The 25 year limit on VBA searches is no longer applied, but was the practice at the time of planning for audited coupes.
²⁸ Of these sections of the DELWP-managed permanent road network.



- Removal of waterway crossing culverts without adequately managing the risk of embankment materials being washed into the waterway;
- Poorly constructed road drainage, which allows a long length of in-coupe road to drain directly into a permanent or temporary stream;
- Harvesting within a rainforest buffer²⁹.

Issues associated with waterway crossings have previously been discussed (Sections 4.2.2 and 5.1.1) and have been illustrated in Box 1. The single incident of harvesting in a rainforest buffer (#24 Take Me Home coupe) was discussed in Section 4.2.3.

As discussed in Section 5.1.1, there appear to be systematic deficiencies in VicForests' practices in relation to the construction and management of waterway crossings and these deficiencies lead to a consistently high frequency of non-compliant waterway crossings with high potential for environmental impact. No similar systematic issues with high potential for environmental impact were evident in other aspects of VicForests' operations.

5.1.3 Findings in relation to forest regeneration activities

This audit found that two of the four coupes considered were not adequately stocked and were not suitable for finalisation. Since the four coupes were specifically selected because of DELWP concerns about the adequacy of regeneration, this finding cannot be considered to be representative of the larger set of regeneration coupes which VicForests has nominated for finalisation.

5.2 VicForests' responses to 2015 FAP recommendations

Three separate audits were commissioned by DELWP as part of its 2015 FAP. The audits each focussed on a different compliance priority: construction and maintenance of in-coupe roads (Jacobs, 2016); construction and rehabilitation of waterway crossings (Indufor, 2016) and protection of mandatory exclusion areas from the impacts of harvesting (GHD, 2016). Waterway crossings were considered in both the in-coupe road and waterway crossing audits.

Each of the audits made a series of recommendations to VicForests which the auditors considered were relevant to the respective compliance theme. These recommendations are consolidated in Table 5.1, along with VicForests' responses (as provided to DELWP). This audit team's assessments of the relevance of the recommendations and VicForests' actions in response to these is also given. This perspective is based on the results of the 2016-17 audit program³⁰.

VicForests' responses to recommendations from 2015 FAP audits may be characterised as follows:

- Reference to the in-progress roading review: this was the largest type of response, with 12
 recommendations addressed in this way. At about the time of the 2015 audits, VicForests engaged an
 engineer to conduct an independent review of its roading documentation and practices. While the review
 has been completed, VicForests has advised the auditors that they are still in the process of determining
 how to respond to the independent engineer's work. No known progress has been made against any of
 these 12 recommendations.
- Reference to DELWP: seven of the recommendations were considered by VicForests to be DELWP's, rather than its own responsibility. Hence they did not propose to make any specific response. VicForests' responses were either consistent with the auditor's assessment of the recommendation or were not within this audit's scope and therefore no finding was made.

²⁹ Note that VicForests disputes this finding for #24 Take Me Home coupe.

³⁰ Note that at least some of the coupes included in this audit were planned and harvested over a similar timeframe to coupes included in the 2015 FAP. In some cases, this audit revisited coupes which were included in the 2015 program. Given this, there may have been little or no opportunity for any changes in VicForests' coupe planning or operational practice in response to the 2015 audits' recommendations.

Table 5.1 Responses to recommendations from audits conducted under DELWP's FAP in 2015.

Recommendations	VicForests' responses	Auditor's comments and observations
Compliance theme: protection of mandatory exclusion areas from th	e impacts of harvesting (GHD, 2016)	
1. It is recommended that potential spatial data inaccuracies are taken into consideration when selecting appropriate sites for future audits, and that measures are put in place to increase the likelihood of selecting sites containing biodiversity values.	Recommendation for DELWP.	This recommendation is applicable to selecting coupes with other compliance priorities (i.e. length of in-coupe roads, presence of waterway crossing). Data provided for selection of audit targets is based on coupe planning and not on the actual works and is often an unreliable indicator of what is actually present (see Table 3.1). This is an area of potential improvement for the audit program (see Recommendation D5). The issue of accuracy of spatial data is relevant to rainforests and other priority vegetation communities (heathland, MRT). Mapping is based on modelled data. DELWP is the custodian of this information and is responsible for any enhancement, as per VicForests' response. Finding: recommendation applicable to DELWP.
2. To aid in future compliance monitoring work undertaken by auditors or DELWP, it is recommended that VicForests adopt a standardised level of documentation across coupes and FMAs.	VicForests' Coupe Planning Instruction outlines documentation requirements within coupe folders. It is noted that there is some variance in the level of detail included in some coupe folders between regions. VicForests endeavours to implement consistency across the business.	 Inconsistency in the detail and information included in coupe folders was observed in the current audit. Examples of issues are: classification of riparian and rainforest buffers and their annotation on operations maps; listing of in-coupe road class. The digital coupe files used in part of this audit do not necessarily hold all relevant information. Further standardisation of content and level of detail could be achieved. The content of digital coupe files (going forward) should include scans of all relevant records. Finding: recommendation still not satisfactorily addressed.
3. VicForests set up checks to ensure LBP habitat checks are happening in the field, and that they are being stored in a set place within the FCP for each coupe so that they can be easily accessed by staff managing the site to confirm the presence or absence of any biodiversity values.	VicForests' form used for the identification of Leadbeater's Possum habitat and regrowth retention harvesting instruction outline a series of checks throughout the coupe planning stages through to post-harvest and post-burn to ensure correct documentation has been recorded. VicForests retains records of habitat retention in both the coupe folder and a central regrowth retention harvesting tracking spreadsheet. VicForests will include review of coupe folders within its next internal audit.	No issue was identified with Leadbeater's Possum (LBP) habitat recording. In most cases LBP records resulted in the formation of 200 m radius SPZs. Finding: VicForests' routine practice appears to be consistent with recommendations.

Recommendations	VicForests' responses	Auditor's comments and observations
4. If a coupe has only been re-opened for the use of the landing, VicForests should include an updated "Coupe planning Checklist" in the FCP targeted around the re-opening of the landing, highlighting biodiversity values, i.e. that a Leadbeater's Possum Habitat checklist would not need to be completed due to the type of works proposed on site.	VicForests will review its Coupe Planning Checklist to ensure it accurately reflects the operation.	VicForests advises that it has regularly reviews and revises its Coupe Planning Checklist. Current practice is to perform a new coupe overlay analysis if there is a gap of more than 12 months from the original analysis. The documents are not undated if there is no change. No landings were constructed on several of the audit coupes. Logs from trees harvested on these coupes were snigged to an adjacent coupe. No evidence was sighted in the digital or hard copy coupe file that values associated with the coupe to which the logs were snigged were reconsidered in coupe planning. This could reflect that no values had changed, that an update was not required or that it was not performed. Finding: recommendation has been addressed.
5. VicForests set up checks to ensure Rainforest ID checks are happening in the field, and that they are being stored in a set place within the FCP for each coupe so that they can be easily accessed by staff managing the site to confirm the presence or absence of any biodiversity values.	VicForests will review the coupe folder contents form and provide clarity to staff as to where rainforest ID forms are stored. An assessment of rainforest documentation compliance forms part of the annual internal audit program.	This audit found that digital and hard copy coupe files are ambiguous as to the results of checking for rainforest stands. The FCP includes results of the GIS-based values check, but not necessarily the field assessment. VicForests report that results of the field assessment are not reported if rainforest is not found. This is not consistent with the recommendation. Our experience is that VF is typically conservative with rainforest stand identification and often provides rainforest buffers where they are not required. Finding: recommendation does not appear to have been addressed.
6. When mapping features that require an exclusion zone (i.e. Rainforest patches that require a 40 m buffer), VicForests clearly show on the maps within the FCP that the area mapped as rainforest either a) includes the 40 m buffer, or b) apply an additional 40 m buffer on the rainforest mapping. This would make it clear to those on the ground where the buffer is and where the value to be protected, in this instance rainforest, is located.	VicForests' operational maps provided to contractors are required to display the marked boundary of a coupe, and identify any special values located within or adjacent to the coupe. VicForests will review consistency of its mapping as part of the next internal audit program.	VicForests' operations maps show the location of the coupe boundary, but not necessarily the reason for a buffer being provided. Information content on operations maps continues to be inconsistent. VicForests is not required to map the rainforest boundary as suggested by this recommendation. Finding: opportunity to improve the information content and consistency of VicForests' operations maps remains.
7a. VicForests make a submission to DELWP to update the SPZ layers when inaccuracies are identified during the field assessment so that the presence of an SPZ is updated within the DELWP spatial layers. This might be the removal or addition of an SPZ from within coupe boundaries, e.g. updating the SPZ layer for patches of Rainforest or the	Submissions to DELWP to update the Forest Management Zoning are often completed when inaccuracies are identified in the field. VicForests will continue to work with DELWP to ensure this process is completed in an efficient way.	No observations relevant to this recommendation were made during this audit. No finding.

Recommendations	VicForests' responses	Auditor's comments and observations
Alpine Walking Trail based on better spatial data for the location of the track.		
7b. DELWP determine an appropriate response time and action for when VicForests submit applications to have areas re-zoned, and commit to meeting this target.	Recommendation for DELWP. VicForests supports this recommendation.	No observations relevant to this recommendation were made during this audit. No finding.
8. VicForests submit requests to DELWP to update spatial layers for mappable features (i.e. Waterways, Alpine Walking Trail, Rainforests) which have been inaccurately modelled in some areas.	As per Recommendation 7a, submissions to DELWP to update the Forest Management Zoning are often completed for inaccuracies identified in the field. There are a large number of modelled values that are not accurately mapped. The data regarding these values is not intended to be relied upon for small scale application, but provide a trigger to check for the value in the field. VicForests will continue to work with DELWP to ensure this process is completed in an efficient way.	The auditors agree with VicForests' response. Finding: recommendation is not applicable to VicForests' operations.
9. VicForests identify habitat retention areas on both the Operations and/or Post Harvest (regeneration) maps within the FCP. By mapping these areas, it can be clearly determined whether appropriate habitat retention standards have been met.	VicForests require habitat areas to be displayed on both operations and regeneration maps. VicForests will review compliance as part of its next internal audit.	 Habitat retention areas and other unharvested buffers were routinely (but consistently) recorded in operations and final harvest maps. Finding: opportunity to improve the information content and consistency of VicForests' operations maps remains.
10a. VicForests identify the location of retained seed trees within the maps stored in the FCP – either by marking individual trees on the operations or post-harvest maps, or by adding a polygon to the maps outlining any areas where trees have been intentionally retained as seed trees. A figure (number) should also be included identifying the number of seed trees that have been retained, clearly highlighting that consideration in to seed tree retention has occurred.	VicForests records in its coupe management system a figure for the target number of retained trees per hectare in the coupe planning stage, as well as an actual number retained per hectare post-harvest. Habitat patches are displayed on maps, but scattered individual trees are not always displayed. VicForests will review its procedure regarding recording retention requirements on operations and post- harvest maps.	 Hard copy or digital FCPs routinely record target density for seed tree retention. No records of actual (estimated) retention were observed in this audit. VicForests reports that seed tree retention is recorded elsewhere in their management system. Finding: opportunity to improve the information content and consistency of VicForests' operations maps remains. It is not clear what long-term value mapping of retained seed trees would provide. In ash-type forests, most are killed by the regeneration burn and in all forest types many are subject to windthrow. Finding: no action in response to the seed tree mapping recommendation is considered to be appropriate.
10b. Where seed trees are being retained for the dual purpose of habitat retention, VicForests should take the quality of trees retained as seed trees in to consideration, so that trees selected to be retained are those	VicForests will review the training framework for Operations Foresters and provide refresher training for seed and habitat tree selection where required.	This issue was not specifically considered by the audit. No finding.

Recommendations	VicForests' responses	Auditor's comments and observations
that are deemed as having a good probability of surviving and contributing hollows in the future. Refresher training of operational foresters needs to be maintained so that they are able to take full advantage of the opportunities to achieve optimal solutions on the ground.		
11. VicForests introduce a requirement that forest contractors managing the coupes to include detail within the coupe diary entries outlining whether trees that have fallen/slid out of place have been retrieved or left <i>in situ</i> , and that they mark the location of all accidental tree falls on the operations maps, so that they correspond with the coupe diary notes. It should be clear whether any accidental tree falls have impacted any mandatory buffers or exclusion areas from both the coupe diary entries and the maps.	VicForests requires its contractors to record boundary intrusions in the coupe diary and to notify their supervising Forester. The supervising Forester assesses the incident on site, signs the diary entry and records the location on the post-harvest map. VicForests will ensure that this process is being adequately implemented.	From the auditors' experience (from previous audits), recording of trees crossing marked boundaries is not consistently carried out between VicForests offices. This point was not specifically within the scope of this audit. No finding
12. DELWP establish a clear regulatory requirement for VicForests to submit applications to DELWP to update spatial data layers where inaccuracies are identified during planning and field work associated with timber harvesting operations, and commit to a specified timeframe in which DELWP must respond (either approving or denying the request, or requesting additional information). This maximum turn around period in which DELWP must respond to VicForests will be important in allowing VicForests to manage areas of forest effectively and to continue with their planning processes to meet operational requirements.	Recommendation for DELWP.	This appears to repeat recommendation 7. No finding.
13. In the next review of the Code and MSP, DELWP considers providing further guidance on the requirements for assessing the presence of rare and threatened species during forest coupe planning. This could include the use of a risk based approach where the need for and level of assessment required is determined based on the likelihood of occurrence and potential impact of harvesting on the rare or threatened species.	Recommendation for DELWP.	Finding: this recommendation is for DELWP rather than VicForests.
Compliance theme: construction and rehabilitation of waterway cros	sings (Indufor, 2016)	
1. It is again recommended that VicForests implements Recommendation VF3 from the 2014 audit report and increases the desktop VBA search area around waterway crossings to reflect common	VicForests conducts a search of environmental values within and surrounding coupes on the VBA prior to operations commencing. The desktop assessment process was	As noted by VicForests, their VBA (and other) searches relate to coupes rather than individual elements, like waterway crossings.

