

total earth care

Vegetation Management Plan
Grain Milling Facility, Picton Road
Maldon

Total Earth Care Pty Ltd
June 2006



Vegetation Management Plan

Grain Milling Facility, Picton Road Maldon

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Prepared by:	B Morrisey, R Blackall, A McGahey and A Mason		
Prepared for:	Kellogg, Brown and Root Pty Ltd		
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1 INTRODUCTION

1.1 Background

Allied Mills Pty Ltd has been given approval to construct and operate a flour and maize mill at 330 Picton Road, Maldon in the Wollondilly Local Government Area (LGA) on the southern outskirts of Sydney. The site has a total area of 24 hectares, is located in a rural setting and is zoned 4a Industrial under the *Wollondilly Local Environmental Plan 1991*. The approved Development Application (DA) involves the construction and operation of the mill that will incorporate silos, bulk storage, grain handling, rail handling, loading and unloading facilities and offices. In addition, major works are required for the construction of; a double rail siding with shunting and turn back facilities; a new access road connecting to Picton Road via a new intersection; landscaped areas; restoration of a riparian zone surrounding a major watercourse at the site; and realignment of a minor watercourse at the site for stormwater management.

The development is both a state significant development and designated development requiring assessment by the former Department of Infrastructure, Planning and Natural Resources (DIPNR) with approval granted (subject to conditions of consent) by the NSW Minister for Planning (the Minister). In accordance with statutory requirements and consideration of Environmental Planning Instruments (EPI's) for development of this nature the public and other government authorities including Wollondilly Shire Council, the NSW Roads and Traffic Authority, the Mine Subsidence Board and the Department of Environment and Conservation were consulted during the assessment of the proposal. An Environmental Impact Statement (EIS) was prepared by Kellogg Brown and Root Pty Ltd (2004) to accompany the DA. As a result of the consultation process other studies and reports were prepared to address issues raised by the public and other government authorities. In issue of the conditions of consent the Minister has specified that a Vegetation Management Plan (VMP) is to be prepared for the 'Riparian Zones' of the development site (herein referred to as the 'subject site') The Minister has noted in the conditions of consent that the preparation of the VMP and other plans such as a Soil and Water Management Plan and subsequent on ground works incorporate a General Term of Approval under the *Rivers and Foreshores Improvement Act 1948*.

On behalf of Allied Mills Pty Ltd, Kellogg Brown and Root Pty has engaged Total Earth Care Pty Ltd to prepare a VMP for the subject site that addresses the *How to prepare a Vegetation Management Plan – Version 4*, guidelines (DIPNR, undated).

1.2 Previous Studies and Surveys

Allied Mills Pty Ltd lodged a DA with the then NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) for the proposed flour and maize mill in December 2004. The DA was accompanied by an EIS titled *EIS for Grain Milling Facility, Picton Road, Maldon*, prepared by Kellogg Brown and Root Pty Ltd. The EIS was completed to assess the potential social, economic and environmental impacts of the construction and operation of the proposed mill.

Of particular relevance to the Vegetation Management Plan is the previous *Flora and Fauna Survey and Assessment* report prepared by Ambrose Ecological Services (2004), which was submitted as part of the EIS. The flora and fauna survey and assessment identified key flora and fauna habitats, addressed potential impacts on the flora and fauna and their habitats resulting from the proposed development, proposed appropriate impact mitigation measures and assessed the likelihood of significant impacts on threatened species, populations, and endangered ecological communities.

DIPNR considered the EIS, and the submissions received from the public exhibition process, and recommended approval of the proposed development, subject to conditions to ensure environmental

impacts are mitigated and managed throughout the life of the development. These conditions of consent included the requirement for the preparation of a Vegetation Management Plan.

1.3 Scope

The VMP applies to the parcel of land shown in Figure 1. The VMP will focus on the Riparian Zones as defined in consent condition 2.19 (DIPNR, 2005). Briefly, the main drainage line that is a tributary of Carriage Creek is referred to in the conditions of consent as Riparian Zone A. The minor drainage tributary that joins Riparian Zone A from the northeast incorporating the central dam is referred to as Riparian Zone B (DIPNR, 2005). These two watercourses (Figure 1) are defined as 'protected waters' (DIPNR, 2005) and will be referred to herein as Riparian Zones A and B to maintain consistency with the conditions of consent.

Additional terms of reference for the preparation of this VMP are provided in the conditions of consent issued by DIPNR (2005). Briefly, consent condition 2.23 summarises what the VMP is to address and states that 'Prior to the commencement of any construction activities, the Applicant shall prepare and submit for approval a Vegetation Management Plan in accordance with the Department's guideline *How to Prepare a Vegetation Management Plan – Version 4*. The Plan shall include drawings that clearly show the approved extent of the Riparian Zones, address all matters relating to Riparian Zone protection, including vegetation to be retained/removed, plant material to be used for rehabilitation, densities and species mix for areas to be rehabilitated, establishment methods, sequencing of tasks, maintenance and performance monitoring. Site rehabilitation and maintenance is to be carried out in accordance with the Plan, and the Department is to be advised of the person responsible for any seed or vegetative propagation prior to the commencement of that propagation.' (DIPNR, 2005). Further to the original conditions of consent, liaison between Allied Mills Pty Ltd and DNR, regarding conflict in objectives specified for restoration works and aboriginal heritage conservation in Riparian Zone A, has resulted in amendment to the specification for revegetation works in this zone.

This VMP has been prepared by qualified bushland and vegetation management consultants (TEC) and the majority of VMP vegetation management measures are to be implemented by a qualified bushland regeneration contractor ('BR Contractor') and/or a suitably qualified individual(s).

1.4 Aims & Objectives

The general aim of the VMP is to provide a working document for the protection and rehabilitation of native vegetation and habitats within the subject site. More specifically, the objectives of the VMP are to:

- review previous studies and surveys and reports for the subject site;
- address all conditions of consent (including amendments) that relate to Riparian Zones A and B and vegetation management;
- assess the current status of the vegetation to be retained within the subject site, including weed densities, physical disturbance, native plant diversity and resilience;
- develop an appropriate management regime for the retained vegetation and habitats, based primarily on aboriginal heritage conservation, natural vegetation resilience and future land uses of the site;
- determine appropriate vegetation management measures including consideration of aboriginal heritage conservation constraints and bush regeneration and revegetation methods that ensure the longevity and success of all conservation and rehabilitation works within the study area; and
- recommend the appropriate timing of vegetation management measures, assign responsibilities for work tasks and estimated costs.

2 METHODS

2.1 Flora and Fauna

A general botanical survey was conducted over the study area on May 9, 2006, involving:

- the identification of commonly occurring native and exotic plant species;
- the identification and mapping of plant communities (where present) according to the structural definitions of Specht & Specht (1999), and to previous broad-scale mapping of the Cumberland Plain by NPWS (2003);
- weed density mapping and bushland resilience assessment; and
- targeted searches for plant species of conservation significance using the "random meander" method of Cropper (1993).

Plants were identified in the field using Robinson (2003) and according to the latest published scientific names in Harden (1992, 1993, 2000 and 2002).

A formal fauna survey was not required as part of the scope of works. However, incidental fauna observations and fauna habitats were recorded as part of the survey effort.

3 SITE DESCRIPTION

3.1 General

The subject site is located at 330 Picton Road, Maldon, in the Wollondilly LGA which is part of the Sydney Basin Bioregion and falls within the Southern Highlands Region of the Hawkesbury Nepean catchment. At a local scale the subject site lies approximately one kilometre northeast of the confluence of Stonequarry Creek and the Nepean River, is bound to the north by Picton Road and the Main Southern Railway line forms the southern boundary. Riparian Zone A of the subject site is a tributary of Carriage Creek which drains southward into the Nepean River. Riparian Zone B is a minor eastern tributary of Riparian Zone A and joins Riparian Zone A below the spillway near the railway line culverts. The subject site has low rolling hill topography and slopes gently toward Riparian Zone A from all boundaries.

The subject site is typical of the rural landscape of the locality and region and has most recently been used for grazing. Archaeological survey of the study area site has identified aboriginal heritage items that indicate the area was used by indigenous Australians. Apart from three small stands of trees, some scattered trees and small patches of native groundcovers the subject has been completely cleared of its previous native vegetation cover. Other land use surrounding the site includes rural residential dwellings, industry and infrastructure (transport and electricity sub station).

3.2 Soils

Original surface soils across the majority of the study area are likely to have been altered by previous land management practices such as clearing of native vegetation, earthworks, compaction from gazing and vehicle access tracks, pasture improvement and imported fill.

3.3 Topography

The topography of the subject site study area is relatively flat with a gentle slopes falling from the Picton Rd frontage into Riparian Zone A and relief is from approximately 130m above sea level (asl) to 150m asl. The drainage lines know as Riparian Zones A and B are major topographic features of the subject site. Riparian Zone A is a tributary of Carriage Creek which it joins to the south before flowing further southward into the Nepean River. Part of Riparian Zone B forms a minor tributary of Riparian Zone A. The section of Riparian Zone B between the central dam and Riparian Zone A is an open

grassed swale. Low hills lie to the north of the subject site and nearby spot heights are mapped at 277m asl and 225m asl.

3.4 Drainage

Riparian Zone A in the north-western sector of the subject site is characterised by; a reservoir that has been created by the construction of an earth wall and spillway; steep rock and earth banks; emergent and floating attached aquatic vegetation around the margins; and gully erosion in the section below the spillway (Figure 1). The lower section of Riparian Zone B is a minor eastern tributary of Riparian Zone A and joins Riparian Zone A below the spillway near the railway line culverts (Figure 1). The majority of Riparian Zone B is an open grassed swale that runs to the large dam in the central portion of the site. The dams currently support a sparse cover of aquatic vegetation. There is another minor tributary to Riparian Zone A that drains from the north-western corner of the subject site into the reservoir. The subject site has low rolling hill topography and slopes gently toward Riparian Zone A from all boundaries.

3.5 Flora

3.5.1 Plant Species

Recent detailed flora survey by Ambrose (2004) identified a total of 45 plant species within the study area, including 21 native species and 24 introduced species. Despite targeted searches for threatened flora species recorded from the DEC Wildlife Atlas within 10km of the subject site, none were located during the flora survey by Ambrose (2004).

A brief flora survey was conducted for the current investigation and was mainly limited to recording dominant grass, herb, shrub and trees species. Generally the dominant flora species were consistent with that previously recorded by Ambrose (2004). No threatened plant species as listed on the *NSW Threatened Species Conservation Act 1995* (TSC Act) were recorded on the subject site in the current investigation.

