

	Management Plan Limestone National Forest Offset Area Revegetation Plan			 NORTH PARKES
	Doc ID No. NA	Version No. No.1	Owner PSE Manager	Next Review Date NA

Management Plan

Limestone National Forest Offset Area

Revegetation Plan

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Revision Summary

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0	16 Jul 07	Document drafted by NPM	NPM

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1	6 Oct 2015		Document reformatted into CMOC template by R. Feeney	Environment and Farms Superintendent

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1. BACKGROUND

This Revegetation Plan is an outline of the work to be undertaken by Northparkes Mines (NPM) to fulfil the commitments (as outlined in the Environmental Assessment (Corkery, 2006)), development consent conditions and other requirements discussed with representatives from the Department of Primary Industries – Forests in Dubbo.

Revegetation of the Limestone National Forest (LNF) offset area will be undertaken in conjunction with the NPM annual tree corridor establishment initiative. Works will be undertaken by the NPM appointed Farm Manager, using established preparation and planting methods.

The area to be affected by the subsidence zone, along with the 45.14 hectares (ha) of offset area has been duly registered and the legal transfer of ownership is in progress.

1.1 General site overview

NPM is a metalliferous mining operation located 27 km north of Parkes, New South Wales (NSW). The main features of the operation comprises of an underground section (E26), two open cut pits (E22 & E27), a surface mineral processing facility and two tailings storage facilities (Figure 1).

NPM currently extracts copper-gold bearing ore from an underground block cave referred to as E26. The operation processes approximately 5.5 million tonnes of ore per annum and produces around 130,000 tonnes per annum of copper concentrate. The mine has been operational for 12 years, with a further planned operating life to 2018 based on known reserves. The mine employs a full time workforce consisting of approximately 200 direct employees and an additional 250 contractors.

The project location and the area around Parkes are typical of the intensively developed agricultural land of the central slopes of NSW. The pre-European settlement landscape of open savannah woodlands has been extensively cleared, with trees generally confined to road verges, scattered along creek lines and areas too poor to cultivate such as rocky outcrops or clay gilgais.

1.2 Development description

In 1993 a significant copper-gold bearing orebody was discovered approximately 2km north of the existing E26 underground mine. This orebody is locally referred to as E48 (Figure 2) and is expected to produce 35 million tonnes. Development of the underground block cave is currently underway and mining of the E48 reserve is scheduled to begin in 2009 and continue for eight years.

Underground mining of the ore body will result in the removal of the geology under the clay and soil layers which will create a subsurface cavity. Over time the surface layers (soil profile and weathered rock) will collapse into the underlying cavity resulting in a surface subsidence of approximately 24.4 ha as indicated in Figure 2. The surface subsidence will be similar in outcome to the E26 subsidence area (Figure 1).

1.3 Offset area

An offset area of 45.14ha on the western side of the LNF has been swapped to compensate for the area to be disturbed as a result of the E48 surface subsidence (Figure 2). Agreements were exchanged on 12 October 2006, subsequently all statutory requirements for the transfer of the offset property have been concluded.

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1.4 Statutory requirements

1.4.1 NPM commitments

Listed below are the commitments specific to the LNF offset area made by NPM in the Environmental Assessment (Corkery, 2006).

- Section 9.12: Prepare and implement a detailed revegetation plan for the Limestone National Forest offset area.
- Section 9.17: Swap an area of 45ha (as identified in Figure F1 of the Environmental Assessment in agreement with the Department of Primary Industries (DPI Forests)) for 24ha located within the E48 subsidence zone.
- Section 9.18: Prepare, seed, plant, monitor and maintain (including weed control) in order to revegetate the offset area"
- Section 9.19: Ensure revegetation of offset area involves the use of local native species, sourced locally.

1.4.2 Project Development Consent Conditions

Listed below is the consent condition relating specifically to the LNF offset area, and can be found in Schedule 3, Section 13 of the project approval (Department of Planning, 2006).