Recommendations	VicForests' responses	Auditor's comments and observations
practice among other professional users of the VBA. The auditor understands that the threatened flora and fauna models referred to in Recommendation 2014 REG4 were reviewed by DELWP and found in their current form to be inadequate for use in forested areas. DELWP has advised that it is assessing if these models can be amended for future forest use	reviewed following the 2014 audit report recommendations and has been broadened where determined necessary to help identify additional environmental values. VicForests will continue to engage with DELWP regarding any future review of these models.	The search area defined in the FCP documentation is "within the coupe" and "within 500 m of the coupe". Some values referenced in the MSP (Spotted Tree Frogs, Barred and Mountain Galaxias; 3.3.1.2) are to be protected up to 1 km upstream from a recorded site. While VicForests advised the auditors that the search area for at least some protected values extends greater than 500 m from the coupe boundary, this is not consistent with their current coupe planning documentation. Finding: opportunity to improve coupe planning documentation remains. References in the recommendation to species models is a matter for DEWLP to consider. No finding.
2. It is recommended that if a rare or threatened species is identified as present or potentially present in the coupe but is not listed in the MSPs, VicForests as a minimum should contact DELWP for management advice, as a precautionary approach.	The Management Standards and Procedures provide authoritative advice on the management actions required for specific values. It is VicForests' understanding that species not listed have adequate representation and protection within standard Code protection measures or the supporting reserve system. Where VicForests encounters a species where additional advice is required, VicForests will contact DELWP for management advice	As VicForests have noted the MSPs and their Planning Standards provide relatively up to date (2014) and authoritative advice on the management of specific values. This audit did not identify instances where that advice was not followed. Finding: VicForests' practice was compliant with the regulatory framework prior to the recommendation.
3. It is recommended that VicForests implements Recommendation VF4 from the 2014 audit report. It is recommended that VicForests reviews, revises and implements its documented procedures to ensure that its operations systematically comply with the Code prescription that "Plans for roads must be based on field surveys to ensure that all environmentally sensitive locations are identified"; and that records are kept of findings (including nil findings) and management actions taken in response to findings.	VicForests disagrees with the recommendation. All newly constructed roads are completed under a coupe plan which undergoes an assessment of values prior to operations commencing. New roads and crossings are assessed, approved and marked in the field. VicForests will review compliance of environmental value assessment during the next internal audit.	VicForests disagreed with the recommendation and, from the evidence of this audit, appear not to have changed practice in relation to pre-harvest values checking and site assessment. Where OGF is modelled as being present within the coupe, surveys for listed, threatened species are conducted and recorded. In other situations, searches are confined to species with confirmed records. On the evidence of this and previous audits conducted by this team, VicForests and its contractors routinely seek to minimise roading across environmentally sensitive areas (e.g. rainforest stands, waterways), but this is not always possible. Finding: VicForests' practice typically complies with the regulatory framework.

Recommendations	VicForests' responses	Auditor's comments and observations
4. It is recommended that VicForests obtains and documents engineering advice in relation to the construction of log bridge crossings to meet relevant Code and MSPs requirements.	VicForests engaged an Engineer to conduct an independent review of VicForests roading documentation. Following this, VicForests is currently in the process of addressing actions and reviewing roading activities across all regions. As part of this review, VicForests will assess documentation in relation to the construction of log bridge crossings and recording of engineering advice.	VicForests' have advised that the activities described in their response are still in progress and have not yet been incorporated into routine practice. Finding: response to recommendation still to be implemented.
5. It is recommended that VicForests obtains revised datasets to accommodate pre- and post-harvest flows and design requirements for longer serving crossings.	VicForests will review its process in regards to pre- and post- harvest flow and design as part of the above mentioned roading review.	VicForests' have advised that the activities described in their response are still in progress and have not yet been incorporated into routine practice. Finding: response to recommendation still to be implemented.
6. It is recommended that VicForests considers whether there are alternate crossing designs that require less cutting back of the stream bed, for example, using more fill and less cut at crossings with steep side slopes.	VicForests disagrees with the above recommendation. VicForests current process involves a thorough desktop and field assessment of proposed crossing location, and all other possible locations taking into account environmental impact. In the example that this recommendation refers to, all factors were considered in the design and construction and no feasible alternatives were present.	VicForests' response is noted. However, this audit was provided with no evidence of a specific design or basis for design for waterway crossings. This may be one reason for the apparently systematic non-compliance with Code and MSP waterway crossing requirements. Our observations suggest that crossings are typically located appropriately, given landscape and practical constraints. Finding: VicForests practice in siting waterway crossings typically conforms with the regulatory framework. However, there is no known documentation of discussions on crossing planning or design.
7. It is recommended that VicForests considers the modification of current culvert construction methods to prevent streambeds eroding beneath culvert outlets.	VicForests will include a review of its culvert construction methods as part of the roading review.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. The issue to which this recommendation responds was identified in the current audit. Finding: response to recommendation still to be implemented.
8. It is recommended that VicForests completes the current engineer review and approval of waterway crossing construction methods and materials used.	VicForests has completed the independent engineer review and are in the process of implementing required actions.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.
9. It is recommended that VicForests maintains current and accessible copies of manufacturers' specifications for all pipes used in waterway crossings.	VicForests will review maintenance of manufacturers' specifications for all pipes used in waterway crossings as part of the roading review.	VicForests' response does not specifically address the recommendation. No evidence was provided that copies of manufacturers' specifications are held with coupe files to confirm that culverts associated with the coupes have been constructed correctly.

Recommendations	VicForests' responses	Auditor's comments and observations
		Finding: response to recommendation still to be implemented.
10. It is recommended that VicForests considers, documents and internally communicates the key culvert design elements that contribute to protecting water quality to ensure all future culvert crossings are constructed using a consistent approach across all FMAs.	VicForests is in the process of reviewing culvert designs as part of the roading review.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.
11. It is recommended that VicForests develops a register of waterway crossings to monitor current installation status for its removal and rehabilitation program, and to also assist in scheduling and recording appropriate maintenance.	VicForests is in the process of developing a register of waterway crossings as part of its roading review.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. It is not clear to the auditors that a waterway crossing register has been developed. Finding: response to recommendation still to be implemented.
12. It is recommended that VicForests documents, communicates and implements a procedure that ensures the removal of cording on completion of harvesting, with minimum damage to retained vegetation and soils, from stream buffers, filters and other areas of significance, such as rainforest.	Cording and Matting Prescriptions and the rehabilitation of snig tracks and landings are included within VicForests' Utilisation Procedures. Compliance is monitored through the monthly Coupe Monitoring Form. VicForests will ensure compliance continues to be monitored to ensure there is minimal damage to retained areas.	VicForests' response is noted. On the evidence of this audit, cording is removed from sections of snig tracks and snig track crossings where it is laid. In #5 Giraffe coupe, two snig track crossings were constructed with log fill crossings and cording. Removal of one of the crossings resulted in excessive disturbance to adjacent bush and was assessed to have moderate potential environmental impact. Finding: recommendation is addressed in VicForests' routine practice, although some departures from this were detected in this audit.
Compliance theme: construction and maintenance of in-course reads	(Jacobs 2016)	audit.
 VicForests should document its planning of in-coupe roads in the "Roading" section of the FCP. Documented evidence of planning should include: Map of the planned road alignment; Explanation of rationale for the planned alignment; Analysis and discussion of the environmental and other risks posed by the road and which are to be managed through planning; Discussion of any alternatives routes to manage risks from waterway crossings, other wet areas, steep slopes etc. If the actual and planned route of an in-coupe road differ substantively, an additional entry should be made in the FCP to explain the divergence and a map should be included which shows the actual route taken. 	VicForests is currently in the process of conducting a review of roading activities across all regions. As part of this review, VicForests will review what documented evidence is required and where it should be stored in the Forest Coupe Plan	Planning for in-coupe roads was not within the scope of the current audit program. VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.

Recommendations	VicForests' responses	Auditor's comments and observations
 2. VicForests should be more proactive in seeking engineering advice on the design and construction of in-coupe roads where they will traverse areas of steep slope and require deep side cuts and/or large fill embankments to be constructed. The precise limits for seeking engineering advice prescribed by the MSP (i.e. 30°/25° for areas with lower/higher soil erodibility) are not necessarily consistent with the limited accuracy of available topographic mapping, digital elevation models or field measurement. It is recommended that engineering advice is sought in these higher risk areas, based on the possibility (>50% chance) that: Side slopes will be within 5° of the respective MSP limit; and/or Side cuts or embankments greater than 2 m in height will need to be constructed. 	VicForests has completed the independent engineer review and are in the process of implementing required actions.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.
3. VicForests' FCP records should include the actual basis for design of its in-coupe roads, road drainage, larger embankments and waterway crossings. Record keeping should be proportional to the level of risk which is addressed through road design. The minimum requirement should be to specify the class of road (as per MSP Appendix 4) and explicitly reference which UP provisions are addressed by the road design. Evidence of engineering advice and how this has been incorporated into road design and construction should also be included whenever it has been sought.	VicForests will review FCP records proportional to the level of risk as part of the roading review.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.
4. VicForests should actively seek to reduce the incidence of road fill embankments covering the base of live trees which are retained within coupes. The mandatory nature of this requirement should be reinforced with contractors by targeted training, monitoring, reporting and corrective action (if non-compliance is detected).	The management of fill and material covering the base of live trees are included within VicForests' Utilisation Procedures. Compliance of road works activities is monitored through the monthly Coupe Monitoring Form. VicForests will ensure compliance continues to be monitored to ensure there is minimal impact to live trees.	Instances of road fill covering parts of the base of retained, live trees were observed within two coupes (#6 Zebra, #26 Comp515). Finding: recommendation is addressed in VicForests' routine practice, although some departures from this were detected in this audit.
5. VicForests should ensure that contractors construct MSP compliant cross drainage systems along temporary in-coupe roads with less than 6 months intended use. This drainage should be constructed prior to a forecast significant rainfall event and/or to the temporary or permanent removal of harvesting machinery from the coupe. Construction of	The requirement for contractors to ensure there is adequate drainage prior to substantial rainfall being forecast is included within VicForests' Utilisation Procedures. Compliance is monitored through the monthly Coupe Monitoring Form – Temp Clearance. VicForests will ensure	Based on the evidence of this audit, drainage of many short-lived in-coupe roads continues to only be constructed following the completion of harvesting and withdrawal of machinery from the coupe.

Recommendations	VicForests' responses	Auditor's comments and observations
appropriate drainage systems must be confirmed through VicForests' temporary or final clearance monitoring process. Drainage systems should be constructed prior to the use of any in-coupe road which is intended to be used for more than 6 months.	compliance continues to be monitored to ensure in-coupe roads are adequately drained.	Finding: recommendation is addressed in VicForests' routine practice, although some departures from this were detected in this audit.
6. VicForests should regularly communicate with its contractors about the risks to the environment which are posed by poorly constructed, maintained and/or rehabilitated waterway crossings. Contractors should be instructed in the construction and maintenance of waterway crossings which comply with the requirements of the Code, MSP and VicForests' internal Utilisation Procedures (UP). VicForests should regularly monitor compliance with waterway crossing requirements and assess the potential for sediment movement into waterways in the vicinity of crossings. Corrective actions should be taken by VicForests and its contractors if waterway crossings are not constructed in compliance with the regulatory framework or if sediments are entering waterways at or near crossings. Any non-compliance issues and corrective actions should be recorded in the Forest Coupe Plan (FCP) and the potential environmental impact assessed using the FAP's environmental impact assessment (EIA) rating tool. Non-compliance issues and corrective actions should be reported to DELWP's Timber Harvesting Compliance Unit where the EIA rating is major or greater.	VicForests will review construction, maintenance and rehabilitation of waterway crossings as well as contractor compliance as part of the roading review.	VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.
7. VicForests should explore the more widespread use of rollovers or similar, trafficable cross-drainage structures for in-coupe roads. This type of structure has been observed to be used effectively by VicForests in some settings and by other Victorian forestry operators. They are also widely used in forest and rural roading in tropical and sub-tropical regions of Australia. Rollover structures reduce the need for culverts and, if properly constructed, should function effectively through and following harvesting. They are generally more stable and resilient to damage by post-harvest traffic than traditional "bar and breach" cross drainage structures.	The use of rollovers is not always appropriate in all circumstances, but VicForests will explore the more widespread use of rollovers as part of the roading review.	The recommendation did not suggest that "roll over" type structures were suited to all situations. VicForests have advised the auditors that outcomes of their roading review have not yet been implemented. Finding: response to recommendation still to be implemented.



