

**FLORA AND FAUNA COMPONENT OF THE  
GERROA INDEPENDENT ENVIRONMENTAL AUDIT**

---

**GERROA SAND QUARRY  
MUNICIPALITY OF KIAMA**

*prepared by*

**KEVIN MILLS & ASSOCIATES**

ECOLOGICAL AND ENVIRONMENTAL CONSULTANTS  
12 HYAM PLACE  
JAMBEROO NSW 2533  
ABN 346 816 238 93

*for*

**CLEARY BROS (BOMBO) PTY LIMITED**

39 FIVE ISLANDS ROAD  
PORT KEMBLA NSW 2505

---

**November 2013**

09/087

---

Kevin Mills & Associates Pty Limited ACN 003 441 610  
as trustee for Kevin Mills & Associates Trust

## Document Reference

Kevin Mills & Associates (2013). Flora and Fauna component of the Gerroa Independent Environmental Audit, Gerroa Sand Quarry, Municipality of Kiama. Report prepared for Cleary Bros (Bombo) Pty Ltd, November.

### **Kevin Mills & Associates**

Ecological and Environmental Consultants  
12 Hyam Place  
Jamberoo NSW 2533  
ABN 346 816 238 93

Ph: (02) 4236 0620 or 0429 848094

Email: [k.mills@bigpond.net.au](mailto:k.mills@bigpond.net.au)

### **COPYRIGHT**

© Kevin Mills & Associates 2013

**All intellectual property and copyright reserved.**

Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the *Copyright Act, 1968*, no part of this report may be reproduced, transmitted, stored in a retrieval system or updated in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without written permission. Enquiries should be addressed to Kevin Mills & Associates.

This report was prepared for Cleary Bros (Bombo) Pty Limited. The report should be used only by the company, and only for the stated purpose and not for any other purpose, unless authorised by the company.

**Contents**

1. **Introduction**..... 1

2. **Review of the Conditions of Approval** ..... 2

3. **Conclusion** ..... 17

4. **References** ..... 18

**Appendices**

1. *Species recorded in Random Plots – Northern Corridor* ..... 19

2. *Species recorded in Random Plots – East-West Link* ..... 21

**Tables**

1. *Number of Plant Species Recorded*..... 7

2. *Summary of Survey Plot Data*..... 8

3. *Number of Animal Species recorded* ..... 9

4. *Number of Bird Species Recorded* ..... 10

5. *Summary of schedule 3 condions 16 to 28 and schedule 5 condition 7* ..... 12

**Figures**

1. *Defined areas on the Gerroa Site* ..... 1

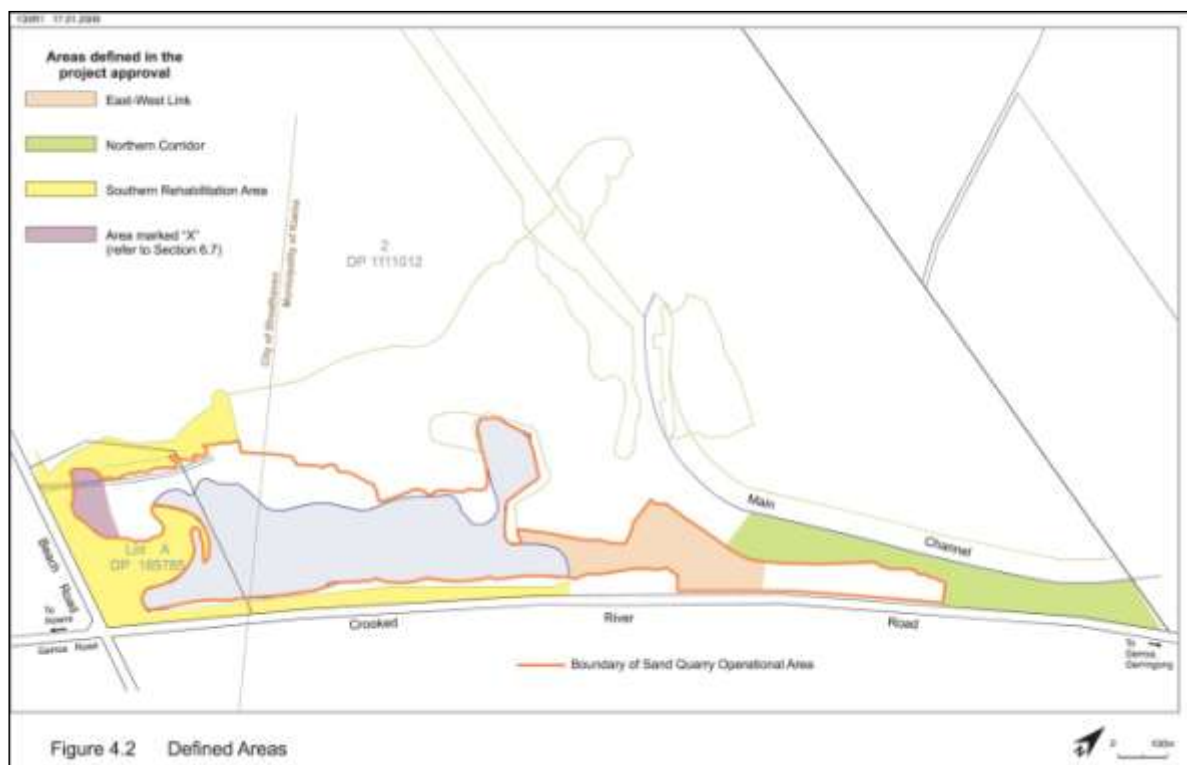
2. *Detailed map showing relevant areas near quarry* ..... 2

## 1. INTRODUCTION

The Land and Environment Court granted approval to Application 05/0099 for sand extraction and processing operations on land comprising Lot A DP 185785 and part of the Certificate of Title Vol. 5841 Folio 139 on 2 September 2008. The Consolidated Conditions of Approval are dated 25 August 2008. A Landscape and Rehabilitation Management Plan dated 20 August 2008 is attached to, and forms an integral part of, the approval conditions.

The approval concerns the expansion of sand quarrying operations at the Gerroa Sand Resource, operated by Cleary Bros (Bombo) Pty Limited. The proposal and the particulars of the approval are set out in the document prepared by Perram & Partners (2009), titled "Gerroa Sand Resource, Quarry Environmental Management Plan."

