

# Biodiversity monitoring 2019

Chain Valley Colliery

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Prepared for Delta Coal  
February 2020





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# Biodiversity monitoring 2019

Chain Valley Colliery

**Report Number**

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H190762 RP1

**Client**

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Delta Coal

**Date**

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20 February 2020

**Version**

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v1 Final

**Prepared by****Approved by**

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20 February 2020

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20 February 2020

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# 1 Introduction

## 1.1 Rehabilitation monitoring plan requirements

Chain Valley Colliery (CVC) and Mannering Colliery (MC) (the mines) are underground coal mines located at the southern extent of Lake Macquarie, approximately 60 km south of Newcastle. The mines are operated by Delta Coal Pty Ltd (Delta Coal) and produce thermal coal for the domestic and export markets.

The mines operate in accordance with project approval MP10\_0161 and SSD-5465. MP10\_0161 required the preparation of Chain Valley Colliery Biodiversity Management Plan (EMGA 2016) (BMP). The BMP includes an annual terrestrial biodiversity monitoring program which commenced in 2016, comprising:

- condition and composition of an area of Swamp Oak Forest;
- condition of vegetation adjacent to the ventilation shafts and fans;
- mapping the location and distribution of weeds; and
- abundance and distribution of feral animal use.

This report aims to detail the annual monitoring results which will be reviewed and assessed against trigger values and condition criteria identified in the BMP. EMM has not undertaken the weed monitoring component of the field surveys as this has recently been completed for a weed management plan and bush regeneration works by Total Earth Care 2019).

## 2 Methods

### 2.1 Condition and composition of Swamp Oak Forest

The condition and composition of an area of Swamp Oak Forest adjacent to the sediment ponds in the pit top area and downstream of the D10 discharge was monitored in line with the method set out in in the BMP, including:

- completion of two biobanking plots as per Section 11.1 of the BMP and the proforma in Appendix 1 of the BMP; and
- a comparison of the collected plot data against the previous years' data (specifically to monitor dieback of *Melaleuca quinquenervia* observed in Plot 1 during the 2017 monitoring) as well as to determine the total weighted scores for both plots to assess any other change in condition and against the trigger value identified within the BMP.

### 2.2 Condition of vegetation adjacent to the ventilation shafts and fans

Condition monitoring of vegetation surrounding the ventilation shaft area includes:

- observation of two Rough-barked Apple (*Angophora floribunda*) trees directly adjacent to the Ventilation Shaft, as shown in Figure 9 of the BMP, for assessment of condition and health due to their proximity to the ventilation shaft;
- the completion of four photo points, as per Figure 9 of the BMP, and assessment of any change in vegetation condition from 2017; and
- the recording of dominant species (canopy, mid-storey, understorey and ground layers) around the periphery of each side of the Ventilation Shaft area.

### 2.3 Location and distribution of weeds

Weed monitoring targets existing locations (recorded by EMM during the 2018 monitoring) and significant new weed occurrences in the eastern management zone (within the Swamp Oak Forest) as well as at the ventilation shaft area. The weed monitoring component of the field surveys has recently been completed for a weed management plan and bush regeneration works by Total Earth Care 2019.

### 2.4 Abundance and distribution of feral animal use

The monitoring of feral animals is undertaken in conjunction with the weed monitoring and as per the proforma in Appendix one of the BMP and includes recording of activity of feral species by searching for tracks, diggings, burrows and sighting of individuals.



# 3 Results

## 3.1 Condition and composition of Swamp Oak Forest

The detailed monitoring results are provided in Appendix A, with the location of monitoring plots provided in Figure 3.1 with a description of the findings for each plot provided below. The weighted score for the combination for the combination of the two plots is 65, which is identical to the 2018 monitoring. No remedial actions are required as the score is above the minimum trigger of 60.

### 3.1.1 Plot 1

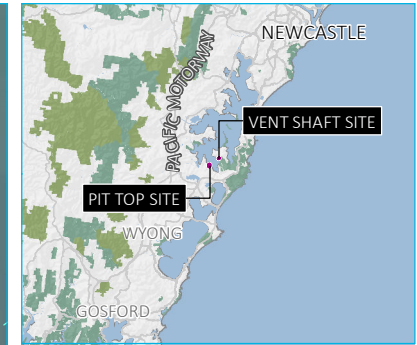
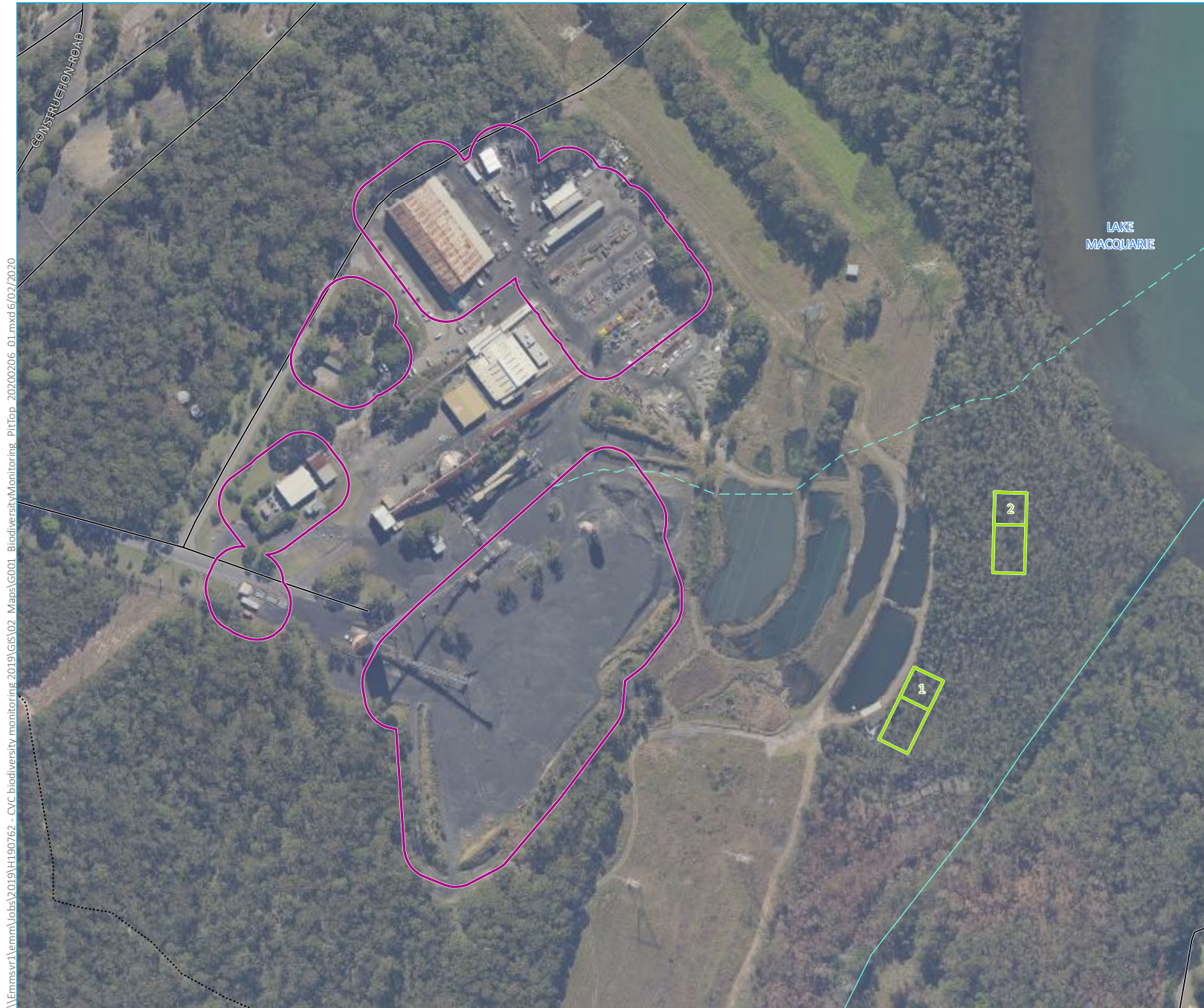
The condition and composition of the vegetation within Plot 1 was broadly comparable with the monitoring results from the previous year. The canopy of Swamp Oak is continuing to regenerate, with slight increase in coverage from 19.5 % to 20.5 %. The ground cover was largely unchanged with one additional native species recorded; Samphire (*Sarcocornia quinqueflora subsp. quinqueflora*). This species is a Halophyte (grows in saline conditions) therefore its presence should be monitored to determine if it increases in dominance.

