

Kunzea similis subsp. *mediterranea*

REGIONAL SEARCH 2015

FQM AUSTRALIA NICKEL PTY LTD

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ENVIRONMENTAL

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Kunzea similis subsp. mediterranea Regional Search 2015

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DEFINITIONS

Term	Definition
DEC	Department of Environment and Conservation
DPaW	Department of Parks and Wildlife
EP Act	Environmental Protection Act 1986
FQM	First Quantum Minerals
GPS	Global Positioning System
KSCCA	<i>Kunzea similis</i> Community Conservation Area
Pty Ltd	Proprietary Limited
RNO	Ravensthorpe Nickel Operation
SST	Sandy Silcrete Thicket
T-DRF	Threatened-Declared Rare Flora
UCL	Unallocated Crown Land

1 INTRODUCTION

FQM Australia Nickel (FQM) have approval under Part IV of the *Environmental Protection Act 1986* (EP Act) for their lateritic nickel mining operations near Ravensthorpe. A proponent commitment for the project was to create conservation zones for Threatened-Declared Rare Flora (T-DRF) taxa to ensure their ongoing survival in the vicinity of the operation. The *K. similis* Community Conservation Area (KSCCA) hosts the vast majority of remaining plants of *K. similis* subsp. *mediterranea* and as such is a site of extreme environmental sensitivity. Despite some regional searching for this subspecies in the past failing to record additional populations, discussion with Department of Parks and Wildlife (DPaW) botanists has indicated that searching has not been exhaustive and that areas of potential habitat for the subspecies have not been adequately surveyed.

FQM commissioned Woodman Environmental Consulting Pty Ltd (Woodman Environmental) to conduct further regional searching for additional populations of *K. similis* subsp. *mediterranea* during 2015.

1.1 Aim and Objectives

The aim of the regional search was to identify additional populations of *K. similis* subsp. *mediterranea* in the region if possible.

To conduct the regional search, the following tasks were undertaken:

- Preparation of a plan to guide field survey during Winter 2015 utilising available information from regional vegetation surveys, soil and geology maps, previous searching, and aerial photography;
- Consultation with DPaW botanist prior to commencement of searching to fine-tune search locations;
- Conduct searching of likely habitat for *K. similis* subsp. *mediterranea* during Winter 2015 prior to flowering of the subspecies to identify populations that may be the target subspecies of the taxon (*K. similis* subsp. *mediterranea*); and
- Preparation of a report and associated maps, presenting the results of the survey in a format suitable for use in preparing an impact assessment for future mining activities.

In the event that new populations were located during the Winter 2015 search, these locations were to be revisited during the peak flowering period for the species (October 2015) to verify the identity of each population, map locations of populations and provide estimates of population numbers where possible.

This report provides a description of the methods used to plan and undertake the searches for *K. similis* subsp. *mediterranea* and the results of the Winter 2015 searches. Some recommendations regarding long term conservation of the taxon are provided to identify FQM with potential management actions that may improve the long term survival of the taxon and to provide potential offsets in the event of future impacts to the population.

1.2 Study Area Location

Pre-field desktop planning for the regional search encompassed the vast area of remnant native vegetation located between Ravensthorpe, Hopetoun and Jerdacuttup on the south coast of Western Australia. An area between the single population of *K. similis* subsp. *mediterranea*, located 33 km east-southeast of Ravensthorpe, and the only known population of *K. similis* subsp. *similis* (T-DRF), located 10 km west of Hopetoun, was targeted during the planning process (Figure 1). A smaller area between Ravensthorpe and Jerdacuttup was targeted during the field survey (see Figure 3).

2 BACKGROUND AND LITERATURE REVIEW

2.1 Previous Searches

Surveys both directly and indirectly for *K. similis* have been undertaken since 1998, with new no populations located outside of the known occurrences of the two subspecies.

Numerous local vegetation mapping studies and targeted flora surveys on Bandalup Hill and its immediate surrounds have been undertaken for the RNO. These are documented in:

- *Flora and Vegetation Surveying for Ravensthorpe Nickel Project September - October 2000* (Landcare Services Pty Ltd 2000);
- *Flora and Vegetation Surveys – October-November 2001 – Ravensthorpe Region* (Landcare Services Pty Ltd 2001);
- *Habitats, Vegetation and Flora of the Ravensthorpe Nickel Operation Tenements – 2002-2003* (updated Dec 2004) (Western Botanical 2005); and
- *Halley's Orebody Declared Rare & Priority Flora Targeted Survey* (Western Botanical 2011).

