GOONDICUM STATION
ENVIRONMENTAL ACCOUNT

ACCOUNT SUMMARY & INFORMATION STATEMENT

GOONDICUM®
PASTORAL CO.

2021-22

CONTENTS

ROBERT AND NADIA CAMPBELL, GOONDICUM STATION, QLD

"By working with Accounting for Nature (AfN) to undertake this assessment of Goondicum, we now, for the first time in our history, have a credible framework to assess our biodiversity and ecosystems. Being able to measure and monitor those natural capital assets, we are able to continue to manage them to reduce our footprint, enhance biodiversity and increase the overall value.

We have found that the AfN Framework is very practical and because it is certifiable it helps us demonstrate exactly how we are improving our environment whilst operating a productive and profitable grass-fed beef enterprise.

The better-quality native pasture we can produce means healthier and better-quality beef and a far better environment for our native fauna and flora – of which we have in abundance at Goondicum. It helps us further our commitment to reducing our environmental footprint; and helps us support and encourage healthy native pasture, healthy soils, healthy vegetation, waterways biodiversity and ecosystems – our natural capital assets.

As landowners and graziers, we have found that the AfN Framework provides a great way to better understand the natural capital assets in the paddock. By getting back to grass-roots practical assessments, landowners can better understand the condition of their land, what is living alongside them and what impacts their management has on their land. It also means landowners and land managers can better manage those natural capital assets to improve their bottom-line, increase biodiversity values and play their part in improving the environment for Australian wildlife and future generations."

EXECUTIVE SUMMARY

This Environmental Account documents the baseline year of data collection and reporting at Goondicum Station – a regenerative grazing enterprise, located near Monto in central Queensland, and owned by Nadia and Rob Campbell. The Account has been prepared in accordance with the Accounting for Nature Framework and Methods and includes three environmental assets – Native Vegetation, Native Fauna and Soils. Data were collected and the account has been prepared by Afn Accredited Experts with support and assistance from Goondicum Station owners and staff. This case study has received financial support from Burnett Mary Regional Group, as part of a regional trial of the Afn Framework across the Burnett Mary NRM Region.

Healthy vegetation surrounds a freshwater spring at Goondicum Station, which was impacted by drought at the time of survey.

The first year of environmental data collection at Goondicum Station has documented an ecosystem in excellent condition despite drought conditions at the time of survey. Native vegetation, soils and fauna were assessed by ecologists and Goondicum staff using Afn Accredited Methods between September 2021 and April 2022. Long-term monitoring sites were established at 70 locations, designed to capture the diversity of vegetation communities, soils and fauna habitat types found across the property.

» An Econd® of 71.2 was recorded for native vegetation. An Econd® of at least 75 was recorded for all four native vegetation assessment units, with cleared areas accounting for the reduced overall score.

» An Econd® of 82.9 was recorded for terrestrial mammals, indicating that this element of the fauna at Goondicum Station is mostly intact. This is an extremely encouraging finding, given the significant declines experienced by wildlife populations across most of Australia since European colonisation.

» An Econd® of 95.5 and a Pcond of 80.0 were recorded for soils, indicating that soils are in excellent productive and ecological condition.

The high Econd® and Pcond values recorded at Goondicum Station in this baseline year demonstrate that a sustainable grazing enterprise can operate alongside a healthy ecosystem that supports populations of native species. In coming years, the Campbells aim to include additional environmental assets in the Goondicum Station Account, including birds and freshwater ecosystems.

ENVIRONMENTAL
ACCOUNT INFORMATION

OVERVIEW

Goondicum is an iconic 7000-hectare agricultural property in the headwaters of the Burnett River catchment. At its centre is a volcanic crater, which has created a unique environment, with highly productive soils that support a beef cattle enterprise alongside thriving native ecosystems. Goondicum is owned by Rob and Nadia Campbell and has been under the stewardship of the Campbell family since the 1860s. Their approach to sustainable land management is founded on the belief that co-existence of grazing, where the natural environmental and wildlife is preserved as much as possible, makes both environmental and economic sense. To document the outcomes of that land management approach, Goondicum Pastoral Co. is working with the Burnett Mary Regional Group and Accounting for Nature to develop a holistic Environmental Account, covering the native vegetation, fauna, freshwater, and soils of this unique property.

PROPONENT	Nadia and Rob Campbell
AUTHORS & QUALIFICATIONS/EXPERIENCE	Matt Taylor - Ecologist, Afn Accredited Expert (Category 1 Fauna and Native Vegetation / Category 2)
CERTIFICATION TIER	Tier 2 – Self Verified
RELATED ENVIRONMENTAL ACCOUNTS	*GreenCollar – Beef and Conservation for the Future 2022 (AFN-PROJECT-04)* An Environmental Account has been developed for a 977 hectares carbon project where the owners are undertaking restoration of a previously cleared areas of Goondicum Station.
REPORT CITATION	Goondicum Station Environmental Account 2021-22
ACKNOWLEDGEMENTS	Goondicum Station would like to acknowledge the generous support of Burnett Mary Regional Group, who co-funded this project. For a full list of our partners please see the Acknowledgement section at the end of this Account.

Figure 1. Location of Goondicum Station

ACCOUNT DETAILS

PURPOSE	The purpose of this account is to document the condition of environmental assets, to inform sustainable management of the property, and to communicate positive environmental outcomes to other graziers and the community.
SCOPE	This is a first-year environmental account, presenting a snapshot assessment of environmental condition for FY 2021-22. The intention is to continue to collect environmental data and subsequent years will document change in environmental condition over time.
SCALE	Property
LOCATION	Monto, Queensland
BIOREGION	Southeast Queensland / Brigalow Belt South
TOTAL AREA (HA)	6789 ha
SITE HISTORY	The Campbell family have grazed the property for five generations. An ilmenite mine operated on a 500 ha lease between 2007 and 2019.
CURRENT LAND-USES	– Grazing – 6645 ha – Mine restoration – 144 ha

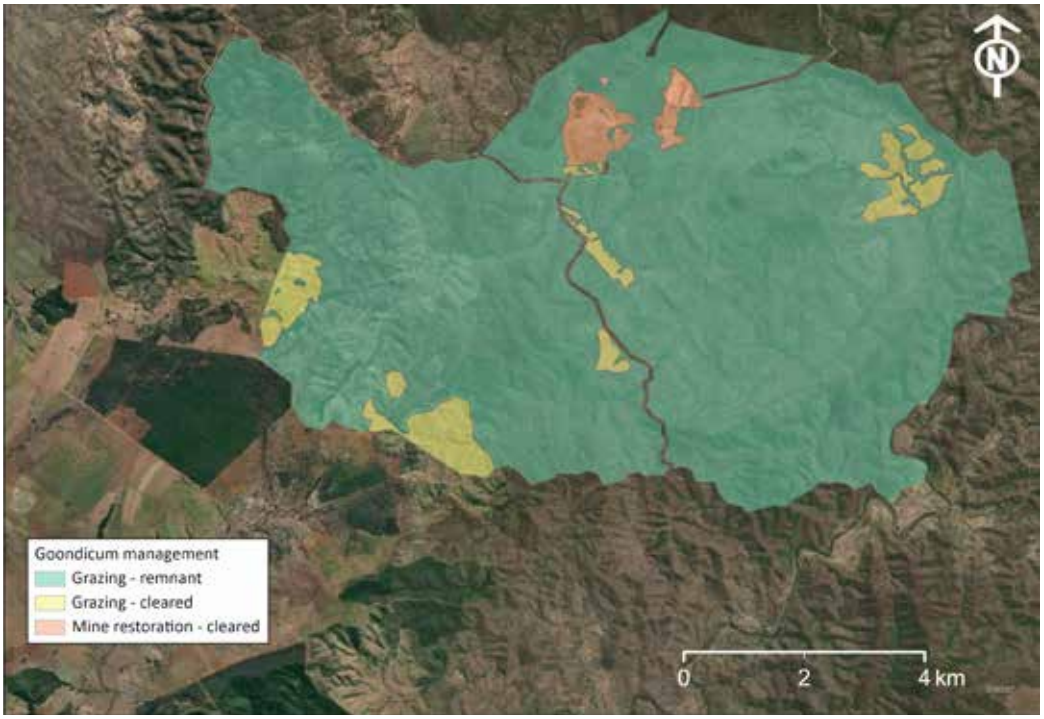

Figure 2: Goondicum Station land use map

ENVIRONMENTAL
ACCOUNT SUMMARY

ENVIRONMENTAL ACCOUNT SUMMARY

ASSET	ASSET AREA	BASELINE ECOND® AND PCOND 2021-22	CONFIDENCE LEVEL AND METHOD
NATIVE VEGETATION	6789 ha	ECOND® 71.2	LEVEL 3 AFN-METHOD-NV-06
NATIVE FAUNA	6789 ha	ECOND® 82.9	LEVEL 3 AFN-METHOD-F-01
SOIL	6789 ha	ECOND® 95.5	LEVEL 3 AFN-METHOD-S-02
SOIL	6789 ha	PCOND 80.0	LEVEL 3 AFN-METHOD-S-02

Econd®: is an index that describes the environmental condition of an asset on a scale between 0 (degraded) and 100 (undegraded/reference state). Econd® scores are constructed by aggregating Indicator Condition Scores as per the formula described in the applicable Method.