Weed prevalence was limited to a single Ground Asparagus (*Asparagus aethiopicus*) plant, with no evidence of any new weed species within the plot or area immediately adjacent.

### 3.1.2 Plot 2

The condition and composition of the vegetation within Plot 2 was broadly comparable with the 2018 monitoring. Swamp Oak was the only canopy species present, which increased its canopy cover from 23 % to 23.5 %. The ground cover was largely unchanged with one additional native species recorded; Samphire (*Sarcocornia quinqueflora subsp. quinqueflora*). As discussed above, this species is a Halophyte, therefore its presence should be monitored to determine if it increases in dominance, indicating potential transition of the community. This is unlikely to be of concern unless it occurs concurrently with dieback of Swamp Oak.

Weed prevalence within the plot was substantially lower than 2018, with no Bitou Bush (*Chrysanthemoides monilifera*) or Cassia (*Senna pendula var. glabra*) recorded in 2019, likely owing to successful weed control. It is noted that these species, and Sharp Rush (*Juncus acutus*) are relatively frequent outside of the plot. These will require ongoing management, to prevent them increasing in prevalence at the expense of native species.



- KEY**
- FDI100
  - Plot (20x20 m) and transect (20x50 m)
  - Local road
  - ..... Vehicular track
  - Strahler stream order
  - 1st order
  - 2nd order

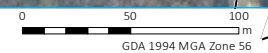
Pit top monitoring  
eastern zone

Chain Valley Colliery  
Biodiversity monitoring 2019  
Figure 3.1



\\Emmsvr1\emmm\Jobs\2019\H190762 - CVC biodiversity monitoring 2019\GIS\02 Maps\G001 BiodiversityMonitoring\_PitTop\_20200206\_01.mxd 6/02/2020

Source: EMM (2020); DFSI (2017); GA (2015); DPI (2013)



### 3.2 Condition of vegetation adjacent to the ventilation shafts and fans

A photolog of the photo monitoring points and tree monitoring points are provided in Appendix B, with a summary of observations provided in Table 1.1.

Vegetation around the ventilation shaft compound was cleared for an asset protection zone (APZ) prior to the 2017 monitoring. This did not affect any of the tree monitoring points, however would affect the photo point monitoring, with obvious clearance of shrubs and regenerating small trees close compound.

