Arrowsmith Hydrogen Project
(AHP)

Section 38 Referral
Supporting Document

Environmental Management Review Framework (EMRF)

(Pursuant to Section 40(2)(a) of The EP Act 1986)

Impact Mitigation Strategies

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Project Acronym	AHP
Project Title	Arrowsmith Hydrogen Project
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Revision History

Rev	Description	Date	Author	Checked	Appr
A	Changes as per EPA requirements	24/07/24	PG	MH	SG
1	Update for Re-submission to EPA	23/02/25	PG	MH	SG

IGE respectfully acknowledges traditional owners of the land and water it manages, and recognises their continuing connection to land, water and community

Contents

Tables

Figure

Acronyms and Abbreviations

Abbreviation / Term	Descriptor
3D	Three Dimensional
AHP	Arrowsmith Hydrogen Project
AHD	Arrowsmith Hydrogen Hub
BESS	Battery Energy Storage System
BKNR	Beekeepers Nature Reserve
BoM	Bureau of Meteorology
CBC	Carnaby's Black Cockatoo
CO_2-e	Carbon Dioxide equivalent
DBCA	Department of Biodiversity, Conservation and Attractions
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DE	Development Envelope
DFES	Department of Fire and Emergency Services
DGs	Dangerous Goods
DMIRS	Department of Mines, Industry Regulation and Safety
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Land, Planning and Heritage
DWER	Department of Water and Environmental Regulation
EFG	Environmental Factor Guideline
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GDE	Groundwater Dependent Ecosystem
GHG	Greenhouse Gas
GHPF	Green Hydrogen Production Facility(GHPF)
IGE	Infinite Green Energy Pty Ltd
IBRA	Interim Biogeographic Regionalisation of Australia
IMR	Inspection, Maintenance and Repair
ADH	Arrowsmith Development Hub
DWERS	Department of water and Environmental Regulation
GDE	Groundwater Dependent Ecosystem
EPA	Environmental Protection Authority
IUCN	International Union for Conservation of Nature
LCT	Landscape Character Type
Met Mast	Meteorological Mast (for data collection)
MHF	Major Hazard Facility
MNES	Matter of National Environmental Significance
MP	Member of Parliament
MRWA	Main Roads of Western Australia
NSP	Noise Sensitive Premises
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
RFSU	Ready for Start-Up
SIMOPS	Simultaneous Operations
SRE	Short Range Endemic

Abbreviation / Term	Descriptor
TEC	Threatened Ecological
TDS	Total Dissolved Solids
TF	Threatened Flora
VT	Vegetation Type
WASG	Western Australian Speleological Group
WoNS	Weed of National Significance
YSRC	Yamatji Southern Regional Corporation

1. Introduction

This document has been prepared to provide supporting information for referral of the Arrowsmith Hydrogen Project (AHP), under Section 38 of the Environmental Protection Act 1986 (WA) (EP Act). This updated supporting document is Pursuant to section 40(2)(a) Notice, "Requiring Information for Assessment''.

This supporting information utilises EPA Management plan guidelines and endeavours to provide clarification and further information regarding environmental management and mitigation, associated objectives and positive environmental outcomes, related to the construction and operation of the AHP Proposal.

1.1 Adaptive Management

IGE will implement an Adaptive Management approach to navigate the inherently dynamic nature of both wind turbine technology and hydrogen production facilities; this approach ensures that projects remain not only flexible but also highly responsive to ongoing developments, whether they arise from new information, emerging environmental data, or technological advancements. By continuously monitoring operational performance and environmental impact, and by incorporating real-time adjustments as new technologies or insights become available, IGE can optimise outcomes in a manner that balances sustainability with innovation; this iterative process guarantees that the projects can evolve effectively, remaining aligned with both current best practices and future industry breakthroughs.

A robust monitoring system is critical for continuously collecting data on the performance of wind turbines, solar arrays, and hydrogen production facilities. Regular evaluation of environmental impacts, benchmarked against baseline data, will enable the assessment of the effectiveness of mitigation measures and ensure environmental compliance. The flexible design of these facilities will allow for easy upgrades or modifications as new technologies emerge. By utilizing modular components, the infrastructure can be efficiently upgraded or replaced without major overhauls, ensuring the project remains adaptable and future-proof as technological advancements unfold.

Where project monitoring reveals that performance outcomes are not being met in relation to impact mitigation or environmental factors, corrective action strategies will be promptly implemented and integrated into the Adaptive Management approach. This ensures continuous improvement and responsiveness to environmental challenges.
Additionally, scenario planning will be employed to evaluate multiple potential future scenarios, anticipating changes in technology and environmental conditions. By preparing contingency plans, IGE will be positioned to swiftly adapt as these scenarios unfold, maintaining project resilience and performance.

Collaboration with research institutions will be a key component of IGE's strategy, enabling the company to stay at the forefront of technological advancements and environmental science. By actively participating in and supporting research initiatives, IGE can leverage cutting-edge findings to inform better management practices and enhance both environmental and operational outcomes.

To implement this approach, IGE will start with baseline assessments to identify key indicators for monitoring. Pilot projects can test new technologies and management practices, with successful approaches being scaled up. Regular reviews of project performance, incorporating monitoring data and stakeholder feedback, are essential. Transparent reporting on progress, challenges, and adjustments builds trust and support from stakeholders.

By integrating these components into our project management practices, IGE can ensure their wind turbine and hydrogen production facilities remain cutting-edge while minimising our environmental footprint. This approach enhances sustainability and builds resilience against future uncertainties and challenges.

1.2 Early Response indicators

Early response indicators, criteria and actions are deemed to be appropriate for the AHP project, where critical environmental factors may be impacted due to a degree of technological uncertainty regarding turbine facility layout, electrolysis systems, visual amenity impacts and avifauna blade strike effects.

As required in 'section 6' of the request for further information document, all relevant mitigation and management measures specified in the management plans are included in this revised supporting document for each relevant environmental factor.

1.3 The Proposal

IGE Pty Ltd are proposing to develop a Green Hydrogen Production Facility(GHPF) (the Proposal). The Proposal, including associated infrastructure, will be located within the Arrowsmith Development Hub (ADH) approximately 30 km south of Dongara in the Mid-West Gascoyne region of Western Australia.

The Proposal includes the construction of a Green Hydrogen Production Facility(GHPF) and associated infrastructure including: a solar photovoltaic (PV) solar farm; a Windfarm, electrolysers for processing hydrogen and associated equipment.

2. Summary

This revised environmental review document has been prepared by IGE Pty Ltd (IGE) to update information required for assessment **(Section 40(2)(a))** pursuant to section 40(2)(a) of the *Environmental Protection Act 1986*, This document has been prepared in accordance with the Western Australian Environmental Protection Authority

Table 1 The following tables summarises the factors and content of the proposal

Summary of the Proposal	
Proposal title	Green Hydrogen Production Facility(GHPF), Arrowsmith AHP
Proponent name	IGE Pty Ltd
Address	Level 13/99 St George Terrace, Perth, 6000 WA, Australia.
Purpose of this document	Further information required for assessment by EPA - Summary
Key environmental factors and objectives	The key environmental factors and associated EPA objectives are: **Flora and vegetation** – To protect flora and vegetation so that biological diversity and ecological integrity are maintained. **Terrestrial fauna** – To protect terrestrial fauna so that biological diversity and ecological integrity are maintained. **Social surroundings** – To protect social surroundings from significant harm. **Inland Waters**- To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.
Condition clauses	As per Notice Requiring Information for Assessment

Environmental Factors	**Flora and Vegetation** Additional survey information to determine the potential impact to significant flora and vegetation. Evidence of consultation with the Department of Biodiversity, Conservation and Attractions (DBCA) regarding potential indirect impact to Beekeepers Nature Reserve. **Terrestrial fauna** Additional black cockatoo habitat assessment to determine the extent and quality of foraging habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*). Identification of adequate mitigation measures during wind turbine operation. **Inland waters** Further clarification of the proposed groundwater extraction strategy and whether the potential environmental impacts of the chosen strategy have been assessed. Further surface water assessment based on the site layout as referred, and clarification of management measures to determine impact to surface water. **Social surroundings** Further information to clarify the extent and effort of the Aboriginal heritage survey, including further discussion on potential impacts to ethnographic aspects, and confirmation that all recommendations set out in the survey report will be addressed. **Other environmental factors** Further information and clarification of proposed management and mitigation measures to determine that the EPA's objective for landforms is met. Evidence of consultation with the Western Australian Speleological Group (WASG) regarding potential impact to karst formation and cave systems. **Cumulative and holistic impact assessment** A holistic impact assessment, providing a summary of the environmental effect of the proposal on the environment as a whole is required. A cumulative impact assessment of the proposal for each environmental factor is required

2.1 General Proposal Content Description

Proposal element	Location / Description	Maximum extent, capacity or range	Current hectares
Physical Elements hectares			
Development Envelope (IGE Property Extent Lot 703)	Figure 1 Project Development Envelope	Maximum Extent	**1904.48 ha**
Development Envelope (Road verge widening and AHP Site Access)	Figure 1	Maximum Extent	**1.68 ha**
Solar Farm (PV Solar Array)	Figure 1	Maximum Extent	140.70 ha
		Previously Disturbed Area	74.83 ha
		Clearing Required	**65.87 ha**
Green Hydrogen Production Facility (GHPF) - Alkaline Electrolyser units - Water Treatment plant: RO Filtration units, demineralisation units, and water storage tanks - Battery Storage units - Grid Connection - Hydrogen powered Turbine - Energy Storage Systems - Optional Temporary Accommodation facilities - Compressed Gas Storage - Cryogenic Liquid Storage: Cooled Hydrogen - Hydrogen Compression Unit - Cooling Systems - Power Management System - Oxygen Management - Hydrogen Liquefaction System - Control and Monitoring Systems - Hydrogen Dispensing System - Pipelines and Distribution Networks - Safety and Ventilation Systems - Waste Management Systems - Office Control Centre and switch room **Note: Clearing Extents include GHPF Entry Road and proposed Gate Widening**	Figure 1 Located near the Northern Boundary	Maximum Extent	22.19 ha
		Previously Disturbed Area	1.53 ha
		Clearing Required	**20.66 ha**

