

Coastal IFOA: Monitoring plan
**Independent evaluation of
forestry practice**

October 2020



Monitoring strategy summary	
Monitoring strategy	Independent evaluation of forestry practice
Version 1.0	8 October 2020

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1.3 Protocol 38	
<ul style="list-style-type: none"> ▪ Protocol 38.3 (1) (a) The monitoring program must be designed to monitor and evaluate the effectiveness of the conditions of the approval, including but not limited to: <ul style="list-style-type: none"> (ii) drainage feature crossing and road conditions 	
1.4 Coastal IFOA condition and associated outcome statements	
See Appendix 1 for detail of conditions.	
<u>Drainage feature crossing and road conditions:</u>	
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See also:

Protocol 10: Road design

Protocol 14: Design methods for crossings and drainage structures

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Pre- and post-harvest burning conditions:

Outcome statement: Environment features, habitat, landscapes and communities are maintained through the implementation of best management practices for pre-harvest burns and post-harvest burns.

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Outcome statement: ESAs and important habitat are managed during burning operations to maintain their intended, specific environmental values and provide short-term refuge habitat.

Condition 91-92. Category 1 and 2 Environmentally Significant Areas

Condition 113. Burning

Species and habitat survey and modelling conditions:

Outcome statement: Environment features, habitat and risks are identified to ensure that protections and management actions are implemented to mitigate the impact of the forestry operation.

Condition 56. Targeted flora surveys and targeted fauna surveys

Condition 57. Broad area habitat searches

Condition 58. Incidental records of species and habitat features requiring protection

Outcome statement: Site-specific measures are implemented to mitigate the impact of the forestry operation on fauna species and their habitat, and to support their persistence.

The following conditions list 'modelled habitat':

Condition 67. Albert's Lyrebird, *Menura alberti*

Condition 68. Marbled Frogmouth, *Podargus ocellatus*

Condition 69. *Phyloria* species and *Assa darlingtoni* (Southern meta-population)

See also:

Protocol 20: Pre-operational surveys

1.5 Strategy objective

- Design and implement an evaluation plan that addresses the three evaluation questions (see Section 1.2 Monitoring Questions)

1.6 Strategy summary

The proposed suite of evaluations will be to, initially, determine the effectiveness of the following practices used in coastal native hardwood state forest in NSW:

- Drainage feature crossings and roading

- Pre- and post-harvest burning
- Species and habitat survey and modelling conditions and practices

Drainage feature crossings and roading

The program will adapt existing methods for assessing the effectiveness of road networks in forestry operations. For example, as outlined in Croke and Mockler (2001). This method uses remote imagery and car-based survey to assess the hydrological connectivity of the road and stream networks. Alluvium and the NSW Soil Conservation Services have been engaged to assist the Commission with this evaluation.

Pre- and post-harvest burning

The program will evaluate the effectiveness of the burn plan approval conditions (for example seasonal timing, fire return interval, control lines, burn prescriptions) in maintaining key habitat features, such as environmentally significant areas, habitat clumps or retained hollow-bearing trees so they continue to provide short-term refuge to forest-dependent fauna species.

Species and habitat survey and modelling conditions and practices

The program will evaluate the effectiveness of species and habitat survey and modelling conditions and practices in the Coastal IFOA. Specifically, this evaluation will establish if the current methods are adequate to mitigate the impacts of forestry operations on flora and fauna species and their habitat.

1.7 Outline of methods and approach

Question 1: Drainage feature crossings and roading

- The program will adapt existing methods for assessing the effectiveness of road networks in forestry operations. For example, as outlined in Croke and Mockler (2001).¹ These methods uses remote imagery and car-based survey to assess the sediment generation and hydrological connectivity of the road and stream networks.
- This evaluation will be undertaken in conjunction with the Forest Monitoring and Improvement Program (FMIP) as a cross-tenure project. The Coastal IFOA component will only focus on coastal state forests, the requirements of the approved monitoring program, and relevant drainage feature crossings and roading conditions in the Coastal IFOA.
- The objectives of the cross-tenure program are to:
 - apply existing methods to ensure forest road network design and management maintains forest environments as catchments providing high quality surface water
 - assess the adequacy of existing road drainage (including stream crossings) to reduce soil erosion and protect water quality through the application of peer reviewed literature to establish a field survey method
 - select and assess a sample of forest road networks across different forest tenures in NSW

¹ Croke, J. and Mockler, S., (2001), Gully initiation and road-to-stream linkage in a forested catchment, southeastern Australia. *Earth Surface processes and landforms*. 2001; 26:205-217.