Surveys for *K. similis* were undertaken in October 1998 in the Ravensthorpe Range, and in the 'Bandalup gravel' pits (approximately 4.5 km north of Bandalup Hill) in October 2000, with the taxon "extensively searched for as part of the program during September and October 2000" (Landcare Services Pty Ltd 2000).

Mason Bay Road was surveyed for T-DRF and Priority flora in 1998 and 1999 (Craig 1998 and Craig 1999a in Landcare Services Pty Ltd 2000). Areas within the Whoogerup Range and Mt Drummond were searched in December 1998 (Craig 1999b in Landcare Services Pty Ltd 2000).

Extensive searches have been conducted in a 1-2 km radius to the west, northwest and north of East Mt Barren on foot, and 17 km to the west by vehicle in October 2000. In addition, all roads and tracks in the eastern section of Fitzgerald River National Park (including Hamersley Drive, Telegraph Track, Moir Track, Quoin Head track, the western sector of Whalebone Beach track, Hamersley Inlet Track and Old Ongerup Rd) were driven and surveyed for *K. similis* (Landcare Services Pty Ltd 2000).

Landcare Services Pty Ltd undertook a regional survey for *K. similis* in late October and early November 2001 on foot, by vehicle and by helicopter where road access was not available. An extensive area was surveyed, mainly covered by road with the assistance of helicopter to spot suitable vegetation, and included the knoll west of Bandalup Hill, the region near the Bandalup Gravel Pits, Maydon (between Ravensthorpe and Bandalup Hill) and north-east of Kundip. The wider region between the Oldfield River (20 km north-east of Bandalup Hill), the southern portion of the Ravensthorpe Range at Mt Chester and Mt Desmond, the low ranges at Cocanarup (20 km south-west of Ravensthorpe), Mt Drummond, Whoogerup Range and East Mt Barren (all within the Fitzgerald River National Park) were also investigated, including the Eyre Range and westward along the coast to Hamersley Inlet (Landcare Services Pty Ltd 2000, 2001). Appendix 2 of 'Part 5: Regional Surveys for *Kunzea*

similis, October - November 2001' in Landcare Services Pty Ltd (2001), details the extent and mode of survey.

The Department of Environment and Conservation's (DEC) (now DPaW) *Ravensthorpe Regional Flora Survey – Annual Operational Review, February 2008 – January 2009* indicated that searches for this taxon were undertaken in the Jerdacuttup River valley, the Plateau in Kundip Nature Reserve, on some of the low hills to the west of Bandalup Hill and the remote silcrete hill to the west of the Jerdacuttup River, without success. This document also states that there are very few unsurveyed areas of potential habitat (DEC 2009).

2.2 Regional Vegetation Surveys

Three vegetation mapping surveys have been undertaken by DEC in the region:

- *Vegetation of the Ravensthorpe Range, Western Australia: Mt Short to Kundip, 1:10,000 Scale* (Craig *et al.* 2008);
- *Floristic Communities of the Ravensthorpe Range, Western Australia* (Markey *et al.* 2012); and
- *Flora and vegetation of greenstone formations of the Yilgarn Craton: south-west Ravensthorpe Greenstone Belt* (Thompson *et al.* 2013).

The vegetation units *Efal/Eple* (occupying 28 % of the project area) and *Efal/Epre* (occupying 1 % of the project area) recorded by Craig *et al.* (2008) in the Ravensthorpe Range were identified as containing similarities in species composition to the habitat of *K. similis* subsp. *mediterranea*. The soil and geology of these units were quite variable, ranging from brown to red clayey sand to light clay in *Efal/Eple*, and orange to light brown sandy loam in *Efal/Epre*, with ironstone gravel and laterite to metamorphosed sedimentary rock. Both communities were found to dominate the laterite landscapes of the Range. Although extensive traverses of the entire length of the Ravensthorpe Range were undertaken, *K. similis* subsp. *mediterranea* was not recorded (Craig *et al.* 2008).

