



Crookwell 2 Wind Farm

Second Annual Report on the implementation of the Operational Flora and Fauna Management Plan

**Prepared for
Crookwell Development Pty Ltd**

June 2023
Report No. 8172.05 (30.0)



(Formerly Brett Lane & Associates Pty Ltd)

5/61-63 Camberwell Road
Hawthorn East, VIC 3123
PO Box 337, Camberwell VIC 3124

(03) 9815 2111
www.natureadvisory.com.au

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1. Introduction

Development consent (DA 176-8-2004-i) was originally granted in June 2005 for the Crookwell 2 Wind Farm (C2WF), comprising up to 46 wind turbines and associated infrastructure. This development consent was modified in 2009 (Mod-1). A total of 28 turbines, of the 32 approved, were constructed.

C2WF is approximately 14 kilometres south-east of Crookwell and approximately 28 kilometres north-west of Goulburn in the Southern Tablelands of New South Wales. The site lies on a series of higher ridges that have been used for decades for sheep and cattle grazing. The area has been either completely or mostly cleared of its original native vegetation. As a consequence of the long grazing history, the vegetation present lacks an indigenous ground cover – introduced pasture grasses now dominate the ground cover.

Crookwell Development Pty Ltd engaged Nature Advisory to monitor implementation of the second year of the approved Operational Flora and Fauna Management Plan (OFFMP) for the C2WF. This second annual report reviews work undertaken in the first and second year of the plan and includes documentation of the following activities:

- Monitoring revegetation/rehabilitation areas and documenting their condition;
- Monitoring weed control and documenting progress; and
- Bird and Bat impact mitigation.

2. Requirements of the OFFMP

The specific requirements of the OFFMP are presented below as extracted from the approval conditions.

Condition (83)

An Operation Flora and Fauna Management Sub Plan must be prepared as part of the OEMP. The Sub Plan must be prepared in consultation with the Department and OEH and include:

(a) plans showing:

- *terrestrial vegetation communities; important flora and fauna habitat areas; areas to be protected; and areas to be planted;*

(b) methods to manage impacts on flora and fauna species (terrestrial and aquatic) and their habitats which may be directly or indirectly affected by the development. These must include:

- *habitat management procedures including rehabilitation requirements and active replanting of windrows;*
- *operation stage measures to minimise bird and bat disturbance, in particular reducing the incidence of bird/bat strike. Management measures that must be considered for areas near the turbines include:*
 - i. minimising the availability of raptor perches;*
 - ii. modifying structures to prevent perching;*
 - iii. management of lambing;*
 - iv. swift carcass removal;*
 - v. pest control, including rabbits;*
 - vi. management of stock (grain) feeding;*
 - vii. filling in of small dams that might attract insects and birds;*
 - viii. use of deterrents (eg. flags, marker balls);*
 - ix. minimising external lighting;*
 - x. turbine management, that might include the turning off of turbines that are predicted to cause unacceptable bird/bat mortality at identified times;*
 - xi. measures identified from research undertaken at other wind farms to reduce the incidence of bird/bat strike;*

(c) performance criteria against which to measure the success of the methods; and a programme for reporting on the effectiveness of management measures against the identified performance criteria. Management methods must be reviewed where found to be ineffective.

2.1. Compliance Summary

Table 1 sets out which sections of the OFFMP addressed the specific requirements of Condition 83 of the 2017 Mod-2 approval.

Table 1: Sections within the OFFMP that respond to Condition of Consent 83

Condition number	Abbreviated condition details	OFFMP Section/s
83 (a)	<i>Plans showing: terrestrial vegetation communities; important flora and fauna habitat areas; areas to be protected; and areas to be planted</i>	3.1.1
83 (b)	<i>Habitat management procedures including rehabilitation requirements and active replanting of windrows</i>	3.1 & 3.2
	<i>Operation stage measures to minimise bird and bat disturbance, in particular reducing the incidence of bird/bat strike...</i>	
83 (c)	<i>Performance criteria against which to measure the success of the methods; and a programme for reporting on the effectiveness of management measures against the identified performance criteria. Management methods must be reviewed where found to be ineffective.</i>	5

2.2. OFFMP Objectives

The overall aim of the OFFMP is to provide methods to manage the impacts on flora and fauna species (terrestrial and aquatic) and their habitats which may be directly or indirectly affected by the development of the C2WF and provide performance criteria against which to measure the success of the methods.

The specific objectives of this OFFMP, derived from the conditions of approval, are set out below.

- Provide plans showing important areas of flora and fauna habitat areas to be protected or revegetated;
- Provide methods to for active management of habitat, including revegetation and rehabilitation;
- To detail and address specific and potential mitigation measures and related implementation strategies to reduce impacts on birds and bats;
- To document an agreed performance criterion that outlines the measures of success of the mitigation measures implemented and allows for review where these are found to be ineffective; and
- To identify matters to be addressed in periodic reports on the outcomes of the application of the mitigation measures against the performance criterion and their success.

The management plan adopts an adaptive management approach. Therefore, management measures can be amended to ensure more effective outcomes in response to monitored impacts on flora and fauna from the wind farm.

3. Reporting requirements

This second annual report has been prepared after the completion of the second year of operation of C2WF. It addresses:

- A brief description of the management prescriptions implemented and identification of any modifications made to the original management practices;
- Review of the management prescriptions against the performance criteria;
- Identification of any unacceptable impacts including whether identified indirect impacts on flora and fauna of the site are of significance at a regional, state or national level, or if species of concern have been affected;
- A discussion of any prescriptions found to be ineffective;
- An outline of proposed refinements or additional supplementary management prescriptions;
- A summary of livestock carcass removal for the purposes of predator reduction;
- Details of any landowner feral animal control programs and their timing;
- Details of the native vegetation protection measures implemented and their success; and
- A summary of how impacted areas have been rehabilitated.