Pcond: also called the Production Condition index, describes the condition of a biophysical asset relating to its potential to produce a defined set of goods or services.

ENVIRONMENTAL ASSET TABLES

Table 1: Native vegetation summary

ASSET	SUB-ASSET	ASSESSMENT UNIT	AREA (HA)	ASSESSMENT UNIT ECOND®	SUB-ASSET ECOND®	ECOND®
Vegetation	Eucalypt dry woodlands on inland depositional plains	Remnant	824	82.7	77.0	71.2
		Cleared*	61	0		
	Eucalypt open forests to woodlands on floodplains	Remnant	244	78.2	73.9	
		Cleared*	14	0		
	Eucalypt woodlands to open forests (mainly Eastern)	Remnant	5143	75.7	72.3	
		Cleared*	248	0		
	Rainforests and scrubs	Remnant	79	82.5	25.7	
		Cleared*	175	0		

Table 2: Fauna summary

ASSET	SUB-ASSET	ASSESSMENT UNIT	AREA (HA)	ASSESSMENT UNIT ECOND®	ASSET ECOND®
Fauna	Terrestrial mammals	Whole of property	6789	82.9	82.9

Table 3: Soil summary

ASSET	SUB-ASSET	ASSESSMENT UNIT	AREA (HA)	AU PCOND	AU ECOND®	SUB-ASSET PCOND	SUB-ASSET ECOND®	ASSET PCOND	ASSET ECOND®
Soils	Chromosol	Grazing	564	80	76	78.2	74.3	80.0	95.5
	Chromosol	Mine restoration*	13	0	0				
	Dermosol	Grazing	4141	80	100	77.7	97.1		
	Dermosol	Mine restoration*	122	0	0				
	Kandosol	Grazing	181	100	92	100	92		
	Sodosol	Grazing	57	80	72	80	72		
	Tenosol	Grazing	1708	84	100	84	100		

NOTE - Cleared areas and the mining restoration zone were not assessed and assigned a score of 0.

ASSET 1:
NATIVE VEGETATION

DESCRIPTION

The vegetation at Goondicum Station is almost entirely native (92.5%). The predominant vegetation types are grassy woodlands and open forests, which are composed of numerous regional ecosystems, including several which are listed as threatened under Queensland legislation. Remnant pockets of rainforest scrub occur in steep country such as gorges along the Burnett River. These areas are diverse and of significant conservation value. The property is grazed by a herd of Brangus cattle, which are managed in large, fenced grazing runs. Cool seasonal burning is used as a regular land management tool to keep the vegetation open and productive.

METHOD

The native vegetation account was developed in accordance with the Accounting for Nature Accredited Method:

» *ACCOUNTING FOR NATURE AND LANDCARE FARMING NATIVE VEGETATION METHOD - AFN-METHOD-NV-06*

» AFN-METHOD-NV-06 is a Level 3 Method, which indicates a confidence level of +/- 20%

DATA SOURCES

Data sources used during the planning, data collection and analysis phases of account preparation are listed in Table 4.

Table 4: Native vegetation data sources

DATA NAME	SOURCE	USE
Queensland Regional Ecosystem Pre-Clear Vegetation Mapping	Queensland Government 2021	Identification of Sub-Assets
Queensland BioCtondition Benchmarks	Queensland Government 2021	Determination of reference benchmarks
Regional Ecosystem Technical Descriptions – Brigalow Belt South	Queensland Government 2022	Determination of reference benchmarks for 11.11.18
ESRI World Imagery	ESRI 2021	Mapping of native vegetation extent

SUB-ASSETS

Prior to stratifying the accounting area, native vegetation sub-assets were identified using the Queensland Government Pre-Clear Regional Ecosystem GIS Dataset (Table 4), clipped to the property boundary using the Clip geoprocessing tool in ArcGIS Pro. This dataset provides a state-wide best estimate of pre-1750 extent of Broad Vegetation Groups (BVG), mapped at a scale of 1:5M. Four BVGs were identified as occurring at Goondicum Station. Ground truthing revealed each of these communities as still present on the property. A description of the BVG sub-assets and the regional ecosystems they comprise is provided in Table 5. The distribution of those sub-assets at Goondicum Station is shown in the map below (Figure 3).

Table 5: Native Vegetation sub-assets within the accounting area

SUB-ASSET	AREA	DESCRIPTION	NOTES
Rainforests and scrubs	254 ha	Rainforest comprising regional ecosystems 11.5.15 and 11.11.18	Regional ecosystem mapping was confirmed during the field survey
Eucalypt dry woodlands on inland depositional plains	885 ha	Eucalypt woodlands comprising regional ecosystems 12.12.8 and 12.12.12	
Eucalypt open forests to woodlands on floodplains	258 ha	Open forest and woodlands dominated by eucalypts comprising regional ecosystems 12.3.3 and 12.3.7	
Eucalypt woodlands to open forests (mainly Eastern)	5391 ha	Eucalypt forests and woodlands comprising regional ecosystems 11.3.26, 11.7.6, 12.11.6 and 12.12.7	

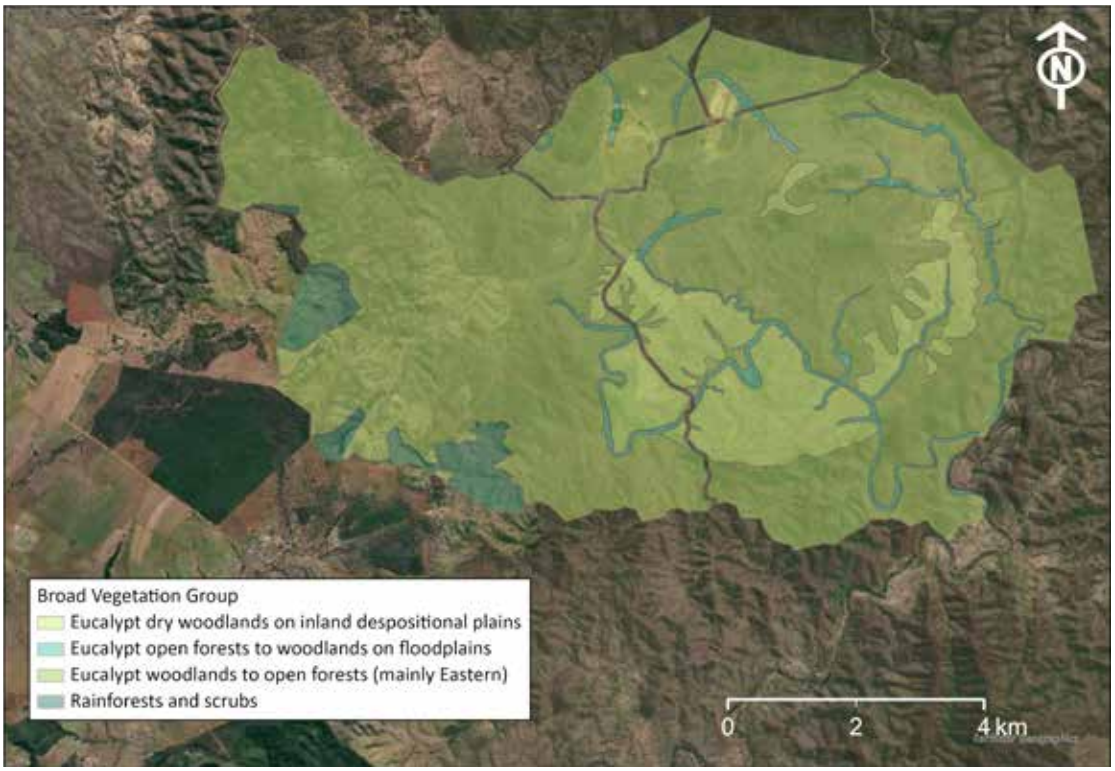

Figure 3: Native vegetation sub-assets within the accounting area. (Source: QLD Government 2021)

STRATIFICATION – ASSESSMENT UNITS

The accounting area was stratified into assessment units by overlaying the land management GIS layer for Goondicum Station (Figure 2), with the sub-asset layer (Figure 3), using the Intersect geoprocessing tool in ArcGIS Pro. This resulted in eight assessment units, which are described in Table 6 and displayed as a map in Figure 4.

