



CONSERVATION ZONE MONITORING MAINTENANCE TECHNICAL MEMO

NEW ACLAND COAL MINE

JUNE 2023

**Prepared for
New Hope Group Pty Ltd**

**Biodiversity Assessment and Management Pty Ltd
PO Box 1376
CLEVELAND 4163
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EXECUTIVE SUMMARY

Background

BAAM was engaged to undertake conservation zone monitoring at New Acland Coal Mine in June 2023 as required by EA approvals for both Stage 2 and Stage 3 mining projects and the Commissioner General report. The conditions of approval include the conservation and rehabilitation of two key “Conservation Zones” – Lagoon Creek and Bottle Tree Hill.

In keeping with NAC’s obligation to ensure that suitable maintenance strategies are implemented and provide information on the progress of revegetation and management programs within the conservation zones, the following technical memo has been prepared documenting the observed conditions and recommended maintenance actions to correct or improve the overall performance of deficient sites in those areas surveyed during the June 2023 conservation monitoring event.

Bottle Tree Hill

In the Bottle Tree Hill conservation zone, there is evidence of past treatment of Prickly Pear. On-going weed maintenance should continue to ensure no regrowth of succulent pads occurs from prior treated individuals. Boxthorn is evident in the lower and more open areas of Bottle Tree Hill. There is evidence of some successful treatment but emphasis on future eradication is required and should be prioritized. The undergrowth of dense non-native grass species may limit recruitment of native vegetation in these zones. As such, treatment to encourage native ground covers is recommended as part of the future maintenance works.

There is a cleared area on the site where a house and surrounding structures have been removed. The area has been cleared bare and with the sodic nature of the red soil it is likely to develop rill and sheet erosion if not vegetated. There are numerous garden escapee weeds including Mother of Millions (*Bryophyllum delagoense*) that should be prioritized for treatment. No revegetation has yet been undertaken at Bottle Tree Hill, however species appropriate tube stock planting is recommended as a future rehabilitation task in addition to ongoing monitoring and weed maintenance until self-sustainability is achieved.

Lagoon Creek

The remnant protection areas of Lagoon Creek are in relatively good condition with only occasional occurrence of large individual *Opuntia* specimens; treatment should be prioritized to reduce any further spread. Some sodic erosion is occurring around the pooled areas; however, this is confined and should ongoing unassisted revegetation occur, is unlikely to progress. Some non-native grass exists in this zone and this should be monitored and treated as necessary.

The natural regeneration areas along Lagoon Creek vary in success. Recruitment of EDL species is very low in some areas due to dense undercover of *Lippia* (*Phyla canescens*). This will require a dedicated maintenance and treatment program in conjunction with tube stock planting or other assisted revegetation methods. Occasional *Opuntia* and Boxthorn are present and will require future control to reduce spread and ensure ease of movement for Koala through the landscape.

Most of the prior planted revegetated areas appear to have had successful establishment, however infill planting will be required in some areas to achieve the 100 koala trees per square ha target set out the Koala Species Management Plan (KSMP).

Feral Animal and Stock Control

Evidence of feral pig damage was identified along Lagoon Creek. NAC has a feral management control plan that allows for an annual aerial control (undertaken August) to address these pests.

Stock exclusion from Bottle Tree Hill has been achieved and is underway in Lagoon Creek. NAC will be implementing and improving cattle exclusion from Lagoon Creek using agricultural fencing in stages. NAC is underway with commissioning a fencing contractor to improve fencing around ML50216 before moving into ML50232.

1.0 INTRODUCTION

BAAM was engaged to undertake conservation zone monitoring at New Acland Coal Mine in June 2023 as required by EA approvals for both Stage 2 and Stage 3 mining projects and the Commissioner General report. The conditions of approval include the conservation and rehabilitation of two key “Conservation Zones” located within the mining lease properties. These are:

1. Lagoon Creek – a heavily disturbed, ephemeral riparian corridor supporting small patches of remnant vegetation consisting of Poplar Box, Brigalow, Belah and Weeping Myall (preclear RE 11.3.17) and confirmed Koala habitat.
2. Bottle Tree Hill – retained patch of remnant and regrowth vegetation consisting of REs 11.8.3 and 11.8.5, dominated by semi-evergreen vine-thicket species.

