



Kelcey Tier Greenbelt Bushfire Management Plan

Prepared for
Devonport City Council

11 December 2017



DOCUMENT TRACKING

Item	Detail
Project Name	Kelcey Tier Greenbelt Bushfire Management Plan
Project Number	16HNG_5698
Project Manager	Rod Rose 0402 054 751 1/51 Owen Street, Huskisson NSW 2540
Prepared by	Adrian Pyrke
Reviewed by	Rod Rose
Approved by	Rod Rose FPAA BPAD-A Certified Practitioner No. BPAD1940-L3
Status	Final
Version Number	3
Last saved on	11 December 2017
Cover photos	Kelcey Tier 2017. All photos by Adrian Pyrke.

This report should be cited as 'Eco Logical Australia December 2017. *Kelcey Tier Greenbelt Bushfire Management Plan*. Prepared for Devonport City Council.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Disclaimer

This document may only be used for the purpose for which it was commissioned and in accordance with the contract between Eco Logical Australia Pty Ltd and Devonport City Council. The scope of services was defined in consultation with Devonport City Council, by time and budgetary constraints imposed by the client, and the availability of reports and other data on the subject area. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information.

Eco Logical Australia Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.

Template 08/05/2014

Contents

Abbreviations.....	vi
1 Introduction.....	7
1.1 Purpose of plan	7
1.2 Objectives	7
1.3 Fire planning context	7
1.4 Plan Format	7
1.5 Legislation and Policy	8
2 Bushfire Risk Assessment	8
2.1 Landscape context	8
2.2 Fire climate	9
2.3 Fuel hazard and fire behaviour	9
2.4 Fire history	10
2.5 Built assets and community	10
2.6 Fire Protection Plan	10
2.7 Fire simulation modelling	10
2.8 Duty of care	11
3 Fire and Natural Values.....	11
3.1 Vegetation and Threatened Species	11
3.2 Appropriate Fire Regimes.....	12
4 Fire Management and Hazard Reduction.....	12
4.1 Hazard management at reserve boundaries	12
4.1.1 Fire breaks	12
4.1.2 Hazard management on neighbouring properties	13
4.1.3 Future development.....	13
4.2 Planned Burning	13
4.3 Fire Trails and other access	14
4.4 Water supply for fire-fighting.....	14
4.5 Bushfire preparedness and response	14
4.5.1 Season preparedness	14
4.5.2 Emergency response plans	14
5 Monitoring and Evaluation	16
References	17
Tables.....	18

Maps..... 21

List of tables

Table 1: Recommended fire regimes to maintain biodiversity. 18

Table 2: Planned burning schedule..... 18

Table 3: Guidelines for persons responsible for planning and conducting individual planned burns. 19

Table 4: Monitoring and evaluation of fire plan strategies. 19

Table 5: Action Plan20

Glossary of Terms

Term	Description
Bushfire	Unplanned vegetation fire. A generic term which includes grass fires, forest fires and scrub fires both with and without a suppression objective.
Bushfire Attack Level (BAL)	A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, which is the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire.
Fire regime	The history of fire in a particular vegetation type or area including the frequency, intensity and season of burning. It may also include proposals for the use of fire in a given area.
Fuel hazard	Fine fuels in bushland that burn in the continuous flaming zone at the fire's edge. These fuels contribute the most to the fire's rate of spread, flame height and intensity. Typically, they are dead plant material, such as leaves, grass, bark and twigs thinner than 6 mm thick, and live plant material thinner than 3 mm thick.
Fuel reduction burning	The planned application of fire to reduce hazardous fuel quantities; undertaken in prescribed environmental conditions within defined boundaries.
Head fire	The part of the fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope.
Intensity	The rate of energy release per unit length of fire front usually expressed in kilowatts per metre (Kw/m).
Overall fuel hazard rating	A fuel hazard rating based on the sum of influences of bark hazard, elevated fine fuel hazard, near-surface hazard and surface hazard.
Planned burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives

Abbreviations

Abbreviation	Description
BAL	Bushfire Attack Level
CSMS	Coordinated Smoke Management Strategy
DCC	Devonport City Council
FFDI	Forest Fire Danger Index
KTG	Kelcey Tier Greenbelt (the area covered by this plan)
TFS	Tasmania Fire Service

1 Introduction

1.1 Purpose of plan

The Kelcey Tier Greenbelt (KTG) is 185 hectares of predominantly natural bushland owned and managed by Devonport City Council (DCC) located on the southern outskirts of the expanding urban development of Devonport. This Council reserve is completely surrounded by private properties, many of which have contiguous bushland. The bushland has important conservation values, provides recreational opportunities and social amenity, but is also a bushfire risk to neighbouring residents and community assets.

This plan guides Devonport City Council in the fire management activities for the next ten years, stating the required actions by Council and other responsible parties.

1.2 Objectives

The plan objectives are to:

- i. Facilitate the suppression of fire in order to reduce the threat to human life and property, impact on the environment and culturally significant assets;
- ii. Provide access for fire suppression and property protection;
- iii. Maintain fire regimes within biodiversity threshold guidelines for plant communities; and
- iv. Facilitate cooperative and complementary fire management strategies with neighbouring land holders and the Tasmanian Fire Service.

1.3 Fire planning context

A fire plan was prepared for Devonport City Council for Kelcey Tier Greenbelt in 2005 (AVK Environmental Management 2005). Considerable urban and semi-rural property development has occurred around the reserve since that plan was prepared. Therefore, the bushfire risk has changed and revised strategies are required. However much of the background information in the earlier plan remains relevant.

In 2014 the Tasmanian state government initiated a new program of strategic fuel reduction burning across the State. Strategic bushfire risk assessment at the state-wide (State Fire Management Council 2014) and sub-region levels (State Fire Management Council 2016) is used to guide the prioritisation of burning in this new program. Through these risk assessments, Kelcey Tier has been identified as a priority area for strategic burning and resources now contribute to the burning operations that were not previously available.

In a hierarchical sense, this bushfire management plan for Kelcey Tier Greenbelt sits under the Fire Protection Plan for the Central North Fire Management Area (State Fire Management Council 2016). Therefore, it is important that these plans are consistent and complementary.

1.4 Plan Format

The Bushfire Management Plan focuses on fire management actions on the A3 maps and tables at the end of this plan; providing a succinct document for Devonport City Council and other parties responsible for implementation. Background information sets the context, summarises built, community and environmental values and the underpinning risk assessments.

1.5 Legislation and Policy

The actions in this plan must be undertaken in consideration of the following state legislation:

- Aboriginal Relics Act 1975
- Environmental Management and Pollution Control Act 1994
- Fire Service Act 1979
- Forest Practices Act 1985
- Historic Cultural Heritage Act 1995
- Land Use Planning and Approvals Act 1993
- Threatened Species Protection Act 1995
- Water Management Act 1999 / State Policy on Water Quality Management 1997
- Work Health and Safety Act 2012.

Some management activities may also need to consider federal jurisdiction under the Environmental Protection and Biodiversity Act, 1999.

A number of Council documents that are relevant to fire management of Kelcey Tier Greenbelt are available on the website of the Devonport City Council:

- Devonport City Council Strategic Plan 2009-2030 (provides a high level vision for management of the natural environment)
- Open Space Strategy
- Risk Management Framework.

2 Bushfire Risk Assessment

2.1 Landscape context

Located approximately 3 km southwest of the urban centre of Devonport, the Kelcey Tier Greenbelt (KTG) is 185 hectares in area and provides a visible bush skyline on the south side of the City. The low hills are covered in eucalypt forest, with a network of fire trails, mountain bike trails and increasingly surrounded by houses (**Map 1**).

Over the last 12 years suburban housing has filled in the rural area on the northern perimeter of the KTG, with houses within 10 m of the bushland boundary on Leary Avenue. Larger block subdivisions are now along the entire western boundary, although to date, the setback of houses is greater from the KTG than on Leary Avenue. A semi-rural subdivision extends to the south along Wrenswood Drive and the subdivision on Racecourse Road is on the eastern boundary. The newest neighbouring housing is built to contemporary Tasmanian bushfire planning standards, but as the remainder do not they are likely to be exposed to a higher bushfire risk.

2.2 Fire climate

The temperate and maritime climate of Devonport ameliorates the potential bushfire conditions compared to some parts of Tasmania, although significant fire weather and fuel dryness conditions can be expected in summer months. The mean annual rainfall at KTG is probably greater than 1000 mm (AVK Environmental Management 2005) although the summer months are much drier than winter months. The most significant fire weather in summer is associated with south-westerly to westerly winds, low humidity and High fire danger (SFMC 2014). Figure 1 indicates that Very High fire danger may occur approximately two days every three years over the worst months of January and February. Days of Severe, Extreme or Catastrophic fire danger are extremely rare; only one such day was recorded from 2006 to 2016 (Figure 1).