Two plant species listed as noxious under the *NSW Noxious Weeds Act 1993* for the Wollondilly LGA (Table 1) were recorded in the current survey. All noxious weed species present on the site must be either controlled or removed (and disposed of appropriately) by the landowner, according to the requirements of the Act.

3.5.2 Plant Communities

Previous mapping of the native vegetation of Western Sydney has identified Shale/Sandstone Transition Forest (with less than 10% canopy cover) on the subject site that roughly corresponds to the locations of two stands of trees on Riparian Zone A (NPWS 2003 and Tozer 2003). The large area of woodland vegetation along Carriage Creek southwest of the subject site (Figure 1) is mapped as Shale/Sandstone Transition Forest with Western Sandstone Gully Forest mapped along the Nepean River (NPWS 2003 and Tozer 2003).

Shale/Sandstone Transition Forest is listed as an endangered ecological community under Schedule 1 of the TSC Act and Ambrose (2004) suggests 'The original vegetation community on the subject site was probably Sydney Sandstone Transition Forest (SSTF)' as assessed from previous flora survey of the subject site.

Two plant communities were identified on the subject site in the current survey;

- Exotic Grassland; and
- Riparian/Wetland.

The distribution of plant communities within the study area is shown in Figure 2 and described below. Plant communities assessed in current survey generally correspond to the 'Grazing Land with Scattered Trees' and 'Drainage Line Vegetation' previously described by Ambrose (2004).

Exotic Grassland

The Exotic Grassland plant community covers the majority of the study area and is dominated by introduced pasture grasses including *Pennisetum clandestinum* Kikuyu, *Paspalum dilatatum* Paspalum, *Bromus catharticus* Prairie Grass *Setaria gracilis* Slender Pigeon Grass. Annual weeds such as *Capsella bursa-pastoris* Shepherd's Purse, *Chenopodium album* Fat Hen, *Senecio madagascariensis* Fireweed and *Cirsium vulgare* Spear Thistle occur either commonly or occasionally. Shrubs of the Exotic Grassland include *Lycium ferocissimum* African Boxthorn and *Rubus fruticosus* aggregate species Blackberry.

Native species are mostly limited to isolated patches of groundcovers and scattered individuals or small stands of remnant or regrowth tree species. Weeping Meadow Grass *Microlaena stipoides*, *Chloris ventricosa* Tall Chloris and *Austrodanthonia* spp Wallaby Grasses are common in the groundcover layer with *Eucalyptus crebra* narrow-leaved Ironbark are the most common native tree species.

Tree cover of the Exotic Grassland has an FPC of <5% with some specimens up to 30m. Shrubs are mainly confined to the locations of scattered trees and a few thickets of Blackberry. Shrubs are up to 2m with the aggregate FPC <5%. The groundcover stratum is approximately 0.5m and FPC varies from 70 to 90% across the subject site.

Riparian/Wetland

Riparian vegetation occurs in the reservoir, on the banks and below the spillway of Riparian Zone A and around the shallows of the constructed dam in Riparian Zone B. Common aquatic and semi-aquatic plant species are *Damasonium minus* Starfruit, *Typha orientalis* Broadleaf Cumbungi and *Juncus usitatus*. Terrestrial plant species along the banks of Riparian Zone A and the dam of Riparian Zone B are dominated by exotic grasses such as Kikuyu and Paspalum with annual weeds such as Fireweed and Spearthistle also common. Native species in the groundcover stratum include Weeping Meadow Grass, *Cynodon dactylon* Couch and *Atriplex semibaccata* Creeping Saltbush.

There is a small stand of trees at the northern end of Riparian Zone A with several scattered trees along the length of this drainage line. Forest Red Gum to 15m is common, *Eucalyptus baueriana* Blue Box is uncommon and there some scattered exotic shrubs (*Olea europaea* subsp *cuspidata* Olive and African Boxthorn) under the trees.

3.6 Fauna

No formal fauna survey was carried out for the current investigation. However, a total of 19 native vertebrate fauna species were recorded during the previous fauna survey by Ambrose (2004) comprising 4 frog species one reptile and 14 bird species. Small and medium sized bird species including *Zosterops lateralis* Silver-eye, *Psephotus haematonotus* Red-rumped Parrot and *Anas superciliosa* Pacific Black Duck were observed in the current survey.

No threatened fauna species as listed on the TSC Act were recorded on the subject site in the previous investigation. The majority of fauna species recorded (or expected to occur) on the site are typical of urban bushland, semi rural or rural areas within the Sydney Basin region and are widespread in distribution and common to abundant within their ranges. Additionally the study area is likely to be utilised by a range of other bird, reptile and invertebrate species, both native and introduced.

Ambrose (2004) assessed the subject as having habitat potential for nine threatened fauna species including two frogs and seven bats and applied the former 8-part test (Section 5A of the *Environmental Planning and Assessment Act 1979*) was carried out. In application of the 8-part test Ambrose (2004) determined there was unlikely to be significant impacts from the proposed development on these threatened species, or their habitats, and that there was no requirement to prepare Species Impact Statements for any of the species.

3.7 Fauna and Flora Habitat

The main habitat types occurring in the study area are:

- Exotic Grassland; and
- Riparian/Wetland.

Exotic Grassland

The cleared and disturbed habitat of the Exotic Grassland is composed mainly of pasture grasses with scattered trees and shrubs. It represents a highly modified landscape that lacks many of the natural habitat features and resources that are important in the maintenance of native fauna diversity and life cycles, including fully structured vegetation, a diverse shrub layer for food sources and protection, leaf litter and rocks and logs. Canopy and hollows in the trunks and limbs of some larger trees of this community provides limited shelter, nectar, blossom and seed for birds and arboreal mammals. Although the understorey is largely absent scattered shrubs would provide some shelter and roosting opportunities for small bird species.

The cleared and disturbed habitat type favours ecological generalist species (as previously recorded) that are capable of utilising a wide range of habitats for foraging, as well as disturbance-tolerant species that are ubiquitous in modified urban and rural habitats throughout the region. Some generalist bird species that were recorded within this habitat include the *Gymnorhina tibicen* Australian Magpie and *Grallina cyanoleuca* Magpie Lark. These species are likely to forage over the cleared parts of the site and throughout the locality in general.

Riparian/Wetland

Riparian Zone A is a significant habitat feature of the subject site and has high habitat corridor potential for the locality. The reservoir large is providing shelter, nesting and foraging resources for water fowl, other birds, frogs, reptiles and it is likely that mammals such as microbats, rodents dasyurids, and larger native fauna use this resource for foraging (food and water) and shelter. The small freshwater dam of Riparian Zone B provides similar habitats to Riparian Zone A but these are smaller in size and less developed (wetland features such as diverse macrophyte cover, fallen branches, logs and snags are largely absent). Given the proximity and connectivity of Riparian Zone B to Riparian Zone A, it is expected that a similar suite of fauna species use the dams for sheltering and foraging to those described for Riparian Zone A.

3.8 Weeds and Resilience

Weed growth recorded within the study area generally comprises:

- opportunistic, annual or perennial species (eg Fireweed, Spear Thistle and *Verbena bonariensis* Purpletop) that have colonised disturbed ground;
- exotic grasses (eg Kikuyu, Paspalum and Pigeon Grass); and
- woody weeds (eg Blackberry and African Boxthorn).

Weed diversity and densities are high throughout the site and bushland resilience is very low to low. Bushland resilience and weed densities are mapped in Figure 3 and described in more detail below.

Exotic Grassland

The Exotic Grassland plant community has a very low resilience with weed densities mapped at between 80 and 100% cover. Due to a high level of disturbance including the loss of native vegetation cover, modification of surface soils and hydrological flow regimes from previous land management practices, the Exotic Grassland Cleared has very little to no potential to naturally recover to a fully structured native plant community. However, there are scattered stands and isolated remnant and regenerating Eucalyptus spp throughout the community and these trees are a significant component of

the present and future natural resilience of the site (eg seed source, habitat, age class diversity and canopy linkage).

Riparian/Wetland

The Riparian/Wetland community has a low resilience with weed densities at mapped at 70 to 90% (Figure 3). As with the Exotic Grassland a significant degree of disturbance has occurred in areas where this community exists and the aquatic and semi-aquatic vegetation that the reservoir and dams support has colonised post disturbance. At the time of survey no aquatic weed species were recorded in the waterbodies of either riparian zone. Exotic grasses dominate the vegetation of the ephemeral channels, banks and shorelines of Riparian Zone A and B. Resilience is limited to small patches of native ground covers and scattered stands and isolated trees and this community is not likely to regenerate naturally to a fully structured community without appropriate and continued management measures.

Noxious Weeds

Two noxious weed species listed under the *NSW Noxious Weeds Act 1993* (NW Act, Order No.19, 2003) were recorded on the subject site in the current survey (Table 1). Recent changes to the *NSW Noxious Weeds Act 1993* particularly Weed Control Order No. 19 has resulted in amendment to weed control categories (to control classes), species listings and also strategies for noxious weed control throughout the state. The species listed in Table 1 are assigned to Control Class 4 of Order No. 19 and must be 'controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed' by the landowner according to the provisions of the NW Act.

Table 1 Plant species recorded within the study site listed under the *NSW Noxious Weeds Act 1993* for Wollondilly LGA (Order No.19).

Control Class ¹	Scientific Name	Common Name
4	<i>Lycium ferocissimum</i>	African Boxthorn
4	<i>Rubus fruticosus</i> sp. agg.	Blackberry

4 VEGETATION MANAGEMENT MEASURES

The main aim of vegetation management for the subject site will be to comply with conditions of consent (and amendments) relating to Riparian Zones A and B issued by DIPNR (2005). The specific objective for native vegetation will be to enhance the condition of Riparian/Wetland communities described in other sections of this document and reconstruct a native plant community similar to that which would have occurred along Riparian Zone A but which will ultimately be determined by aboriginal heritage constraints. This objective will be met by implementing a program of vegetation management measures that;

- the final locations of planting works in Riparian Zone A has been established in consultation with the traditional land owners of the site;
- ensures a minimal amount of further disturbance occurs to the remnant and regrowth native vegetation of the site during construction works;

¹

Class 1	State Prohibited Weeds. The plant must be eradicated from the land and the land must be kept free of the plant.
Class 2	Regionally Prohibited Weeds. The plant must be eradicated from the land and the land must be kept free of the plant.
Class 3	Regionally Controlled Weeds. The plant must be fully and continuously suppressed and destroyed.
Class 4	Locally Controlled Weeds. The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
Class 5	Restricted Plants. The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

- restores or replicates native plant communities that are similar in structure and floristics to Shale/Sandstone Transition Forest and considers future uses of the subject site (eg Aboriginal heritage conservation);
- improves the habitat value for existing fauna of the site and habitat potential for threatened fauna recorded from the locality;
- secures natural and cultural heritage for the local community in the long term.