13. The Proponent shall:

- revegetate the 45.14ha of land adjacent to the Limestone National Forest As marked in blue and labelled "Addition To Limestone National Forest" on Figure 2 in Appendix 2); and
- monitor and maintain this vegetation for 3 years, to the satisfaction of DPI (Forests).

This Plan has been prepared in consultation with the DPI - Forests (Appendix A).

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Figure 1 Northparkes Mines Existing Layout

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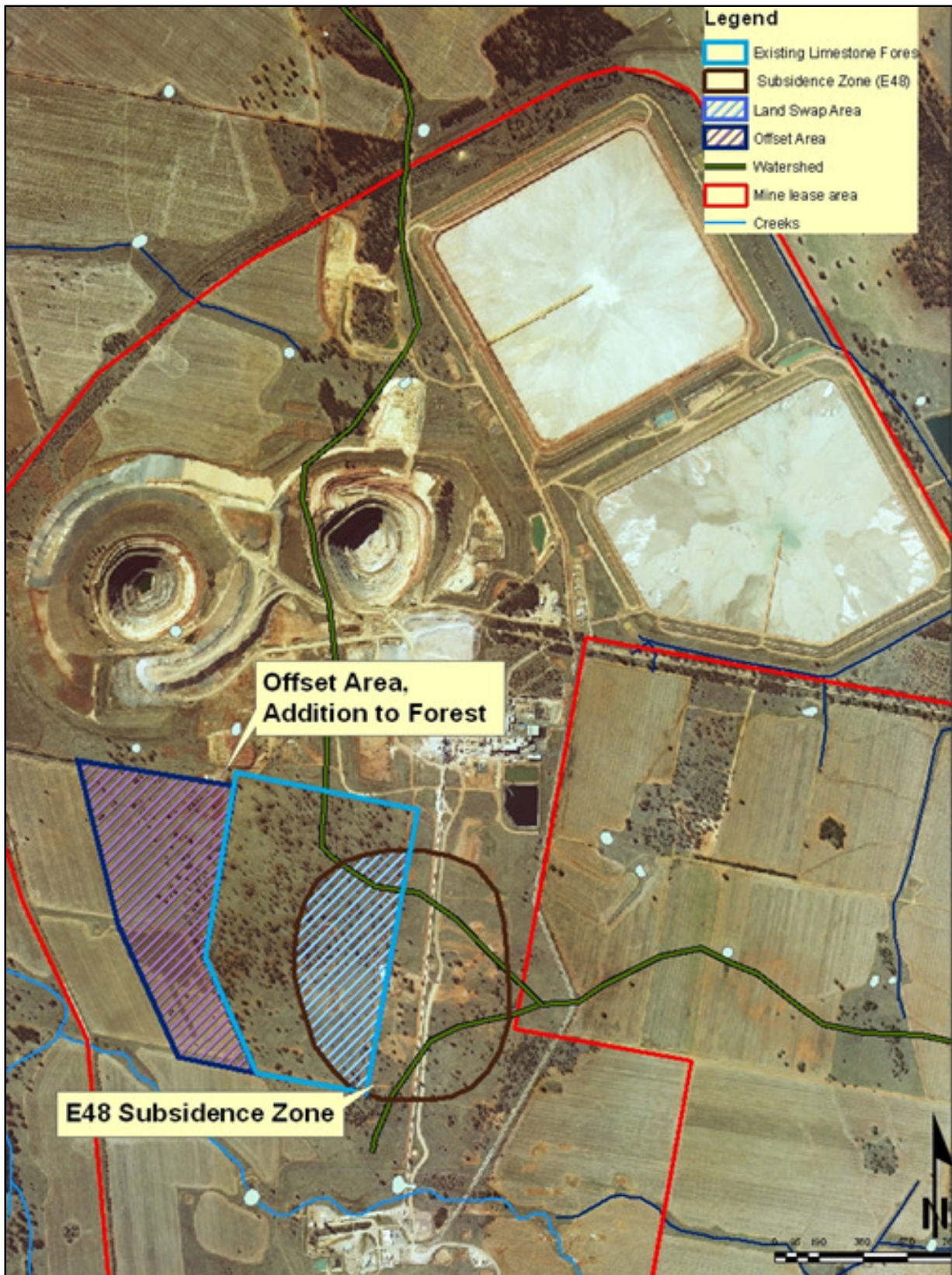