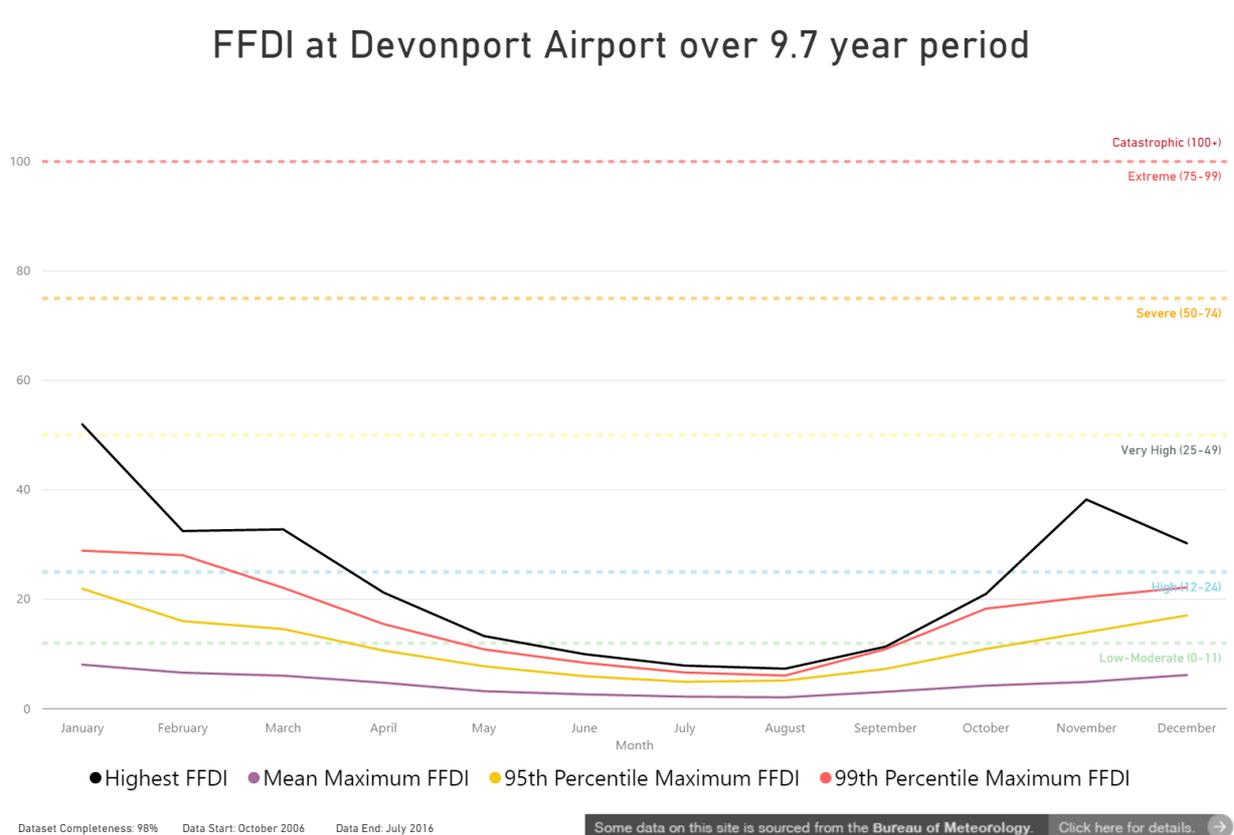


Figure 1: Forest Fire Danger Index (FFDI) at Devonport Airport. 99th percentile is shown per calendar month, which means approximately one day per three years. Source: State Fire Management Council.

2.3 Fuel hazard and fire behaviour

The eucalypt forests and woodlands of KTG are highly flammable. The ‘Overall Fuel Hazard’ (Hines et al. 2010) rating for most of the area is Very High. Areas burnt by plan burns from 2014 to 2016 have a Low fuel hazard. The understory typically has dense shrubs, bracken and sedges up to 1.5 m high; these near surface and elevated fuels are conducive to fast spreading, intense fires. The bark fuels on the dominant stringy bark (*Eucalyptus obliqua*) and black peppermint (*E. amygdalina*) trees within the KTG have the potential to produce significant numbers of embers and spot fires under Moderate to Very High fire danger conditions.

Under High fire danger conditions in areas with a Very High fuel hazard, bushfires are likely to be very difficult to control and embers will present a significant bushfire attack on nearby houses.

2.4 Fire history

Bushfires of undetermined cause burnt the western side of the KTG in 2004 and 2006 but the fuel hazard in these areas has now returned to Very High levels. Planned burns on the northern and eastern boundaries of KTG were conducted in 2014, 2015 and 2016. The entire KTG reserve was burnt at least once by various bushfires in the 1980s and 1990s (AVK Environmental Management 2005). Planned and unplanned fires from 2004 onwards are indicated on **Map 2**.

2.5 Built assets and community

Urban and semi-rural housing borders KTG on all sides. Recent subdivisions are infilling on the northern and western boundaries (**Map 1**). The houses assessed as being most at risk from bushfires in KTG at the present time are located on Leary Avenue.

A high voltage powerline easement extends across the northern end of the reserve while a transmission line easement is located in the southeast corner. A major water storage facility, the Williams Reservoir, is located at the northern end of KTG although this land is managed by TasWater.

All of the built and infrastructure assets within and neighbouring the KTG are vulnerable to bushfire attack and damage, along with nearby communications towers on private property.

Facilitated by the network of trails (**Map 3**), the KTG is used by the public for recreation activities including running, mountain biking and bushwalking; these users are at risk from bushfires on days of High fire danger. The mountain bike trails, walking tracks, track markers and signs are all community assets that could be damaged by bushfires.

2.6 Fire Protection Plan

Under the Fire Service Act 1979, the Fire Management Area Committee for the Central North Fire Management Area is responsible for preparing and annually updating a Fire Protection Plan (State Fire Management Council 2016). The KTG sits within this area and has been identified in the current Fire Protection Plan as an area of strategic importance and high priority for fuel treatment. The plan also identifies the need for a fire break between KTG and houses on Leary Avenue.

The Fire Protection Plan presents the results of computer bushfire risk modelling that has been conducted by the Fuel Reduction Unit of the Tasmania Fire Service for the broader landscape that includes KTG. This model called Phoenix RapidFire, illustrates where ignition points under High fire danger conditions with a west to south-west wind would most impact on built areas (mapped as 'human settlement areas' in the model; see also State Fire Management Council 2014). The results indicate that under current fuel conditions bushfires starting in bushland to the west and southwest of the KTG present significant bushfire risk to built areas, while a bushfire starting within KTG is also a risk (**Map 4**).

2.7 Fire simulation modelling

A computer bushfire simulator called SPARK (<https://research.csiro.au/spark/>) was used for this bushfire plan to examine the spread of fires under several ignition scenarios. These simulations utilised a scenario that matches the 99th percentile for fire weather (**Figure 1**) and under a west to southwest wind direction as used in the Phoenix RapidFire simulations (Section 2.6; State Fire Management Council 2014). The simulations illustrate the size and intensity of fire that could be expected from different ignition points and

therefore the length of the impact zone when these fires reach built areas (**Map 5a, 5b and 5c**). The ignition points were selected to maximise fire development and size over KTG with the given wind direction as indicative high risk bushfire scenarios. Other scenarios are possible with differing ignition points, wind direction and fire weather conditions which would produce different spread patterns and impacts.

The simulations illustrate the significant bushfire potential in KTG. It is conceivable that the entire KTG could burn within several hours and that the fire intensity could exceed 10,000 kW/m at the urban interface such as at Leary Avenue (**Map 5a and 5b**); an intensity considered sufficient to cause damage to built assets (State Fire Management Council 2014).

2.8 Duty of care

Devonport City Council has a duty to take reasonable care to keep fire on the land it manages to prevent harm to neighbours. This principle comes from common law but what obligation Council (or any other landowner) has to manage vegetation fuel hazard prior to the ignition of a fire started by a third party is untested in an Australian court (Eburn and Cary 2016). A reasonable standard of care in terms of managing fuels requires consideration of the following factors:

- i. The level of risk in terms of consequences (e.g. proximity of houses at risk) and likelihood (e.g. fuels, climate, ignition history, access).
- ii. The cost of managing the fuels.
- iii. Meeting wider community expectations beyond what may be unambiguous legal requirements.

3 Fire and Natural Values

3.1 Vegetation and Threatened Species

The vegetation of Kelcey Tier Greenbelt (KTG) is mostly shrubby eucalypt forest dominated by stringy bark (*Eucalyptus obliqua*), black peppermint (*E. amygdalina*) and black gum (*E. ovata*). Ground truthing indicated that the latest version of the state-wide vegetation map TASVEG (Kitchener and Harris 2013) is inaccurate and therefore the more accurate map from the 2005 plan is used in this plan (AVK Environmental Management 2005) (**Map 6**). Much of the forest in KTG is intermediate between wet and dry eucalypt forest and while small areas of typical wet eucalypt forest are present, particularly on the eastern side, the understorey structure is closer to dry forest over most areas.

Threatened native vegetation communities listed under the Nature Conservation Action 2002 and present in KTG include:

- *Eucalyptus ovata* forest and woodland
- *Eucalyptus viminalis* wet forest

There are several areas of these threatened communities within KTG, although these are not all indicated on the latest TASVEG map. Paperbark (*Melaleuca ericifolia*) is present in some areas of KTG as either a shrub or sub-dominant tree in the understorey beneath eucalypts but does not form a swamp forest as listed under the Nature Conservation Action 2002.

No threatened flora species have been recorded for KTG. Threatened fauna recorded in KTG (AVK Environmental Management 2005 and Natural Values Atlas) include:

- Central North burrowing crayfish (*Engaeus granulatus*)

- eastern barred bandicoot (*Perameles gunnii*)
- grey goshawk (*Accipiter novaehollandiae*)
- masked owl (*Tyto novaehollandiae*)
- spotted-tailed quoll (*Dasyurus maculatus*)
- swift parrot (*Lathamus discolor*)
- tasmanian devil (*Sarcophilus harrisi*)

However, no raptor nests are recorded from the KTG.

The vegetation mapping and descriptions and other information on flora and fauna in the earlier fire plan for KTG (AVK Environmental Management 2005) is still a useful reference, including citation of the vegetation survey conducted by Louise Gilfedder in 1992.

3.2 Appropriate Fire Regimes

To maintain biodiversity, the aim should be to provide appropriate fire regimes that will facilitate the persistence of species and habitat. To achieve this planned burning is required at appropriate intervals, seasons and intensity. Maintenance of habitat such as large, old trees is important for fauna. **Table 1** summarises the recommended fire regimes for biodiversity maintenance objectives. Care should be taken to ensure appropriate fire regimes are maintained in threatened native vegetation communities (section 3.1).

