

**SCHEDULE 2****(Conditions 9; 11; Schedules 1, 3, 4 & 5)****Factors to be taken into account when planning scheduled and non-scheduled forestry activities****Part A: Information to be assessed during the pre-operational planning and assessment of scheduled and non-scheduled forestry activities**

The following environmental and operational factors must be assessed by State Forests during the planning of forestry activities in each compartment, age class or roading area, as required by conditions 9 and 11 of this licence. State Forests must be able to demonstrate the manner in which the relevant factors were considered during the pre-operational planning process, and must identify special site-specific conditions to mitigate against water pollution associated with scheduled or non-scheduled forestry activities. This planning documentation, including the special site-specific conditions that have been developed to mitigate against water pollution must be kept on file in the Regional Office.

**ENVIRONMENTAL FEATURES****A. Climate**

- A1. rainfall characteristics for the proposed area of operations that are relevant to the calculation of design capacity for road and snig track drainage structures, such as rainfall intensity; and
- A2. annual rainfall erosivity and maximum monthly rainfall erosivity values.

**B. Geology**

- B1. dominant rock types (occurrence and distribution); and
- B2. bedding planes.

**C. Soil Regolith**

- C1. distribution of soil regolith types;
- C2. soil regolith characteristics;
- C3. presence and distribution of dispersible soil material; and
- C4. location of soil or regolith boundaries.

**D. Landform**

- D1. total area (ha) for each of the slope classes as specified in the inherent hazard matrices in module 1 of Schedule 3;
- D2. rockiness and rock outcrops mapped or known at the time of planning;
- D3. mass movement or areas of potential mass movement hazard (occurrence and distribution marked on a map at the same scale as the operational map) as determined in accordance with module 2 of Schedule 3.

**E. Condition Omitted (amendment 6)****F. Condition Omitted (amendment 6)**

**AMENDMENT 6**  
1 March 2013  
Paragraph A1  
replaced and A2  
deleted

**AMENDMENT 6**  
1 March 2013  
Paragraphs C to  
D replaced

**AMENDMENT 6**  
1 March 2013  
Paragraphs E  
and F omitted

**OPERATIONAL SYSTEMS**

<p><b>AMENDMENT 6</b> 1 March 2013 Paragraphs G to L replaced</p>
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**G. New Road Construction (including upgrading) greater than 40 metres in length (Items must be assessed for each road licensed)**

- G1. length of road to be constructed or upgraded;
- G2. maximum width of road to be constructed or upgraded;
- G3. sites where clearing will exceed 3 metres in width on either side of road prism;
- G4. sites where the slope of the land to be used for construction or upgrading exceeds 30 degrees;
- G5. maximum grade of road to be constructed or upgraded;
- G6. sites where road grade will exceed 10 degrees;
- G7. type of road drainage structures to be installed (“eg culverts, roll-overs, rubber flaps);
- G8. type of sediment trapping or soil erosion and sediment control devices to be used during road construction and upgrading;
- G9. maximum height of cut and fill batters to be constructed;
- G10. maximum length of cut and fill batters to be constructed;
- G11. type of drop-down structures and dissipators to be used on fill batters greater than one metre in height;
- G12. site-specific design and stabilisation techniques to be used on any roading to be constructed or upgraded on ground slopes exceeding 30 degrees;
- G13. site-specific design and soil stabilisation techniques to be used on any roading to be constructed or upgraded on areas that, or are likely to have a mass movement hazard;
- G14. site-specific details for the disposal of dispersible spoil material from road construction or upgrading;
- G15. site-specific soil stabilisation techniques of disturbed areas;
- G16. site-specific soil erosion and sediment control techniques; and
- G17. stabilisation assessment intervals.

**H. Existing Roads Maintenance (items must be assessed for each road licensed)**

- H1. form, extent and location of any historical or existing erosion;
- H2. length and name of each existing road to be used in forestry activities and the total length of existing roads to be used in forestry activities;
- H3. sites where road maintenance is required;
- H4. description of road maintenance to be carried out;
- H5. sites where clearing will exceed 3 metres in width on either side of road prism;
- H6. type of proposed road drainage structures;
- H7. sites where road drainage structures exceed road drainage spacing conditions;
- H8. maximum height of cut and fill batters;
- H9. maximum length of cut and fill batters;
- H10. site-specific stabilisation techniques to be applied to unstable cut and fill batters;
- H11. type of drop-down structures and dissipators to be used on fill batters greater than one metre in height and having unstable surfaces or surfaces with less than 70% ground cover;
- H12. site-specific stabilisation techniques for roads, road drainage structures and road batters on roads that traverse ground-slopes in excess of 30 degrees;
- H13. additional site-specific design and stabilisation techniques to be used on existing roads on areas that have, or are likely to have a mass movement hazard;
- H14. site-specific techniques to prevent erosion of the road batters, road surface and table drains and to provide efficient sediment trapping and energy dissipation at drainage structure outlets;

- H15. site-specific details on roads to be re-opened:
  - length of road re-alignment;
  - lowering of road grade; and
  - placement/disposal of spoil material; and
- H16. site-specific soil erosion and sediment control techniques.