Property Fire Roads Including Boundary **(Shire of Irwin/Dfes)**	Figure 1	Maximum Extent	28.12
		Previously Disturbed Area	26.46
		Clearing Complete	**0.00**
		Clearing Required	0 ha
Windfarm (Wind Turbines)	Figure 1	Maximum Extent	15.03 ha
		Previously Disturbed Area	0.25 ha
		Clearing Required	**14.78**
Turbine Blade laydown area revegetated after assembly	Figure 1 Located adjacent to the access road	Maximum Extent	4.21 ha
		Revegetated after use	4.21 ha
		Clearing Required	**4.21ha**
Met Mast and Sodar	Figure 1	Maximum Extent	1.69 ha
		Previously Disturbed Area	**1.69 ha**
		Clearing Complete	**0.00**
Project Roads to Install	Figure 1	Maximum Extent	19.02 ha
		Previously Disturbed Area	0.00 ha
		Clearing Required	**19.02**
Vegetation Disturbance: Gate widening for AHP site access (MRWA Verge Side)	Figure 1	Maximum Extent	0.001
		Previously Disturbed Area	0.00
		Clearing Required	**0.001**
Road Widening (Brand Highway)	Figure 1	Maximum Extent	1.68 ha
		Previously Disturbed Area	0.78ha
		Clearing Required (Ground Disturbance)	**0.9 ha**
Proposal Clearing Extent			**127.13**
Proposal Extents			
Proposal Maximum Extent, (Development Envelope Lot 703)			**1904.48 ha**
Proposal Maximum Extent (Development Envelope, Road verge widening and AHP Site Access)			**1.68 ha**

Combined DE Extents		1906.16
Previously Disturbed Vegetation		105.5 ha
Post Construction Rehabilitation		4.21ha
Permanent Site Disturbance Footprint		232.63 ha
Proposal Element	**Location / description**	**Maximum Extent, Capacity or Range**
Construction Elements		
Site Facilities	GHPF	Optional: On-site accommodation facility equipped with the necessary wastewater discharge infrastructure to ensure environmental compliance.
Salt and Brine Emissions	GHPF	Salt solids volumes are dependence on further engineering analysis and infrastructure equipment design, to a maximum of 1100 kg per day Liquid Emission Volumes are based on current Geotechnical investigations and engineering solutions and are subject to change dependent on engineering outputs. Options are being considered to discharge processed brine onsite to: - Leach drain system, - A Zero Liquid Discharge system - Reverse Osmosis (RO) and Brine Minimisation - Advanced Filtration and Treatment to meet discharge to ground standards - Hybrid System: Above-Ground Treatment with Leach Drain Discharge - Stock dams for Discharge and evaporation - Groundwater, or Soil infiltration basins, Discharge options as required will be based on further geotechnical investigations and ongoing engineering solutions. Discharge and engineering options will be included within the Wastewater Management Plan

Road Widening AHP Site Gate Access Widening	Brand Highway Brand Highway	0.9 ha (Ground Disturbance) 0.001 ha (Vegetation Clearing)
Operational Elements		
Wind turbines	Wind Farm	18 Turbines x 7.2 MW, maximum rating of 129.6 MW
Solar farm	PV Solar Array (Adjacent to Brand HWY)	85MW maximum rating
Groundwater Water Abstraction	GHPF	Water abstraction to a maximum of 2,340 kL per day
Hydrogen Production Electrolysis	GHPF	Production capacity up to a maximum of 42 tonnes per day.
Stormwater and Wastewater	GHPF	Stormwater management will align with the impending stormwater and wastewater management plans. Wastewater discharge will accommodate up to 15 operational staff.

Proposal Elements with Greenhouse Gas Emissions	
Construction Elements: Note Scope 3 Not Required.	
Scope 1:	Not expected to be greater than14,364t CO2-e per annum
Scope 2:	N/A
Operation elements:	
Scope 1:	Not expected to be greater than 632t CO2-e -per annum
Scope 2:	N/A

Decommissioning and Rehabilitation

The decommissioning plan for the Arrowsmith Hydrogen Project will detail the required actions for safely dismantling and restoring the site at the end of its projected 25-year lifespan. It will also include provisions for asset life extensions or rehabilitation if the project does not proceed beyond this period.
The decommissioning plan includes:

- Removal of all vehicles, machinery, and buildings: All equipment, vehicles, and infrastructure utilised during the project's operation will be dismantled and removed from the site.

- Removal from site and recycling or appropriate disposal of all infrastructure and waste: This step involves the proper disposal or recycling of all infrastructure components and waste generated during the project's lifespan, ensuring minimal environmental impact.

- Decommissioning of water bores: Any water bores or wells drilled for the project's operations will be decommissioned, ensuring they are properly sealed to prevent contamination and pose no hazards.

- Remediation of any contaminated soil: If soil contamination has occurred during the project's operation, remediation measures will be implemented to restore soil quality, following regulatory requirements.

- Rehabilitation and revegetation of disturbed areas: Disturbed areas of the site will undergo rehabilitation, including revegetation efforts using native vegetation consistent with that from the local area to restore natural habitats and ecosystems. This aims to mitigate the environmental impact caused by construction activities.
- Vegetation reinstatement: In the event that the project does not continue beyond its 25-year lifespan and rehabilitation is initiated, vegetation reinstatement will commence. This involves replanting native vegetation to restore the landscape.

- Rehabilitation management procedures: The rehabilitation process will be conducted in accordance with established management procedures, ensuring that activities are carried out efficiently and effectively to achieve restoration goals.

- Monitoring: Monitoring activities will be undertaken annually to assess the progress of rehabilitation efforts. Quantitative completion criteria will be established, and monitoring will continue until these criteria are met, indicating successful rehabilitation.

- Reporting and Compliance:

    - Detailed documentation of all decommissioning activities to ensure compliance with regulatory standards.
    - Regular progress reports submitted to environmental regulators, documenting rehabilitation success and adherence to closure requirements.

By implementing these decommissioning and rehabilitation measures, the Arrowsmith Hydrogen Project (AHP) aims to minimise its environmental disturbance footprint and ensure the responsible management of the project site following the conclusion of operations.

Commissioning

The commissioning process of the AHP will be methodically executed in stages, with systems commissioned incrementally as they reach completion. A comprehensive commissioning plan will be devised to prioritise the commissioning of systems utilising non-hazardous products before transitioning to hydrogen production.

Upon the conclusion of construction activities, the construction contractor will formally hand over the site at 'construction completion' to the commissioning team designated by the Proponent. This commissioning team is envisioned to encompass a blend of contracting engineers, engineers from the Proponent, operational personnel, and specialized commissioning subcontractors.

Given the inherently hazardous properties of hydrogen and oxygen, coupled with the intricate nature of the facility's infrastructure, a robust commissioning and completions management system will be employed. The development of this system will be meticulously undertaken during the detailed engineering phase, ensuring meticulous planning and execution of the commissioning process to guarantee safety, operational efficiency, and regulatory compliance throughout the facility's lifecycle.

Critical Containment Infrastructure Report

A Critical Containment Infrastructure Report (CCIR) may be required for premises that include containment infrastructure (e.g. for the purpose of storage and containment of liquid hydrogen). The purpose of the CCIR is to confirm that the environmental controls regarding containment infrastructure are constructed to the correct engineering specifications before materials are deposited within the containment cell.

Facility Commissioning and activation will be staged; The anticipated order is as follows (subject to change):

- Power Generation – PV Solar Array, Wind Turbines, Battery Energy Storage System (BESS) and Hydrogen turbines
- Green Hydrogen Production Facility (GHPF) Utilities
- Hydrogen Production
- Hydrogen Liquefaction and Storage
- Liquid Hydrogen Offloading and transporting

Activation will commence when completion assurance is complete, and each area is approved “Ready for Start-Up” (RFSU). The commissioning team will begin with a mark-up of the key deliverables such as Piping and Instrumentation Diagrams to define the system boundaries. IGE will identify the subcontractors and vendors required for commissioning and develop the detailed scopes of work.

