LANDSCAPE Masterplan Report

GRETA Proposed Train Support Facility

Lot 1 in DP 1117342, GRETA NSW

Prepared for: PACIFIC NATIONAL.

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Introduction

1.1 Background

Moir Landscape Architecture has been commissioned by Pacific National to prepare a Landscape Masterplan and Report for the proposed Pacifc National Train Support Facility at Greta. The landscape Masterplan and Repor twill support the Environmental Assessment documnet prepared for the development and lodged with the Department of Planning for assessment under Part 3A of the Environmental Planning and Assessment Act, 1979.

The purpose of the report to provide a simplified set of guiding principles and information specific to landscape which aim to minimise adverse or negative effects associated with the implementation of the proposal including site clearing, bulk earthworks, construction of buildings, rail and road infrastructure, landscape / revegetation, establishment and ongoing monitoring and maintenance. Preparation of the landscape / vegetation management plans has been largely guided by the recommendations put forward in the Visual Impact Assessment, Bushfire Threat Assessment and Flora and Fauna Report.

Figure 1 - Site locality plan.

The Site

2.1 Site Description

The subject site is legally described as Lot 300 in DP 1117342 and zoned 1(a) Rural 'A' in the Cessnock Local Environment Plan 1989. The study area is roughly linear in shape and extends for a distance of 2.4 kilometres towards Branxton. The Main Northern Railway forms the eastern boundary of the site and the Hunter Expressway corridor forms the western boundary. The topography of the site is gently undulating with the general grade of the site running west to east.

According to SKM the broader landscape is characterised by a mosaic of open agricultural land with patches of forest and woodland including riparian vegetation and residential allotments. The majority of the site has extensive tree coverage with a large area of cleared land occurring towards its southern end. Sawyers Creek and associated vegetation traverses the site towards its southern end. The flora and fauna report prepared by SKM provides an assessment of the flora and fauna species, communities and habitats located on the Study Area. Vegetation communities represented within the Study Area include Spotted Gum-Ironbark Forest, generally located on the elevated drier parts of the site, and Forest Redgum-Ironbark Forest, within or surrounding drainage lines and open depressions. The site supports remnant and regenerating areas interspersed with cleared areas and tracks, resulting from past agricultural practices.

The objective of any landscape proposal should, wherever possible retain and protect native vegetation unaffected by earthworks and construction, and provide supplementary planting in available areas to reflect the vegetation communities originally occurring in the local area. Clearances and buffer zones for bushfire protection also need to be considered and incorporated into the landscape proposal.