- present the findings and suggestions for the adaptation of forest road network design and management to improve effectiveness.
- Note: In April to June 2020, the FMIP ran an open tender process, received several proposals, an assessment panel evaluated each proposal and recommended a preferred supplier, and the steering committee endorsed the preferred supplier (Alluvium in collaboration with Soil Conservation Services (SCS)) to deliver this work.
- The proposal (including addendum) by Alluvium in collaboration with SCS outlines the proposed approach which includes to:
 - deliver an approved methodology with specific differences for coastal state forests
 - refine the field work required when the methodology is agreed to
 - undertake a minimum of field work (across all tenures) that will include:
 - visual geomorphic assessment at each survey event (10 locations, 12 surveys at each location)
 - monthly water quality monitoring including six wet weather and six dry weather events, focussing physio-chemical sampling (pH, dissolved oxygen, electrical conductivity, temperature, turbidity and total suspended solids) (10 locations, 12 surveys at each location)
 - peer review by Dr Jacky Croke (Professor and Head of School of Geography at the University College Dublin) and Dr Patrick Lane (Professor Landscape Water, Ecosystem and Forest Sciences, University of Melbourne)

Question 2: Pre- and post-harvest burning

- **Background:** Pre-harvest burns and post-harvest burns are forestry operations. Forestry Corporation of NSW (FCNSW) must conduct pre-harvest or post-harvest burns in accordance with burning prescriptions in the Coastal IFOA, or they may elect to carry out a hazard reduction burn under the *Rural Fires Act 1997* (NSW), instead of a burning operation in accordance with the approval. FCNSW prepares a burn plan (if relevant) as part of the harvesting plan for an area. Managed fire also has a role in both maintaining the ecological functioning of key habitat features and reducing wildfire fuel hazard.
- **Additional context to the evaluation question:** the pre- or post-harvest burning operation must have been conducted in accordance with the Coastal IFOA and the key habitat feature must have been identified in the burn plan (i.e. the evaluation is not looking at non-compliant operations – compliance issues are a matter for EPA to investigate)
- **Objective:** To evaluate the effectiveness of the burn plan approval conditions (for example seasonal timing, fire return interval, control lines, burn prescriptions) in maintaining key habitat features, such as environmentally significant areas, habitat clumps or retained hollow-bearing trees so they continue to provide short-term refuge to forest-dependent fauna species.
- The evaluation will consist of:
 - Identifying a suitable sample of burn plans to evaluate.
 - **a field assessment:** to determine if the habitat features identified in the burn plan retain the function for which they are conserved.

- **recommendations:** the evaluation will include recommendations on what improvements could be made to the burn plan and the associated conditions in the Coastal IFOA
- **Timing considerations:**
 - Evaluation is scheduled to commence in the 2021-22 financial year
 - The field assessment delays relate to 2019-20 wildfire impacts on harvesting operations and conditions
 - Pre- and post-harvest burning operations under the Coastal IFOA conditions need to resume (or commence) for the field assessment component to be conducted
 - The timing of field assessments for a post-harvest burning operation needs to be considered.
 - Note: A pre-harvest burning operations may be conducted within one year prior to the harvesting operation and a post-harvest burning operation can be conducted anywhere up to two years after harvesting. The timing of this field assessment may be informed by the inter-jurisdictional review and literature review, or consideration of the forest type.
- **Delivery method:** Work with expert panel to identify the appropriate sample of plans to evaluate. A service provider with experience in ecological assessment and prescribed burning could undertake this work

Question 3: Species and habitat survey and modelling conditions and practices

- The aim of this question is to evaluate the effectiveness of species and habitat survey and modelling conditions and practices in the Coastal IFOA. Specifically, this evaluation will establish if the current methods are adequate to mitigate the impacts of forestry operations on flora and fauna species and their habitat.

Background

- Targeted flora and fauna surveys are completed in areas where modelled habitat exists within or records occur within or close by an operational area.
- Targeted flora surveys are completed in areas mapped as ‘potential habitat’ under the conditions (20.3(1)) for those species identified in Protocol 31. Where no potential habitat occurs, a minimum of 15-minute searches are required in an operational area in those locations where the most suitable habitat occurs, or the lack of habitat is to be documented.
- Targeted fauna surveys are based on the identification of habitat via habitat models (exist for Rufous Scrub-bird, Albert’s Lyrebird, Marbled Frogmouth, *Assa darlingtoni* (Southern meta-population), *Philoria* species, Northern Corroboree Frog, Hastings River Mouse, Powerful Owl, Masked Owl, Sooty Owl and Barking Owl) or proximity to existing records.

