Endorsed by Council 27 October 2021

PRACTICAL ECOLOGY
ecological restoration & consulting

Hanging Rock Environmental Management Plan

2021 Update

Part 1 – Background Report

Acknowledgement of Country

This report discusses the unceded lands of Hanging Rock.
The Rock is known as a place of gathering and cultural significance to the Dja Dja Wurrung, Taungurung and the Wurundjeri Woi Wurrung people. We would like to acknowledge them as the traditional owners, and pay respects to their Elders, past and present, and the Elders from other communities who may be present on their lands or reading this document.

As an organisation, Practical Ecology acknowledge the Traditional Custodians of the land on which our office is located, the Wurundjeri Woi Wurrung people of the Kulin Nation. We pay our respects to their Elders, past and present. We also acknowledge the Traditional Custodians of the lands on which we conduct our business throughout Australia. We pay our respects to their Elders, past, present and emerging, and the Elders of other communities who may be present on those lands.

PRACTICAL ECOLOGY
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Macedon Ranges
Shire Council

Hanging Rock Environmental Management Plan Update 2021
Part 1– Background Report

Prepared for Macedon Ranges Shire Council

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1.1 Background

1.1.1 Project Context

This report has been commissioned by Macedon Ranges Shire Council (MRSC) and the Department of Environment Land, Water and Planning (DELWP), as an update to the 2015 Hanging Rock Environmental Management Plan (Smedley 2015), hereafter referred to as the 2015 EMP. The 2015 EMP outlined a 10-year management plan for the Hanging Rock Precinct – an historic recreational reserve with significant ecological and cultural values.

The purpose of the 2015 EMP was to identify the environmental values within the Hanging Rock Precinct and to establish a management system that was considerate and protective of such values. Prior to this, management focus was primarily the ongoing maintenance of recreational areas to facilitate visitation by tourists, local sporting groups, as well as hosting special events such as markets, car shows, and most notably, music events that have now become synonymous with The Rock.

The 2015 EMP shifted a primarily recreational focus towards a greater consideration of the ecological values and biodiversity conservation, providing guidance on the implementation of management practices to enhance the sites significant ecological values.

In late 2015 the Victoria State Government announced its commitment to the protection of ecological, cultural and social values of the site, and proposed a comprehensive review by the DELWP to include stakeholder and community consultation, and the establishment of the Hanging Rock Strategic Advisory Committee. The result of this process was the development of the Hanging Rock Strategic Plan (DELWP 2018).

The Hanging Rock Strategic Plan, hereafter referred to as the Strategic Plan, was developed with the aim to further strengthen the Reserve's long term strategic direction and to recognise the significance of Hanging Rock and the Precinct. The plan also sets out a vision for the future uses of the Hanging Rock Precinct for the next 50 years, stated as:

> *"Hanging Rock will be renowned for its importance to our First Peoples, its dramatic geological form and its wider landscape setting within the Macedon Ranges. The role of the rock throughout history as a place of gathering, reflection and intrigue will be* understood and celebrated. The revegetated bushland environment will enhance the *secluded ambience and provide a habitat for native wildlife. Activities around the Rock will reflect it historical uses centred on recreation and education, and its State and national significance"*

1.1.2 EMP Aim

The aim of this Hanging Rock EMP Update is to build upon the progress made in implementation of the 2015 EMP, developing a robust and refined framework and elevates protection of ecological values as a primary consideration in future decisions about management of the Precinct. This update therefore includes;

- the updating of contents of the 2015 EMP to respond to the vision and objectives of the Strategic Plan (DELWP 2018)
- assessment of environmental and recreational values of the Hanging Rock Precinct, as identified through a review of relevant literature and databases, site assessments and stakeholder engagement
- identification of the current threats to these values, as determined through integration of the information sources listed above,
- prescription of management actions to address these threats and guide ongoing management of the Precinct in the short term, and providing guidance for the development of a future Master Plan for the Precinct, and

2.

EMP approach, methods and development

2.1 Literature and Desktop Review

A literature review was undertaken of relevant documents, current and historic, relating to the management of values of the Hanging Rock Precinct, the guiding documents being:

- the Hanging Rock Strategic Plan (DELWP 2018)
- Hanging Rock Precinct Aboriginal Cultural Heritage Landscape Conservation Plan (CMP) (ELA 2021)
- The Hanging Rock Grassland Management Plan (Scott-Walker and Lamandé 2020)
- 2015 Hanging Rock EMP (Smedley 2015)

The completion of the 2015 EMP included the compilation of data from many sources of management and monitoring activities within the Hanging Rock Precinct. The cumulative knowledge that has been compiled is extensive, and is the result of hundreds of hours of individuals over decades. Preparation for this EMP therefore included the collation of this information, review and analysis of available public data, as well as that provided directly in the review and consultation process.

2.1.1 Data Review

Data from a number of sources was reviewed as part of the development of this 2021 EMP. This included:

- historic data relating to flora and fauna species known to occur within the Precinct, as presented in the 2015 EMP
- results of flora and fauna monitoring activities conducted by MRSC, between 2015 and 2020
- a search of the Victorian Biodiversity Atlas (VBA) to identify flora and fauna recorded on this database within the Precinct, and those within 5km of the boundary of the Precinct, with a focus on a review of records documented since 2015
- the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matter Search Tool, to identifying modelled habitat for rare and threatened species or communities listed at a Commonwealth level.

It is noted that site-specific information on fauna habitat and occupancy of fauna species at Hanging Rock has been collected by various individuals and organisation over many years. Community groups, Council staff, volunteers, local naturalists, and academics have over time accumulated this important fauna-related data which has been compiled in this report.

Practical Ecology did not complete comprehensive fauna surveys as part of this 2021 EMP update, and has relied on the provision of long-term data from these monitoring observations and reports

by other parties. This has been supplemented by database records and consultation with stakeholders and personal communication where possible.

2.1.2 Review of 2015 EMP

The effectiveness of the 2015 EMP including its aims, the implementation status and the outcomes of recommended management actions were analysed as part of this 2021 EMP Update. This analysis aimed to identify opportunities to improve or modify current management practices and previous recommendations to ensure they are in line with the new management priorities of the Strategic Plan.

This review and analysis of the 2015 EMP identified:

- recommendations that were appropriate and successful, to be updated in line with the priorities of the 2018 Strategic Plan, and incorporated into this update,
- recommendations that were made in the 2015 EMP that, once implemented, did not achieve outcomes as expected
- recommendations of the 2015 EMP that were not fully implemented or had not commenced to date.

Opportunities were therefore identified throughout the review of the 2015 EMP for the development of new implementation actions to further emphasise the ecological and cultural significance of the Precinct.

Review of the 2015 EMP also resulted in identification of knowledge gaps in relation to ecological values or threats, providing an opportunity to incorporate additional information into this update.

2.2 Stakeholder Engagement

2.2.1 Consultation Process

Consultation with both internal and external stakeholders was conducted in conjunction with the literature/data review and site assessments. Consultation was undertaken to assist in understanding the history of the site and to discuss issues associated with management of the Precinct from a variety of perspectives. Anecdotal information was relied upon in some cases to discuss previous and current management practices that have occurred and whether they were considered successful. This information was utilised to inform the fieldwork and the preparation of this EMP.

Internal preliminary consultation consisted of meetings with key stakeholders. This included MRSC representatives as the current site management authority, along with representatives from DELWP,, being the governing body responsible overseeing the preparation of the 2018 Strategic Plan, and the implementation of the future Hanging Rock Master Plan.

2.2.1.1 Macedon Ranges Shire Council

Liaison with key staff at MRSC took place throughout the completion of this update. This included liaison with J. Walsh (Senior Project Officer), M. Wyatt (Environment Coordinator), E. Aitkin (Project Support Officer), J. Summers (Acting Senior Project Officer). S. Purves (Conservation Reserves Officer), and S. Caruana (Senior Ranger Team Leader)

Further to this, discussion with MRSC was completed through online workshops with a range of MRSC representatives. The following table summarises the discussion points during these internal MRSC workshops that were completed during the initial stages of development of this 2021 EMP. These workshops were conducted to gain an understanding of the history of site management from the view of the managing municipal council. Attendees with knowledge and experience of Hanging Rock included participants from a number of relevant departments, including team members from the environment, sports and recreation, tourism and planning departments. The aim was to promote discussion of possibilities for addressing the objectives and strategies of the Strategic Plan that could subsequently be incorporated into the 2021 EMP update.

Table 1. Consultation and correspondence with MRSC

Macedon Ranges Shire Council		
Online Workshops		
27th October 2020	Biodiversity and Conservation	J. Walsh, D.Young, W. Rayner, A. Walsh, M. Bullen. M. Wyatt, W. Terry, B. Kent, K. Muscat, K Delfosse
28th October 2020	Safety and Site management	J. Walsh, D.Young, W. Rayner, A. Walsh, M. Bullen. M. Wyatt, S. Gilchrist, K Delfosse
10th November 2020	Visitor Experience	J. Walsh, D.Young, W. Rayner, A. Walsh, M. Bullen. M. Wyatt, W. Terry D. Frank, K Delfosse
Site Meetings – Site Rangers Team		
2nd October 2020 20th October 2020	General discussion	D. Young,
16th April 2021	General discussion	M. Wyatt, S. Purves
Phone and Email Correspondence		
June 2020 – March 2021	Project Management	J. Walsh, M. Wyatt
March 2021 – September 2021	Project Management	E. Aitkin, M. Wyatt, J. Summers

2.2.1.2 Department of Environment, Land, Water and Planning

Consultation with DELWP representatives involved site meetings with a focus on the topics of bushfire risk and fuel management, as well as protection of biodiversity and enhancement of habitat.

Table 2. Consultation and correspondence with DELWP

Date	DELWP Department	Attending DELWP Representatives	Attending MRSC Representatives	Attending Practical Ecology Staff
2nd October 2020	Forest Fire Management Victoria	T. Nelson B. Matthews	M. Roberts	E Wilkin, L. Kern J. Drummond
20th October 2020	Land For Wildlife	P. Johnson L. Mathieson	W. Terry	E. Wilkin, A. Ewing

2.2.1.3 Traditional Owner Consultation

Consultation with Traditional Owners was facilitated by Eco Logical Australia (ELA). This was completed as part of cultural values recording sessions during the preparation of the Conservation Management Plan (CMP) (ELA 2021). Practical Ecology was invited to participate in these sessions aimed at capturing the tangible and intangible values and oral history of Hanging Rock, and the connection and recognition of place for each of the Traditional Owner Groups.

Findings of the broader study of the Aboriginal Cultural Values of the Hanging Rock Precinct are presented in the Hanging Rock CMP, and are recognised in in part through the recommendations for the Precinct that are presented in Part 2 of the Hanging Rock 2021 EMP update– Part 2: Management Plan.

Table 3. Consultation and correspondence with Traditional Owner Groups

Date	TO Group	Attending TO Representatives	Attending ELA Consultants	Attending Practical Ecology Consultants
14th April 2021	Wurundjeri	D. Wandin, A. Kolasa N. Zukanovic, K. Jones M. Mills, J. Hoye S. Thomson	C. Hawker M. Grist	E Wilkin, L. Kern
4th May 2021	Dja Dja Wurrung	R. Nelson	F. Robson M. Grist	E. Wilkin, A. Ewing
21st May 2021	Taungurung	M. Harding	C. Hawker M. Grist	E. Wilkin

2.2.1.4 Newham and District Landcare Group

Consultation with the Newham and District Landcare Group was undertaken as a site meeting in May 2021, to discuss the history of vegetation management of the Precinct, the key ecological values and threats, and a discussion of options to improve and build upon the progress made in recent years around revegetation, weed control and vegetation monitoring.

Table 4. Consultation and correspondence with Newham and District Landcare Group

Date	Correspondence type	Attending TO Representatives	Attending Practical Ecology Consultants
27th May 2021	Meeting and Site walkover	P. Roberts	E Wilkin,

2.3 Data collection and analysis

2.3.1 Fieldwork Activities

The following site visits and activities were undertaken by Practical Ecology during the fieldwork component of the 2021 review and update, for the purposes of data collection as it relates to flora, fauna and bushfire risk.

Table 5. Summary of site visits and fieldwork activities

Date	Survey Type	Attending consultants
2nd October 2020	Initial Site Visit, Meeting with Lead Ranger	E Wilkin, L. James
20th October 2020	Spring Vegetation Survey – Day 1	E. Wilkin, L. James, M. Savona
21st October 2020	Spring Vegetation Survey – Day 2	E. Wilkin, L. James
21st October 2020	Bushfire Risk Assessment	J. Drummond
21st October 2020	Bird Census 1, Fauna Habitat Assessment	E. Ewing
9th November 2020	Bird Census 2	E. Ewing
16th April 2021	Autumn Flora Surveys	E. Wilkin

2.3.2 Flora

The following sections outline the methodology used for the collection of floristic data, as undertaken by Practical Ecology in 2020 and 2021 during field assessments.

2.3.2.1 Plant Identification

Species that could not be identified in the field were recorded to the nearest possible family or genera. These were then collected as per protocols of Practical Ecology's FFG permit (No. 10003267) for the collection of plant material. Major features of the specimen were collected where possible including leaves, parts of branches, fruits and/or flowers.

2.3.2.2 Limitations of Flora Survey

The following considerations should be made regarding the limitations of the flora survey:

- Surveys were undertaken in Spring and in Autumn- generally the best time for accurate flora identification. Seasonal variation and timing of flora surveys means that some species, especially bulbous exotic species, may not have been visible at the time of survey and hence not recorded
- It is expected that some species, particularly orchid, lily and other herbaceous species that can only be observed for a limited period of time, may not have been recorded during the assessments
- It is possible that certain species may be only present in poorly accessible locations, such as at the base of the rock area and in caves and crevices, and as such, these flora species may be undocumented
- Estimations of vegetation cover tend to be subjective between different assessors, resulting in the need for broad categorises (e.g., 1-25%). Though these categories may be viewed as non-specific, they are deemed appropriate for the purpose of measuring vegetation quality through indicate native and exotic groundstorey over large areas.

With regard to these limitations, it is considered that the majority of flora species within the Precinct will now have been recorded in the updated flora list presented in Appendix 7 of this report.

2.3.3 Vegetation Categorisation, Classification and Quality

Vegetation in the Precinct was categorised into different types to facilitate collection of data. Vegetation in all sections of the Reserve was either classified as native or exotic.

Vegetation was assessed for its categorisation according to Ecological Vegetation Class and its quality.

2.3.3.1 Vegetation Categories

Vegetation in the Reserve was surveyed for categorisation as per the definitions within *Guidelines for the Removal, Destruction or Lopping of Native Vegetation* known as "The Guidelines" (DELWP 2017) which are outlined below:

Native Vegetation

Native Vegetation as per the Victorian Planning Provisions (Clause 73.01): plants which are indigenous to Victoria, including trees shrubs, herbs and grasses.

Remnant Vegetation

Remnant patch of native vegetation is either:

- an area of vegetation where at least 25% of the total perennial understorey plant cover is native
- any area with three or more native canopy trees where the canopy foliage cover is at least 20% of the area

Scattered Tree

A *scattered tree* is a native canopy tree that does not form part of a remnant patch. A canopy tree is a mature tree that is greater than 3m in height and is normally found in the upper layer of a vegetation type.

Exotic Vegetation

Exotic vegetation is vegetation dominated by weed species, where there is an area of vegetation, with or without trees, where more than 75% of the total understorey plant cover is weeds or non-native plants, such that less than 25% of the understorey cover is native

Whilst exotic vegetation is dominated by non-indigenous plant species, which in the context of indigenous species are mostly considered to be weed species, not all weed species are as threatening to indigenous vegetation as other weed species.

2.3.3.2 Ecological Vegetation Classes

Ecological Vegetation Classes (EVCs) are a method of systematic organisation of plant communities into common types that occur in similar environmental conditions throughout Victoria. Each vegetation type is identified on the basis of its floristic composition (the plant species present), vegetation structure (woodland, grassland, saltmarsh), landform (gully, foothill, plain) and environmental characteristics (soil type, climate).

DELWP EVC mapping (DELWP 2020) was accessed to determine the EVC likely to occur on the study area. EVCs were then identified in the field according to observable attributes including dominant and characteristic species consistent with the benchmark descriptions.

Note there is no known reference site for the vegetation of Hanging Rock- vegetation appears to be responsive to the unique microclimates created by rock formation (D. Young 2020, P. Roberts 2021, pers. comm.)

EVCs assigned the Rock area are therefore based on the broadscale mapping (DELWP) of landscape-scale geology types within the Central Victorian Uplands. As such, the EVCs allocated do not reflect the full diversity and complexity of the vegetation within the Precinct.

Refer to **Section 4.3** for discussion of the flora values of the site, and **Appendix 1: Map 3** for EVC mapping

2.3.3.3 Vegetation Quality Mapping

Vegetation quality mapping provides a useful guide for determining management priorities within vegetated areas. Vegetation Quality Maps can also be utilised to monitor indigenous vegetation quality across a Precinct, providing indicative data on the indigenous groundstorey vegetation cover. Indigenous ground storey is measured to signal areas of ground storey disturbance and areas which may require specific management actions to improve conditions.

This task involved the assessment of all ground storey vegetation through estimation of percentage cover. The amount of 'indigenous' versus 'exotic' plant cover is then considered to determine the vegetation quality category. Vegetation Quality Mapping is based on a five-colour coded rating system as presented in Table 6 below.

Table 6. Indigenous Vegetation Quality Mapping Categories

<25% indigenous ground storey vegetation cover Areas where remnant vegetation has been severely degraded as a result of weed invasion to the extent it is almost completely replaced by exotic plant species
25–50% indigenous ground storey vegetation cover Areas where remnant vegetation is severely degraded although some remnant vegetation is evident
50–75% indigenous ground storey vegetation cover Areas of remnant vegetation with light to moderate infestations of weeds
75%–100% indigenous ground storey vegetation cover Areas of remnant vegetation virtually free of exotic plants and where the native plant communities' structure, species composition and diversity are comparatively intact
REVEGETATION Areas where indigenous ground storey vegetation cover is present, but mostly represented by recent revegetation plantings Examples areas are TCZs, and areas within and adjacent to the Kangaroo Refuge area.

2.3.4 Fauna and Habitat

The focus of the fieldwork component for fauna assessments of this EMP was to:

- Monitor for avian species – repetition of monitoring completed for 2015 EMP
- Assess current on ground conditions and habitat availability across the Precinct
- Record incidental fauna observations, and
- Map habitat for significant fauna species (based on the 5km database radius search using the VBA)

Fauna and habitat assessments completed by Practical Ecology as part of this 2021 EMP update were conducted by a qualified zoologist in October 2020. This included incidental fauna observation, general habitat assessments, as well as targeted bird survey.

2.3.4.1 Incidental Observations

Diurnal (daytime) surveys involved the recording of incidental fauna observation. They were based on visual and auditory observations of fauna either directly or indirectly through evidence such as scats, tracks, burrows etc. Incidental observations by other Practical Ecology staff from June 2020 to June 2021 were also recorded and included in the general observation data.

2.3.4.2 Fauna Habitat Assessment

In conjunction with the general incidental diurnal fauna survey, habitat conditions across the reserve were mapped. These were based on threatened species data within the general landscape surrounding the Precinct (based on a 5km radius around the reserve) to determine any likely threatened species habitat within the Reserve.

2.3.4.3 Bird Monitoring

Three bird monitoring plots were established during monitoring for the 2015 EMP to provide a framework for the collection of longitudinal data to monitor changes in bird populations over time. Ideally, this monitoring is undertaken in multiple seasons each year to observe and record different bird populations, such as migrating birds returning to Melbourne after summer, or birds migrating from south to north in autumn/winter.

The locations of bird monitoring plots were determined through consultation with the MRSC Environment Education and Programs Officer, and are distributed across the Reserve as such;

- the woodland area on the northern side of 'the rock',
- the forested area on the southern side of 'the rock', and;
- around the racecourse dam.

Refer to Map 8 for location of bird surveys.

Bird monitoring methodology at these locations is based on that used as a standard method of data collection- the Birdlife Australia 20-minute search method: The following information is required for this protocol:

- *Date*
- *Duration (20mins)*
- *The number of people doing the survey*
- *Start time*
- *Area (2-hectare)*

The survey requires the count of all individuals of all species heard or seen within the two-hectare survey area including birds flying over the area, but not individuals heard or seen outside the survey area.

2.4 Bushfire Risk Assessment

Bushfire risk has been previously managed through the *Hanging Rock Reserve Fire Management Plan* (revised and adopted by Council in 2015) which details the potential risks posed to/from the Precinct. The principles of the *Hanging Rock Reserve Fire Management Plan* are*:*

- Protection and preservation of life is paramount
- Issuing of community information and warnings detailing incident information that is timely, relevant and tailored to assist community members make informed decisions about their safety
- Protection of residential property as a place of primary residence
- Protection of assets supporting individual livelihoods and economic production that supports individuals and community financial sustainability
- Protection of environmental and conservation values that considers the cultural, biodiversity, and social values of the environment
- Road intersections – zone outside of Reserve: to reduce the overall fuel levels through conservation management to allow for unimpeded access.

2.4.1 Methods

The following measures were undertaken through a site assessment of on-ground conditions to determine assessment of effectiveness of current management, and through a desktop assessment to determine the bushfire hazard to/from the Precinct in the broader landscape. The site assessment was undertaken on the 21st of October 2020 by Julian Drummond and was based on the following:

- a review of the vegetation types within the Precinct as per *Australian Standards 3959-2018: Construction of Buildings in Bushfire Prone Areas* (AS3959-2018) (Standards Australia 2018) and *Clause 53.02 Bushfire Planning*.
- identification of bushfire hazards in regards to the existing bushfire management zones and the following items identified prior to the site assessment which includes:
    - Determining whether to incorporate more fuel management into the adjacent road reserves or into the reserve to reduce the amount of management on whichever has the higher quality habitat.
    - Reviewing the potential of improving the amount of vegetation within an existing row of trees on the eastern side of the reserve (the area separating the concert pavilion from the carpark) as a wildlife corridor without increasing the bushfire risk.
    - Reviewing the potential of planting more vegetation within the *RZ1* to connect *CCZ1* with *RTCZ2* and *SCCZ* in the south-western corner of the site to connect these two habitat patches without increasing the bushfire risk.

- determination of the fuel loads at various locations across the site (primarily within the *CCZ*), including assessment as per DSE's *Overall Fuel Hazard Assessment Guide* (Hines *et al.* 2010).
- a review of the current site infrastructure including layout and proximity to bushfire hazards
- a review of the surrounding infrastructure (existing dwellings and other structures and adjacent roads) and their proximity to bushfire hazards.

2.4.2 Bushfire Risk Assessment

This involved analysing the data collected during the site assessment along with office and online resources to determine the overall risk to and from the site along with the implications of specific hazards. This was performed at the site and landscape scale with summaries of the assessments provided below.

2.4.2.1 Landscape Assessment

This assessment was designed to analyse the hazards present more than 150m from the reserve boundary (primarily within the wider landscape 1–5km from the reserve) to determine the following:

- The overall landscape conditions from a bushfire perspective.
- The bushfire history within the surrounding landscape.
- Potential bushfire scenarios which could affect the site and their likelihood of occurrence.
- Options regarding refuge and evacuation locations and their suitability.
- The Landscape Typology as per Planning Practice Note 65 (DTPLI 2014) to guide future development.

These factors were considered before the site scale hazards to provide an accurate assessment of what their implications are.

2.4.2.2 Site Assessment

This assessment was designed to analyse the hazards present from within 150m of the reserve boundary to determine the following:

The vegetation types as per AS3959–2018 and Clause 53.02 and the hazard they pose to existing and potential infrastructure

- The suitability of the access conditions within the site considering the bushfire risk.
- The results and the implications of the fuel load assessments
- The effectiveness of the fuel management currently being performed within the site considering the factors above and the results of the landscape assessment.

2.5 Mapping

2.5.1 Data Collection

Geographical positioning data collection in the field for the purposes of map display was carried out using a combination of handheld GPS units, tablets, aerial photography and existing site plans.

Determination of vegetation boundaries was undertaken using a combination of GPS data and ground-truthing with aerial photography. Due to some inaccuracy that can be expected with GPS data, the mapping should be considered approximate only.

Visual representations, and background data collected as part of the 2015 EMP was utilised as baseline data and has been updated to reflect current site conditions.

3.

Precinct description and management

3.1 Landscape and Geology

Hanging Rock Precinct is located in Newham, near the townships of Woodend and Mount Macedon, located approximately 80km to the north-west of Melbourne in Victoria, Australia. The broader landscape is characterised by undulating slopes of cleared farmland, patches of plantation, bushland, or granitic boulder fields.

Hanging Rock is an iconic regional landscape feature. The "Rock" is a single formation that has formed from a volcanic plug (mamelon) which has been exposed to considerable weathering and erosion over millions of years, leading to the current conglomeration of rock formations within the one volcanic peak. The rock complex occurs 718 metres above sea level, and rises 105 metres above the surrounding plains, visible from multiple vantage points of the surrounding landscape, including the nearby Calder Freeway.

This unique formation was formed six million years ago when viscous lava formed rounded layers on the earth's surface as it was pressurised and slowly released up through a narrow vent from within the earth. This lava had a high soda content, and combined with rainwater, resulted in an unusual rock type known as solvsbergite, or soda trachyte. This rock type is also found at the nearby Brocks Monument, Camel's Hump on Mt Macedon. Aside from these locations, the only other known locations of this rock type are in Norway and Sweden.

The name "Hanging Rock" is generally the name given to the entire rock formation; however, this name refers to a particular suspended rock located along the access steps on the eastern side of the formation, to an area known as 'Stonehenge'. Thus, the name Hanging Rock has become synonymous not only with the larger rock formation, but the broader recreational reserve, known as the Hanging Rock Precicnt.

3.1.1 Bioregion

Bioregions are a landscape-scale approach to classifying the environment using a range of attributes such as climate, geomorphology, geology, soils and vegetation. There are 28 bioregions identified within Victoria. The Hanging Rock Precinct and surrounding Macedon Ranges are located within the Central Victorian Uplands bioregion. The following geological description of the area is provided by DELWP.