The purpose of this report is to assess certain conditions of approval for the expansion of the sand quarry granted in 2008. In particular, those conditions relating to the creation of native habitat in the northern corridor are addressed in detail. To date, five flora and fauna monitoring surveys have been completed in the area in the past 30 months; i.e. October-November 2009 (KMA 2010a), January-February 2010 (KMA 2010b), February 2011 (KMA 2011), January-February 2012 (KMA 2012) and January 2013 (KMA 2013). The sections of the Gerroa site referred to in these studies are shown on **Figures 1 and 2**.



**Figure 1. Defined Areas on the Gerroa Site.**

The key components of the Gerroa sand quarry are:

- I. The Northern Corridor, which we divide into three sections, namely the Establishing Corridor, the Adjacent Corridor and the remainder of the Northern Corridor;
- II. The East-West Link, i.e. that area of forest on the approved sand quarry and which will eventually be removed.

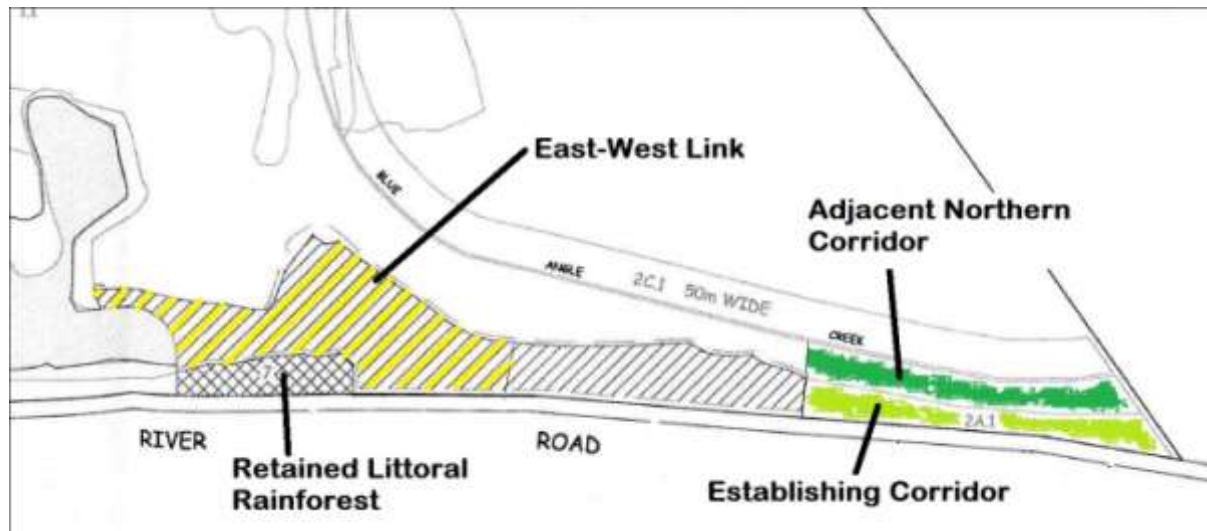


Figure 2. Detailed map showing relevant areas near quarry.

## 2. REVIEW OF THE CONDITIONS OF APPROVAL

The key objective of the conditions of consent is to ensure that the habitat within the Northern Corridor is successfully established and is operating as a fauna movement corridor before the East-West Link is severed. The prerequisites for severing the East-West Link are specified in the conditions of consent, as set out below.

### Condition 16

Within 3 months of the date of this approval, the Proponent shall

(a) enter into a planning agreement with the Minister under section 93F of the EP&A Act. This Agreement must be generally consistent with commitments in terms of the offer made by the Proponent to the Minister on 1 May 2007, and must specifically provide for the:

- (i) implementation of the Compensatory Planting shown in the plan in Appendix 3;
- (ii) protection of the vegetation in the area shown in Appendix 4 (Conservation Area);
- (iii) identification by survey plan of the Conservation Area shown in the plan titled Vegetation Conservation Area (shown conceptually in Appendix 4);
- (iv) implementation of the Landscape and Rehabilitation Management Plan for the site; and
- (v) insurance of the Conservation Area against the impact of fire or vandalism.

(b) register the planning Agreement on the title of the land in accordance with the Real Property Act 1900.

Clery Bros advised that a draft planning agreement was submitted to the Department of Planning in December 2008 and comments were received from DoP for incorporation into the Agreement in May

2009, however due to an oversight, the signed Planning Agreement was not sent by Cleary Bros to DoP until November 2013.

**Condition 17**

*The Proponent shall:*

*(a) progressively rehabilitate the site in a manner that is generally consistent with the rehabilitation objectives in Chapter 3.8 of the EA (see Appendix 5).;*

*(b) ensure that within 4 years of the date of this approval, the additional plantings in the Northern Corridor and Southern Rehabilitation Area are comprised of at least 60% of the plant species recorded for the representative plant communities in the quarry extension area, such as Bangalay Sand Forest and Littoral Rainforest.*

*(c) implement the Compensatory Planting in a manner that is consistent with the Landscape and Rehabilitation Management Plan referred to in Condition 21, including the:*

- establishment, conservation and maintenance of approximately 23.99 hectares of native vegetation;*
- enhance 5.25 hectares of the vegetation in Areas 4 and 5; and*
- conservation and maintenance of approximately 45.25 hectares of the remnant vegetation on the site (shown conceptually in Appendix 3); and the best practice guidelines set out in*
  - Bringing the bush back to Western Sydney, Best Practice Guidelines for bush regeneration on the Cumberland plain. Department of Infrastructure, Planning and Natural Resources (2003) (DIPNR 2003); and*
  - Recovering bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland. Department of Environment and Conservation (2005) (DEC 2005).*

*to the satisfaction of the Director-General.*

**Plantings**

Monitoring on the Northern Corridor has found that over 60 percent of the number of species found in the forest to be removed are found in the Northern Corridor. Plant survival has been a problem in the Southern Rehabilitation Area, possibly due to a high water table, past compaction of soil and weed competition. This issue is currently being addressed.

**Compensatory Planting**

The Compensatory Planting program for all identified areas has almost been completed. The work is in accordance with the Landscape and Rehabilitation Management Plan.

**Condition 18**

*Within 12 months of the date of this approval, the Proponent shall densely plant Banksia integrifolia along the 5 metre setback zones to the Littoral Rainforest vegetation and these areas shall thereafter be planted with species as may be specified in the Landscape and Rehabilitation Management Plan.*

The above plantings were carried out in the manner indicated and in the time frame required. Other plantings have occurred as part of the dredge pond bank revegetation. There has also been colonisation of the area with local native plants.