After the second annual report, the need for additional annual reports on mitigation methods will be reviewed in consultation with BCD.

4. Year two plan outcomes

This section outlines the outcomes of measures and actions that were undertaken during the second year of operation C2WF to prevent/reduce the potential for an impact on indigenous flora and fauna.

Landscaping activities have been undertaken at the Crookwell 2 Wind Farm for visual amenity purposes, involving several areas planted with native and introduced tree and shrub species. As a requirement, upon completion of these plantings, an independent inspection was undertaken to ensure landscaping activities have been completed according to the 'Crookwell 2 Wind Farm, Crookwell Road Landscape Management Plan' (LMP).

4.1. Habitat Management Procedures

4.1.1. *Impacts on pasture, native vegetation, and planted wind breaks*

Areas subject to disturbance from construction activities, most notably areas associated with roadside batters and underground cabling, exhibited signs of erosion and degradation during the first year of operation. To combat these impacts, areas subject to erosion have been treated as described in section 4.1.2.

Impacts to native vegetation from construction works were restricted to native grassland. Two specific actions have been implemented to address the disturbance or removal of native vegetation, with native grass rehabilitation and weed control occurring within four designated riparian zones (see Figure 1), and the supplementary planting of various native trees and shrubs within fenced re-planting areas on-site.

Similar measures were implemented in areas of pre-existing planted wind breaks that were impacted during construction. Directly affected areas that are part of the permanent wind farm development footprint, such as roads and cable routes have not been rehabilitated but other affected areas have been planted with both native and introduced tree species, depending on the previous species present. These plantings have been established in the form of fenced-off rows adjacent to roadsides, serving as visual screening and contributing to the overall replacement of impacted wind break habitat within the C2WF site.

Most of the vegetation identified to be retained on-site is intact. However, native vegetation appears to have been removed within Native Vegetation Zone 2, with the most northerly situated tree/shrub appearing to have been removed during road construction according to satellite imagery.

4.1.2. *Rehabilitation of removed/disturbed vegetation*

An initial baseline assessment of removed vegetation was conducted by Biosis Pty Ltd and reported within a Vegetation Management Plan (VMP) in November 2018. This informed the scope and extent of revegetation efforts in 2019.

Subsequent monitoring of these revegetation areas was conducted in spring 2019 (Year 1) and autumn 2020 (Year 2).

