



Environmental Management Plan

Upper Burdekin Wind Farm

Report prepared for: Windlab

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Abbreviations

AEMO	Australian Energy Market Operator
BBMP	Bird and Bat Management Plan
BOM	Bureau of Meteorology
BUS	Bird Utilisation Survey
CASA	Civil Aviation Safety Authority
CEMP	Construction Environmental Management Plan
CHMA	Cultural Heritage Management Agreement
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DES	Department of Environment and Science
ELA	Eco Logical Australia
EMP	Environmental Management Plan
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESC	Erosion and sediment control
GBP	Gugu Badhun People
HBTs	Hollow-bearing trees
HSE	Health, safety and environment
IECA	International Erosion Control Association
ILUA	Indigenous Land Use Agreement
LiDAR	Light Detection and Ranging
LGA	Local Government Area
MNES	Matters of National Environmental Significance

MSDS	Material Safety Data Sheet
NC Act/NCA	<i>Nature Conservation Act 1992</i>
PER	Public Environment Report
Planning Act	<i>Planning Act 2016</i>
PO	Performance Outcome
Qld	Queensland
QREZ	Queensland Renewable Energy Zone
RE	Regional Ecosystem
SWMS	Safe work methods statement
SPV	Special purpose vehicle
UBWF	Upper Burdekin Wind Farm
VM Act	<i>Vegetation Management Act 1999</i>
WTG	Wind turbine generators
WONS	Weeds of National Significance
Windlab	Windlab Developments Pty Ltd

1 Introduction

1.1 PROJECT BACKGROUND

Windlab Developments Pty Ltd (Windlab) is proposing to build the Upper Burdekin Wind Farm (UBWF) at a site located on the Seaview Range, approximately 65 km south-west of Ingham in North Queensland (Figure 1-1). The site is located within the Charters Town Local Government Area (LGA) on Lot 3198 on PH2177.

The Proposed Action, here in referred to as the project, includes the construction, operation and decommissioning of the UBWF. The project area has a wind resource potential of 400 MW of power and associated works will include a new substation to connect to the existing transmission infrastructure to the east.

The location of the UBWF has been determined based both on the availability and quality of the wind resource and critically, proximity to the existing electricity grid.

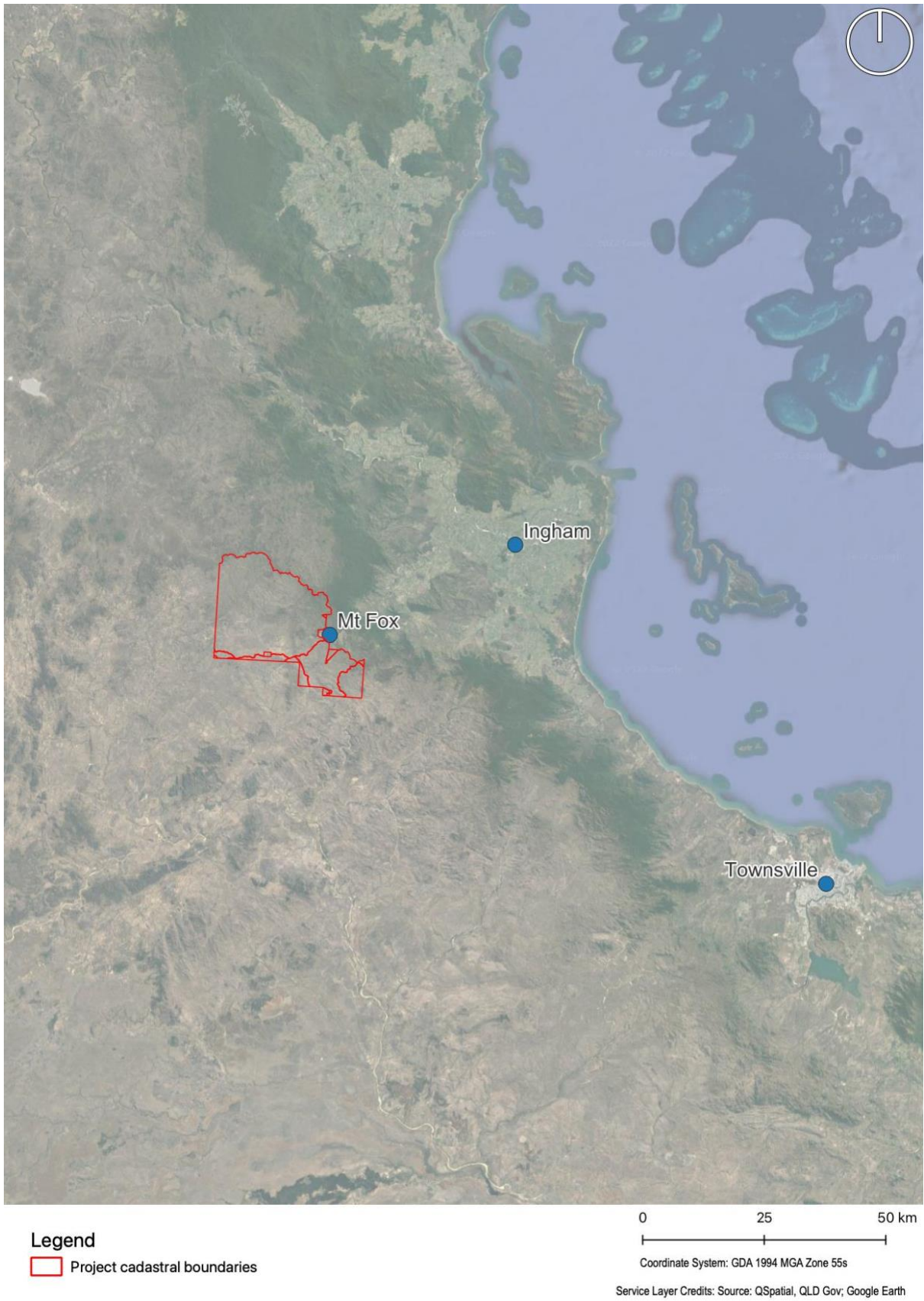


Figure 1-1: Project area location

1.2 THE PROPONENT

The proponent for the purposes of application, assessment, and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is Upper Burdekin Wind Farm Holdings Pty Ltd (the proponent), a wholly owned subsidiary of Windlab Pty Ltd.

1.3 STATUTORY ROLE OF THIS EMP

Windlab is currently seeking approval for UBWF from the Commonwealth Minister for Environment under the EPBC Act and the Queensland Minister for State Development, Infrastructure and Planning under the *Planning Act 2016*.

The proposal was referred under the EPBC Act and declared a controlled action on the 23rd November 2021. This was due to likely significant impacts on the following Matters of National Environmental Significance protected under Part 3 of the EPBC Act:

1. Listed threatened species and ecological communities (s18 & s18A);
2. Listed migratory species (s20 & s20A);
3. The world heritage values of a World Heritage Property (s12 & s15A); and
4. The heritage values of a National Heritage Place (s15B & s15C).

The Proposed Action is to be assessed by Public Environment Report (PER) under Part 9 of the EPBC Act. The Commonwealth Department of Environment (the Department) has provided guidelines for a draft PER for UBWF.

The PER guidelines specify that an Environmental Management Plan (EMP) is to be included in the PER. The EMP is to set out the framework for management, mitigation and monitoring of relevant impacts of the action, including the construction, operation, and decommissioning stages of the project. This EMP fulfils this requirement.

The project is not currently approved under State legislation. Development approval under the Queensland *Planning Act 2016* (Planning Act) will be sought. Further, the project will be required to be assessed against the *Vegetation Management Act 1999* for the proposed clearing of native vegetation. The EMP has been developed to be consistent with the requirements of the state framework.

[PLACEHOLDER FOR COMMONWEALTH AND STATE APPROVAL CONDITIONS]

1.4 OBJECTIVE

Implementation of the UBWF in accordance with the EMP will assist the proponent in meeting their environmental obligations including legislation, regulations and conditions of approval.

The EMP's objective is to establish suitable controls to eliminate or minimise the risks to the environment to a level that is low, negligible or reduced to as low as reasonably practicable. The EMP further seeks to provide a framework for measuring environmental performance against legislative requirements and company policies and standards.

To achieve these overarching objectives, the EMP specifically aims to:

1. Inform UBWF staff and contractors of their environmental obligations;

2. Provide site-specific environmental control procedures;
3. Provide rational and practical environmental guidelines for the construction and operation of the UBWF, to ensure activities do not adversely affect environmental values and in particular threatened species;
4. Ensure that any potential environmental impacts arising from the construction and operation of the UBWF are managed in accordance with legislative requirements;
5. Develop environmental guidelines for conducting staff induction and training.

1.5 SCOPE OF THIS EMP

This EMP has been developed to provide an overarching framework and the detailed management plans required for the UBWF in order to meet statutory requirements and protect biodiversity values. This EMP addresses activities associated with the construction, operation and decommissioning of the UBWF and should be read in conjunction with the following other key management documents:

- Bird and Bat Management Plan (BBMP), which details the environmental management requirements for managing impacts associated with collisions risk during the operational stage of the project. It also fulfils components of Performance Outcome (PO) 5 of State Code 23 – Wind Farm Development

A risk assessment for the UBWF has been undertaken to support the development of the EMP and identify where key management controls are required for the project. The risk assessment identifies the potential impacts with a greater environmental risk, and consequently where environmental impact assessment and management should be focussed. The project activities that generated pre-mitigation risk ratings as 'intermediate' or above are addressed in the EMP. The risk assessment and risk register for the UBWF are described in Section 5 and the full risk assessment register is provided in Appendix B.

This EMP applies to all phases of the UBWF; construction, operation, and decommissioning of the UBWF.

1.6 STRUCTURE AND CONTENT OF THIS EMP

The EMP comprises:

- Background to the UBWF and the purpose of this EMP
- A description of the UBWF
- A summary of the environmental management, regulatory and compliance framework within which the UBWF will operate
- A summary of the environmental values in the project area
- A summary of the risk assessment that has guided the EMP
- A series of management sub-plans describing:
 - measures to be applied to avoid and minimise the environmental impacts of construction, operation and decommissioning of the UBWF
 - monitoring to track and assess management performance against targets
 - contingency measures to mitigate unavoidable or accidental impacts
- A description of the overarching Environmental Management System which the proponent will apply to the project and contractors.

2 Description of Project

2.1 PROJECT OBJECTIVES

The objectives of the UBWF are to:

- Develop and deliver a world-class renewable energy resource servicing north Queensland
- Deliver an ecologically sustainable development that balances economic, ecological and social outcomes
- Comply with all relevant legislative requirements
- Avoid or reduce environmental and social impacts by applying leading practice management approaches.

2.2 PROJECT LOCATION AND CURRENT LAND USE

The project area is located on the Seaview Range, approximately 65 km south-west of Ingham in North Queensland. The project area is within the Charters Town Local Government Area and occurs on Lot 3198 on PH2177. The land is currently used for cattle grazing, with limited pasture improvement or land clearing having occurred to date. The project area is being managed consistent with an operating pastoral enterprise with limited pest and weed control being undertaken.

At a wider scale, the UBWF is located within Queensland's Northern Renewable Energy Zone (QREZ), which is an area identified by the Australian Energy Market Operator (AEMO) as having good quality renewable resources and other characteristics suitable for renewable energy development. At the site scale, the location of UBWF has been influenced by the presence of a significant wind resource located over a large agricultural property that is directly adjacent to existing electricity transmission infrastructure. Importantly, power generated from this wind resource is a good match for the North Queensland load profile, and no additional electricity transmission infrastructure needs to be developed in order to export power to the grid.

2.3 NOMENCLATURE USED IN THIS REPORT

2.3.1 Project

The project nomenclature used throughout this document refers to the construction, operation, and decommissioning of the UBWF.

2.3.2 Development footprint

The development footprint nomenclature used throughout this document refers to the 769 ha of land that will be utilised to facilitate the infrastructure elements associated with the development of the project.

2.3.3 Project area

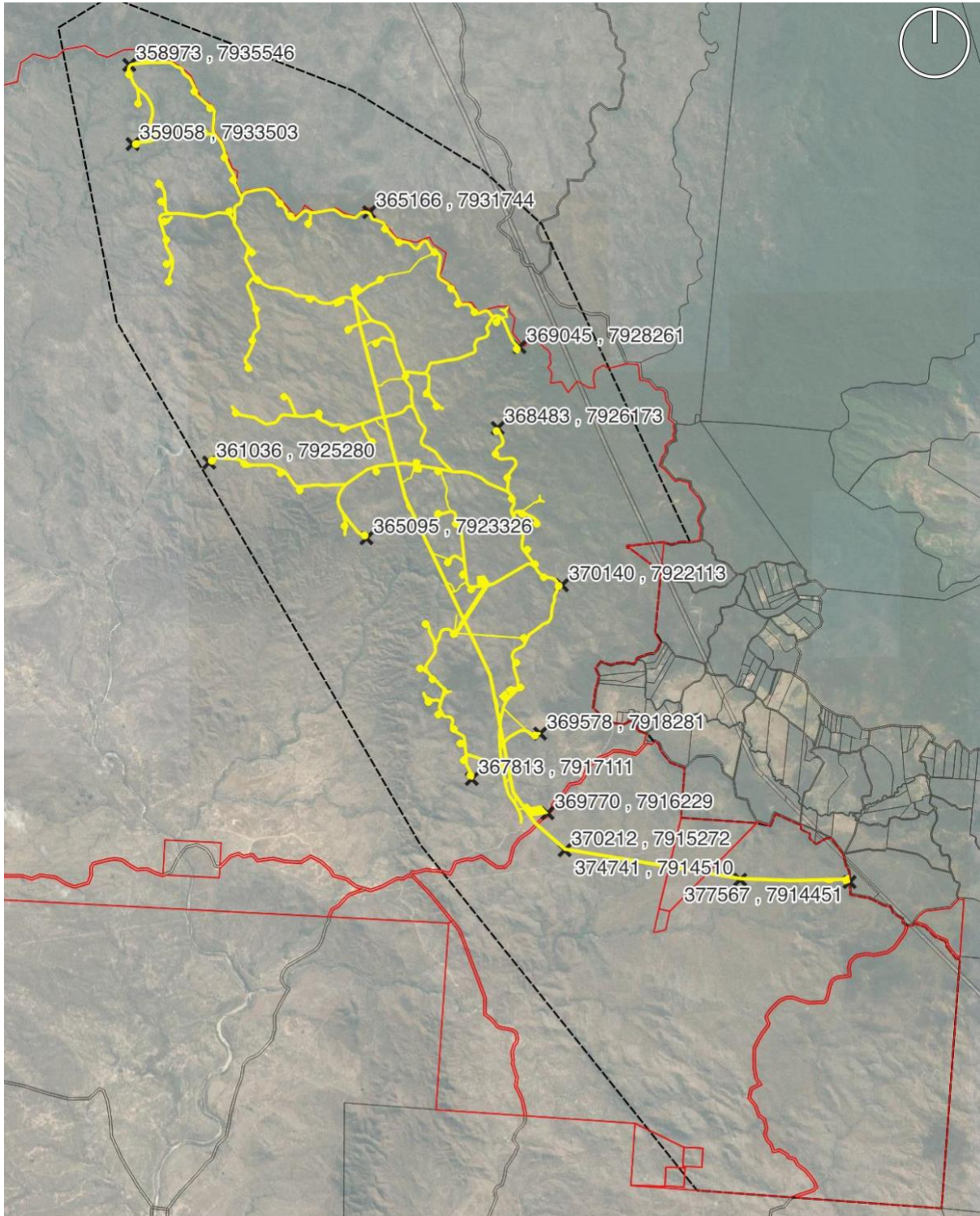
The project area nomenclature used throughout this document refers to the 29,038 ha of land that has been subject to a variety of studies and surveys. It occurs on one property, Kilclooney Station, Lot 3198 on Plan PH2177.

2.4 PROJECT OVERVIEW

The project includes the construction, operation, and decommissioning of the UBWF. The development elements include the following:

- Up to 80 wind turbine generators (WTG) complete with foundations
- WTGs will have a maximum hub height of 200 m, and maximum blade length of 100 m
- Turbine laydown areas 100 m x 80 m
- Permanent meteorological/wind monitoring masts
- Underground electrical cabling, reticulation system to follow internal access tracks as much as possible
- Up to two generation collector substations approximately 250 m x 250 m
- One switching yard; approximately 200 m x 200 m
- A 275 kV electricity line to connect the wind farm collector substations to the switching yard and the grid network
- One site entrance connecting to approximately 150 km of internal access tracks of 50 m maximum construction width and 5-6 m operational width.
- Accommodation camp up to 10.8 ha in area:
 - up to 300 personnel
 - transportable accommodation buildings, each room fully self-contained
 - central kitchen, dining hall, outdoor dining area, laundry
 - Car park facilities
- Up to two compounds (one of which will be incorporated into the Accommodation Camp) approximately 100 m x 100 m for construction, operations and maintenance purposes
- Up to eight temporary work areas (approx. 200 m x 200 m) located on the leased land, to be used for batching plants, laydown areas or materials storage
- Rehabilitation of temporary construction areas will be undertaken upon construction completion.

The Proposed Action, here in referred to as the project, has a total development footprint of 769 ha. The development footprint is shown within Figure 2-1.



Legend

- Project Cadastral Boundaries
- Survey Area
- Development Footprint
- ✕ Co-ordinates
- Turbines

0 2.5 5 km

Coordinate System: GDA 1994 MGA Zone 55s

Service Layer Credits: Source: QSpatial, QLD Gov; Google Earth

Figure 2-1: Development footprint

2.5 SCHEDULE

Construction of the project will be staged. The current program is provided in Table 2-1.

Table 2-1: Schedule of works

Commencement	Completion	Activities
Q2 2020	Ongoing	Monitoring
Q3 2023	Q4 2023	Site establishment and mobilisation
Q1 2024	Q3 2025	Civil construction
Q2 2024	Q2 2026	Electrical construction
Q1 2025	Q2 2026	Plant delivery and construction
Q2 2025	Q3 2026	Commissioning and testing
Q1 2026	Ongoing	Operation

2.6 WIND FARM CONSTRUCTION

Details of the main components of UBWF, including turbine layout and dimensions, access roads, temporary and permanent infrastructure are outlined in Table 2-2 below.

Table 2-2: Details of Wind Farm Construction

Construction element	Brief description
Turbine details	80 wind turbines with maximum dimensions including: <ul style="list-style-type: none"> • tip height of 300 m, • hub-height of 200 m • rotor diameter of 200 m.
Turbine location	Refer to Figure 2-1 Micro siting is likely to occur at some locations due to environmental and/or geotechnical constraints Environmental requirements that will affect micro siting are included in the following sub-plans provided below – Fauna Management, Vegetation Management
Access roads	Existing roads/tracks will be used as a preference, with additional access tracks of up to 96 km of heavy vehicle access roads and 26km of light vehicle access tracks constructed Heavy vehicle access tracks will be maximum width of 50 m, light vehicle access tracks will be a maximum width of 10m Tracks will be unsealed Appropriate drainage structures will be installed as required
Crossings	New access tracks will cross waterways All crossings will comply with Code for self-assessable development - Minor waterway barrier works - Part 4: bed level crossings
Crane hardstand	Each turbine will require a crane hardstand with a footprint of 80m x 100m

	<p>This includes temporary storage, fire and safety buffers</p> <p>Hardstands retained during operational life of wind farm</p>
Turbine erection	<p>Turbine components will be stored in temporary laydown areas (3) prior to erection</p> <p>Cranes will be used to install the turbines</p> <p>Tower erection usually takes 2-3 days per turbine</p>
On-site laydown and concrete batching	<p>Temporary laydown areas (3) will be used for material stockpiles, temporary storage of turbine components, some onsite assembly and fabrication, vehicle parking and truck deliveries</p> <p>Temporary concrete batching plants (3) may be erected to supply concrete for turbine foundation</p> <p>Footprint of laydown areas and concrete batching areas will be approximately 150m x 150m</p> <p>Material stockpiles will be managed via construction of sediment basins, silt fences, dust suppression and appropriate siting to mitigate any risk of contamination</p>
Turbine foundations	<p>Turbine foundation type will depend on geotechnical studies</p> <p>Suitable foundations are dependant on substrate type (soils to rock)</p>
Site facilities	<p>During construction there will be a number site facilities:</p> <p>An accommodation camp to house up to 300 personnel, including:</p> <ul style="list-style-type: none"> • Transportable accommodation buildings, each room fully self-contained • Central kitchen, dining hall (dry mess), outdoor dining area (dry mess), laundry, gym • Car park facilities, including provision for 4 coach buses <p>Up to two compounds (one of which will be incorporated into the Accommodation Camp), approximately 100 m x 100 m for construction, operations and maintenance purposes will also be constructed.</p> <p>Three temporary work areas (approx. 150 m x 150 m) to be used for batching plants, laydown areas or materials storage</p> <p>Operation hours of the site will be during business hours, Monday to Friday. 24 hr access will be available in case of emergency maintenance</p>
Underground reticulation	<p>Wind turbines will be connected by predominantly underground transmission lines</p> <p>Collection strings will be connected to two 275 kV site sub-stations</p> <p>Connection will be into the national grid through a generator substation to be constructed by Powerlink</p>
Sub-station	<p>The underground cabling will meet up to site substations</p>
Other construction requirements	
Workforce	<p>Expected to generate up to 300 jobs in the region during the construction period</p> <p>Exact number of staff on site each day will vary with construction stage and element</p> <p>Daily shift normally 12 hours ~ 6.30am – 6.30pm. Night-time work will be very limited</p> <p>Will be accommodated onsite in an accommodation camp</p>

Power	Diesel generators will provide power to work site
Waste	Existing approved municipal landfill services would be used to dispose of non-hazardous waste Hazardous waste quantities expected to be small, and will be removed from site and disposed of at approved facilities
Transport and logistics	Components for the project would be manufactured at a variety of locations around Australia and overseas Components delivered to the project area, predominantly from the Port of Townsville, via road, using the existing highway and road network Project area will be accessed via Charters Towers. No heavy vehicles will be required to traverse the Wet Tropics World Heritage Area Minor upgrades along the transport route will be required and are the responsibility of the main transport contractor
Lighting	No night-time work on the project is envisaged and lighting would not be required Specific requirements for lighting may arise at sites only as a safety requirement and will be kept to a minimum No aviation lighting is proposed on the wind turbines, as CASA considers the wind farm development unlikely to be a hazard to aviation safety Placement and orientation of lighting will be away from sensitive fauna habitats
Fuel and dangerous goods / hazardous materials	Diesel fuel would be required for construction equipment, sourced from local service stations or from larger regional centres where practicable On site fuel storage tanks would be fully lined and bunded and comply with AS-1940 and AS-1692 Dangerous goods storage would be in designated areas and comply with AS-1940, Queensland <i>Dangerous Goods Safety Management Act 2001</i> and associated codes
Fire management, emergency and incident response	No controlled burning proposed Fire ignition risk from welding and other hot works, and risk of fires can increase with spread of weed species which can increase fuel load. Risks are addressed within sub-plans below Water trucks will be on-site to implement fire response measures

2.7 WIND FARM COMMISSIONING

Commissioning of the UBWF would involve:

- Testing of components
- Energisation (powering-on) of the plant
- Performance testing of the operating plant

A commissioning team would coordinate and undertake the above activities and at completion, hand over responsibility to operational staff. Commissioning is expected to take 3 months.