Figure 2 Limestone National Forest Offset Area

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2. OFFSET AREA LANDSCAPE CHARACTERISTICS

2.1 Landform

Landform falls within the Mid Lachlan Region and can be described as flat to gentle sloping, with drainage in a westerly direction towards the Bogan River.

2.2 Soil profile types

A soil study was undertaken as part of the Environmental Assessment (Cunningham, 2006) identified two main soil types in the offset area (Figure 3).

Unit 1: Red Dermosol, Red Chromosol.

Unit 1 soil profile is described by Cunningham (2006) as follows:

Soil to 88cm deep; usually crest location sometimes midslopes; surface condition usually firm to hard setting, sometimes loos; some much angular [sometimes rounded] surface gravel 1-5cm present; at times angular stones to 20cm recorded

Topsoil – loam, sandy clay loam, clay loam, occasionally silty clay loam or loam; mainly roots present; no line present, no gypsum present; no manganese present; pH 5.0-7.0.

Subsoil – two subsoil horizons identified in sample pits; texture generally becomes more clayey with depth' sandy light clay, light clay, light to medium clay, medium to heavy clay usually many roots present no line present; no gypsum present; usually some manganese present; pH 5.5-7.5.

Unit 2: Red, Brown or Black Vertosol.

Unit 2 soil profile is described by Cunningham (2006) as follows:

Topsoil – is usually a light to medium clay, medium clay, medium to heavy clay, rarely loam; usually roots common to many; no lime present no gypsum present, no manganese present pH usually 5.0 – 6.5. No gravel or stones observed

Subsoil – comprised of up to five horizons; clay texture throughout with horizons sometimes becoming gritty near bedrock; usually high pedal but some massive horizons sometimes becoming gritty near bedrock".

2.3 Land use

Current land uses for the offset area are agricultural (cropping) and natural forest. These land uses approximately correlate with the mapped soil type profiles, where cropping takes place in the deeper soils of 'Unit 2' and the forest areas occur in the shallow soils of 'Unit 1' (Figure 3). The offset area will be integrated into the Limestone National Forest with final land use as forest.