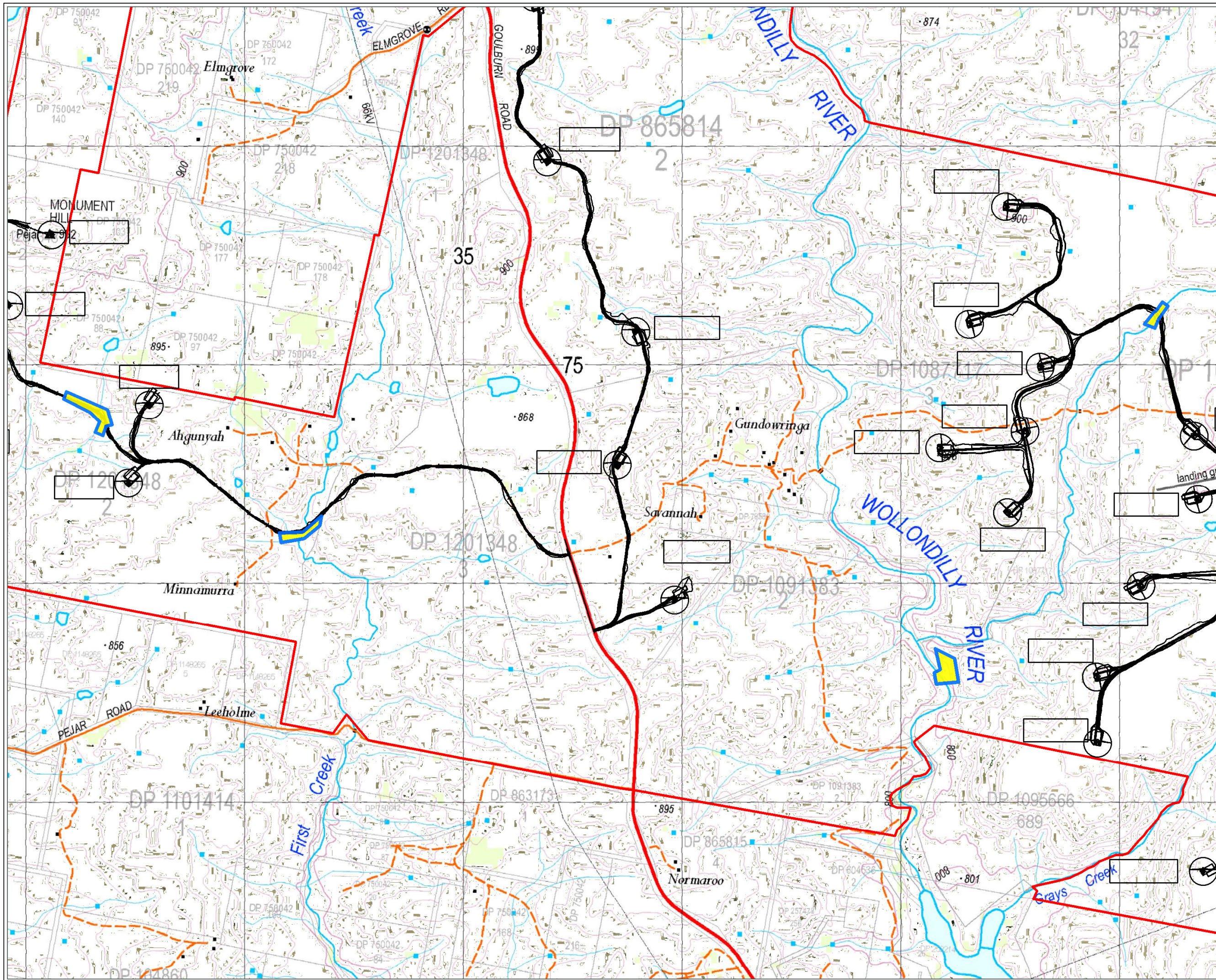


Figure 1: Riparian areas

Project: Crookwell 2 Windfarm
Client: Crookwell Development Pty Ltd
Date: 01/04/2020
 Riparian areas

N

Metres
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Nature Advisory
 PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

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Pasture

Roadside batters and underground cabling site that exhibited signs of erosion and degradation were rehabilitated with a pasture revegetation method known as aqua-seeding. This has promoted the recruitment of pasture grasses and has limited the amount of soil lost during times of high winds and rainfall. Livestock were subsequently excluded from areas treated with aqua-seeding to remove grazing pressure and allow grasses to establish. In areas where aqua-seeding was deemed unsuccessful in establishing pasture grasses, a direct seeding method was adopted to maximise recruitment. Pasture rehabilitation has generally been concentrated within circuits 1 (Turbines 1 – 6) and 5 (Turbines 25 – 28) of C2WF.

Native vegetation

Four riparian zones were identified and subsequently revegetated by Greening Australia, a reputable habitat restoration organisation, to minimise the impacts of erosion and improve habitat structure these areas (see Figure 1). Specific tasks carried out at these locations have included weed management and the use of weed matting, installation of coir logs to slow water flow, and the planting of native grasses comprising Wallaby Grass *Rytidosperma* sp. and Kangaroo Grass *Themeda triandra*.

During the most recent assessment of these riparian zones conducted in May 2020, survivorship of planted native grass was approximately 90 percent. Recommendations following the assessment recommended that dead plants be replaced by new plantings, and that further weed management was to be performed carefully to ensure that existing plants were not compromised.

Furthermore, planted rows of native trees and shrubs were established throughout the wind farm site as part of a greater effort to compensate for vegetation losses during construction. Approximately 1,104 tube-stock seedlings were distributed and planted within these areas, comprising species such as White Box, Yellow Box, Large-leaf Hickory-wattle, Lightwood and Sweet Bursaria (Appendix 1 and Appendix 2). Monitoring of these planted areas in May 2020 confirmed that some Woodhouselee Road sites fell short of their targets (Appendix 1) and all Crookwell Road sites fell short of their targets and in one case no native species survived (Appendix 2).

Planted wind breaks

Planted rows, composed of both native and introduced tree species, were primarily established throughout the wind farm to replace and compensate for losses during construction. A secondary purpose of these plantings which was largely restricted to introduced species such as *Populus canadensis* and *Cupressus leylandii*, was to provide visual screening for residents who wished to have the view of the wind farm obscured from along local roads for both aesthetic and safety reasons. In addition to more than 1104 native tube-stock distributed across the site, almost 1853 introduced trees were also planted concentrated along roadsides on the wind farm boundary for screening (Appendix 1 and Appendix 2). Survivorship was high amongst planted introduced trees with most sites found to have two trees under the expected number during the May 2020 surveys.

4.1.3. Monitoring, reporting, and results

On-site inspections were undertaken on the 26th and 27th of May 2020. All assessments were conducted by an independent experienced ecologist from Nature Advisory.

Each site was assessed in detail by walking the length of the planting area. The following was assessed at each site:

- Status of the fencing

- Count of the number of plants, with identification of species planted (to genus level)
- Checks for dead and missing plants
- Other general comments

According to the LMP, each area was required to be planted according to the following methods:

- Eucalypts to be installed at 7m centres with 2 of same shrub species at equal spacing between.
- *Populus x canadensis* planted in double staggered row and planted in single row at 2.5m plant centres closest to road (where necessary).
- Mixed planting to be installed in random groups of 3-5 number of same plant species.

This section details the numbers of plants required as per the LMP against observations made by the ecologist for each site.

Woodhouselee Road sites

The following summary is provided for the planting sites for Woodhouselee Road:

- Planting areas corresponded to the areas numbered in the LMP;
- All fences were adequate and enclosed all planting areas;
- A detailed assessment of the Woodhouselee Road sites found these areas had a total of 162 less plants than that required in the LMP;
- Areas were overgrown with weeds such as Cocksfoot and Variegated Thistle;
- Summer heat and drought conditions may have contributed to plant deaths.

Details of the observations against the required plant numbers in the LMP for the planting sites for Woodhouselee Road is provided in Appendix 1. Overall, it is considered that the initial planting of the Woodhouselee Road sites has not met the requirements of the LMP. Additional planting to replace dead plants will be required.

Crookwell Road sites

Plants were defined as alive or dead on the following basis:

- Alive - at least some living leaves present
- Dead – no living leaves present or tree guard was empty.

Please note, alive and dead trees could not be distinguished for *Populus x canadensis* due to the autumn timing of the survey and their deciduous nature.

