

Purple Copper Butterfly Monitoring Program

for the

Pine Dale Coal Mine (Including the Yarraboldy Extension)



August 2015

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CONTENTS

Page

ACRO	NYMS USED THROUGHOUT THIS REPORT	. v
1.	INTRODUCTION	1
3.	OBJECTIVES	3
4.	SITE LOCATION AND DESCRIPTION	3
5.	LEGISLATIVE REQUIREMENTS	5
6.	POTENTIAL IMPACT SOURCES	6
6.1	DUST EMISSIONS	6
	6.1.1 Neighbouring Sources of Dust	6
	6.1.2 Pollutant Sources Associated with the Pine Dale Coal Mine	6
6.2	VIBRATION EMISSIONS	6
6.3	OTHER POTENITAL IMPACT SOURCES	7
7.	OPERATIONAL SAFEGUARDS AND MITIGATION MEASURES	7
7.1	DUST MANAGEMENT	7
7.2	BLASTING / VIBRATION MANAGEMENT	8
8.	MONITORING PROGRAM	9
8.1	IMPACT ASSESSMENT CRITERIA	9
	8.1.1 Dust	9
	8.1.2 Vibration	9
8.2	MONITORING LOCATIONS	9
8.3	MONITORING PARAMETERS AND FREQUENCY	11
8.4	MONITORING PROCEDURES	11
	8.4.1 Deposited Dust	.11
	8.4.2 Vibration	.11
	8.4.3 Feeding Benaviour	12
8.5	ANALYSIS OF MONITORING RESULTS	.14
0		1/
0.1		11
9.1	9.1.1 Single Exceedance of Target Dust Level Outside of Active Larvae Stage of Butterfly Life Cycle	14
	9.1.2 Ongoing Exceedance of Target Dust Level Outside of Active Larvae Stage of Butterfly Life	15
	9.1.3 Single Exceedance of Target Dust Level During the Active Larvae Stage of Butterfly Life Cycle	.15
	9.1.4 Single Exceedance of Feeding Behaviour Criteria During the Active Larvae Stage of Butterfly Life Cycle	.16
	9.1.5 Evidence of Impact on Bursaria Growth	16
10.	RESPONSIBILITIES AND ACCOUNTABILITES	16
11.	REFERENCES	18
TABL	ES	
Table	PC1 Purple Copper Butterfly Monitoring Parameters and Frequency	12

Table PC2	Accountable Positions and Tasks17
FIGURES	
Figure PC1	Pine Dale Coal Mine Operations and Known Purple Copper Butterfly Populations and Habitat2
Figure BF1	Locality Plan4
Figure PC2	Purple Copper Butterfly Monitoring Locations

ACRONYMS USED THROUGHOUT THIS REPORT

AS	-	Australian Standard
DDG	-	Deposited Dust Gauge
DPE	-	NSW Department of Planning and Environment
OEH	-	NSW Office of Environment and Heritage
SEWPaC	-	Commonwealth Department of Sustainability, Environment, Water, Populations and Communities

1. INTRODUCTION

In 2009, the NSW and Commonwealth listed threatened species Purple Copper Butterfly, *Paralucia spinifera* ("the butterfly") was identified adjacent to the Pine Dale Coal Mine. Based on the recorded occurrences of the butterfly, and habitat provided by native Blackthorn (*Bursaria spinosa subsp. Lasiophylla*) ("*Bursaria*"), known and potential habitat for the species was defined (see **Figure PC1**).

It is apparent that, given the limited dispersal ability of the butterfly due to its dependence on *Bursaria*, the butterfly has coexisted with operations at the original Pine Dale Coal Mine. The butterfly also has a mutualistic relationship with the ant (*Anonychomyrma itinerans*), which are thought to offer the butterfly larvae some protection while they feed in return for nutritional secretions from the larvae (CSIRO 2002; Dexter & Kitching 1991a), further restricting the dispersal ability of the butterfly.

Recently, concerns have been raised by the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) as to the indirect impacts of dust and vibration from the Pine Dale Coal Mine, including the recently approved Yarraboldy Extension (PA 10_0041), on the butterfly. This Purple Copper Butterfly Monitoring Program (PCBMP, "the Program") has been prepared to monitor potential indirect impacts on the known populations of the butterfly and provide the details of procedures to be followed in response to monitoring results.