2.8 WIND FARM OPERATION

The UBWF will supply energy to the national electricity grid by connecting into the into the Powerlink Guybal Munjin Switchyard at Mount Fox. The wind farm and associated facilities would be operated and maintained in accordance with relevant Australian Standard and industry guidelines.

Windlab Asset Management expects to have at least one staff member based in Upper Burdekin on an ongoing basis to manage the project. In total, including the staff of the operations and maintenance contractor there will be up to approximately 12 staff permanently based at the Upper Burdekin facilities.

On-going maintenance requirements for the wind farm include:

- Vegetation maintenance along powerlines and roads and around turbines and substation on an annual basis, likely in the early dry season
- Grading/rolling of access tracks and hardstands and laydown areas as needed
- Scheduled maintenance of each turbine and ancillary equipment
- Regular maintenance of the electrical works would be included in the above.

2.9 WIND FARM DECOMMISSIONING

The UBWF will be designed with an operational life of 30 years and will be designed fit for purpose. With refurbishment, the wind farm may have a much longer operational life.

At the appropriate time, areas disturbed as part of the permanent footprint will be rehabilitated and the wind farm decommissioned consistent with the requirements of legislation, Australian Standards and industry practices at the time, and the land agreement requirements and regulatory authorities. At the appropriate time, a detailed decommissioning and rehabilitation plan will be prepared to guide these activities.

3 Environmental Management Framework

3.1 WINDLAB POLICY AND COMMITMENTS

The proponent does not have an environmental policy and planning framework. However, in conducting its core business of project development it leverages the experience of its parent companies, including Windlab Developments.

Windlab and its partner companies have separately developed, constructed and operated renewable energy projects across a number of jurisdictions in Australia, Africa, Asia, Europe and the Americas. Both Windlab and its partner companies work towards positive environmental outcomes consistent with regulatory requirements applicable in the relevant jurisdiction.

The construction of the UBWF will be undertaken by a reputable contractor with a proven track record in environmental performance on similar projects. As part of the selection process for the site contractor, the bidding contractors will be required to provide the details of their corporation's environmental policy and environment management system, along with supporting evidence of its environmental performance for the past three years. For any notifiable environmental incidents recorded during that period the contractor will be required to provide details of the incident, the investigation report and actions taken to prevent recurrence.

3.2 STRUCTURE AND RESPONSIBILITY

The proponent will hold overall responsibility for environmental management and ensure adequate resources are provided for the implementation of the EMP. All staff are responsible for the environmental performance of their activities and for reporting any environmental hazards and incidents. Environmental responsibilities for staff are contained within position descriptions, relevant procedures and work instructions. Overarching environmental roles are described in Table 3-1 below.

The proponent intends to engage a Construction Contractor to build the project and individual contractors will be engaged for specific components of the build as required. Ensuring that the contractors understand and adhere to the environmental controls established for the project will be critical to achieving the performance objectives and targets established in the EMP. Adherence will be achieved by:

- Clearly identifying the respective responsibilities of the proponent and the Construction Contractor for the controls within each sub-plan included in the EMP
- Requiring, reviewing and approving the Construction Contractor's Construction Environmental Management Plan (CEMP) to ensure that the controls implemented by the Constructor through the CEMP are consistent with and support the overarching EMP for the project
- Ensuring clear line responsibility and supervision between proponent and the Construction Contractor
- Clearly identifying the environmental responsibilities for proponent staff and the Construction Contractor within position descriptions, relevant procedures and work instructions. The overarching roles of the Construction Contractor are set out in Table 3-1.
- Requiring the Construction Contractor to conduct regular inspections and record keeping against compliance with the EMP, coupled with proponent auditing of these arrangements.

Table 3-1: Key environmental responsibilities (note that one person may hold multiple roles)

Position title	Environmental Responsibilities
Directors of Upper Burdekin Wind Farm Pty Ltd	<ul style="list-style-type: none"> • Hold overall responsibility for environmental management • Review, understand, approve and support implementation of the EMP • Ensure adequate resources are provided for the implementation of the EMP
Head of Windlab Asset Management	<ul style="list-style-type: none"> • Ensure that environmental obligations are embedded into design, systems and processes for satisfying compliance and due diligence requirements • Ensure that proposed project additions and alterations obtain all necessary environmental approvals • Management of environmental emergencies • Oversee completion of emergency response exercises annually • Assess emergency response capabilities • Remediation of any contaminated sites (if applicable)
Construction Manager (Windlab)	<ul style="list-style-type: none"> • Conduct adequate project planning to ensure that construction may meet all design and schedule requirements specified within this plan • Ensure that the relevant environmental requirements are implemented and complied with in the design and construction of minor projects • Ensure that environmental approval processes are embedded within project construction systems • Ensure all necessary environmental approvals relevant to the project are obtained • Ensure that project specific obligations/commitments are captured within the CEMP, and effectively implemented • Ensure that any ongoing obligations/commitments upon the completion of construction are identified, documented and handed over via the project handover process to operations staff • Ensure incident reporting protocols are followed and that the construction personnel report Events/Hazards and near misses • Respond to environmental incidents as required
Construction Contractor	<ul style="list-style-type: none"> • Facilitate day to day compliance with this plan • Ensure all construction personnel are aware of their obligations under this plan • Conduct regular inspections against compliance with this plan • Report on and respond to environmental non-compliances and events • Coordinate emergency response plan
Compliance Manager (Windlab)	<ul style="list-style-type: none"> • Monitor implementation of and compliance with this EMP and environmental risk assessment recommendations • Facilitate and monitor EMP Reviews • Review audits reports and monitor completion of required corrective actions • Report significant environmental non-compliances with EMP and legislation internally to the Executive Management Team and externally to regulatory authorities, as required • Ensure all environmental obligations are recorded and are kept current
Senior Advisor Environment (Upper Burdekin)	<ul style="list-style-type: none"> • Identify changes during construction and update the EMP to address and manage any new environmental risks • Provide assistance and/or advice regarding implementation of the EMP and any other environmental management concern

Position title	Environmental Responsibilities
	<ul style="list-style-type: none"> • Liaise with government agencies regarding environmental issues • Assess environmental incidents to determine regulatory reporting requirements • Undertake planned external reporting
Community Liaison Manager (Upper Burdekin/Windlab)	<ul style="list-style-type: none"> • Liaise with landholders, traditional owners, community representatives, contractors, councils, planning and local government authorities as well as utilities and infrastructure owners on land management and environmental matters as required
Technical and Development Advisor (Upper Burdekin/Windlab)	<ul style="list-style-type: none"> • Facilitate the maintenance, implementation and ongoing improvement of training and induction programs
All personnel	<ul style="list-style-type: none"> • Read, understand and implement the control measures detailed within the CEMP, as appropriate • Report all observed non-compliances to a supervisor • Report all observed incidents, hazards and near misses • Continually seek to identify areas for improvement of environmental management and report these to the Senior Advisor Environment

4 Summary of Environmental Values

4.1 PHYSICAL ENVIRONMENT

4.1.1 Bioregion

The project area lies within two bioregions in north Queensland, the Wet Tropics (Bioregion 7) and the Einasleigh Uplands (Bioregion 9). Within the Wet Tropics portion, the project area occurs in the Paluma-Seaview subregion. The project area occurs across two subregions in the Einasleigh Uplands bioregion: Herberton-Wairuna and Broken River.

The Wet Tropics bioregion is diverse, with vegetation ranging from rainforest, sclerophyll forests and woodlands to shrublands, heathlands and mangroves. The Einasleigh Uplands consists of rugged hills and ranges, dissected plateaus and alluvial and sand plains, ranging from 410 to 790 m above sea level. Vegetation is dominated by eucalypt woodlands.

4.1.2 Climate

The Wet Tropics bioregion receives very high rainfall, most of which falls over summer (the wet season). Mean annual rainfall ranges from approximately 4,000 mm along the coast to approximately 1,200 mm inland. The Einasleigh Uplands also receives most of its rainfall over the summer months. However, the mean annual rainfall is much lower than the Wet Tropics bioregion, ranging from approximately 730 mm to 1,000 mm annually.

The nearest Bureau of Meteorology weather station to the project area is the Ingham Composite (032078), located close to the coast approximately 40 km to the north-west of the project area. A summary of climate statistics for this station is provided in Table 4-1 (BOM 2022a). The nearest rainfall gauge to the project area is Michael Creek Alert (032186), where the mean annual rainfall is 1,318.5 mm (BOM 2022b).

Table 4-1: Climate summary for Ingham Composite

Statistic	Average
Annual maximum temperature (°C)	29.3
Annual minimum temperature (°C)	19.0
Annual rainfall (mm)	2,180.1

4.1.3 Soils, Geography, Topography

Twelve surface rock types occur in the project area, with granite being the dominant rock which forms more than half of the project area. Overall, rock formations across the project area are a combination of composite unit (dominantly stratified), intrusive unit and stratified unit (including volcanic and metamorphic). The most wide-spread rock type are:

- Granitoid
 - Cream to pink, medium to coarse-grained, predominantly equigranular biotite granite
 - Cream to grey, fine to medium-grained, seriate to abundantly porphyritic biotite granite; minor biotite-hornblende granite
- Sedimentary Rock

- Feldspathic to lithofeldspathic arenite and mudstone local polymictic conglomerate with limestone clasts, allochthonous limestone blocks
- Colluvium
 - Clay, silt, sand, gravel and soil; colluvial and residual deposits (generally on older land surfaces)
- Dioritoid
 - Grey, medium-grained, equigranular hornblende-biotite quartz diorite; some granodiorite and minor gabbro

Soils derived from project area geologies mapped at 1:2M (ASRIS, 2021) are tenosols (55% of the project area), kandosols (29.7%) and dermosols (15.2%); however, project area surveys detected the likely presence also of ferrosols in areas ground-truthed as land zone 8.

The topography varies from steep, deeply dissected hills with prominent granite tors in the north and east of the project area, to more gentle and less incised foothills in the west and areas of reasonably level ground in the south.

4.1.4 Hydrology

The project area is traversed by numerous watercourses comprised of both minor drainage lines (stream order one) through to major watercourses (stream order five). The largest watercourse traversing the project area is Michael Creek (stream order five). The project area lies within two separate drainage basins, Burdekin Basin (associated with the Einasleigh Uplands) and Herbert Basin (associated with the Wet Tropics).

4.2 BIOLOGICAL ENVIRONMENT

4.2.1 Vegetation

The project area is dominated by woodlands to open forests which are largely made up of various mixes of *Eucalyptus* and *Corymbia* species in remnant condition. Shrub layers of these woodlands are highly variable in density and dominated by *Acacia* species, ground layers are dominated by grasses. The Eastern portion of the project area contains prominent granite tors and rock pavements, and areas of *Melaleuca* swamp. Well-developed riparian woodland communities with *Casuarina cunninghamii* and *Melaleuca* species are present along major watercourses. Small areas of species rich vine thicket and simple notophyll vine forest are also present within the project area.

No flora species, listed as threatened under the EPBC Act or NC Act, have been located within the development footprint, or within the project area.

4.2.2 Weeds

A number of weed species were recorded across the project area. Most are limited in extent and/or occur in low density.

4.2.3 Threatened and Migratory Fauna

The project area has habitat values for a range of native bird, reptile, and mammal species. Open forests and woodlands dominate the project area and provide habitat for woodland birds. Hollow bearing trees of various sizes throughout the project area provide habitat for various arboreal mammals and microbats, including the threatened greater glider. Boulders provide habitat for various mammals and reptile species, including Sharman's rock-wallaby.

4.2.4 Introduced Fauna

Eight introduced fauna species have been observed within the project area. Of these, the following are of special concern due to known impacts on native fauna:

- Wild dogs (*Canis familiaris*)
- Cats (*Felis catus*)
- Cane toads (*Bufo marinus*)
- Pigs (*Sus scrofa*).

4.2.5 Bushfires

The project area has been subject to a number of bushfires of the past decade¹. Qld government State Planning Policy Interactive mapping identifies the majority of the project area as a Bushfire Prone Area - Medium Potential Intensity Bushfire Intensity, with numerous smaller areas of High and Very Potential Bushfire Intensity.

4.2.6 Protected Areas

The project area lies to the west of the Wet Tropics of Queensland World Heritage Area (Wet Tropics); the separation distance is approximately 4.8 km between the Wet Tropics and the closest part of the development footprint. The project area is immediately adjacent to part of Lannercost State Forest and Girringun National Park (Mount Fox section). It is also approximately 650 m from the main section of Girringun National Park, and 23 km from Paluma National Park and Paluma State Forest (to the east). These protected areas hold a significant amount of remnant vegetation within the landscape.

4.2.7 Connectivity

The project area is predominantly covered by remnant vegetation and contains large tracts of well-connected native vegetation. The combined area of Range View Nature Reserve, Lannercost State Forest and Girringun National Park (part of the Wet Tropics World Heritage Area located approximately 4.8 km east of development footprint at its closest point) provides an important wildlife corridor within the regional landscape. The project area is broadly connected to surrounding landscapes and vegetation by a state-mapped remnant corridor (state regional ecosystem mapping v11.1), which is situated in a north to south alignment throughout the project area.

4.3 SOCIAL ENVIRONMENT

4.3.1 Gugu Badhun People

On 22 March 2005 the Gugu Badhun People (GBP) were awarded Native Title over the land on which the project will occur. The UBWF proposed development area is wholly contained within the Gugu Badhun Native Title Determination and within leasehold Lot 3198 on Crown Plan PH2177.

Windlab has conducted extensive consultations with the GBP resulting in the registration of an Indigenous Land Use Agreement (ILUA) and Ancillary Agreement with the GBP in July 2022. A Cultural Heritage Management Agreement (CHMA) was executed on 9th June 2020, providing for an agreed framework for surveys, monitoring, and mitigation measures.

¹ <https://firenorth.org.au/nafi3>

4.3.2 Current Land Use

The project area is located on the Seaview Range, approximately 65 km south-west of Ingham in North Queensland. The project area is within the Charters Towers Local Government Area and occurs on Lot 3198 on PH2177. The land is currently used for cattle grazing, with limited pasture improvement or land clearing having occurred to date. The project area is being managed consistent with an operating pastoral enterprise with limited pest and weed control being undertaken.

4.3.3 Mt Fox Community

Numerous community information sessions have been held in the Mt Fox community along with other stakeholder engagement activities. Community response to the project has been generally positive and Windlab continues to engage with the local community in respect of the development.

5 Risk Assessment

5.1 METHOD

A risk assessment for the project was undertaken to identify the potential impacts with a greater environmental risk and where assessment and management controls should be focussed. Through undertaking a risk assessment, proposed measures can be evaluated as to their expected or predicted effectiveness.

The risk assessment was undertaken using a systematic risk-based approach based on international best practice standards, including:

- AS/NZS ISO 31000:2009: Risk management - Principles and Guidelines (Standard).
- HB 158:2010: Delivering assurance based on ISO 31000:2009 Risk management – Principles and Guidelines (Handbook).
- HB 203:2012: Managing environment-related risk (Handbook).
- HB 436:2004: Risk Management Guidelines Companion to AS/NZS 4360:2004 (Handbook).

The risk assessment is depicted conceptually in Figure 5-1.

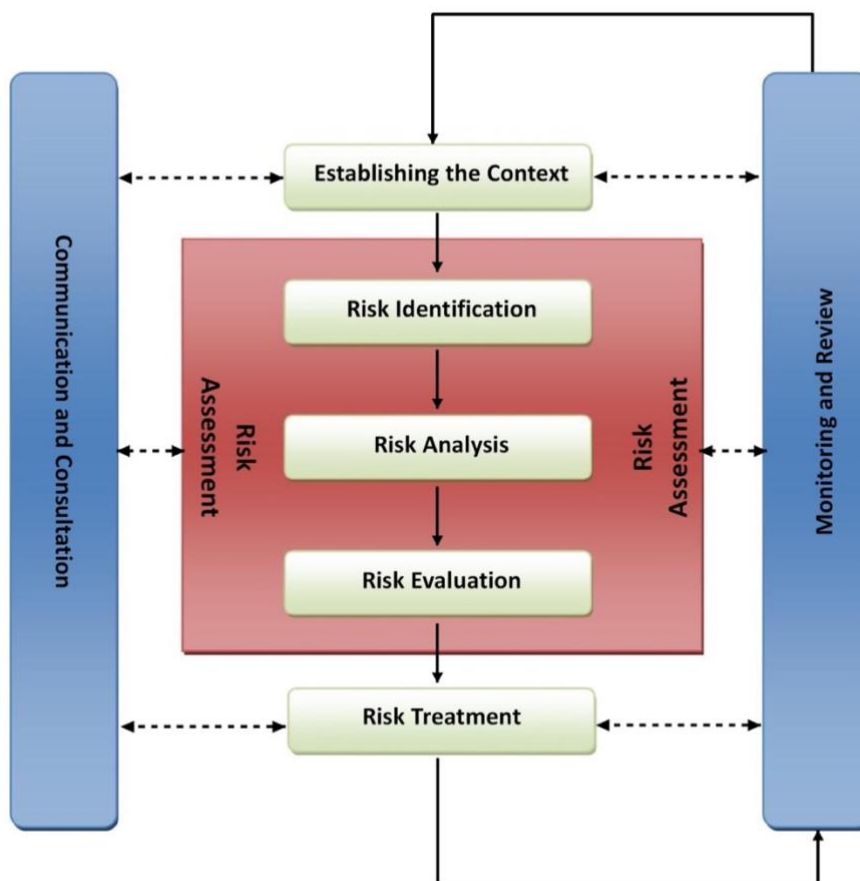


Figure 5-1: Risk assessment process

The risk assessments were conducted collaboratively between the consultants (2rog Consulting) and Windlab to identify the objectives, scope and risk criteria for the project.

The scope of the risk assessment included all activities directly related to the construction, operation and decommissioning of the project. Environmental activities² relevant to the project and considered in the risk assessment were:

- Vegetation clearing
- Excavation
- Vehicle movements
- Fire ignition
- Spills and leaks
- Dust emissions
- Light emissions
- Noise and vibration emissions
- Changes to water surface hydrology (including sedimentation and erosion)
- Weed and pest incursion
- Waste deposition
- Physical presence of infrastructure
- Increased human presence (including waste and domestic pets).

The risk ratings were determined for each combination of environmental receptor and project activity, using the definitions of consequence and likelihood detailed in Appendix B and applying the risk matrix (Table 5-1).

Table 5-1: Risk matrix

		Consequence	1	2	3	4	5
			Trivial	Minor	Severe	Major	Catastrophic
Likelihood	A	Almost Certain	Low	Intermediate	High	Extreme	Extreme
	B	Likely	Low	Low	Intermediate	High	Extreme
	C	Possible	Negligible	Low	Intermediate	High	High
	D	Unlikely	Negligible	Negligible	Low	Intermediate	High
	E	Rare	Negligible	Negligible	Negligible	Low	Intermediate

² Risks from turbine blades, collision and barotrauma, are addressed within the Bird and Bat Management Plan.

Inherent risk ratings were determined with the assumption that minimum standards would be met without the implementation of additional management controls or risk assessment. Minimum standards would include compliance with legislative and corporate requirements or with operating practices commonly used for construction and operation of wind farm in Australia. Knowledge of the likely occurrence of flora and fauna species (particularly threatened species) was addressed in the initial (pre-mitigation) risk assessment.

Management controls relevant to each inherent risk were identified, applying the management response criteria (Table 5-2) and particularly focussing on those inherent risks rated as 'intermediate' and above. Standard controls employed by the proponent in their other operations were applied initially to determine initial residual risk ratings. These ratings were further informed by impact analysis and specific project controls developed within the EMP. The ratings were revised iteratively to reduce the residual risks to as low as reasonably possible.

Table 5-2: Risk rating, risk class and associated risk management response

Rating	Risk management response
Extreme	Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention. Modify the threat, likelihood or consequence so that the risk is reduced to 'Intermediate' or lower.
High	Risks that exceed the risk acceptance threshold and require proactive management. Modify the threat, likelihood or consequence so that the risk is reduced to 'Intermediate' or lower.
Intermediate	Risks that lie on the risk acceptance threshold and require active monitoring. The implementation of additional measures could be used to reduce the risk further. Modify the threat, the likelihood or consequence to reduce the risk to 'Low' or 'Negligible' if practicable
Low	Determine the management plan for the threat to prevent occurrence and monitor changes that could affect the classification.
Negligible	Review at the next review interval Manage by routine procedures – reassess at the next review

Further details of the risk assessment methodology, and the mitigated and unmitigated risk rankings are provided in a risk register at Appendix B.

5.2 OUTCOMES

Inherent risks were highest for vegetation clearing and bushfire. Vegetation clearing has the potential to result in severe consequences for threatened species if left unmanaged. Unmanaged vegetation clearing can result in over clearing, soil erosion and sedimentation of waterways, injury and mortality to fauna, and significant degradation of habitat. If bushfires start and cannot be contained, they are likely to have widespread regional effects, due to the large areas of remnant vegetation surrounding the project area.

With the application of the management controls, the residual risk of impacts from potential impacts from bushfire was reduced to low. However, vegetation clearance retained a residual risk of intermediate for terrestrial fauna. As per Table 5-2 above, this means they lie on the risk acceptance threshold and require active monitoring.