Reference to routine VicForests practice: responses to six of the recommendations included references to standard VicForests' operating procedures, via (e.g.) adherence to its *Utilisation Procedures* (VicForests 2013) and its monthly coupe monitoring. While this response may reflect that VicForests do not consider the recommendations to result from systematic issues with its operations, it is not entirely satisfactory.

The recommendations were made by the 2015 FAP auditors in response to incidences of non-compliance with both the regulatory framework and VicForests' own procedures, notwithstanding monthly coupe monitoring. The recommendations suggest that a more pro-active response is required. For some recommendations, this may be to ensure that VicForests or its contractors fully comply with the regulatory framework or that coupe monitoring is more diligent and identifies and addresses non-compliances where they occur. It other cases, the recommendations flag opportunities (with which this auditor agrees) for improvements in VicForests' documentation (mapping or coupe records).

- Commitment to review VicForests' practices and/or documentation: responses to six of the
 recommendations committed VicForests to reviewing its current practices or documentation, including
 through its own annual internal audit program. It is not clear whether any further responses were proposed
 following these reviews. This audit did not find evidence of changed practices or documentation in
 response to this set of recommendations.
- Disagreement: VicForests disagreed with two of the recommendations and did not propose any response.
 In both cases, this audit has found that VicForests typically complies with the applicable aspect of the regulatory framework and that no specific response to the recommendation was necessary.

5.3 Potential improvements to timber harvesting practices

The findings of this audit and observations made during the field assessments suggest several potential areas for improvement in timber harvesting and related roading and coupe regeneration activities. These are discussed in the following sections.

5.3.1 Waterway crossings

Waterway crossings were the main source of non-compliances with high potential for environmental impact identified in this audit. This reflects the frequency of non-compliances with the regulatory framework and the environmental sensitivity of the locations at which crossings are constructed. If not appropriately constructed and/or rehabilitated, crossings are potentially a significant entry point for sediment and may pose a barrier to the movement of fish or other aquatic fauna.

Defects in the design, construction and/or rehabilitation of crossings were found to be so common as to suggest there are systematic deficiencies in the approaches to these which are taken by VicForests and their contractors. The auditors consider that there are several opportunities to improve compliance and environmental outcomes associated with waterway crossings, as follows:

- Establish a standardised engineering basis for design and construction: the regulatory framework (Code 2.4.2.4) requires that stream crossings are "designed" to account for traffic, water flows and the characteristics of the stream and that they are to be constructed in a manner consistent with designs and plans (Code 2.4.3.2). Despite this, no evidence was provided during this audit of a clear basis for design for any of the crossings within or adjacent to the selected coupes.

It is proposed that VicForests develop a set of standardised engineering designs for crossings in various representative situations and that these be used as the starting point for design of each individual crossing. The basis of design would consider various features of the site and the crossing's operation, including: traffic, operational life, topography, geotechnical stability, pre and post-harvest flows, requirements for fish passage and successful rehabilitation and constructability.

Drawing on the basis for design, a specific design would be developed and documented for each crossing and retained with the coupe file.

Design and construction review: unknown site features are likely, in many instances, to require that modifications are made to the initial design. All material changes in design should be recorded (and copies retained with the coupe file), a clear rationale provided and a statement of how risks to the environment



(and user safety) are managed included. Once completed, the constructed waterway crossing should be reviewed to ensure compliance with the agreed design and regulatory requirements. Any defects should be identified and remediated.

- Use of sediment traps: sediment carried in table drains on the "inside" of the approach to the crossing (i.e. the embankment side) can be challenging to manage. Opportunities to filter drainage waters through undisturbed vegetation may be limited. Where this is the case, sediment or "silt" traps or similar features should be used (as required by the Code 2.4.2.6) to reduce the quantity of sediment reaching the waterway.
- Rehabilitation plan: planning for rehabilitation of temporary crossings should be incorporated into their
 design so that construction facilitates an appropriate environmental outcome. The plan should specify how
 embankment materials are to be managed so that they do not become a significant source of sediment and
 how drainage from the approach of the closed in-coupe road will be managed to prevent sediment delivery
 into the waterway. Records from planning and review of construction should be retained with the coupe file.
- Rehabilitation review: as with construction of the crossing, its rehabilitation should be reviewed to ensure that works are completed as planned and that any defects are rectified. The review should also consider the interception of road drainage from about 20 m beyond the crossing to ensure this is operating effectively. A second review should take place following the winter after closure to ensure that rehabilitation has been successful and that road drainage interception continues to work effectively.

It is suggested that this process be scaled to the level of risk, with a more rigorous approach to design, construction and rehabilitation taken for crossings over permanent streams, those upstream of protected aquatic species or potable water diversion points and those located on unstable soils. Where possible, planning should be used to avoid the need for crossings.

Priority: high

V2: VicForests should thoroughly review its approach to the design, construction and rehabilitation of waterway crossings to significantly improve their compliance with regulatory requirements. This review should consider the suggestions included in Section 5.3.1

5.3.2 Embankments

Recommendation to VicForests

The regulatory framework (e.g. Code, 2.4.2.3) requires that embankments *must be planned and designed to minimise soil erosion, mass soil movement, and potential water quality deterioration.* As with waterway crossings, no documented basis for design of any in-coupe road or waterway crossing embankment was sighted during this audit. Instances of failure of in-coupe road and landing embankments were observed during this audit (Figure 4.9). However, it is not clear that this resulted from no or an inappropriate design or deficiencies in construction.

A similar (but simplified) process to that proposed to address systematic non-compliance with waterway crossing design, construction and operation is proposed for larger embankments (say >2 m high), as follows:

- Develop standard designs for in-coupe road and landing embankments: based on a range of requirements and site characteristics. These would then be adapted to suit particular site conditions. Appropriate and engineer-approved (as per MSP 6.2.2.3) construction techniques would be specified. The final design would be documented and a copy retained with the coupe file.
- Construction review: any changes to the proposed design in construction would be reviewed, with risks
 assessed and managed as required. Any changes to the design would be documented, with a copy
 retained in the coupe file. Compliance of the constructed road with the design would be assessed, with a
 focus on the management of road drainage. Any defects (e.g. uncontrolled drainage across the
 embankment, culverts outlets with no erosion protection) would be identified and rectified at this stage.

Recommendation to VicForests

Priority: moderate

V3: VicForests should review its approach to the design and construction of large in-coupe road or landing embankments to reduce the incidence of failure during or following their use. This review should consider the suggestions included in Section 5.3.2.



5.3.3 Regeneration burning

Several instances were observed in this audit where regeneration burns crossed marked coupe boundaries into unharvested riparian buffers³¹. The level of impact ranged from damage to understorey vegetation to canopy scorch and death of fire sensitive overstorey species (i.e. ash eucalypts, Myrtle Beech). In most cases, environmental impacts are likely to persist for 1-2 years, although this will be much longer where, for example, overstorey vegetation is killed.

The auditors acknowledge the practical difficulties in managing regeneration burns, particularly in wetter and higher elevation areas where safe and effective burning opportunities are limited. However, we recommend that VicForests continue to review its burning practices and incidents where regeneration burns cross into riparian or habitat buffers to identify opportunities to burn safely, accomplish regeneration objectives and reduce unintended impacts in unharvested buffer areas.

Recommendation to VicForests

Priority: moderate

V4: VicForests should continue to review its approach to regeneration burns to identify and implement opportunities to reduce unintended impacts in unharvested buffer areas.

5.4 Regulatory framework improvement opportunities

In commissioning this audit, DELWP asked for comments on opportunities to improve the regulatory framework for timber harvesting in State forests. These are discussed below in the context of the Code and MSPs and the Forest Audit Program.

5.4.1 Improvements to the Code and Management Standards and Procedures

The scope of this audit highlights two areas in which the regulatory framework for timber harvesting activities in State forests may be improved, in relation to the provision of buffers for rainforest stands and the provision of fish passage at waterway crossings:

Rainforest buffers: rainforest protection measures are specified in Section 4.4.9 of the MSPs and Section 4.6.5 of the Planning Standards. Clause (d) of 4.4.9.1 is ambiguously worded and includes an incorrect cross-reference, as follows,

Exclude all rainforest stands (including linear stands) equal to or exceeding 0.4 ha from timber harvesting operations. Protect these stands with a 40 m buffer except for rainforest stands in the Central Highlands FMAs and the Gippsland FMAs where 3.4.8.2 (sic) must be complied with.

Section 4.4.9.2, the clause to which the cross-reference is actually directed, references Table 6 in Appendix 5 of the Planning Standards, which specify buffers greater than 40 m for some rainforests sites of significance (RSOS), but only (according to PS 4.6.5.1) in the Gippsland FMAs. Wording of this clause in the Planning Standards and MSP 4.4.9.1 means that it is unclear what buffer should be provided for rainforest stands greater than 0.4 ha located within the Central Highlands FMAs. According to the letter of the regulatory framework, the only requirements for such stands is to exclude them from timber harvesting operations. This is unlikely to be the intention of the compliance requirement and is not consistent with VicForests' practice³².

When the regulatory framework is next revised, these clauses should be rewritten to ensure that rainforest protection requirements are unambiguous.

Recommendation to DELWP

Priority: high

D1: DELWP should revise the wording of the *Management Standards and Procedures* and their *Planning Standards* to provide consistent, unambiguous guidance on the requirements for providing unharvested buffers around rainforest stands equal to or larger than 0.4 ha in area, including those associated with rainforest sites of significance.

³¹ These were not necessarily assessed to be non-compliances with the regulatory framework, particularly outside of the Central Highlands FMAs and in less fire-sensitive forest types (i.e. other than ash-type forests), where the MSPs do not refer to coupe impacts associated with regeneration.

³² Note that VicForests' practice for rainforest stands 0.4 ha or grater in area is to provide a 40 m buffer.



Provision of fish passage: the MSPs (6.2.5.9) specify that, *on permanent streams, include a fish ladder if the diameter of the culvert is greater than 750 mm.* While this clause is consistent with the previous iteration of the MSPs (DSE, 2009), it is not clear what the basis in science for the requirement is. Culverts smaller than 750 mm diameter (on permanent streams) are not necessarily more or less likely to pose a barrier to the movement of fish or other aquatic fauna than larger culverts. It may also be possible for a culvert larger than 750 mm diameter to be constructed so that it provides fish passage. Fish passage may also not be a relevant consideration high within the catchment of a permanent stream and there is potential for fish passage to be provided unnecessarily³³.

It is recommended that in advance of the next review of the regulatory framework, DELWP conduct research to provide a sound science basis for prescriptions relating to the use of fish ladders with waterway crossings.

Recommendation to DELWP	Priority: moderate
D2: DELWP should develop a science basis for prescribing the provision of fish passage at waterway crossing	s and implement this in
the next revision of the regulatory framework for timber harvesting.	

A second errant cross reference was identified in MSP 4.4.3.2, which should refer to Section 4.3.2 rather than 3.4.2.

In our previous audit of the construction and maintenance of in-coupe roads (Jacobs, 2016), we provided a series of recommendations on the regulatory framework for timber harvesting which, in our view, remain relevant. These were of two kinds: the first group of recommendations was concerned with providing a more objective basis for audit and the second group was concerned with strengthening provisions relating to pests, weeds and diseases. These recommendations have been revised and are included in Appendix C and may also be considered by DELWP.

5.4.2 Improvements to audit program management

The FAP forms an important component of the accountability and adaptive management process which is required to deliver and demonstrate sound and improving environmental performance during timber harvesting activities. Several opportunities exist to improve the management and effectiveness of the program, as follows:

Clear process for responding to audit recommendations: although the FAP potentially forms part of a continuous improvement process for timber harvesting activities, there is no clear process to ensure agreed responses to audit findings and recommendations are implemented. The discussion of VicForests' progress with recommendations arising from the 2015 FAP (Section 5.2, Table 5.1) indicates that there has been little progress in addressing the findings of previous audits.

It is proposed that DELWP, as the regulator of timber harvesting compliance, develop a process for reviewing and acting on audit findings and recommendations. That process could involve meeting with VicForests (and [potentially] the auditors) to discuss findings and recommendations and agree on how these will be responded to. This would be documented in an implementation plan to which DELWP and VicForests would commit and whose progress would be tracked at 6-12 monthly intervals.

 Adoption of revised EIA tool: in developing our approach to this audit, the audit team reviewed and revised the FAP's EIA tool (Appendix B). The main change was to extend impact assessment descriptors to account for non-compliances relating to road drainage, waterways and other unharvested buffer areas. The changes strengthen the focus of ratings on the environmental sensitivity of locations at which noncompliances occur. Thus while environmental impact assessments may overstate the actual level of environmental impact of a non-compliance incident, they accurately reflect its location.

It is proposed that this revised tool be adopted for use or further modification in future FAP audits.

 Coupe selection: the data VicForests provides to DELWP to support the selection of audit targets is based on coupe planning information. It indicates the intended length of in-coupe road, any proposals for waterway crossings and the presence of modelled rainforest within the gross coupe area. As demonstrated by Table 3.1, the actual characteristics of the coupe are often quite different from those understood at the

³³ Note that no instances where observed where 750+ mm culverts on permanent streams included fish ladders.



time of coupe planning. This results in coupes being selected for audit on the basis of risk to sensitive values not actually having the attributes which were considered to contribute to risk. While this may improve the representativeness of the audit, it potentially dilutes the focus on key risk issues.

It is therefore proposed that DELWP seek information from VicForests on the actual coupe characteristics to support audit target selection.