**I Construction or Upgrading of Drainage Feature Crossings for Roads and Snig Tracks (items must be assessed for each licensed crossing)**

- 11. types of drainage feature crossings to be constructed/upgraded;
- 12. location of drainage feature crossings to be constructed or upgraded (shown on operational map);
- 13. sites where disturbance of vegetation and groundcover will exceed three metres upstream or downstream of the crossing;
- 14. site-specific soil erosion and sediment control measures to:
  - provide temporary protection to disturbed areas from water from the road surface and road drainage structures; and
  - prevent the deposition of spoil material into the drainage feature during drainage feature crossing construction and upgrading operations;
- 15.
  - (a) type of proposed drainage structures to drain roads between five metres and 30 metres from a watercourse, drainage line, wetland or swamp crossing;
  - (b) site-specific techniques to be used to prevent the pollution of water where a road drainage structure cannot be installed between five metres and 30 metres of a watercourse, drainage line, wetland or swamp crossing;
- 16. site-specific soil stabilisation techniques to be undertaken on disturbed areas within 20 metres either side of watercourses, within 20 metres either side of drainage lines or within protection or filter strips of wetlands or swamps;
- 17. sites where roads are constructed in dispersible soils within 20 metres either side of a drainage feature crossing;
- 18. permanence of water flow; and
- 19. site-specific techniques to dispose of excess spoil material.

**New or upgraded culverts**

- 110. site-specific techniques to be used to prevent spoil entering the drainage feature when removing and/or installing culverts;
- 111. site-specific techniques to be used to stabilise fill material around inlets and outlets of pipes;
- 112. site-specific techniques to be used to stabilise outlet discharge areas; and
- 113. site-specific techniques to be used to prevent pavement or surface material from entering the drainage feature.

**New or upgraded bridge**

- 114. site-specific techniques to be used to protect bridge embankments from table drain discharge;
- 115. site-specific techniques to be used to prevent spoil entering the drainage feature when replacing or removing bridges; and
- 116. site-specific techniques to be used to prevent road pavement material from entering the drainage feature.

### **New or upgraded causeways**

- I17. site-specific techniques to be used to protect the bed and banks of the drainage feature; and
- I18. type of surface material proposed.

### **J. Existing Drainage Feature Crossings Maintenance for Roads and Snig Tracks**

- J1. proposed type of drainage feature crossing to be maintained;
- J2. description of maintenance to be carried out;
- J3. location of crossing on which maintenance is to be carried out (shown on operational map);
- J4. type of proposed drainage structures to drain roads between 5 metres and 30 metres from a watercourse, drainage line, wetland or swamp crossing;
- J5. site-specific techniques to be used to prevent the pollution of water where a road drainage structure cannot be installed between five metres and 30 metres of a watercourse, drainage line, wetland or swamp crossing;
- J6. type of pavement or surface to be used on the drainage feature crossing;
- J7. site-specific soil stabilisation techniques to be undertaken on disturbed areas within 20 metres either side of drainage feature crossings;
- J8. Site-specific soil erosion and sediment control measures to:
  - provide temporary protection to disturbed areas from water from the road surface and road drainage structures; and
  - prevent the deposition of spoil material into the drainage feature during drainage feature crossing maintenance operations; and
- J9. site-specific techniques to dispose of excess spoil material.

### **Existing culvert crossings**

- J10. site-specific techniques to be used to stabilise fill material around inlets and outlets of pipes;
- J11. site-specific techniques to be used to stabilise outlet discharge areas; and
- J12. site-specific techniques to be used to prevent road pavement or surface material from entering the drainage feature.

### **Existing bridge crossings**

- J13. site-specific techniques to be used to protect bridge embankments from table drain discharge; and
- J14. site-specific techniques to be used to prevent road pavement material from entering the drainage feature.

### **Existing causeway crossings**

- J15. site-specific techniques to be used to protect the bed and banks of the drainage feature.

### **K. Borrow Pits & Gravel Pits Active or Used for the Operation Licensed**

- K1. location of borrow pits or gravel pits to be used; and
- K2. site-specific techniques to drain borrow pits or gravel pits.

**L. Harvesting Factors**

- L1. gross area of the compartment or roading areas (hectares);
- L2. net harvestable area of the compartment or roading areas (hectares);
- L3. per cent canopy removal (either > or equal to 50% or < 50% canopy removal);
- L4. expected extraction method (eg crawler tractor, wheeled skidder, forwarder, etc);
- L5. areas within the compartment where ground based harvesting must not occur; and
- L6. seasonality restrictions on forestry activities as specified in module 4 of Schedule 3 of this licence.

AMENDMENT 6  
1 March 2013  
Paragraph M3  
omitted

**M. Log Dumps & Log Landings**

- M1. location of log dumps;
- M2. location along roads where log landings are not permitted (if applicable).