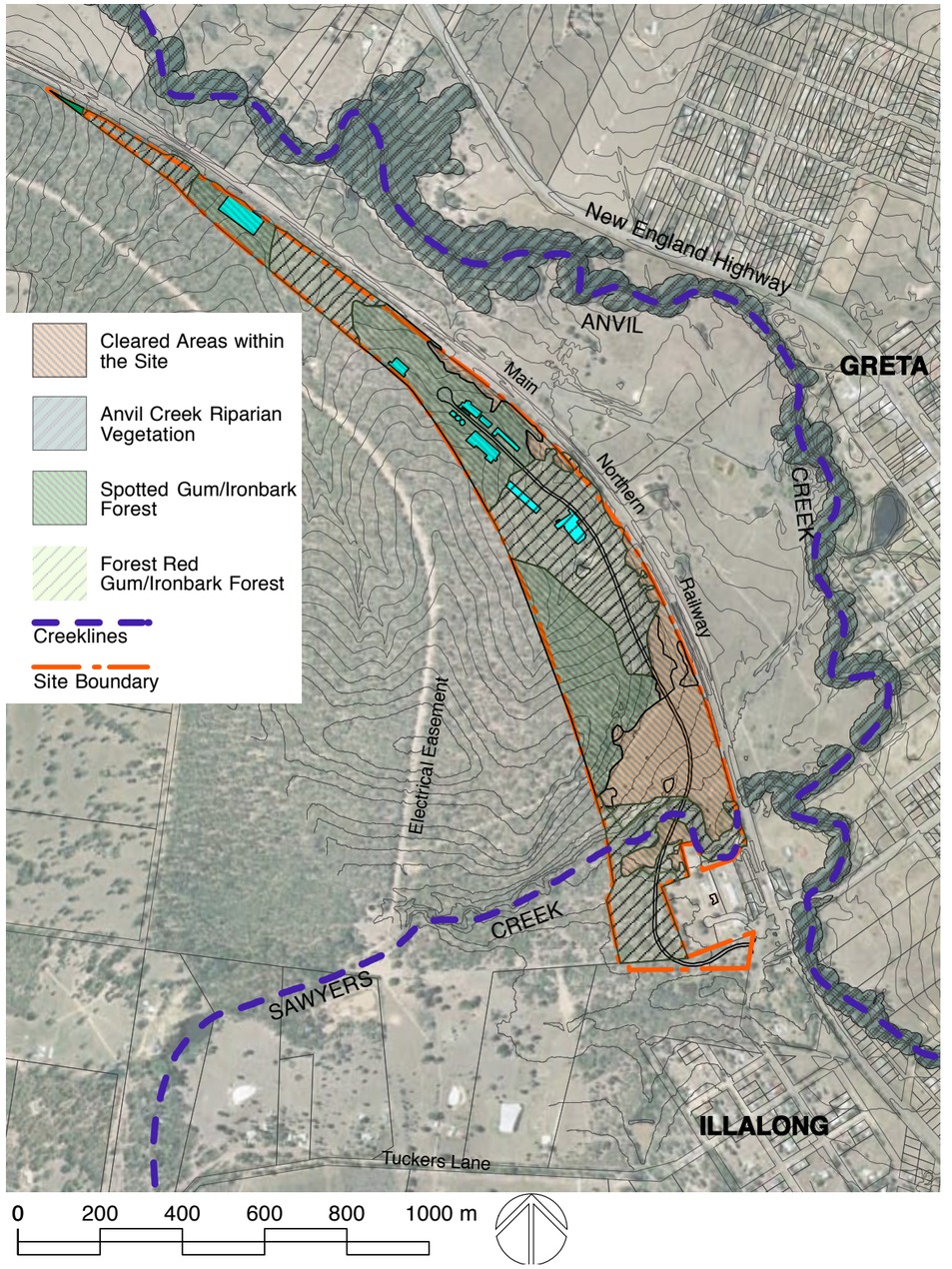


Figure 2 - The Study Area and Vegetation Communities.

The Proposal

3.1 Proposal Description

The proposal is to establish a train support facility (TSF) to service and provision the Pacific National coal freight business. The proposed facilities will include infrastructure to support activities associated with refueling, maintenance, crew changes and administration. The facility will operate 24 hours a day, 7 days a week. Trains will be serviced on their return trip from Newcastle. Construction of the operational facilities are to be staged and a summary of each stage is provided below.

Stage 1

- Tracks 1, 2 and 3 with a three track Provisioning Facility.
- Facility access road and infrastructure necessary to support provisioning.
- Diesel Storage to be minimum 1 million litres with allowance for increase.
- Maintenance facility capable of basic administration and maintenance.
- Construction of locomotive maintenance facility access track on which a temporary locomotive wash bay will be located.
- Lighting, fencing and associated landscaping.

Stage 2

- Construction of maintenance and inspection tracks 4 and 5.
- Extend locomotive wash bay towards future loco maintenance facility.
- Construct wagon storage sidings.
- Construct large administration building.
- Diesel storage to increase to 2.0 million litres.
- A shunting neck at the Branxton end of the provisioning shed.
- Lighting, fencing and associated landscaping

Stage 3

- Construct loco maintenance facility
- Construct wheel lathe facility
- Lighting, fencing and associated landscaping

The location of the proposed facilities and associated earthworks means the majority of the existing vegetation on the site will be removed as part of the construction process. The general grade of the site slopes up from the Main Northern Railway towards the F3 corridor, requiring cutting in of the land to accomodate proposed railway sidings and their associated grades. Buffer zones and setbacks associated with the water course at the southern end of the site will ensure environmental protection of Swayers Creek. There are also opportunities towards the southern extents of the site for retention of vegetation and enhancement in the form of revegetation. Retention of vegetation at key locations such as the southern extent of the western boundary combined with off-site buffers each side of the road alignment for the extension of the F3 will also assist in mitigating adverse visual impacts associated with the TSF and compensate for lost vegetation..