Condition 15 of the Coordinator-General’s evaluation report on the Stage 3 Project EIS outlines requirements pertaining to the development and implementation of the Conservation Zone Management Plan (CZMP) which aims to achieve:

- (i) control and management (including fencing) of stock from the area
- (ii) a program of weed management to assist natural regeneration of native species and protect remnant areas from impacts of weed invasion;
- (iii) suitable monitoring and maintenance strategies.

Additionally, the CZMP is to ensure that suitable monitoring and maintenance strategies are implemented and that the outcomes and progress of revegetation and management programs are published and updated on the company website.

BAAM was engaged to assist in the implementation of the CZMP by conducting monitoring and maintenance as described in the CZMP. BAAM commenced the monitoring program in June 2023 with surveys conducted between 28 – 30 June. Eight previously established monitoring transect sites (3 on Bottle Tree Hill and 5 in the northern section of Lagoon Creek) were surveyed and site condition attributes measured in accordance with the Department of Science, Information Technology and Innovation (DSITI) BioCondition Assessment methodology. An additional, broad visual survey was conducted over the central and southern portions of Lagoon Creek to determine priorities for management and scope potential monitoring transect locations to be established during future monitoring events.

In keeping with NAC’s obligation to ensure that suitable maintenance strategies are implemented and provide information on the progress of revegetation and management programs, the following technical memo has been prepared documenting the observed conditions and recommended maintenance actions to correct or improve the overall performance of deficient sites in those areas surveyed during the June 2023 conservation monitoring event.

2.0 ASSESSMENT METHODOLOGY

During the June 2023 field survey, a total of eight previously monitored assessment plots (shown in **Figure 1**) were visited to obtain updated site condition data.

These included three assessments plots at the Bottle Tree Hill conservation zone:

- BTH01 (RE 11.8.5/11.8.3 natural regeneration)
- BTH02 (RE 11.8.5 remnant protection/reference site)
- BTH03 (RE 11.8.3 remnant protection/reference site)

And five assessment plots along the northern portion of the Lagoon Creek conservation zone:

- LC01 (RE 11.3.17 revegetation)
- LC02 (RE 11.3.17 natural regeneration)
- LC03 (RE 11.3.17 remnant protection/reference site)
- LC04 (RE 11.3.17 revegetation)
- LC05 (RE 11.3.17 natural regeneration)

Site attributes were measured at all plots in accordance with the BioCondition Assessment methodology (Eyre et al. 2015) for comparison with rehabilitation targets set out in NAC's Conservation Zone Management Plan (CZMP) and Coordinator General report. In addition, revegetated sites along Lagoon Creek were assessed against performance criteria outlined in the Koala Species Management Plan by recording information on planted Koala food tree density and height.

In July 2023 additional assessment plots are to be established in the central and southern portions of the Lagoon Creek conservation zone to be included in future monitoring activities. A detailed report documenting the monitoring results at each assessment plot will be provided to NAC following establishment of these plots.

3.0 REHABILITATION CONDITION AND MAINTENANCE SUMMARY

A summary of the current state and suggested management actions for the Bottle Tree Hill and Lagoon Creek conservation zones are provided in **Table 1**. Indicative photos from each rehabilitation zone are given in **Table 2**.