The following summary is provided for the planting sites along Crookwell Road:

- Planting areas corresponded to the areas numbered in the LMP;
- All fences were adequate and enclosed all planting areas;
- A detailed assessment of the Crookwell Road sites found that all sites fell short of the number of plants required in the LMP;
- A high percentage of the cypress plantings were not successful, particularly in CR4;
- A moderate to high proportion of the native plantings were dead, where they supported no living foliage or the tree guards were empty; and

- Weed invasion by pasture grasses, such as Cocksfoot, and thistles was high in most sites;
- Summer heat and drought conditions may have contributed to high number of plant deaths.

Details of the observations against the required plant numbers in the LMP for the planting sites along Crookwell Road is provided in Appendix 2. The initial planting of the Crookwell Road sites has established the planting areas as per the LMP, however additional planting to replace dead plants, and bring up numbers as per the LMP will be required.

Riparian Zone planting

One additional planting area was inspected on 26th May 2020 – a large, fenced area east of the Wollondilly River – west of Turbine 23. This area had been planted with 6000 native grasses to rehabilitate the site after ground disturbance occurred in the area during construction.

The following was noted during this inspection:

- The area was securely fenced on all sides;
- Jute matting had been installed across the entire sloped planting area to manage weeds, and allow for success of plantings;
- Plantings comprised of a range of native grasses including plume grass (*Dichelachne* sp.), red-leg grass (*Bothriochloa* sp.) and Kangaroo Grass (*Themeda triandra*);
- Four coir logs had been installed at regular intervals to manage erosion throughout the planting area;
- At the time of survey, survivorship of planted grasses was estimated to be 90%;
- There was some encroachment of weeds into the area including Clover, Flatweed, Sheep Sorrel and Annual Poa.

Photographs of all planting sites are provided below as appendices.

4.1.4. Weed Control

To date, high-threat weeds have been controlled within several areas of disturbed ground across the wind farm, namely near hardstands, roadside batters and cable trenches. High-threat weed species subject to spraying were predominantly thistles, with Saffron Thistle and Scotch Thistle found to be co-existing in high concentration within some areas of the site disturbed by wind farm construction. In year one assessments, areas that required weed control were in the far west, near turbines 1 – 6, in central areas, near turbines 7, 8, 9 and 10, and south of turbine 20 in the east (including the main access tracks from Woodhouselee Road).

In year two, some of the Woodhouselee Road sites were overgrown with weeds such as Cocksfoot and Variegated Thistle. Occurrence of pasture grasses, such as Cocksfoot and thistles were also high in most sites along Crookwell Road. There was some encroachment of weeds into the area east of the Wollondilly River (west of Turbine 23), including Clover, Flatweed, Sheep Sorrel and Annual Poa.

Other high-threat weeds that have been identified on-site but have not yet been subject to control measures include Serrated Tussock, Willow sp. existing within drainage lines, and Blackberry. Most of these are not related to the wind farm and are a broader land management issue common to the region.

Ongoing weed monitoring and reporting

A baseline weed assessment was undertaken in mid-2020 to establish current conditions and weed monitoring will then be undertaken for the following two years as required in the approved OFFMP to evaluate weed control efforts and refine them to improve their effectiveness.

4.2. Operational stage measures to minimise bird and bat disturbance

4.2.1. Carcass removal

Aside from monthly carcass searches, no specific wind farm personnel have been formally assigned the role of actively searching turbines for carcass removal. Carcasses of dead livestock are commonly removed by landholders when discovered during routine tasks on-site, which aids efforts to prevent raptors from being 'lured' close to operating turbines. As there were no carcass removals recorded and no log book maintained, it is not possible to evaluate whether removal should be increased or decreased. As Wedge-tailed Eagle is one of the most at risk bird species on the site, it is important that the carrion removal program be undertaken diligently and a log book maintained. The program is outlined in Section 5.1 of the BBAMP. The log book is to be provided to OEH as part of an annual report, in accordance with the approved BBAMP.

4.2.2. Management of lambing

During lambing season (usually late autumn/winter) at C2WF, landholders have indicated that ewes and lambs are typically shifted to paddocks well beyond 200 metres from turbines close to farm houses so that landholders can monitor the health and condition of young lambs. As a result, the known associated risk of raptors suffering from blade-strike when feeding on dead or injured lambs beneath turbines has been avoided. To date and in the foreseeable future, the presence of lamb carcasses is not considered a key issue of concern and no additional measures for lamb exclusion are currently being considered.

4.2.3. Pest control, including rabbits

Wind farm staff have indicated that minimal numbers of rabbit has been observed on the site in the last year. Hares are present in low numbers.

To date, an integrated rabbit control program has not been required. Rabbit presence will continue to be monitored by wind farm staff, and if deemed necessary, rabbit control will be implemented.

European Hare has been previously been observed during formal monthly carcass searches. However, given that the species is predominantly solitary, and that observations of hares on-site have been infrequent, it is expected that they occur in low densities and provide very infrequent feeding opportunities for raptors on-site. As such, the species is not currently considered a high priority for targeted pest control.

Though foxes have been observed to occur commonly throughout the site and they featured repeatedly on remote-camera images from scavenger trials. Targeted baiting and other control measures are not currently occurring on properties within the wind farm. Fox control has historically been conducted within portions of the site, though a combination of factors in the previous two years such as movement restrictions imposed by construction activities and regulations, and the increase in labour and financial costs caused by recent prolonged drought conditions, has led to landholders having to withdraw from continued fox control measures. Foxes generally do not attract birds to turbines and their control is not considered a specific risk warranting action by the wind farm operator.