The program will focus on retaining and using the existing native vegetation and natural resilience of the site to meet the guiding objective and this will require:

- weed removal and control;
- bush regeneration techniques in Riparian Zone A and other specific planted areas;
- erosion control; and
- revegetation.

The proposed management strategy for this VMP has been divided into four components.

- **Construction Activities** – incorporating the construction of permanent and temporary flood mitigation, stormwater control infrastructure and sediment and erosion control devices;
- **Restoration and Revegetation** - incorporating weed control, bush regeneration techniques, revegetation and erosion control;
- **VMP Monitoring** – actions required to ensure the vegetation management measures of this VMP are being met and remain appropriate; and
- **Roles, Responsibilities and Timing** – recommending the staging of vegetation management works and assigning responsibilities.

Reference has been made to and *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. (DEC, 2005a) in the preparation of the strategy and it is recommended that these documents be referred to in the refinement of this VMP to a scope of works for a restoration and rehabilitation project and the carrying out of on ground works. Cost estimates for the implementation each major vegetation management measure are included as a guide for budgeting.

4.1 Construction Activities

4.1.1 Overview

The current approved development will require major earthworks for the construction of the mill, ancillary facilities and services infrastructure. Measures to minimise the impacts on Riparian Zones A and B for the life of the development are specified in the conditions of consent and include the preparation of a Construction Environmental Management Plan (CEMP), a Soil and Water Management Plan (SWMP) and a Water Monitoring and Management Plan.

4.1.2 Vegetation Management Measures

Site Inductions

As would be part of a comprehensive CEMP, site inductions for all construction personnel are to identify environmental impact control measures, procedures and constraints. General site inductions must include specific reference to work activity constraints for Riparian Zone A. General site inductions must also include presentation of an image or example of the signage to be installed that defines Riparian Zone A. It is recommended that a Riparian Zone A and B specific induction be developed in the CEMP for any earthworks or construction works to be carried out in this zone and which identifies site environmental constraints.

Establishment of Riparian Zone A

Prior to commencement of any earthworks, clearing and grubbing works in Riparian Zone A (Figure 1) and the mapped 'Aboriginal Heritage Zone' is to be fenced off with parrawebbing or temporary cyclone mesh fencing. Riparian Zone A includes the waterbody, main channel and for 40m measured horizontally from the top of the bank and at right angles to the bank. The Aboriginal Heritage Zone incorporates Riparian Zone A and the majority of land up to the north-western boundary line.

The exclusion fencing is to include gates or restricted entry points in locations that provide the most direct access to areas of earthworks, construction and restoration works in this zone. Fencing is to be maintained for the period of the rehabilitation and restoration works in Riparian Zone A, unless otherwise advised by the consent authority. Signage is to be installed/erected along the length of the exclusion fencing that clearly identifies it as a rehabilitation and restoration area and the signage is also to be maintained.

Establishment of Riparian Zone B

No provision is made in the conditions of consent for establishing exclusion fencing in Riparian Zone B and given that major earthworks will be required for the construction of the Bioswales along the length of Riparian Zone B and it is not considered necessary at the site establishment phase. The Bioswale will be 10m wide (DIPNR, 2005) and the current condition of the vegetation for the length of Riparian Zone B is very low to low. Reinvasion by weed species is highly likely into the revegetated Bioswale and therefore as per consent condition 2.20b an additional 10m either side of the Bioswale is also to be revegetated. On completion of the construction and revegetation it is recommended that temporary exclusion fencing, similar to that described above, be installed if construction works for the mill are still in progress. Temporary exclusion fencing would be decommissioned once construction of the mill is complete.

Earthworks and Construction within Riparian Zones A and B

Any noxious weeds located within excavation areas must be treated prior to the commencement of earthworks to prevent the spread of propagules or reproductive vegetative matter to other parts of the construction site. Treatment of noxious weeds will be as per the Control Class for each species under the NW Act (1993) and the listing of the species for Wollondilly LGA.

Where possible, the design and construction of bank stabilisation or hydrological control devices should avoid the removal of any native trees. As far as practicable trees scheduled for removal are to be retained on site for chipping or mulching. Any seed that can be collected from trees scheduled for removal is to be used for propagation for site specific plantings. Excess seed is to be stored by a nursery or recognised seed bank for use in on-going revegetation of the site.

A Tree Protection Zone (TPZ) is to be established for any native trees that are to be retained but which may be affected by earthworks within Riparian Zones A and B. Distances for TPZ for trees will preferably be a minimum distance of five times the tree diameter measured at 1.4 m (Diameter at Breast height, DBH) above ground level raised to the next 0.5m. Additionally excavation must not disturb the main feeder roots of any retained native trees in Riparian Zones A and B and batters adjacent to native trees must be at low angles to ensure slope stability and reduce the potential for tree root damage. TPZ's are to be determined by a qualified and experienced arborist, defined by temporary exclusion fencing and installed prior to the commencement of earthworks or construction works. TPZ's are to be maintained for the duration of earthworks and construction.

Temporary sediment and erosion controls and must be installed throughout Riparian Zones A and B in accordance with the specifications of the SWMP and maintained for the duration of the restoration project or until these areas are sufficiently stabilised by established native vegetation cover.

Finished levels of any areas disturbed by earthworks within Riparian Zones A and B, prior to revegetation with native plant species, are to be stabilised by one or more combinations of jute meshing (open weave), sterile grass seeding, hydro mulching or mulching (mulching is to be to a minimum depth of 75mm).

All Construction Activities

No vehicles, machinery, heavy plant, site sheds, stockpiling or materials storage are to use any area defined or mapped as a Riparian Zone other than for earthworks, construction activities or restoration works specified in the conditions of consent. Access/egress, parking of vehicles and machinery or heavy plant or stockpiling and materials storage is to be restricted to areas in the immediate vicinity of earthworks, construction works or restoration works.

Native trees scheduled for removal for construction works elsewhere on the subject site (ie outside Riparian Zones A and B) must be checked for occupation by fauna species well in advance of removal. Removal of trees with occupied hollows must not occur until the hollows are vacated after which the hollows should be blocked. Fauna survey and clearances are to be carried out by a suitably qualified, experienced and licensed individual or organisation.

Trees scheduled for removal are to be retained on site for chipping or mulching or placed in Riparian Zone A as habitat logs. Any seed that can be collected from trees scheduled for removal is to be used for propagation for site specific plantings. Excess seed is to be stored by a nursery or recognised seed bank for use in on-going revegetation of the site.

A TPZ is to be established for any native trees that are to be retained but which may be affected by earthworks for any construction activities outside Riparian Zones A and B. Distances for TPZ for trees will preferably be a minimum distance of five times the tree diameter measured at 1.4 m (Diameter at Breast height, DBH) above ground level raised to the next 0.5m. Additionally excavation must not disturb the main feeder roots of any retained native trees in Riparian Zones A and B and batters adjacent to native trees must be at low angles to ensure slope stability and reduce the potential for tree root damage. TPZ's are to be determined by a qualified and experienced arborist, defined by temporary exclusion fencing and installed prior to the commencement of earthworks or construction works. TPZ's are to be maintained for the duration of earthworks and construction.

All exposed soil surfaces resulting from construction activities that are not designated a specific vegetation management measure (eg rehabilitation or landscaping) are to be stabilised by one or more combinations of jute meshing (open weave), sterile grass seeding, hydro mulching or mulching (mulching is to be to a minimum depth of 75mm).

4.2 Restoration and Revegetation

4.2.1 Overview

The current proposal for the site incorporates the restoration of Riparian Zone A to a native plant community and modification of Riparian Zone B to manage effluent and stormwater from the mill and associated infrastructure. The implementation of a restoration project for Riparian Zone A revegetation of Riparian Zone B (using appropriate native plant species) will require noxious weed control, bush regeneration, revegetation and erosion control and this will be consistent with the aims and objectives described above for vegetation management of the site. Several of the guiding principles for the following information have been drawn from *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. (DEC, 2005a).

4.2.2 Project Planning and Site Establishment

Restoration and Regeneration Project Planning

Adequate funding for the implementation of restoration and revegetation project is critical for its success. The original conditions of consent for the development specified that 'The rehabilitated Riparian Zones shall be maintained and monitored for a period of at least four years after final planting, or where other revegetation methods are used, two years after plants are of tubestock size and are at the densities specified in the Vegetation Management Plan.' (DIPNR, 2005). Revision of the areas to be planted in Riparian Zone A has resulted in a minimum four year maintenance period and this is the main premise on which the accompanying budget estimates are based. Cost estimates of this document are a guide and are for a project establishment period of six months (completion of all major works) followed by the maintenance period of four years.

Planning of the implementation of a restoration and revegetation project must also consider that departures from the works recommended in this VMP may be required in response to directions from a consent authority, changing site conditions due to natural processes, other construction works (required to meet specifications) or encroachments that result in major disturbance to restoration works in progress (including during the four year maintenance period). Departures to rectify disturbance to restoration works will require additional finance and no allowance is made in the cost estimates of this VMP for rectification works.

This VMP recommends that no restoration or revegetation works, other than that required to stabilise areas of disturbance or control erosion, commence in Riparian Zones A or B until all scheduled earthworks and construction works are complete in these zones. This strategy will minimise the likelihood of accidental or incidental disturbance to restoration works by construction works.

Invitation to Tender for a Restoration and Revegetation Project

The landowner or landowner's project manager will need to prepare a scope of works for a restoration and revegetation project and either invite bush regeneration contractors to tender, or put out to open tender, a contract for the project. Alternatively the landowner may employ a suitably qualified individual(s) to carry out the works. The scope of works to be prepared will consider this VMP and items discussed above for the planning phase. As mentioned the development of scope of works should reference *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. (DEC, 2005a).

