



Stylidium ensatum survey report

BP33 LITHIUM PROJECT



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1 INTRODUCTION

This report presents the methodology and results of a targeted survey for *Stylidium ensatum* that was conducted as part of the ecological assessment for the BP33 Lithium Project.

1.1 *Stylidium ensatum*

Stylidium ensatum is a small annual herb, one of approximately 40 described species of *Stylidium* (commonly known as trigger plants) from the Northern Territory (NT Herbarium 2015). *Stylidium ensatum* is listed as Endangered under both the *Territory Parks and Wildlife Conservation Act* and the *Commonwealth Environment Protection and Biodiversity Conservation Act*.

The species grows to 22 cm tall, has sessile obovate or orbicular leaves attached to a short stem, and small pink flower with lobed petals, as shown in Figure 1. *S. ensatum* is a member of the *Stylidium* subgenus *Andersonia*, species known from South-east Asia and northern Australia (Bean 2000), where the climate is monsoonal and rainfall is strongly seasonal. As is typical of other species of *Stylidium*, *S. ensatum* is likely to germinate where water has recently receded in seepage areas and seasonally-inundated sites. Plants grow in the early dry season, and are best able to be detected between June and July when flowering and fruiting occurs (Donna Lewis, NT Herbarium, pers. comm. 2020).

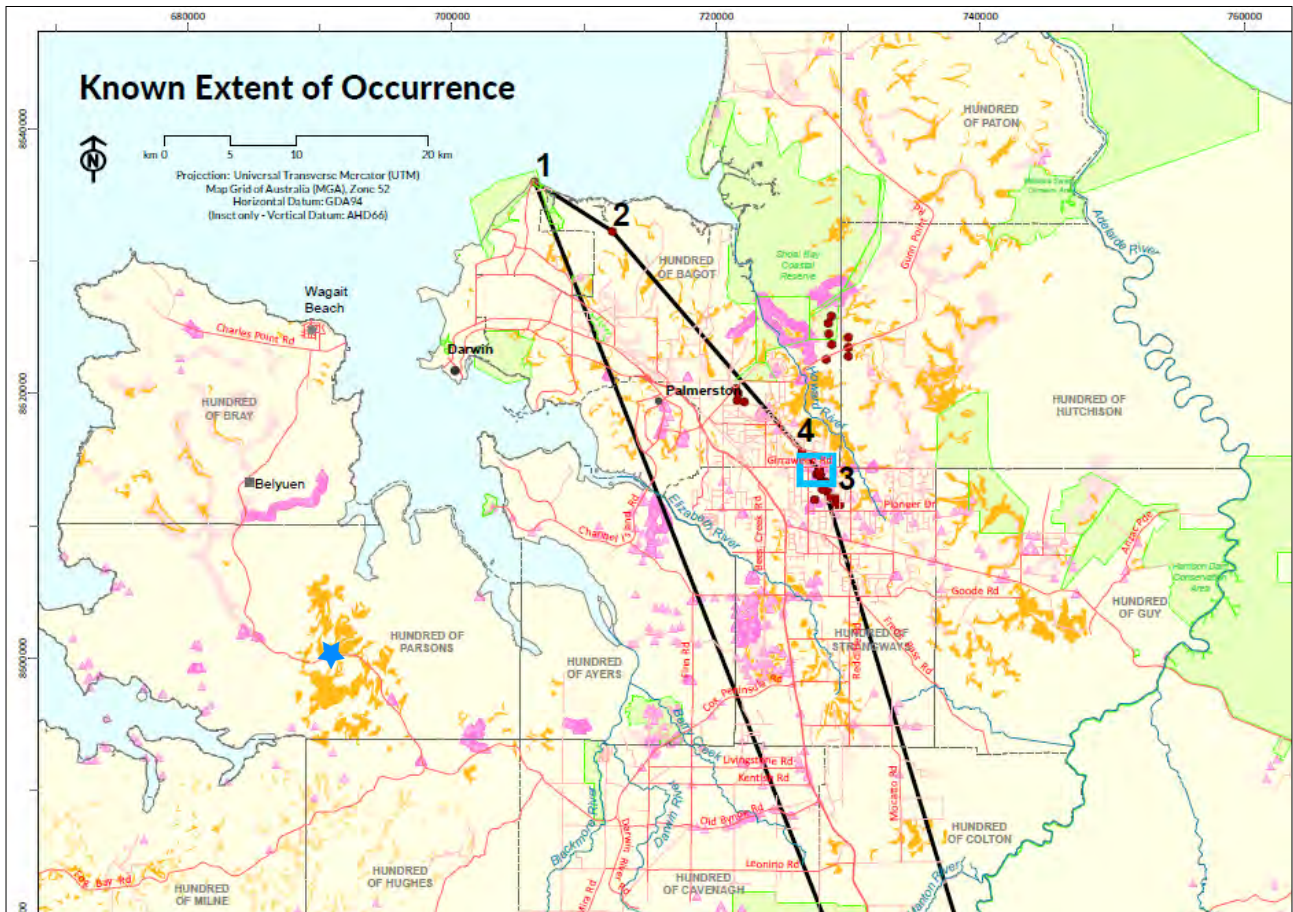
Stylidium ensatum inhabits margins of drainage areas in damp heavy clay or peaty soil (Cowie & Westaway 2012), although it may prefer sandier or loamy soils (Ian Cowie, NT Herbarium, pers. comm. 2017). Suitable areas for *S. ensatum* tend to be adjacent to Lophostemon swamps, where surface moisture is maintained into the early to mid-dry season (Nick Cuff, NT Herbarium, pers. comm., 2017). The preferred habitat for *S. ensatum* generally supports *Melaleuca viridiflora*, *Eucalyptus alba* and *Lophostemon lactifluus*, but also perennial grasses such as *Eriachne burkittii*, *Pandanus spiralis*, *Osbeckia australiana*, and scattered *Banksia dentata* (Donna Lewis, NT Herbarium, pers. comm. 2020).



