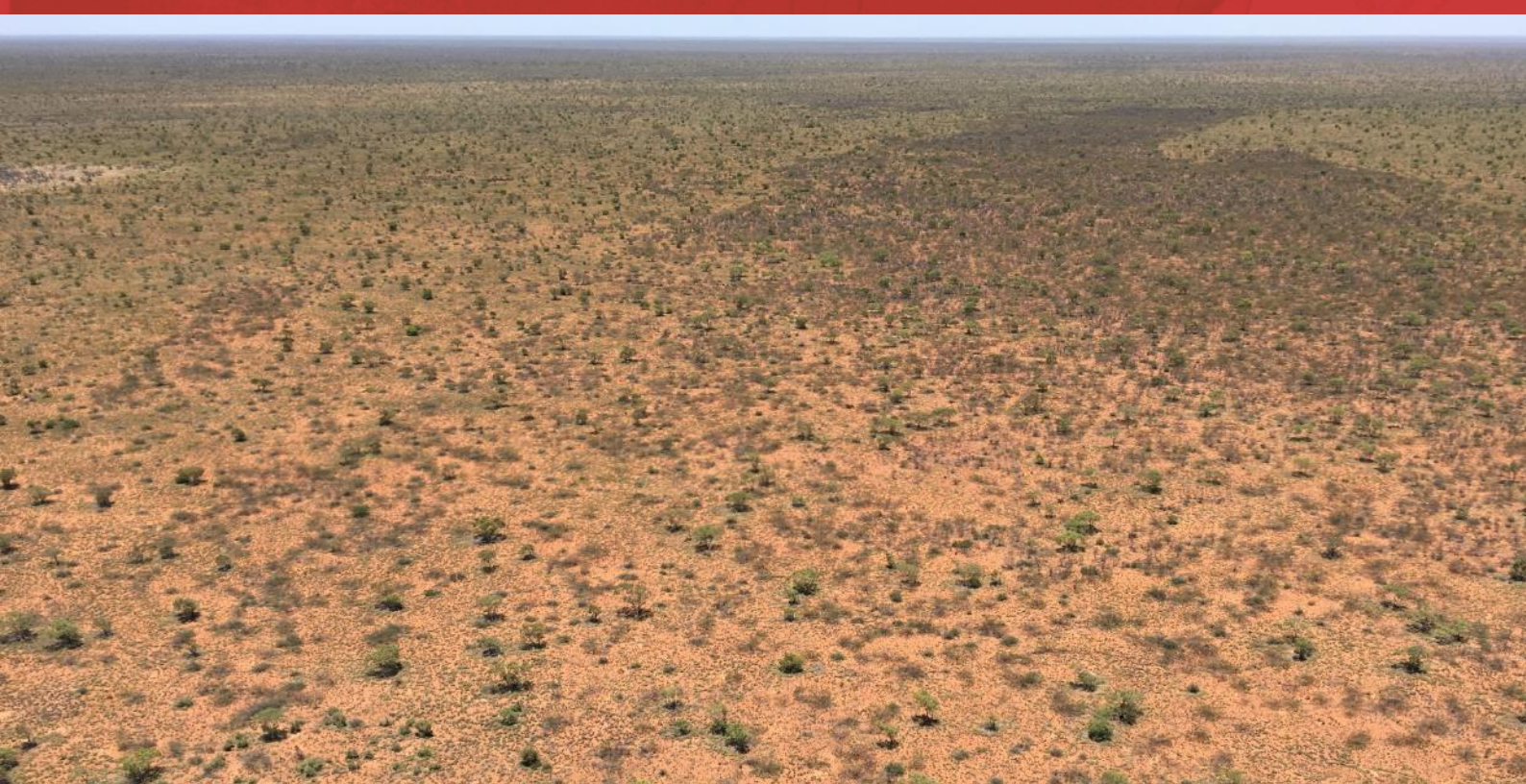


## APPENDIX A SOLAR PRECINCT LAND TYPE REPORT



# Land type assessment of the Solar Precinct footprint Australia – Asia PowerLink SUN CABLE



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Appendix B	Land type survey site data
Appendix C	Reference site data
Appendix D	Flora species list

## Acknowledgements

Thanks to Andrew Schubert (Consulting Botanist, Alice Springs) for assistance with identification of voucher specimens and photographs of plant species post-field work.

**Front cover:** Aerial photograph from helicopter taken by Tom Ewers-Reilly during land type mapping survey in November 2020.

# 1 INTRODUCTION

---

Sun Cable is developing the Australia-Asia PowerLink ('the project') to generate, store, transmit and deliver renewable energy. The project is comprised of multiple components. This report focusses on the 12,000 hectare Solar Precinct footprint – see Figure 1-1 – located on Powell Creek pastoral station.

Development of that footprint will require land clearing. The clearing of pastoral land is assessed under the *Pastoral Land Act*. The Pastoral Land Board is the consent authority for clearing applications on pastoral land. In determining an application, the Pastoral Land Board must take into account the *Land Clearing Guidelines* (DENR 2020). Those guidelines require that all land clearing applications need to be accompanied by an appropriate, field-verified, soil, vegetation and land resource assessment, providing:

- A specific *land type*<sup>1</sup> map with accompanying land type descriptions, including:
  - Soil and landform data to comply with Australian technical standards.
  - Vegetation data (vegetation assessment must adhere to NVIS level 5 attribution).
  - Other supporting data associated with the land type field investigation – including site information coordinates, soil descriptions and photographs of soil and vegetation.

EcOz Environmental Consultants (EcOz) was engaged by Sun Cable to prepare a land type map for the Solar Precinct footprint. This report presents the methods used to develop the map and the results.

The mapping identified four land types occurring within the Solar Precinct footprint. The majority of the footprint is a flat to gently sloping loamy plain that supports a patchy shrubland of *Acacia* species (with sandier areas supporting scattered *Corymbia opaca*). The western side of the footprint is a loamier area supporting mostly *Eucalyptus pruinosa*. Small localised depressions are scattered throughout. These support species suited to episodic and ephemeral inundation. A small portion in the south-east of the footprint intersects lower alluvial flats associated with significant outflow events from westerly flowing drainages from the Ashburton Range. This land type has loamy surface soils. There are scattered, small, localised depressions within this land type that have a high clay content and moisture-holding capacity (and were often more densely vegetated).

The *Land Clearing Guidelines* also require that land clearing capability be based upon the land types present within the area proposed to be cleared. This report does not include a land capability assessment. That will be undertaken when Sun Cable is ready to apply for a land clearing permit.

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<sup>1</sup> A land type is a unit of land that incorporates 'a reasonably homogenous part of a land surface, distinct from surrounding terrain with consistent properties in landform, soils or vegetation' (Hooper 1970). They provide a finer level of detail than other types of regional mapping data – such as land systems and the National Vegetation Information System (NVIS) and land units (where that exists).