The vegetation of most areas of KTG is amenable to planned burning, although the ideal fire regimes for KTG forests and woodlands are not documented in any evidence-based publication. Therefore, what are considered to be appropriate fire regimes for the vegetation communities of KTG are recommendations that will need to be reviewed following monitoring over many decades, in other words, by applying the adaptive management model (see AFAC 2016).

To manage fuel loads at levels that will reduce bushfire risk, planned burning may be required at intervals shorter than recommended in **Table 1** in some areas and therefore may not be optimal for biodiversity.

4 Fire Management and Hazard Reduction

4.1 Hazard management at reserve boundaries

4.1.1 Fire breaks

Firebreaks at the boundary of Kelcey Tier Greenbelt (KTG) will reduce the risk of a fire exiting the reserve and affecting neighbouring properties. Fuels nearest to houses will contribute the most to ember attack and access at the boundary provides advantage for bushfire control. The width of the fire breaks should be sufficient to provide safe access for fire tankers.

Based on the risk assessments, current landscape context, practical considerations and applying the TFS guidelines for Management (Class 1) standard calculations (Tasmania Fire Service 2016), the maintenance of fire breaks at the boundary of KTG is required at the locations shown on **Map 7**, adjacent to houses on sections of Hedstrom Drive and Leary Avenue. These fire breaks should be the width indicated on **Map 7**, as measured from the property boundaries, and maintained to the standards indicated in the TFS fuel break guidelines (Tasmania Fire Service 2016), including the provision of access points and drivable by four-wheel drive light tankers. Cooperation with TasWater is required for the maintenance of the fire break on Leary Avenue.

4.1.2 Hazard management on neighbouring properties

Some houses bordering KTG have either a bush fuel hazard actually on their properties, poorly designed/maintained buildings or gardens/landscaping (or a combination of these) that exacerbate their bushfire risk. The most effective reduction of bushfire risks to life and property on neighbouring land occurs within the hazard immediately abutting built assets, with management of the fuel hazard in the adjoining KTG an important complementary risk reduction measure.

To maximise the reduction of risks to life and property a bushfire risk awareness program with neighbours is required; it will provide advice on the following:

- Clarification of the level of risk (likelihood and consequence)
- Removal/modification of fuel hazard in gardens and around houses to maintain a hazard management area.
- Ensuring garden plantings are consistent with providing a hazard management area.
- If reticulated water is not connected to the property, provision of personal water supply.
- For houses that are not constructed to a level appropriate to their Bushfire Attack Level (BAL), retrofitting measures that can reduce their risk.

Much of this information is readily available on the TFS website and can be downloaded. The awareness program will also provide neighbours with information about the risk reduction measures being undertaken within KTG.

4.1.3 Future development

It is important that all future housing, subdivisions and other development surrounding KTG complies with contemporary bushfire planning standards (Australian Standard 3959-2009) and local government regulation. While this is now normal practice for subdivision and building approval, it is important that Council maintains diligence to minimise the cost burden on ratepayers and environmental impact of fuel management within KTG that may be incurred by further development.

4.2 Planned Burning

Planned burning units are indicated on **Map 7** and categorised by the primary burning objective as follows:

- *Asset Protection* – for each individual burn, reduce the Overall Fuel Hazard rating to Low over 80% of the target burn area; burn at intervals to maintain, as far as feasible with available resources, an Overall Fuel Hazard rating of Moderate or less; increase burn intervals if there is measured evidence of degradation of important habitat.

Considerations for the design of the burning units and schedule (**Table 2**) were as follows:

- The bushfire risk as described in section 2 and the Central North Fire Management Area Fire Protection Plan (State Fire Management Council 2016)
- The burning program of the Fuel Management Unit, Tasmania Fire Service which is guided by the Fire Protection Plan
- The fire history and current fuel hazard
- The vegetation communities and what is currently believed to be an ecologically appropriate fire regime (**Table 1**)
- Practical fire boundaries
- Likely available resources.

Burn scheduling is subject to priorities and resources allocated by TFS. Burning operations should consider the guidelines in **Table 3**.

4.3 Fire Trails and other access

The KTG has a network of fire trails that provide access for fire-fighting as well as boundaries for planned burning units. The standard of these fire trails is adequate for small four-wheel drive fire-fighting appliances up to class 5 size (<1000 litres water capacity).

The fire trails indicated on **Map 3** should be maintained to ensure they continue to be trafficable. Fire trails should be inspected at least annually in spring and maintenance undertaken as required such as removal of fallen trees, slashing and erosion control.

New control lines were created in 2017 on or near the boundary of KTG to facilitate the fuel reduction burning operation for unit KTG3 (Map 7). Subject to agreement between Council and the relevant landowners, these should be maintained as permanent fire trails.

Signage is important for fire trails because it facilitates efficient access by fire crews during fire operations and reduces the safety risk to fire-fighters. Therefore, good signage should be maintained throughout KTG utilising the fire trail numbers indicated on **Map 3**.

4.4 Water supply for fire-fighting

Reticulated water and fire plugs are located in subdivisions surrounding KTG. Two dams are located near the western end of Durkins Road on private property that are suitable for fire appliances to draw water (**Map 3**). No new water infrastructure is proposed.

4.5 Bushfire preparedness and response

4.5.1 Season preparedness

Suppression response within the KTG is the responsibility of TFS. Annual pre-season briefing between Council staff, TasWater and TFS district staff and brigades is required to ensure that TFS are aware of issues that will affect their capacity to respond, for example:

- Condition of fire trails
- Location of access points, locked gates and provision of keys
- Recent fuel management
- Sharing of contact details and names of key officers
- Sharing of mapped information.

Appropriate Council staff should be available to provide liaison for TFS during suppression operations to ensure that information is provided on known natural and cultural values that may affect suppression strategies or tactics, for example:

- minimise damage to large habitat trees
- sensitivity with earth moving equipment, for example: *Eucalyptus ovata* forest and woodland; *Eucalyptus viminalis* wet forest; swift parrot habitat (**Map 6**)
- avoidance of occupied swift parrot habitat (if known).

The above considerations will always be limited by the overall objectives of fire suppression and practical constraints.

4.5.2 Emergency response plans

An emergency response plan is desirable for the regular activities of community organisations (e.g. mountain bike club). These plans, which should be developed in consultation with the TFS, should identify

the Forest Fire Danger Index trigger above which activities are suspended and evacuation procedures in the event of a bushfire occurring in the KTG. The preparation and maintenance of these plans is the responsibility of the community organisations. While it is not known if such plans already exist, Council will discuss the matter with the organisations in the context of this bushfire management plan.

5 Monitoring and Evaluation

The effectiveness of the strategies and actions listed in the plan are to be monitored and evaluated. Whilst management of access, neighbour awareness and other risk factors are important, it is worth elaborating on the key bushfire risk management strategy which is fuel and fire regime management.

The success of planned burning depends on the extent to which completed operations achieve the intended objectives. Typically, it is necessary to be able to answer the following questions:

- Was the fuel hazard reduced to the targeted level?
- Has the burning contributed to a fire regime that is maintaining natural values?

If the answer to either of these questions is no, then adjustments to burning prescriptions and or the planned fire regimes need to be made.

The recommended fire intervals (**Table 1**) are based on a general knowledge of the ecology of the plants in Kelcey Tier Greenbelt (KTG) and expert judgement, but in reality there is little detailed underpinning evidence at the local scale. The thresholds of 15 and 25 years may be too high, too low, or unhelpful to determine the best fire regime for maintaining biodiversity. From the perspective of bushfire risk management, it would be beneficial to validate whether or not the minimum threshold can be reduced, because there is an apparent discrepancy at the present time in understanding of fire intervals best suited for fuel reduction verses biodiversity management.

Given that the KTG contains thousands of native species of higher and lower plants, mammals, reptiles, birds and invertebrates, we will never have knowledge of the fire ecology requirements for all individual species. It is possible, however, to monitor some indicators of vegetation health and species diversity.

The actions required to assess fuel loads and monitor vegetation and species diversity are specified in **Table 4**.

References

AFAC 2016. *A Risk Framework for Ecological Risks Associated with Prescribed Burning – National Burning Project: sub-project 3*. Australasian Fire and Emergency Service Authorities Council Limited, Melbourne, Victoria.

AVK Environmental Management 2005. *Fire Management Plan Kelcey Tier Greenbelt*. Prepared by AVK Environmental Management and Renaissance Forestry for Devonport City Council. 55 pages, maps.

Eburn, M. and Cary, G. 2016. *You own the fuel, but who owns the fire?* Non-peer reviewed research proceedings from the Bushfire and Natural Hazards CRC & AFAC conference, Brisbane, 30 August – 1 September 2016.

Hines F, Tolhurst K G, Wilson A A G, McCarthy GJ 2010. *Overall Fuel Hazard Assessment Guide 4th Edition July 2010*. Fire and Adaptive Management Report Number 82. Published by the Victorian Department of Sustainability and Environment.

Kitchener, A. and Harris, S. 2013. *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Edition 2. Department of Primary Industries, Parks, Water and Environment, Tasmania.

Marsden-Smedley, J.B. 2009. *Planned burning in Tasmania: operational guidelines and review of current knowledge*. Fire Management Section, Parks and Wildlife Service, Department of Primary Industries, Parks, Water and Environment, Hobart, Tasmania.

State Fire Management Council 2014. *Bushfire in Tasmania: A new approach to reducing our statewide relative risk*. State Fire Management Council Unit, Tasmania Fire Service, Hobart, Tasmania.