**Condition 19**

*The Proponent shall:*

*(a) clearly identify the boundary of the vegetation area in consultation with a suitably qualified ecologist prior to the commencement of any conservation works to ensure that an adequate buffer distance is maintained from the dredging activities/quarry operations to the Conservation Area and SSF [BSF].*

*(b) ensure that the dredging activities and associated quarry operations remain within the defined boundary of the Project Area (shown on the plan in Appendix 1);*

*(c) develop a monitoring program and document it in the EMP to demonstrate that the defined boundary of the quarry extension area is maintained and not compromised during operations; and*

*(d) revegetate the buffer area with appropriate native species and be subject to the Landscape and Rehabilitation Management Plan for inclusion in the EMP for its long term restoration and maintenance and be not less than 5 metres wide.*

The conservation areas were identified and fenced within 12 months of the date of approval. The quarry area/conservation area boundary was pegged, allowing for a five metre set back from the habitat edge.

Regular inspections have ensured that the dredging activities are kept within the defined boundary of the Project Area.

Regular inspections by the ecologist and company staff have ensured that quarrying activities did not transgress the above pegged boundary.

Revegetation of the buffer area with appropriate native species has progressed as the dredge pond has moved northwards.

### **Condition 20**

*The Proponent shall:*

*(a) commence the Compensatory Planting and the vegetation screen along the Crooked River Road frontage north of the east-west link (as shown conceptually in Appendix 3), within 12 months of the date of this approval or when sufficient propagation material has been collected;*

*(b) not sever the east-west link until it can be demonstrated to the satisfaction of the Director-general that the established communities represented in the Northern Corridor comprise at least 60% of the native flora species as set out in Appendix 6 and the Northern Corridor is successful according to the criteria in Condition 25;*

*to the satisfaction of the Director-General.*

*In this Condition, 'not sever' means that no works of clearing, tree removal or other habitat removal shall take place which will reduce or impede the function of the East-West Corridor to provide connectivity to the National park from Zone 1.1 as measured by Condition 25(b).*

The Compensatory Planting areas are almost completely planted out as at December 2013. There are a few problem areas as set out in this audit (see **Section 3**).

The screen planting was completed and has also been re-inforced since the earlier plantings due to poor plant growth. There is still a problem with slow plant growth given the hot, exposed nature of the site, drought conditions and the sandy soils. Nonetheless, trees are thickening up; further planting is of little use at this stage.

The matter of severing the east-west link is also dealt with in detail under Condition 25, below. We note that the letter from the DoP and dated 28 November 2012 approved the severing of the East-West Link.

### **Condition 20a**

*Within the area marked "A" on Appendix 1, a person shall not clear any of the land of vegetation or trees without the consent of the Director-General.*

This area has not been affected by any of the quarry works and no trees have been removed or affected in any way. Some Lantana removal has occurred in the vicinity in recent years.

### **Condition 21**

*The Proponent shall prepare and implement a Landscape and Rehabilitation Management Plan for the project to the satisfaction of the Director-General.*

*This plan must:*

- (a) be submitted to the Director-General for approval within 3 months of the date of this approval.*
- (b) be generally in accordance with the draft Landscape and Rehabilitation Management Plan, dated 20 August 2008 prepared by Kevin Mills & Associates and accepted by the Land and Environment Court as appropriate;*
- (c) be prepared in consultation with the DECC by suitably qualified expert/s approved by the Director-General;*
- (d) clearly identify the biological purpose of the linkage and describe how its design, dimensions and management will achieve this purpose.*
- (e) collect baseline data for the Project Area including flora species, fauna species and ecological function parameters;*
- (f) include a figure showing the location, extent and size of areas to be planted/regenerated for each community to be impacted;*
- (g) identify strategies to use the natural recourses of the impacted areas to their full potential, including:*
  - all plant material to be used as a primary source for restoration and rehabilitation should be collected and propagated from relevant communities prior to clearing;*
  - all areas proposed for replanting should be assessed initially for their regeneration potential appropriate restoration strategies should follow best practice guidelines as described in DIPNR (2003) and DEC (2005);*
- (h) describe in general the short, medium and long term measures that would be implemented to:*
  - rehabilitate the site;*
  - implement the Compensatory planting show in Appendix 3;*
  - manage the remnant vegetation and habitat on the site, including the areas of Bangalay Sand Forest to be retained (shown conceptually in Appendix 3).;*
  - landscape the site (including the bunds) to mitigate visual impacts of the project; and*
  - upgrade and protect the remaining area of Littoral Rainforest on the eastern side of the pond extension.*
- (i) describe in detail the measures that would be implemented over the first 5 years and every subsequent 5 year period, to rehabilitate and manage the landscape and vegetation on the area, including*
  - Setting clear targets to the satisfaction of the Director-general to determine the level of success and make timely changes to management strategies, as necessary;*
  - Monitoring each vegetation type separately.*
- (j) set completion criteria for the rehabilitation of the site (i.e. when plantings are self-sustaining;*
- (k) describe how the performance of these measures would be monitored over time; and*
- (l) include a Long Term Management Plan.*

The Landscape and Rehabilitation Management Plan was completed in the first few months after approval and was attached to the QEMP; this was approved by the then Department of Planning in their letter dated May 2009.

The matter of a Long Term Management Plan is dealt with under Condition 26, below.

#### **Condition 21a**

*The Proponent shall engage a qualified ecologist, bush regenerator or providence nursery group who will develop a program consistent with the objectives and procedures set out in the draft Landscape and Rehabilitation Management Plan and this program will address the following issues:*

- (a) soil testing;*
- (b) on site collection of seed and other propagation material;*
- (c) an assessment of the need to develop plants on the site;*
- (d) a program of successional plantings and management that will achieve the agreed purposes of the planting;*
- (e) targets for short term, medium and long term planting and management;*



- (f) monitoring requirements;*
  - (g) reporting frequency and methodology;*
  - (h) consultation with the relevant government agencies;*
  - (i) water quality monitoring;*
  - (j) quantitative vegetation monitoring;*
- unless otherwise incorporated in the draft Landscape and Rehabilitation Management Plan.*

The project has since its inception been managed by a consultant ecologist, on-site staff with horticultural qualifications and by an off-site specialist nursery engaged to collect seed and propagate plants. This program has followed the approved Landscape and Rehabilitation Management Plan.