The Program applies for the life of the mine and applies to both the construction and operational phases. It is proposed, however, that the Program will be reviewed on an annual basis and, if required, updated to reflect any changes to management or monitoring practices.

The Pine Dale Mine has been placed on care and maintenance following cessation of all coal extraction in April 2014. Whilst in Care and Maintenance, Pine Dale will continue to meet environmental approvals and obligations. This environmental management plan has been modified to reflect the current reduced impact consistent with the care and maintenance term. Rehabilitation activities are proposed during the care and maintenance term only.



Figure PC1 Pine Dale Coal Mine Operations and Known Purple Copper Butterfly Populations and Habitat

2. SCOPE

The scope of the PCBMP applies to the mine, incorporating ML 1569, ML 1578, and MLA 375, and covers all activities during the care and maintenance term which may impact on, or influence a risk to the Purple Copper Butterfly. The purpose of the PCBMP is to:

- a) Identify potential dust and vibration emission sources and impacts (Section 6.0);
- b) Implement controls to mitigate dust and vibration emissions (Section 7.0);
- c) Describe monitoring program (Section 8.0);
- d) Describe monitoring parameters and impact criteria (8.1);
- e) Identify monitoring locations (Section 8.2);
- f) Describe a monitoring parameters and frequency (Section 8.3);
- g) Detail monitoring procedures (Section 8.4);
- h) Detail analysis of monitoring results (Section 8.5);
- i) Describe monitoring protocol and contingency measures (Section 9.0); and
- j) Define responsibilities (Section 10);

3. OBJECTIVES

The objectives of the Program are as follows.

- Complete baseline monitoring data for three populations in proximity to the mine site.
- Identify the potential sources of indirect impacts upon the butterfly / butterfly larvae and relevant impact management measures that will be implemented at the mine.
- Establish impact criteria.
- Outline a monitoring program to assess the potential impacts of the mining operations upon the butterfly / butterfly larvae.
- Establish a management protocol for the review of monitoring results including contingency measures to be implemented in the event that monitoring indicates indirect impacts from the operations are having an adverse impact upon the butterfly / butterfly larvae.

4. SITE LOCATION AND DESCRIPTION

The Pine Dale coal mine is owned and operated by Enhance Place Pty Ltd (Enhance Place), located approximately 17 kilometres north-west of Lithgow and 5km north of Wallerawang in New South Wales (see **Figure BF1**).

Extractive open cut mining operations ceased in April 2014 when Approved mineable resources were exhausted. Rehabilitation activities are currently being undertaken consistent with the Approved Care and Maintenance Mining Operations Plan.



Figure BF1 Locality Plan

5. LEGISLATIVE REQUIREMENTS

The Purple Copper butterfly is listed as an endangered species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is considered a matter of national environmental significance (MNES). A proposal requires approval under the EPBC Act if it may result in a significant impact on MNES. On 20 October 2011 the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC) advised that the proposal was not a controlled action if undertaken in a particular manner under sections 75 and 77A of the EPBC Act. To meet the Departments requirements of the referral decision (2011/6016) the PCBMP has been developed to address the potential significant impacts on the purple copper butterfly.

6. POTENTIAL IMPACT SOURCES

6.1 DUST EMISSIONS

6.1.1 Neighbouring Sources of Dust

Sources of atmospheric pollution surrounding the mine are predominantly other mining and energy-related activities. The mine is situated approximately 17km northwest of Lithgow and 5km north of Wallerawang, in the Western Coalfield of New South Wales. The Mt Piper Power Station is located 3km to the west and the Wallerawang Power Station is located approximately 5km to the southeast.

The Angus Place to Mt Piper Power Station Private Coal Haul Road runs in an east-west direction through Pine Dale Coal Mine and immediately south of the major butterfly population. While this road is sealed, wheel generated dust and emissions from loaded trucks will occur.

6.1.2 Pollutant Sources Associated with the Pine Dale Coal Mine

Dust could be generated by the following activities at the Pine Dale Coal Mine.