State Fire Management Council 2016. *Central North Fire Management Area Fire Protection Plan December 2015 to December 2016 Review*.

Tasmania Fire Service 2016. *Fuel Break Guidelines Version 1.0, October 2016*. Tasmania Fire Service, Hobart.

Tables

Table 1: Recommended fire regimes to maintain biodiversity.

Vegetation Community	Recommended fire interval	Comment for this fire plan period
<i>Eucalyptus obliqua</i> dry forest <i>Eucalyptus obliqua</i> - <i>E. amygdalina</i> damp sclerophyll forest <i>Eucalyptus ovata</i> forest and woodland	15-25 years	Some areas may require burning at 8-10 year intervals to manage bushfire risk.
Grassy <i>Eucalyptus ovata</i> woodland Grassy <i>Eucalyptus viminalis</i> woodland	5-20 years	Avoid burning in spring if swift parrots present
<i>Eucalyptus obliqua</i> forest with dense <i>Melaleuca ericifolia</i>	25-100 years	Avoid burning
<i>Eucalyptus obliqua</i> wet forest <i>Eucalyptus viminalis</i> wet forest	25-100 years	Avoid burning

Table 2: Planned burning schedule.

Unit Code	Objective	Ideal Burn Year	Area (ha)	Notes
KTG1	Asset Protection	2026	11.4	Burn when Overall Fuel Hazard reaches High
KTG2	Asset Protection	2019	6.0	
KTG3	Asset Protection	2018	143.7	Exclude the areas burnt in 2014
KTG4	Asset Protection	2021	1.4	Consult neighbours about water infrastructure
KTG5	Asset Protection	2027	9.8	Burn when Overall Fuel Hazard reaches High
KTG6	Asset Protection	2020	15.7	The inclusion of neighbouring private land in the burn unit should be considered

Table 3: Guidelines for persons responsible for planning and conducting individual planned burns.

Planned Burn Guidelines
1. Prescriptions for planned burning should follow the Tasmanian operational burning guidelines (Marsden-Smedley 2009).
2. A detailed written operational burn plan is required for each individual burn. To prepare this plan, field inspection will be required to assess fuels, internal areas that should be excluded (if practical) and condition of boundaries. Some other factors to consider are noted below. The boundaries of units may be modified from those indicated on Map 7 where necessary.
3. The impact of smoke on neighbours should be managed in accordance with best practice as guided by Tasmania's Co-ordinated Smoke Management Strategy (CSMS): http://epa.tas.gov.au/Pages/Management-of-Planned-Burning.aspx .
4. Consult neighbours, user groups and community groups when preparing the operational burn plan to identify any issues that may impact the burn operation.
5. Consult weed managers to plan any pre-burn and post-burn weed treatment. Spanish heath (<i>Erica lusitanica</i>) and gorse (<i>Ulex europaeus</i>) are of particular concern.
6. Wet eucalypt forest and dense <i>Melaleuca ericifolia</i> stands should be excluded from burning within burn units by setting prescriptions that utilise the fuel moisture differential between the stands and surrounding vegetation. Typically target fuels will dry out faster than non-target fuels following rain events.
7. Large old trees should be protected from burning as far as practical (e.g. clearing fuels, wetting down) to protect habitat. Concerned community groups may assist in identifying the location of these.
8. If swift parrots are present in the burn unit then do not burn in spring or summer.
9. If major bushfires occur in the area then the burn schedule will require revision, taking into account the reduction in future bushfire risk and recommended fire regimes.

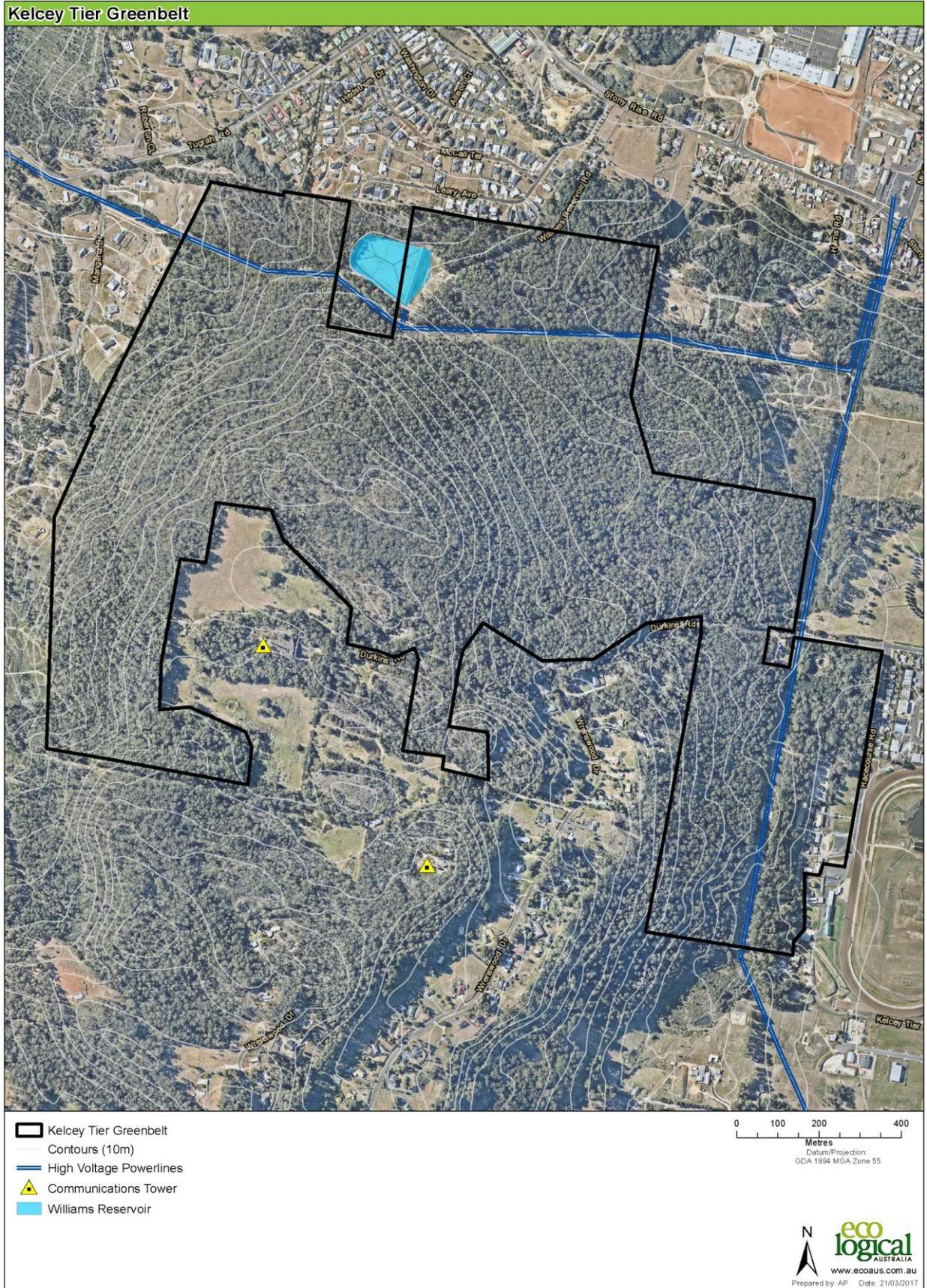
Table 4: Monitoring and evaluation of fire plan strategies.

Action	When
1. Fire history: record all fire perimeters, both planned and unplanned, in a GIS database, including categorical estimates of the fire intensity and post-fire fuel status: surface, near surface, elevated and bark fuel hazard ratings. This is a key element of monitoring and the highest priority because it enables fire managers and researchers (e.g. university students) to undertake investigations at any time in the future that may inform adjustment of the planned fire regimes.	After each fire event
2. Conduct tree risk assessment due to potential hazard of falling limbs and trees.	After each fire event
3. Fuel hazard: estimate Overall Fuel Hazard rating in Asset Protection burn units (Map 7).	Annually from 7 years post-burn onwards
4. Understorey shrubs: select several species to monitor at specific monitoring points and record estimates of cover and abundance over a specified area. At least 6 monitoring points.	Once per burn cycle: ideally 5 years post-burn
5. Forest structure: utilise photographic monitoring points to monitor change in density, age and cover of tree and shrubs. Include categorical descriptions of tree and shrub health. At least 6 monitoring points including at least 3 in Asset protection burn units.	Once per burn cycle: ideally 5 years post-burn
6. Swift parrot habitat: subject to available resources, record and map the utilisation of habitat (foraging and nesting) over successive seasons.	Annually in early summer
7. Record all species monitoring data in a Council database linked to GIS.	Every year