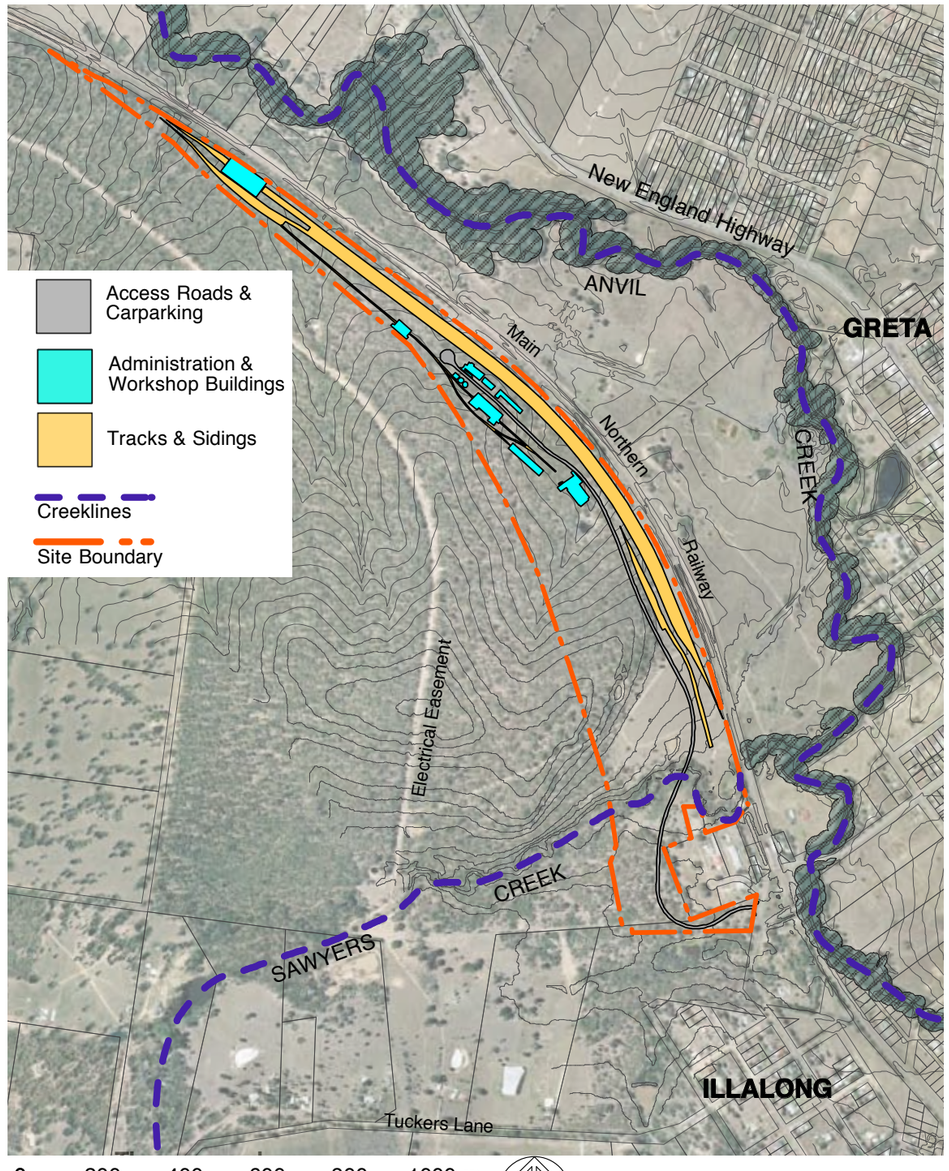


Figure 3- The Proposal

The Proposal (contd.)

3.2 Landscape Objectives

The main aim of the rehabilitation is to provide a final Landscape design scenario that competently balances the development of the site as a Train Support Facility whilst retaining and protecting vegetation unaffected by proposed infrastructure and providing for rehabiliatation of degraded areas.

A Landscape Plan has been prepared documenting the proposed landscape works (refer Appendix A – Landscape Rehabilitation Plan). The plan and report address: tree clearing, vegetation protection, weed management, planting methodology, species selection as well as issues such as visual impact, habitat creation, plant establishment and ongoing maintenance.

Landscape Rehabilitation Objectives

The landscape rehabilitation plan and report aim to:

- Retain and protect existing native vegetation unaffected by proposed buildings and associated infrastructure.
- Provide for ongoing site rehabilitation and revegetation, whilst allowing for continued extraction and assisting in sediment and erosion control across the site.
- Provision of managed buffers to provide protection from bushfire
- Provide screening of the quarry operations from adjoining properties through buffer planting along the sites boundaries and retention of existing vegetation.
- Provide an attractive end-use landform which contributes positively to the landscape character of the area and reduces visual impact.
- Provide a self-sustaining environment utilising endemic species to build on vegetation communities originally occurring in the local area.
-

3.3 Key features

Landscaped buffers

- Provision of landscape buffers at the interface of the floodplain and proposed development areas and the provision of tree planting along ridgelines. Planting of large canopy trees and dense shrubs around the perimeter of development areas would screen outside views and reduce the scale of the built form. Integration of landscape stormwater treatment ponds into these buffer zones adds to the visual quality of the catchment.

Endemic species reflective of pre existing vegetation communities

- A revegetation strategy, as far as is possible, reflects the pre-existing vegetation communities on the site. Locally native trees will ensure that proposed revegetation will be seen as a continuation of neighbouring bushland or patches of native vegetation.
- The planting of vegetation endemic to the area will assist in integrating the proposed development with the existing landscape character, in particular the large canopies which will have a positive impact in the broader view.

- Locally sourced native plant species, especially trees, should be utilised throughout the development. They help preserve the landscape character and scenic quality of the area as well as building habitat for local fauna. Native species are also well suited to local conditions (i.e. soil, climate, etc.) and will build on the existing vegetation assemblages in the area. Understorey planting will also contribute to the habitat values and screening potential of the proposed landscape works

- Amenity tree planting such as shade tree planting in carparks and adjoining administration buildings should comprise species endemic to the area. This is recommended to restore lost habitat and provide visual integration with surrounding bushland or pockets of remnant trees.

Staging

The rehabilitation, involving filling, capping and revegetation is intended to occur sequentially over the site, generally moving from the east to the west as extraction ceases in each sector the quarry. The following sections describe the proposed methodology for the quarry rehabilitation.

Methodology

4.1 Vegetation Protection

All vegetation identified on the plans to be retained is to be protected from earthworks and machinery. These areas are valuable sources of seed and require a system of hand weeding to remove exotic species and encourage the regeneration of native plants and seed stocks.

