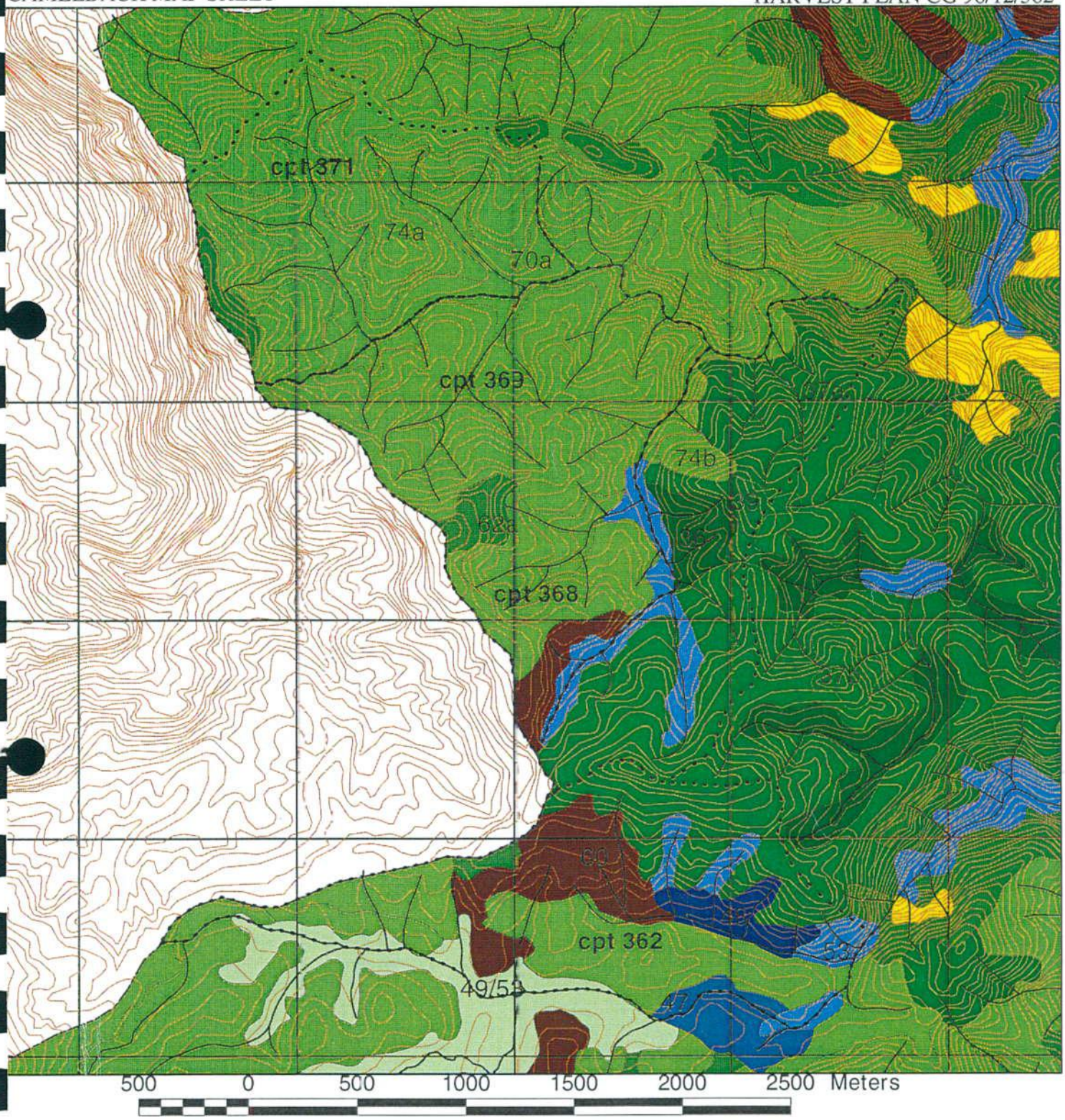
GRANGE 362,368,369 & 371

Grafton District
Northern Region

NORTHERN REGION - GRAFTON DISTRICT
FOREST TYPES MAP
COMPARTMENTS 362, 368, 369 AND 371
GRANGE STATE FOREST

SCALE 1:25000
CAMELBACK MAP SHEET

06/11/1996
HARVEST PLAN CG 96/12/362



BOUNDARIES
- Compartment Boundaries

FOREST TYPES
- 23 Myrtle
- 36 Moist Blackbutt
- 37 Dry Blackbutt
- 39 Blackbutt - Spotted Gum
- 46 Sydney Blue Gum
- 47 Tallowwood - Sydney Blue Gum

FOREST TYPES
- 48 Flooded Gum
- 49/53 Turpentine / (Brush Box)
- 53 Brush Box
- 60 Narrowleaved White Mahogany - Red Mahogany - Grey Ironbark - Grey Gum
- 62 Grey Gum - Grey Ironbark - White Mahogany
- 70 Spotted Gum
- 74 Spotted Gum - Ironbark / Grey Gum

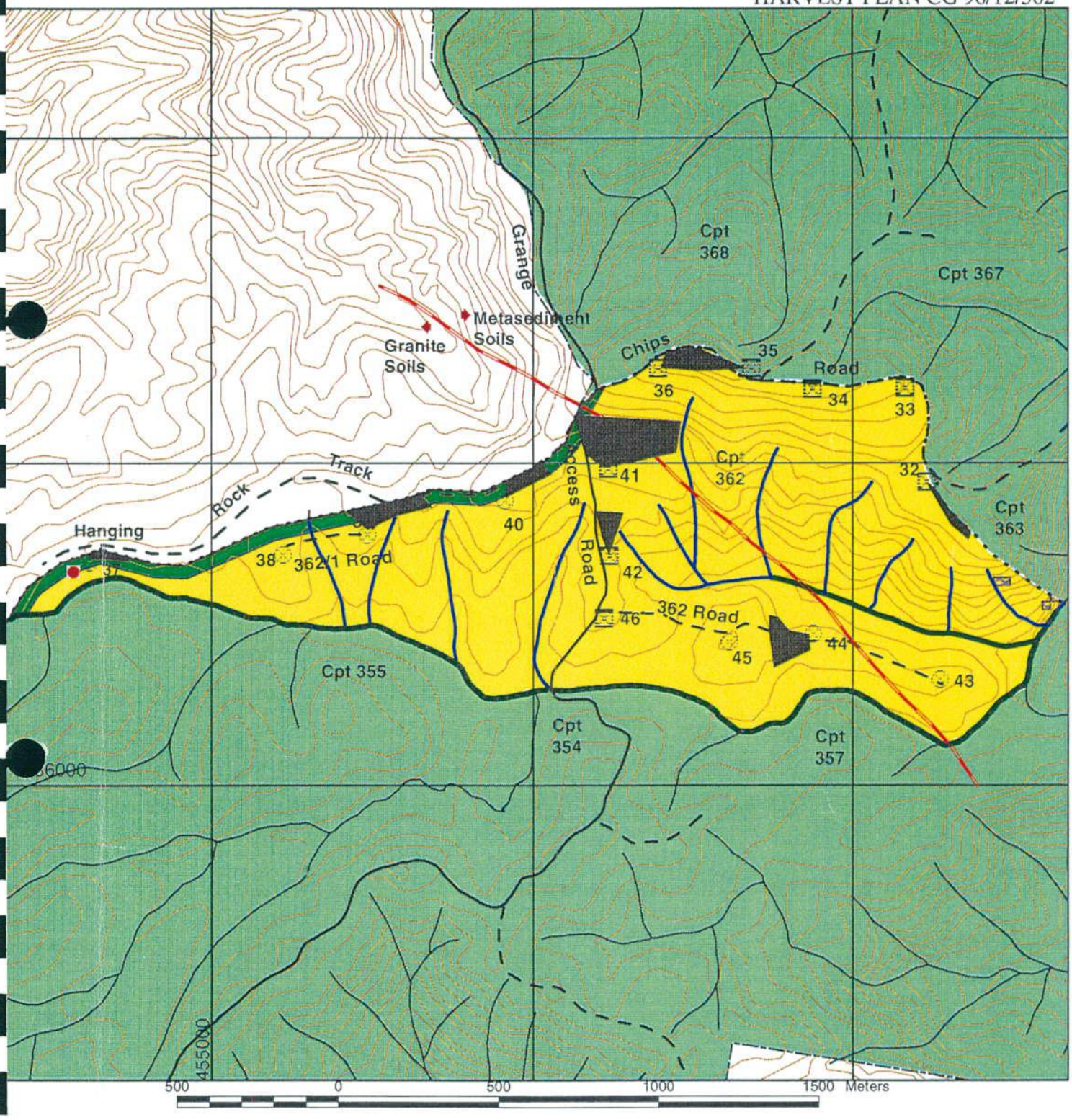
FOREST TYPES
- 92 Forest Red Gum
- 163 New England Blackbutt
- 234 Rock

MN

NORTHERN REGION - GRAFTON DISTRICT
HARVEST PLAN OPERATIONAL MAP
COMPARTMENT 362
GRANGE STATE FOREST

SCALE 1:17000
JACKADGERY/CAMELBACK MAP SHEET

6 NOVEMBER 1996
HARVEST PLAN CG 96/12/362



BOUNDARIES
- State Forest Boundary
- Compartment Boundaries
- Soil Unit Boundary

ROADS
- Natural Surface
- Sealed or Gravelled

NORMAL PRESCRIPTIONS
- Harvestable Area
- Downhill Snigging

MODIFIED PRESCRIPTIONS
- Visual Resource Protection

DUMP SITES OR LANDINGS
- Permanent Dry
- Permanent Wet

NON HARVEST AREAS
- Riparian Habitat Zones
- Aboriginal Archaeological Site

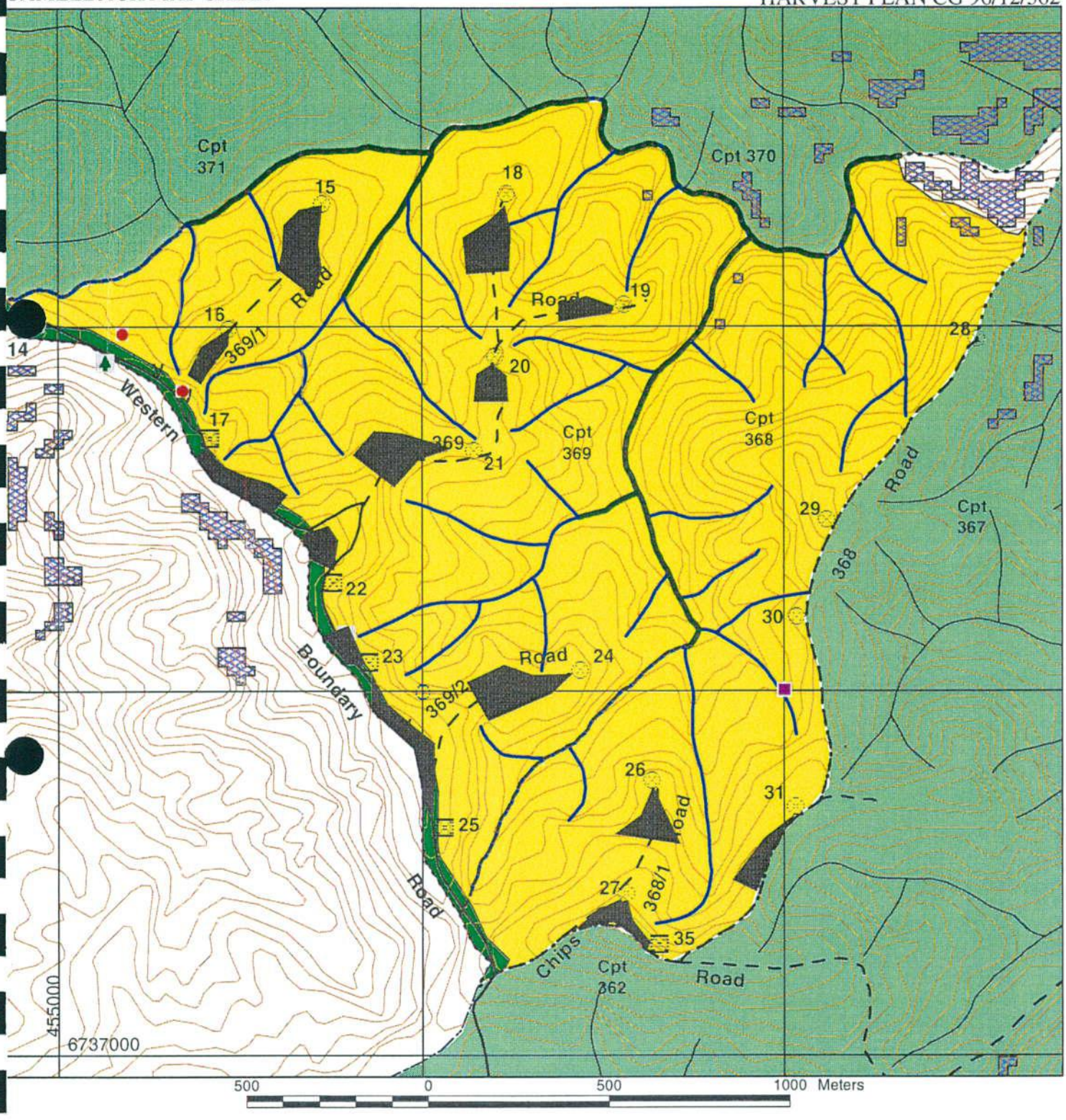
WATERCOURSES & DRAINAGE
- Filter Strip
- Drainage Line

MN

NORTHERN REGION - GRAFTON DISTRICT
HARVEST PLAN OPERATIONAL MAP
COMPARTMENTS 368 AND 369
GRANGE STATE FOREST

SCALE 1:15000
CAMELBACK MAP SHEET

6 NOVEMBER 1996
HARVEST PLAN CG 96/12/362



BOUNDARIES
State Forest Boundary
Compartment Boundaries

ROADS
Natural Surface
Sealed or Gravelled

NORMAL PRESCRIPTIONS
Harvestable Area
Downhill Snigging

MODIFIED PRESCRIPTIONS
Visual Resource Protection
Permanent Growth Plot
Assessment Plot 344

DUMP SITES OR LANDINGS
Permanent Dry
Permanent Wet

NON-HARVEST AREAS
Aboriginal Archaeological Site
Elite Tree
Riparian Habitat Zones
Slopes likely over 30 degrees
Non Harvestable

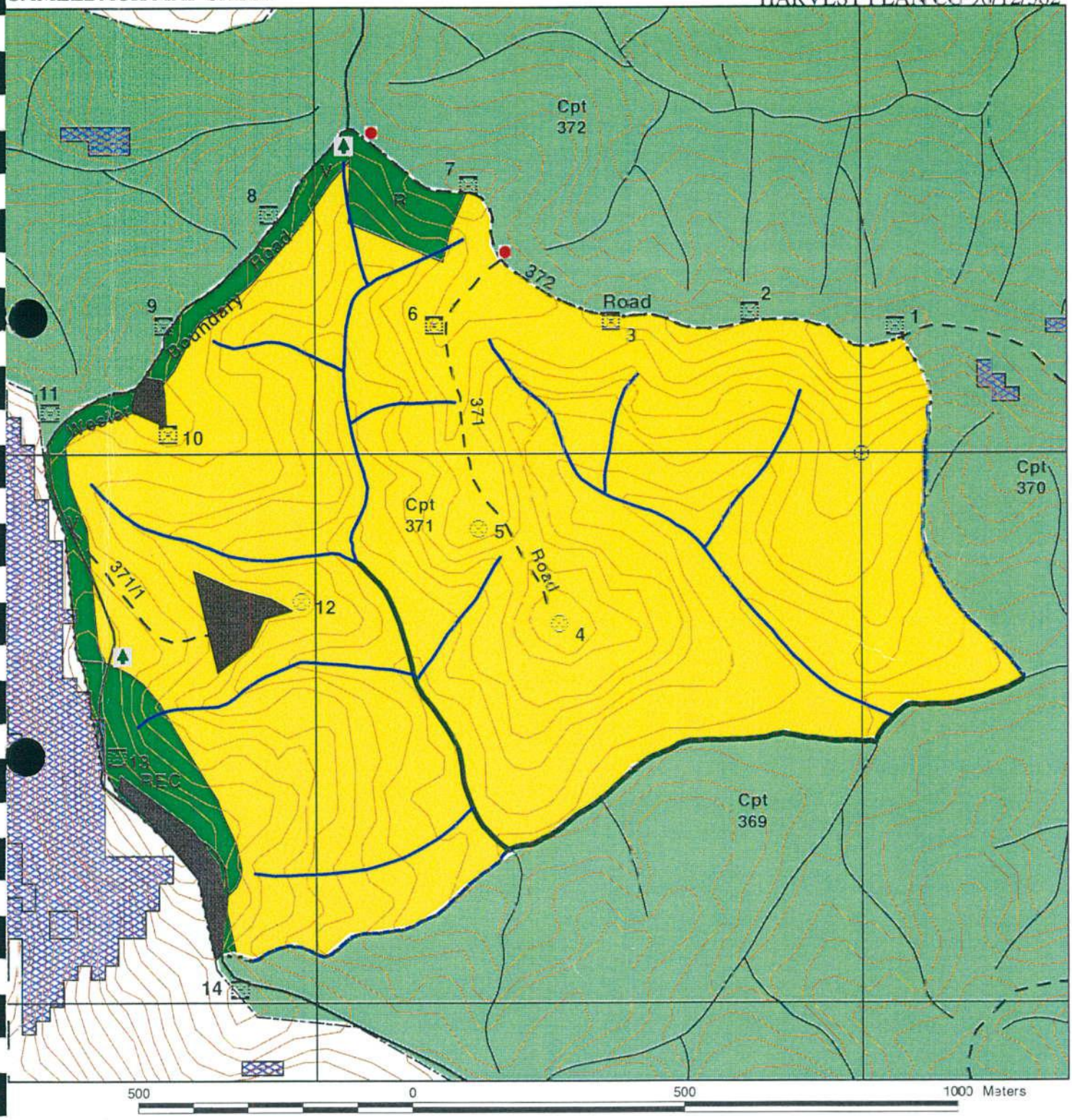
WATERCOURSES & DRAINAGE
Filter Strip
Drainage Line

MN

NORTHERN REGION - GRAFTON DISTRICT
HARVEST PLAN OPERATIONAL MAP
COMPARTMENT 371
GRANGE STATE FOREST

SCALE 1:10000
CAMELBACK MAP SHEET

6 NOVEMBER 1996
HARVEST PLAN CG 96/12/362



BOUNDARIES
- State Forest Boundary
- Compartment Boundaries

ROADS
- Natural Surface
- Gravelled

NORMAL PRESCRIPTIONS
- Harvestable Area
- Downhill Snigging

MODIFIED PRESCRIPTIONS
- Visual Resource Protection
- REC Recreation
- Research

Permanent Growth Plot

DUMP SITES OR LANDINGS
- Permanent Dry
- Permanent Wet

NON-HARVEST AREAS
- Aboriginal Archaeological Site
- Riparian Habitat Zones
- Slopes likely over 30 degrees
- Elite Tree

WATERCOURSES AND DRAINAGE
- Filter Strip
- Drainage line

MN

Harvesting Plan No CG 96/12/362

Contents

Part 2 FOREST MANAGEMENT & ENVIRONMENTAL CONSIDERATIONS

2.1 PHYSICAL FEATURES

Description 1 Physical Description of the Area

STATE FOREST	**Grange No 771**	DISTRICT	**Grafton**
REGION	**Northern**	COMPARTMENT	**362 / 368 / 369 / 371**
MANAGEMENT AREA	**Grafton**		
NORTH-EASTERN CORNER		**457764 / 6739552**	
SOUTH-WESTERN CORNER		**454385 / 6736537**	

Natural Features

General: The compartments contain undulating/moderate to steep slopes with scattered small very steep areas. The compartments are basically secondary ridges running off the main ridge system

Catchment: Clarence River Catchment. Compartment 362 drains into Chips Creek, which runs into Table Creek. Compartments 368, 369 and 371 drain into Towgon Creek.

Altitude range: 454 - 561 m Above Sea Level

Aspect: Compartment 362 has a generally southerly aspect. Compartment 368 has a generally north-western aspect in the northern part and a generally northern aspect in the southern part. Compartment 369 generally has a north-eastern aspect and compartment 371 generally has a south-eastern aspect.

Topography: The major part of the compartments vary from undulating to steep with slopes up to 20°. There are small, scattered areas with slopes above 20°.

Artificial Features

Roads: Grange Access Road and Western Boundary Road together form the main access through the forest. Grange Access Road runs through compartment 362. Western Boundary Road forms the south-western boundary of compartment 368, and the western boundaries of compartments 369 and 371. Chips Road runs off Grange Access Road and gives access to compartment 362.

Minor Roads: 368 Road runs off Chips Road and gives access to compartment 368. 369 and 372 Roads run off Western Boundary Road and give access to compartments 369 and 371 respectively.

362, 362/1, 368/1, 369/1, 369/2, 371 and 371/1 Roads give access within the compartments to dump sites.

Description 2 Special Warning of Critical Boundaries or Non-harvest Areas

Riparian Habitat Zones exist 20m either side of streams (watercourses, drainage lines and drainage depressions) with catchments greater than 40 hectares.

Aboriginal Archaeological sites are located in the western section of compartment 362, in the north-western section of compartment 369 and in the northern section of compartment 371, as indicated on the Operational Map. These have been marked in the field using three yellow rings, and are to be protected from disturbance.

There is an area of Flooded Gum (Forest type 48 - 12.6 ha) along drainage lines in the eastern section of compartment 362. This type was deferred from logging under the DFA, and will only be logged if released.

Elite Spotted Gums are located on the western boundaries of compartments 369 and 371 as shown on the Operational Map.

Private Property adjoins the western boundaries of the compartments. This boundary has been surveyed and blazed with yellow paint in places. A fence exists along this boundary. This fence must not be damaged and must be left in the condition found before the commencement of operations. If damaged, it must be repaired before the completion of the operations.