> *Central Victorian Uplands, located in the central Victoria, is dominated by Lower Palaeozoic deposits giving rise to dissected uplands at higher elevations, amongst granitic and sedimentary (with Tertiary colluvial aprons) terrain with metamorphic and old volcanic rocks which have formed steeply sloped peaks and ridges. The less fertile hills support Grassy Dry Forest and Heathy Dry Forest ecosystems. Herb-rich Foothill Forest and Shrubby Foothill Forest ecosystems dominate on the more fertile outwash slopes. The granitic and sedimentary (with Tertiary colluvial aprons) terrain is dominated by Grassy Woodlands much of which has been cleared. Lower lying valleys and plains are dominated by Valley Grassy Forest and Plains Grassy Woodland ecosystems*

3.2 Historical Context

3.2.1 Traditional Owner History

Traditional Owner history is being explored through consultation with the three Traditional Owner groups; the Dja Dja Wurrung, Taungurung and the Wurundjeri Woi Wurrung, as part of the cultural values recording session for the development of the Hanging Rock CMP, a project running in parallel to this EMP update. The CMP when finalised will guide the telling of indigenous history and connection with the Rock.

Each of the Traditional Owner groups share connection with the Rock and surrounding Country, and acknowledge the site as a place of gathering for tribal groups over thousands of years prior to European colonisation. The future involvement of Traditional Owners through the implementation of the Strategic Plan will enable the voices of indigenous people to be heard and stories told, as curated and presented by the Traditional Owner Groups themselves.

Refer to the Hanging Rock Strategic Plan (DELWP 2018) and the Hanging Rock CMP (ELA 2021) for further discussion of Traditional Owner history and associations with the Rock and surrounds.

3.2.2 European History

The first European record of Hanging Rock was by Major Mitchell who named the formation Mount Diogenes. Hanging Rock later became part of the early settler Edward Dryden lands, and became known as 'Dryden's Rock'.

In the 1860's, Mr W Adams built the Hanging Rock Hotel to the west of the rock (the site is now at the crossroads of Coach and Colwells Roads). Mr Adams also owned land to the south-west of Hanging Rock (in the current picnic grounds at the southern base of the rock) and he began holding picnics and race days on this land from the 1860s. Adams acquired the allotment that contained Hanging Rock in 1869.

In 1870, the Government gazetted the 38-hectare allotment to the east of Hanging Rock (now the racecourse) as a recreation and water reserve. The allotment containing Hanging Rock was gazetted in 1884, and the combined sites were permanently reserved as a 'site for Public Recreation and for affording Access to Water'. The Reserve was controlled by the Council of Newham and Woodend until 1959, when at the request of the Council, three members of the Hanging Rock Race Club were added to the Committee of Management.

The racecourse was moved from south-west of Hanging Rock to its' present location, in 1878. The Hanging Rock Racing Club was formed in 1885, and the race track was extended to its present form in 1911. Racing at Hanging Rock has been popular and well attended since the 1860's.

Perhaps the most well know "historical event" was its setting in the 1967 publication of Joan Lindsey's novel 'Picnic at Hanging Rock' and the film production of the same name in 1975. The mystery and intrigue that was communicated through the film and novel have drawn visitors to the site ever since.

3.3 Site description

Hanging Rock Precinct is approximately 92-hectare in size, consisting of a combination of natural areas, managed recreational spaces, and built facilities.

The western third of the site is highly vegetated and contains the main attraction of the Rock formation itself, and surrounding slopes of remnant bushland that are traversed by three main walking tracks. The visitor information centre and café are located at the base of the rock area and at the start of the walking trail loop. South of the visitor centre are the main picnic areas, featuring large open lawns with many scattered large old Eucalyptus trees.

The centre third of the site features the main recreational facilities including the racecourse buildings and amenities; the racetrack itself encircles an open native grassland and large dam. South of the racecourse grassland and within the track is the cricket oval and clubhouse. The main carparking is located adjacent to both the main picnic area and the cricket oval, though busy days see parking across all open and accessible areas of the south-west section of the Precinct.

Smokers Creek, a narrow semi-permanent waterway, traverses the site east to west, parallel to the southern boundary, and includes a narrow vegetation corridor of large trees and understory shrubs.

The eastern third of the site contains a largely open 22-hectare area known as the East Paddock. This expanse provides the best views of the overall Rock formation and has been used for its vantage point to host concerts with the backdrop of the rock feature. The East Paddock was purchased over 20 years ago for the purpose to alleviate the picnicking and event pressure on the sensitive crown land reserve, and to enable expansion of the site's conservation values, serving as a buffer between the reserve and the adjoining rural living uses (Loder & Bayly Consulting Group 1993). Historically used as grazing land, it now consists of two cleared 'paddocks', and a smaller third area to the south which is lower lying and situated along Smokers Creek. This southern section has been substantially revegetated with indigenous tree species, mostly along Smokers Creek's riparian zone. and plantations of indigenous trees have been established around the perimeter of the two paddock areas at the boundaries.

Racecourse Road traverses north-south through the Precinct and provides the main access from South Rock Road. Straws Lane forms the boundary to the east and provides the main access into the East Paddock. Access for major events is via Colwell Road to the north, facilitating horse floats, trailers and buses. The Precincts' western perimeter is adjacent to a number of small 'rural living' allotments, with six of these allotments backing directly onto the Precinct boundary.

Perimeter fencing consists of secure cyclone fencing and barbed-wire, and access via the main entrance from the south is enabled through a boom gate and ticketing system only. All gates remain

locked unless required for alternative access for major events, with the exception of wildlife gates that remain open and are primarily used by the resident kangaroo population.

3.3.1 Land Tenure

The western two-thirds of the Precinct is Crown Land permanently reserved for the purpose of Public Recreation and Affording Access to Water by way of notice in the Government Gazette 1884.3210. Council is the current Committee of Management on behalf of DELWP for this western portion, and owns the freehold land known that is East Paddock.

The Victorian State Government is currently in the process of negotiating the purchase of the East Paddock to bring it into the Crown Land reserve system.

3.3.2 Current Management and Use

The Hanging Rock Precinct is currently managed by the Visitor Economy and Environment Units of MRSC, as the Committee of Management, as designated by DELWP.

The operational management of Hanging Rock is generally self-sufficient in terms of funding through entrance fees, although corporate support is also provided by Council. State and Federal Government funding has also been made available in recent years for environmental management, infrastructure needs and asset renewal.

Recent management has seen a greater focus on the environmental values of the site, as a result of implementation of the 2015 EMP, and the introduction of the position of Conservation Reserves Officer as part of the on-ground management team.

3.3.2.1 Recreational Use

Historically, the Hanging Rock Precinct has primarily been managed as a recreational reserve. The site's natural values and passive recreation opportunities are a major tourism and visitor attraction in the region with over 30,000 people visiting the reserve each year to climb the Rock, picnic and bushwalk.

The annual horseracing meetings are likely the most well-known recreational event held at the reserve, with a history that dates back 130 years.

Table 7 below summarises the current recreational uses of the Precinct.

Table 7. Summary of recreational activities currently available at the Hanging Rock Precinct

Passive recreation: Unorganised, or non-competitive recreational activities, including	
• Picnicking	Year-round
• Walking/running, including the Pinnacle Walk	
• Fishing	
• Bird/Wildlife watching	
• Photography	
Active recreation – Sporting clubs that use facilities at the reserve	
• The Hesket Cricket Club	Year-round
• The Hanging Rock Petanque Club	Year-round
• The Hanging Rock Tennis Club	Year-round
Major Events – Occasions where visitor numbers to the reserve require additional staff/amenities	
• Horse races (x2) hosted by the Kyneton and Hanging Rock Racing Club	January
• Music concerts	Nov -March
• "Run The Rock"	April
• Car shows hosted by The Macedon Ranges & District Motor Club	February
• Craft markets hosted by Craft Markets Australia	October-March
Small Events – private events, or small- scale council run events	
• Camp Out at the Rock	March
• Film nights	February
• Private events (e.g., weddings)	Year-round
Educational or volunteering activities	
• Night walks	Summer
• Landcare working bees	Opportunistic
• Bird surveys	October

3.3.2.2 Ecological Management and Monitoring

External perimeter Fence

The current fence allows for the movement of wildlife in an out of the Reserve. Wildlife gates are located on the western site boundary and are primarily used by Kangaroos. There are several holes that occur on the northern and eastern boundaries that appear to be man-made, and show signs of being used by wildlife. Other Precinct boundaries show signs where fauna have dug beneath the fence. The fence does appear to operate effectively to prevent unauthorised access by the public.

Discussion within Council over several years has considered the option of installing predator-proof fencing, and having the Precinct run as a predator-free ecosystem. However, given the relatively small area, and the limited high-quality natural habitat within the site, the Hanging Rock Precinct is not an ideal location for a predator-free facility. It is also worth noting the significant role of The Precinct within the Cobaw Biolink, and the need for free movement of fauna in and out of the Reserve. Further to this, high-visitation levels associated with the current level of recreation use, including scheduled events, are not conducive to the management and objectives of a predator free facility.

Delineation of Conservation Areas

Methods of demarcation are utilised to visually or physically separate areas of ecological values from those areas with a recreational focus, primarily to reduce impacts to conservation areas. For areas adjacent to main picnic areas, such as along Smokers Creek, natural vegetated areas are separated with large logs and fallen trees, creating an aesthetic separation between managed and unmanaged areas. In most other areas of the reserve, fencing of various types and condition are in place to restrict access to vehicle's and keep visitors to the main walking tracks or roads.

Protection of Large Trees

The Reserve has historically been subject to regular and ongoing tree management for human safety due to high visitation levels. Arboricultural assessments and limb lopping/removal are undertaken across many of the multi-use areas and funded by an annual tree maintenance budget. The areas of the Reserve in which this occurs are the those typically considered as high- use, mostly correlating with the mown areas of the picnic/recreation areas, along the main walking tracks, car parks, in and around the cricket oval, and in the picnic area north of the racecourse facilities.

All trees within these areas are assessed annually, and there is a census of all mature trees. On an 'annual' or 'as needs' basis, unsafe and/or dead trees/limbs within the mown areas and along the main walking tracks are assessed for safety and the limb/tree removed if deemed a safety risk by the arborist.

The 2015 EMP presented recommendations for consideration of biodiversity values in the ongoing management of these trees. Tree Conservation Areas (TCAs) were introduced for large trees, mostly within the popular picnic areas, to improve the health of large trees, and reduce some the need for tree lopping. Recommendations for the TCAs included mulching and revegetation of the area beneath and within the canopy dripline. This approach has been successfully implemented across the main

picnic areas south of the Rock, around the large trees south of Smokers Creek, and for trees close to the recreational facilities around the Cricket Oval.

The 2015 EMP states that;

> *Whilst the TCAs will not eliminate limb lopping/tree removal management works, they will ensure large mature trees, or groups of trees, are primarily managed for conservation purposes in the Recreation Zones. Mowing underneath will be eliminated, understorey will be planted and habitat for ground dwelling fauna will be created.*

Revegetation

Revegetation works have been the key action implemented to improve biodiversity values on the site since adoption of the 2015 EMP, which outlined directions for the use of EVC templates in decision-making and implementation of revegetation programs. EVC templates were to provide guidance on the species and planting densities, however this strategy was found to be limited in its application given the variability in existing conditions and multiple uses of the Precinct, and not applicable in situations where native vegetation was already present and infill/supplementary planting was required.

A Revegetation Plan (Young 2018) was completed to build on the methodology outlined in the 2015 EMP, providing clear decision-making and the logical application of revegetation principles. It also recognised the differing objectives and requirements of management areas within the Precinct. This Revegetation Plan has guided the installation of approximately 28,000 plants within the Precinct in recent years, and continues to be an important tool for the implementation of revegetation works within the Precinct. Table 8 below summarises the purpose of revegetation within the site as it has been completed to date.

Table 8. Summary of revegetation aims

Purpose	Locations	Comments
Tree Protection	Managed Picnic Areas	Specifically, in areas that are regularly mown- vegetation installed to reduce impact to large trees in high traffic areas. Features low groundcovers, grasses and sedges, shrubs and large trees avoided to reduce stress/competition with large trees.
Ecological Enhancement	Conservation	Replacement or recovery of missing or diminishing vegetation types to improve overall structure, diversity, and habitat opportunities of the area
Remediation	Rock Area	Used to create barrier/deterrent to prevent visitors from leaving formal paths and to reduce erosion issues etc
Aesthetic improvement	High traffic areas, boundaries.	Used to enhance the aesthetic appeal of the site. Most often around entries and along paths, in the form of grasses or sedges

Monitoring

Fauna Monitoring is currently conducted directly for, or facilitated by, the MRSC Environment Unit. This is completed in line with the Hanging Rock Fauna Monitoring Plan 2018 (MRSC 2018a). Methodology and record keeping is described within this Plan for a range of annual monitoring events, including spotlighting, nest boxes, camera traps, bird surveys, koala counts and pest animal monitoring.

There is currently no Precinct-wide plan in place for monitoring of flora; monitoring that has been conducted has been relatively sporadic in its application, or specific to set locations within the Precinct. Monitoring of grassland plots has been completed annually since 2016, and has contributed to understanding of grazing pressures and deterioration of the grassland values through lack of fire, or any other biomass control method application for management of the grassland flora values. (Just 2018) (Scott-Walker and Lamandé 2020). Monitoring has also taken place in 2016 and 2018 in monitoring plots within the Core Conservation Zone 1- The Rock and Surrounds. Continued monitoring of this area will be vital for instructive management and evidence-based actions for adaptive management of the vegetation surrounding the Rock.

3.3.2.3 Weed Control

Invasive plant management is currently implemented in line with the weed categorisation system outlined in the 2015 EMP, and is summarised in Table 9 below.

Table 9. Weed Prioritisation Categories

Weed Prioritisation Categories	Description of each Category
Keystone (K)	Totally dominate structurally and floristically/old populations that have reached the peak of their invasion potential in a given area • Many species (flora and fauna) may have become dependent on the weed • Work slowly and systematically from highest understorey indigenous vegetation quality areas outwards • Remove mature specimens first • Keep in mind buffers/habitat
Small patches (S)	Of variable risk, but easiest to eliminate as they are in small numbers Small patches or the only observed occurrence of a species in the site
S1	**S1:** Highest risk and priority for control. Eliminate from the site
S2	**S2:** Moderate risk and priority for control. Eliminate from the highest quality areas first
Ubiquitous species (U)	Scattered weeds of disturbed areas Hard to eliminate; look at management regimes Eliminate in high quality areas, But of lower priority elsewhere in the site

Weed categorisation categories provided by Gidja Walker, 2014

The Implementation Plan (MRSC 2020) used to schedule and document the success of works against the directions and management works of the 2015 EMP indicates that weed control is undertaken on an ongoing basis; quarterly, bi-annually or annually as required.

Consultation and literature review revealed that Smokers Creek was once 'choked' with a thicket of Blackberries **Rubus fruticosus subsp. agg*, Montpellier Broom **Genista Monspessulana*, Holly and Portuguese Laurels **Prunus lusitanica*. This thicket has been mostly removed, and the area restored through revegetation, though this area continues to require treatment and monitoring for weed infestations.

Successful weed control is evident as a general lack of woody weeds in the high-visitation areas around the visitor centre, carpark and main picnic grounds. However, woody weeds have persisted in the less frequented areas of the reserve, including along the full extent of the riparian corridor of Smokers Creek, within the Core Conservation Area of the Rock, and within established revegetation areas.

The amount of on-going weed control works undertaken therefore appears to be limited to managing small infestations in high usage areas. Opportunity now exists to target the weeds growing within the lower-usage areas.

Whilst there are some woody and scrambler/climber (i.e.: Blackberry) weeds present, the dominant weeds are grassy/herbaceous, which tend to be more difficult to control and eradicate than woody and scrambler/climber weeds.

Woody Weeds

As was reported in the 2015 EMP, the main observation from the 2021 fieldwork was that Hanging Rock's recreational areas (the mown areas) were well maintained. The majority of pest plants were located around the rock, in the racecourse grassland, along Smokers Creek and in the unmown sections of the Reserve.

Leafless English Broom **Cytisus scoparius* is scattered throughout the reserve, and may have evaded control when hidden in dense vegetation, or appear as sedges or rushes in wetter areas. The riparian corridor contains small remaining infestations of other woody weeds, most notably Holly**Ilex aquifolium*, though revegetation efforts and weed control efforts appear to have improved the areas that were reportedly once choked with weeds (pers. comm Penny Roberts)

Woody weeds, including Holly remains present in areas close to the Summit Track, with a large mature Holly plant located off the track, on the southern aspect of the Rock. This has the potential to lead to further spread into harder-to-access locations around the rock.

Winged Slender-thistle **Carduus tenuiflorus* and Spear Thistle **Cirsium vulgare* appear to have increased in cover. Although historically controlled, Spear Thistles especially have now spread into both managed and unmanaged areas of the Reserve.

The Grassland Management Plan (Scott-Walker and Lamandé 2020) identified woody weeds including Hawthorn *Crataegus monogyna, English Broom, Montpellier Broom **Genista monspessulana*, Sweet Briar **Rosa rubiginosa*, Common Blackberry **Rubus anglocandicans*, and Spear Thistle.

Herbaceous Weeds

Most of the picnic and recreation areas that are maintained as mown/slashed lawn are dominated by exotic grasses. Capeweed has been targeted in recent years and is now only visible in small patches in scattered locations.

The large infestation of Blue Periwinkle at the western end of the creek was reportedly well managed at the time of the 2015 EMP. This site has now been allowed to go unmanaged, and cover has increased. (P. Roberts 2020, pers. comm).

Autumn surveys also identified patches of Chickweed **Stellaria media* in and around the lower sections of the rock formation.

The most extensive weed on site is Sweet Vernal-grass **Anthoxanthum odoratum*, which occurs as high-cover within conservation areas including through most of the vegetation around the Rock formation as well as the Smokers Creek Riparian corridor.

3.3.2.4 Pest Animal Control

Control of pest animals is currently undertaken in line with the 2015 EMP, primarily for the control of rabbits, involving fumigation and closing of warrens. These programs have been relatively successful, resulting in a reported decline in observed rabbit numbers and warren locations Several active warrens and fresh scratching's were identified during the site assessments in the less visited areas of the reserve.

3.3.2.5 Current Fuel Management

Fire Management Zones (FMZs)

The objective of designating Fuel Management Zones is to define the exact location and extent of these areas, to ensure that other land management uses (such as revegetation) do not overlap with fuel management practices.

Fire Management Zones are located at all boundaries, occurring as wider managed areas on the Northern and western boundaries adjacent to the Rock formation and surrounding vegetation. FMZs also occur adjacent to Racecourse Road, for management of fine fuels in close proximity to main recreation areas, the Racecourse facilities, as well as the café and visitor Information centre.

Within FMZs vegetation is slashed to 10cm or less at the beginning of the Fire Danger Season, and throughout the season as required. Slashing in early Spring and mid to late Summer has been

recommended to enable any existing wildflowers to flower. For areas of native vegetation – there are scattered trees and some shrubs, which are either isolated shrubs or they occur in clumps which are separated from other shrubs/clumps of shrubs. The lower branches on some trees have been removed so they do not create a 'ladder' for fuels, or hinder the management of understorey vegetation.

3.4 Progress of 2015 EMP

3.4.1 Review of 2015 EMP implementation

Hanging Rock was classified as a recreation reserve at the time of development of the EMP in 2015, and was managed through the Sport and Recreation Department of the Macedon Ranges Shire Council. As such, the 2015 EMP highlighted options for ecological improvement of the high value conservation areas while also considering possible improvements of ecological values within areas that had a predominantly focus on recreation. The approach required a balance between the management for ecological values with the priority of ongoing recreational activities

The objectives of the 2015 Hanging Rock EMP were:

- To identify the environmental values of the Hanging Rock Precinct
- To establish a prioritisation program of management actions aimed at conserving and enhancing the sites environmental values while managing environmental risks and maintaining the Precinct's recreation and tourist functions
- To establish a monitoring and evaluation program for the precinct's environmental assets

The key document for monitoring the status of implementation of tasks required under the 2015 EMP has been the *Implementation Plan – Hanging RockV4 – 2019-20 (D18-96521).* This document has been maintained by lead rangers at Hanging Rock, being updated each year to reflect the completion of works carried out against the actions and recommendations in the 2015 EMP.

A comprehensive review of this Implementation Plan indicates that these actions and recommendations have been largely implemented each year since its commencement in 2015. The key actions aimed at improving the quality and ecological function of the site have included the retention of logs and branches where possible, an extensive revegetation effort, and monitoring recommendations to improve knowledge of the site's ecological significance.

The following section breaks down the Implementation Actions as recommended in the 2015 EMP and uses a traffic light system to assesses the completeness and the effectiveness of the implementation in achieving objectives the of the 2015 EMP since its commencement.

fully implemented	effective
partially implemented	moderately effective
not implemented	not effective

Recommendation	*1, 2, 5, 7, 12, 14, 16, 18*
	Control all woody and scrambler/climbing weeds and thistles across the Reserve
Implementation	partially implemented
	• Weed control activities have been implemented each year since 2015 with some success. • Focus has reportedly been on high-traffic areas and on high-threat weeds. • Stands of woody weed Holly remain in the southern areas of CCZ1(Rock area) • Smokers Creek and CCRZ1 remain the key areas for woody weed control • Woody weed elimination programs may be appropriate to further address remaining species after targeted efforts in the last 5 years.
Effectiveness	effective
	Control of woody weeds is a standard and achievable management direction typical of any management plan. Focus on high significance conservation areas is required moving forward due to presence of large seeding mature weed individuals now present in no-low traffic areas, as well as for aesthetic purposes in high traffic areas.

Recommendation	*5*
	Prepare a Grassland Management Plan (with reference to the previous Plan prepared in 1993)
Implementation	fully implemented
	• The Grassland Management Plan was completed by Arcadis in 2020 • Given its recent completion, directions and recommendations are largely yet to commence
Effectiveness	effective
	Recommendations for the development of a Management Plan specifically addressing the Racecourse Grasslands were appropriate given the significance of the grassland in the region and the ongoing management concerns, regarding use of fire, and response to the evidence of overgrazing by kangaroos as outlined in 2018 monitoring activites.

Recommendation	*6*
	Prepare and implement a Kangaroo Action Plan that reviews the carrying capacity of the reserve, including within the Grassland
Implementation	not implemented
	A Kangaroo Action Plan is yet to be developed.
Effectiveness	effective

A Kangaroo Action plan is an important document required to be produced in order to appropriately manage the permanent population of Kangaroos at the Precinct. Current unknowns are the carrying capacity of the Precinct and Grassland areas, and the full extent of the effect of kangaroo grazing/browsing to biodiversity within the Precinct. Grassland monitoring occurring between 2016 and 2018 (Just 2018) provides documented evidence of the detrimental effect of permanent Kangaroo Grazing on the Racecourse Grassland area, and initial observation during site visits suggest browsing of shrubs in treed areas, which may be associated with a lack of shrub recruitment and regeneration long-term.

Recommendation	*9, 15, 17, 88, 90, 92, 98*
	Undertake a staged annual program of implementing Tree Conservation Areas in the Recreation Zones
Implementation	partially implemented
	• a total of 20 TCAs have been installed across the Precinct • a further 40 are planned to be installed in the coming years
Effectiveness	effective
	This recommendation responds to documentation of the health of large trees, particularly in reference to areas of high traffic. TCAs provide an opportunity of mitigate the effects of soil compaction and the opportunity to increase plant diversity through revegetation through the main recreation areas of the Precinct, and creating connectivity throughout generally non-vegetated areas of the Precinct, such as the main parkland/picnic areas

Recommendation	*11, 22, 25, 29, 99, 31a*
	Undertake revegetation along Smokers Creek riparian zone where appropriate and throughout the reserve more broadly
Implementation	partially implemented
	• Approximately 28,000 plans have been installed throughout the Precinct since 2015 • Focus areas are primarily TCZ,
Effectiveness	effective
	Revegetation plays an important role in creating habitat structure and connectivity in modified environs. The installation of revegetation within the Smokers Creek zone appears problematic given the high cover of woody and herbaceous weeds.