Protective fencing for existing native vegetation shall be installed prior to any other work on site is undertaken to clearly identify those areas to be protected. The boundaries of the tree protection / exclusion zones should be identified by surveyors prior to commencement of any vegetation clearing and construction works. A temporary fence is to be erected for identification purposes.

Soil and vegetation debris should not be stockpiled within the zones. All personnel involved in the clearing and construction operations for the site should be inducted on the significance of the conservation areas of the site prior to approval to commence clearing.

Best practice erosion and sedimentation control measures are to be installed in all appropriate drainage areas where surface runoff is likely to enter vegetation protection zones, in particular riparian corridors. Control devices should be periodically checked and maintained throughout the duration of the clearing and construction phases, and particularly after each period of substantial rainfall.

4.2 Sediment and Erosion Control

The planning, design and implementation of comprehensive erosion and sediment controls is important to the success of the rehabilitation works. Details and principles included on the rehabilitation plans and within this report include the following:

- Retention of existing vegetation to stabilise and trap sediments.
- Ongoing revegetation of the site including top-soiling and revegetation of batters and embankment immediately after construction.
- The use of erosion control products such as biodegradable matting to steep sections subject to erosion.
- Progressive revegetation of disturbed areas.

Other areas addressed in the erosion control include:

- Designated no go areas for machinery and defined access tracks and haul roads.
- Site preparation including vegetation clearing.
- Topsoil and spoil stripping, stockpiling and reuse.
- Controls during construction including temporary drains, sediment fences and traps and swale drains.

PHOTOGRAPH 1: Tree Protection.

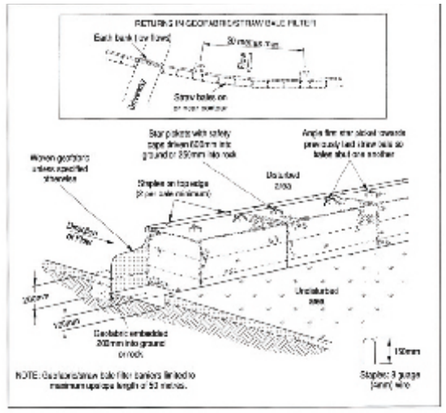
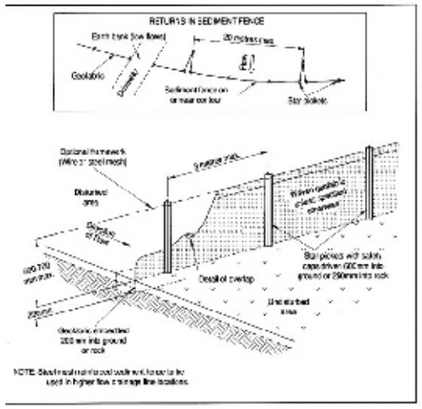


FIGURE G – Filter Barrier Construction (DLWC Figure 24.6, p.392)

FIGURE 4: Sediment Fence Construction (DLWC Fig 24.7 p.393)



URE H –Sediment Fence Construction (DLWC Figure 24.7, p.393)

FIGURE 5: Filter Barrier Construction (DLWC Fig 24.6 p.392)

Methodology (contd.)

4.3 Site Clearing

The limits of clearing including stockpile areas should be designated and clearly marked for approval. In accordance with Section 4.1 - solid barricades or fencing should be erected to ensure protection of retained vegetation. Felled native trees should be chipped to produce mulch for future landscape works. Stockpile mulch in an approved location for future use.

The trees are to be felled in accordance with the recommendations by King to ensure wherever possible survival and relocation of native fauna. (p.44-46). Some of the major recommendations outlined in the flora and fauna report include:

- Trees with hollows to be felled during the construction phase, will be felled under the NSW National Parks and Wildlife Act 1974, for the purpose of rescuing displaced fauna.
- The fauna specialist will be suitably attired with protective clothing and have suitable equipment and experience to undertake the work.

4.4 Weed Management

Weed removal in landscaped areas and areas of retained on site vegetation is to be carried out for the life of the maintenance period. Identified weed species should be removed by hand, taking care not to dislodge seeds, off cut limbs, or leave rootstock in the ground. Weed removal should be timed to minimise weed germination and seed dispersal. Care should be taken to minimise disturbance to existing juvenile natives and any disturbance to the soil.

Acceptable methods may include:

- On larger woody weeds, cutting the trunk and poisoning the remaining stump with concentrated glyphosate herbicide.
- Hand removal of the entire plant taking care not to leave plant material or dislodge seeds.

Displaced weed material is to be disposed of off site where there is no potential of seed dispersal. Where areas of ground are disturbed from the weed removal the soil shall be tamped into place and covered with site leaf litter or site mulch (free from weed seed) to avoid erosion.

Follow up weeding is essential to ensure the success of the initial weeding activities and should be carried out at regular intervals throughout the maintenance period. Weed germination may occur in areas to be planted. This can be controlled by light scarification.