Table 6: Native Vegetation assessment units for Goondicum Station

ASSESSMENT UNIT	AREA (HA)
Rainforests and scrubs - remnant	79
Rainforests and scrubs - cleared	175
Eucalypt dry woodlands on inland depositional plains - remnant	824
Eucalypt dry woodlands on inland depositional plains - cleared	61
Eucalypt open forests to woodlands on floodplains - remnant	244
Eucalypt open forests to woodlands on floodplains - cleared	14
Eucalypt woodlands to open forests (mainly Eastern) - remnant	5143
Eucalypt woodlands to open forests (mainly Eastern) - cleared	248
TOTAL	**6789**

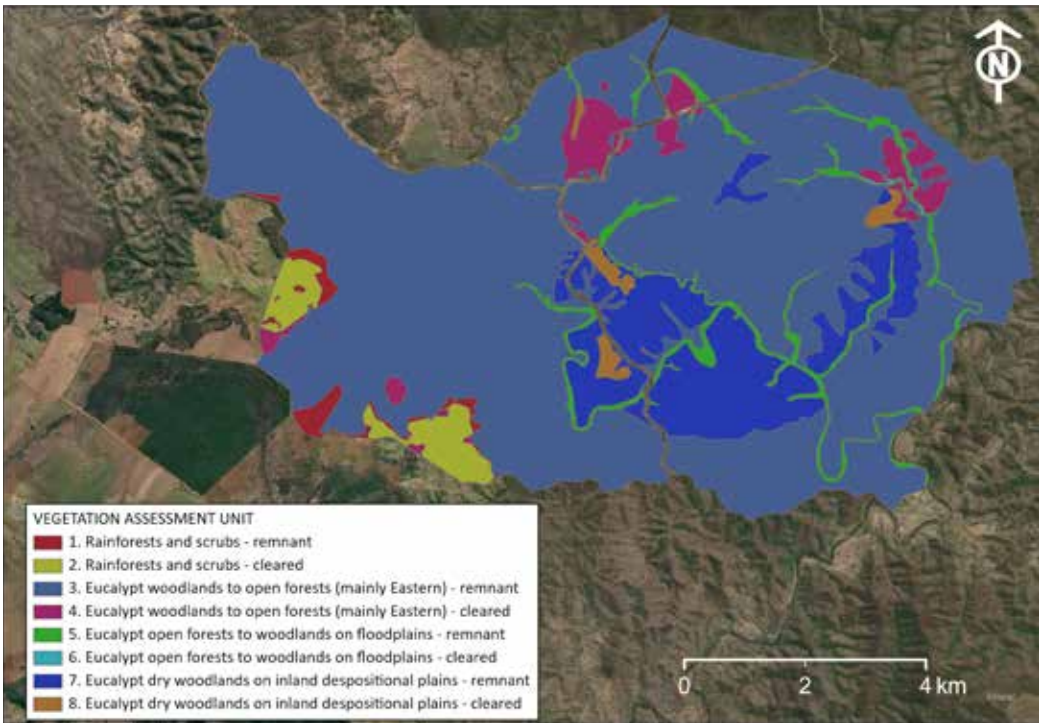

Figure 4: Native Vegetation assessment units for Goondicum Station

SAMPLING

Sample sites were selected in accordance with the AfN Method. Account specific sampling information is provided in Table 7. Data were collected through field surveys conducted in September 2021, from 40 permanent sample sites spread across the eight assessment units (Table 8). Cleared areas were not sampled and were assigned a score of 0.

Table 7. Overview of sample site selection

SITE SELECTION	The monitoring sites were established in 2021. Sites were selected as representative of the vegetation communities present across the property, and generally within 200 m of an access track.
TIMING	To reduce the influence of natural variability across seasons, sampling is undertaken consistently during the month of September (spring). The sampling in 2021 was undertaken between 27-30 September and the weather during this period was mostly dry, with rain on the final day of the survey.

Table 8: Native Vegetation assessment units for Goondicum Station

ASSESSMENT UNIT	AREA (HA)	SAMPLES (N)
Rainforests and scrubs - remnant	79	8
Rainforests and scrubs - cleared	175	0
Eucalypt dry woodlands on inland depositional plains - remnant	824	10
Eucalypt dry woodlands on inland depositional plains - cleared	61	0
Eucalypt open forests to woodlands on floodplains - remnant	244	10
Eucalypt open forests to woodlands on floodplains - cleared	14	0
Eucalypt woodlands to open forests (mainly Eastern) - remnant	5143	12
Eucalypt woodlands to open forests (mainly Eastern) - cleared	248	0
Total	**6789**	**40**

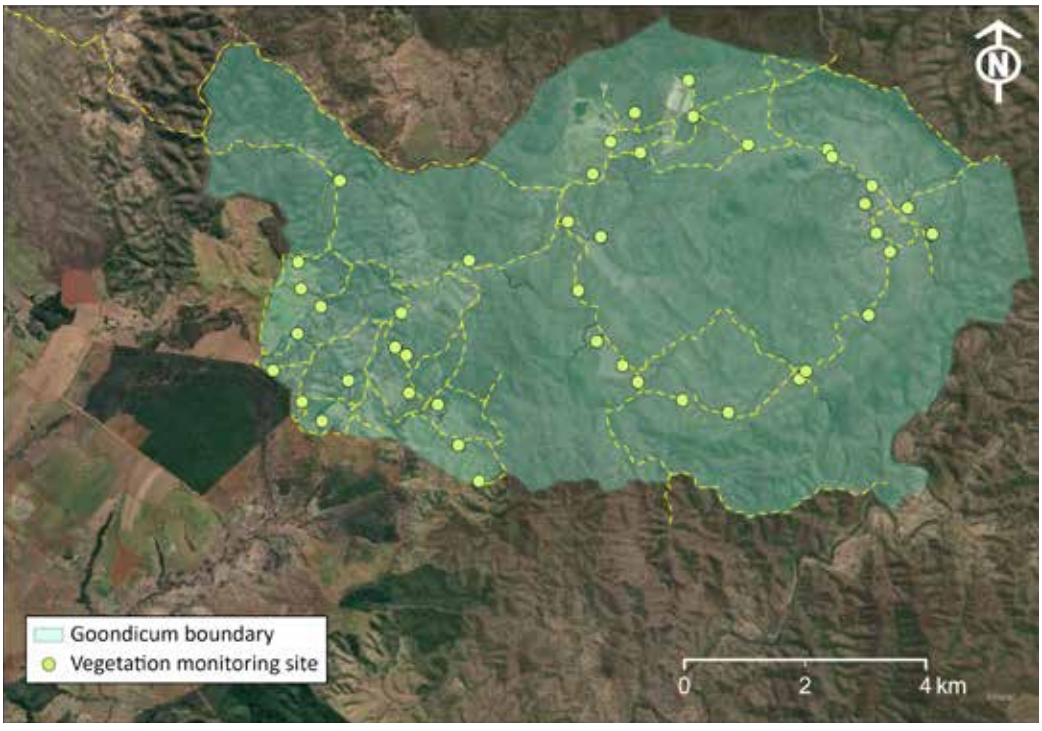

Figure 5: Native vegetation monitoring sites

INDICATORS AND REFERENCE BENCHMARKS

Indicators for native vegetation extent, configuration and composition are outlined in the AfN Method. Reference benchmarks were determined as per the instructions of the Method. BioCondition Benchmarks were available for nine of the ten Regional Ecosystems (RE) mapped at Goondicum. For RE 11.11.18, benchmarks were obtained using expert interpretation of the Regional Ecosystem Technical Description. For RE 12.12.8, the benchmarks for RE 11.12.2 was used, as dominant species and composition are similar and RE 11.12.2 is listed as occurring within the mapped extent RE 12.12.8. Although these communities are in different bioregions, they actually represent the same vegetation communities. A description of indicators and reference benchmark sources is provided in Table. 9.