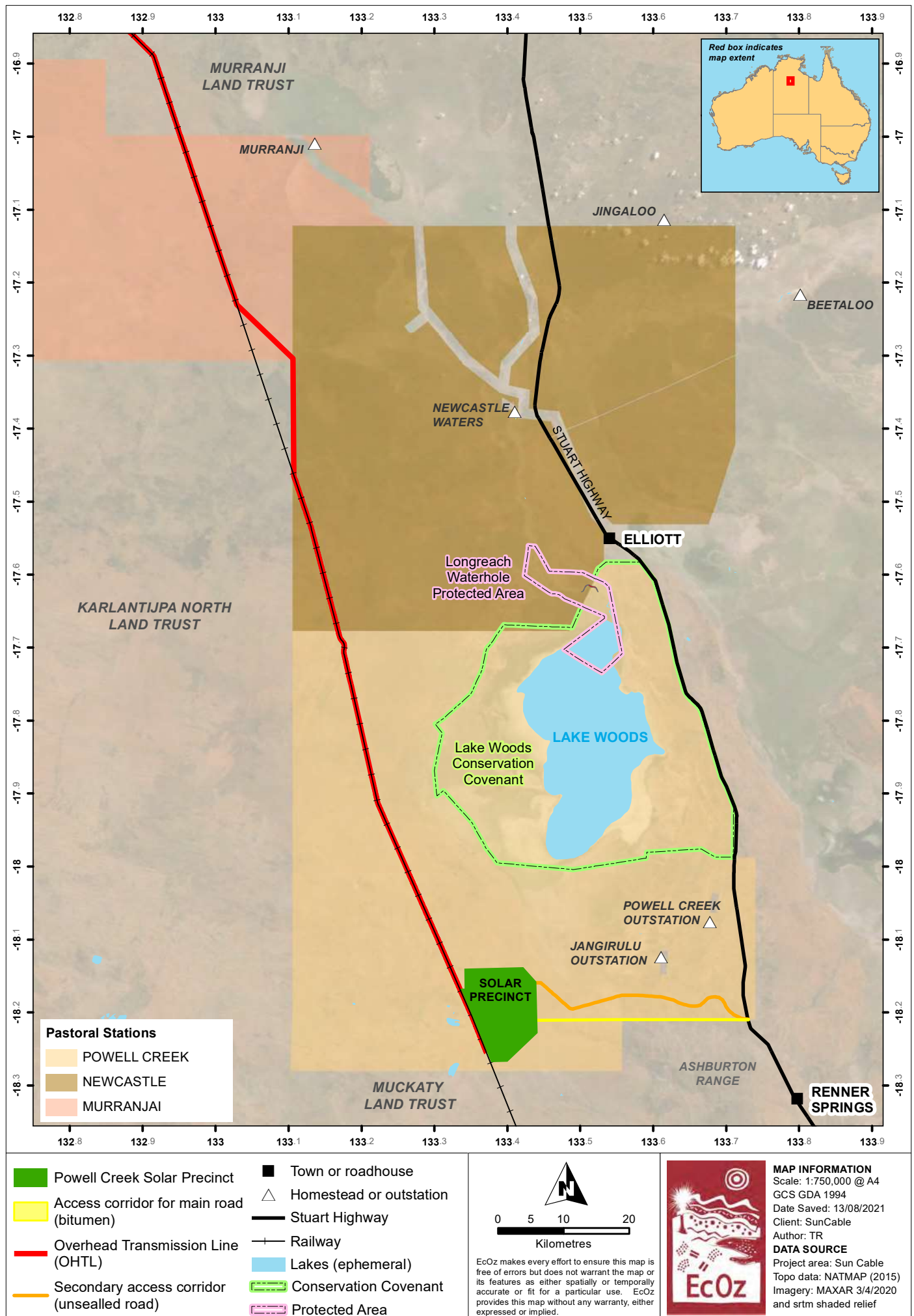


Figure 1-1. Map of Solar Precinct footprint location

## 2 DESKTOP REVIEW

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This section describes the desktop resources that were used for designing the land type survey within the Solar Precinct footprint.

### 2.1 Aerial imagery

Aerial imagery available on ESRI ArcMap (ArcGIS 10.8) was used for land type mapping. This included aerial imagery from MAXAR with imagery dates from April 2020 (when viewed at a scale of 1:20,000) – see Figure 2-1. Sun Cable later acquired imagery for the footprint areas. This high-resolution imagery was not available at the time of survey; however, it was used when finalising land type polygons post-survey.

### 2.2 Contours

At the time of survey, site-specific contour data was not available. DEM imagery was used to infer 5 m contour intervals, which indicated that the site had very little relief (i.e. <5 m) – and this interval range was not fine enough to be useful for aiding in delineating different land types. However, project-specific contour mapping at 50 cm intervals became available post-survey and was used when finalising land type polygons – as shown on Figure 2-1.

### 2.3 Land systems

A land system is ‘an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation’ (Christian and Stewart 1968). Land Systems have been mapped by across the NT by the government at scales between 1:250,000 and 1:1,000,000. The Solar Precinct footprint occurs within the Redsan land system, which was describe and mapped at a scale of 1:500,000 by Stewart et al. (1970).

The Redsan land system falls within the ‘desert sandplains’ group, and covers an extensive area of land within the northern and north eastern region of the Tanami Desert. Redsan is an area of gently undulating plain with deep sandy soil that supports an open Eucalyptus woodland (including (*Eucalyptus polycarpa*, *E. argillacea*, *E. setosa*, *E. pruinosa*, *E. microtheca*, *E. ferruginea*) over spinifex (mainly *Triodia pungens*) interspersed with areas of tussock grasses (i.e. *Aristida spp.*) (Stewart et al. 1970). The land system also supports standard / patches of Lancewood (*Acacia shirleyi*) and Bulwaddy (*Macropteranthes kekwickii*) along the south-eastern margin (Stewart et al. 1970).

No land unit or land type mapping is available for the Solar Precinct footprint or surrounding areas.

### 2.4 Vegetation

NVIS vegetation data (as per NVIS 5.1, based on Wilson et al 1990) indicates that the Solar Precinct footprint is located within ‘*Eucalyptus low open woodlands with hummock grass*’ (NVIS map unit 1042) which occurs on gentle undulating plains, with deep sandy yellow earths, lateritic red earths, or deep sands. The NVIS Level 4 description is:

- Upper stratum: Low open woodland of *Eucalyptus pruinosa* with *Bauhinia cunninghamii* and *Corymbia opaca*.
- Mid stratum: Mid open shrubland of *Acacia lysiphloia* with *Carissa lanceolata* and *Atalaya hemiglauca*.
- Ground stratum: Low hummock grassland of *Triodia pungens* with *Chrysopogon fallax* and *Enneapogon polyphyllus*.