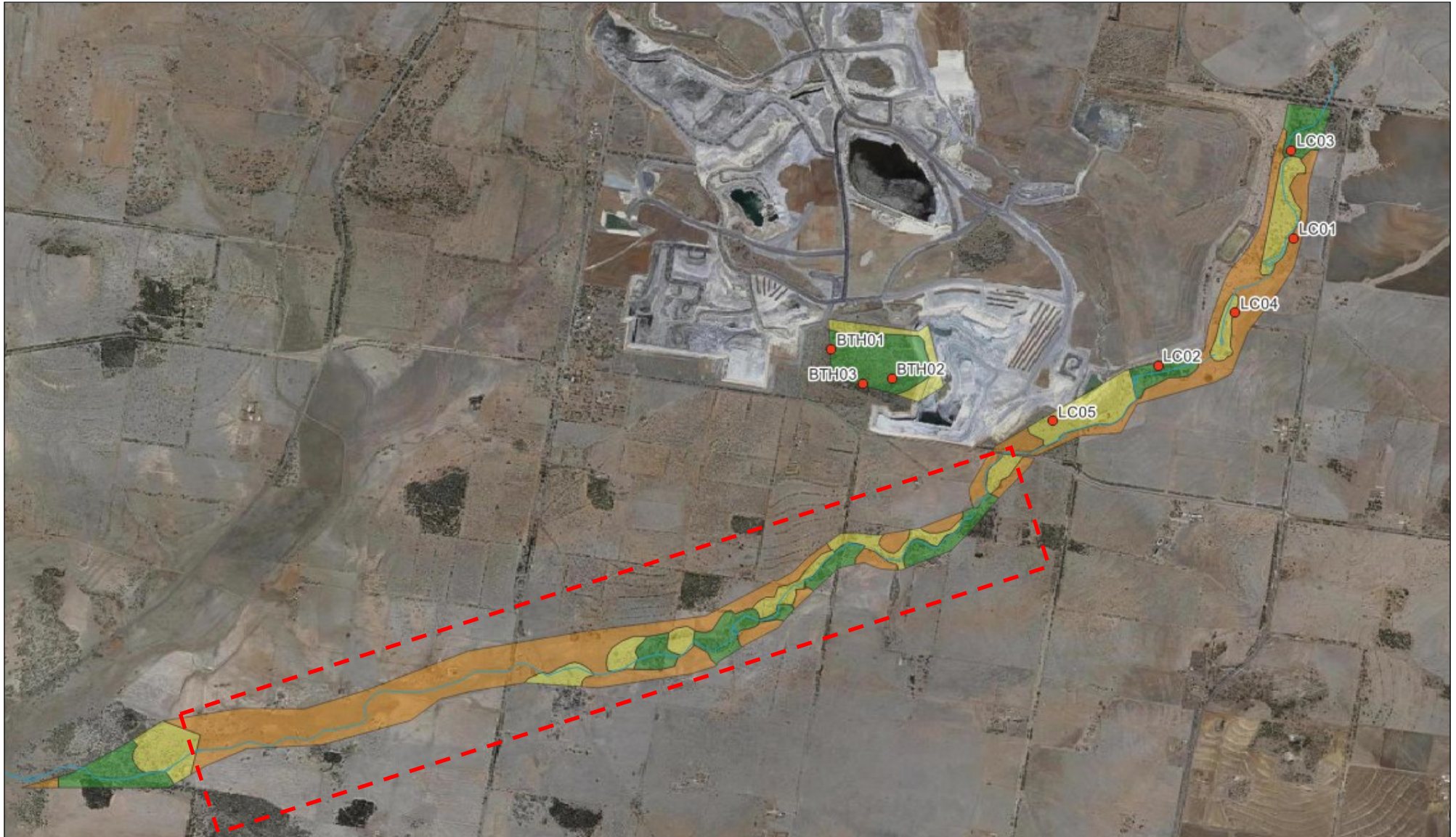


Figure 1. June 2023 survey locations. Red dashed area = broad visual inspection only.

Table 1. Bottle Tree Hill and Lagoon Creek conservation zone condition and maintenance summary

| Assessment plots | Weeds | Native species recruitment | Erosion | Other comments | Action/s undertaken | Further management action/s required |
|---|--|--|---|--|--|---|
| Bottle Tree Hill - Remnant protection (RE 11.8.3 and 11.8.5) | | | | | | |
| BTH02 (RE 11.8.5 reference site), -27.304218 151.710855 | ~ 30% non-native cover. Guinea grass dominates the groundcover layer. Occasional prickly pear and boxthorn present. | Minimal Ecological Dominant Layer (EDL) species recruitment recorded as 0% Guinea grass dominance prohibiting successful recruitment | Steep slope with small igneous rocky tors present. Little current rill erosion present. | Native grasses occur in small patches amongst the guinea grass | Previous successful treatment of large prickly pear evident. | Continue monitoring for re-establishment of prickly pear and treat as needed. Boxthorn treatment/removal recommended. Non-native grasses to be brushcut and sprayed around existing native grassy patches to encourage native re-establishment. |
| BTH03 (RE 11.8.3 reference site) -27.304561 151.708933 | As above | Minimal. EDL species recruitment recorded as 0% Guinea grass dominance prohibiting successful recruitment | Steep slope with small igneous rocky tors present. Little current rill erosion present. | Native grasses occur in small patches amongst the guinea grass | Previous successful treatment of large prickly pear evident. | Continue monitoring for re-establishment of prickly pear and treat as needed. Boxthorn treatment/removal recommended. Non-native grasses to be brushcut and sprayed around existing native grassy patches to encourage native re-establishment. |
| Bottle Tree Hill - Natural regeneration (RE 11.8.3/11.8.5) | | | | | | |
| BTH01 -27.302707 151.706786 | ~ 30% non-native cover. Guinea grass dominates the groundcover layer. Occasional prickly pear and boxthorn present. Madeira and asparagus vine | Minimal. EDL species recruitment recorded as 0%. Guinea grass dominance prohibiting successful | Exposed rocks on upper slope Little rill erosion present. | 80% of transect 11.8.3 20% transect 11.8.5 | Previous successful treatment of large prickly pear evident. Regrowth of pads evident | Continue monitoring for re-establishment of prickly pear and treat as needed. Boxthorn treatment/removal recommended. Weed vine removal recommended. Non-native grasses to be brushcut and sprayed around exiting native grassy patches to encourage |