Table 9: Native Vegetation Indicator and Reference Benchmark Summary

INDICATOR CLASS	INDICATOR	REFERENCE BENCHMARK
Extent*	Extent (%)	Pre-clear extent of vegetation within the accounting area (assumed to be 100%).
Configuration*	Context (%)	Pre-clear extent of native vegetation within 1 km of each sample site (assumed to be 100%).
Composition**	Non-native plant cover (BB Score)	Reference condition values for composition indicators are derived from Queensland's BioCondition assessment framework.
	Organic litter ground cover (%)	
	Native perennial grass cover (%)	
	Native canopy height (if present)	
	Native sub-canopy height (if present)	
	Native canopy cover (%)	
	Native sub-canopy cover (%)	
	Native shrub cover (%)	

*Indicator assessed using GIS geoprocessing tools

**Indicators assessed in the field using AfN Method field procedures

DATA COLLECTION

Data were collected and analysed in accordance with the AfN Method. Field data collection of composition data was undertaken by plant ecologists, with support from Goondicum staff in September 2021. The accuracy of Regional Ecosystem mapping was verified during the field survey. Vegetation mapping was updated where discrepancies between mapping and site conditions were identified. Monitoring sites were relocated based on field-verified mapping where required. A description of the field data procedures, GIS analyses and an evaluation of the resultant quality of data is provided in Table 10.

Table 10: Data collection, analysis, and quality control processes

FIELD DATA	Field data on vegetation composition were collected in accordance with the AfN Method. Refer to the method for detailed descriptions of the field procedures. The survey was undertaken by the landholder, vegetation scientists and volunteers , under the supervision of Matt Taylor (Afn Accredited Expert – Native Vegetation). The survey was undertaken in September 2021, following an extended period of drought. It is likely that the vegetation condition had been impacted by the dry conditions to some extent. The large scale of the property and limited access for vehicles, constrained the sampling to areas accessible by road. Star pickets were installed at each site to enable repeat sampling in future years. A field app was developed using the Fulcrum platform, to facilitate data collection.
GIS ANALYSES	Satellite imagery (ESRI World Imagery 2021) was used to visually assess and map native vegetation extent, then verified by field assessment. ArcGIS Pro GIS software was used for all spatial analyses. The extent in hectares of each sub-asset was calculated using the Calculate Geometry tool. Configuration (percentage of native vegetation within 1km of each monitoring site) was calculated using the *Buffer* and *Clip* tools.
ASSESSMENT OF DATA QUALITY	The data quality is high, with source data derived from high precision remote sensing satellites. The analyses are standard GIS geoprocessing functions that are performed automatically by GIS software with a high degree of accuracy. Data quality is high – data collection was overseen by experienced vegetation scientists, according to the AfN protocols and using a field app to eliminate transcription errors.

ICS AND ECOND® CALCULATION

Data tables showing summary calculations for Native Vegetation Assets are provided in Table 11.

ICS Calculation

Data were compiled and ICS were calculated in Microsoft Excel, in accordance with the instructions contained within the AfN Method. Refer to the Method for detailed description of the calculation procedures. Data tables and detailed workings have been provided to AfN for review and quality assurance.

Econd® Calculation

The Econd® calculations were performed in Microsoft Excel, in accordance with the instructions contained within the AfN Method. Refer to the Method for detailed description of the calculation procedures. Data tables and detailed workings have been provided to AfN for review and quality assurance.

LIMITATIONS

Stratification

The scale of Goondicum station required native vegetation to be stratified by Broad Vegetation Group (scale 1:5M), rather than Regional Ecosystem, as the sampling requirements required to assess vegetation at that scale, would have been beyond the available resources.

Drought conditions

Climatic conditions strongly influence vegetation condition. The data were collected at the end of a significant drought and condition scores are likely to be lower than they would be if collected in an average year.

Sampling

The rugged terrain of Goondicum Station makes access to remote parts of the property challenging. Monitoring sites have therefore been located in proximity to roads and tracks. These areas may be more prone to disturbance from farm activities and grazing than remote areas, which may skew the results towards poorer conditions scores than would be achieved if remote sites were to be measured.

Table 11: Native Vegetation Asset Table

VEGETATION GROUP	ASSESSMENT UNIT	INDICATOR		REFERENCE BENCHMARK	SITE MEASURE	ICS
Rainforests and scrubs (RE 11.11.18, 11.5.15)	Grazing	Configuration (site context)		100	85.5	85.5
		Composition	canopy height	11.9	11.8	100.0
			subcanopy height	7.0	7.3	100.0
			canopy cover	49.6	62.9	87.4
			subcanopy cover	44.0	66.7	90.0
			shrub cover	47.3	45.0	100.0
			native perennial cover	1.1	0.4	25.0
			litter cover	60.8	76.4	85.2
			non-native cover	0	1.50	65.0
	Cleared	Not measured – score assumed to be 0				
Eucalypt woodlands to open forests (mainly Eastern) (RE 11.3.26, 11.7.6, 12.11.6, 12.12.7)	Grazing	Configuration (site context)		100	86.5	86.5
		Composition	canopy height	20.1	25.3	100
			subcanopy height	10.1	9.3	82.2
			canopy cover	36.3	45.6	89.3
			subcanopy cover	9.8	11.1	20.6
			shrub cover	5.2	6.1	70.0
			native perennial cover	36.1	45.5	75.4
			litter cover	39.8	39.2	88.1
			non-native cover	0	1.9	51.7
	Cleared	Not measured – score assumed to be 0				
Eucalypt dry woodlands on inland depositional plains (RE 12.12.8, 12.12.12)	Grazing	Configuration (site context)		100	92.0	92.0
		Composition	canopy height	16.9	19.8	100
			subcanopy height	4.0	7.4	100
			canopy cover	24.0	55.4	68.1
			subcanopy cover	3.6	13.3	100
			shrub cover	3.0	10.5	75
			native perennial cover	51.3	42.4	65.2
			litter cover	18.8	31.7	65.0
			non-native cover	0	1.5	63.1
	Cleared	Not measured – score assumed to be 0				
Eucalypt open forests to woodlands on floodplains (RE 12.3.3, 12.3.7)	Grazing	Configuration (site context)		100	86.9	86.9
		Composition	canopy height	24.2	19.3	94.8
			subcanopy height	10.8	9.2	93.3
			canopy cover	37.6	45.0	83.3
			subcanopy cover	17.6	30.8	68.3
			shrub cover	12.6	5.0	51.8
			native perennial cover	30.8	61.2	71.9
			litter cover	25.9	50.2	81.9
			non-native cover	0	1.8	56.7
	Cleared	Not measured – score assumed to be 0				

ASSET 2:
NATIVE FAUNA

DESCRIPTION

Native fauna at Goondicum station has been well documented over the years, as the property has hosted numerous visits and surveys from university researchers, student groups, environmental consultants, naturalist clubs and wildlife enthusiasts. The property is also a registered wildlife rehabilitation and release location. Threatened and iconic species known to occur on the property include koala (*Phascolarctos cinereus*), brushtail rock wallaby (*Petrogale penicillata*), rufous bettong (*Aepyprymnus rufescens*), and greater glider (*Petauroides armillatus*). While the focus of this account is native mammals, the property also supports a diverse population of birds, reptiles, amphibians, and fish. Some of the noteworthy species include the threatened white throated snapping turtle and glossy black cockatoo. The Campbells intend to include additional elements of Goondicum's fauna in future environmental accounts.

METHOD

The native fauna account was developed in accordance with the Accounting for Nature Method:

» *AFN AUSTRALIAN TERRESTRIAL MAMMAL METHOD- AFN-METHOD-F-01*

» AFN-METHOD-F-01 is a Level 3 Method, which indicates a confidence level of +/- 20%

DATA SOURCES

Data sources used during the planning, data collection and analysis phases of account preparation are listed in Table 12.

Table 12: Native fauna data sources

DATA NAME	SOURCE	USE
Australian Mammal Pre-1750 Distribution (GIS Layer)	Taylor 2021	Determining reference benchmarks
National Vegetation Information System (NVIS)	Australian Government 2021	Habitat identification and sampling design
The Mammals of Australia	Strahan 1995	Refining list of reference fauna species
ESRI World Imagery	ESRI 2021	Mapping of fauna niche habitat areas

Juvenile bearded dragon (Pogona barbata)

SUB-ASSETS

For the purposes of this account, the sub-asset is defined as native terrestrial mammals. Additional taxonomic groups (e.g. birds, aquatic fauna) may be included as sub-assets in future accounts. A description of the terrestrial mammal sub-asset is provided in Table 13. A map showing major habitat types present at Goondicum is provided as Figure 6.

Table 13. Native Vegetation sub-assets within the accounting area

SUB-ASSET	AREA	DESCRIPTION	NOTES
Terrestrial mammals	N/A	Native marsupial and placental mammals, including arboreal species such as gliders and possums.	Species that are not easily identified by wildlife cameras (e.g. bats, koalas) are not included in this assessment.