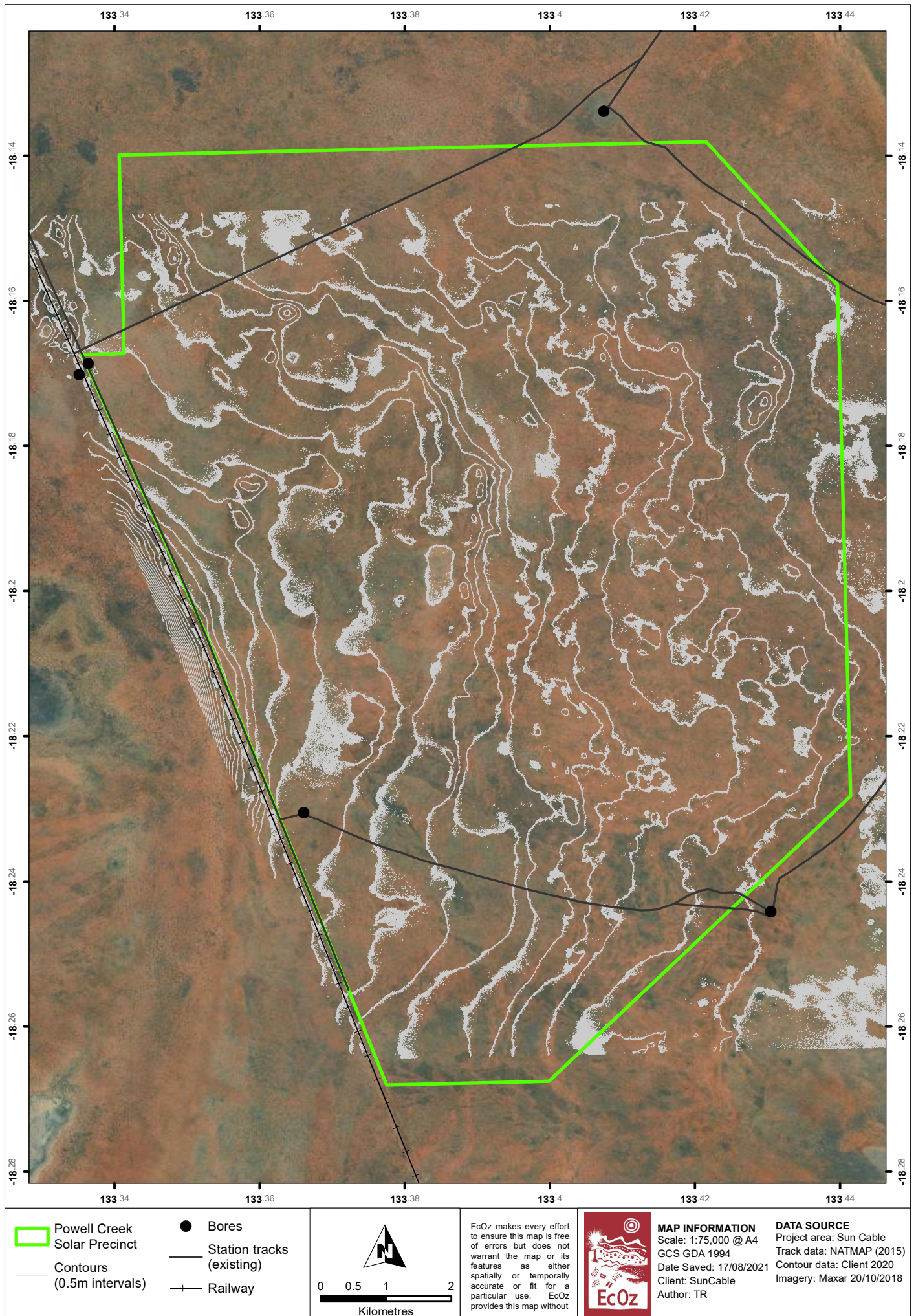
## 2.5 Soil

The Solar Precinct footprint occurs within soil unit AB30 as per Atlas of Australian Soils (Northcote et al., 1960-68; scale 1:2,000,000). Explanatory notes for this unit are – 'Gently undulating sand plains with poorly developed dune formations in some parts; ironstone gravels and block laterite may occur at depth below the soils: chief soils are red earthy sands (Uc5.21) in association with smaller areas of yellow earthy sands (Uc5.22). Other soil occurrences include various shallow stony sands – such as (KS-Uc1.2), (KS-Uc1.41) and (KS-Uc5.21) – on crests and slopes; some (Gn2) soils – such as (Gn2. 12) and (Gn2.21) – that may margin the unit where it adjoins cracking clay plains; and small seasonally-flooded flats of (Uc) and (Gn2) soils.'

## 2.6 Fire history

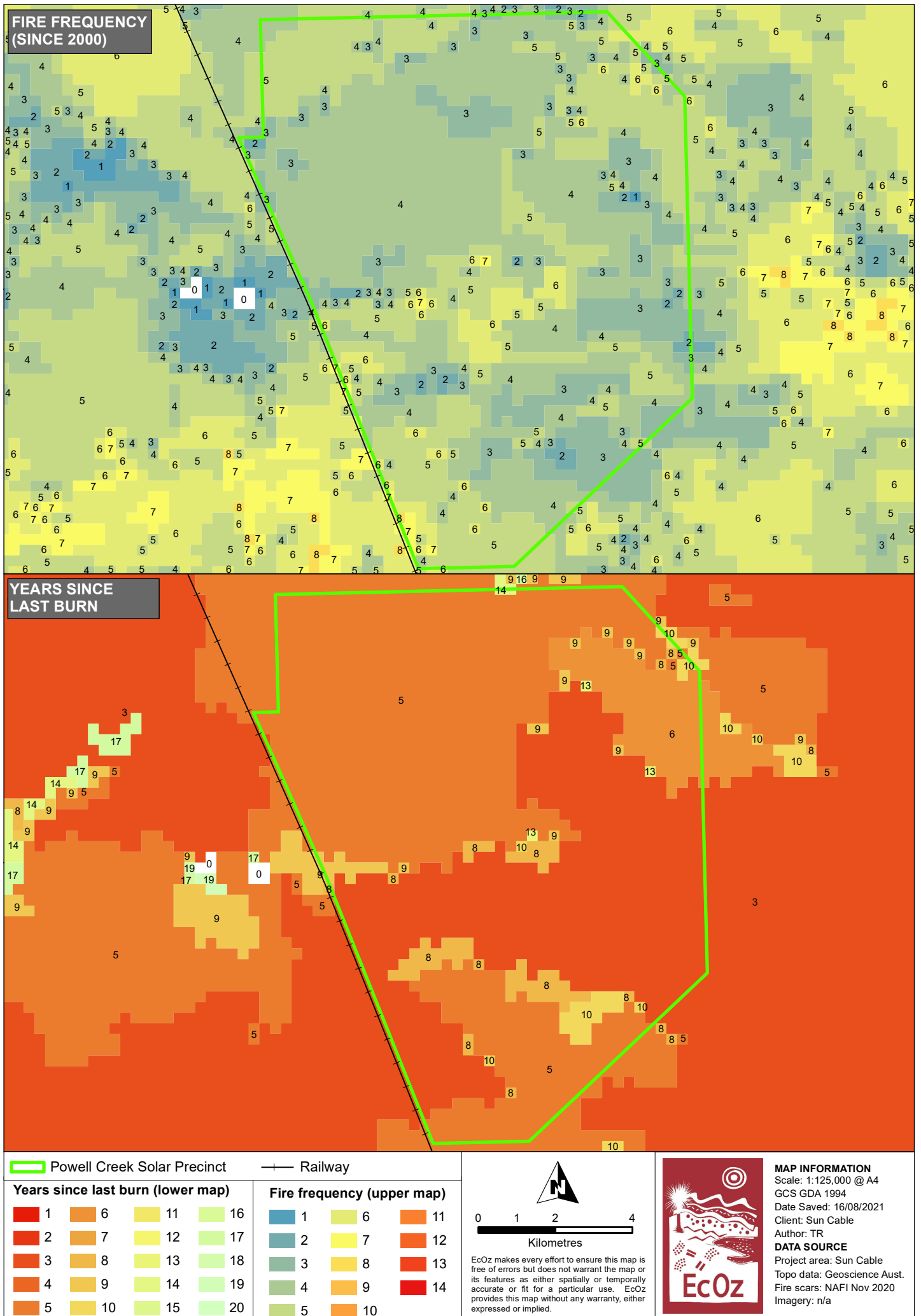
Fire history and fire scar mapping over the last 20 years was obtained through the [Northern Australia and Rangelands Fire Information](#) (NAFI) website. The fire history within the footprint is mapped in Figure 2-2, which shows 'fire frequency' (i.e. number of burns) and 'years since last burn' (using NAFI fire scar data). Additional to NAFI datasets., Landsat Quicklook imagery, fractional groundcover imagery (using VegMachine), and [Google Timelapse](#) was viewed back to 1990 for a detailed look at fire scar edges to confirm of vegetation pattern is fire related (or not). Results indicated that there are numerous fire scars of variable sizes within potentially same land types – and as such caution was used when viewing aerial imagery to demark land type boundaries as darker areas (that typically represent areas of thicker vegetation) could potentially be indicative of fire history rather than being different land type.

Fire occurrences within the Solar Precinct footprint since 1990 are summarised on an annual basis in Appendix A, which includes aerial image extracts of each burn year. This review identified that fires have occurred within the footprint in 15 of the past 26 years (years are 1994, 1995, 1997, 1998, 2000, 2002, 2005, 2007, 2008, 2011, 2012, 2013, 2014, 2016 and 2018), and that all areas have burnt at least 2 or 3 times within that period. No fires have occurred within the footprint since 2018 – likely a result of low rainfall.