**Condition 22**

*The Landscape and Rehabilitation Management Plan must include:*

- (a) the objectives for the rehabilitation of the site and implementation of the Compensatory planting and the vegetation screen along Crooked River Road frontage north of the east-west link;*
- (b) a description of how the rehabilitation of the site and implementation of the Compensatory planting and the vegetation screen along Crooked River Road frontage would be integrated with the surrounding vegetation to provide a comprehensive strategic framework for the restoration and enhancement of the landscape over time;*
- (c) a description of the short, medium and long term measures that would be implemented to:*
  - Rehabilitate the site;*
  - Implement the Compensatory Planting;*
  - Manage the remnant vegetation and habitat on the site; and*
  - Landscape the site (including the bunds) to mitigate visual impacts of the project;*
- (d) a detailed description of the performance and completion criteria for the rehabilitation of the site and implementation of the Compensatory Planting and the vegetation screen along Crooked River Road frontage;*
- (e) a detailed description of what measures would be implemented over the next 5 years to rehabilitate the site, and implement both the Compensatory Planting and the vegetation screen along Crooked River Road frontage, including the procedures for*
  - undertaking pre-clearance surveys;*
  - conserving and re-using topsoil*
  - collecting and propagating seed for rehabilitation works;*
  - salvaging and re-using material from the site for habitat enhancement, particularly tree hollows;*
  - controlling weeds and feral pests;*
  - controlling access;*
  - bushfire management;*
  - managing any potential conflicts between the proposed rehabilitation of the site and implementation of the Compensatory Planting and any Aboriginal cultural heritage values in those areas;*
  - progressively rehabilitate the areas disturbed by sand extraction;*
  - implementing revegetation and regeneration within the disturbed and compensatory plantings areas, including the establishment of canopy, sun-canopy (if relevant), understorey and ground cover vegetation;*
  - reducing the visual impacts of the project; and*
  - protecting areas outside the disturbance areas.*
- (i) a detailed program to monitor the performance of the rehabilitation of the site and implementation of the Compensatory Planting and the vegetation screen along the Crooked River Road frontage against the relevant objectives and performance and completion criteria (see above).*
- (j) a description of the potential risks to successful rehabilitation and/or revegetation and a description of the contingency measures that would be implemented to mitigate risks; and*
- (k) details of who is responsible to monitoring, reviewing and implementing the plan.*

The above matters are included in the approved Landscape and Rehabilitation Management Plan.

**Condition 23**

*Successful establishment of the Northern Corridor shall be measured by the following criteria:*

*(a) presence of native flora species;*

Some native plants have been present in the Establishing Corridor from the beginning. Extensive plantings of local indigenous species were undertaken early in the project. A total of 4,581 plants of nine key local species have been planted in the establishing corridor to date.

Introduction of topsoil from the quarry area brought seeds, rhizomes, etc. that have established various species in the area. More recently, seeds of plants gathered on site have been spread across the site or planted. To date, the following numbers of indigenous and exotic plant species have been recorded in the areas indicated; see **Table 1**.

**Table 1**  
**Number of Plant Species Recorded**

Area Year	Indigenous					Exotic				
	2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
East-West Link	58	58	58	61 <sup>1</sup>	61	36	40	40	40	40
North Corridor-Establishing	52 <sup>2</sup>	54 <sup>1 2</sup>	48 <sup>1 2 3</sup>	58 <sup>1 2</sup>	58	52	57	40 <sup>3</sup>	46	34
North Corridor-Adjacent	36	36	36	44	48	not recorded				

1. Cumulative total. 2. Excludes planted species; 9 were planted, some of which also occur naturally on site.

3. Some small species were overlooked due to the dense plant growth.

The cumulative number of indigenous species recorded in the Establishing Corridor is almost the same as the number of species in the East-West Link; the difference is greater if the planted species are counted. Native plant cover in the Establishing Corridor is increasing over time; this is greatly assisted by control measures regularly undertaken for invasive weeds. The figures for “native flora species” to date demonstrate compliance with this criterion.

*(b) a majority of the flora species recorded from the removed forest occur in the area; (e.g. 60% of flora species recorded in removed forest are present).*

The above figures indicate that more native species occur in the Establishing Corridor than the East-West Link. The numbers of species tabulated above is a cumulative figure. The figures to date demonstrate compliance with this criterion.

*(c) species from all four layers have been planted and at least 50% of the projected cover has been achieved for each of the shrub and ground cover layers.*

Tree cover by early 2012 had increased significantly since late 2010, partly because of the age of the plantings and also the wet spring/summer seasons in between 2010 and 2012. In late 2013, trees are significantly taller and their canopy cover is much greater.

To determine the average percentage cover of native shrubs and groundcovers, 30 plots 4m by 4m plots were temporarily established along a transect running through the long axis of the northern corridor. The paced distance between plots was determined using a table of random numbers between 0 and 30. Within each plot, the percentage cover of native plants and exotic plants was determined separately. The presence of shrubs was noted as were the main plants contributing to the native cover. The same procedure was followed along a transect across the east-west link, where ten plots were sampled.

The raw results of the above sampling are presented in **Appendices 1 and 2**. These results are summarised in **Table 2**, where the results for both sites are compared. The results indicate that the establishing northern corridor supports more than the required 50 percent native cover; the average was 65 percent (range 30-95%). Native shrub cover is considerably more than 50 percent of the average cover of the East-West Link, although 47 percent of plots contained shrub species; the average shrub cover in the Establishing Corridor was 12.3 percent. The average cover in the East-West Link was only 0.6%; that area supported much Lantana but very few native shrubs.

**Table 2**  
**Summary of Survey Plot Data**

Area	NC (north)	NC (central)	NC (south)	NC (all plots)	E-W Link
No. of plots	10	10	10	30	10
Average no. indigenous species	8.5	9.6	8.4	8.8	10
Range in no. of indigenous species	4-12	7-12	7-13	4-13	5-15
Average cover of indigenous species	62%	59%	73%	65%	92%
Range in cover of indigenous species	30-95%	25-90%	30-90%	30-95%	70-100%
Average cover of exotic species	53%	56%	52%	54%	36%
Range in cover of exotic species	30-75%	20-80%	20-90%	20-90%	5-60%
Average shrub Cover	15.5%	7.2%	14.2%	12.3%	0.6%
Range in shrub Cover	5-20%	0-25%	0-40%	0-40%	0-5%

(d) *self-sustaining native plant populations (e.g. regeneration of a second generation);*

Native plant species are common in the establishing northern corridor, with many species now having established self-sustaining populations (i.e. seed is being produced and second generations are occurring). Observations to date demonstrate compliance with this criterion.

(e) *no dominance by single flora species (e.g. Bracken);*

The issue of dominance by a single native species or exotic species has not yet arisen, and may not do so. Observations to date demonstrate compliance with this criterion.

(f) *weeds are not significantly impacting on the native vegetation;*

Management of weeds to control invasive perennial species, particularly grasses, is required and this has been ongoing since the beginning of the project. Regular inspections by the ecologist ensure that such weeds are not overlooked. The most invasive weeds are removed or poisoned as soon as practical after detection. Observations to date demonstrate compliance with this criterion.