STRATIFICATION - ASSESSMENT UNITS

The accounting area comprises a single assessment unit covering the whole property. Grassy woodland is the predominant habitat type, and the entire property is used for cattle grazing. Small areas of niche habitat were captured in the sampling design, for example improved pasture, pockets of remnant rainforest occurring in steep or rocky areas, and gorges and cliffs that provide potential habitat for rock wallabies (Table 14 and Figure 6).

Table 14: Native fauna assessment units for Goondicum Station

ASSESSMENT UNIT	AREA (HA)
Whole of property	6789
TOTAL	**6789**

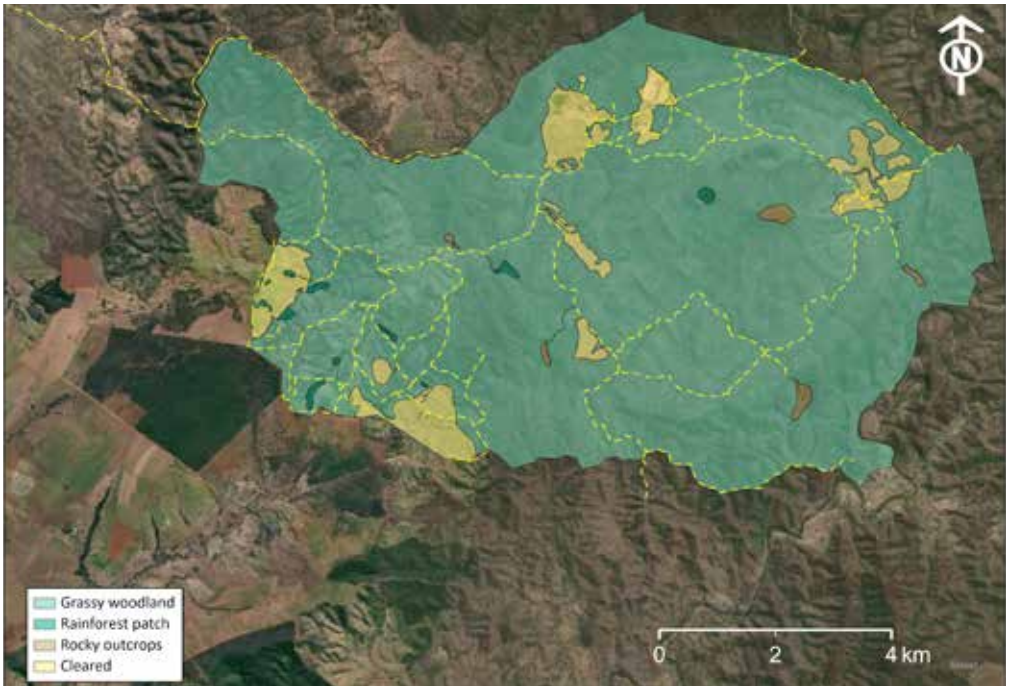

Figure 6: Fauna habitat types targeted by sampling at Goondicum Station

SAMPLING

Sample sites were selected in accordance with the Method, and as described in Table 15. Data were collected through field surveys from 30 permanent sample sites spread across a single assessment unit (Table 16). Sites were spaced at least 500m apart. Three wildlife cameras are established at each site to target small ground animals, mid-large animals, and arboreal animals. Niche habitats such as rainforest remnants, creeks and rocky outcrops were targeted to increase the likelihood of detecting habitat specialists such as brushtail rock-wallaby (*Petrogale penicillata*). The location of survey sites is shown on the map below (Figure 7).

Table 15: Native fauna assessment units for Goondicum Station

SITE SELECTION	The monitoring sites were established in 2021. Sites were selected as representative of the fauna habitat types present across the property, and generally within 200 m of an access track.
TIMING	To reduce the influence of natural variability across seasons, sampling is undertaken consistently during spring (September-November). The sampling in 2021 was undertaken in three rounds to allow for rotation of 30 wildlife cameras across the sites. Cameras were left in situ for at least 14 days per survey.

Table 16: Native fauna assessment units

ASSESSMENT UNIT	AREA (HA)	SAMPLES (N)
Whole of Property	6789	30
TOTAL	**6789**	**30**

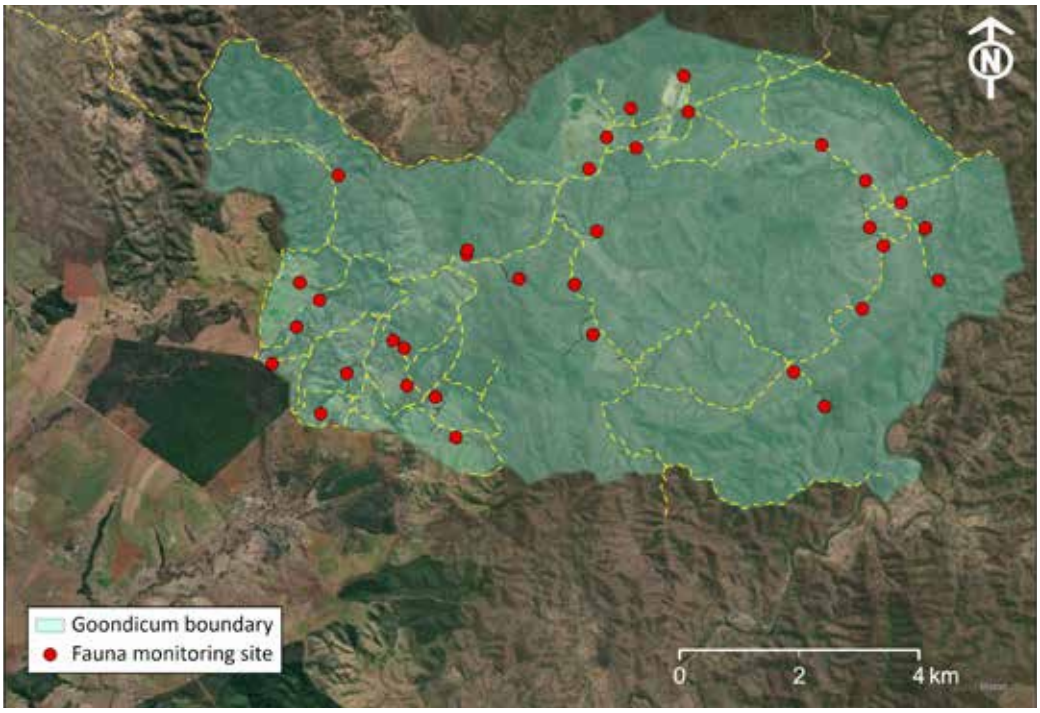

Figure 7: Location of fauna monitoring sites at Goondicum Station

INDICATORS AND REFERENCE BENCHMARKS

A single indicator – richness – is used to evaluate fauna condition under the AfN Method. Species lists for each site are aggregated to give a combined species list for assessment units. This is compared to a pre-1750 reference list of species, from which a reference richness measure is calculated. Richness is a count of the total species expected to occur in the area. A weighting is applied to each species based on the likelihood of detection. A description of indicators is provided in Table 17 and a description of reference species and richness benchmarks is provided in Table 18.

Table 17: Native Vegetation Indicator and Reference Benchmark Summary

INDICATOR	REFERENCE BENCHMARK
Richness	The reference benchmark for richness was determined by reviewing the Australian Mammal Pre-1750 Distribution (GIS Layer). The property crosses the boundary of two bioregions. A list of species expected to occur in both bioregions was compiled. This list was refined by a fauna expert (the report author), based on range, habitat preferences and identifiability.