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**Figure 2-1. Map of aerial image and contours within the Solar Precinct**



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**Figure 2-2. Map of fire history within the solar precinct**

## 3 LAND TYPE SURVEY

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This section presents the methodology and results from the land type survey conducted within the Solar Precinct footprint between 4 and 6 November 2020 by ecologists Tom Ewers-Reilly and Ella-Monique Mason.

### 3.1 Methodology

#### 3.1.1 Preliminary land type mapping

Using information from the desktop review (Section 2), preliminary land type polygons were created in ArcGIS (version 10.8). Land type polygons aimed to separate areas of different landform, soil and vegetation characteristics at a scale set to 1:20,000 (or finer) – to be ground-truthed as part field studies described below.

It is noted that the footprint has been exposed to numerous fire events over the past two decades (see Section 2.6), so vegetation patterns observed on aerial imagery often represent fire scars rather than different land types or vegetation type.

#### 3.1.2 Data collection

Land type boundaries were ground-truthed by recording information on landform, soil and vegetation to comply with *Land Clearing Guidelines* (DENR 2020). Two types of sites were conducted:

- 1) Reference site – a ground-based survey within 50 x 50 m quadrat that provides a detailed description of the landform, vegetation and surface soil (methodology explained in the following sub-sections). At least one reference site was undertaken within each land type to provide a comprehensive description; multiple reference sites were conducted in habitat units that covered large areas to ensure that variation was captured in final descriptions.

A sub-set of reference sites also included a subsurface soil assessment to record soil horizons to a depth of 1m or point of refusal (i.e. bedrock) using a hand-held soil auger – at least one auger site was conducted within each land type.

- 2) Check site – a spot check (typically 5 minutes) that records basic information on landform, vegetation structure, dominant flora species, surface soil type and any other notable observations (i.e. weeds). These sites were either observed from the helicopter (hovering over location), or a quick ground-based check.

Additional to data collected at reference and check sites, numerous geo-referenced photographs and Garmin VIRB video footage were also collected to aid in determining final land type boundaries. All field data was collected on hard copy datasheets and notebooks, with map adjustments sketched in the field.

Proposed survey sites were selected prior to field work to be spatially representative of land types within the Solar Precinct footprint. The survey was undertaken using a helicopter for site access, which allowed for flexibility a comprehensive coverage of the footprint. Site locations were confirmed in the field and were recorded by taking a GPS coordinate (projection / datum GCS GDA94) and geo-tagged representative photograph(s). Spatial data was uploaded into Avenza Maps and handheld GPS units for field verification and data collection. Site data and other field observations were used to finalise land type descriptions and boundaries. All mapping and editing were performed using GIS software (ArcGIS 10.8).

### ***Landform***

Landform classes used are adopted from those currently used by the department for land unit and land type mapping projects with a scale of less than 1:100,000 (Hill and Napier 2015), which are based on national criteria and the *Australia Soil and Land Survey Field Handbook* (NCST 2009). Other information collected included slope (% estimate), run-off or run-on potential, micro-relief (i.e. depressions, gilgai), and presence / abundance termite mounds.

### ***Soil type***

Soils were described based on surface characteristics at all reference sites; and to a depth of 1m (using a hand auger) at a sub-set of these sites. Soil descriptions included an assessment of coarse fragments, moisture content, texture, colour, presence of mottling, with using terminology and methods recommended in the *Australia Soil and Land Survey Field Handbook* (NCST 2009), *Munsell Soil Colour Charts* (Munsell 2009), Isbell (2002) and Stace et al. (1968). This information in combination with vegetation indicators, provides insight into soil drainage and absorption capacity (described below).

The potential for presence of soil salinity was assessed by looking for potential salinity indicators in surface and sub-surface soils – such as salt crusting, salt-indicator plant species (i.e. *Atriplex spp.* and *Halosarcia spp.*) and dispersive soils. If salinity indicators had been detected, a soil sample would have been collected for laboratory analysis (electrical conductivity and salinity concentrations).

Sodic soils were also assessed in a similar manner, and are typically only present when fine clay soils are present – as such, if clay soils were detected, the likelihood of sodicity would be investigated.

### ***Drainage potential***

Drainage potential was assessed based on soil type and allocated one of the following categories based on the relief, soil type and vegetation present at the site:

- Rapid to well drained
- Moderately well drained
- Imperfectly drained
- Poor to very poorly drained.

### ***Vegetation description***

Vegetation was described to National Vegetation Information System (NVIS) Level 5 detail, in line with the *NT Guidelines and Field Methodology* (Brocklehurst et al. 2017). Vegetation cover and structural classification was estimated using the categories presented in Table 3-1 and Table 3-2, with the dominant flora species were recorded. Reference sites also included a record of all flora species present with the site at the time of survey. Each species was allocated a cover category as per Table 3-3 and average height range.

Check sites included descriptions aligned with *National Vegetation Information System (NVIS) Level 4* – which includes a structural description and record of dominant flora species.

**Table 3-1. Vegetation cover and structural classification (NVIS) adopted for this survey**

Canopy cover	Trees	Shrubs
<0.25%	Isolated trees	Isolated shrubs
0.25 – 20%	Open woodland	Sparse shrubs
20 – 50%	Woodland	Open shrubland
50 – 80%	Open forest	Shrubland
>80%	Forest	Closed shrubland

**Table 3-2. Height classifications (NVIS) used for vegetation descriptions**

Height (m)	Trees	Shrubs	Grass
>30	Tall	-	-
10 - 30	Mid	Tall	-
<10	Low	Mid	-
<3	-	Low	-
1 - 2	-	-	Tall
0.5 - 1	-	-	Mid
<0.5	-	-	Low

**Table 3-3. Summary of height classifications (NVIS) used for vegetation descriptions**

Species cover category:	
1	<5% cover with 1 to 5 individuals
2	<5% cover with 6 to 50 individuals
3	<5% cover with >50 individuals
4	5 to 9% cover
5	10 to 29% cover
6	30 to 69% cover
7	<70% cover

### ***Vegetation condition***

Vegetation condition was described at each reference site based on level of impacts from threatening processes such as weeds, introduced herbivores (Cattle, Horses and Rabbits) and fire. Drought affected vegetation was also noted as the region has experienced repeated below average rainfall over the past few years which has resulted in shrub and tree death – and also slower vegetation regeneration after fire events.