Table 5: Action Plan

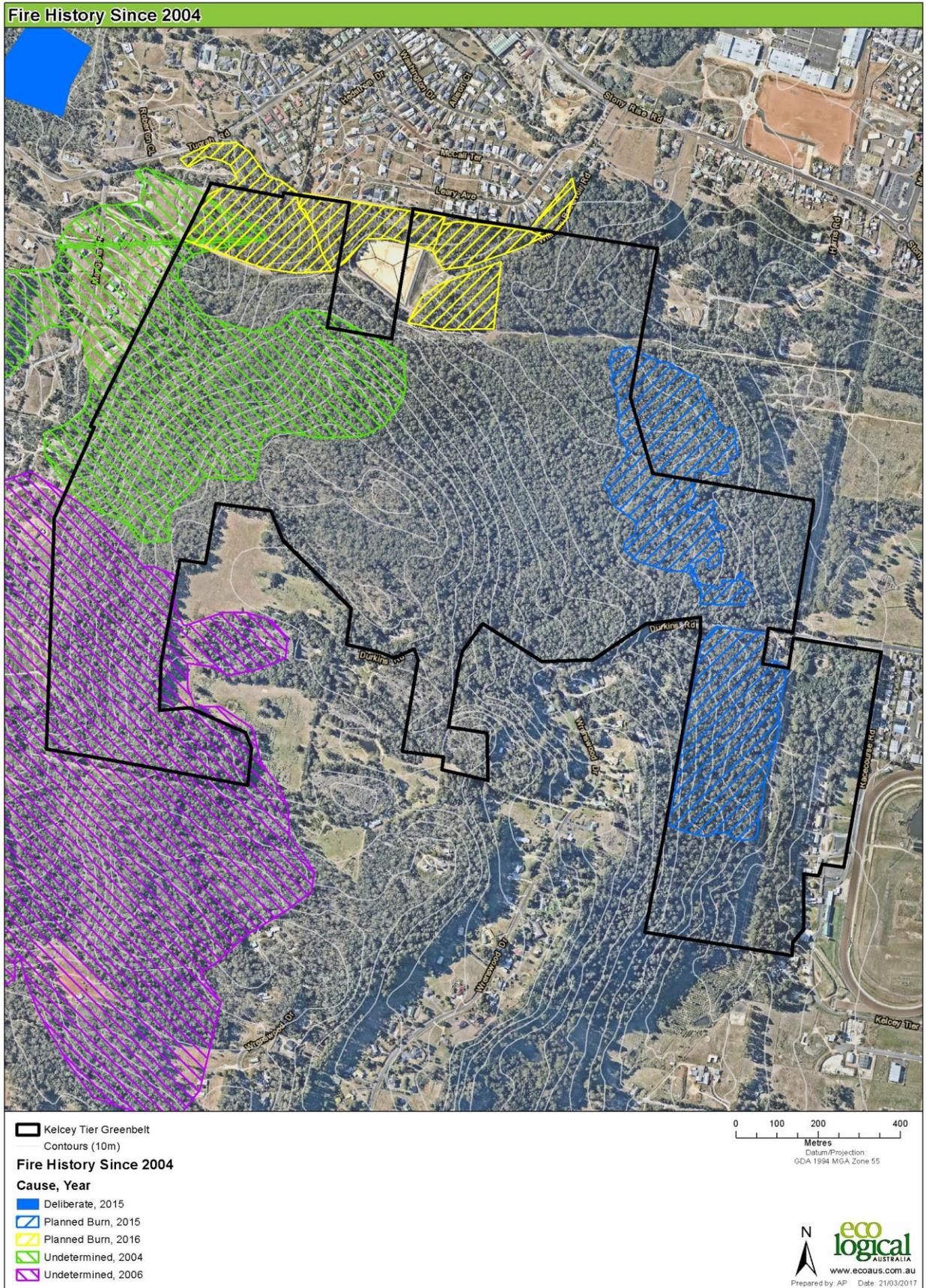
Strategy	Action	When	Responsibility
Hazard management at KTG boundaries in accordance with the TFS Fuel Break Guidelines (Map 7)	1. Undertake and then annually review a risk assessment of recommended fire breaks to determine extent of works required	Staged approach	DCC
	2. Boundary fire breaks slashed	Annually	DCC
	3. Appropriate hazard management areas maintained within private properties around houses	Annually	Neighbouring property owners
	4. Bushfire awareness program to inform neighbours	Every 2 years	DCC and TFS
	5. Future development surrounding KTG managed	Ongoing	DCC
Planned burning (Map 7)	Planned burns conducted in accordance with schedule (Table 2) and guidelines (Table 3)	Autumn / spring of planned year	TFS with support and advice from DCC
Fire trails (Map 3)	Tree clearing, slashing and surface maintenance	Checked each spring and maintain as required	DCC
Preparedness and response	1. Pre-season briefing and sharing of information (e.g. at multi-agency pre-season briefing)	Oct-Nov each year	DCC and TFS
	2. Emergency response plans for relevant community organisations to include evacuation procedures for bushfire	Every bushfire	relevant community organisations with advice from TFS (e.g. Mountain Bike Club)
	3. Response	Every bushfire	TFS with liaison and advice from DCC

Maps

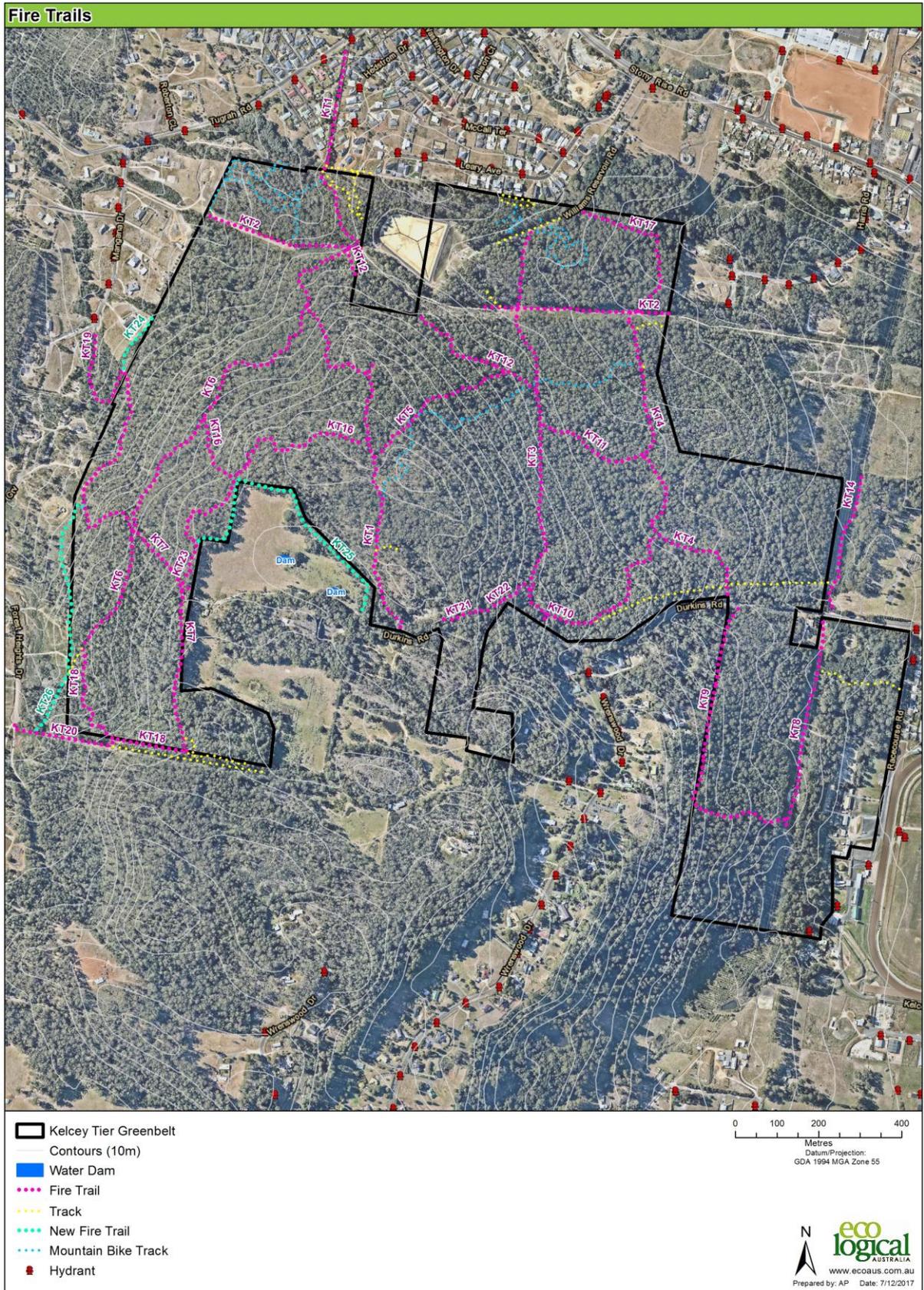


Map 1: Kelcey Tier Greenbelt

Kelcey Tier Greenbelt boundary; Significant Assets: high voltage powerlines, communications towers, Williams Reservoir