Table 18: Reference species list and weightings

REFERENCE SPECIES LIST	LIKELIHOOD OF OCCURRENCE	WEIGHTING
Feathertail glider (*Acrobates pygmaeus*)	Somewhat likely	0.5
Rufous bettong (*Aepyprmnus rufescens*)	Likely	1
Dingo (*Canis lupus dingo*)	Likely	1
Northern quoll (*Dasyurmnus hallucatus*)	Somewhat likely	0.5
Spotted-tailed quoll (*Dasyurmnus maculatus*)	Somewhat likely	0.5
Northern brown bandicoot (*Isoodomnus macrourus*)	Somewhat likely	0.5
Black-striped wallaby (*Macropmnus dorsalis*)	Likely	1
Eastern grey kangaroo (*Macropmnus giganteus*)	Likely	1
Whiptail wallaby (*Macropmnus parryi*)	Likely	1
Euro (*Macropmnus robustus*)	Likely	1
Red-necked wallaby (*Macropmnus rufogriseus*)	Likely	1
Long-nosed bandicoot (*Peramemnus nasuta*)	Somewhat likely	0.5
Greater glider (*Petaurmnus volans*)	Somewhat likely	0.5
Yellow-bellied glider (*Petaurmnus australis*)	Somewhat likely	0.5
Sugar glider (*Petaurmnus breviceps*)	Somewhat likely	0.5
Squirrel glider (*Petaurmnus norfolcensis*)	Somewhat likely	0.5
Brush-tailed rock-wallaby (*Petrogmnus penicillata*)	Somewhat likely	0.5
Brush-tailed phascogale (*Phascomnus tapoatafa*)	Somewhat likely	0.5
Common ringtail possum (*Pseudomnus peregrinus*)	Somewhat likely	0.5
Eastern pebble-mound mouse (*Pseudomnus patrius*)	Somewhat likely	0.5
Echidna (*Tachygmnus aculeatus*)	Likely	1
Red-legged pademelon (*Thylogmnus stigmatica*)	Likely	1
Brushtail possum (*Trichomnus vulpecula*)	Likely	1
Swamp wallaby (*Wallabmnus bicolor*)	Likely	1

DATA COLLECTION

Data were collected using an array of wildlife cameras between September and December 2021. Cameras were deployed by wildlife ecologists and Goondicum staff in three rounds due to equipment constraints (i.e. 30 cameras were available). Flooding delayed the deployment of the final round of surveying. Details of data collection and analysis procedures, and an evaluation of data quality, are provided in Table 19 below.

Table 19: Details of data collection, analysis and quality assurance processes

FIELD DATA	Field data were collected using wildlife cameras which were deployed in accordance with the guidelines of the AfN Method. Three cameras were installed at each monitoring site, targeting smaller ground mammals, medium-large ground mammals and arboreal mammals. Cameras were attached to trees or star pickets. A scent lure (fish oil and/or peanut oil) was applied in the field of view of the camera. Cameras were left in situ to record wildlife observations for at least 14 days.
DATA ANALYSIS	Wildlife images were uploaded to the Wildlife Insights platform for review and classification. Deployment metadata, including site code, site coordinates, survey start and end date, were recorded during the upload process. Images were classified to species where possible. Where identification was not possible, identification was made to the next taxonomic level (e.g. Macropodia, Rodentia). Classifications were reviewed by a local wildlife ecologist as a quality assurance measure (Misty Neilson – Burnett Catchment Care Association and AfN Accredited Expert – Fauna). A table of data was exported from Wildlife Insights and species richness was calculated for each site. An aggregate species list was produced.
ASSESSMENT OF DATA QUALITY	Data quality is high – data collection was overseen by experienced fauna ecologist. Cameras were deployed in accordance with the Method. All cameras remained functional for the full survey period. Data was analysed using the Wildlife Insights platform (www.wildlifeinsights.org), which reduces the likelihood of metadata and transcription errors. Data was analysed by an experienced, local fauna expert (Misty Neilson – fauna ecologist and AfN Accredited Expert – Fauna).

ECOND® CALCULATION

The Econd® calculations were performed in Microsoft Excel, in accordance with the instructions contained within the AfN Accredited Method. Refer to the method for detailed description of the calculation procedures.

LIMITATIONS

Stratification

Most mammal species targeted by this Method are mobile and utilise a range of habitats for foraging and shelter. We therefore decided to treat the entire property as a single assessment unit. In order to maximise our detection rate for a wide range of species, sampling targeted niche habitats that were too small to be worth considering as an assessment unit.

Drought conditions

Climatic conditions are a strong influence on fauna populations, limiting the availability of resources and thereby impacting the abundance and distribution of target species. The data were collected at the end of a significant period of drought and the fauna scores may be lower than they would be if collected in an average year.

False negatives

The survey failed to detect several species that are known to occur on the property. This includes yellow-bellied gliders (*Petaurus australis*), squirrel gliders (*Petaurus norfolcensis*), and eastern ringtail possum (*Pseudocheirus peregrinus*). The later species is relatively abundant, particularly in and around the homestead. This reflects the hit-and-miss nature of wildlife surveys in general. In subsequent years, additional sites may be included where species are known to occur or have been observed in the past.

Reference species list

Small mammals were not included in this account, as it was not possible to reliably identify those species. This resulted in the exclusion of 12 species of rodent or marsupial based on size alone, that may occur on the property, but could not be reliably identified from wildlife camera images. As camera quality and AI classification improves it may be possible to include more species in analyses.

Table 20: Native fauna Asset Table

SUB-ASSET	ASSESSMENT UNIT	SPECIES OBSERVED	OBSERVED	OBSERVED RICHNESS*	REFERENCE RICHNESS*	ECOND®
Terrestrial mammals	Whole of Property	Feathertail glider	YES	14.5	17.5	82.86
		Rufous bettong	YES			
		Dingo	YES			
		Northern quoll	NO			
		Spotted-tailed quoll	NO			
		Northern brown bandicoot	YES			
		Black-striped wallaby	YES			
		Eastern grey kangaroo	YES			
		Whiptail wallaby	YES			
		Euro	YES			
		Red-necked wallaby	YES			
		Long-nosed bandicoot	YES			
		Greater glider	YES			
		Yellow-bellied glider	NO			
		Sugar glider	YES			
		Squirrel glider	NO			
		Brush-tailed rock-wallaby	YES			
		Brush-tailed phascogale	NO			
		Common ringtail possum	NO			
		Eastern pebble-mound mouse	YES			
		Echidna	YES			
		Red-legged pademelon	YES			
		Brushtail possum	YES			
		Swamp wallaby	YES			

*Weighted using the values shown in the Table 18.

ASSET 3: SOIL

DESCRIPTION

Most of Goondicum Station is located within the caldera of an ancient volcano, centred on Mt Goondicum. Erosion and deposition acting on this unique landscape over millions of years has created unusual topography and diverse soils. The predominant soil orders are chromosols, dermosols, kandosols, sodosols and tenosols. The patterns of distribution of soils are reflected in the native vegetation communities. The soils across an area of the property (144ha), that was leased and mined for ilmenite, have been substantially disturbed and were therefore excluded from data collection and given a score of 0 for all indicators.

METHOD

The soil account was developed in accordance with the Accounting for Nature® Method:

» *LEVEL 3 SOIL ASSESSMENT FOR PRODUCTIVE LAND (LANDCARE) – AFN METHOD S-02*

» AFN-METHOD-S-02 is a Level 3 Method, which indicates a confidence level of +/- 20%

DATA SOURCES

Data sources used during the planning, data collection and analysis phases of account preparation are listed in Table 21.

Table 21: Datasets used for Soil Asset

DATA NAME	SOURCE	USE
Dominant soil orders of Queensland (GIS layer)	DES 2019	Identify Sub-Assets
Soil and Land Information Platform (SALI)	DES 2022	Reference site data
ESRI World Imagery	ESRI 2021	Mapping of mine restoration footprint

SUB-ASSETS

For the purposes of this account sub-assets are defined as dominant soil orders. Soil sub-assets were identified using Queensland Government Soil Orders GIS Layer (see Table 22). A description of soil sub-assets is provided in Table 22. A map showing the distribution of soil sub-assets is provided in Figure 8.

Table 22: Soil sub-assets within the accounting area

SUB-ASSET	AREA	DESCRIPTION	NOTES
Chromosol	577	Chromosols have a strong contrasting texture. They are not strongly acidic or sodic in the upper B horizon. The parent material of Chromosols ranges from highly siliceous, siliceous to intermediate in composition.	Soil orders were confirmed for each sample as part of the laboratory analysis.
Dermosol	4265	Dermosols do not have strong texture contrast. They have a well-structured B2 horizon containing low levels of free iron. The parent materials of dermosols range from siliceous, intermediate to mafic in composition.	
Kandosol	181	Kandosols do not have a strong texture contrast between the A and B horizons. They have a massive or weakly structured B horizon and are not calcareous. Parent material of Kandosols ranges from highly siliceous, siliceous to intermediate in composition.	
Sodosol	57	Sodosols show strong texture contrast with highly sodic B horizon, but they are not highly acidic (pH > 5.5). Parent materials of Sodosols range from highly siliceous, siliceous to intermediate in composition.	
Tenosol	1710	Tenosols have a weakly developed soil profile which is typically very sandy and without obvious horizons. Tenosols form from highly salicious parent material and where rainfall is from 0 to 1400mm.	