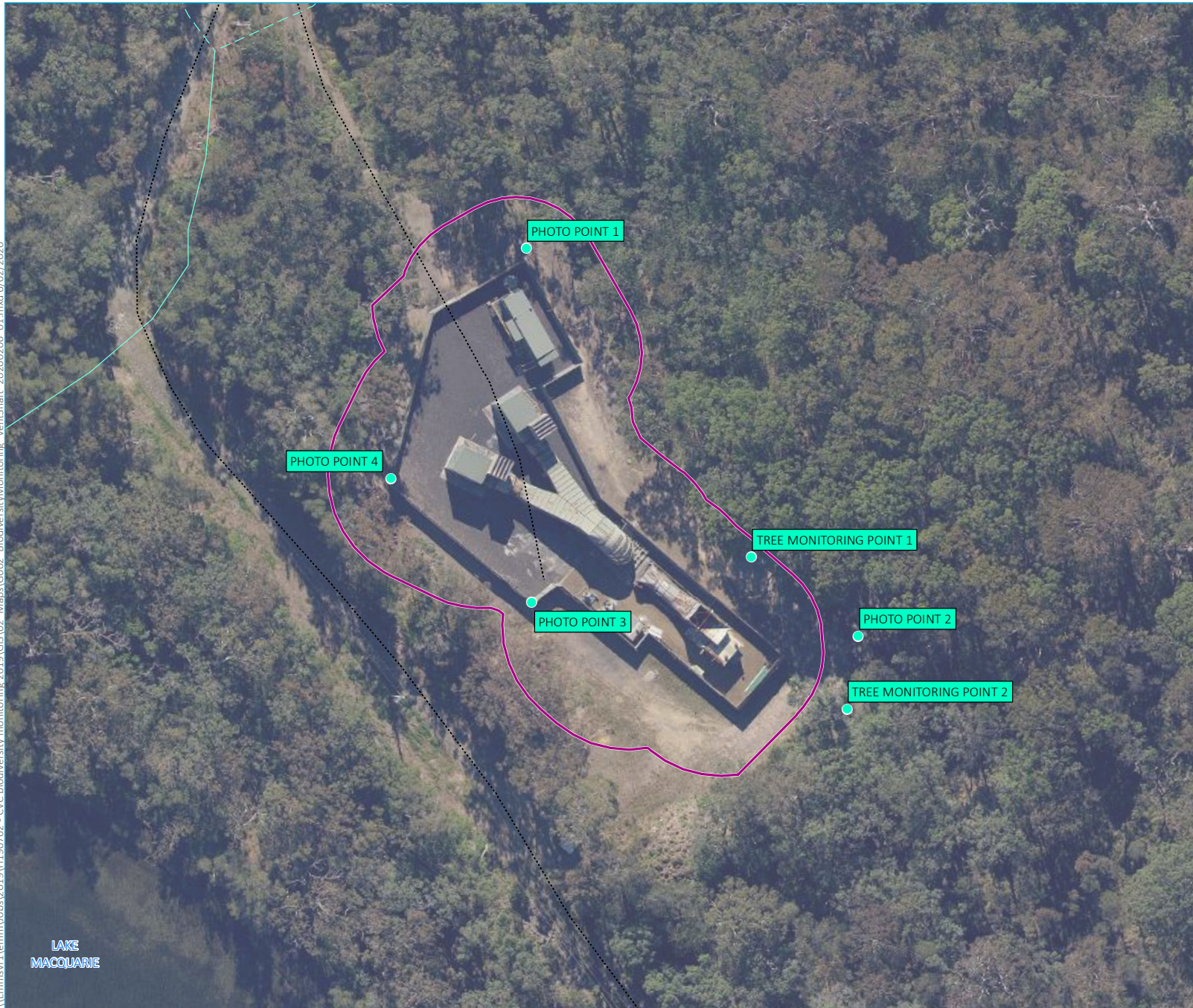
When clearance for the asset protection zones is taken into account (APZ), vegetation condition was broadly similar to previous years, with no observable negative impact from the vent shaft. Ground cover and mid-storey cover appeared to be regenerating well, with increased height and density of native species in 2019 compared to the previous year.

**Table 3.1 Monitoring point observations**

<b>Monitoring point</b>	<b>2019 monitoring observations</b>
1	Vegetation appears healthy with observable growth of canopy species and midstorey species. Not comparable with the 2016 monitoring given the clearing for an asset protection zones (APZ).
2	Vegetation appears healthy with observable growth of canopy species and midstorey species compared, to previous monitoring events. Isolated dieback of individual branchlets observed, however on balance, canopy crown density has is similar or demonstrates a net increase.
3	Vegetation has increased in height and density with native midstorey species growth particularly prevalent.
4	Vegetation appears healthy with observable growth of canopy species and midstorey species. Not comparable with the 2016 monitoring given the clearing for an asset protection zones (APZ).
Tree 1	Tree appears healthy, with new growth, dense foliage within the crown and no dieback observed.
Tree 2	Tree appears healthy, with new growth and dense foliage within the crown. Small areas of dieback observed on small and isolated limbs, however this is less noticeable than observed in previous years. The tree has increase foliage cover compared to the 2016 BMP photograph.



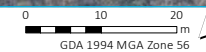
\\Emmsvr1\emmm\jobs\2019\h190762 - CVC biodiversity monitoring 2019\GIS\02 Maps\G002 BiodiversityMonitoring\_VentShaft\_20200206\_01.mxd 6/02/2020



- KEY
- FDI100
  - Photo point
  - ..... Vehicular track
  - Strahler stream order
  - - - 1st order
  - 2nd order

LAKE  
MACQUARIE

Source: EMM (2020); DFSI (2017); DPI (2013)



Ventilation shaft monitoring

Chain Valley Colliery  
Biodiversity monitoring 2019  
Figure 3.2



### 3.3 Location and distribution of weeds

Evidence of weed control was apparent during the site survey. Weed prevalence was similar to previous years in the Swamp Oak Forest and improved at the vent shaft area.

Weed prevalence has been documented in Appendix C (TEC 2019), with a detail of weed treatment conducted, including species and locations targeted. A list of recommendations are also provided for each areas with several actions likely required.

### 3.4 Abundance and distribution of feral animal use

No evidence of feral animals has been detected for the last three years of monitoring (2017-2019).

## 4 Summary

The 2019 biodiversity monitoring established that the vegetation and habitat values within the subject areas was broadly similar to the 2018 monitoring.

Observations and photo monitoring at the vent shaft area demonstrated increased growth of native vegetation, especially observable in the ground and midstory. The canopy within the Swamp Oak areas had also increased slightly with additional tree dieback trees observed. No remedial actions are required as the condition score remained above the trigger threshold.

Whilst evidence of successful weed control was observed in several area, ongoing control is recommended to suppress those weeds still present and to prevent reestablishment in treated area.



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Appendix A

# Swamp Oak monitoring data

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A.1.1 Plot 1

**Plot 1**

Swamp Oak Floodplain Forest

Photo no: Plot 1

Date: 6/11/2019

Data collectors:  
E. Dodd

Plot/transect: 1

**Coordinates start transect**  
Easting: 365034.00 m E  
Northing: 6329516.00 m S

Native plant species (#) (plot): 8

**Coordinates finish transect**  
Easting: 365012.00 m E  
Northing: 6329471.00 m S

Regeneration (%) (plot): 1

Trees with Hollows (#) (plot): 0

**Native overstorey cover % (every 5m)**

1	30
2	20
3	20
4	10
5	15
6	25
7	35
8	15
9	30
10	5
<b>AVG</b>	<b>20.5</b>

Total length of fallen logs (m) (plot): 6

Layer	Cover in 20x20m plot (%)
Native midstorey	0
Native ground (grasses)	8
Native ground (shrubs)	0
Native ground (other)	93
Exotics	0.1

Species	Common Name	Native
<i>Asparagus aethiopicus</i>	Ground asparagus	n
<i>Baumea juncea</i>	Twig-rush	y
<i>Casuarina glauca</i>	Swamp Oak	y
<i>Fimbristylis ferruginea</i>	Rusty Sedge	y
<i>Gahnia clarkei</i>	Tall Saw-sedge	y
<i>Juncus krausii</i>	Sea Rush	y
<i>Selliera radicans</i>	Creeping Brookweed	y
<i>Sarcocornia quinqueflora</i> su Samphire		y

**Weeds**  
Weeds were largely limited to one Ground Asparagus plant.

**Dieback of canopy**  
No additional dieback of canopy species from the last monitoring period. Individual Swamp Oak trees appear to increase in cover.