Reference Grafton Management Area Environmental Impact Statement

2.2 FOREST MANAGEMENT AND SILVICULTURE

Description 3 Compartment Subdivision, Forest Types

	cpt 362	cpt 368	cpt 369	cpt 371
Gross Area of Compartment	187 ha	142 ha	212 ha	157 ha
Riparian Habitat Zones	8.6 ha	3.8 ha	8.9 ha	4.5 ha
Filter Strips	7.9 ha	9.4 ha	15.0 ha	10.6 ha
Steep/Inaccessible	nil	7.0 ha	nil	nil
Proposed for Logging	**170.5 ha**	**121.8 ha**	**188.1 ha**	**141.9 ha**

Logging History:

The area was logged for sawlogs in the mid-1970's. All the compartments were harvested between 1993 and 1994 for poles, girders and veneer logs.

Forest Types:

Forest Types		Area (ha)			
		cpt 362	cpt 368	cpt 369	cpt 371
36	Moist Blackbutt	nil	12	nil	nil
37a	Dry Blackbutt (site height 35-45 m)	40.3	84	nil	nil
39	Blackbutt - Spotted gum	nil	9	nil	nil
47	Tallowwood - Sydney Blue Gum	3	nil	nil	nil
48	Flooded Gum	6.3	nil	nil	nil
49/53	Turpentine/Brush Box	6.5	nil	nil	nil
53	Brush Box	20.4	12	8.1	nil
60	Narrowleaved White Mahogany - Red Mahogany - Grey Ironbark - Grey Gum	37.4	1	10.1	nil
62a	Grey Gum - Grey Ironbark - White Mahogany (site height 30-35 m)	2	nil	8.1	nil
62b	Grey Gum - Grey Ironbark - White Mahogany (site height 20-30 m)	nil	9	nil	4.1
70a	Spotted Gum (site height 35-50 m)	18.1	2	37.3	70.3
74a	Spotted Gum - Ironbark/Grey Gum (site height 30-40 m)	53.1	7	148.4	82.6
74b	Spotted Gum - Ironbark/Grey Gum (site height 20-30 m)	nil	6	nil	nil

Reference For Commission NSW (1989). Research Note 17. *Forest Types in New South Wales*

Description 4 Broad Description of Vegetation

(a) Forest Types

Type 36 occurs in a patch on the western boundary of compartment 368.

Type 37 occurs on the northern boundary of compartment 362 and in the southern section of compartment 368.

Type 39 occurs in a small band in the central section of compartment 368.

Type 47 occurs in a small section on the south-eastern section of compartment 362.

Type 48 occurs in a patch along a drainage line in eastern part of compartment 362.

Type 49/53 occurs along Chips Creek along the southern boundary of compartment 362.

Type 53 occurs along drainage lines. It surrounds the Flooded Gum in compartment 362. It occurs along drainage lines in the southern section of compartment 368 and along the eastern boundary of compartment 369.

Type 60 occurs in a patch near the western boundary of compartment 362 and in a small patch in the south-eastern corner of compartment 369.

Type 62 occurs in a small patch on the western boundary of compartment 362, on the northern boundary of compartment 368, in a patch on 369 Road in compartment 369 and in two patches along the northern and western boundaries in compartment 371.

Type 70 occurs in the south-eastern corner of compartment 362, in a patch on the north-western boundary of compartment 368, in the southern section of compartment 369 and along the drainage lines in compartment 371.

Type 74 occurs on the western boundary and in the southern section of compartment 362, in a small patch on the western boundary of compartment 368, covers the majority of

compartment 369 and surrounds the Spotted Gum along the drainage lines in compartment 371.

Overstorey species

The overstorey species are, Spotted Gum, Grey Ironbark, Grey Gum, White Mahogany, Blue Gum, Brush Box, Tallowwood, Red Mahogany, Turpentine, Brushbox, Blackbutt, Flooded Gum and Grey Gum.

(b) Understorey

The understorey on the ridges and upper slopes is typically dry and open, being eucalypt regeneration, Forest oak, Backhousia, Acacia, scattered Grass Trees and other xerophytic shrubs, Geebung, Indigo, Hakeas and Native Cherry. There are small patches in the gullies that are more moist, having Native Ginger, Tobacco Bush, Soft Tree Fern, Blechnum sp, Black Wattle, Tree Heath and Forest Oak.

(c) Ground-cover

The ground cover is mostly grass (kangaroo, poa and bladey), bracken fern and litter.

(d) Rare or threatened species

No occurrences of rare or threatened flora are recorded on the compartment and none were encountered during field inspections.

(e) Rainforest

There are no areas of rainforest in the compartments.

(f) Exotic weeds

Lantana occurs in small scattered patches through the compartment.

(g) Regeneration and serial stages

The compartments carry a multi-age forest consisting of a very few remnants of the original stand and a high proportion of regrowth resulting from earlier harvesting operations and possibly fire.

Description 5 Forest and Crop Condition

The compartments have a long history of selective logging of varying intensities. Previous operations have removed most of the original stand and have produced significant areas of regeneration. The current stand is largely regrowth forest at varying stages. There is a need to thin the stand through the selective removal of larger mature trees not required for fauna habitat, and competing co-dominants. Increased growth rates on the retained higher quality stems will improve the overall productivity of the stand. In areas where regeneration from the past operations has been limited, there is a need to replace a proportion of the existing stands over the next few cutting cycles to maintain stand vigour and increase growth rates.

The forest has been managed for grazing more or less since European settlement in the mid 1800s, originally as part of *Newbold Grange* station, and since State forest dedication by way of lease or permit. Grazing has seemingly been light in recent years and there is little evidence of it in the compartments.

Description 6 Forest Management Activities

(a) Silviculture

The main silvicultural objectives are to:

- Maintain the natural forest in a healthy condition, with some areas in a relatively undisturbed state. This will include the provision of habitat trees and provide for their future replacement.
- Obtain adequate post-harvesting regeneration that is similar in species composition to that of the original forest.
- Provide for growth and development of regeneration.
- Produce multi-aged stands on a broader area basis.

The area of forest type 48, Riparian Habitat Zones and filter strips on the compartment will remain in a relatively undisturbed state.

Habitat trees will be retained to meet wildlife habitat requirements.

On the balance of the area selective logging techniques, including the Australian Group Selection system, will be implemented.

(b) Harvesting Method

The harvesting method proposed for the area is based on current accepted operational practices. It comprises:

- Chainsaw felling using directional felling techniques where required.
- Snigging of logs using a crawler tractor and/or a rubber tyred skidder.
- Debarking and loading of logs at the dump using an excavator or forklift.
- Transport of logs from the site using a jinker and prime mover.

A number of different log types will be produced by the harvesting. These will be segregated at the dumps and usually transported to different purchasers.

(c) Fire Management

Fire management is required to;

- limit damage to stands caused by wildfires
- ensure the establishment and survival of regeneration
- maintain wildlife habitat
- maintain hydrological conditions
- meet State Forests' obligations under the Bush Fires Act.

Fire management entails the quick response to wild fire occurrence to limit fire spread, and the maintenance of fine fuels at low levels, usually by burning under mild conditions, to decrease wild fire intensities. Activities are coordinated with other fire control agencies through the Nymboida District Fire Plan.

In Compartments 362, 368, 369 and 371 bark and logging debris will be progressively spread through the logged area and/or accumulated in small heaps on the dump during the harvesting operation. Logging debris will be kept approximately 5 metres clear of identified habitat trees. Bark and logging debris will be burnt, and in the longer term fine fuels will be managed as detailed in the **Grafton District Fuel Management Plan 1993** and the **Nymboida District Fire Plan**.

2.3 FLORA PROTECTION

Description 7 Presence of Protected or Endangered Plant Species

No species listed as Rare or Threatened have been detected in the compartments and none are expected to occur.

Reference Briggs, J.H. and Leigh J. H., 1988. Rare and Threatened Australian Plants, Aus NPWS
Grafton Management Area Environmental Impact Statement

Description 8 Presence of Rainforest

There are no areas of rainforest in the compartments.

Description 9 Protection of Plant Species

Not applicable to these compartments.

2.4 FAUNA PROTECTION

Description 10 Endangered and Protected Fauna Occurrence

(a) General

Threatened species recorded within these and surrounding compartments (including recently logged compartments) include the Powerful Owl, Sooty Owl, Wompoo Fruit Dove, Yellow-bellied Glider, Rufous Bettong, Hoary Bat, Bent-wing Bat, Little Bent-wing Bat and Golden-tipped Bat. Threatened species expected to occur in or in the vicinity of the compartments are;

Glossy Black Cockatoo	**Powerful Owl**	**Sooty Owl**
Masked Owl	**Wompoo Fruit Dove**	
Stephen's Banded Snake	**Pale-headed Snake**	
Spotted-tailed Quoll	**Brush-tailed Phascogale**	**Yellow-bellied Glider**
Squirrel Glider	**Rufous Bettong**	**Red-legged Pademelon**
Common Planigale	**Koala**	**Long-nosed Potoroo**
Great Pipistrelle	**Golden-tipped Bat**	**Little Bent-wing Bat**
Common Bent-wing Bat	**Large-footed Mouse-eared Bat**	

References Grafton Management Area Environmental Impact Statement
SFNSW GIS Records

(b) Habitat Trees

Compartments 362, 368, 369 and 371 contain Dry Hardwood forest and Moist Hardwood forest with xeromorphic understorey and limited areas of Moist Hardwood forest with mesic understorey. Sufficient potential habitat and recruitment habitat trees exist in the net harvest area to allow for the retention of enough trees to meet prescription requirements.

(c) Riparian Habitat Zones

Riparian Habitat Zones exist 20 metres either side of streams (watercourses, drainage lines and drainage depressions) with catchments greater than 40 hectares.

(d) Refugia Areas

No areas of critical habitat for Threatened Species have been located in the net harvest area and no refugia areas have been set aside.

Description 11 Species and Habitats Descriptions

Brief habitat descriptions for Threatened Species that might be adversely impacted by forest management activities on Compartments 362, 368, 369 and 371 are stated below:

(a) Critical Weight Range Species

Critical Weight Range species likely to occur in compartments 362, 368, 369 and 37 are the Rufous Bettong, Red-legged Pademelon, Long-nosed Potoroo and Spotted-tailed Quoll. Rufous Bettongs inhabit well-grassed open forests and are commonly associated with Spotted Gum. Long-nosed Potoroos prefer dense understorey vegetation and will forage in open areas. Red-legged Pademelons are dependent on dense cover for refuge and will feed in adjacent open areas. Spotted-tailed Quolls occur in a variety of forest types favouring moister areas.

(b) Glossy Black Cockatoos

Glossy Black Cockatoos require stands containing species of Casuarina for food and large tree hollows for nesting in a range of hardwood forest types. Casuarina occurs in the compartments and there are also large tree hollows present.

(c) Powerful/Masked/Sooty Owls

These Owls inhabit forest margins and open areas, require large tree hollows for nesting, roost in large trees and require a large home range. Suitable areas occur on and adjacent to the compartments.

(d) Stephen's Banded Snake and Pale-headed Snake

These snakes require tree hollows and old trunk scars. There is a scattering of suitable older trees through the compartments.

(e) Brush-tailed Phascogale

This species requires tree hollows for nesting and prefers open forest areas, foraging generally in large rough barked trees. The more open drainage lines might be suitable.

(f) Yellow-bellied Glider

Yellow-bellied Gliders require tree hollows for nesting, feed on Eucalypt sap by cutting v-notches into the bark of certain eucalypts, eucalypt nectar and insects harvested beneath the loose bark-shedding eucalypts.

(g) Squirrel Glider

This species requires tree hollows for nesting, feeds in upper canopies on flowers and insects and on sap from Yellow-bellied Glider V-notches.

(h) Koala

Koalas feed on eucalypt leaves from a range of species and prefer high nutrient areas. There might be suitable habitat in the compartments, however the higher nutrient areas in nearby private property might be more suitable.

(i) Golden-tipped Bat

This bat roosts in moist forests, seemingly preferring dense vegetation.

(j) Little Bent-wing Bat/Common Bent-wing Bat

These bats roost in caves and similar structures and occur in most forest woodland habitats.

(k) Large-footed Mouse-eared Bat

This bat inhabits moist riparian forest areas and requires open water bodies for feeding.

References
Grafton Management Area Environmental Impact Statement.
State Forests' Response to Submissions to the Grafton Environmental Impact Statement.

2.5 SOIL EROSION AND WATER POLLUTION CONTROL

Description 12 Site Soil and Water Data and Other Information

(a) Location

Compartments 362, 368, 369 and 371 are located in the south-western section of Grange State forest, which in turn is located some 60 km north-west of Grafton. See location map attached.

(b) Climate

Generally the climate in the Grafton area is sub-tropical with hot summers, mild winters and a distinct winter/spring dry season.

Rainfall

The average annual rainfall for the Grange area is about 1200 mm

The annual rainfall erosivity - **R = 3000**

January to March is the wettest period while June to August is the driest period. Heavy rainfall events are common during summer and autumn. There are no monthly rainfall recordings available. The compartment is in rainfall zone 2 The monthly erosivity details are:

	J	F	M	A	M	J	J	A	S	O	N	D
Erosivity	570	510	360	120	60	90	60	60	180	210	330	450

Reference Rosewell C.J. & Turner J.B. (1992). *Rainfall Erosivity in New South Wales.* Technical Handbook No 11 (1st Edition), Soil Conservation Service of New South Wales.
Grafton Management Area Environmental Impact Statement.

Temperature

Mean maximum temperatures range from 30° in January/February down to about 20° in July/August. The mean minimum temperature range is from about 15° mid summer to around 0° July/August. These data give an indication that ground cover growth can be prolific during the warmer months but slows down considerably during the cooler drier winter periods and at times is basically nil.

(c) Geology

The south-western half of compartment 362 is on Granites, being undifferentiated Carboniferous granites and granodiorites. The north-eastern half of compartment 362 and compartments 368, 369 and 37 are on Metasediments, being argillites, phyllites, slates and intermediate volcanics, all with abundant quartz veins, of Ordovician-Silurian age.

Bedding planes

There are no obvious bedding or fracture planes in the area and no indications of mass movement.

References Veness & Associates (1994). Soils Report Grafton Environmental Impact Statement.

(d) Soils

The compartment is included in the Grafton Management Area EIS Study Soils Report carried out by Veness and Associates (published 1994). This study identifies Granite Unit soils as occurring in the south-western half of Compartment 362 and Metasediment Unit soils in the north-eastern half of Compartment 362 and Compartments 368, 369 and 371 as indicated on the Operational Map. Field inspection indicates that the Granite and Metasediment unit soils do occur in the compartments.

Soil sampling of the area and soil testing has been carried out by J Veness of Veness & Associates Pty Ltd. Soil sample sites are indicated on the map included with the attached Soils Report. The attached letter from Veness & Associates describes the landform elements occurring within this and adjacent compartments, and the sampling for each element. Data from all samples covering landform elements within the compartments are used below.

Soil types

The two rock types in the compartments give rise to two different soil types. The soil derived from the granite is typed as red podsolic. The soil derived from the metasediments is typed as structured plastic and subplastic clays, at times krasnozems, xanthozems, chocolate soils, structured loams.

Description and profile

The Granite soil is described as brownish black to dark reddish brown, weakly to moderate pedal, sometimes stony, sandy clay loam top soil, grading through sandy and stony clay loams layers to a reddish brown, to light brown pedal, very stony sandy light clay subsoil layer.

The topsoil layers are up to about 70 cm in depth. The surface condition is described as loose with abundant stones and plant litter. Stones are rounded or angular and their size range is 2-200mm.

The Metasediment soil is described as bioturbated, strongly structured, stony, silty clay loam top soil, grading through brownish black to very dark brown, pedal, sandy to silty clay to a reddish to bright brown, pedal, stony, light clay subsoil layer.

The top soil layers are up to 50 cm and more in depth. The surface condition is described as friable, with up to 20% stones and a litter layer up to 1 cm thick.

References Veness & Associates (1994). Soils Report Grafton Environmental Impact Statement.

Erodibility

Granite Soils

K values A horizon = 0.029 (site 362/3; ridge/crest) (Method B3)
K values B horizon = 0.021 (site 362/3; ridge/crest) (Method B3)

Metasediment Soils

K values A horizon = 0.037 (site 369/2; ridge/crest) (Method B3)
K values B horizon = 0.050 (site 369/2; ridge/crest) (Method B3)

Texture

Granite Soils

A horizon -Sandy Clay Loam
B horizon -Sandy Clay Loam

Metasediment Soils

A horizon -Silty Clay Loam
B horizon -Fine Sandy Clay Loam

Dispersibility (Method D1)

Granite Soils (site 362/2; simple slope)

%clay A horizon 10%(inclusive of gravels)
%clay B horizon 41%(inclusive of gravels)
D% A horizon 29%
D% B horizon 23%
%dispersible soil A horizon 10/100x29/100x100 = **2.90**
%dispersible soil B horizon 41/100x23/100x100 = **9.43**
The A horizon is not significantly dispersible.
The B horizon is not significantly dispersible.

Metasediment Soils (site 362/1; ridge/crest)

%clay A horizon 21%(inclusive of gravels)
%clay B horizon 32%(inclusive of gravels)
D% A horizon 16%
D% B horizon 34%
%dispersible soil A horizon 21/100x16/100x100 = **3.36**
%dispersible soil B horizon 32/100x34/100x100 = **10.88**
The A horizon is not significantly dispersible.
The B horizon is significantly dispersible.

Reference Veness and Associates. Soils report Number VA1946B of 17th September, 1996 and letter of 17th September, 1996..

A copy of the above report and letter from J. Veness is attached.

Inherent fertility

The soils are relatively fertile compared with soils on State forests in the Grafton area. The nearby private property is typical Clarence valley open Red Gum/Apple woodland country. Much of the original stand on the forest would have been very open.

Depth to subsoils and bedrock

Granite Soils

Subsoils are from around 35 cm up to 70 cm, bedrock is at about 100 cm and possible deeper on the flatter areas. The harvesting should rarely disturb the subsoil.

Metasediment Soils

Subsoils are from around 30 to 50 cm, bedrock is at about 100 cm to 150 cm. The harvesting should rarely disturb the subsoil.

Existing erosion

There is very little evidence of existing erosion in the compartments and structures built during previous operations seem to be functioning. There is limited deposition of sand and fine gravel in the drainage lines and minor rilling has occurred on the steeper sections of the roads giving access off Western Boundary Road to the compartments. These will be rectified by improving drainage on the sections where this occurs.

(e) Landform

Slope

More than half of the compartments contain slopes less than 20°. Absolute and percentage areas of slope classes are given in Table 1a - 1d below.

Table 1a - Slope Class Areas - cpt 362

Slope Class	0° - ≤5°	>5° - ≤10°	>10° - ≤15°	>15° - ≤20°	>20° - ≤25°	>25° - ≤30°	>30°
Area	69.6	51.9	38	21.3	5.8	1.9	0.2
% Area	36.9	27.5	20.1	11.3	3.1	1.0	0.1

Table 1b - Slope Class Areas - cpt 368

Slope Class	0° - ≤5°	>5° - ≤10°	>10° - ≤15°	>15° - ≤20°	>20° - ≤25°	>25° - ≤30°	>30°
Area	9.3	30.6	38.6	34.4	19.8	5.8	3.1
% Area	6.6	21.6	27.3	24.3	14.0	4.1	2.1

Table 1c - Slope Class Areas - cpt 369

Slope Class	0° - ≤5°	>5° - ≤10°	>10° - ≤15°	>15° - ≤20°	>20° - ≤25°	>25° - ≤30°	>30°
Area	20.4	60.9	72.6	39	14.3	3.4	0.1
% Area	9.7	28.9	34.4	18.5	6.8	1.6	0.1

Table 1d - Slope Class Areas - 371

Slope Class	0° - ≤5°	>5° - ≤10°	>10° - ≤15°	>15° - ≤20°	>20° - ≤25°	>25° - ≤30°	>30°
Area	21	38.3	49	33.6	13.1	2.3	nil
% Area	13.4	24.3	31.1	21.4	8.3	1.5	nil

Terrain

Compartments 362, 368, 369 and 371 are on the main forest ridge line. The compartments consist of minor secondary ridges running from the main ridge.

Drainage line condition

The drainage lines are in good condition. They are deeply incised on the steeper areas of the compartments but not often down to bedrock. On the flatter sections the drainage lines are mostly wide, some being grassy.

The flow in the streams is intermittent and the drainage lines were dry at the time of recent inspections, with the only water being in a few large water holes in the main creeks.

Aspect

The aspect is generally southern for compartment 362. Compartment 368 has a generally north-western aspect in the northern part and a generally northern aspect in the southern part. Compartment 369 generally has a north-eastern aspect and compartment 371 generally has a south-eastern aspect.

Rockiness

There are no areas of rock on the compartments and rockiness is not a consideration. The surface condition on the granite is described as loose with abundant stones and plant litter, and on the metasediments as friable with variable amounts of stones up to 20% and plant litter.

(f) Hydrology

The compartments are in the Clarence River catchment. Towgon Creek flows north-east out of the forest and on about three and a half kilometres to the Clarence River. Table Creek runs south-east out of Grange State forest and then north-east for about 12 kilometres to the Clarence River, being the forest boundary for part of that length. Chips Creek joins Table Creek along this eastern forest boundary. There are no prescribed streams, swamps or wetlands within the net harvest area.

No major water storages occur adjacent to or downstream from the compartment.

Verification of drainage lines

All drainage features verified during harvesting plan preparation as watercourses or drainage lines are shown on the harvesting plan Operational Map with filter strip protection (unless already protected by other harvesting exclusions). Other smaller drainage features which are not marked on the map will be inspected by the SFO during tree marking and given protection in accordance with the Pollution Control Licence.

Representative water monitoring sites

The representative water monitoring site is yet to be determined.

Reference Forest Planning Branch *Water quality monitoring program* **SFNSW** 1994

Previous harvesting

The area was harvested for sawlogs in the mid-1970s. All the compartments were harvested between 1993 and 1994 for poles, veneers and girders.

Upstream catchment water use

Production forestry - the upstream catchment is within Grange State Forest.

Downstream catchment water use

Table Creek flows through steep grazing country before joining the Clarence River. Towgon Creek flows through grazing country downstream of Grange State Forest. There may be limited stock watering from these watercourses.