This will include:

- Leak Testing
- Testing, Cleaning and Drying Services
- Specialist Package Commissioning Engineers (e.g., Wind turbines, Electrolysers, LH2 and H2 Production)

Other Elements that Impact Extent of Effects on The Environment		
Proposal time*	Maximum project life	Preliminary 25 years Every 25 years asset life extension review and possible extension works to be conducted.
	Construction phase	Approximately 24 months
	Commissioning phase	Approximately 6 months
	Operations phase	25 years
	Decommissioning	Approximately three years

3. Construction Scope

3.1 Proposal works

Construction of the project is dependent on Government regulatory approval timelines. Construction works for the Proposal will include:

- Establishment of temporary construction facilities within the development area, including temporary lay-down areas for assembling wind turbines, storage facilities for chemicals/hydrocarbon and construction materials;
- Ground preparation works for the Solar Farm, Wind farm layout, hydrogen production infrastructure
- Installation and operation of the Green Hydrogen Production Facility(GHPF), including, electrolyser modules (alkaline water electrolysis, a type of electrolyser that is characterised by having-two electrodes operating in a liquid alkaline electrolyte solution of Potassium hydroxide (KOH) or Sodium hydroxide(NaOH);
- The Windfarm infrastructure: Access tracks, surface drainage design, wind turbine structures (blades and tower), met mast, concrete foundations, turbines housing and electrical switchgear;
- Green Hydrogen Production Facility(GHPF) including RO system (to filter production water impurities), compressors (to achieve required pressure), piping infrastructure, cooling systems, storage tanks and the remainder of associated equipment (civil and electrical works);
- Solar Farm: Installation of required components for the solar farm, including PV modules, mounting structures, foundations, inverters, and batteries.
- Concrete Batch plants ; and
- Site Battery infrastructure (Battery Energy Storage Systems (BESS).

3.2 Bores

Three production bores will be constructed to enable aquifer groundwater abstraction to supply the hydrogen production process, utilising alkaline electrolyser technologies. This approach ensures a steady supply of water essential for hydrogen production.

The use of alkaline electrolyser technologies in the hydrogen production process offers several advantages, including high efficiency, scalability, and the capability to operate under varying load conditions. These benefits support IGE's commitment to integrating advanced, environmentally friendly technologies into their operations.

By carefully planning the construction of the production bores and utilising temporary access tracks, when necessary, IGE aims to mitigate potential environmental impacts. This approach reflects IGE's dedication to sustainable practices and responsible resource management, ensuring that the hydrogen production process aligns with environmental conservation goals and regulatory requirements.

3.3 Key Environmental Factors

The key environmental factors that have been identified by the EPA as relevant to the Proposal are:

- Flora and vegetation
- Terrestrial fauna
- Inland waters
- Social surroundings

The updated Proposal Disturbance Footprint presented in Figure 1 has been redesigned to avoid areas of key environmental and heritage values.

The Proposal Disturbance Footprint layout has been redesigned and optimised to avoid:

- Heritage sites;
- Known Karst formations/ cave locations;
- Surface drainage and creek lines;
- Water abstraction from the superficial aquifer
- Vegetation and fauna values associated with Carnaby's Black Cockatoo (CBC) foraging habitat
- PEC and DBCA Priority listed flora species;
- GDE's including vegetation and fauna values associated with the drainage/water lines and wetlands, including the ephemeral waterbody; and
- Surface water bodies providing foraging habitat for the CBC and Migratory bird species.

3.4 Condition Requirements

This information review and accompanying updated EPA referral applies to the Proposal and associated infrastructure outlined in Section 1.3.

3.4.1 Survey and Study Findings

Studies and surveys undertaken to support the Proposal, have informed the rationale and approach to clarify and respond to management review requirements.

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0 0,5 1 km

Arrowsmith Hydrogen Project (AHP) Layout and Regional Context

infinite green

Author : Peter Galloway Date : December 2024

Figure 1: AHP Indicative layout and Regional Context

Surveys and Reports Relevant to the Proposal

Table 2 Surveys Relevant to the Proposal

Key Environmental Factor	Report (Author Year)	Survey Description	Survey Findings
Flora and Vegetation / Terrestrial Fauna	Flora and Vegetation Survey (Ecoscape 2021)	Previously the work was commissioned to complete a reconnaissance flora and vegetation survey and targeted flora survey of areas within and adjacent to the Arrowsmith property boundary (the survey area).	The summary of relevant information contained in the report is as follows, noting that the 2020 survey (Ecoscape, 2021) was conducted over a larger area, including the portion of the site to be retained as conservation lands. The desktop assessment identified the following significant features of the survey area: - The project is located immediately adjacent to Beekeepers Nature Reserve. - The nearest Threatened or Priority Ecological Community is approximately 25 km from the survey area. - 83 conservation-listed flora have been recorded within 25 km of the site, including eight Threatened Flora (TF) and a further six TF (or their habitat) are likely to or may occur. - 5 Priority-listed flora (PF) have a high likelihood of occurring - 27 conservation-listed fauna species have been recorded from within 30 km of the survey area (DBCA and NatureMap search results) and a further 25 EPBC-listed species or their habitat are known to or could occur within the survey area; two were considered to have a High desktop likelihood of occurring: Mallee fowl and Carnaby's Black Cockatoo, both listed as Threatened under both Commonwealth and Western Australian Legislation. The survey area is not within the mapped breeding range of Carnaby's Black Cockatoo.

	Supplementary Survey: Detailed Flora and Vegetation Survey (Ecoscape, 2023)	To supplement the results of the reconnaissance flora survey previously undertaken by Ecoscape, a detailed flora survey of the disturbance footprint and an area of at least 50 meters surrounding the disturbance footprint was commissioned by IGE. The detailed flora and vegetation survey and targeted flora survey was undertaken during October 2022, during the recommended timing for flora and vegetation surveys in the Eremaean Botanical Province (March-June) (EPA, 2016). The survey methodology employed by Ecoscape was undertaken with reference to the EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. A black cockatoo habitat assessment to determine the extent of *Banksia sessilis* and *B. prionotes* in the Disturbance Footprint, and the quality of foraging habitat for Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*).	**Detailed Flora Summary** The IGE survey area occupied 768.95 ha overall, inclusive of a 50 m buffer applied to the proposed Disturbance Footprint. A total of 234 vascular flora species were recorded from 34 floristic quadrats and detailed relevés (14 recorded in 2022 and 20 recorded in 2020), opportunistic observations, including during searches for conservation-listed flora, and from 13 descriptive relevés wherein only the dominant species were recorded in 2022. Almost one fifth of the total flora inventory (44 species; 18.80%) were introduced reflecting the level of disturbance in the survey area from previous livestock and feral animal, including goats grazing. The most commonly represented families were Fabaceae (27 taxa), Myrtaceae (23) and Poaceae (22). The most commonly represented genera were *Melaleuca* with eight taxa, *Acacias* (seven definitely defined) and *Eucalyptus* (six). **Conservation-Listed Flora** **Threatened Flora** No TF species listed for protection under the Commonwealth EPBC Act or Western Australian BC Act were recorded. **Priority Flora** None of the unidentified taxa resemble any currently described PF taxa. Two Priority 2, two Priority 3 and Priority and one Priority 4 species were recorded from within the 'Disturbance Footprint' including a 50-metre buffer. Five Priority Species were recorded, as follows. - *Eucalyptus foecunda* subsp. *aeolica* (Priority 2); - *Scholtzia calcicola* (Priority 2); - *Beyeria cinerea* subsp. *cinerea* (Priority 3) - *Dampiera tephrea* (Priority 3); and - *Eucalyptus zopherophloia* (Priority 4).

			Note: Vegetation type **EobEorEzMOMF** *is likely to be representative of the Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria and Eucalyptus obtusiflora (Geraldton area) P1 PEC, noting that this PEC has a likely 125 km north-south distribution. It occupied 40.60 ha in the survey area (5.28%) plus representation in mosaics, although only 6.96 ha (2.89%) of the proposed disturbance footprint.* CBC Foraging Habitat Summary. As the site is within the suggested semi-resident population extent (Johnstone & Kirkby, 2019) it could be used for foraging and roosting throughout the year. This is in part confirmed as the sightings of Black Cockatoo within the overall IGE site during October 2020 (Ecoscape, 2021) were within the species' breeding period. However, if drinking water is not available at the site, CBC are unlikely to be present as they require a drinking source within 6 km of roosting sites (Le Roux, 2017). Therefore, they would likely move to areas closer to a source of drinking water like Lake Logue (Department of Sustainability Environment, Water, Population and Communities, 2021; Johnstone & Johnstone, 2010; Johnstone & Kirkby, 2019) or Lake Indoon approximately 40 km to the south, both of which appear to be within the extent indicated in this reference (Johnstone & Kirkby, 2019). It is unknown if there are sources of drinking water closer than these lakes. In summary, it appears that CBC utilise the overall survey area as they have been observed to be present in at least close proximity and would, as a minimum, overfly it, between traverses for foraging, roosting and water sources. However, suitable foraging habitat with *Banksia* species (vegetation types **AspBsBlMS** and **BpLW**) is potentially only visited on occasion, particularly taking into consideration that these vegetation types are negligible and form the northern edge of a much larger area of similar vegetation to the south in Beekeepers Nature Reserve. In conclusion CBC may visit the foraging habitat infrequently, however, specific surveys or observation from the proposed site radar data would be required to confirm detailed foraging behaviour (Ecoscape, 2023).