Invitation to Tender for VMP Monitoring

The landowner or landowner's project manager will need to engage a vegetation management or ecological consultants to carry out the VMP monitoring works. The scope of works for VMP monitoring will consider this VMP and items discussed above for the planning phase. Generally the aim of the VMP monitoring will be to assess progress and success of the restoration and revegetation project and recommend alterations to, or further vegetation management actions and prepare and

submit the monitoring reports as per consent condition 2.25 (DIPNR). The vegetation management consultant is to be engaged at the commencement of the restoration and revegetation project so that this consultant can collaborate with the bush regeneration contractor and have a detailed understanding of the progress the project, particularly in relation to the desired outcomes.

Site Establishment and Preparation

Once contracts are awarded for the restoration and revegetation project and VMP monitoring the site establishment and preparation works will involve:

- project initiation meeting between the mill Construction Contractor, Bush Regeneration Contractor (BR Contractor) or suitably qualified individual(s) and Vegetation Management Consultant to ensure coordination of site activities;
- preparation of a time line showing the order of the main restoration and revegetation and monitoring works with start and finish times and milestones;
- advise the Department of Natural Resources of the person responsible for any seed or vegetative propagation prior to the commencement of the plant propagation;
- general and site specific inductions for bush regeneration and VMP monitoring staff;
- addressing occupational health and safety (OH&S) issues, including preparation of a site hazard assessments and safe work method statements.

The appointed BR Contractor/suitably qualified individual(s) and Vegetation Management Consultants will have formal Occupational Health and Safety Programs (OH&S Program), set up in accordance with the *NSW Occupational Health & Safety Act 2000* (OH&S Act) and the *NSW Occupational Health & Safety Regulation 2001*, incorporating:

- workplace principles and policies relating to QA;
- reporting systems;
- project management system;
- training and education;
- workplace inspections, evaluations and audits; and
- staff manuals.

The appointed BR Contractor/suitably qualified individual(s) and Vegetation Management Consultant will ensure that the following OH&S issues are addressed:

- a hazard assessment is conducted for the site prior to commencement of works;
- preparation of a safe work method statement covering all vegetation management actions for the contract and all areas of the site;
- site induction for any personnel engaged or internally employed, identifying all relevant safety issues and environmental risks;
- ongoing reviews of safe work methods and hazards; and
- self-auditing of OH&S procedures.

4.2.3 Vegetation Management Measures

Restoration and revegetation activities will be focused on Riparian Zones A and B and other planting areas of the subject site. Weeding of Riparian Zone A will occur in three stages: primary, secondary and maintenance and weed control works will aim to treat noxious weeds throughout Riparian Zones A and B and other planting areas as a priority. Weeding of Riparian Zone B will involve maintenance of the planted Bioswale and buffers. Other bush regeneration methodologies and vegetation management actions for these areas will be required but should not be limited to those recommended below.

Restoration and Regeneration Project Area Establishment

As described in Section 4.1 above the boundaries of Riparian Zone A will have been established prior to commencement of restoration and revegetation works. In addition the BR Contractor/suitably qualified individual(s) is to be made aware of Heritage Conservation Area 1 and any management measures to eliminate the likelihood of impact to Aboriginal Objects either known or later identified in Heritage Conservation Area 1.

Noxious Weed Control

Weeds that are listed as 'noxious' for Wollondilly LGA must be removed from the site or controlled, depending on the Control Class for the weed and according to the provisions of the NW Act. Blackberry and African Boxthorn are recorded in Riparian Zone A and noxious weed control will focus on these two species and any other emerging or previously unrecorded noxious weeds.

Noxious weed control is to be carried out across Riparian Zones A and B other planting areas and the Aboriginal heritage Conservation Zone of the subject site the duration of the restoration works in this plan and of the duration of the life of the development.

Primary Weeding

Primary weeding is the first round of weeding activity and involves the removal of most of the weed biomass present, incorporating:

- 'cut-and-paint', 'frill and fill', long stem scrape or target spraying of woody weeds (eg Olive);
- hand-removal and spot spraying of smaller woody herbaceous weeds (eg. Purple Top and Shepard's Purse); and
- spot-spraying and hand-weeding of exotic grasses (eg. Kikuyu, Paspalum and Pigeon Grass).

Previous land uses has resulted in high the highly disturbed nature of the vegetation in Riparian Zone A. Primary weeding in preparation for revegetation works will require broad spraying only tree areas identified for revegetation. Spray application should be with non selective herbicide carried out during late Autumn to early Spring.

Exotic grasses are to remain on the steeper banks and main channels of Riparian Zone A to maintain soil and slope stability. Weeding of the banks will focus on woody, perennial and herbaceous annuals (other than grasses) and use a combination of handweeding and spot spraying. Weeding of the channels and within 2m of the reservoir waterline will also focus on woody, perennial and herbaceous annuals (other than grasses) by handweeding only.

Primary weeding of Riparian Zone B will also require minor earthworks and broad spraying in preparation for planting. The 10m of Bioswale and 10m buffers (outside the overlapping Riparian Zone A and B areas) are to be broad sprayed one month after construction of the Bioswale is complete.

Secondary Weeding

One month after initial broad spraying (primary weeding) the revegetation areas are resprayed. Secondary weeding of the steeper banks and main channels of Riparian Zone A is also to occur and follow the same methodology as described above for primary weeding. The site will be inspected at regular monthly intervals by the BR Contractor/suitably qualified individual(s) to determine the need and appropriate timing of secondary weeding. This will vary according to the timing of the primary weeding, insofar as regrowth will be stronger if primary weeding occurs during spring and summer, and slower during autumn and winter. However secondary weeding is to be carried out within a minimum of three months from completion of primary weeding of the banks and channels of Riparian Zone A.

Secondary weeding is to continue until the date of final plantings in either Riparian Zones A or B and this is only likely only to require a minor amount of spot spraying or handweeding.

Maintenance Weeding

Maintenance weeding will be required to ensure that weed growth following secondary weeding and revegetation is controlled in the long-term.

Maintenance will commence at the date of final planting in either Riparian Zone A or B for a period of four years. Weeding activities will include continued noxious and environmental weed control and bush regeneration techniques such as hand weeding and spot spraying throughout Riparian Zones A, B other planting areas and the Aboriginal Heritage Conservation Zone.

It is noted here that adequate site preparation prior to planting in the revegetation areas as described above, if timed to maximise the effect of broad spraying, will reduce the maintenance weeding required to sustain planted stock regrowth rates and survival.

Construction Debris and Excess Fill or Soil

Except in designated and active construction areas in Riparian Zones A and B both areas are to be kept clean and free of all excess construction materials and debris and excess fill or soil. The exception will be temporary stockpiles or storage areas for works directly associated with the restoration and revegetation works of this VMP (eg mulch, plant stock and irrigation equipment).

Herbicide Application

Herbicide applications by cut and paint, frill and fill, long stem scrape or spray will mainly use Glyphosate (or equivalent). Treatment of some noxious weeds species or grass weeds may require selective or residual herbicides. Spray application of herbicides is to be restricted in the Riparian/Wetland communities with a total exclusion of residual herbicides. The use of herbicides on the site must be in accordance with labelling instructions, MSDS's and comply with the NSW *Pesticides Act 1999*.

Revegetation

Revegetation works will aim to reconstruct a native plant community in the planting areas of Riparian Zone A (Figure 4) and establish plant cover in Riparian Zone B (Figure 4) that compliments the waste water management objective of the Bioswale. Other areas of the subject site are to be planted and these are shown in Figure 5. Reconstruction of a native plant community is defined by DEC (2005a) as 'active intervention to facilitate the restoration of an ecosystem. It generally involves the reintroduction/augmentation of plant species to a site in a process known as revegetation.' For Riparian Zones A, B and other areas a planting scheme is to be developed in the preparation of a scope of works for the restoration and revegetation project that;

- complies with development consent condition 2.20 as amended (DIPNR, 2005);
- improves vegetative connectivity between retained stands or individual trees;
- creates a mosaic of habitat through clumping of groundcover, shrub and canopy species in the discrete planting areas in Riparian Zone A;
- reduces the potential for erosion;
- is consistent with the floristics of Shale/Sandstone Transition Forest in Riparian Zone A;
- uses locally and commonly occurring aquatic and semi-aquatic plant species in the Reservoir and open channel of Riparian Zone A;
- is compatible with the hydrological flow and function of the Bioswale and associated control structures of Riparian Zone B;
- is developed in consultation with the traditional landholders (Aboriginal community) with regard to the conservation and management of Aboriginal objects or potential archaeological deposits for species selection within the revegetation areas (eg only groundcovers for within 2m of Aboriginal objects); and

Appendix A is the recommended planting species list and this is derived from a combination of species; occurring on the subject site; growing in the woodland and drainage line south of the railway

line; and the NSW Scientific Committee Final Determination for Shale/Sandstone Transition Forest (1998). The majority of the species included in the list are readily propagated from seed or cutting and are commercially available.

Planting works should be carried out in Autumn and attempt, where possible, to utilise existing site features that will improve survival rates such as dips or depressions, natural water sheds and shade. Plants are to be propagated and supplied by a commercial or community nursery that is a member of a recognised industry association. Supply and installation of plants will be 'forestry tubes' for trees, shrubs and scramblers and 'Hyco cells' or 'Viro cells' for groundcovers such as grasses and herbs. Figure 4 illustrates the areas to be revegetated.

Planting is to be programmed to commence after all revegetation preparation works and between two weeks and one month after mulch has been spread. Planting areas prepared by earthworks and mulching are to be thoroughly watered (ie water has penetrated mulch and saturated cultivated soil) prior to planting.

Seed Collection and Cuttings

Production of plant stock will be, as far as possible, from seed or cuttings collected on-site or from nearby remnant bushland and must be of local provenance as per condition 2.25 of the development consent (DIPNR, 2005). Definition of local provenance for plant propagation is given by DEC (2005a) as material for propagation found on-site or close to it and states that 'The use of site-adapted local seed for propagation is best for restoring pre-existing plant communities and conserving local biodiversity. It is also more likely to lead to a successful self-perpetuating plant community, as local provenant seed is adapted to local soils, climatic conditions and ecological processes.' Table 5 of *Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. (DEC, 2005a) provides guidelines on seed collection ranges based on estimated dispersal distances for various plant categories. Alternatively plant stock may be sourced from existing supplies of seed or stock from a contracting nursery but proof of the origin of the material, that identifies it as of local and provenance, must be forwarded to the Vegetation Management Consultant. Further to seed collection and plant propagation, DNR is to be advised of the person responsible for any seed or vegetative propagation prior to the commencement of that propagation as per development consent condition 2.23.