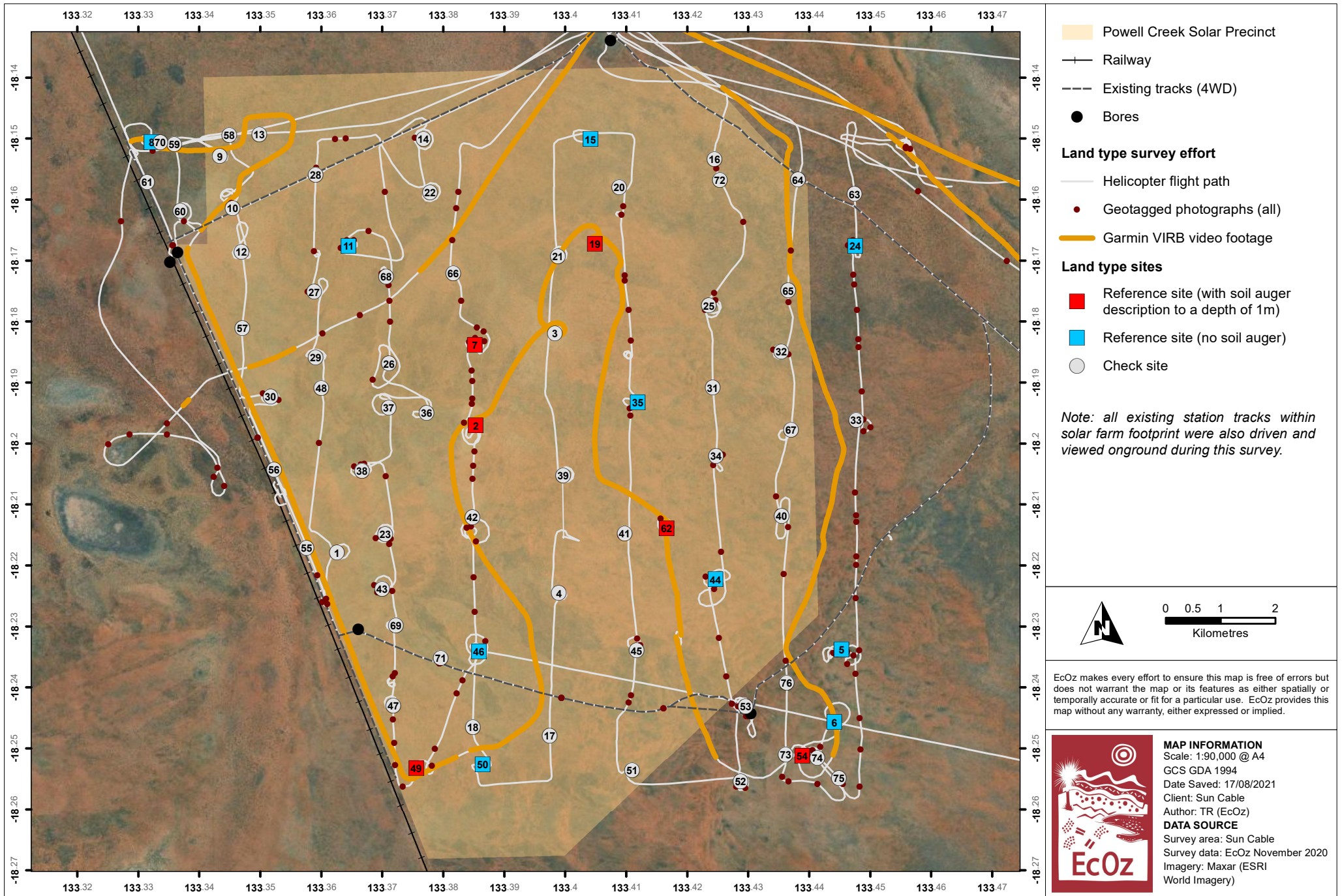
Vegetation was ranked as per below with justifications / reasons for the ranking provided in site descriptions.

- A. Excellent – no land management issues; vegetation is in good health.
- B. Good / Average – no significant land management issues; vegetation is mostly in good health but is recovering or regenerating from a weather event (i.e. fire, drought, flooding etc.)
- C. Poor – land management issues may be present; vegetation is generally in poor health – which could be as a result of drought or fire impacts.
- D. Very poor – land management issues are present that require remediation or alternative management practices; vegetation is in poor health.

## **3.2 Survey effort**

Approximately 350 km of aerial transect was undertaken within the Solar Precinct footprint, and a total of 76 sites were surveyed – including 16 reference sites (of which soil logs were undertaken at 6 sites) and 60 check sites. A total of six soil auger sites were conducted in a sub-set of the reference sites (they have suffix of 'S' on the site ID number). Survey effort is shown in Figure 3-1 and Table 3-4. Site details and coordinates are provided in Appendix A.

Georeferenced video footage was recorded using a Garmin VIRB (flight path of footage is shown in Figure 3-1), and data can be provided on request. This high-resolution footage can be viewed with in parallel with aerial imagery (see example layout in Figure 3-2) and is therefore very useful for confirming features and land type boundaries where site data is not available.



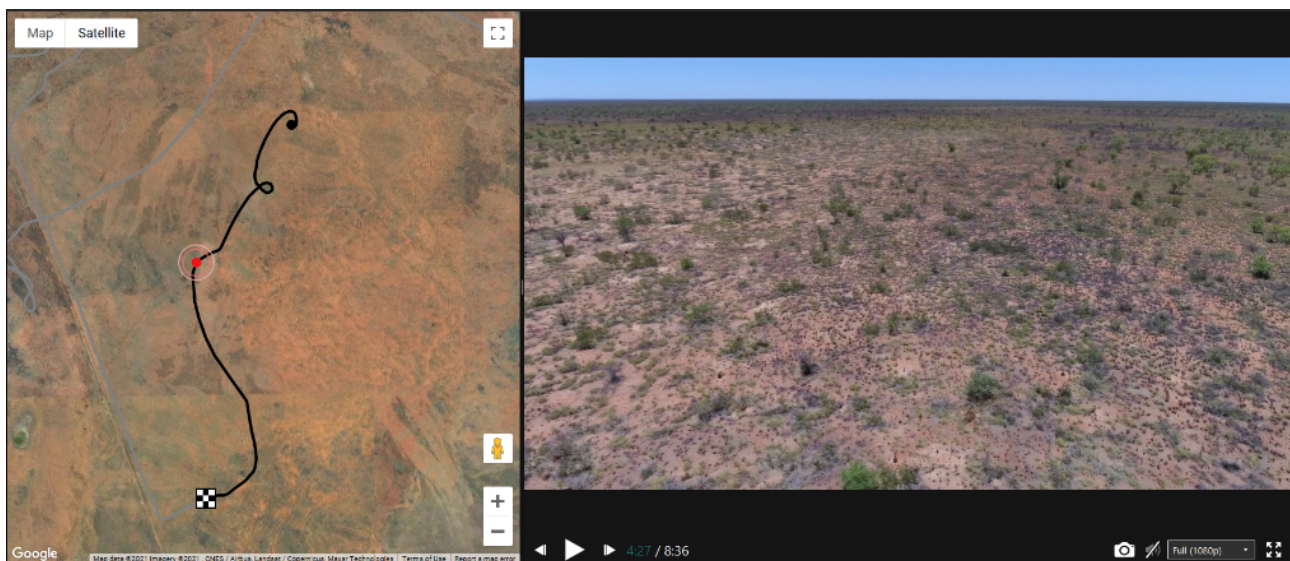
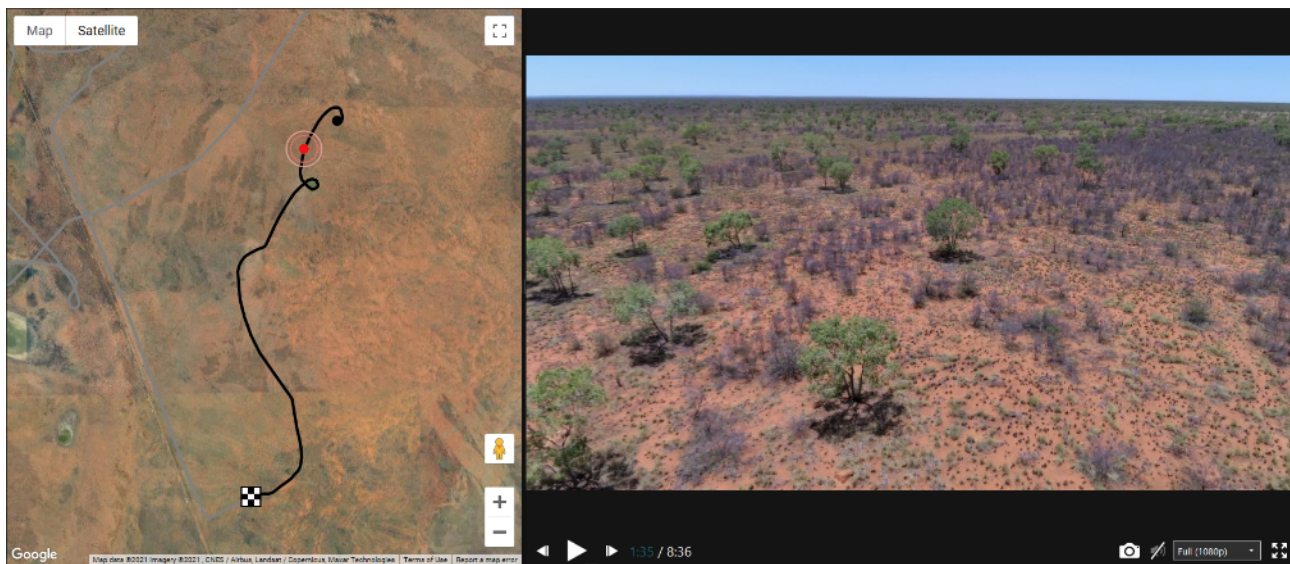
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**Figure 3-1. Map of land type survey effort within the Solar Precinct Footprint**