- Vegetation clearing. Run-of-Mine coal removal and transport.
- Soil stripping.
- Coal product transport.
- Drilling operations.
- Overburden removal, transport and emplacement
- Blasting activities.

Wind erosion from exposed surfaces would also be a source of dust emissions at the Pine Dale Coal Mine.

6.2 VIBRATION EMISSIONS

The principal source of vibration emissions is from blasting. Blasting had been undertaken at the Pine Dale Coal Mine for 3 years up until 2014 in Mining Areas B and C within 300m of, now known, butterfly populations (with no apparent impact). Based on an analysis of blasting conducted between September 2009 and 2010, vibration levels of between 25mm/s and 52mm/s were predicted to have been received at the closest population/s (Enviro Strata Consulting [ESC], 2011b).

Enviro Strata Consulting (ESC, 2011a) has also calculated likely vibration levels, from blasting within the Yarraboldy Extension, at the closest point of the major (14ha) butterfly population identified on **Figure PC1**) as follows.

- 40mm/s and 60mm/s when blasts occur on the eastern pit edge.
- <20mm/s when blasts are 50m from the eastern pit edge.
- 10mm/s and 15mm/s when blasts are 100m from the eastern pit edge.
- <5mm/s when blasts are 250m from the eastern pit edge.

ESC (2011a) notes that the peak of the blast will last for only between 2 to 3 seconds, with a frequency in the order of 20-40Hz at close range.

The operator of the Pine Dale Coal Mine ("Enhance Place") had committed to restricting the number of blasts undertaken during the larvae feeding stage in the life cycle of the butterfly (identified conservatively as from the last week in October to the first week in December) to once per week. This was a significant concession from Enhance Place as up to 4 blasts could be initiated each week depending upon geological presentation.

Pine Dale Mine has been placed in care and maintenance following the cessation of coal extraction in April 2014. Ash such no blasts at the mine have been undertaken and the Blast Management Plan has been suspended for the duration of the care and maintenance term. As there are no planned blasting activities proposed to be undertaken during care and maintenance, no vibration emissions are expected from this source.

Other potential sources of vibration emissions include movement of equipment during general mining operations and movement of trucks on the Private Coal Haul Road. However, at the closest butterfly populations, these emissions would be orders of magnitude less than vibration levels received during blasting. In care and maintenance there will be minimal moving of equipment and movement of trucks whilst the mine in non-operational.

6.3 OTHER POTENITAL IMPACT SOURCES

Other potential indirect impacts could include visual (lighting) and noise. As the Yarraboldy Extension operations will be undertaken during daylight hours, visual impacts are not expected to be significant or require any specific consideration. Noise sources will include operation of equipment for general mining, crushing and transportation operations.

However, Eco Logical Australia (2011) considers it highly unlikely that noise from the Yarraboldy Extension will adversely impact on the species for the following reasons.

- The species has limited or no audio sense.
- There are a number of current and historic occurrences of this species persisting in close proximity to other mines and roads, where similar levels of noise are generated.

7. OPERATIONAL SAFEGUARDS AND MITIGATION MEASURES

7.1 DUST MANAGEMENT

The following operational safeguards and mitigation measures will be implemented to ensure that dust emissions are minimised.

- Haulage routes will be designated so that vehicles are restricted to the most direct route practicable with minimal manoeuvring.
- Speed limit of 40km/hr, unless otherwise sign posted, will be enforced on all areas of the mine site. All track gear limited to second gear except in emergency situations.
- A 3m high vegetated bund will be constructed around the eastern perimeter of the open cut. This will create a physical barrier for airborne dust particles and will work as a wind break to reduce the disturbance and transport of dust across the site.