Audit coupe register: since harvest coupes remain on the Timber Release Plan (TRP) for several years and may be harvested over more than one season, it is possible that a coupe with higher risk attributes may be selected for audits in successive years³⁴. DELWP should maintain a register of coupes included in the audit program to ensure auditors do not inadvertently audit coupes which have previously audited under the FAP.

Maintaining a register of audited coupes would also allow longitudinal assessments of environmental impacts associated with instances of non-compliance with the regulatory framework for timber harvesting. This would help to strengthen the evidence base for the regulatory framework.

Recommendations to DELWP

D3: DELWP should develop a process for reviewing and acting on key findings and recommendations from each years' forest audit program. **High priority**

D4: DELWP should adopt the revised EIA tool developed for this years' audit program. Moderate priority

D5: DELWP and VicForests should gather information on actual coupe attributes to support audit coupe selection rather than information from the coupe planning stage. **Moderate priority**

D6 DELWP maintain a register of coupes included in the FAP. Moderate priority

³⁴ This occurred during the 2016-17 audit program. Several coupes included in the Indufor (2015) audit of waterway crossings (#6 Zebra, #9 Mosquito, #15 Makybe Diva, #19 Turkey Neck) were selected for this audit – in part because they had waterway crossings. This was known in advance of the field assessments of most of these coupes. Audits proceeded because of the wider scope of the 2016-17 audit program than the Indufor audits in 2015.



6. Conclusions and recommendations

6.1 Conclusions

The objectives of DELWP's FAP are to assess VicForests' compliance with the regulatory framework for timber harvesting activities in State forests and any risks non-compliances pose to the State's sustainable forest management objectives. The 2016-17 FAP addressed mandatory compliance elements selected by DELWP's Timber Harvesting Compliance Unit. These draw on both the Code and MSPs and follow three main themes:

- Protection of soil, water and biodiversity values from adverse impacts associated with harvesting and incoupe roading;
- · Design, construction, maintenance and closure of in-coupe roads;
- · Forest regeneration.

Compliance of harvesting and roading activities with the regulatory framework was assessed for 30 coupes located in State forests within the Central, Central Gippsland, Dandenong and East Gippsland FMAs. The audit of forest regeneration considered four coupes located in State forest within the Tambo FMA. Coupe selection was risk-based, meaning that audit findings cannot be taken as being statistically representative of VicForests' operations overall.

Overall compliance findings for harvesting coupes

A total of 104 compliance criteria were identified from the various compliance elements applicable to timber harvesting coupes. Of these, 20 criteria did not actually apply to any of the selected coupes.

The overall average level of compliance with applicable audit criteria was 86%. A further 6% of compliance criteria were found not to fully comply with the regulatory framework, but did not have direct potential for environmental impact. The level of compliance for individual coupes ranged between 71% and 100%. Of the 30 coupes included in this component of the audit, eight had no non-compliances with potential for environmental impact.

Some non-compliance "incidents" (e.g. an inappropriately constructed waterway crossing) may be assessed against multiple criteria and result in multiple non-compliances. The average number of individual non-compliance incidents was 1.4 per coupe, with actual number ranging between zero and five.

The FAP's EIA tool was revised in developing the methodology for this audit. The amended tool was used to assess the potential environmental impact associated with each (full) non-compliance incident. Assessed environmental impact ranged between negligible and major across the 43 recorded incidents. Non-compliances which were assessed to have major environmental impact were detected in eight of the 30 harvest coupes.

Compliance with environmental audit criteria

"Environmental" audit criteria were grouped into three themes, with some criteria applicable to more than one theme. The main findings for each theme were as follows:

- Protection of forest soils: 21 audit criteria were relevant to the protection of forest soils, of which two were
 not applicable to any of the selected coupes. The level of compliance with applicable criteria ranged
 between 56 and 100%, with an average of 83% compliance. All non-compliances assessed to have major
 environmental impact and most non-compliances assessed to have moderate environmental impact were
 associated with the movement of sediments into or within waterway crossings.
- Protection of water flows, water quality and river health: 39 audit criteria were relevant to this theme, of which two were not applicable to any of the selected coupes. The average level of compliance with applicable criteria was 85%, with compliance ranging between 60 and 100%. Non-compliances which were assessed to have major environmental impact were identified on eight coupes, with each of these (and many moderate non-compliances relating to waterway crossings.



Protection of biodiversity values: 51 audit criteria were relevant to the protection of biodiversity values, of which 17 were not applicable to any of the selected coupes. Average compliance with applicable criteria was 90%, with the range being 70-100%. Non-compliances with major environmental impact on seven coupes related to constructed waterway crossings, four of which resulted from the culvert disrupting the potential passage of fish or other aquatic fauna. Major potential environmental impact was assessed on one coupe where harvesting took place within 40 m of what was classified as a warm temperate rainforest stand exceeding 0.4 ha in area³⁵.

Compliance with roading criteria

Roading criteria were grouped for the audit into three themes, as follows. Some criteria were applicable to more than one roading theme and in some cases were relevant to environmental themes. The main findings for each theme were as follows:

- Road design: the average level of compliance with the 12 criteria relevant to this theme was 57%, with compliance ranging between 0% (for a single applicable criterion) and 100%. "Part" non-compliances were relatively common for this compliance element, reflecting the frequent lack of a direct connection between design non-compliance and environmental impact. Non-compliances assessed to have major environmental impact were identified on five coupes, with all of these relating to the design (and construction) of waterway crossings.
- Road construction: 35 compliance elements were relevant to this theme. The average level of compliance with applicable criteria was 79%, with the level of compliance ranging between 0% (part compliance for a single applicable criterion) and 100%. Non-compliances with assessed major environmental impacts were identified on seven coupes and were all associated with waterway crossings.
- Road maintenance and closure: there were only five compliance criteria which were relevant to road
 maintenance or closure. The average level of compliance with applicable criteria was 73%, with the level of
 compliance ranging between 0% (non-compliance for one or two applicable criteria) and 100%. Major
 potential environmental impact was assessed for non-compliances at three coupes, two of which were
 associated with the removal and rehabilitation of in-coupe road waterway crossings.

Audit of forest regeneration

This component of the audit considered only four coupes and was targeted towards a group of coupes whose regeneration status was the subject of particular concerns by DELWP. Only seven criteria were considered, of which no more than three were applicable to any of the coupes. With the exception of the criterion relating to successful restocking (1.2), the other criteria were complied with where they were relevant to the coupe.

Regeneration stocking surveys conducted at the four coupes found two to be satisfactorily regenerated and two to not be satisfactorily stocked. These two coupes had previously been found to have been adequately stocked and were finalised and handed back to DELWP for on-going management.

Waterway crossings

While instances of non-compliance with the regulatory framework were identified from across the various compliance themes, the main source was non-compliant waterway crossings. These typically had their origins in crossing construction and/or removal and rehabilitation. As a result of non-compliant construction and/or removal, the crossings (or coupes in which they were located) were subsequently found not to comply with other audit criteria and regulatory framework requirements. Many instances of non-compliance were assessed to have major potential environmental impact.

The main issues contributing to the non-compliances with waterway crossings were:

- Management of road drainage on the entry to the waterway crossing;
- Failure to provide for the passage to fish and other aquatic fauna;

³⁵ Note that this finding is disputed by VicForests.



- Erosion at the outlet of the culvert;
- · Crossing rehabilitation following culvert removal.

The frequency of non-compliant waterway crossings was such that this is considered by the auditors to reflect a systematic issue or consistent deficiency with VicForests' and/or their contractors' approach.

VicForests' responses to previous audit recommendations

Three separate audits were commissioned by DELWP as part of its 2015 FAP. Each audit had a specific compliance priority, as follows:

- · Construction and maintenance of in-coupe roads;
- · Construction and rehabilitation of waterway crossings;
- · Protection of mandatory exclusion areas from the impacts of harvesting.

Waterway crossings were considered in both the in-coupe road and waterway crossing audits.

Each of the audits made a series of recommendations to VicForests (35 in all) which the auditors considered were relevant to the respective compliance theme. While VicForests did not explicitly disagree with many of the recommendations, it proposed few specific actions in response. Responses to 12 of the recommendations were deferred until outcomes of an independent engineer's review of its roading documentation have been finalised. That process has not yet been completed.

Most other recommendations were referred (appropriately) to DELWP, VicForests' routine practices (as per its *Utilisation* Procedures) or reviews during internal audit processes.

6.2 Recommendations

Findings of this audit have led to a series of recommendations for VicForests (the auditees) and DELWP as the environmental regulator of timber harvesting activities. Recommendations address potential improvements to the management of timber harvesting and related roading activities, as well as potential improvements to the regulatory framework.

The priority given to recommendations reflects either the potential environmental impact associated with the aspect of harvesting practice or the importance of the recommendation to the effectiveness of the regulatory framework.

Recommendations for VicForests

Recommendation	Rationale
V1: Moderate priority	
VicForests should modify its coupe planning process to ensure that in East Gippsland FMA, areas with >25° slope in coupes which have granite-derived soils are specifically identified during coupe planning and excluded from harvesting.	FCP documentation does not specifically call out this restriction of harvesting – which is applicable only in East Gippsland FMA. This may lead to harvesting occurring inadvertently in areas where it is not allowed under the regulatory framework.
V2: High priority	
VicForests should thoroughly review its approach to the design, construction and rehabilitation of waterway crossings to significantly improve their compliance with regulatory requirements. This review should consider the suggestions included in Section 5.3.1.	This audit found what are effectively systematic deficiencies in VicForests' approach to waterway crossings. A series of recommendations have been proposed to provide an engineering basis for design for the crossings, reviews of design and construction, rehabilitation planning, monitoring and defect rectification.



Recommendation	Rationale
V3: Moderate priority	
VicForests should review its approach to the design and construction of large in-coupe road or landing embankments to reduce the incidence of failure during or following their use. This review should consider the suggestions included in Section 5.3.2	As per V2, this recommendation proposes a strengthening of the engineering basis of design for large embankments (>2 m high). It proposes a similar, but simplified approach to design, documentation, review and defect rectification.
V4: Moderate priority	
VicForests should continue to review its approach to regeneration burns to identify and implement opportunities to reduce unintended impacts in unharvested buffer areas.	While regeneration burns may be challenging to contain within a coupe's harvest area, environmental impacts of incursions into buffer areas mean that continued improvement in practice is required.

Recommendations for the Department of Environment, Land, Water and Environment

Recommendation	Rationale
D1: High priority DELWP should revise the wording of the <i>Management Standards and</i> <i>Procedures</i> and their <i>Planning Standards</i> to provide consistent, unambiguous guidance on the requirements for providing unharvested buffers around rainforest stands equal to or larger than 0.4 ha in area, including those associated with rainforest sites of significance.	Ambiguity in the wording of MSP 4.4.9 mean that it is unclear as to what, if any, buffers are required to be provided for rainforest stands ≥0.4 ha within Central Highlands FMA.
D2: Moderate priority DELWP should develop a science basis for prescribing the provision of fish passage at waterway crossings and implement this in the next revision of the regulatory framework for timber harvesting.	The current requirement to provide a fish ladder for permanent stream culverts > 750 mm in diameter does not appear to account for the requirement to provide fish passage for smaller culverts nor the opportunities to provide fish passage without a fish ladder in larger culverts. The science basis of this compliance element should be reviewed to ensure that fish ladders or other fish passage devises are used in appropriate circumstances.
D3: High priority DELWP should develop a process for reviewing and acting on key findings and recommendations from each years' forest audit program.	The FAP is a potentially important process in achieving continuous improvement in timber harvesting activities in State forests. The lack of a formal process for responding and acting upon findings and recommendations diminishes its value.
D4: Moderate priority DELWP should adopt the revised EIA tool developed for this years' audit program.	The revised EIA tool allows more consistent and repeatable assessments of potential environmental impacts associated with road drainage, waterway crossings and some incursions into unharvested buffer areas. It focusses on the sensitivity of locations to environmental impacts, even if the actual impact is low.
D5: Moderate priority DELWP and VicForests should gather information on actual coupe attributes to support audit coupe selection rather than information from the coupe planning stage.	Use of planning stage information means that audit targets may not have the values or risk factors for which they were selected. This potentially dilutes the value of the audit.
D6: Moderate priority DELWP should maintain a register of coupes included in the FAP.	A register will help to avoid inadvertent re-auditing of coupes and also provide a basis for longitudinal studies assessing the environmental impacts of non-compliances with the regulatory framework.



7. References

Department of Environment and Primary Industries [DEPI] 2014a. Code of practice for timber production 2014. DEPI.

DEPI 2014b. Management standards and procedures for timber harvesting operations in Victoria's State forests 2014. DEPI.

DEPI 2014c. Planning standards and procedures for timber harvesting operations in Victoria's State forests 2014. Appendix 5 to the Management standards and procedures for timber harvesting operations in Victoria's State forests 2014. DEPI.

Department of Sustainability and Environment [DSE] 2006. Sustainability charter for Victoria's State forests. DSE.

DSE 2009. Management procedures for timber harvesting, roading and regeneration in Victoria's State forests 2009. DSE.

GHD 2016. Forest Audit Program 2015 - The protection of mandatory exclusion areas from the impacts of timber harvesting. Audit Report. April 2016.

Indufor 2016. Forest Audit Program 2015. Environmental audit of the construction & rehabilitation of waterway crossings. Final Report to DELWP. February 2016.