**Table 3-4. Summary of survey sites per land type**

Land type	Reference sites *	Check sites	Total
A	<b>8 sites</b> (sites 8, 15, 19-S, 24, 35, 44, 46, 62-S)	<b>31 sites</b> (sites 4, 9, 13, 14, 16, 17, 21, 22, 25, 26, 27, 31, 32, 33, 34, 36, 37, 39, 40, 41, 45, 51, 58, 63, 64, 65, 66, 67, 68, 70, 72)	39
B	<b>2 sites</b> (sites 49-S, 50)	<b>19 sites</b> (sites 1, 10, 12, 18, 28, 29, 30, 38, 43, 47, 48, 55, 56, 57, 59, 60, 61, 69, 71)	21
C	<b>1 site</b> (sites 54-S)	<b>5 sites</b> (sites 53, 73, 74, 75, 76)	6
D	<b>5 sites</b> (sites 2-S, 5, 6, 7-S, 11)	<b>5 sites</b> (sites 3, 20, 23, 42, 52)	10

\* Sites with a "S" suffix denote soil auger sites



Red dot shows location of imagery, black dot is start and gridded-square is end of video transect.

**Figure 3-2. Examples of Garmin VIRB footage within the solar precinct**

### 3.3 Land type descriptions

Four land types occur within the Solar Precinct footprint (summarised and mapped in Figure 3-3). Descriptions are provided in the following sub-sections and in Table 3-5 to Table 3-8 (including representative photographs). Site data are provided in Appendix A (general data) and Appendix C (reference sites); and a list of flora species recorded during the survey is provided in Appendix D.

#### 3.3.1 Land Type A – sandplain

Land type A is a flat to gently sloping shallow sandplain that supports a patchy shrubland of *Acacia spp.* (mainly Turpentine, *Acacia lysiphloia*) over Soft Spinifex (*Triodia pungens*) and emergent Bloodwood (*Corymbia opaca*) common throughout the unit. There are also occurrences of Desert Walnut (*Owenia reticulata*), Dogwood (*Acacia sericophylla*) and Cabbage Ghost-gum (*Corymbia flavescens*). Shrub layer vegetation is dominated by *Acacia lysiphloia* (observed as dominant species in most sites); however its variability in cover is likely a result of fire age. Areas that have not been burnt for 10+ years often support denser (higher cover) of Turpentine (*A. lysiphloia*) – of which most has died (senesced) as a result of recent dry conditions – and higher cover of *Triodia pungens*. Patches of heathy *A. lysiphloia* are uncommon within the footprint. Other commonly observed shrub species are *Petalostigma pubescens*, *Croton aridus*, *Brachychiton multicaulis* which typically have a scattered occurrence. Very little diversity of groundcover forbs and tussock grass were recorded – which is to be expected in dry conditions (as many of these species are annuals or short-lived perennials).

The soil surface is covered by a thin veneer of red sand assumed to be Aeolian deposits from adjacent desert dunefields and sandplains to the west. Sub-surface soils are sandy loam with a red-brown to grey-brown colour, and these loamy soils become exposed in some areas – but this is less common in this land type compared to other land types in the survey footprint. Soils are well drained (i.e. relatively permeable) and stormwater run-off would only be expected in prolonged heavy rainfall events.

#### 3.3.2 Land type B – loamy plain

Land type B predominantly occurs in the western part of the footprint. It comprises of a broad gently sloping plains (easterly aspect) with sandy loam soils that supports Silver Box (*Eucalyptus pruinosus*) and, to a lesser extent, Cabbage Ghost-gum (*Corymbia flavescens*) and Bauhinia (*Lysiphyllum cunninghamii*) over Soft Spinifex (*Triodia pungens*). In the northern section of this unit, *Eucalyptus pruinosus* becomes absent or sparse, and is replaced by *Lysiphyllum cunninghamii* and Dogwood (*Acacia sericophylla*), as well as a range of other transitional low tree and shrub species common in the region.

Similar to land type A, *Acacia lysiphloia* is also the dominant shrub and its patchy occurrence is likely associated with fire history (i.e. areas with dense shrubs have not been recently burnt). Other commonly observed shrub species are *Carissa spicatum*, *Melaleuca spp.* (stunted/small *M. nervosum* and *M. viridiflora*), *Petalostigma pubescens*, *Hakea arborescens*. Very little diversity of groundcover forbs and tussock grass were recorded – which is expected in dry conditions (as many of these species are annuals or short-lived perennials).

Soils are very similar to land type A; however land type B has a higher incidence of exposed loamy areas at the surface and are slightly heavier in nature than the ‘sandplain’ soils in land type A. Land type B does have numerous areas of thin Aeolian red sand on the surface; however, it is less common and dominant tree and shrub vegetation is different. There is very little difference in ground layer floristics – as both units are dominated by Soft Spinifex (*Triodia pungens*).

### 3.3.3 Land type C – alluvial flats

Land type C occurs in the south-eastern part of the footprint intersects lower alluvial flats associated with significant outflow events from westerly flowing drainages from the Ashburton Range (namely Hunter Creek and, to a lesser extent, Burke Creek). It is very flat and has low floristic diversity of perennial species. It supports sparse to scattered Bloodwood (*Corymbia opaca*) (mallee form from fire impacts), scattered *Melaleuca glomerata* shrubs over *Triodia pungens*. Soils are grey sandy loam, with surface mainly being exposed thin loamy crust likely as a result of water flow and settling prior to infiltration.

### 3.3.4 Land type D – shallow depressions

Land type D is localised shallow depressions that support species suited to seasonal / ephemeral inundation (i.e. *Melaleuca viridiflora*, *M. nervosum*, *Acacia sericophylla*, *Eulalia aurea*) however there is also a range of sandplain species also present. These depressions are scattered throughout the footprint and varying from less than a hectare to 46 ha. The largest depression equates to approximately 46 ha which is located in the central part of the footprint (site 2). Although these depressions are run-on drainage features, they are not considered to be wetlands as they have loamy rather than clayey soils, and inundation events are only expected to be episodic and short-lived.

Most of these depressions support a tussock grass dominated understory; however spinifex is present as a dominant or co-dominant species in some depression sites (often the smaller shallower depressions that have a more influence from surrounding loamy sandplains).

Soil logs (to a depth of 1m) did not detect clay soils within depressions located within land type A and B – however the loam soils were slightly heavier indicative of a higher level of inundation. Clay soil was only found in one very small depression situated within the alluvial flats (site 6) of land type C.