Recommendation	*11, 22, 25, 29, 99, 31a*
	Prepare and implement a pest animal management program to target specific species as required. Undertake rabbit control to reduce rabbit harbour amongst the Bracken
Implementation	partially implemented
	• Rabbit control has been implemented with moderate success within the Precinct using fumigation only • Remaining infestations are in difficult to treat areas, namely beneath buildings and racecourse facilities • Fox control has not been implemented and has not been viewed by rangers as essential
Effectiveness	effective

	Control of Pest animals is a requirement under the CALP Act 1994 and is a standard management action required to be implemented, especially in areas with biodiversity values. Use of baiting within the Precinct is difficult to implement – to be reviewed in 2021 update

Recommendation	*20, 30, 31, 39, 40, 50, 18a*
	Install monitoring plots prior to undertaking any revegetation/regeneration works on top of the rock for erosion control purposes. Prior to undertaking any works, baseline data should be collected. Data should then be collected on an annual basis, depending on the projected timeline of the project
Implementation	partially implemented
	• Implementation plan suggests monitoring plots have not been implemented • Purpose of monitoring unclear to Rangers as communicated in implementation plan – monitoring of existing monitoring points are recorded to have occurred. • Transect based survivorship monitoring is recommended by former lead Ranger Danial Young within the Revegetation Plan and to be explored and implemented where practical.
Effectiveness	partially effective
	• Monitoring purpose unclear, may be used in the future to – gauge effectiveness and reducing erosion – identify plants preferable/ suitable for revegetation on the rock through analysis of success rates

Recommendation	*35*
	Continue current practice of removing fallen/lopped limbs in the Recreation Zones, for aesthetic and slashing/mowing purposes *o Re-use larger logs as barriers to define TCAs and Management Zones* *o Re-use smaller limbs for mulch* *o Store any unusable/exotic material in on-site depot (refer to Section 8.6.10), for later disposal, which could include burning or removal to a Council Transfer Station*
Implementation	partially implemented – ongoing
	• These activities are undertaken on an ongoing basis • Mowing and removal of debris is acceptable and required from a safety and bushfire risk perspective
Effectiveness	effective
	Provides an excellent solution to the designation of revegetation areas and TCZs through the retention and use of large logs, and is aesthetically beneficial for Recreation Areas, and well as providing some level of ground

Recommendation	*14, 36*
	Continue the current management practice of safety inspections and tree/limb removal as required, in the Recreation and Tree Safety Management Zones as well as around racecourse
Implementation	fully implemented

	• These activities are undertaken on an ongoing basis • Mowing and removal of debris required from a safety and bushfire risk perspective • Tree assessment are undertaken at least annually for high traffic areas, and along Maintenance tracks
Effectiveness	effective
	Appropriate and required for site safety, especially in high traffic areas, maintenance and emergency vehicle tracks within the Precinct.
Recommendation	*42, 42a, 43*
	Continue existing fuel management works along the perimeter of the Reserve
Implementation	fully implemented
	• ongoing management across the Precinct within fuel management zones as Maps 10 & 11 in 2015 EMP in line with the Defendable Space Management Standards • includes mowing/slashing, removal of small woody material, large logs are retained
Effectiveness	effective
	Appropriate and required for a site safety in the context of high visitation during the summer months. Fuel management recommendation to be updated in 2021 EMP.
Recommendation	*49, 52, 53, 54, 56, 57, 58, 59, 61, 62, 63, 65, 65a, 66, 82*
	Develop a Fauna Monitoring Action Plan for the reserve to facilitate collection of ongoing data and information about the presence/ absence of species, population densities and population changes
Implementation	partially implemented (TBD)
	• Unclear if such a plan is use – has not been provided for review as part of this 2015 EMP review and update. • Internal consultation process indicated that a Threatened Species Monitoring Program is in place for Hanging Rock – details unknown
Effectiveness	effective
	Fauna monitoring Action Plan is now deemed even more important in response to the objectives of the strategic plan; the prioritisation of biodiversity, and the requirement of considerations for eco-tourism and education, and the role of community groups in Precinct management and activities
Recommendation	*72*
	Monitor the perimeter fence regularly and undertake maintenance works as required to prevent access by domestic dogs and cats from adjacent areas.

Implementation	fully implemented
	• fences checked on a weekly basis, and maintained as required
Effectiveness	partially effective
	Further direction is required as to the purpose of current fencing. Current fences allow fauna movement through open gates and fence breaks at various points along the boundary, including invasive species.

Recommendation	*87, 62a*
	Design and install appropriate signage to identify some TCAs and outline their function. Install signage along the walking tracks under some of nest boxes, to provide information about their use in the Reserve.
Implementation	partially implemented
	• Implementation plan suggests this has been partially implemented, no further information available
Effectiveness	partially effective
	TCA's may not be considered priority areas for signage at the Precinct in the context of the features of the broader site. Recommendation for signage for visitor information, education, and with consideration of passive movement around the site to be included in the 2021 EMP update – Part 2

Recommendation	*87, 62a*
	Undertake an ecological impact assessment for future recreation activities, as appropriate, as a part of the investigation process and refer these proposals to Council's environment unit for approval. Ensure Council staff and contractors entering Hanging Rock are included in Council's vehicle hygiene program. Identify and signpost a clean down area for machinery entering the site
Implementation	partially implemented (TBD)
	• ecological impact assessments completed on a case-by-case basis – unclear if any completed to date • Implementation plan unclear what hygiene measures are currently in plan, and identifies requirement to implement more regularly
Effectiveness	partially effective
	Highlights the need to consider possible detrimental effect of the various recreational activities on flora and fauna. This recommendation may be built upon further in regards to fauna. Considerations of vehicle and equipment hygiene may be considered apart from the requirements of future recreational activities and to form separate recommendations

2015 EMP GAP Analysis

Based on the fieldwork completed as part of the current EMP review and internal Council consultation to date, the following have been identified as gaps in management of Hanging Rock Precinct that were not addressed within the 2015.

Addressing these gaps through additional implementation actions within this 2021 EMP Update will aim to meet the objectives of the 2018 Strategic Plan, which will form the basis of updated objectives for the management of the Precinct moving forward.

Flora and Fauna Management	
GAP	**Proposed Action – EMP Update Part 2**
• lack of reference site- Hanging Rock Precinct unique in its geology and as such is unique in its floristic composition	• recommend detailed floristic investigation of the site to improve knowledge of individual site and its significance
• provision of defined actions and targets for measuring the success of works to support the management objectives	• clear time or condition-based actions where possible to guide management
• further improvement for connectivity throughout the Precinct, especially relating to connectivity in recreation areas and through and around East Paddock in conjunction with Cobaw Biolink project	• consideration for additional locations across site that is appropriate for enhancement through revegetation while remaining suitable for public use and having a negligible increase to bushfire risk
• consideration for the role for natural regeneration for the long-term health and sustainability of the vegetation within the Precinct	• establish monitoring and commission documentation to identify drivers for lack of regeneration of native flora across the site, • consider supplementary planting/restoration methods for mid-story and canopy species particularly in the rock area
• direction for consideration of the effects of climate change on the site long term, and how these may be mitigated	• recommendation to investigate provenance options for revegetating species towards more drought-tolerant populations
• effective use of fire within the Precinct as a management tool	• recommendation for development of a burn plan, TBD through consultation with fire safety Officers, DELWP and traditional owner groups
• consideration for alternative parking arrangements, with the focus of moving traffic away from Core Conservation Areas	• recommendation to investigate options for parking in the east paddock, especially for high traffic days
• consideration for enhancement of main dam as habitat, including revegetating with wetland species as appropriate	• investigate advantages and disadvantages of revegetation in Dam areas, as well as limitations
Safety and Site Management	
GAP	**Proposed Action**

• direction to improve connectivity across the site while also considering increased fire risk that may be associated with successful revegetation programs	• revegetation to be focused on Core Conservation Areas until the development of the Master Plan for site including proposals for the East Paddock
• clear direction for permitted dog activity within the Precinct, if any	• update as directed by the Council Dog and Cat Order introduced in 2019
• defendable space requirements unknown until plans are developed for future development (such as expansion of visitor centre or relocation)– how could this effect work to enhance vegetation surrounding these areas?	• investigate simple scenario testing to indicate whether revegetation will be affected by new proposals (likely largely unknown at this stage)
• indication of defendable space for existing or proposed infrastructure and how that impacts other proposed works	• discussion of opposing factors for further development in relating to site enhancement
• consideration of Australian Standards for track installation and maintenance	• Consider developing a document for track standards, or implement an existing document utilise in the wider municipal area where tracks are to be upgraded or established
• alternative parking for high visitation days – parking currently occurring in proximity to main picnic and core conservation areas	• investigate possible alternatives for parking, including advantages and disadvantages of parking locations within the east paddock and use of shuttle service for visitors with limited mobility to picnic areas
• direction of whether predator proof fence is likely/ or appropriate to be installed	• Site deemed too small overall to be considered as a contained predator-proof area, however predator proof fencing techniques may be beneficial for some sections of the perimeter as a deterrent for pest animals– noting that perimeter fencing must allow for free movement of wildlife in and out to avoid captive populations. Development of Hanging Rock Precinct into a predator-proof area may be considered as a goal in the future, dependant on the direction of the Master Plan.
• direction for installation of signage on rock, and throughout the Precinct more broadly	• Opportunity to create a passive interactive experience for visitors, to direct movement on the rock – can be used for education/biodiversity /cultural awareness as well as to logistically manageme movement of people on the Rock, and direct traffic away from/to particular areas
Community and Education	**Proposed Action**

• inclusion of clear description or role of community groups in the management of HR	• discussion of opportunities for community engagement
• managing communication with community, including detail of ongoing management events occurring through the Precinct – weed control, baiting programs burning off etc	• creation of a comms plan for communication notification
Municipal environmental education events currently not hosted at Hanging Rock Precinct despite availability of visitor facilities and the unique nature of the Precinct	Investigate the feasibility of hosting community environment events at Precinct

4.

Values of the Hanging Rock Precinct

4.1 Landscape Values

4.1.1 Landscape connectivity

The Macedon Ranges have recently been recognised as a Distinctive Area and Landscape under the *Planning and Environment (Distinctive Areas and Landscapes) Act 2018*.

The role of the Hanging Rock Precinct in the region is integral to the overall vegetation connectivity of the surrounding landscape. The 24 hectares of remnant bushland that surround the rock formation is the largest patch of uncleared land and indigenous habitat between the Macedon Ranges and the Cobaw Ranges, forming an important component of the Cobaw Biolink.

The riparian corridors of both Five Mile Creek and Deep Creek at Newham, as well as the area's high conservation roadsides, also form habitat links that meander through the landscape. These vegetation corridors, while comprised generally of narrow patches of native vegetation, connect with remnant and strategic plantings on private land to effectively link Hanging Rock to both the Macedon Regional Park and the Cobaw State Forest.

The Biodiversity Strategy (MRSC 2018b) acknowledges the importance of landscape connectivity and vegetation cover, and features the protection and improvement of such corridors as one of the key goals of the Strategy.

The Cobaw Biolink

In the regional landscape, the Precinct occurs between the Macedon Ranges (part of the Great Dividing Ranges) to the south and the Cobaw Ranges to the north, and is an important landscape feature that rises from the surrounding volcanic plains. It is the largest landscape feature between these two areas that is still predominantly vegetated with numerous ecological values, as is discussed in Section 4.2.

There is an Environmental Significance Overlay (ESO) that affects the footprint of the Cobaw Biolink which requires a permit for certain developments and land management actions with obligations to improve connectivity. The prime focus of the Cobaw Biolink ESO is to improve biodiversity in the region by connecting native vegetation in the landscape. Referenced in the Macedon Ranges Planning scheme, it also aims to enhance the region through requirements for pest plant and animal management, protection of remnant vegetation, strategic revegetation and other conservation and community education initiatives.

4.1.2 Smokers Creek and Adjoining Waterways

Smokers Creek is a key landscape feature of the Precinct, its few smaller tributaries flowing east to west through the southern portion of Hanging Rock Precinct. The Creek enters the site in several locations along South Rock Road (where it travels under the road), and in one place along Straws Lane. There are also two smaller drainage lines that enter the site from the north-east, that run into a small dam in the north-east corner of the East Paddock and into the racecourse dam.

Three small dams are located along or adjacent to the Creek, the largest of which is noted to have been historically planted with exotic vegetation and stocked with waterbirds to give more of a "European Feel" (Loder & Bayly Consulting Group 1993). As a result, the areas around dams and creek-line continue to require ongoing weed management, and lack the indigenous vegetation typical of high-quality or natural aquatic habitats.

Today, the waterway itself is a small, semi-permanent open channel drain that flows in the wetter seasons and experiences periods of intermittent drying. The Creek corridor is noticeably less managed than the more highly trafficked areas; weed cover is high overall, with the ground storey almost entirely dominated with exotic Sweet Vernal, Brome grass **Bromus diandrus*, as well as discrete patches of Blackberry and Blue Periwinkle *Vinca Major*, Cleavers **Gallium aparine* and Variegated Thistle *Silybum marianum*, along with occurrences of weedy shrubs Sweet Briar and Hawthorn. It is understood that wide-scale removal of ground-layer weeds through spraying has been avoided to maintain the green aesthetic of this creek line for the general public.

There are issues with erosion within the creek-line due to the narrow channel causing flows to be concentrated, resulting in the undermining of the bank in some locations. This is particularly evident in the section of creek south of the Cricket Oval.

Opportunities exist to improve the health of the creek by altering management practices, site infrastructure and amenities in relation to water use

Smokers Creek has much potential for further improvement, with concentrated restoration likely to dramatically increase the function of this biologically important aquatic ecosystem within the site, as well as offer an improved space to be appreciated by visitors.

4.2 High-value Conservation Areas

4.2.1 The Rock and Surrounds

The rock formation is the most dominant landscape feature- the slopes and the rock itself are surrounded by native vegetation generally considered remnant, with European occupation and modification of the site likely to have had some impacts on species richness and diversity over time. The most notable features presently are the large mature Eucalypt trees that surround the rock formation, and which also occur north and south of the Rock within the Picnic grounds, and through the Smokers Creek riparian corridor.

Groundstorey vegetation on the lower slopes of the rock is variable in response to changes in aspect. The cool and damp areas of the south and east slopes feature high cover of exotic grasses and dense stands of Bracken *Pteridium esculentum*. Slopes with a north or west aspect are noticeably drier with higher occurrences of indigenous forbs and grasses.

Canopy tree species are generally large, at least 60cm DBH, predominately Narrow Leaf Peppermint *Eucalyptus radiata*, Manna Gum *E. viminalis* and Candlebark *E. rubida* and the occasional Swamp Gum *E. ovata*. Regeneration of these species is notably absent with little to no recruitment. Some newer cohorts are present of the north aspect, where the drier environment and hence more open understorey may lead to greater opportunity for germination. This area also features plots that have been restored and revegetated successfully.

Middle-story vegetation around the rock formation is generally limited; large Blackwood *Acacia melanoxylon* occur on the damp south-facing slopes, along with Black Wattles *Acacia mearnsii* and Hazel Pomaderris *Pomaderris aspera.* Other middle storey species are small to medium shrubs; Musk Daisy-bush *Olearia argophylla*, Large-leaf Bush-pea and *Pultenea daphnoides.*

The rock summit consists of open, exposed and rocky areas with little to no vegetation, or alternatively, more sheltered areas with larger remnant eucalypts and shrubs, as well revegetated tussocks grasses, and sedges. The main canopy species in this location are a population of the lowland variety of Snow Gums *Eucalyptus pauciflora* which are believed to be a relic of the sub-alpine landscape that characterised the area during the last glacial period over 10,000 years ago. Other significant vegetation at the summit includes a stand of mature tree-form of Silver Banksias *Banksia marginata*.

4.2.2 The Racecourse Grassland

The 1993 *Hanging Rock Recreation Reserve Management Plan* (Loder & Bayly Consulting Group 1993) outlined the existence of a grassland of national significance within the northern half of the centre of the racecourse. This grassland still exists; however is now anecdotally in poorer condition than in 1993, potentially due to the cessation of strip burning and an increase in Kangaroo numbers (Just 2018).

The Racecourse Grassland Management Plan has now been adopted by Council (Scott-Walker and Lamandé 2020), highlighting the significance of the Grassland within the Precinct and within the broader landscape, and the requirement of appropriate management practices to preserve and enhance this asset. The following extract from the 2020 report discusses the significance of this site;

> *Grassy ecosystems throughout south-east Australia have suffered significant decline since colonial settlement, exacerbated within the Greater Melbourne region by the rapid growth and expansion of urban areas. Reserves including the Racecourse Grassland, able to support grassland flora, cryptic fauna, habitat for common fauna and native vegetation of Commonwealth significance, are essential for local biodiversity conservation (Kendal 2007). Further to this, land clearance for agriculture in the local area has resulted in steep declines in the extent and connectivity of native vegetation. The Racecourse Grassland occurs close to the boundaries of two bioregions and contains a unique mix of montane, woodland and grassland flora and fauna assemblages. The Racecourse Grassland reserve is therefore considered a precious environmental asset to the community of the Macedon Ranges Local Government Area and the broader Central Victorian Uplands and Victorian Volcanic Plain bioregions.*

4.3 Flora values

A flora species list has been collated for the Precinct through review of historical and recent floristic investigations, and through site assessments conducted by Practical Ecology in 2020 and 2021. This includes general observations for the entire site, as well as detailed assessments of the regionally significant racecourse grassland in 2019 to inform the Racecourse Grassland Management Plan (Scott-Walker and Lamandé 2020), and other detailed flora monitoring.

The aim of compiling all of the current and previous flora data into a single set of data was to provide a comprehensive source for referencing the flora of the Precinct, and to provide a framework for future flora surveys. The source/reference and date of all the flora species listed has been noted in separate columns within the flora list/s.

The planted native and/or indigenous trees and shrubs; located along the creek, Racecourse Road and around the car parks; have not been included in the species list, as per database conventions.

Seedlings from any planted native and/or indigenous trees and shrubs that have grown and spread within the Precinct were recorded as naturalised species.

4.3.1 Ecological Vegetation Classes

The following pages provide descriptions of the EVCs recorded at Hanging Rock based on DELWPs EVC benchmark descriptions, and the EVCs that are a result of a mosaic or transition which do not fall within the available EVC benchmark descriptions.

EVC No.	EVC	Bioregion Conservation Status	General Benchmark Description	Location within the Reserve Dominant Visual Characteristics
			EVCs Classified according to Benchmark Descriptions	
23	Herb-rich Foothill Forest	Depleted	Occurs on relatively fertile, moderately well-drained soils on an extremely wide range of geological types and in areas of moderate to high rainfall. Occupies easterly and southerly aspects mainly on lower slopes and in gullies. A medium to tall open forest or woodland to 25m tall with a small tree layer over a sparse to dense shrub layer. A high cover and diversity of herbs and grasses in the ground layer characterise this EVC (DSE 2004).	Located around the slopes and base of Hanging Rock, mostly to the south and east of the Rock. Historically this EVC extended to the east of the rock, and covered the hills located to the east of the Precinct. Fragments of this EVC can still be observed at the northern end of the racecourse and along Colwells Road. Around the rock it is dominated by Narrow-leaf Peppermints, with some Candle barks, with a Bracken *Pteridium* understorey. There are some scattered shrubs (Blackwood's *Acacia melanoxylon*, Hazel Pomaderris *Pomaderris aspera*, Must Daisy-bush *Olearia argophylla*, Large-leaf Bush-pea, *Pultenea daphnoides,* Black Wattles *Acacia mearnsii* and Kangaroo Apple *Solanum spp*) mostly along/near the walking track and surrounding the base of the rock formation. It is a moist, green and shady area, and as such ground storey is dominated by exotic grasses To the north of the racecourse this EVC is represented by a mixture of Narrow-leaf Peppermints, Candlebarks and Swamp Gums with a denser shrub layer of Blackwoods and Black Wattles.

EVC No.	EVC	Bioregion Conservation Status	General Benchmark Description	Location within the Reserve Dominant Visual Characteristics
47	Valley Grassy Forest	Vulnerable	Valley Grassy Forest occurs under moderate rainfall regimes of 700–800 mm per annum on fertile well-drained colluvial or alluvial soils on gently undulating lower slopes and valley floors. Open forest to 25 m tall may carry a variety of eucalypts, usually species that prefer more moist or more fertile conditions over a sparse shrub cover. In season, a rich array of herbs, lilies, grasses and sedges dominate the ground layer but at the drier end of the spectrum the ground layer may be sparse and slightly less diverse, but with the moisture-loving species still remaining.	Modified vegetation with historic and on-going canopy and shrub removal that has resulted in a ground-storey layer dominated by indigenous species characteristic of alley Grassy Forrest, The Hanging Rock Racecourse Grassland sits close to the modelled boundaries of these EVC's and characteristics of each can to a greater or lesser degree be observed within the Racecourse Grassland. This observation suggests that while the vegetation is more representative of Valley Grassy Forest (EVC 47) with a cleared canopy, it was likely once within an area where vegetation gradually graded between two or more of the surrounding EVC's. (Scott-Walker and Lamandé 2020)
55	Plains Grassy Woodland	Endangered	An open eucalypt woodland to 15m tall occurring on a number of geologies and soil types. Occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. The understorey consists of a few sparse shrubs over a species-rich grassy and herbaceous ground layer (DSE 2004).	Located around the western and northern bases of the rock, along the perimeters of the Precinct, Dominated by Narrow-leaf Peppermints and Candlebark. Some scattered shrubs present including Cherry Ballart *Exocarpus cupressiformis*, Dogwood and Black Wattles High diversity of understorey species including numerous indigenous grasses such as Kangaroo Grass *Themeda triandra* and Wallaby Grasses *Rytidosperma spp*, with Chocolate Lilies *Arthropodium spp*, Bulbine Lilies *Bulbine bulbosa* and orchids. A drier and more open area with a more open tree cover, no Bracken and a grassy/herbaceous ground-storey.

EVC No.	EVC	Bioregion Conservation Status	General Benchmark Description	Location within the Reserve Dominant Visual Characteristics
83	Swampy Riparian Woodland	Endangered	Woodland to 15m tall generally occupying low energy streams of the foothills and plains. The lower strata are variously locally dominated by a range of large and medium shrub species on the stream levees with large tussock grasses and sedges in the ground layer (DSE 2004).	Located along the south of the Precinct mostly along and around Smokers Creek. Characterised by mostly large eucalypts that are fairly dense along the creek and are more open around the picnic areas as a result of vegetation removal. It is dominated by Swamp Gums with a few Manna Gums *Eucalyptus viminalis* and Narrow-leaf Peppermints. Some shrubs, especially along the creek. Mostly Blackwoods with some Black wattles. The understorey is essentially non-existent and is either unmown exotic grasses/ herbaceous species along the creek and in the south-west corner of the Precinct or mown and maintained picnic areas.

EVC No.	EVC	Bioregion Conservation Status	General Benchmark Description	Location within the Reserve Dominant Visual Characteristics
			Non-Benchmark EVCs	
859	Montane Grassy Woodland/Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	**EVC 859 Status not available** EVC 73: Least Concern EVC 37: Vulnerable	**Benchmark description not available for EVC 859** <u>Description for EVC 73: Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic</u> Occurs in areas of low site quality on exposed rocky outcrops where rock is a dominant landform feature, soils are shallow or virtually absent and effectively rainfall is low. Shrubland to 2m tall with occasional emergent trees interspersed with discrete shrubless areas dominated by herbs and bryophytes/lichens characterise this EV mosaic. Commonly, the shrubland and herbland components of this mosaic cannot be separated at the site scale (DSE 2004). <u>Description for EVC 37: Montane Grassy Woodland</u> Occurs in montane elevations on moderately fertile soils on all aspects. An open eucalypt woodland to 10m tall, sometimes with a secondary tree layer. The understorey often consists of a sparse shrub layer which can be variable in height. The EVC is characterised by its grassy ground cover together with a variety of other graminoids and herbs (DSE 2004).	The rock consists of a variety of areas, open exposed rocky areas with little to no vegetation or more sheltered areas with larger eucalypts and shrubs. Near the summit of the rock, there is a patch of larger Snow Gums, which are also scattered in other areas of the rock. In lower parts of the rock on the southern side (known as the Central Forest Area), which is more sheltered, there are large old Narrow-leaf Peppermints and Candlebarks. The shrub layer contains numerous Musk Daisy-bushes and Large-leaf Bush-pea, In the rockier areas, there are a variety of indigenous Wallaby Grasses, Flax-lilies *Dianella* sp, and Mat-rushes *Lomandra* spp. The grasses/herbaceous species are growing in areas where there is no or limited foot traffic, or on the sides of the rock formation which cannot be accessed.

EVC No.	EVC	Bioregion Conservation Status	General Benchmark Description	Location within the Reserve Dominant Visual Characteristics
N/a	Shrubby Foothill Forest/Plains Grassy Woodland Mosaic	N/a	N/a	Band of vegetation along the western and northern slopes of the rock formation. Transition between the 'drier' Plains Grassy Woodland and the moister Herb-rich Foothill Forest. This area is rockier than either the areas of Plains Grassy Woodland or Herb-rich Foothill Forest, and contains Shiny Cassinia *Cassinia longifolia*. Characterised by a strip of shrubs (predominantly Shiny Cassinia with Bracken and some Wallaby Grasses in places. Dense shrubs are essentially non-existent in the other two EVC patches

4.3.2 Significant Flora Species

Table 10. Significant Species occurring within the Precinct

Species		FFG	EPBC	Location
Black Gums	*Eucalyptus aggregata*	vu	VU	Southern section of the East Paddock along Smokers Creek. Small patch- it is not known whether these plants are naturally occurring, as there is no known history of them being planted within the Precinct. This species does occur naturally within the region where they almost exclusively occur on roadsides and rail lines where they are not formally protected.
Matted Flax-lily	*Dianella amoena*	cr	EN	VBA 2019 record on Road Precinct Precinct boundary on South Rock Road
Dwarf Silver Wattle	*Acacia nanodealbata*	vu		A patch of Dwarf Silver-wattles recorded near the eastern lookout on the rock formation. There were approximately 6 plants in the patch. Individuals also identified in 2019, North West of the Racecourse Grassland (Scott-Walker and Lamandé 2020)
Floodplain Fireweed	*Senecio campylocarpus*	en		Racecourse Grassland (Scott-Walker and Lamandé 2020)
Leafy Fireweed	*Senecio squarrosus A.Rich.*	Regionally significant		The form identified in the grassland has only been identified as a scattered occurrence across Victoria, and the closest recorded occurrence to Hanging Rock is in Kilmore, to the east of the site. There are only a few records in the greater Melbourne area (Australian Virtual Herbarium)
Pale Swamp Everlasting	*Coronidium gunnianum*	cr		Racecourse Grassland (Scott-Walker and Lamandé 2020)
Silver Banksia	*Banksia marginata*	Regionally significant		Racecourse Grassland (Scott-Walker and Lamandé 2020)
Snow Gums	*Eucalyptus pauciflora*	Regionally significant		There is a population of Snow Gums growing on the rock formation and in the racecourse grassland, believed to be the lowland form, possibly remnant from the previous sub-alpine landscape that characterised the area during the last glacial period over 10,000 years ago.
Spotted Hyacinth-orchid	*Dipodium pardalinum*	en		VBA record 2015 – location unknown

EPBC Act 1999:
EX: Extinct, CR: Critically endangered, EN: Endangered,
VU: Vulnerable and CD: Conservation dependant

FFG Act 1998 (2020 status)
Cd: Conservation dependant, Cr: Critically endangered,
En: Endangered, Ex: Extinct, Th: Threatened, Vu: Vulnerable
En(ExV): Endangered (extinct in Vic)

4.3.3 EPBC Listed Vegetation Communities

Table 11 below lists the Nationally threatened communities identified by the EPBC Act Protected Matters Search Tool as potentially occurring within five kilometres of the Study Area. These communities are marked in the EPBC Act PMST as 'known to occur', 'likely to occur' or 'may occur'.

The following ecological vegetation communities have been identified as possibly occurring within the Precinct.