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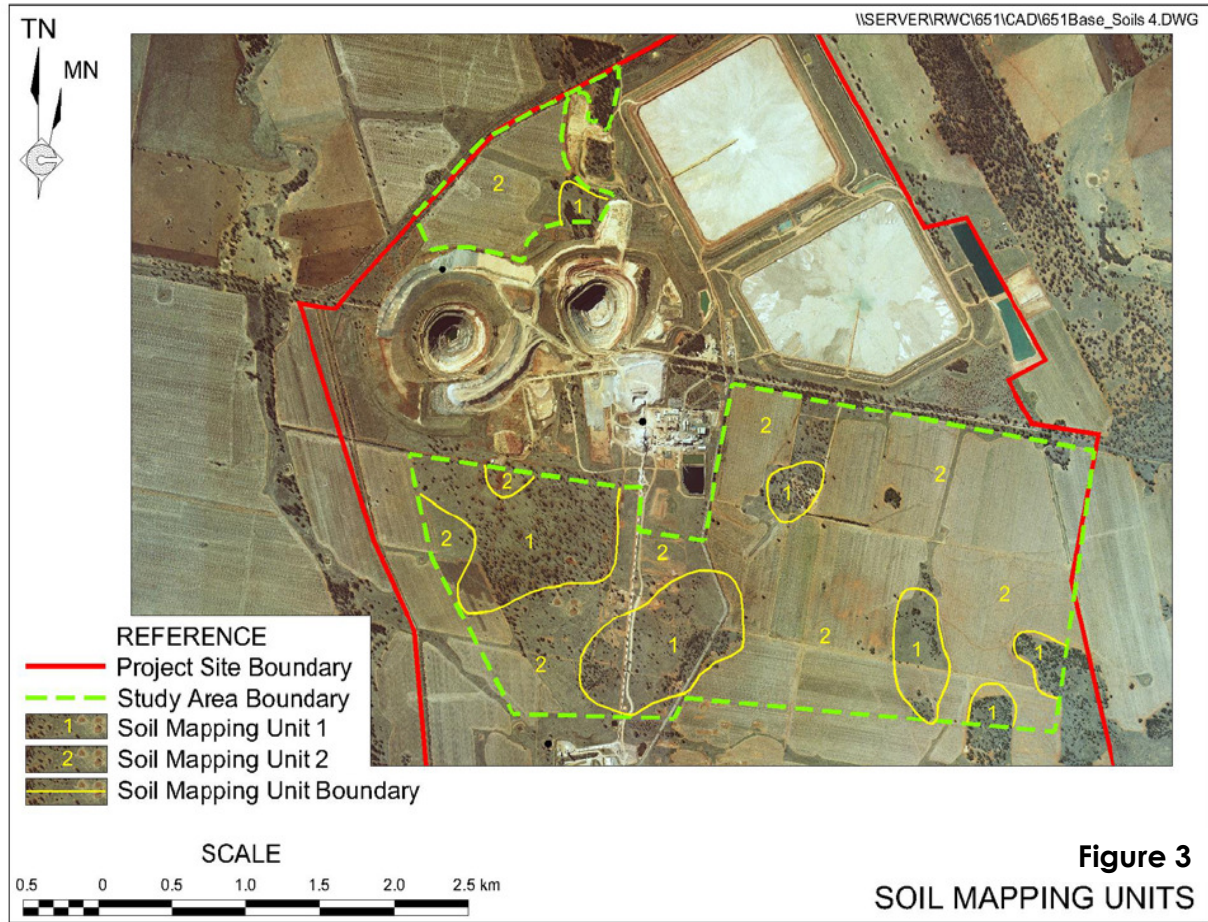


Figure 3 Soil Mapping Units

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3. VEGETATION SELECTION AND ESTABLISHMENT

3.1 Vegetation objectives

The key objectives will be to:

- Revegetate the offset area to open savannah woodland intermingled with white cypress pine, and
- Improve biodiversity, whilst maintaining the commercial potential of the forest.

3.2 Species selection

Native seedlings for the offset area will be sourced locally where possible. Establishment of the native vegetation will be based on the *Practical Guide to Revegetation in the Mid Lachlan Region* (Sydes et al., 2003) to achieve the desired open savannah woodland (e.g. Bimble Box, Yellow Box, Grey Box communities).

Detailed lists of selected plant species are given in Table 1 and Table 2. Species used will be determined by their availability at the time of planting. Planting density for native species will be aimed at 400 stems per hectare¹, 70% of plantings will be of those species listed in Table 1².

Commercial potential of the forest will be maintained by including White Cypress Pine (*Callitris glaucophylla*) in the planting program. Species such as White Box (*Eucalyptus albens*) and Fuzzy Box (*Eucalyptus conical*) will not be included, as they are not considered to be consistent with the objective of maintaining the commercial potential of the area.

Planting is to take place in the beginning of winter in the June – July period when soil moisture is optimal. Planting was postponed in 2007 due to continuing drought conditions. Planting is now scheduled for the 2008 winter period and will be dependent on favourable soil moisture content.