Herbicide application shall only be used where there is no possibility of damage to native vegetation from overspray or wind drift. Herbicide should be used in accordance with the manufacturers' recommended rates. A follow up treatment, two weeks after the initial spray is required to kill any regrowth of seed.
Approved herbicide: Glyphosate.

4.5 Soils

Topsoil Stripping

The topsoil layer in areas on site to be cleared or excavated is to be stripped and stockpiled. Topsoil should not be stockpiled for any longer than 12 months (preferably less than 6). Topsoil and subsoils are to be stockpiled separately.

Soil Testing

Substrates suitable for landscape works should be identified and tested during site investigations for their suitability to support plant growth. Substrate materials should be stockpiled on site and protected from erosion for later placement to newly formed batters and revegetation areas. Soil will be tested and the nutrient levels and pH adjusted as required. Fertilisers and soil ameliorants should also be used where soil tests indicate the need.

Carry out soil tests in accordance with the guidelines recommended in AS4419 – 2003 (Soils for Landscaping and Garden Use). Test samples should be taken for each soil type on site. Soil samples should be sent to the soil laboratory for testing, together with a site plan locating sources of soil samples and a record of any relevant details about the site and source locations.

Where possible soils are to be improved using recycled compost or green waste. Where the soil on site is unable to be improved a recycled soil mix suitable for the specified planting is to be incorporated in the top 300mm layer. Superabsorbent polymer granules or soil wetting agents are a valuable way to increase soil moisture and should be incorporated as part of the backfill mix. Imported or recycled organic topsoil should be limited to the top 150-300mm of the soil profile, with a free draining sandy loam or manufactured soil with low organic content forming the remainder.

Methodology (contd.)

PHOTOGRAPH 2: Soil Stockpiling.

PHOTOGRAPH 3: Soil Spreading.

4.6 Vegetation Communities

According to SKM (2009):

The majority of the study area supports remnant vegetation in a relatively good ecological condition, including remnant and regenerating areas. Some areas exhibit some evidence of previous disturbance in the form of selective vegetation clearance, track formation and minor weed invasion as a result of past land use activities.

Two main vegetation communities were identified within the study area comprising higher elevated drier habitats dominated by Spotted Gum (Corymbia maculata) and Narrow-leaved Ironbark (Eucalyptus crebra), and habitats within and surrounding drainage lines and open depressions dominated by Forest Red Gum (Eucalyptus tereticornis). The study area is within an ecotonal area between vegetation community types of the central and lower Hunter region. Based on the dominant canopy species the Spotted Gum – Ironbark vegetation community in the study area is more consistent with Central Hunter Ironbark – Spotted Gum – Grey Box Forest.

Additionally there are open paddock areas supporting regenerating shrubs on the edges of remnant vegetation at the southern end of the study area. Map units identified in the study area are described below.

Map Unit 1: Spotted Gum – Ironbark Forest

This community is associated with higher elevated slopes of the study area. The community supports an open canopy ranging between 15-20 m dominated by Spotted Gum (Corymbia maculata) and Narrow-leaved Ironbark (Eucalyptus crebra), with other species being co-dominant in areas including Broad-leaved Ironbark (E. fibrosa), Grey Gum (E. punctata x canaliculata) and Forest Red Gum (E. tereticornis). Some areas support a high abundance of regenerating trees with larger trees interspersed. A low-moderate abundance of Bulloak (Allocasuarina luehmannii) is present throughout this community.

The understorey varies throughout the study area comprising a mix of shrub and groundcovers varying in density. The dominant shrub species within this community varies throughout the study area and ranges from 1-3 m in height. The groundcover of this community includes a relatively high diversity of flora species varying in density with the degree of soil moisture and shelter.

A sparse cover of weed species are present throughout this community most likely as a result of past agricultural practices, and are most abundant on the edges of this community adjoining the rail corridor.

Map Unit 2: Forest Red Gum – Ironbark Forest

This community is associated with lower elevated areas of the study area, including open depressions and slopes surrounding drainage lines. The community supports an open canopy ranging between 15-20 m dominated by Forest Red Gum and Narrow-leaved Ironbark with other species being co-dominant in areas including Rough-barked Apple (Angophora floribunda), Grey Box, Grey Gum and Spotted Gum. Some areas support a high abundance of regenerating trees with larger trees interspersed. A moderate abundance of small-medium sized trees (4-8 m high) are present throughout this community, particularly along drainage lines.

The understorey varies throughout the study area comprising a mix of shrub and groundcovers varying in density. A sparse to moderately dense shrub layer is present 1-3 m in height dominated by similar species to map unit 1. The groundcover of this community includes a relatively high diversity of flora species varying in density with the degree of soil moisture and shelter. A sparse cover of weed species are present throughout this community most likely as a result of past agricultural practices, and are most abundant on the edges of this community adjoining the rail corridor and along the major drainage line at the southern end of the study area.

Map Unit 3: Regenerating Shrubland

This area occurs on the edges of the paddock area at the southern end of the study area comprising a moderate-density of the shrub Needlebush with regenerating Eucalypt species.

Methodology (contd.)