AMENDMENT 6  
1 March 2013  
Paragraph N2  
omitted

**N. Post-logging Burning**

- N1. seasonal timing of the burn.

State Forests must assess the interaction of the attributes listed above. The interpretation process must concentrate on those factors most relevant to mitigating soil erosion and water pollution associated with the proposed forestry activity. Operational and environmental factors that must be considered:

- inherent soil erosion and water pollution hazard;
- periods of high rainfall erosivity;
- season of poorest ground cover recovery;
- rock bedding planes limiting side-cut roads and side-cut snig track construction;
- mass movement hazard;
- rocky outcrops;
- dispersible soils;
- areas of inherent hazard level 4;
- extraction method;
- sensitive areas; and
- soil compaction.

State Forests must develop site-specific conditions for each compartment, age class or roading area, following the above site-specific assessment. Special site-specific conditions must deal with:

- crossing of drainage features by roads;
- crossing of drainage features by snig tracks and extraction tracks;
- roading construction, upgrading and maintenance operations;
- road drainage within 30 metres of drainage feature crossings;
- ground cover management for soil erosion and sediment control;
- filter strips, protection zones, operational zones and buffer strips;
- snig or timber extraction tracks;
- log dumps and log landings;
- borrow pits and gravel pits;
- soil stabilisation techniques;
- seasonality restrictions;
- soil erosion and sediment controls; and
- post-harvest burning.

## **Part B: Determination of Stream Order for Drainage Feature Protection**

The determination of stream order must be undertaken by State Forests during the pre-operational planning of scheduled or non-scheduled forestry activities in each compartment, age class or roading area, as required by condition 7 of Schedule 4 of this licence. Stream order must be determined according to the methodology outlined below.

1. A first order stream is defined as that part of a drainage system between its point of origin and the first junction with another stream. A second order stream commences at the junction of two first order streams. A third order system commences at the junction of two second order streams. A schematic diagram of stream order is provided in Figure 2 of this licence.
2. Downstream from the junction of two streams of different stream order, the higher stream order is maintained.
3. The determination of stream order must commence from the catchment boundary, even if that is outside the compartment, age class or roading area.
4. For the purpose of this licence, all streams that have a stream order greater than third order must be given, as a minimum, the same level of drainage feature protection as third order streams.
5. Stream order must be derived from the drainage network provided on the relevant topographic map(s) for the proposed compartment, age class or roading area, from a 1:25 000 map sheet produced by the Land Information Centre (formerly the Central Mapping Authority). Where a 1:25 000 topographic map sheet is not available for the compartment, age class or roading area, then the best available scale map sheet produced by the Land Information Centre must be used.

## Part C: Design Methods for Crossings and Drainage Structures

AMENDMENT 6  
1 March 2013  
Paragraph 1  
heading and text  
modified

### 1. Design of bridges or culverts

Design calculations used to determine the peak discharge for the specified recurrence intervals relating to the design of bridges or culverts, must be undertaken in accordance with the "Modified McArthur rational method" as specified in the State Forests' roading manual (Forestry Commission, 1983). This design methodology must only be applied to catchments less than 1000 hectares.

Where State Forests chooses to use an alternative method for calculating the peak discharge for the specified recurrence intervals required by this licence for bridges, causeways or culverts, State Forests must have the prior written approval of the EPA.

### 2. Design of road and snig track drainage structures

Design calculations used to determine the design capacity for the specified recurrence interval relating to road and snig/extraction track drainage structures must be undertaken in accordance with the following methodology:

The design calculation to determine the capacity of road and snig/extraction track drainage structures is a two stage calculation.

- i) Determine the peak discharge (Q) using the "*Rational Method*" described in "Australian Rainfall and Runoff" (1987, page 293). The rational method uses the equation:

$$Q = C.I.A/360 \quad \dots(1)$$

where

Q	=	peak discharge (cubic metres/second)
C	=	runoff coefficient (set at 0.85)
I	=	rainfall intensity (mm/hr)
A	=	catchment area (ha)

Note: The rainfall intensity (I) factor to be used in this equation must be derived using the "*Kinematic Wave Equation*" provided in "Australian Rainfall and Runoff" (1987, page 300).

- ii) Once the peak discharge (Q) has been calculated, State Forests must use the "*Manning's Equation*" to determine the minimum depth of water flow in the drainage structure. The "*Manning's Equation*" is provided in equation 2:

$$Q = 1/n.A.R^{2/3}.S^{1/2} \quad \dots(2)$$

where

Q	=	flow (cubic metres/second)
n	=	roughness coefficient (derived from Australian Rainfall and Runoff, 1987)
A	=	cross sectional are of flow (m <sup>2</sup> )
R	=	hydraulic radius
S	=	channels slope (m/m)

Where State Forests chooses to use an alternative method for calculating the peak discharge for the specified recurrence intervals required by this licence for road and snig/extraction track drainage structures, State Forests must have the prior written approval of the EPA.