Table 1: Overview of species requirements for targeted fauna surveys

Species	Modelled habitat	Records	Method
Rufous Scrub-bird	Modelled habitat in an operational area	Record of Rufous Scrub-bird in or within two kilometres of the	Listening for calls in breeding season

		boundary of an operational area	
Albert's Lyrebird	Where there is 10 hectares or more of Albert's Lyrebird modelled habitat in an operational area	Record of Albert's Lyrebird in or within two kilometres of the boundary of an operational area	Look for nests
Marbled Frogmouth	10 hectares or more of Marbled Frogmouth modelled habitat in an operational area	Record of Marbled Frogmouth in or within two kilometres of the boundary of an operational area,	Call broadcast
Assa darlingtoni (Southern meta-population)	10 hectares	2 km	Call broadcast
Philoria species	10 hectares	2 km	Call broadcast
Northern Corroboree Frog	In each operational area with Northern Corroboree Frog modelled habitat in Bondo and Micalong State Forests	N/A	Shout response
Hastings River Mouse	10 hectares	200m	Microhabitat transect showing moderate to high suitability - then Elliot traps over 4 nights
Koala	Tallaganda, Badja, Dampier, Moruya, Wandella and Bodalla State Forests in the Southern Subregion; and (ii) Glenbog and Glen Allen State Forests in the Eden Subregion; and	Any local landscape areas in the Southern Subregion or Eden Subregion where a Koala record occurs in or within two kilometres of the local landscape area in the last 10 years	Either Koala RGSAT survey or a quality acoustic recording device survey
Owls	The 'Large_Forest_Owl' spatial dataset shows forest owl exclusion zones which includes all modelled habitat for large forest owls	Record of a large forest owl species, being Powerful Owl, Masked Owl, Sooty Owl or Barking Owl, within an operational area which contains unassessed Crown-timber land or within two kilometres outside the boundary of the operational area which contains unassessed Crown-timber land	None identified

- Broad areas habitat searches aim to identify habitat features or species prior to operational impacts.

Table 2: Habitat features or species

Habitat features or species that must be searched for during broad area habitat searches	
Nest, roost or den trees (as listed in Table 4, Chapter 4 of the approval)	Koalas, and evidence of koalas
Stick nests greater than 50 cm in diameter	Soaks and seepages in <i>Assa darlingtoni</i> modelled habitat , <i>Philoria</i> species modelled habitat and where there is a record of <i>Philoria</i> species or <i>Assa darlingtoni</i> within two kilometres of that operational area
Bat roost trees and potential subterranean bat roosts	Hollow-bearing trees and nectar trees
Flying-fox camps	Spotted-tailed Quoll dens (including maternal dens)
Glossy Black-Cockatoo feed tree	Spotted-tailed Quoll latrine sites
Glider sap feed trees	Bare-nosed Wombat (Northern Population Management Area) burrows
Wetlands	Flora species listed in Part 3 and Part 4 of condition 31.2 of Protocol 31: Matters covered by the approval recorded within five kilometres of the boundary of the operational area , where potential habitat occurs in the operational area
Rocky outcrops and cliffs	Evidence of any other subject species
Heath and scrub	Evidence of any other habitat that requires protection under the approval

- Pre-harvest by a suitably qualified person must visually assess each tree for Koalas immediately prior to it being felled.

Evaluation method

- **Records:** The accuracy and age of records used, databases used and how often this information is updated will be evaluated. The evaluation will be completed by the Commission, with interviews and workshops with FCNSW, EPA and DPI Forest Science.
- **Habitat models:** The adequacy, data and methods used for habitat models, if and how these are validated and how often they are updated (given habitat change over time) will be evaluated. This will also include an evaluation of the inclusion of disturbances outside forestry (e.g. climate change, increased potential for wildfire) and how these are accounted for and how adequately these are incorporated. Models for specific species and their inputs will be compared to other available habitat models including EES habitat modelling. This comparison and review of methods will be undertaken by an independent industry expert.
- **Survey methods and timing:** The survey methods, effort and timing used for each species/taxa group will be evaluated. The length of time between targeted survey and operational impacts will also be evaluated. A literature review will be completed for the key species and taxa groups (flora) identified in the conditions, to determine current

industry practices for targeted surveys and to evaluate the methods proposed in the Coastal IFOA Protocols. This will be undertaken by an independent industry expert.