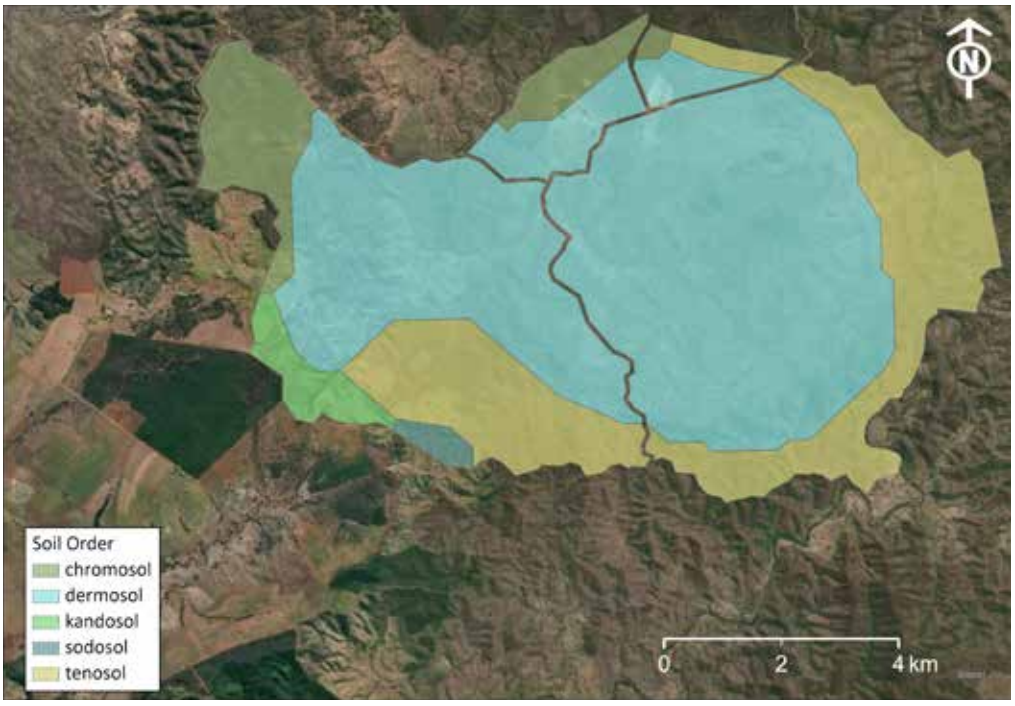

Figure 8: Soil sub- assets within the accounting area. (Source: DES 2019)

ASSESSMENT UNITS

The accounting area was stratified into assessment units based on land use (Figure 2) within each sub-asset (Soil Order -Figure 8). This resulted in seven assessment units (Table 23 and Figure 9). With the exception of a mining restoration area, the entire property has been treated as a single management unit, used for grazing cattle on mosaic of perennial pastures and woodlands. Soil condition in the mine restoration assessment units was not assessed and each of these units was assigned a score of zero due to the significant disturbance in this area.

Table 23: Soil assessment units for Goondicum Station

ASSESSMENT UNIT	AREA (HA)
Chromosol - grazing	564
Chromosol – mine restoration	13
Dermosol - grazing	4141
Dermosol – mine restoration	122
Kandosol - grazing	181
Sodosol - grazing	57
Tenosol - grazing	1708
TOTAL	**6789**

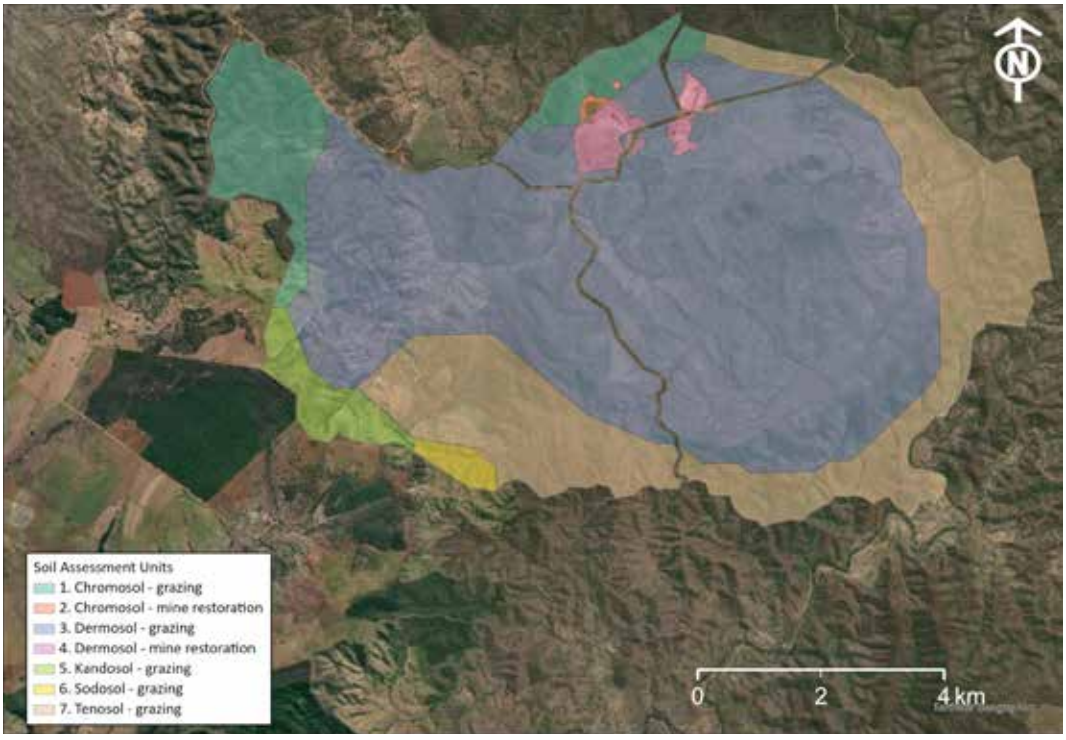

Figure 9: Soil assessment units for Goondicum Station

SAMPLE SITES

Sample sites were selected in accordance with the Method, and as described in Table 24. Data were collected through field surveys from 45 permanent sample sites spread across the seven assessment units (Table 25). Sample sites are shown on the soil monitoring sites map (Figure 10).

Table 24: Overview of sample site selection

SITE SELECTION	Sampling sites within each assessment unit were randomly selected within a 200m buffer of roads, using the Create Random Points tool in ArcGIS Pro. Sites were located >25m from infrastructure.
TIMING	To reduce the influence of natural variability across seasons sampling is undertaken consistently during the month of September (spring). The sampling in 2021 was undertaken between 25-30 September and the weather during this period was mostly dry, with wetter conditions experienced on the last day of the survey.

Table 25: Soil assessment units for Goondicum Station

ASSESSMENT UNIT	AREA (HA)	SAMPLES (N)
Chromosol - grazing	564	10
Chromosol – mine restoration	13	0
Dermosol - grazing	4141	10
Dermosol – mine restoration	122	0
Kandosol - grazing	181	10
Sodosol - grazing	57	5
Tenosol - grazing	1708	10
TOTAL	**6789**	**45**

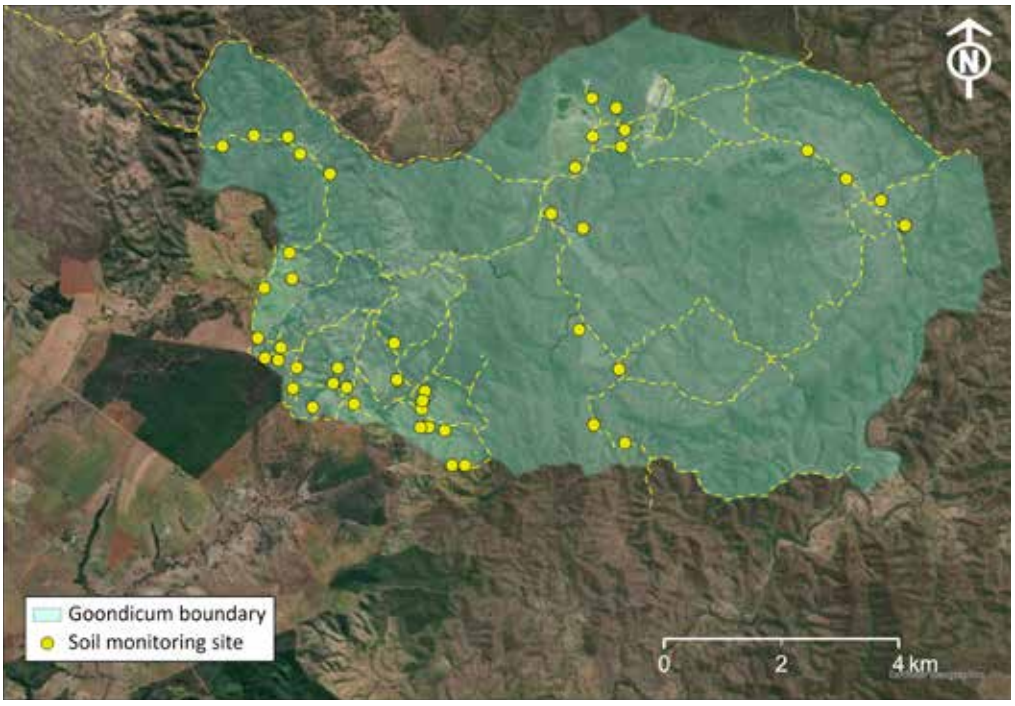

Figure 10: Soil monitoring sites map

INDICATORS AND REFERENCE BENCHMARKS

The AfN Method used for this account outlines methods for measuring two separate indices – the Econd® (environmental condition) and Pcond (productive condition). The same set of soil indicators is used to calculate the Econd® and Pcond and are shown in Table 26. These are standard measures used in a wide variety of agricultural contexts. However, the approach for determining reference benchmarks for the Econd® and Pcond differ.