Flora and Vegetation Targeted Survey within Disturbance Footprint extents	Targeted Flora and Vegetation Survey (IGE 2023) Ecoscape	IGE initiated a targeted flora and vegetation survey encompassing the AHP disturbance footprint. This targeted survey within the survey was commissioned to better understand PEC's, priority vegetation types and CBC foraging extents within the disturbance footprint This survey is designed to augment the findings of the prior detailed flora and vegetation and CBC survey conducted in 2023 by Ecoscape.	Flora and Vegetation Targeted Drone Survey Summary - The targeted flora and vegetation survey summary, including Priority Ecological Communities (PECs), Carnaby's Black Cockatoo (CBC) foraging habitat, and Priority Flora Types, provided valuable insights into the ecological characteristics of the project area - Priority Ecological Communities (PECs): The survey identified the presence of priority ecological communities within the project area. These communities play a crucial role in supporting biodiversity and ecosystem function. Detailed drone assessments were conducted to evaluate the extent, condition, and ecological significance of PECs to inform conservation and management strategies. - Carnaby's Black Cockatoo (CBC) Foraging Habitat: The survey assessed the presence and quality of CBC foraging habitat within the Disturbance Envelope(DE). This includes areas with vegetation resources that CBC relies on for feeding. Identification of CBC foraging habitat helps inform habitat protection measures and minimises disturbances to critical foraging areas. - Priority Flora Types: The survey documented the occurrence of priority flora types, including species of conservation concern or those with specific habitat requirements. These flora types may include endemic species, rare plants, or those with specialised ecological niches. Understanding the distribution and abundance of priority flora types is essential for implementing targeted conservation actions and ensuring their long-term survival. - Overall, the targeted flora and vegetation survey provides essential baseline data to guide environmental management and conservation efforts within the project area. By incorporating these findings into project planning and decision-making processes, IGE can effectively mitigate potential impacts on sensitive ecological resources and promote sustainable development practices. Ongoing monitoring and adaptive management will be essential to ensure the continued health and resilience of the local flora and vegetation communities.

Key Environmental Factor	Report (Author Year)	Survey Description	Survey Findings
Social Surrounds	Arrowsmith Green Hydrogen Production Facility(GHPF) Project Area YSRC Heritage Survey 2021 (Sticks and Stones Cultural Resources Management, 2021)	Sticks and Stones undertook a desktop heritage survey and an archaeological and ethnographic site verifications survey to verify the heritage and ethnographic values within the Disturbance Footprint. The survey involved Yamatji archaeologists and an anthropologist and consultation with the Yamatji Southern Aboriginal Corporation.	There are no Aboriginal cultural heritage sites listed on the AHIS within or immediately adjacent to the survey area. As such, there will be no impact to currently registered Aboriginal sites. A field heritage survey has been undertaken with the South Yamatji people and seven sites of significance were identified. - Two rock shelters - One water source - Two stone arrangements - Two potential archaeological deposits The South Yamatji people have made a request that IGE avoid heritage locations during construction activities Heritage sites will bel avoided within the project Disturbance Footprint to ensure cultural heritage impact mitigation Yamatji Heritage monitors will be mobilised to site during ground disturbing activities to ensure that no heritage sites are disturbed due to project activities
	2023 Infinite Green Energy Arrowsmith Aboriginal Heritage Survey: Comprising Women's cultural practice and additional ethnographic aspects (Sticks and Stones Cultural Resources Management, 2023)	Sticks and Stones heritage consultants completed a follow-up heritage survey in April 2023, including: Identifying women's heritage, ethnographic values, and women's cultural practice within the project site. The consultation was undertaken over 2 days with two separate Yamatji groups. The original Aboriginal heritage survey report had a strong focus on the archaeology of the surveyed area, with little discussion on ethnographic aspects or findings.	The Yamatji people communicated that there are no specific Women's ethnographic or archaeological concerns within the Proposal Disturbance Footprint. The project Disturbance Footprint retains general importance to the Yamatji people as a place where their ancestors camped, travelled, and gathered resources.

		Ethnographic importance of the area to Traditional Owners and relevant knowledge holders. A discussion on the results of the ethnographic survey. In particular, the importance of any identified sites to women's cultural practice should be considered given the survey appears to only have been undertaken by Yamatji men. Addressing recommendations from the previous Yamatji Southern Regional Corporation - Heritage Survey Report SandS (2021)	*Recommendation 1* *The project area has potential for subsurface Aboriginal site disruption:* - *A monitoring program will be adopted as a response to this.* - *Earthworks and clearing activities will avoid heritage areas.* - *Monitoring and inspections during Earthworks and clearing activities (including Aboriginal observers) will be implemented and the Yamatji people will be informed immediately of heritage material discoveries.* *Recommendation 2* *Section 18 application under the Aboriginal Heritage Act 1972 may be required by IGE should they wish to disturb any of the heritage sites and features within the survey area.* IGE will ensure zero disturbance to any of the seven demarcated heritage sites within the project Disturbance Footprint or surrounds. *Recommendation 3* The Southern Yamatji representatives' recommendations*:* - Recorded heritage places should be avoided - *(No construction activity within the heritage places exclusion zones)* - If the opportunity presents, further research should be undertaken on the cave, mounds (PADs) and stone arrangements*.* - *(2023 survey consultation and site walk conclude no more action required)* - Southern Yamatji monitors are present for the ground disturbance work. - *(The Yamatji people have been invited to participate in all ground disturbance and ground disturbance activities)*

Key Environmental Factor	Report (Author Year)	Survey description	Survey findings
Inland Waters	Surface Water Assessment Renewable Energy Project CW1183400 (Cardno, 2021c) Hydrogeological Investigations Arrowsmith Hydrogen Project CW1183400 (Cardno, 2021b)	Surface water assessment	This report considered surface water impacts on the proposed Arrowsmith Green Hydrogen Production Facility(GHPF). The site is impacted by surface water generated from local catchments in regular events including overflow from the Arrowsmith Lake and River system. Anecdotal information suggests that the Arrowsmith River system regularly flooded the site in the 1960's, however the incidence of this has reduced substantially and has not been observed this century. Anecdotal information suggests this is due to lower groundwater levels in the area that impact the level of Arrowsmith Lake. Flow rates and flooding extents were estimated for the site based on local and Arrowsmith River catchment data. Substantial limestone cave systems exist on site and are accessed from the Lake Arramall area. Anecdotal information advises that when the lake fills to the limestone /cave level that water will flow into the cave systems and chasms. The level of these features should be confirmed via site inspection to confirm the assumptions in this report. *The proposed conceptual layout requires amendment to suit flooding extents. The main issues identified are with site roads and the southern portion of the solar farm.* ***(The Solar Farm and access roads has been relocated to higher ground to avoid future flooding)***
	Groundwater Extraction Scenarios Arrowsmith Hydrogen Project CW1183400 (Cardno, 2021a)	Groundwater water assessment	Comparison of each groundwater modelling scenario found that Scenario 1, pumping from two Yarragadee Aquifer bores, provided sufficient groundwater volumes for on-site use whilst limiting the potential impact on the surrounding GDEs. With a modelled constant pumping rate of 1,233 m^3/day per bore (2,466 m^3/day total), this scenario displayed minimal drawdown (maximum 0.2 m) with a small drawdown radius.

			GDE's are considered to be at risk with drawdown greater than 0.2 m, Scenario 1 within the assessment, provides a solution with little to no impact on the local GDE's: whilst providing a solution with constant groundwater extraction assurance. Water abstraction Impacts have been mitigated Minimal drawdown may occur across both terrestrial and aquatic GDE locations however, the bore locations will be relocated west to avoid GDE's resulting in a greatly reduced groundwater take to limit residual impact.
	Hydrogeological Investigation Arrowsmith Hydrogen Project CW118340 (Cardno, 2021b)	Hydrogeological Investigation	In summary, the modelled abstraction from the Yarragadee Aquifer may result in a maximum drawdown of 0.2 m within areas of GDE occurrence. (Previous calculations Cardno 2021) The effect of drawdown will be mitigated by optimised bore location/placement, the spread of water abstraction over three bores, and a reduction of water take The salinity of natural inflow to the lake, and the variation of lake salinity with seasons is unknown. The preliminary assessment indicates groundwater level change at the GDE will be minimal (< 0.05 m) (Cardno modelling 2021)

Key Assumptions and Uncertainties

Table 3 Key Assumptions and Uncertainties are Detailed Below:

Factor	Assumptions and uncertainties
Flora and Vegetation	The flora and vegetation survey conducted by Ecoscape in 2023 has reported nil to minor limitations in both the desktop and field components. As a result, there is no substantial uncertainty regarding the accuracy and reliability of the survey findings for the purposes of this management review. The survey findings are considered valid and robust, providing valuable information about the flora and vegetation present within the project area. These findings serve as a reliable basis for informing decision-making processes and developing management strategies to mitigate potential impacts on the environment. With confidence in the validity of the survey data, stakeholders can proceed with the management review process, utilising the information provided to make informed decisions and implement appropriate measures to safeguard environmental resources and minimise ecological risks associated with the project. It is assumed that the survey undertaken has accurately identified and mapped significant flora and vegetation associations and potential impacts, identified Priority flora, extended CBC foraging habitat and populations of *Banksia sessils* and *B. prionotes* within the Proposal footprint and 50m surrounds.
Terrestrial Fauna	The findings of the detailed surveys conducted thus far have served as the foundation for the rationale and management approach adopted for the management review process. These surveys have provided valuable insights into the environmental conditions, ecological sensitivities, and potential impacts associated with the project. Based on the findings of these surveys, a comprehensive management approach has been developed to address and mitigate identified risks and impacts effectively. This approach includes measures to minimise disturbances to sensitive habitats, protect endangered species, and ensure compliance with regulatory requirements. It is assumed that the surveys undertaken have accurately identified and mapped CBC foraging habitat recorded fauna occurrences, updated the referral information and mapping accordingly and included an assessment of the potential impacts to CBC. Assessed and Identified within a report, adequate mitigation measures during wind turbine operation to minimise impact to avifauna and bats as required to demonstrate that the EPA's objectives can be met.

Social Surrounds	It is assumed that the updated assessment/ consultation undertaken within the Disturbance Footprint has accurately identified ethnographic, archaeological sites, and meaningful engagement with the Yamatji people. Consultation and site survey identifying women's cultural practice within the project area and addressing the recommendations set out in the original Aboriginal heritage survey report. It is also assumed that data taken from the Aboriginal Heritage Inquiry System and the State Heritage Register (Inherit) was current and correct at the time of enquiry.
Inland Waters	The updated ground and surface water survey findings have formed the basis for the rationale and management approach adopted for the management review. It is assumed that the surveys undertaken have accurately identified and mapped water bodies relevant to the site layout and modelled water extraction data accurately, impacts to surface water, including drainage/water lines, wetlands, and the ephemeral waterbody.