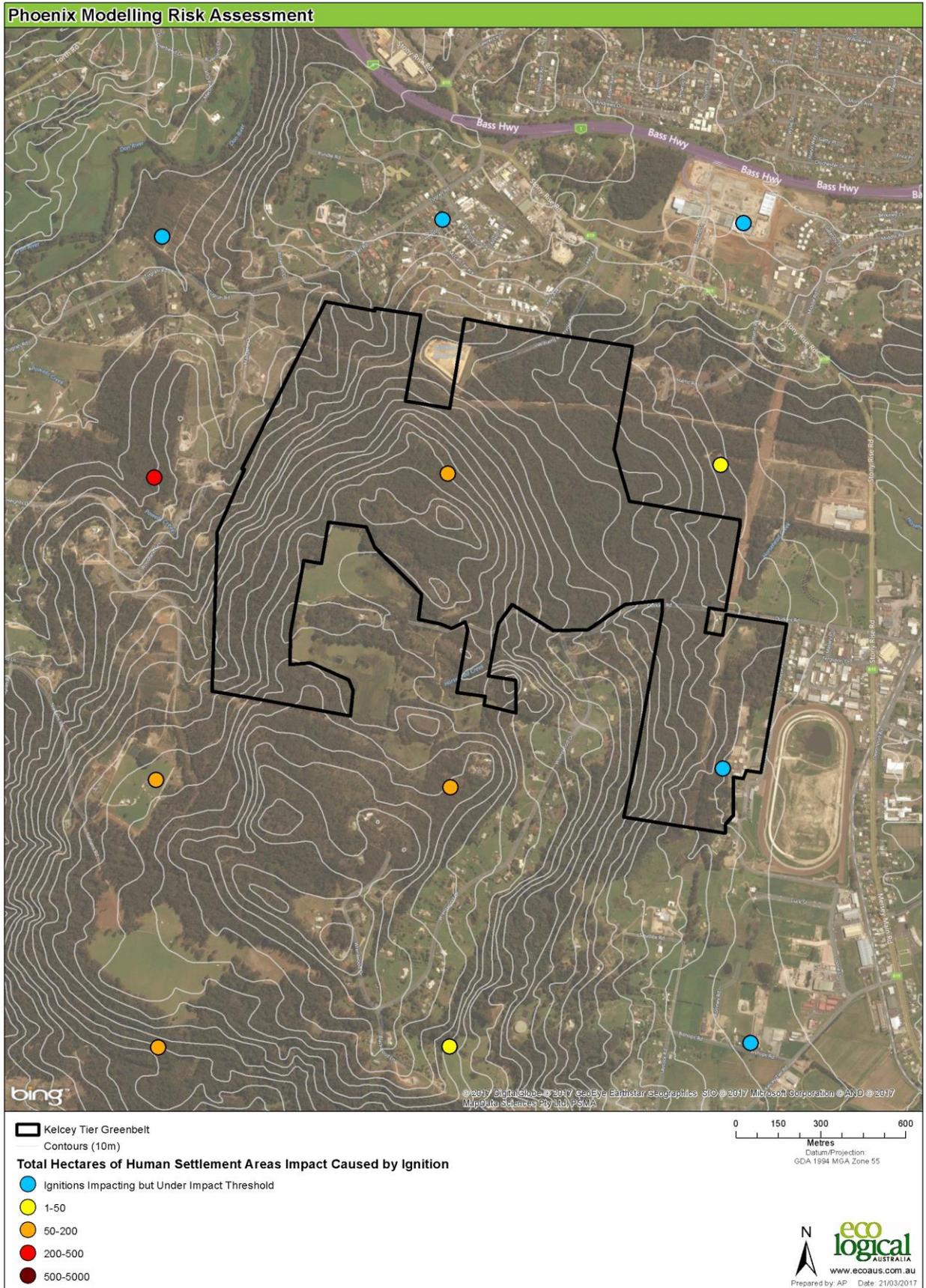


Map 2: Fire history since 2004
 Fire history showing ignition cause

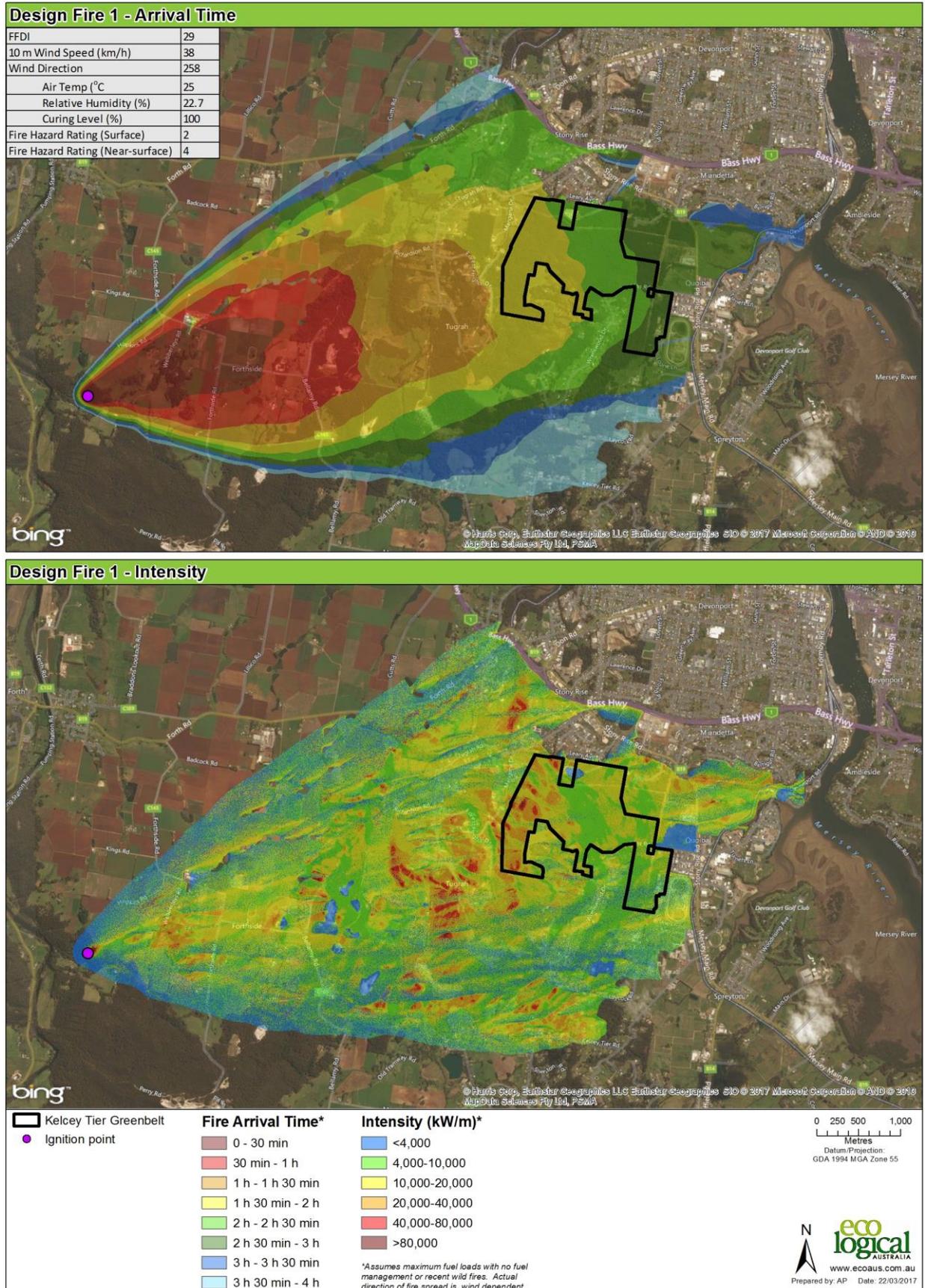


Map 3: Fire trails and water points

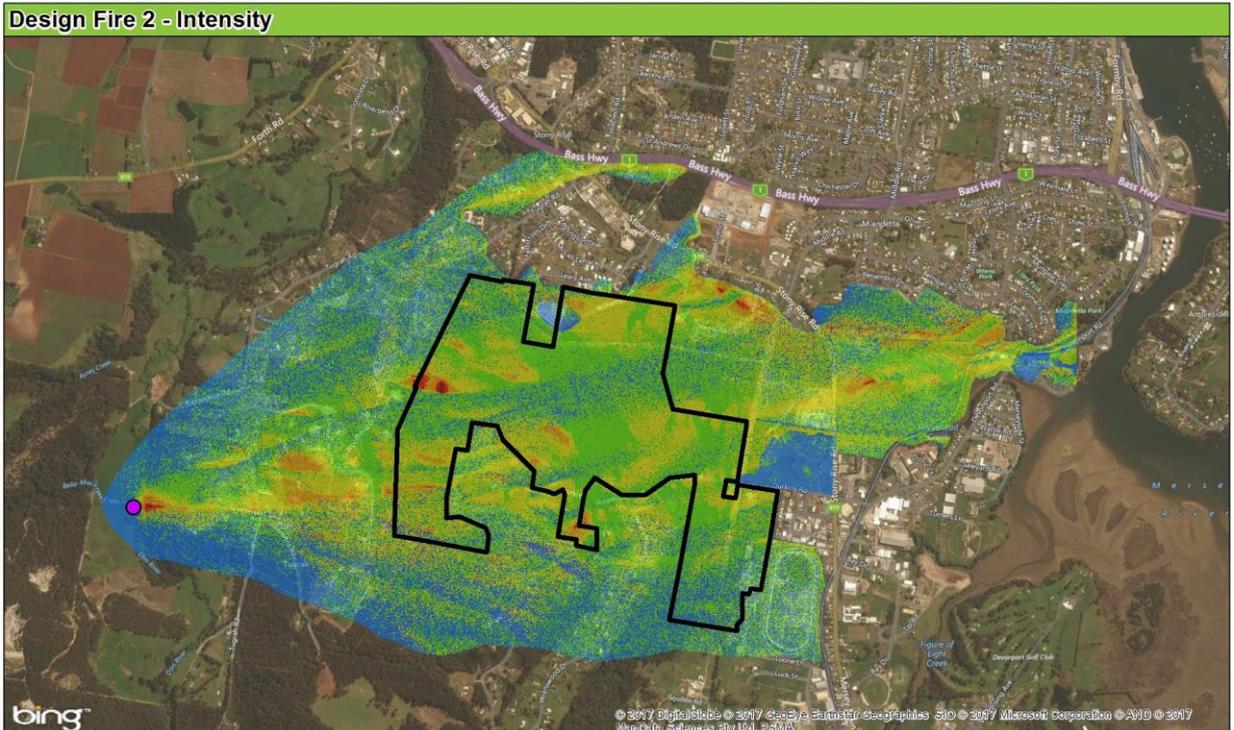
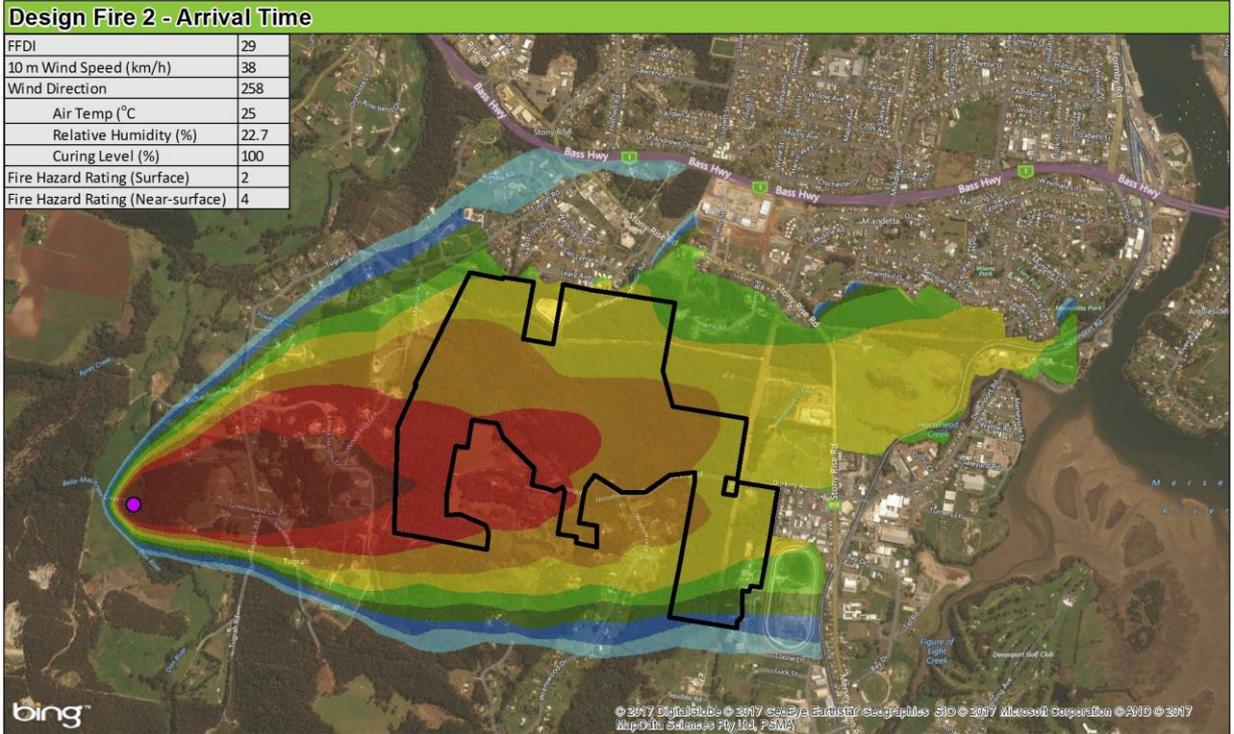
Fire trail numbers; Water dams; Fire hydrants