**Water** Waterlogged soils with ponding areas and channels containing flowing waters.

**Comments**  
No Bitou Bush seedlings (*Chrysanthemoides monilifera*) were observed - one seedling was hand pulled during the last survey (2018). Samphire (*Sarcocornia quinqueflora* subsp. *quinqueflora*) was recorded for the first time. This species was recorded in low abundance adjacent to the discharge channels.

A.1.2 Plot 2

**Plot 2**

Swamp Oak Floodplain Forest

Photo no: Plot 2

Date: 6/11/2018

Data collectors:  
E. Dodd

Plot/transect: 2

Coordinates start transect  
Easting: 365085  
Northing: 6329629

Native plant species (#) (plot): 9

Coordinates finish transect  
Easting: 365084  
Northing: 6329580

Regeneration (%) (plot): 1

Trees with Hollows (#) (plot): 0

Native overstorey cover % (every 5m)	
1	35
2	20
3	15
4	35
5	25
6	20
7	30
8	20
9	15
10	20
<b>AVG</b>	<b>23.5</b>

Total length of fallen logs (m) (plot): 19

Layer	Cover in 20x20m plot (%)
Native midstorey	0
Native ground (grasses)	8
Native ground (shrubs)	0
Native ground (other)	88
Exotics	0.5

Species	Common Name	Native
<i>Asparagus aethiopicus</i>	Ground asparagus	n
<i>Baumea juncea</i>	Twig-rush	y
<i>Casuarina glauca</i>	Swamp Oak	y
<i>Fimbristylis ferruginea</i>	Rusty Sedge	y
<i>Gahnia clarkei</i>	Tall Saw-sedge	y
<i>Juncus kraussii</i>	Sea Rush	y
<i>Samolus repens</i>	Creeping Brookweed	y
<i>Selliera radicans</i>	Swamp Weed	y
<i>Sporobolus virginicus</i>	Marine Couch	y
<i>Sarcocornia quinqueflora</i>	Samphire	y

**Weeds**  
No Bitou Bush or Cassia was recorded within the plots and one Ground Asparagus were recorded. Weeds were frequently recorded throughout the plot and surrounding area.

**Dieback of canopy**  
No additional dieback of canopy species from the last monitoring period. Individual Swamp Oak trees appear to increase in cover.

**Water** Soils waterlogged throughout majority of area, occasional areas of shallow pooled water.

**Comments**  
  
Swamp Oak recruitment observed.



A.1.3 Weighted condition score for Plot 1 and 2 combined

Site attribute	Benchmark	Plot 1 data	Plot 1 score	Plot 2 data	Plot 2 score	Average	Weighting %	Calculation	Weighted score %
A	>6	8	4	9	4	4	25	25	25.0
B	5 to 18	20.5	3	23.5	3	3	10	7.5	7.5
C	36 to 48	0	1	0	1	1	10	2.5	2.5
D	3 to 21	8	4	8	4	4	2.5	2.5	2.5
E	0 to 0	0	4	0	4	4	2.5	2.5	2.5
F	1 to 13	93	1	88	1	1	2.5	0.625	0.6
G		0	4	0.5	3	3.5	5	4.375	4.4
H	>0	0	1	0	0	0.5	20	2.5	2.5
I		1	4	1	4	4	12.5	12.5	12.5
J	>20	6	2	19	4	2	10	5	5.0
Total						27	100		65.0

trigger is <60%

Site attribute	Site attribute score	Site attribute score				Weighting for site
		1	2	3	4	
A	Native plant species richness	0	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark	25%
B	Native over-storey cover	0-10% or >200% of benchmark	10-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	10%
C	Native mid-storey cover	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	10%
D	Native ground-cover (grasses)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.50%
E	Native groundcover (shrubs)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.50%
F	Native groundcover (other)	0-10% or >200% of benchmark	0-<50% or >150-200% of benchmark	50-<100% or >100-150% of benchmark	Within benchmark	2.50%
G	Exotic plant cover (all strata)	>66%	>33-66%	>5-33%	0-5%	5%
H	Number of trees with hollows	0 (unless benchmark includes 0)	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark	20%
I	Proportion of over-storey species occurring as regeneration	0	>0-<50%	50-<100%	100%	12.50%
J	Total length of fallen logs	0-10% of benchmark	>10-<50% of benchmark	50-<100% of benchmark	≥ benchmark	10%
Total weighted score						100%

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Appendix B

# Vent shaft monitoring

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B.1 Vent shaft photolog



Photograph B.1 Photo point 1



**Photograph B.2**      **Photo point 2**





**Photograph B.3**      **Photo point 3**



Photograph B.4      Photo point 4





**Photograph B.5**      **Tree monitoring point 1**



**Photograph B.6**      **Tree monitoring point 2**

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Appendix C

# Weed monitoring – Total Earth Care 2019

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# Weed Management

## Bush Regeneration Works 2019



### **Delta Coal**

<b>Company/Client</b>	Delta Coal – Chris Armit / Katie Weekes
<b>Site name &amp; location</b>	Chain Valley Colliery & Mannering Valley Colliery, Mannering Park
<b>Site Manager/Supervisor</b>	Aaron Mason / Joshua Watkins

# Works Report

Prepared

By: Aaron Mason of Total Earth Care Pty. Ltd.  
 For: Delta Coal – Chris Armit / Katie Weeks

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# 1.0 Introduction

Total Earth Care Pty. Ltd. was contracted by Delta Coal to provide weed management works at Chain Valley Colliery and Mannering Valley Colliery. A total of five (5) crew days were completed on site targeting areas highlighted by Delta Coal Officer – Chris Armit. These preliminary works precede the implementation of a Weed Management Plan currently being developed for Delta Coal.