Community 15 (*Eucalyptus* spp./*Banksia lehmanniana*/*B. heliantha* mallee shrublands) and Community 17 (Northern lateritic *Eucalyptus pleurocarpa*/*E. falcata* subsp. *falcata*/*E. ssp.* Mallee shrublands) of Markey *et al.* (2012), contained a number of similar species to those recorded in the *K. similis* subsp. *mediterranea* habitat. Community 15 occurred on brown to sandy loams, to clays and clay sands and was associated with the crest of Bandalup Hill. Community 17 was associated with laterite in the north of the Ravensthorpe Range, occurring on gravelly and rocky sandy loams. However Community 18 (Southern lateritic *Eucalyptus pleurocarpa*/*E. falcata* subsp. *falcata* mallee shrublands) was found to be statistically representative of the vegetation of the KSCCA, with several quadrats located on Bandalup Hill recording *K. similis* subsp. *mediterranea* (the known population). Community 18 was considered a southern variant of Community 17, with sites located on the south-eastern half of the Ravensthorpe Range, particularly around Kundip and on Bandalup Hill. Soils consisted of grey-brown sandy loams, clay sands and loamy sands, with occasional and varied outcropping (Markey *et al.* 2012). Seventeen quadrats were established in vegetation that represents Community 18 (Markey *et al.* 2012), four of which occur in the Sandy Silcrete Thicket (SST) vegetation unit on Bandalup Hill where *K. similis* subsp.

mediterranea occurs (the KSCCA). Of the eight Community 18 quadrats (Markey *et al.* 2012) that overlapped with the Mt Short to Kundip project area (Craig *et al.* 2008), six of these occurred in the broad *Efal/Eple* vegetation unit of Craig *et al.* (2008) (Kern 2010).

Thompson *et al.* (2013) mapped a corridor of vegetation southwest of Ravensthorpe from Cocanarup to the Fitzgerald River National Park. Review of this paper found there to be no suitable vegetation communities recorded.

2.3 Geology and Soils

The *Geology of the Ravensthorpe and Cocanarup 1:100,000 Sheets* (Witt 1997) were consulted to determine the geological unit upon which *K. similis* subsp. *mediterranea* occurs, and the extent of this unit. The KSCCA was found to occur on ‘Silcrete – brown silica caprock over ultramafic rock’ (*Czu*). This unit is restricted to Bandalup Hill and the Shoemaker-Levy orebody on the north side of the South Coast Highway (Figure 2), northwest of Bandalup Hill, with scattered occurrences along the highway to the west (the latter which are mostly cleared paddock). *Czu* does not occur elsewhere within the extent of these mapsheets.