- **Broad habitat searches:** The methods and effort used to identify habitat features will be evaluated. This will be undertaken by the Commission, with interviews and workshops with FCNSW and DPI Forest Science.
- **Pre-harvest surveys for Koala:** The methods to identify Koala's based on browse prescriptions or Koala records will be evaluated. Data on the occurrence of Koala's found within trees immediately prior to operations will be reviewed for all operations to date.

May be incorporated with research program regarding the effectiveness of pre-harvest detection of Koalas with UAV

Undertaken by the Commission, with interviews and workshops with FCNSW and DPI Forest Science.

Recommendations

- The evaluation will assess whether species and habitat survey and modelling conditions and practices are effective in achieving specified outcomes
- The results will be used to identify if the conditions and protocols need to be amended to facilitate the adoption of improved survey and modelling methods.

Timing considerations:

- This evaluation is scheduled for 2022-23.

Delivery method:

- The Commission will undertake this work including engaging service providers, as required, with experience in ecological survey methods and modelling.

1.8 Summary of approach to develop baselines and benchmarks for adaptive management

The evaluation of forestry practice is designed to adapt to changes to the Coastal conditions and protocols. Where adaptation is required, the evaluations provides the evidence-base to the performance of protocols within the Coastal IFOA and where different approaches and practices should be adopted.

1.9 Existing programs and data that will inform the strategy

Drainage feature crossings and roading:

- The method will require the use of spatial information to generate a digital elevation model of the area being assessed
- NSW government and FCNSW spatial information will be accessed to implement the assessment.

Species and habitat survey and modelling:

- FCNSW operational survey data, survey methods, habitat models and threatened species records
- Saving Our species survey and modelling practices.
- ESS Threatened biodiversity survey guidelines

1.10 How the data will be stored, analysed and presented

Data will be collected and stored to the standards set out in the Forest Monitoring and Improvement Program data management system, including analysis and presentation, then made available for integration with the state-wide forest monitoring program analysis platform.

Drainage feature crossings and roading:

- The method will develop a GPS positioning of roading and drainage features
- The method will also develop on road-stream connections that can be used to plan for remedial activities
- A data management plan will be prepared to guide the management of data generated by this program.

Species and habitat survey and modelling:

- A detailed review report will be developed for this evaluation. Any data that was gathered during this process of the review will be integrated into the state-wide forest monitoring program analysis platform.

1.11 Expected strategy outcomes

Drainage feature crossings and roading:

- Establish a consistent methodology for evaluation of forest road networks.
- Establish effective benchmarks for roading and drainage in NSW State forests
- Evaluate the effectiveness of roading and drainage features practices in state forests against benchmarks.

Pre- and post-harvest burning

- Improvements in the effectiveness of conditions and practice in conserving the ecological function of forests.
- Confidence of the community in the impacts pre- and post-harvest burn operations

Species and habitat survey and modelling

- Improvements in the effectiveness of conditions and practice in relating to the survey and modelling of species and habitat features
- Confidence of the community in the survey and modelling conditions and practice associated with harvesting operations.

1.12 Linkages and uses with the overall NSW Forest Monitoring and Improvement Program Framework

Drainage feature crossings and roading:

- Roding occurs in the forested landscapes of all tenures. The application of the same method in conservation forests will provide a useful comparative analysis of the effectiveness of different roading practices.

- The FMIP soil and water baseline, drivers and trends directly relate to this evaluation program.

Pre- and post-harvest burning

- FMIP fire severity mapping project.
- Research project on the impact of the 2019-20 bushfires on the Coastal IFOA outcomes.

Species and habitat survey and modelling

- Fauna acoustic monitoring project.
- Biodiversity baseline drivers and trends project.
- NSW fire extent and severity mapping (FESM).

Part 2: Timeline		
Activity description	Start date	End date
Prepare an evaluation program and plan for the remaining monitoring questions	July 2020	September 2020
Develop the methodology for the evaluation of forest road networks.	July 2020	September 2020
Evaluate the roading and drainage practices of forestry operations State Forests	November 2020	January 2021
Review of harvest burn plans	July 2021	October 2021
Post-harvest burn field assessment	August 2021	November 2021
Evaluation and report of pre- and post-harvest burning practices	December 2021	March 2022
Interviews and workshops with FCNSW, EPA and DPI Forest Science for review of species and habitat survey and modelling	July 2022	September 2022
Review of habitat models, survey methods, effort and timing, and methods and effort used to identify habitat features	September 2022	October 2022
Review of methods to identify Koala's based on browse prescriptions or Koala records	October 2022	November 2022
Report on review of species and habitat survey and modelling	November 2022	December 2022

Appendix 1:

Pre- and post-harvest burn conditions and outcome statements:

Outcome statement for Division 7 of Chapter 4 of the approval Environment features, habitat, landscapes and communities are maintained through the implementation of best management practices for pre-harvest burns and post-harvest burns.