## Chain Valley Colliery





Manning Valley Colliery



## 2.0 Site Description

### 2.1 Work Areas

- See section 3

### 2.2 Flora

#### 2.2.1 Threatened or Locally Significant Species or Vegetation Communities as Listed by the TSCA

The site is considered significant as it contributes to a broad area of reserved bushland that encompasses it. It also:

- contains and adjoins relatively intact vegetation communities
- it contains vegetation of State or local significance
- it contains Swamp Oak Floodplain Forest which is an Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act (1995)*
- it contains threatened species under the *Threatened Species Conservation Act (1995)*
- and provides valuable fauna habitat and corridors linking adjacent bushland and waterways

#### 2.2.2 Threatened Species Conservation Act 1995

In NSW, the key piece of legislation relating to the protection and management of biodiversity and threatened species is the Threatened Species Conservation Act 1995 (TSC Act). The Office of Environment and Heritage (OEH) is responsible for administering the TSC Act, which aims to protect species, populations and ecological communities threatened with extinction in NSW.

One aim of the TSC Act is to eliminate or manage certain key threatening processes (KTPs) that threaten the survival or evolutionary development of threatened species, populations and ecological communities.

KTPs listed by the TSC Act are identified as having significant impacts on the conservation of native flora and fauna. There are currently 37 key threatening processes listed under the TSC Act including:

- i. Invasion and establishment of exotic vines and scramblers.
- ii. Invasion, establishment and spread of *Lantana camara*.
- iii. Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed).
- iv. Invasion of native plant communities by exotic perennial grasses.
- v. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants. (Delta WMP 2015)

#### 2.2.3 Flora Considerations

- Work carefully within EEC
- Prior to any works being undertaken the presence or absence of threatened flora will be determined by conducting a brief survey of each management zone. Obviously cutting or damaging any native flora let alone threatened flora was avoided.
- All plants will be positively identified prior to their removal (Precautionary Principle applies)
- All weed removal within 2 metres of a threatened / regionally significant species will be hand weeding or cut and paint (no spraying).
- No spraying of chemicals within 5 metres of a threatened / regionally significant species



## 2.2.4 Exotic vegetation

**Table 1:** Weed species of national and regional significance identified or potentially present.

Common Name	Species Name
Bitou bush	<i>Chrysanthemoides monilifera</i>
Blackberry	<i>Rubus fruticosus</i>
Crofton Weed	<i>Ageratina adenophora</i>
Fireweed	<i>Senecio madagascariensis</i>
Green Cestrum	<i>Cestrum parquii</i>
Ground Asparagus	<i>Asparagus aethiopicus</i>
Lantana	<i>Lantana camara</i>
Mother of Millions	<i>Bryophyllum delagoense.</i>
Pampas Grass	<i>Cortaderia selloana</i>
Salvinia	<i>Salvinia molesta</i>
Spiny Rush	<i>Juncus acutus</i>
Tussock Paspalum	<i>Paspalum quadrifarium</i>
St Johns Wort	<i>Hypericum perforatum</i>

**Table 2:** Environmental weed species identified as growing on site

Common Name	Species Name
Canary Island Date Palm	<i>Phoenix canariensis</i> -
Canna Lilly	<i>Canna indica</i>
Coastal Morning Glory	<i>Ipomoea cairica</i>
Coral Tree	<i>Erythrina X sykesii</i>
Camphor Laurel	<i>Cinammomum camphora</i>
Castor Oil	<i>Ricinus communis</i>
Cobbler's Peg	<i>Bidens pilosa</i>
Cooch	<i>Cynodon dactylon</i>
Easter Cassia	<i>Senna pendula</i>
Green Cestrum	<i>Cestrum parquii</i>
Japanese Honeysuckle	<i>Lonicera japonica</i>
Kikuyu	<i>Pennisetum clandestinum</i>
Madeira Vine	<i>Anredera cordifolia</i>
Milk Thistle	<i>Sonchus oleraceus</i>
Mother of Millions	<i>Bryophyllum delagoense</i>
Ochna	<i>Ochna serrulata</i>
Paddy's Lucerne	<i>Sida rhombifolia</i>
Paspalum	<i>Paspalum dilatatum</i>
Penny Wort	<i>Hydrocotyle bonariensis</i>
Privet – Broad Leaf	<i>Ligustrum lucidum</i>
Privet – Narrow Leaf	<i>Ligustrum sinense</i>
Purple Top	<i>Verbena bonariensis</i>
Swiss Cheese Plant	<i>Monstera deliciosa</i>
Tall Fleabane	<i>Conyza sumatrensis</i>
Turkey Rhubarb	<i>Acetosa sagittata</i>
Vasey Grass	<i>Paspalum urvillei</i>
Whisky Grass	<i>Andropogon virginicus</i>
Wild Tobacco	<i>Solanum mauritianum</i>
Wild Watsonia	<i>Watsonia bulbifera</i>