These impacts are considered to have intermediate residual risk because:

- Even with the application of appropriate controls, terrestrial fauna habitats may be disturbed, lost and/or degraded via vegetation clearance
- Pre-clearance searches of threatened species habitats may not be 100% effective in removing animals from the clearing area prior to impacts.

These outcomes have been factored into the relevant sub-plans below. Extra vigilance and awareness of these risks is required by all staff working on the project.

6 'S.M.A.R.T' Principle

All proposed mitigation and management measures have been drafted to meet the 'S.M.A.R.T' principle:

- S – Specific
- M – Measurable
- A – Achievable
- R – Relevant
- T – Time-bound

This ensures that management objectives are clear and effective. The EMP has been broken down into sub-plans to specifically address each of the environmental values and potential impacts identified by the risk assessment. Control measures have been explicitly set out in each sub-plan specific to each activity or impact. Where species are directly impacted, species specific mitigation measures have been outlined. Sub-plans have been broken down to include management and mitigation measures for different stages of the development. This ensures that the EMP objectives remain relevant throughout the project timeline.

Each sub-plan has set management objectives which are outlined in the relevant sections below. These objectives have set targets and associated measurement criteria so that the performance of the management plan can be assessed.

An adaptive management approach will be taken to ensure that management objectives are achieved. This involves ongoing evaluation of this EMP against project performance criteria, environmental policies, objectives and targets, and will allow for continuous improvement of this management plan and an overall improvement in outcomes for native vegetation and native fauna. This plan will be reviewed periodically and updated where necessary, to incorporate best practice mitigation measures as the wind farm industry develops in Australia, and more relevantly in far-north Queensland where the project area is located.

The review process will enable:

- Identification of areas for improvement
- Investigation into non-conformances or deficiencies
- Implement corrective actions to address non-conformances or deficiencies
- Investigation into the effectiveness of previous corrective actions
- Document procedural changes.

As part of the adaptive management approach, each sub-plan has detailed monitoring and reporting requirements. These are time-specific, identify the person responsible for monitoring and recording, and are set out to measure the success of management actions and identify the need for corrective actions to be implemented. For each of these sub-plans measurable triggers are set out to accompany monitoring and recording requirements. Corrective actions and contingencies have been specified for each of these triggers to ensure that management objectives remain on target.

7 Environmental Management – Construction

The environmental management strategy for the construction phase of the UBWF project includes a series of management sub-plans.

7.1 FAUNA MANAGEMENT SUB-PLAN

7.1.1 Overview of ecological surveys

Numerous ecological investigations and surveys of the project area have been undertaken over a period of several years. An overview of surveys undertaken, and their primary purpose is outlined in Table 7-1 and discussed in detail in PER Section 2: Existing Environment and MNES. Ecological survey reports are provided as Appendices E to G of the Public Environment Report (PER).

Table 7-1: Overview of field surveys

Date	Survey	Purpose
September 2019 (late dry/early wet season) July 2020 (dry season)	Baseline field survey of project area	Gather baseline information on ecological value to inform design and environmental impact assessment. Surveys involved: <ul style="list-style-type: none"> • Desktop investigation (identify Commonwealth and State ecological values potentially present) • Targeted fauna surveys • Targeted flora and vegetation community surveys • General habitat assessments
October 2019	LiDAR assessment	To refine constraints mapping and inform targeted field survey for July 2020 early dry season survey
March – May 2022 (wet season)	Additional baseline field survey focusing on impact area	Additional baseline studies in impact area including: <ul style="list-style-type: none"> • Contemporary desktop investigation prior to field survey • Targeted searches for threatened flora • Vegetation community and RE surveys • Targeted habitat assessments • Targeted fauna surveys
March / April 2022 (wet season)	Bird Utilisation Survey (BUS) White-throated needletail survey Red goshawk survey Roaming bird survey Microbat survey	Focused on gathering site-specific data to inform Bird and Bat Management Plan and bird and bat risk assessment. Surveys timed to occur during peak migratory bird movement patterns (white-throated needletail and fork-tailed swift). Survey design informed by results of previous ecological studies.
May 2022	BioCondition Survey	BioCondition surveys within development footprint to inform offsets planning and calculations
August / September 2022	Bird Utilisation Survey (BUS) Red goshawk survey Roaming bird survey Microbat survey Masked owl survey	Focused on gathering site-specific data to inform Bird and Bat Management Plan and bird and bat risk assessment.

Table 7-2 outlines species listed as threatened or migratory under the EPBC Act or NC Act are known or have the potential to occur within the UBWF project area, based on the findings of the ecological surveys.

Table 7-2: Threatened and migratory fauna species potentially occurring in the project area

Species	NC Act Conservation Status	EPBC Act Conservation status	Presence in project area
Marsupials			
Sharman's rock-wallaby	Vulnerable	Vulnerable	Known
Koala	Endangered	Endangered ³	Known
Greater glider	Vulnerable	Vulnerable	Known
Flying-foxes			
Spectacled flying-fox	Endangered	Endangered	Known
Grey-headed flying-fox	Least concern	Vulnerable	Potential
Microbats			
Greater large-eared horseshoe bat	Vulnerable	Vulnerable	Known
Bare-rumped sheath-tail bat	Endangered	Vulnerable	Known
Diadem leaf-nosed bat	Near Threatened	Not listed	Known
Reptiles			
Atherton delma	Near Threatened	Vulnerable	Potential to occur in the project area
Birds			
Red goshawk	Endangered	Vulnerable	Known
Masked owl	Vulnerable	Vulnerable	Known
White-throated needletail	Vulnerable	Vulnerable Migratory	Known
Southern cassowary	Endangered	Endangered	Potential to occur in project area
Glossy black cockatoo	Vulnerable	Not listed	Potential to occur
Migratory species			
Fork-tailed swift	Special Least Concern	Migratory	Known
Latham's snipe	Special Least Concern	Migratory	Potential to occur in the project area, unlikely to occur in development footprint
Oriental cuckoo	Special Least Concern	Migratory	Known
Barn swallow	Special Least Concern	Migratory	Potential

³ Vulnerable at the time of Referral

Species	NC Act Conservation Status	EPBC Act Conservation status	Presence in project area
Black-faced monarch	Special Least Concern	Migratory	Potential to occur in the project area, unlikely to occur in development footprint
Spectacled monarch	Special Least Concern	Migratory	Known
Satin flycatcher	Special Least Concern	Migratory	Known
Rufous fantail	Special Least Concern	Migratory	Known
Eastern osprey	Special Least Concern	Migratory	Known

7.1.2 Fauna assemblages

A total of 51 fauna species were recorded in the project area (ELA 2020, 2022; NA 2022a, 2022b, 2022c). The potential threats to these species by the proposed wind farm development differ between species, depending on their behaviour and habitat. Fauna assemblages are provided in Table 7-3.

Table 7-3: Fauna assemblages within the UBWF project area

Assemblage	Observations
Terrestrial mammals	Sixteen species identified, including several small mammal species, eight macropod species and one monotreme. Conservation significant terrestrial mammals that were recorded included the threatened Sharman's rock wallaby and the special least-concern short-beaked echidna.
Arboreal mammals	Six arboreal mammals were detected, including the threatened species Koala and greater glider.
Reptiles	Twelve reptile species were observed on an incidental basis and included lizards, snakes and turtles.
Amphibians	Five amphibian species were observed throughout the survey area.
Pest fauna	Eight exotic fauna species were observed throughout the survey area. A high presence of feral predators such as cats and dogs were detected on remote cameras, with wild dogs also detected in acoustic recordings.

7.1.3 Fauna habitat

Eight broad habitat types were identified within the development footprint (ELA 2022) including:

- Riparian forest (hollow bearing trees, watering point and aquatic habitat, koala habitat)
- Very open woodland on metamorphic rock (koala habitat, infrequent hollow-bearing trees)
- Very open woodland on basalt plains and low hills (koala habitat, infrequent hollow-bearing trees)
- Open woodland to open forest on granite, basalt and tertiary surfaces (boulders and crevices, koala and greater glider food trees, large hollows, fruiting species)
- Open forest to woodlands on uplands (*Allocasuarina sp.* stands, dense understorey, boulders)
- Rock pavement (stacked boulders, crevices)
- Open forest with *Allocasuarina spp.* (stands of *allocasuarina*, denning habitat).

Five additional broad habitat types were identified during within the broader project area. However, these areas were found not to exist within the development footprint. These broad habitat types are:

- Floodplain
- Tussock grassland
- Simple or notophyll vine forest (rainforest) (fruiting trees, water source and aquatic habitat)
- Vine thicket (dense vegetation and rock crevices, fruiting trees)
- Melaleuca swamps (aquatic habitat, arboreal foraging habitat).

7.1.4 Potential impacts

Construction activities have the potential to impact on fauna through:

- Clearing and earthworks for construction, including in sensitive habitats (e.g. denning, roosting and foraging habitats)
- Open trench excavations for underground cabling
- Increased vehicle movement associated with construction of the wind farm
- Fire ignition
- Introduction and spread of weeds and pest species
- Spills of hydrocarbons, hazardous materials or wastewater discharges
- Noise, dust and vibration impacts.

Construction activities may result in the following impacts on terrestrial fauna, arboreal fauna that require some movement along the ground, and avifauna that rely on cover from dense understorey:

- Direct loss, degradation or fragmentation of fauna habitat
- Fauna injury or mortality from vehicle strike or entrapment
- Introduction or spread of weeds or pest species.

7.1.5 Management objectives

Environmental targets and performance indicators have been prescribed in line with fauna and habitat management objectives for the project and are identified in Table 7-4.

Table 7-4: Terrestrial fauna performance management

Issue	Objective	Target	Measurement Criteria
Direct fauna impacts	To minimise the direct impacts on fauna through impacts with vehicles, entrapment in excavation works, or extraordinary exposure to predators.	<ul style="list-style-type: none"> No deaths of conservation significant fauna as a consequence of construction activities. 	<ul style="list-style-type: none"> Environmental Incident Reports for fauna encounters. Daily fauna clearance reports (whilst works occurring in habitat areas). No. incidents of vehicle speeds exceeded on access roads.
Fauna habitat decline	To minimise the temporary and permanent reduction or degradation of existing fauna habitat.	<ul style="list-style-type: none"> Total area of threatened fauna habitat cleared by completion of construction shall not exceed areas approved within the EPBC Act approval conditions There will be no ongoing decline in condition of surrounding habitat areas. 	<ul style="list-style-type: none"> All activities undertaken within the boundaries of the approved project area and limits of the native vegetation clearing permits and EPBC approval. Conformance with the conditions of the native vegetation clearing permit and EPBC approval.

7.1.6 Management measures

A range of control measures to reduce the potential for impacts on terrestrial fauna and fauna habitat are provided in Table 7-5.

Table 7-5: Measures that will be implemented to avoid and manage impacts from construction and activities

Parameter	Control measures	Responsibility
General	<ul style="list-style-type: none"> All staff will attend site inductions prior to commencing works and daily toolbox talks. The site inductions and Toolbox talks will include environmental requirements, notices and special attention areas. All environmental requirements, risks and measures will also be reflected in the relevant safe work methods statement (SWMS) Smoking will be prohibited on site. 	Construction contractor
Feral predators	<ul style="list-style-type: none"> Pets including dogs will be prohibited on site Feeding of wild dogs and feral cats is prohibited Manage pits and trenches to prevent entrapment (refer Open trench excavations). 	Construction contractor
Vegetation clearing	<ul style="list-style-type: none"> Vegetation clearing is only permitted in approved areas Micro-siting of infrastructure will prioritise the use of already cleared or disturbed areas, in preference of vegetated areas The extent of vegetation clearing will be clearly marked on construction plans and in the field prior to clearing commencing to ensure only approved vegetation is cleared 	Construction contractor

Parameter	Control measures	Responsibility
	<ul style="list-style-type: none"> • No go zones and areas of high conservation significance will be marked with high visibility fencing or flagging. Identification of such areas, will be undertaken by a suitably qualified ecologist or fauna spotter-catcher • Where possible, fencing shall be erected to align with the Tree Protection Zones of trees to be retained (refer AS 4970-2009 <i>Protection of Trees on Development Sites</i>) • Vehicle movement and storage of machinery to be excluded from Tree Protection Zones of trees to be retained • Any fencing or flagging material must be maintained in good condition and replaced as soon as practical if damaged/removed to reduce the potential for accidental clearing • All fencing must be fauna friendly unless specifically erected to exclude fauna from trenches/pits etc • Where infrastructure must cross waterways, areas of existing disturbance (i.e. existing tracks) have been selected. Where this is not practical, vegetation clearing will be minimised as much as practicable (targeting 10 – 20 m clearing widths) and large habitat trees will be preferentially retained • If works occur outside the approved area, an incident investigation will be undertaken as soon as possible and appropriate controls instated in response • Clearing will be undertaken sequentially • Fauna spotter-catchers and/or suitably qualified ecologist will be present during all clearing. This will involve pre-clearance searching of key habitat areas (e.g. hollow bearing trees, rock piles, large logs) prior to clearing and relocating any fauna to a suitable and safe relocation area • Wherever possible, key fauna habitat features will be retained including hollow bearing trees (especially in habitat for greater glider, masked owl, and greater large-eared horseshoe bat habitat) and logs and coarse woody debris (as close to felling location as possible, without presenting a safety or fire risk) • Cleared vegetation (including topsoil) must not be located within the dripline of retained trees, pushed up or stored against fences/flagging or within 50 m of waterways • Any cleared vegetation stockpiled for more than 24 hours should be inspected for sheltering fauna, by fauna spotter prior to moving and/or mulching • Rehabilitation of temporary construction areas will be undertaken sequentially and as soon as possible after the completion of works 	
Vehicle movement and operation of machinery	<ul style="list-style-type: none"> • All machinery will be inspected daily prior to use for sheltering fauna • Access tracks will be appropriately designed to cater for the size of vehicle required • Unauthorised off-road driving will be prohibited • Speed limits will be imposed on all vehicles to minimise the risk of fauna strike • Major machinery movement will be limited to daytime hours (as far as practical) to avoid disturbance to nocturnal species • Roadkill will be dragged at least 10 m sideways, away from the edge of the track where possible to prevent vehicle strike of birds (or other fauna) that feed on the roadkill 	Construction contractor

Parameter	Control measures	Responsibility
	<ul style="list-style-type: none"> All injured wildlife will be managed using the injured fauna protocol (see Appendix A: Injured animal Protocol) 	
Open trench excavations	<ul style="list-style-type: none"> Trench excavations will be backfilled as soon as possible Trench excavations will be fenced to prevent fauna entry Fauna spotter catchers will inspect trenches a minimum of twice daily (more on hot days) and release any fauna that are trapped in a safe and suitable relocation area Open excavations will contain fauna escape structures – such as fauna ladders, ramps dug into the side of the excavation, and shelters (e.g., hessian sacks) for fauna that cannot self-disperse out of the excavation 	Construction contractor
Habitat disturbance via light, noise and vibration	<ul style="list-style-type: none"> Site lighting will be kept to the minimum required for safety (incl. security). Placement and orientation of lighting will be away from sensitive fauna habitats Direction of lighting beams will be downwards or shields/baffles used to minimise light spill into habitat area All vehicles must comply with maintenance schedules and standard operational requirements to minimise noise impacts All vehicles and machinery will be switched off when not in use Major machinery movement will be limited to daytime hours (as far as practical) to avoid disturbance to nocturnal species 	Construction contractor
Habitat degradation from compaction, dust, run-off & sedimentation, spills, weeds	<ul style="list-style-type: none"> The Erosion and Sediment Control sub-plan will be implemented The Hazardous Materials Spill Response Management sub-plan will be implemented The Weed & Pest Management sub-plan will be implemented All vehicles will stay on designated tracks Dust suppression will be undertaken as required Weather conditions will be monitored and temporary controls implemented during extreme events. This may include ceasing construction during adverse weather conditions that have the potential to significantly increase risks from dust, runoff or sedimentation The duration of instream works will be minimised as far as possible to reduce the potential for sedimentation 	Construction contractor
Fire	<ul style="list-style-type: none"> Smoking will be prohibited on site No hot works when fire bans are in effect If controlled burns or other fire management is required, the ecological requirements of relevant species will be considered, including Sharman's rock-wallaby, greater glider, koala, red goshawk, masked owl 	Construction contractor

7.1.7 Species specific mitigation measures

A number of species-specific management measures will also be implemented in addition to measures outlined in section 7.1.6. Species specific management measures are outlined in Table 7-6 below.

Table 7-6: Species specific mitigation measures

Species	Mitigation Measure
Sharman's rock-wallaby	<ul style="list-style-type: none"> Establish no-go zones around occupied rock pile habitats* (min 220m⁴) (refer to Section 7.1.7.1 for details) Access to occupied rock pile habitat is prohibited Excavations which are to be left open overnight located within 500m⁵ of a known colony are to have temporary fencing erected or covered Excavations which are to be left open overnight located within 500m of a known colony are to have ramp or plug a minimum of every 50m Prioritise rehabilitation of temporary construction areas within 500m of known colonies Undertake a monitoring and control program for feral predators (cat/dog) across disturbance areas and particularly within 500m of known colonies (refer Section 7.11)
Koala	<ul style="list-style-type: none"> Undertake a monitoring and control program for feral predators (cat/dog) across disturbance areas particularly and riparian zones (refer Section 7.11)
Greater glider	<ul style="list-style-type: none"> Minimise clearing of hollow bearing trees in greater glider habitat Avoid clearing of hollow bearing trees that have been identified as being used for denning/roosting (den trees) during pre-clearance surveys Where den trees cannot be avoided, install three greater glider nest boxes for every den tree removed within the immediate vicinity Install glider poles as outlined in Section 7.1.7.2 The use of barbed wire will be prohibited unless otherwise required by legislation or specific industry standards (e.g. relating to sub-station security) Undertake a monitoring and control program for feral predators (cat) across disturbance areas and particularly within known glider locations (refer Section 7.11).
Flying-foxes	<ul style="list-style-type: none"> No flying-fox roosting camps are known to be present but they have the potential to occur. If a camp is discovered, stop work, reassess impact, and develop site-specific management plan, or ensure development footprint/disturbing activities do not encroach camp or surrounds (within 200 m of camp) The use of barbed wire will be prohibited unless otherwise required by legislation or specific industry standards (e.g. relating to sub-station security)
Bare-rumped sheathtail	<ul style="list-style-type: none"> Minimise impacts to potential roost habitat including creek banks and rock piles The use of barbed wire will be prohibited unless otherwise required by legislation or specific industry standards (e.g. relating to sub-station security)
Greater large-eared horseshoe bat	<ul style="list-style-type: none"> Minimise removal of large trees with basal hollows in greater large-eared horseshoe bat habitat Undertake a monitoring and control program for feral predators (cat) across disturbance areas, especially riparian zones (refer Section 7.11).
Red goshawk	<ul style="list-style-type: none"> Pre-clearance surveys targeting potential nest trees must be undertaken prior to clearing. Surveys are required in all works areas within 1km of permanent water, with particular focus on tall emergent trees Any nest trees detected must be avoided and a 400 m permanent exclusion zone applied to turbine placement Clearing within 4 km of confirmed nest trees must not remove more than 25% of habitat within the area⁶

⁴ A study by Hayes (2019) found 220m the average foraging distance from shelter sites

⁵ A study by Hayes (2019) found 500m the average maximum foraging distance from shelter sites

⁶ Fledgling success significantly drops (33% success rate compared to 77% success rate) when greater than 25% of species home range habitat is cleared (Baker-Gabb 2009)

Species	Mitigation Measure
Masked owl	<ul style="list-style-type: none">Minimise removal of large hollow-bearing trees in masked owl habitat

7.1.7.1 *Sharman's rock wallaby*

Prior to clearing vegetation, pre-clearing surveys will be undertaken, within the development footprint and within 220m of the development footprint, to identify the presence and the physical extent of occupied rock pile habitats. Rock pile habitats are those with a complex structure of stacked granite boulders as illustrated in **Error! Reference source not found.**, and less complex rocky outcrops as illustrated in Plate 7-2.

Occupied rock piles are those boulder stacks and rocky outcrops with confirmed presence of Sharman's rock wallaby. The species presence will be determined through either:

- Observation of the species during pre-clear surveys
- Observation of potential scats with follow-up placement of camera traps to confirm Sharman's rock wallaby presence. Camera traps will remain in place for 14 nights (as per Venz & Rowland 2013).



Plate 7-1: Complex stacked boulder habitat



Plate 7-2: Less complex rocky outcrops

Where occupied rock pile habitat is confirmed within approved development footprint or within 220m of development footprint, the following is to be undertaken prior to clearing and disturbance:

1. The outer extents of the occupied rock pile habitat are to be mapped by hand-held GPS by project ecologist
2. The Proponent will overlay the approved development footprint with the mapped extents of the occupied rock piles
3. The Proponent will refine development footprint in consultation with project ecologist to locate all clearing and construction works for UBWF to a minimum of 220m from occupied rock piles⁷
4. Areas within 220m of an occupied rock pile will be designated a no-go zone, demarcated with temporary fencing erected⁸ as specified in Table between development footprint and occupied rock pile habitat
5. Signage shall be attached to the fencing at 20m intervals⁹ clearly identifying it is a no-go zone for all construction activities and personnel as follows: 'No Unauthorised Access – Threatened Species Protection', words to be large and clear enough to be read at a distance of 5m
6. No clearing and construction works will commence until the installation of the fencing and signage and approved by project ecologist
7. All fencing and signage must be removed at the end of construction.

⁷ Project ecologist to review updated layout with respect to other ecological constraints (eg. threatened flora habitat)

⁸ By Principal Contractor - Site manager in consultation with Project Manager (UBWF) and project ecologist

⁹ By Principal Contractor in consultation with Project Manager (UBWF)

7.1.7.2 *Greater glider*

A Greater Glider Monitoring and Management Plan (GGMMP) will be prepared by a fauna ecologist prior to construction commencing for UBWF. The GGMMP will consist of two main elements – an impact mitigation plan and a five-year monitoring program.