(g) weeds do not represent a majority of the flora species or a higher percentage cover than the native flora species; and

The 2012 survey results (see **Tables 1 and 2**) indicate that (i) the average percentage cover of native plants is 65%, the figure for weeds is 54%; and (ii) the number of native species is 64 while the number of weed species is 46. These observations demonstrate compliance with this criterion. Inspections in late 2013 indicate continuing improvement in the above figures.

(h) impacts such as grazing are excluded from the area.

Grazing was removed from the area some years ago; no grazing occurs in the area today. Vehicles are not permitted anywhere in the area except on the management track. Compliance with this criterion has been achieved.

**Condition 24**

24. Successful establishment of fauna habitat in the Northern Corridor would be measured by:

(a) presence of species;

A summary of the number of animal species recorded in each study area up to December 2013 is provided below, in **Table 3**.

**Table 3**

**Number of Animal Species recorded**

Species Group	East-West Link	Northern Corridor Establishing	Adjacent	Whole Corridor	All sites
Mammals	7	5	5	6	8
Birds	51	45 <sup>1</sup>	48	59	65
Reptiles	7	7	3	8	10
Frogs	3	3	5	6	6
Total Vertebrates	68	60	61	79	89

1. Includes species observed overhead; i.e. crossing the corridor.

Avifauna is a key fauna group and surveys targeted birds within and flying across the Establishing Corridor (to determine bird movements across the area) and in the East-West Link; the same observation time was spent in each area; see **Table 4**. A summary of the number of bird species and number of individual observations in each area is provided below. The data indicates that a total 65 bird species was recorded and 2,011 observations made during the four survey periods. If the East-West Link and adjoining forest are compared to the surveyed northern corridor (i.e. adjacent forest plus the Establishing Corridor), more species were recorded and more observations were made in the latter than the former; 61 compared to 51 species. Almost the same number of species have been seen on and over the Establishing Corridor than in the East-West Link, 48 compared to 51 species. Observations to date demonstrate compliance with this criterion.

**Table 4**  
**Number of Bird Species Recorded**

Observations	East-West Link Area			Northern Corridor			All survey areas
	Retained	Remove	Total	Adjacent	Establishing	Total	
Observation Hrs	22.85 hrs			22.85 hrs			45.70 hrs
No. species	-	-	51	45	48	61	65
No. observations	112	729	841	656	514	1170	2,011

(b) *a majority of the resident species recorded from the removed forest occur in the area;*

As tabulated above, the majority of vertebrate animal species observed in the East-West Link have been seen in or flying across the Establishing Corridor, and more species have been recorded in the Northern Corridor as a whole than the East-West Link; see **Table 3**. Observations to date demonstrate compliance with this criterion.

(c) *fauna populations are resident in the area;*

Many species have been recorded in the Establishing Corridor, as documented above. Various ground animals are resident in the Establishing/Adjacent Corridor, such as the small mammals and several species of reptile and frog; see **Table 3**. The Establishing Corridor is a part of the home range of many species, regularly recorded in the area. The animal populations present in or flying over the Establishing Corridor already equal the East-West Link. Observations to date demonstrate compliance with this criterion.

(d) *pest animals are controlled and not impacting upon the fauna or its habitat; and*

No problem pest animals are known to exist in the area; occasional observations of Brown Hares and Foxes indicate that they are not a problem to date. Observations to date demonstrate compliance with this criterion.

(e) *impacts such as grazing are excluded from the area.*

Grazing was removed from the area some years ago; no grazing occurs in the area today. Observations to date demonstrate compliance with this criterion.

**Condition 25**

25. *Prior to the severance of the East-West Link the Proponent shall:*

(a) *determine the presence of species in both the east-west link and northern corridor by conducting standard animal survey techniques at least twice in the first year (e.g. Eliot trapping for small mammals, pitfall trapping for reptiles, observational surveys for frogs and birds, and spotlighting transects for arboreal animals);*

Several animal survey methods have been used in the East-West Link and Northern Corridor (Establishing and Adjacent). These methods, repeated during each survey period, are:

- timed bird surveys;
- small mammal trapping with box traps;
- pitfall trapping (primarily aimed at reptiles);
- searches for reptiles and other small animals below tin sheets placed in both areas;
- ground searches in the areas for small ground animals and signs of larger animals; and
- general observations during other surveys and visits, including night-time surveys.

The work to date complies with this criterion.

*(b) determine whether a majority of animal species (particularly those determined to be likely to be impacted by fragmentation) utilising the corridor in the east-west link are present in the conservation area and the northern corridor and the re-created link at the northern boundary; and*

The results to date show that almost all animal species recorded in the East-West Link are present in or have been recorded flying across the Northern Corridor; most of these from the Establishing Corridor. In total, more animal species have been recorded in the Northern Corridor than in the East-West Link. Observations to date demonstrate compliance with this criterion.

*(c) conduct genetic analysis for a number of key species for whom genetic markers have already been developed (e.g. Brown Antechinus, Bush Rat and at least two skink species) to establish that genetic relatedness exists between individuals within the two corridors, the Conservation Area and National Park).*

Genetic testing was carried out and was approved by the DoPI in their letter dated 28 November 2012.

**Condition 26**

*The Long Term Management Strategy must be prepared in consultation with Shoalhaven City Council, Kiama Municipal Council, DECC, DPI-Fisheries and the CCC, and must:*

*(a) define the objectives and criteria for quarry closure and post-extraction management;*

*(b) investigate options for the future use of the land;*

*(c) describe the measures that would be implemented to minimize or manage the ongoing environmental effects of the development; and*

*(d) describe how the performance of these measures would be monitored over time.*

*Note. The Department accepts that the initial Long Term Management Strategy may not contain detailed information on post-extraction management.*

The Long Term Management Strategy is contained in the approved QEMP.

**Condition 27**

*Within 6 months of the date of this approval, the Proponent shall lodge a rehabilitation bond for the project with the Director-General. The sum of the bond shall be calculated at:*

*(a) \$2.50/m<sup>2</sup> for the total area to be disturbed by the proposed dredge pond as show in Appendix 1; and*

*(b) \$1.00/m<sup>2</sup> for the total area of land to be rehabilitated consisting of Zones 2A.1, 2A.2, 2A.3, 2B.1, 2B.2, 2C.1, 2C.2, 2D and 2E of Appendix 3.*

*or as otherwise directed by the Director-General.*

**Condition 28A**

*The rehabilitation bond shall continue to be retained after completion of the Compensatory Planting to ensure that there shall be a continuation of the Planning Agreement; and*

**Condition 28B**

*The Director-General may at his or her discretion and on advice from an independent environmental auditor release or vary the rehabilitation bond where conditions permit. If the rehabilitation is not completed to the satisfaction of the Director-General, the Director-General will call in all or part of the rehabilitation bond, and arrange for the satisfactory completion of the relevant works.*

**Condition 28C**

*The bond may be in the form of a Bank Guarantee or as directed by the Director-general.*

A rehabilitation bond was Lodged with DoP on 5 March 2009 and approved on 15 May 2009 by letter from the department.