Domestic water use

The only domestic water drawn from the Mann/Clarence below the junctions with Table and Towgon Creeks is the Copmanhurst town supply. These creeks would amount to only a fraction of a percent of the Clarence flow and would have no influence at all on the town supply. Copmanhurst is to transfer to the lower Clarence scheme, which sources its water higher up the Clarence catchment, during the next year or so.

(g) Vegetation and Ground-Cover

Effect on ground-cover during operations

The harvest operations are expected to remove less than 20% of the overall ground cover of the net harvest area.

(h) Proposed Operation System

Use of existing roads

Existing roads have been evaluated for their potential to cause water pollution.

Grange Access Road (about 15 km) and Western Boundary Road (total length about 12.5 km, about 4.7 km of which will be used during this operation) form the main access through the forest. These are fully designed roads with concrete relief pipes in the side-cuts and mitre drains on the ridges. Chips Road (total length about 7 km, about 1.5 km of which will be used duing this operation) is a long established road effectively drained by table drains and mitres. All three roads are permanently maintained. The batters are stable and well vegetated. The maximum width of the existing running surface is about 4 m. The maximum cleared width on either side of the running surface is about 2 m. The maximum grade of the road is about 10°. The maximum height of cut and fill batters is about 4.0 m for a total length of approximately 600 m. The average height of cut and fill batters is approximately 1.0 m.

Routine maintenance, consisting primarily of patch grading and gravelling, may be required on these roads during the course of this harvesting operation. This may occur over the full lengths of Grange Access and Chips Roads (the full length of Chips Road will be used in subsequent operations), and over that part of Western Boundary Road being used during this operation.

Hanging Rock Track (0.5 km) runs through the private property along the boundary of compartment 362. This road will be used during the operation to take logs out from the western section of the compartment. This road is long established, stable and is drained by a combination of rollovers, mitre drains and outfall drainage. The batters are stable and well vegetated. The maximum height of the cut and fill batters is about 80 cm for a total of approximately 20 m (there are no other batters). Maximum width of existing running surface is 4 m and the maximum cleared width either side of the road is about 1.5 m. Maximum road grade is 6°.

Minor roads, 362 (1.0 km), 362/1 (0.25 km), 368 (2.0 km), 368/1 (0.5 km), 369 (1.5 km), 369/1 (0.75 km), 369/2 (0.75 km), 371 (1.75 km), 371/1 (0.5 km) and 372 (1.25 km) Roads give access to ridges within the compartments. These will be reopened for use during the operations. These are stable roads with litter and grass cover. They are drained by a combination of outfall drainage, rollovers and mitre drains. All batters are stable and well vegetated. They are generally about 1 m high. Maximum batter height is 2.0 m for a total distance of approximately 80 m. Maximum width of existing running surface is 3 m. The maximum cleared width on either side of the running surface is 1.5 m. Maximum road grade on the minor roads is 14° which runs for a total of approximately 150 m. Road grade everywhere else is less than 10°.

Reopening of minor roads will involve removal of fallen timber and regrowth from the road pavement, and very limited brushing of vegetation that may interfere with movement of trucks. Crossfall banks will need to be lowered that have been constructed. This will be done by logging machinery and will cause minimal disturbance to the road pavements.

The pavements have been consolidated by long use and the verges are well grassed. There is no evidence of existing erosion. None of the existing roads are likely to cause significant water pollution.

Chips, Hanging Rock and 372 Roads are to remain open. Other minor roads in the compartments will be bedded down and closed to traffic.

Use of existing drainage feature crossings

Grange Access Road and Western Boundary Road cross a number of drainage lines. Most of these crossings are log bridges (7). There is also one pipe and one open natural surface causeway (over Table Creek). These crossings are stable. There are permanent water pools in these crossings.

362/1 Road crosses a drainage line in the north-western section of compartment 362. This crossing is a long established, stable, open, natural surface causeway. The batters are stable and well vegetated. No additional stabilisation work is required on this crossing, which will only be used in dry weather conditions.

There is a very old crossing on 371 Road in the south-eastern section of the compartments, which does not appear to have been used for about 40-50 years. This crossing will not be used in this operation, and does not require any additional stabilisation work.

Road construction

Not applicable to this operation.

Construction of drainage feature crossings

Not applicable to this operation.

Harvesting

The harvesting method proposed for the area is based on current accepted operational practices. It comprises:

- Chainsaw felling, using directional felling techniques where required.
- Snigging of logs using an articulated rubber tyred skidder and/or a crawler tractor.
- Debarking and loading of logs at the dump using an excavator or forklift.
- Transport of logs from the site using a jinker and prime mover.

The crawler tractor is used for construction work and snigging from steeper slopes including winching of logs and snigging larger logs. The rubber-tyred skidder is used on the flatter terrain, for snigging smaller logs and logs from steeper areas that have been bunched by the tractor.

Cover factor

The harvesting operations described above result in a cover factor (in accordance with PCL Sch 4, Part A, Table 2) of **C = 0.108**.

Location of log dumps

Log dumps are located on ridge tops to facilitate uphill snigging, as indicated on the operational map. There will be limited downhill snigging to dumps 10, 12 - 22, 24, 26, 27, 31, 32, 35-37, 39 - 42 and 44 to reduce snigging distances and take advantage of previously constructed log dumps and snig tracks. These snig tracks are stable. Less than 10% of the snigging activity will be downhill.

Log Dump 13 is located in the Special Emphasis Recreational Area (PMP 1.1.2) located on Western Boundary Road in compartment 371. The dump will not affect the recreational value of the lookout.

Log dumps will be located as indicated on the Operational Map.

Post-harvest burning

In Compartments 362, 368, 369 and 371 bark and logging debris will be progressively spread through the logged area during the harvesting operation and/or accumulated in small heaps on log dumps. Logging debris will be kept approximately 5 metres clear of identified habitat trees. Bark and logging debris will be burnt, and in the longer term fine fuels will be managed as detailed in the Grafton District Fuel Management Plan (1993) and the Nymboida District Fire Plan.

Post-harvest rehabilitation

Natural regeneration and natural re-seeding of overstorey, understorey and ground-cover plants will provide ground cover rehabilitation. Supervision by the SFO and fortnightly check sheets will assess that road surfaces, batters and drainage structures are stable at the completion of operations and prior to the shifting of the contractor.

Description 13 Evaluation of Soil and Water Data

(a) Soil Erosion and Water Pollution Hazard Categories

Soil Erosion and Water Pollution Ratings (SE/WPR) have been assessed using SOILOSS 5.1. The Ratings have then been used to assess Soil Erosion and Water Pollution Categories (SE/WPC) for the net harvest area. For the Granite soils the topsoil data from site 362/3 give lower slopes for the categories and for the Metasediment soils, the subsoil data from site 369/2 give lower slopes for the categories, and have been used in the calculations. Details are in Tables 2a and 2b below.

Granite Soils

SE/WPR = R x K x LS x C (5.1) where:

R = 3000

K = 0.029 **Topsoil (A horizon)** Method B3

K = 0.021 **Subsoil (B horizon)** Method B3

S = As factored in SOILOSS 5.1

L = 20 metres

C = 0.108 Native forest harvesting "B" Table 2

P = 1.0

Table 2a: Water Pollution Hazard Categories

Slope Ranges (Degrees)	Water Pollution Category	Indicative % of Net Harvest Area cpt 362
0 - ≥5	1	30
>5 - ≤22	2	25
>22 - ≤30	3	5
Roads	3	N/A

The following factors for rainfall erosivity and soil erodibility also apply to road construction:

R = 3000 **K = 0.029**

Metasediment Soils

SE/WPR = R x K x LS x C (5.1) where:

R = 3000

K = 0.037 **Topsoil (A horizon)** Method B3

K = 0.050 **Subsoil (B horizon)** Method B3

S = As factored in SOILOSS 5.1

L = 20 metres

C = 0.108 Native forest harvesting "B" Table 2

P = 1.0

Table 2: Water Pollution Hazard Categories

Slope Ranges (Degrees)	Water Pollution Category	Indicative % of Net Harvest Area			
		cpt 362	cpt 368	cpt 369	cpt 371
0 - ≤3	1	5	5	5	10
>3 - ≤13	2	10	35	40	40
>13 - ≤30	3	25	60	55	50
Roads	3	N/A	N/A	N/A	N/A

The following factors for rainfall erosivity and soil erodibility also apply to road construction:

R = 3000 **K = 0.050**

(b) Dispersibility

Granite Soils (site 362/2; simple slope)

%dispersible soil A horizon = 10/100x29/100x100 = **2.90** (Method D1)

%dispersible soil B horizon = 41/100x23/100x100 = **9.43** (Method D1)

The A horizon is not significantly dispersible.

The B horizon is not significantly dispersible.

Metasediment Soils (site 362/1; ridge/crest)

%dispersible soil A horizon = 21/100x16/100x100 = **3.36** (Method D1)

%dispersible soil B horizon = 32/100x34/100x100 = **10.88** (Method D1)

The A horizon is not significantly dispersible.

The B horizon is significantly dispersible.

(c) Other Factors

There are no other soil erosion or water pollution factors which need to be considered in relation to the planned harvesting of Compartments 362, 368, 369 and 371.

References

Standard Erosion Mitigation Guidelines for Logging in New South Wales **Soil Conservation Service, CaLM**, NSW 1993

Rosewall C.J. SOILOSS A program to assist in the selection of management practices to reduce erosion

Soil Conservation Service Technical handbook No. 11 First Edition 1990, **2nd Edition** 1993.

2.6 FOREST ZONING AND SPECIAL ATTRIBUTES

Description 14 Forest Zoning and Special Attributes

(a) Research Plots

There is a Spotted Gum growth plot in the north-west corner of compartment 371. The area has been given a PMP Classification of 1.1.4 Research, and is indicated on the Operational Map. Normal conditions apply to the harvesting of this area.

Assessment Plot 344 is located in the south-western section of compartment 368 as indicated on the Operational Map.

Four elite Spotted Gum trees are located along the western boundaries of compartments 369 and 371.

(b) Permanent Growth Plots

Permanent Growth Plots 319 and 325 are located in compartments 371 and 369 respectively.

(c) Aboriginal Archeological Sites

Aboriginal Archaeological sites are located in the western section of compartment 362, in the north-western section of compartment 369 and in the northern section of compartment 371, as indicated on the Operational Map. These have been marked in the field using three yellow rings, and are to be protected from disturbance.

(d) PMP 1.1.2 Recreation and PMP 1.1.6 Visual Resource Protection

An area off Western Boundary Road at Mulligan's Lookout has been designated PMP 1.1.2 Special Emphasis Recreation. There are no plans for this area to be developed and it is likely that the PMP classification will be revoked. Harvesting will not affect the existing values at the site and no special conditions are proposed.

A Visual Resource Protection strip (PMP 1.1.6) exists along the western boundary of the compartments as shown on the Operational Map. Harvesting will be modified in this area to protect its aesthetic values.

Part 3 AUTHORISATION CONDITIONS

3.1 COMPLIANCE

(a) Area Identification

GRAFTON DISTRICT

Grange State Forest No. 771

Compartments 362, 368, 369 and 371

Grafton Management Area

(b) Third Party/Lessee or Other Interest

The compartments are within the area of Occupational Permit No 13556 held by Albarine Pty. Ltd for the purpose of grazing.

(c) Environmental Compliance Requirements

This Harvesting Plan is prepared by State Forests of New South Wales (State Forests) under the authority of the Forestry Act 1916. This Harvesting Plan is a condition of all Timber, Forest Products, Contractors and Operators Licences issued in connection with the timber harvesting operations described in the Plan.

All operations conducted under the authority of the Timber Licence and other Licences and Agreements issued for the area covered by this Harvesting Plan must comply with:

- Licence conditions issued by State Forests under the Forestry Act 1916.
- the **"Forest Practices Code Part 2 - Timber Harvesting in Native Forests"** - State Forests (1993).
- the **"Standard Erosion Mitigation Guidelines for Logging in New South Wales" (SEMGL 1993)** issued by the Soil Conservation Service of Department of Land & Water Conservation (LaWC).
- the conditions of **Pollution Control Licence No 4017** issued by the Environment Protection Authority under the Pollution Control Act 1970. Those general conditions which affect licensees are set out in Schedule "A" attached to every Timber, Contractors and Operators Licence.
- conditions attached to licences issued by the National Parks and Wildlife Service under the Endangered Fauna (Interim Protection) Act 1992 and the National Parks and Wildlife Act 1974 (NPW Act).
- conditions resulting from the determination of the **Grafton Management Area Environmental Impact Statement.**
- the silvicultural specifications as stated in the **Grafton Management Area Environmental Impact Statement** (as amended by Operational Circular 95/14 of 30/10/95).
- the schedule of specifications for the harvesting and utilisation of timber applicable to this operation, in this case:

- **Grafton/Coffs Harbour Compulsory Sawlog Specification Hardwood Sawlog Flat Rate Royalty Utilisation Standards**
- **Specification for Eucalypt Veneer Logs for Rotary Peeling**
- **Australian Standard AS2209 - 1979 (poles)**

- the Code of Procedure for the measurement of timber and other products applicable to this operation, in this case:
  - **Code of Procedure for the Measurement of Hardwood Logs and other Timber Products - Northern Region.**

Variations, additions or amendments to the above documents may be made by the responsible authorities at any time, and must be implemented immediately by the State Forests Licensee.

(d) Environmental Planning & Assessment Act Requirements

In preparing this Harvesting Plan, the requirements of Part V of the EPA Act (as amended) and Section 92 of the NPW Act have been considered and Grafton Management Area Environmental Impact Statement (EIS) has been produced.

(e) Breaches and Infringements

Non-compliance with any condition or instruction set out in this Harvesting Plan will be dealt with in accordance with Section 4 of the **"Forest Practices Code Part 2 - Timber Harvesting in Native Forests"**. Serious breaches may lead to the issue of a penalty notice, licensee suspension or prosecution.

(f) Variations and Amendments to this Harvesting Plan

Conditions and requirements relating to the Pollution Control Licence cannot be varied in the field without the prior written approval of the EPA, other than those areas detailed in Condition 5.1 (c), or consistent with condition 24A of the Pollution Constrol Licence.

Variations and other specified approvals detailed Condition 5.1(c), or consistent with condition 24A of the Pollution Control Licence, may be made by the Supervising Forest Officer to this Harvesting Plan, subject to the District Forester's counter approval.

Other approvals may only be made by the Supervising Forester and are also subject to the District Forester's counter approval. Major variations that relate to the conditions of the Pollution Control Licence, minor variations that would result in an increased risk of water pollution, or any variation relating to drainage feature protection conditions can only be made with the prior written approval of the EPA.

All approvals must be recorded on a variation advice, attached as Part 6 to all operational copies of this Harvesting Plan.

This Plan must not be amended by a licensee or contractor.

(g) Harvesting Plan Availability

Copies of this Harvesting Plan must be held available by the contractor or bush supervisor at the site of timber-harvesting operations at all times that felling, snigging or environmental work is being undertaken within the area covered by this Harvesting Plan.

3.2 CERTIFICATION

(a) Plan Preparation

Prepared by: Leonie Walsh Signature: .....

Title: Marketing Forester Date: 6 November 1996

(b) District Approval

I approve the issue of this Harvesting Plan subject to any amendments, endorsements or approvals that may be made following submission to the National Parks and Wildlife Service, the Environment Protection Authority and/or the Regulatory and Public Information Committee (constituted under the Timber Industry (Interim Protection) Act, 1993 as amended).

The date that operations will need to commence is: ....., 19

Signature: ..... District Forester Date: ....., 19

(c) Receipt of External Authority Approvals

(To be completed by the District Forester or a person nominated by the District Forester who must attach the relevant amendments to the Plan.)

Table 3: External Authority Approvals

Name of Authority	Date Received	Attached to Plan by
NPWS		
EPA		
RaPIC		
Other Authority		

I note approval of this Harvesting Plan from the above-mentioned authorities, together with the amendments they have required to be included in the Plan.

These amendments have been included in the final Plan. This Harvesting Plan comprises pages 1 - 45, attachments and the Operational, Forest Types and Locality maps marked and referenced to this Harvesting Plan. This is Harvesting Plan No. CG 96/12/362

Date for commencement of operations: .....

Signature: ..... Date: .....

District Forester

3.3 DISTRIBUTION

Recipient	Parts	Minimum Copies
Timber Licensee	1,3,4	1
Contractors	1,3,4	1
Operator(s) (where required)	1,3,4	
Supervising Forest Officer(s) [SFO(s)]	1 ,3-5, (2 optional)	1
Supervising Forester(s)	All	
District Forester	All	
District Office Register	All	
Compartment History File	All	1
Regional Office (optional)	All	
Community Groups		
Soil Conservationist (Forestry)	All	

Forest Planning Branch, Head Office, for distribution to:

Regulatory and Public Information Committee	All	3
National Parks And Wildlife Service	All	2
Environment Protection Authority	All	3
Department of Lands and Water Conservation (for harvesting in other Crown-timber lands)	All	1

3.4 INDUSTRY ENDORSEMENT

I endorse the harvesting plan on behalf of industry.

Signature: ..... Licence No.: ..... Date: .....

Position: ..... Company: .....

Signature: ..... Licence No.: ..... Date: .....

Position: ..... Company: .....

Signature: ..... Licence No.: ..... Date: .....

Position: ..... Company: .....

3.5 BUSH SUPERVISORS ACKNOWLEDGMENT

I acknowledge that I have received a copy of Harvesting Plan No CG 96/12/362 and that I understand the conditions of the Plan as explained to me by a State Forests officer.

Signature: ..... Licence No: ..... Date: .....

Position.....

Signature: ..... Licence No: ..... Date: .....

Position.....

Signature: ..... Licence No: ..... Date: .....

Position.....

Part 4 OPERATIONAL CONDITIONS

The Tree-marking Code shown in this Plan will be used to apply other Conditions of this Plan as required. All necessary tree-marking in the field must be carried out before and during the harvesting operation by the SFO. Product marking will generally be for extraction.

4.1 Harvesting Activity Description

The logging will be a selective harvesting operation in maturing and regrowth native hardwood forest. The products that will be harvested are sawlogs, poles and veneer logs.

4.2 Tree-marking Code and Harvest Regulation

Tree Marking Code

(a) Trees to be removed

Trees will be marked with a **dot**. Some trees may also be marked to produce a specific log type; **P** = Pole, **G** = girder, **V** = veneer log.

(b) Trees to be retained

Trees will be marked with a **horizontal line**. Some trees may be marked for a specific purpose; **H** = habitat tree, **R** = recruitment habitat tree.

(c) Trees marked for information

Two horizontal lines indicates that machinery is not permitted past the point but there may be trees to be felled. **Three horizontal lines** indicates that machinery and that felling is not permitted past the point. **F** = wildlife corridor, **Z** = riparian zone, "**5**", "**10**", "**15**", "**20**", or "**25**" = buffer or filter strip width as appropriate. **D** = dump site, **O** = compartment boundary.

Forest boundaries are marked by yellow painted **blazes** and/or **sawn stakes**.

Vertical line indicates location of a minor road or snig track. **Vertical lines with arrowheads** indicates an approved crossing.

X = cancellation mark

Reference: Northern Region Tree Marking Code (1995)

4.3 Order of Working

(a) Wet Weather, Dry Weather and Intermediate Areas.

46 dump sites have been located and marked in the compartments, as indicated on the Operational Map. Dumps 1 - 3, 6 - 11, 13, 14, 17, 22, 23, 25, 32 - 36, 41, 42 and 46 have been designated as suitable for working when conditions are wet. While allowing for wet conditions, harvesting will generally commence on dump 1 and work progressively through to dump 46.

(b) Wet Weather Controls - Roads

During wet weather, the wet-weather controls set out in Section 7 of the Forest Practices Code Part 2 (Timber Harvesting in Native Forests) must apply. In particular, when it is raining and/or where runoff occurs from a road surface, haulage must not occur unless the road is a gravel or sealed road.

[FPC Pt2 7.2, PCL Sch 4 C 85]

(c) Wet Weather Controls - Snigging

During wet weather, snig tracks must not be used where:

(i) there is runoff from the track surface, or;

(ii) there is a likelihood of significant rutting leading to turbid runoff from the track surface. [FPC Pt2 7.2, PCL Sch 4 C 96]

The SFO is responsible for determining the order of working in the field.

4.4 Silviculture

(a) General

The aim of the harvest is to promote growth on retained trees and to create conditions that will allow the establishment and growth of regeneration. Selective logging techniques, including the Australian Group Selection system where appropriate, shall be implemented.

(b) Tree Marking

Tree marking must aim at:

Retaining trees capable of net merchantable timber value increment for cutting in future cutting cycles, except where:

a) the removal would result in more valuable increment on preferred retained trees (redistribution).

b) the tree has been or is likely to be significantly damaged during the course of harvesting operations.

c) the removal of a small group of merchantable trees would create favourable conditions for the establishment and growth of regeneration.

In general tree marking and supervision must be directed towards:

1. Harvesting for the highest economic end use for which markets are available.

2. Ensuring maximum economic utilisation of all trees felled.

3. Minimising damage to the retained stand and minimising soil disturbance in excess of that required for successful regeneration establishment.

Tree marking for removal must be carried out by the SFO.

Reference Grafton Management Area Environmental Impact Statement
Jacobs (1955) Growth Habits of the Eucalypts. Forestry and Timber Bureau. Commonwealth Government Printer, Canberra.

(c) Harvesting Debris

Debris must be removed from within approximately 5 metres of the butts of retained habitat trees to minimise bark scorch during prescribed burning operations, or any wild fire.

Harvesting debris which is likely to impede the flow of water in road drainage structures must be removed from such structures every 2 days.

Bark and debris produced by the harvesting must be returned to the logging area and dispersed as far as practicable around the net harvest area and/or stacked in small heaps on log dumps.

(d) Directional Felling

Directional felling techniques must be employed to minimise damage to retained trees, to avoid hang ups and to maintain values of the Riparian Habitat Zones, filter strips and buffer strips. Directional felling must also be used to avoid falling trees onto road batters in the Metasediment soils.

4.5 Flora Protection

(a) Rare or Endangered Species

No occurrences of rare or threatened flora are recorded on the compartments and none were encountered during field inspections.

(b) Rainforest Protection

There are no areas of rainforest in the compartments.