The intended outcomes from the implementation of the GGMMP are as follows:

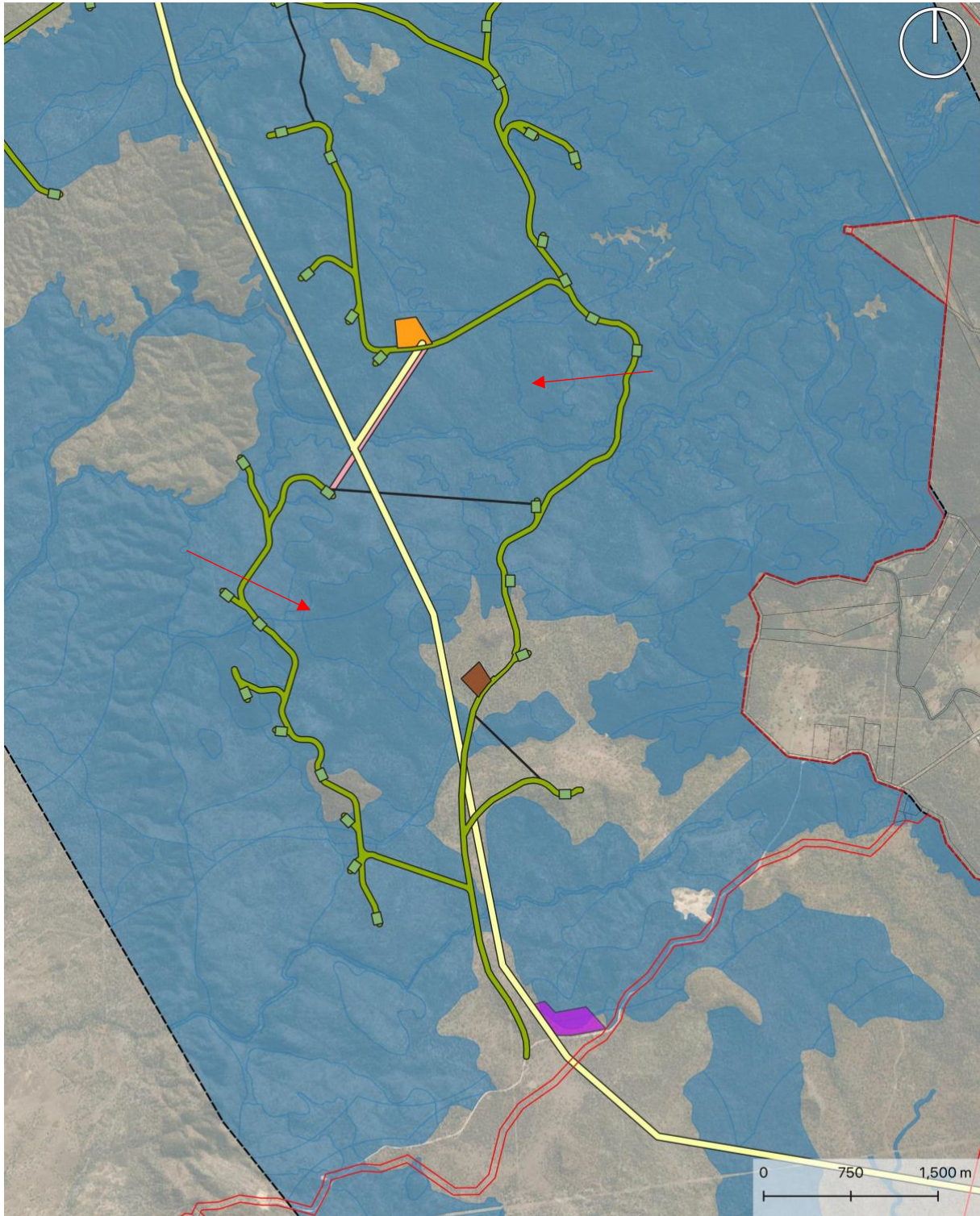
- Continued presence of greater glider within ‘islands’ created by transmission line and access track construction (refer Figure 7-1)
- Movement of greater glider into and out of ‘islands’.

Mitigation measures to be detailed in the GGMMP and implemented include:

- Minimise clearing for transmission lines and access tracks through detailed design and micro-siting during construction
- Maximise the span of transmission lines where topography and construction constraints allow for the retention of canopy vegetation and habitat connectivity
- Targeted surveys focussed on habitat areas within and adjacent ‘islands’ prior to clearing. Surveys to build upon previous ecological baseline and targeted surveys undertaken during the project approval process, to ascertain greater glider presence
- Glider pole installation plan developed, informed by targeted surveys and species ecology, for glider pole installation adjacent to access tracks, in areas of glider activity within and/or adjacent ‘islands’
- Installation of glider poles as soon as practicable after the construction of access tracks and turbine installation
- Targeted revegetation to reduce access track width outside operational footprint at ‘island’ locations, where surveys indicate greater glider activity
- Where den trees cannot be avoided, install three greater glider nest boxes for every den tree removed within the immediate vicinity.

Five-year monitoring program to include:

- Commencement within 6 months post-clearing, annual monitoring undertaken to assess greater glider continued presence within ‘island areas’ post-clearing
- Monitoring and assessment of glider pole use (eg. camera traps) including for movement across tracks
- Monitoring and assessment of greater glider nest box utilisation.



Legend

- | | |
|--------------------------------|----------------------------------|
| Project Cadastral Boundary | Layout |
| Survey Area | Proposed Transmission Easement |
| Greater glider Habitat | Proposed Overhead Lines Easement |
| Foraging and denning / shelter | 33kV Reticulation Easement |
| | Access Roads Corridor 50m wide |

Coordinate System: GDA 1994 MGA Zone 55s

Service Layer Credits: Source: QSpatial, QLD Gov; Google Earth

Figure 7-1: Example of 'islands' (refer red arrows) created through construction of access tracks and transmission line

7.1.8 Monitoring and Recording

The monitoring program for fauna and habitat has been designed to ensure that construction of the project is consistent with the control measures (Table 7-7). Monitoring will measure the success of these actions and the need for corrective actions to be implemented.

Table 7-7: Monitoring and recording requirements

Monitoring	Details	Timing	Responsibility	Records
Weather conditions	Ensure predicted conditions are suitable for works; implement any additional adverse weather controls	Daily & ongoing	Construction Contractor	Daily environment checklist
Implementation of mitigation measures	Ensure all of the above listed mitigation measures are being implemented effectively	Weekly & ongoing	Construction Contractor	Weekly environment checklist
Habitat boundary demarcation review	Inspection of adequacy of demarcation of all approved boundaries; ensure all flagging & fencing is in good condition	Weekly	Construction Contractor	Weekly environment checklist
Habitat clearing	Record the location, date of clearing and total hectares of all habitat clearing; ensure cumulative totals tracked against approved limits	Ongoing	Construction Contractor	Disturbance limits register Event report
Pre-clearing & fauna recovery	Record methods & outcomes of all preclearing surveys undertaken by spotter-catchers, including any fauna recovery incidents	Ongoing	Construction Contractor; lead spotter catcher	Pre-clearing inspection report
Analysis of Incident Trends	Analyse incidents reported for any non-compliances, incidents (including unauthorised clearing or fauna injury/fatality)	Monthly	HSE Manager	Incident report

At a minimum, monitoring records should contain the following information:

- Date and time of monitoring event
- Name of personnel performing monitoring
- Features being monitored
- Outcomes of monitoring and details of compliance / non-conformance
- Requirement for corrective actions
- Photographic records detailing evidence of monitoring.

Results of monitoring will be recorded and maintained by the construction contractor and will be made available to relevant agencies upon request.

7.1.9 Corrective Actions and Contingencies

Where required contingency actions will be implemented, as outlined in Table 7-8.

Table 7-8: Corrective actions and contingencies

Trigger	Action
Injury or death of conservation significant vertebrate fauna as a result of vehicle collision, or other project activity.	<ol style="list-style-type: none"> 1. Investigate cause. 2. Undertake appropriate remedial action (e.g. contacting a nominated carer to assess possible rescue and rehabilitation of the animal) as required. 3. Report as an incident 4. Revise procedures and education / induction programs as required to prevent reoccurrence. 5. Collate reports of any such incidents for reporting
Marked habitat clearing boundary not in accordance with approvals.	<ol style="list-style-type: none"> 1. Stop work in relevant area. 2. Investigate and complete an incident report 3. Implement corrective actions, including the amendment of clearing boundaries.
Habitat clearing outside the approved area is identified.	<ol style="list-style-type: none"> 1. Stop work in relevant area. 2. Investigate and complete an incident report. 3. Report to regulators as required (with notice of proposed corrective action). 4. Implement corrective actions, including rehabilitation where required.
A new threatened species not previously recorded, is found within the project area.	<ol style="list-style-type: none"> 1. Stop work in immediate area if animal is still in construction area. 2. Allow opportunity for animal to leave construction area or where appropriate allow a qualified fauna handler to relocate to adjacent habitat. 3. Recommence work within minimum works area. 4. Assess likely extent of habitat for threatened species. 5. Investigate opportunities to prevent or minimise the impact to recorded fauna such as evaluating potential to relocate temporary construction areas, access roads, camps or any other infrastructure that there is potential to shift at this stage of planning or construction. 6. Indicate 'no-go' areas / habitats to be avoided through flagging / repegging.

7.2 VEGETATION MANAGEMENT SUB-PLAN

7.2.1 Overview of Ecological Surveys

Numerous ecological investigations and surveys of the project area have been undertaken over a period of several years. An overview of surveys undertaken, and their primary purpose is outlined in Table 7-1 in section 7.1.1 above and discussed in detail in PER Section 2: Existing Environment and MNES. Ecological survey reports are provided as Appendices E to G of the Public Environment Report (PER).

The flora assessment included ground-truthing of State Regional Ecosystem (RE) mapping across the survey area. Data on vegetation characteristics (floristic and structural form), ecological condition and extent of the vegetation communities was collected via two methods - secondary and quaternary assessments, in accordance with Nelder et.al. (2019, 2020; ELA 2020, 2022). Sites were selected to sample as many mapped REs as possible, within time and access constraints (ELA 2020).

Targeted searches for threatened flora species were also undertaken across the survey area based on desktop survey results and known habitat preferences. Incidental observations of weed species across the survey area were recorded (ELA 2020, 2022).

7.2.2 Vegetation Communities and Regional Ecosystems

Most of the area (>97%) is mapped as Category B - remnant vegetation with small areas (<3%) of Category C – high value regrowth vegetation and Category X – other areas.

A total of 69 Regional Ecosystems (RE) have been ground-truthed in the survey area. Of these, 36 (including multiple vegetation associations within singular REs, eg. 7.12.29a and 7.12.29b) are likely to be impacted by the development.

The condition of the vegetation was found to be generally high, with relatively small areas of poor condition vegetation near roads, watercourses and some farm dams. The area has been grazed by domestic stock for about 100 years, and there has been some localised timber extraction for local building purposes. Fire management (whether deliberate or accidental) has maintained mosaics of time-since-fire patches of vegetation that afford a broad range of habitats for wildlife. However, some invasive weeds are very widespread throughout the project area (see Section 7.3).

No Threatened Ecological Communities were confirmed in the project area.

7.2.3 Threatened Flora

One threatened flora species, listed under the NC Act, was detected within the survey area but lies outside the proposed clearing footprint. *Commersonia reticulata* (Byttneriaceae, syn. *Androcalva reticulata*) was found in two populations in RE 9.12.2/9.12.1a. Populations were comprised of approximately 50 and 20 plants respectively, both in single dense clusters (probably from suckering (Guymer 2005)). This species is Vulnerable under the NC Act and has only been recorded from four localities in North Queensland. The occurrence in the survey area lies between the southernmost known locations (Hervey and High Ranges west of Townsville) and in Girringun National Park. This species was not returned in the results of the desktop searches.

A number of other threatened flora species may occur but have not been detected during surveys to date (Table 7-9).

Table 7-9: Threatened flora species potentially occurring in the project area

Scientific Name	Common Name	NC Act Status	EPBC Act Status
<i>Acacia longipedunculata</i>	-	NT	-
<i>Acacia tingoorensis</i>	Tingoorensis wattle	V	-
<i>Commersonia reticulata</i>	-	V	-
<i>Corchorus subargenteus</i>	-	V	-
<i>Corybas cerasinus</i>	Red helmet orchid	NT	-
<i>Corymbia leptoloma</i>	Yellowjacket	V	V
<i>Cycas platyphylla</i>	-	V	V
<i>Dichanthium setosum</i>	Bluegrass	-	V
<i>Drosera adela</i>	Sundew	NT	-
<i>Glossocardia orthochaeta</i>	-	E	-
<i>Homoranthus porteri</i>	-	V	V
<i>Marsdenia brevifolia</i>	-	V	V

Scientific Name	Common Name	NC Act Status	EPBC Act Status
<i>Phaius pictus</i>	-	V	V
<i>Phalaenopsis amabilis</i> subsp. <i>rosenstromii</i>	Native moth orchid	E	E
<i>Rhomboda polygonoides</i> (syn. <i>Zeuxine polygonoides</i>)	Velvet jewel orchid	V	V

7.2.4 Potential Impacts

Planning for the UBWF has included detailed assessments of environmental risks. The locations of turbines and roads have been selected to avoid sensitive environmental assets as far as possible, including Of Concern REs, Essential Habitat, Protected Plant High Risk Areas. However, practicalities of turbine installation, access and landholder requirements mean some impacts to Regulated Vegetation may be unavoidable.

Potential impacts to vegetation from the UBWF include:

- Clearing including removal of trees, shrubs and ground covers
- Reduction in flora habitat (amount and diversity)
- Fragmentation of vegetation communities
- Introduction and spread of invasive weeds and pathogens
- Local erosion and sedimentation of waterways and associated riparian vegetation.

The area of clearing of Regulated Vegetation required by the construction footprint is 766 ha.

Areas of each Vegetation Management (VM) Act class of vegetation and major vegetation types to be cleared for construction are given in Table 7-10.

Table 7-10: Areas of each vegetation class proposed to be cleared

Class	Total Area of Property (ha)	UBWF Clearance Area (ha)	% of Total Clearance Area
VM Act status			
Endangered	89	0	0
Of Concern	2,505	89	3.5
Least Concern	47,914	677	1.4
Total	50,508	766	1.5

7.2.5 Management objectives

Environmental targets and performance indicators have been prescribed in line with flora and vegetation management objectives for the project, identified in Table 7-11.

Table 7-11: Flora and vegetation performance management

Issue	Objective	Target	Measurement Criteria
Disturbance to native vegetation	Minimise and manage disturbance to native vegetation particularly sensitive vegetation communities (of concern REs) and hollow-bearing trees (HBTs)	<ul style="list-style-type: none"> Total area of native vegetation to be cleared not to exceed 769 ha Removal of 'of concern' REs is reduced to as low as possible Removal of HBTs is minimised No contravention of vegetation clearing permits or EPBC approval specifying spatial limits to vegetation clearing 	<ul style="list-style-type: none"> Conformance with spatial delineation of approved vegetation clearance
Potential presence of threatened flora	Confirm threatened flora species do not occur within development footprint	<ul style="list-style-type: none"> Pre-clearance flora surveys are undertaken within potential threatened flora habitat within development footprint¹⁰ 	<ul style="list-style-type: none"> No threatened flora species are cleared without prior understanding and approvals in place
Conservation of threatened flora species	Minimise the disturbance to or removal of threatened flora species and communities	<ul style="list-style-type: none"> No disturbance to or removal of threatened flora species or communities other than that approved. 	<ul style="list-style-type: none"> Conformance with requirements for approval to interfere with threatened flora species

7.2.6 Management measures

A range of control measures to reduce the potential for impacts on vegetation and flora are provided in Table 7-12.

Table 7-12: Measures to be implemented to avoid and manage impacts from construction activities

Parameter	Control measures	Responsibility
General	<ul style="list-style-type: none"> All staff will attend site inductions prior to commencing works and daily toolbox talks. The site inductions and Toolbox talks will include environmental requirements, notices and special attention areas. All environmental requirements, risks and measures will also be reflected in the relevant work SWMS Smoking will be prohibited on site Pets including dogs will be prohibited on site. 	Construction contractor
Vegetation clearing	<ul style="list-style-type: none"> Vegetation clearing is only permitted in approved areas 	Construction contractor

¹⁰ A pre-clearance survey does not preclude the requirements of the NC (Plants) Regulation 2020 Protected Plant Flora Survey Guidelines

Parameter	Control measures	Responsibility
	<ul style="list-style-type: none"> • Undertake pre-clearing surveys where threatened flora habitat is located with development footprint • Micro-siting of infrastructure will prioritise the use of already cleared or disturbed areas, in preference of vegetated areas • The extent of vegetation clearing will be clearly marked on construction plans and in the field prior to clearing commencing to ensure only approved vegetation is cleared • No go zones and areas of high conservation significance will be marked with high visibility fencing or flagging. Identification of such areas, will be undertaken by a suitably qualified ecologist or spotter-catcher • Where possible, fencing shall be erected to align with the Tree Protection Zones of trees to be retained (refer AS 4970-2009 <i>Protection of Trees on Development Sites</i>) • Vehicle movement and storage of machinery to be excluded from Tree Protection Zones • Any fencing or flagging material must be maintained in good condition and replaced as soon as practical if damaged/removed to reduce the potential for accidental clearing • All fencing must be fauna friendly unless specifically erected to exclude fauna from trenches/pits etc • Where infrastructure must cross waterways, areas of existing disturbance (i.e. existing tracks) have been selected. Where this is not practical, vegetation clearing will be minimised as far as practicable (targeting 10 – 20 m clearing widths) and large habitat trees will be preferentially retained • If works occur outside the approved area, an incident investigation will be undertaken as soon as possible and appropriate controls instated in response • Clearing will be undertaken sequentially • Unless used for habitat features (e.g. large woody debris), vegetation will be mulched and stockpiles will be respread or mulched and respread on areas of disturbed ground • Mulching of weeds should be avoided, where not possible mulch piles should be left to age for 6 months, weeds being treated as they appear, prior to use • Cleared vegetation (including topsoil) must not be located within the dripline of retained trees, pushed up or stored against fences/flagging or within 50 m of waterways • Rehabilitation of temporary constructions areas will be undertaken sequentially and as soon as possible after the completion of works 	
Weeds	<ul style="list-style-type: none"> • The Weed Management sub-plan will be implemented. The plan will include the provisions listed in Section 7.3 below as minimum requirements. 	Construction contractor

Parameter	Control measures	Responsibility
Habitat degradation from compaction, dust, run-off & sedimentation, spills	<ul style="list-style-type: none"> The Erosion and Sediment Control sub-plan will be implemented The Hazardous Materials Spill Response Management sub-plan will be implemented All vehicles will stay on designated tracks Dust suppression will be undertaken as required Weather conditions will be monitored and temporary controls implemented during extreme events. This may include ceasing construction during adverse weather conditions that have the potential to significantly increase risks from dust, runoff or sedimentation The duration of instream works will be minimised as far as possible to reduce the potential for sedimentation 	Construction contractor
Fire	<ul style="list-style-type: none"> Smoking will be prohibited on site No hot works when fire bans are in effect If controlled burns or other fire management is required, the ecological requirements of relevant species will be considered, including Sharman's rock-wallaby, greater glider, koala, red goshawk, masked owl 	Construction contractor

7.2.7 Monitoring and recording

The monitoring program for vegetation and flora species has been designed to ensure construction of the project is consistent with the control measures (refer to Table 7-13). Monitoring will measure the success of these actions and the need for corrective actions to be implemented.

Table 7-13: Monitoring and recording requirements

Monitoring	Details	Timing	Responsibility	Records
Weather conditions	Ensure predicted conditions are suitable for works; implement any additional adverse weather controls	Daily & ongoing	Construction Contractor	Daily environment checklist
Implementation of mitigation measures	Ensure all of the above listed mitigation measures are being implemented effectively	Weekly & ongoing	Construction Contractor	Weekly environment checklist
Vegetation clearing boundary demarcation review	Inspection of adequacy of demarcation of all approved boundaries; ensure all flagging & fencing is in good condition	Weekly	Construction Contractor	Weekly environment checklist
Vegetation clearing	Record the location, date of clearing and total hectares of all vegetation clearing; ensure cumulative totals tracked against approved limits	Ongoing	Construction Contractor	Disturbance limits register Event report

Monitoring	Details	Timing	Responsibility	Records
Analysis of Incident Trends	Analyse incidents reported for any non-compliances, incidents (including unauthorised clearing)	Monthly	HSE Manager	Incident report

At a minimum, monitoring records should contain the following information:

- Date and time of monitoring event
- Name of personnel performing monitoring
- Features being monitored
- Outcomes of monitoring and details of compliance / non-conformance
- Requirement for corrective actions
- Photographic records detailing evidence of monitoring.

Results of monitoring will be recorded and maintained by the construction contractor and will be made available to relevant agencies upon request.

7.2.8 Corrective actions and contingencies

Where required contingency actions will be implemented, as outlined in Table 7-14.

Table 7-14: Corrective actions and contingencies

Trigger	Action
Marked vegetation clearing boundary not in accordance with approvals.	<ol style="list-style-type: none"> 1. Stop work in relevant area. 2. Investigate and complete an incident report 3. Implement corrective actions, including the amendment of clearing boundaries.
Vegetation clearing outside the approved area is identified.	<ol style="list-style-type: none"> 1. Stop work in relevant area. 2. Investigate and complete an incident report. 3. Report to regulators as required (with notice of proposed corrective action). 4. Implement corrective actions, including rehabilitation where required.
Weed outbreaks	<ol style="list-style-type: none"> 1. Infestations are identified and mapped 2. Source of infestation is investigated and addressed 3. Infestations are controlled via appropriate use of herbicide or other control techniques 4. Implement any rehabilitation as required.

7.3 WEED MANAGEMENT SUB-PLAN

7.3.1 Weed presence

A number of weed species were recorded across the project area. Most are limited in extent and/or occur in low density. Those that present a risk within the project area include weeds that are:

- Widespread across the project area
- Present in high densities within the project area

- Recognised by Commonwealth, State or local government as presenting risks.

These are listed in Table 7-15 below.