- Water will be applied to trafficked areas and stockpiles of the mine site as required and based on the location of potentially dust generating activities, weather conditions and observed dust emissions¹. Water is applied at a rate of at least $2L/m^2$ per application.
- Water will be applied when trucks are placing overburden during dry conditions and/or conditions where the potential for dust generation is elevated. For the purpose of the Program, periods of potential dust generation include overburden placement when winds exceeding 5m/s prevail from the western quadrant and overburden placement is within 200m of the major known butterfly population.
- A water truck will be operated to maintain dust emissions at an acceptable level during operations (except during wet conditions) throughout the susceptible phases of the Purple Copper Butterfly life cycle, namely:
 - the active (flying) Purple Copper Butterfly adult stage (September); and
 - the larval grazing time (from the start of the last week in October until the end of the first week in December).
- Vegetation clearing and soil stripping campaigns will avoid the active adult and larvae stage of the butterfly (September to first Week in December).
- The areas of surface disturbance exposed to wind erosion will be minimised through ensuring that groundcover clearing and soil stripping is limited to the area required for immediate mining disturbance and by conducting progressive rehabilitation on available areas.
- The drop heights between machinery buckets and trucks carrying coal or overburden will be minimised through operator training and education on the management of dust.
- Soil stockpiles that are to be retained for periods greater than 3 months will be seeded with a cover crop to minimise wind (and water) erosion from these areas.
- Any dust–generating activity/ies will be ceased if strong (>9m/s) winds are blowing from the west and dust is observed to be deposited over the butterfly populations to the east until winds abate.
- All coal transportation trucks that leave the mine via public roads will be appropriately covered to minimise dust emissions.

7.2 BLASTING / VIBRATION MANAGEMENT

During care and maintenance all blasting at the mine has been suspended, and as such no safeguards and mitigation measures for potential blasting related impacts will be required.

¹ It is worthy of note that Enhance Place has had no exceedances of deposited dust criteria since the commencement of mining at Pine Dale Coal Mine, illustrating effective dust suppression.

8. MONITORING PROGRAM

No changes to the monitoring program are expected during care and maintenance and the Program will be performed as detailed as below.

8.1 IMPACT ASSESSMENT CRITERIA

8.1.1 Dust

There are no known established criteria for ecological impacts upon the butterfly / butterfly larvae resulting from dust or vibration. However, for dust impacts, the Office of Environment and Heritage (OEH) has established criteria for assessing the impact of dust deposition on amenity, otherwise referred to as nuisance criteria ($4g/m^2/month$). This level represents the level of dust likely to create a film over surfaces, e.g. washing, window sills, parked cars. Assuming that the butterfly larvae find dust covered leaves unpalatable², this deposition level ($4g/m^2/month$) is considered a reasonable indicator of the level of dust that could potentially impact indirectly on the butterfly.

8.1.2 Vibration

For vibration impacts, the principal concern relates to potential stress upon the larvae resulting in changes in feeding behaviour. As mentioned, there are no known precedents for assessing vibration impacts. Therefore, it is proposed that impacts from vibration have occurred if the proportionate number of larvae feeding has reduced by more than 50% between the evening prior to the blast and the evening following the blast, when compared to a control site.

8.2 MONITORING LOCATIONS

Three monitoring locations have been defined to monitor potential indirect impacts and are illustrated on **Figure PC2** and described as follows.

- PCB1: located at the western edge of the major butterfly population and approximately 30m from the Yarraboldy Extension pit perimeter. This location is approximately 100m north of the Private Coal Haul Road.
- PCB2: located approximately in the middle of major butterfly population and approximately 400m from the Yarraboldy Extension pit perimeter. This location is also approximately 100m north of the Private Coal Haul Road.
- PCB3: located near the eastern edge of the major butterfly population and approximately 800m from the Yarraboldy Extension pit perimeter. This location is also approximately 100m north of the Private Coal Haul Road. This location is considered the control site.

² There is no evidence available to suggest that the butterfly larvae are affected at all by dust accumulated on leaves. In fact, it is reasonable to assume that the native Blackthorn would naturally be subject to accumulated dust deposition levels from natural events such as dust storms and bushfire. Consequently, it is reasonable to assume that the butterfly larvae would be relatively unaffected by accumulated dust levels.



Figure PC2 Purple Copper Butterfly Monitoring Locations

An additional monitoring location not illustrated on Figure PC2 and described as follows.

• PCB7: located immediately to the south of PCB1, adjacent to the internal mine access road to the south of the major butterfly population. This dust gauge is considered a background location outside of the forested butterfly population area.