The BR Contractor or contracting nursery will commence seed and cutting collection from native plants within the site or nearby remnant bushland at least twelve months prior to the scheduled commencement of revegetation works. The BR Contractor (or appointed nursery sub-contractor) will possess the necessary licence for seed collection issued by DEC under the *National Parks & Wildlife Act 1974* and will obtain permission from other adjacent land holders or natural area management authorities for collection activities within any remnant bushland areas.

Some seed should be retained for direct broadcast into regeneration areas as part of the maintenance works.

Planting Densities

Planting densities are specified in the original consent condition 2.20c and in subsequent amendment by DNR and these are;

- Riparian Zone A - At least 1 tree or 1 shrub (in approximately equal numbers) alternately planted at 1 plant per 16 square metres and for groundcovers 'intensive patches of 9 square metres scattered around the site' in approximately 30 areas;
- Riparian Zone B (bioswale) - Native grasses only required to the outside edge of Riparian Zone A, and thence plantings as per Watercourse A; and
- The Reservoir - Within the reservoir, and below the contour equal to the broad crest level of the spillway, macrophytes are to be densely planted to assist in water quality polishing.

Planting densities are to be based on the conditions of consent with the total number installed determined by the total area to be planted in Riparian Zones A and B. The actual distribution of groundcover, shrub and tree species across both Riparian Zones A and B will be determined by some of the considerations in dot point from the *Revegetation* chapter above (eg creating a mosaic of

habitats, higher densities in areas of potential erosion, function of Bioswales, APZ's etc). If mulching is to be excluded from the Bioswale of Riparian Zone B as a finished surface treatment then groundcover densities in this area are to be a minimum of 5 plants per square metre.

Mulching

Mulching has been referred to in the original conditions of consent (item 2.20(i) and 2.24), however in further consideration of this component of the revegetation works DNR has determined that mulching 'only needs to be applied if needed, ie to facilitate weed control or moisture retention' (DNR notes to Draft VMP, 2006).

Irrigation

Prior to planting works temporary irrigation is to be installed throughout all planting areas. The final design and on site location of the irrigation system shall be determined either in the preparation of a scope of works for the restoration and revegetation project or recommended by organisations tendering for the project. Generally the irrigation system will consist of 2-3 inch 'polypipe' with fitted with connectors, valves, risers, sprinkler heads, pressure reducers, back flow prevention valves and pumps as required. Irrigation using on site water from the Riparian Zone A reservoir is proposed. It will be the responsibility of the BR contractor/suitably qualified individual(s) or their employer to operate the irrigation system to maintain the plantings for the four year maintenance period. Irrigation using water from existing dams or the reservoir must not extract water to levels where the ecological function of these water bodies is adversely affected. The use of on site water from the dams or reservoir for irrigation to planting areas is to be addressed in the Water Monitoring and Management Plan and this should include assessment criteria that determine when extraction is interrupting ecological function of these water bodies.

Alternatively irrigation will be by mains water or purchased and delivered to site by contract water suppliers. Irrigation by Sydney Water mains supply must comply with water use restrictions that apply at the time of the revegetation programme. The BR contractor/suitably qualified individual(s) or their employer must obtain and maintain any exemption permits and adhere to the conditions attached to the permits, issued by Sydney Water.

The BR contractor/suitably qualified individual(s) must maintain the irrigation system during the four year maintenance period and decommission it in full at the end of this period.

Planting Maintenance

Maintenance of plantings in Riparian Zones A and B is to commence from the date of final planting in either of these areas and this will continue for four years as per amendment to development consent condition 2.24. DNR will inspect the plantings before commencement of maintenance period to certify that the planting areas and densities have been achieved as per the conditions of consent and subsequent amendments. Key elements in the maintenance of the revegetated areas will be water, prevention of predation, suppression of smothering weeds and replacement of plant stock.

To prevent damage or loss of plantings by rabbits planting areas are to be closely monitoring for predation by rabbits. Where predation is resulting in losses or damage to more than 5% of the installed plants then all installed plants should be staked and bagged and these should be maintained during until plants are established.

Weeding of plantings throughout the site is to be carried out and will using hand weeding and spot spraying. Weed densities throughout planting areas are not to exceed 5-10% (DNR notes to Draft VMP, 2006).

Supplementary mulching is to be carried out for the duration of the maintenance period to maintain a mulch depth of 75mm.

As a general rule it is expected that there will be a loss of approximately 20% of the original planting numbers. Replacement plantings will aim at maintaining the original planting numbers at 90% throughout the maintenance period. At the end of the four year maintenance period surviving plants in Riparian Zones A and B shall not be less than 90% of the original planting densities as specified in

advise from DNR. In calculation of this figure regeneration of locally occurring native plant species within the revegetation areas can be included.

Feral Animal Control

The implementation of a rabbit control program must be considered in the planning of the restoration and revegetation project. A successful long term rabbit control program for the site will require incorporation of a site specific control program into an existing or proposed local or regional program. The landowner or project manager will need to coordinate and liaise with other government authorities such as Wollondilly Shire Council, the Rural Lands Protection Board, NSW Agriculture, DEC and adjacent private landholders. Any feral animal control on the subject site is to be carried out by a suitably qualified and experienced contractor or employee of a government local control authority.

4.3 VMP Monitoring

A program of monitoring and inspection will be carried out by a qualified Vegetation Management Consultant (or qualified botanist) for the full period of the restoration and revegetation project (approximately four and a half years). The consultant will be responsible for ensuring the measures specified or recommended in this VMP are implemented and that performance criteria are met. The monitoring program will commence at the time of the commencement of site preparation works and will continue for the four years of maintenance.

General observations will be made of the nature and condition of the plant communities of the restoration and revegetation areas during monitoring surveys, including:

- estimates of the success rate of plantings and assessment of plant replacement requirements;
- identification and assessment of any natural regeneration of native plant species;
- evidence of erosion and sedimentation and the correct function of erosion control devices; and
- recommendations for corrective measures and/or vegetation management.

An example of a monitoring sheet is attached in Appendix B, which provides an indication of the parameters to be assessed during monitoring surveys.

A weed density map will also be prepared at commencement of the restoration and revegetation project and it will be updated on a biannual basis. The Vegetation Management Consultant will ensure that the map is prepared on a suitable base plan, which will remain as the base plan for the duration of the monitoring period.

4.4 Roles, Responsibilities and Timing

Roles and Responsibilities

The roles and responsibilities of all project staff of relevance to the VMP are listed in Table 2. The proponent will be primarily responsible for the implementation of this VMP, and will engage a qualified vegetation management consultant with experience in bush regeneration and ecological assessment for monitoring and auditing. The consultant will monitor the vegetation management works and ensure that the BR Contractor/suitably qualified individual(s) has complied with the requirements of this VMP. The consultant will act as a communication link between the BR Contractor/suitably qualified individual(s) or employer and consent authorities.

Table 2 Restoration and Revegetation Project. Roles and Responsibilities

Role	Responsibilities
Project Manager	<ul style="list-style-type: none"> ▪ Project management of entire site including planning, contracting and coordination of all construction works, landscaping, Riparian Zone restoration and revegetation project, compliance with development consent conditions, liaison with stakeholders and consent authorities and OH&S.
Construction Contractor(s)	<ul style="list-style-type: none"> ▪ Construction of Bioswales and other in stream control and stabilisation structures. ▪ Install and maintain exclusion fencing along Riparian Zones and around TPZ's during construction works in Riparian Zones. ▪ Install all erosion and sedimentation controls during construction works in the Riparian Zones. Maintain all erosion and sedimentation controls in the Riparian Zones relating to construction works in the Riparian Zone for the duration of the restoration and revegetation project.
BR Contractor /suitably qualified individual(s)	<ul style="list-style-type: none"> ▪ Vegetation management within Riparian Zones A, B and amended areas. ▪ Implementation of VMP actions. ▪ Weed control, seed collection, planting, erosion control (only for works directly related to the restoration and revegetation project) and maintenance of plantings and mulch.
Commercial or community plant nursery	<ul style="list-style-type: none"> ▪ Collection of local provenance native plant seed and cuttings. ▪ Supply of local provenance native plant stock.
Pest Species Contractor	<ul style="list-style-type: none"> ▪ Rabbit control.
Vegetation Management Consultant (or qualified botanist)	<ul style="list-style-type: none"> ▪ Monitoring and provision of advice of for restoration and revegetation project in Riparian Zones A, B and amended areas. ▪ Ensuring compliance with VMP. ▪ Certification that restoration and revegetation works have met the assessment criteria at completion of the 4 year maintenance project.
Department of Natural Resources	<ul style="list-style-type: none"> ▪ Certification of commencement of maintenance period. ▪ Inspection of restoration and revegetation works during maintenance period. ▪ Certification that restoration and revegetation works have met the assessment criteria at completion of the 4 year maintenance project.

Timing

The entire restoration and revegetation project including on ground works and VMP monitoring will extend for approximately 54 months (four and a half years), allowing 6 months for site preparation, primary and secondary weeding and planting, and a further 24 months for maintenance. Table 3 details the vegetation management actions to be carried out for the site and identifies responsibilities, performance criteria and timing for each recommended action. Table 3 lists the general order in which the vegetation management actions should occur.

Table 3 Vegetation Management Measures for Riparian Zones A and B, Grain Milling Facility, Picton Rd Maldon.

Action	Responsibility	Performance Criteria	Timing
Construction			
Definition and agreement of expected outcomes for Riparian Zone A and B restoration and revegetation project.	Construction Project Manager, BR Contractor/suitably qualified individual(s), Vegetation Management Consultant, Construction Contractor(s) and representative from a consent authority (eg Council, DNR, DEC)..	VMP actions roles and responsibilities clearly identified and defined	Prior to commencement of any construction works in Riparian Zones A or B.
Delineate Riparian Zones A, B, Aboriginal Heritage Conservation zones and no go zones or for construction activities.	Construction Project Manager, Local Aboriginal Land Council, BR Contractor/suitably qualified individual(s), Vegetation Management Consultant, Construction Contractor(s) and representative from a consent authority (eg Council, DNR, DEC).	Aboriginal Heritage and Conservation zones, VMP areas and objectives clearly defined and no unauthorised encroachments or disturbance during construction.	Prior to commencement of any construction works in Riparian Zones A or B.
Install temporary exclusion fencing around Aboriginal Heritage Conservation zones, Riparian Zones A and B, vegetation management areas and 'no go zones'. Install erosion and sediment control fences and devices. Maintain erosion and sediment control fences and devices.	Construction Contractor	Temporary exclusion fencing and sediment control fences and devices installed and maintained according to CEMP and SWMP	Prior to any construction and throughout construction as required
Felling of trees scheduled for removal.	Arborist	No damage to trees not scheduled for removal. Tree limbs and foliage chipped and mulch reused on site. Tree trunks retained for habitat logs in restoration areas.	After fauna clearance surveys and prior to any construction earthworks.
Noxious weed control in VMP areas.	BR Contractor/suitably qualified individual(s)	Control and disposal of noxious weeds	Ongoing for the life of the development.