Jacobs 2016. Forest Audit Program 2015: Audit of in-coupe roads. Environmental audit of the construction and maintenance of in-coupe roads. V2.3 Report to DELWP. March 2016.

SKM 2013. Forest Audit Program. 2012-13 audit of coupe regeneration and finalisation. Report to DELWP. July 2013.

VicForests 2013. *Utilisation procedures for all commercial harvesting and haulage managed by VicForests*. Version 7.0. VicForests

VicForests 2017. Noxious weeds, disease and pest management instruction. Version 2.4. April 2017.

Spatial data sources:

- Victorian government: <u>www.data.vic.gov.au</u>
- · ESRI



Limitation statement

The purpose of this report and the associated services performed by Jacobs was to conduct an environmental audit of the construction and maintenance of in-coupe roads in Victorian State forests. The work has been undertaken in accordance with the scope of services set out in the contract between Jacobs and the Department of Environment, Land, Water and Planning (DELWP).

Jacobs derived the data in this report from field observations and information sourced from DELWP, VicForests and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report.

Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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Appendix A. Audit compliance elements

A.1 Timber harvesting and roading operations

Regulatory compliance elements considered in the audit of timber harvesting and roading activities in 30 coupes in Central, Central Gippsland, Dandenong and East Gippsland FMA are included in Table A.1. They were drawn from the *Code of Practice for Timber Production* (Code; DEPI, 2014a), the associated *Management Standards and Procedures for Timber Harvesting Operations in Victoria's State forests* (MSPs; DEPI, 2104b) and the *Planning Standards* (PS) which form Appendix 5 to the MSPs (DEPI, 2014c). Code compliance elements were selected by DELWP's Timber Harvesting Compliance Unit. Supporting compliance elements from the MSPs and PS were selected by the audit team.

Compliance criteria (stated as a question) were developed by the audit team to enable assessments of compliance with each element of the regulatory framework. Criteria typically (although not always) refer to individual MSP or PS compliance elements, rather than a more overarching Code requirement. In some cases, criteria refer to individual Code compliance elements. Compliance elements have been incorporated with criteria into Table A.1.

Table A.1 also provides a summary of the number of coupes recording non-compliances with potential environmental impact, compared with the total number of coupes for which the criterion was applicable.

Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
Environme	ntal values in State forests – Code section 2.2		
2.2.1 Water	quality, river health and soil protection		
Code	2.2.1.1 Planning and management of timber harvesting operations must comply with relevant soil protection measures specified within the Management Standards and Procedures.	water quality, rive	r health and
MSP	3.1.1.1 Use the following categories when determining buffer (B) and filter (F) widths for water adjacent to each coupe. Aids to the identification of each class of waterway are provided in the Permanent streams, pools and wetlands. (b) Temporary streams. c) Drainage lines.	ways within and i Code Glossary.	mmediately (a)
	1.1 Have the categories prescribed in the MSPs been used in classifying waterways present on the coupe?	0-29	W
	1.2. Are the classification assessed to have been applied correctly?	0-29	
MSP	3.2.1.1 Conduct field assessments to determine the soil erosion hazard and soil permeability of proposed for any soil disturbing timber harvesting operations as follows (3.2.1.2-3.2.1.11, Table	elassifications for e 8).	an area
	2.1 Has soil erosion hazard and soil permeability been assessed using the method prescribed in the MSPs?	0-30	S,W
	2.2 Has the methodology been followed correctly?	0-30	
MSP	3.3.1.1 Apply appropriate protection to class of waterway as outlined in table 9.		
	3.1 If applicable, have the buffer and filter strip widths prescribed in MSP Table 9 been applied to the coupe?	0-28	W
MSP	3.3.1.2 Apply appropriate protection to class of waterway as outlined in table 10 below for coup upstream of verified and potential Spotted Tree Frog sites or coupes in Barred Galaxias and M specified in section 4.2.	oes in catchments Iountain Galaxias	s up to 1 km s SMZs where
	3.2 If applicable, have the buffer and filter strip widths prescribed in MSP Table 10 been applied to the coupe?	0-2	W,B
MSP	3.4.1.1 Exclude timber harvesting operations from slopes over 30 degrees.		
	4.1 Does the forest coupe plan (FCP) show areas of the coupe with slope >30°?	1-10	S,W

Table A.1 Selected regulatory compliance elements for timber harvesting and roading, associated audit compliance criteria and summary of the level of compliance for individual criteria.



Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
	4.2 Has timber harvesting been excluded from areas with slopes >30°?	0-9	
MSP	3.4.1.2 Up to 10% of the net harvest area of any coupe can contain areas greater than 30 deg soil movement has been managed accordingly.	rees, where the r	isk of mass
	4.3 If timber harvesting is undertaken in areas with slope >30°, does the area harvested exceed 10% of net harvest area and has the risk of soil mass movement been managed accordingly?	0-3	S,W
MSP	3.4.1.3 Exclude timber harvesting operations from slopes over 25 degrees in the East Gippsla based soils.	nd FMA in areas	with granite-
	4.4 For applicable couples, does the FCP show areas of the coupe with slope >25°?	0-2	S,W
	4.5 For applicable coupes, has timber harvesting been excluded from areas with slopes >25°?	0-2	
MSP	3.5.1.1 Apply the slope limits, seasonal closures, buffer and filter strip widths and other releval specified in Appendix 3 Table 11 (Water supply protection areas) for timber harvesting operation and regeneration in water supply protection areas.	nt management a ons and associat	ctions ed roading
	5.1 For applicable coupes, does the FCP correctly note that the coupe is located in a WSPA?	0-11	S,W
	5.2 For relevant couples, have the applicable slope limits, seasonal closures, buffer and filter strip widths and other relevant management actions specified in Appendix 3 Table 11 been correctly applied on the coupe?	0-8	
MSP	3.5.1.2 Refer to table 2 in Appendix 5 the Planning Standards for management actions that ap area SMZs in the East Gippsland FMA	pply to water supp	ly protection
	5.3 For coupes in these catchments, are the applicable stream buffers and maximum annual areas harvested correctly applied on the coupe?	0-0	S,W
MSP	3.5.1.3 Obtain approval from the Minister or delegate in accordance with section 1.4 for any til are not conducted in accordance with clauses 3.5.1.1 or 3.5.1.2.	mber harvesting c	operations that
	5.4 For relevant coupes, if timber harvesting operations are not conducted in accordance with the relevant MSP prescriptions, has Ministerial approval been obtained in accordance with MSP section 1.5 and Appendix 1 prior to harvesting commencing?	0-0	S,W
Code	2.2.1.2 Management actions to protect waterways, river health and soil must be appropriate to category, and potential water quality risk posed by timber harvesting operations at each site.	the waterway cla	ass, soil
	6.1 In the auditor's opinion (ITAO), is there evidence from the coupe which suggests that management actions to protect waterways, river health and soil have not been appropriate to protect waterways, river health and soil?	10-30	S,W,B,C
Code	2.2.1.5 Where practical exclude roads and snig tracks from aquatic and riparian habitats.		
	7.1 If roads and snig tracks have not been excluded from aquatic and riparian habitats, ITAO was it reasonably practicable to have done so?	0-21	W,B,C
Code	2.2.1.6 Where crossings are required, minimise the extent of habitat damage, constriction to s and other aquatic fauna.	tream flow and ba	arriers to fish
	8.1 ITAO were there reasonably practicable alternatives to construction of the creek crossing?	0-17	W,B,C
	8.2 ITAO did the crossing minimise the extent of habitat damage, constriction to stream flow and barriers to fish and other aquatic fauna?	5-17	
Code	2.2.1.7 Remove temporary crossings immediately after harvesting or any subsequent regener technique that minimises soil and habitat disturbance.	ation work is com	plete using a
	9.1 ITAO has the crossing been removed as soon as reasonably practicable following harvesting or regeneration work?	0-8	S,W
		4-4	

Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
	9.2 ITAO has removal of the crossing been undertaken in a manner that has minimised soil and habitat disturbance?		
Code	2.2.1.12 Design, construct and maintain roads, crossings, coupe infrastructure and drainage s foreseeable rainfall events and traffic conditions, and protect water quality.	tructures to withs	tand
	10.1 ITAO is there evidence from the coupe which suggests that the design, construction and maintenance of roads, crossings, coupe infrastructure and drainage structures has been insufficient to protect water quality?	10-28	S,W,D,C
2.2.2 Conse	ervation of biodiversity		
Code	2.2.2.1 Planning and management of timber harvesting operations must comply with relevant measures specified within the Management Standards and Procedures.	biodiversity conse	ervation
Code	2.2.2.4 During planning identify biodiversity values listed in the Management Standards and P harvesting, tending and regeneration. Address risks to these values through management acti Management Standards and Procedures such as appropriate location of coupe infrastructure, modified harvest timing, modified silvicultural techniques or retention of specific structural attril	rocedures prior to ons consistent wi buffers, exclusion putes.	o roading, th the n areas,
Code	2.2.2.5 Protect areas excluded from harvesting from the impacts of timber harvesting operation	ns.	
MSP	 MSP4.1.1 Statewide 4.1.1.1 Retain habitat trees in accordance with the FMA summary provided in Appendix 3 Tab prescriptions). 4.1.1.2 Trees in buffers or other exclusion areas that have been extended beyond minimum rehabitat tree retention requirements 	le 12 (Habitat tre equired widths ca	e n contribute to
	11.1 Have the required number of habitat trees been retained on the coupe (as per MSP Appendix 3, Table 12) - including in areas where buffers and other exclusion areas extended beyond the minimum required widths?	0-28	В
MSP	4.1.4 Central Highlands FMAs4.1.4.1 When selecting habitat trees, prioritise hollow-bearing trees where they are present an hollows in the short term.	d trees most likel	y to develop
	4.1.4.2 Scatter habitat trees across the timber harvesting coupe in mixed-species forest.4.1.4.3 Where possible, retain potential hollow-bearing ash eucalypts in clumps to increase the windthrow and fire.	eir protection fror	n exposure,
	4.1.4.4 No gap between retained vegetation is to be greater than 150 m.4.1.4.5 Retain habitat trees where they can be most easily protected from damage during harv treatment.	vesting and site p	reparation
	11.3 ITAO do any retained habitat trees appear to have been selected for hollow bearing or potential to become hollow bearing?	0-8	В
	11.4 If there are retained habitat trees, have they been scattered evenly across the coupe?	0-1	
	11.5 If present, have hollow bearing ash eucalypts been retained in clumps.	0-10	
	11.6 Are gaps between retained vegetation \leq 150 m?	0-11	
	from damage during harvesting and site preparation treatment?	0-12	
	11.8 Is there evidence of damage to retained vegetation from harvesting or regeneration?	2-11	
MSP	4.1.5 East Gippsland FMA and Gippsland FMAs		
	4.1.5.1 When selecting habitat trees, prioritise old living trees with a range of hollow sizes. Wh present in sufficient numbers, prioritise trees that are old enough to develop hollows during the	ere these are abs e next 50 years.	sent or not
	4.1.5.2 Stags and younger, smaller trees may be counted as habitat trees if trees of the type d or not present in sufficient numbers.	escribed in 4.1.5	.1 are absent
	4.1.5.3 Where possible, retain habitat trees in small clusters which include younger regrowth a	and understorey.	
	4.1.5.4 Distribute habitat tree clusters across the coupe with consideration of the proximity of c	other retained vec	getation.



Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
	11.9 ITAO, does the selection of any retained habitat trees appear to have prioritised old living trees with hollows of various sizes or trees that are old enough to develop hollows in the next 50 years?	0-12	В
	11.10 Have habitat trees been retained in small clusters with younger regrowth and understorey?	0-18	
MSP	4.2.1.1 Apply management actions for rare and threatened fauna identified within areas affected operations as outlined in Appendix 3 Table 13 (Rare or threatened fauna prescriptions).	ed by timber harv	esting
	12.1 Does the FCP correctly note record(s) of rare or threatened fauna –based on the Victorian Biodiversity Atlas (VBA) - on the coupe?	0-11	В
	12.2 Have the management actions for fauna (as per MSP Appendix 3, Table 13) been carried out?	0-7	
PS	4.2.1.1 Plan management actions for rare and endangered fauna in accordance with Table 3 (zone [FMZ] rules for fauna) below.	Fixed forest man	agement
	4.2.1.2 Maintain FMZ schemes for rare and endangered fauna in accordance with Table 3 (Fix	ed FMZ rules for	fauna) below
	12.3 Does the FCP correctly note the applicable fauna-related FMZ?	0-8	В
	12.4 Have the management actions specified in PS Table 3 been implemented?	0-6	
MSP	4.3.1.1 Apply management actions for rare and threatened flora identified within areas affected operations as outlined in Appendix 3 Table 14 (Rare or threatened flora prescriptions).	d by timber harve	sting
	12.5 Does the FCP correctly note the applicable fauna-related FMZ?	0-7	В
	12.6 Have the management actions specified in PS Table 4 been implemented?	0-5	
PS	4.3.1.1 Apply the management actions outlined in Table 4 (Detection based FMZ rules for faur threatened fauna.	na) below for zon	ed rare or
	4.3.1.2 Implement FMZ amendments and reviews in accordance with Table 4 (Detection base for new verified rare or threatened fauna records and FMZ amendment requirements outlined	d FMZ rules for fain section 2.	auna) below
	13.1 Does the FCP correctly note record(s) of rare or threatened flora –based on the VBA - on the coupe?	0-8	В
	13.2 Have the management actions for flora (as per MSP Appendix 3, Table 14) been carried out?	0-2	
PS	4.5.1.1 Apply the management actions outlined in Table 5 (Detection based FMZ rules for flora threatened flora values.	a) below for zone	d rare or
	4.5.1.2 Implement FMZ amendments and reviews in accordance with Table 5 (Detection base new verified rare or threatened flora records and FMZ amendment requirements outlined in se	d FMZ rules for fl ction 2.	ora) below for
	13.3 Does the FCP correctly note the applicable fora-related FMZ?	0-3	В
	13.4 Have the management actions specified in PS Table 5 been implemented?	0-3	
PS	4.5.2.4 Plan disturbances in SMZ in consultation with DEPI biologists to ensure the species is	adequately prote	cted.
	13.5 If disturbance has been planned within the SMZ, have DELWP biologists been consulted on species protection?	0-1	В
	13.6 ITAO has the disturbance been carried out according to the agreed approach?	0-0	
MSP	4.4.1.1 In the Gippsland FMAs exclude selective harvesting from Box Ironbark forests typically (<i>Eucalyptus tereticornis</i>), Yellow Box (<i>Eucalyptus melliodora</i>), Coast Grey Box (<i>Eucalyptus bo</i> (<i>Eucalyptus tricarpa</i>). Silvicultural practices that promote regeneration of these species is per	r containing Fores s <i>istoana</i>) and Re mitted.	st Red Gum d Ironbark
	4.4.1.2 In the East Gippsland FMA exclude selective harvesting from Box Ironbark forests typic (<i>Eucalyptus tricarpa</i>), Gippsland Grey Box (<i>Eucalyptus bosistoana</i>), Red Box (<i>Eucalyptus poly</i> (<i>Eucalyptus baueriana</i>) and Yellow Stringybark (<i>Eucalyptus muelleriana</i>). The use of seed-tree permitted to restore the original species mix when combined with: a) cutting stumps of desired	cally containing F <i>vanthemos</i>), Blue re regeneration s species to a ma	Red Ironbark Box ystems is kimum height



Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
	of 30 cm, to encourage coppice growth; b) supplementary planting and sowing where necessa trees of the less-preferred species to remove overwood competition; and d) thinning of advance	ary; c) removing u ed regrowth.	nproductive
	14.1 Has selective harvesting been excluded from the coupe if its composition corresponds with 4.4.1.1 or 4.4.1.2?	0-0	В
	14.2 If seed tree regeneration is used, does it comply with the specifications in 4.4.1.2?	0-0	
MSP	4.4.2.1 Avoid road construction across areas of heathland or within 40 m of heathlands unless exists.	no reasonable a	Iternative
	4.4.2.2 In the Gippsland FMAs, exclude Wet Heathland, Clay Heathland and Riparian Scrub M Protect these heathland EVCs with a 40 m buffer.	losaic EVCs from	harvesting.
	4.4.2.3 In the East Gippsland FMA and Otway FMA where evidence of heathland is found in the classified as SPZ, application must be made to the Secretary or delegate prior to commencem operation to create an SPZ in accordance with table 7 in Appendix 5 the Planning Standards.	ne field and it isn' nent of the timber	t already harvesting
	15.1 If a road was constructed through a heathland EVC, ITAO, was it reasonably practicable to construct the road in another location?	0-0	В
	15.2 If present, has harvesting been carried out in or within 40 m of one of these heathland EVCs?	0-0	
	15.3 If evidence of heathland was found in the coupe and it was not already classified as SPZ, has application been made to the Secretary to create an SPZ in accordance with table 7 in Appendix 5 the Planning Standards?	0-0	
	15.4 Have the SPZ conditions been followed in the management of harvesting?	0-0	
MSP	4.4.3.1 In the Tambo FMA protect small stands of Montane Riparian Thicket (MRT) between 0 than 10 m wide with a 10 m filter strip and stands of MRT wider than 10 m with a 20 m wide filt	.01 ha and 0.5 hater strip.	a and less
	4.4.3.2 In all other FMAs apply the heathland prescriptions listed above in 3.4.2 (sic - actually	4.4.2).	
	16.1 If small Montane Riparian Thicket stands were/are present within the coupe, were the prescribed protections from harvesting noted in the FCP?	0-0	В
	16.2 If small Montane Riparian Thicket stands were/are present within the coupe, were the prescribed protections from harvesting provided?	0-0	
	16.3 If MRT is present and a road was constructed through it, ITAO, was it reasonably practicable to construct the road in another location?	0-1	
MSP	4.4.4.1 Within the Leadbeater's Possum range apply a 100 m buffer around all stands of		
	modelled Ash old growth forest that are depicted in the DEPI old growth spatial layer (MOG2009.shp) and verified during field assessment by the Managing Authority or DEPI to be Ash type forest.		
	17.1 Have 100 m buffers been provided around all stands noted in MSP 4.4.4.1?	0-0	В
Code	2.2.2.7 Rainforest communities must not be harvested.		
MSP	 4.4.9.1 Protect all rainforest from timber harvesting operations as follows: (a) Exclude non-line more in size but less than 0.4 ha from timber harvesting operations. These stands do not requisitands that are at least 0.1 ha but are less than 0.2 ha from timber harvesting operations. These stands do not requisitands that are at least 0.1 ha but are less than 0.2 ha from timber harvesting operations. These buffer. (c) Exclude linear stands that are at least 0.2 ha but are less than 0.4 ha from timber harvesting operations. These stands with a 20 m buffer. (d) Exclude all rainforest stands (including linear stands) equations harvesting operations. Protect these stands with a 40 m buffer except for rainforest start FMAs and the Gippsland FMAs where 3.4.8.2 (<i>sic</i> -actually 4.4.9.2) below must be complied w from retained rainforest stands or buffers. 4.4.9.2 In Central Highlands and Gippsland FMAs, areas categorised as being of National, Stat the Sites of Significance for Rainforest spatial layer where evidence of rainforest is found in the classified as SPZ, application must be made to the Secretary or delegate prior to commencemption. 	ar stands that are ire a buffer. (b) E se stands do not arvesting operation al to or exceeding nds in the Centra vith. (e) Distribut ate or Regional si e field and it isn't ment of the timber	e 0.1 ha or xclude linear require a ons. Protect J 0.4 ha from Highlands e slash away gnificance in already harvesting
	operation to create a SPZ in accordance with table 6 in Appendix 5 the Planning Standards.		



Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
	18.1 Has the existence of mapped/modelled rainforest EVC and any status as a RFSOS	0-23	В
	18.2 Have the prescribed rainforest protection measures for the rainforest type (as per MSP 4.4.9.1 and 4.4.9.2) been provided?	1-17	
PS	4.6.1.1 Include in the SPZ all rainforest stands over 0.4 ha in area (whether already mapped or within the area categorised as National Priority 1 in the Sites of Significance for Rainforest spatextend to the nearest watershed boundary.	r newly detected) tial layer. The S	that fall PZ should
	18.3 Where a rainforest stand of this type is included or identified in the coupe, has an SPZ to the watershed boundary been formed?	0-0	В
PS	 18.4 Has harvesting been excluded from the SPZ? 4.6.3.1 Central Highlands FMAs - Include in the SPZ all rainforest stands over 0.4 hectares in a or newly detected) that fall within the area categorised as State or Regional in the Sites of Sign layer. Also include in the SPZ the relevant buffer as identified below in Table 6 (Buffer widths Significance by category and priority). 	0-0 area (whether alr ificance for Rain for Rainforest Si	ready mapped forest spatial tes of
	18.5 Has the rainforest stand and the required buffer (as per PS Table 6) been included in an SPZ?	0-1	В
	18.6 Has the rainforest and its buffer been excluded from harvesting?	0-1	B,C
PS	4.6.4.1 East Gippsland FMA Where rainforest stands coincide with linear reserves, include in t plus a 100m buffer. Exceptions may apply where an alternative logical boundary exists within t existing road. Avoid road construction across linear reserves containing rainforest wherever pr	he SPZ the rainfo he buffer, for exa acticable.	prest stand ample an
	18.7 Does the SPZ extend 100 m from the rainforest stand or to what ITAO is another logical boundary?	0-0	В
	18.8 If an ICR has been constructed through the linear reserve, was there ITAO any other reasonably practicable alternative.	0-0	
PS	4.6.5.1 In the Gippsland FMAs, include in the SPZ all Cool Temperate Rainforest and Warm Toover 0.4 hectares in area (whether already mapped or newly detected) that fall within the area Regional in the Sites of Significance for Rainforest spatial layer. Also include in the SPZ the rebelow in table 6.	emperate Rainfo categorised as S levant buffer as i	rest stands state or dentified
	18.9 Has the rainforest stand and the required buffer (as per PS Table 6) been included in an SPZ?	0-0	В
	18.10 Has the rainforest and its buffer been excluded from harvesting?	0-0	
Code	2.2.2.13 Implement appropriate vehicle and equipment hygiene precautions when moving from pest animal and pathogen infestations.2.2.2.14 Implement appropriate control actions where timber harvesting operations have introduced and pathogen.	n areas of known luced or exacerb	pest plant, ated a
	pathogen or weed.		
MSP	4.5.1.1 Minimise the risk of introduction or movement of Cinnamon Fungus (<i>Phytophthora cinr</i> (<i>Armillaria</i>) from known infected areas, into uninfected areas by: (a) washing machinery before (b) restricting activities where the movement of soil or gravel is likely to cross from infected site minimising the relocation or movement of infected gravel or soil during road and track construct logging operations; (d) restricting or controlling drainage water run-off from roads and tracks ar (e) testing gravel from infected areas and using only uncontaminated gravel in uninfected areas.	aamomi) and Roc moving into unir sinto healthy ve tion or maintenai way from healthy s; and (f) cleanin	ot Rot nfected areas; getation; (c) nce works, or vegetation; g and
	19.1 Does the FCP note or can VF personnel confirm if the coupe is or is not located in a known Phytophthora or Armillaria infection accord	0-30	В
	19.2 If the coupe is located in a known infection area, ITAO are appropriate measures prescribed to prevent the movement of these pathodens to other coupes?	0-0	
		0-30	

Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
	19.3 If the coupe is not located in a known infection area, ITAO have appropriate measures been taken to prevent the movement of these pathogens (as per MSP 4.5.1.1) to this coupe?		
MSP	4.5.1.2 Minimise the spread of Myrtle Wilt (<i>Chalara australis</i>) when operating in areas where it protecting individual Myrtle Beech (<i>Nothofagus cunninghamii</i>) trees; (b) sterilising equipment water and soap prior to moving into a new area; (c) pruning Myrtle Beech (<i>Nothofagus cunning</i> , ongoing damage by vehicles; and (d) immediately treating wounds on Myrtle Beech (<i>Nothofagus cunning</i> , those left by pruning) with a commercial, waterproof wound sealant.	t is known to exis with anti-fungal ag ghamii) that are s gus cunninghamii	t by: (a) gent or warm subject to) (including
	20.1 Does the FCP note or can VF personnel confirm if the coupe is or is not located in a known area where MW is known to exist?20.2 If the coupe is located in a known infection area, are the prescribed treatment measures to prevent the movement of MW to other coupes being implemented successfully?	1-18 0-18	В
MSP	4.5.2.1 Conduct a pre-harvest assessment to determine the type and extent of weeds on the or access roads.	coupe and on ass	ociated
	21.1 Does the FCP provide evidence that a pre-harvest assessment for weeds of the coupe and roads was undertaken?	1-30	В
Roading fo	r timber harvesting operations – Code section 2.4		
2.4.2 Road	design		
Code	2.4.2.1 Planning and management of timber harvesting operations must comply with this Code and relevant road design measures specified within the MSPs unless the road is covered by a formal roading agreement with DEPI that would supersede this requirement.		ad design would
MSP	6.1.1.4 Identify the intended class of a new road or road upgrade in accordance with the appro- description in Appendix 4 Table 18 (Road classification system).	opriate service fui	nction
	22.1 Does the FCP specify the intended class of a new in coupe road or road upgrade in accordance with MSP Appendix 4 Table 18?	0-25	D
MSP	6.1.2.4 Limit clearing widths to those specified in Appendix 4 Table 20 (Minimum clearing widt construction) plus any additional width required to construct batters.	hs (m) required fo	or typical road
	22.2 Does the minimum clearing width for an in-coupe road not located within the harvest area conform to the specifications in MSP Appendix 4 Table 20?	0-10	D
MSP	6.2.4.1 The maximum distance between drainage structures for road grade and soil erosion had a Table 21 (Maximum distance between drainage structures).	azard is specified	in Appendix
	22.3 Does the maximum distance between drainage structures conform to the specifications in MSP Appendix 4 Table 21?	5-28	S,D
Code	2.4.2.3 All fill disposal areas and embankments must be planned and designed to minimise so movement, and potential water quality deterioration.	il erosion, mass s	soil
Code	2.4.3.3: All fill disposal areas and embankments must be appropriately stabilised. Where revea or embankments, the species must be suitable for the site and where possible indigenous to the	getation is used to he area.	o stabilise fills
	23.1 Does the FCP include evidence of planning and design for embankments (>2m) or fill disposal areas to account for soil erosion, mass movement and water quality risk?	0-8	D,W
	23.2 Is there evidence of soil erosion, mass movement and water quality impact due to fill disposal or embankment construction?	3-9	S,W,D
Code	2.4.2.4 Stream crossings must be designed according to traffic requirements and the nature, s pre and anticipated post-harvest) and characteristics of the bed and banks of the stream.	size and period of	flow (both
	24.1 Does the FCP include evidence of design for the stream crossing, considering the elements specified in Code 2.4.2.4?	0-15	D



Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
2.4.3 Road	construction		
Code	2.4.3.1 Planning and management of timber harvesting operations must comply with this Code construction measures specified within the MSPs unless the road is covered by a formal roadin would supersede this requirement.	and relevant roang agreement wit	ad h DEPI that
MSP	 6.2.1.1 Undertake road construction when rainfall and soil conditions minimise the risk of erosi quality, and when soil moisture is adequate to achieve compaction and stabilisation of the sub-6.2.1.3 For permanent roads, remove all stumps, logs and other debris from within the formed 6.2.1.5 Create table drains by extending the road when it is formed, and not by subsequent extended. 6.2.1.6 Limit earthworks to the least possible to achieve the road design specification. 6.2.1.7 At the completion of permanent road construction operations, notify DEPI of the location may be included on the DEPI Road Register). 	on and impact or •grade. width of the road cavation. n of the road (so	n water site. that the road
	25.1 ITAO, is there evidence that the timing of road construction was inconsistent with the requirement to minimise the risk of erosion and impact on water quality?	0-27	S,W,C
	25.3 Have all stumps, logs and other debris been removed from within the formed width of the road site (for permanent roads)?	0-9	С
	25.4 Is there evidence that table drains have been formed by subsequent excavation?	0-16	С
	25.5 ITAO are the earthworks for ICR a reasonable minimum to achieve the road design specification?	0-28	С
	25.6 Does the FCP include documentation to indicate that DELWP have been notified of the location of the road – for inclusion in its road register?	0-0	С
MSP	6.2.2.1 Prevent fill batters from covering the base of live trees.		
	6.2.2.3 Use engineer approved methods of mechanical consolidation of fill batters.		
	26.1 Do any fill batters cover the base of live, retained trees?	2-16	С
	26.2 For large fill batters, does the FCP include evidence of engineer approval of mechanical consolidation methods?	1-6	
	26.3 Is there evidence of failure of fill batters? (Assessed at 23.2)	2-7	
MSP	6.2.4.2 Construct cross-drains at an angle sufficient to discharge any water from the surface of	the road.	
	6.2.4.4 Appropriate discharge areas for drainage include: (a) a strip of undisturbed vegetation a spill; or (c) some other structure that dissipates the velocity of drainage flows.	at least 20 m wid	e; (b) a rock
	6.2.4.3 On soils of high erosion hazard, use temporary sediment traps to prevent erosion durin	g road constructi	on
	6.2.4.5 Place drainage structures approximately 20 m from permanent or temporary streams, t undisturbed vegetation and to maximise the flow distance between the drainage outlet and the	o allow discharge waterway.	e onto
	6.2.4.6 Within 20 m of a permanent or temporary stream: (a) use crown or cross fall techniques undisturbed vegetation; or (b) pass drainage through an appropriate sediment control structure silt trap before entering a permanent or temporary stream.	s to drain roads i such as a sedin	nto nent pond or
	6.2.4.7 Construct table drains to: (a) allow water to flow, without ponding; (b) include run-offs of table drain and run-offs to be cleaned; (c) be supported by rock or otherwise stabilised in soils (d) have silt traps constructed at the end if discharging directly into a stream or wetland buffer.	f sufficient length of a high erosion	n to allow the hazard; and
	27.1 Have cross drains been constructed at sufficient angle to discharge any water from the surface of the road?	2-26	С
	27.2 Is there physical evidence or evidence in the FCP that temporary sediment traps were considered or used in road construction?	2-4	W,C
	27.3 Do drainage discharge areas comply with MSP 6.2.4.4 specifications?	5-27	С
	27.4 Do drainage structures allow interception and discharge of road drainage prior to a stream crossing, as per MSP 6.2.4.5?	9-16	W,C
	27.5 Does road construction appropriately manage road drainage in the final 20 m prior to a stream crossing, as per MSP 6.2.4.6?	6-16	W,C
	27.6 Does construction of any table drain comply with the requirement of MSP 6.2.4.7?	0-14	С

Source	Compliance elements and criteria ¹	# non- compliance ²	Compliance themes ³
MSP	6.2.5.1 Culverts used in permanent roads are a minimum of 375 mm in diameter.		
	6.2.5.2 Culverts used in temporary roads are a minimum of 300 mm in diameter.		
	6.2.5.3 All culverts are designed to withstand a 1 in 10 year rainfall event.		
	6.2.5.4 Construct culverts in catchment areas exceeding 100 ha in accordance with engineerin	ng advice.	
	6.2.5.5 On drainage lines, stream and river crossings or soils of High Erosion Hazard place sa rock at the head of the culvert and at the point of discharge to hold the culvert in place and pro-	ndbags, timber, o tect it from erosio	concrete or
	6.2.5.7 If constructed of concrete, have a minimum cover of 600 mm as measured from the roapipe and a maximum cover as specified in the Installation of Steel-Reinforced Concrete Draina Association of Australasia.	ad surface to the age Pipelines, Co	top of the Increte Pipe
	6.2.5.8 If constructed of a material other than concrete, have a minimum cover over the pipe a manufacturer's specifications.	s recommended	in the
	6.2.5.9 On permanent streams, include a fish ladder if the diameter of the culvert is greater that	an 750 mm.	
	6.2.5.11 Ensure culverts do not project above the bed of a waterway in a way which may preve fauna.	ent the passage of	of aquatic
	6.2.5.12 Where culvert construction diverts water from its natural course, return water to its na spill, or other hard surface.	tural course over	a flume, rock
	28.1 Is the size of the culvert consistent with the type of road, as per MSP 6.2.5.1 and 2?	0-14	C,D
	28.2 Is there evidence in the FCP that the size of the culvert is consistent with flow requirements in a 10% AEP rainfall event?	5-14	W,C,D
	28.3 Where the catchment area exceeds 100 ha, is there evidence in the FCP that engineering advice has been provided on culvert construction?	0-1	W,C,D
	28.4 Have the head and outlet of culvert(s) been constructed as specified in MSP 6.2.5.5 to hold them in place and protect from erosion?	3-13	W,C,D
	28.5 Is there evidence of erosion at the head and/or outlet of the culvert?	4-13	W,C,D
	28.6 Does the cover provided satisfy MSP 6.2.5.7 requirements for concrete culverts?	0-2	C,D
	28.7 Does the minimum cover for the culvert(s) satisfy the manufacturer's specifications for non-concrete culverts?	0-9	C,D
	28.8 If the culvert is >750 mm (on a permanent stream) does it include a fish ladder?	3-4	W,B,C,D
	28.9 Does the culvert protect above the bed of the downstream waterway and prevent the passage of aquatic fauna?	6-13	B,C,D
	28.10 If the culvert diverts water from its natural course, does it return water to its natural course via a flume, rock spill, or other hard surface?	0-3	W,C,D
Code	2.4.3.6: Road construction must ensure that: disturbance to stream beds and banks is kept to not pushed into waterways, nor placed into a position where there is a risk that it can erode int raw concrete, soil fill and other road making materials are not spilt or disposed of into waterwa	a minimum; soil a o a waterway; an ys during road co	and rock fill is d cement, onstruction.
	29.1 ITAO has the road been constructed in a way that the stream bed and/or banks are unnecessarily disturbed or there is an unnecessary risk of erosion into a waterway?	1-15	S,W,C
	29.2 Have road construction materials been spilt or disposed of into a waterway?	0-16	W,C
Code	2.4.4.2 Roads used for timber haulage must be maintained in a manner that minimises erosion and other environmental values.	and protects wa	iter quality
	2.4.6.2 Roads no longer required for timber harvesting operations or other forest management permanently closed to vehicle traffic and effectively drained following completion of the timber	purposes, must harvesting opera	be tion.
	30.1 Is there evidence that suggests road maintenance is insufficient to minimise erosion and protect water quality and other environmental values influenced by the in-coupe road?	8-27	S,W,M
	30.2 If the road is no longer required for harvesting or other forest management purposes, has it been permanently closed to traffic and effectively drained?	1-14	W,CL
	30.3 Is there evidence that the closed road is contributing to on-going soil degradation or water quality impairment?	2-11	S,W,CL



Notes:

- 1. Rows are shaded as follows: Code compliance elements (orange), MSP compliance elements (blue), PS compliance elements (green), compliance criteria (unshaded).
- 2. # non-compliance number of coupes with non-compliance with criterion having potential environmental impact, compared with the number of coupes for which the criterion is applicable.
- Compliance themes for audit criteria: Themes associated with environmental values in State forests (Code section 2.2): S
 environmental compliance criteria related to protection of soils; W environmental compliance criteria related to protection of water
 quality and river health; B environmental compliance criteria related to protection of biodiversity values. Themes associated with
 roading activities: D roading compliance criteria related to design; C roading compliance criteria related to construction; M roading
 compliance criteria related to maintenance; CL roading compliance criteria related to closure.

A.2 Forest regeneration

Regulatory compliance elements considered in the audit of forest regeneration activities in four coupes in Tambo FMA are included in Table A.2. They were drawn from the Code and MSPs. Code compliance elements were selected by DELWP's Timber Harvesting Compliance Unit. Supporting compliance elements from the MSPs were selected by the audit team.

Compliance criteria (stated as a question) were developed by the audit team to enable assessments of compliance with each element of the regulatory framework. Criteria typically refer to individual MSP compliance elements, rather than a more overarching Code requirement. In some cases, criteria refer to individual Code compliance elements. Compliance elements have been incorporated with criteria into Table A.2.

Table A.2 Selected regulator	v compliance elements for	forest regeneration and	d associated audit con	npliance criteria.
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Source	Compliance elements and criteria ¹
Forest rege	eneration and management – Code section 2.6
2.6.1 Fores	t regeneration
Code	2.6.1.1 Planning and management of timber harvesting operations must comply with relevant regeneration measures specified within the MSPs.
MSP	9.1.1.1 For even-aged stands, conduct stocking surveys 15-30 months after sowing/seed fall or planting.
	1.1 Has the coupe stocking survey for an even aged stand been undertaken 15-30 months after sowing, seed fall or planting?
MSP	9.1.1.2 Successfully stocked even-aged regenerating forests must have: (a) at least 1 acceptable seedling in 65 % of 2.27 m radius (16 m ²) plots placed on a 20 m by 80 m systematic grid or at least 1 acceptable seedling in at least 55 % of 2.27 m radius (16 m ²) plots placed on a 20 m by 40 m systematic grid; and (b) no discrete area greater than 1 ha with less than 400 stems per hectare.
	9.1.1.5 An acceptable seedling is defined as a species indigenous to the area in either a seedling, lignotuber, or coppice form. Seedlings, lignotubers and coppice must be over 40 cm in height for Ash species and over 25 cm in height for non-Ash species. For coppice, the stem must be likely to remain attached to the stump and the base of the stem must be within 20 cm of ground level.
	9.1.1.6 An acceptable sapling (can be in the coppice form) is defined as a species indigenous to the area that is an acceptable size (3−15 m), is not suppressed and has a vigorous, healthy crown.
	9.1.1.7 For both even-aged and uneven-aged silviculture, acceptable species composition for regeneration includes at least 10 acceptable seedling of each eucalypt species present on the site before harvesting.
	1.2 Has the coupe been successfully restocked, as per MSP 9.1.1.2, 9.1.1.5, 9.1.1.6 and 9.1.1.7?
MSP	9.1.1.3 For uneven-aged stands conduct stocking surveys 15-36 months after completion of harvesting.
	1.3 Has the coupe stocking survey for an uneven aged stand been undertaken 15-36 months after completion of harvesting?
MSP	9.1.1.4 Successfully stocked uneven-aged regenerating forests must have in at least 70 % of plots placed on a 20 m by 80 m systematic grid or 60 % of plots placed on a 20 m by 40 m systematic grid: (a) a total basal area of at least 30% of the basal area that the site is capable of supporting, or (b) at least 1 acceptable sapling (or coppice) in a 3.57 m radius (40



Source	Compliance elements and criteria ¹
	m2) plot or at least 1 acceptable sapling (or coppice) in a 3.57 m radius (40 m2) plot, or (c) at least 1 acceptable seedling in a 2.27 m radius (16 m2) plot or at least 1 acceptable seedling in a 2.27 m radius (16 m2) plot; and (d) no discrete area greater than 2 ha with less than 400 stems per hectare (caused by recent harvesting).
	1.4 Has the coupe been successfully restocked, as per MSP 9.1.1.4, 9.1.1.5, 9.1.1.6 and 9.1.1.7
MSP	9.1.1.8 Where stocking, health or early growth is inadequate, remedial work must be conducted as soon as practicable and within 5 years of the previous regeneration attempt to obtain adequate regeneration. Further assessment must be undertaken following remedial treatment to ensure that it has been successfully regenerated.
	1.5 If early stocking was inadequate, has ITAO remedial regeneration work been conducted as soon as reasonably practicable and with 5 years of the previous regeneration attempt?
	1.6 Has further assessment of regeneration success been undertaken after follow up regeneration work?
	1.7 Have the parts of the coupe with inadequate stocking been regenerated successfully as per 9.1.1.2 (even aged) or 9.1.1.4 (uneven aged)

Notes:

1. Rows are shaded as follows: Code compliance elements (orange), MSP compliance elements (blue), compliance criteria (unshaded).