Management of stock (grain) feeding

During formal monthly carcass monitoring throughout 2020, stock feeding has not been evident within 200 metres of turbine locations. This indicates that previous recommendations for restricted stock feeding within 200 metres from turbines has been adhered to and upheld on-site.

4.2.4. Lighting on turbines and buildings

Aviation lights mounted on top of turbines have since been removed due to OH&S concerns, thereby removing any potential for them to change bird and bat behaviour in a manner that would increase turbine collision risk.

4.2.5. Supplementary Mitigation Measures

Fifty-one bird and twenty-nine bat remains were discovered beneath turbines on C2WF between January 2019 and December 2020. This figure includes three incidental records comprising three additional bird and one additional bat. Many of these species are common and widely distributed throughout farm landscapes. No listed bat species were found, only commonly occurring species. As a result, no further bat mitigation measures are currently being considered for implementation at C2WF.

Two Black Falcon (*Falco subniger*) carcasses were recorded under turbines during the monitoring period: on 16th of July 2019 and 29th August 2020. An additional carcass of this species was found on 26th of February 2020 beside an access track 980 metres from a turbine. One Little Eagle (*Hieraaetus morphnoides*) carcass was found on 26th February 2020. Both species are listed as vulnerable in NSW under the Biodiversity Conservation ACT 2016 (BC Act). The results of both further investigation and mitigation measures are presented in a separate report to BCD (Nature Advisory 2020).

5. Management actions and performance criteria

Table 2 summarises specific management objectives, activities, timing, and performance criteria for the implementation of this OFFMP. It can be used for monitoring and reporting on the implementation of this plan.

Table 2: Specific management objectives, activities, timing, and performance criteria

Management action	Management activities and controls	Timing	Performance criteria for measuring success of methods	Completed (yes/no)
Implement native vegetation protection measures	Undertake native vegetation protection measures as per Section 3.1.3	Commencement of Post-construction phase	Native vegetation protection measures in place as prescribed in Section 3.1.3	Yes
Vegetation rehabilitation	Undertake revegetation works as per Section 3.1.4	Two years, beginning at commencement of Post-construction phase	Revegetation targets met as follows: <ul style="list-style-type: none"> ▪ Native vegetation - 75% survival in the first two years of the post construction of the wind farm ▪ Improved pasture and planted windrows – targets to be established through consultation with landowners 	Yes
	Monitoring of progress of the revegetation program undertaken by an independent ecologist	Each mid-spring and late autumn for the first two years of the post construction phase of the wind farm		Yes
	Undertake weed control program as per Section 3.1.4	Two years, beginning at commencement of Post-construction phase	High threat weed cover has been reduced to less than 1% for woody weeds or less than 5% for non-woody weeds	Yes
	Monitoring of progress of the weed control program undertaken by an independent ecologist			No

Management action	Management activities and controls	Timing	Performance criteria for measuring success of methods	Completed (yes/no)
Mitigation measures to reduce risk	Carrion removal program - stock and kangaroo carcasses will be removed from within 200 metres of wind turbines on a monthly basis and be disposed of.	During operation	Carcasses removed	Not required
			Activity recorded in management log book	
	Increase frequency of stock and kangaroo carcass removal and disposal if required			
	Subject to landowner agreement, restrict lambing to paddocks at least 200m from turbines.		No increase in raptor mortality during lambing season	Yes
	Stock will not be fed grain underneath turbines		No increase in bird mortality due to grain underneath turbines	Yes
	Pest control program - Implement rabbit control on an ongoing basis		Monitor effectiveness of rabbit control and, where bird mortality is clearly related to rabbit numbers, increase the effectiveness of rabbit control	Not Required
	Habitat improvement or protection to encourage animals to use habitats away from turbines.		Protection of offset site located in woodland habitat.	Not required
	Minimising external lighting. If required. There are only low levels of lighting on the wind farm during operation.		If mortality at turbines near light sources significantly exceeds that of activity at unlit turbines, type and duration of lighting will need to be reviewed, subject to security and OH&S limitations.	Yes
	Remove permanent lights on buildings and substations to avoid light spillage and visibility from above.			Yes
	Baffle security lighting to avoid light spillage and visibility from above.			Yes
Use of deterrents – Where required, overhead powerlines will have marker balls and/or flags where they cross waterways	No incidental records of bird mortality from power line collision around waterways.	Not required		

Management action	Management activities and controls	Timing	Performance criteria for measuring success of methods	Completed (yes/no)
Supplementary measures - measures to be used if investigation warrants	In the event that the C2WF BBAMP (BL&A 2016) monitoring program detects a significant impact, or an impact trigger occurs, or BCD deems it necessary, supplementary mitigation measures such as those explored in section 3.2.6, will be investigated and employed if required.	As required	To be agreed upon with BCD in the event that supplementary mitigation measures are applied.	Yes
Annual Reports	Preparation of Annual Reports to be submitted to Secretary and OEH for the first two years of operation of the wind farm.	Operational phase – after years one and two.	Annual reports for the first two years delivered within three months of operation of the wind farm.	Year 1 – Yes Year 2 – Late
			Annual reports to include (but not be limited to); mitigation measures implemented, review against criteria and recommendations for the following year.	Yes
			Further annual reports upon agreement	Not required

5.1.1. Recommendations

It is recommended that:

- Grassy weeds near plantings be slashed where possible and/or treated with an appropriate herbicide. Care must be taken to avoid impacting live plantings.
- Dead native plants within areas of revegetation be replaced.
- Consultation should be undertaken with local landholders and interest groups on the replacement of *Cupressus x leylandii* with locally indigenous trees.
- A watering regime is implemented within areas of revegetation to increase the chance of plant survival over dry periods of the year.