Table 3 cont' Vegetation Management Measures for Riparian Zones A and B, Grain Milling Facility, Picton Rd Maldon.

Action	Responsibility	Performance Criteria	Timing
Soil stabilisation works (jute meshing, grass seeding, turfing or other) in areas of disturbance post construction in Riparian Zones A and B.	Construction Contractor or BR Contractor/suitably qualified individual(s).	Exposed soil stabilised	On completion of finished levels where earthworks have occurred.
Collection of seed from felled trees.	Contracting Nursery or BR Contractor/suitably qualified individual(s)	All seed collected and used in revegetation works on site. Surplus seed stored in a seedbank for future revegetation works at the site	Immediately after felling
Make good construction areas in Riparian Zones A and B including removal construction stockpile surplus, rubbish, debris, fenced compounds and no go area exclusion fencing.	Construction Contractor and Vegetation Management Consultant.	Riparian Zones clear of all materials not directly related to restoration and revegetation project and this is certified by the Vegetation Management Consultant.	Once all construction works in Riparian Zones A and B are complete and prior to commencement of revegetation preparation works.
Restoration and Revegetation Project			
Native seed and cuttings collection for propagation	BR Contractor or Nursery Contractor	Collection of native plants and cuttings from the site or locality of recommended planting species (Appendix A)	Commencing twelve months prior to revegetation works.
Project establishment meeting and planning of Restoration and Revegetation Project for Riparian Zones A and B.	Construction Project Manager, BR Contractor/suitably qualified individual(s), Vegetation Management Consultant.	Formulation of a strategic approach and coordination of activities.	Before commencing the major works of the Restoration and Revegetation Project.

Table 3 cont' Vegetation Management Measures for Riparian Zones A and B, Grain Milling Facility, Picton Rd Maldon.

Action	Responsibility	Performance Criteria	Timing
Finalisation of a timeline for the Restoration and Revegetation Project VMP monitoring program showing the order of start and completion, dependencies and milestones.	BR Contractor/suitably qualified individual(s) and Vegetation Management Consultant	Submit Gantt charts or similar to Construction Project Manager that shows start and finish times of major tasks and milestones	Prior to commencement of works and VMP monitoring and updated as required throughout the project
OH&S. Hazard & risk assessment for bush regeneration crews. Prepare Safe Work Method Statement. Conduct internal safety and environmental induction.	BR Contractor/suitably qualified individual(s) and Vegetation Management Consultant	Safe Work Method Statement completed and submitted to Construction Project Manager	Prior to commencement of all works
Carry out noxious weed control	BR Contractor/suitably qualified individual(s).	Noxious weeds controlled as per <i>Noxious Weeds Act 1993</i> provisions.	Prior to revegetation works and for the duration of the life of the development
Rabbit control program	Pest species contractor	Eradication or significant reduction of rabbit population at the site	Prior to revegetation works and for the duration of restoration and revegetation project as required
Carry out primary weeding	BR Contractor/suitably qualified individual(s).	Weeds treated.	Prior to revegetation works.
Install and maintain sediment and erosion control devices directly related to restoration and revegetation works	BR Contractor/suitably qualified individual(s)	Sediment and erosion control fences and devices installed and maintained according to CEMP and SWMP	Prior to any works that may result in soil erosion and for duration of project as required.

Table 3 cont' Vegetation Management Measures for Riparian Zones A and B, Grain Milling Facility, Picton Rd Maldon.

Action	Responsibility	Performance Criteria	Timing
Carry out secondary weeding	BR Contractor /suitably qualified individual(s)	Weed regrowth following primary weeding treated.	Commencing within one month of primary weeding. Secondary weed control to continue until plantings commence.
Install mulch (to facilitate weed control and moisture retention)	BR Contractor/suitably qualified individual(s)	Mulch spread in revegetation areas to a depth of 100mm	As required.
Install irrigation	BR Contractor/suitably qualified individual(s)	Irrigation installed and functioning	On completion of mulching.
Planting of areas identified for revegetation and following the aims of revegetation.	BR Contractor/suitably qualified individual(s)	<p>Revegetation to follow as close as possible the recommendations of this VMP. Watering by on site water extraction from the reservoir and/or current Sydney Water exemption permit.</p> <p>Plants installed as per densities and species specified in this VMP.</p> <p>Only local provenance plant stock of those species recommended in Appendix A to be planted throughout the site</p> <p>All plantings staked and bagged where predation by rabbits exceeds 5% of original numbers</p>	On completion of primary and secondary weeding, mulching and installation of irrigation.

Table 3 cont' Vegetation Management Measures for Riparian Zones A and B, Grain Milling Facility, Picton Rd Maldon.

Action	Responsibility	Performance Criteria	Timing
Carry out planting maintenance	BR Contractor /suitably qualified individual(s)	<p>Weed regrowth following planting carried out to prevent reinvasion and smothering growth of weeds throughout Riparian Zones A, B and other areas. DNR have specified not more than 5-10% weed cover in VMP planting areas.</p> <p>Irrigation maintained and continues to function.</p> <p>Exclusion fencing maintained.</p> <p>Top of mulch to maintain a depth of 75mm. where mulching has been carried out.</p> <p>Replacement planting to maintain native plant species cover that is a minimum of 90% of the original planting numbers.</p>	<p>Commencing from the date of final plantings and continuing for four years. From the date of final planting in either Riparian Zone A or B (ie whichever is the last area to be planted).</p> <p>Maintenance period will only commence once DNR has certified that the conditions of consent and amendments regarding planting areas and plant densities have been met.</p>
Monitoring			
Update project timelines.	BR Contractor/suitably qualified individual(s)	Updated Gantt charts submitted to Vegetation Management Consultant and Construction Project Manager	As required
Verify and update weed density map of the site.	Vegetation Management Consultant	Weed map prepared	Quarterly for the duration of the project

Table 3 cont' Vegetation Management Measures for Riparian Zones A and B, Grain Milling Facility, Picton Rd Maldon.

Action	Responsibility	Performance Criteria	Timing
Regular inspections of restoration and revegetation areas to check levels of weed regrowth following primary weeding.	BR Contractor/suitably qualified individual(s)	Levels of weed regrowth reported to Vegetation Management Consultant.	Monthly following completion of primary weeding.
Certify plant stock is locally indigenous and planting densities if required.	Vegetation Management Consultant.	Certification forwarded to DNR.	Date of final planting.
Certify plant stock has been maintained at minimum 90% of original quantity of plantings.	DNR and Vegetation Management Consultant.	90% success rate for tubestock plantings four years from date of final plantings. Certification forwarded to DNR or other consent authority.	Four years from date of final planting.
Site inspections.	DNR and Vegetation Management Consultant.	Inspection checklist completed.	At Site Establishment, then quarterly for duration of contract.
Final Inspection of Works.	DNR and Vegetation Management Consultant.	Final Inspection carried out at completion of maintenance period.	Four years from date of final planting.

5 COST ESTIMATES

Table 4 provides cost estimates for the major vegetation management works that relate to the restoration and revegetation project for Riparian Zones A and B and VMP monitoring for the actions identified for BR Contractors/suitably qualified individual(s) and Vegetation Management Consultants in Table 3 above. Estimates are based on current industry standard labour charge out rates and materials supply. Estimates are based on the current site conditions and are for a four and a half year establishment period. The costs of construction of the wastewater management, stormwater and flood control works are not included.

Table 4 Cost estimates for the implementation of the VMP.

Vegetation Management Action	Approximate Cost (\$)
Construction	
Delineate native plant communities, vegetation management areas, 'no go zones' and vegetation management objectives.	400.00
Noxious weed control	1900.00
Incidental soil stabilisation works such as jute meshing, sterile grass seeding or other (provisional sum)	5000.00
Sub Total Ex GST	7300.00
Restoration and Revegetation	
Project and contract establishment (meetings, OH&S, forward planning, etc)	900.00
Carry out noxious weed control (quarterly)	4200.00
Carry out primary weeding (broad spraying and handweeding)	2000.00
Carry out secondary weeding (broad spraying and handweeding)	2000.00
Supply and install mulch to Riparian Zone A and B and 10m buffers (provisional sum) ²	47500.00
Supply and install irrigation system	2000.00
Supply and install tubestock, Hycos and Virocells throughout Riparian Zone A and B and 10m buffers	60500.00
Supply and install replacement of plant stock at an average of 10% of original numbers per annum for 48 months	24200.00
Supply and install planting bags if required (to shrubs and trees only)	1500.00
Planting maintenance for 48 months involving; regular inspections to check levels of weed regrowth; watering; weeding; plant replacement; soil and erosion control; pest and disease control; update project timelines; verify and update weed density map of the site for 48 months ³ . Certify plant stock is locally indigenous and planting densities are maintained at minimum 90% of original quantity of plantings at regular intervals and final inspection of works ⁴ .	65000.00

² Refer to 'Mulching' item section 4.2.3 Vegetation Management Measures.

³ These actions are to be carried out 'BR Contractor/suitably qualified individual(s)' as per Table 2 of this VMP.

⁴ These actions will be carried out by a 'Vegetation Management Consultant or qualified Botanist' as per Table 2 of this VMP. The estimates in Table 4 do not include costs for a Vegetation Management Consultant recommended in Section 4.3.

Table 4 cont' Cost estimates for the implementation of the VMP.

Vegetation Management Action	Approximate Cost (\$)
Maintain exclusion fencing and sediment and erosion control devices for works directly related to the restoration and revegetation project only (provisional sum)	1000.00
Maintain irrigation materials costs (provisional sum)	1000.00
Sub Total Ex GST	211800.00
Total Ex GST	219100.00
GST	21910.00
Total Inc GST	\$241010.00

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Appendix A

Plant Species for Revegetation

Vegetation Management Plan

Grain Milling Facility, Picton Road Maldon

Table A1 Recommended Plant Species for Revegetation of Riparian Zones, 330 Picton Road, Maldon.