Table 7-15: Invasive weeds recorded in the project area

Species	Common name	Biosecurity Act restricted matter class	WoNS ¹¹	Local govt status	Occurrence	Relative density
<i>Bidens pilosa</i>	Cobbler's pegs	N/A	No	N/A	widespread	low
<i>Lantana camara</i>	Lantana	3	Yes	priority	widespread	low to high
<i>Macroptilium atropurpureum</i>	Siratro	N/A	No	N/A	widespread	low
<i>Megathyrus maximus</i>	Guinea grass	N/A	No	N/A	widespread	moderate
<i>Melinis repens</i>	Red Natal grass	N/A	No	N/A	widespread	low
<i>Mesosphaerum suaveolens</i>	Hyptis	N/A	No	N/A	widespread	high
<i>Praxelis clematidea</i>	Praxelis	N/A	No	N/A	very widespread	moderate
<i>Senna obtusifolia</i>	Sicklepod	N/A	No	priority	limited	low
<i>Side rhombifolia</i>	Paddy's lucerne	N/A	No	N/A	widespread	
<i>Sphagneticola trilobata</i>	Singapore daisy	N/A	No	priority	limited	low
<i>Sporobolus jacquemontii</i>	American rat's tail grass	3	Yes	environmental	limited	low
<i>Stylosanthes hamata</i>	Caribbean stylo	N/A	No	N/A	widespread	low
<i>Stylosanthes humilis</i>	Townsville stylo	N/A	No	N/A	widespread	low
<i>Themeda quadrivalvis</i>	Grader grass	N/A	No	N/A	limited	high

7.3.2 Environmental activities to be managed

Construction activities have the potential to introduce or disperse weeds through the following aspects of the project:

- Vegetation clearing
- Excavation and earthworks for construction

¹¹ Weeds of national significance

- Vehicle and personnel movements
- Fire ignition
- Physical presence of infrastructure.

7.3.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Increased infestations of existing weed species in the project area
- Introduction of new weed species in the project area
- Degradation of vegetation communities
- Degradation of fauna habitat
- Increased fire fuel load and more intense fires.

This sub-plan addresses management of impacts from weeds. Weed management protocols also address the introduction and spread of pathogens including myrtle rust. The management approach for vegetation is outlined in the Vegetation management sub-plan and fire is outlined in the Bushfire sub-plan.

7.3.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with weed management objectives for the project, as indicated in Table 7-16.

Table 7-16: Weeds performance management

Issue	Objective	Target	Measurement Criteria
Introduction of new weeds	Minimise the potential for new weeds to be introduced into the project area.	<ul style="list-style-type: none"> • No new species of weeds recorded in the project area within 2 years of completion of construction • Compliance with the <i>Biosecurity Act</i>. 	Species of weed recorded in the project area. No non-compliance with <i>Biosecurity Act</i> and internal weed hygiene procedures.
Spread of existing weeds	Minimise the risk of spreading existing weeds within the project area and to adjacent areas.	<ul style="list-style-type: none"> • No significant change to the extent and distribution of existing weeds within 2 years of completion of construction. • Compliance with the <i>Biosecurity Act</i>. 	Number of recorded locations of weed infestation in project database. Extent of weed cover at recorded locations.

7.3.5 Management measures

The construction contractor will be responsible for preparation of a Weed Management Plan. The Weed Management Plan will include hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation. The Weed Management Plan will include protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density.

The minimum weed management requirements for this plan are outlined in Table 7-17 below.

Table 7-17: Weed control measures

Parameter	Control measures	Responsibility
Weed extent	<ul style="list-style-type: none"> A weed survey will be undertaken to confirm the initial extent of weeds on site, including the extent of weeds that present a risk within the project area, as listed above Weed mapping conducted prior to construction to identify a baseline and to identify all major infestations that intersect with the construction footprint 	Construction contractor
Declared weed control	<ul style="list-style-type: none"> Declared weeds within construction footprint will be treated or removed prior to the commencement of construction. New weed infestation shall be treated at the earliest stage while small and manageable Treatment options must follow published advice e.g. weed control fact sheets published by Queensland Department of Agriculture and Fisheries (https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets) 	Construction contractor
Chemical use and storage	<ul style="list-style-type: none"> Will be restricted to approved uses only, following manufacturers' instructions Herbicides will be stored in an appropriate manner Only wildlife-friendly herbicides will be used Herbicide will not to be sprayed near creeks or dams or within two days of rain 	Construction contractor
Vehicle entry	<ul style="list-style-type: none"> Must carry a current weed hygiene certificate from an accredited inspection station. Vehicles re-entering the site will not need a new certificate if they have only been used on formed roads (gravel and bitumen) Temporary vehicle washdown station should be established close to the construction site as the nearest facility is in Ingham Vehicles must use designated tracks only 	Construction contractor
Fill and other imported materials	<ul style="list-style-type: none"> Weed-free declaration certificate required for imported fill Log to record all material imported on site required Log is to include material description, quantity, source and deposition at the site 	Construction contractor
Exposed areas	<ul style="list-style-type: none"> Areas of exposed earth will be minimised and rehabilitated with appropriate non-invasive species 	Construction contractor

7.3.6 Monitoring and recording

The monitoring program for weeds has been designed to ensure that construction of the project is consistent with the control measures, management objectives and targets. Monitoring measures are identified in Table 7-18 below.

Table 7-18: Monitoring and recording requirements

Monitoring	Details	Timing	Responsibility	Records
Implementation of mitigation measures	Ensure all of the above listed mitigation measures are being implemented effectively	Weekly & ongoing	Construction Contractor	Weekly environment checklist
Weed infestations or outbreaks	Record any evidence of weed infestations or outbreaks, particular focus on high-risk weeds, comparison to baseline survey results to assist	Ongoing	Construction Contractor; lead spotter catcher	Weed register
Clean entry for vehicles	Ensure all vehicles are adhering to weed hygiene protocols including strict clean on entry requirements	For each vehicle entering site	Construction Contractor	Weed hygiene inspection register
Analysis of Incident Trends	Analyse incidents reported for any non-compliances, incidents (including weed incursion)	Monthly	HSE Manager	Incident report

7.3.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for weeds are not being achieved, contingency actions will be enacted, as indicated in Table 7-19.

Table 7-19: Weed corrective actions and contingencies

Trigger	Action
Weed outbreaks	<ol style="list-style-type: none"> 1. Infestations are identified and mapped 2. Source of infestation is investigated and addressed 3. Infestations are controlled via appropriate use of herbicide or other control techniques 4. Implement any rehabilitation as required.

7.4 BUSHFIRE SUB-PLAN

7.4.1 Environmental values

The project area is located on the Seaview Range, approximately 65 km south-west of Ingham in North Queensland. The area is characterised by typical dry-tropics climate, with the majority of annual rainfall falling in the four months from December to March. UBWF is situated in an area of moderate bushfire intensity risk, however the project area includes patches of high and very high potential bushfire intensity, and is adjacent to a large area of high potential bushfire intensity.

7.4.2 Environmental activities to be managed

Construction activities have the potential to increase the risk of fire, causing injury or loss of human life, loss of flora and vegetation, fauna and habitat, and impacting surface water quality, through the following aspects of the project:

- Introduction of ignition sources including vehicles and machinery and equipment such as generators
- Welding, grinding and other hot works
- Introduction or spread of weed species which can increase fuel load.

7.4.3 Potential impacts

Construction of the project may result in the following impacts:

- Injury or loss of life to the public and project workforce
- Disruption to utility supply as a result of damage
- Generation of smoke, dust and ash
- Disturbance and /or loss of terrestrial flora species and fire sensitive vegetation communities
- Degradation vegetation communities caused by sediment deposition, physical modification of watercourse
- Degradation or loss of sensitive communities (e.g. 'of concern RE') and hollow bearing trees
- Mortality of fauna
- Loss, degradation and fragmentation of fauna habitat
- Degradation of surface water quality due to input of silt
- Damage to culturally sensitive areas and other infrastructure outside project area.

This sub-plan addresses management of issues relating to bushfire. The management approach to flora and vegetation, terrestrial fauna and habitat, and surface and groundwater is described in the appropriate sub-plans.

7.4.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with bushfire management objectives for the project and identified in Table 7-20.

Table 7-20: Bushfire performance management

Issue	Objective	Target	Measurement Criteria
Bushfire	To prevent fires occurring as a result of project activities	No fires caused by project activities.	Number of fires caused by project activities

7.4.5 Management measures

Specific actions have been identified to assist in achieving bushfire management objectives for the project as identified in Table 7-21.

Table 7-21: Bushfire control measures

Parameter	Control Measure	Responsibility
Inductions and training	<ul style="list-style-type: none"> • Relevant personnel shall be trained in the use of fire fighting equipment 	Construction Contractor
Fire control equipment	<ul style="list-style-type: none"> • Appropriate fire control equipment (including fire extinguishers, dry chemical, foam extinguisher, water carts as required) will be provided in all vehicles, at construction sites, and when and where 	Construction Contractor

Parameter	Control Measure	Responsibility
	hot works are undertaken, and will be regularly replenished and maintained	
Ignition sources	<ul style="list-style-type: none"> Open fires and ignition sources such as cigarettes, lighters and matches are prohibited in the project area 	All personnel
Consultation	<ul style="list-style-type: none"> All construction activities shall be conducted in accordance with and in liaison with relevant fire authorities 	Construction Contractor
Weather	<ul style="list-style-type: none"> Fire weather warnings will monitored daily and communicated to construction teams 	Construction Contractor
Equipment maintenance	<ul style="list-style-type: none"> All machinery and vehicles will be inspected and maintained in accordance with manufacturer's specifications and to comply with fire safety standards 	Construction Contractor
Equipment maintenance	<ul style="list-style-type: none"> Defective machinery shall be shut down until the defect is rectified and the machine made safe for operations 	Construction Contractor
Vehicles	<ul style="list-style-type: none"> Vehicles shall be regularly inspected for build up of combustible materials including grass and debris, to ensure fire risk is low 	All personnel
Hot works	<ul style="list-style-type: none"> During hot works, including welding, grinding and other hot works, dedicated spotters will be engaged to detect evidence of spot fires Exclusion zones will be maintained around hot works to maintain safe distance from much, vegetation, and any unused vehicles or machinery 	Construction Contractor
Chemical storage	<ul style="list-style-type: none"> Combustible chemicals will be stored in accordance with regulatory requirements and standards, and incompatible chemicals shall not be stored together 	Construction Contractor
Fire prevention	<ul style="list-style-type: none"> Firebreaks shall be maintained around buildings and facilities 	Construction Contractor
Reporting	<ul style="list-style-type: none"> All fires must be immediately reported to a supervisor 	All personnel

7.4.6 Monitoring and recording

The bushfire monitoring program has been designed to ensure that construction of the project is consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets and identified in Table 7-22.

Table 7-22: Bushfire monitoring and recording

Monitoring	Details	Timing	Responsibility	Records
Weather conditions	Monitor weather conditions and fire rating to assess fire risk in order to prevent and minimise risk of fire	Daily	Construction Contractor	Environmental Inspections
Hot works	Spotters to be engaged during hot works to identify evidence of hot spots or fire activity to identify fire risk early	During hot works	Construction Contractor	Environmental Inspections

Monitoring	Details	Timing	Responsibility	Records
Site Inspections	Opportunistic observation for evidence of ignition sources or fire hazards to reduce the risk of fires	Daily	Construction Contractor	Environmental Inspections
Fire control equipment	Monitor fire control equipment to ensure in good working order and sufficient supply to ensure preparedness for fire event	Weekly	Construction Contractor	Environmental Inspections
Fire events	Maintain records of fires and near misses including cause, date/time, location, response, outcome. Modify activities to reduce fire risk in the future	Ongoing, as required	Construction Contractor	Fire Incident Report

7.4.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for bushfire management are not being achieved, contingency actions will be enacted, as identified in Table 7-23.

Table 7-23: Bushfire contingencies and corrective action

Trigger	Action
Project-induced fire activity	<ol style="list-style-type: none"> 1. In the event of a project-induced fire activity (including hot spots or fire), activate and implement fire control (including on-site response and notification of emergency response authorities, as required). 2. Investigate and complete an incident report. 3. Implement appropriate measures to avoid re-occurrence. 4. Rehabilitate vegetation in the affected area, as required

7.5 SOILS AND SEDIMENT SUB-PLAN

7.5.1 Geology and soil types

The landscape is undulating, ranging from steep to gently sloping. The dominant rock type is granite which is found across more than half the project area. A more detailed overview of geology and soil types is provided in Section 4.1.3.

7.5.2 Environmental activities to be managed

Construction activities have the potential to impact on soils and sediment through the following aspects of the project:

- Vegetation clearing
- Excavation
- Vehicle movements outside of designated areas and on unstable ground
- Spills and leaks of hydrocarbons, hazardous materials or liquid (including septic).

7.5.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Accelerated soil erosion and sedimentation of watercourses
- Landform instability
- Soil compaction
- Contamination of soil and sediment.

This sub-plan addresses management of issues relating to impacts to soils and sediment. The management approach to rehabilitation, weeds, fire, dust (air emissions), surface and groundwater, hazardous materials and spill response is described in the appropriate sub-plans.

7.5.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with soils and sediment management objectives for the project and identified in Table 7-24.

Table 7-24: Soils and sediment performance management

Issue	Objective	Target	Measurement Criteria
Topsoil	Minimise change to soil profile from excavation activities	<ul style="list-style-type: none"> • No evidence of subsoil on surface within excavated areas following backfill • No visual evidence of soil compaction following backfill and rehabilitation 	<ul style="list-style-type: none"> • Subsoil on surface (as detected by colour and texture) within excavated areas following backfill • Presence of soil compaction following backfill and rehabilitation (e.g. hard soil, local water pooling)
Erosion and sediment control	Prevent occurrence of soil erosion during and following construction	<ul style="list-style-type: none"> • No soil erosion inconsistent with that of the surrounding land 	<ul style="list-style-type: none"> • Presence of soil erosion inconsistent with that of the surrounding land

7.5.5 Management measures

The soils and sediment sub-plan has been developed in accordance with the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control Guidelines (IECA 2008). Specific actions have been identified to assist in achieving soils and sediment management objectives for the project and identified in Table 7-25.

Table 7-25: Soils and sediment control measures

Parameter	Control measures	Responsibility
Pre-Construction works	<ul style="list-style-type: none"> • Sediment fences to be erected; • Stockpile areas to be designated to minimise impacts on site runoff; • Implementation of cut off swales and diversion drains; • Provision of shakedown pit for any entry/exit points to the site; and 	Construction contractor

	<ul style="list-style-type: none"> • Toolboxes talk to inform any regular site personnel. 	
Construction works	<ul style="list-style-type: none"> • Avoid placement of structures within the identified riparian zone, even if such riparian vegetation does not currently exist; • Minimise disturbance to the riparian zones and waterway channel to the minimum necessary to achieve the required project outcomes; • Construction related activities should be contained within the subject site where possible to minimise areas of disturbance; • Topsoil retention for site rehabilitation; • Monitoring of wind speeds for during of construction and dust suppression via water truck; • Construction of temporary cut-off drains and clean water diversions throughout site to ensure that during and after storm events, clean water upstream flows entering the site are not contaminated with construction material and/or particulates that might enter the downstream system; similarly, site flows should be diverted to temporary sediment basins for treatment prior to leaving site and entering the downstream stormwater network; • Implementation of temporary sediment basins compliant with QLD State Planning Policy target objectives and local authority specifications; • For embankments steeper than 1V:4H, a hydro mulch seed mix or polymer binder such as Vital BonMatt P47-VR1 or similar, is recommended to be applied to the face of the slope as a stabilising agent until such time that revegetation or landscaping can commence • Regular inspection of sediment control measures • Continual maintenance and upkeep of erected sediment & dust fences, diversion drains, control measures; and • Dynamic response to any changing site conditions such as inclement weather 	Construction contractor
Post-Construction works	<ul style="list-style-type: none"> • Replacement of stockpiled topsoil material on top of disturbed areas to allow revegetation • Maintenance of revegetated areas, e.g. watering 	Construction contractor

7.5.6 Monitoring and recording

The monitoring program for soils and sediment has been designed to ensure that construction of the project is consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets and identified in Table 7-26.

Table 7-26: Soils and sediment monitoring and recording

Monitoring	Details	Timing	Responsibility	Records
Topsoil stockpile inspection	Visual inspection of topsoil stockpiles for evidence of erosion	Weekly	Construction Contractor	Event Report
Watercourse bed and banks and areas of sloping topography	Visual inspection at site of watercourse crossings for evidence of instability, compaction or erosion	Weekly	Construction Contractor	Event Report
Hazardous materials	Storage, handling and disposal monitored in accordance with the Hazardous Materials Management sub-plan to prevent soil and sediment contamination	In accordance with Hazardous Materials Management sub-plan	Construction Contractor	Monthly Health, Safety, Environment Report

7.5.7 Contingencies and corrective action

If monitoring indicates that environment objectives and targets for soils and sediment are not being achieved, contingency actions will be enacted, as indicated in Table 7-27.

Table 7-27: Soils and sediment contingencies and corrective action

Trigger	Action
Evidence of erosion of topsoil stockpiles	1. Apply erosion control measures such as stabilisers, or other, as appropriate to prevent further loss
Formation of gullies	1. Investigate cause. 2. Undertake maintenance as required. 3. Adaptive management.
Instability or compaction of watercourse beds and banks	1. Investigate cause (e.g. vehicle movements) 2. Remediate through stabilisation or ripping, as required 3. Maintain remediated area 4. Review vehicle access to beds and banks, if required 5. Monitor bed and banks and maintain remediated area
Increased run-off leading to erosion of soil and subsequent deposition	1. Investigate cause (e.g. construction, wind and/or soil erosion, feral animals, inappropriate soil and/or sediment controls). 2. Undertake a risk assessment (risk of remediation options vs do nothing options). 3. Remediate cause if possible. 4. Maintenance of rehabilitated areas until the required outcome is achieved. 5. Adaptive management.
Hazardous materials spill contaminating soil and/or sediment	1. Implement measures identified in the Hazardous Material and Spill Response Management sub-plan.

7.6 NOISE SUB-PLAN

7.6.1 Environmental values

The project area is remote and there are few anthropogenic sources of noise. There are several sensitive receptors to noise within the vicinity of the project including homes on the properties within the project area and the township of Mt Fox.

7.6.2 Environmental activities to be managed

Construction activities have the potential to generate noise through the following aspects of the project:

- Clearing and earthworks activities
- Infrastructure installation
- General operation of equipment during construction
- Construction traffic during the project.

7.6.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Disturbance to nearby sensitive receptors including nearby residences
- Disruption to fauna behaviour.

This sub-plan addresses management of issues relating to impacts to noise and vibration, other than health and safety issues. The management approach to terrestrial fauna, is described in the appropriate sub-plans. The management approach for health and safety is addressed elsewhere.

7.6.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with noise management objectives for the project and indicated in Table 7-28.

Table 7-28: Noise and vibration performance management

Issue	Objective	Target	Measurement Criteria
Noise nuisance	To minimise the impact of project generated noise and vibration emissions on nearby sensitive receptors and the environment	<ul style="list-style-type: none"> • No substantiated land user complaints • Maintain compliance with relevant noise regulations 	<ul style="list-style-type: none"> • Number of substantiated land user complaints • Predicted average construction noise levels for all receivers

7.6.5 Management measures

Specific actions have been identified to assist in achieving noise management objectives for the project, as indicated in Table 7-29.

Table 7-29: Noise and vibration control measures

Parameter	Control Measure	Responsibility
Sensitive receptors	<ul style="list-style-type: none"> Residents will be informed of potential noise generating activities prior to the commencement of activities near residences. 	Construction Manager/ Land Manager
Scheduling of activities	<ul style="list-style-type: none"> Noise generating activities will be scheduled to occur during daylight hours; Monday to Sunday 6:30am – to 6:30pm, with extended work hours as required. If this is not possible, additional assessment of impacts to sensitive receptors will be undertaken. 	Construction Contractor
Noise generating equipment	<ul style="list-style-type: none"> Equipment will be selected and maintained to minimise noise emissions as far as practicable Noise abatement devices (e.g. mufflers, silencers and screens) will be utilised where relevant Equipment will be shut down (or throttled down if shut down is not feasible) when not in use and tasks should be completed in the minimum time that is feasible and safe Semi-fixed noise generating equipment (e.g. generators, compressors) shall be located as far as practicable from sensitive receptors. Local shielding provided by site topography and infrastructure will be used. Reversing alarms on plant will be adjusted to limit the acoustic range to the immediate danger area. 	Construction Contractor
Site access	<ul style="list-style-type: none"> Site access and deliveries will be located as far away from sensitive receptors and will use non-residential roads, as much as possible Deliveries will be scheduled to arrive during the day. 	Construction Contractor
Complaints records	<ul style="list-style-type: none"> Report and respond to all noise complaints as an environmental incident. 	Project Manager
Fauna	<ul style="list-style-type: none"> Fauna shall be managed in accordance with the Fauna Management sub-plan. 	Construction Contractor

7.6.6 Monitoring and recording

The monitoring program for noise has been designed to ensure that construction and operation of the project are consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets, as indicated in Table 7-30.

Table 7-30: Noise and vibration monitoring and recording

MONITORING	DETAILS	TIMING	RESPONSIBILITY	RECORDS
Analysis of Incident Trends	Analyse incidents reported for identification of noise complaints. Determine number of noise complaints	Annually	HSE Manager	HSE reporting
Noise monitoring	Monitor noise at adjacent sensitive receptors in response to complaints or in high-risk work programs (i.e. those with	As required	Senior Advisor – Environment and Heritage/	Noise Monitoring Report

	nearby sensitive receptors where noisy works are required outside standard hours). Determine if noise is at unacceptable levels.		Construction Contractor	Environmental Incident Report
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7.6.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for noise are not being achieved, contingency actions will be enacted, as indicated in Table 7-31.

Table 7-31: Noise and vibration contingencies and corrective action

Trigger	Action
Monitoring reveals noise levels are above acceptable levels.	Report as Environmental Incident and initiate Incident Response Procedure, including: <ol style="list-style-type: none"> 1. Investigate cause. 2. Implement corrective actions where required.
Noise or vibration complaint is received.	Report as Environmental Incident and initiate Incident Response Procedure, including: <ol style="list-style-type: none"> 1. Investigate cause. 2. Implement corrective actions where required.
Monitoring reveals vibration impacts have occurred (e.g. to threatened fauna habitats).	Report as Environmental Incident and initiate Incident Response Procedure, including: <ol style="list-style-type: none"> 1. Investigate cause. 2. Report to relevant government agency. 3. Implement corrective actions where required.

7.7 AIR EMISSIONS SUB-PLAN – DUST

7.7.1 Environmental values

The project area traverses remote areas where there are limited anthropogenic air emission sources. Dust generation from traffic on unsealed roads are likely to contribute to air emissions in the area.