Appendix 1: Plant numbers at the planting sites along Woodhouselee Road

Planting Area	Number of plants required to be planted (as per LMP)	On-site inspection findings														
1	8 <i>Eucalyptus dives</i> 8 <i>Eucalyptus blakelyi</i> 16 <i>Acacia falciformis</i> 16 <i>Bursaria spinosa</i> Total 48 natives	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td><i>Eucalyptus dives</i></td> <td>11</td> </tr> <tr> <td><i>Eucalyptus blakelyi</i></td> <td>17</td> </tr> <tr> <td><i>Acacia falciformis</i></td> <td>22</td> </tr> <tr> <td><i>Bursaria spinosa</i></td> <td>5</td> </tr> <tr> <td>Total</td> <td>55</td> </tr> <tr> <td>Empty guards or Dead</td> <td>57</td> </tr> </tbody> </table> <p>7 more intact plants than required in LMP as planting area was extended to fit in with landholders own fencing plans. Stock proof fencing installed (extends to Planting area 2)</p>	Species	Count	<i>Eucalyptus dives</i>	11	<i>Eucalyptus blakelyi</i>	17	<i>Acacia falciformis</i>	22	<i>Bursaria spinosa</i>	5	Total	55	Empty guards or Dead	57
Species	Count															
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2	24 <i>Eucalyptus dives</i> 24 <i>Eucalyptus blakelyi</i> 48 <i>Acacia falciformis</i> 48 <i>Bursaria spinosa</i> Total 144 natives	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td><i>Eucalyptus dives</i></td> <td>26</td> </tr> <tr> <td><i>Eucalyptus blakelyi</i></td> <td>8</td> </tr> <tr> <td><i>Acacia falciformis</i></td> <td>36</td> </tr> <tr> <td><i>Bursaria spinosa</i></td> <td>23</td> </tr> <tr> <td>Total</td> <td>93</td> </tr> <tr> <td>Empty guards or Dead</td> <td>21</td> </tr> </tbody> </table> <p>51 less plants than required in LMP Stock proof fencing installed</p>	Species	Count	<i>Eucalyptus dives</i>	26	<i>Eucalyptus blakelyi</i>	8	<i>Acacia falciformis</i>	36	<i>Bursaria spinosa</i>	23	Total	93	Empty guards or Dead	21
Species	Count															
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<i>Bursaria spinosa</i>	23															
Total	93															
Empty guards or Dead	21															
3	87 <i>Populus x canadensis</i> Total 87 poplars	<p>Total of 87 plants – as required Due to the deciduous nature of poplars, live and dead trees could not be distinguished Stock proof fencing installed</p>														
4	7 <i>Eucalyptus dives</i> 7 <i>Eucalyptus blakelyi</i> 28 <i>Acacia falciformis</i> 28 <i>Bursaria spinosa</i> Total 70 natives	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td><i>Eucalyptus dives</i></td> <td>1</td> </tr> <tr> <td><i>Eucalyptus blakelyi</i></td> <td>5</td> </tr> <tr> <td><i>Acacia falciformis</i></td> <td>7</td> </tr> <tr> <td><i>Bursaria spinosa</i></td> <td>4</td> </tr> <tr> <td>Total</td> <td>17</td> </tr> <tr> <td>Empty guards or Dead</td> <td>7</td> </tr> </tbody> </table> <p>53 less plants than required. Geography and transmission line easement prevented installing larger fenced area and so resulted in less plants being planted. Stock proof fencing installed</p>	Species	Count	<i>Eucalyptus dives</i>	1	<i>Eucalyptus blakelyi</i>	5	<i>Acacia falciformis</i>	7	<i>Bursaria spinosa</i>	4	Total	17	Empty guards or Dead	7
Species	Count															
<i>Eucalyptus dives</i>	1															
<i>Eucalyptus blakelyi</i>	5															
<i>Acacia falciformis</i>	7															
<i>Bursaria spinosa</i>	4															
Total	17															
Empty guards or Dead	7															
5	48 <i>Populus x canadensis</i> Total 48 poplars	<p>Total of 48 plants – as required Due to the deciduous nature of poplars, live and dead trees could not be distinguished Stock proof fencing installed</p>														
7	102 <i>Populus x canadensis</i> Total 102 poplars	<p>Total of 100 plants – 2 less than required</p>														

		<p>Due to the deciduous nature of poplars, live and dead trees could not be distinguished</p> <p>Stock proof fencing installed</p>												
8	<p>12 <i>Eucalyptus dives</i></p> <p>12 <i>Eucalyptus blakelyi</i></p> <p>12 <i>Eucalyptus albens</i></p> <p>12 <i>Eucalyptus melliodora</i></p> <p>32 <i>Acacia falciformis</i></p> <p>32 <i>Acacia implexa</i></p> <p>32 <i>Bursaria spinosa</i></p> <p>Total 144 natives</p>	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td><i>Eucalyptus</i> spp.</td> <td>35</td> </tr> <tr> <td><i>Acacia</i> spp.</td> <td>39</td> </tr> <tr> <td><i>Bursaria spinosa</i></td> <td>7</td> </tr> <tr> <td>Total</td> <td>81</td> </tr> <tr> <td>Empty guards or Dead</td> <td>63</td> </tr> </tbody> </table> <p>63 less plants than required in LMP, with approximately 55% survival rate</p> <p>Stock proof fencing installed</p>	Species	Count	<i>Eucalyptus</i> spp.	35	<i>Acacia</i> spp.	39	<i>Bursaria spinosa</i>	7	Total	81	Empty guards or Dead	63
Species	Count													
<i>Eucalyptus</i> spp.	35													
<i>Acacia</i> spp.	39													
<i>Bursaria spinosa</i>	7													
Total	81													
Empty guards or Dead	63													

Appendix 2: Plant numbers at the planting sites along Crookwell Road.