4.6 Fauna Protection

(a) Sightings of Fauna

Threatened species recorded within these and surrounding compartments (including recently logged compartments) include the Powerful Owl, Sooty Owl, Wompoo Fruit Dove, Yellow-bellied Glider, Rufous Bettong, Hoary Bat, Bent-wing Bat, Little Bent-wing Bat and Golden-tipped Bat. Threatened species expected to occur in or in the vicinity of the compartment are;

Glossy Black Cockatoo	**Powerful Owl**	**Sooty Owl**
Masked Owl	**Wompoo Fruit Dove**	
Stephen's Banded Snake	**Pale-headed Snake**	
Spotted-tailed Quoll	**Brush-tailed Phascogale**	**Yellow-bellied Glider**
Squirrel Glider	**Rufous Bettong**	**Red-legged Pademelon**
Common Planigale	**Koala**	**Long-nosed Potoroo**
Great Pipistrelle	**Golden-tipped Bat**	**Little Bent-wing Bat**
Common Bent-wing Bat	**Large-footed Mouse-eared Bat**	

Contractors and supervisory staff shall report any sightings of Threatened species to the District Marketing Forester. Such confirmed sightings or findings shall generate the application of the appropriate prescriptions to reduce the impact on the species.

(b) Habitat Trees

Compartments 362, 368, 369 and 371 include Dry Hardwood forest and Moist Hardwood forest with xeromorphic understorey, and limited areas of Moist Hardwood forest with mesic understorey. Sufficient potential habitat and recruitment habitat trees exist in the net harvest area to allow for the retention of enough trees to meet prescription requirements.

Prescription 1:

Habitat Tree Retention

Habitat tree retention in Dry Hardwood and Moist Hardwood forests with a xeromorphic understorey shall be four trees per hectare. For the purpose of this prescription a xeromorphic understorey is considered to be one composed predominantly of grasses, heath and/or shrubs with sclerophyllous leaves.

Habitat tree retention in Moist Hardwood forests with a mesic understorey shall be six trees per hectare. For the purpose of this prescription a mesic understorey is considered to be one composed predominantly of moist elements such as vines, shrubs with mesophyllous leaves and/or species often found in Rainforest areas.

Habitat trees will be live hollow bearing trees. They are to be well spaced throughout the compartment being harvested, consistent with requirements for adequate regeneration and growth for the species of the forest types. Where the specified density of habitat trees is not present the existing density is to be retained. Sufficient recruitment habitat trees to sustain the retained density of habitat trees into perpetuity are also to be retained. Stags shall not be counted as habitat trees.

Habitat trees shall be marked by the SFO.

All practical precautions must be taken to avoid tree heads landing adjacent to identified habitat trees. Tree heads shall be removed from within approximately 5 metres of identified habitat trees. Tree heads shall be removed with minimum disturbance to understorey vegetation and on-ground logs.

(c) Non Harvest and Modified Harvest Areas

Riparian Habitat Zones

Riparian Habitat Zones exist 20 metres either side of streams (watercourses, drainage lines and drainage depressions) with catchments greater than 40 hectares.

- except to use crossings harvesting machinery must not enter Riparian Habitat Zones.
- felling and snigging must be excluded from Riparian Habitat Zones.
- trees must not be felled into Riparian Habitat Zones.
- trees must not be damaged in Riparian Habitat Zones.

Refugia areas

No areas of critical habitat for Threatened species have been located in the net harvest area and no refugia areas have been set aside.

(d) Species and Mitigation Prescriptions

Mitigation prescriptions to be applied in Grafton Management Area have been determined for Threatened species that might be adversely impacted on by forest management

activities. Those relevant to Compartments 362, 368, 368 and 371 are stated below. The appropriate mitigation prescription shall be immediately applied when any of the listed species is sighted or critical habitat is located.

Prescription 2:

Preservation of Critical Weight Range species

In applying the following prescription it should be noted that the *Bush Fires Act* 1949 overrides Section 99 (1) of the *National Parks and Wildlife Act* 1974. That is, it is not an offence to undertake an activity which will take or kill any endangered fauna if that activity is authorised or required by a section 41A plan or authorised or required under the Bush Fires Act.

Given the above, the prescription should only be seen as a guide for managing the habitat of critical weight range (CWR) fauna.

Critical weight range species expected to occur in the compartment are the Rufous Bettong, Red-legged Pademelon, Long-nosed Potoroo and Spotted-tailed Quoll.

SFNSW are to ensure, to the fullest extent practicable, that any post-logging burning is to be carried out in such a manner that encroachment into critical habitat for those species listed above is prevented. This can be achieved by carrying out post-logging burning under weather and fuel conditions which minimises the chance of encroachment into critical habitat and minimises the destruction of large fallen logs (ie. those logs with a diameter greater than 40 cm).

For the purpose of this prescription critical habitat for the Spotted-tailed Quoll is defined as moist gullies, wet sclerophyll, rainforest and fallen logs with a diameter of greater than 40 cm. Critical habitat for the Red-legged Pademelon is defined as moist gully vegetation and rainforest. Critical habitat for the Rufous Bettong is defined as well grassed open forest and woodland, and large fallen logs of greater than 40 cm diameter.

Prescription 3:

Glossy Black Cockatoo

All practical attempts must be made to minimise disturbance to mature feeding forest oaks throughout the logging area. On location of a nest tree the NPWS's Manager Threatened Species, Northern Zone is to be informed and logging in the immediate area (ie within 100 metre radius) is to cease pending delineation of an appropriate buffer by a joint NPWS / SFNSW inspection of the area.

Prescription 4:

Powerful/Masked/Sooty Owls

A thorough search of gullies and heads of gullies within 1.5 km of the detection sites must be undertaken by a qualified person.

During tree-marking, care must be taken to identify possible Owl roosting and nesting sites.

A 100 metre radius disturbance free zone must be established around each identified roost site. A 200 metre radius disturbance free zone must be established around each identified nest site.

Prescription 5:

Stephen's Banded Snake and Pale-headed Snake

100 metre radius buffer zone must be established around each identified location site. This prescription is to be reviewed when more than 10 confirmed locations of the species have been recorded in the management area.

Prescription 6:

Brush-tailed Phascogale

200 metre radius buffer zone must be established around each identified nest site. This prescription is to be reviewed when more than 10 confirmed locations of the species have been recorded in the management area.

Prescription 7:

Yellow-bellied Glider

The Yellow-bellied Glider has been recorded in compartments 367 and 368, and a V-notch tree has been identified in compartment 371 near Dump 10. An inspection shall be undertaken in the vicinity of these records to identify trees with evidence of use by Yellow-bellied Gliders.

All trees with V-notch markings must be retained.

The tree with the most recent V-notch markings or other incisions shall be the centre tree of an area with a 100 metre radius. Within this area the following trees will be retained: a minimum of 30 trees (>10cm dbh) of the sap feed tree species, and a minimum of 15 bark shedding trees, with their bark shedding in long strips.

Where there is more than one marked feed tree within the 100 metre radius, the additional feed trees may count as those feed trees to be retained.

Prescription 8:

Squirrel Glider

200 metre radius buffer zone must be established around each identified nest site. This prescription is to be reviewed when more than 10 confirmed locations of the species have been recorded.

Prescription 9:

Koala

If a koala is observed during logging, numerous scats (more than twenty below a tree) are found, or less than twenty pellets of different sizes are found, logging will be excluded from within a 100 metre radius of the site and a survey undertaken.

The survey shall be undertaken according to the agreed coastal prescription for koalas. Tree felling will be excluded from within fifty metres of a high use area, or modified within intermediate use areas.

Prescription 10:

Long-nosed Potoroo

100 metre radius buffer zone must be established around each identified location site. This prescription is to be reviewed when more than 10 locations of the species have been recorded in the management area.

Prescription 11:

Golden-tipped Bat/Little Bent-wing Bat/Common Bent-wing Bat/Large-footed Mouse-eared Bat

100 metre radius buffer zone must be established around each identified roost site. This prescription is to be reviewed when more than 10 locations of the species have been recorded in the management area.

References Environmental Impact Statement Grafton Management Area.
State Forests' Response to Submissions to the Grafton Environmental Impact Statement.

4.7 Soil Erosion and Water Pollution Control Conditions

(a) Soil Erosion and Water Pollution Categories

The calculated Soil Erosion and Water Pollution Categories for Compartments 362, 368, 369 and 371, based on the topsoil data from site 362/3 for Granite soils and the subsoil data from site 369/2 for Metasediment soils, are detailed in Tables 4a and 4b below.

Table 4a - Water Pollution Hazard Categories
Granite Soils

Slope Ranges (Degrees)	Water Pollution Category	Indicative % of Net Harvest Area cpt 362
0 - ≤5	1	31.9
>5 - ≤22	2	5.5
>22 - ≤30	3	1
Roads	3	N/A

Table 4b - Water Pollution Hazard Categories
Metasediment Soils

Slope Ranges (Degrees)	Water Pollution Category	Indicative % of Net Harvest Area			
		cpt 362	cpt 368	cpt 369	cpt 371
0 - ≤3	1	4	5	6.5	9.7
>3 - ≤13	2	40.6	46.3	62.1	53
>13 - ≤30	3	17	48.7	31.4	37.3
Roads	3	N/A	N/A	N/A	N/A

(b) Approved Timber Harvesting and Extraction Method

- Chainsaw felling, using directional felling techniques where required.
- Snigging of logs using a crawler tractor and/or a rubber tyred skidder.
- Debarking and loading of logs at the dump using an excavator or forklift.
- Transport of logs from the site using a jinker and prime mover.

(c) Marking and Location of Roads, Log Dumps, and Crossings

The marking and location of roads, log dumps, and crossings in the field must be in accordance with condition 4.2. The location of roads and log dumps are indicated on the Operational Map.

(d) Wet Weather Controls

Harvesting operations may be conducted throughout the year subject to the application of normal wet weather closure procedures as per Section 7 of the Forest Practices Code Part 2 (Timber Harvesting in Native Forests). During wet weather, the wet weather controls for road usage and for snigging set out in section 7 of the Forest Practices Code Part 2 (Timber Harvesting in Native Forests) will apply. In particular, where:

i) runoff occurs from a road surface:

- haulage must cease on natural surface roads.

ii) there is runoff from a snig track surface:

- snig tracks must not be used.

(iii) there is a likelihood of significant rutting leading to turbid runoff from a snig track surface;

- snig tracks must not be used.

(iv) it is raining:

- operations must cease.

In any event, if:

rutting of a snig track is, or is likely to approach a maximum of 200 mm below the natural surface, measured over any 20 metre length of track, snig tracks must not be used.

Dumps 1 - 3, 6 - 11, 13, 14, 17, 22, 23, 25, 32 - 36, 41, 42 and 46, as marked on the Operational Map, are suitable to be worked during wet weather periods.

(e) Existing Roads

Road maintenance (Grange Access, Western Boundary and Chips Roads)

Where required, routine maintenance of Grange Access, Western Boundary and Chips Roads will be undertaken by State Forests or contractors engaged by State Forests. The SFO is responsible for determining whether road maintenance is required. Maintenance may include grading lengths of road, and gravelling where there is insufficient existing material to reform the road pavement.

Where grading is required, the following conditions apply. The Grafton District Operations Foreman is responsible for the supervision of such operations. The Operations Foreman must be present at all times during the operation.

Where wheel ruts have formed on the road pavement, these must be scarified prior to grading, and these sections must be well rolled after grading.

Disturbance to cut batters and stable, well vegetated table drains must be avoided.

The direction of grading must be away from crossings.

When working in mitre drains, the machine must reverse down the drain and grade back onto the road where practicable. when reinstating outfall drainage, outside windrows must be graded back onto the road where practicable, not brushed off the side.

Spoil must not be deposited in filter strips. Any spoil from the operation accidentally deposited within a drainage line or watercourse must be removed with minimal bed or bank disturbance unless removal will cause more damage than non-removal. Spoil so removed must be respread on the road pavement or deposited outside the filter strip.

Where there is less than 5 m undisturbed vegetation between a drainage outlet and a drainage feature, a sediment trap (silt mesh or hay bales) must be installed. The Operations Foreman is responsible for the installation of sediment traps.

Clearing of regrowth

Reopening of existing roads will involve lowering of crossbanks and the removal of fallen timber and small regrowth from the road pavement and edges. Clearing outside the running surface must be confined to the minimum required to provide safe sight distances and effective drainage, and allow free movement by logging trucks. Maximum clearing width on either side of the running surface is 1.5 m on the minor roads within the compartments, and 2 m on Chips Road. Debris from clearing must not be deposited in the outlets of drainage structures or within filter strips or buffer strips.

Soil disturbance must be minimised. In particular, disturbance to road batters in the Metasediment soils must be avoided.

Road surface drainage

Rollover crossbanks may be required on some sections of the minor roads to log dumps where outfall drainage has not been established or is inadequate. Where required, rollover crossbanks must be spaced as stated in the Table below. The banks must have a minimum design consolidated vertical height from spillway to bank top of 20 cm. Such banks will convey the peak flow of a 1 in 5 year storm event (see calculations attached as Appendix 2).

Spacing of Rollover Crossbank Drainage
(grade of road - degrees)

0 - ≤5	>5 - ≤10	over 10
100m	60m	40m

Rollover crossbanks must drain onto undisturbed vegetation or logging slash wherever possible. Where it is necessary to convey runoff water over a fill batter greater than 1 m high, that has been disturbed by the operation or on which the soil is exposed, drop down structures constructed of rock or prefabricated fluming must be installed. Dissipaters must be installed at the bottom of drop down structures.

Road drainage must minimise the flow of unchecked water onto extraction tracks, snig tracks or log dumps. Where this cannot be achieved by outfall drainage, a rollover crossbank must be placed as close as possible to the track or dump, consistent with haulage practicalities, to minimise the catchment area above it.

While a road is in use for hauling timber, spoon drains may be used in preference to rollover banks, but must be converted to rollover banks on completion of operations in the area.

Crossing of drainage features

The drainage line crossing on 362/1 Road must not be used in wet weather.

All crossings used during the operation must be left in a condition that is stable and does not impede the flow of water. Disturbed or exposed areas adjacent to crossings must be seeded with Japanese millet (or other suitable species) at the rate of 20 kg/ha. The SFO is responsible for determining if seeding is required.

The old crossing on 371 Road, in the south-eastern part of compartment 371, must not be used.

Revegetation and rehabilitation

On completion of operations, all spoon drains must be converted to rollovers, and crossfall (outfall) drainage reinstated.

Revegetation of minor roads following harvesting will be through natural regeneration. 362, 362/1, 368, 368/1, 369, 369/1, 369/2, 371 and 371/1 Roads are to be closed and must be bedded down on completion of operations. Crossbanks sufficient to prevent use by vehicles must be constructed at the entrance to these roads. Chips Road, Hanging Rock Road and 372 Road are to remain open.

Road surfaces, batters and drainage feature crossings on all roads must be left in a stable condition.

Dispersible soils

If the subsoil is exposed in the Metasediment soils on the road surface, batters or table drains within 20 metres of the drainage feature crossings, topsoil from the road, or imported gravel, must be spread over the road surface at the site. Where subsoil is exposed on cut and fill batters, the site must be seeded with Japanese millet (or other suitable species) at the rate of 20 kg/ha.

(f) Road Construction

No road construction is required for the harvesting.

(g) Slope limits for the area

Maximum slope for harvesting	30 degrees
Maximum grade of snig track construction	25 degrees
Maximum side slope for snig track construction	29 degrees
Maximum road grade permitted	10 degrees
Maximum side slope for road construction	30 degrees without design

Areas with slopes over 30° are indicatively marked on the Operational Map. The SFO is responsible for identifying areas with slopes over 30° in the field, where logging is not permitted. The SFO is also responsible for identifying areas over 29°, where snig track construction is not permitted.

(h) Drainage Feature Protection

Riparian Habitat Zones exist 20 metres either side of watercourses, drainage lines and drainage depressions with catchments greater than 40 hectares.

Filter strips must be retained along all watercourses and drainage lines within the net harvest area of Compartments 362, 368, 369 and 371 at minimum widths (measured in the horizontal plane) as stated in Table 5 below. These minimum widths meet or exceed the requirements of the Pollution Control Licence.

Where a filter strip extends beyond the boundary of the catchment of the drainage feature that is the subject of the protection, then the filter strip may be terminated at the catchment boundary.

In addition buffer strips 5 metres wide must be maintained on either side of drainage depressions.

Table 5 - Filter Strip Widths
(distance each side of stream)

Water Pollution Category	CATCHMENT /SLOPE	Riparian Zone	Filter Strip
1	<40 ha		5m
1	>40 ha	20m	
2	<40 ha		10m
2	>40 ha	20m	
3	<40 ha <18° slope		10m
3	<40 ha >18° slope		15m
3	>40 ha <18° slope	20m	
3	>40 ha >18° slope	20m	

(i) Tree Marking Rules for Filter Strips and Buffer Strips

The SFO must mark the Riparian Habitat Zones and filter strips in the compartment progressively ahead of harvesting operations, except where there are no trees marked for removal within a tree length of Riparian Habitat Zones and filter strips.(See also 4.2, 5.2)

Contractors and operators are responsible for identifying drainage depressions encountered in the field and taking appropriate action whilst operating within the buffer strip or crossing the drainage depression. (See also 5.2)

(j) Felling and Extraction from Filter Strips

Trees located in a filter strip must not be felled, except for the purposes of constructing an approved road, extraction or snig track crossing.

Trees must not be felled into filter strips.

Crowns, logs and substantial debris accidentally felled into filter strips must be removed with minimal disturbance to the groundcover and soil in the filter strip. Any disturbance caused must be remedied by reshaping of furrows and replacement of cover, so that concentrated water flow does not occur. Instances of trees being accidentally felled into filter strips must be documented on the SFO's copy of the harvesting plan, including the reason for the accident and the remedial action taken.

Machinery must not enter a filter strip except for the construction and use of road, extraction track or snig track crossings.

(k) Extraction from Drainage Depression Buffer Strips

Machinery must not operate in buffer strips when the soil is saturated.

Soil exposure must be minimised and channelised flow must be prevented by use of the following techniques:

- no snigging along drainage depressions

- operating with the blade up at all times
- preventing skewing of machinery tracks (by approaching logs in reverse gear, and minimal changes in direction while snigging logs out of the buffer strip).

No earthworks can be undertaken within buffer strips except for the construction of road, extraction tracks or snig track crossings.

(l) Snig Tracks

Wherever practicable, walkover extraction techniques must be used in preference to snig track construction.

Snig tracks must not be located where they cannot be drained effectively. Wherever practicable, snig tracks must be located slightly off ridge-top to ensure free crossfall drainage. Side cut tracks must have crossfall drainage.

Snigging along roads must only occur in order to avoid snig track construction and where approved by the SFO. Effective road drainage must be re-instated by the contractor/operator immediately at the completion of the snigging operation.

The grades of the snig tracks must not exceed 25°.

Snig track construction is not permitted in areas with slopes above 29°.

Snig tracks must be drained to minimise the flow of water along them and the flow of water directly into watercourses, drainage lines or onto roads and dumps. Drainage must be effected within 2 days of the completion of use, or where operations are to be temporarily suspended in accordance with Tables 6a and 6b.

Table 6a - Drainage of Snig Tracks at Temporary Cessation of Operations

Granite Soils

Slope boundaries	WP Category	No. Days
0 - ≤5	1	10
>5 - ≤22	2	8
>22 - ≤30	3	5

Table 6b - Drainage of Snig Tracks at Temporary Cessation of Operations

Metasediment Soils

Slope boundaries	WP Category	No. Days
0 - ≤3	1	10
>3 - ≤13	2	8
>13 - ≤30	3	5

Where earth banks are required they must be constructed to a minimum unconsolidated effective height of 35 cm, with spacing in accordance with Table 7a and 7b.

Table 7a - Maximum Earth Bank Spacing

Granite Soils

Track Grade (degrees)	WPH Category		
	1 (0° - ≤5°)	2 (>5° - ≤22°)	3 (>22° - ≤30°)
0 - ≤5	200 m	150m	100m
>5 - ≤10		100m	60m
>10 - ≤15		60m	40m
>15 - ≤20		40m	25m
>20 - ≤25		30 m	20m

Table 7 - Maximum Earth Bank Spacing

Metasediment Soils

Track Grade (degrees)	WPH Category		
	1 (0° - ≤3°)	2 (>3° - ≤13°)	3 (>13° - ≤30°)
0 - ≤5	200 m	150m	100m
>5 - ≤10		100m	60m
>10 - ≤15		60m	40m
>15 - ≤20			25m
>20 - ≤25			20m

The above spacings are the maximums and should be varied to utilise the most suitable outlet point. Crossbanks must be discharged into undisturbed vegetation or logging debris.

(m) Downhill Snigging

Limited downhill snigging will be required to dumps 10, 12 - 22, 24, 26, 27, 31, 32, 35-37, 39 - 42 and 44.

The following techniques must be used where downhill snigging is used:

- Crossfall drainage must be used where practicable.
- Where practicable the snigging pattern must be uphill from the stump with the logs being bunched for the downhill portion of the snig onto a centrally located extraction track(s).
- Where possible, tracks must enter the log dump from the side or below. Where this is not possible, a crossbank must be in place immediately before a snig track enters the log dump at the end of each day's operation.

(n) Snig Track Drainage Line Crossings

All snig track watercourse and drainage line crossings must be approved by the SFO before construction and must be open causeways utilising the natural surface at the site. Crossings must be rehabilitated after use, and any harvesting debris inadvertently deposited during use must be removed from the channel. As far as practicable the crossing point must be reshaped to its original condition and seeded with Japanese millet or other suitable species at the rate of 20 Kg/ha.

(o) Dispersible Soils

It is not anticipated that snigging will expose significantly dispersible subsoil. To minimise the possibility, walkover extraction techniques must be utilised wherever practicable. If more than 30% of metasediment subsoil, measured over any 20 m length of track is exposed, topsoil or logging slash from the track construction must be spread over the track surface at

the site and at the completion of use of the track, cut batters must be seeded with Japanese millet or other suitable species at the rate of 20kg/ha.

(p) Log Dumps

Field location of log dumps must utilise the most level site available, consistent with the location marked in the field and indicated on the Operational Map.

Because of the dispersible subsoil, topsoil must not be stripped and stockpiled on dumps in the metasediment soils (ie dumps 1-36 and 43). Before operations on the remaining dumps (37-42, 44-46), topsoil must be stripped and stockpiled, and respread at the completion of operations.