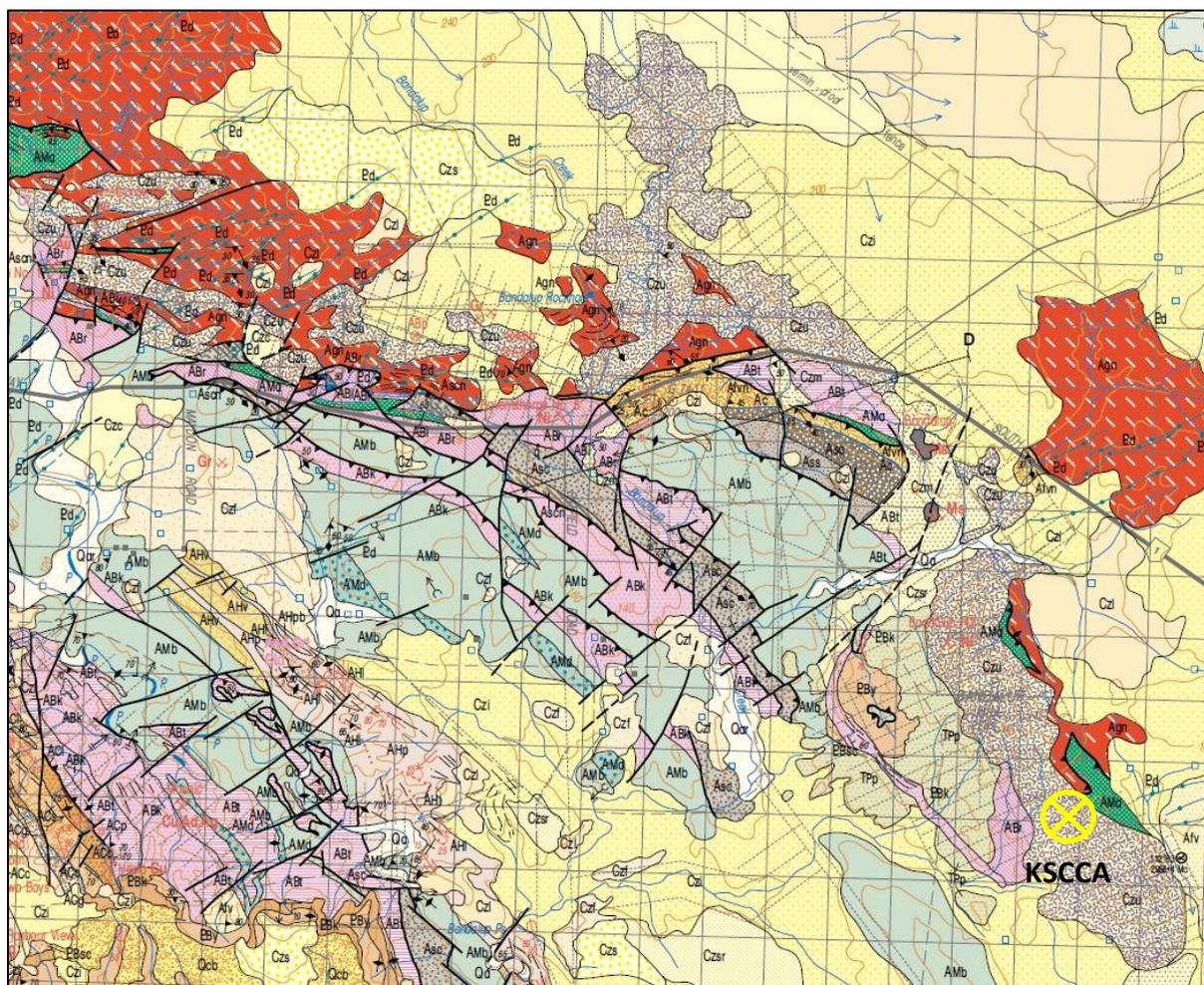


Figure 2: *Kunzea similis* subsp. *mediterranea* Geology (Witt 1997)

The 17 Community 18 quadrats (Markey *et al.* 2012) occurred in the following geological units, predominantly the first two units (Witt 1997):

- *Czi* – Sand with limonitic pisoliths and gravel;
- *Czl* – Lateritic deposits - laterite, ferruginous duricrust, and ferricrete, massive;
- *PBk* – Quartzite, massive to coarsely bedded, minor peltic beds;
- *TPp* – White to yellow to brown siltstone, silty sandstone, and spongolite, mainly deeply weathered; and
- *AHs* – Sandstone and siltstone, metamorphosed, with thin chert and peltic interbeds.

TPp and *AHs* has a very restricted occurrence, consisting of only small patches. *PBk* tends to occur in strips around Kundip and west towards Fitzgerald River National Park.

The known population of *K. similis* subsp. *similis* occurs on the *PBy* geological unit (Kybulup Schist: peltic schist and phyllite with minor psammitic layers) (Witt 1997).

2.4 Liaison with Department of Parks and Wildlife

Consultation with Sarah Barrett, DPaW Flora Conservation Officer based in Albany, was undertaken during the planning process. Ms Barrett advised that Kundip Nature Reserve was a potential area to target (S. Barrett, pers. comm. 2015). Clarification of the areas surveyed as reported in DEC 2009 (Section 2.1) was also sought, with inferences to surveys in the Jerdacuttup River valley and low hills to the west of Bandalup Hill being part of the regional vegetation survey of the Ravensthorpe Range (Markey *et al.* 2012).

3 METHODS

3.1 Pre-field Planning

Information, as outlined in Section 2, from regional vegetation surveys combined with regional geological data and reports relating to the RNO (provided by FQM), were utilised to assist in the identification of potential areas to search for *K. similis* subsp. *mediterranea*. These locations were used in conjunction with recent aerial photography to identify possible survey targets of similar geology and vegetation characteristics (density and appearance) to the KSCCA, taking into account advice provided by DPaW (Section 2.4). Areas of the geological units *Czu*, *Czi*, *Czl* and *PBy* were targeted.