Figure 1. Photographs of *Stylidium ensatum* leaves and flower; plants from the Girraween Road location

1.2 Known extent of occurrence

The NT Government has mapped the extent of occurrence of *Styloidium ensatum* based on known recorded locations close to Darwin and a site at Hayes Creek (NT Government 2016). The habitat modelling is primarily derived from historical land resources, and considers existing land unit mapping and vegetation mapping. Potential habitat for the species has also been mapped from historical land resource survey information, and serves as a guide to identify areas where the species may be present (NT Government 2016). While the species has not previously been recorded from the Cox Peninsula, mapping (as shown in Figure 2) indicates the potential for habitat in portions of the investigation area.



Blue star - approximate location of Grants Lithium Project in relation to NT Herbarium mapping of potential habitat for *S. ensatum*.
Orange - mapped potential habitat of *S. ensatum* (NT Herbarium), Pink triangle - locations of previous surveys with no *S. ensatum* records, Red circle - *S. ensatum* records, Black lines - Extent of Occurrence of *S. ensatum*

Figure 2. Map of the known extent of occurrence and modelled habitat of *S. ensatum* (DLRM 2016)

2 METHODS

2.1 Desktop preparation

A desktop search of the habitat model identified areas of high likelihood of *Styloidium ensatum* habitat within the survey area – see Figure 3. Satellite imagery were also examined to identify potential areas of suitable *Styloidium ensatum* habitat to be targeted for on-ground investigation. Relevant features used to determine potentially suitable locations for on-ground survey were:

- Areas that are poorly drained with seasonal inundation or waterlogging and have hydrosols soils – i.e. they are saturated with water for extended periods, are generally a greyish colour and have a high organic content.
- Shallow inundation or saturated soils in the mid dry season.
- Overstorey consisting of *Melaleuca* spp. and/or *Lophostemon lactifluus*, *Pandanus spiralis*.
- Ground layer incorporating grasses and herbs that occur in poorly-drained habitats.
- Relatively open overstorey.