| Assessment plots | Weeds | Native species recruitment | Erosion | Other comments | Action/s undertaken | Further management action/s required |
|--|--|--------------------------------|--|--|--|--|
| | present. | recruitment. | | | | native re-establishment. |
| Bottle Tree Hill - Future revegetation (demolished house block) | | | | | | |
| Plot to be established | <p>Garden escapees including (cacti sp) Cape Honeysuckle (<i>Tecoma capensis</i>) present and other woody weeds around perimeter of house pad such as Easter cassia (<i>Senna pendula</i>) and yellow bells (<i>Tecoma stans</i>).</p> <p>Guinea grass present and extensive boxthorn along perimeter and outside of conservation fencing.</p> | 0% recruitment – block cleared | Area currently clear and sheet and rill erosion likely in the event of heavy rainfall inundation. | | Prior treatment of Mother of Millions evident. | <p>Undertake control and removal of garden escapee weed vegetation.</p> <p>Active revegetation through direct planting is recommended.</p> <p>Establish topsoil, mulch and tubestock revegetation in cleared area.</p> |
| Lagoon Creek – Remnant protection (RE 11.3.17) | | | | | | |
| LC03 -27.288864 151.737757 | <p>17% non-native cover.</p> <p>Guinea grass, Rhodes grass. Opuntia and sparse boxthorn present.</p> | 100% EDL species recruitment | Very slight sodic gully erosion around pools. Streambank vegetation and coarse woody debris protects pools of water and edges. | Feral pig damage and cattle grazing evident. | Previous successful treatment of large prickly pear evident. | <p>Treat remaining prickly pear.</p> <p>Boxthorn treatment/removal recommended.</p> <p>Non-native grass to be sprayed out using repeat visits and native grass rejuvenation facilitated.</p> |

| Assessment plots | Weeds | Native species recruitment | Erosion | Other comments | Action/s undertaken | Further management action/s required |
|---|--|--|--|---|---------------------|--|
| Lagoon Creek – Natural regeneration (RE 11.3.17) | | | | | | |
| LC02 -27.303352 151.728768 | 15% non-native cover. Mostly restricted to non-native grassy areas (Rhodes and guinea grass). Occasional boxthorn and opuntia. | EDL species recruitment recorded as 100% at LC02. Native grassland and forbs present. | LC02 has runoff floodplain areas with potential rill runoff but no concern at present. | Stock present. | | Monitor non-native grass cover and treat as needed. |
| LC05 -27.30707 151.721674 | 80% non-native cover. Ground cover dense with non-native forbs especially Curly dock and Lippia. Bathurst burr was also present. Boxthorn out of creek line (around trees). | EDL species recruitment recorded as 0% at LC05. Curly dock and Lippia prohibiting seed germination. | Little erosion in LC05 due to coverage of groundcover (esp Lippia). | Slight feral pig damage in ephemeral creek pools. Koala sighted in Poplar box. | | Area to be prioritised for weed treatment and revegetation. with a focus on Lippia Removal of boxthorn from around remnant poplar box base (in area outside of plot). Aerial pig control is currently one of the mines feral animal control actions and a cull is planned to be conducted in August 2023 |
| Lagoon Creek – Existing revegetation | | | | | | |

| Assessment plots | Weeds | Native species recruitment | Erosion | Other comments | Action/s undertaken | Further management action/s required |
|----------------------------------|--|--|----------------------|---|---------------------|---|
| LC01 -27.294749 151.737871 | 10% non-native cover. Weeds occurring include both non-native grasses and forbs including Cotton bush verbena and Rhodes Grass. | Planted stock ranging in height from 0.5 – 4 m One in three EDL species are naturally recruiting. Native grasses establishing well. | No erosion observed. | 72 Koala food trees/ha Evidence of stock present. | | Infill planting necessary to meet min 100 food trees/ha target. Stock protection required for future planting. Weed control to be implemented with any future infill planting events. |
| LC04 -27.299775 151.733935 | 70% non-native cover. Weeds included Rhodes Grass, Lippia and occasional prickly pear | Planted stock ranging in height from 0.5 - 5m. Zero natural recruitment of canopy species observed. | No erosion observed. | 72 Koala food trees/ha Evidence of cattle present. | | Infill planting necessary to meet min 100 food trees/ha target. Stock protection required for future planting. Weed control to be implemented with any future infill planting events. |