3.5 Management Approach

The approach adopted to address mitigation and management measures outlined in the EPA management plan guidelines employs an objective-based methodology to identify and prioritise management objectives. This revised supporting document supersedes the Environmental Management Plans (EMPs) submitted in the initial submission and outlines relevant measures to manage both key environmental factors and other environmental considerations. It follows a management hierarchy to prioritise objective management actions and targeted provisions effectively.

This framework also delineates monitoring and reporting procedures, which incorporate principles of continuous improvement consistent with an adaptive management approach. By implementing this approach, stakeholders can systematically assess environmental impacts, adjust management strategies as needed, and ensure compliance with regulatory requirements. Additionally, the framework facilitates ongoing evaluation and enhancement of environmental management practices, fostering sustainable development and environmental stewardship within the project area.

3.6 Rationale for Choice of Provisions

This information review adopts management-based provisions that align with established industry practices for avoidance and minimisation of environmental and heritage impacts relating to developments within the region. The overall management approach avoids disturbance to key environmental and heritage values as far as practicable. Where avoidance is unachievable, the management approach will endeavour to mitigate disturbance of key environmental and heritage values.

The management provisions detailed in this information management review align with the mitigation measures outlined in the Green Hydrogen Production Facility(GHPF), Section 38 Referral Supporting Document (Infinite Green Energy, 2023). The management provisions have considered the direct, indirect and cumulative impacts as a result of the Proposal including expected intensity and duration of these impacts during the construction and operational phase of the project.

Recommendations from technical studies have also been considered (Section 3) and included within this section 40(2)(a) update.

3.7 Updated Management Provisions

Sections below detail the management objectives, actions, and targets for each key environmental factor.

4. Key Factor: Flora and Vegetation

EPA Notice Requiring further Information for Assessment

Update of the referral information using results of the detailed flora survey, including an assessment of the potential impact on significant flora and vegetation.

Table 4 Flora and Vegetation

EPA Objective: To protect flora and vegetation to ensure biological diversity and ecological integrity are maintained.
Information Management Review update Objectives: Additional Detailed flora Survey information Mitigate potential impacts to significant flora and vegetation Minimise clearing of native vegetation and direct and indirect impacts to native vegetation, as far as practicable
Key environmental values: Native vegetation including significant vegetation and flora. Carnaby's Black Cockatoo foraging flora and CBC foraging vegetation. Provide evidence of consultation with the Department of Biodiversity, Conservation and Attractions (DBCA: Consultation regarding impact to Beekeepers Reserve (See below) PEC's **Key impacts and risks:** Significant vegetation and flora impacts Loss of vegetation and flora as a result of clearing activities Introduction and spread of weeds Fragmentation of native vegetation Changes to vegetation structure and floristic composition in surrounding/adjacent areas through altered surface water drainage patterns and flows Altered fire regimes.

Legislation

Legislation, Policy, and Guidance

- Environmental Protection Act 1986
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004)
- Biodiversity Conservation Act 2016
- Environment Protection and Biodiversity Conservation Act 1999
- Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (Environmental Protection Authority, 2016d)
- Environmental Factor Guideline Flora and Vegetation (Environmental Protection Authority, 2016a)
- Guidance for planning and development: Protection of naturally vegetated areas in urban and peri-urban areas (Department of the Environment, 2013)
- Matters of National Environmental Significance: Significant Impact Guidelines 1.1 0 (Department of the Environment, 2013)

Direct Impacts	Indirect Impacts
Loss of vegetation and flora Clearing and earthwork activities will remove existing vegetation and flora. Significant impact on plant species in the area, including those that provide habitat and food sources for Carnaby's Black Cockatoo. Fragmentation of native vegetation communities Disruption of continuous habitat, leading to isolated patches of vegetation. Reduced connectivity for wildlife movement and gene flow. Potential increase in edge effects, making habitats more vulnerable to invasive species and environmental changes. Sedimentation and erosion Soil disturbance from construction activities can lead to increased sedimentation in nearby water bodies. Erosion can degrade soil quality and stability, affecting plant growth. Localised loss of vegetation and flora due to changes in soil structure and composition. Impact on Carnaby's Black Cockatoo Reduction in available foraging habitat. Potential displacement of individuals due to habitat loss and fragmentation.	Changes to vegetation structure and floristic composition in surrounding or adjacent areas may occur as a result of clearing and construction activities associated with the project. These changes could lead to alterations in the distribution and abundance of plant species, as well as shifts in overall vegetation structure. Additionally, the clearing and construction of infrastructure may disrupt surface water drainage patterns and alter surface water flows in the surrounding areas. This could result in changes to the hydrological dynamics of the landscape, potentially affecting local ecosystems, water quality, and aquatic habitats. To mitigate these impacts, comprehensive environmental assessments have been conducted prior to project commencement to identify potential risks and develop appropriate mitigation measures. These measures may include implementing erosion control measures, establishing buffer zones around water bodies, and implementing stormwater management strategies to minimise adverse effects on vegetation and surface water systems.

Long-term impacts on population dynamics and reproductive success if critical habitats are significantly altered or lost. These impacts emphasize the importance of implementing comprehensive mitigation and management strategies to preserve the habitat and support the conservation of Carnaby's Black Cockatoo.	Regular monitoring during and after construction will also be essential to assess the effectiveness of mitigation measures and to identify any additional impacts that may arise. By proactively managing these potential impacts, the project aims to minimise its environmental footprint and ensure the long-term sustainability of surrounding ecosystems and water resources. Beekeepers Nature Reserve GDE's Changes to ground water table impacting GDE's. Potential spread of dieback from construction and operational activities (Low Risk) Introduction and spread of environmental weeds. Potential reduction in vegetation health as a result of dust generation.

Management Action	Management Target	Monitoring	Reporting
Clearing and Earthworks			
Prior to ground-disturbing or clearing activities, it is essential to demarcate the Disturbance Footprint extents using appropriate visual markers. These markers serve as visible boundaries to delineate the area where construction or clearing will take place, helping to ensure compliance with project plans and environmental regulations. The use of visual markers, such as flags, stakes, or temporary fencing, helps to clearly define the boundaries of the Disturbance Footprint and minimise the risk of inadvertent encroachment into sensitive areas.Avoid PEC's Demarcate Disturbance Footprint extents using appropriate visual markers prior to ground disturbing/clearing activities.	No clearing outside of the agreed Disturbance Footprint Minimise Impacts to PEC's. Restrict disturbance to significant flora No impact to significant vegetation and flora outside of Disturbance Footprint. No direct or indirect impacts to Carnaby's Black Cockatoo Foraging Habitat. No clearing of vegetation outside of the Disturbance Footprint during construction activities Confirm clearing is within	Daily visual inspection of Disturbance Footprint boundary demarcation during clearing activities. Pre-clearing inspections, check variations between pegged disturbance footprint and approved plans resolved prior to clearing. Inspection of clearing extents before clearing activities commence to confirm no over-clearing: Visual GIS	Report unauthorised clearing as soon as practicable after identified. Vegetation clearing records and annual environmental reporting. Induction records. Monthly environmental compliance inspection reports. Quarterly environmental audit. Annual reporting

Reduce turbine quantity with greater energy output models to reduce the native vegetation disturbance footprint . Avoid indirect impacts to surrounding areas (including Beekeepers nature reserve) from altered surface water drainage, sediment migration or surface water flows. Map and demarcate proposed disturbance footprints Conduct spatial analyses to identify habitat fragmentation, connectivity, and proximity to other important features (e.g., water sources, roosting sites). Calculate landscape metrics (e.g., patch size, edge density) to assess habitat quality and suitability for CBC foraging. Disturbances to drainage lines will be minimised where practicable. Minimise impacts to sensitive areas as outlined in the detailed flora and vegetation survey. Cleared vegetation will be stockpiled in windrows less than 2 m high Stockpiled topsoil will be lightly compacted in windrows to a height of no more than 2 m and covered in brush. Visual inspection of cleared areas will be undertaken prior to disturbance to ensure no excess clearing. Clearing documentation and extents will be checked post-clearing	demarcated Disturbance Footprint extents No clearing within sensitive vegetation areas Enhanced Project Sustainability Contributes to the long-term sustainability of the project by maintaining the health and resilience of the surrounding ecosystem. Supports ongoing ecological functions and services provided by intact vegetation areas. Limit vegetation clearing to no more than 5% of the total project area to preserve natural habitats and biodiversity. Ensure that clearing is avoided in areas where significant species are present and implement relocation or conservation strategies where necessary.	Monitor potential impact to significant flora and vegetation. (Disturbance Footprint defined area) Monthly visual inspections for environmental compliance. Undertake Visual inspection and record of cleared areas post-clearing to ensure no over-clearing.	Reporting on exceedance of management target Monthly Environmental Report A monthly environmental report will be generated to provide a comprehensive overview of environmental performance and compliance within the project area. This report will include data and analysis related to various environmental aspects, such as air and water quality, noise levels, wildlife observations, vegetation monitoring, waste management, and any relevant regulatory compliance updates. Additionally, the report may highlight any incidents, mitigation measures implemented, and progress made towards environmental objectives and targets. Reporting: Prepare regular monitoring reports summarizing key findings, trends, and recommendations for conservation action.