Dumps must be constructed with outfall drainage and must be kept drained during use and at the completion of operations.

Upon completion of operations any debris at or near the edge of a dump must be moved away from standing vegetation into the dump area. The log dump surface must be left in a stable condition by using one of the following techniques or a combination thereof:

- retaining at least 70% ground cover of existing vegetation;
- retaining a 70% cover of logging slash
- retaining a 70% cover of at least 5 cm of topsoil;

Where these techniques are not adequate to ensure stability of the dump surface, it must be seeded with Japanese millet at the rate of 20 kg/ha.

(q) Prescribed Burning

Pre-logging burning

The is no pre-logging burning associated with the harvesting of Compartments 362, 368, 369 and 371.

Post-logging burning

Post-logging burning of Compartments 362, 368, 369 and 371 must be carried out in accordance with provisions and specifications of the Nymboida District Fire Plan and the Grafton District Fuel Management Plan.

Objectives

Post-logging burning objectives for the compartment are:

- to meet State Forests' obligations under the Bush Fires Act.
- to decrease fine fuel loads and logging debris under prescribed conditions to decrease the intensity of any wildfire that might occur in the compartment and hence, decrease associated damage to regeneration and retained stems.
- to reduce the possibility of wildfire burning through the compartment and entering and damaging adjacent forests and private property areas.
- to simplify and increase the efficiency and the safety of any wildfire control activity.
- to promote good seedbed conditions for regeneration.

Ignition

Burning must be undertaken by the lighting of individual heaps of harvesting slash and debris under conditions that will enable the fires to be contained within the compartment.

Post-logging burning must be undertaken under conditions that will prevent fire travelling into filter strips, and where fire can be contained to slopes under 30°.

The Grafton District Operations Foreman is responsible for ignition, subject to the requirements of the Grafton District Fuel Management Plan.

Preferred season to burn

February to August.

4.8 Research and Inventory Plots

The Spotted Gum growth plot in the north-west corner of cpt 371 will be harvested under normal conditions. This area is shown as PMP 1.1.4 Research on the Operational Map.

Permanent Growth Plot 325 exists in the southern part of compartment 369. Permanent Growth Plot 319 exists in the north-eastern part of compartment 371 as indicated on the Operational Map.

Assessment Plot 344 is located in the south-western section of compartment 368 as indicated on the Operational Map.

None of these plots need to be measured prior to harvesting. The contractor or operator must advise the SFO when the plots are to be harvested, and the SFO must be present during harvesting to record products removed and damage to retained stems.

Four elite Spotted Gum trees are located along the western boundaries of compartments 369 and 371 as indicated on the Operational Map.

- these trees must not be damaged by the harvesting activity.
- if necessary, directional felling must be employed to fall trees away from the elite trees.
- logging debris must be removed 5 metres away from the trees.

4.9 Non Harvest Areas and Modified Harvest Conditions

(a) Riparian Habitat Zones

Riparian Habitat Zones, 20 metres either side of the stream, exist on all watercourses, drainage lines and drainage depressions with catchments greater than 40 hectares.

- except to use crossings harvesting machinery must not enter Riparian Habitat Zones.
- felling and snigging must be excluded from Riparian Habitat Zones.
- trees must not be felled into Riparian Habitat Zones.
- trees must not be damaged in Riparian Habitat Zones.

(b) Aboriginal Archaeological Sites

The locations of the Aboriginal archaeological sites are indicated on the Operational Map and have been marked in the field.

- harvesting machinery must not enter site boundaries;
- felling and snigging must be excluded from within site boundaries;
- trees must not be felled into site boundaries;
- where an existing road passes through the site the road may be used, but vehicles must not move off the road within site boundaries.
- routine maintenance may be undertaken on roads within site boundaries, but blading off or other road alterations must not be undertaken within site boundaries.

(c) Visual Resource Strip

A Special Emphasis Visual Resource Protection Zone (PMP 1.1.6) exists along the central ridge, as shown on the Operational Map.

- Harvesting activity in the Visual Resource Strip must be restricted to trees under 40 cm dbhob and 50% of trees greater than 40 cm dbhob.
- Harvesting activity in the Visual Resource Strip must be restricted so as to always maintain the high tree line as seen from a distance.
- Any roads must run at an acute angle through the Visual Resource Strip.
- Dumps located in the Visual Resource Strip must be established in such a way that the high canopy can be maintained.

(d) PMP 1.1.2 - Mulligan's Lookout

An area off Western Boundary Road at Mulligan's Lookout has been designated PMP 1.1.2 Recreation. Harvesting activities will not affect the existing values at the site and no special conditions are proposed for this area.

(e) Other

Private Property exists along the western boundaries of the compartments. These have been surveyed and blazed. A fence runs along the boundary. It must not be damaged and must be left in the condition found before the commencement of operations. If the fence is damaged, it must be repaired before the completion of operations.

4.10 Specification of Type of Products to be Removed.

Compulsory Sawlogs	See **Grafton/Coffs Harbour Compulsory Sawlog Specification Hardwood Sawlog Flat Rate Royalty Utilisation Standards.**
Salvage Sawlogs	See **Grafton/Coffs Harbour Compulsory Sawlog Specification Hardwood Sawlog Flat Rate Royalty Utilisation Standards.**
Poles	See **Australian Standard AS2209 - 1979 (poles)**
Veneer Logs	See **Specification for Eucalypt Veneer Logs for Rotary Peeling.**

Yield Information for Compartments 362, 368, 369 and 371

Estimated Yields are:

Compulsory Sawlogs 40 cm +	1500 m^3
Compulsory Sawlogs <40 cm	500 m^3
Salvage Sawlogs	400 m^3
Poles	40 m^3
Veneer Logs	40 m^3

Part 5 CONDITIONS FOR SUPERVISING FOREST OFFICERS (SFOs)

Condition 5.1 SFO Authority to Supervise Harvesting Operations

(a) General

The Supervising Forest Officer responsible for the direct field supervision of this harvesting operation, including tree-marking, log measuring and/or log check measurement, safety, implementation of wet weather controls, and monitoring and reporting generally is:

The appointed Hardwood Marketing Foreman, Grafton District.

(b) Relieving SFOs

Relieving SFOs, if required are:

The Forest Assistant, Marketing, Grafton District.

The Marketing Forester, Grafton District.

(c) SFOs Authority

The SFO has the authority to approve:

- the blading off of natural surface roads provided that damage will be minimal and the removed material is recoverable for respreading.
- downhill snigging routes where provided for in the Harvest Plan.
- use of natural surface roads for snig track crossings or as snig tracks to dumps provided restoration of the road for wheeled traffic is undertaken as necessary and use of the road significantly reduces soil disturbance.
- the exact location and type of watercourse and drainage line crossings for snig tracks - for this plan area all crossings must be open causeways.

All approvals must be noted on the harvesting plan. The location of drainage line crossings must be marked on the Operational Map.

Condition 5.2 Tree Marking and Other Harvesting Control Requirements

(a) Tree Marking for Forest Management and Silviculture

The Northern Region Tree Marking Code will apply to the harvesting operation. All trees to be removed must be marked for extraction. (Also see Part 4.2)

Habitat trees and habitat recruitment trees for fauna protection

Habitat trees and habitat recruitment trees must be marked for retention by the SFO according to Prescription 1 in Part 4.6 (b).

Non-harvest areas and modified harvest areas

The boundaries of the Riparian Habitat Zones must be marked ahead of harvesting operations, except where there is no tree marked for removal within a tree length of the Riparian Habitat Zone. The boundaries of the Aboriginal archaeological sites have been marked in the field.

(b) Soil Erosion and Water Pollution Control

Road maintenance

The SFO is responsible for identifying sections of Grange Access, Western Boundary and Chips Roads that may require routine maintenance. The Grafton District Operations Foreman is responsible for supervision of road maintenance operations, and must ensure that such operations are in accordance with Part 4.7 (e).

Road drainage

The SFO must ensure that all drainage structures on existing roads within the compartments are in accordance with Parts 4.7 (e).

Sowing of watercourse and drainage line crossings

The SFO must ensure that crossing approaches within the compartments are seeded in accordance with Part 4.7 (e and n).

Dispersible Soils Exposed During Road/Snig Track/Dump Construction

The SFO must ensure that adequate cover is maintained on snig tracks in dispersible metasediment subsoils in accordance with part 4.7 (o). Where required, the SFO must ensure that exposed areas on roads and snig tracks are seeded in accordance with parts 4.7 (e) and 4.7 (o).

The SFO must ensure that adequate cover is maintained on the log dump in accordance with part 4.7 (p).

Slope limits

Areas with slopes over 30° are indicatively marked on the Operational Map. The SFO is responsible for identifying slopes over 30° in the field, where logging is not permitted. The SFO is also responsible for identifying slopes over 29°, where snig track construction is not permitted.

Marking of filter strips

In most cases, Riparian Habitat Zone prescriptions are equivalent to or greater than filter strip and drainage line buffer strip requirements. There is no need for filter strips and drainage line buffer strips where they would be embedded in Riparian Habitat Zones. Hence filter strips shall only be marked in the field where they are not embedded in Riparian Habitat Zones.

Similarly, where filter strip requirements exceed Riparian Habitat Zones (ie in Water Pollution Hazard Category 3, where the slope of the filter strip exceeds 18°), there is no need to mark Riparian Habitat Zones.

All drainage features must be inspected by the SFO during the harvesting operation in conjunction with tree marking and protected in accordance with the Pollution Control Licence. Where practicable, any variation between the actual drainage feature found in the

field and that shown on the harvest plan Operational Map should be marked on the SFO's copy of the map for future reference.

Filter strips and drainage line buffer strips must be retained along all drainage features at the minimum widths as specified in Table 5 in Part 4.7 (i).

The SFO is responsible for marking filter strips in the field progressively and prior to the commencement of operations in each section of the harvest area. Filter strips need not be marked where there is no tree marked for removal within a tree length of the area.

Drainage depression buffer strips

The SFO is responsible for ensuring that contractors and operators are detecting drainage depressions in the field and taking appropriate protective precautions within the buffer strip area whilst operating in the buffer strip or crossing the drainage depression. (See also Part 4.7 (k)).

Condition 5.3 Monitoring and Reporting

(a) Daily and Fortnightly Reporting

The standard District procedures for daily and fortnightly reporting on the conduct of operations must be followed.

(b) Fauna Reporting and Mitigation Prescriptions

Sightings of any Threatened fauna must be reported to the District Marketing Forester within 24 hours of the sighting being made, as required in Part 4.6 (a). For any of the animal species listed in Part 4.6 (d) the stated mitigation prescriptions shall be immediately applied.

(c) Soil Erosion and Water Pollution Control Conditions

The SFO must report the following matters and record their location if necessary on the SFO's copy of the Harvesting Plan Operational Map, or the recording map attached to the Plan for that purpose:

- any accidental felling into filter strips and remedial action taken.
- any approval to leave soil from road and track construction in drainage lines or watercourses where attempts at removal would have resulted in excessive damage.
- any approval to defer stabilisation works at a drainage feature crossing beyond five days.
- any approval to leave a snig track drainage feature crossing structure in place and the reason for it to be left in place.
- any instances where effective cross bank drainage of a snig track is not effected within two days of completion of snigging from the area served by the track.

Post Harvest Rehabilitation

Supervision by the SFO and fortnightly check sheets must assess that road surfaces, batters and drainage structures are stable at the completion of operations and prior to the shifting of the contractor.

Condition 5.4 Pre- and Post-logging Burning

(a) Pre-logging Burning

There is no pre-logging burning associated with the harvesting of Compartments 362, 368, 369 and 371.

(b) Post-logging Burning

Post-logging burning of Compartments 362, 368, 369 and 371 must be carried out in accordance with provisions and specifications of the Nymboida District Fire Plan and the Grafton District Fuel Management Plan.

Ignition

The Grafton District Operations Foreman is responsible for ignition, subject to the requirements of the Grafton District Fuel Management Plan.

Condition 5.5 Other Instructions

The required measuring of assessment plot 344 in compartment 368, and the Permanent Growth Plot 325 in compartment 369 and Permanent Growth Plot 319 in compartment 371 must be carried out during the harvesting operation in accordance with Part 4.8.

There are no other instructions related to compartment 362.

Condition 5.6 Supervising Forest Officer's Acknowledgment

I acknowledge that I have received a copy of Harvesting Plan No CG 96/12/362 and that I have been briefed on the conditions of the Plan and understand the supervision and operational control requirements as explained to me by the District Marketing Forester.

Signature: ..... Date: .....

Position: .....

Supervising Forest Officer

Signature: ..... Date: .....

Position: .....

Relieving Supervising Forest Officer

ATTACHMENTS
CLEARANCE CERTIFICATE

HARVESTING PLAN No. ..... **Compartment:.....**

.....STATE FOREST.....DISTRICT

To M.....Supervising Forest Officer

I request approval for me to move my logging crew and all associated machinery from the above mentioned area to the next Compartment in accordance with Section 3.5 of the Code of Logging Practice.

I certify that:

(a) all permanent roads, trails and mitre drains have been cleared of harvesting debris;
(b) butt damage to retained trees has been kept to acceptable limits;
(c) all trees marked for removal have been felled;
(d) utilisation limits have been satisfactorily met;
(e) stump heights conform to requirements;
(f) all hanging trees have been felled and brought down;
(g) all log dump sites have been satisfactorily restored as required;
(h) harvesting debris is not accumulated around retained trees;
(i) all accumulated litter has been disposed of properly;
(j) all filter, protection and buffer strip requirements have been complied with;
(k) all snig track, extraction track and temporary logging road drainage has been installed satisfactorily and other required rehabilitation work has been completed;
(l) all necessary repairs to damaged roads, signs, fences and other structures have been carried out.

I believe that I have met all my obligations under the conditions of the Timber Licence, the Pollution Control Licence, and/or any licence issued under Section 120 of the National Parks and Wildlife Act, which apply to the Compartment just completed, as stated in this Harvesting Plan.

Signature.....Licence No.....Date .....
Contractor/licensee

As a result of inspections of the logging operations made in accordance with this Harvesting Plan, I am satisfied that, to the best of my knowledge, the licensee/contractor responsible for this harvesting operation has satisfactorily completed all work and approval is given for her/him to remove her/his machinery and equipment and leave the area/commence operations in another Compartment. (Compartment .....).

This clearance does not release the licensee/contractor from any obligation to undertake any remedial work if subsequent deficiencies are shown to result from inadequate practices during the harvesting operation, which are found during any inspections of the area made within 12 months of the date of this post-harvesting inspection.

Last inspection was made on .....(Date)

Signed: .....(Date).....
Supervising Forest Officer

Notes

Appendix 1: Erosion Hazard Assessment - Soil Type "D" Granite Formation

(a) Soil Erosion Hazard Classes

Soil Erosion Hazard Ratings (SEHR) have been assessed using SOILOSS High. The rating has then been used to assess Soil Erosion Hazard (SEH) classes for the net harvest area.

SEHR = R x K x LS x C x P where

R = 3000 Derived from $R = 89.31 \times {}^{2}I_{12}{}^{1.74}$

K = 0.029 topsoil (A Horizon)

Derived from Laboratory Analysis of the A Horizon

A Horizon has been adopted as it gives lower slopes for the erosion classes.

S As factored in SOILOSS High

L = 10 metres

C = 0.45

Derived from 0.45 SEMGL standard

P = 1.0

Slope Ranges (Degrees)	Erosion Hazard Class	Where SEHR is	Indicative % of Net Harvest Area cpt 362
>0 to <=6	Low	less than 40	35
6> to <=27	Moderate	40 - 400	4
27> to <=30	High	400 - 800	nil
N/A	Extreme	greater than 800	nil

(b) Special Conditions

No special conditions, other than the following, are required as the conditions for use with Harvesting Plans, Schedule 4, of the EPA Pollution Control Licence (PCL) for 1995/96, are adequate to address the erosion and pollution risk.

(a) In areas of high erosion hazard, the grades of snig tracks and extraction tracks must not exceed 25°.

(Conditions derived above are to be inserted into the Harvest Plan at Condition 4.7 Soil Erosion and Water Pollution Control, (d) Wet Weather Controls - Seasonal Operations and Safeguards and (k) Extraction Tracks and Snig Tracks, when necessary.)

Preparation (by Forester, Forest Assistant)

Prepared by ..... Signature .....

Title ..... Date .....

District Approval (by District Forester)

Signature .....
District Forester

Date .....

Appendix 1b: Erosion Hazard Assessment - Soil Type "C" Metasediment Formation

(a) Soil Erosion Hazard Classes

Soil Erosion Hazard Ratings (SEHR) have been assessed using SOILOSS High. The rating has then been used to assess Soil Erosion Hazard (SEH) classes for the net harvest area.

SEHR = R x K x LS x C x P where

R = 3000 Derived from $R = 89.31 \times {}^{2}I_{12}{}^{1.74}$

K = 0.050 subsoil (B Horizon)

Derived from Laboratory Analysis of the B Horizon

B Horizon has been adopted as it gives lower slopes for the erosion classes.

S As factored in SOILOSS High

L = 10 metres

C = 0.45

Derived from 0.45 SEMGL standard

P = 1.0

Slope Ranges (Degrees)	Erosion Hazard Class	Where SEHR is	Indicative % of Net Harvest Area cpt 362	cpt 368	cpt 369	cpt 371
0> to <=4	Low	less than 40	5	5	7	10.4
4> to <=19	Moderate	40 - 400	49	72.5	82	75.4
19> to <=29	High	400 - 800	6.5	20.5	10.9	13.9
29> to <=30	Extreme	greater than 800	0.5	2	0.1	0.3

(b) Special Conditions

No special conditions, other than the following, are required as the conditions for use with Harvesting Plans, Schedule 4, of the EPA Pollution Control Licence (PCL) for 1995/96, are adequate to address the erosion and pollution risk.

(a) In areas of high erosion hazard, the grades of snig tracks and extraction tracks must not exceed 25°.

(b) In areas of extreme erosion hazard, snigging and extraction of timber is not permitted if snig track construction is required.

(Conditions derived above are to be inserted into the Harvest Plan at Condition 4.7 Soil Erosion and Water Pollution Control, (d) Wet Weather Controls - Seasonal Operations and Safeguards and (k) Extraction Tracks and Snig Tracks, when necessary.)

Preparation (by Forester, Forest Assistant)

Prepared by ..... Signature .....

Title ..... Date .....

District Approval (by District Forester)

Signature .....
District Forester

Date .....

HARVESTING PROTOCOL ATTACHMENT

Cpts 362, 368, 369, and 371, Grange State Forest

API

The API line-work for these compartments from the Broad Old Growth Mapping Project was obtained from the NPWS Northern Zone (see attached).

Results summary (ocular estimate)

Candidate OGF	Net loggable area (as per photos)
Polygons >25 ha	No
Contiguous areas >25ha	No

Mapping required? No

Prepared by:

L A Walsh
Marketing Forester
5 November 1996

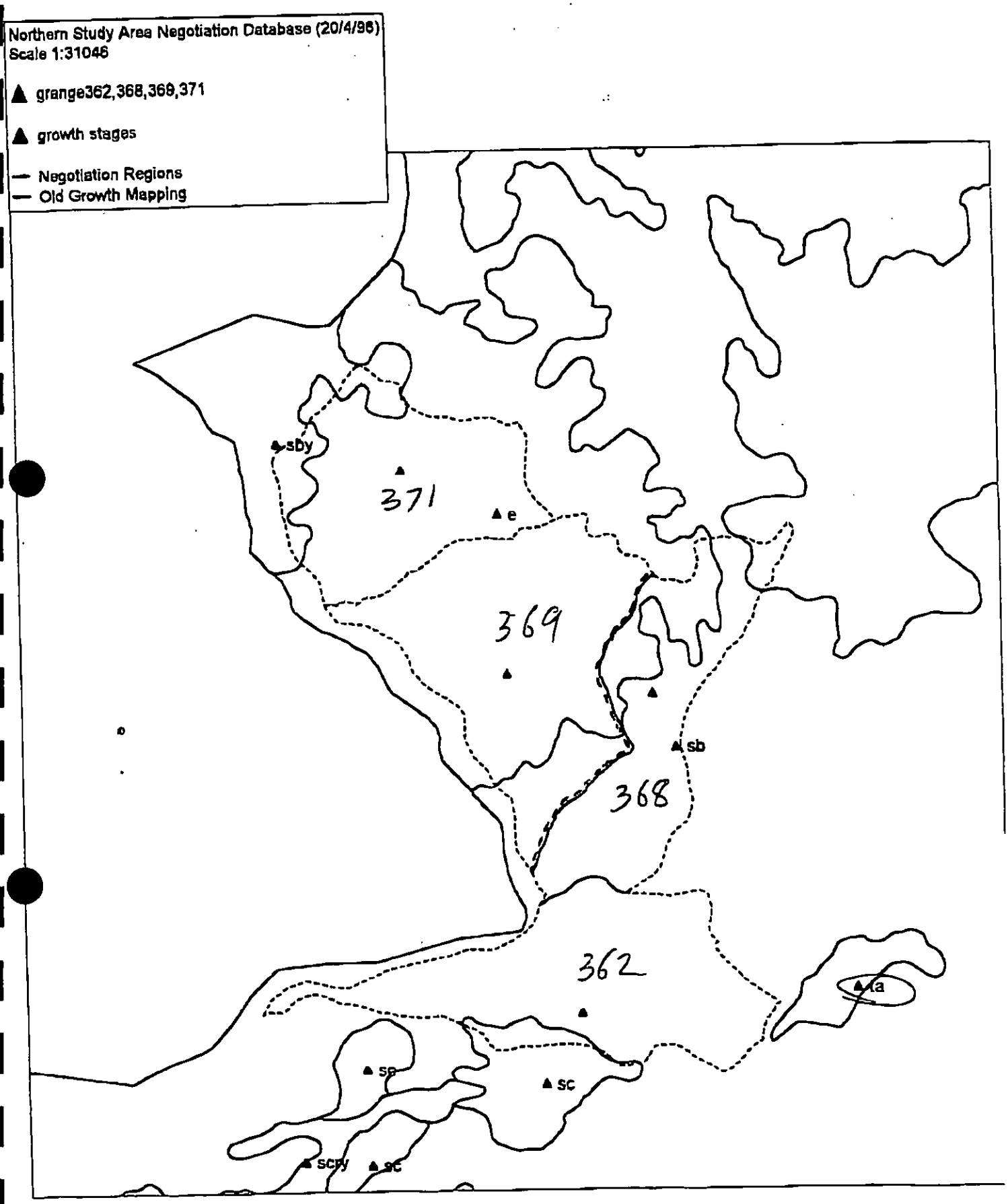
Approved by:

R J Williams
District Forester
Grafton District
Date:

MAP FOR OLD GROWTH PROTOCOL

SOIL SAMPLING REPORT

ROLLOVER CROSSBANK DESIGN CALCULATIONS


Northern Study Area Negotiation Database (20/4/96)
Scale 1:31046
grange362,368,369,371
growth stages
Negotiation Regions
Old Growth Mapping
sDy
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sa
sB
sC
scpy
sc

VENESS & ASSOCIATES

ACN 003 419 958 Pty Limited

10 Dutton Crescent
COFFS HARBOUR NSW 2450
Telephone: (066) 52 7692
Facsimile: (066) 52 8232

17th September, 1996

Attn: Leonie Walsh
State Forests of NSW
PO Box 366
GRAFTON NSW 2460

Dear Leonie,

Re: soil testing / harvesting plans – Grange SF

Attached please find the results of the soil testing program undertaken on samples from compartments 366 & 367 and 362, 368, 369 & 371 within Grange State Forest. It is understood that compartments 366 and 367 will be submitted as one harvesting plan while the other four compartments will be submitted as another harvesting plan.