Table 2. Indicative photos of maintenance requirements in each rehabilitation zone

| Bottle Tree Hill – remnant protection area | | |
|--|---|--|
|  |  |  |
| <p>Extensive guinea grass cover restricting native recruitment</p> | <p>Successful prior treatment of prickly pear</p> | <p>Patch of native grass surrounded by guinea grass</p> |
| Bottle Tree Hill – natural regeneration area | | |
|  |  |  |
| <p>Prickly pear regrowth</p> | <p>Guinea grass and prickly pear regrowth</p> | <p>Small patch of madeira vine</p> |

Bottle Tree Hill – future revegetation area



Cape honeysuckle and other garden escapees



Cleared pad



Guinea grass, prickly pear, fleabane, tecoma etc. along outer edges of pad

Lagoon Creek – remnant protection



Large opuntias requiring treatment



Small opuntia requiring treatment



Guinea grass and occasional boxthorn

Lagoon Creek – natural regeneration



LC05 – ground cover dominated by non-native forbs and grasses



LC02 – Rhodes grass dominating ground cover between remnant area and regrowth



LC02 – Occasional boxthorn and prickly pear

Lagoon Creek – existing revegetation



LC04 - Rhodes grass and Condamine couch dominate. Occasional large prickly pear



LC01 - Scattered cotton bush and verbena



Gap in planting along southern section of Lagoon Creek

4.0 MAINTENANCE PRIORITIES

4.1 BOTTLE TREE HILL

4.1.1 Demolished house block

The demolished house block on the southwestern edge of Bottle Tree Hill represents an ideal area for revegetation. The area currently contains a cleared pad of around 2,000 m² surrounded by a disturbed weedy edge with various woody weeds and non-native grasses. It is recommended that this area be prioritised for treatment to prevent further spread of weeds into the conservation area.

All weeds within at least 10 m of the cleared pad should be treated as a priority. Where possible, woody weeds should be treated via cut stump method. Shrubby weeds such as lantana, boxthorn and cape honeysuckle may be cut down using a hedge trimmer or brush cutter and allowed to resprout before a follow up foliar spray treatment of new active growth. Non-native grasses should be brushcut and foliar sprayed when active regrowth is present.

Following weed treatment, topsoil and a layer of weed-free mulch should be installed over the bare pad prior to planting. The existing track up to the house pad should be retained for access. Planting of tube-stock should occur soon after site preparation and receive follow-up watering and weed maintenance to support plant establishment. Species selection and plant density will be based on the predominant RE in this area (RE 11.8.3) and existing species in the locality.

4.1.2 Natural regeneration and remnant protection areas

Natural regeneration and remnant protection areas on Bottle Tree Hill would benefit from on-going weed maintenance, particularly in the treatment of non-native grass cover. Maintenance works should prioritise treatment of any prickly pear regrowth, boxthorn, and weedy vines, followed by treatment of non-native grasses (Guinea, Rhodes, buffel etc.) under canopy and surrounding native grass patches to encourage re-establishment of native groundcovers and recruitment of canopy species.

4.2 LAGOON CREEK

4.2.1 Remnant protection

During the June 2023 survey, only the remnant protection patch on the northern end of the Lagoon Creek conservation area was inspected. This area was generally in good condition and had evidence of Ecological Dominant Layer (EDL) recruitment; however, large prickly pears were observed in this area which should be prioritised for treatment to prevent fruiting and further respread down-stream. Previous treatment of prickly pear at Bottle Tree Hill through stem injection appears to have been largely successful and should be implemented in this area of Lagoon Creek. Any remaining African boxthorn should also be treated as a priority to prevent fruiting and further spread.