			The monthly environmental report serves as a valuable tool for monitoring environmental performance, identifying trends, and facilitating continuous improvement initiatives throughout the project lifecycle. Data Analysis: Analyse monitoring data using statistical methods and GIS tools to identify trends and patterns.
Personnel undertaking clearing are required to populate a Clearing Vegetation Record Form to provide a record of disturbance The construction manager is required to submit and maintain clearing vegetation records including mapping and GIS information/documentation Ensure Clearing optimisation prior to construction (Consult Maps and GPS limits) Clear demarcation facilitates communication among project personnel, contractors, and stakeholders, promoting awareness and adherence to designated work areas. By establishing visible boundaries early in the project timeline, potential conflicts or misunderstandings regarding land use and environmental protection can be mitigated, contributing to effective project management and environmental stewardship.	No project native vegetation clearing activities undertaken without procedural documentation All native vegetation clearing activities for the project must be accompanied by procedural documentation. This documentation should outline the specific steps, approvals, and considerations taken before any clearing occurs, including assessments of potential impacts on the environment and native species. It also ensures that all necessary permits and permissions are obtained and that the clearing activities are conducted in accordance with relevant regulations and guidelines.	Audit environmental documentation: Quarterly environmental audits.	Audit schedule Retain Clearing documentation

Flora and Vegetation			
Management Action	**Management Target**	**Monitoring**	**Reporting**
Ecoscape Conducted a detailed fauna and vegetation survey (2022) of the disturbance footprint with a 50 m buffer Drone survey implemented: Where vegetation was impassable, Ultra Hi-Resolution photography was utilised to accurately identify vegetation types.	Minimise fauna habitat loss. No avoidable deaths of conservation significant fauna during vegetation clearing for construction. Minimise fauna injury/death during Proposal construction. Data Collection and Analysis: Collect data systematically during each monitoring activity and analyse it to identify trends and assess the effectiveness of mitigation measures.	Weekly Flora and vegetation walk and inspections To systematically track and document disturbances to flora and vegetation caused by project activities. To assess the effectiveness of mitigation measures in minimising disturbance impacts. To provide data for adaptive management and continuous improvement in environmental protection practices. Drone Surveys: Utilise drone technology to capture high-resolution aerial imagery of the project area, enabling detailed analysis of vegetation cover and disturbance patterns. Monitor for the presence and spread of invasive plant species that could outcompete native vegetation.	Detailed survey/ Assessment report. Weekly vegetation condition reporting Monthly Summaries: Compile monthly summaries of monitoring data to provide a broader view of vegetation health and disturbance trends. Seasonal Surveys: IGE will implement detailed seasonal surveys to observe changes in vegetation health and biodiversity through different climatic conditions. Assess the effectiveness of seasonal mitigation measures, such as erosion control during wet seasons.

		Implement control measures promptly when invasive species are detected. Conduct weekly inspections of the project area to identify and document any new disturbances to vegetation. Record details such as the type and extent of disturbance, location, and potential causes. Data Collection and Analysis: Collect data systematically during each monitoring activity and analyse it to identify trends and assess the effectiveness of mitigation measures.	Annual Environmental Impact Reports: IGE will Produce comprehensive annual reports that evaluate the overall environmental impact of the project, summarize monitoring results, and recommend any necessary adjustments to management practices.
Included IBSA data packages as part of the survey submission As part of the comprehensive survey submission for the Arrowsmith Hydrogen Project (AHP) hydrogen project, the inclusion of IBSA (Integrated Biodiversity Survey and Assessment) data packages plays a crucial role.	Submit data in the required format	Track information updates and/or amendments	Submit IBSA Data package Submission and Review: Report Compilation: Compile data findings into a structured report.

These data packages provide detailed, standardized, and reliable information about the biodiversity within the project area, enhancing the overall environmental assessment process. Components of IBSA of the completed Data Packages: Species Lists: Detailed lists of all flora and fauna species recorded during the surveys, including their conservation status. Habitat Descriptions: Descriptions of the different habitat types found within the project area, highlighting key ecological features. Vegetation Communities: Detailed mapping and characterization of vegetation communities, including their condition and extent. Fauna Surveys: Results from targeted surveys for key fauna species habitat, including Carnaby's Black Cockatoo and other significant species foraging habitat. Ecological Function: Information on the ecological functions and processes occurring within the habitats surveyed. Impact Assessments: Assessments of the potential impacts of the proposed development on the identified species and habitats. Mitigation Measures: Recommendations for mitigation measures to avoid, minimise, or offset potential impacts upon biodiversity.			External Submission: Submit the report to the EPA/Green Energy team management team for review. Stakeholder Communication: Share relevant findings with stakeholders, including regulatory authorities and the, as required

Priority Listed Flora Manage proposed impacts (direct and indirect) on the PEC occurrence if present within the disturbance footprint or DE. Gain a thorough understanding of the extent and significance of the proposed impacts on the listed priority species and PEC's and develop tailored management strategies to conserve and mitigate potential negative effects on their populations and habitats. Avoid clearing Priority Listed Flora: - *Eucalyptus foecunda* subsp. *aeolica* (Priority 2); - *Scholtzia calcicola* (Priority 2); - *Beyeria cinerea* subsp. *cinerea* (Priority 3) - *Dampiera tephrea* (Priority 3); and - *Eucalyptus zopherophloia* (Priority 4). Clearly ascertain the full extent and significance of proposed impacts on priority 2 species, Eucalyptus foecunda subsp. aeolica (Priority 2); Scholtzia calcicola (Priority 2); Information provided, and investigations undertaken, to clearly identify, quantify and describe the total number of individuals, or numbers in populations of this species to be impacted, in a local and regional context Develop and implement targeted mitigation measures to minimise impacts on Priority listed flora: Eucalyptus foecunda subsp. aeolica and Scholtzia calcicole	Priority Population Surveys (Targeted): Conduct focused surveys to identify and quantify the total number of individuals and populations of P2's, Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola within the project area Impact Assessment: Evaluate the potential impacts of the proposed project on the habitats and populations of these priority 2 species. This should include direct impacts such as habitat loss, fragmentation, and degradation, including indirect impacts like altered ecological processes and increased Human vegetation disturbance/interaction Clearly mark and designated access routes will be established to control and direct human movement. This helps to avoid unnecessary trampling and disturbance of vegetation outside these areas. Ensure comprehensive data collection and analysis, it will be possible to clearly identify, quantify, and describe the impacts on priority 2 species like Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola, and implement appropriate conservation measures to minimise adverse effects	Ongoing flora and vegetation inspections and monitoring. (Pre-Clearing) Pre-clearing inspection to ensure no clearing outside of demarcated extents and impacts to CBC foraging habitat and priority communities/priority vegetation types Conduct Post-Clearing inspections to ensure no clearing outside of demarcated extents or markers Monitoring Protocols: Design and implement rigorous monitoring protocols to track the status of Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola populations and habitats over time. Monitor key indicators such as population size, reproductive success, habitat condition, and response to mitigation measures.	Significant vegetation, flora, and community identification will be conducted through ongoing surveys focusing on Priority Vegetation and Flora, as well as Priority Ecological Communities (PEC). Reports to identify and assess the ecological importance of vegetation, flora, and communities within the project area, with specific emphasis on prioritised ecological assets. Objective: Compile results into a comprehensive report for stakeholders and decision-makers. Prepare a detailed report documenting the methodology, results, and implications for CBC conservation. Include maps, tables, and figures illustrating the extent and quality of CBC foraging habitat, including recommendations for habitat management and conservation measures.

Threat Assessment: Identify and assess potential threats to P2's Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola, including habitat loss, fragmentation, invasive species, climate change impacts, and human disturbances such as construction activities. Avoidance Measures: Implement strict avoidance measures to minimise or eliminate clearing of habitats occupied by Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola. This includes rerouting construction activities, adjusting project boundaries, and preserving critical habitats through buffer zones and conservation easements **Eucalyptus foecunda subsp. aeolica (Priority 2)** Pre-Clearing Target: Map and flag 100% of known individuals and populations before any clearing begins to ensure they are clearly identified. Clearing Target: Avoid 100% of identified individuals where possible through site redesign or micro-siting to preserve the population within the project area. **Scholtzia calcicola (Priority 2)** Pre-Clearing Target: Conduct a detailed flora survey to locate and demarcate 100% of known occurrences of Scholtzia calcicola before clearing.	**Conservation Goals:** Establish clear conservation targets and objectives for Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola based on the assessment of population status, habitat quality, and threats. Define specific goals for population maintenance, habitat protection, and restoration efforts. **Avoidance:** Implement strict avoidance measures to minimise or eliminate clearing of habitats occupied by Eucalyptus foecunda subsp. aeolica and Scholtzia calcicole Restrict Access Zones: Areas with sensitive or high-value vegetation will be designated as restricted access zones to prevent accidental damage. Maintain buffer zones around sensitive vegetation areas to protect them from indirect impacts. **General Flora Conservation Targets** for Pre-Clearing and Clearing:	Monitoring and Reporting: Establish a robust monitoring program to track the status of Eucalyptus foecunda subsp. aeolica and Scholtzia calcicola populations pre-, during, and post-construction. Regular reporting and data analysis will help assess the effectiveness of mitigation measures and identify any additional actions needed. Environmental Monitoring: Regular monitoring will be conducted to assess the impact of construction and operational activities on vegetation. This includes tracking any signs of disturbance or degradation. Compliance Audits: Environmental audits will be performed to ensure adherence to vegetation protection measures and to identify areas for improvement.	Regular Weekly Vegetation Condition Reporting Objective: To maintain an ongoing assessment of vegetation health and condition within the project area Regular weekly reports. Reporting Requirements: Weekly Reports: Submit weekly vegetation condition reports detailing observations, actions taken, and any issues identified. Monthly Reports: Compile monthly summaries of vegetation monitoring data, including trends and progress towards targets. Annual Reports: Prepare annual environmental impact reports that evaluate the overall effectiveness of management actions and the status of vegetation health.