Table 11. Details of threatened communities identified by the PMST within 5km of the Precinct

Community	Status	Summary of Community	EPBC Act PMST Report Status	Present within Study Area?
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Eucalypt woodland that is restricted to Quaternary basalt soils. Occurs on flat to gently undulating plains and associated stony knolls, generally at elevations up to 500 metres above sea level. The ecological community lies within a rainfall zone of 500–800 mm per annum and has a canopy typically dominated by River Red Gum *Eucalyptus camaldulensis*	Community known to occur within search area	**Likely:** CCZ 2 deemed likely to be representative of this EPBC Act listed community; see below for further detail
White Box–Yellow Box–Blakely's Red Gum Grassy Woodland and Derived Grassland	Critically Endangered	This ecological community can occur as either a woodland or derived grassland. It has a ground layer of native tussock grasses and herbs, and a sparse, scattered shrub layer. White Bow *Eucalyptus albens*, Yellow Box Eucalyptus melliodora or Blakeley's Red Gum *Eucalyptus blakelyi* dominate where a tree layer still occurs	Community known to occur within search area	**No** No vegetation within Study Area meets all Key Diagnostic Criteria for this Community
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Dominated by a ground layer of native tussock-forming perennial grasses interspersed with a variety of herbs. Large shrubs and trees are absent to sparse. Limited to the basalt plain of Victoria that extends from Melbourne, west to about Hamilton.	Community likely to occur within search area	**Likely:** CCZ 2 deemed likely to be representative of this EPBC Act listed community; see below for further detail
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Temporary freshwater wetlands that are inundated on a seasonal basis, typically filling after winter–spring rains, and then drying out. The vegetation is generally treeless and dominated by a herbaceous ground layer, often with a considerable graminoid component and with forbs present.	Community likely to occur within search area	**Likely:** CCZ 2 deemed likely to be representative of this EPBC Act listed community; see below for further detail

4.3.4 Vegetation Quality

The vegetation quality mapping compares the percentage of indigenous versus exotic ground storey vegetation cover present across the Precinct during the timing of assessment in November 2020.

As the mapping was concerned with ground storey vegetation cover present; areas with large areas of the Rock were mapped as having a 'high' indigenous vegetation cover, even if there is only a small amount of actual vegetation present amongst the rocks.

The site assessment determined that there are several 'levels' of indigenous vegetation cover across the Precinct:

Generally Intact Areas

Areas with all three vegetation layers (canopy, shrub and ground-storey) present, which covered approximately a quarter of the Precinct:

- The actual rock formation, its' slopes and some of its' base areas, and
- The racecourse grassland

These areas varied in indigenous ground storey vegetation cover (the overall vegetation cover divided into indigenous versus exotic cover), containing mostly indigenous shrubs and a completely indigenous canopy cover. The indigenous ground storey vegetation cover map (refer to page 40) depicts the varying ground storey cover across all areas of the Precinct with remnant vegetation.

Poor Understorey and Intact Canopy

There were numerous locations where poor indigenous ground storey areas occurred with an intact canopy layer, as indicated by the presence of large eucalypts and some shrubs. These areas contained either mown or unmown grassy areas dominated by exotic grasses and herbaceous species. These areas were predominantly located in:

- the picnic areas to the south of the actual rock formation,
- the unmown treed area in the south-west corner of the Precinct near the tennis courts
- areas along the northern edge of the racecourse,
- around the parking areas maintained for the racing club committee members, horse floats and buses for the concerts at the northern end of Racecourse Road, and
- along sections of Smokers Creek

Managed Grassy Areas

Areas dominated by exotic grasses and herbaceous species that are used as picnic areas, for car parking during the large events such as the race meets, classic car display and concerts.

This area includes the East paddock which is used for the concerts and car parking.

Riparian Areas

Areas located along Smokers Creek which contain remnant canopy and shrub layers, and that have been revegetated by the Friends of Hanging Rock and Newham and District Landcare.

Revegetation

Areas of revegetation which are dominated by young indigenous eucalypts saplings (predominantly Swamp Gums)

- These areas are located in the south-east section of the East paddock, and
- In the south-east corner below the racecourse around Dam 1 (refer to Map 1 for the location of Dam 1)

Indigenous Plantations

Plantations of predominantly Swamp Gums around the perimeter and internal fences of the East Paddock.

4.4 Fauna and Habitat Values

4.4.1 Fauna records

There are many indigenous fauna species that have been recorded at Hanging Rock, illustrating high faunal diversity, which is a reflection of the variety of habitat available across the Precinct, including: cliff faces, rock formations, large old trees with hollows, forest, open woodland, dense shrubby areas, riparian strips, riparian woodland, grassland and dams. Most of this habitat has been modified to some degree. The total numbers fauna species recorded within the Precinct are;

- 71 bird species,
- 23 mammal species (including nine bat species),
- 4 reptile species,
- 3 amphibian species and
- 4 fish species
- 3 invertebrate species.

4.4.1.1 Iconic species

Koalas

Koalas remain one of the most popular native animals for tourists at any location within Australia, and Hanging Rock has been home to a fluctuating resident population for over 20 years. Koalas are

spotted within the Precinct frequently, usually on the upper regions of the Rock, and within the racecourse Grasslands.

Kangaroos

There is a sizeable Eastern Grey Kangaroo population in the Precinct, estimated at between 200-300 animals. The majority of the population tend to habit the racecourse grassland and East Paddock during the day and graze in the main picnic and tourist-frequented areas at dawn and dusk, as evidenced by the large number of scats across the lawns. Smaller family groups can also be found within vegetated areas throughout the Precinct during the day.

Kangaroos, similar to Koalas, are synonymous with the Precinct and are a species that attracts both local and visitor interest. The resident population at Hanging Rock move across the local landscape and take refuge within the fenced Precinct. While the population is not captive, with wildlife gates located on the eastern edge of the Precinct, it is likely that most animals remain permanently within the Precinct (Pers. comm W. Terry). As such, the population has grown accustomed to the regular activities and visitors to the Precinct, and are tolerant to being in close proximity to humans. Population dynamics of the site are largely unknown. A Kangaroo Management Plan has been recommended in previous reports, including the 2015 EMP, Grassland Monitoring Report (Just 2018) and the 2020 Grassland Management plan (Scott-Walker and Lamandé 2020) in response to anecdotal and documented evidence that grazing within the grassland is having a detrimental effect on the vegetation community present in this area

Native Birds

Crimson Rosella, Musk Lorikeet and Eastern Rosella are colourful inhabitants of the site. While the Precinct is frequented by over 70 different bird species, it is the parrot species, and especially the Eastern Rosella that become known to tourists. Like the Kangaroos, these wild animals have become relatively tame through frequent interaction with humans – likely through feeding. Magpies at the site also behave in a manner that is indicative of frequent feeding by visitors. While tourists especially enjoy and appreciate close wildlife encounters, feeding of any wild animals is not to be encouraged.

Peregrine Falcons

There is a resident pair of Peregrine Falcons at Hanging Rock. This species resides where there are abundant and secure nest sites available- 2 sites are known to occur within the rock formation. They are not typically nest builders, but lay their eggs in cliff faces, tree hollows or in large abandoned nests from other birds (Birds in Backyards website).

Peregrines are a mostly residential bird that feed on other small and medium-sized birds, rabbits and other small diurnal mammals. They mate for life and the pair maintains a home range of 20-30 square kilometres. In early 2021, a Council environmental officer discovered one of the resident birds dead. This animal was found within the Rock formation close to the nest, and reportedly had signs of gunshot wounds (Pers. Comm, W. Terry). This was a devastating find for the local ecological community that had monitored and observed the pair over many years. Subsequently there was

amazement and joy that another Peregrine Falcon quickly took up with the remaining resident, and there remains a breeding pair within the Precinct today.

The presence of these falcons indicates another level of biological diversity within the Precinct and the use of specialised habitat niches. Whilst not considered a threatened species they are inherently limited in population because of their ecological behaviour, it is important to recognise and conserve these breeding pairs, as an important component of the ecological values of the Precinct.

4.4.1.2 Arboreal mammal abundance

Possums and Gliders

Regular spotlighting activities conducted my MRSC Conservation Officers have determined that forest vegetation surrounding the Rock supports a very large number of arboreal mammals. Species that are abundant are Common Brush-tailed Possum *Trichosurus vulpecula*, Eastern Ringtail Possum, *Pseudocheirus peregrinus*, Sugar Glider *Petaurus breviceps*. Spotlighting activities conducted between 2015 and 2020 found up to 70 individual arboreal mammals identified in a single night. Such abundance of arboreal mammals is considered indicative of high-quality habitat, with variation of vegetation structure and complexity to support food and nesting resources to support such a large populations and species numbers.

Threatened Brush-tailed Phascogales have also been recently identified as occurring within the Precinct and in the surrounding area. Individuals have been recorded inside nest boxes and as roadkill at front of Precinct.

Bats

Investigation and discussion of bats within the Precinct was conducted as part of the 2015 EMP. Two bat surveys in, 2008 and 2010, recorded nine species of bats in a small area of the Precinct along the lower section of the Summit Walking Track. Essentially two types of bats were recorded: bats that forage amongst the vegetation, and bats that fly and forage above the canopy. All of the species recorded roost and breed in hollows or crevices of dead or alive trees.

24 White-striped Freetail Bats were recorded in the 2008 survey. Detecting such a large number of this species, which is an above canopy foraging species, indicated that a maternity site was located near the survey site. It was surmised there is likely a large old tree with a large hollow in it is trunk, that could house up to 100 bats, located near the lower end of the Summit Walking Track. This tree would be a significant breeding site within the Precinct for the White-striped Freetail Bats (L Lumsden 2014, pers comm.). To date, this tree has not been identified, and is important to be considered in ongoing monitoring efforts for protection of the species with regard to vegetation management and should be protected from any inadvertent management practices (i.e.: limb lopping or controlled burns) that could impact upon breeding for the White-striped Freetail Bat.

As only a small portion of the Precinct has been surveyed, it is probable due to the number of large old trees scattered across the Precinct that bats roost and breed in several other sites across the Precinct.

General information about bats and their roosts is provided below:

- In Australia, most "microbats" (small, insect- eating bats) rely on shelters like tree hollows as a place to roost, where they can rest and find protection from predators and extreme daytime temperatures.
- Bats use roosts for shelter during the day, and also at night when they rest between feeding excursions.
- During the breeding season, female bats will group together in maternity roosts to raise their young. Groups of breeding females are often found within the trunks and branches of trees, while males find shelter under shedding bark.

Many bats like to use a number of roost sites, moving between them on a regular basis, so it's important to have many suitable roost trees for bats to use (Australasian Bat Society).

4.4.1.3 Significant species

Searches undertaken of the VBA and the EPBC Act PMST identified 58 fauna species of state and/or national significance. This includes species listed as migratory under the EPBC Act. These fauna species have either been recorded within five kilometres from the Subject site boundaries or are predicted to occur within 5km of the Precinct area.

While some EPBC Migratory species listed under the EPBC Act 1999 may use habitats within the site on rare occasions, none of these species are considered likely to make significant use of the Precinct, and the site is unlikely to be considered important habitat for any Migratory species.

Five threatened fauna species known to reside within or utilise the Precinct have been recorded to date. These species are considered to be threatened in Victoria, four are listed under the *FFG Act (1988)*, and one is listed as Critically Endangered under the EPBC Act (1999). These species utilise different habitats across the Precinct; racecourse dam, racecourse grassland, aerial space, winter-flowering eucalypts, woodland and forest habitat, large old trees with hollows, logs and rocks.

Note that as of 19th July 2021, species that were previously considered listed as a VROT (Victorian Rare and Threatened Species (DEPI 2014) are now represented through updated categorisations to the FFG Act 1998 (2021 status) as part of the FFG Amendment 2019 for a Central Assessment Method for listed species.

All species identified on from the VBA and the EPBC Act PMST species are listed in the significant species likelihood table- refer Appendix 8.

Table 12. Significant fauna species within the Precinct

Common Name	Scientific Name	TREATY	EPBC	FFG	Last recorded
Species recorded/known to occur within the Precinct					
Grey Goshawk	*Accipiter novaehollandiae*			En	2015
Chestnut-rumped Heathwren	*Calamanthus pyrrhopygius*			Vu	2019
Swift Parrot	*Lathamus discolor*		CR		-
Powerful Owl	*Ninox strenua*			Vu	2015
Brush-tailed Phascogale	*Phascogale tapoatafa*			Vu	2018
Species likely to occur within the Precinct					
Australasian Shoveler	*Spatula rhynchotis*		VU	Vu	-
Black Falcon	*Falco subniger*			Cr	-
Brown Toadlet	*Pseudophryne bibronii*			En	-
Common Greenshank	*Tringa nebularia*	B, R, J, C		En	-
Golden Sun Moth	*Synemon plana*		CR	Vu	-
Great Egret	*Ardea alba*	C, J			-
Hardhead	*Aythya australis*			Vu	-
Latham's Snipe	*Gallinago hardwickii*	B, R, J, C			-
White-throated Needletail	*Hirundapus caudacutus*	C, R, J		Vu	-

EPBC Act 1999 conservation status

EX: Extinct, **CR:** Critically endangered, **EN:** Endangered, **VU**: Vulnerable and **CD**: Conservation dependant.

International Treaty

B: Bonn Convention; **C**: CAMBA; **J:** JAMBA; **R**: ROKAMBA.

FFG Act 1998 (2020 status)

Cd: Conservation dependant, **Cr:** Critically endangered, **En:** Endangered, **Ex**: Extinct, **Th**: Threatened, **Vu**: Vulnerable, **En(ExV)**: Endangered (extinct in Vic)

4.4.2 Fauna habitat

The habitat types observed within the Precinct are as follows:

Built Waterbodies

The largest waterbody within the Precinct is the Racecourse Dam, which has a range of habitat present. Largely consisting of open water, this waterbody supports waterfowl such as ducks and grebes, in addition to cormorants. More vegetated areas of this dam, along with the four, smaller, dams elsewhere across the Precinct, all with fringing vegetation, are supporting species such as White-faced Herons, Eastern Great Egret, Australasian Swamphens, Eurasian Coots, Dusky Moorhens, frogs, fish and aquatic invertebrates. Such habitat is likely to at least occasionally support other herons, egrets, turtles, and more cryptic wetland specialists such as bitterns, crakes and rails and the migratory Latham's Snipe and Sharp-tailed Sandpiper. Woodland and/or aerial specialists such as swallows and martins, and honeyeaters were also observed hawking for insects which were very active over well-vegetated areas of these waterbodies. Waterbodies also provide an important water source for terrestrial birds, mammals and reptiles, especially when within proximity with vegetated areas and accessible banks.

Smokers Creek riparian corridor

The riparian corridor along the Smoker Creek is of varied habitat quality, with patches of higher quality riparian, and adjacent, vegetation. Increased planting of suitable species at the western end of the site will likely improve this further.

As for waterbodies discussed above, vegetation presence adjacent to a watercourse provides shelter, foraging and breeding habitat for a range of vertebrate, and invertebrate fauna. Fish are also likely to be present when the creek is running, although their presence was not observed during site visits. Riparian habitat is likely to support species such as insectivorous birds, and kingfishers, including Sacred and Azure Kingfishers. Riffles and areas where snags are present within/adjacent to aquatic vegetation are likely to provide fish and aquatic invertebrate breeding habitat.

Open grassy areas

Open grassed areas are present across both the north, south, and east of the Precinct. With the largest areas of such habitat being associated with the racecourse, surrounding the dam, and further east into the East Paddock. Smaller areas are associated with picnic areas, to the south of the Conservation Zone.

These largely support grazing herbivores such as Eastern Grey Kangaroos and Australian Wood Ducks, as well as a range of invertebrates, which in turns supports vertebrate fauna such as skinks and birds. Australian Magpies and corvids were observed foraging across these areas. Adjacent to moist depressions or waterbodies, there are likely to be frogs, which also support predators such as snakes, including Lowland Copperheads (observed), and White-faced Herons. Birds, such as finches, parrots, cockatoos and corellas are likely to forage when grasses and herbs are in seed/fruit.

Forested areas

Areas of dense canopy with a more complex understorey structure are present to the immediate west and south of the Conservation Zone, with more open, grassy or sparsely shrubby areas to the north and north east of the Conservation Zone, and further south, outside of the main Conservation Zone, and along the western and northern boundary adjacent to the Racecourse. A small patch of more open woodland occurs adjacent to, and east of the Racecourse Dam, and along the internal fence boundary with the Eastern Paddock.

More dense canopied treed areas are likely support a greater variety of fauna; however, more open canopy treed areas also provide important habitat, largely for birds and more mobile arboreal mammals, including microbats, and more dry-country specialised birds (species generally associated with north of the Great Dividing Range).

Dense shrubby areas

The bulk of dense, shrubby understorey vegetation is located around the southern to eastern aspect slopes and base of the rock, which has deeper organic litter and higher soil moisture. There are also smaller patches of more dense vegetation along the creek line.

Shrubby areas with dense cover provide safe harbour and foraging habitat for a range of fauna, and also, particularly, browse for Swamp Wallabies. Small birds favour more closed vegetation where they can easily and quickly take shelter from predators and/or larger birds (such as wattlebirds and Noisy Miners) which may chase them out of a given area, especially in areas of sparse understorey.

Rocky areas and cliff faces

Rocky areas within the study area are largely within the Conservation Zone, with scattered rocks/boulders elsewhere. Such habitat is likely to support a suite of reptiles – particularly community groups of Black Rock Skinks, geckoes, snakes and other skinks, small scansorial (climbing) mammals and potentially some hollow-dependent birds.

Large Old Trees

Large trees are a fundamental habitat component for both managed areas and conservation areas, directly supporting populations of birds, arboreal mammals, bats, and ultimately contributing to the overall health and biodiversity of the Precinct.

Large old trees often have hollows present, and as such provide essential sheltering and breeding habitat for a range of hollow-dependent fauna; birds, microbats and arboreal mammals, and scansorial/arboreal reptiles, particularly geckos and Lace Monitors. Large old trees with connecting understorey habitat, particularly acacias are more valuable for arboreal mammals.

Large trees also enhance the overall character and visitor experience of the Precinct, reflecting the long-term history and significance of the site for both First Nations People and for Europeans during occupation, for the park-like quality that often present in mature woodland communities.

4.5 Cultural Heritage Values

4.5.1 Traditional Owner Cultural Heritage

The following Traditional Owner Cultural value have been determined through investigations in the preparation of the Hanging Rock CMP ELA 2021);

- Artefact scatters and low-density artefact distributions
- Scarred trees
- Natural resources used for cultural and economic purposes
- Ceremonial locations
- Locations related to Mens stories
- Culturally significant views

Refer to Hanging Rock CMP (ELA 2021) for detailed discussion and management of Traditional Owner values.

4.5.2 European Cultural Heritage

The Hanging Rock Precinct is determined to be significant to the State of Victoria, as described in the Victorian Heritage Database Report (Heritage Victoria 2015). The values recognised relate to the following categories;

Criterion A– Importance to the course, or pattern, of Victoria's cultural history

Criterion E– Importance in exhibiting particular aesthetic characteristics

Criterion G– Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. This includes the significance of a place to indigenous people as part of their continuing and developing cultural traditions.

Table 13. **Summary of European Cultural Values**

Criterion A	• Early and popular meeting place for Victorians • Distinctive and rare geological formation of the Rock • Popularity of outdoor pursuits, particular in the nineteenth and twentieth century • Long association with horse racing, from 1860 to present, as important to the rural communities of Victoria
Criterion E	• Aesthetic significance, distinctive and unusual place of natural beauty • Visitors enjoy experiencing and exploring within the Rock and the surrounding woodland • Significant view points and lines of sight across the landscape • Has been described and imparted into innumerable sketches, painting, photographs, writing, film and music
Criterion G	• Significant for its continuous use and appreciation by the wider Victorian community as a popular gathering place for recreational purposes since the mid-1860s, reinforced by the production of the book (1967) and the film (1975) of Picnic at Hanging Rock,

4.6 Tourism and Recreational Values

4.6.1 Picnic grounds and visitor infrastructure

The picnic areas south of the rock offers built walking paths, public toilets, bench seats and a children's playground. The areas are maintained with regular mowing as grassy open areas, and are delineated from other management zones using large logs, aesthetically separating managed areas from conservation areas.

With the exception of the large picnic shelter, shade in these areas is limited to the large canopy trees scattered across the lawns. Shady locations therefore become high traffic areas for walking, sitting, and parking on busy days where formal carparking is limited, and where shade is accessible. These large trees provide the character of the parkland that has become so desirable to picnic, and signify the history of the location through their size.

Managed picnic areas with large trees are also located on the northern end of the site, adjacent to the stabling yards of the Racecourse.

There is a kiosk and visitor centre located close to the base of the Rock, and north of the main picnic areas. The kiosk was built in 1968 with the adjoining discovery centre built in 1999.

4.6.2 Hanging Rock Racecourse

The Hanging Rock racecourse is located directly east of the rock formation and encircles the Racecourse grassland, and dam, as well as the Cricket Oval. Stabling yards and associated buildings are located adjacent to Racecourse Road, on the highest point of a sloping bank that overlooks the racetrack. This grassy bank creates a natural viewing area consistent with the atmosphere of picnicking at the site, and includes a timber edged terrace and a number of mature exotic tree species between the buildings and the track (Heritage Victoria 2015).

4.6.3 The East Paddock

The East Paddock consists of 4 lots to the east of the Rock and Racecourse Grassland, totalling approximately 22 hectares. This area includes a large volcanic rise to the North, and is the location of arguably the most iconic views of the Rock. This feature has resulted in the use of this area for hosting music events, utilising the view lines to create a dramatic backdrop for such events.

In general, the current use of the East Paddocks is for large events only. The areas form a large proportion of available grazing area for the permanent population of Eastern Grey Kangaroos at the site. The southern section of the East Paddock has been revegetated with indigenous tree species, and is used as a kangaroo refuge area for times where the East Paddock, or other Precinct areas are utilised for events.

5.

Management issues and threats

5.1 Biodiversity Management

5.1.1 Dieback and lack of recruitment

Recruitment and regeneration of indigenous flora species are key to the long-term health and sustainability of remnant indigenous vegetation in the Precinct. Given the variation in use across different areas of the site, the condition and overall health and function of vegetation communities vary.

Managed Areas

Managed areas include those that are regularly maintained through mowing and irrigation for the benefit of recreational uses and visitors to the Precinct. These areas include the main picnic areas south of the rock, the northern picnic areas adjacent to the Racecourse entrance, Racecourse and associated facilities, cricket oval, the Racecourse Dam and surrounds, and the East Paddock. These areas are kept well maintained in the interests of aesthetic appeal and visitor enjoyment, with safety a priority.

Ongoing mowing of these areas inhibits opportunity for natural regeneration of existing native vegetation, while also removing organic litter. In these areas, the ground layer is a combination of maintained exotic and native grasses.

These Managed Areas contain many of the oldest trees within the Precinct, however as a consequence of the current mowing regime, natural recruitment of these trees is largely absent. Long term, if such management is to continue long- term, is likely to result in these main picnic areas containing dead, limbless trees (stags) retained for habitat, with no surrounding naturally regenerated vegetation from these parent plants, and no shade.

The death of such trees within the managed areas is already evident, as large historic stags retained in situ with branches removed for safety. While this loss may be a result of old age, other factors relating to current and historical management may have also been affecting the health over a long period of time. Soil compaction in these managed areas is high, as reported in the 2015 EMP and in the most recent site arborist report (Cameron 2018). Compaction mitigation has been implemented in some areas through the installation of TCAs – areas directly surrounding the trunk that are mulched and revegetated to prevent impacts to soil and the root zone. This technique has aimed to improve the health of trees and extend their life-span while also allowing for increased biodiversity through encouraging natural regeneration and planting of middle and groundstorey species. However, this approach has not allowed for regeneration of canopy species in these areas to date.

It is therefore important for the current health and the long-term sustainability and resilience, as well as for the aesthetic quality that management practices are revised to enable the recruitment and replacement of canopy species throughout these areas.

Conservation areas

Tree dieback and lack of regeneration within the Core Conservation Area of the Rock has been described by the former Hanging Rock Environmental Officer Daniel Young (2018).

The loss of mature canopy species for unknown reasons has been occurring within CCZ1 (Rock Area) *for some time, in particular adjacent the upper base walking track although tree loss has been observed scattered throughout the heavily wooded areas surrounding the rock formation. Whilst the death of canopy trees is a natural and integral process within healthy forest/woodland systems, sufficient regeneration is required to facilitate stand replacement over time. At the time of producing this plan, the author had failed to detect any naturally recruiting individuals of any canopy species within CCZ1, with a general absence of any naturally occurring (non-planted) individuals less than approximately 30 years old.*

Overall findings of vegetation assessments conducted by Practical Ecology in 2020 and 2021 as part of this EMP update are consistent with Young's observations in that natural recruitment of canopy species was markedly absent. Immature canopy trees are only present in areas where active revegetation efforts have been made- specifically in monitoring plots located on the northern aspect of the Rock area where cool ecological burns and grazing exclusion has allowed for recruitment.

As many of the younger specimens or trees around the rock are estimated to be between 30 and 50 years old, this implies a chronic and systemic lack of successful recruitment of canopy species across the main vegetated area of the Precinct. Note that while canopy species in this location refers primarily to Eucalypts, natural recruitment of understory species is also considered limited.

The cause of this lack of recruitment is likely complex, and resulting from a combination of factors. Groundstorey across much of the Core Conservation Area around the Rock is dense, featuring a high cover of exotic Sweet Vernal Grass and dense thickets of indigenous Austral Bracken. These species could be preventing or outcompeting seed germination of canopy and middle-storey species. The pattern of vegetation within this section of the Precinct is also consistent with the historical grazing of cattle (pers. comm P. Johnson), where lower, accessible slopes tend to be open, and shrub species are limited to areas difficult to access by stock during historical browsing and disturbance events.