Sites for monitoring larvae feeding will be identified in the vicinity of PCB1, PCB2 and PCB3 by the ecologist commissioned to conduct the monitoring and based on observed larvae feeding.

8.3 MONITORING PARAMETERS AND FREQUENCY

Table PC1 presents the monitoring parameters and frequencies that will be undertaken for each of the monitoring sites.

8.4 MONITORING PROCEDURES

8.4.1 Deposited Dust

Deposited dust monitoring will be undertaken using deposited dust gauges in accordance with the procedures outlined within the Air Quality and Greenhouse Gas Management Plan prepared for the Pine Dale Coal Mine (incorporating the Yarraboldy Extension) and approved by the NSW Department of Planning and Infrastructure.

In addition to the procedures within the Air Quality and Greenhouse Gas Management Plan, due to the location of these monitoring sites within State Forest, particular emphasis will be given by the person collecting the sample bottles to record any noticeable activities in the vicinity of the monitoring site which could affect recorded dust levels (such as recent trail bike or 4WD activity, camping, fires etc.).

It is also noted that the positioning of the deposited dust gauges within the Bursaria patches, which are located in forest habitat, does not meet the Australian Standard AS 3580.10.1:2003 which requires dust gauges to be placed with a clear sky angle of 120° (i.e. clear of obstructions such as trees). However, the placement of dust gauges in these locations will provide data on the level of deposited dust likely received upon the Bursaria beneath the forest canopy.

8.4.2 Vibration

Vibration monitoring was undertaken using blast monitors in accordance with the procedures outlined within the Blast Management Plan prepared for the Pine Dale Coal Mine (incorporating the Yarraboldy Extension) and approved by the, then, NSW Department of Planning. However, the Blast Management Plan will be suspended for the duration of the care and maintenance term and need not be addressed due to its non-applicability.

8.4.3 Feeding Behaviour

From the first week in September (when the larvae are expected to commence feeding) a qualified ecologist will conduct a weekly survey of the known butterfly habitat for appearance of larvae and commencement of feeding.

Monitoring Location	Parameter	Units of measure	Averaging Period	Frequency
PCB1	Deposited Dust	g/m ² /month	Month	Continuous
	Vibration	mm/s	NA	Every 3 weeks during the larvae feeding stage of the butterfly life cycle
	Overpressure	dB(Linear Peak)	NA	
	Feeding Behaviour ¹	Number of Feeding Larvae	Daily	
		Weight of final larvae instar	Feeding Season	
		Proportion of <i>Bursaria</i> Consumed	Feeding Season	Weekly
	Bursaria Growth	Height and circumference of individual plants	Annual	Annual
		Density within Patch	Annual	Annual
PCB2	Deposited Dust	g/m ² /month	Month	Continuous
	Feeding Behaviour ¹	Number of Feeding Larvae	Daily	Every 3 weeks during the larvae feeding stage of the butterfly life cycle
		Weight of final larvae instar	Feeding Season	
		Proportion of <i>Bursaria</i> Consumed	Feeding Season	Weekly
	Bursaria Growth	Height and circumference of individual plants	Annual	Annual
		Density within Patch	Annual	Annual
PCB3	Deposited Dust	g/m ² /month	Month	Continuous
	Feeding Behaviour ¹	Number of Feeding Larvae	Daily	Every 3 weeks during the larvae feeding stage of the butterfly life cycle
		Weight of final larvae instar	Feeding Season	
		Proportion of <i>Bursaria</i> Consumed	Feeding Season	Weekly
	Bursaria Growth	Height and circumference of individual plants	Annual	Annual
		Density within Patch	Annual	Annual
Note 1: see See	ction 9.4.3 for more de	etail on feeding behaviour moni	toring	

 Table PC1

 Purple Copper Butterfly Monitoring Parameters and Frequency

On confirmation of the commencement of the larvae 'feeding' season, a qualified ecologist will conduct feeding behaviour surveys until the completion of larvae feeding, i.e. the adult butterfly flying phase of the life cycle. The 'feeding' season may potentially extend to January of February (Mjadwesch and Nally 2008). Suitable training shall occur for Enhance Place personnel to become competent in assisting the ecologist during surveys. These surveys will be completed as follows.