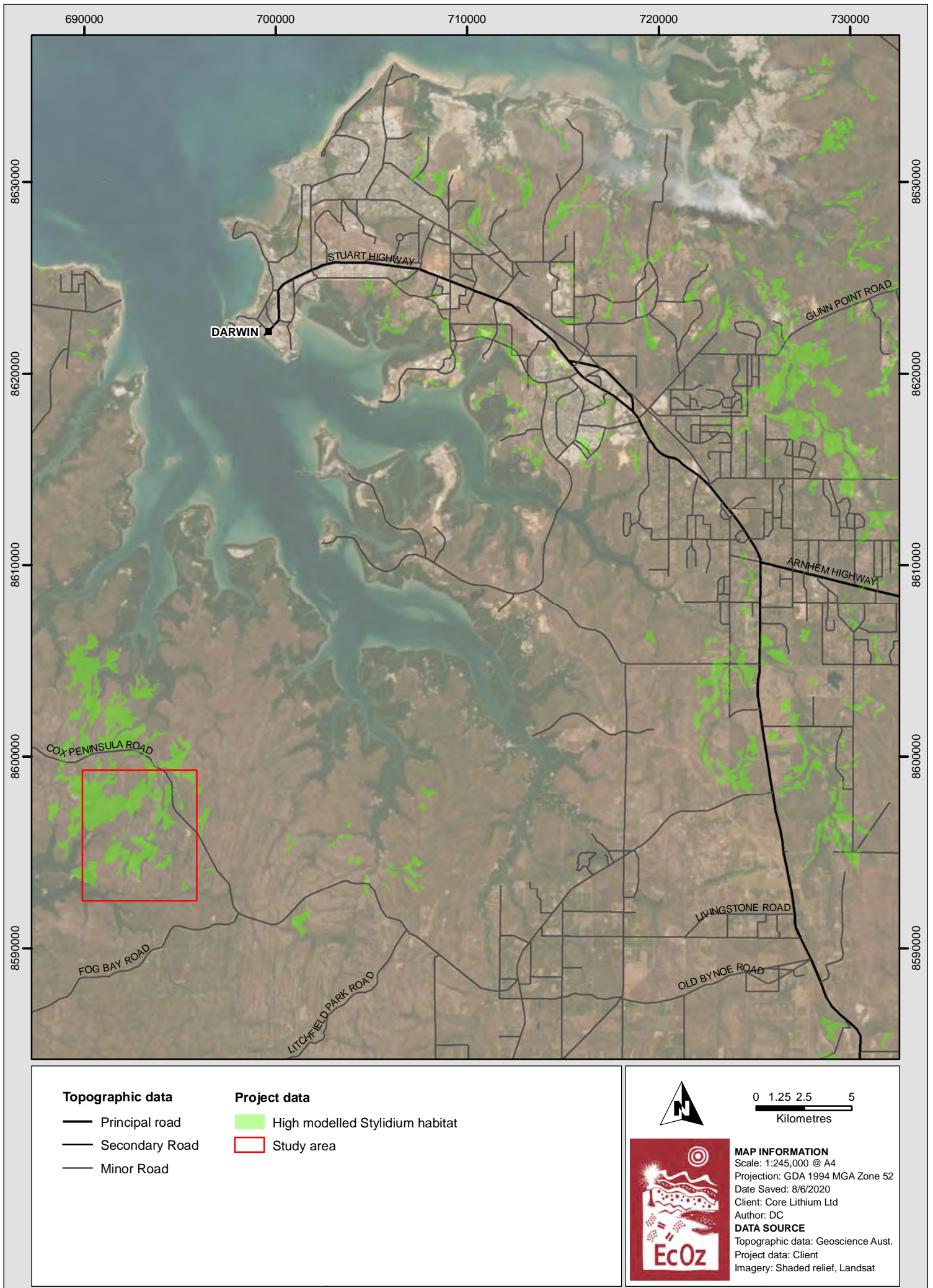
Approximately 16 ha of the mine site footprint and 2 ha of the road corridor are within the areas modelled as high likelihood habitat. Figure 3 depicts only the mine site components and road corridor that intersect or contain high modelled habitat suitable for *Styloidium ensatum*.