85. General obligations on burn planning

85.1 FCNSW must not conduct a pre-harvest burn or post-harvest burn in an operational area unless:

- (a) it has prepared a burn plan in accordance with Protocol 4: Operational plans and the limitations in conditions 86 and 87;
- (b) the burn plan clearly states that FCNSW elected to apply the terms of the approval instead of the requirements of the *Rural Fires Act 1997* (NSW);
- (c) the burn plan clearly states whether the proposed burning operation is a pre-harvest burn or post-harvest burn; and
- (d) the burn plan is recorded in the NSW Rural Fire Service State-wide fire recording system.

85.2 FCNSW must ensure that pre-harvest burn or post-harvest burn planning and implementation is carried out by a suitably qualified person.

85.3 Each pre-harvest burn or post-harvest burn must be carried out in accordance with:

- (a) the burn plan prepared for each operational area; and
- (b) all conditions specified in the approval that relate to a pre-harvest burn or post-harvest burn.

86. Limits on the timing of burns

86.1 A pre-harvest burn may only be conducted within one year before the commencement of a harvesting operation or within such other period as approved under condition 5.2 of Protocol 5: Approvals for restricted activities.

86.2 A post-harvest burn may only be conducted within two years after the completion of a harvesting operation.

86.3 A pre-harvest burn must not be conducted in any part of the net harvest area that has been subject to a burn event within the preceding five years.

86.4 A post-harvest burn must not be conducted in any part of the net harvest area in which a preharvest burn was conducted.

86.5 A pre-harvest burn or a post-harvest burn must not be ignited where immediately prior to the planned start time for the burn:

- (a) the recorded McArthur Forest Fire Danger Index within the burn area is greater than 12; or
- (b) the McArthur Forest Fire Danger Index is predicted to be greater than 15 at any time during the intended duration of the burn; or
- (c) the McArthur Forest Fire Danger Index is predicted to be greater than 15 at any time in a 24-hour period following the planned completion of the burn.

86.6 For land classified as inherent hazard level 2 or 3 in accordance with Protocol 15: Inherent soil erosion and water pollution hazard assessment:

- (a) a pre-harvest burn or post-harvest burn must not be carried out during, or within the month

prior to, a month with an average monthly rainfall erosivity of greater than 1100; and
(b) a pre-harvest burn or post-harvest burn carried out during a month with an average monthly rainfall erosivity of 900 to 1100 may only be conducted using a ground burning (top disposal) method.

87. Limits on the application of fire during pre-harvest burns and post-harvest burns

87.1 FCNSW must not carry out a pre-harvest burn or a post-harvest burn in an ESA or ground protection zone, unless approved in accordance with Protocol 5: Activities in restricted areas.

87.2 FCNSW must stabilise and rehabilitate any area in an ESA or ground protection zone disturbed by a pre-harvest burn or a post-harvest burn irrespective of whether this disturbance was unintended or was carried out intentionally in accordance with Protocol 5: Activities in restricted areas.

Outcome statement for Division 7 of Chapter 5 of the approval ESAs and important habitat are managed during burning operations to maintain their intended, specific environmental values and provide short-term refuge habitat.

113. Burning

113.1 A pre-harvest burn or post-harvest burn must be carried out in accordance with the burn plan prepared for the forestry operation in accordance with conditions 85, 86 and 87 of the approval.

113.2 In an area where there has been a pre-harvest burn, a forestry operation must not commence in any operational area until the soil is stable.

113.3 A pre-harvest burn or post-harvest burn must be undertaken in a manner that meets condition 23.3(7) of Protocol 23: Tree retention

Drainage feature crossing and roading conditions and outcome statements:

Outcome statement for Division 1 of Chapter 4 of the approval Environment features, habitat and risks are identified to ensure that protections and management actions are implemented to mitigate the impact of the forestry operation.

55. Road design and planning

55.1 Protocol 10: Road design must be applied and complied with for the construction of any new road, or the maintenance or upgrade of any existing road, where that construction, or maintenance or upgrade, will take place in a location where there is:

- (a) mass movement hazard; or
- (b) the ground slope is greater than 30 degrees.