**Table 5****Summary of Schedule 3 conditions 16 to 28 and Schedule 5 condition 7**

<b>Sch</b>	<b>Item</b>	<b>Requirement</b>	<b>Comments</b>
3	16a	Enter into a Planning Agreement.	CB submitted a copy of the signed Planning Agreement to DoPI on 18 November 2013. Note this occurred outside three months of the date of the approval of the Consent. Awaiting signed returned copy. Forest Insurance has been undertaken.
3	16b	Register the Planning Agreement.	Awaiting execution by the Minister before registering Agreement.
3	17a	Progressively rehabilitate the site in accordance with App 5.	KMA Annual Reports confirm rehabilitation in accordance with Plan.
3	17b	Within 4 years that additional plantings are 60% of recommended species.	1st annual report states 2A2 ready for planting, subsequent inspections confirm plantings. KMA 5th annual report verifies exceeds 60% in Northern Corridor.
3	17c	Implement compensatory planting.	KMA Annual Reports confirms Compensatory Planting is in accordance with Plan.
3	18	Within 12 months, densely plant Banksia Integrifolia along 5 metre setback zone.	See KMA First Annual Report, Clause 4.1.
3	19a	Clearly identify the boundary of the extension area in consultation with ecologist.	KMA First Annual Report Clause 4.3.
3	19b	Ensure dredging is within boundaries.	Survey report from KFW confirming survey pegs installed as per plan.
3	19c	Develop a program and document in EMP to demonstrate defined boundary is maintained.	Quarterly reports and inspected on a quarterly basis and verified by checklist.

3	19d	Revegetate the buffer area and maintain.	Refer Zone 7 in LRMP and First Annual Report confirms plantings completed..
3	20a	Commence the Compensatory Planting and vegetation screen within 12 months.	Zone planting commenced in October 2008 and has continued annually.
3	20b	Not sever the EW link until approved by DG.	Refer letter from DoPI dated 28 Nov. 2012; the EW link was not severed until receipt of this letter.
3	20A	No clearing in Area marked X.	No clearing has occurred in this area as confirmed by a site inspection.
3	21a	Prepare LRMP & submit within 3 months	Submitted as part of QEMP, Perram & Partners letter dated 5 Feb. 2009.
3	21b	Be generally in accordance with draft.	In accordance with LRMP approved by Court.
3	21c	Be prepared in consultation with DECC (now OE&H) and by suitably qualified personnel.	The LRMP was approved by DoP on 29 May 2009. The letter to DoP dated 5 Feb. 2009 nominated Dr Kevin Mills of Kevin Mills and Associates as the expert nominated to prepare the LRMP. The QEMP was submitted to DECC for approval.
3	21d	Identify biological purpose of linkage and describe how it will achieve purpose.	The biological measures for the link are set out in the LRMP and in the Site Work Instruction for Landscape, Rehabilitation and Conservation Management WIGSR12 Section 3.4.
3	21e	Collect baseline data.	Baseline data included in Clause 2.2 & 2.3 of the LRMP.
3	21f	Include a figure showing areas.	KFW Plan 106198/308 Revision K is the figure approved for this use and is included in the Conditions of Consent.
3	21g	Identify strategies to use natural resourced to full potential.	Plant material collection is included in the LRMP in CI 6.6. Rehabilitation strategies are in accordance with best practice guidelines, referenced in LRMP, Section 10.
3	21h	Describe short, medium & long term measures.	Included in LRMP Table 7.



3	21i	Monitor first 5 years and each subsequent 5 years.	The targets for each area are included in LRMP Table 7. Work Instruction 12 Clause 3.1.5 states that the areas are to be inspected every 3 months.
3	21j	Set completion dates for when plants are self sustaining.	Included in LRMP Table 7.
3	21k	Describe how performance is measured.	Work Instruction 12 Clause 3.1.5 states that the areas are to be inspected every 3 months. The QEMP Clause 8.8 also states a qualified ecologist will monitor the entire area annually.
3	21l	Include long term management plan.	Included in LRMP Table 7.
3	21Aa	Soil testing.	Addressed in Clause 6.19 of LRMP.
3	21Ab	On site collection of seed and other propagation material.	Site collection of seed is addressed in Clause 6.6 of the LRMP. Site personnel have collected seed on site and attempted to re-seed with limited success to date.
3	21Ac	An assessment of the need to develop plants on site.	The LRMP Clause 6.8 identifies that plants species will be obtained from a local nursery (Jamberoo Native Nursery) that has propagated them from plant material obtained from the local area or from site.
3	21Ad	A program for successional planting.	QEMP Clause 6.9.1 and LRMP Table 7.
3	21Ae	Targets for short, medium and long term.	QEMP and Table 7.
3	21Af	Monitoring requirements.	LRMP page 32, Monitoring Regime.
3	21Ag	Reporting requirements & frequency.	LRMP Clause 6.20 refers to day to day monitoring by Cleary Bros staff and annual reporting by an ecologist.
3	21Ah	Consultation with relevant government authorities.	LRMP notes where consultation with DECC (now OE&H) is required e.g. trial plots (reference Monitoring Regime, page 32).
3	21Ai	Water quality monitoring.	LRMP Clause 5.4 addresses the requirement to maintain the existing level of groundwater flow to the Swamp Sclerophyll Forest. This is addressed in the QEMP Clause 8.6.