Further to this, Wallabies and Kangaroos have a visible effect on revegetation efforts, with significant browsing activity of the more palatable plants that have been introduced. This same grazing pressure by these native animals could be inhibiting regeneration. Fire, as a tool for regeneration, has also been absent from much of this part of the Precinct for decades. The combination of these factors may be resulting in reduced recruitment overall to the detriment of the long-term sustainability of the vegetation within the Precinct more broadly.

In regards to actions to monitor this risk, trial ecological burns have been implemented in the northern sections of the vegetation surrounding the Rock, and exclusion fencing has been installed. Initial results show in improvement in both species diversity and richness, and is a promising indication of the restoration potential through a combination of regenerative fire and reduction in grazing pressures.

5.1.1.1 Grazing and Browsing

Kangaroos

The Hanging Rock Precinct is an attractive home for a Kangaroos due to its large open cleared grassy areas and easy access to water. Prior to European settlement and large-scale landscape modification, Kangaroo numbers were naturally limited according to the availability of food and water resources. In modern times, grazing areas are generally in the form of farmland, where Kangaroos are at best seen as a nuisance, and at worst are actively managed through permitted and non-permitted hunting on private and public land. Rural and urban development has also limited the natural movement patterns of populations across the landscape, resulting in the cutting-off of resources. As such, the relative safety and availability of resources within protected land, such as parks and reserves has resulted in an increase in population density of Kangaroos and the consequential increase in grazing pressures (O, Connor *et al*, 2019).

In the context of Hanging Rock, monitoring that has been completed for vegetation within the Racecourse Grassland determined that if the current grazing regime of Kangaroos were to continue, it is likely that the ecological values of the site will steadily decline (Just, 2018). These results reflect the consequences of unmanaged populations within a contained area, inappropriate grazing patterns, either overgrazing or selective grazing, along with the absence of other methods for biomass control, such as burning or slashing.

The relationship between Kangaroo grazing pressure, biomass and regeneration is also relevant to management works within the vegetated area surrounding the Rock. The need for natural recruitment and regeneration of all flora species in this location, as well as the need to manage fuel loads and reduce cover of exotic grasses has determined that it will likely be beneficial, and even necessary, for ecological burns to be implemented. Monitoring plots located at the northern aspect of the rock present the possibilities for biodiversity improvement in these areas. In 2018, Precinct Rangers conducted a cool burn that included one of the fenced monitoring plots already present allowing a view of potential for natural regeneration in response to fire that is unaffected by grazing pressures. The results were an increase of variation and cover of indigenous forbs and grasses, and an observable reduction in exotic Sweet Vernal Grass. While ongoing ecological monitoring of these plots is required, these initial findings present a promising solution to the issues of lack of regeneration, where fire can be introduced to the landscape and follow-up grazing pressures, particularly by Kangaroos, can be managed through exclusion fencing.

The effect of grazing pressures and overabundance of Kangaroos in areas across Victoria, NSW and the ACT is well documented. It is also noted that there is heightened public awareness and controversy around the active management and control of Kangaroo populations in such situations. With regard to the Hanging Rock Precinct specifically, it is acknowledged here that the notion of Kangaroo management has been no less controversial. As such, no active management of Kangaroos, or detailed investigations relating to Kangaroo management has taken place to date. This is despite numerous recommendations in previous management plans and Precinct documentation for a Kangaroo Management Plan (KMP) to be completed.

Such a KMP has the potential to determine an appropriate carrying capacity for Kangaroos within the Precinct and provide recommendations for active management of the resident population. Graham Caulson of the University of Melbourne (2007) discusses the need for Kangaroo management to be clear in its objectives; to identify underlying problems and develop a management approach that directly targets the issues. The key issues for regarding Kangaroo management at Hanging Rock relate to public safety- in general and during large public evets, protection and enhancement of the nationally significant Racecourse Grassland, and protection of biodiversity more broadly within the Precinct.

Swamp Wallaby

The 2015 EMP noted concern about the Swamp Wallaby numbers. Wallabies are generally cryptic and reside only in the densely vegetated areas around the rock and occasionally along the riparian corridor of Smokers Creek. As swamp wallabies are known browsers, they are also likely a factor in the overall lack of recruitment, and are generally the culprit for damage to revegetation plantings. The current population status of the Swamp Wallaby population is unknown, and will require targeted monitoring.

5.1.2 Loss of significant fauna

Populations of threatened species across the Macedon Ranges appear to have declined in the last decade (Pers. Comm, W. Terry, 2020). This is likely due to a number of factors, including reduction in available resources necessary for conditions that support active breeding opportunities within diminishing populations. Annual Koala counts within the Precinct continue to indicate a long-term pattern of decline as discussed in further detail below. Annual monitoring conducted by MRSC since 2015 has also identified that sightings of two other iconic species, Powerful Owl, and Greater Glider, have reduced and that these species no longer permanently reside within the Precinct

5.1.2.1 Koalas

Koala numbers within the Precinct appear to be declining. Monitoring activities undertaken in years 2016, 2017 and 2018 observed less individuals than was recorded and described in the 2015 EMP (MRSC 2021).

A 2008 study of koala habitat within the Precinct concluded that between two to five koalas utilise the Hanging Rock Precinct as part of their home range. Subsequent investigations have resulted in fluctuation in numbers if individuals identified within the Precinct.The study concluded the two major factors in the long-term population decline in the Precinct was that Hanging Rock was isolated from other preferred habitat areas, and was surrounded by high-speed roads. Preferred habitat areas were defined as habitats composed of Manna Gums *Eucalyptus viminalis* and Snow Gum on volcanic substrates (AKF 2008).

Unfortunately, as the major corridors within the landscape are along drainage lines dominated by Swamp Gums, koalas would have to move along the road Precincts or move from patch to patch of Manna and Snow Gums, making them vulnerable to attack or injury from cars.

5.1.2.2 Powerful Owls

Powerful Owls were previously known to roost in two separate locations within the Precinct – refer to Appendix 1: Map 7 for documented location of roost sites.

The northern site is located adjacent to Racecourse Road at the northern end of the stable complex. This location features large old trees, many of which are stags, containing large and small hollows. Understory is typical of other managed recreational areas and is comprised of irrigated and mown lawns. This area tends to be a quieter recreational picnicking area, given it's located away from the main entrance and visitor centre, in contrast, at busier times this area is used for overflow parking and as a bus parking area for large tour groups. A second recorded roost site is located south of the cricket oval, adjacent to Smokers Creek within the Riparian Corridor. This area also contains large trees, with increasing cover of understory shrubs closest to the creek- a result of recent and historical revegetation efforts to improve the creek margins and riparian corridor.

Monitoring of each both sites since 2015 during nesting season has determined that Powerful Owls are no longer using these sites. However, the Precinct continues to support extremely high number of arboreal mammals, and is likely to be utilised continuously by Powerful Owls that have roosting sites elsewhere in the local landscape (Pers, Comm, W. Terry) but utilises the food resources within the Precinct throughout the year. This species has large home ranges of up to 400ha, and thus, could potentially still occur at least occasionally for foraging and/or roosting, if not observed as breeding within the site

Given the availability of food resources, with improved management for conservation there may be hope for this species to return to the roosting sites that were previously utilised.

5.1.2.3 Greater Gliders

Similar to Powerful Owls, two family groups of Greater Gliders were previously known to reside within the Precinct and have been absent from observation during monitoring efforts conducted since 2015. Greater Glider numbers have declined across the wider municipal area, with the population suffering a "death by a thousand cuts" (Pers comm. W. Terry), potentially through a loss of resources, reduced habitat availability and connectivity, disruption to breeding activities and declining survival rates. Greater Gliders were historically known to inhabit hollows in the large trees adjacent to the Powerful Owl roost site, close to the Racecourse stabling area.

Given the length of time that this species has been absent in monitoring, and its reduced local population, it is likely that Greater Gliders no longer occur in the reserve, and is possibly considered to be locally extinct.

A second site was located in the south-west corner of the Precinct, close to the tennis courts. This area is close to the main road, recreational facilitates and neighbouring residence.

5.2 Invasive species - Plants

5.2.1 Pest Plants

The Precinct remains vulnerable to infestation of new weeds, as the recreational values result in high visitation levels which increases the likelihood of incidental introductions of pest plant material, or pathogens.

CALP Act Weeds

There are a number of invasive weeds listed under the *Catchment and Land Protection (CaLP) Act 1994* growing at Hanging Rock. Under the CaLP Act declared noxious weeds are categorised; depending on their known and potential effects and specific circumstances for each region; into State Prohibited Weeds (S), Regionally Prohibited Weeds (P), Regionally Controlled Weeds (C) or Restricted Weeds (R). Table 14 below lists the declared noxious weeds observed at Hanging Rock.

Table 14. **Declared Noxious weeds occurring at Hanging Rock Precinct**

Scientific Name	Common Name	CaLP Act Control Category	WONS	Location within Precinct
**Allium triquetrum*	Angled Onion	R		Along creek
**Carduus tenuiflorus*	Slender Thistle	C		On rock
**Cirsium vulgare*	Spear Thistle	C		Across the Precinct On rock Grassland
**Conium maculatum*	Hemlock	C		Along the creek
**Crataegus monogyna*	Hawthorn	C		Across the Precinct Grassland
**Cytisus scoparius*	English Broom	C	Yes	Grassland
**Genista monspessulana*	Montpellier Broom	C	Yes	Across the Precinct Grassland
**Rosa rubiginosa*	Sweet Briar	C		Grassland
**Rubus fruticosus spp. agg.*	Blackberry	C	Yes	Across the Precinct On rock Grassland
**Ulex europaeus*	Gorse	C	Yes	Across the Precinct Grassland

5.3 Invasive species - Animals

As Hanging Rock is located in a fragmented and predominantly cleared rural landscape, the impacts of pest plants and animals on the Precinct's ecological values will require an on-going management commitment.

On-going pest animal management actions need to be well defined and targeted. They also need to be realistic and recognise that it will not be possible to return Hanging Rock to its' pre-European state. However, it is possible to manage a Precinct and its buffers.

Pest animal control will always be harder to achieve without undertaking major infrastructure investments such as constructing predator proof fencing, and then undertaking regular (daily or weekly) monitoring and maintenance of the fence.

Pest animal information was provided during the stakeholder consultations, via incidental observations or through remote camera monitoring. The main pest animals identified within the Precinct are discussed below.

Rabbits

There is evidence of rabbit scratching's and warrens across the Precinct. It is difficult to determine if the scarcity of ground-storey regeneration in some areas of the Precinct is due to rabbits or the grazing pressure from Kangaroos and/or wallabies. Consultation with Council Rangers determined that Rabbits are also known to live beneath the buildings of the racecourse facilities, making management difficult. Rabbits are also said to persist in the Precinct despite treatment of warrens, by utilising the dense understory of Sweet Vernal Grass and Austral Bracken as harbour (D. Young 2020, pers. comm). Rabbits are often seen grazing in open recreational areas & returning to bracken cover in south & eastern Rock Area. Camera Trapping conducted in mid-2021 has also identified rabbits below rock formation on small tracks in the bracken at multiple site, Lower track (western & northern CCZ1), Smokers Creek and the Depot area.(S. Purves pers. comm)

Warren systems are found through the Precinct, and are most evident in;

- Smokers Creek CCZ2
- Northern section of CCZ1 & possibly throughout the bracken in remaining zone
- Proposed CCZ 5
- Race Course buildings
- Race Course grassland

Rats

Black Rats are thought to be occurring in increasing numbers and are possibly out-competing native species for food and habitat. This species may be increasing as a result of tourist visitation, scavenging on leftover food associated with the picnic areas and rubbish bin locations (W. Terry pers. comm.)

Camera trapping continues to pick up large numbers of Black Rats around the Rock in the bushland areas, including below rock formation on small tracks in the bracken. Multiple rats have been recorded at ground level, as well as on lower branches of trees.

They are also likely preying upon native birds and small mammals. Nest predation and long-term impacts to bird populations is a concern with increasing recorded numbers. To date, no Bush Rats or Antechinus species have been found- and it is questioned whether this is due to the presence and abundance of Black Rats (W. Terry pers. comm.).

Cats

Feral and domestic cats are regularly recorded and are highly likely to be predating upon many small animals and/or causing pathogenic disease or deaths in larger animals Periodically cats are trapped by the Rangers, which are then taken to the Local Laws Department for scanning (for micro-chips) and management. Recent camera trap observations include the Tennis Club and throughout the Below rock formation and surrounding vegetation (S. Purves pers. comm)

Foxes

Foxes are known predators of native animals and known spreaders of weed seeds. They have a huge impact on native fauna across the State. Foxes are known to occur at the site and are often sighted by management staff. Observations include the identification of a den close to Dam Zone 1, and well as frequent scats. Camera trapping conducted in May/June 2021 has identified presence of foxes through the extent of the Precinct, the depot area being an area that foxes tend to visit multiple visits weekly

The main fence is used for management of these unwanted predators. Baiting of pest animals is not undertaken within in the Precinct due to the high presence of companion pet dogs that are permitted during visitor opening hours.

Exotic birds

Exotic birds such as Blackbirds and Starlings have only been observed in small numbers at the Precinct, mainly around the picnic areas/along the southern boundary of the Precinct. These birds are associated with urban areas. As a rural bushland Precinct, they are not expected to be in large numbers or to cause major impacts. However, their numbers should be monitored to determine if they are increasing in population size. If they are, then they should be controlled before they become problematic.

Free- roaming domestic animals

Remote cameras used within the Precinct prior to 2015 EMP detected domestic dogs and cats entering the Precinct at night from adjacent properties to hunt. Domestic dogs do feed on wildlife and their scent also disturbs the 'more sensitive' wildlife, especially ground dwelling mammals.

The issue of maintaining the perimeter fence versus allowing ongoing access for indigenous fauna is problematic. The key aim is ideally to ensure that free-roaming domestic animals such as dogs and cats do not enter the Precinct at all.

Achieving this aim therefore relies on the diligence of local landowners in ensure that pets are controlled, particularly in relation to cats at night. It is likely some of animal owners are unaware their domestic animals are entering the Precinct at night. Others may be unaware of their impacts, or are aware but not convinced, or concerned. Solutions therefore include ongoing correspondence and community education programs to be undertaken in cooperation with the adjacent landholders.

With regards to cat control, both feral and domestic cats are currently managed via the existing cat trapping program run through MRSC.

5.4 Visitor Impacts

5.4.1 Erosion and vegetation trampling

The Rock and Surrounds

Preliminary consultation with MRSC identified concerns in relation to the extent of erosion and trampling of vegetation within and around the Rock feature, and the inherent difficulties with managing these areas. This issue was also raised in the 2015 EMP- the prime areas of concern at the time were "Stonehenge" and leading up to "The Saddle".

Concerns of erosion on the Rock formation have been held for many years, with such erosion the result of both human induced and natural causes.

The evidence of continuous water erosion from rain fall can be observed at the edges of the rock formation, causing funnelling into the vegetation below. This process of water erosion on the rock itself relatively unavoidable, though can be managed in terms of proper design of drainage of filled or sealed areas, and for the summit walk access track.

Other concerns however relate to erosion resulting from visitors leaving the formal track, causing trampling of vegetation and disturbance of the ground layer, ultimately leading to lack of any vegetation and the creation of patches of bare earth. Water erosion can then compound these issues, as vegetation once removed can no longer stabilise the soil layer and new water flow patterns are created.

Historically, the issue of erosion causing changes to water distribution has been severe, and was believed to be a contributing factor in the dieback of large trees on the north aspects. Revegetation works have therefore been designed to restrict visitor movement and prevent access to new or existing informal paths, using dense planting of shrubs and other understory species.

Other areas where high foot-traffic has created concern is at the summit, where is it difficult to determine the actual track route though lack of clear signage. Due to the lack of vegetation at the summit and the steep drop off, the middle of the summit area is generally more accessible than other sections of the rock, and therefore sees the greatest impact of foot traffic over the area. Evidence is generally shown in the lack of presence of lichen growing on the rock, though water erosion is also a contributing factor here.

To date, erosion in the Rock area and surrounds has been managed by through defining the actual track (and sealing it), installing some fencing and using large fallen logs to define the edges of the track/'no go' areas which have been also planted. This has managed and minimised the erosion in the highest impact areas. It is the erosion in the lower impact areas that is more difficult to manage.

The main method for managing erosion is to continue the current management practices, to increase the signage leading to the summit (so less people stray from the track) and to investigate installing temporary fencing or monitoring plots in some areas to monitor both weed control/planting works and to control erosion though reducing access and increasing the number of dense revegetation plantings and the use of low-impact erosion and sedimentation management techniques.

Walking the Rock, to either the Summit or to Stonehenge, is the one of the main reasons most visitors travel to Hanging Rock. Observations made in the 2015 EMP were that the majority of people will remain on the main track if it is well-defined and easy to follow, however there will always be desire by some people to go 'off track and explore. If the numbers of these people can be minimised, then resulting impacts are also minimised. The fine line between minimising impacts and not prohibiting off-path movement needs to be considered for all future decisions regarding people movement and management of the Rock.

Erosion – Smokers Creek

Great effort has been made through revegetation works over the past 2 decades to restore the waterway, and today, most indigenous vegetation present is a direct result of successful revegetation projects.

Issues were identified in 2015 relating to the types of weed control works carried out within close proximity to waterways – where regular spraying was undertaken for aesthetic maintenance, creating bare ground and in the case of woody weed removal, disturbance of soil surface. It is therefore important that weed control practices are not conducted in a way that will create or exacerbate erosion.

5.4.2 Visitors and domestic animals

5.4.2.1 Pet Dogs

Visitors are currently permitted to bring domestic dogs into the Precinct with the requirement of being on lead at all times. Dogs are however not permitted to enter the Rock Area, either on or off lead, due to the potential of dogs chasing or disturbing wildlife. Scent marking by dogs also represents 'predator scents' to many indigenous fauna which can have the effect of altering the natural behaviour and movement patterns of fauna. Dogs are also known to cause issues in waterways through release of chemicals from either pelts or faeces as used in common worm or tick treatments, entering the waterway and killing microorganisms and macroinvertebrates.

The 2018 Strategic Plan clearly sets out the prioritisation of conservation values of the Precinct. Given the shift away from recreation and the focus of the Precinct on the enhancement and protection of biodiversity values, future decisions for both the Master Plan and beyond should consider if it is appropriate for visitors to bring pets into the Precinct. It is preferable that a shift toward the creation of nature-based visitor experience and education will result in dogs no longer being permitted within the Precinct.

5.4.2.2 Noise and Lighting

Major events, as well as general day-to-day visitation, and the generation of sounds and lighting from dusk/evening events are particularly relevant to nocturnal fauna. Artificial light is a form of pollution that alters the natural patterns of light and dark in an ecosystem and can affect fauna species in different ways. The main responses include disorientation, attraction or avoidance with various studies exemplifying these responses. Artificial lights have been found to disorientate flying species such as birds and bats (Gleeson and Gleeson; 2012). Conversely, such artificial lighting may increase orientation, providing a benefit for predator species such the Magpie and Kookaburra to forage (Patriarca 2010). Some species may avoid well-lit areas due to an increased risk of predation (Longcore & Rich 2004). Such responses to light affect species foraging ability, reproduction, communication and other critical behaviours.

Many wildlife species have the ability to perceive different wavelengths of light, often extending passed the range to that of a human. In order to develop the best practice lighting design, the positioning and direction of floodlights and path lights should be considered with the local wildlife in mind but the different wavelengths of light that can be implemented to have the least impact to the native wildlife within the Precinct.

Current management under the 2015 EMP has specific requirements for events and timing

- Considerations of timing - not allowing concerts during the breeding season for the Powerful Owls (between April to September),

- Ensuring that any lighting used is low key and not of the laser variety around the rock itself

In relation to the direct impacts of large events such as concerts, it is difficult to determine a causal relationship between changes in species presence or abundance without detailed analysis of long-term species or population changes, as well as individual observations of change to fauna behaviour. Management of sound and noise should therefore continue through a best practice approach to ensure that ongoing event and visitation are considerate of fauna welfare and conducive to long-term sustainability of populations.

5.4.2.3 Horse Racing

Impacts associated with the annual horse racing events are largely undocumented. Some possible risks to environment values are:

- introduction of pest plants and pathogens either directly from horses or their manure, or from vehicles and floats, feed, bedding, or other equipment associated with horses entering the Precinct
- impacts of increased nutrient loads though runoff of manure into the dam area
- impacts to loading areas, either to flora and fauna values, or to the overall habitat of the site.

It is also noted that the northern end of the Precinct, adjacent to Racecourse Road is heavily used during the race events for parking and loading of vehicles, trucks and horse floats. This area is also the location of known, and now historical nesting sites of two significant species, Powerful Owl and Greater Glider that are now no longer deemed present within the Precinct.

5.4.2.4 Major events and kangaroo management

Kangaroos within the Precinct boundary are actively managed to restrict movement at certain times of the year as part of preparation for large events, including annual horse racing events, annual community events, and concerts. At these times, attempts are made to corral the Kangaroos away from the grassland and racetrack areas, and move them into either the large East Paddock or the "Kangaroo Refuge Area" – an area at the southern end the East Paddock separated from the rest of the Precinct using tall hurricane fencing.

Similar arrangements are made in the reverse during large events with large numbers of people or cars located in the East Paddock. Kangaroos can be easily startled and have been observed amongst parked cars, causing potential safety issues for the Kangaroos and the public. At these times, Kangaroos are moved into the western side of the Precinct closer to the Rock, and are again separated from the event through the tall hurricane fencing that runs north south through the centre of the site adjacent to the racetrack.

The actions for event preparations, which require intentional corralling of Kangaroos, have been prepared in conjunction with DELWP and are in line with policy requirements for considerations of wildlife safety and wellbeing.

Due the requirement of active management, Kangaroos are viewed as a management issue in relation to large events. Their presence around the track on race days creates a risk of injury to horses, jockeys and Kangaroos themselves in the event that horses are spooked or where Kangaroos enter the track during a race. At times, Kangaroo presence near the track has necessitated race stoppage. A high, perimeter fence has been purposely constructed between the racecourse and the East Paddock, and the fence is patrolled for Kangaroos during race days.

At all other times, the resident population is free to move, and to enter or exit the Precinct through the open fauna gates located on the eastern boundary, adjacent to Straws Lane. These gates are only closed in instances where Kangaroos are to be restricted from moving onto the surrounding road boundary for the purposes of public safety, such scheduled events where vehicle traffic on roads surround the Precinct is high prior to entry into the Precinct for large events.

5.5 Natural Disasters

5.5.1 Storm Damage

Within the project timeline of this EMP update, Victoria experienced some of the most damaging storms on record, including strong winds, floods and hail. Impacts to the vegetation with the Hanging Rock Precinct was significant, with approximately 80 trees either uprooted, or damaged through limb loss.

The Precinct was closed to the public for approximate 1 week while on-ground management crew worked to remove trees from main access roads and paths, and for arboricultural assessment to determine priority safety works. Various tracks and areas remain off limits while clean-up is undertaken, which is estimated to take several months.

It is estimated that between 10-20 tonnes of limb/tree matter is generated annually from the natural loss of limbs/trees following storm events (A Walsh and G Bigolin 2015 Pers. Comm.), the most recent storm events would has resulted in a considerably greater amount.

Most significantly from an ecological viewpoint, vegetation loss on and around the Rock formation was extensive, including loss of large mature canopy and understory species resulting in opening up the of the canopy and additional light to understory species. Given historical dieback in some areas, and the general lack of regeneration and recruitment across much of the Precinct, the process of responding through management actions should be implemented after vegetation monitoring to determine aims for enhancement and protection of the remaining vegetation and habitat values, and to document any change associated with the alteration in vegetation structure associated with storm damage, or loss of tree canopy generally.

5.6 Site Maintenance

5.6.1 Tree Maintenance

Trees in all areas of the reserve that are viewed as high-traffic areas for either visitors or management staff are required to be managed for safety. This involves the lopping overhanging limbs, regular maintenance of ground story vegetation close tracks, and removal of trees that are deemed unsafe.

One key ecological concern with regard to limb removal due to tree safety management works, is the impacts on fauna, especially birds, bats and other arboreal mammals; with regard to the gradual loss of habitat and the inadvertent potential to injure or kill animals present in lopped limbs.

Many dead and/or larger limbs contain hollows, and smaller limbs can also contain cracks. Numerous native fauna species are dependent on hollows and/or cracks for roosting and breeding. Many are also nocturnal and likely to be inactive during daylight hours when limb/tree removal works are

undertaken. In the cooler months some species such as bats also enter a state of torpor. It is therefore unlikely that these species would have time to waken and become sufficiently alert to react and more to safety if limb lopping or tree removal is undertaken in winter.

The accumulated effects of tree maintenance works across the Precinct are not insignificant and should be considered in the planning of new and additional areas that would require such works. It is important that areas with high-conservation values are maintained in a way that is conducive to the protection of habitat, and not compromised through prioritisation of recreation activities within high-value conservation areas.

Extent of Lopped Limb Removal

Whilst the extent of naturally fallen limbs/trees cannot be controlled, there is scope to reduce the extent of habitat loss and increase stockpiling of these limbs across the Precinct for the improvement of groundstorey habitat.

Tree safety management works do not currently occur away from the main walking tracks in the unmown areas of the Precinct, around the Rock and its' Surrounds and along the less frequented sections of Smokers Creek. Tree removal and thinning does occur in the grassland as a component of race track management, not for safety purposes.

Currently arboricultural assessments and subsequent limb lopping/removal is undertaken for public safety across many of the multi-use areas of the Precinct. Limb lopping/removal is completed as required within the annual tree maintenance budget. The areas of the Precinct in which this occurs mostly correlate with the mown areas including the picnic/recreation areas, along the main walking tracks, in the car park, in and around the cricket oval, and in the mown area to the north of the racecourse facilities.

On an 'annual' or 'as needs' basis, unsafe and/or dead trees/limbs within the mown areas and along the main walking tracks are assessed for safety and the limb/tree removed if deemed a safety risk by the arborist. The cut limbs are currently then stockpiled across the Precinct for later disposal.

5.6.2 Mowing

As discussed above in Section 5.1.1, the practice of mowing recreation areas that are adjacent to either large trees, or areas of remnant vegetation inhibits the natural recruitment of understory species, and the replacement of canopy species such as the large Eucalypts. The loss of these old specimens without regeneration or replacement over time will result in dramatic changes that are likely to be detrimental to the overall character and historic values of the Precinct.