Scientific Name	Common Name	Riparian Zone A	Riparian Zone B
Trees			
<i>Angophora floribunda</i>	Rough-barked Apple	✓	
<i>Angophora subvelutina</i>	Broad-leaved Apple	✓	
<i>Corymbia gummifera</i>	Red Bloodwood	✓	
<i>Eucalyptus baueriana</i>	Blue Box	✓	
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	✓	
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringbark	✓	
<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark	✓	
<i>Eucalyptus moluccana</i>	Grey Box	✓	
<i>Eucalyptus punctata</i>	Grey Gum	✓	
<i>Eucalyptus sclerophylla</i>	Hard-leaved Scribbly Gum	✓	
<i>Eucalyptus tereticomis</i>	Forest Red Gum	✓	
Shrubs			
<i>Acacia decurrens</i>	Black Wattle	✓	
<i>Acacia falcata</i>	Sickle Wattle	✓	
<i>Acacia parramattensis</i>	Sydney Green Wattle	✓	
<i>Bursaria spinosa</i>	Native Blackthorn	✓	
<i>Daviesia ulicifolia</i>	Gorse Bitter Pea	✓	
<i>Dillwynia seiberi</i>	Parrot Pea	✓	
<i>Dodonaea triquetra</i>	Common Hop Bush	✓	
<i>Hakea dactyloides</i>	Broad-leaved Hakea	✓	
<i>Hakea sericea</i>	Bushy Needlebush	✓	
<i>Hibbertia aspera</i>	Guinea Flower	✓	
<i>Indigofera australis</i>	Native Indigo	✓	
<i>Kunzea ambigua</i>	Tick Bush	✓	
<i>Leptospermum trinervium</i>	Paperbark Tea-tree	✓	
<i>Leucopogon juniperinus</i>	Bearded Heath	✓	
<i>Melaleuca thymifolia</i>	Paperbark	✓	
<i>Persoonia linearis</i>	Narrow-leaved Geebung	✓	
<i>Pimelea linifolia</i>	Rice Flower	✓	
<i>Platylobium formosum</i>	Handsome Flat-pea	✓	

Table A1 cont' Recommended Plant Species for Revegetation of Riparian Zones, 330 Picton Road, Maldon.

Scientific Name	Common Name	Riparian Zone A	Riparian Zone B
Groundcovers (Grasses, Herbs, Scramblers & Vines)			
<i>Aristida ramosa</i>	Three-awn Speargrass	✓	✓
<i>Aristida vagans</i>	Three-awn Speargrass	✓	✓
<i>Austrodanthonia tenuior</i>	Wallaby Grass	✓	✓
<i>Chloris truncata</i>	Windmill Grass	✓	✓
<i>Chloris ventricosa</i>	Tall Chloris Grass	✓	✓
<i>Cymbopogon refractus</i>	Barbed-wire Grass	✓	✓
<i>Dianella longifolia</i>	Flax Lilly	✓	✓
<i>Entolasia marginata</i>	Bordered Panic	✓	✓
<i>Glycine clandestina</i>	Twining Glycine	✓	✓
<i>Goodenia hederacea</i>	Ivy Goodenia	✓	✓
<i>Hardenbergia violacea</i>	False Sarsaparilla	✓	✓
<i>Lomandra filiformis</i>	Wattle Mat-rush	✓	✓
<i>Lomandra longifolia</i>	Matt Rush	✓	✓
<i>Microlaena stipoides</i>	Weeping Grass	✓	✓
<i>Poa labillardieri</i>	Tussock Grass	✓	✓
<i>Themeda australis</i>	Kangaroo Grass	✓	✓
Aquatic and Semi-Aquatic			
<i>Baumea rubiginosa</i>	Soft Twig-rush	✓	✓
<i>Bolboschoenus fluviatilis</i>	Club-rush	✓	✓
<i>Carex appressa</i>	Sedge	✓	✓
<i>Casuarina glauca</i>	Swamp She-oak	✓	
<i>Eleocharis sphacelata</i>	Tall-spike Rush	✓	✓
<i>Gahnia clarkei</i>	Saw Sedge	✓	✓
<i>Gahnia sieberiana</i>	Saw Sedge	✓	✓
<i>Isolepis nodosa</i>	Club Rush	✓	✓
<i>Juncus usitatus</i>	Common Rush	✓	✓
<i>Melaleuca styphelioides</i>	Prickly Leaved Tea Tree	✓	
<i>Paspalum dischitum</i>	Water Couch	✓	✓
<i>Persicaria decipiens</i>	Spotted Knotweed	✓	✓

Table A1 cont' Recommended Plant Species for Revegetation of Riparian Zones, 330 Picton Road, Maldon.

Scientific Name	Common Name	Riparian Zone A	Riparian Zone B
<i>Persicaria strigosa</i>	Knotweed	✓	✓
<i>Philydrum lanuginosum</i>	Woolly Water-lily	✓	✓
<i>Phragmites australis</i>	Native Reed	✓	✓
<i>Typha orientalis</i>	Broad-leaf Cumbungi	✓	✓

Appendix B

Example Monitoring Inspection Checklist

Vegetation Management Plan
Grain Milling Facility, Picton Road Maldon

Table B1 Monitoring Inspection Checklist.

Action	Performance Criteria	Compliance (Yes/No)	Comments/Corrective Action	Initials (Date)
Site Establishment				
OH&S. Hazard & risk assessment for bush regeneration crews. Prepare Safe Work Method Statement. Attend Council induction. Conduct internal safety and environmental induction.	Safe Work Method Statement completed.			
Verify and update (if required) weed density map of the site.	Weed map prepared.			
Works				
Primary weeding	Main weed infestations and targeted or noxious weeds removed			
Compliance with <i>Noxious Weeds Act 1993</i> ; ie on-site destruction or removal from site of noxious weed propagules and biomass, as per specific action control categories for each species.	Noxious weeds controlled as per <i>Noxious Weeds Act 1993</i> provisions.			
Secondary weeding	Weed regrowth following primary weeding removed.			
Carry out maintenance weeding throughout the study area.	Existing weed growth minimised or controlled. Regrowth following secondary weeding controlled. No new weed species or infestations.			

Table C1 cont Monitoring Inspection Checklist.





Action	Performance Criteria	Compliance (Yes/No)	Comments/Corrective Action	Initials (Date)
Bulk of weed biomass disposed of at an approved waste management centre, as appropriate for each weed species.	Evidence of receipts for disposal fees.			
Broadcast locally collected native seed throughout site.	No exotic grass species used in broadcasting.			
Plant areas identified for revegetation. Plant tubestock of shrub species at mean density in conditions of consent or VMP.	Minimum 90% of the original plant stock should be maintained.			
Only locally indigenous plant stock to be planted within bushland management zones.	Tubestock and cellstock comprise locally indigenous species, as listed in Appendix B.			
Carry out replacement of plant stock.	Minimum 90% original quantity of plant stock maintained one year from the date of final planting. No dead plant stock left in ground.			


Table C1 cont Monitoring Inspection Checklist.


Action	Performance Criteria	Compliance (Yes/No)	Comments/ Corrective Action	Initials (Date)
<i>Monitoring and auditing</i>				
Regular inspections of bushland to check levels of weed regrowth following primary weeding.	Levels of weed regrowth reported to Vegetation Management Consultant.			
Certify plant stock is locally indigenous. Certify required planting densities have been achieved.	Certification forwarded to Council.			
Certify plant stock has been maintained at minimum 80% of original quantity of plantings.	80% success rate for tubestock plantings one year from date of final plantings. Certification forwarded to Council.			
Site inspections.	Inspection checklist completed.			
Final Inspection of Works.	Final Inspection carried out at completion of contract.			

Title: Figure 1
Site Location and Riparian Zones
Site: 330 Picton Road
 Maldon
Client: Kellogg Brown & Root
Date: June 23, 2006
Project No: C492-KB&R
Author: TEC - R Blackall & S Morrissey

LEGEND

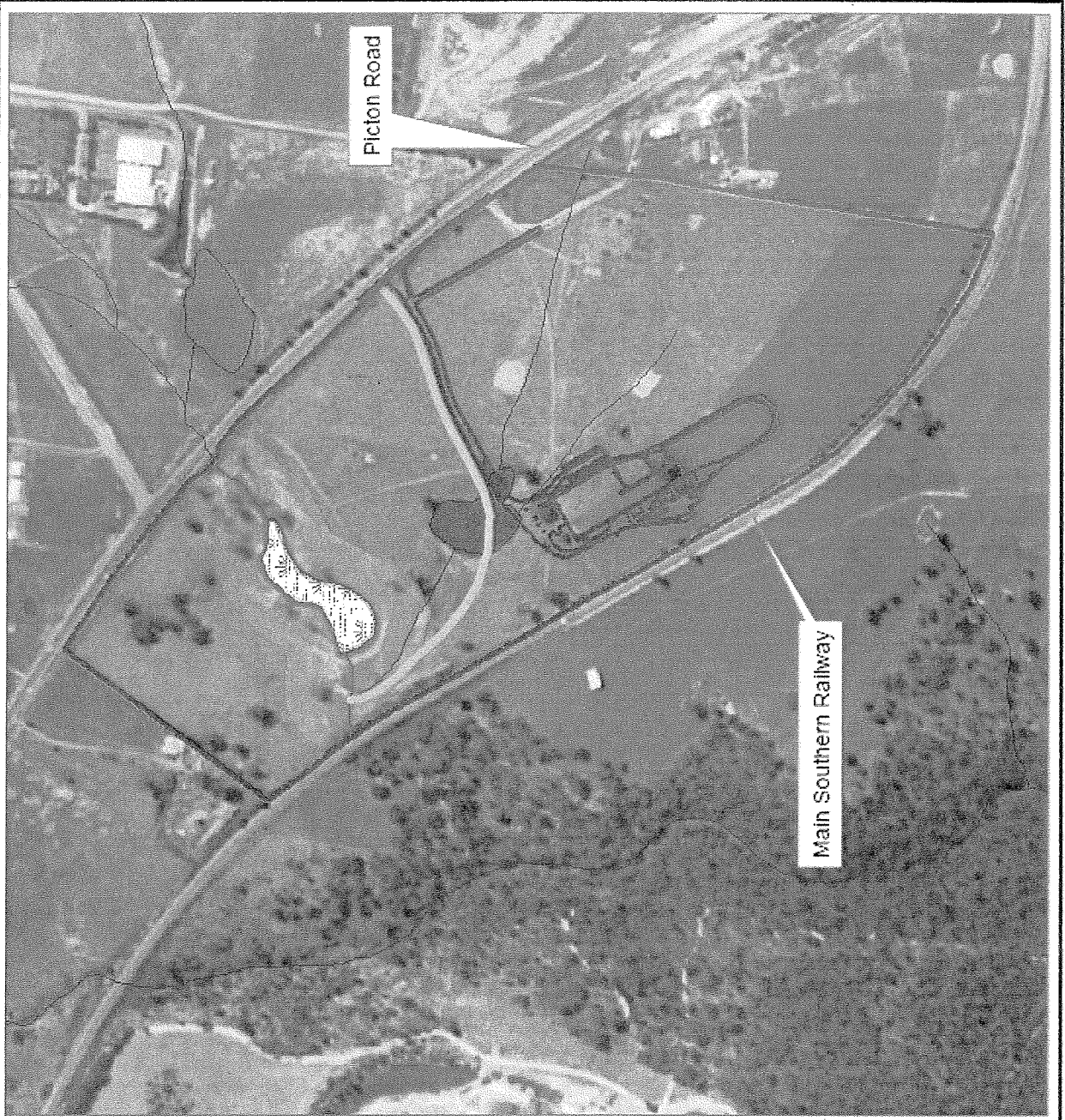
-  Site Boundary
-  Riparian Zone A
-  Riparian Zone B
-  Flour Mill Location