3	21Aj	Quantitative vegetation monitoring.	LRMP Clause 6.20 refers to day to day monitoring by Cleary Bros staff and annual reporting by an ecologist. In addition, Work Instruction 12 Clause 3.1.5 states that the areas are to be inspected every 3 months
3	22a	LRMP to include objectives of rehabilitation.	LRMP approval by DoP on 5 Feb. 2009. Objectives addressed in Clauses 3 and 4 of LRMP.
3	22b	Description of how planting is to be integrated.	Addressed in Clause 6 of LRMP.
3	22c	Include short, medium & long term.	Addressed in LRMP, Table 7.
3	22d	Detailed performance and completion criteria.	Addressed in LRMP, Table 7 and Clause 8.3.
3	22e	Pre-clearance surveys.	Addressed in LRMP, Clause 6.14.
3	22e	Conserving and reusing topsoil.	QEMP 5.1.2 and LRMP page 22.
3	22e	Collect and propagating seed.	LRMP Cause 6.6.
3	22e	Salvage & reuse materials eg tree hollows.	QEMP 5.1.1 & LRMP 6.11.
3	22e	Control Weeds and feral pests.	LRMP 6.7, 6.16 and page 30.
3	22e	Control access.	LRMP page 22 and Clause 6.10.
3	22e	Bushfire management.	LRMP page 22.
3	22e	Managing any potential conflicts between rehab and Aboriginal cultural values.	See QEMP & Aboriginal Management Plan, LRMP Clause 8.5.
3	22e	Progressively rehabilitate areas disturbed by sand mining.	LRMP, page 29, Zone 6.
3	22e	Implement revegetation.	LRMP, Section 7.
3	22e	Reduce visual impacts.	LRMP, page 8 Zone 3
3	22e	Protect areas outside disturbed areas.	pg 22 and 6.10 of LRMP
3	22i	Detailed program to monitor progress.	Clause 8 of LRMP.
3	22j	Potential risks and mitigation measures.	Clause 8.1 of LRMP.
3	22k	Who is responsible for managing plan?	Clause 1.3 of LRMP.
3	23	Successful establishment of the Northern Corridor – flora.	See KMA annual reports and KMA email dated 16 Dec. 2011 where each item is reviewed for compliance.

3	24	Successful establishment of the Northern Corridor – fauna.	See KMA annual reports and KMA email dated 16 Dec. 2011 where each item is reviewed for compliance
3	25a	Prior to severance of EW link, determine presence of species.	See KMA annual reports and KMA email dated 16 Dec. 2011 where each item is reviewed for compliance
3	25b	Prior to severance of EW link, determine whether a majority of species are present in conservation and northern corridor.	See KM annual reports and KM email dated 16 Dec. 2011 where each item is reviewed for compliance
3	25c	Prior to severance of EW link, conduct genetic analysis.	Refer letter from DoPI dated 28 Nov. 2012.
3	26	Long Term Management Strategy.	QEMP Section 6.10
3	27	Landscape and Rehabilitation Bond.	Lodged with DoP on 5 March 2009 and approved on 15 May 2009.
3	28	Rehabilitation bond shall continue to be retained.	There is no expiry date.

### **3. CONCLUSION**

---

This audit has investigated certain conditions of approval for the Gerroa Sand Resource owned by Cleary Bros( Bombo) Pty Limited of Port Kembla. Each condition has been discussed above. A summary of these conditions is provided in **Table 3**, above.

A critical review of the conditions was carried out to establish that these have been/are being adhered to on the Gerroa quarry site. The consultant is regularly involved in prosecuting and monitoring those conditions that relate to flora and fauna matters, and has been since the project began in 2008.

In particular, a summary of the results is provided of the flora and fauna surveys of the critical habitat areas at Gerroa known as the East-West Link and the Northern Corridor in relation to the conditions of consent for the Gerroa Sand Quarry. The results gained to date clearly demonstrate that the establishing section of the Northern Corridor is being utilised by a broad range of native vertebrate animals. Also, the area now supports an ever increasing cover of native plants and just as many plant species have been recorded there as in the East-West Link.

The number of animal species recorded in and flying across the Establishing Corridor indicates that this regenerating area is not a major impediment to fauna movement. In fact, if the results of the Establishing and Adjacent Corridors are considered together, more species have been recorded in that combined area than in the East-West Link.

We believe that the surveys, monitoring and work undertaken on site in the past four years demonstrate that the intent of the conditions of consent has been achieved. In particular the Northern Corridor is successful as a habitat link between the forest on the Company's land, the forest to the north and the forest to the east within Seven Mile Beach National Park. As noted above, the letter from the DoP dated 28 November 2012 approved the severing of the East-West Link.

There have been problems with achieving satisfactory results in a few locations within the rehabilitation zones; these are discussed below. Such setbacks are quite expected in such a large and long term project and in our view do not pose a serious risk to achieving the project. Most of these have been identified and successfully mitigated during the past four years through the continued involvement of the project ecologist, company staff and field employees, guide by quarterly reports and regular inspections of the site at Gerroa. As at November 2013, the following matters were identified for further work.

Plant survival has been a problem in the Southern Rehabilitation Area, possibly due to a high water table, past compaction of soil and/or weed competition. This issue is currently being addressed.

Poor plant growth has characterised the screen planting along Gerroa Road. Slow plant growth and some death seems related to the hot, exposed nature of the site, drought conditions in some years and the sandy soils. To remedy this, Cleary Bros has installed an earth bund with vegetation which prevents the sand mine works being viewed from Gerroa Road.

#### **4. REFERENCES**

---

Kevin Mills & Associates (2008). Landscape and Rehabilitation Management Plan, Extension and Continuation of Gerroa Sand Quarry, Municipality of Kiama, City of Shoalhaven. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, August.

Kevin Mills & Associates (2009). Weed Survey. Cleary Bros (Bombo) Pty Ltd, Gerroa Sand Quarry, Municipality of Kiama/City of Shoalhaven. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, September.

Kevin Mills & Associates (2009). First Annual Survey. Flora and Fauna Monitoring Surveys, Gerroa Sand Quarry, Municipality of Kiama. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, December.

Kevin Mills & Associates (2010). Second Annual Survey. Flora and Fauna Monitoring Surveys, Gerroa Sand Quarry, Municipality of Kiama. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, March.

Kevin Mills & Associates (2011). Third Annual Survey. Flora and Fauna Monitoring Surveys, Gerroa Sand Quarry, Municipality of Kiama. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, February.

Kevin Mills & Associates (2012). Fourth Annual Survey. Flora and Fauna Monitoring Surveys, Gerroa Sand Quarry, Municipality of Kiama. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, February.

Kevin Mills & Associates (2013). Fifth Annual Report, Flora and Fauna Monitoring Surveys, Gerroa Sand Quarry, Municipality of Kiama. Report prepared for Cleary Bros. (Bombo) Pty Ltd, February.

Perram & Partners (2009). Gerroa Sand Resource, Quarry Environmental Management Plan. Prepared for Cleary Bros (Bombo) Pty Limited, Port Kembla, May.