5.6.3 Water Management

Current water use relies primarily on potable and non-potable water stored on site. Non-potable water is stored within the Racecourse Dam. The other four dams are much smaller; three are located

along Smokers Creek and were historically created as small water storages, and are a modification to the natural water flow through the Precinct.

Discussions by land managers have included considerations and proposals for the use of recycled water from the Woodend sewerage treatment plant for irrigation and non-potable water uses.

Any plans to alter the current usage and/or storage capacity of the racecourse dam needs to consider the fauna usage of the dam and the wetland habitat it provides. Any planned usage of recycled water needs to consider potential impacts to the area's flora and fauna.

5.6.3.1 Irrigation

The Racecourse Dam has been used for an extensive period to provide water for irrigation of the race track, picnic areas, oval, and select areas of the East Paddock prior to events. The dam also has some habitat values: four threatened wetland bird species have been recorded using the dam on a casual basis. Kangaroos and other fauna species also utilise the dams.

Overall, recreation areas of the site are maintained with regular irrigation and mowing. The areas include:

- all parkland and picnic areas,
- the racecourse track and viewing area
- the cricket oval
- sections of the East Paddock

5.6.3.2 Smokers Creek

The intermittent flows of Smokers Creek are used to supplement the stored water within the Precinct. Each Spring, the racecourse dam is filled from run-off and water pumped from Smokers Creek under licence agreement when the creek is flowing.

Smokers Creek was once a permanent creek that flowed all year around (G Bigolin pers. comm. 2015). However, the creek now often stops flowing over summer, which is potentially due to a range of factors including reduced water flows into the entire catchment and the increase in number of constructed of dams across the landscape.

The continued use of the seasonal flows of Smokers Creek for irrigation and aesthetic maintenance may be counterproductive to the protection and enhancement of environmental values within the Precinct as prioritised within the Strategic Plan.

5.7 Fire and Fuel Management

5.7.1 Current Bushfire Risk Assessment

The following information has been determined through assessment completed by Practical Ecology in 2020 for the purposes of updating the findings of the Bushfire Risk Assessment presented in the 2015 EMP.

This 2020 update involved analysing the data collected during the site assessment along with office and online resources to determine the overall risk to and from the site along with the implications of specific hazards. This was performed at the site and landscape scale with summaries of the assessments provided below.

References to mapped zones apply to those as named in the 2015 EMP- Refer to the 2015 Map presented on the following page.

Summary of conditions

Based on the landscape assessment, the Precinct is at minimal risk of a large bushfire front impacting it directly. The terrain to the north-west is primarily farmland and a grassfire is unlikely to reach the site before being contained unless it approaches from relatively close. The Macedon Ranges to the south are high risk but separated from the Precinct by more paddocks so the only threat will be from embers igniting onsite vegetation or starting a more local grassfire.

There is a lot of vegetation onsite with the greatest hazard being the rock and CCZ1 which is dense Forest vegetation. There are measures in place to make a bushfire within this area easier to contain but considering the only planned burn went out of control, this Precinct should not be occupied during Extreme to Code Red conditions. The other vegetation onsite also presents varying amounts of risk which can potentially be addressed.

The following points are factors observed onsite which increase or decrease the bushfire risk overall based on the site assessment and the analysis above:

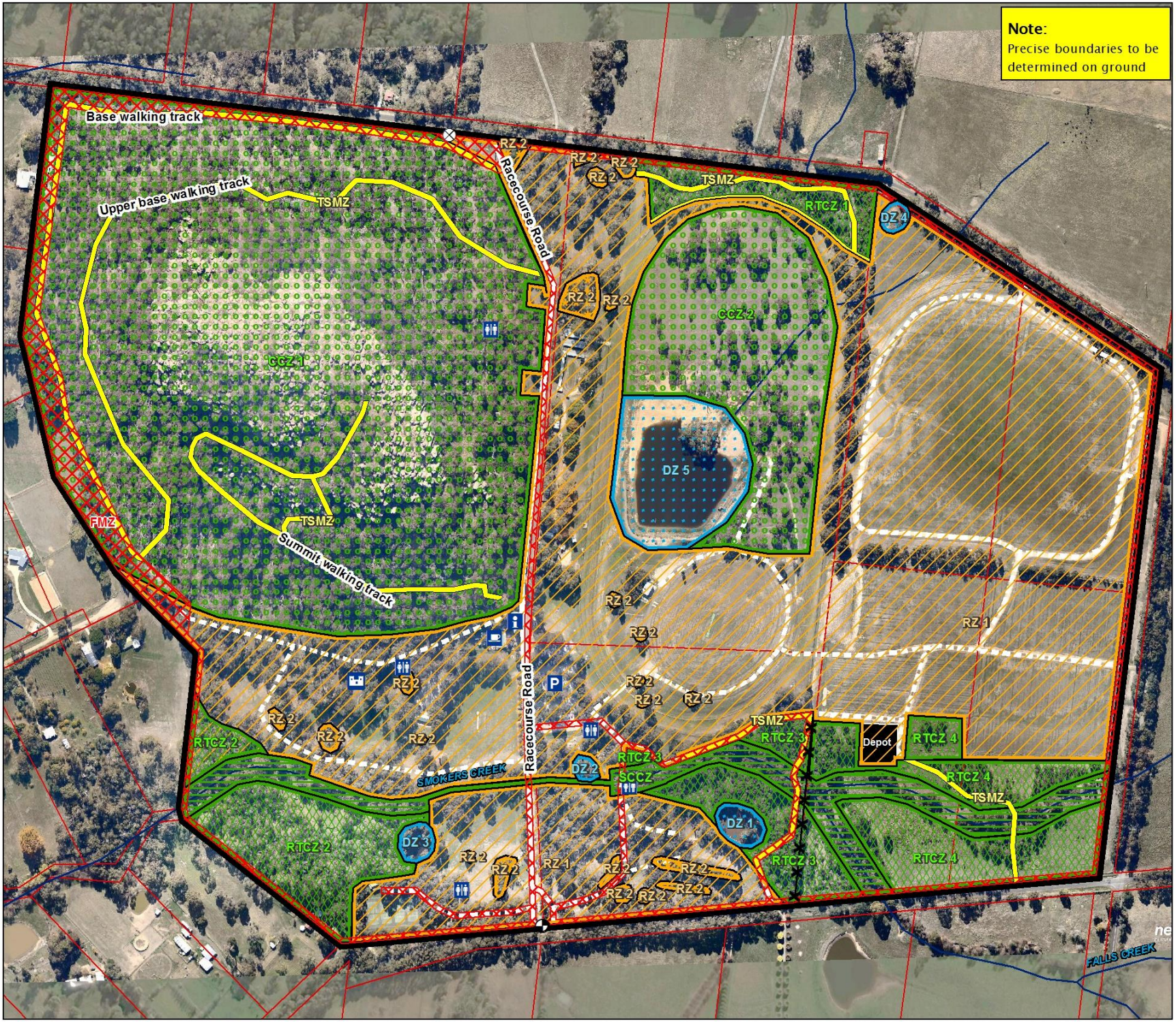
- The bushfire management within CCZ1 and RTCZ3 and 4 is considered appropriate as the observed fuel loads have been reduced and the vegetation is clear enough to provide safe access and staging for emergency services.
- The bushfire management within CCZ2 was considered a bit excessive since the racecourse provides a cleared staging area in which fire can be contained so allowing for additional habitat in this area is relatively low risk.
- The bushfire management within RTCZ2 was not considered to be sufficient as no measurable fuel break was present along the boundary and limited fuel management was observed.
- Fuel breaks were present along the majority of the boundaries with some exceptions or areas where more management could occur. The northern boundary could potentially forego a fuel

break and incorporate the Colwells Road Precinct to avoid clearing. The eastern boundary should incorporate the fuel break into the already cleared Precinct to promote good vegetation within the Straws Lane road reserve.

- Planned burning efforts created a patch of very dense understory vegetation which will be significantly more difficult to control than the more open and managed terrain observed across the rest of CCZ1.
- Considering the proximity to Forest vegetation within CCZ1 and the modified vegetation of various types within the RZ, the current structures onsite are not ideally placed in regards to bushfire risk. A higher BAL rating as per AS3959-2018 (BAL-29 or higher) will be required as part of any renovations and relocating to a lower risk area is recommended for any new or replacement structures.

The remaining management zones (RTCZ1 and 3, the SCCZ, RZ1 and 2, the TSSZ's and DZ1-5) posed minimal risk to life or infrastructure so no changes or reconsiderations are needed.

Endorsed by Council 27 October 2021



Management Zones

Hanging Rock Reserve

- Management Tracks
- Racecourse Rd
- Internal fence
- Watercourse
- Study site
- Parcels

Core Conservation Zones (CCZ)

- CCZ 1. The rock and its surrounds
- CCZ 2. Racecourse grassland

Remnant Tree (exotic groundstorey) Conservation Zones (RTCZ)

- RTCZ 1. North of racetrack
- RTCZ 2. South-West corner
- RTCZ 3. Dam 1 surrounds
- RTCZ 4. Southern portion of East Paddock

Smokers Creek (riparian) Conservation Zone (SCCZ)

- SCCZ. Smokers Creek (3m or 15m buffer)

Recreation Zones (RZ)

- RZ 1. Recreation Zones
- RZ 2. Tree Conservation Areas

Fuel Management Zones (FMZ)

- FMZ. Fuel Management Zones

Tree Safety Management Zones (TSMZ)

- TSMZ. Tree Safety Management Zones

Dam Zones (DZ)

- DZ 1. Dam Zone 1
- DZ 2. Dam Zone 2
- DZ 3. Dam Zone 3
- DZ 4. Dam Zone 4
- DZ 5. Dam Zone 5

- Depot

0 25 50 75 100 125 150 m

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5.7.1.1 Bushfire Hazard Landscape Assessment

The bushfire hazard landscape assessment provides information on the bushfire hazard more than 150 m away. This information is presented in Map 9 and discussed further below.

Landscape

The majority of the surrounding landscape to the north is level and covered in farmland with the largest patch of vegetation being the Cobaw State Park to the north. The landscape to the south contains the Macedon Ranges which is a large mountainous area covered in bushland and several timber plantations to the south-west. This terrain does contain scattered townships including Mount Macedon, Woodend and Cherokee and other development, but overall, the lands to the south are considered high risk terrain.

History of Fire

Other than a planned burn on the southern side of Hanging Rock in 2007 (which was recorded to have broken containment lines), there are no records of a bushfire impacting the site directly. The landscape to the south has been extensively burnt with the largest fires being the Ash Wednesday bushfires of 1983 and some smaller bushfires in 1965 and 2013. The Macedon Ranges have also been subject to several planned burns from 1991 onwards with no recorded activity within 5km north of the site.

Potential Fire Behaviour

During bushfire season, fires are propelled by powerful north-westerly winds before a south-westerly change brings cooler, more humid air from over the Southern Ocean. This can result in less intense bushfire approaching from the south-west or existing fires being turned in this direction. In rare circumstances, the change can reignite burnt terrain behind the front to create a much wider and more powerful bushfire (see Figure 1). This can potentially occur within the Macedon Ranges south of the site but will likely not directly impact the site.

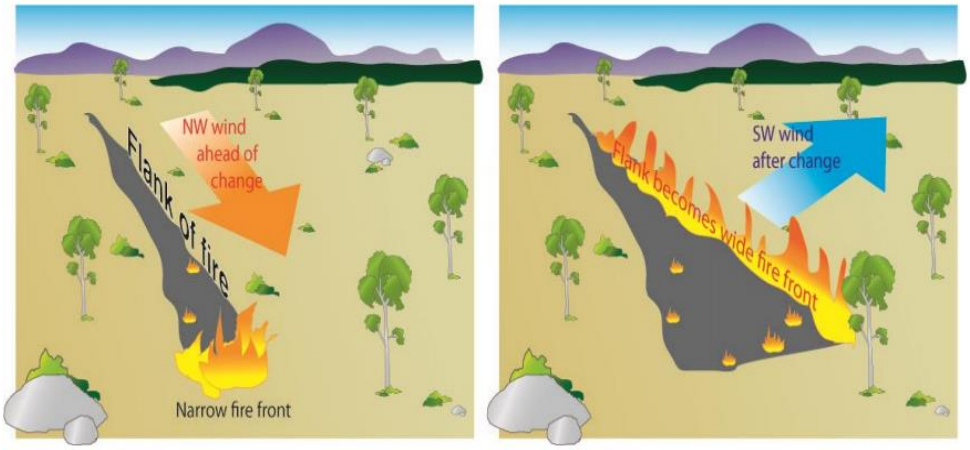

Figure 1. Directional change in fire front with wind change

The site's position more than 2km north of the vegetated slopes and within open managed paddocks to the north-west provides a buffer from significant bushfire activity. A grassfire could approach from the north-west but it is unlikely to reach the site before being contained. A bushfire within the Macedon Ranges is far more likely but the existing separation from this terrain means the only impact would be from embers igniting onsite vegetation or igniting a grassfire closer to the site.

Shelter and refuge options

While the risk of a bushfire directly threatening the site is low, there is the possibility of embers igniting the site or the surrounding area which could create severe bushfire conditions with minimal warning so evacuation is recommended during very high to extreme bushfire conditions. An update to the current Emergency Management Plan which factors in bushfire risk is essential and must contain the following:

- Conditions under which the Precinct will be closed to the public and events postponed/cancelled due to forecasted conditions.
- Conditions under which the Precinct will be pre-emptively closed/evacuated when conditions become too severe.
- A full evacuation and/or shelter-in-place procedure in the event of a bushfire.
- Policy regarding events hosted within the Precinct and whether they need to follow the Precinct's emergency procedures or provide their own.

The closest neighbourhood safer place to the Precinct is the Buffalo Stadium in Woodend which can be reached by proceeding west along South Rock Road and Romsey Road into Woodland, turning left onto High Street and then right onto Forest Street to reach the stadium. The position of this refuge relative to the site is considered safe but the CFA should be consulted before any evacuation is attempted.

The Calder Freeway can also be used for evacuation but proceeding south towards Melbourne is not recommended as this route moves through the Macedon Ranges where the bushfire threat is highest. Heading north towards Kyneton or to other towns along the freeway with CFA advice is recommended. If a full evacuation of the site is required, occupants should proceed to a designated refuge before proceeding elsewhere to ensure everyone is accounted for and out of harm's way.

Landscape typology

Planning Practice Note 65 provides a typology of bushfire landscapes -refer Table 15 below.

This landscape can be considered a Type 3 as bushfire can potentially approach from multiple aspects but there are multiple aspects which place this closer to a Type 2. The bushfire conditions are much more likely to be embers and spot fires than direct bushfire fronts which reduces the risk from fires approaching from multiple aspects and the presence of well maintained, main roads mean access is more or less assured. The site's position within farmland places this as Type 3 but this should not be defining factor in approving new developments.

Table 15. Landscape typology as presented in Planning Practice Note 65 **(DTPLI 2014)**

Type 1	Type 2	**Type 3**	Type 4
- There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation). - Extreme bushfire behaviour is not possible. - The type and extent of vegetation is unlikely to result in neighbourhood scale destruction of property. - Immediate access is available to a place that provides shelter from bushfire.	- The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site. - Bushfire can only approach from one aspect and the site is located in a suburban, township or urban area managed in a minimum fuel condition. - Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area.	**- The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site.** **- Bushfire can approach from more than one aspect.** **- The site is located in an area that is not managed in a minimum fuel condition.** **- Access to an appropriate place that provides shelter from bushfire is not certain.**	- The broader landscape presents an extreme risk. - Evacuation options are limited or not available.

5.7.1.2 Bushfire Hazard Site Assessment

The bushfire hazard site assessment provides information on bushfire hazards within 150m of the site. Map 9 and Map 10 provide an overview of the site along with categorised bushfire hazards based on AS3959-2018 and site-specific bushfire hazards respectively.

Site shape, dimensions and size

The shape of the site:	Irregular
The dimensions of the site:	~1,250m x ~900m
The site has a total area of:	~92.14ha

Infrastructure and access

Current infrastructure	The current infrastructure in and around the Precinct includes: • Reception, visitors centre and café area • Racecourse infrastructure (club house, stables, etc.) • Managed parkland areas with playgrounds, BBQ facilities and shaded picnic areas. • Cricket oval with club/changing rooms • Concert pavilion with stage area and expanded temporary parking facilities with ticket office • Tennis club • Gatehouse • Parking areas • Land management facilities and storage • Amenities blocks x5
Current access	The site has the following access roads and points: • There is a gated main entrance along the southern boundary onto South Rock Road which connects to Racecourse Road that runs through the centre of the site to another entrance along the northern boundary onto Colwells Road. This road accesses the racecourse, cricket oval and visitors centre. • The concert arena has access along the eastern boundary onto Straws Lane which is the main access point during ticketed events. There are access roads to the parking area and around the concert pavilion with a service access for staff along the north-eastern boundary onto Colwells Road. • There is a perimeter road along the northern and north-western boundaries and sparingly around the remaining boundaries. There are also scattered access road along the southern side of CCZ 1 and throughout RTCZ 4 and the RZ.

Vegetation and Topography

Refer to Map 11 and Table 160 for the results of the vegetation and slope assessment as per AS3959-2018.

Table 16. Bushfire hazard site assessment

Patch	1	2	3	4	5	6	7
Placement within and/or around Precinct	North—western side of the site within CCZ1, along the northern boundary within RTCZ1 and on the south-western side of the site within RTCZ4 and the SCCZ	On paddocks surrounding the site within 150m	On adjacent properties to the south-west and north-west	In the south-eastern corner of the site within RTCZ 4 and the SCCZ and along the north-western boundary within the FMZ	At the northern end of the site within CCZ2	In the south-western side of the site and along Racecourse Road	Within the concert pavilion, even parking area, racecourse and cricket oval, along the Colwells Road, Straws Lane and South Rock Road Precincts and on adjacent properties to the north-east and west.
Vegetation type	Forest	Grassland	Modified vegetation (as per Clause 53.02)	Modified vegetation (Forest)	Modified vegetation (Woodland)	Modified vegetation (Parkland)	Low Threat
Effective slope (up/down) *	Up	Up/Flat	Up/Flat	Up/Flat	Up/Flat	Up/Flat	Up/Flat
Effective slope (degrees) *	>20° (majority)	0-2°	0-2°	0-2°	0-2°	0-2°	0-2°

* Slope is considered relative to the infrastructure onsite and on how most of the slopes are viewed from within the Precinct

Forest Vegetation

Forest vegetation as per AS3959-2018 consists of a canopy layer between 10-30m high (can be taller) with foliage cover of between 30-70%. There is also an elevated fuel layer of shrubs along with groundstorey fuels (grasses and herbs). This vegetation is typically dominated by Eucalypts but also includes Pine plantations and denser covering of exotic trees.

This vegetation covers the majority of CCZ 1 on the rock (see Figure 2), within RTCZ 1 and 2 (see Figure 3), along Smokers Creek within SCCZ and on an adjacent property north of Colwells Road (see Figure 4). While there is management within this vegetation (planned burns in CCZ1 and some bushfire management within RTCZ2), fuel levels and vegetation structure indicate that this vegetation is Forest.

Figure 2. Forest vegetation

Figure 3. Forest vegetation

Figure 4. Forest vegetation north of the Precinct

Grassland Vegetation

Grassland vegetation as per AS3959-2018 is dominated by grass and herb species and can contain canopy and elevated fuel layers of varying heights as long as the foliage cover is less than 10%. This vegetation was not found within the Precinct but was present on paddocks surrounding it within 150m (see Figure 5 and Figure 6). These are grazed pasture so livestock will be removed periodically to allow regrowth so we consider these as Grassland as long as this occurs.

Figure 5. Grassland north of the Precinct

Figure 6. Grassland south of the Precinct

Low-threat modified vegetation

Low Threat vegetation as per AS3959-2018 consists of vegetation managed to minimal fuel conditions including maintained lawns, golf courses, maintained public Precincts and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and wind breaks. This occurred largely in the East Paddock and on the racecourse/cricket oval which are managed lawn areas. Outside the Precinct this vegetation type is present along adjacent road Precincts and adjacent properties.

Figure 7. Low threat areas around concert pavilion

Figure 8. Low threat areas within event carpark

The management observed in these areas can also be considered insufficient to consider the vegetation Low Threat but enough to rule out other classified vegetation. Clause 53.02 considers this vegetation Modified as it:

- has been modified, altered or is managed due to urban development or gardening,
- has different fuel loads from those assumed in the standard,
- has limited or no understorey vegetation, or
- is not low-threat or low-risk vegetation as defined in the standard

Areas which can be considered within this category include residential properties to the north-west and south-west of the Precinct. Other areas within the site also contained management but these varied based on the usage and the management aims of the area.

Figure 9. Modified vegetation to the north-west

Figure 10. Modified vegetation to the south-west

Patch 4 included Forest vegetation along the north-western boundary within the FMZ of CCZ1 and in the south-eastern corner within RTCZ4 (see Figure 11). This terrain would normally be Forest as per AS3959-2018 but the management present has effectively lowered the fuel levels enough to allow emergency service access and staging as per the *Hanging Rock Precinct Fire Management Plan*.

Figure 11. Modified vegetation within CCZ1

Patch 5 was an area where significantly more fuel management has been performed to protect the adjacent racecourse (see Figure 12). Since there is still some conservation management present, the best simile which can be applied to this patch is Woodland as per AS3959-2018. While this vegetation has a lower fuel load than those assumed for Woodland, the key difference between Forest and Woodland is the ability to support a crown fire. The denser canopy and higher fuels in the managed vegetation within CCZ1 could still potentially support a crown fire for a short distance while this is not a possibility here even if management ceased.

Figure 12. Modified vegetation within CCZ2

Patch 6 refers to the modified vegetation within the managed parkland areas of the RZ (see Figure 13 and Figure 14). These areas are managed as parkland as opposed to the previous categories which were modified natural habitat. This can be considered within the same category as standard Modified vegetation under Clause 53.02 but since this is within the Precinct then more fire management controls can be applied as appropriate.

Figure 13. Parkland along Racecourse Road

Figure 14. Parkland south of CCZ1

5.7.1.3 Fuel Load Assessments

Overall, the recorded results were lower than assumed fuel loads recorded for Forest and Woodland vegetation (25/35 tonnes/ha and 15/25 tonnes/ha respectively) which can be attributed to management but only to an extent. The survey was performed during/following a wet period and the overall amount of leaf litter was significantly reduced due to more growth and greater decomposition. The results can still be considered accurate however and the implications are detailed below.

FHA 1 and 2 were located within CCZ2 which, as detailed above, was subject to significant bushfire management to protect the adjacent racecourse and has its fuel load limited to 3 tonnes per hectare. This was evident from the assessment which recorded a significantly reduced risk and overall fuel load (accounting for bark and canopy fuels it was approximately 3-5 tonnes per hectare).

Considering the placement of this zone relative to CCZ1, some management is warranted to avoid creating a situation where both sides of Racecourse Road are burning out of control but the management observed within this area can be viewed as extreme. The area is surrounded by a managed racecourse which can provide immediate access for emergency services and a substantial staging area so the management levels observed within CCV1 may be more appropriate.

FHA 2, 3 and 6 were located within CCZ1 at points where management was observed. This zone's management zone was designed to create safer staging areas emergency services which includes vegetation removal to ensure safe access, no plantings outside of fallen tree replacement and a reduction of ladder fuels to prevent a crown fire. These measures appear effective with fuel levels lower than the 25/35 tonnes/ha expected from Forest vegetation.

FHA 5 was unique in that it was located within the planned burn of 2007. The surrounding trees were burnt which resulted in a lower canopy level and the surface and near-surface fuels were reduced as well. This can be attributed to the extremely high levels of elevated fuels which were too dense to move through at multiple locations. This has implications for bushfire control as these fuels tend to burn very hot which could impact the ability to contain them.

5.7.1.4 Potential Risks and Recommendations

Based on our review of the bushfire risk to the site as documented in Part 1of this EMP, there are a few outstanding issues which will need to be addressed by future management or development:

- Whether to incorporate more fuel management into the adjacent road Precinct's or into the Precinct to reduce the amount of management on whichever has the higher quality habitat.
- The potential of improving the amount of vegetation within an existing row of trees on the eastern side of the Precinct (the area separating the concert pavilion from the carpark) as a wildlife corridor without increasing the bushfire risk.
- The potential of planting more vegetation within the *RZ1* to connect *CCZ1* with *RTCZ2* and *SCCZ* in the south-western corner of the site to connect these two habitat patches without increasing the bushfire risk (see Map 11 for location).

A Bushfire Risk Assessment was undertaken as part of preparation of this EMP. This assessment responds to the management, use and zoning as presented in the 2015 EMP, along with preliminary identification of opportunity for protection and enhancement of ecological values, as options to inform the Master Plan.

Some Zoning names within this section are therefore consistent with the previous 2015 EMP, and recommendations have been used to inform the updated Management Zone layout presented in Map 12.

References of superseded Zone names are presented as italicised e.g., **CCZ, * RTZ etc*

Table 17 below details the questions raised from stakeholder consultation, the preliminary findings of the ecological assessment, and the Bushfire Risk Assessment completed to address these abovementioned issues, and the potential risks and recommendations to reduce this risk.

Table 17. Potential risks and recommendations

Query	Potential risk/conditions	Options
Can the bushfire management be reduced within **CCZ2* to allow for more conservation management?	• The zone would have a higher fuel load which would create the potential for bushfires on either side of the racing infrastructure. • The racecourse provides a managed staging area where emergency services can contain a bushfire within this area.	• Apply management conditions from **RTCZ2* or **RTZ4* where management if primarily for conservation and aesthetic but management of weeds and understory fuels is employed to reduce fuel levels.
Can more bushfire management be employed within **RTCZ2?*	• The risk from this area is relatively high and there was no fuel break or track observed along the boundary. • The risk was increased by the presence of dwellings on the adjacent properties very close to this boundary.	• Definitely consider increasing the bushfire management within **RTCZ2.* This can be done through employing a greater fuel break like those observed in **CCZ1* or increasing management to **RTCZ4* levels On a similar note, **RTCZ4* is flanked by road Precinct's with no adjacent dwellings and can potentially increase its management to **RTCZ2* levels with no increase in bushfire risk.