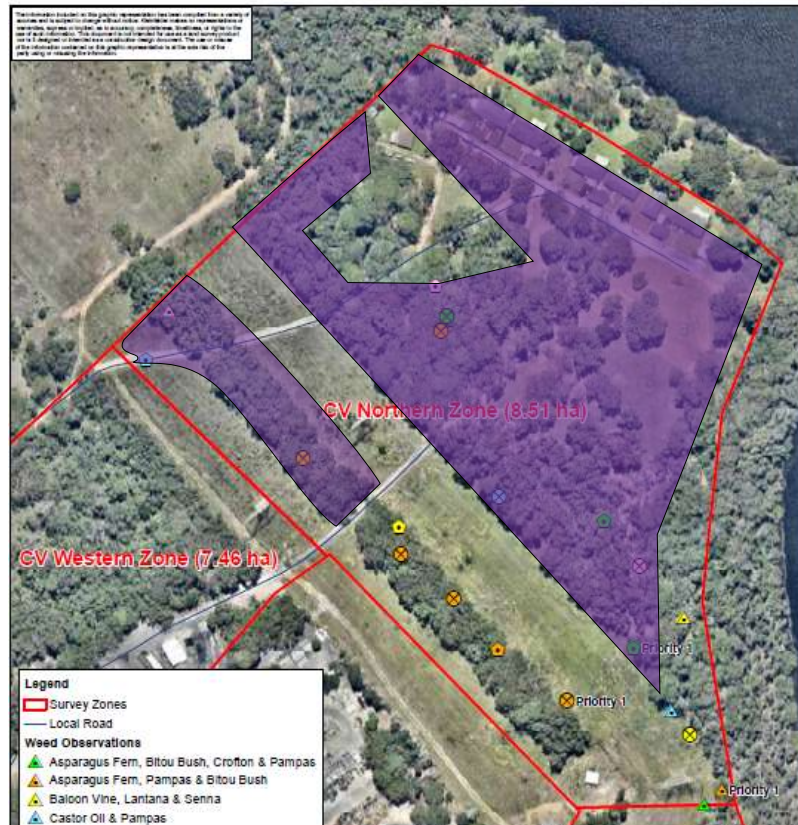
### **2.3 Fauna Considerations**

- The habitat and refuge potential of weeds and rubbish was be considered prior to its removal
- Manual removal of some weeds was implemented allowing frogs, birds, lizards to move into adjoining sections of bushland.
- Generally weeds are removed gradually / incrementally in areas where an infestation is severe/extensive, however due to time constraints for this project, a relative swift removal of woody weeds was required
- Limited disturbance of rocks, logs and any other potential habitat unnecessarily
- Only registered herbicides around water use were used or not at all

A detailed fauna list can be requested during the implementation of the Weed Management Plan (if TEC are selected)

## 3.0 Bush Regeneration Works

### 3.1 CV North



#### Works involved:

- Primary Weeding and some Secondary weeding
- Considerable focus on areas surrounding dwelling and along eastern edges
- Works generally progressed from core bushland back out to trail/weedy edges. Targeting Lantana, Pampas, Senna, Ochna, Tobacco Bush and other exotics
- Large plumes of Lantana were successfully sprayed when conditions were suitable
- Systematically sweep known problem areas prior to seed setting and reduce propagule recruitment
- Targeted Noxious, WoNS and environmental weeds using industry approved methods
- Weed propagules/seed will be bagged and removed from site
- Photographic monitoring of works (in progress) have been included in this report
- 

#### Recommendations:

- Continue primary and secondary weeding before xmas 2019. Weeds are in peak growing season
- Target remaining Lantana, Senna, Honeysuckle, Pampas Grass
- Target Blackberry in November 2019 before it sets fruit (currently in flower)
- Use a combination of handweeding and spot spraying to cover larger areas before summer growth period.

### 3.2 CV Central and CV East



#### Works:

- Minimal works were completed here due to other client priorities
- Targeting some Lantana, Pampas Grass, Castor Oil & Crofton
- Spot sprayed some Crofton weed when conditions were appropriate.
- Target Noxious, WoNS and environmental weeds using industry approved methods
- Some weed propagules/seed were bagged and removed from site

#### Recommendations:

- Treat plumes of Lantana, Pampas Grass, Castor Oil, Crofton Weed using a combination of cut/paint, hand removal and spraying techniques.
- Considerable areas of *Juncus acutus* and Pampas that need works around CVC and ponds
- Priority weeds in southern half of CV East to be worked before xmas 2019.
- Carefully treat weeds around ponds where there is active bird/reptile life



### 3.3 CV West



#### Works involved:

- Considerable time was spent in CV West due to the nature of weed/native ratio and the weeds returning rampantly after works completed some time ago.
- After preliminary inspection, the southern half of CV west contained the majority of the weeds. Primary weeding along the southern edges of CV West. Targeted Lantana, Senna, Bitou Bush, Pine Trees, Crofton Weed, Pampas Grass and other problematic weeds.
- A systematic work pattern was used to sweep through core sections and the northern edges bordering the fire trail. Sporadic Lantana, Pampas Grass, several large Camphor Laurel trees, Passionfruit Vine and Crofton Weed.
- Immediately Targeted Pampas Grass which is a noxious weed (currently in full flower)
- The eastern and western edges contained several Lantana, Oleander, Pines and Senna which were cut and painted with Glyphosate.
- Cut and paint, chisel and paint, spraying and manual removal were all techniques utilised
- Target Noxious, WoNS and environmental weeds using industry approved methods
- Trained/qualified/inducted staff will undertake all works
- Weed propagules/seed will be bagged and removed from site
- Photographic monitoring of works included in this report

#### Recommendations

- Follow up works should be scheduled soon as weeds will return in large densities during the upcoming the summer months. A 12-24 month contract is suggested so any saplings regrowth can be secondary weeded and maintained to reduce numbers for next season
- Regular observation for weeds on edges, fire trails and road verges.
- Systematic sweeps to effectively cover large areas will be utilised.
- Focus on Lantana, Pampas, Crofton, Camphor laurel, Senna and Pine Trees



### 3.4 MC North



#### Works:

- Selective works were completed here due to other priorities. The main focus was the southern remnant bushland pocket and any obvious weeds around wetlands/ponds
- Targeting some Lantana, Pine Tree, Pampas Grass, Castor Oil & Crofton
- Numerous *Acacia saligna* were cut and painted
- Spot sprayed some Crofton weed, Thistle and Pampas when conditions were appropriate.
- Target Noxious, WoNS and environmental weeds using industry approved methods
- Some weed propagules/seed were bagged and removed from site

#### Recommendations:

- Immediate works in the southern remnant bushland to consolidate primary weeding completed in August/September 2019.
- Treat plumes of Lantana, Pampas Grass, Castor Oil, Crofton Weed using a combination of cut/paint, hand removal and spraying techniques.
- Continue the treatment of remaining *Acacia saligna* around the northern retention pond.
- Considerable areas of *Juncus acutus* and Pampas need works
- Carefully treat weeds around ponds where there is active bird/reptile life