4.7 Species Selection

The planting scheme aims to achieve structural diversity and a random distribution of plants. This provides a variety of growth forms, and various habitat types and food for fauna. It also ensures against plant failures. The criteria used to determine which species are suitable for revegetation include:

- The current distribution of native species on site and in adjacent bushland areas.
- Availability of seed indigenous to the area.
- Commercial availability of seed/tube-stock.
- The soil type.
- Local and site specific drainage patterns.
- Suitability of the species selected to the proposed landscape treatment.

An important factor is the availability of local seed or plant material to recreate the desired vegetation communities identified in the Flora and Fauna Assessment, and as outlined above.

The proposed planting lists include a species selected from the Map Units 1 and 2. Potential substitutes or replacement plantings throughout the life of the landscape works should be sourced from these lists.

Map Unit 1: Spotted Gum – Ironbark Forest

DOMINANT TREES:

Corymbia maculata	Spotted Gum
Eucalyptus crebra	Narrow-leaved Ironbark

CO DOMINANT TREES:

Allocasuarina luehmannii	Bulloak
Eucalyptus fibrosa	Broad-leaved Ironbark E. fibrosa
E. punctata x canaliculata	Grey Gum
Eucalyptus tereticornis	Forest Red Gum

SHRUBS GRASSES & GROUNDCOVER

Acacia elongata	Swamp Wattle
Breynia oblongifolia	Coffee Bush
Bursaria spinosa	Black Thorn
Daviesia ulicifolia	Gorse Bitter-pea
Hakea sericea	Needlebush
Persoonia linearis	Narrow-leaved Geebung
Pimelea linifolia ssp. linifolia	Rice Flower

GRASSES & HERBS

Aristida ramosa	Purple Wiregrass
Aristida vagans	Three-awn Spear-grass
Cymbopogon refractus	Barbed-wire Grass
Entolasia stricta	Wiry Panic
Microlaena stipoides	Weeping Grass
Lomandra multiflora	Many-flowered Mat-rush
Cheilanthes sieberi	Mulga Fern
Lomandra filiformis	
Gonocarpus tetragynus	Poverty Raspwort
Pratia purpurascens	White Root

COMMON WEEDS

Hypocharis radicata	Flatweed
Olea europaea ssp. cuspidata	African Olive
Tagetes minuta	Stinking Roger

Map Unit 2 - Forest Red Gum – Ironbark Forest

DOMINANT TREES:

Eucalyptus tereticornis	Forest Red Gum
Eucalyptus crebra	Narrow-leaved Ironbark

CO DOMINANT TREES:

Angophora floribunda	Rough-barked Apple
Eucalyptus moluccana	Grey Box
E. punctata x canaliculata	Grey Gum
Corymbia maculata	Spotted Gum

SMALL TREES ASSOCIATED WITH DRAINAGE LINES:

Melaleuca decora	White Feather Honey Myrtle
Melaleuca nodosa	Prickly-leaved Paperbark
Allocasuarina luehmannii	Bulloak

SHRUBS GRASSES & GROUNDCOVER

Acacia falcata	Hickory Wattle
Acacia parvipinnula	Silver-stemmed Wattle
Breynia oblongifolia	Coffee Bush
Daviesia ulicifolia	Gorse Bitter-pea
Hakea sericea	Needlebush
Leptopsermum parvifolium	Yellow Tea Tree
Persoonia linearis	Narrow-leaved Geebung
Pimelea linifolia ssp. linifolia	Rice Flower

GRASSES & HERBS

Cymbopogon refractus	Barbed-wire Grass
Echinopogon caespitosus var. caespitosus	Tufted Hedgehog Grass
Eragrostis leptostachya	Paddock Lovegrass
Microlaena stipoides	Weeping Grass
Paspalidium distans	Spreading Panic Grass
Halogris heterophylla	Rough Raspwort
Lomandra longifolia	Mat-rush
Lagenophora stipitata	Blue Bottle-daisy

COMMON WEEDS

Axonopus affinis	Carpet Grass
Lantana camara	Lantana
Hypocharis radicata	Flatweed
Olea europaea ssp. cuspidata	African Olive

Methodology (contd.)

4.8 Planting Methodology

Planting will combine a number of methods including hydroseeding/hydromulching, tube-stock planting, jute matting and seeding, and combinations of each. The initial stages of revegetation should be monitored closely to observe the most successful methods of plant establishment.

Hydroseeding / hydromulching

This method will be used on areas with moderate to low grade slope. This method will be combined with tube-stock planting to ensure 'hard to germinate' species and large canopy tree are represented in the desired plant matrix.

Advantages:

- Fixative (eg. wood pulp fibre) gives moderate erosion control and allows for retention of soil moisture.
- Provides dense coverage of plants and a random distribution of species.
- Good establishment rates.
- Can be used in combination with tube-stock and advanced plantings.

Tube-stock planting

This is the preferred method of plant establishment and may be combined with advanced plantings (2.5-10 litre pots) to create an instant effect.

Advantages:

- Quick method of establishing trees and shrubs.
- Provides dense coverage of plants.
- Good establishment rates / low mortality.