Query	Potential risk/conditions	Options
Can more road reserves be employed as fuel breaks to reduce onsite clearing?	• Road reserves are present along three of the reserve boundaries and can potentially be employed to avoid clearing vegetation onsite. • The reserve has high fences so the ability to incorporate road reserves will depend on the ability to access the interior of the site. • The eastern boundary has vegetation preferable to that found inside the reserve.	• Fuel breaks within the Precinct along the northern and southern boundaries can potentially relax their fuel break requirements as long as bushfire management is incorporated into the adjacent road reserves, considering the vegetation present and the access currently available. • The eastern boundary should have additional fuel management to protect the vegetation on the Straws Lane road reserve.
Should any more planned burns be considered?	• A planned burn took place in 2007. • The burnt area now has an extreme amount of elevated fuel which presents a higher risk.	• Planned burns are generally not recommended for the purpose of fuel reduction as the other bushfire control measures employed appear to be effective. Cool/cultural burns may be implemented for ecological/cultural purposes
Should existing structures be relocated to lower risk areas?	• The current visitors centre and racecourse infrastructure is placed too close to **CCZ1* to adequately defend against bushfire. • The modified vegetation within the parklands adjacent to these structures also mean moving them marginally away from **CCZ1* may not be sufficient.	• If these structures remain in their current position, it will need to unoccupied during Extreme to Code Red conditions. • Any updates to these structures will necessitate a higher BAL rating (BAL-29 or higher) so relocation is recommended. • The current cricket oval may be the best location for any new development as this will not impact any vegetation and will increase the separation from existing hazards.
Can the vegetation row on the eastern side of the site be increased to provide a better wildlife corridor?	• This row of vegetation separates the concert pavilion from the event parking area and would connect vegetation along Straws Lane to **CCZ2* and **RTCZ1.* • Both the concert pavilion and the event parking area are managed, low threat areas with access onto the adjacent roads within each area.	• This vegetation can be increased as a wildlife corridor without increasing bushfire risk provided consideration of density and species selection is made

Query	Potential risk/conditions	Options
Can the vegetation separating **CCZ1* and **RTCZ2* be increased to connect these habitats?	• This would involve connecting the largest patch of vegetation onsite with another very large patch of vegetation so there is a high bushfire risk (especially considering the number of dwelling along this boundary. • The bushfire management along the north-western boundary within **CCZ1* was good but this level of management was not present within **RCTZ2.*	• If these two zones are connected through the separating parkland the bushfire management within **CCZ1* will need to be employed within both zones including clearing for access and fuel reduction. • If these areas are managed in this way, then there is additional incentive to move the existing structures to safer locations.

5.7.1.5 Localised Bushfire Hazards

In addition to the vegetation conditions observed onsite, the following hazards were noted within the Precinct and the immediately surrounding areas

- There was no management track or significant reduction of fuel observed within RTCZ2 which impairs the ability of emergency services to contain bushfires threatening the dwellings adjacent to this boundary.
- Fuel breaks were only partially present along the boundaries but this can be considered a minor issue if the road reserves are incorporated into them.
- The visitors centre and the racecourse buildings are located too close to CCZ1 to realistically defend them against a bushfire or provide refuge.

5.7.2 Emergency management

The measures in this Bushfire Risk Assessment cannot guarantee safety during an extreme fire event; buildings are only designed to withstand fire up to a Fire Danger Index (FDI) of 100 (i.e., not designed for Code Red Fire Danger), and even below this threshold building survival cannot be guaranteed. Council has also indicated some form of emergency management will be required in response to bushfire.

As previously stated, considering the potentially devastating consequences of a bushfire to a facility of this nature, a response should definitely be developed despite the risk being relatively low. It is difficult to determine whether evacuation is the best option considering the organisation required to move people and animals quickly and the limited options of where to evacuate them to. Staying and defending is a potential option which should be considered as the only threat to the site will be from grassfires.

A dedicated emergency management plan for the site with a response to bushfire is therefore essential. This response should include listening for CFA alerts and bushfire conditions during bushfire season (October-April) and being prepared to close and vacate the facility during Extreme and/or Code Red conditions or during a bushfire emergency. Additional arrangements will need to

be made to evacuate horses or if there are provisions to defend them (CFA consultation is recommended for both options).

The focus of fire risk management for the Precinct is the appropriate planning and risk mitigation through strict control of visitors at particular high-risk periods or circumstances, as well as vegetation management in preparation of a fire event that would require access to the site by local fire agencies, being Country Fire Authority (CFA) and Forest Fire Management Victoria (FFMV- DELWP)

The current policy and planning for the site are contained within the following documents

- Hanging Rock Reserve Fire Management Plan (MRSC, 2015)
- Hanging Rock Emergency Management (MRSC, …)
- Municipal Emergency Management Plan (MRSC, 2019)
- Municipal Fire Management Plan - DRAFT (MRSC, 2020)

It is necessary that these documents specific to the Hanging Rock Precinct are updated to reflect any future changes to site use, or risk, as part of the implementation of the Strategic Plan, or in response to future changes to management as determined by the Master Plan once completed.

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MAPS

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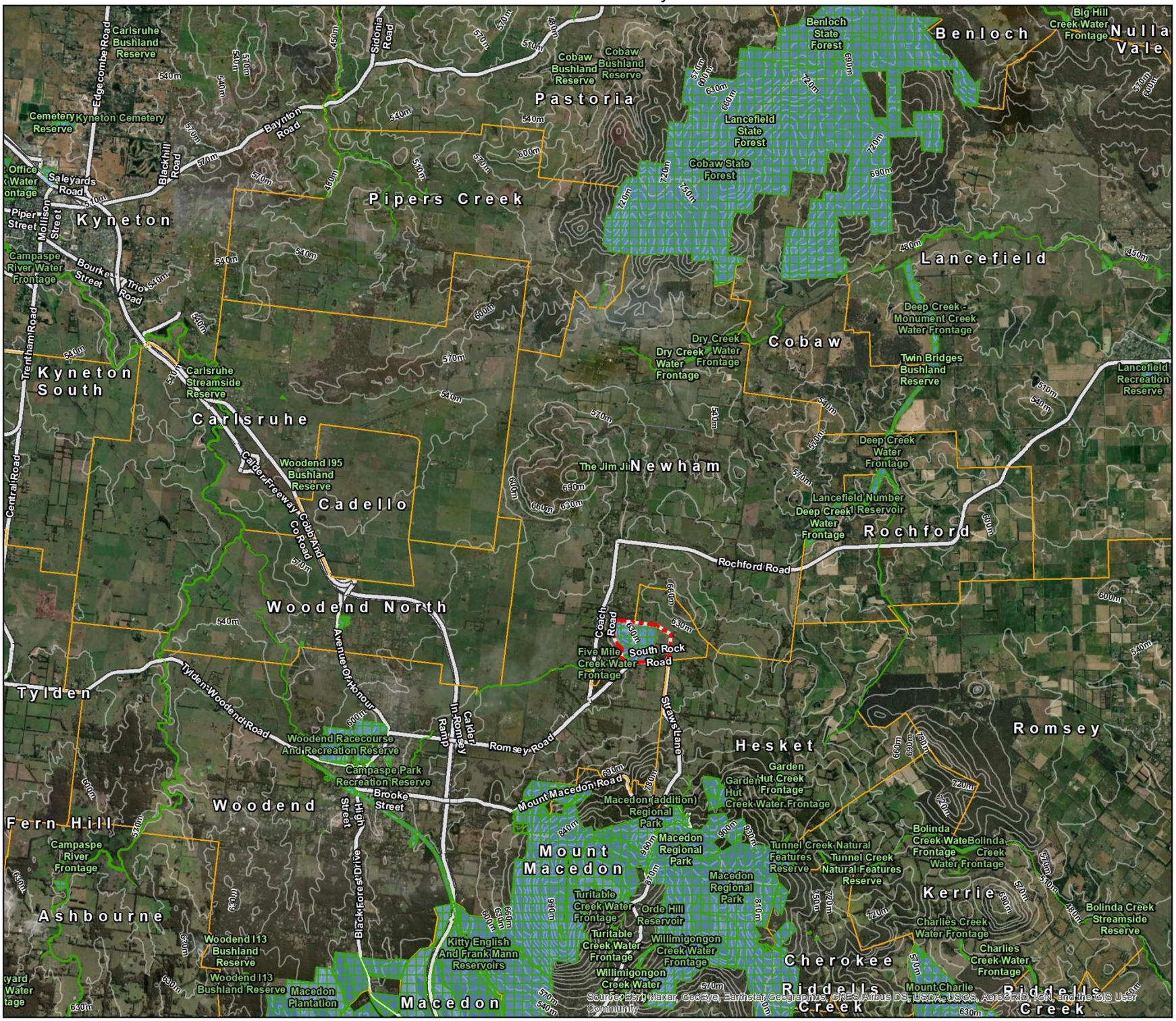

Map 1. Landscape Context

Hanging Rock Reserve

Legend

- Study site
- Contours (30m)
- Localities
- Public land
- Public land management
- Major Roads

Details

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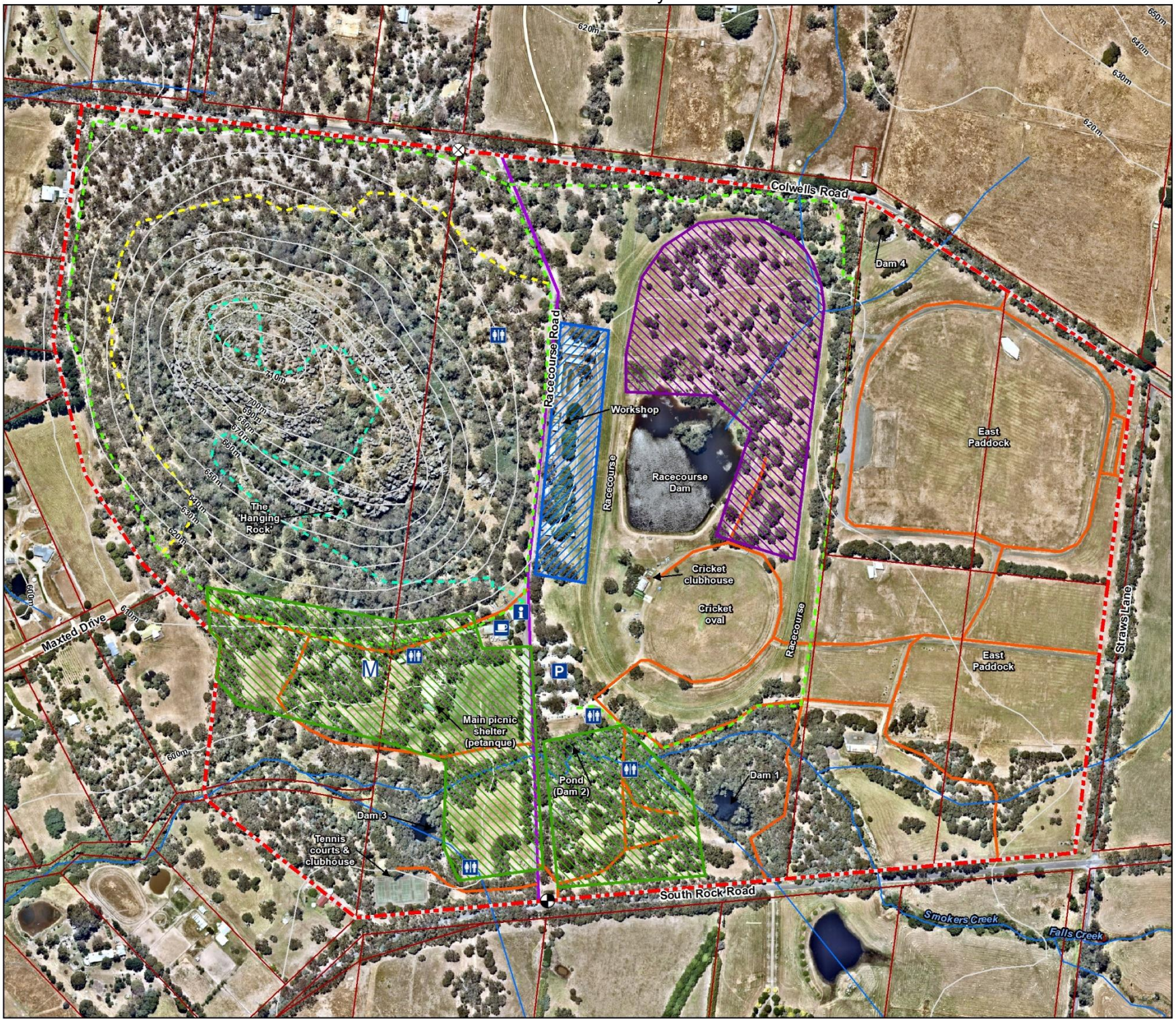

Map 2. Site Layout

Hanging Rock Reserve

- Study site
- Parcels
- Contours (10m)
- Natural watercourse

Roads

- Management Tracks
- Racecourse Rd

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track
- Main entrance
- Northern entrance (race days & concerts)
- Information
- Car parking
- Toilet block
- Cafe
- Playground
- Picnic areas
- Racecourse Precinct
- Racecourse grassland

Details

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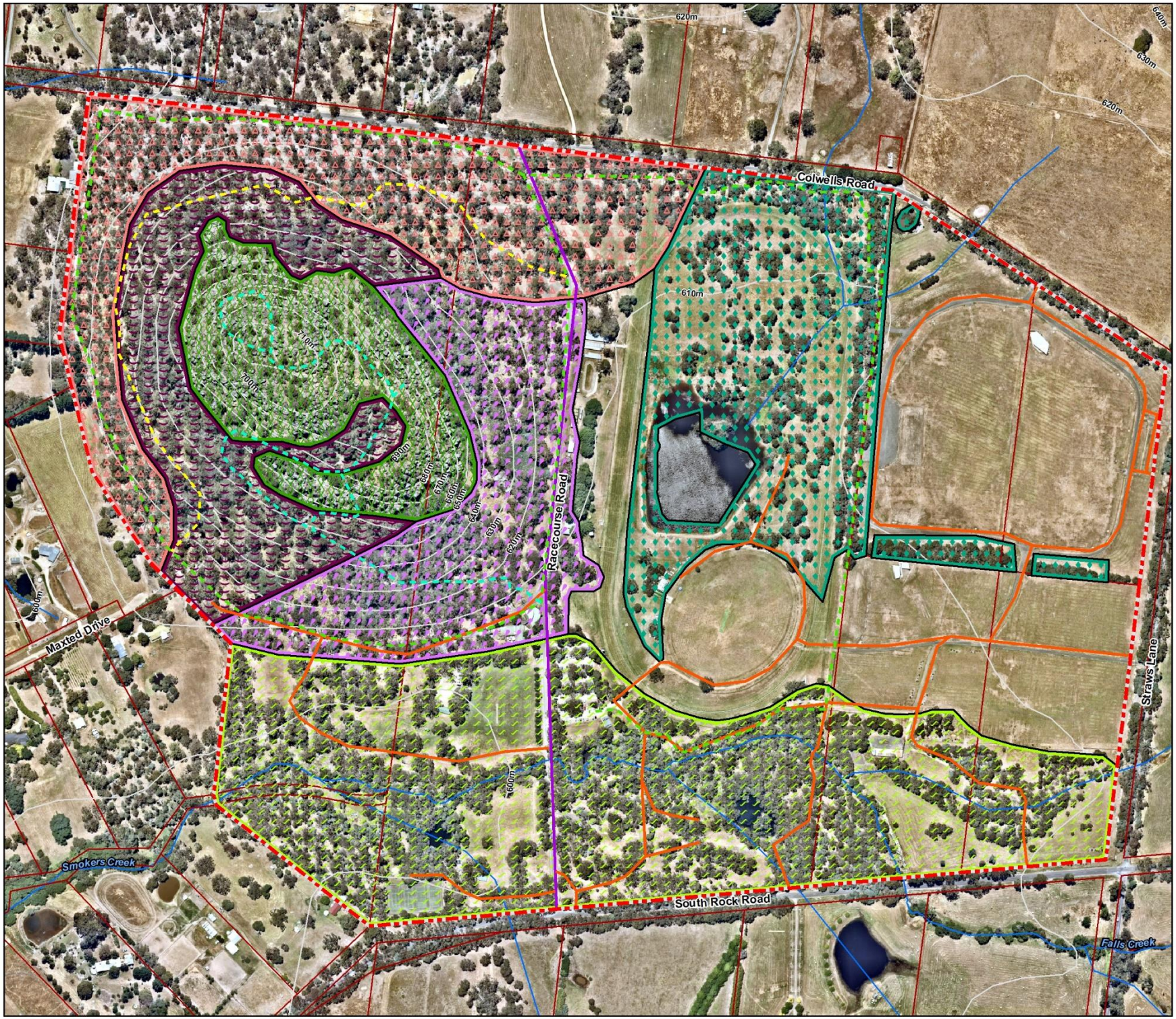

Map 3. Ecological Vegetation Classes

Hanging Rock Reserve

- Study site
- Parcels
- Natural watercourse
- Contours (10m)

Roads

- Management Tracks
- Racecourse Rd

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track

Ecological Vegetation Classes

- EVC 23: Herb-rich Foothill Forest (TBD)
- EVC 47: Valley Grassy Forest (*as per 2020 Grassland Management Plan)
- EVC 55: Plains Grassy Woodland
- EVC 45/55: Shrubby Foothill Forest/ Plains Grassy Woodland Mosaic
- EVC 83: Swampy Riparian Woodland
- EVC 859: Montane Grassy Woodland/ Rocky Outcrop Shrubland/ Rocky Outcrop Herbland Mosaic

Details

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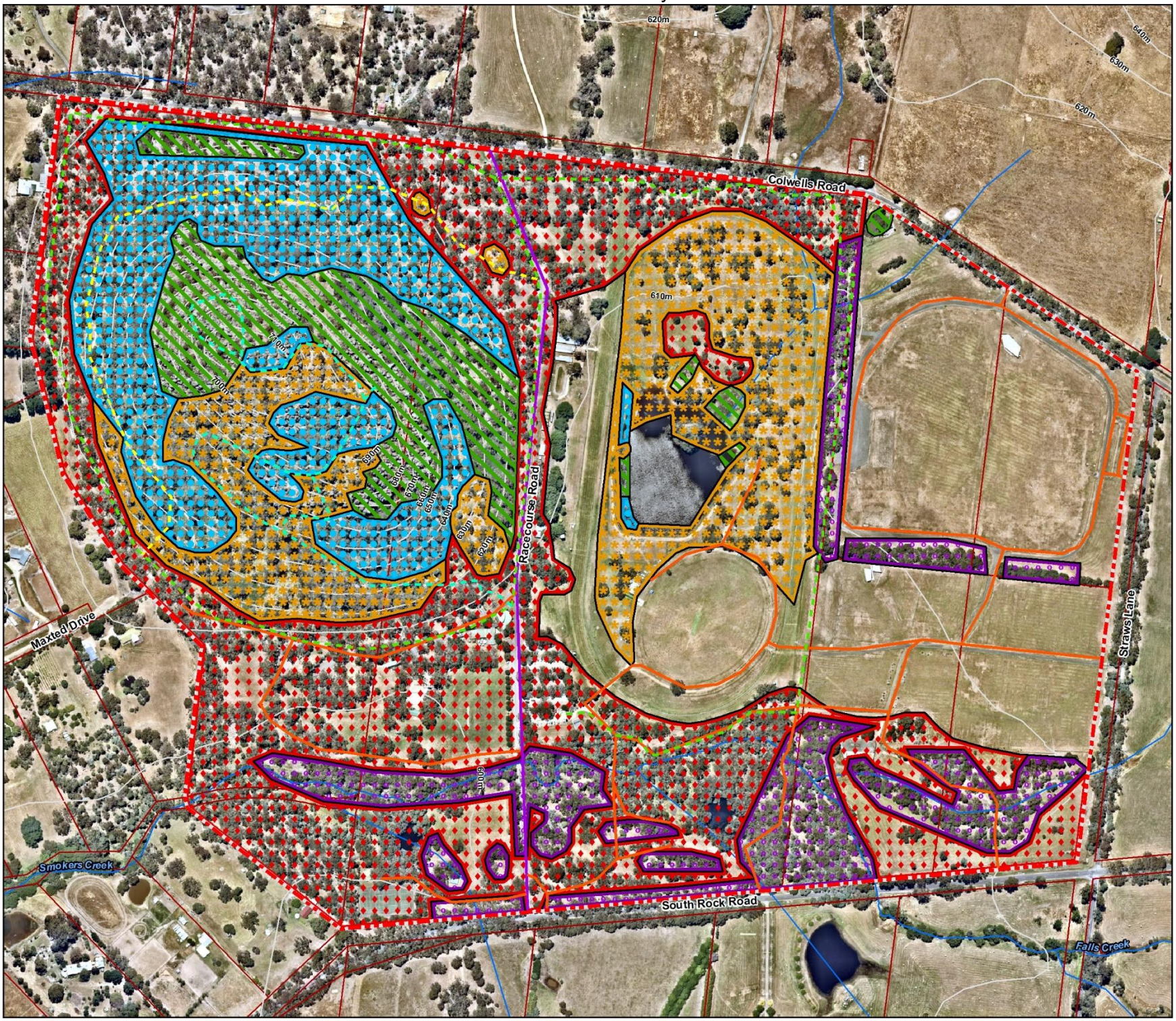

Map 4. Indigenous Groundstorey Vegetation Quality

Hanging Rock Reserve

- Study site
- Parcels
- Natural watercourse
- Contours (10m)

Roads

- Management Tracks
- Racecourse Rd

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track

Indigenous groundstorey vegetation cover

Remnant

- 0-25% indigenous groundstorey vegetation cover
- 25-50% indigenous grounstorey vegetation cover
- 50-75% indigenous groundstorey vegetation cover
- 75-100% indigenous groundstorey vegetation cover

Revegetation

- Revegetation (<25% indigenous groundstorey vegetation cover) - to be confirmed

Details

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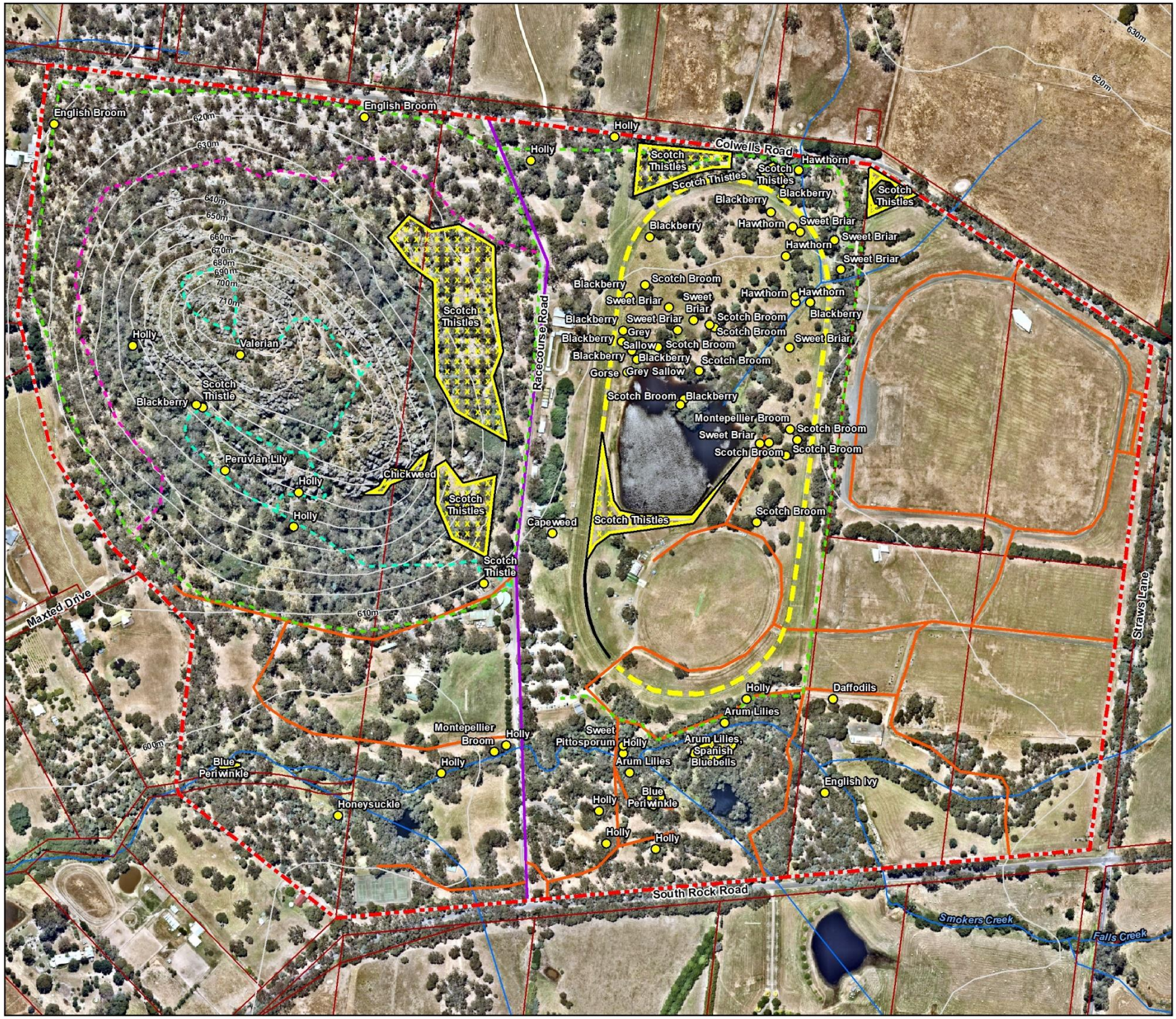

Map 5. Current weeds

Hanging Rock Reserve

- Study site
- Parcels
- Natural watercourse
- Contours (10m)