2.2 Field survey

The field survey was undertaken by botanists Anna Lemon, and Nicole Clark; both of whom have extensive experience in undertaking vegetation surveys in the Top End, including surveys for and identification of, threatened flora. Prior to the survey, the surveyors visited the NT Herbarium to become more familiar with the diagnostic features of the plant, and to ensure correct identification in the field. There are other species that are similar and can be mistaken for *S. ensatum* including *S. lobuliflorum*, *S. accedens*, *S. capillare*, *S. muscicola* and *S. notabile*; these were also viewed at the herbarium for comparison.

The field survey method was recommended by NT Herbarium and advice was received prior to visiting the survey area. The on-ground survey was undertaken on 7 July 2020. High likelihood areas were searched for *S. ensatum* using a meander technique by walking a zig-zag fashion as determined by type and configuration of habitat. Waypoints are recorded where plants occur at intervals of five to 10 metres (the limits of GPS precision) to delineate the extent of patches and a track log saved to record search area.

A GPS track was recorded to provide a record of the survey range and effort, and photographs of habitats were taken.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19171 - BP33 NOI\01 Project Files\Figure 3. BP33 Lithium Project *Styliidium ensatum* survey area.mxd

Figure 3. Map showing the location of the *Styliidium ensatum* study area

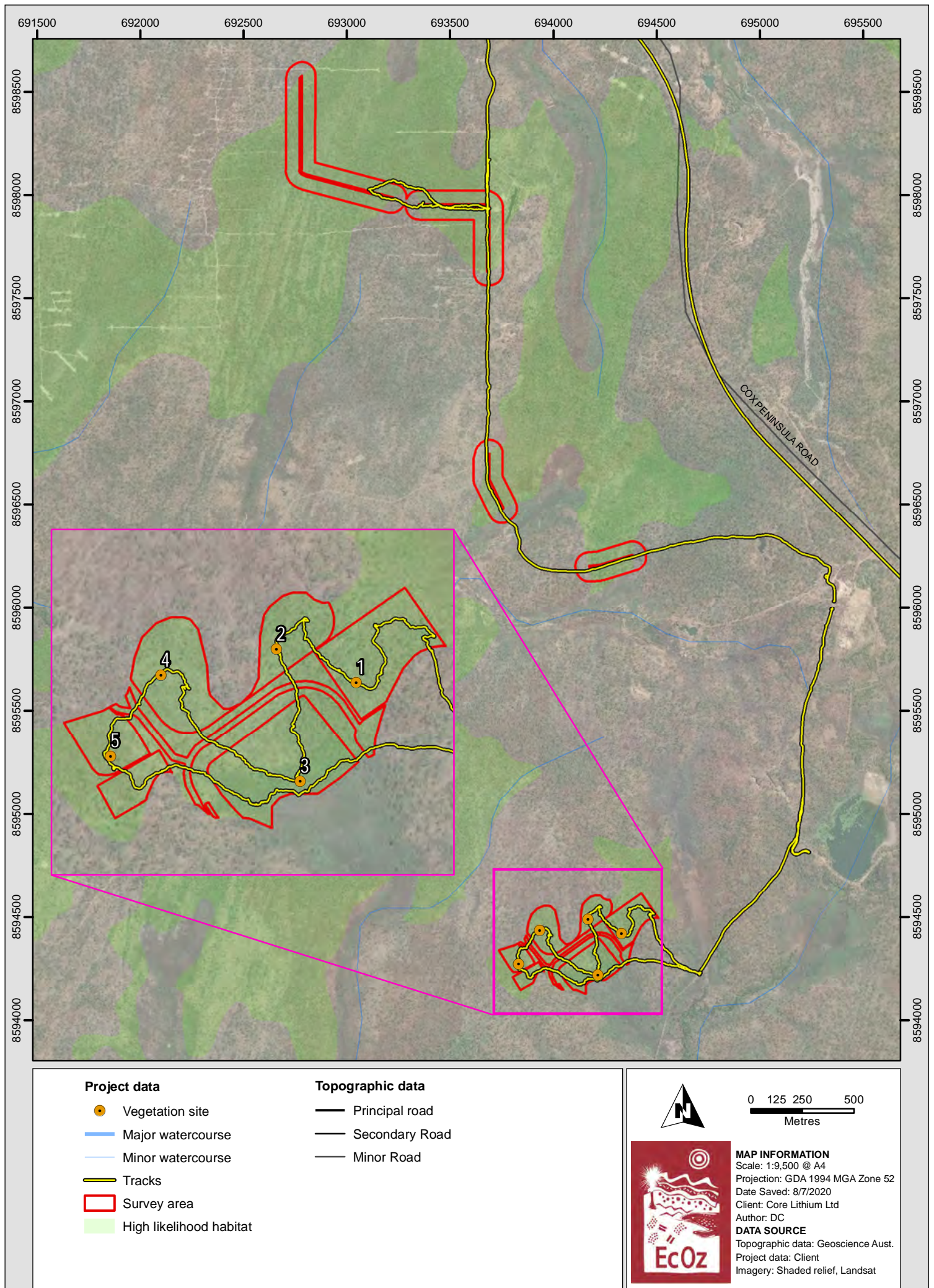
3 RESULTS AND DISCUSSION

No *S. ensatum* plants were found in the survey area. Figure 4 presents survey tracks and the locations searched. While traversing, general vegetation and soil descriptions was noted at each transitioning polygons within survey area – see Table 1 for detailed descriptions.

