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CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
A.C.N. 056 544 551

FLORA SURVEY.

PROPOSED OPEN CUT COAL MINE AT

INVINCIBLE COLLIERY

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Floristic Study of the Proposed Opencut at Invincible Colliery.

Section 1.0 Introduction.

Coalpac Pty. Limited is proposing to develop an open cut coal mine to the north of Invincible Colliery pit top. The purpose of the open cut is to supplement and/or sustain the coal won from current underground workings to supply coal to Delta Electricity's Mount Piper Power Station. The extent of the open cut may be limited by the success in working the underground area of Old Invincible workings from underground. The success of winning coal from these workings will not be fully known prior to the proposed commencement of the open cut so this report was prepared to cover the entire area proposed to be mined.

The discussion within this report has been prepared for inclusion in the environmental impact statement and details both the plant communities and the species found during the extensive field investigations carried out to identify species present.

The Study Area.

The subject area, as listed above, is an area of approximately 28 hectares approximately 1.5 kilometres to the north of Invincible colliery (See Figure 1).

The breakdown of the area is as follows; 8 hectares which allows for the construction of the haul road and the addition of some temporary office facilities, workshop area and hard stand area; the remaining 20 hectares is composed of cleared pasture land and part of Ben Bullen State Forest, the area of land within the State Forest will be approximately 12 hectares, the remaining 16 hectares is the cleared pasture land.

The study area was extended beyond the actual proposed area of disturbance so that a wider representative section of the vegetation of the area was covered in the survey. Note the area bordered by yellow and black in Figure 2.

Section 2.0 Aims of this Flora Survey.

The aims of this flora survey are to:

- identify the species and plant communities found to exist on this site;
- identify and describe any rare or threatened plant species and assess the conservation significance of any that are found to exist;
- ascertain the extent of any impact the proposal may have on the species and communities identified within the study area and what affect these impacts are likely to have on the communities identified; and
- finally to recommend any measures which may assist in mitigating the affect of identified impacts on any of the identified species or communities.

Section 3.0 Survey Methods.

The field work, carried out to identify species and communities present, was carried out in several daily visits between October and Early November of 1997. The survey was carried out over the six week period in order to maximise the time period in which plant species might be flowering to aid in the accurate identification of species in the field, keeping the need to remove or reducing the need for the removal of plant specimens from the site.

The field survey method consisted of extensive foot traverses and quadrant surveys throughout the study area however work concentrated largely on the area of Ben Bullen State Forest as this area showed the greatest species diversity and thus would be the area which would be the subject of the greatest impact.

The traverses covered the full range of altitudes and aspects, identifiable soil types and/or geological changes and the identifiable fauna habitats within the study area. The purpose of the foot traverses was primarily to identify or locate the different plant species that occurred within the area, particular attention was paid to identifying or locating any rare or threatened plant species, and noting the extent of any disturbance to the natural vegetation particularly the presence of weed or introduced plant species.

The quadrant surveys were then randomly positioned, in each of the identified different areas. At each site records were made of the height, composition, density, floristics and cover of the dominant plant stratum, the understory layer and the groundcover.

While every effort was made to identify species in the field, some species were not able to be identified, these were tagged and collected for later identification using selected texts at the office. Some difficult specimens were identified by using the Royal Botanic Gardens public reference collection in Sydney.

The location of the transects and quadrants are shown on figure 2.

Literature searches of the National Parks and Wildlife Services data base, the Atlas of NSW Wildlife, for the Wallerawang and Bathurst 1:100 000 topographic map sheets, and the use of Benson and Keith (1990), were used in order obtain a listing of the flora that has been previously identified in the area and particularly the rare or threatened species that have been found within the area.

Section 4.0 Results of Surveys.

Section 4.1 Results of Field Investigations.

From the field investigations carried out five distinct vegetation units have been identified.

1. Open Forest with dominant tree species Eucalyptus viminalis and E. macrorhyncha.

2. Woodland with dominant tree species of Eucalyptus rossii and E. macrorhyncha.

3. Cleared land used for grazing. Has, in the past, been sown with improved pasture species such as oats.

4. Swampy area of low lying ground within the northern most disused open cut.

5. A vegetation unit that has been classed as regeneration by the investigator. This unit has mixed tree species of Eucalyptus macrorhyncha, E. mannifera and E. viminalis.

The majority of the timbered or forested area, within the bounds of Ben Bullen State Forest, would be classified as an open forest situated predominantly on the valley floors in areas of alluvial soils to the north and east of the study area. This vegetation unit contains dominant tree species of Eucalyptus viminalis (Ribbon Gum) and E. macrorhyncha (Red Stringybark). See figure 2 showing the location of the vegetation units as identified during field excursions. The area marked as vegetation type 1(a) is open forest of the same classification as vegetation type 1 however the dominant tree species is more E. macrorhyncha and less E. viminalis whereas the other areas marked as vegetation type 1 are equally dominated by E. macrorhyncha and E. viminalis.

The ridge to the east of the study area that dissects the open forest characteristic of the valley floors is classed as a woodland with dominant tree species of Eucalyptus rossii (Inland Scribbly Gum) and E. macrorhyncha (Red Stringybark).