---

**Appendix 1**

**Species recorded in Random Plots – Northern Corridor**

Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Average
Native Cover (%)	70	50	30	40	70	95	70	50	95	50	25	50	60	40	90	70	80	50	70	50	50	70	90	80	30	60	90	90	90	80	65%
Exotic Cover (%)	50	50	70	75	40	30	50	50	40	70	70	75	60	80	20	30	35	70	40	80	90	50	70	30	70	40	20	50	40	60	54%
Shrubs (%)	10	20	20	5	5	10	50	5	25	5	10	25	5	5	0	5	15	5	1	1	25	0	50	5	40	5	10	1	1	5	12.3%
<u>Dominant Species</u>																															
<i>Cynodon dactylon</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30
<i>Commelina cyanea</i>	1			4	5			8		10		12					17			20										30	9
<i>Dichelachne crinita</i>	1			4	5						11		13		15	16	17	18				22	23	24	25	26	27	28	29	30	18
<i>Ficinia nodosa</i>																			19												1
<i>Hemarthria uncinata</i>		2				6																									2
<i>Imperata cylindrica</i>																								24							1
<i>Lomandra longifolia</i>	1					6	7		9					14	15	16	17		19	20		22		24			27	28	29		15
<i>Microlaena stipoides</i>			3											14	15												27				4
<i>Oxalis rubens</i>										10																					1
<u>Other Species</u>																															
<i>Acacia longifolia</i>											11									20											2
<i>Acacia mearnsii</i>																			19	20											2
<i>Acacia sp.</i>																		18									27				2
<i>Banksia integrifolia</i>		2			5		7																	24							4
<i>Billardiera scandens</i>						6									16		18						23				28				5
<i>Breyntia oblongifolia</i>			3												16																2
<i>Commelina cyanea</i>			3						9				13	14		16					21	22					27				8
<i>Cyperus polystachyos</i>			3															18						24							3
<i>Cyperus gracilis</i>					5							13										22									3
<i>Dianella caerulea</i>		2										12		14		16	17	18	19	20		22	23	24	25	26		28		30	15
<i>Dichelachne crinita</i>						6	7	8	9	10		12								20	21										8
<i>Dichondra repens</i>		2																													1
<i>Echinopogon caespitosus</i>						6										16										26					3
<i>Euchiton sphaericus</i>																	17														1
<i>Ficinia nodosa</i>									9								17			20	21							29			5
<i>Geranium solanderi</i>	1																		19	20	21										4
<i>Glycine clandestina</i>	1	2				6		8							16	17	18			20							27				9
<i>Glycine tabacina</i>								8							16																2
<i>Hemarthria uncinata</i>			3																			22									2
<i>Hibbertia scandens</i>																			19			22									2
<i>Imperata cylindrica</i>			3						9																						2

Plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	No.
<i>Kennedia rubicunda</i>	1	2	3			6		8	9		11		13	14	15				19		21	22	23	24		26		28			17
<i>Lomandra longifolia</i>		2	3		5						11	12	13					18			21		23		25	26				30	12
<i>Macrozamia communis</i>											11																				1
<i>Microlaena stipoides</i>					5		7		9			12	13		15		17				21	22	23	24	25			28	29	30	15
<i>Monotoca elliptica</i>									9						15							22									3
<i>Oxalis rubens</i>	1	2	3	4	5		7		9		11	12		14	15		17	18	19	20	21	22	23	24	25			28	29	30	23
<i>Parsonsia straminea</i>								8																							1
<i>Pteridium esculentum</i>	1														15																2
<i>Rubus parvifolius</i>						6										16	17		19	20		22									6
<i>Senecio hispidulus</i>	1		3														17														3
<i>Sigesbeckia orientalis</i>		2																													1
<i>Solanum americanum</i>		2																													1
<i>Themeda australis</i>																		18													1
<i>Veronica plebeia</i>															16				19												1
<i>Wahlenbergia gracilis</i>	1		3	4	5			8	9									18							25	26	27		30	11	
<i>Elymus ? scaber</i>																			19												1
No. Species	11	11	12	5	9	9	6	8	11	4	7	7	7	7	9	12	12	11	12	12	9	13	8	10	7	7	8	8	6	8	
Average no. species - 8.8; range - 4 - 13																															

## Appendix 2

### Species recorded in Random Plots – East-West Link

Plot	1	2	3	4	5	6	7	8	9	10	Average
Native Cover (%)	90	80	100	100	100	90	100	90	100	70	92%
Exotic Cover (%)	40	50	50	30	5	15	5	60	40	60	36%
Shrubs (%)	0	0	0	0	0	0	1	0	0	5	0.6%
<u>Dominant Species</u>											
<i>Cynodon dactylon</i>	1					6					2
<i>Commelina cyanea</i>										10	1
<i>Imperata cylindrica</i>		2									1
<i>Lomandra longifolia</i>			3	4	5	6	7		9		6
<i>Microlaena stipoides</i>	1			4				8	9	10	5
<i>Pteridium esculentum</i>	1	2	3	4			7	8	9	10	8
<i>Themeda australis</i>						6	7				2
<u>Other Species</u>											
<i>Banksia integrifolia</i>		2					7				2
<i>Breynia oblongifolia</i>				4							1
<i>Cayratia clematidea</i>										10	1
<i>Cissus htpoglauca</i>			3	4							2
<i>Commelina cyanea</i>	1	2	3	4	5	6	7	8	9		9
<i>Cynodon dactylon</i>		2	3		5		7		9		5
<i>Cyperus polystachyos</i>		2		4							2
<i>Cyperus gracilis</i>		2	3	4					9		4
<i>Desmodium varians</i>										10	1
<i>Dichelachne crinita</i>	1	2			5	6	7				5
<i>Eragrostis leptostachya</i>						5	6				2
<i>Echinopogon caespitosus</i>				4							1
<i>Glochidion ferdinandii</i>				4							1
<i>Glycine clandestina</i>			3	4	5		7		9	10	6
<i>Hemarthria uncinata</i>								8	9		2
<i>Hibbertia scandens</i>				4	5				9	10	4
<i>Imperata cylindrica</i>						6	7	8	9	10	5
<i>Lomandra longifolia</i>		2						8			2
<i>Microlaena stipoides</i>		2	3				7				2
<i>Oplismenus hirtellus</i>				4					9	10	3
<i>Oxalis rubens</i>		2		4	5	6					4
<i>Pellaea falcata</i>		2									1
<i>Pteridium esculentum</i>					5	6					2
<i>Rubus parvifolius</i>					5						
<i>Stephania japonica</i>										10	1
<i>Themeda australis</i>				4	5			8		10	4
<i>Veronica plebeia</i>										10	1
No. Species	5	12	8	15	11	9	10	7	11	12	Av. 10 Range 5-15