More intensive survey effort was focused along the creek margin south of the survey area. It appeared to be the most suitable habitat for the species because it had maintained soil moisture (vegetation site 3 – see Table 1 and Figure 4). However, dense *Sorghum* was also present in this area, lowering detectability.

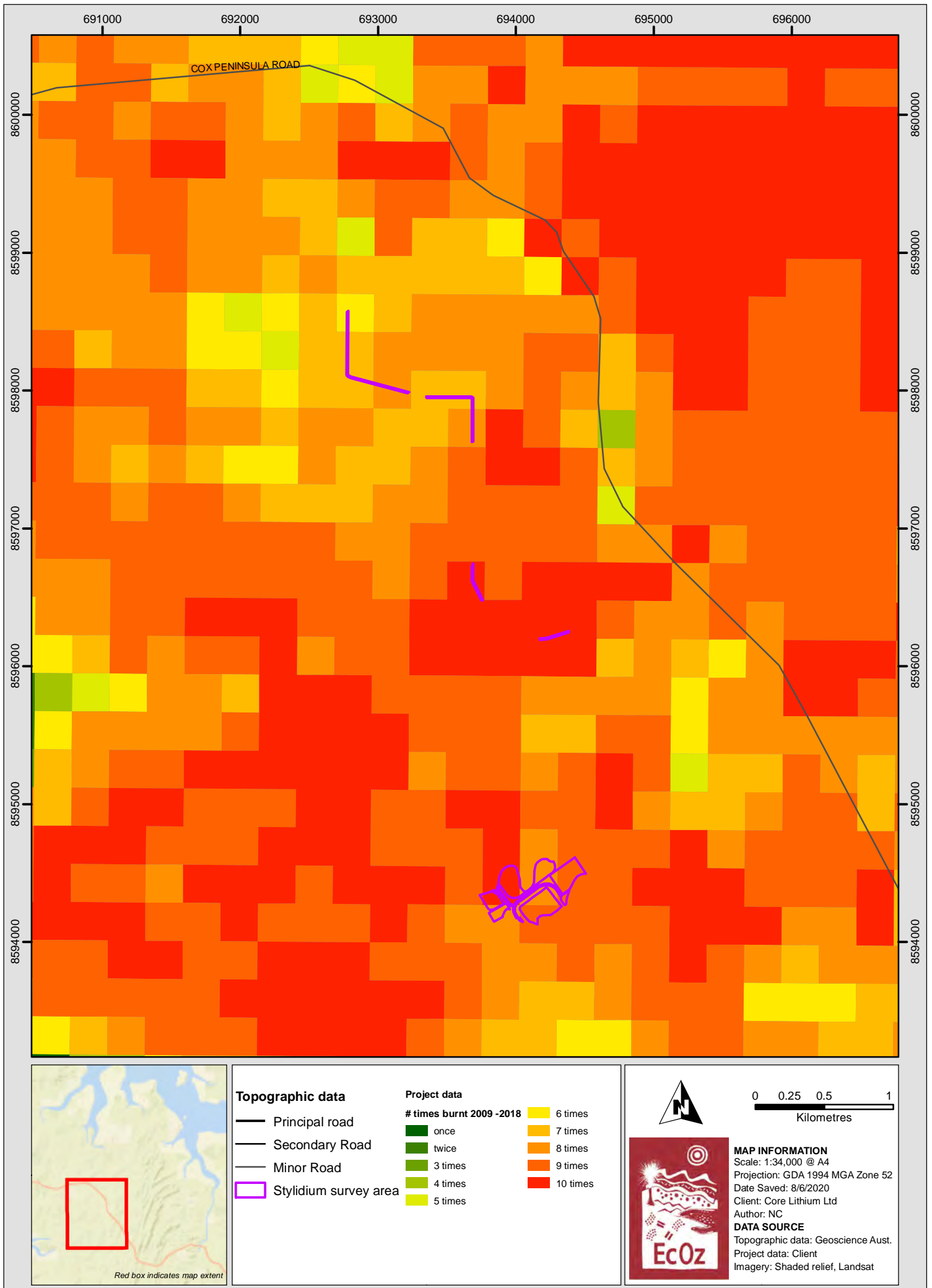
The remaining areas that are evidently seasonally-saturated were dry at the surface at the time of the survey and therefore are unlikely to provide habitat for *Stylidium ensatum*. The survey identified that some areas – although modelled as suitable habitat – actually had vegetation comprising of *Eucalyptus miniata* and *Erythrophleum chlorostachys* on higher ground with skeletal rudisol soils. These species and associated soil type do not indicate suitable habitat for *S. ensatum* and were not surveyed thoroughly.