### 3.5 MC West



#### Works:

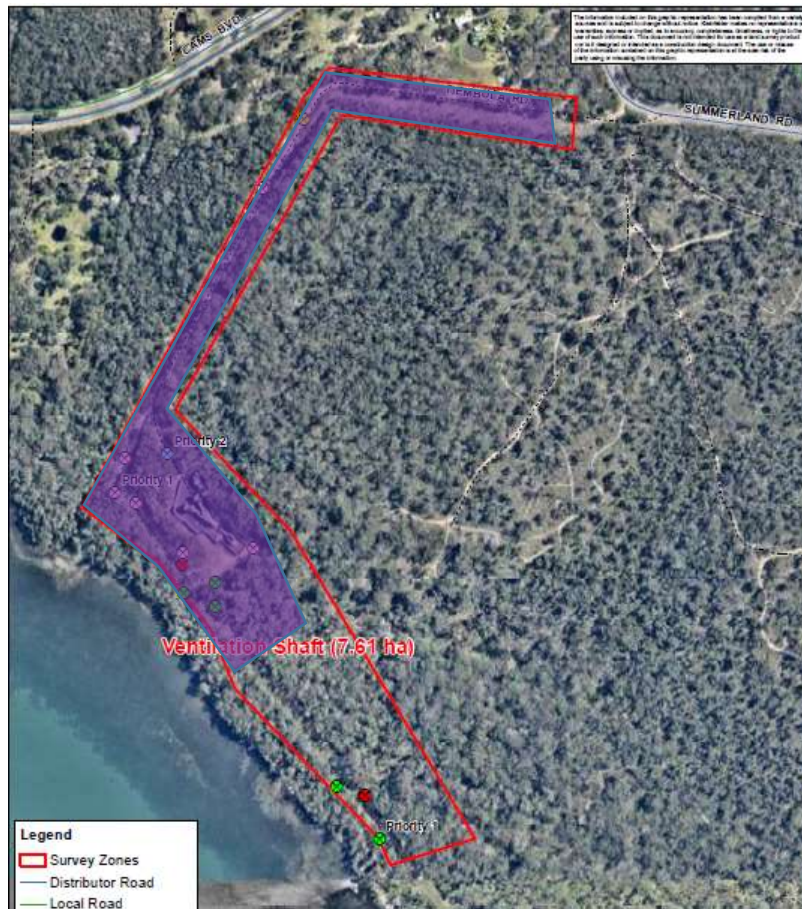
- Most of the works in MC West were around the coal loading/storage area
- Chris Armit requested a day for complete some APZ works along the northern coal conveyor belt where the native vegetation was growing near/over causing a fire risk especially coming into summer.
- Another request by Chris Armit was completed on Day 1 of our work schedule. This was to clear low lying grasses/weeds from 2 x fenced areas manned for routine maintenance. This involved spraying grass weeds and herbaceous weeds from 2 separate caged areas
- Targeting some Lantana, Bitou Bush, Pampas Grass, Castor Oil & Crofton
- Spot sprayed some Crofton weed when conditions were appropriate.
- Target Noxious, WoNS and environmental weeds using industry approved methods
- Several bags of weed propagules/seed were removed from site

#### Recommendations:

- A large pocket of Bamboo and Lantana require immediate treatment before spreading through more native bushland.
- Treat plumes of Lantana, Pampas Grass, Castor Oil, Crofton Weed using a combination of cut/paint, hand removal and spraying techniques.
- Numerous large Pine Trees are spread across this zone and over Delta fencelines.
- Considerable areas of *Juncus acutus* and Pampas that need works



### 3.6 Ventilation Shaft



#### Works:

- Staff spent some time weeding along the edges of fire trail and areas surrounding the ventilation shaft area. Due to this being away from CVC and MVC, this section was left to last to minimise transit time loss for staff movement.
- The majority of weeds were to the north of the ventilation shaft and there was more than first observed. Lantana, Senna, Crofton, Bitou were the priority weeds treated
- Spot sprayed some Crofton weed when conditions were appropriate.
- Target Noxious, WoNS and environmental weeds using industry approved methods

#### Recommendations:

- Immediately treat remaining weeds including Bitou Bush in the southern edges of this zone.
- Sweep all bushland that surrounds the ventilation shaft structure.
- Treat plumes of Lantana, Pampas Grass, Castor Oil, Crofton Weed using a combination of cut/paint, hand removal and spraying techniques
-

### 3.7 Weed Species List and Treatment

Botanical Name	Common Name	Weeding Technique	WONS	Noxious Weed Class	Herbicide Group	Herbicide Application	Ratio
<i>Acetosa sagittata</i>	Turkey Rhubarb	Juvenile single specimens to be dug out. Large infestations foliar spraying with Glyphosate.			M	Glyphosate 360g/L	1/100
<i>Ageratina riparia</i>	Mist Flower	Physical removal. Large stands can be sprayed Glyphosate.		4	M	Glyphosate 360g/L	1/100
<i>Alternanthera philoxeroides</i>	Alligator Weed	Hand weeded, bagged and taken to deep landfill or terrestrial specimens spot sprayed with Glyphosate/Metsulfuron-Methyl	YES	3	M & B	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	1/100 & 1g/10L
<i>Andropogon virginicus</i>	Whiskey Grass	Remove seed and crown out with knife or spot spray			M	Glyphosate 360g/L	1/100
<i>Anredera cordifolia</i>	Madeira vine	Individuals to be dug out					
<i>Araujia sericifera</i>	Moth Vine	Small patches to be hand pulled, scraped & painted with Glyphosate			M	Glyphosate 360g/L	Neat
<i>Arundo donax</i>	Giant Reed	Cut and paint with neat Glyphosate.			M	Glyphosate 360g/L	Neat
<i>Asparagus aethiopicus</i>	Asparagus Fern	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl	YES		M & B	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	1/100 & 1g/10L
<i>Asparagus asparagoides</i>	Bridal Creeper	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl.	YES	4	M & B	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	1/100 & 1g/10L
<i>Asparagus officinalis</i>	Asparagus	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl	YES		M & B	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	1/100 & 1g/10L
<i>Asparagus plumosus</i>	Climbing Asparagus Fern	Small single specimens to be crowned or Sprayed with Glyphosate/metsulfuron methyl	YES		M & B	Glyphosate 360g/L & Metsulfuron-Methyl 600 g/kg	1/100 & 1g/10L
<i>Aster subulatus</i>	Aster	Hand removal, cut and paint, or foliar spraying in large stands.			M	Glyphosate 360g/L	1/100 & Neat
<i>Bidens pilosa</i>	Cobblers Pegs	Foliar spraying using Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100