Local vegetation mapping and targeted flora surveys undertaken on Bandalup Hill and its immediate surrounds for the RNO were reviewed to determine if there were any suitable areas of vegetation and soil present that may have not have been covered during these studies. Vegetation polygon mapping, quadrat locations, existing access tracks or roads that would have been utilised during these studies, and maps of GPS (Global Positioning System) track logs of areas searched for rare flora were taken into account.

The track log map and vegetation map of Craig *et al.* (2008) were used in conjunction to identify areas of suitable vegetation types adjacent to mapped areas to search; and to identify gaps or large areas of vegetation within the project area (between GPS track logs), that were not visited or within which transects not conducted, that might be suitable to search.

The location of the Community 18 quadrats of Markey *et al.* (2012) were cross-referenced with geological maps and aerial photography to select potential points of suitable geology and vegetation to search. Other areas of potentially suitable geology (Section 2.3) were plotted on aerial photography to determine if extant native vegetation still exists in those areas.

The resultant fieldmaps contained numerous point locations of potential areas to search, that would be further refined once in the field based on observation and accessibility. These pre-field points were merely estimations of places to search and to provide a basis on which to commence the field approach. At no time was there any intention to visit all points. Locations that were determined to be privately owned or were mineral leases were selectively avoided.

3.2 Field Survey

The field survey was conducted from the 5th to the 10th August 2015 by experienced Senior Botanists, David Coultas and Bethea Loudon. The field survey involved driving tracks and roads, and walking in to pre-determined points (both those identified in the pre-field planning process and those identified in the field). In general, areas were targeted that were least likely to have been searched before.

A number of pre-field point locations were visited, in part as a preliminary reconnaissance, but also to eliminate areas that would have already been searched based on pre-field literature review or were determined as not being suitable habitat. Vehicle access and vantage points from where the broader landscape could be viewed were utilised to determine the appropriateness of vegetation and to identify additional areas of vegetation (to the pre-field points) that may be suitable to walk to.

Based on the topography of the known habitat of *K. similis* subsp. *mediterranea*, significant hills were targeted, in particular those with stands of *Eucalyptus pleurocarpa* or those that had similar species composition to the KSCCA. Such points were walked to, to investigate the appropriateness of the vegetation and soils for the presence of the *Kunzea*. In addition, old overgrown tracks were walked targeting hills in the distance that would not have previously been searched, and conducted searches on foot in the vicinity of previous searching to broaden the search area along hills of suitable habitat (e.g. to the west of Bandalup Hill). In areas where similar vegetation in conjunction with appropriate silcrete soil and geology was located, wandering transects were undertaken to search for plants of *K. similis* subsp. *mediterranea*. Track logs of the survey and waypoints of suitable habitat encountered, were recorded using a handheld GPS. Any new populations encountered were to be recorded using GPS, with an estimate of the population size made and the population boundary determined if possible.

In the event that new populations were located, a Spring survey would have involved briefly re-visiting each location to confirm which subspecies the population represented, collection of specimens for confirmation of identification and submission to the Western Australian Herbarium, and collection of species distribution and abundance data.

4 RESULTS

Figure 3 presents the areas traversed on foot and by vehicle in search of *K. similis* subsp. *mediterranea* over a five and half day period. A number of areas searched on foot were found to be suitable habitat, containing species that dominate the SST in which *K. similis* subsp. *mediterranea* occurs, along with silcrete soil and surface pebbles and rocks. However no new populations were encountered.

The areas of suitable habitat that were encountered are presented on Figure 3 (indicated by blue triangles), and include:

- Hill to the west of Bandalup Hill (Plate 1);
- Small hill to the northwest of Bandalup Hill on the South Coast Highway (Plate 2);
- Ridge/plateau (Plate 3) and lower hills of Kundip Nature Reserve (Plates 4 and 5);
- Unallocated Crown Land (UCL) north of Kundip Nature Reserve (Plates 6 and 7);
- Hills in UCL to the west of the Ravensthorpe-Hopetoun Road (Plate 8) and north of Road Eleven (Plate 9).