Biodegradable Matting

Biodegradable hessian matting shall be laid on batters to prevent erosion. The matting should be laid, trenched and pinned in accordance with the manufacturers' recommendations. The matting protects the soil from rainfall erosion and promotes water infiltration into the soil.

Advantages of matting:

- Effective erosion control on steep slopes.
- Good weed suppression.
- Can be used in combination with tube-stock and advanced plantings.

PHOTOGRAPH 4: Tubestock nursery.

PHOTOGRAPH 5: Tubestock.

PHOTOGRAPH 5: Matting

PHOTOGRAPH 6: Matting

Mulch

Mulch specified for revegetation areas should be site chippings. Where volumes of site mulch are insufficient substitute with a locally sourced, recycled product.
Benefits of mulching include:

- Mulch will help prevent the germination of many weed species.
- Mulch helps retain soil moisture, reducing the need for watering.
- Mulch helps bind the soil and protects the soil from the impact of raindrops.
- Mulch encourages the growth of worms and other beneficial soil organisms which help improve soil structure and the availability of soil nutrients to plants.

Timing

The ideal time for planting is between October and March. This also coincides with weed germination. To assist in control of annual weeds in the areas to be planted cultivate the soil just prior to planting or allow the first germination to occur and then remove weeds.

Methodology (contd.)

4.9 Plant Establishment & Maintenance

During plant establishment the landscape works should be checked regularly for plant health and weed invasion. Regular inspections will reduce the potential for minor infestations becoming major problems. Weed control and ongoing plant maintenance will be carried out for a minimum of 6 months. All rubbish related to landscape works shall be removed by the landscape contractor before it is allowed to accumulate. During the maintenance period the landscape contractor shall undertake the following: Regular watering, weeding, mulching and other activities as required to promote healthy growth. Replace any dead or dying plants within this period. Contingency funds should be made to replant failed areas.

Landscaped areas should be fenced or individual plants bagged to protect stock from grazing animals such as rabbits and kangaroos. The landscape areas should also be monitored to document such things as growth rates, success and failures.

Monitoring of the growth, root distribution and transpiration rates of establishing species will help identify species that are successful and suitable for use in future stages or as replacement plantings.