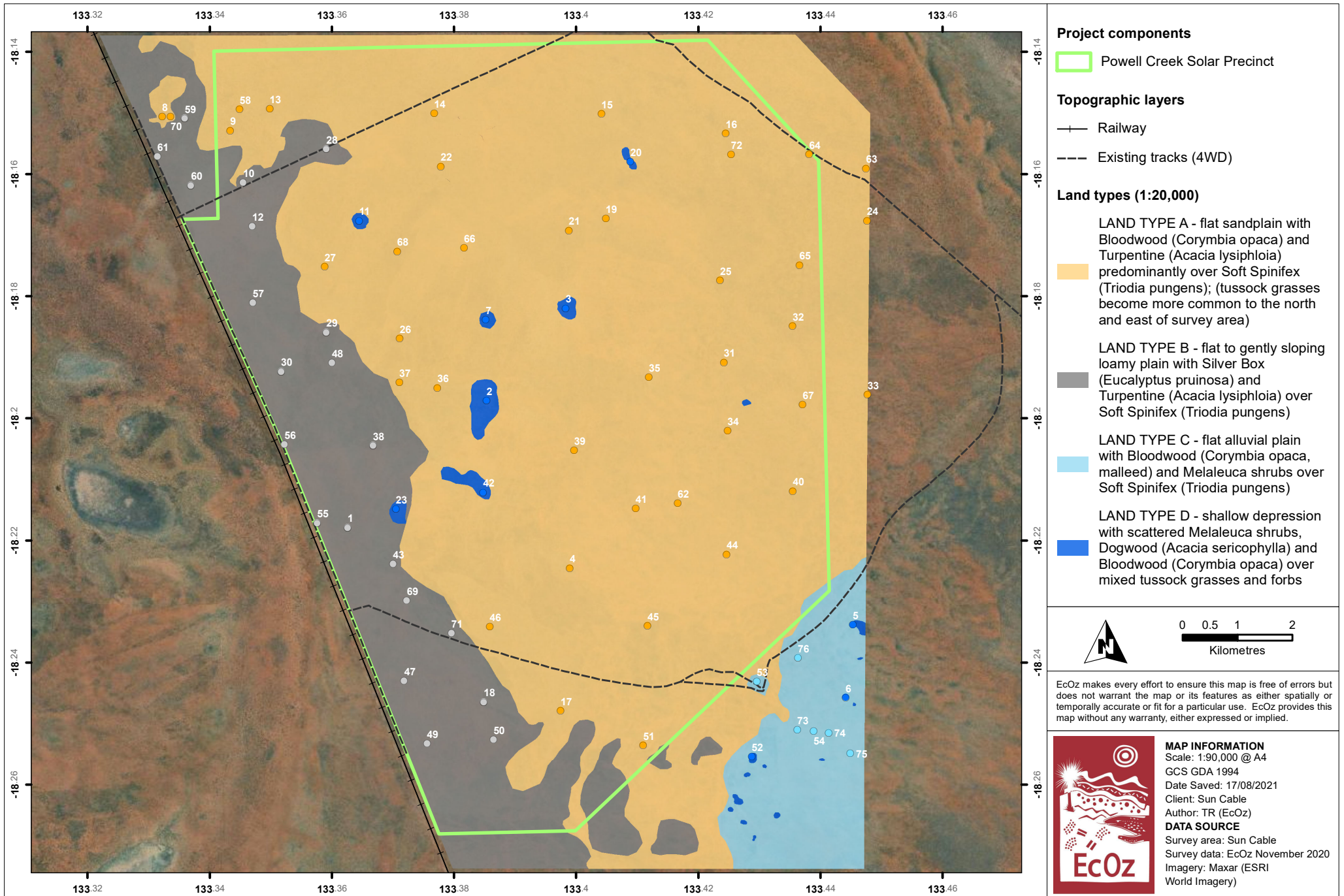
## 3.4 Vegetation condition

It is noted that drought conditions experienced between 2017 and 2019 has resulted in mortality of large areas of Acacia shrubs (mainly *Acacia lysiphloia*) that avoided recent fire events.

Pastoral impacts within the footprint are currently minor – with no grazing observed and only scarce occurrence of scats and tracks. It is apparent that this area is not currently grazed by high cattle numbers. The bores within the footprint have only been recently installed (in 2019).

No weeds or erosion issues (or other types of land degradation) were observed. The footprint has been burnt on a relatively high frequency – and there are numerous examples of trees such as Bloodwood (*Corymbia opaca*) that have been reduced to shrub-like mallee growth forms, rather than tall standing trees.




Fire has impacted vegetation condition within the footprint with imagery indicating that fires have occurred in 15 of the past 26 years (see Section 2.6 and Appendix A) – including several extensive burns. There are no patches of vegetation within the footprint that have avoided fire in the past 2 decades. Frequent fires in this type of vegetation often decrease floristic diversity, habitat condition and have consequences in regards to overall biodiversity value.



Path: C:\Users\tom.reilly\ECOZ\OneDrive - Ecoz\Documents\01\_EcoZ GIS Projects (TR) - new\EZ20220 (Tom) - SunCable Baseline Ecology\01 Project Files\LandTypes\_Results.mxd

**Figure 3-3. Map of land types within Solar Precinct footprint**

**Table 3-5. Description of Land Type A – Sandplain**

LAND TYPE A – SANDPLAIN WITH BLOODWOOD AND TURPENTINE OVER SOFT SPINIFEX	
<b>Landform:</b>	
Sandplain; flat to very gentle slopes (<1%); drainage is via sheet flow in an easterly to north-easterly direction; there are no drainage features present; run-off is expected to be low (and slow due to little relief) with the majority of rainfall rapidly infiltrating into sandy loam soils.	
<b>Soil:</b>	
Loamy sand; orange-brown to red-brown; no clay intersected during 1m auger at sites; Kandosols / Tenosols; thin sandy veneer on surface (aeolian deposits); some areas of greyish exposed loam; soil depth >1m; no surface gravel or rock; no outcrop present; erosion hazard is low; no salinity indicators present. Soil data described at sites 19 & 62.	
<b>Vegetation:</b>	
<u>NVIS Level 4</u>	Low Open Shrubland ( <i>Acacia lysiphloia</i> ) over Low Hummock Grassland ( <i>Triodia pungens</i> ) with Isolated emergent low trees ( <i>Corymbia opaca</i> ).
<u>Upper layer</u>	Isolated trees (average height 6m; emergents up to 10m). Dominant species is <i>Corymbia opaca</i> . Other species - <i>Corymbia flavescens</i> , <i>Acacia sericophylla</i> , <i>Owenia reticulata</i> , <i>Hakea chordophylla</i> .
<u>Mid layer</u>	Open to patchy shrubland (patchy coverage due to fire history); average height 1 – 2m; dominated by <i>Acacia lysiphloia</i> (mostly dead due to prolonged dry conditions). Other common species include <i>Petalostigma pubescens</i> , <i>Croton aridus</i> , <i>Brachychiton multicaulis</i> .
<u>Ground layer</u>	Hummock grassland dominated by <i>Triodia pungens</i> (variable cover and height dictated by fire history). Low cover of forbs/grasses (many species are expected to be annual or short-lived and as such are currently present in low numbers due to dry conditions).
<u>Comment</u>	Floristics are relatively consistent across the mapped area; however, there is notable structural variation in response to fire history.
<b>Representative photographs:</b>	
	