Table 1 Tree species to be used in revegetation

Common name	Botanical name	Maximum No/ha
Yarran	<i>Acacia homalophylla</i>	20
Bullock	<i>Allocasuarina luehmannii</i>	30
White cypress pine	<i>Callitris glaucophylla</i>	175
Kurrajong	<i>Brachychiton populneus</i>	5
Yellow box	<i>Eucalyptus melliodora</i>	15
Western grey box	<i>Eucalyptus microcarpa</i>	40
Poplar box*	<i>Eucalyptus populnea</i>	5
Bimble box*	<i>Eucalyptus populnea subsp. bimbil</i>	5
Wilga	<i>Geijera parviflora</i>	30

*These species will be planted in complementary numbers due to their similarity.

Table 2 Shrubs and groundcover species to be used in revegetation

Common name	Botanical name	Maximum No/ha
Deane's wattle	<i>Acacia deanei</i>	20
Western golden wattle	<i>Acacia decora</i>	30
Hakea wattle	<i>Acacia hakeoides</i>	20
Punty Bush	<i>Cassia eremophila</i> var. <i>eremophila</i>	
Broad-leaf hopbush	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>	20
Wedge-leaf hopbush	<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	20
Butter bush	<i>Pittosporum angustifolium</i>	10

¹ As requested by DPI-Forests (Dubbo).

² As requested by DPI-Forests (Forbes).

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3.3 Land Preparation

The offset area will be prepared for planting by NPM. This will include deep ripping (using a savannah plough) at approximately 5 metre spacing. Ripping and mounding will improve water and root penetration. The rip lines will avoid existing trees and rocky outcrops. If required and practicable, the rip lines will also be graded, mounded and rolled to remove excessive grass matter or weeds. Initial ripping was completed in April 2007 (Plate 1).

Appropriate fencing (Western electrical) will be erected around the areas to be revegetated to minimise access by herbivores.



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Plate 1 Pre-ripping of offset area- completed in April 2007

Adequate weed control is an important factor in determining survival and early growth. Weed control will be undertaken to limit the spread and colonisation of noxious and environmental weeds.

Weed control methods will include:

- Ongoing surveillance and reporting (refer Section 4.1);
- Limiting vehicle access to the offset area;
- Chemical spraying with approved herbicides; and
- Physical removal by manual chipping.

4. MONITORING AND MAINTENANCE

4.1 Monitoring

NPM will undertake revegetation monitoring and maintenance of the offset area for a period of three years prior to hand over to DPI – Forests.

Revegetation monitoring will include observation of the following criteria on a quarterly basis:

- Presence/absence of erosion
- Presence/absence of grazing/browsing by herbivores
- Presence/absence of weed species
- Condition of fencing

Additionally the newly established vegetation will be monitored annually (typically in May) and the following criteria will be recorded:

- Survivability
- Growth rates
- Presence/absence of disease
- Species diversity

4.2 Maintenance

If poor vegetation establishment is observed (e.g. high seedling death rate due to disease, drought or other) the cause will be investigated and appropriate remediation will be undertaken. This may include follow up planting, disease control, erosion control or other.

In the event that weeds and/or feral animals are observed during the regular monitoring program, controls will be implemented in accordance with existing procedures for the mine lease and farm properties. Noxious weeds such as Bathurst burr (most common to the area) will be controlled by chipping, slashing and the use of herbicides.

Fencing will be maintained during the life of mine by NPM.

5. REPORTING

The results of the revegetation monitoring program will be maintained at NPM and reported in the Annual Environmental Management Report. A copy of this report will be provided to the relevant agencies, including DPI – Forests

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6. OFFSET AREA RELINQUISHMENT

Upon completion of the offset area revegetation, NPM will monitor and maintain the area for a period of three years. The offset area will then be handed over to DPI – Forests for ongoing management as part of the LNF.

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7. REFERENCES

Corkery R.W., (2006). "North Mining Limited Environmental Assessment".