Appendix B. Revised environmental impact assessment tool

The assessment of risk of harm to the environment resulting from any instance of non-compliance with the regulatory framework for timber harvesting is assessed using an environmental impact assessment (EIA) tool. The tool which has previously been used within the FAP was modified during this audit to improve the consistency and transparency of assessments of environmental risk resulting from non-compliances relating to in-coupe road drainage and waterway crossings.

The revised tool is based on that developed to the FAP. It includes expanded descriptions for the "extent of impact" assessment criterion and combines the "duration of impact" and "likelihood of recovery" criteria. The scoring scheme and ratings of overall potential environmental impact are similar to the original EIA tool.

The original and revised EIA assessment criteria and scoring schemes are given in the tables below.

B.1 Extent and location of impact

The original "extent of impact" criterion has been expanded to include extent and location of impact. Changed wording enables more consistent and transparent assessments of risk resulting from non-compliances for incoupe road drainage and waterway crossings (for example). Descriptors for both the original and revised criteria are given in Table C.1.

Extent of impact (original)		Extent and location of impact (revised)	
0-10% of the authorised harvesting area		Impact affects 0-10% marked harvesting area. ≤100/80 m ICR not correctly drained (low-med/high soil erosion hazard)	
11-25% of the authorised harvesting area		Impact affects 11-25% marked harvesting area. 101-150/81-100 m ICR not correctly drained (low-med/high soil erosion hazard)	
26-50% of the authorised harvesting area	3	Impact affects 26-50% marked harvesting area. 151-200/101-130 m ICR not correctly drained (low-med/high soil erosion hazard). Single or localised incidence of unplanned or unauthorised disturbance within drainage line filter area (e.g. entry of harvesting machine) affecting <10% of filter area.	
>50% of the authorised harvesting area	4	Impact affects >50% marked harvesting area. >200/130 m ICR not correctly drained (low-med/high soil erosion hazard). Multiple and/or widespread (>10% of filter area) unauthorised disturbance within drainage line filter area. Localised (<10% of filter or buffer area) unauthorised disturbance to temporary stream filter or buffer (e.g. single entry of harvesting machine, escape of regeneration burn). Non-compliant waterway crossing disturbs temporary stream within 10 m of the crossing.	
Impact extends 0-10m outside authorised harvesting area. Involves disturbance or harvesting of small area (0-10m) within the authorised harvesting area that should have been excluded from harvesting under regulatory rules (e.g. threatened species habitat or rainforest)	5	Impact involves disturbance (including regeneration burn escape) or harvesting of small area (within gross coupe area) extending ≤10m into an area that should have been excluded from harvesting (e.g. threatened species habitat, rainforest, riparian buffer). Non- compliant waterway crossing disturbs permanent stream within 10 m of the crossing or a temporary stream >10 m from the crossing.	

Table C.1 Extent and location of impact assessment criteria and scoring



Extent of impact (original)		Extent and location of impact (revised)
Impact extends 10-100m outside harvesting area. Involves disturbance or harvesting of moderate area (10-100m) within the authorised harvesting area that should have been excluded from harvesting under regulatory rules (e.g. threatened species habitat or rainforest). Involves moderate area (10-100m) of authorised harvesting area that should have been protected.		Impact involves disturbance (including regeneration burn escape) or harvesting 10-100 m into area (within gross coupe area) that should have been excluded from harvesting (e.g. threatened species habitat, rainforest, riparian buffer). Non-compliant waterway crossing disturbs permanent stream >10 m of the crossing.
Impact extends >100m outside harvesting area. Involves disturbance or harvesting of large area (>100m) within the authorised harvesting area that should have been excluded from harvesting under regulatory rules (e.g. threatened species habitat or rainforest)	7	Impact involves disturbance or harvesting (within gross coupe area) extending >100m into an area that should have been excluded from harvesting (e.g. threatened species habitat, rainforest, riparian buffer) or extends beyond the coupe into an area which should not have been harvested.

B.2 Extent and duration of recovery

The original EIA tool assess the expected duration of impact separately from the likelihood of recovery, when these are essentially similar properties. The two criteria were combined in the revised tool, as per Table C.2.

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Likelihood of recovery	Duration of impact	Score	Duration and recovery from impacts
Expected/likely to fully recover	0-12 months (short term)	1	Near full recovery from impact or disturbance within 1 year
Expected/likely to mostly recover	12-36 months (medium term)	2	Near full recovery from impact or disturbance within 1-3 years
Expected/likely to partially recover	> 3 years (long term)	3	Near full recovery from impact or disturbance within 3-10 years
Expected/likely to never recover		4	Near full recovery unlikely within harvest cycle.

B.3 Asset

The asset score from the original EIA tool has been adopted, as per Table C.3. This assesses the consequence or significance of the environmental risk resulting from non-compliance with the regulatory framework.

Table C.3 Asset or value significance score

Asset or value	Score	
General forest	1	
Filters	2	
Landscape buffers, representative Special Protection Zones (based on modelled values)		
Riparian Buffers, Rainforest and Rainforest Buffers, Special Protection Zones; other protected forest		
values such as threatened species habitat; National Parks or other formally acknowledged reserves.		

B.4 Overall environmental risk

Overall environmental risk associated the non-compliance issue is taken as the sum scores for the criteria in Tables C.1-C.3. This is ranked in five classes as per Table C.4. This table shows the scoring scheme the original and revised EIA tool.


Table C.5 Ranking of EIA scores

	Overall score	
EIA class	Original tool	Revised tool
Negligible	4-5	3-4
Minor	6-7	5-7
Moderate	8-10	8-10
Major	11-14	11-13
Severe	15-18	14-15



Appendix C. Potential modifications to the regulatory framework for timber harvesting in State forests.

C.1 Modifications to improve auditing against the regulatory framework

The Code states that its purpose is to provide direction to timber harvesting managers, harvesting entities and operators to deliver sound environmental performance when planning for and conducting timber harvesting operations (DEPI, 2014a). While it is not necessarily written with auditing in mind, audits are an important component of the accountability and adaptive management process which is required to deliver and demonstrate sound and improving environmental performance during timber harvesting activities.

This appendix (Table C.1) includes a series of comments and recommendations on potential changes in the Code to clarify intent, reduce ambiguity and provide a more objective basis for audit. These are reproduced from the report on the audit of the construction and maintenance of in-coupe roads (Jacobs, 2016).

Table C.1 Analysis of Code mandatory actions applicable to in-coupe roads for which objective assessment of compliance is impeded by ambiguous wording.

Code mandatory action	Comment
2.2.1.6 Where crossings are required, minimise the extent of habitat damage, constriction to stream flow and barriers to fish and other aquatic fauna.	The aim of this mandatory action is to prevent unnecessary habitat damage at waterway crossings and prevent avoidable restrictions to streamflows (particularly during low flows) and fish passage. It is impossible to determine if these have been "minimised", although it is possible to determine if the level of damage and flow and fish passage impairment is excessive. The wording of this action could be revised to, <i>Where crossings are necessary, ensure stream flow and fish passage are maintained during low flows and that habitat damage is confined to the crossing pathway and applicable clearing widths on either side.</i>
2.2.1.10 Minimise the extent and duration of soil disturbance adjacent to or within waterways.	Aside from the use of "minimise", the context for this action is unclear. It could be applicable to roading and/or harvesting operations and could apply to one or all three classes of waterway. The wording of this action should be modified to clarify its intent.
2.2.1.11 Use management practices such as modified harvesting techniques, scheduling, wet weather suspensions or progressive rehabilitation to minimise the potential for sediments and other pollutants to move into streams.	"Minimise" is used, but the action is concerned with implementing particular types of actions which reduce sediment supply and mobilisation. The wording of this action could be revised to, <i>Restrict</i> <i>the mobilisation of sediments or other pollutants into waterways</i> <i>through practices such as modified harvesting techniques, scheduling,</i> <i>wet weather suspensions or progressive rehabilitation.</i>
2.2.1.12 Design, construct and maintain roads, crossings, coupe infrastructure and drainage structures to withstand foreseeable rainfall events and traffic conditions, and protect water quality.	All flows (and hence rainfall) up to the maximum possible flood are "foreseeable". The intent of the action is to ensure design handles relatively low frequency/high intensity rainfall and flow events. The wording could be revised to be consistent with the MSP requirement for culvert design to handle a 1 in 10 year (10% Annual Exceedance Probability) rainfall or flow event.
2.2.1.14 Minimise potential for soil erosion or mass movement by planning and using operational methods and restrictions appropriate to the assessed soil erosion risk and slope.	The point of this action is the use of planning and operational methods. The wording could be modified to, <i>Use planning and operational methods and restrictions which are proportional to the risk of erosion and mass movement.</i>
2.2.1.15 Locate coupe infrastructure and roads to minimise soil erosion and degradation.	The point of the action is to locate coupe infrastructure appropriately. The wording could be modified to, <i>Wherever possible, locate coupe</i> <i>infrastructure and roads away from areas with high risk of erosion and</i> <i>soil degradation.</i>



Code mandatory action	Comment
2.2.1.17 Limit the area of soil affected by coupe infrastructure and roads to the minimum required to safely complete timber harvesting operations to the required standard.	Objectively determining the "minimum possible" level of soil disturbance for safe harvesting is not possible, particularly given the diversity of slopes, soil conditions and harvesting methods likely to be encountered. In the absence of objective criteria on what an appropriate limit to soil disturbance might be, it is suggested the wording could be changed to, <i>Develop coupe infrastructure and roads</i> to enable timber harvesting operations to be completed safely, to the required standard and without excessive soil disturbance.
 2.4.1.3 Road planning must: i. locate roads so as to minimise risks to safety and environmental values, particularly soil, water quality and river health, during both construction and ongoing road use; and ii. ensure that the timing of construction activities minimises risks associated with unsuitable weather conditions and provides for completion to the required standard in advance of timber harvesting operations. 	Use of "minimise" is unnecessary in both components of this action and makes them impossible to audit objectively. The wording should be revised to focus on locating roads to avoid high risk areas for safety and soil disturbance and to undertake construction activities during periods when there is a low likelihood of unsuitable weather.
2.4.1.4 Existing roads must be used for access to a coupe or work site and to haul timber, except where it can be clearly demonstrated that a new or relocated road further minimises or removes existing threats to soil, water quality or biodiversity.	It is not possible to "further minimise" a threat. "Reduce" should be used in place of "minimise".
2.4.2.3 All fill disposal areas and embankments must be planned and designed to minimise soil erosion, mass soil movement, and potential water quality deterioration.	Planning and design of fill disposal areas and embankments are intended to reduce the risk of various forms of erosion and subsequent water quality impairment. The wording could be revised to, <i>Plan and design fill disposal areas to effectively manage risks to</i> <i>soils and water quality from soil erosion and mass movement.</i>
2.4.3.6 Road construction must ensure that:i. disturbance to stream beds and banks is kept to a minimum;	A "minimum" level of disturbance is difficult to quantify. This component of the action could be rephrased to, <i>confine disturbance to stream beds and banks to the pathway of any crossing.</i>
2.4.4.3 Road drainage systems must be maintained at sufficient frequency to minimise erosion and the discharge of sediment into waterways.	The point of road design and maintenance is to prevent discharge of sediment into waterways. The outcome rather than the frequency of maintenance is the point. This action could be reworded as follows, <i>Road drainage systems must be maintained to prevent the discharge of sediment into waterways.</i>

C.2 Modifications relating to pests, weeds and diseases

The 2014 FAP audit of harvesting and coupe closure (URS, 2015) found a systemic non-compliance in relation to the prevention of *P.cinnamomi* introduction via infected quarry materials. It found no evidence that VicForests had assessed the risk of disease transmission on coupes where gravel was used to surface roads. No similar finding was made in this audit or the previous Jacobs (2015) audit of in-coupe roading.

While the auditors agree with the URS (2015 finding that the management of disease risk is not sufficiently rigorous, our view is that this reflects a systemic issue with the Code.

Code mandatory actions relating to pests, weeds and diseases which are applicable to roading are:

- 2.2.2.13 Implement appropriate vehicle and equipment hygiene precautions when moving from areas of known pest plant, pest animal and pathogen infestations.
- · 2.4.3.5 Quarry materials known to be infected with any pest plant or pathogen must not be used.

Both of these require action on the basis of knowledge of a disease issue, rather than the risk or assessment of it. The auditor considers that to mitigate this risk more effectively, hygiene procedures should be adopted as a



matter of course and that all quarries should be subject to regular checks to assess their disease and pest status. Complementation mandatory actions in the MSP are more pro-active than those in the Code, but still only apply when infection is known. Suggested improvements are:

- Wash down: all harvesting and road construction machinery should be thoroughly cleaned and inspected before being brought onto a new coupe (unless it is adjacent to the one from which the machinery is being moved). This is routine practice for VicForests (VicForests, 2017) and many other land managers (e.g. Department of Defence).
- *Monitoring of disease status:* quarries from which materials are sourced for forest road construction should be checked annually by a competent, independent party to confirm disease and weed free status;
- *Treatment:* gravel obtained from quarries which are not confirmed as weed and disease free should be treated to mitigate any weed or disease threat prior to use within a harvest coupe.

Evidence of machinery inspections, disease and weed free status of quarries and/or treatment should be retained in the FCP for all applicable coupes.