Both of these vegetation units have an understory of medium to low density containing small trees and shrubs of the following species; Acacia dealbata (Silver Wattle), A. buxifolia (Box LeafWattle), A.longifolia (Sydney Golden Wattle), Persoonia levis (Broad Leaf Geebung) and P. linearis (Narrow Leaf Geebung), Eucalypt regeneration or saplings is also common in these areas contributing to the density of the understory.

The ground cover within both of these units varied between the range of 40% to 100%. Species of ground cover plants found and identified can be seen in the list of species identified, attached as an appendix to this report.

Common groundcover species, consistent with both the woodland and open forest communities include patches or clumps of Pteridium esculeńtum (Bracken Fern), Viola betonicifolia (Native or Mountain violet), individuals of Acaena novae-zelandiae and various members of the Asteraceae family.

Common grasses that are consistent with both of these vegetation units are Chionochloa species, Danthonia species, Poa species and Agrostis species. In specific areas species of Lomandra, Dianella, Stylidium and Gonocarpus can be found.
Common to the open forest are areas of spear grass or Stipa species.

Individuals of the following were found to occur in each of these vegetation units. Eucalyptus bridgesiana (Apple Box), E.

mannifera (Red Spotted Gum) and Callitris endlicheri (Black Cypress Pine).

The open forest, and to a lesser extent the woodland, is showing signs of infestation by Rubus species (Blackberry), some Rosa species (Briar Rose) and some Amyema species (Mistletoe) primarily on Eucalypts.

The cleared land which will be the main focus of the open cut proposal should the underground proposal succeed, is bounded by the state forest on two sides, by the regeneration vegetation on one side and by open country on the other side.

This land has been cleared and used for grazing purposes for some 50 years and has, during that time been sown out to improved pasture species such as oats.

Within this area there are a few remaining trees which are congregated around the dam towards the centre of the paddock and then along the drainage line as it drains to the west of the site. These trees are of the species Eucalyptus viminalis (Ribbon Gum), E. bridgesiana (Apple Box) and E. manniffera (Red Spotted Gum). There are also some Leptospermum flavescens (Yellow Tea Tree) and one large tree of Banksia spinulosa (Hairpin Banksia).

This drainage line has not been ploughed nor sown with other species and contains grasses of the Stipa species consistent with those growing in the open forest to the north and east of the site.

This cleared area has and is showing signs of infestation with Rubus species (Blackberry) and Echium plantagineum (Pattersons Curse).

Some annual herb species and species of thistle were germinating at the time of the survey and could not be fully identified.

The swampy area or vegetation unit is located within a disused open cut. This area must remain wet for the majority of the year as it sustains a healthy frog population, at least two red bellied black snakes along with sustaining an insect food source for bats that have been recorded at the site.

The species identified to be present were one variety of Typhaceae, most probably T. domingensis although floral structures were not avaiable to confirm the identification of these plants to species level. These Typhae species congregated from the centre of the pond to the extremities or within one to two metres of the edge where Juncus australis was found growing quite prolifically.

Originally this area was within the area of impact although following the discovery of the ecological richness of this area the planned disturbance by the construction of the haul road was diverted and it is now planned to isolate this area from the operation of the pit and leave it as it is currently found.

The vegetation unit marked as regeneration by me is an area of dumped overburden from the open cut which now contains the

wetland area and an area created due to similar activities further to the south at the end of the proposed haul road.

The vegetation that has self seeded on these spoil dumps has a dominant vegetation of juvenile to mature Eucalyptus trees of the species Eucalyptus mannifera (Red Spotted Gum), and E. rossii (Inland Scribbly Gum) with individuals of E. viminalis (Ribbon Gum) . These trees may be stunted in growth rather than being juvenile specimens as a result of the quality of the growing medium in which they have seeded.

The area surrounding the wetland has no understory species but has extensive growth of Cassinia arcuata (Biddy Bush or Chinese Scrub).

The regeneration unit of vegetation marked to the south of the study area is dominated by the same tree layer but the understory of Biddy Bush does not occur. The tree layer is more dense and Rubus species (Blackberry) predominates as a groundcover species in this area. The climber Glycine clandestina (Twining Glycine) is prevalent in the trees of this regeneration unit and Hardenbergia violaceae (False Sarsparilla or Native Lilac) is also starting to make headways into this area.

The pasture grasses from the areas adjoining these regeneration units are beginning to encroach beyond the treeline and individuals of Echium plantagineum (Pattersons Curse) also appear in the verges of these areas.

Section 4.2 Results of Literature Searches.

According to Benson and Keith (1990), the area proposed to be open cut is covered by two map units or classifications of vegetation as classified by Benson and Keith in their publication Cunninghamia Vol.2(2).

The first of the map units is cleared ,which is described by Benson and Keith as ;

> "Native vegetation has been largely removed for agricultural, industrial or urban development but remnant vegetation of varying sizes and condition may remain."
>
> (Benson and Keith. 1990)

The other map unit that the vegetation complies to is the map unit 10h, the "Tablelands Grassy Woodland Complex". This map unit or vegetation community type is further classified into three woodland communities and one open forest community depending on the different habitats which may occur which correlates with the topography within the area. The vegetation within this map unit is characteristically found at altitudes greater than 800 metres on soils derived from the Permian Illawarra group.

The first of the woodland communities is characterised by Eucalyptus rossii and E. macrorhyncha trees and is found in areas where the topography is hilly with dry aspects.