<i>Brassica sp.</i>	Mustard Weed	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Briza maxima</i>	Blowfly Grass	Hand removal, foliar spraying with Glyphosate.			M	Glyphosate 360g/L	1/100
<i>Bryophyllum delagoense</i>	Mother of Millions	Hand pulled or spot sprayed with Starane Advance	3		I	Fluroxypyr 333 g/L present as meptyl ester	0.36/100
<i>Cardiospermum grandiflorum</i>	Balloon Vine	Skirted, Hand removed & scraped and painted with Glyphosate			M	Glyphosate 360g/L	Neat
<i>Cestrum parqui</i>	Green Cestrum	Scrape & painted with Glyphosate or cut and painted with Vigilant Gel	3		M or I	Glyphosate 360g/L or Picloram 43g/km	Neat
<i>Chloris gayana</i>	Rhodes Grass	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Cinnamomom camphora</i>	Camphor laurel	Scrape and paint or drill and fill with neat Glyphosate			M	Glyphosate 360g/L	Neat
<i>Conyza bonariensis</i>	Fleabane	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Coreopsis sp.</i>	Tickseed	Foliar spraying with Glyphosate or manually removed.			M	Glyphosate 360g/L	1/100
<i>Cortaderia selloana</i>	Pampas Grass	Foliar spraying or cuttr/paint with Glyphosate or hand removed.	4		M	Glyphosate 360g/L	1/100 & Neat
<i>Cotoneaster glaucophyllus</i>	Cotoneaster	Cut & paint with Glyphosate			M	Glyphosate 360g/L	1/100
<i>Cirsium vulgare</i>	Spear Thistle	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Crocosmia sp</i>	Crocosmia	Remove seed and crown corm with trowel					
<i>Cynodon dactylon</i>	Couch	Foliar spraying with Glyphosate			M	Glyphosate 360g/L	1/100
<i>Ehrharta erecta</i>	Panic Veldgrass	Foliar spraying with Glyphosate			M	Glyphosate 360g/L	1/100
<i>Eragrostis curvula</i>	African Love Grass	Hand pulled or brush cut and foliar sprayed with Glyphosate			M	Glyphosate 360g/L	1/100
<i>Erythrina crista-galli</i>	Cockspur Coral Tree	Cut & paint or drill/frill and paint with Glyphosate			M	Glyphosate 360g/L	Neat
<i>Erythrina X sykesii</i>	Coral tree	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate			M	Glyphosate 360g/L	Neat
<i>Foeniculum vulgare</i>	Fennel	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Ipomoea cairica</i>	Coastal Morning Glory	Small single specimens hand pulled, skirting larger vines scraping and painting with neat Glyphosate			M	Glyphosate 360g/L	Neat



<i>Ipomoea indica</i>	Blue Morning Glory	Small single specimens hand pulled, skirting larger vines scraping and painting with neat Glyphosate			M	Glyphosate 360g/L	Neat
<i>Lactuca serriola</i>	Prickly Lettuce	Physical removal, ciut and paint, or foliar spraying with Glyphosate.			M	Glyphosate 360g/L	1/100 & Neat
<i>Lantana camara</i>	Lantana	Cut and paint, sprayed or splattered with Glyphosate	YES	4	M	Glyphosate 360g/L	Neat
<i>Ligustrum lucidum</i>	Large Leaf Privet	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate		4	M	Glyphosate 360g/L	Neat
<i>Ligustrum sinense</i>	Small Leaf Privet	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate		4	M	Glyphosate 360g/L	Neat
<i>Lonicera japonica</i>	Japanese Honeysuckle	Scrape & painted with Glyphosate		4	M	Glyphosate 360g/L	Neat
<i>Myriophyllum aquaticum</i>	Parrots Feather	Physical Removal					
<i>Ochna serrulata</i>	Mickey mouse plant	Double side scrape and paint all stems to 75% coverage.			M	Glyphosate 360g/L	Neat
<i>Olea europaea subsp. cuspidata</i>	African Olive	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate			M	Glyphosate 360g/L	Neat
<i>Opuntia stricta</i>	Prickly Pear	Removed by hand					
<i>Paspalum dilatatum</i>	Caterpillar Grass	Foliar spraying with Glyphosate			M	Glyphosate 360g/L	1/100
<i>Paspalum quadrifarium</i>	Tussock Paspalum	Hand pulled or brush cut and foliar sprayed with Glyphosate				Glyphosate 360g/L	1/100
<i>Pinus radiata</i>	Radiata	<80mm cut & painted; >80mm will be drilled/frilled with neat Glyphosate		4	M	Glyphosate 360g/L	Neat
<i>Plantago lanceolata</i>	Plantain	Foliar spraying with Glyphosate			M	Glyphosate 360g/L	1/100
<i>Ricinus communis</i>	Castor Oil Plant	Hand pulled and cut & painted with neat Glyphosate		4	M	Glyphosate 360g/L	Neat
<i>Rubus fruticosus aggregate</i>	Blackberry	Brush cut, crowned and scraped & painted with neat Glyphosate	YES	4	M	Glyphosate 360g/L	Neat
<i>Rumex sp.</i>	Dock	Hand removed, cut and painted, or spot sprayed.			M	Glyphosate 360g/L	1/100 & Neat
<i>Sida rhombifolia</i>	Paddy's Lucerne	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Solanum mauritianum</i>	Tobacco Bush	Cut & paint with Glyphosate			M	Glyphosate 360g/L	Neat
<i>Solanum nigrum</i>	Blackberry Night Shade	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100

<i>Solanum pseudocapsicum</i>	Jerusalem Cherry	Cut and paint with neat Glyphosate.			M	Glyphosate 360g/L	Neat
<i>Sonchus oleraceus</i>	Common Sow thistle	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Verbena sp.</i>	Purple top	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Vinca major</i>	Greater Periwinkle	Foliar spraying with Glyphosate, hand pulled and brush cut			M	Glyphosate 360g/L	1/100
<i>Watsonia meriana</i>	Wild Watsonia	Hand removal of plant and corms if soil conditions suit. Foliar spraying with diluted Glyphosate or Associate. Painting with neat Glyphosate.			M	Glyphosate 360g/L	1/100 & 1g/10L
<i>Zantedeschia aethiopica</i>	Arum Lily	Physical removal of whole plant and rhizome or cut and paint with Neat Glyphosate			M	Glyphosate 360g/L	
<i>Phytolacca octandra L.</i>	Inkweed	Physical removal of whole plant and rhizome or cut and paint with Neat Glyphosate			M	Glyphosate 360g/L	

## 4.0 Photographic Monitoring

### CHAIN VALLEY COLLIERY

#### CV WESTERN











































































### CV NORTHERN ZONE

































































CV Eastern/Central Zone

















### MANNERING COLLIERY MC NORTHERN ZONE





















MC WESTERN ZONE APZ



























PHOTOS OF WORKED AREAS, NO BEFORE





**Miscellaneous Photos –  
Additional Works, Regen and Weed Issues**



## 5.0 References

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