You would be aware that Veness & Associates undertook the soil survey work associated with the Grafton Forestry EIS. In respect of the area covered by these six compartments, two Soil Mapping Units occur. These are: Unit C – soils developed on metasediments which consist of Ordovician-Silurian sediments comprising of argillites, phyllites, slates and intermediate volcanics, all with abundant quartz veins; and Unit D – soils developed on granites comprising of undifferentiated Carboniferous granites and granodiorites.

These seven compartments in Grange SF were originally sampled by Veness & Associates for harvesting plan purposes in June, 1995 which was prior to the EPA's requirement to locate one sampling site approximately every 100 hectares. This early work generated samples from sites 366/1 & 367/1 and 362/1, 362/2, 368/1, 369/1 & 371/1.

Compartments 362, 368, 369 and 371

These four compartments cover an area of approximately 698 hectares which requires a minimum of seven sampling sites. Consequently, additional sampling was undertaken by Veness & Associates in August, 1996.

The south-western half of compartment 362 is situated on Soil Mapping Unit D (granites) while the north-eastern half of this compartment and the entire area covered by compartments 368, 369 and 371 are situated on Soil Mapping Unit C (metasediments).

The landform elements occurring within each compartment were mapped from the ten metre contour map and these elements were field checked during the soil sampling program. The results of this mapping are presented on the attached map which indicates that within each compartment, there are two landform elements mainly ridge/crest and simple slope. In respect of compartment 362, each of these landform elements occur within each of the two different geologies.

Combined, the two sampling programs resulted in eight sampling sites: three sites were located within the ridge/crest landform element and five sites within the simple slope

element.

At each site, both the A and B horizons were sampled and analysed for PSA and D% while values for 'K' and D% x clay% were calculated. The results of these analyses are presented on the attached report 1946B.

Compartments 366 and 367

These two compartments, located entirely on Soil Mapping Unit C, cover an area of approximately 331 hectares which requires a minimum of three to four sampling sites. Additional sampling was undertaken by Veness & Associates in August, 1996.

The landform elements occurring within each compartment were mapped from the ten metre contour map and these elements were field checked during the soil sampling program. The results of this mapping are presented on the attached map which indicates that within each compartment, there are two landform elements mainly ridge/crest and simple slope.

Combined, the two sampling programs resulted in four sampling sites: two sites were located within the ridge/crest landform element and two sites within the simple slope element.

At each site, both the A and B horizons were sampled and analysed for PSA and D% while values for 'K' and D% x clay% were calculated. The results of these analyses are presented on the attached report 1946C.

The attached map also indicates the location of the sampling sites for each of these seven compartments as well as those for compartments 365, 374, 375 and 376, the results of which will be shortly forwarded to you as report 1946D.

Yours faithfully,

Jim Veness

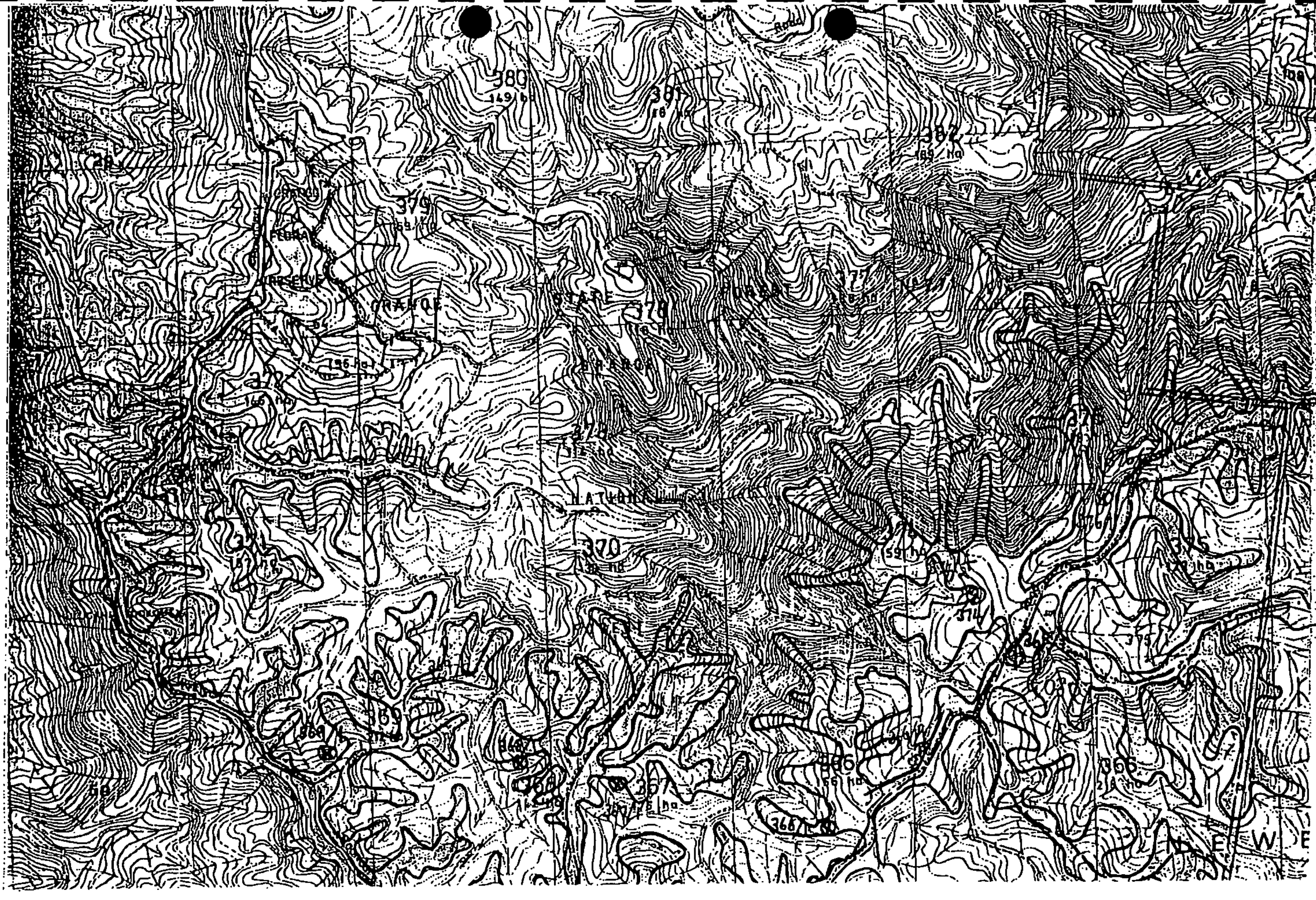
District: Grafton Compartment(s): 362, 368, 369, 371 REPORT NUMBER: VA1946B

Sample Number	Sample Type	Soil Type	Sample Depth (cm)	Horizon Depth (cm)	L'form Elmnt	Particle Size Analysis (%) clay	silt	fine sand	coarse sand	gravel	D%	Texture+	Struct@	Perm@	Organic Matter (%)	'K'#	per cent dispers soil D%xclay%
362/1/A	*Topsoil*	*C*	*0–10*	*nr*	*Ridge/*	*21(22)*	*16(16)*	*32(33)*	*28(29)*	*3*	*16*	*SiCL*	*1*	*3*	*9.43*	*0.020*	*3.36*
362/1/B	*Subsoil*	*C*	*25–30*	*60**	*crest*	*32(33)*	*16(16)*	*24(24)*	*26(27)*	*2*	*34*	*LC*	*1*	*4*	*2.18*	*0.017*	*10.88*
362/2/A	*Topsoil*	*D*	*0–10*	*nr*	*Simple*	*10(10)*	*12(13)*	*30(32)*	*43(45)*	*5*	*29*	*SCL^*	*3*	*3*	*5.45*	*0.022*	*2.90*
362/2/B	*Subsoil*	*D*	*40–50*	*70**	*slope*	*41(45)*	*6 (7)*	*20(22)*	*24(26)*	*9*	*23*	*LC*	*3*	*3*	*0.74*	*0.015*	*9.43*
362/3/A	Topsoil	D	5–12	15	Ridge/	7 (8)	14(15)	34(37)	37(40)	8	29	SCL	3	2	3.44	0.029	2.03
362/3/B	Subsoil	D	20–30	39*	crest	10(11)	13(14)	26(29)	42(46)	9	31	SCL	3	3	5.68	0.021	3.10
362/4/A	Topsoil	C	4–12	16	Simple	10(12)	20(24)	50(60)	4 (4)	16	24	FSCL	2	2	8.60	0.015	2.40
362/4/B	Subsoil	C	30–44	70+	slope	37(38)	24(24)	31(31)	7 (7)	1	12	LC	1	4	2.06	0.023	4.44
368/1/A	*Topsoil*	*C*	*1– 8*	*nr*	*Simple*	*11(17)*	*15(22)*	*22(33)*	*19(28)*	*33*	*19*	*SiCL*	*1*	*3*	*9.43*	*0.008*	*2.09*
368/1/B	*Subsoil*	*C*	*50–60*	*85**	*slope*	*26(31)*	*23(27)*	*17(20)*	*19(22)*	*15*	*40*	*LC*	*1*	*4*	*2.18*	*0.022*	*10.40*
369/1/A	Topsoil	C	2– 8	nr	Simple	14(15)	48(51)	27(29)	5 (5)	6	34	SiCL	1	3	9.43	0.034^	4.76
369/1/B	Subsoil	C	25–30	50*	slope	23(24)	47(48)	22(23)	5 (5)	3	33	LC	2	4	2.18	0.047	7.59
369/2/A	Topsoil	C	2– 6	8	Ridge/	5 (6)	25(30)	32(38)	22(26)	16	22	SiCL	3	3	5.33	0.037	1.10
369/2/B	Subsoil	C	35–45	70+	crest	4 (4)	24(25)	35(36)	34(35)	3	71	FSCL	2	4	1.20	0.050	2.84
371/1/A	*Topsoil*	*C*	*2–10*	*nr*	*Simple*	*21(25)*	*23(28)*	*31(37)*	*8(10)*	*17*	*19*	*SiCL*	*1*	*3*	*9.43*	*0.005*	*3.99*
371/1/B	*Subsoil*	*C*	*25–35*	*50**	*slope*	*34(41)*	*418(22)*	*22(26)*	*9(11)*	*17*	*23*	*LMC*	*2*	*4*	*2.18*	*0.008*	*7.82*

NOTES: PSA values are calculated inclusive of gravels. The values in brackets have been recalculated after excluding gravels
Samples 362/1, 362/2, 368/1, 369/1 and 371/1 printed in italics, were originally presented in report 1595B
+ textures determined after Northcote (1979); @ structure and permeability classes are those to be used in SOILOSS; * BC or C horizon was reached at this depth
nr = not recorded
# 'K' value has been determined using SOILOSS version 5.1; ^ As directed by the SOILOSS program, 'K' for 369/1/A was determined using the nomograph, due to the high proportion of fine sand. It is worth noting that this nomograph only permits the use of organic matter to a maximum of 4% while this layer's value is really 9.4%

These data have been determined on soil samples collected by Veness & Associates.
The laboratory methods used are those required by EPA in its documentation relating to Harvesting Plans.
The data presented on this page have been calculated and determined by me.

Jim Veness
(Managing Director)
VENESS & ASSOCIATES Pty Limited
17th September, 1996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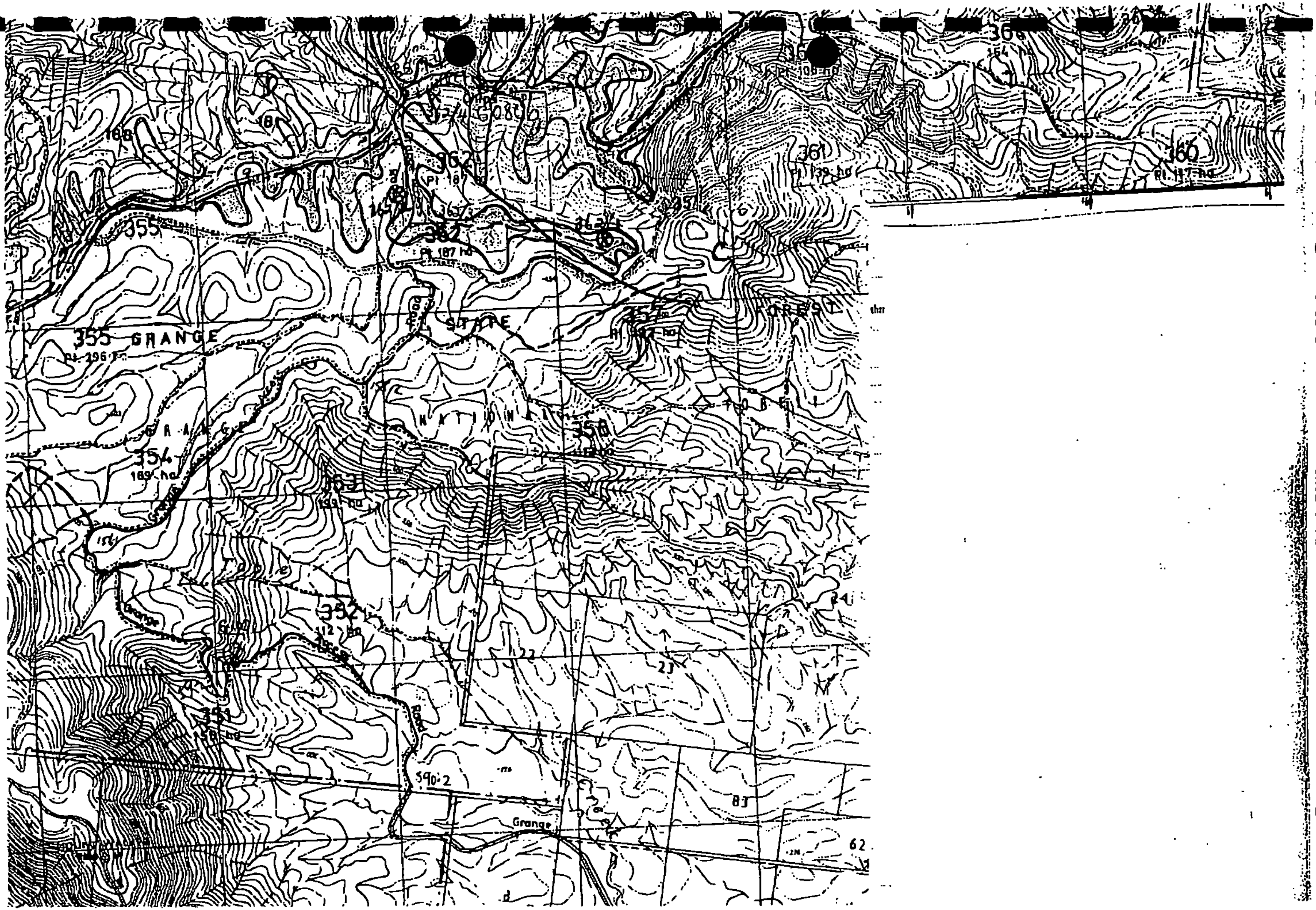
NEW



355 GRANGE
STATE
FOREST
355
354
169 ha
352
112 ha
351
361
360
362
356
Grange
Road
590·2

LAND & WATER CONSERVATION

TO: Bob Williams

FROM: Kel Christiansen

DATE: 29/2/96

SUBJECT: Rollover Crossbank Design

Bob,

I have done some design calculations to determine whether it is valid to use 0.2m as a minimum height for rollover crossbanks at Grafton.

The calculations consist of two components. The first is determination of peak discharge. This has been done using the Kinematic Wave Equation (AR&R, Urban Stormwater Drainage, page 300). A Roughness Coefficient, n, of 0.0275 has been used in this equation. Catchment Areas, (A), are taken as being Road Length x Road Width (5m assumed) and catchment discharge calculated from Q=C.I.A/360 where a Runoff Coefficient, C, of 0.85 (ie 85% runoff) has been adopted. I have attached a printout of these calculations for a variety of bank spacings and road grades. A worst case scenario is assumed i.e. 180m bank spacing on a 15° grade road. The result is a peak discharge of 0.036 cubic metres/second (5 year recurrence interval).

The second component of the bank design is calculation of bank dimensions. This has been done using the Design Manual for Soil Conservation Works, Soil Conservation Service Technical Manual No. 5 (Section 2.5, Bank Design). The design was based on a trapezoidal channel shape. The following bank dimensions were used in the calculations.

Flow Rate (Peak Discharge) = 0.036 cubic metres/second
Bottom Width (B) = 0.5m
Batter Grade (Z) = 3:1
Roughness Coefficient (n) for the channel = 0.0275
Channel Slope = 1%
Velocity = 0.6m/second

The calculations result in a depth of flow of 0.08m. Accordingly, it is considered that a bank height of 0.2 metres is sufficient to convey a 1 in 5 year flow. The extra 0.12 m of bank height is required to provide freeboard and to allow for bank settlement. Note that 0.2m relates to

70 Pound Street, PO Box 242, Grafton NSW 2460
Phone: (066) 43 2222 Fax: (066) 43 2149

compacted bank height. Flatter batters or increased bottom width will decrease depth of flow.

The above figures have been derived for Grafton. Other calculations may need to be done for higher rainfall areas, e.g. closer to Dorrigo, however the differences would not be expected to be significant.

I hope this information is of use to you. Don't hesitate to contact me if you have any further queries.

Regards,

Kel Christiansen

*** FOREST ROADS STORM RUNOFF ***

LOCATION: GRAFTON
ARI= 5 years I(1 hr,ARI)= 47.5 mm/hr Rough. Coeff.= .027
Runoff Co-efficient= .85

ROAD LENGTH metres	SLOPE deg	STORM Tc min.	I mm/hr	DISCHARGE Cumec	VELOCITY m/sec
10	5.[illegible]	[illegible]	[illegible]	[illegible]	0.21
20	[illegible]	[illegible]	[illegible]	[illegible]	0.28
30	5.0	[illegible]	[illegible]	[illegible]	0.32
40	[illegible]	1.7	[illegible]	[illegible]	0.36
50	5.0	2	[illegible]	[illegible]	0.37
60	5.[illegible]	2.4	[illegible]	[illegible]	0.4[illegible]
[illegible]	[illegible]	2.[illegible]	[illegible]	[illegible]	0.44
[illegible]	[illegible]	2.[illegible]	[illegible]	[illegible]	0.46
90	[illegible]	3.[illegible]	[illegible]	[illegible]	0.48
100	5.0	[illegible]	[illegible]	[illegible]	0.50
[illegible]	[illegible]	0.8	[illegible]	[illegible]	0.26
20	[illegible]	1.0	[illegible]	0.[illegible]	0.34
30	10.	1.2	[illegible]	[illegible]	0.40
40	[illegible]	1.5	[illegible]	[illegible]	0.45
50	[illegible]	1.7	[illegible]	[illegible]	0.4[illegible]
60	[illegible]	[illegible]	[illegible]	[illegible]	0.52
70	[illegible]	[illegible]	[illegible]	[illegible]	0.55
80	[illegible]	[illegible]	[illegible]	[illegible]	0.58
90	10.[illegible]	2.[illegible]	[illegible]	0.[illegible]	0.60
100	[illegible]	2.7	[illegible]	0.[illegible]	0.63
10	15.0	0.6	206.2	[illegible]	0.30
20	15.[illegible]	0.9	[illegible]	[illegible]	0.39
30	15.0	[illegible]	[illegible]	[illegible]	0.46
40	15.0	[illegible]	[illegible]	[illegible]	0.51
50	15.[illegible]	1.5	[illegible]	[illegible]	0.55
60	15.[illegible]	[illegible]	[illegible]	[illegible]	0.59
70	15.0	1.9	[illegible]	0.[illegible]	0.63
[illegible]	[illegible]	2.[illegible]	[illegible]	[illegible]	0.66
90	15.0	2.[illegible]	[illegible]	0.010	0.69
[illegible]	15.[illegible]	[illegible]	[illegible]	[illegible]	0.72
10	20.[illegible]	0.[illegible]	[illegible]	0.002	0.33
20	20.[illegible]	0.8	[illegible]	[illegible]005	0.43
30	20.0	1.0	[illegible]	[illegible]	0.50
40	20.[illegible]	1.[illegible]	[illegible]	0.009	0.56
50	20.[illegible]	1.[illegible]	1[illegible]	0.0[illegible]	0.61
60	20.[illegible]	1.5	192.3	[illegible]	0.65
70	20.[illegible]	1.7	190.2	0.014	0.69
80	[illegible]	[illegible]	188.3	[illegible]	0.73
90	20.0	2.0	186.3	0.020	0.76
100	20.[illegible]	2.1	184.5	0.02[illegible]	0.79
10	25.0	0.5	207.6	0.002	0.33
20	25.0	0.7	[illegible]	[illegible]	0.46
30	25.[illegible]	[illegible]	[illegible]	0.[illegible]	0.54
40	25.[illegible]	1.1	[illegible]	0.00[illegible]	0.61
50	25.0	1.3	195.9	0.012	0.66
60	25.0	1.4	193.8	0.014	0.71
70	25.0	1.6	191.9	0.016	0.75
80	25.0	1.7	190.1	0.018	0.79
90	25.0	1.8	188.4	0.020	0.82
100	25.0	2.0	186.8	0.022	0.85