There was also evidence of recent fires in sections of the survey area, mainly occurring within the road corridor polygons and surrounding bushland. The majority of fires have burnt between May and July 2020 (Figure 6). Regional fire history and fire scar mapping was obtained through the [Northern Australia and Rangelands Fire Information](#) website. Between the years 2009 - 2018, the survey area and surrounds has burnt frequently, on an annual basis (Figure 5). High fire frequencies are likely to be a factor detrimental to the survival of this species and decreases the likelihood of its occurrence.



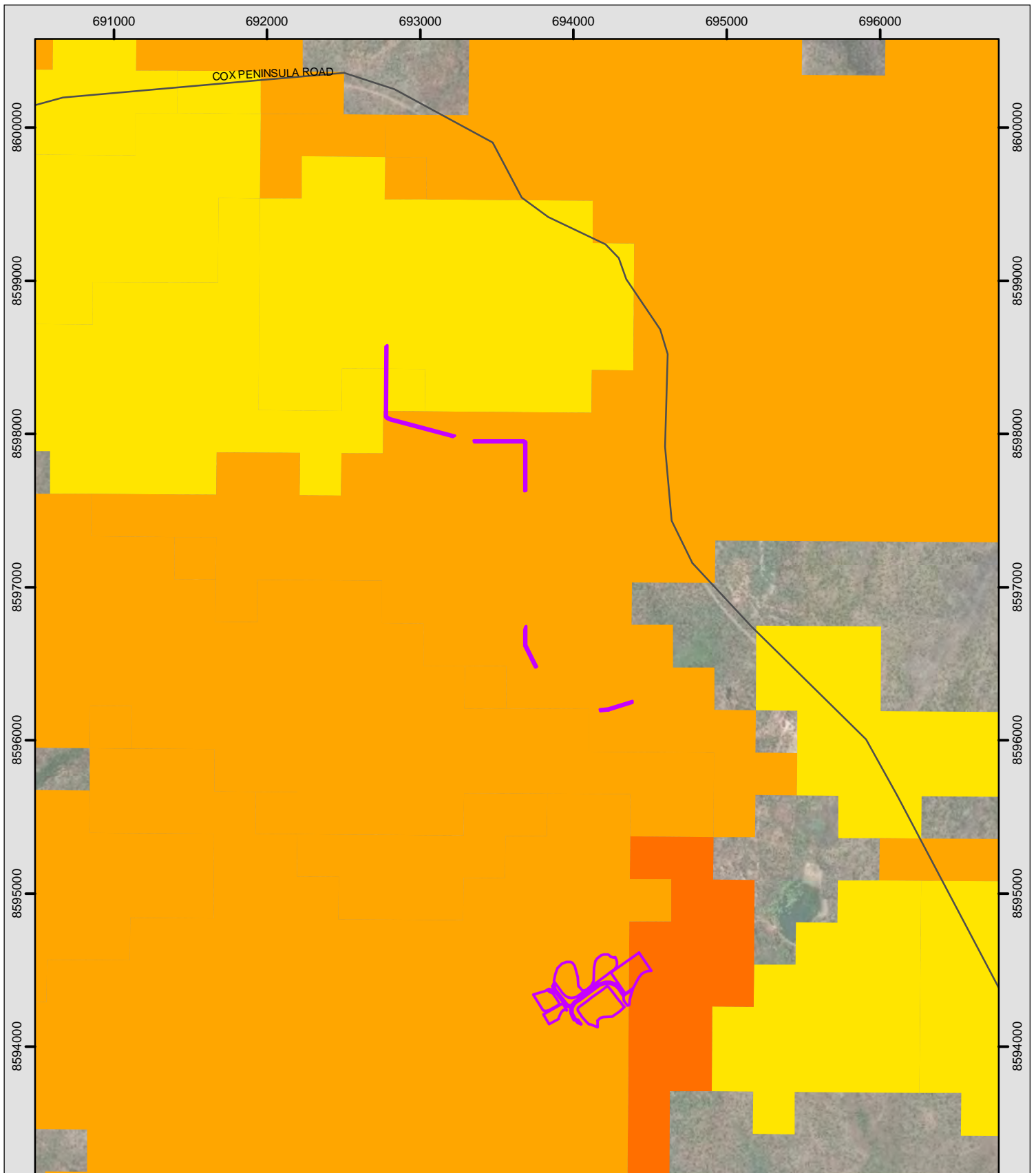
Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19171 - BP33 NOI\01 Project Files\Figure 4. Stylidium survey.mxd

Figure 4. Map of survey effort (tracks and details of search locations)



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19171 - BP33 NOI\01 Project Files\Figure 5. Fire scar mapping.mxd

Figure 5. Map of fire history (number of times burnt) over the past 10 years (NAFI)

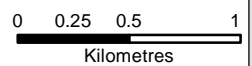


Topographic data

- Principal road
- Secondary Road
- Minor Road
- Stylidium survey area

Project data

- Fire scar map 2020 (NAFI)**
- Months burnt**
- Jan
 - Feb
 - March
 - April
 - May
 - June
 - July
 - August













MAP INFORMATION
 Scale: 1:34,000 @ A4
 Projection: GDA 1994 MGA Zone 52
 Date Saved: 8/6/2020
 Client: Core Lithium Ltd
 Author: NC

DATA SOURCE
 Topographic data: Geoscience Aust.
 Project data: Client
 Imagery: Shaded relief, Landsat

Figure 6. Map of 2020 fire scar (NAFI)

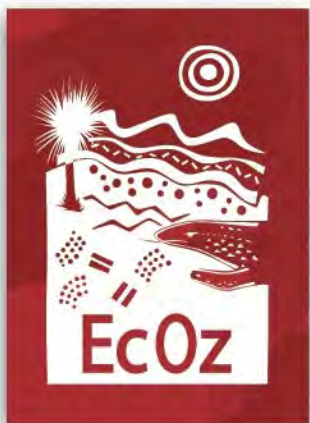
Table 1. Vegetation and soil sites descriptions