Plate 1: Vegetation and Soils of Hill West of Bandalup Hill, S15 (Woodman Environmental)



Plate 2: Vegetation and Soils of Hill Northwest of Bandalup Hill on South Coast Highway, S34 (Woodman Environmental)



Plate 3: Vegetation on Ridge/Plateau in Kundip Nature Reserve, S4 (Woodman Environmental)



Plate 4: Vegetation of Lower Hill of Kundip Nature Reserve near Horner Road, S1 (Woodman Environmental)



Plate 5: Vegetation of Lower Hill of Kundip Nature Reserve East of Ravensthorpe-Hopetoun Road, S19 (Woodman Environmental)



Plate 6: Vegetation and Soils in UCL Northeast of Kundip Nature Reserve, S9 (Woodman Environmental)



Plate 7: Vegetation and Soils in UCL North of Kundip Nature Reserve, S22 (Woodman Environmental)



Plate 8: Vegetation and Soils of Hill West of Ravensthorpe-Hopetoun Rd in UCL, S6 (Woodman Environmental)



Plate 9: Vegetation of Hill North of Road Eleven, S13 (Woodman Environmental)

Traversing the vegetation found that little appropriate vegetation and soil/geology similar to the SST exists within the region. Stands of *Eucalyptus pleurocarpa* on silcrete particularly on higher terrain, were very limited and of patchy occurrence. Several areas searched on low hills contained similar vegetation to the SST however the soils comprised of laterite pebbles and outcropping with grey-white through yellow-white sand, to orange-brown sandy clay. Other patches of *E. pleurocarpa* encountered north of the South Coast Highway and along Hatfield Road contained vegetation dominated by proteaceous species on white sand. The patches of *Czu* to the north of the South Coast Highway and west of Shoemaker-Levy, did not hold appropriate habitat and were positioned low in the landscape.

The majority of the vegetation in the region was predominantly other mallee species over lateritic substrates – vast areas of unsuitable vegetation and geology. Many of the pre-field points were not found to be suitable.

5 DISCUSSION

The areas of suitable habitat encountered were very similar to the SST, such that if *K. similis* subsp. *mediterranea* occurred elsewhere, it would have been present at these locations. Given the extent of searches undertaken since 1998, it is quite unlikely that any other occurrences exist.

Should FQM wish to undertake any actions to increase the security of this taxon or future proposals to mine the KSCCA be considered. In lieu of the absence of additional populations of *K. similis* subsp. *mediterranea*, employment of additional conservation strategies is highly recommended. The following options are provided for FQM consideration:

- All attempts should be made to conserve some of the existing population in situ;
- Establish a seed orchard on site incorporating plants grown from seed collected from all parts of the existing population;
- Undertake a translocation of the taxon in suitable habitat identified during the 2015 regional search, in UCL east of the Ravensthorpe Range; and
- If this translocation is successful, undertaken a translocation in the secure tenure of Kundip Nature Reserve in consultation with DPaW Albany.

FQM have undertaken successful establishment of *K. similis* subsp. *mediterranea* in the Bandalup Gravel pits, north-northwest of Bandalup Hill (established in 2002). In addition to the recommendations for future establishment of such translocations outlined in Woodman Environmental (in draft), burning of the vegetation at a site of suitable habitat followed by the direct sowing of *K. similis* subsp. *mediterranea* seed onto the ashbed would be a potential low-intensity method of establishment. This will provide nutrients and an environment free of competition for the establishment of seedlings. However additional plantings of established seedlings may be beneficial as observation of the gravel pit translocations in 2015 found that individuals that had been planted were more robust than those established from seed (Woodman Environmental, in draft).