- 1. At the commencement of the feeding season, *Bursaria* will be inspected to identify individual *Bursaria* plants which are being utilised for feeding by the butterfly larvae. Several survey sites will be established nearby each monitoring location (PCB1, PCB2 and PCB3).
- 2. Every 3 weeks, a survey will be undertaken during the evening to count the number of larvae observed feeding on the selected *Bursaria* plants. These counts will be repeated at three intervals throughout the evening to take into account the variation in feeding behaviour between different cohorts of larvae and to obtain a mean result.
- 3. Towards the end of the larvae feeding season, larvae will be inspected by a suitably qualified and experienced consultant to determine if they are at the final instar stage and a small sub-set (<5% of the total sample size) will be weighed to determine the "mass at pupation" to provide a further indice of the relative health of populations at each of the monitoring sites.
- 4. In addition to weekly photographs of the selected *Bursaria* plants taken by Company personnel, an ecologist will make an assessment every 3 weeks as to the proportion of the *Bursaria* plants consumed for each survey site together with the relative level of accumulated dust on the *Busaria* leaves and any noticeable effects of this upon larvae feeding.
- 5. Any other activities occurring within the State Forest (e.g. trail bike riding, camping, firewood collection, fires, etc.) which may influence the feeding behaviour will also be recorded.
- 6. Preliminary findings will be provided to the Manager Mining Engineering (or nominated Enhance Place personnel) prior to leaving the site. These findings will identify as to whether impact criteria have been triggered (see section 9.1.2) and the implementation of contingency measures is required.

8.4.4 Bursaria Growth

Coinciding with the initial survey for commencement of larvae feeding, a qualified ecologist will assess the growth³ of Bursaria at each of the monitoring locations (PCB1 to PCB3). Monitoring will be undertaken as follows.

- 1. At each monitoring location a suitably sized quadrat, containing Bursaria or varying maturity will be established.
- 2. The number of Bursaria within each quadrat will be measured, with measurement considering sub-sets of sapling and mature plants.
- 3. Within each quadrat, individual Bursaria plants will be marked as subject plants.
- 4. The height, circumference (at breast height) and foliage cover will be measured.
- 5. General observations related to plant condition will also be recorded.
- 6. Each year, the survey will be repeated within the same quadrats and for the same individual plants.

³ Bursaria's growth is predominantly during the winter months.

8.5 ANALYSIS OF MONITORING RESULTS

All monitoring results will be reviewed in conjunction with quantitative measurements of prevailing local meteorological conditions throughout the monitoring period as recorded by the on-site automatic weather station.

On receipt of monthly deposited dust samples, the following analyses will be completed.

- 1. The deposited dust level will be compared against the $4g/m^2/month$ target.
- 2. Deposited dust levels will be compared between the three sites (PCB1, PCB2 and PCB3), and the reference location (PBC7).
- 3. Deposited dust levels will be considered against prevailing wind conditions during the monitoring period.

A report will be generated commenting on the level of dust recorded compared to the target level and whether this level of dust can be wholly, partially or not attributed to mining operations at Pine Dale Coal Mine. A copy of the dust reports will be provided to the ecologist prior to, or immediately following the completion of the Bursaria growth monitoring. The ecologist will subsequently provide a brief report outlining the findings results of the Bursaria growth survey and any correlation to the dust monitoring.

As blasting will not be scheduled during care and maintenance term, the vibration report usually provided by the blasting contractor for each monitored blast will not be required. The ecologist will prepare a short report outlining the findings of the 3 weekly ecological surveys. The report will include a summary of the following.

- 1. The status of the proportion of larvae feeding relative at PCB1 compared to PCB2 and the control site (PCB3) to previous monitoring events. Should a reduction occur, the proportion will be displayed as a percentage reduction (relative to the control site).
- 2. The estimated proportion of the *Bursaria* plants consumed by the larvae at each survey site.
- 3. The relative level of dust accumulated upon the *Bursaria* leaves for each monitoring location and any noticeable effects of dust levels upon larvae feeding.
- 4. A review of the effects of any other relevant observations for factors which may influence larvae feeding behaviour or the health of the selected *Bursaria* plants (e.g. trail bike riding, camping, firewood collection, fires, etc.).