Cunningham, G., (2006). "Soils Survey and Land Capability Assessment" Northparkes Mines – E48 Project Specialist Consultant Studies Compendium Part 2.

Department of Planning, (2006). "Notice of Project Approval".

Sydes M., Butterfield L. and Rutledge S. (2003). "A Practical Guide to Revegetation in the Mid Lachlan Region".

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Appendix A Regulatory correspondence



FORESTS NSW
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12/10/2007

Renee Morphet
Graduate Environmental Officer
Northparkes Mines

Dear Renee,

LNF Revegetation Plan

Forests NSW has reviewed the draft revegetation plan for the Limestone National Forest Offset Area and has the following recommendations for improvement.

- 1) **2.1 Landform**
The offset area lies east of the Bogan River and drains in a westerly direction, not easterly as described in the Plan.
- 2) **2.2 Soil Profile Types**
The landform and soil landscape descriptions, together with Figure 3, indicate that the offset area has a tendency towards heavier soils than the balance of Limestone National Forest. This is consistent with it being on the lower slopes and swales of the landscape. This would make it unlikely that the area previously supported plant species that prefer the better-drained or gravelly, ridge-type soils, yet there are several of these in the revegetation species mix. *Eucalyptus dwyeri*, *E polyanthemos*, *E sideroxylon*, and *E viridis* may survive if planted in the Offset Area but will probably be 'out of place' and should be deleted from the species mix. Similarly, *Acacia doratoxylon* is a species of hilltop, skeletal soils and not a natural inhabitant of this site.
- 3) **3.2 Species Selection**
Acacia dealbata is not a species that is widespread in this area but is a popular garden plant. Forests NSW does not want it planted on this site.
- 4) *E. populnea* and *E. populnea ssp. bimbil* will only need to be planted in complementary numbers (if you have them available separately) because of their similarity.
- 5) Of the shrub species listed in table 2, *Acacia linearis* and *A. spectabilis* are both species of gravelly ridgetops and probably will not do well on the heavier soils of the Offset Area.

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- 6) A notable omission from the list of local shrub species is *Cassia eremophila* var. *eremophila* (Punty Bush). A small number could be added to the mix.
- 7) The Plan proposes a planting of 400 stems per hectare but does not specify what proportion will be overstorey trees and what proportion shrubs. Forests NSW requests that 70% of the plantings be of species in Table 1.
- 8) It is accepted that the exact proportions of species planted will vary according to what is available, but Forests NSW recommends the proportions set out in Tables 1 and 2 below.

TABLE 1: Tree species to be used in revegetation

Common name	Botanical name	Maximum. No./ha
Yarran	<i>Acacia homalophylla</i>	20
Bullock	<i>Allocasuarina luehmannii</i>	30
White cypress pine	<i>Callitris glaucophylla</i>	175
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Poplar box	<i>Eucalyptus populnea</i>	5
Bimble box	<i>Eucalyptus populnea</i> subsp. <i>bimbi</i>	5
Wilga	<i>Geijera parviflora</i>	30

Table 2: Shrubs and groundcover species to be used in revegetation

Common name	Botanical name	Maximum. No./ha
Deane's wattle	<i>Acacia deanei</i>	20
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Hakea wattle	<i>Acacia hakeoides</i>	20
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Wedge-leaf hopbush	<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	20
Butter bush	<i>Pittosporum angustifolium</i>	10

- 9) **3.3 Land Preparation**
The site preparation so far has been good, well up to current industry standards. However, adequate weed control is an important factor in determining survival and early growth. There is no detail in the plan to suggest how this will be achieved. While cultivation will provide effective pre-planting control, selective knockdown or pre-emergent sprays are usually required to control new weed germination after planting. Please provide details of your proposed weed control program.

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Please accept my apologies for the delay in responding to your proposal. I trust that the above comments will help to ensure effective and durable revegetation of the offset area.

Yours sincerely,

S R Campbell
for P D Wells
Regional Manager

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