Site	Vegetation description	Vegetation photograph	Soil	Soil photograph
VS1	<p>Open <i>Banksia dentata</i> and <i>Grevillea pteridifolia</i> woodland.</p> <p>Upper and mid strata – <i>Banksia dentata</i>, <i>Xanthostemon paradoxus</i>, <i>Pandanus spiralis</i>, <i>Grevillea pteridifolia</i>, <i>Lophostemon lactifluus</i>, <i>Persoonia falcata</i>, <i>Livistona humilis</i>, <i>Acacia lamprocarpa</i></p> <p>Ground strata – <i>Heteropogon triticeus</i>, <i>Sorghum intrans</i>, <i>Eriachne sp.</i>, <i>Goodenia sp.</i>, <i>Drosera sp.</i>, <i>Goodenia sp.</i></p>		Yellowish brown sandy clay loam – dry soils	
VS2	<p>Open <i>Eucalyptus miniata</i> and <i>Erythrophleum chlorostachys</i> woodland.</p> <p>Upper strata – <i>Eucalyptus miniata</i>, <i>Erythrophleum chlorostachys</i>, <i>Xanthostemon paradoxus</i>, <i>Grevillea pteridifolia</i>.</p> <p>Mid strata – <i>Livistona humilis</i></p> <p>Ground strata – <i>Eucalyptus tetradonta</i>, <i>Erythrophleum chlorostachys</i>, <i>Sorghum intrans</i>, <i>Grevillea pluricaulis</i>, <i>Petalostigma quadriloculare</i>, <i>Themeda triandra</i>.</p>		Lower slope drainage; yellowish/brown sandy clay loam – dry soils	
VS3	<p>Low open <i>Grevillea pteridifolia</i> and <i>Pandanus spiralis</i> woodland.</p> <p>Ground strata – Dense <i>Sorghum intrans</i>, with scattered herbs including <i>Utricularia sp.</i> and a ground orchid. Other species included <i>Xanthostemon paradoxus</i>, <i>Lophostemon lactifluus</i>, <i>Pandanus spiralis</i>, <i>Livistona humilis</i> and stunted <i>Melaleuca sp.</i> juveniles.</p>		Dark brown sandy clay soils with organic layer on surface; very poorly drained – damp soils	

Site	Vegetation description	Vegetation photograph	Soil	Soil photograph
VS4	<p>Open <i>Xanthostemon paradoxus</i>, <i>Grevillea pteridifolia</i> and <i>Lophostemon lactifluus</i> woodland.</p> <p>Upper strata – <i>Xanthostemon paradoxus</i>, <i>Grevillea pteridifolia</i>, <i>Lophostemon lactifluus</i>, <i>Corymbia latifolia</i>, <i>Erythrophleum chlorostachys</i>.</p> <p>Mid strata – <i>Livistona humilis</i>, <i>Pandanus spiralis</i>, <i>Acacia mimula</i>.</p> <p>Ground strata – <i>Eucalyptus tetradonta</i>, <i>Erythrophleum chlorostachys</i>, <i>Sorghum intrans</i>.</p>		<p>Upland drainage; brownish/grey sandy loam – dry soils</p>	
VS5	<p>Mixed open woodland, with <i>Grevillea pteridifolia</i>, <i>Corymbia bleeseri</i>, <i>Corymbia latifolia</i>, <i>Erythrophleum chlorostachys</i>, <i>Melaleuca nervosa</i>, and <i>Xanthostemon paradoxus</i>.</p> <p>Upper strata – <i>Grevillea pteridifolia</i>, <i>Corymbia bleeseri</i>, <i>Corymbia latifolia</i>, <i>Erythrophleum chlorostachys</i>, <i>Melaleuca nervosa</i>, and <i>Xanthostemon paradoxus</i></p> <p>Mid strata – <i>Banksia dentata</i>, <i>Syzygium eucalyptoides</i> subsp. <i>bleeseri</i>, <i>Pandanus spiralis</i>, <i>Acacia lamprocarpa</i>, <i>Lophostemon lactifluus</i>.</p> <p>Ground strata – <i>Eucalyptus tetradonta</i>, <i>Erythrophleum chlorostachys</i>, <i>Sorghum intrans</i>, <i>Grevillea pluricaulis</i>, <i>Heteropogon triticeus</i>.</p>		<p>Brownish/yellow sandy clay soils</p>	

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