Pcond benchmarks for field-based indicators are provided in a table in the AfN Method. No benchmarks are provided for kandosols – so the most conservative benchmarks for other soil orders were adopted for this account.

The Method provides several options for determining reference benchmarks for the Econd®. For the Goondicum account, we used a reference-site approach as outlined in the AfN Method.

» Following correspondence with the method author and several Queensland soil experts, we used the SALIS Soil Database (QLD Government 2022) to identify 10 undisturbed reference sites per soil order.

» Local reference sites were selected within 125km of the property.

» Reference value ranges were determined by calculating the mean value for each indicator ± the standard deviation.

Table 26: Soil indicator and reference benchmark summary

INDICATOR	REFERENCE BENCHMARK PCOND	REFERENCE BENCHMARK ECOND®
Soil organic carbon (%)	Defined in AfN Method	Reference sites – remnant forest/woodland vegetation
Soil pH	Defined in AfN Method	Reference sites – remnant forest/woodland vegetation
Electrical Conductivity (µS/cm)	Defined in AfN Method	Reference sites – remnant forest/woodland vegetation
Phosphorous	Defined in AfN Method	Reference sites – remnant forest/woodland vegetation
Ground cover (%)	Defined in AfN Method	AfN Method Table

DATA COLLECTION

Data were collected in September 2021, by ecologists and Goondicum staff, in accordance with the field protocols outline in the AfN Method. Samples were packaged, labelled, and sent to a lab in Bundaberg for analysis. Soil order mapping was verified in the laboratory and maps were updated where required. Ground cover was calculated using a web-based GIS tool as per the Method (Table 27).

Table 27: Details of data collection, analysis, and quality assurance processes

FIELD DATA	Field data and samples were taken at the permanently marked sample sites in 2021, in accordance with the field protocols outlined in the Method. Ground cover data was accessed and reports for each sub-asset area were acquired from the VegMachine web platform https://vegmachine.net/ (CSIRO 2021) in accordance with protocols outlined in the Method.
DATA ANALYSIS	The extent of sub-assets (soil orders) and assessment units was measured using the *Calculate Geometry* tool in ArcGIS Pro. Lab analyses were undertaken at Hortus Analytical Solutions, which is a NATA accredited laboratory.
ASSESSMENT OF DATA QUALITY	High - the sampling procedure (pooling multiple samples) is designed to reduce errors caused by random variability in the soil distribution. A well respected and accredited laboratory was used for analyses. VegMachine uses precise GIS calculations on highly accurate remote sensing datasets.

ECOND® AND PCOND CALCULATION

Econd® and Pcond calculations were performed in Microsoft Excel, in accordance with the AfN Method. Refer to the Method for detailed instructions on the procedures. Calculations of the Pcond index of soil productivity used reference benchmarks provided in the AfN Method. Calculations of the Econd® index were based on property specific reference benchmarks. Condition scores were assigned based on the thresholds outlined in the Method.

LIMITATIONS

Soil phosphorous benchmarks

The soil phosphorous measures are highly variable across the property, including within areas of long-undisturbed native vegetation (ie sites that would be considered to be in reference condtion). Application of the Method resulted in some sub-assets receiving condition scores of 0 for this indicator. This suggests that scoring of this indicator may need revision for future accounts.

Mine restoration zone

The mine restoration zone was not assessed due to the significant soil disturbance that has occurred in this area, with large areas of topsoil removed. However, there remain small areas of remnant native vegetation and intact soils within this area, which have been excluded from this assessment. Excluding these areas will have reduced the soil condition scores to a small degree.

Soil management history

Cropping has occurred on some areas of the property and management practices in these areas may have influenced soil condition. Documenting, mapping and stratification of the property based on management history will be considered for subsequent accounts.

Sodosol sampling intensity

Only five samples were collected from the sodosol assessment unit of 57 hectares. An additional site will be included in future rounds of data collection.

ASSET 3: SOIL – DATA TABLE

SOIL ORDER	ASSESSMENT UNIT	INDICATOR	REFERENCE BENCHMARK (PCOND)	REFERENCE BENCHMARK (ECOND®)	SITE MEASURE	ICS (PCOND)	ICS (ECOND®)
Chromosol	Chromosol - grazing	pH	5.5-7.5	5.9-6.7	6.31	100	100
		Electrical conductivity	< 3	0.1-0.5	1.216	80	80
		Phosphorus	10-23	4.1-26.6	48.56	0	0
		Organic carbon	> 2	0.8-3.0	4.78	100	100
		Ground cover	> 90	>90	94.3	100	100
	Mining restoration area	Not measured – score assumed to be 0					
Dermosol	Chromosol - grazing	pH	5.5-7.5	5.6-6.7	6.43	100	100
		Electrical conductivity	< 2	0.1-0.8	0.73	100	100
		Phosphorus	10-23	7.3-73.7	45.82	100	100
		Organic carbon	> 3	1.3-3.0	3.19	100	100
		Ground cover	> 90	>90	95.02	100	100
	Mining restoration area	Not measured – score assumed to be 0					
Kandosol	Chromosol - grazing	pH	5.5-7.5	5.3-6.3	6.09	100	100
		Electrical conductivity	< 2	0.2-0.5	0.82	100	80
		Phosphorus	10-23	1.2-15.4	15.5	100	80
		Organic carbon	> 3	1.8-4.3	4.49	100	100
		Ground cover	> 90	>90	94.54	100	100
Sodosol	Chromosol - grazing	pH	5.5-7.5	5.2-6.3	7.09	100	60
		Electrical conductivity	< 3	0.1-0.7	3	100	40
		Phosphorus	10-23	2.0-8.8	37.8	0	0
		Organic carbon	> 2	0.9-2.0	5.38	100	100
		Ground cover	> 90	>90	94.5	100	100
Tenosol	Chromosol - grazing	pH	5.5-7.5	5.9-7.0	6.24	100	100
		Electrical conductivity	< 3	0.1-1.0	0.845	100	100
		Phosphorus	10-23	0.4-30.8	29.5	20	100
		Organic carbon	> 2	0.6-3.0	3.773	100	100
		Ground cover	> 90	>90	94.18	100	100

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THE ACCOUNTING FOR NATURE FRAMEWORK

WHO IS ACCOUNTING FOR NATURE?

Accounting for Nature Ltd is a not-for-profit company with a vision to be a recognised global leader for measuring changes in the health of the environment. Our mission is to provide transparent, affordable and verifiable measures of change in environmental condition of sufficient quality to inform policy and investment decisions - both at an enterprise and at an ecosystem scale.
To achieve this, the Accounting for Nature® Certification Framework sets the first globally consistent, scientifically credible Standard for measuring, certifying and communicating changes in the condition of any environmental asset (native vegetation, soil, water and wildlife).

PURPOSE OF THIS DOCUMENT

The Accounting for Nature® Certification Framework specifies that a set of tables and maps be produced, together with an Information Statement, to create an Environmental Account that describes the condition of a range of environmental assets – similar to a financial balance sheet for a company. The Information Statement provides full transparency on how an Environment Account is developed. The Information Statement documents, in non-technical terms, the rationale for the selection of assets, choice of indicators, the origins of the data, the analysis and treatment of data and construction of the Econd®.

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This trust mark means that Nadia and Robert Campbell have measured the condition of environmental assets at Goondicum Station (AfN-Project-40) according to the science-based Accounting for Nature® Certification Standard. For more information →

ACKNOWLEDGEMENTS

We would like to acknowledge the Traditional Owners of the land where we live and work, and pay our respects to elders past, present, and emerging.

Goondicum Station would like to thank all the organisations we have worked with for many years

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