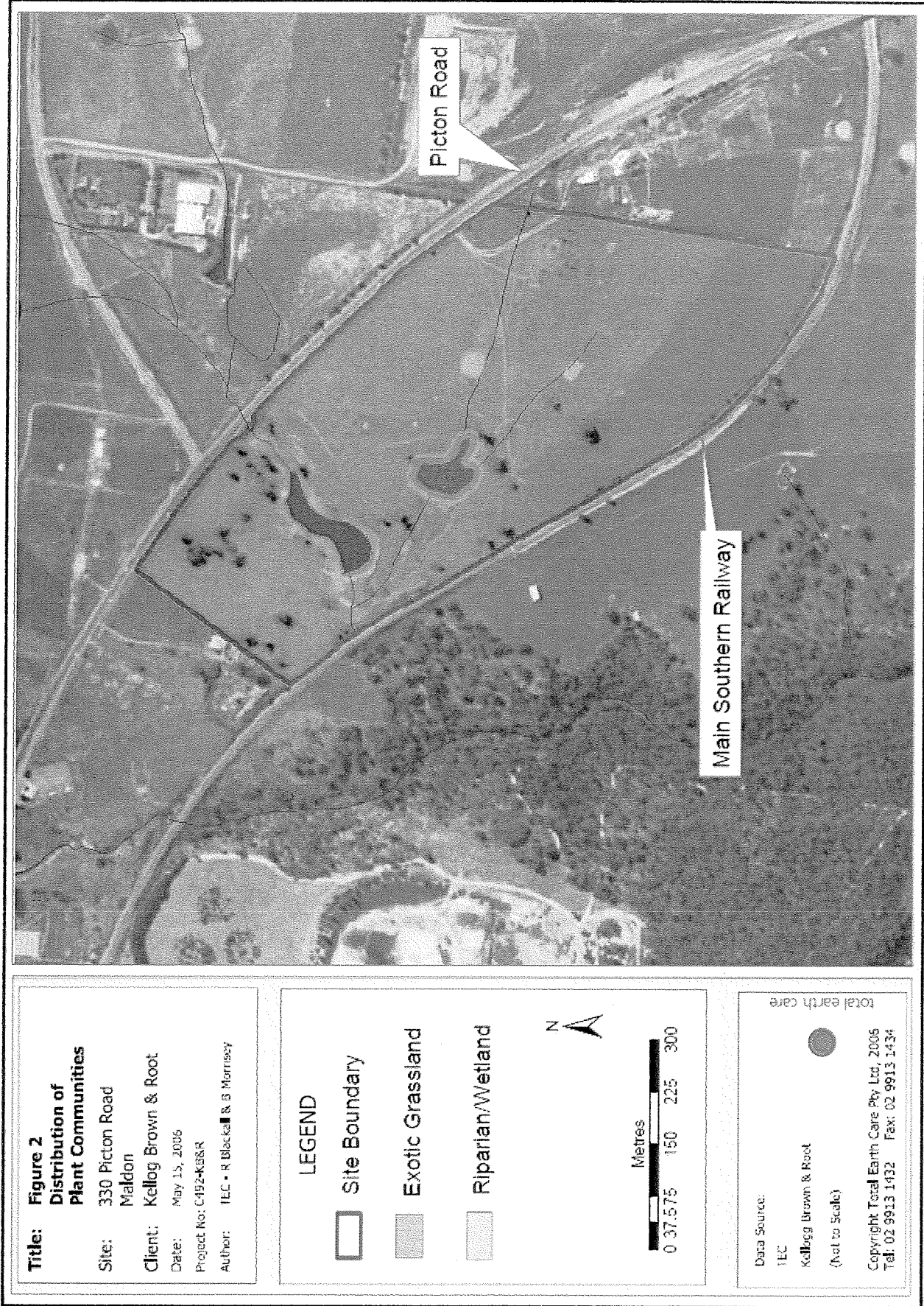
N 

Metres

 0 35 70 140 210 280

Data Source:
 TEC
 Kellogg Brown & Root
 (Not to Scale)

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 Tel: 02 9913 1432 Fax: 02 9913 1434





Title: Figure 2
Distribution of Plant Communities

Site: 330 Picton Road
 Maldon




Client: Kellogg Brown & Root

Date: May 15, 2006

Project No: C492-KB&R

Author: IEC - R Blocke & S Morrissey

LEGEND

-  Site Boundary
-  Exotic Grassland
-  Riparian/Wetland

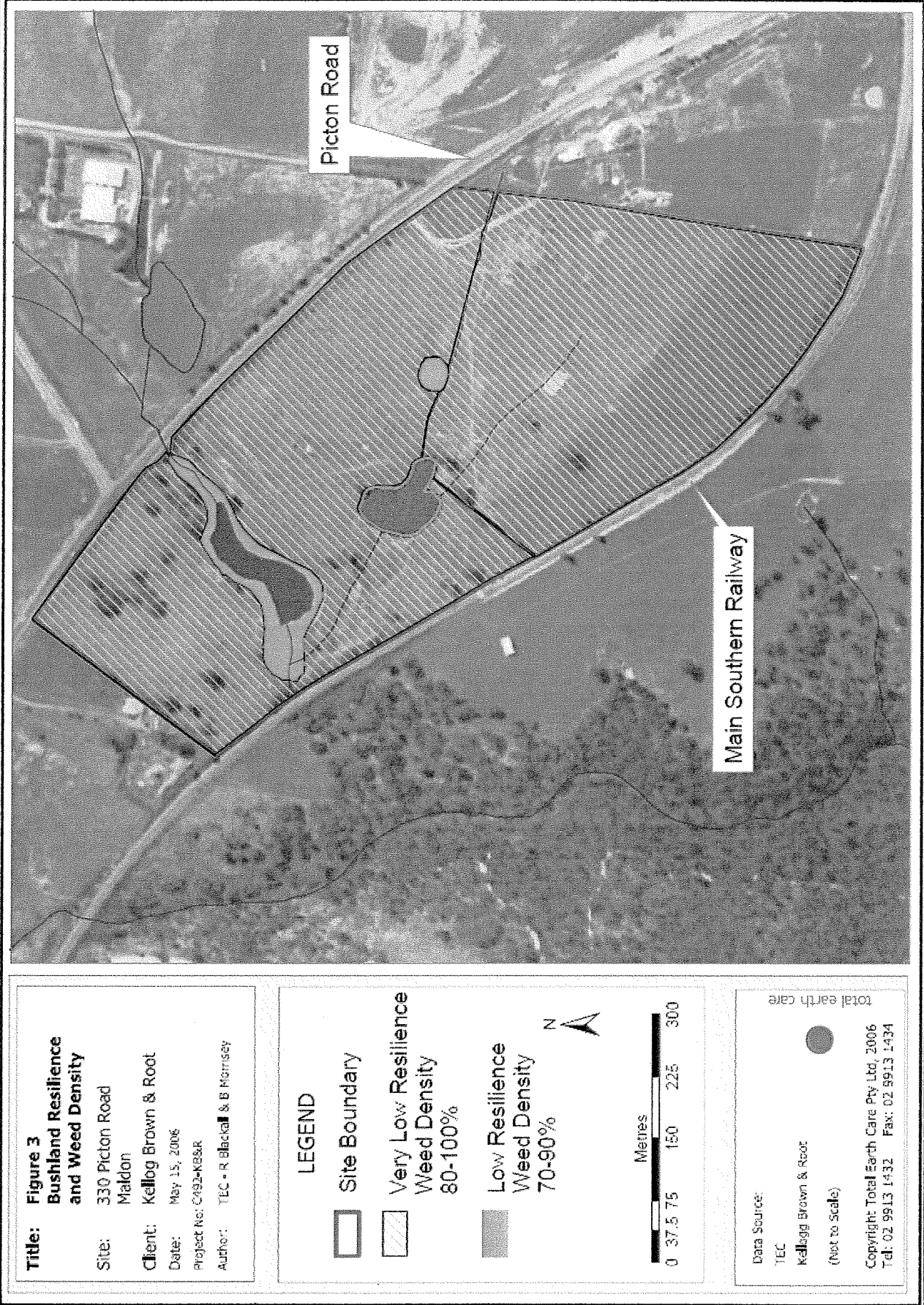


Metres

0 75 150 225 300

Data Source:
 IEC
 Kellogg Brown & Root
 (Not to Scale)

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 Tel: 02 9913 1432 Fax: 02 9913 1434



Title: Figure 3
Bushland Resilience and Weed Density

Site: 330 Picton Road
 Maldon

Client: Kellogg Brown & Root

Date: May 15, 2006

Project No: C492-K&R

Author: TEC • R Blackall & B Morrissey

LEGEND

Site Boundary

Very Low Resilience Weed Density 80-100%

Low Resilience Weed Density 70-90%

Metres

0 37.5 75 150 225 300

Data Source:
 TEC
 Kellogg Brown & Root
 (Not to Scale)

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