END OF OUTPUT

*** FOREST ROADS STORM RUNOFF ***

LOCATION: GRAFTON
ARI= 5 years I(1 hr,ARI)= 47.6 mm/hr Rough. Coeff.= .0275
Runoff Co-efficient= .65

ROAD LENGTH metres	SLOPE Deg.	STORM Tc min.	I mm/hr	DISCHARGE Cumecs	VELOCITY m/sec
[illegible]	7.0	3.4	170.9	[illegible]	0.47
[illegible]	[illegible]	3.8	168.	[illegible] 22	[illegible]
[illegible]	[illegible]	3.6	166.2	0.024	0.52
[illegible]	[illegible]	4.0	164.1	0.025	0.54
[illegible]	[illegible]	4.2	162.3	[illegible] 27	[illegible]
[illegible]	5.0	[illegible]	160.8	[illegible]	[illegible]
[illegible]	[illegible]	4.4	158.8	[illegible] 030	[illegible]
[illegible]	[illegible]	4.8	[illegible]	0.032	[illegible]
[illegible]	[illegible]	5. [illegible]	155.7	0.03[illegible]	[illegible]
[illegible]	[illegible]	2.7	177.8	[illegible]	[illegible]
[illegible]	[illegible]	2.[illegible]	176.0	[illegible] 023	[illegible]
[illegible]	[illegible]	3.0	174.2	0.022	[illegible]
[illegible]	10.0	3.2	172.4	0.026	0.[illegible]
[illegible]	10.0	3.4	170.8	[illegible] 28	[illegible]
[illegible]	10.[illegible]	3.5	169.2	[illegible] 030	[illegible]
[illegible]	[illegible]	3.7	167.7	0.032	[illegible]
[illegible]	[illegible]	3.[illegible]	166.1	0.033	[illegible]
[illegible]	[illegible]	[illegible]	164.5	[illegible]	0.7[illegible]
100	15.[illegible]	2.4	18[illegible].7	0.021	0.7[illegible]
110	15.[illegible]	2.5	180.2	0.023	0.[illegible]
120	15.0	2.7	178.8	0.025	0.72
130	15.0	[illegible].8	175.9	0.027	[illegible]
140	15.0	2.[illegible]	175.3	0.02[illegible]	[illegible]
150	15.0	[illegible]	174.0	[illegible]	[illegible]
160	[illegible]	3.2	172.8	0.031	0.8[illegible]
170	[illegible]	3.[illegible]	[illegible]	0.034	0.82
180	15.[illegible]	3.4	169.8	0.036	0.87
100	[illegible]	[illegible]	184.[illegible]	0.022	0.7[illegible]
[illegible]	[illegible]	2.2	183.7	0.024	0.[illegible]
120	20.0	2.4	181.6	0.026	0.8[illegible]
130	20.0	2.5	179.5	0.028	0.86
140	20.0	2.7	178.3	0.030	0.80
150	20.0	2.8	177.1	0.031	0.[illegible]
160	20.0	2.9	171.2	0.033	[illegible]
170	20.[illegible]	3.0	174.6	0.035	0.94
180	20.0	3.1	173.3	0.037	0.[illegible]
100	25.0	2.0	186.4	0.022	0.84
110	25.0	2.1	185.0	0.024	0.87
120	25.0	2.2	183.6	0.026	0.90
130	25.0	2.3	182.[illegible]	0.028	0.9[illegible]
140	25.0	2.4	180.8	0.030	0.93
150	25.0	2.6	179.5	0.032	0.9[illegible]
[illegible]	25.[illegible]	2.7	178.[illegible]	0.034	1.0[illegible]
[illegible]	25.[illegible]	2.8	177.[illegible]	0.036	1.0[illegible]
180	25.0	2.9	175.9	0.037	1.04

END OF OUTPUT

EPA

CERTIFIED MAIL

RB 451749553

FORESTRY COMMISSION OF NSW
LOCKED BAG 23 P.O.
PENNANT HILLS NSW 2120

Environment
Protection
Authority
New South Wales

Civic Tower
Cnr of Jacobs Street
and Rickard Road
Locked Bag 1502
Bankstown
NSW 2200

Telephone .02. 9795 5000
Facsimile .02. 9795 5002

Our Reference: 600000/D69/Not. Nos. 003608

Your Reference:

5 December, 1996

NOTICE UNDER SECTION 17D(3)
OF THE POLLUTION CONTROL ACT 1970

WHEREAS -

(a) FORESTRY COMMISSION OF NSW is the holder of licence number 004017 in respect of premises situated at LAND IN THE NORTHERN REGION, - which expires on 7 August, 1997.

TAKE NOTICE THAT -

In accordance with the powers vested in the Environment Protection Authority (EPA) under Section 17D(3) of the Pollution Control Act 1970, the EPA with respect to licence number 004017 from the date of this Notice hereby:-

1. Varies this licence by inserting the following compartment descriptions, corresponding water pollution hazard categories, special conditions, representative water quality monitoring site, and date of licence variation into Schedule 1:

   "Compartments Description

   Compartments 182, 185 & 199
   Forestland State Forest No. 529

Water Pollution Hazard Categories

Geological Unit D - Coarse Grained Granites

Water Pollution Hazard Category	Slope Ranges (degrees)
1	Less than or equal to 5.
2	Greater than 5 and less than or equal to 23.
3	Greater than 23 and less than or equal to 30
4	Not applicable.

Geological Unit E - Fine Grained Granites

Water Pollution Hazard Category	Slope Ranges (degrees)
1	Less than or equal to 4.
2	Greater than 4 and less than or equal to 16.
3	Greater than 16 and less than or equal to 30
4	Not applicable.

Proportion of dispersible soils:

Geological Unit D
A horizon less than 10%
B horizon less than 10%

Geological Unit E
A horizon less than 10%
B horizon greater than 10%

Special Conditions

Special conditions are those conditions contained in the harvesting plan for Compartments 182, 185 & 199, Forestland State Forest No. 529, prepared by State Forests of NSW, received by the EPA on 18 November 1996, and as amended by addendum 1 received by the EPA on 29 November 1996.

********** F I L E C O P Y **********

Water Quality Monitoring Site

To be determined

Date of licence variation

5 December 1996."

2. Varies this licence by inserting the following compartment descriptions, corresponding water pollution hazard categories, special conditions, representative water quality monitoring site, and date of licence variation into Schedule 1:

"**Compartments Description**

Compartments 362, 368, 369 & 371
Grange State Forest No. 771

Water Pollution Hazard Categories

Granite Soils

Water Pollution Hazard Category	Slope Ranges (degrees)
1	Less than or equal to 5.
2	Greater than 5 and less than or equal to 22.
3	Greater than 22 and less than or equal to 30
4	Not applicable.

Proportion of dispersible soils: A horizon less than 10%
B horizon less than 10%

Metasediment Soils

Water Pollution Hazard Category	Slope Ranges (degrees)
1	Less than or equal to 3.
2	Greater than 3 and less than or equal to 13.
3	Greater than 13 and less than or equal to 30
4	Not applicable.

Proportion of dispersible soils: A horizon less than 10%
B horizon greater than 10%

Special Conditions

Special conditions are those conditions contained in the harvesting plan for Compartments 362, 368, 369 & 371, Grange State Forest No. 771, prepared by State Forests of NSW, received by the EPA on 18 November 1996, and as amended by addendum 1 received by the EPA on 3 December 1996.

Water Quality Monitoring Site

To be determined

Date of licence variation

5 December 1996.

NEIL SHEPHERD
Director-General

Per .....
Geoff Noonan
Manager - Waters & Catchments Policy
WATERS AND CATCHMENTS
(by Authorisation)

FOR ACTION OR NOTING BY	
ORIGINATOR	5/12/96
1.	5/12/96
2.	
3.	
4.	

313app-KG

FACSIMILE TRANSMISSION

To	Dr. Neil Shepherd, Environment Protection Authority P O Box 1135 CHATSWOOD NSW 2057		
Attention	Mr Geoff Noonan Catchments Branch	**Date**	5 December 1996
Your Fax		**Our Fax**	(02) 9980 7042
From	Kris Gounder Forest Planning Branch	**Phone**	(02) 9980 4217 (015) 271 625
No of Pages	1 (including this cover page)		

STATE FORESTS

State Forests of New South Wales
Building 2
423 Pennant Hills Road
Pennant Hills NSW 2120
Phone (02) 980 4100

RE: NOTICE UNDER SECTION 17D(3) OF THE POLLUTION CONTROL ACT 1970

In terms of Clause 13(b) of the Pollution Control Regulations, State Forests of New South Wales hereby notifies you that no appeal will be made against EPA's decision to vary Licence No. 4017 on 5 December 1996 to include the following areas:

Compartment No.	State Forest	Management Area
182, 185 & 199	Forestland	Tenterfield
362, 368, 369 & 371	Grange	Grafton

for KRIS GOUNDER
for Manager
Forest Planning

For State Forests Use Only (Page 1 of 5)

District Forester: Glen Innes & Grafton

As required under the above legislation we advised EPA about our intention not to appeal against this Licence amendment **on 5 December 1996**. Accordingly you may start logging these compartments **on 7 December 1996**.

Manager, Forest Planning

HARVEST PLAN DESK AUDIT CHECKLIST

Register No: 1029 Date Received: 18 / 11 /1996.

State Forest: GRANGE Compartment/Age Class: 362, 368, 369, 3-

District: GRAFTON State Forest No: 771

Region: NORTHERN Harvest/Thinning:

Forest Type: Native Forest/Native Plantation/Softwood Plantation* (delete)

WATER POLLUTION HAZARD CATEGORY

Factor	Provided Yes	Provided No	Relevant Yes	Relevant No	Comment
R					R = 3000
K					K = ·029 - GRANITE / 0.05 MEDIUM SEDIMENT
S					as factored by SOILOSS 5.1
L					L = 20 M
C					C = 0·108

Soil Sampling personnel named and approved: Yes (Yes/No)

CALCULATION OF WATER POLLUTION HAZARD CATEGORIES

1. Calculation provided — YES/NO
2. Verified against SOILOSS — YES/NO
3. Appropriate WPHC assigned — YES/NO
4. Slopes associated with WPHC — YES/NO
5. % Compartment per WPHC — YES/NO

Soil Unit 1: GRANITE

	% Cpt	Slope (°)	Catchment Size
WPHC 1	30	0-5	
WPHC 2	25	6-22	
WPHC 3	5	23-30	
WPHC 4			

Soil Unit 2: METASEDIMENTS (if applicable)

	% Cpt.	Slope (°)	Catchment Size
WPHC 1	10	0-3	
WPHC 2	40	4-13	
WPHC 3	50	14-30	
WPHC 4			

Soil Unit 3: _____ (if applicable)

	% Cpt	Slope (°)	Catchment Size
WPHC 1			
WPHC 2			
WPHC 3			
WPHC 4			

PROPORTION DISPERSIBLE SOIL

Soil Unit 1: Granite

A Horizon % D: _____ x % C: _____ / 100 = 2.9
B Horizon % D: _____ x % C: _____ / 100 = 9.43

Soil Unit 2: (if applicable) Metasediments

A Horizon % D: _____ x % C: _____ / 100 = 3.36
B Horizon % D: _____ x % C: _____ / 100 = 10.88

Soil Unit 3: (if applicable)

A Horizon % D: _____ x % C: _____ / 100 = _____
B Horizon % D: _____ x % C: _____ / 100 = _____

REPRESENTATIVE WATER MONITORING

Representative Water Monitoring Site: Yet to be determined State Forest

Annual rainfall: _____ Geology: _____

Forest Type: _____

HARVEST PLAN DESK AUDIT CHECKLIST

Condition	Condition	Comply	Comment
1 b	**Site Specific conditions** Attached site specific conditions to harvesting plan	NIL	
6	**Minimum protection widths for drainage line in native forests** Any prescribed streams, swamps and wetlands	NIL	Pg 13
7	Any major water storages present	NIL	Pg 13
9 (1 c)	Minimum protection widths Show filter strips on harvesting plan map	Y	MAP
~~9 (2)~~	~~Show protection strips on harvesting plan map~~		
10	Prescriptions for marking F, ~~P~~, and B strips in the field		
20	**Operations within Native Forest Protection strips** Person responsible for identifying ~~F~~ strips in the field	Y	Pg 35
22	**Operations within Native Forest Buffer strips** Person responsible for identifying B strips in the field	Y	Pg 35
24	Specifications of techniques for minimising soil exposure and that any disturbance will cause no channelised flow in buffer strip	Y	Pg 35/36.
25	**Minimum protection widths for drainage feature in native plantations** (as per 6 and 7)	N/A	
32	**Operations within Native Plantation Protection strips** (as per 20)		
33	**Operations within Native Plantation Buffer strips** (as per 22 and 24)		

HARVEST PLAN DESK AUDIT CHECKLIST

Condition	Condition	Comply	Comment
34	**Minimum protection widths for drainage feature in Softwoods Plantations** (as per 6 and 7)	N/A	
40	**Operations within Softwood Plantation Filter Strips** Person responsible for determining 5 metre machinery zone	↓	
46	**Operations within Softwood Plantation Buffer Strips** (as per 22 and 24)	↓	
47	**Road design, construction and maintenance** Specify techniques for the road design, construction and maintenance	Y	Pg 32, 33.
48	Proposed road locations are shown on harvesting plan map	Y	Map
49	Maximum slopes for road construction Specify techniques for road stabilisation within 6 months of construction for roads built on slopes > 30 °	NIL	Pg 35
53	**Road Clearing** Specify techniques for clearing areas adjacent to roads with minimal disturbance to groundcover and topsoil and with 70% groundcover attained with 12 months	NIL	
57	**Borrow Pits and Gravel Pits** Specify techniques for 1. construction of stable batters 2. stabilisation at the completion of operations	?	Check.

Condition	Condition	Comply	Comment
60	**Road Batters** Specify road batter stabilisation techniques	Y	Pg 32, 33
63	**Road Drainage** Specify road drainage structures to be used and techniques for: 1. conveying peak flow in 1:5 year event 2. diverting water onto stable surfaces 3. minimising unchecked flow of water from table drains directly to watercourses and drainage lines, snig tracks and log dumps 4. discharging onto surface or structure which provide efficient sediment trapping	Y	Pg 33
71	**Crossing of drainage features** Specify location and type of crossings at drainage features	Y	Pg 15
78	**Road no longer required** Specify techniques to be used to stabilise roads that are no longer used		
81	**Dispersible Soil** Specify techniques used to protect roads and dispose of spoil that is dispersible	Y	Pg 32
89	Snig Track Construction Specify criteria for ensuring that snig tracks are located and constructed where they can be drained effectively	Y	Pg 36

Condition	Condition	Comply	Comment
99	**Snig Track Drainage** Specify techniques to: 1. conveying peak flow in 1:2 year storm event 2. diverting water onto stable surfaces 3. minimising unchecked flow directly to watercourses and drainage lines, snig tracks and log dumps 4. divert water at a velocity which minimises damage to the structure	Y	Pg 36, 37
109	**Downhill snigging** Specify measures to prevent concentrated water flow where downhill snigging occurs	Y	Pg 37
112	**Snig Tracks and Dispersible Soil** Specify measures to protect dispersible soils	Y	Pg 37, 38 Need more
115	**Log Dumps** Specify location of log dumps on harvesting plan map	Y	Map.
119	**Specify techniques for:** 1. drainage of log dumps during and at completion of operation 2. Log dumps being left in a stable condition at the completion of operations	Y	Pg 38

Condition	Condition	Comply	Comment
125	**Burning** Specify key and strategic and operational details of burning: 1. Objective of burn 2. Method of ignition 3. Preferred season of burn	✓ ✓	Pg 38, 39.

Additional Harvesting Plan Requirements

1. Appropriate Variation Conditions (Condition 3 of the Harvesting Plan) Yes/No
2. Appropriate SFO Authority Conditions (Condition 5 of the Harvesting Plan) Yes/No
3. Canopy Gapping Conditions Yes/No

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********** ENVIRONMENT PROTECTION AUTHORITY **********
****

SOIL LOSS ESTIMATION

The computer program, SOILOSS, uses the procedures of the Universal Soil Loss Equation (USLE) to predict the average annual soil loss due to sheet and rill erosion. It is based on extensive research in the United States and by the Soil Conservation Service in New South Wales.

The following report was prepared by SOILOSS:

==========

Estimation prepared for : GRANGE 362
Date : 22-11-1996 Time : 14:34 Report Number : 1

GRANITE

A = R x K x L x S x P x C

Rainfall Erosivity: Rainfall Zone: 2 R = 3000
Soil Erodibility : User supplied K = 0.029
Topography :Slope: 5.0° Slope Length: 20 m LxS = 0.922
Support Practice : No cultivation (P = 1) P = 1.000
Management :
Rotation :
Cultivations :
Stubble Mgmt : - User Supplied C = 0.1080

Long-term average annual soil loss: A = 8.7 t/ha

Soil Loss Targets :

There is very little information to indicate target levels of soil loss for Australian soils. The following are suggested as a guide:

Very deep and fertile soils	<10 t/ha.a
Moderately deep and fertile soils	<5 t/ha.a
Shallow or infertile soils	<1 t/ha.a

Management Options :

To reduce soil loss from 8.7 to 5 t/ha.a the options are :
* Reduce C to 0.0623

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********** ENVIRONMENT PROTECTION AUTHORITY **********
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SOIL LOSS ESTIMATION

The computer program, SOILOSS, uses the procedures of the Universal Soil Loss Equation (USLE) to predict the average annual soil loss due to sheet and rill erosion. It is based on extensive research in the United States and by the Soil Conservation Service in New South Wales.

The following report was prepared by SOILOSS:

==========

Estimation prepared for : GRANGE 362
Date : 22-11-1996 Time : 14:34 Report Number : 2

A = R x K x L x S x P x C

Rainfall Erosivity: Rainfall Zone: 2 R = 3000
Soil Erodibility : User supplied K = 0.029
Topography :Slope: 22.0° Slope Length: 20 m LxS = 5.133
Support Practice : No cultivation (P = 1) P = 1.000
Management :
Rotation :
Cultivations :
Stubble Mgmt : - User Supplied C = 0.1080

Long-term average annual soil loss: A = 48 t/ha

Soil Loss Targets :

There is very little information to indicate target levels of soil loss for Australian soils. The following are suggested as a guide:

Very deep and fertile soils <10 t/ha.a
Moderately deep and fertile soils <5 t/ha.a
Shallow or infertile soils <1 t/ha.a

Management Options :

To reduce soil loss from 48 to 10 t/ha.a the options are :
* Reduce C to 0.0224

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********** ENVIRONMENT PROTECTION AUTHORITY **********
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SOIL LOSS ESTIMATION

The computer program, SOILOSS, uses the procedures of the Universal Soil Loss Equation (USLE) to predict the average annual soil loss due to sheet and rill erosion. It is based on extensive research in the United States and by the Soil Conservation Service in New South Wales.

The following report was prepared by SOILOSS:

==========

Estimation prepared for : GRANGE 362
Date : 22-11-1996 Time : 14:34 Report Number : 3

A = R x K x L x S x P x C

Rainfall Erosivity: Rainfall Zone: 2 R = 3000
Soil Erodibility : User supplied K = 0.029
Topography :Slope: 30.0° Slope Length: 20 m LxS = 6.639
Support Practice : No cultivation (P = 1) P = 1.000
Management :
Rotation :
Cultivations :
Stubble Mgmt : - User Supplied C = 0.1080

Long-term average annual soil loss: A = 62 t/ha

Soil Loss Targets :

There is very little information to indicate target levels of soil loss for Australian soils. The following are suggested as a guide:

Very deep and fertile soils <10 t/ha.a
Moderately deep and fertile soils <5 t/ha.a
Shallow or infertile soils <1 t/ha.a

Management Options :

To reduce soil loss from 62 to 10 t/ha.a the options are :
* Reduce C to 0.0173

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********** ENVIRONMENT PROTECTION AUTHORITY **********
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SOIL LOSS ESTIMATION

The computer program, SOILOSS, uses the procedures of the Universal Soil Loss Equation (USLE) to predict the average annual soil loss due to sheet and rill erosion. It is based on extensive research in the United States and by the Soil Conservation Service in New South Wales.

The following report was prepared by SOILOSS:

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Estimation prepared for : GRANGE 362
Date : 22-11-1996 Time : 14:34 Report Number : 4

METASEDIMENTS

A = R x K x L x S x P x C

Rainfall Erosivity: Rainfall Zone: 2 R = 3000
Soil Erodibility : User supplied K = 0.050
Topography :Slope: 3.0° Slope Length: 20 m LxS = 0.571
Support Practice : No cultivation (P = 1) P = 1.000
Management :
Rotation :
Cultivations :
Stubble Mgmt : - User Supplied C = 0.1080

Long-term average annual soil loss: A = 9.2 t/ha

Soil Loss Targets :

There is very little information to indicate target levels of soil loss for Australian soils. The following are suggested as a guide:

Very deep and fertile soils	<10 t/ha.a
Moderately deep and fertile soils	<5 t/ha.a
Shallow or infertile soils	<1 t/ha.a

Management Options :

To reduce soil loss from 9.2 to 5 t/ha.a the options are :
* Reduce C to 0.0584

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********** ENVIRONMENT PROTECTION AUTHORITY **********
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SOIL LOSS ESTIMATION

The computer program, SOILOSS, uses the procedures of the Universal Soil Loss Equation (USLE) to predict the average annual soil loss due to sheet and rill erosion. It is based on extensive research in the United States and by the Soil Conservation Service in New South Wales.