Map 4: Phoenix Modelling Risk Assessment

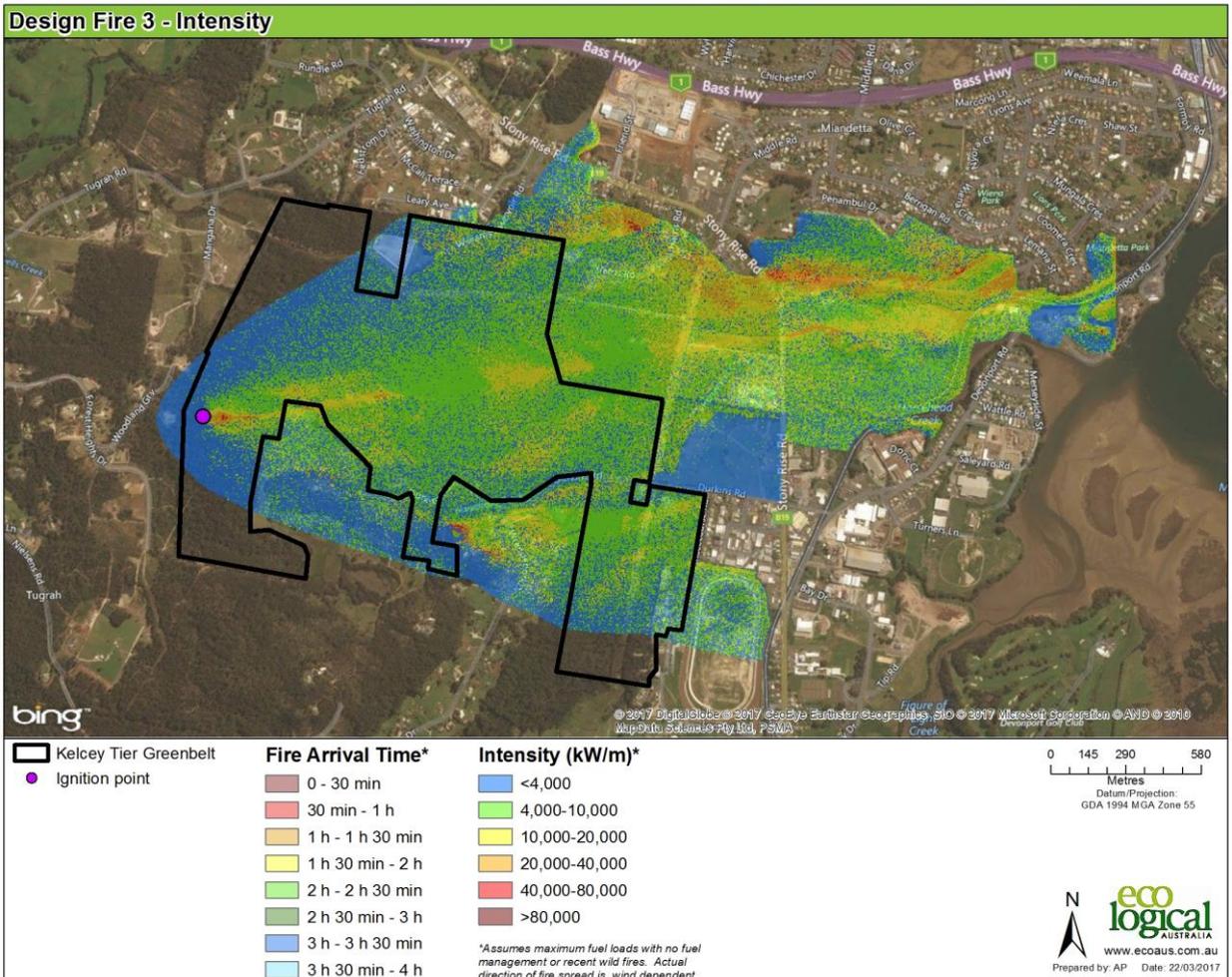
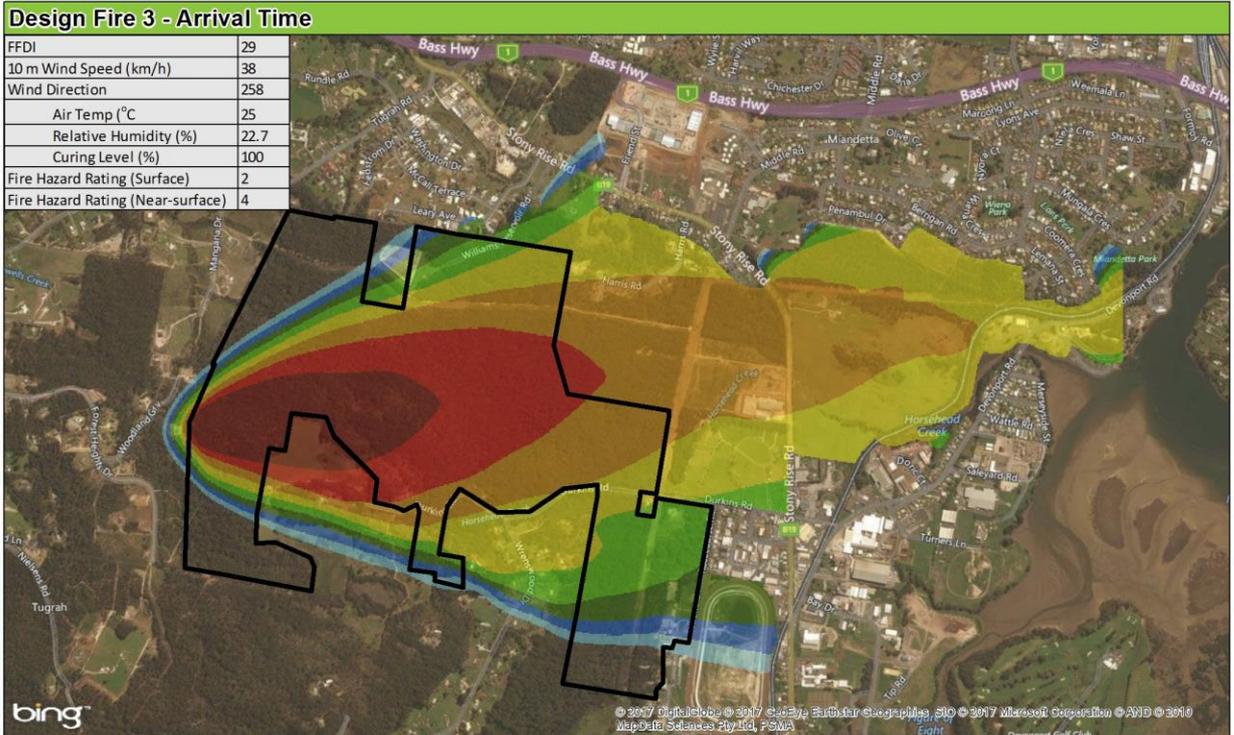


Map 5a: Spark Simulation (Design Fire 1)