4.2.2 Natural regeneration areas

LC05 is identified as occurring in a natural regeneration area according to rehabilitation zone mapping in the CZMP. This area is located adjacent to the existing mine site north of Acland Silverleigh Road. Currently the area consists mostly of open floodplain dominated by non-native groundcover vegetation including Condamine couch (AKA Lippia) *Phyla canescens* and curly

dock *Rumex crispus*. Scattered native trees persist in the area; however, native recruitment is minimal due to the dense groundcover present.

It is recommended that this area be prioritised for weed treatment and revegetation with works progressing from around existing native tree patches and incrementally pushing out into more open areas. *Lippia* is a particularly aggressive weed known to form dense mats and rapidly establish in riparian areas and over bare ground. Effective treatment is likely to involve a combination of mechanical and herbicide control. In areas of little water flow, infestations of *Lippia* can be ploughed or harrowed as a short-term control, followed by herbicide treatment. Revegetation of these areas should occur soon after weed treatment. Direct seeding of native grasses may be a suitable option for these areas in addition to planting tree seedlings.

LC02 was observed to be in better condition at the edge of a remnant protection area with good recruitment of *Belah*; however, non-native pasture grasses such as Guinea grass and Rhodes grass is expected to limit future recruitment without treatment. This area should be monitored and treated if non-native cover increases.

4.2.3 Existing revegetation areas

Most of the existing revegetation areas, particularly in the central and southern portions of Lagoon Creek appear to be in relatively good condition. Some of the prior revegetated areas include tubestock planting for biodiversity offsets outlined in the Koala Species Management Plan (2019) (KSMP). The KSMP was developed in response to the CoG evaluation report conditioning a Management Plan for Matters of National Significance (MNES), in particular Koalas and Koala habitat.

It is understood that plant growth has increased significantly in these revegetated areas in the last two years with an increase in rainfall; however, at the two surveyed revegetation monitoring plots, LC01 and LC04, counts of planted Eucalypt trees across the plot area (0.5 ha) found that both plots have a current Koala tree stem density of 72/ha and are therefore 28% below the KSMP rehabilitation target of minimum 100 koala food trees/ha. Given the limited observed natural recruitment in these plots, supplementary planting will likely be required to achieve the target density within the 10-year rehabilitation timeframe.

Occasional large Prickly Pear were also observed (at LC04) which should be prioritised for treatment to avoid further spread.

4.2.4 Future revegetation

Much of the riparian zone of Lagoon Creek has undergone planting activities at various points in time such that most of the creek line is establishing increased habitat connectivity. Future revegetation should focus on connecting gaps between planted areas and supplementary planting of areas not achieving stem density targets before moving restoration actions out further from the creek line. Monitoring to occur in the next few months will aim to determine target areas for planting so that additional planting activities can commence before the end of 2023.

5.0 CONCLUSION

Monitoring conducted in June 2023 has found there to be some success in previous rehabilitation management works across the conservation zones, most notably the successful prior treatment of *Opuntia* at Bottle Tree Hill and establishment of plantings along Lagoon Creek; however, additional works are required to ensure the targets of the CZMP and KSMP are achieved within the 10-year rehabilitation timeframe. Some works currently being undertaken by NAC include stock exclusion along Lagoon Creek through improved fencing and aerial pig culling

as well as targeted weed treatment (e.g. mother of millions at Bottle Tree Hill). Additional works required include revegetation at Bottle Tree Hill and infill planting at deficit natural regeneration and revegetation sites along Lagoon Creek. A more thorough weed management program across the conservation zones is also necessary to encourage natural recruitment in areas currently dense in non-native groundcover vegetation and to control the spread of large weeds such as Prickly Pear and Boxthorn. A summary of these management actions is provided in **Table 2** below. On-going monitoring will aim to identify areas requiring particular attention and appropriate management actions to ensure compliance with rehabilitation targets are achieved.

Table 2. Summary table of rehabilitation management/maintenance actions

| Rehabilitation Management Action | Status |
|---|---|
| Stock exclusion from Bottle Tree Hill | Completed |
| Stock exclusion from Lagoon Creek | Commenced |
| Feral pig control | On-going (annual aerial cull) |
| Primary weed treatment - Bottle Tree Hill | Completed (Prickly pear) On-going (Boxthorn and other weeds) |
| Primary weed treatment – Lagoon Creek | Planned to commence (Aug 2023) |
| Revegetation at Bottle Tree Hill (houseblock) | Planned to commence (Oct/Nov 2023) |
| Infill planting along Lagoon Creek | Working towards |
| Additional plantings | Working towards |
| Groundcover weed treatment | Working towards |