9. MONITORING PROTOCOL AND CONTINGENCY MEASURES

Each monthly dust deposition report and three weekly ecological monitoring report will be reviewed by Company personnel upon receipt. In the event that the reports confirm exceedances of impact criteria outlined in Section 9.1 which can be wholly or partially attributed to mining operations at Pine Dale Coal Mine the following contingency measures will be implemented.

9.1 NO EXCEEDANCE OF IMPACT CRITERIA

Operations and monitoring will continue without modification.

9.1.1 Single Exceedance of Target Dust Level Outside of Active Larvae Stage of Butterfly Life Cycle

In the event that monthly analysis indicates dust deposition in exceeding the $4g/m^2/month$ target, and which can be wholly or partially attributable to Pine Dale Coal Mine, the following management measures will be implemented.

- The main contributing activity will be identified and either:
 - reduced in intensity; or
 - relocated to another location; or
 - dust suppression activities will be increased. Water application rates will be increased (either through increase in direct application rate of water or by an increase in the number of applications) to ensure dust emissions are reduced.

9.1.2 Ongoing Exceedance of Target Dust Level Outside of Active Larvae Stage of Butterfly Life Cycle

In the event that monthly analysis indicates continuing exceedances of the $4g/m^2/month$ target (two consecutive months) and which can be wholly or partially attributable to Pine Dale Coal Mine, the following management measures will be implemented.

- The main contributing activity will be identified and either:
 - reduced in intensity; or
 - relocated to another location.

In the event that a third exceedance of the target level is recorded, the following management measures will be implemented.

- The intensity of the main contributing activity will be further reduced in intensity or ceased.
- The frequency of dust deposition monitoring will be increased to fortnightly⁴ and continued at this frequency until two consecutive fortnightly results are below the target level.

9.1.3 Single Exceedance of Target Dust Level During the Active Larvae Stage of Butterfly Life Cycle

In the event that monthly analysis indicates dust deposition in exceeding the $4g/m^2/month$ target, and which can be wholly or partially attributable to Pine Dale Coal Mine, the following management measures will be implemented.

• Mining activities will be relocated away from the eastern perimeter of the open cut (at least 100m)⁵.

⁴ It is recognised that this is not as per the relevant Australian Standard for monitoring dust deposition.

⁵ Deposited dust tends to settle relatively quickly closest from the generation source, settling more slowly the further it disperses from the generation source. As outlined in the Air Quality Assessment prepared by Heggies (2010), it can be seen that the contour lines (which reference $0.5g/m^2/month$ increments) get closer together the closer to the source they are. Over a distance of 100m, in close proximity to dust generating activities, a substantial decline in received deposited dust levels is anticipated.

- Personnel of OEH will be notified and advice sought as to additional mitigation measures to be implemented.
- With the exception of drill and blast operations, mining activities may not recommence within 100m of the eastern perimeter until the larvae stage of the butterfly is complete. This will be determined in consultation with the ecological consultant undertaking the ecological monitoring and/or OEH personnel.

9.1.4 Single Exceedance of Feeding Behaviour Criteria During the Active Larvae Stage of Butterfly Life Cycle

In the event that the 3 weekly ecological analyses indicates the relative proportion of larvae feeding decreases by 50% or more, and which can be wholly or partially attributable to Pine Dale Coal Mine, the following management measures will be implemented.

• Personnel of OEH will be notified and advice sought as to additional mitigation measures to be implemented.

It is not expected that the operations would have any impact upon the health of the Bursaria population themselves. The Bursaria are known to grow successfully in areas adjacent unsealed roads, highways and adjacent quarries and mines. The existing Bursaria population was located in close proximity to Mining Area A of the original Pine Dale Coal Mine.

9.1.5 Evidence of Impact on Bursaria Growth

In the event that annual ecological analysis of Bursaria growth identifies significantly reduced growth attributable to dust emissions from the mine, the following contingency measures will be implemented.