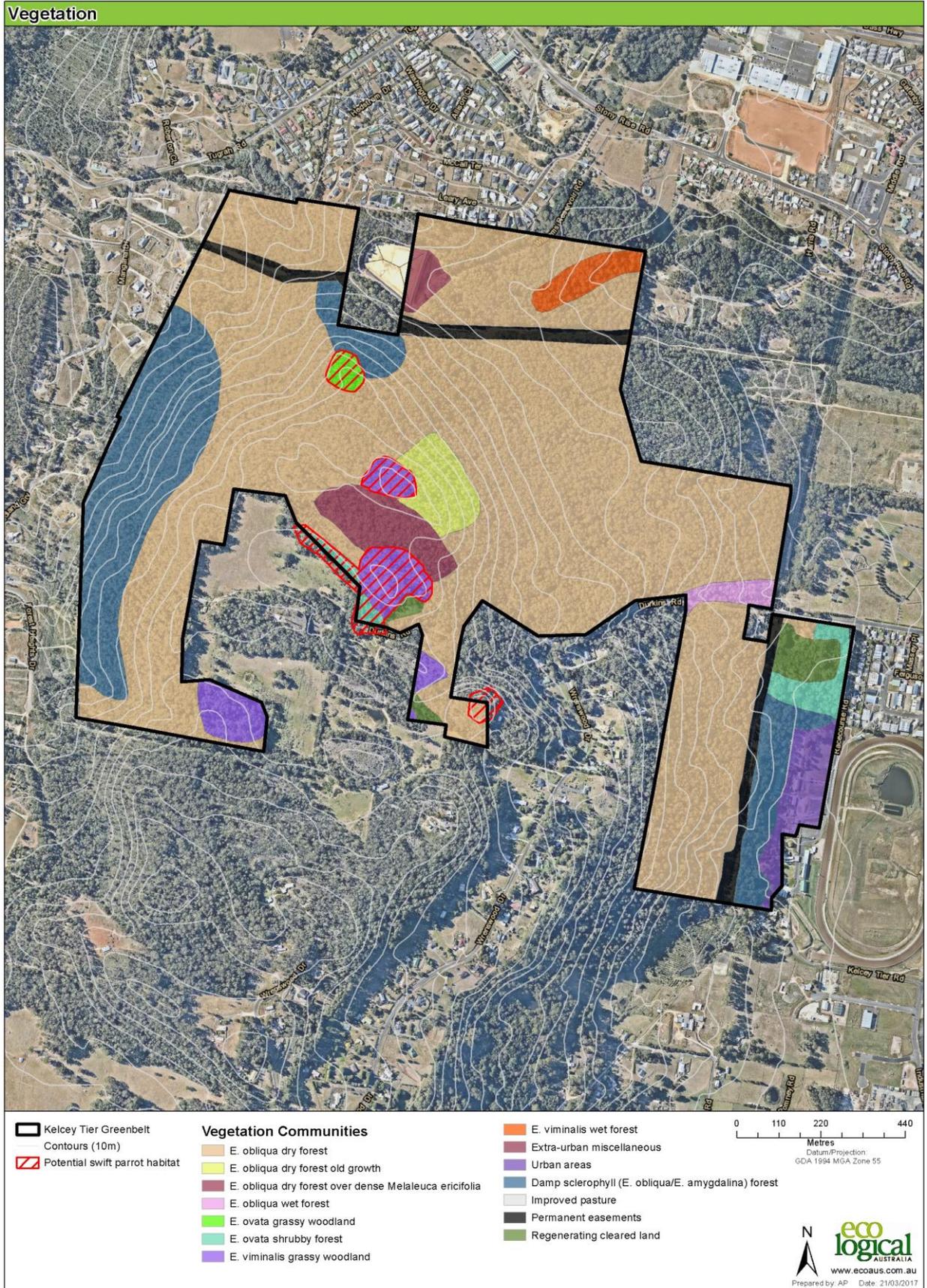


<ul style="list-style-type: none"> Kelcey Tier Greenbelt Ignition point 	<p>Fire Arrival Time*</p> <ul style="list-style-type: none"> 0 - 30 min 30 min - 1 h 1 h - 1 h 30 min 1 h 30 min - 2 h 2 h - 2 h 30 min 2 h 30 min - 3 h 3 h - 3 h 30 min 3 h 30 min - 4 h 	<p>Intensity (kW/m²)*</p> <ul style="list-style-type: none"> <4,000 4,000-10,000 10,000-20,000 20,000-40,000 40,000-80,000 >80,000 <p><small>*Assumes maximum fuel loads with no fuel management or recent wild fires. Actual direction of fire spread is wind dependent.</small></p>	<p>0 170 340 680 Metres Datum/Projection: GDA 1994 MGA Zone 55</p> <p style="text-align: center;"> <small>Prepared by: AP Date: 22/03/2017</small> </p>
---	---	--	---

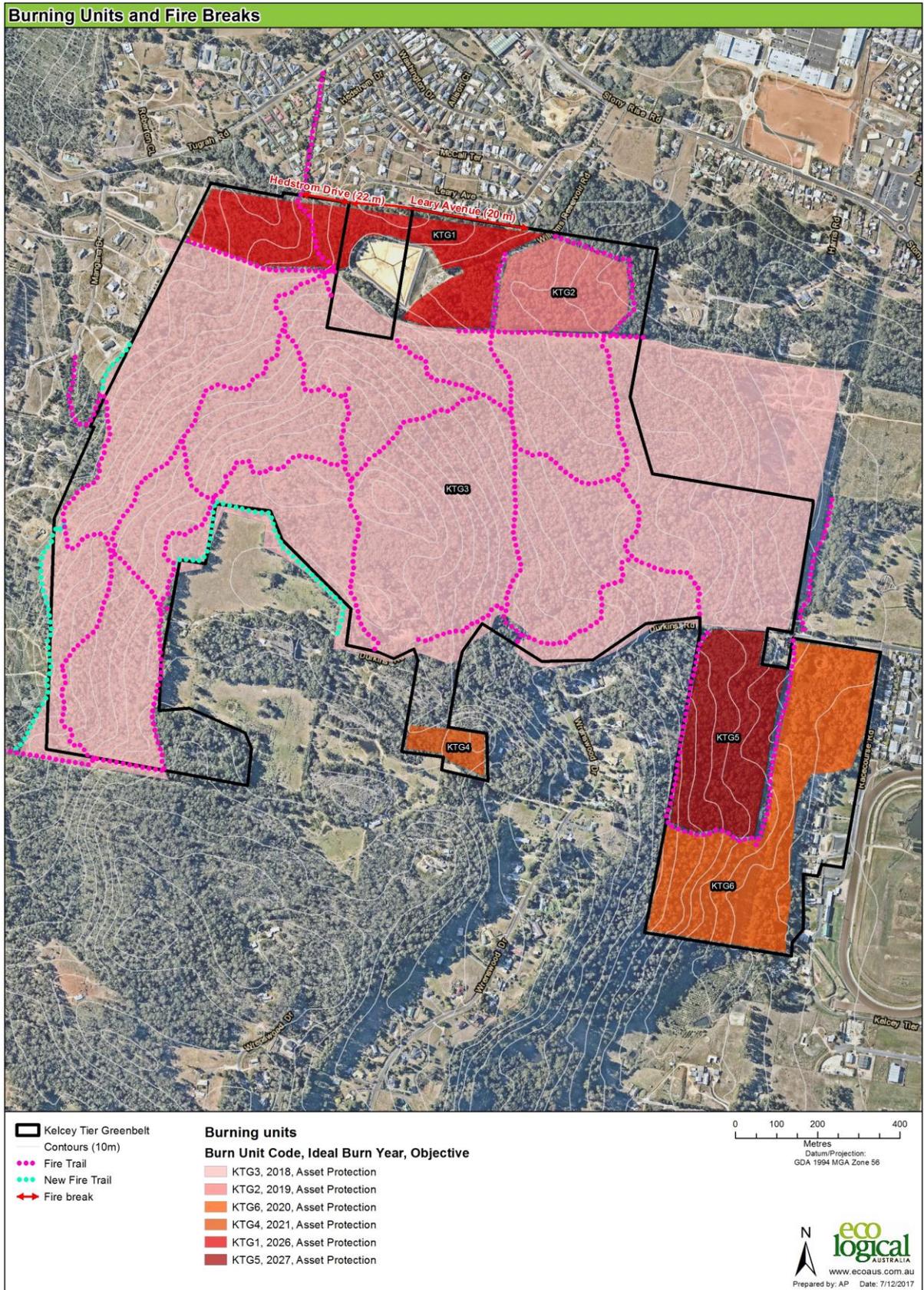
Map 5b: Spark Simulation (Design Fire 2)



Map 5c: Spark Simulation (Design Fire 3)



Map 6: Vegetation



Map 7: Burning Units and Fire Breaks

Burning units showing code (unit name), ideal burn year and objective (colour: Asset protection or Ecological); Fire breaks indicating width.

eco
logical
AUSTRALIA



HEAD OFFICE

Suite 2, Level 3
668-672 Old Princes Highway
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 6103 0148

COFFS HARBOUR

35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 08 9322 1358

DARWIN

16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601
F 08 8941 1220

SYDNEY

Suite 1, Level 1
101 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9542 5622

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 4910 0126

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2681
F 02 6772 1279

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 4268 4361

BRISBANE

Suite 1, Level 3
471 Adelaide Street
Brisbane QLD 4000
T 07 3503 7191
F 07 3854 0310

HUSKISSON

Unit 1 51 Owen Street
Huskisson NSW 2540
T 02 4201 2264
F 02 4443 6655

NAROOMA

5/20 Canty Street
Narooma NSW 2546
T 02 4476 1151
F 02 4476 1161

MUDGEES

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1230
F 02 6372 9230

GOSFORD

Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1220
F 02 4322 2897

1300 646 131
www.ecoaus.com.au