Planting Area	Number of plants required to be planted (as per LMP)	On-site inspection findings													
CR1	190 <i>Populus x canadensis</i> 33 <i>Eucalyptus dives</i> 33 <i>Eucalyptus blakelyi</i> 45 <i>Acacia falciformis</i> 45 <i>Acacia implexa</i> 45 <i>Bursaria spinosa</i> Total 391 plants	Species	Count												
		<table border="1"> <tr><td>Poplar</td><td>179</td></tr> <tr><td><i>Eucalyptus dives</i></td><td>3</td></tr> <tr><td><i>Eucalyptus blakelyi</i></td><td>8</td></tr> <tr><td><i>Acacia</i> spp.</td><td>21</td></tr> <tr><td><i>Bursaria spinosa</i></td><td>7</td></tr> <tr><td>Total</td><td>218</td></tr> <tr><td>Empty guards or Dead</td><td>141</td></tr> </table>	Poplar	179	<i>Eucalyptus dives</i>	3	<i>Eucalyptus blakelyi</i>	8	<i>Acacia</i> spp.	21	<i>Bursaria spinosa</i>	7	Total	218	Empty guards or Dead
Poplar	179														
<i>Eucalyptus dives</i>	3														
<i>Eucalyptus blakelyi</i>	8														
<i>Acacia</i> spp.	21														
<i>Bursaria spinosa</i>	7														
Total	218														
Empty guards or Dead	141														
CR2	192 <i>Populus x canadensis</i> 34 <i>Eucalyptus dives</i> 34 <i>Eucalyptus blakelyi</i> 45 <i>Acacia falciformis</i> 45 <i>Acacia implexa</i> 45 <i>Bursaria spinosa</i> Total 395 plants	Species	Count												
		<table border="1"> <tr><td>Poplar</td><td>204</td></tr> <tr><td><i>Eucalyptus</i> spp.</td><td>26</td></tr> <tr><td><i>Acacia</i> spp.</td><td>16</td></tr> <tr><td><i>Bursaria spinosa</i></td><td>21</td></tr> <tr><td>Total</td><td>267</td></tr> <tr><td>Empty guards or Dead</td><td>115</td></tr> </table>	Poplar	204	<i>Eucalyptus</i> spp.	26	<i>Acacia</i> spp.	16	<i>Bursaria spinosa</i>	21	Total	267	Empty guards or Dead	115	<p>128 less plants than required in LMP, approximately 65% survival rate</p> <p>Stock proof fencing installed</p>
Poplar	204														
<i>Eucalyptus</i> spp.	26														
<i>Acacia</i> spp.	16														
<i>Bursaria spinosa</i>	21														
Total	267														
Empty guards or Dead	115														
CR3	44 <i>Populus x canadensis</i> Total 44 poplars	Total of 43 plants – 1 less than required													
CR4	470 <i>Cupressus x leylandii</i> Total 470 cypress	Species	Count												
		<table border="1"> <tr><td>Cypress</td><td>39</td></tr> <tr><td>Empty guards or Dead</td><td>415</td></tr> </table>	Cypress	39	Empty guards or Dead	415	<p>431 less plants than required in LMP, approximately 10% survival rate</p> <p>Stock proof fencing installed. Very overgrown with weeds, with weeds obscuring tree guards in many cases making it likely that some plants were not counted in this assessment</p>								
Cypress	39														
Empty guards or Dead	415														
CR5	219 <i>Populus x canadensis</i> 40 <i>Eucalyptus melliodora</i> 40 <i>Eucalyptus albens</i> 55 <i>Acacia falciformis</i> 55 <i>Acacia implexa</i> 55 <i>Bursaria spinosa</i> Total 464 plants	Species	Count												
		<table border="1"> <tr><td>Poplar</td><td>213</td></tr> <tr><td><i>Eucalyptus</i> spp.</td><td>42</td></tr> <tr><td><i>Acacia</i> spp.</td><td>69</td></tr> <tr><td><i>Bursaria spinosa</i></td><td>37</td></tr> <tr><td>Total</td><td>361</td></tr> <tr><td>Empty guards or Dead</td><td>45</td></tr> </table>	Poplar	213	<i>Eucalyptus</i> spp.	42	<i>Acacia</i> spp.	69	<i>Bursaria spinosa</i>	37	Total	361	Empty guards or Dead	45	<p>103 less plants than required in LMP, approximately 75% survival rate</p>
Poplar	213														
<i>Eucalyptus</i> spp.	42														
<i>Acacia</i> spp.	69														
<i>Bursaria spinosa</i>	37														
Total	361														
Empty guards or Dead	45														