Site 46	Site 62
	
Site 66	

**Table 3-6. Description of Land type B – Loamy Plains**













LAND TYPE B – LOAMY PLAIN WITH SILVER BOX AND TURPENTINE OVER SOFT SPINIFEX	
<b>Landform:</b>	Flat plain; gentle slope to the east (<1%); drainage is via sheet flow; no drainage features present; run-off is expected to be low and slow (due to little relief) with the majority of rainfall infiltrating into loamy soils.
<b>Soil:</b>	Loam to sandy loam; grey-brown to red brown; Kandosols / Tenosols; no clay intersected during 1m auger at site 62; loose sandy veneer on surface; numerous areas of greyish exposed loam; soil depth >1m; no surface gravel or rock; no outcrop present; erosion hazard is low; no salinity indicators present. Soil horizon data described at site 49.
<b>Vegetation:</b>	<p><b>NVIS Level 4</b> Mid Open Shrubland / Low Trees (<i>Eucalyptus pruinosa</i>) over Low Sparse (or patchy) Shrubs (<i>Acacia lysiphloia</i> and <i>Eucalyptus pruinosa</i>) over Low Hummock Grassland (<i>Triodia pungens</i>), with isolated to sparse low trees (<i>Corymbia opaca</i>, <i>C. flavescens</i>, <i>Lysiphyllum cunninghamii</i>, <i>Acacia sericophylla</i>).</p> <p><b>Upper layer</b> Isolated to sparse low trees (height range 4 to 6m). Dominant species is <i>Eucalyptus pruinosa</i>. Other common species (maybe emergents up to 10m high) – <i>Corymbia opaca</i>, <i>Corymbia flavescens</i>, <i>Lysiphyllum cunninghamii</i>, <i>Acacia sericophylla</i>.</p> <p><b>Mid layer</b> Patchy shrubland (associated with fire scars) (height 1 – 2 m) dominated by <i>Acacia lysiphloia</i> (mostly dead due to prolonged dry conditions) and mallee'd <i>Eucalyptus pruinosa</i> (up to 3 m). Other common species - <i>Carissa spicatum</i>, <i>Melaleuca spp.</i>, <i>Petalostigma pubescens</i>, <i>Hakea arborescens</i>.</p> <p><b>Ground layer</b> Hummock grassland dominated by <i>Triodia pungens</i>. Low cover of forbs/grasses.</p> <p><b>Comment</b> There are some patches of open <i>Melaleuca spp.</i> shrubs in low lying areas that could not be accurately mapping at scale; and also areas of sandplain with vegetation type being a mix of land type A and B. Fire history has resulted in structural variation.</p>
<b>Representative photographs:</b>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;">  <p style="text-align: center;">Site 71</p> </div> <div style="width: 50%;">  <p style="text-align: center;">Site 50</p> </div> <div style="width: 50%;">  <p style="text-align: center;">Site 69</p> </div> <div style="width: 50%;">  <p style="text-align: center;">Site 28</p> </div> </div>

Table 3-7. Description of Land type C – Alluvial Flats

LAND TYPE C – ALLUVIAL FLATS WITH BLOODWOOD AND MELALEUCA SHRUBS OVER SOFT SPINIFEX	
<b>Landform:</b>	
Flat plain; residual alluvial flats associated with significant (or potentially historic) outflow events from westerly flowing drainages from the Ashburton Range (namely Hunter Creek and, to a lesser extent, Burke Creek); drainage is via sheet flow; no drainage features present.	
<b>Soil:</b>	
Sandy loam; grey to grey-brown, some area with redder tone associated with Aeolian (wind-blown) sands from adjacent sandplains; Kandosols / Tenosols some areas of minor crusting and cryptogam; numerous areas of greyish exposed loam; run-off is expected to be low and slow (due to little relief) with the majority of rainfall infiltrating into loamy soils. Water potentially takes longer to infiltrate in this land type; soil depth >1m; no surface gravel or rock; no outcrop present; erosion hazard is low; no salinity indicators present. Soil horizon data described at site 54.	
<b>Vegetation:</b>	
<u>NVIS Level 4</u>	Low to Mid Sparse Shrubs ( <i>Corymbia opaca</i> and <i>Melaleuca glomerata</i> ) over Low hummock grassland ( <i>Triodia pungens</i> ), with Isolated (very occasional to rare) Low Trees ( <i>Corymbia opaca</i> ).
<u>Upper layer</u>	Isolated (very rare) emergent low trees of <i>Corymbia opaca</i> (up to 5m). <i>Corymbia opaca</i> present within this land type have all been reduced to shrubs due to fire history.
<u>Mid layer</u>	Sparse Low to Mid shrubs – <i>Corymbia opaca</i> (mallee form due to high fire frequency) and <i>Melaleuca glomerata</i> ; height range 1 – 2 m. Other low shrubs with a patchy occurrence include – <i>M. viridiflora</i> , <i>M. nervosum</i> and <i>Acacia lysiphloia</i> .
<u>Ground layer</u>	Low hummock grassland (<1m height) dominated by <i>Triodia pungens</i> . Low cover of forbs/grasses. <i>Cassutha filiformis</i> (a vine creeper) relatively common in area.
<u>Comment</u>	There is very little floristic variation in this land type; relatively homogenous – with the exception of transitional edges of the adjacent sandplain (land type A). A few shallow depressions (land type D).
<b>Representative photographs:</b>	
	
Site 54	Site 74
	
Site 73	Site 75

**Table 3-8. Description of Land Type D – Depressions**

LAND TYPE D – LOCALISED DEPRESSION WITH SCATTERED MELALEUCA SPP. (SHRUBS), DOGWOOD, BLOODWOOD OVER MIXED TUSSOCK GRASSES AND FORBS	
<b>Landform:</b>	
Shallow depression (localised); flat (<1%); minor run-on areas that become inundated for short periods of time following rainfall; drainage entering depressions is via sheet flow from surrounding plains (i.e. no drainage features).	
<b>Soil:</b>	
Sandy loam; brown to grey-brown; Tenosols, Dermosols, Kandosols; seasonally inundated, but is not expected to hold water for long period of time due to sandy loam soils having a moderate to high infiltration potential; soil auguring only found clay soils at one depression (site 6); crusting and cryptogam are present; some large cracks present; termite mounds scattered (<1m); numerous areas of greyish exposed loam; soil depth >1m; no surface gravel or rock; no outcrop present; erosion hazard is low; no salinity indicators present. Soil horizon data described at site 2 & 7.	
<b>Vegetation:</b>	
<u>NVIS Level 4</u>	Low Open Woodland ( <i>Corymbia opaca</i> , <i>Bauhinia cunninghamii</i> , <i>Acacia sericophylla</i> ) and Low Open Shrubland ( <i>Melaleuca viridiflora</i> , <i>M. nervosum</i> , <i>Hakea arborescens</i> , <i>Acacia lysiphloia</i> ) over Low Tussock Grassland (mixed species), and occasionally Hummock Grassland ( <i>Triodia pungens</i> ).
<u>Upper layer</u>	Open Woodland; average height 5m; emergents occasionally up to 10m. Dominant species include <i>Corymbia opaca</i> , <i>Bauhinia cunninghamii</i> , <i>Acacia sericophylla</i> .
<u>Mid layer</u>	Sparse Shrubs to Open Shrubland; height range 1 – 3m. Dominant species <i>Melaleuca viridiflora</i> and/or <i>M. nervosum</i> ; . Other common species (occasionally dominant or co-dominant) - <i>Hakea arborescens</i> , <i>Acacia lysiphloia</i> , <i>Ehretia saligna</i> , <i>Atalaya hemiglauc</i> , <i>Carissa spicatum</i> .
<u>Ground layer</u>	Tussock grasses and forbs. <i>Chrysopogon fallax</i> , <i>Eulalia aurea</i> , <i>Aristida holathera</i> , <i>A. hygrometrica</i> , <i>Cleome viscosa</i> , <i>Bonamia media</i> , <i>Fimbristylis dichotoma</i> .
<u>Comment</u>	There is a distinct absence (or scarcity) of spinifex ( <i>Triodia pungens</i> ) in this land type. There is a notable level of floristic variation between depressions in terms of dominant tree and shrub species.
<b>Representative photographs:</b>	
	
Site 52	Site 2
	
Site 11	Site 6

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