Roads

- Management Tracks
- Racecourse Rd

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track

Recorded weeds

- Individual weeds
- Weed rows
- Weed patches

Details

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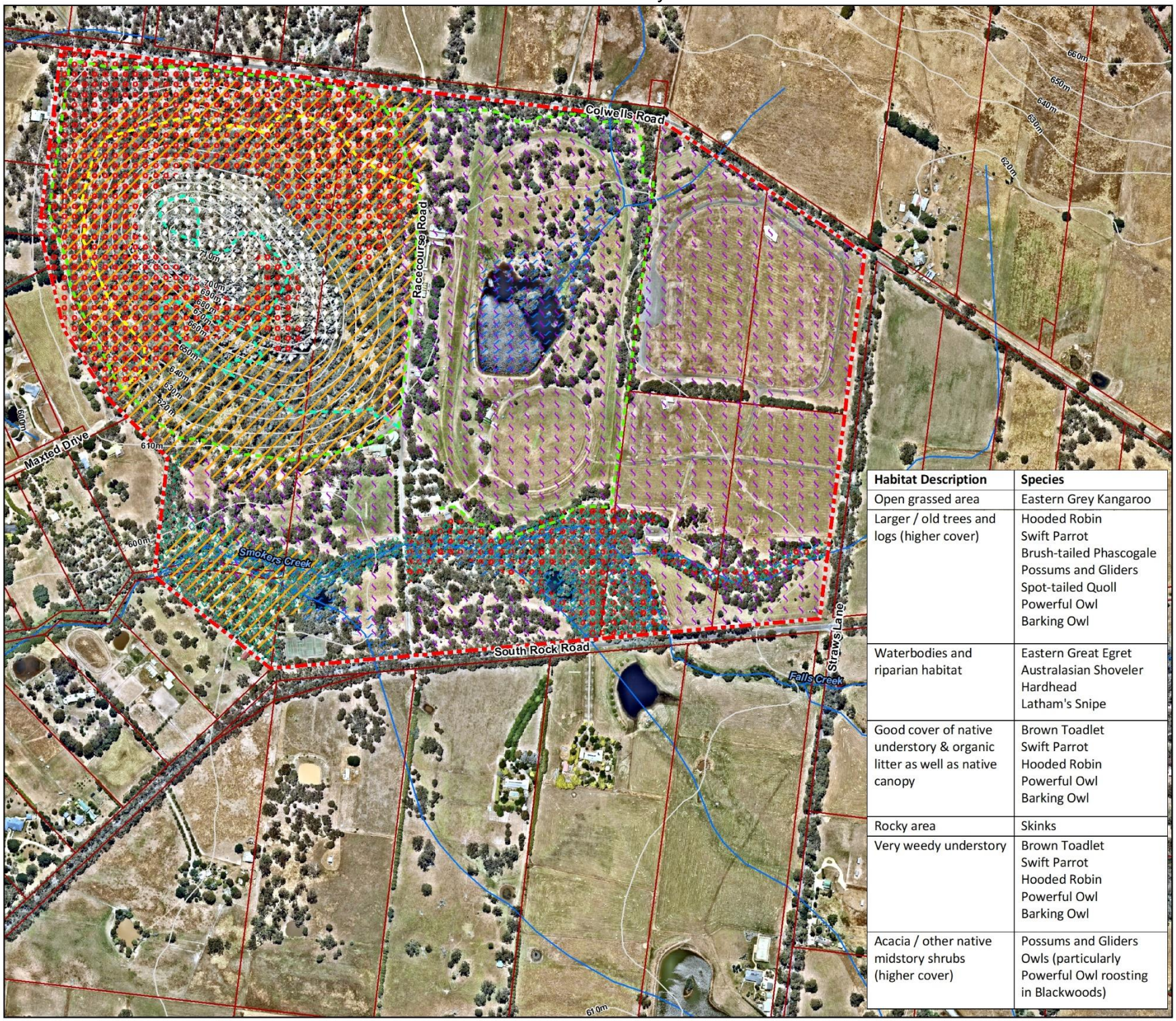

Habitat Description	Species
Open grassed area	Eastern Grey Kangaroo
Larger / old trees and logs (higher cover)	Hooded Robin Swift Parrot Brush-tailed Phascogale Possums and Gliders Spot-tailed Quoll Powerful Owl Barking Owl
Waterbodies and riparian habitat	Eastern Great Egret Australasian Shoveler Hardhead Latham's Snipe
Good cover of native understory & organic litter as well as native canopy	Brown Toadlet Swift Parrot Hooded Robin Powerful Owl Barking Owl
Rocky area	Skinks
Very weedy understory	Brown Toadlet Swift Parrot Hooded Robin Powerful Owl Barking Owl
Acacia / other native midstory shrubs (higher cover)	Possums and Gliders Owls (particularly Powerful Owl roosting in Blackwoods)

Map 6. Fauna Habitat

Hanging Rock Reserve

- Study site
- Parcels
- Contours (10m)
- Natural watercourse

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track

Fauna Habitat

- Open grassed area
- Larger/old trees and logs (higher cover)
- Waterbodies and riparian habitat
- High-cover mid-storey shrubs
- Good cover of native understory & organic litter with a native canopy
- Organic litter/ground-storey and canopy
- Rocky area

Details

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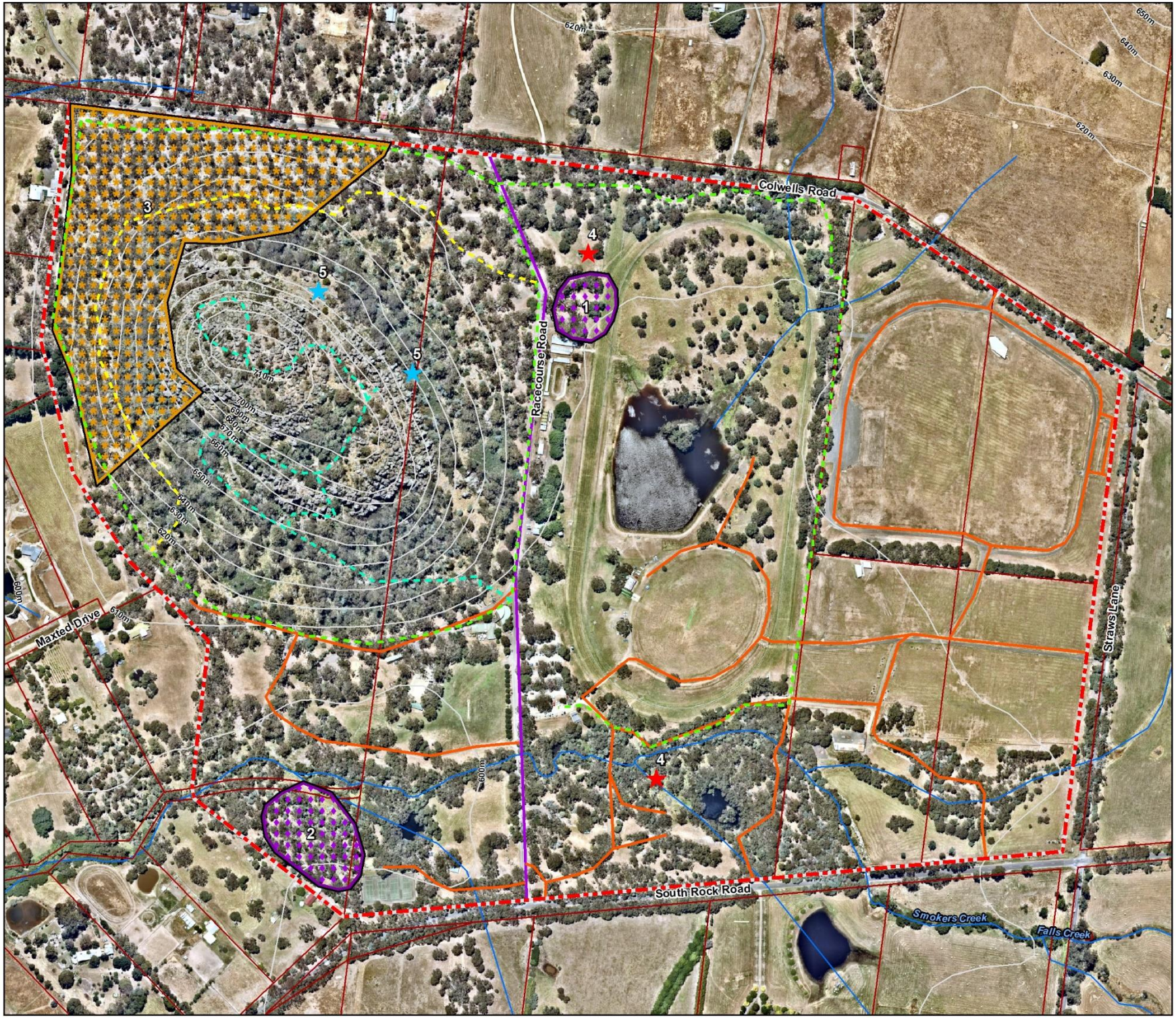

Map 7. Historic Significant Species Locations

Hanging Rock Reserve

Legend

- Study site
- Parcels
- Contours (10m)
- Natural watercourse

Roads

- Management Tracks
- Racecourse Rd

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track

Fauna locations

- Greater Glider family
- Sugar Gliders
- Peregrine Falcon nest
- Powerful Owl roost site

Details

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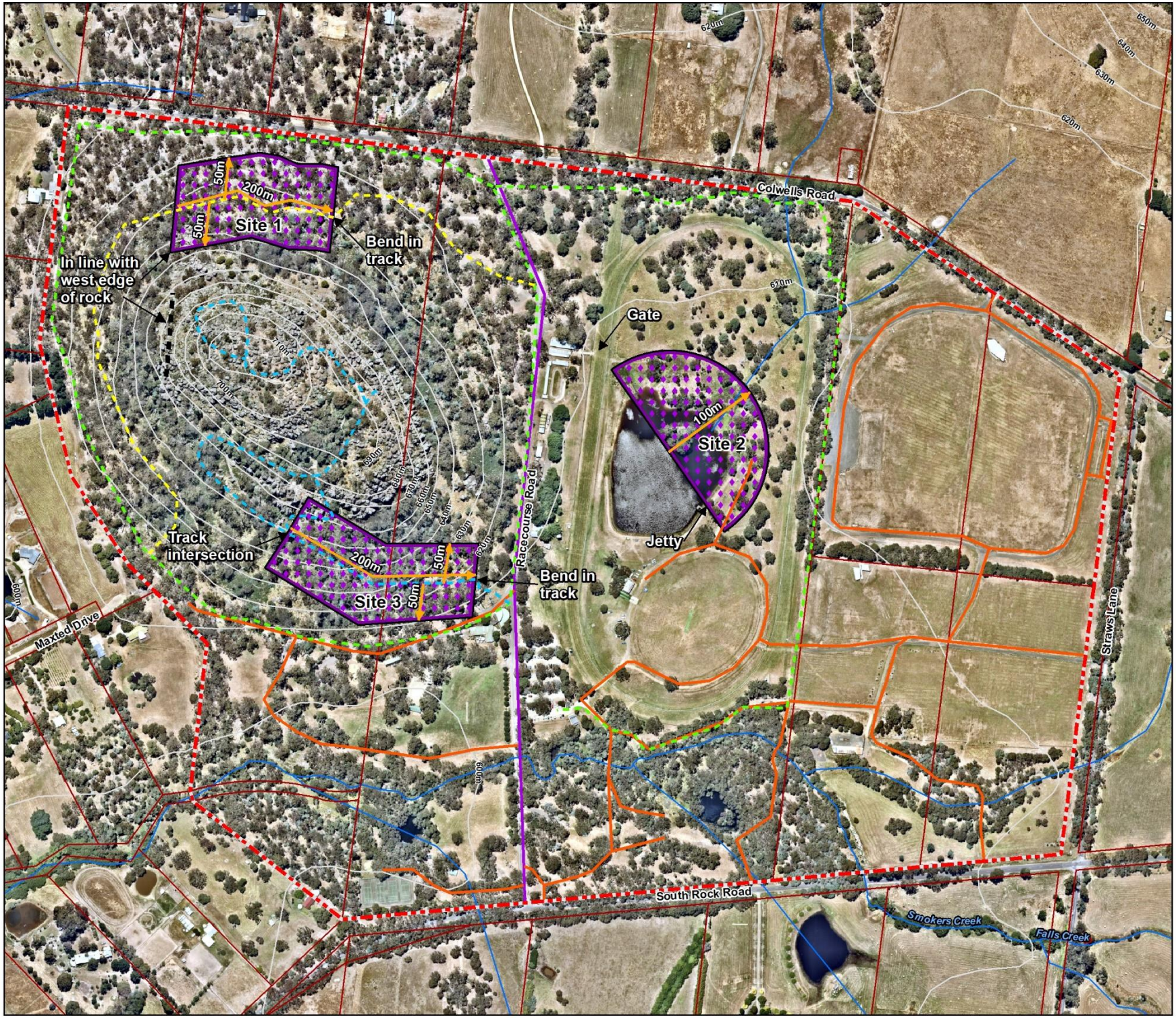

Map 8. Bird Survey Areas

Hanging Rock Reserve

Legend

- Study site
- Parcels
- Contours (10m)
- Natural watercourse

Roads

- Management Tracks
- Racecourse Rd

Walking tracks

- Base walking track
- Upper base walking track
- Summit walking track
- Bird survey areas (2ha)

Details

Mapping by: Karen McGregor & Colin Broughton
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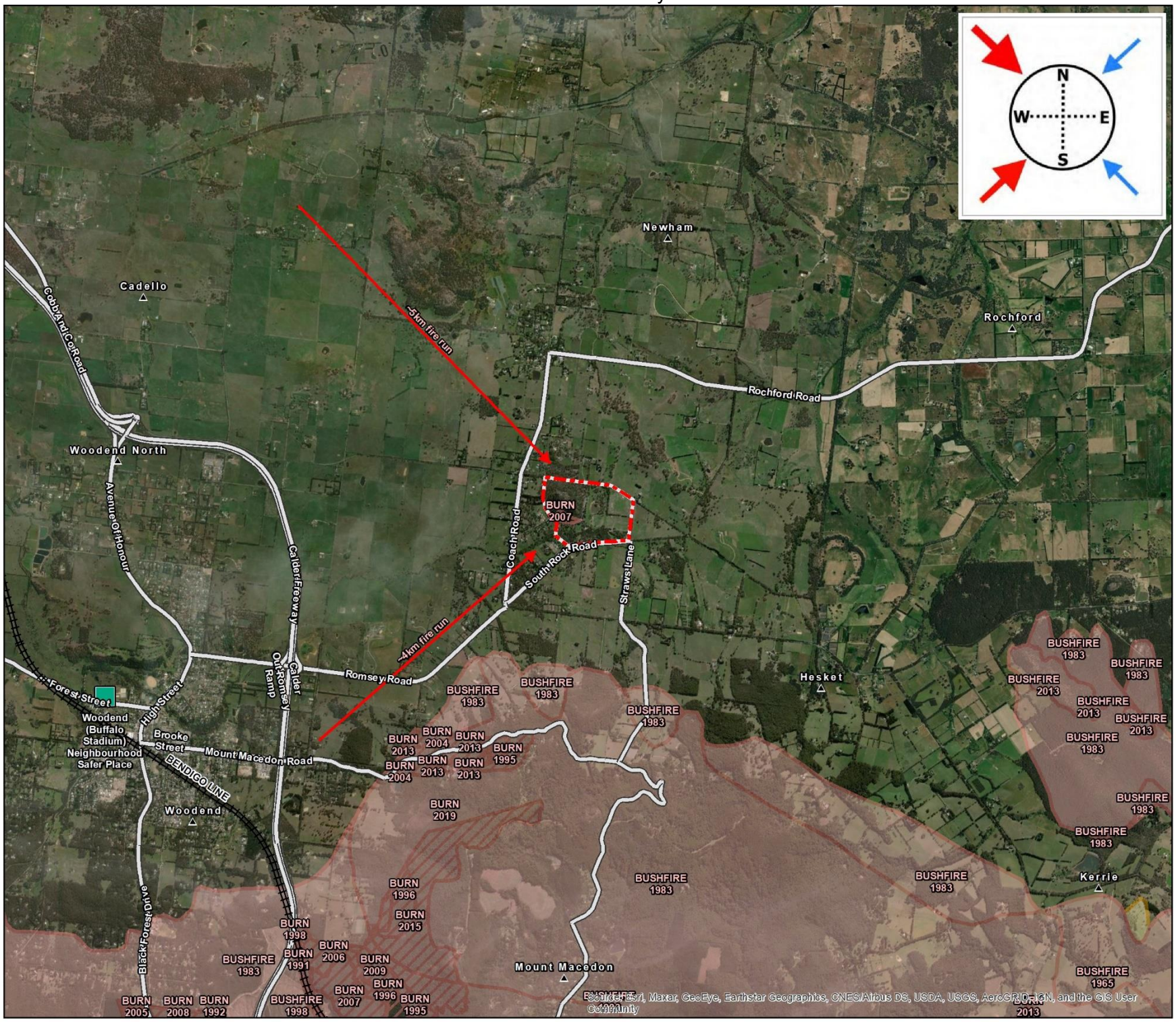

Map 9. Bushfire Hazard Landscape Assessment

Hanging Rock Reserve

Legend

- Subject site
- Town centre
- Neighbourhood Safer Place
- Railways
- Major Roads
- Potential fire runs

Fire History

Bushfire

- Bushfire 1950-1979
- Bushfire 1980 onwards

Planned Burn

- Planned Burn 1980 onwards

Details

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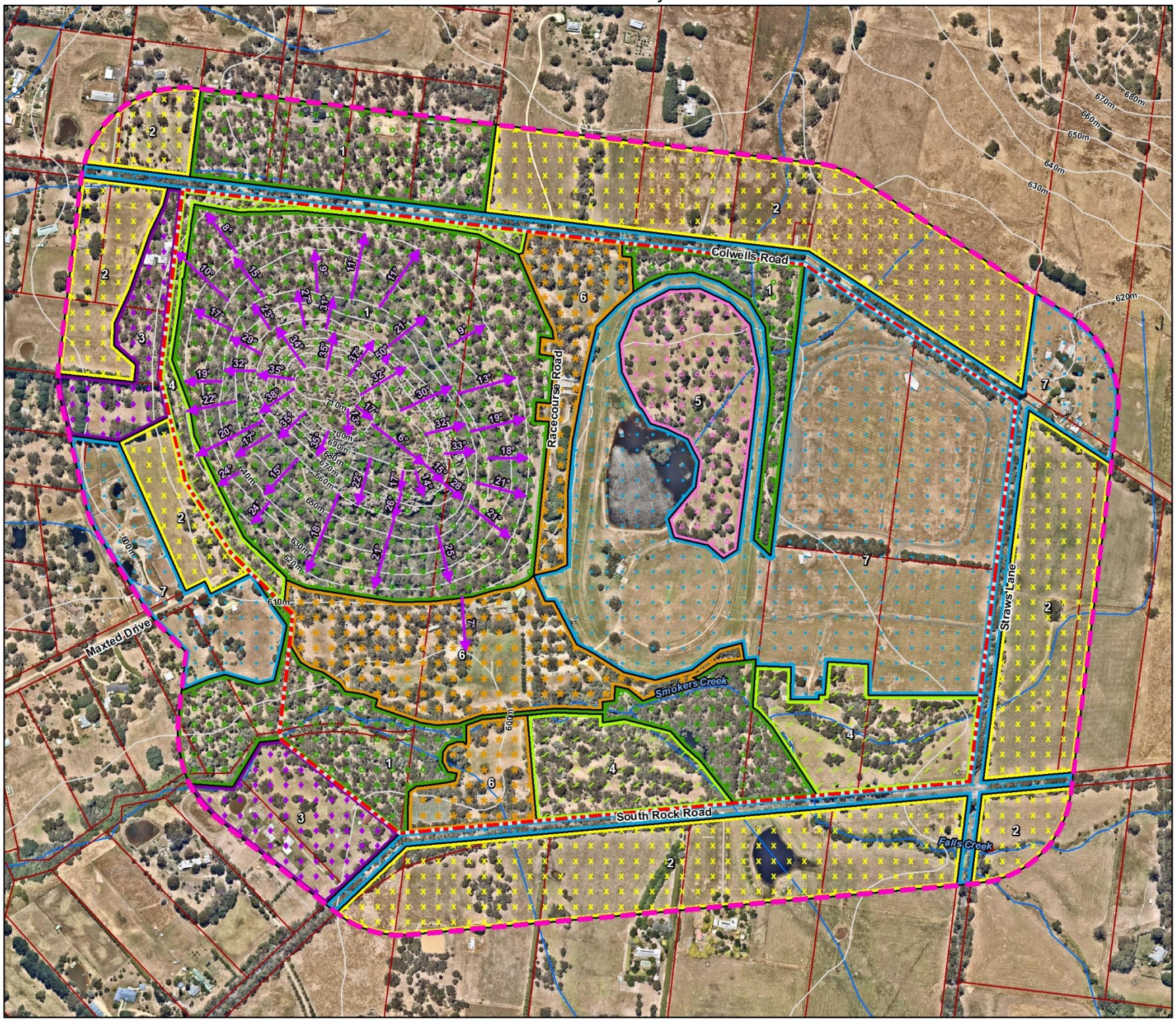

Map 10. Bushfire Hazard Site Assessment – Vegetation

Hanging Rock Reserve

Legend

- Subject site
- Parcels
- Contours (10m)
- Constructed watercourse
- Natural watercourse
- Slope calculated from contours

Vegetation classes

- Forest, Upslope
- Grassland, Upslope/Flat
- Low threat
- Modified vegetation (Clause 53.02)
- Modified vegetation (Forest)
- Modified vegetation (Woodland)
- Modified vegetation (Parkland)

Details

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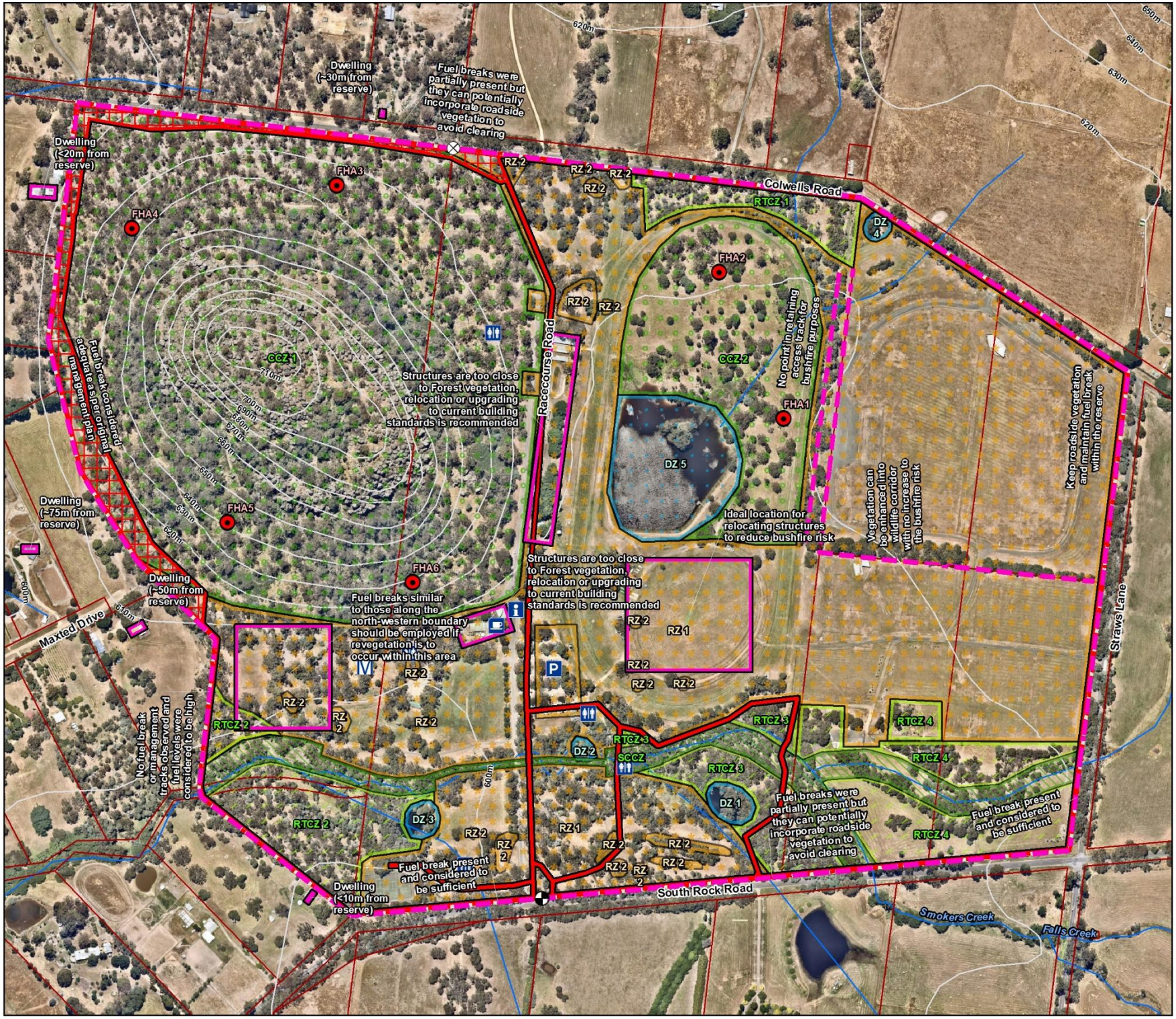

Map 11. Bushfire Hazard Site Assessment – Site Features

Hanging Rock Reserve

Legend

- Subject site
- Parcels
- Contours (10m)
- Natural watercourse
- Bushfire features
- Fuel hazard assessments

Management Zones

- Core Conservation Zones (CCZ)
- Remnant Tree (exotic groundstorey) Conservation Zones (RTCZ)
- Smokers Creek (riparian) Conservation Zone (SCCZ)
- Recreation Zones (RZ)
- Dam Zones (DZ)
- Fuel Management Zone (FMZ)

Details

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Scale 1:4,200 (Page size A3)

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