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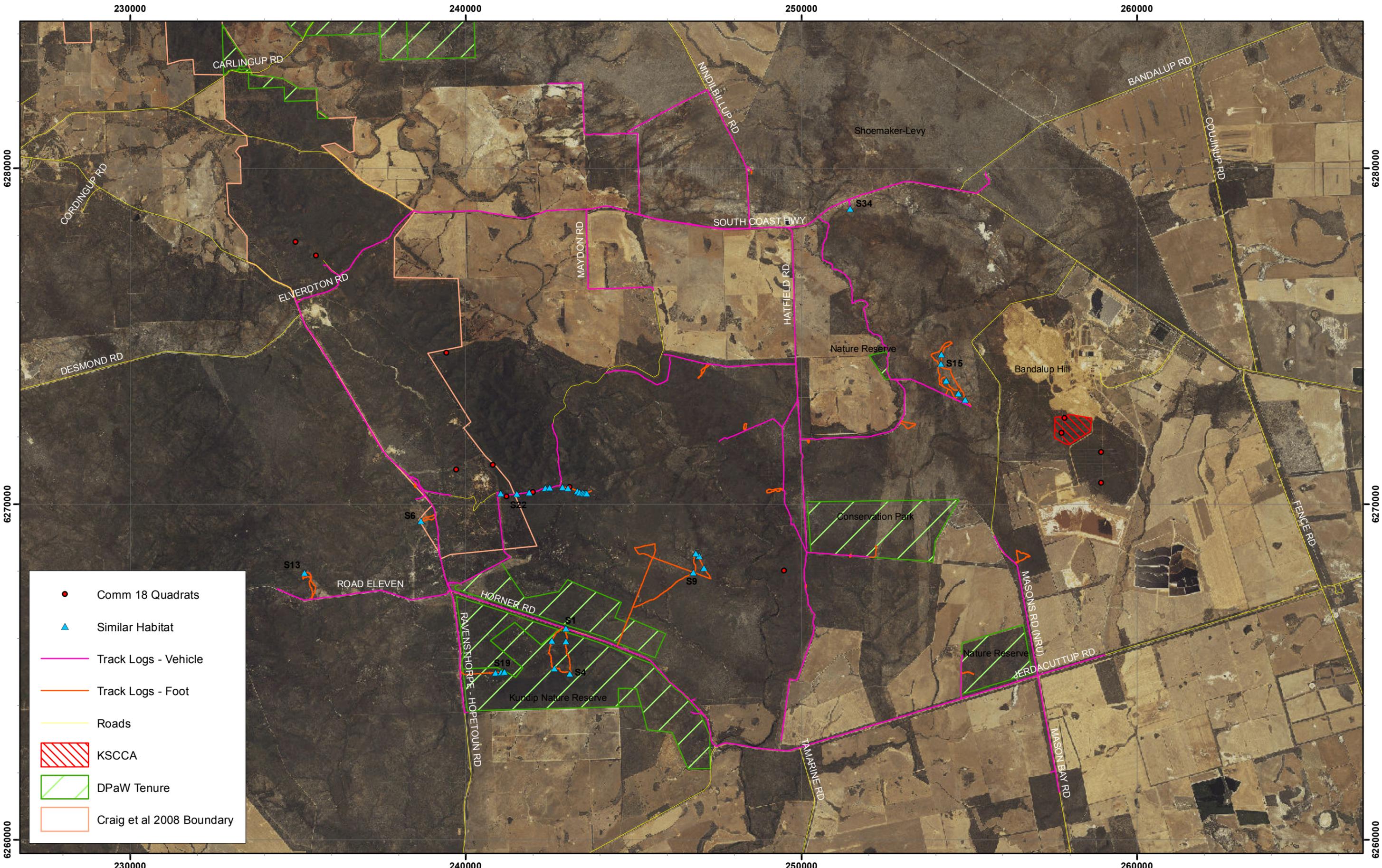
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- Towns
- *Kunzea similis subsp. similis*
- Roads
- KSCCA
- DPaW Tenure

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 <small>This map should only be used in conjunction with WEC report FQM15-06-01.</small>		2015 Regional Search for <i>Kunzea similis subsp. mediterranea</i>	Author: Bethea Loudon WEC Ref: FQM15-06-01 Filename: FQM15-06-01-f01.mxd	Figure 1
		Revision: A - 11 September 2015	Scale: 1:200,000 (A3) Grid: MGA Zone 51	



- Comm 18 Quadrats
- ▲ Similar Habitat
- Track Logs - Vehicle
- Track Logs - Foot
- Roads
- KSCCA
- DPaW Tenure
- Craig et al 2008 Boundary



This map should only be used in conjunction with WEC report FQM15-06-01.



2015 Regional Search for *Kunzea similis* subsp. *mediterranea*

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Scale: 1:100,000 (A3) Grid: MGA Zone 51

**Figure
3**