55.2 Where an existing road is not planned to be used for the forestry operation, then:

- (a) the operational plan and operational map must clearly indicate it is not to be used; and
- (b) if FCNSW becomes aware that the existing road is not stable, and is causing water pollution, then FCNSW must stabilise the existing road.

Outcome statement for Division 4 of Chapter 5 of the approval Water quality, aquatic habitat and native fish movement are maintained through the implementation of best management practices for roads and road crossings.

100. Roads

100.1 All road batters, table drains and road surfaces must be stable.

100.2 Where clearing for road construction or road maintenance extends three metres or more beyond the inflexion point of the road prism, the area that is disturbed must be stabilised prior to the completion of the road construction or road maintenance.

101. Drainage of roads

101.1 Roads must be drained to divert water flow or potential water flow from road surfaces and each table drain and:

- (a) road drainage structures must have the capacity to wholly convey a peak flow from a 1:5-year storm event, as determined in accordance with Protocol 14: Design methods for crossings and drainage structures;
- (b) road drainage structures must divert water onto a stable surface that:
 - (i) is capable of handling concentrated water flow; and
 - (ii) provides for sediment trapping and energy dissipation; and
- (c) road drainage structures and sediment control measures must be designed, installed and operated so that water flow does not discharge, or have the potential to discharge, directly into drainage features.

102. Wet weather restrictions

102.1 A haulage operation must immediately cease when runoff from a road causes or contributes to, or is likely to cause or contribute to, water pollution.

102.2 If runoff from a road causes or contributes to, or is likely to cause or contribute to, water pollution, a road must not be used for a haulage operation, other than for the purposes of allowing a truck that is already loaded or partially loaded with timber products to leave the compartment and/or coupe.

103. Road crossings

103.1 A road crossing must be:

- (a) stable and capable of withstanding haulage operations;
- (b) located, designed, constructed, upgraded, used and maintained for fish passage in accordance with:
 - (i) Protocol 17: Fish passage; and
 - (ii) Protocol 18: Aquatic habitat assessment.

103.2 A drainage feature crossing must only be a bridge, a culvert, a causeway, an existing stable gully stuffer, or an existing side-cut causeway.

103.3 A new gully stuffer or new side-cut causeway must not be constructed.

103.4 An existing gully stuffer must not be upgraded. Where an existing gully stuffer becomes unstable or not capable of withstanding haulage operations, it must be replaced with a bridge, a culvert or a causeway.

103.5 Each road crossing must be capable of withstanding the peak flow from a 1:10-year storm event, as determined in accordance with Protocol 14: Design methods for crossings and drainage structures.

103.6 If a road crossing other than a causeway is constructed or upgraded, that road crossing must have the capacity to wholly convey a peak flow from a 1:5-year storm event, as determined in accordance with Protocol 14: Design methods for crossings and drainage structures.

103.7 Each outlet of a road crossing must discharge onto a stable surface capable of handling concentrated water flow.

103.8 A road must be drained between five metres and 30 metres on each side of a drainage line crossing, measured from the bankfull level.

103.9 If a road cannot be drained between five metres and 30 metres either side of a drainage line crossing, the road approaches to the crossing must be armoured.

103.10 The construction, upgrade or maintenance of a road crossing must restrict the disturbance of vegetation and groundcover in the ESA to the area that is three metres upstream and downstream of the road crossing unless otherwise approved in accordance with Protocol 5: Approvals for restricted activities.

103.11 Where a road is constructed or upgraded in dispersible soils, each part of the road prism within 20 metres of each side of a road crossing must be stabilised.

103.12 Spoil derived from road crossing construction, upgrading, maintenance, removal or use:

- (a) must be removed from all drainage features; and
- (b) must not be placed in any ESA or ground protection zone.

103.13 If the removal of spoil from a drainage feature disturbs an area, that area must be re-shaped and stabilised.

103.14 If any works are carried out to construct, upgrade, maintain or remove all, or part of, a road crossing, then:

- (a) any disturbed area caused by such works must be re-shaped and stabilised; and
- (b) any disturbed area within the road prism, 20 metres each side of the road crossing of a drainage line, must be stabilised.

103.15 Any in-stream works in class 1 aquatic habitat, including the construction or upgrading of road crossings must comply with Protocol 17: Fish passage, unless otherwise approved in accordance with Protocol 5: Approvals for restricted activities.

Outcome statement for Division 5 of Chapter 5 of the approval Water quality, aquatic habitat and native fish movement are maintained through the implementation of best management practices for tracks and track crossings.