Bushfires may also contribute to the local and regional air quality. Bushfires occur predominantly during mid- to late dry season, and these contribute smoke, which is a mixture of particulate matter, water vapour and gases including carbon monoxide, carbon dioxide and oxides of nitrogen.

7.7.2 Environmental activities to be managed

Construction activities have the potential to release dust emissions to the air through the following aspects of the project:

- Vegetation clearing and earthworks for construction
- An increase in vehicle movements on unsealed roads
- Increased fire ignition sources.

7.7.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Dust emissions causing nuisance and reduced visibility
- Smoke, ash and silt due to bushfire.

This sub-plan addresses management of issues relating to impacts caused by dust emissions. The management approach to surface water, soils and sediment, and flora and vegetation are described in the appropriate sub-plans.

7.7.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with dust emission management objectives for the project, as indicated in Table 7-32.

Table 7-32: Air emissions performance management

Issue	Objective	Target	Measurement Criteria
Dust causing nuisance reduced visibility or smothering	To minimise the impact of dust emissions from construction activities, machinery and vehicles.	<ul style="list-style-type: none"> • No reasonable substantiated complaints • No air pollution incidents/ events caused by dust deposition • No vegetation smothering from dust deposition 	<ul style="list-style-type: none"> • Number of substantiated complaints and dust related incidents • Vegetation condition assessments • Dust within limits outlined in Australian Standards and in line with DES Guideline (2021)
Degradation of air quality due to fire activity	To minimise risk of air emissions from project related fire	<ul style="list-style-type: none"> • No reported project related fire events • No significant change to air quality • Compliance with statutory regulations. 	<ul style="list-style-type: none"> • Number of reported project related fire events incidents to health and safety • Number of substantiated complaints

7.7.5 Management measures

Specific actions have been identified to assist in achieving air emission objectives for the project, as indicated in Table 7-33.

Table 7-33: Air emission control measures

Parameter	Control Measure	Responsibility
Weather	<ul style="list-style-type: none"> • BOM forecasts will be consulted daily to avoid undertaking earthworks during high wind events or when prevailing winds are toward sensitive receptors. 	Construction Contractor

Prevention of dust emissions	<ul style="list-style-type: none"> The construction schedule shall be planned to minimise the elapsed time between clearing, grading and reinstatement. 	Construction Manager
Sensitive receptors	<ul style="list-style-type: none"> Local residents and land users will be advised of the likely duration of ground disturbance activities and mitigation measures to be undertaken whilst construction is occurring in their vicinity. 	Land Manager
Vehicle movements	<ul style="list-style-type: none"> Vehicle movements will be speed and access restricted. 	Construction Contractor
Stockpiles	<ul style="list-style-type: none"> Stockpiles will be located and managed to avoid impacts to sensitive receptors. Physical barriers such as bunds or windbreaks will be constructed around dust generating stockpiles where required. 	Construction Contractor
Vegetation	<ul style="list-style-type: none"> Water spraying of nearby sensitive vegetation will occur if visible dust sedimentation is observed Burning of vegetation will be prohibited. 	Construction Contractor
Dust control	<ul style="list-style-type: none"> Appropriate dust controls (including but not limited to water carts, non-toxic stabilisers, vehicle covers, or other) to be implemented throughout construction as required to prevent and minimise dust impacts to sensitive receptors and the surrounding environment. 	Construction Contractor
Complaints records	<ul style="list-style-type: none"> All complaints regarding dust nuisance shall be reported as an environmental incident. 	Construction Contractor and Land Manager
Bushfire	<ul style="list-style-type: none"> Fire control shall be in accordance with the Bushfire Management sub-plan. 	Construction Contractor

7.7.6 Monitoring and recording

The monitoring program for air emissions has been designed to ensure that construction and operation of the project are consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets, as indicated in Table 7-34.

Table 7-34: Air emission monitoring and recording

Monitoring	Details	Timing	Responsibility	Records
Visual airborne dust emissions	Ongoing visual inspection to monitor dust emissions required. This includes inspections of vegetation for deposition. Ensure dust suppression is undertaken when necessary.	Ongoing	Construction Contractor	Environmental Inspection Environmental Incident Report

7.7.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for air emissions are not being achieved, contingency actions will be enacted, as indicated in Table 7-35.

Table 7-35: Air emission contingencies and corrective actions

Trigger	Action
Where excessive airborne dust is generated or a substantiated landholder complaint received	<p>A combination of one or more of the following shall be implemented as required:</p> <ol style="list-style-type: none"> 1. Application of water or stabilisers via water trucks and sprayers to dampen down soil. No run-off should be generated from application. Applications shall be frequent enough to provide persistent dust suppression. 2. Cover vehicles with dust emitting loads (except when loading and unloading). 3. Use of dust stabilisers, tarps or geo-textile materials to suppress dust generated from stockpiles.
Where visible dust sedimentation on sensitive vegetation is observed	<ol style="list-style-type: none"> 1. Application of water to remove dust. No run-off should be generated from application. 2. See above for implementation of dust suppression measures.

7.8 SURFACE WATER SUB-PLAN

7.8.1 Environmental values

The survey area is traversed by numerous watercourses comprised of both minor drainage lines (stream order one) through to major watercourses (stream order five). The largest watercourse traversing the survey area is Michael Creek (stream order five). The survey area lies within two separate drainage basins, Burdekin Basin (associated with the Einasleigh Uplands) and Herbert Basin (associated with the Wet Tropics). The majority of the development footprint is located within the Burdekin Basin, with only potential (subject to accurate survey) minor encroachment into the Herbert Basin.

The wind turbines and hardstand are located on, or close to, ridges and therefore above or at the top of drainage paths.

7.8.2 Environmental aspects to be managed

Construction activities have the potential to impact on surface and groundwater through the following aspects of the project:

- Vegetation clearing
- Construction of access tracks and hardstand
- Vehicle movements
- Liquid and solid waste disposal may result in contamination of surface waters
- Spills and leaks of hydrocarbons, hazardous materials resulting in contamination of surface water.

This sub-plan addresses management of issues relating to impacts to surface water. The management approach for erosion and sedimentation, hazardous materials and spill response is described in the appropriate sub-plans.

7.8.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Degradation of surface water quality
- Physical modification of drainage lines, including instability or erosion
- Increased ponding, leading to increased cane toad numbers.

7.8.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with surface water management objectives for the project, as indicated in Table 7-36.

Table 7-36: Surface water and groundwater performance management

Issue	Objective	Target	Measurement Criteria
Surface Water	To ensure that natural surface water flow patterns are not detrimentally impacted by activities	<ul style="list-style-type: none"> • Natural surface water flow patterns are maintained. • No detectable increase in erosion and sedimentation along watercourses/drainage lines due to the project. 	<ul style="list-style-type: none"> • Conformance with conditions of licences and/or permits (where applicable)
Water quality	To prevent contamination of surface water	<ul style="list-style-type: none"> • No fuel and chemical spills. 	<ul style="list-style-type: none"> • No at fault contamination of surface or ground water quality to below background or guideline levels (whichever is deemed relevant)
Ponding	To prevent concentrations of water along access tracks and ponding	<ul style="list-style-type: none"> • No prolonged ponding of stormwater 	<ul style="list-style-type: none"> • Stormwater clearance protocols implemented

7.8.5 Management measures

Specific actions have been identified to assist in achieving surface water management objectives for the project, as indicated in Table 7-37.

Table 7-37: Surface water and groundwater control measures

Parameter	Control Measure	Responsibility
Runoff	<ul style="list-style-type: none"> • The compacted gravel crane hardstand and components storage areas will be located within a flat portion of the turbine clearings to avoid concentration of runoff and to minimise runoff velocities • Stormwater runoff from the project areas will be diverted and discharged through vegetated surfaces where possible 	Construction Contractor

	<ul style="list-style-type: none"> Concentration of runoff from the proposed access tracks will be avoided by removing stormwater regularly from the track and associated side drains 	
Water quality	<ul style="list-style-type: none"> Construction of temporary cut-off drains and clean water diversions throughout site to ensure after storm events, clean water upstream flows entering the site are not contaminated with construction material and/or particulates that might enter the downstream system Where drains are required within or about the wind farm infrastructure, these drains will be discharged through spreaders onto grassed areas designed and maintained to trap any sediment load in the runoff before it reaches to drainage features. The location of the stormwater infrastructure will be determined in the detail design phase Continuous maintenance and upkeep of erected sediment and dust fences, diversion drains and control measures Natural surface water patterns will be maintained to avoid potential impacts on existing overland flow paths. Diversion drains will be installed upstream of the wind farm infrastructure to prevent contaminated runoff from entering disturbed areas No storage of fuel or hydrocarbons shall occur within 200 m of a waterbody Maintenance of mobile equipment and vehicles shall not be conducted within 200 m of a waterbody Refuelling shall not be conducted within 200 m of a water body Liquid and solid waste disposal shall be disposed of appropriately 	Construction Contractor
Erosion	<ul style="list-style-type: none"> The velocities of any table drains be checked during detailed design and an appropriate lining adopted to prevent scour 	Construction Manager
Fire	<ul style="list-style-type: none"> Fire control shall be managed in accordance with the Bushfire Management sub-plan 	Construction Contractor

7.8.6 Monitoring and recording

The monitoring program for surface water has been designed to ensure that construction of the project is consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets, as indicated in Table 7-38.

Table 7-38: Surface water monitoring and recording

Monitoring	Details	Purpose	Timing	Responsibility	Records
Watercourse bed and banks and areas of sloping topography	Visual inspection at site of watercourse crossings for evidence of instability, compaction or erosion	Identification of instability, compaction or erosion	Weekly	Construction Contractor	Event Report
Areas at risk of ponding (e.g. access tracks)	Visual inspection of at-risk areas for evidence of prolonged ponding	Identification of prolonged ponding (and increased cane toad risk)	Weekly	Construction Contractor	Event Report

7.8.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for surface water are not being achieved, contingency actions will be enacted, as indicated in Table 7-39.

Table 7-39: Surface water and groundwater contingencies and corrective actions

Trigger	Action
Impact on natural surface water flow patterns	<ol style="list-style-type: none"> 1. Investigate cause 2. Undertake maintenance and remediation as required (e.g. remove accumulated material / stormwater) 3. Modify/re-engineer on-site drainage management system as required
Integrity of on-site drainage management system compromised.	
Evidence of prolonged ponding	
Increased sediment load in watercourses	
Erosion of watercourses	
Liquid or solid waste spill	<ol style="list-style-type: none"> 1. Implement Hazardous Materials Management sub-plan

7.9 HAZARDOUS MATERIALS AND SPILLS SUB-PLAN

7.9.1 Environmental values

The project area is remote with few potential sources of contamination. The land is currently used for cattle grazing, with limited pasture improvement or land clearing having occurred to date.

7.9.2 Environmental activities to be managed

Construction activities have the potential to result in the uncontrolled release of hazardous materials through the following aspects of the project:

- Storage, handling and disposal of hydrocarbons and hazardous materials
- Refuelling activities
- Vehicle and equipment maintenance.

7.9.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Contamination of soils and water resources
- Exposure of workforce and landholders to hazardous materials causing injury or loss of life
- Degradation or loss of vegetation and/or fauna habitat
- Injury to or loss of fauna
- Fire activity causing damage to property, persons or native vegetation and habitats.

This sub-plan addresses management of issues relating to impacts from the storage and handling of hazardous materials.

7.9.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with hazardous material management objectives for the project, as indicated in Table 7-40.

Table 7-40: Hazardous materials performance management

Issue	Objective	Target	Measurement Criteria
Contamination	Prevent the contamination of the environment and injury or loss of life due to accidental spills of hazardous materials.	<ul style="list-style-type: none"> No significant spills or leaks of hazardous materials. No spills or leaks in or near watercourses. 	<ul style="list-style-type: none"> No spills or leaks of hazardous materials in excess of 80 L. No spills or leaks within 100 m of waterbodies.

7.9.5 Management measures

Specific actions have been identified to assist in achieving hazardous material management objectives for the project, as indicated in Table 7-41.

Table 7-41: Hazardous materials control measures

Parameter	Control Measure	Responsibility
Induction and training	<ul style="list-style-type: none"> All personnel involved in hazardous materials handling shall be adequately trained 	Construction Contractor HSE Manager Training manager

Parameter	Control Measure	Responsibility
Management of hazardous materials	<ul style="list-style-type: none"> • All storage locations shall maintain a Material Safety Data Sheet (MSDS) manifest and inventory. MSDSs for all stored hazardous materials shall be readily accessible • All chemicals used during operations shall be transported, stored, handled and disposed of in accordance with statutory requirements, codes of practice and industry standards. • Dangerous goods shall be transported by an appropriately licensed contractor • Chemical use shall be minimised where practicable • Minimum practicable volume of chemicals shall be stored on-site • Hazardous materials shall be stored in containment facilities (e.g. bunded areas, leak-proof trays) designed to hold 110% of the capacity of the largest tank or 25% of the total combined volume of stored materials (whichever is greater) and be impervious to prevent the release of spilt substances to the environment • On-site fuel/chemical storage areas shall be clearly signed and designated • Hazardous materials are to be provided and stored and in sealed, labelled containers, without leaks • Fuels and chemicals shall not be stored or handled within 200 m of waterbodies 	Construction Manager
Spill response	<ul style="list-style-type: none"> • Spills kits are to be provided at the following: • All refueling vehicles carry 250 L spill kits • All vehicles fitted with hydraulic hoses have immediate access to 20 L spill kits • All crews handling hazardous chemicals have immediate access to 20 L spill kits • All supervisors will carry 20 L spill kits • Additional spill containment facilities such as compacted pads or drip trays are to be provided at refueling stations, oil and chemical storage sites and vehicle maintenance areas 	Construction Contractor
Spill prevention	<ul style="list-style-type: none"> • Major servicing of plant and equipment shall be undertaken off-site in appropriately equipped areas • Minor vehicle maintenance, if required during construction activities (i.e. re-fueling/lubricating), it shall be done in dedicated areas at least 200 m from waterbodies • Drip tray or absorbent material to intercept inadvertent spillage will be used at all times when refueling or lubricating • Refueling vehicles shall be equipped with the following to enable quick response to spillages: <ul style="list-style-type: none"> ○ 250 L spill kits ○ Spill tray(s) ○ Shovel ○ Containers for temporary storage and transport of contaminated soil 	Construction Contractor

7.9.6 Monitoring and recording

The monitoring program for hazardous materials has been designed to ensure that construction and operation of the project are consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets, as indicated in Table 7-42.

Table 7-42: Hazardous materials monitoring and recording

Monitoring	Details	Timing	Responsibility	Records
MSDS and chemicals inventory	Inspect MSDS register and inventory to ensure records are accurate and up to date	Monthly	Construction Contractor	Monthly Health, Safety, Environment Report
Handling procedures	Random monitoring of personnel handling to ensure compliance with safe handling procedures	Ongoing	Construction Contractor	Weekly Environment Report
Storage areas and bunding	Inspect integrity of bunding and supply of leak-proof trays to ensure adequate containment in the event of a spill	Monthly	Construction Contractor	Monthly Health, Safety, Environment Report
Spill kits	Inspect spill kits to ensure adequately stocked to ensure adequate spill response supplies and equipment are available	Monthly or after spill event	Construction Contractor	Monthly Health, Safety, Environment Report
Signage	Inspect storage and handling areas to ensure signage to ensure in place To ensure appropriate signage is in place	Quarterly	Construction Contractor	Annual Environment Report
Refuelling equipment	Inspect tanks, lines, hoses, pumps, couplings, valves and associated equipment To ensure in good working order	Weekly	Construction Contractor	Weekly Environment Report

7.9.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for hazardous material management are not being achieved, contingency actions will be enacted, as indicated in Table 7-43.

Table 7-43: Hazardous materials contingencies and corrective action

Trigger	Action
Spill of hazardous materials in excess of 80 L	<ol style="list-style-type: none"> 1. Identify source of spill 2. Exclude workforce and public from affected area 3. Stop leak or spill, where practicable 4. Implement containment and control to prevent dispersal of hazardous materials 5. Capture and contain hazardous materials 6. Remediate affected area in consultation with relevant authorities

	7. Review hazardous materials procedures and report incident
Spill within 100 m of a waterbody	<ol style="list-style-type: none"> 1. Identify source of spill 2. Exclude workforce and public from affected area 3. Implement containment, such as booms to prevent dispersal downstream 4. Stop leak or spill, where practicable 5. Remediate watercourse, in consultation with relevant authorities 6. Engage wildlife rescue service to treat any injury fauna

7.10 WASTE MANAGEMENT SUB-PLAN

7.10.1 Environmental values

The project area is remote with few potential sources of rubbish and building waste. The land is currently used for cattle grazing, with limited pasture improvement or land clearing having occurred to date.

7.10.2 Environmental activities to be managed

Construction activities have the potential to result in the unintended deposition of construction waste through the following aspects of the project:

- Temporary storage of waste
- Handling and transport of waste
- Waste generated by site personnel.

7.10.3 Potential impacts

Construction of the project has the potential to result in the following impacts:

- Contamination of soils, water resources and vegetation
- Degradation or loss of vegetation and/or fauna habitat
- Injury to or loss of fauna
- Attraction and increase in pest species.

This sub-plan addresses management of issues relating to impacts from the storage and handling of waste materials.

7.10.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with waste management objectives for the project, as indicated in Table 7-44.

Table 7-44: Waste performance management

Issue	Objective	Target	Measurement Criteria
Waste management	To minimise potential contamination of soil, water, vegetation or habitat values	<ul style="list-style-type: none"> • No land contamination as a result of waste deposition 	<ul style="list-style-type: none"> • No deposition of waste materials within project area

	from improper storage and handling of waste	<ul style="list-style-type: none"> Wastes minimised and opportunities for reuse and recycling identified and implemented All waste disposal to be carried out by a licensed waste contractor 	<ul style="list-style-type: none"> No spills or leaks within 100 m of waterbodies.
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7.10.5 Management measures

Specific actions have been identified to assist in achieving waste management objectives for the project, as indicated in Table 7-45.

Table 7-45: Waste control measures

Parameter	Control Measure	Responsibility
Induction and training	<ul style="list-style-type: none"> All project personnel will be instructed in applicable waste management practices as a part of the environmental induction process. 	Construction Manager HSE Manager Training manager
Management of waste materials	<ul style="list-style-type: none"> All general refuse and food wastes to be collected and transported to a local government approved disposal site and suitable bins and skips will be provided for waste streams (general, recyclable, metal, regulated) Portable toilets will be made available at all site offices, accommodation camp and work sites, supplied and managed by licensed contractors All construction waste left on site will be kept in an appropriately secured, stacked area Regulated waste will be stored and appropriately marked, identifying their contents and collected by a licensed waste contractor No on-site burial or burning of waste material Excavated soils will be reused on site where possible 	Construction Manager HSE Manager Construction Manager Project Manager All personnel

7.10.6 Monitoring and recording

The monitoring program for waste materials has been designed to ensure that construction and operation of the project are consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets, as indicated in Table 7-46.

Table 7-46: Waste materials monitoring and recording

Monitoring	Details	Timing	Responsibility	Records
Waste materials	Housekeeping checks of all waste storage areas to ensure:	Weekly	HSE Manager	Environmental checklist

	<ul style="list-style-type: none"> • Adequate storage and segregation of waste streams • Effectiveness of waste management strategies • Waste tracking and recording. 			
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7.10.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for waste management are not being achieved, contingency actions will be enacted, as indicated in Table 7-47.

Table 7-47: Waste materials contingencies and corrective action

Trigger	Action
Improper waste management	<ol style="list-style-type: none"> 1. Inspect waste storage areas. 2. If area is untidy or unkept, undertake measures to rectify

7.11 FERAL PREDATOR MANAGEMENT SUB-PLAN

Prior to commissioning of UBWF a feral predator monitoring and control program will be developed, consistent with the Feral Predator Management sub-plan, and implemented during construction.

7.11.1 Feral predator presence

A high presence of feral predators such as cats and wild dogs / dingoes were detected on remote cameras, with wild dogs / dingoes also detected in acoustic recordings.

7.11.2 Environmental activities to be managed

There is an existing high level of feral predators present within the project area. The UBWF has the potential to increase predation by feral predators on a number of species through:

- Introduction of pets including dogs to the project area from UBWF construction personnel
- Waste materials, particularly food rubbish attracting pest species
- Construction of linear infrastructure improving access to pest species into the project area
- Entrapment leading to exposure to predators.

7.11.3 Potential impacts

UBWF supports a number of MNES species that are vulnerable to predation by feral predators. The UBWF has the potential to increase predation by feral predators on a number of species through the construction of linear infrastructure. Feral cats are identified as a threat within the Recovery Plan for Sharman's rock wallaby and the Conservation Advice for greater glider and greater large-eared horseshoe bat. Wild dogs are identified as a threat to koala in the National Recovery Plan for Koala. Undertaking monitoring and control measures for feral predators will manage potential ongoing impacts of increasing predation on these species and negative pressure on species populations.

This sub-plan addresses management and control of feral predators. The management approach for food wastes is outlined in the Waste Management sub-plan, and management of pits and trenches (entrapment) and pets are outlined in the Fauna Management sub-plan.

7.11.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with feral predator management objectives for the project, as indicated in Table 7-48.

Table 7-48: Feral predator performance management

Issue	Objective	Target	Measurement Criteria
Introduction of feral predators	Avoid the introduction of feral predators into project area	<ul style="list-style-type: none"> No new species of feral predators species in the project area within 2 years of completion of construction Compliance with the <i>Biosecurity Act</i>. 	Species of feral predators recorded in the project area. No non-compliance with <i>Biosecurity Act</i> and Feral predator control measures in the Fauna Management sub-plan.
Predation by feral predators adversely impacting MNES fauna populations in project area	Reduce the threat of feral species predation on Sharman's rock wallaby, greater glider, koala, greater large-eared horseshoe bat in the UBWF project area.	<ul style="list-style-type: none"> A reduction in wild dog and feral cat populations within the project area within 2 years of completion of construction in comparison to baseline (refer Section 7.11.5 Management measures below) Successful design and implementation of control program Compliance with the <i>Biosecurity Act</i>. 	Number of recorded locations of feral predators in project database.

7.11.5 Management measures

The Proponent will be responsible for preparation of a Feral Predator Control Program. A key component of the program to manage feral predators at UBWF will be to first understand how these are impacting project area fauna, in particular MNES species. Establishing a baseline of feral predator distribution, abundance and density prior to implementing control measures will inform the control program design and allow success of program to be measured.