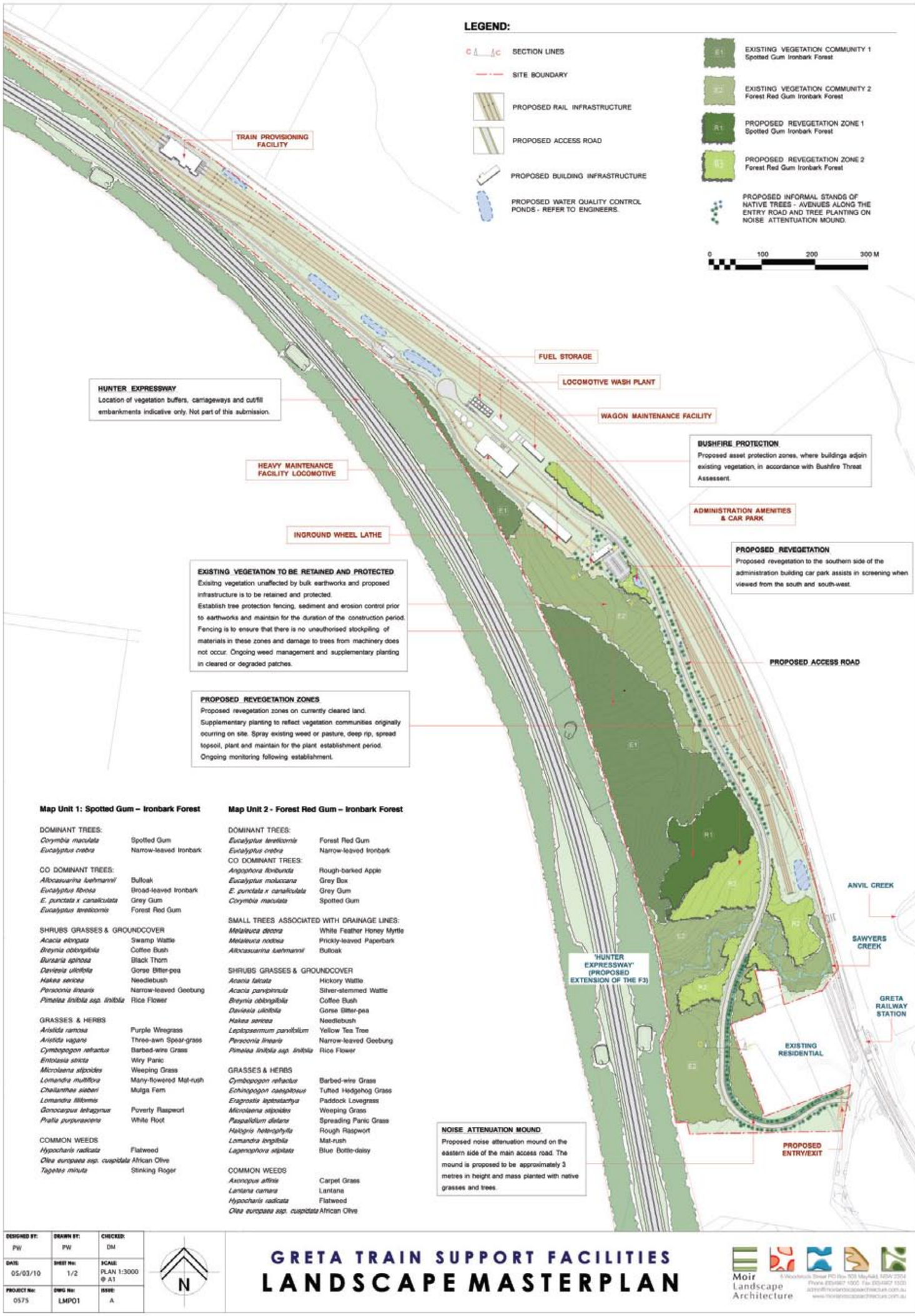
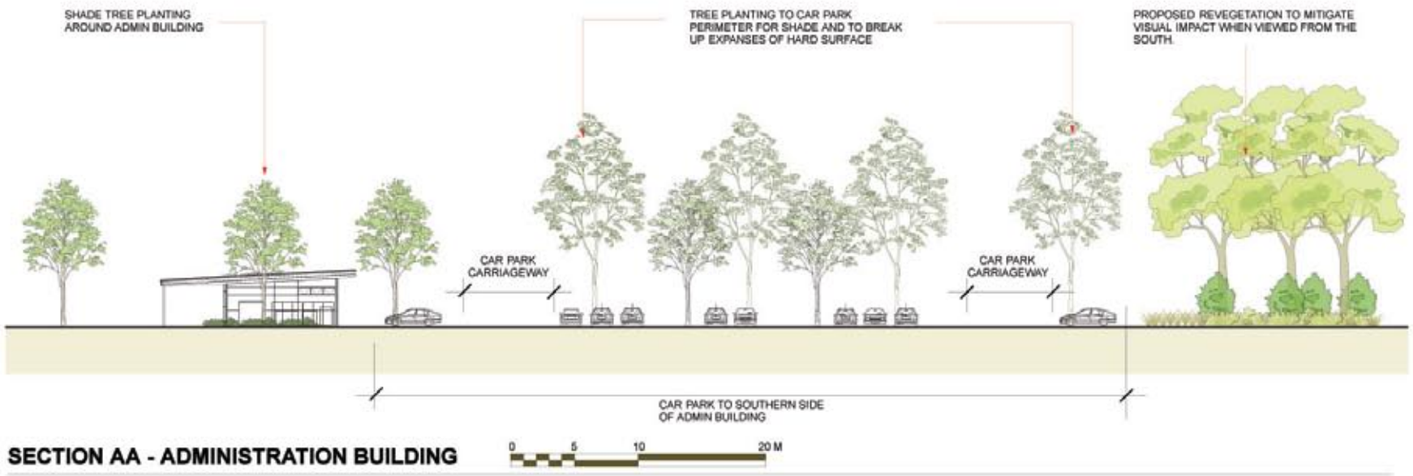


Figure 6 - Landscape Masterplan



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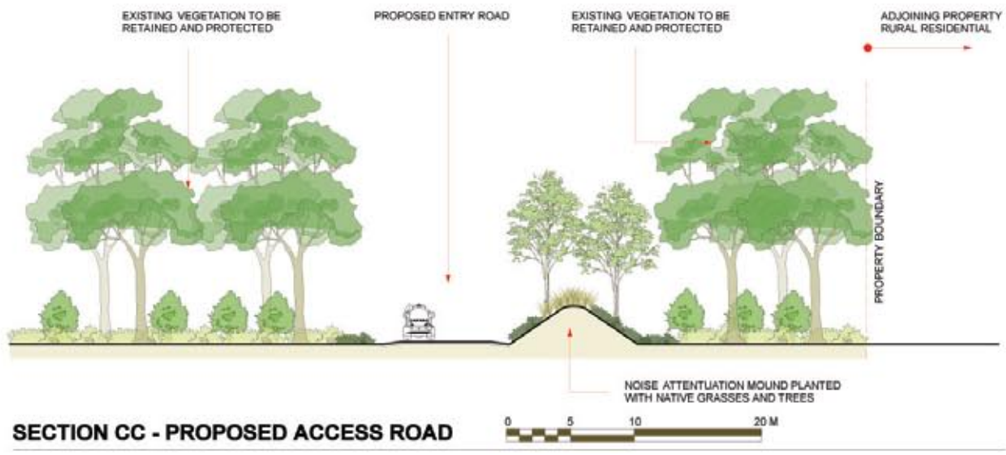

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GRETA TRAIN SUPPORT FACILITIES
LANDSCAPE ELEVATIONS

Moir Landscape Architecture

Figure 7 - Landscape Sections

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