104. Drainage of tracks

104.1 Tracks must be drained to divert water flow or potential water flow from the track surface on completion of use of the track for the forestry operation, or if the track is not, or will not be, used for five consecutive days or longer.

104.2 Each track drainage structure must have the capacity to wholly convey a peak flow from a 1:2- year storm event as determined in accordance with Protocol 14: Design methods for crossings and drainage structures.

104.3 Each track drainage structure must be located, designed, installed and maintained in such a way that:

- (a) water is diverted onto a stable surface capable of handling concentrated water flow and provides for sediment trapping and energy dissipation; and
- (b) water flow does not discharge directly to drainage features.

104.4 Blading off is prohibited on tracks.

104.5 Where outfall or walkover techniques are used, crossbanks are not required.

104.6 Crossbanks must be constructed of soil only.

105. Wet weather restrictions

105.1 A track must not be used where the use of that track causes or contributes to, or is likely to cause or contribute to, runoff that causes water pollution.

106. Track crossings

106.1 A track must not cross a wetland.

106.2 A track crossing must not be used when:

- (a) water is flowing from the drainage feature across the pavement or running surface of the crossing; or
- (b) the track crossing is saturated.

106.3 A track crossing must be stable and capable of withstanding snigging.

106.4 A track crossing must only be a bridge, a culvert, a causeway, a temporary log crossing, or an existing stable gully stuffer.

106.5 A new gully stuffer must not be constructed.

106.6 An existing gully stuffer must not be upgraded. Where an existing gully stuffer becomes unstable or not capable of withstanding snigging, it must be removed and replaced with a bridge, a culvert, a causeway or a temporary log crossing.

106.7 The construction, use and removal of each temporary log crossing must be carried out in accordance with Protocol 32: Temporary log crossings.

106.8 Each track crossing must be capable of withstanding the peak flow from a 1:10-year storm event, as determined in accordance with Protocol 14: Design methods for crossings and drainage structures.

106.9 Each permanent track crossing, other than a causeway, must have the capacity to wholly convey a peak flow from a 1:5-year storm event, as determined in accordance with Protocol 14: Design methods for crossings and drainage structures.

106.10 Each permanent track crossing must be located, designed, constructed, upgraded, used and maintained for fish passage in accordance with:

- (a) Protocol 17: Fish passage; and
- (b) Protocol 18: Aquatic habitat assessment.

106.11 A track must be drained between five and 20 metres on each side of a drainage line crossing, measured from the bankfull level.

106.12 Each outlet of a track crossing must discharge onto a stable surface capable of handling concentrated water flow.

106.13 Where a track is in dispersible soils, the track surface must be stabilised for a length of 20 metres each side of a track crossing, measured from the bankfull level.

106.14 Each temporary track crossing must be removed at the completion of its use.

106.15 Spoil derived from track crossing construction, upgrading, maintenance, removal or use must:

- (a) be removed from drainage features, and
- (b) not be placed in any ESA or ground protection zone.

106.16 If the removal of spoil from a drainage feature disturbs an area, that area must be re-shaped and stabilised.

106.17 Any area of land 20 metres either side of a track crossing of a drainage line that is disturbed by construction, upgrading, maintenance or removal of a track crossing must be re-shaped and stabilised.

Note: This does not include the track surface or track drainage structures within 20 metres either side of the drainage line.

106.18 The construction, upgrade or maintenance of a track crossing must restrict the disturbance of vegetation and groundcover in the riparian exclusion zone to the area that is three metres upstream and downstream of the track crossing unless otherwise approved in accordance with Protocol 5: Approvals for restricted activities.

106.19 Any in-stream works in class 1 aquatic habitat, including the construction or upgrading of track crossings must comply with Protocol 17: Fish passage, unless otherwise approved in accordance with Protocol 5: Approvals for restricted activities.

Species and habitat survey and modelling conditions:

Outcome statement for Division 1 of Chapter 4 of the approval Environment features, habitat and risks are identified to ensure that protections and management actions are implemented to mitigate the impact of the forestry operation.

56. Targeted flora surveys and targeted fauna surveys

56.1 A forestry operation (other than road maintenance) must not be conducted in any part of an operational area, unless a targeted flora survey and/or targeted fauna survey has been undertaken in that part of the operational area no greater than seven years prior to that forestry operation commencing in that area.