An outline of the minimum measures for the feral predator control program is provided in Table 7-49 below.

Table 7-49: Feral predator control measures

Parameter	Control measures	Timing / Frequency	Responsibility
Baseline survey	Control program is informed by dedicated field surveys to provide insight into the distribution, abundance and density of feral predators, prior to construction A focus for the baseline survey will be in and around greater glider / koala habitat, Sharman's rock wallaby habitat	Prior to construction	UBWF in partnership with the Traditional Owners Gugu Badhun and other pest management experts where required
Feral predator control	A range of control techniques may be required, and management will include trialling, refining and implementing management targeted at protecting MNES species. Techniques may include baiting, trapping, and / or hunting, tailored to local conditions and MNES species ecology, including breeding periods. Coordination and collaboration with adjacent land managers and natural resources management groups will be an important aspect of the control program. Control to be undertaken at the most appropriate locations to provide the greatest protection to MNES species particularly within 500m of known Sharman's rock wallaby colonies and riparian zones.	Immediately following the commencement of construction at an appropriately scheduled time to account for MNES species and feral predator ecology, including breeding cycles (Sharman's rock wallaby in particular) Annually for the duration of construction as a minimum and more frequently when required based on monitoring results	
Share knowledge	Key learnings from implementing the program will be shared with key stakeholders and pest management experts.	At the end of the construction control program	UBWF stakeholder liaison officer

7.11.6 Monitoring and recording

The monitoring program for feral predators has been designed to ensure that construction of the project is consistent with the control measures, management objectives and targets. Monitoring measures are identified in Table 7-50 below.

Table 7-50: Monitoring and recording requirements

Monitoring	Details	Timing	Responsibility	Records
Feral predator control	Record personnel, time, location and control measures implemented	With every control action	UBWF Project Construction manager	Feral predator control register

Monitoring	Details	Timing	Responsibility	Records
			UBWF Operations Manager Project ecologist	
Feral predator incidental sightings	Record any incidental sightings of feral cats and wild dogs	Day of sighting	UBWF Project Construction manager UBWF Operations Manager All personnel	Incident report
Feral predator targeted surveys	Dedicated field survey of feral predator distribution, abundance and density to assess control program success in comparison to baseline	Annually post implementation of control measures Immediately post-construction	UBWF Project Construction manager UBWF Operations Manager Project ecologist	Monitoring report, to be updated annually Update to incorporate incidental sighting records
Review control program	Learnings from construction control program and new technologies informs updates to program for operational phase where appropriate.	Immediately following concluding construction phase feral predator targeted survey		Monitoring report

7.11.7 Contingencies and corrective actions

If monitoring indicates that environment objectives and targets for feral predators are not being achieved, contingency actions will be enacted, as indicated in Table 7-51.

Table 7-51: Feral predator control corrective actions and contingencies

Trigger	Action
Increase in feral predator numbers from baseline Anecdotal or direct evidence of predation of MNES species	Review of control methods and implement adaptive management Increase in program intensity (additional methods) or frequency Assessment of waste control methods at works site and correction where required

8 Environmental Management – Operation

Once in operation the potential for impacts to the environment from UBWF is generally considered low. The most at-risk environmental values during operation are aerial terrestrial fauna species.

Furthermore, ongoing controls will be implemented to address small operational risks associated with the site maintenance at a ground level. These will be implemented as per the above sub-plans, but appropriately scaled down to provide adequate controls for proposed maintenance related impacts. These include:

- Fauna management
- Vegetation management
- Bushfire control measures
- Hazardous materials and spills management
- Waste management.

Dedicated operational management sub-plans are provided below for site reinstatement & rehabilitation; weeds; and feral predators.

8.1 SITE REINSTATEMENT AND REHABILITATION SUB-PLAN

8.1.1 Environmental values

Rehabilitation will be required to revegetate areas cleared for construction purposes that are not required for operational use. Therefore, rehabilitation will focus on reducing the risk of promoting weed species and stabilising disturbed areas, thereby reducing the potential for erosion and sedimentation of surrounding environments.

8.1.2 Environmental aspects to be managed

Following construction, a number of aspects need to be managed by rehabilitation:

- Weeds
- Soil disturbance and soil compaction
- Erosion.

This sub-plan addresses management of activities associated with rehabilitation. The management approach to fire, soils and sediment, surface water, flora and vegetation, terrestrial fauna, and weeds is described in the appropriate sub-plans.

8.1.3 Potential impacts

Disturbance caused by construction has the potential to result in the following impacts:

- Introduction and /or spread of weeds
- Erosion and landform instability.

8.1.4 Management objectives

Environmental targets and performance indicators have been prescribed in line with rehabilitation objectives for the project and indicated in Table 8-1.

Table 8-1: Rehabilitation performance management

Issue	Objective	Target	Measurement Criteria
Vegetation Rehabilitation	To re-establish vegetation cover that does not promote weeds.	Areas rehabilitated to re-establish groundcover.	Appropriate groundcover re-established.
Site Reinstatement	To re-establish site conditions in line with pre-disturbance conditions.	No substantiated landholder complaints regarding site reinstatement.	Number of substantiated landholder complaints.

8.1.5 Management measures

Specific actions have been identified to assist in achieving rehabilitation objectives for the project, as indicated in Table 8-2.

Table 8-2: Rehabilitation control measures

Parameter	Control Measure	Responsibility
Reinstatement	<ul style="list-style-type: none"> All flagging and bunting installed for other than environmental or safety reasons shall be removed from the construction areas once works are completed All waste materials and equipment shall be removed from the construction areas once works are completed All temporary gates shall be removed (unless required for operational reasons) and the fence, gates and barriers reinstated as agreed with the landowner Trenches/excavations shall be backfilled with stockpiled subsoil material following cable laying Backfilling of trenches will match the natural height of the surrounding area, to prevent water ponding 	Construction Contractor
Rehabilitation	<ul style="list-style-type: none"> Subsoils shall be ripped to a depth of 30 cm prior to respreading topsoil Segregated topsoil stockpiles and seed stock will be re-spread over graded surfaces in an even layer to match the natural soil horizons Re-vegetation and rehabilitation treatments (seeding, hydro-mulching or planting) shall be formulated to be comparable to the species composition to that identified pre-disturbance Re-vegetation treatments shall be evenly dispersed, as soon as practicable, taking advantage of the most appropriate season Inspections shall be undertaken of all stabilised, reinstated and rehabilitated areas at the end of the works to confirm stabilisation is in accordance with the required specifications Photos shall be taken to document the site conditions once reinstated for the monitoring program 	Construction Contractor

	<ul style="list-style-type: none"> Weeds will be managed in accordance with the Weed Management sub-plan, including; vehicles and equipment will be clean of weeds prior to entry of rehabilitation area Soils will be managed in accordance with the Soil and Sediment Management sub-plan 	
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8.1.6 Monitoring and recording

The rehabilitation monitoring program has been designed to ensure that construction and operation of the project are consistent with the control measures. Monitoring will measure the success of these actions in accordance with management objectives and targets, as indicated in Table 8-3

Table 8-3: Rehabilitation monitoring and recording

Monitoring	Details Purpose	Timing	Responsibility	Records
Site Closure Inspection	Inspect the suitability of reinstatement and rehabilitation efforts. Ensure rehabilitation has been undertaken to the appropriate standard.	Once, upon construction completion	Construction Contractor	Completion Report
Rehabilitation Monitoring	Inspect the suitability of rehabilitation post site-closure to determine success of rehabilitation.	Annually for a minimum of 2 years and until the rehabilitated areas have stabilised	Senior Advisor – Environment and Heritage	Rehabilitation Report

8.1.7 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for rehabilitation are not being achieved, contingency actions will be enacted, as indicated in Table 8-4.

Table 8-4: Rehabilitation contingencies and corrective action

Trigger	Action
Rehabilitation fails to stabilise.	<ol style="list-style-type: none"> Investigate cause (e.g. construction, wind and/or soil erosion, feral animals, inappropriate soil and/or sediment controls). Remediate cause if possible. Maintenance of rehabilitated areas until the required outcome is achieved.
Revegetation/grass seeds fail to establish.	<ol style="list-style-type: none"> Investigate cause (e.g. soil erosion, low seed viability, seeds washed away). Remediate cause if possible. Maintenance of rehabilitated areas until the required outcome is achieved. Continue to monitor revegetation establishment.
Weed outbreak.	<ol style="list-style-type: none"> Assess threat to revegetation, based on aggressiveness and fuel load of the species.

	2. If deemed a threat, implement weed management activities for the outbreak in accordance with the Weed Management sub-plan.
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8.2 WEED MANAGEMENT SUB-PLAN

8.2.1 Environmental activities to be managed

Operational activities have the potential to introduce or disperse weeds through the following aspects of the project:

- Vehicle and personnel movements
- Fire ignition
- Physical presence of infrastructure.

8.2.2 Potential impacts

Operation of the project has the potential to result in the following impacts:

- Increased infestations of existing weed species in the project area
- Introduction of new weed species in the project area
- Degradation of vegetation communities
- Degradation of fauna habitat
- Increased fire fuel load and more intense fires.

This sub-plan addresses management of impacts from weeds. Weed management protocols also address the introduction and spread of pathogens including myrtle rust. The management approaches for vegetation and fire will be consistent with that outlined in Section 7 Environmental Management – Construction, with appropriately scaled down plans to be developed to provide adequate controls for proposed maintenance related impact.

8.2.3 Management objectives

Environmental targets and performance indicators have been prescribed in line with weed management objectives for the operation of the project, as indicated in Table 8-5.

Table 8-5: Weeds performance management

Issue	Objective	Target	Measurement Criteria
Introduction of new weeds	Minimise the potential for new weeds to be introduced into the project area.	<ul style="list-style-type: none"> • No new species of weeds recorded in the project area over life of project • Compliance with the <i>Biosecurity Act</i>. 	<p>Species of weed recorded in the project area.</p> <p>No non-compliance with <i>Biosecurity Act</i> and internal weed hygiene procedures.</p>
Spread of existing weeds	Minimise the risk of spreading existing weeds within the project area and to adjacent areas.	<ul style="list-style-type: none"> • No significant change to the extent (increase) and distribution over life of project (from baseline, refer Table 7-17) • Compliance with the <i>Biosecurity Act</i>. 	<p>Number of recorded locations of weed infestation in project database.</p> <p>Extent of weed cover at recorded locations.</p>

8.2.4 Management measures

UBWF will be responsible for preparation of an Operational Weed Management Plan. The Weed Management Plan will include hygiene protocols restricting the movement of vegetation and soil between impacted areas and areas of significantly lower weed infestation. The Weed Management Plan will include protocols for monitoring and management of weeds to identify and appropriately respond to significant changes in weed distribution and density.

The minimum weed management requirements for this plan are outlined in Table 8-6 below.

Table 8-6: Weed control measures

Parameter	Control measures	Responsibility
Declared weed control	<ul style="list-style-type: none"> New weed infestation shall be treated at the earliest stage while small and manageable Treatment options must follow published advice e.g. weed control fact sheets published by Queensland Department of Agriculture and Fisheries (https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets) 	UBWF Site manager (operation)
Chemical use and storage	<ul style="list-style-type: none"> Will be restricted to approved uses only, following manufacturers' instructions Herbicides will be stored in an appropriate manner Only wildlife-friendly herbicides will be used Herbicide will not to be sprayed near creeks or dams or within two days of rain 	UBWF Site manager (operation)
Vehicle entry	<ul style="list-style-type: none"> Vehicles must use designated tracks only 	UBWF Site manager (operation)
Fill and other imported materials	<ul style="list-style-type: none"> Weed-free declaration certificate required for imported fill Log to record all material imported on site required Log is to include material description, quantity, source and deposition at the site 	UBWF Site manager (operation)
Exposed areas	<ul style="list-style-type: none"> Areas of exposed earth will be minimised and rehabilitated with appropriate non-invasive species 	UBWF Site manager (operation)

8.2.5 Monitoring and recording

The monitoring program for weeds has been designed to ensure that operation of the project is consistent with the control measures, management objectives and targets. Monitoring measures are identified in Table 8-7 below.

Table 8-7: Monitoring and recording requirements

Monitoring	Details	Timing	Responsibility	Records
Implementation of mitigation measures	Ensure all of the above listed mitigation measures are being implemented effectively	Weekly & ongoing	UBWF Site manager (operation)	Weekly environment checklist
Weed infestations or outbreaks	Record any evidence of weed infestations or outbreaks, particular focus on high-risk weeds, comparison to baseline survey results to assist	Ongoing	UBWF Site manager (operation)	Weed register
Analysis of Incident Trends	Analyse incidents reported for any non-compliances, incidents (including weed incursion)	Monthly	UBWF Site manager (operation)	Incident report

8.2.6 Corrective actions and contingencies

If monitoring indicates that environment objectives and targets for weeds are not being achieved, contingency actions will be enacted, as indicated in Table 8-8.

Table 8-8: Weed corrective actions and contingencies

Trigger	Action
Weed outbreaks	<ol style="list-style-type: none"> 1. Infestations are identified and mapped 2. Source of infestation is investigated and addressed 3. Infestations are controlled via appropriate use of herbicide or other control techniques 4. Implement any rehabilitation as required.

8.3 FERAL PREDATOR MANAGEMENT SUB-PLAN

Prior to commissioning an operational feral predator control program will be developed consistent with the construction control program and the following framework:

- Overview of construction feral predator control program, including:
 - Feral predator distribution, abundance and density at final construction targeted survey
 - Learnings from construction control program (eg. what worked and should be continued vs. what was unsuccessful)
- Outline an approach to stakeholder engagement and coordination
- Identify operational activities that could contribute to increased threat of predation by feral species
- Targets and measurement criteria for the following management objectives
 - Avoid the introduction of feral predators into project area
 - Reduce the threat of feral species predation on Sharman's rock wallaby, greater glider, koala, greater large-eared horseshoe bat in the UBWF project area
- Management measures including timing/frequency of actions and responsible personnel
- Monitoring and recording requirements
- Identify triggers and corrective actions.

The Operational Feral predator control program will be implemented over the life of the project, or as determined necessary by monitoring results.

9 Environmental Management – Decommission

The UBWF will be designed with an operational life of 30 years and will be designed fit for purpose. With refurbishment, the wind farm may have a much longer operational life.

At the appropriate time, areas disturbed as part of the permanent footprint will be rehabilitated and the wind farm decommissioned consistent with the requirements of legislation, Australian Standards and industry practices at the time, and the land agreement requirements and regulatory authorities. At the appropriate time, a detailed decommissioning and rehabilitation plan will be prepared to guide these activities.

10 Environmental Management System

UBWF will engage a construction contractor for the project, who will be responsible for commitments to minimising environmental harm, and the delivery of agreed environmental outcomes.

All employees and contractors have a general duty of care under Section 319 of *Environmental Protection Act 1994*. Notwithstanding any specifications in this EMP, Windlab and its contractors must:

- Report environmental incidents to their immediate superior and participate in the investigation and corrective action required to reduce environmental harm or the reoccurrence of the incident
- Comply with the requirements of environmental legislation.

10.1 ROLES AND RESPONSIBILITIES

Roles and responsibilities will be assigned to individuals to implement relevant management plans, in accordance with Table 10-1 during construction. Roles and responsibilities for implementation of the Bird and Bat Management Plan are provided in that document and include a number of highly specialised requirements.

The UBWF Project Manager will have overall responsibility and accountability for the implementation of this plan and compliance with all environmental legislation, condition of approval and contractual obligations.

Table 10-1: Roles and responsibilities for environmental management for the construction phase

Role	Responsibilities
Project Manager (UBWF)	<ul style="list-style-type: none"> • Handover of design and approvals requirements to the principal contractor • Ongoing oversight and accountability across project delivery • Responsible for managing the construction work timetable in consultation with project personnel listed below
Principal Contractor – Site Manager	<ul style="list-style-type: none"> • Overall responsibility for ensuring all mitigation measures are implemented during works, including development of any sub-plans • Reviews and approves the final sub-plans • Ensures any design changes during construction are approved by Windlab, including obtaining any necessary additional or modified planning approvals

Role	Responsibilities
	<ul style="list-style-type: none"> • Ensures the environmental performance of the construction phase, including a responsibility for the effective implementation of health, safety and environment (HSE) management measures • Oversees development and ensures effective delivery of all environmental inductions • Manages community complaints with respect to environmental matters • Responds and reports on incidents
Clearing Contractor – Environmental Manager	<ul style="list-style-type: none"> • Shall be suitably qualified and experienced environmental scientist/engineer • Responsible for site management, CEMP compliance, including subcontractors • Issues stop work orders, if required • Monitors works to ensure all environmental obligations are met, e.g. undertakes minimum of weekly environmental inspections (or if environmental conditions change, e.g. rain) • Undertakes internal audits • Reports demonstration of compliance with applicable environmental legislation, conditions of approval and contractual obligations • Records any community complaints and notifies Project Manager • Facilitates inductions and toolbox talks for site personnel • Initiates corrective actions • Initiates preventative measures with 48 hours of significant forecast rain events (25 mm within a 24-hour period) • Reports EMP non-conformances to the Project Manager • Notifies the Contractor’s Site Manager if the EMP needs revising
All staff	<ul style="list-style-type: none"> • Undertakes inductions and training appropriate for this EMP • Constructs and implements environmental controls and procedures • Reports any malfunctions, incidents, emergencies or other environmental incidents to both the Environmental Manager and the Site Manager • Rectifies temporary situations that may result in or are resulting in, environmental harm • Undertakes environmental monitoring where required • Records community concerns and notify Site and Environmental managers

10.2 TRAINING AND INDUCTION

Well trained and environmentally aware personnel are a key factor in ensuring that all aspects of the project are executed with minimal impacts to the environment and that the highest possible standards of environmental management are met. UBWF will ensure all employees and subcontractors involved with the project receive environmental training appropriate to their role. The provision of training will be in accordance with the training and competence HSE management measures developed for the project.

A comprehensive environmental awareness induction will be provided when personnel commence on the project. Environmental topics will also be included in toolbox talks during construction and other ongoing environmental training is to be provided as appropriate. All training will be guided and maintained by an assessment of training needs.

10.2.1 Inductions

A comprehensive environmental awareness induction will be provided when personnel commence on the project and is required for all first-time visitors to the site. This induction will include aspects such as:

- Objectives of relevant management plans and associated control measures
- Guidance on the significance and sensitivity of vegetation within the project area
- Information about threatened species (flora and fauna)
- Environmental objectives and policies of Windlab
- Individual's and organisation's environmental obligations under relevant environmental legislation
- Any restricted or 'no-go' areas
- Controls and procedures to prevent impacts
- Responsibilities for environmental monitoring and reporting
- Procedures for responding to environmental incidents and emergencies.

The environmental induction training will be developed prior to construction commencing.

10.2.2 Toolbox talks

All staff and sub-contractors will be briefed daily on environmental requirements for specific construction activities, focussing on reinforcement of practical measures to reduce environmental harm. Toolbox talks will include but not be limited to:

- Identification of vegetation/habitat clearing demarcations
- Management of potentially toxic chemicals
- Vehicle speed limits and refuelling plant and machinery protocols
- Precautions to prevent sediment-laden run-off entering watercourses
- Safety share
- Lessons learnt
- Specific precautions for protected flora and fauna.

10.2.3 Training needs assessment

As part of the HSE Management System, a training needs assessment and training plan will be developed for the project to include within the site's overall Construction Environment Management Plan (CEMP). This plan will identify training requirements for each role within the project and will include environmental awareness training areas, including around vegetation management.

10.2.4 Emergency response

An emergency response plan will be developed as part of the overall site CEMP and will include measures around emergencies directly related to biodiversity management.

10.2.5 Incident management

An incident investigation and reporting procedure will be developed by Windlab as part of the overall CEMP.

10.3 INSPECTIONS AND AUDITS

The Construction Contractor shall be responsible for conducting regular weekly inspections against compliance with the relevant management plans. Records shall be maintained in a project log book or other appropriate reporting system. Specific monitoring requirements have been detailed within each management plan, as necessary.

Windlab will conduct regular audits of the Construction Contractor to monitor compliance against this EMP. All open items from previous inspections will be checked during the next inspection to ensure remedial action has been taken, and to determine if that action has been effective. Records of all works including inspections will be maintained to demonstrate compliance with the requirements of the EMP.

Construction is proposed to commence and be completed within the 3 years of the proposed start. At a minimum 3 annual environmental compliance audits will be conducted to ensure that the systems and controls detailed within the EMP are implemented.

10.4 REVIEW AND IMPROVEMENT

Windlab policies and procedures will be adopted across the operation of all its businesses and is committed to ongoing review and improvement of existing systems and controls.

Ongoing review commitments relevant to this EMP are presented in Table 10-2.

Table 10-2: Details of system elements requiring periodic review

Subject	Detail	Timeframe	Responsibility
EMP	<p>The review shall:</p> <ul style="list-style-type: none"> Assess the appropriateness of the EMP to the construction and operational activities based on audit information Determine if any changes to the EMP are required as a result of scope, legislative or organisational changes. <p>All revisions shall be submitted to relevant regulators for approval, if required.</p>	In response to a material change to the activities and/or the use of equipment or in response to actions arising from any audit taken.	Senior HSE Advisor
HSE Policy	Review to identify and implement continuous improvement opportunities.	Annual	HSE Manager/ Executive Management Team
Legislation and other requirements	Review to identify amendments to existing and addition of new legislation which is relevant to the environmental management of wind farm activities.	Annual and opportunistic	Audit and Compliance Manager/ Senior HE Advisor

10.5 REPORTING

To demonstrate and maintain compliance against legislative requirements, routine external reporting to key regulatory agencies shall be conducted. Routine external reporting requirements for the project are summarised in Table 10-3.