		Stock proof fencing installed. Poplars staked. Plant survival is best at the northern end with <i>Acacia</i> species growing well.														
CR6	<p>52 <i>Populus x canadensis</i> 9 <i>Eucalyptus melliodora</i> 9 <i>Eucalyptus albens</i> 18 <i>Acacia falciformis</i> 18 <i>Acacia implexa</i> Total 106 plants</p>	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>Poplar</td> <td>37</td> </tr> <tr> <td><i>Eucalyptus</i> spp.</td> <td>0</td> </tr> <tr> <td><i>Acacia</i> spp.</td> <td>0</td> </tr> <tr> <td>Total</td> <td>37</td> </tr> <tr> <td>Empty guards or Dead</td> <td>46</td> </tr> </tbody> </table> <p>69 less plants than required in LMP, with no native species survival.</p> <p>Stock proof fencing installed. Very overgrown with weeds, such as Toowoomba Canary-grass, Cocksfoot and Mallow, that have encroached into almost all tree guards.</p>	Species	Count	Poplar	37	<i>Eucalyptus</i> spp.	0	<i>Acacia</i> spp.	0	Total	37	Empty guards or Dead	46		
Species	Count															
Poplar	37															
<i>Eucalyptus</i> spp.	0															
<i>Acacia</i> spp.	0															
Total	37															
Empty guards or Dead	46															
CR7	<p>90 <i>Populus x canadensis</i> 32 <i>Eucalyptus melliodora</i> 32 <i>Acacia falciformis</i> 32 <i>Kunzea ericoides</i> Total 186 plants</p>	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>Poplar</td> <td>85</td> </tr> <tr> <td><i>Eucalyptus melliodora</i></td> <td>9</td> </tr> <tr> <td><i>Acacia falciformis</i></td> <td>5</td> </tr> <tr> <td><i>Kunzea ericoides</i></td> <td>11</td> </tr> <tr> <td>Total</td> <td>110</td> </tr> <tr> <td>Empty guards or Dead</td> <td>69</td> </tr> </tbody> </table> <p>76 less plants than required in LMP, approximately 60% survival rate.</p> <p>Stock proof fencing installed</p>	Species	Count	Poplar	85	<i>Eucalyptus melliodora</i>	9	<i>Acacia falciformis</i>	5	<i>Kunzea ericoides</i>	11	Total	110	Empty guards or Dead	69
Species	Count															
Poplar	85															
<i>Eucalyptus melliodora</i>	9															
<i>Acacia falciformis</i>	5															
<i>Kunzea ericoides</i>	11															
Total	110															
Empty guards or Dead	69															
CR8	<p>48 <i>Populus x canadensis</i> 17 <i>Eucalyptus melliodora</i> 18 <i>Acacia falciformis</i> 18 <i>Acacia implexa</i> Total 101 plants</p>	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>Poplar</td> <td>45</td> </tr> <tr> <td><i>Eucalyptus melliodora</i></td> <td>7</td> </tr> <tr> <td><i>Acacia</i> spp.</td> <td>9</td> </tr> <tr> <td>Total</td> <td>61</td> </tr> <tr> <td>Empty guards or Dead</td> <td>26</td> </tr> </tbody> </table> <p>40 less plants than required in LMP, approximately 60% survival rate.</p> <p>Stock proof fencing installed</p>	Species	Count	Poplar	45	<i>Eucalyptus melliodora</i>	7	<i>Acacia</i> spp.	9	Total	61	Empty guards or Dead	26		
Species	Count															
Poplar	45															
<i>Eucalyptus melliodora</i>	7															
<i>Acacia</i> spp.	9															
Total	61															
Empty guards or Dead	26															
CR9	<p>98 <i>Populus x canadensis</i> Total 98 poplars</p>	Total of 96 plants – 2 less than required														
CR10	<p>140 <i>Populus x canadensis</i> Total 140 poplars</p>	Total of 138 plants – 2 less than required														
CR11	<p>102 <i>Cupressus x leylandii</i> Total 102 cypress</p>	<table border="1"> <thead> <tr> <th>Species</th> <th>Count</th> </tr> </thead> <tbody> <tr> <td>Cypress</td> <td>64</td> </tr> <tr> <td>Empty guards or Dead</td> <td>29</td> </tr> </tbody> </table> <p>38 less plants than required in LMP, approximately 60% survival rate</p> <p>Stock proof fencing installed. On a rise with rocks and comparatively low weed cover</p>	Species	Count	Cypress	64	Empty guards or Dead	29								
Species	Count															
Cypress	64															
Empty guards or Dead	29															

Appendix 3: Photographs of planting sites



PA1 – Taken from SW corner (facing east)



PA2 – Taken from NW corner (facing east)



PA3 – Taken from NE corner (facing south)



PA4 – Taken from NE corner (facing south)



PA5 – Taken from SW corner (facing east)



PA7 – Taken from NE corner (facing south)



PA8 – Taken from the southern end (facing north)



Example of dead *Eucalyptus* sp. (left) and flourishing *Acacia* sp. (right) in PA8



CR1 – Photo taken from northern end of treeline (looking south)



Example of an 'empty' guard (left) and guard infested with Variegated Thistle (right) in CR1



CR2 – Photo taken from northern end of treeline (looking south)



CR3 – Photo taken from north east end of treeline (looking south west)



CR4 – Photo taken from northern end of treeline (looking south)



Example of a dead cypress (left) and a live cypress surrounded by weeds (right) in CR4



CR5 – Photo taken from northern end of treeline (looking south)



Acacia sp. with poplars staked behind (left) and *Eucalyptus* sp. (right) in CR5



CR6 – Photo taken from northern end of treeline



Tree guards overrun by weeds in CR6



CR7 – Photo taken from northern end of treeline (looking south)



CR8 – Photo taken within northern portion of treeline (looking south)



CR9 – Photo taken from northern end of treeline (looking south)



CR10 – Photo taken from northern end of treeline (looking south)



CR11 – Photo taken from northern end of treeline (looking south)



Riparian zone (west of T23) – Photo taken from north (looking south)



Riparian zone (west of T23) – Photo taken from east (looking west)