56.2 Each survey must:

- (a) be carried out by a suitably qualified person;
- (b) be carried out in, and within 100 metres of, the base net area of the operational area;
- (c) search for each of the species set out in conditions 20.3 and 20.4 of Protocol 20: Preoperational surveys, unless otherwise specified in that condition; and
- (d) be conducted and reported in accordance with condition 20.3, 20.4 and 20.5 of Protocol 20: Pre-operational surveys.

56.3 Any subject species or habitat feature detected in a targeted flora survey and/or targeted fauna survey must be:

- (a) managed and protected in accordance with the applicable requirements of the approval and protocols; and
- (b) mapped in accordance with condition 117 of the approval.

56.4 Despite condition 56.1, and subject to condition 57.1, a targeted flora survey and/or targeted fauna survey is not required for a species to which conditions 66, 67, 68, 69, or 71 of the approval apply if FCNSW:

- (a) has recorded in the operational plan that it will comply with conditions 66.2, 67.2, 68.2, 69.2, 69.3 or 71.1(c) of the approval, in relation to the species, as relevant; and
- (b) complies with those conditions, as applicable.

57. Broad area habitat searches

57.1 A forestry operation (other than road maintenance) must not be conducted in any part of an operational area unless:

- (a) at least 100 metres in advance of the forestry operation occurring in any part of the operational area, the base net area has been broken up into patches that are no more than 10 hectares in size and mapped in accordance with condition 117 of the approval;
- (b) a broad area habitat search has been undertaken in accordance with condition 57 of the approval in the patch that contains that part of the operational area; and
- (c) the broad area habitat survey was completed within a maximum of six months prior to the commencement of the forestry operation in that patch.

57.2 Each search must:

- (a) be carried out by a suitably qualified person;
- (b) be carried out in, and within 100 metres of, the base net area of the operational area;
- (c) look for, identify, and record the habitat features and species listed in Table 2 of this condition; and

(d) be conducted in accordance with condition 20.2 and 20.5 of Protocol 20: Pre-operational surveys.

57.3 All habitat features or species listed in Table 2 and identified under condition 57.2(c), or which were not identified under that condition but identified later during the carrying out of forestry operations, must be:

- (a) protected in accordance with the requirements for that habitat feature or species in the approval and the protocols; and
- (b) mapped in accordance with condition 117 of the approval.

Table 2: Habitat features or species
(see page 26 of the Coastal IFOA conditions for the table)

57.4 Condition 56.1 and 57.1 do not apply to a post-harvest burn or forest product operation if:

- (a) the post-harvest burn or forest product operation is conducted in a part of an operational area in which a targeted flora survey and/or targeted fauna survey and broad area habitat search was conducted for an associated harvesting operation, as set out in the operational plan; and
- (b) a targeted flora survey and/or targeted fauna survey and broad area habitat search conducted for the associated harvesting operation and the post-harvest burn or forest product operation were conducted in accordance with the approval.

57.5 Where a species that requires a flora road management plan (as listed in Part 3, Table 4 of condition 31.2 of Protocol 31: Matters covered by the approval) has been recorded within, or within five kilometres of the boundary of, the operational area a road maintenance operation must not be conducted in any areas of potential habitat for that species unless:

- (a) a flora road management plan applicable to the species has been prepared by FCNSW and approved by the EPA;
- (b) unless other provisions regarding survey of the species are expressly identified in the approved flora road management plan, a suitably qualified person must search:
 - i. areas of potential habitat in, and within 10 metres of, the planned road maintenance operation;
 - ii. in the relevant survey season (if any) identified in Part 3, Table 4 of condition 31.2 of Protocol 31: Matters covered by the approval;
 - iii. at least 100 metres in advance of road maintenance in that part of the operational area; and
 - iv. no more than six months (or other period if identified in the flora road management plan) prior to road maintenance in that part of the operational area;
- (c) the search effort and results are recorded in accordance with condition 20.5 of Protocol 20: Pre-operational surveys; and
- (d) any requirements regarding protection of the species or disturbance to sites identified in the approved flora road management plan are applied in a manner that reflect the results of condition 57.5(b) above.

58. Incidental records of species and habitat features requiring protection

58.1 Where FCNSW identifies a subject species, habitat feature or threatened species that requires protection under the approval, before or during the planning, surveying or carrying out of a forestry operation, FCNSW must:

- (a) immediately apply the conditions of the approval to that subject species, habitat feature or threatened species;

- (b) record the details of the subject species, habitat feature or threatened species;
- (c) map the subject species, habitat feature or threatened species in accordance with condition 117 of the approval; and
- (d) update the operational plan to include the requirements at condition 58.1(b).