Table 10-3: External reporting

Report	Details	Frequency	Responsibility
EMP implementation - construction	Reportable incident	Quarterly	Senior HSE Advisor
Native vegetation clearing report	As required in Vegetation Clearing Permits (Development Consent)	As required in Development Consent	Senior HSE Advisor
EPBC Approval	As required in EPBC Approval conditions	As required in relevant EPBC Approval condition	Senior HSE Advisor
EMP implementation – operation (BBMP)	Monitoring reports Adaptive management reporting Reportable incident	Annually or as required by plan	Senior HSE Advisor

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Appendix A. Injured animal Protocol

If fauna is injured on site, the following procedures will be adopted for the handling of the injured animals:

- All nearby operations (within an ~50 m radius) will cease immediately.
- The site fauna handler will request, whilst monitoring the location of the injured animal, that the work site is made safe to allow access to the injured animal.
- The fauna handler is to conduct a rapid assessment to determine the state of health and any injury to the animal.
- Where it is safe for the animal and fauna handler, the animal will be carefully removed into a secure holding container, kept warm (or cool as required) and taken to a quiet location.
- If it is unsafe or not possible to handle/recover the animal, then:
 - An additional fauna handler (preferably the most experienced one) and Site Environmental Officer will be contacted immediately to assist in the capture of the injured fauna
 - The fauna handler will GPS-mark the location of the injured animal and keep a watch on the animal at a safe distance to monitor the condition of the animal and be on standby if the animal moves
 - The Site Environmental Officer and fauna handler will arrange the best method for removal of the injured fauna
 - The fauna handler will secure and capture the injured animal.
- Injured fauna will be referred to an appropriate wildlife carer group or veterinarian for example –
 - Tropical Vet Services clinic for treatment Address: 13 Palm Terrace, Ingham, QLD 4850. Phone: (07) 4776 1572). Other Local wildlife carers can be accessed through the RSPCA hotline ph 1300 264 625
- Department of Environment and Science will be notified of wildlife incidences within 24 hours of any injuries or deaths Ph 1300 130 372 (Press Option 1).
- Fauna injured/killed will be recorded within a Fauna Interactions Register and a Fauna Handling Report-Injury/Death report will be completed within 24 hrs.
- Seriously injured animals will be euthanised on site at the discretion of the experienced/trained fauna handler who is licensed to administer euthanasia under the Queensland *Health (Drugs and Poisons) Regulation 1996* and *Animal Care and Protection Act 2001*.

Following the capture/recovery of injured fauna, an investigation into the cause of the incident will be undertaken and reported to regulators as part of the annual compliance report.

Appendix B. Risk Assessment

The risk assessment was undertaken as described in Section 5. Criteria and outcomes of the risk assessment are provided below.

Table 11-1: Definition of terms

Factor	Definition
Long-term	More than 10 years
Short-term	1-10 years
Seasonal	<1 year
Local	Within wind farm development footprint and 100 m buffer
Widespread	Outside and beyond (up to 10 km from) development footprint
Regional	Across the entire southern Upper Burdekin region
Species habitat	Includes preferred species habitat, habitat where the species is located and habitat that has the potential to support the species (but the species may not currently occur there)

Table 11-2: Definition of likelihood

Likelihood/Probability		
A	Almost certain	Common repeating occurrence that is ongoing. Is expected to occur with wind farm developments of this scale
B	Likely	Will probably occur at some time and in most circumstances. Known to occur with wind farm developments.
C	Possible	Could occur at some time but not often. Sometimes occurs with wind farm developments.
D	Unlikely	Could potentially occur at some time. Uncommonly occurs in wind farm developments.
E	Rare	Practically impossible. Will only occur in very rare circumstances. Not known to occur in wind farm developments.

Table 11-3: Consequences definitions for terrestrial flora and vegetation

1	2	3	4	5
Trivial	Minor	Severe	Major	Catastrophic
Minor local loss and/or moderate local degradation of significant (non-threatened) vegetation community	Moderate local loss and/or substantial local degradation of significant (non-threatened) vegetation community	Substantial local loss and/or moderate regional degradation of significant (non-threatened) vegetation community	Moderate regional loss and/or substantial regional degradation of significant (non-threatened) vegetation community	Substantial regional loss and/or substantial regional degradation of significant (non-threatened) vegetation community
No loss of individuals of threatened flora species	Minor local decrease in size of population(s) of threatened flora species	Moderate local decrease in size of population(s) of threatened flora species	Substantial local decrease in size of population(s) of threatened flora species	Moderate regional decrease in size of population(s) of threatened flora species

Table 11-4: Consequence definitions for terrestrial and arboreal fauna

1	2	3	4	5
Trivial	Minor	Severe	Major	Catastrophic
No loss of threatened species habitat Minor local habitat modification ¹² and/or lifecycle disruption ¹³ for a threatened species	Minor local loss of threatened species habitat Moderate local habitat modification ¹² above and/or lifecycle disruption ¹³ for a threatened species	Moderate local loss of threatened species habitat Substantial local habitat modification ¹² and/or lifecycle disruption ¹³ for a threatened species	Substantial local loss of threatened species habitat Moderate regional habitat modification ¹² and/or lifecycle disruption ¹³ for a threatened species	Moderate or substantial regional loss of threatened species habitat Substantial regional habitat modification ¹² and/or lifecycle disruption ¹³ for a threatened species
No loss of individuals of threatened fauna species	Minor local decrease in size of population(s) of threatened fauna species	Moderate local decrease in size of population(s) of threatened fauna species	Substantial local decrease in size of population(s) of threatened fauna species	Moderate or substantial regional decrease in size of population(s) of threatened fauna species

¹² Habitat modification can include fragmentation, and alteration of fire regimes, nutrient cycles and/or hydrological cycles

¹³ Lifecycle disruptions can include disruption of breeding, feeding, migration, resting behaviour, etc

Table 11-5: Consequence definitions for terrestrial environmental quality

1	2	3	4	5
Trivial	Minor	Severe	Major	Catastrophic
Minor leak or spill contained within bunded area	Minor leak or spill affecting soil around bunded area; minimal response and clean-up required	Leak or spill affecting soil; Clean-up procedures required	Major leak or spill affecting soil beyond storage area, some minor permanent impacts	Leak or spill causing widespread environmental impact to soil in the region, some permanent impacts
Short term impact to surface soils. Readily reversible	Medium term reversible impact to surface soils. May take less than 1 year to remediate or become stable	Long term recovery of surface soils. May take longer than 1 year to remediate or become stable	Impact of deep soil profiles requiring long term recovery. May take a number of years to remediate or become stable	Impact of deep soil profiles requiring long term recovery leaving residual impacts. May take decades to fully remediate or become stable

Table 11-6: Consequence definitions for inland water environmental quality

1	2	3	4	5
Trivial	Minor	Severe	Major	Catastrophic
No detectable change to background water quality; no exceedance of background	Local, short-term, minor exceedance of background	Local, long-term OR widespread, short-term, exceedance of background	Local, permanent OR widespread, long-term exceedance of background	Major exceedance of background that is widespread and permanent Widespread, permanent exceedance of background

Table 11-7: Consequence definitions for hydrological processes

1	2	3	4	5
Trivial	Minor	Severe	Major	Catastrophic
No detectable change to surface water hydrology or flow regimes	Local, short-term change in surface water hydrology and flow regimes that can be readily remediated Non-significant change in surface water hydrology and flow regimes that are local and short-term, and that can be easily remediated	Significant change in surface water hydrology and flow regimes that is either widespread and short-term, or local and long-term	Significant change in surface water hydrology and flow regimes that is either widespread and long-term, or local and permanent	Significant change in surface water hydrology and flow regimes that is widespread and permanent

Table 11-8: Consequence definitions for air quality (dust)

1	2	3	4	5
Trivial	Minor	Severe	Major	Catastrophic
No measurable air quality impacts	Local short-term and minor exceedance(s) of standards	Localised long-term change in air quality	Regional short-term change in air quality	Regional long-term change in air quality

Table 11-9: Risk matrix

		Consequence	1	2	3	4	5
			Trivial	Minor	Severe	Major	Catastrophic
Likelihood	A	Almost Certain	Low	Intermediate	High	Extreme	Extreme
	B	Likely	Low	Low	Intermediate	High	Extreme
	C	Possible	Negligible	Low	Intermediate	High	High
	D	Unlikely	Negligible	Negligible	Low	Intermediate	High
	E	Rare	Negligible	Negligible	Negligible	Low	Intermediate

Table 11-10: Risk rating, risk class and associated risk management response

Rating	Risk management response
Extreme	Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention. Modify the threat, likelihood or consequence so that the risk is reduced to 'Intermediate' or lower.
High	Risks that exceed the risk acceptance threshold and require proactive management. Modify the threat, likelihood or consequence so that the risk is reduced to 'Intermediate' or lower.
Intermediate	Risks that lie on the risk acceptance threshold and require active monitoring. The implementation of additional measures could be used to reduce the risk further. Modify the threat, the likelihood or consequence to reduce the risk to 'Low' or 'Negligible' if practicable
Low	Determine the management plan for the threat to prevent occurrence and monitor changes that could affect the classification.
Negligible	Review at the next review interval Manage by routine procedures – reassess at the next review

Table 11-11: Certainty level matrix

Level	1	2	3	4	5
Certainty	Uncertain	Low	Moderate	High	Certain
Description	Perception only; No information or knowledge forms the basis of the opinion.	Perception based; Some Information known on process but not directly relevant to region, or information at a regional level has significant limitations.	Limited information is known; Expert knowledge would lead to this outcome, some differences in opinion.	Information is known; Process has been described and documented at a regional level and experts can verify this position.	Information is known and well represents the specific nature of the process; Described and documented at a regional level and experts would be expected to agree on this position.

Construction Phase

Table 11-12: Construction Phase Risk Assessment

Environmental Aspect (Activity)	Environmental Factor (Receptor)	Potential Impact (Change/ Effect)	Consequence	Likelihood	Inherent Risk	Assumptions/ Comments	Management Controls	Consequence	Likelihood	Residual Risk	Certainty
Vegetation clearing	Terrestrial flora and vegetation	Disturbance/ loss of flora species and vegetation communities, including impacts outside the immediate clearing area due to degradation of habitat caused by sediment deposition, weed invasion, clearing outside proposed development footprint	3	B	I	Access tracks to be collocated with existing tracks where possible Watercourses unlikely to be in flow in drier months but will reach peak flows through summer Infrastructure avoids drainage lines within the project area but access tracks do bisect some waterways. Creek crossings to be collocated with existing tracks where possible. Standard reinstatement, revegetation or rehabilitation of laydown areas / gully crossings	Avoidance through design and micro siting infrastructure to maximise use of disturbed areas and the need for vegetation clearing minimised. Vegetation sub-plan Weed sub-plan Soils and sediment sub-plan Site reinstatement and rehabilitation sub-plan	2	C	L	H
		Disturbance/ loss of EPBC Act and/or NCA listed threatened species)	2	C	L	No EPBC Act listed flora species were identified during survey One NCA-listed species was identified within the project area	Avoidance through design and micro siting infrastructure to maximise use of disturbed areas and the need for vegetation clearing minimised. Pre-clearance surveys for protected plants will occur Vegetation sub-plan (including any species specific mitigation as a result of pre-clearance surveys) Weed sub-plan Soils and sediment sub-plan	2	D	N	H
		Degradation of vegetation community due to spread of weeds	2	B	L	Access tracks to be collocated with existing tracks where possible Weed presence (including WONS) known within development footprint and surrounds Weed spread is a known risk for construction activities	Weed sub-plan	1	C	N	H
Vegetation clearing	Terrestrial and arboreal fauna	Disturbance/ loss/ degradation of habitat	3	A	H	Access tracks to be collocated with existing tracks where possible EPBC Act and NCA-listed species are known to or have the potential to occur within the project area Habitat will be removed as part of the project	Fauna sub-plan Vegetation sub-plan Species-specific management plans Site reinstatement and rehabilitation sub-plan Weed sub-plan Soils and sediment sub-plan Bushfire sub-plan Noise sub-plan Air-emissions sub-plan	3	C	I	H
		Fragmentation of habitat	3	A	H	Access tracks to be collocated with existing tracks where possible Project is sited within a large area of remnant vegetation and habitat Clearing causes a linear fragmentation representing a minor barrier for fauna species, or additional vectors (roads / tracks) for predators New tracks will be collocated with clearing for transmission lines where practically possible to minimise clearing Where practically possible transmission lines can be strung over gullies to avoid clearing in sections	Avoidance through design and micro siting infrastructure to maximise use of disturbed areas and the need for vegetation clearing minimised. Fauna sub-plan Vegetation sub-plan	3	A	I	H

Environmental Aspect (Activity)	Environmental Factor (Receptor)	Potential Impact (Change/ Effect)	Consequence	Likelihood	Inherent Risk	Assumptions/ Comments	Management Controls	Consequence	Likelihood	Residual Risk	Certainty
Vegetation clearing	Terrestrial environmental quality	Accelerated erosion and landform instability possible due to intense rainfalls	2	C	L	Infrastructure avoids drainage lines within the project area but access tracks do bisect some waterways. Creek crossings to be collocated with existing tracks where possible. Dry-tropical environment – rainfall high intensity in summer Construction will occur over period of significant rainfall, only where construction within the wet season is necessary Best practise ESC measures to be tailored for environment to be implemented	Soils and sediment sub-plan Surface water sub-plan Site reinstatement and rehabilitation sub-plan	2	D	N	M
Vegetation clearing	Inland water environmental quality	Degradation of surface water quality due to erosion of soils and landforms	2	B	L	Infrastructure avoids drainage lines within the project area but access tracks do bisect some waterways. Creek crossings to be collocated with existing tracks where possible. Rainfall high intensity and generally limited to summer Standard construction and reinstatement measures Watercourse crossings minimised Construction will occur over period of significant rainfall, only where construction within the wet season is necessary	Soils and sediment sub-plan Surface water sub-plan Site reinstatement and rehabilitation sub-plan	1	C	N	H
Excavation	Terrestrial flora and vegetation	Degradation of vegetation community due to spread of weeds	2	B	L	Many proposed tracks are within alignment of existing tracks Weed presence (including WONS) known within development footprint and surrounds Weed spread is a known risk for construction activities	Weed sub-plan	1	C	N	H
Excavation	Terrestrial fauna	Mortality of individuals due to capture in trenching where undertaken	2	C	L	Trenching associated with laying underground cables for ~7 km The majority of trenches will run alongside existing access tracks	Fauna sub-plan	1	C	N	H
Excavation	Terrestrial environmental quality	Accelerated erosion and landform instability possible due to intense rainfalls	3	B	I	Rainfall high intensity in summer Construction will occur over period of significant rainfall, only where construction within the wet season is necessary Best practise ESC measures to be tailored for environment to be implemented	Soils and sediment sub-plan Surface water sub-plan Site reinstatement and rehabilitation sub-plan	2	C	L	H
Vehicle movements	Terrestrial flora and vegetation	Degradation of vegetation community/ alteration of community composition due to introduction and/or spread of weeds	2	B	L	Many tracks are already accessed by landholders Use of existing access tracks has been maximised during design phase	Weed sub-plan	2	D	N	H
Vehicle movements	Terrestrial fauna	Degradation of fauna habitat due to introduction and/or spread of weeds	3	B	I	Many tracks are already accessed by landholders Use of existing access tracks has been maximised during design phase	Weed sub-plan Fauna sub-plan	2	D	N	H
		Loss of individuals (mortality due to vehicle strike)	2	B	L	Generally daytime only traffic but dawn and dusk included. Significant vehicle movements limited to short construction phase. Vehicle movements are a known cause of wildlife mortality	Vehicle speed limits shall be imposed on construction vehicles to minimise the risk of fauna strike and driving at dawn and dusk shall be limited. Fauna sub-plan	2	D	N	H
Fire ignition	Terrestrial flora and vegetation	Disturbance/ loss of terrestrial flora species and vegetation communities (non-threatened).	4	C	H	Accidental fire ignition caused by the project Immediate attempts to extinguish the fire fail Potential additive effect of grassy weed species	No hot works on fire ban days Relevant personnel shall be trained in the use of fire-fighting equipment	4	E	L	H

Environmental Aspect (Activity)	Environmental Factor (Receptor)	Potential Impact (Change/ Effect)	Consequence	Likelihood	Inherent Risk	Assumptions/ Comments	Management Controls	Consequence	Likelihood	Residual Risk	Certainty
						Project area is adjacent to large areas of remnant vegetation Moderate natural fire frequency Risk higher during construction phase	Appropriate fire control equipment will be made available Bushfire sub-plan Weed sub-plan				
		Degradation of vegetation communities caused by sediment deposition, physical modification of watercourse resulting from fire	3	C	I	As above	As above	3	E	N	H
		Disturbance/loss of conservation significant flora species (e.g. NCA listed threatened species)	3	C	I	As above	As above	3	E	N	H
Fire ignition	Terrestrial and arboreal fauna	Fragmentation of habitat	4	C	H	As above	No hot works on fire ban days No smoking on site Relevant personnel shall be trained in the use of fire-fighting equipment Appropriate fire control equipment will be made available Fauna sub-plan Bushfire sub-plan Weed sub-plan	4	E	L	H
		Disturbance/ loss of habitat or food sources (due to input of silt, ash, etc. caused by wildfire)	4	C	H	As above	As above	4	E	L	H
		Degradation of surface water quality due to input of silt, ash, etc. caused by wildfire	3	C	I	As above	As above	3	E	N	H
Fire ignition	Inland water environmental quality	Generation of dust and ash due to wildfire caused or exacerbated by project activities	3	C	I	As above	As above	3	E	N	H
Fire ignition	Air quality	Generation of smoke, dust and ash due to wildfire caused or exacerbated by project activities	4	C	H	As above	As above	4	E	L	H
Spills and leaks	Terrestrial flora and vegetation / Terrestrial fauna	Disturbance / loss of significant vegetation, flora or habitats due to spills	3	C	I	Management and storage of hazardous materials to Australian Standards and consistent with MSDS Threatened flora / fauna species known in project area and region	Hazardous materials and spill response sub-plan	2	D	N	H
Waste	Terrestrial flora and vegetation / Terrestrial fauna	Disturbance and degradation of habitat from construction waste materials	2	C	L	Construction waste will be disposed of at a licensed waste management facility Debris from clearing vegetation will be managed according to the vegetation management sub-plan	Waste management sub-plan	1	C	N	H
Dust emissions	Terrestrial flora and vegetation	Disturbance/ loss of conservation significant flora species (e.g. NCA listed threatened species) due to dust deposition	2	C	L	Rainfall high intensity in summer provides natural dust suppression Dust during clearing activities, and in open areas and along access tracks during construction Many tracks are already accessed by landholders Use of existing access tracks has been maximised during design phase	Vehicle movements will be speed and access restricted Air emissions (dust) sub-plan	1	C	N	H
	Terrestrial fauna	Degradation of terrestrial fauna habitat (e.g. foraging, nesting) due to dust deposition	2	C	L	As above	As above	1	C	N	H

Environmental Aspect (Activity)	Environmental Factor (Receptor)	Potential Impact (Change/ Effect)	Consequence	Likelihood	Inherent Risk	Assumptions/ Comments	Management Controls	Consequence	Likelihood	Residual Risk	Certainty
Light emissions	Terrestrial arboreal fauna	Disruption to nesting/ roosting/ foraging habitats and/or behaviour Attraction of exotic fauna such as cane toads / dogs / cats	2	C	L	Construction will not be undertaken past dusk for most of the construction period. No lighting for aviation safety required Lighting will be restricted to offices and compound areas for security	Generally, no night time work on the project is envisaged Fauna sub-plan	2	D	N	H
Noise emissions and vibration (including wind turbine noise)	Terrestrial and arboreal fauna	Disruption to nesting/ roosting/ foraging habitats and/or behaviour	3	C	I	Construction noise may be continuous from during daylight hours will be temporary (up to 24 months)	Noise sub-plan Fauna sub-plan	2	C	L	H

Operational Phase

Table 11-13: Operational Phase Risk Assessment

Environmental Aspect (Activity)	Environmental Factor (Receptor)	Potential Impact (Change/ Effect)	Consequence	Likelihood	Inherent Risk	Assumptions/ Comments	Management Controls	Consequence	Likelihood	Residual Risk	Certainty
Physical presence of infrastructure	Terrestrial flora and vegetation	Degradation of vegetation community due to spread of weeds	2	B	L	Weeds and feral animals known to exist in project area Maintenance requirements are minimal	Weed sub-plan Vegetation sub-plan Site reinstatement and rehabilitation sub-plan -plan	2	C	L	H
	Terrestrial fauna	Degradation of fauna habitat and loss of individuals due to access / predation by feral animals (or toxication by cane toads)	3	C	I	Feral animals known to exist in project area	Fauna management sub-plan Specific species management plans	2	D	N	H
Increased presence of people	Terrestrial and arboreal fauna	Degradation and disturbance of fauna habitat from rubbish and presence of domestic pets	2	B	L	Number of people regularly on site during operational phase will be limited to 1 -2 people People presence will largely be restricted to undertaking maintenance activities, and implements environmental management and monitoring activities	Fauna management sub-plan Hazardous materials sub-plan Waste management sub-plan Bushfire sub-plan	2	D	N	H
Vehicle movements	Terrestrial fauna	Loss of individuals (mortality due to vehicle strike)	2	B	L	Vehicle movements along access tracks minimal, but regular and typically occurring during daylight Vehicle movements are a known cause of wildlife mortality	Vehicle use procedures including speed limits access track, limit dusk and dawn driving. Fauna sub-plan Specific species management plans	2	D	N	H
Light emissions	Terrestrial and arboreal fauna	Attraction of exotic fauna such as cane toads / dogs / cats Attraction of insects which are key prey items of microbats	3	B	I	No lighting for aviation safety required Lighting will be restricted to offices and compound areas for security	Vehicles are unlikely to be on-site between dusk and dawn. Fauna sub-plan	1	D	N	H
Noise emissions	Avifauna	Disruption to nesting/ roosting/ foraging habitats and/or behaviour				Operational noise from turbines when spinning 3.0 ms ⁻¹ , and will increase with wind speed until approximately 10 ms ⁻¹ where noise levels reach their maximum Modelling of wind turbine noise has been undertaken with results showing maximum noise levels of 50-60 dBA being restricted to relatively small areas (100-200 m) from the base of each wind turbine.	Noise management sub-plan Bird And Bat Management Plan				



ABOUT WINDLAB

Windlab is a global renewable energy development company. It was established to commercialise world leading atmospheric modelling and wind energy assessment technology, developed by Australia's premier scientific research institute, the CSIRO. Windlab owns and exclusively utilises this suite of industry best practice tools to identify and efficiently develop, finance, construct and operate high quality wind farms around the world, with considerably greater certainty and substantially less risk.

This technological advantage has enabled Windlab to amass a large portfolio of high quality wind farm development sites across North America, Australia, New Zealand and Southern Africa.

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