Clearing Target: Ensure 95% of individuals and critical habitats are avoided, with mitigation measures (e.g., buffer zones) for any unavoidable areas.	Pre-Clearing Target: Conduct comprehensive flora surveys to map 100% of all priority flora species before clearing begins. This should include spatial mapping of populations and identification of critical habitats. Clearing Target: Ensure that any unavoidable impacts are minimised and translocation or offset strategies are developed for any significant populations that must be cleared. Buffer Zones: Pre-Clearing Target: Establish and clearly demarcate buffer zones around all priority flora species, with buffer sizes determined based on species sensitivity. Clearing Target: Maintain buffer zones throughout the clearing process, ensuring no incursion into protected areas. Translocation and Restoration: Pre-Clearing Target: For species that cannot be avoided, develop a translocation or seed collection program to preserve genetic material.		

	Clearing Target: Implement translocation programs with a success rate target of at least 80% survival after two years for translocated individuals. Post-Clearing Monitoring: Target: Establish long-term monitoring programs (up to five years) for retained and translocated populations to assess the health, reproductive success, and survival of priority flora species. Minimising Habitat Disturbance: Pre-Clearing Target: Identify areas of minimal habitat disturbance that can support priority flora populations during and after clearing. Clearing Target: Limit clearing to designated areas only, avoiding unnecessary destruction of flora habitats, and aim to keep disturbance below 10% of total flora populations within the project area.		
PEC 1 Priority Ecological Community/Priority 1 vegetation **Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria and Eucalyptus obtusiflora (Geraldton area) PEC distribution and extent: P1 PEC**	Confirm the presence of the Priority 1 'Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria, and Eucalyptus obtusiflora' Ecological Community (PEC) within	Continuous monitoring and adaptive management are key components of the target, ensuring that mitigation efforts are evaluated for effectiveness and adjusted	**Reporting and Compliance:** Prepare regular monitoring reports documenting the findings,

IGE provide further information and conduct additional investigations to confirm the presence of the **Priority 1 'Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria, and Eucalyptus obtusiflora' Ecological Community (PEC) within the development envelope.** This involves detailed assessments and surveys to identify the exact boundaries and composition of the PEC within the project area. It also includes evaluating the significance and conservation status of this ecological community to ensure appropriate measures are taken to protect it during the project's development. Appropriate mitigation measures will address impacts, The project will focus on habitat restoration, invasive species control, and adjustments to project activities to minimise further impacts on the Priority 1 'Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria, and Eucalyptus obtusiflora' Ecological Community (PEC). Habitat restoration efforts will involve restoring any degraded or damaged areas within the PEC, including replanting native vegetation species, enhancing soil quality through erosion control measures, and restoring natural drainage patterns to support ecosystem recovery.	Development Envelope conduct comprehensive investigations and assessments. Make necessary adjustments to project activities to minimise future impacts on the PEC. This involves modifying construction methods, altering timing or location of activities, and implementing protective measures like buffer zones. The overarching goal is to reduce direct disturbances to the ecological community. Ensure project activities are conducted in a manner that sustains the biodiversity and ecological functions of the PEC's.	as needed based on monitoring data and changing conditions Environmental Monitoring: Regular monitoring will be conducted to assess the impact of construction and operational activities on vegetation, particularly within PECs. This includes tracking any signs of disturbance or degradation and implementing corrective measures, as necessary. Compliance Audits: Environmental audits will be performed to ensure adherence to vegetation protection measures and to identify areas for improvement. Special attention will be given to the preservation of PECs.	trends, and actions taken regarding the PEC. Ensure compliance with regulatory requirements and environmental standards and communicate monitoring results to relevant stakeholders and authorities.

Management strategy complying with the Biodiversity Conservation Act 2016 (BC Act): The BC Act that aims to protect and conserve biological diversity in Australia, **Priority Species:** While not a formal category under the BC Act, "priority species" is a term used in environmental assessments and conservation planning to denote species that may not be officially listed as threatened but are still of significant concern due to declining populations, restricted distributions, or specific habitat requirements. Ensure that Priority Species and Priority Ecological Communities are preserved for future generations	Target: Mitigation Measures: Implementing specific actions to reduce negative impacts on priority species, such as habitat restoration and the creation of wildlife corridors.	Key Actions for Priority Species: Monitoring and Research: Conducting regular surveys and research to track the status of priority species and PEC's and understand their ecological needs. Habitat Protection: Ensuring that critical habitats for these species are preserved and protected from development activities.	Vegetation Monitoring: Weekly condition reports on the state of native vegetation within and around the project site. **Regulatory Compliance:** Summary of compliance with relevant environmental legislation, including the Biodiversity Conservation Act 2016 and the Environment Protection and Biodiversity Conservation Act 1999. Monthly and Quarterly Reports: Consolidated data and analysis from the monthly and quarterly reports.
CBC Foraging Habitat Habitat Avoidance Measure: Ensure that project development avoids areas known to be critical habitats for Carnaby's Black Cockatoo, including feeding, and roosting sites. Achieve 100% avoidance of mapped important habitats, especially known breeding sites and areas rich in foraging species such as Banksia, Eucalyptus, and Proteaceae species.	**Minimise Clearing of Foraging Vegetation**: Implement a minimal-clearing policy for CBC Foraging vegetation types AspBsBIMS and BpLW within the development area. Ensure that no native vegetation is cleared without prior procedural documentation and approval.	**Monitoring and Surveillance**: IGE will conduct regular monitoring and surveillance of the CBC foraging habitat to detect any unauthorised clearing or disturbances. Utilize advanced monitoring technologies such as radar or satellite imagery for comprehensive coverage. Monitoring and Evaluation:	Reports: Provide regular updates reports on the implementation progress of revegetation areas, environmental offset projects, and habitat enhancement activities. Include details such as area restored, species planted, habitat features enhanced, and any challenges encountered during implementation.

Establish buffer zones around key habitats to reduce disturbance during construction and operation. Conserve and enhance existing foraging habitats within the development envelope by protecting key species like Banksia It is crucial to avoid clearing vegetation types where possible: AspBsBlMS (Acacia spathulifolia, Banksia sessilis var. cygnorum, and Banksia leptophylla var. melletica mid shrubland) and BpLW (Banksia prionotes low woodland) due to their significance for Carnaby's Black Cockatoo (CBC) foraging habitat. These vegetation types consist of dense populations of Banksia species, which are highly favored by CBC for foraging due to their nutrient-rich nectar and seeds. Additionally, these areas may contain smaller proportions of other Proteaceous species such as Hakea or Grevillea, which also contribute to the CBC's foraging resources. Implementing mitigation measures and restoring Carnaby's Black Cockatoo (CBC) foraging habitat post-construction is crucial for minimising impacts and promoting habitat resilience. One of the key strategies is to create revegetation areas and implement environmental offsetting for vegetation types AspBsBlMS (Acacia spathulifolia, Banksia sessilis var. cygnorum, and Banksia leptophylla var. melletica mid shrubland) and BpLW (Banksia prionotes low woodland), which are vital for CBC foraging.	Revegetation Areas: Develop specific revegetation areas within or near the project site to replant native vegetation species preferred by CBC for foraging. These areas should mimic natural habitat conditions and provide suitable food sources, shelter, and foraging sites for CBC. Environmental Offset Projects: Identify and implement environmental offset projects in areas with similar ecological functions and benefits as CBC foraging habitat. This can include restoring degraded habitats, creating new foraging opportunities, and enhancing connectivity between habitat patches to support CBC populations. **Target**: Habitat Enhancement: Enhance existing CBC foraging habitat features, such as increasing the diversity and abundance of food plants like Banksia species, maintaining or creating suitable foraging sites and minimising disturbances that could disrupt CBC feeding and breeding behaviours.	Describe the monitoring protocols and methodologies used to assess the effectiveness of targeted measures. Report on monitoring results, including CBC population trends, habitat use, vegetation growth, habitat quality indicators, and any changes observed in CBC behavior or foraging patterns. **Habitat Avoidance Monitoring** **Frequency**: Ongoing during construction and operation. **Method**: Conduct periodic site inspections to verify that key habitats are being avoided, particularly Foraging areas. Use GPS mapping to ensure adherence to buffer zones. Monitor habitat mitigation measures for Carnaby's Black Cockatoo are effectively implemented and maintained.	**General Reporting Guidelines:** **Consolidated Reporting**: Reports should be compiled and submitted to relevant stakeholders, including regulatory bodies, project managers, and environmental teams, at agreed intervals (e.g., annually or quarterly). **Data-Driven Insights**: Use quantitative data (e.g., percentage of, vegetation retention rates) to provide measurable outcomes. **Corrective Action Plans**: Include any necessary corrective actions taken based on monitoring results, with clear timelines for implementation. **Stakeholder Engagement**: Regularly update local communities, landowners, and environmental groups on the progress of fire access road management to ensure transparency and maintain public trust. **Regulatory Compliance**: Ensure that all reporting is in line with legal and regulatory requirements, providing evidence that mitigation measures are being implemented effectively. Implement habitat offset programs if avoidance and minimisation are insufficient