The following report was prepared by SOILOSS:

==========

Estimation prepared for : GRANGE 362
Date : 22-11-1996 Time : 14:35 Report Number : 5

A = R x K x L x S x P x C

Rainfall Erosivity: Rainfall Zone: 2 R = 3000
Soil Erodibility : User supplied K = 0.050
Topography :Slope: 13.0° Slope Length: 20 m LxS = 3.026
Support Practice : No cultivation (P = 1) P = 1.000
Management :
Rotation :
Cultivations :
Stubble Mgmt : - User Supplied C = 0.1080

Long-term average annual soil loss: A = 49 t/ha

Soil Loss Targets :

There is very little information to indicate target levels of soil loss for Australian soils. The following are suggested as a guide:

Very deep and fertile soils <10 t/ha.a
Moderately deep and fertile soils <5 t/ha.a
Shallow or infertile soils <1 t/ha.a

Management Options :

To reduce soil loss from 49 to 10 t/ha.a the options are :
* Reduce C to 0.0220

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****
********** ENVIRONMENT PROTECTION AUTHORITY **********
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SOIL LOSS ESTIMATION

The computer program, SOILOSS, uses the procedures of the Universal Soil Loss Equation (USLE) to predict the average annual soil loss due to sheet and rill erosion. It is based on extensive research in the United States and by the Soil Conservation Service in New South Wales.

The following report was prepared by SOILOSS:

==========
===

Estimation prepared for : GRANGE 362
Date : 22-11-1996 Time : 14:35 Report Number : 6

A = R x K x L x S x P x C

Rainfall Erosivity: Rainfall Zone: 2 R = 3000
Soil Erodibility : User supplied K = 0.050
Topography :Slope: 30.0° Slope Length: 20 m LxS = 6.639
Support Practice : No cultivation (P = 1) P = 1.000
Management :
Rotation :
Cultivations :
Stubble Mgmt : - User Supplied C = 0.1080

Long-term average annual soil loss: A = 108 t/ha

Soil Loss Targets :

There is very little information to indicate target levels of soil loss for Australian soils. The following are suggested as a guide:

Very deep and fertile soils <10 t/ha.a
Moderately deep and fertile soils <5 t/ha.a
Shallow or infertile soils <1 t/ha.a

Management Options :

To reduce soil loss from 108 to 10 t/ha.a the options are :
* Reduce C to 0.0100

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Grange 362, 368, 369 & 371

0.1048

NORTH
3/12/96

Previous Register #1029

FACSIMILE TRANSMISSION

To	Forest Regulations Coordinator		
Attention		Date	29/11/96
Your Ref		Our Ref	286
From	Leonie Walsh	Phone	(066) 432022
No of Pages	7 (including this cover page)		

STATE FORESTS
NORTHERN REGION

State Forests of
New South Wales
Grafton District
PO Box 386
Grafton NSW 2460
Phone (066) 432 022

Message

Harvesting Plan - Cpts 362, 368, 369 and 371
Grange SF

The following points relate to the EPA's request dated 28 November 1996. Where appropriate, amended harvesting plan pages follow.

1. The boundary was determined on the 1:25000 map by soil scientist Jim Veness (see soil report attached to the harvesting plan). Mr Veness examined the geology in the field, and considers the boundary is absolutely correct. The difference between the soils is clear in the field. Please note that all SFOs in this District have undergone the Supervisor level Soil and Water Training, and are also very capable map-readers. Even so, for ease of implementation in the field, an amended boundary will be adopted (see map following), that uses readily identifiable features (Grange Access Road, and topographical features). This is on the western side of the actual boundary and therefore more stringent conditions will be imposed in the area in between. This is considered adequate to eliminate any possibility of misidentification.

2. The original figures on page 31 are incorrect. My apologies.

3. Again, my apologies.

4. See attached.

5. No

6. I have included a condition that addressess condition 54 of the PCL. I do not know how I can be any more specific. It should be noted that the sort of clearing being discussed is almost invariably no more than the removal of shrubs and trees. Grass cover on road edges is almost never disturbed. It should also be noted that all operators in this District have undergone the Operator level of the Soil and Water Training.

Please contact Leonie Walsh at this office if any further information is required.

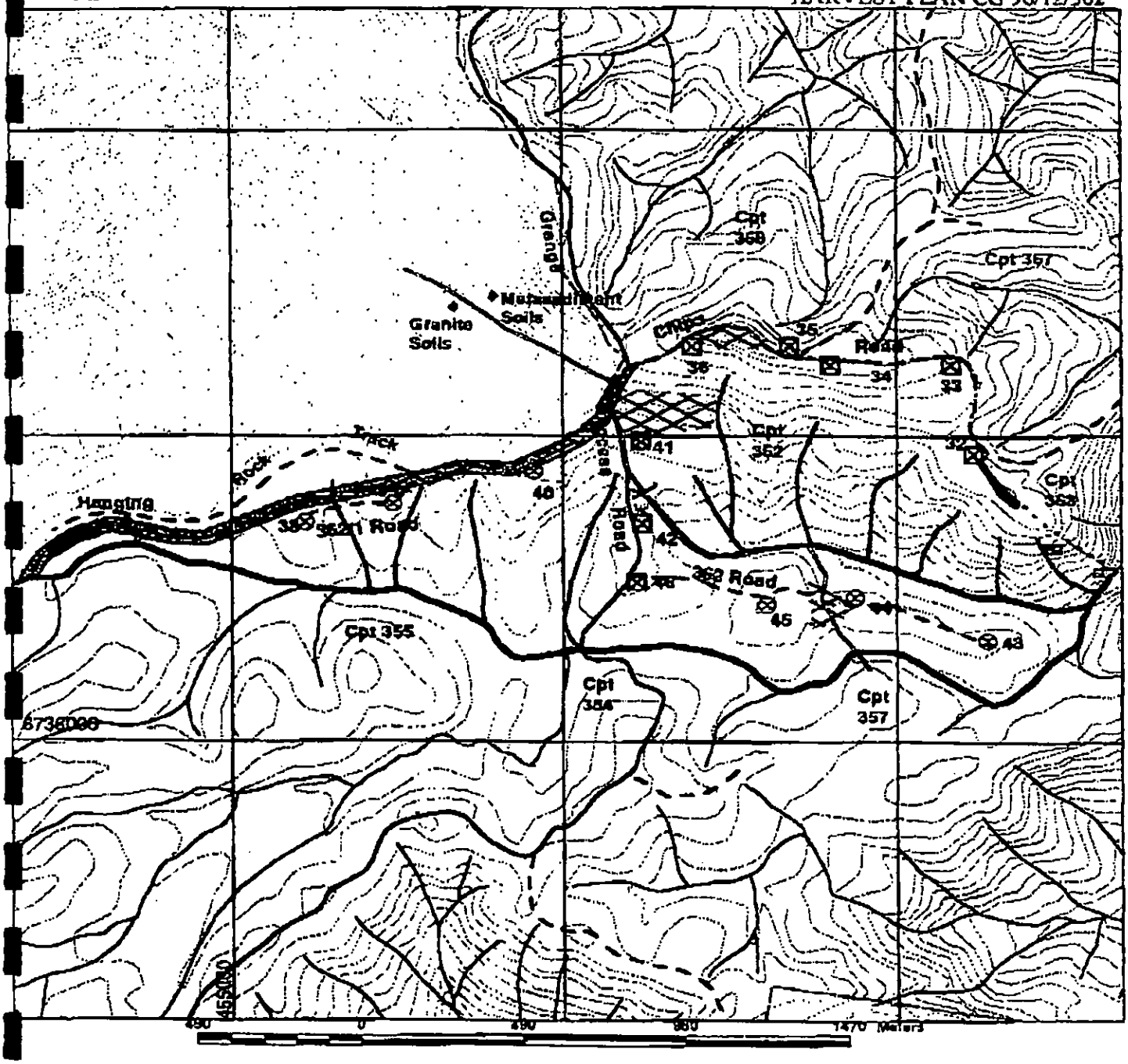
for RJ Williams
District Forester
GRAFTON DISTRICT

NORTHERN REGION - GRAFTON DISTRICT
HARVEST PLAN OPERATIONAL MAP
COMPARTMENT 362
GRANGE STATE FOREST

FORESTS

SCALE 1:17000
JACKADGERY/CAMELBACK MAP SHEET

6 NOVEMBER 1996
HARVEST PLAN CG 96/12/362



BOUNDARIES
- State Forest Boundary
- Compartment Boundaries
- Soil Unit Boundary

ROADS
- Natural Surface
- Sealed or Gravelled

NORMAL PRESCRIPTIONS
- Harvestable Area
- Downhill Snigging

MODIFIED PRESCRIPTIONS
- Visual Resource Protection

DUMP SITES OR LANDINGS
- Permanent Dry
- Permanent Wet

NON HARVEST AREAS
- Riparian Habitat Zones
- Aboriginal Archaeological Site

WATERCOURSES & DRAINAGE
- Filter Strip
- Drainage Line

MN

subsequent operations), and over that part of Western Boundary Road being used during this operation.

Hanging Rock Track (0.5 km) runs through the private property along the boundary of compartment 362. This road will be used during the operation to take logs out from the western section of the compartment. This road is long established, stable and is drained by a combination of rollovers, mitre drains and outfall drainage. The batters are stable and well vegetated. The maximum height of the cut and fill batters is about 80 cm for a total of approximately 20 m (there are no other batters). Maximum width of existing running surface is 4 m and the maximum cleared width either side of the road is about 1.5 m. Maximum road grade is 6°.

Minor roads, 362 (1.0 km), 362/1 (0.25 km), 368 (2.0 km), 368/1 (0.5 km), 369 (1.5 km), 369/1 (0.75 km), 369/2 (0.75 km), 371 (1.75 km), 371/1 (0.5 km) and 372 (1.25 km) Roads give access to ridges within the compartments. These will be reopened for use during the operations. These are stable roads with litter and grass cover. They are drained by a combination of outfall drainage, rollovers and mitre drains. All batters are stable and well vegetated. They are generally about 1 m high. Maximum batter height is 2.0 m for a total distance of approximately 80 m. Maximum width of existing running surface is 3 m. The maximum cleared width on either side of the running surface is 1.5 m. Maximum road grade on the minor roads is 14° which runs for a total of approximately 150 m. Road grade everywhere else is less than 10°.

Reopening of minor roads will involve removal of fallen timber and regrowth from the road pavement, and very limited brushing of vegetation that may interfere with movement of trucks. Crossfall banks will need to be lowered that have been constructed. This will be done by logging machinery and will cause minimal disturbance to the road pavements.

The pavements have been consolidated by long use and the verges are well grassed. There is no evidence of existing erosion. None of the existing roads are likely to cause significant water pollution.

Chips, Hanging Rock and 372 Roads are to remain open. Other minor roads in the compartments will be bedded down and closed to traffic.

Use of existing drainage feature crossings

Grange Access Road and Western Boundary Road cross a number of drainage lines. Most of these crossings are log bridges (7). There is also one pipe and one open natural surface causeway (over Table Creek). These crossings are stable. There are permanent water pools in these crossings.

362/1 Road crosses a drainage line in the north-western section of compartment 362. This crossing is a long established, stable, open, natural surface causeway. The batters are stable and well vegetated. No additional stabilisation work is required on this crossing, which will only be used in dry weather conditions.

There is a very old crossing on 371 Road in the south-eastern section of the compartments, which does not appear to have been used for about 40-50 years. This crossing will not be used in this operation, and does not require any additional stabilisation work.

Road construction

Not applicable to this operation. There will be no need to establish borrow pits or gravel pits.

100 metre radius buffer zone must be established around each identified location site. This prescription is to be reviewed when more than 10 locations of the species have been recorded in the management area.

Prescription 11:

Golden-tipped Bat/Little Bent-wing Bat/Common Bent-wing Bat/Large-footed Mouse-eared Bat

100 metre radius buffer zone must be established around each identified roost site. This prescription is to be reviewed when more than 10 locations of the species have been recorded in the management area.

References
Environmental Impact Statement Grafton Management Area.
State Forests' Response to Submissions to the Grafton Environmental Impact Statement.

(a) Soil Erosion and Water Pollution Categories

The calculated Soil Erosion and Water Pollution Categories for Compartments 362, 368, 369 and 371, based on the topsoil data from site 362/3 for Granite soils and the subsoil data from site 369/2 for Metasediment soils, are detailed in Tables 4a and 4b below.

Table 4a - Water Pollution Hazard Categories
Granite Soils

Slope Ranges (Degrees)	Water Pollution Category	Indicative % of Net Harvest Area cpt 362
0 - ≤5	1	30
>5 - ≤22	2	25
>22 - ≤30	3	5
Roads	3	N/A

Table 4b - Water Pollution Hazard Categories
Metasediment Soils

Slope Ranges (Degrees)	Water Pollution Category	Indicative % of Net Harvest Area			
		cpt 362	cpt 368	cpt 369	cpt 371
0 - ≤3	1	5	5	5	10
>3 - ≤13	2	10	35	40	40
>13 - ≤30	3	25	60	55	50
Roads	3	N/A	N/A	N/A	N/A

For operational purposes, the boundary shown on the Operational Map must be taken to be the soil unit boundary. The sections of soil unit boundary between Grange Access Road and the gully, and between the gully and the compartment boundary, must by marked in the field by the SFO.

(b) Approved Timber Harvesting and Extraction Method

- Chainsaw felling, using directional felling techniques where required.
- Snigging of logs using a crawler tractor and/or a rubber tyred skidder.
- Debarking and loading of logs at the dump using an excavator or forklift.
- Transport of logs from the site using a jinker and prime mover.

Disturbance to cut batters and stable, well vegetated table drains must be avoided.

The direction of grading must be away from crossings.

When working in mitre drains, the machine must reverse down the drain and grade back onto the road where practicable. when reinstating outfall drainage, outside windrows must be graded back onto the road where practicable, not brushed off the side.

Spoil must not be deposited in filter strips. Any spoil from the operation accidentally deposited within a drainage line or watercourse must be removed with minimal bed or bank disturbance unless removal will cause more damage than non-removal. Spoil so removed must be respread on the road pavement or deposited outside the filter strip.

Where there is less than 5 m undisturbed vegetation between a drainage outlet and a drainage feature, a sediment trap (silt mesh or hay bales) must be installed. The Operations Foreman is responsible for the installation of sediment traps.

Clearing of regrowth

Reopening of existing roads will involve lowering of crossbanks and the removal of fallen timber and small regrowth from the road pavement and edges. Clearing outside the running surface must be confined to the minimum required to provide safe sight distances and effective drainage, and allow free movement by logging trucks. Maximum clearing width on either side of the running surface is 1.5 m on the minor roads within the compartments, and 2 m on Chips Road. Debris from clearing must not be deposited in the outlets of drainage structures. Tree debris must not be deposited within filter strips.

Soil disturbance must be minimised. In particular, disturbance to road batters in the Metasediment soils must be avoided. Existing ground cover must be retained as much as possible. Where more than 30% of existing ground cover is removed, it must be replaced with:

- Logging and/or clearing debris; and/or
- At least 5 cm of top soil, and seeded with 20 kg/ha of Japanese millet (or other suitable species).

Road surface drainage

Rollover crossbanks may be required on some sections of the minor roads to log dumps where outfall drainage has not been established or is inadequate. Where required, rollover crossbanks must be spaced as stated in the Table below. The banks must have a minimum design consolidated vertical height from spillway to bank top of 20 cm. Such banks will convey the peak flow of a 1 in 5 year storm event (see calculations attached as Appendix 2).

Spacing of Rollover Crossbank Drainage
(grade of road - degrees)

0 - ≤5	>5 - ≤10	over 10
100m	60m	40m

Rollover crossbanks must drain onto undisturbed vegetation or logging slash wherever possible. Where it is necessary to convey runoff water over a fill batter greater than 1 m high, that has been disturbed by the operation or on which the soil is exposed, drop down structures constructed of rock or prefabricated fluming must be installed. Dissipaters must be installed at the bottom of drop down structures.

Road drainage must minimise the flow of unchecked water onto extraction tracks, snig tracks or log dumps. Where this cannot be achieved by outfall drainage, a rollover crossbank must

permitted. The SFO is also responsible for identifying areas over 29°, where snig track construction is not permitted.

(h) Drainage Feature Protection

Riparian Habitat Zones exist 20 metres either side of watercourses, drainage lines and drainage depressions with catchments greater than 40 hectares.

Filter strips must be retained along all watercourses and drainage lines within the net harvest area of Compartments 362, 368, 389 and 371 at minimum widths (measured in the horizontal plane) as stated in Table 5 below. These minimum widths meet or exceed the requirements of the Pollution Control Licence.

Where a filter strip extends beyond the boundary of the catchment of the drainage feature that is the subject of the protection, then the filter strip may be terminated at the catchment boundary.

In addition buffer strips 5 metres wide must be maintained on either side of drainage depressions.

Table 5 - Filter Strip Widths
(distance each side of stream)

Water Pollution Category	CATCHMENT /SLOPE	Riparian Zone	Filter Strip
1	<40 ha		5m
1	>40 ha	20m	
2	<40 ha		10m
2	>40 ha	20m	
3	<40 ha <18° slope		15m
3	<40 ha >18° slope		20m
3	>40 ha <18° slope	20m	
3	>40 ha >18° slope		30m

(i) Tree Marking Rules for Filter Strips and Buffer Strips

The SFO must mark the Riparian Habitat Zones and filter strips in the compartment progressively ahead of harvesting operations, except where there are no trees marked for removal within a tree length of Riparian Habitat Zones and filter strips.(See also 4.2, 5.2)

Contractors and operators are responsible for identifying drainage depressions encountered in the field and taking appropriate action whilst operating within the buffer strip or crossing the drainage depression. (See also 5.2)

(j) Felling and Extraction from Filter Strips

Trees located in a filter strip must not be felled, except for the purposes of constructing an approved road, extraction or snig track crossing.

Trees must not be felled into filter strips.

must be rehabilitated after use, and any harvesting debris inadvertently deposited during use must be removed from the channel. As far as practicable the crossing point must be reshaped to its original condition and seeded with Japanese millet or other suitable species at the rate of 20 Kg/ha.

(o) Dispersible Soils

It is not anticipated that snigging will expose significantly dispersible subsoil. To minimise the possibility, walkover extraction techniques must be utilised wherever practicable. If more than 30% of metasediment subsoil, measured over any 20 m length of track is exposed, topsoil or logging slash from the track construction must be spread over the track surface at the site and at the completion of use of the track, cut and fill batters must be seeded with Japanese millet or other suitable species at the rate of 20kg/ha.

(p) Log Dumps

Field location of log dumps must utilise the most level site available, consistent with the location marked in the field and indicated on the Operational Map.

Because of the dispersible subsoil, topsoil must not be stripped and stockpiled on dumps in the metasediment soils (ie dumps 1-36 and 43). Before operations on the remaining dumps (37-42, 44-46), topsoil must be stripped and stockpiled, and respread at the completion of operations.

Dumps must be constructed with outfall drainage and must be kept drained during use and at the completion of operations.

Upon completion of operations any debris at or near the edge of a dump must be moved away from standing vegetation into the dump area. The log dump surface must be left in a stable condition by using one of the following techniques or a combination thereof:

- retaining at least 70% ground cover of existing vegetation;
- retaining a 70% cover of logging slash
- retaining a 70% cover of at least 5 cm of topsoil;

Where these techniques are not adequate to ensure stability of the dump surface, it must be seeded with Japanese millet at the rate of 20 kg/ha.

(q) Prescribed Burning

Pre-logging burning

The is no pre-logging burning associated with the harvesting of Compartments 362, 368, 369 and 371.

Post-logging burning

Post-logging burning of Compartments 362, 368, 369 and 371 must be carried out in accordance with provisions and specifications of the Nymboida District Fire Plan and the Grafton District Fuel Management Plan.

Objectives

Post-logging burning objectives for the compartment are:

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EPA

Environment
Protection
Authority
New South Wales

Civic Tower
Cnr of Jacobs Street
and Rickard Road
Locked Bag 1502
Bankstown
NSW 2200

Telephone .02. 9795 5000
Facsimile .02. 9795 5002

Mr D.Ridley
Manager - Forest Planning Branch
State Forests of NSW
Locked Bag 23
Pennant Hills NSW 2120

Our Reference: 600000D1

Your Reference: FPB 70846

Dear Mr Ridley,

I refer to State Forests' application received by the EPA on 18 November 1996 to vary the Pollution Control Licence for the Northern Region, in relation to the harvesting plan listed below:

Compartment	State Forest	District
362, 368, 369, 371	Grange	Grafton

The EPA is unable to determine your application based on the information you supplied. The additional information needed is detailed in the attachments to this letter. You are advised that under the requirements of Condition 20, Division 1 of the Pollution Control Licence, the EPA considers that the 41 days review period, commences on the receipt of the information sought. Once this information is provided, your application will be determined.

Yours sincerely

per 28/11/96

GEOFF NOONAN
Manager, Waters and Catchments Policy

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Request for Additional Information on Harvesting Plan for Grange State Forest, Compartments 362,368,369 & 371.

28 November 1996

The points requiring clarification for this harvesting plan are as follows:

1) A qualified person should determine the location of the boundary between the metasediment and granitic soils in the field prior to operations commencing. The location as shown on the harvest plan operational map if transposed from the Grafton Management Area EIS is indicative only as the scale difference does not allow direct transposing between the two maps. If the boundary shown on the harvest plan operation map has been mapped at a scale of 1:~~15000~~ 17000 by a qualified person then it is still required for the location in the field to be marked by a similarly qualified person who can identify boundaries between two soil units. Such a person needs to specified within the harvest plan.

2) The % of net harvest area differs between the tables on page 17 and page 31.

3) Table 5 page 35. The following filter strip widths should be altered to be consistent with the PCL. A) <40 ha & > 18 degrees = 20 m filter strip (WPHC3)
B) >40 ha & > 18 degrees = 30 m filter strip (WPHC 3)

4) Section 4.7 (o) Dispersible Soils. What mitigating methods are proposed for fill batters with exposed dispersible material?

5) Are gravel / borrow pits proposed for use in this operation?

6) Section 4.7 (e) Clearing of Regrowth. The section on the clearing of regrowth on areas adjacent to the running surface of existing roads, i.e. 1.5m on minor roads and 2m width on Chips Road requires details specifying how soil disturbance will be minimized and avoided on metasediment soils. Condition # 54 of the PCL should be addressed in this section of the harvest plan.