- Mining activities will be relocated away from the eastern perimeter of the open cut (at least 100m).
- Personnel of OEH will be notified and advice sought as to additional mitigation measures to be implemented. This could include planting of additional propagated Bursaria.

In the event that monitoring demonstrates the mining operations are significantly impacting upon the butterfly population and all feasible mitigation measures have been implemented, mining operations would be relocated to a designated setback zone or (if a feasible setback zone cannot be established within the Yarraboldy Extension Area) temporarily suspended until appropriate/alternative mitigation measures can be trialled and/or established.

10. **RESPONSIBILITIES AND ACCOUNTABILITES**

The procedures and management measures presented in the Program will be made available to all members of the workforce on site. The responsible workforce will be made aware of the procedures through inductions, training (as required) and regular toolbox talks / meetings. The ultimate responsibility for the Purple Copper Butterfly Monitoring Program is the Manager Mining Engineering.

It must also be noted that mining within Mining Area A of the original Pine Dale Coal Mine occurred within a distance of less than 100m (to the south) of the main Bursaria population without any known adverse effects.

Table PC2 outlines the accountable positions and tasks relating to Purple Copper Butterfly monitoring and management at the Pine Dale Coal Mine.

Position	Accountable Task
Manager Mining Engineering	• Ensure dust suppression is undertaken on site in accordance with the Air Quality and Greenhouse Gas Management Plan and appropriate to the weather conditions.
	 Notify employees of any additional mitigation measures to be implemented as a result of any complaints or exceedances.
	 Ensure that the automated weather station is operating correctly and contact a technician should any faults be identified (e.g. missing data records).
	 Coordinate monitoring in accordance with the Purple Copper Butterfly Monitoring Program.
Manager Mining Engineering (cont'd)	 Nominate dates at 3 weekly intervals for ecological monitoring to be completed (between October and December).
	 Review monitoring reports and implement nominated actions of the protocol (see Section 6).
	 Retain records of all monitoring results and reports and make available to NSW or Commonwealth government personnel upon request.
	Review this program on an annual basis and revise if required.
Plant Operator	 Ensure dust mitigation measures are implemented as directed by the Manager Mining Engineering.
All Employees	 Report to the Manager Mining Engineering any dust generating activities for which the dust mitigation measures proves ineffective.
The Company Conducting Dust Monitoring	• Ensure dust monitoring is undertaken in accordance with these procedures and relevant Australian Standards (excepting those relating to siting of monitoring location).
	 Analyse dust and relevant weather monitoring data against compliance criteria.
	• Complete a monthly dust monitoring report and compliance assessment within 7 days of completion of monitoring.
	 Inform the Manager Mining Engineering immediately should dust deposition for ecological targets not be met.
The Company Conducting	Ensure ecological monitoring is undertaken on the dates specified by the Manager Mining Engineering.
Ecological Monitoring	Complete a report on butterfly larvae feeding behaviour within 7 days of completing each survey.

Table PC2 Accountable Positions and Tasks

11. **REFERENCES**

CSIRO (2002). Conservation Genetics of Paraluciaspinifera, Bathurst Copper Butterfly.

Dexter & Kitching (1991a). Nomination for the Register of the National Estate.

Eco Logical Australia (2011). *Referral of Proposed Action Stage 1 – Pine Dale Coal Mine (Yarraboldy Extension), Blackmans Flat, NSW.*

Enviro Strata Consulting (2011a). Assessment of vibration impacts for the area adjacent to the proposed Yarraboldy Extension.

Enviro Strata Consulting (2011b). Assessment of vibration impacts from the previous Pine Dale *Mine* (Areas B and C) on the adjacent area.

Heggies (2010). Pine Dale Coal Mine Yarraboldy Extension Air Quality Assessment. Part 6 of the Specialist Consultant Studies Compendium.

Mjadwesch, R. and Nally, S. (2008). *Emergency relocation of a Purple Copper Butterfly colony during roadworks: Successes and lessons learned*. Ecological Management and Restoration. Pp 100-109, Vol 9, No 2, August 2008

National Parks and Wildlife Service (NPWS) (2001). *Purple Copper Butterfly (Paralucia spinifera) Recovery Plan.* NSW National Parks and Wildlife Service, Hurstville NSW.