Any unavoidable impacts should be offset through the establishment of larger revegetation areas nearby or in suitable locations, ensuring a net gain in habitat quality. This involves replanting native vegetation species that CBC prefer for foraging	Maintain or increase the availability of key foraging species, preventing the loss of significant areas of food resources. Foster partnerships with stakeholders to ensure long-term protection and monitoring of Carnaby's Cockatoo habitats. Target: Create or restore offset habitat at a ratio of at least 1:2 or higher to compensate for the loss of habitat if required Maintain or increase the availability of key foraging species, preventing the loss of significant areas of food resources. Achieve 100% avoidance of mapped important habitats, especially known breeding sites and areas rich in foraging species such as Banksia, Eucalyptus, and Proteaceae species.	Track the health and usage of restored or conserved habitats by the cockatoos. Identify any unexpected impacts and implement corrective actions in a timely manner. Provide ongoing data for adaptive management to continually refine and improve conservation strategies.	to fully mitigate impacts. Offset areas should provide equivalent or better habitat quality and quantity than what is being lost. Develop educational materials and programs to raise awareness about Carnaby's Cockatoo conservation and the importance of habitat protection. Document changes in habitat use and recommend habitat enhancement where foraging opportunities are limited.
Quantify the Carnaby's Black Cockatoo (CBC) foraging habitat, delineating the extent of vegetation with *Banksia sessilis* and *Banksia prionotes*. Avoid CBC Forging Habitat: AspBsBlMS; Acacia spathulifolia, Banksia sessilis var. cygnorum and Banksia leptophylla var. melletica mid shrubland on sandplain/lower slopes BpLW; *Banksia prionotes* low woodland on	No direct or indirect impacts to conservation listed or endangered flora species No reduction in the representation of vegetation types at local or regional scales. Minimise impacts to Priority Ecological Species	Ongoing flora and vegetation inspections and monitoring. (Pre-Clearing) Pre-clearing inspection to ensure no clearing outside of demarcated extents and impacts to CBC foraging habitat and priority communities/priority vegetation types	Environmental reports Detailed survey report Drone survey data analysis Visual inspection and approval of Disturbance Footprint boundary prior to ground disturbing activities.

sandplain/lower slopes Habitat Assessment: Ecoscape Conducted a comprehensive habitat assessment and targeted surveys to identify areas of critical importance for Carnaby's Black Cockatoos, including foraging sites and day roosting locations, CBC Demarcate conservation significant flora areas if required, particularly *Banksia sessilis* and *Banksia prionotes* within the Disturbance Footprint. Priority Ecological Communities will be avoided where practicable and impacts mitigated Mitigate potential impacts to flora and vegetation during construction activities CBC foraging habitat will be demarcated and defined by markers to avoid unnecessary clearing.	Minimise potential impacts to native Flora and vegetation including PEC's specifically coastal sands dominated by Acacia Minimal impacts to conservation listed flora species currently recorded on the Disturbance Footprint Mitigate potential negative effects on priority populations and habitats. Design project layouts to avoid critical PES habitats whenever possible. Minimise disturbance to existing vegetation and wildlife corridors during construction and operation phase	Conduct Post-Clearing inspections to ensure no clearing outside of demarcated extents or markers	Visual inspection and mapped records of disturbance footprints Detailed surveys complete 2022, including Significant vegetation, flora, and community identification

Management Action	Management Target	Monitoring	Reporting
Surface and Groundwater Drainage			
Local drainage regimes will be considered during site design and layout. Disturbances to drainage lines will be minimised where practicable. Groundwater-dependent ecosystems GDE's will be avoided by relocating infrastructure and optimising Groundwater aquifer water extraction Consider groundwater requirements for components of GDE's within the Disturbance Footprint. Revised wind turbine layout to avoid drainage lines Reduce turbine quantity with greater energy output to reduce disturbance footprint and groundwater impacts Water abstraction from the Yarragadee aquifer only. Minimise indirect impacts to surrounding/ adjacent areas from altered surface water drainage and flows. Acknowledge variability in groundwater requirements within ecological components of the GDE and manage site impacts accordingly Manage variability in groundwater requirements	Target: Minimise indirect impacts to surrounding water bodies No impacts to surface water infrastructure Efforts will be made to minimise indirect impacts to surrounding water bodies, and no impacts are expected on surface water infrastructure. Measures will be implemented to mitigate potential indirect impacts, ensuring the protection and preservation of water bodies and associated ecosystems. To establish clear and measurable targets for groundwater monitoring to ensure sustainable groundwater management and compliance with regulatory requirements. These targets will help guide monitoring efforts, assess the impact of project activities, and maintain groundwater quality and availability	Monthly visual inspections for environmental compliance. Monthly Groundwater monitoring bore inspection: Bore Dip/Water level measurements Weekly site monitoring surface/ groundwater. Vegetation monitoring: impact Inspection/Visual. Water level monitoring. Weekly environmental inspections Aquifer Recharge Rates: Target: Achieve a balance between groundwater extraction and natural recharge rates to ensure long-term sustainability.	Monthly environmental compliance inspection reports. Bore readings log Weekly environmental inspection report Data Management and Analysis: Data Entry: Enter all recorded data into a centralized database or spreadsheet promptly to ensure data integrity and facilitate analysis. Trend Analysis: Compare current measurements with historical data to identify any significant changes or trends in groundwater levels. Data Recording: Measurement Recording: Record the water level measurement in the field notebook or digital recording device immediately, along with the date, time, bore ID, and any relevant

Regular monthly groundwater monitoring and bore inspections are crucial for effective water resource management and environmental protection. By following this detailed procedure, accurate and reliable data can be collected to inform decision-making and ensure compliance with regulatory requirements.		Indicator: Comparison of extracted volumes versus estimated recharge rates. Frequency: Annually. Action Threshold: Sustained extraction rates exceeding recharge rates by more than 15% will prompt a review of water use practices. Bore Integrity: Target: Ensure all production bores are in good condition and functioning correctly. Indicator: Physical inspections and maintenance records. Frequency: Biannually. Action Threshold: Detection of any physical damage or functional issues will require immediate maintenance.	observations (e.g., water clarity, bore condition). Environmental Conditions: Note any environmental conditions that could affect the measurement, such as recent rainfall, nearby construction activities, or seasonal variations. Reporting: Prepare monthly reports summarizing the findings, including graphical representations of water level changes over time. Highlight any anomalies or significant variations that may indicate potential issues. Reporting: Monthly and quarterly reports will be prepared to summarise findings, highlight any areas of concern, and document compliance with monitoring targets. These reports will be shared with relevant stakeholders, including regulatory authorities, project managers, and the local community.

Surrounding Vegetation Impacts (Indirect)			
Mitigate potential indirect impacts to Beekeepers Nature Reserve. Protect sensitive ecosystems from edge effects, dust, and soil disturbance Site infrastructure and turbine facility layout have been redesigned to mitigate direct and indirect impacts to Beekeepers nature reserve. Monitor surface water flow within and without the Disturbance Footprint. - *Consideration will be given to ensuring that proposed disturbances and placement of infrastructure (e.g., Roads and tracks) associated with the proposal are situated as far as possible from the reserve boundary, to avoid/limit the potential of indirect impacts upon the BKNR and its associated values.* Implement strict **hygiene protocols** to prevent the introduction and spread of Phytophthora dieback through soil movement, equipment, and human activity. Establish washdown stations for all vehicles and equipment before they enter or exit areas adjacent to the Beekeepers Nature Reserve. Install **erosion control measures**, such as silt fences, coir logs, or mulching, to protect exposed soil during and after clearing. Replant cleared areas as soon as possible with native vegetation to reduce erosion and stabilize the soil.	Avoid impacts to Beekeepers Nature Reserve. Ensure no water flow impacting BKNR resulting from AHP construction activities. **Target**: Limit the creation of new edges by reducing the size of cleared areas to no more than 5% of the total project area, with buffer zones between cleared and uncleared vegetation. Protect adjacent vegetation from changes in microclimate (e.g., increased wind, light, and temperature) by minimizing exposed edges. Avoid clearing within 50-100 meters of sensitive ecosystems (e.g., wetlands, riparian zones, high-conservation-value areas) to prevent degradation. Implement buffer zones and no-clearing areas around sensitive habitats to protect them from disturbances such as soil erosion, runoff, or habitat loss.	Weekly monitoring of surrounds. Monitoring after rain events. Conduct monthly inspections during clearing activities, and implement post-clearing monitoring for at least two years to track indirect impacts on vegetation Perform regular surveys and engage with environmental specialists to review and update mitigation strategies **Monitoring**: Track the progress of both clearing and rehabilitation efforts to ensure minimal overlap between clearing and revegetation phases. **Monitoring**: Hold regular meetings with stakeholders to assess the effectiveness of mitigation strategies and adjust plans based on feedback.	Vegetation Reports. Environmental compliance inspection reports. **Reporting**: Provide regular reports to stakeholders and regulatory authorities on the effectiveness of mitigation measures, particularly those related to erosion control, weed management, and habitat connectivity. Implement a comprehensive **reporting program** with quarterly reports to ensure that indirect impacts (e.g., weed spread, dieback, erosion) are identified and managed promptly. **Training and Awareness** **Action**: Provide **dieback awareness and management training** for all staff and contractors working near or within the Beekeepers Nature Reserve.

Use cover crops or temporary groundcover in areas where permanent revegetation is not immediately possible. Implement water management strategies, such as **stormwater control systems** and retention basins, to capture and manage runoff from cleared areas. Avoid clearing near sensitive water bodies, wetlands, or riparian zones to maintain natural hydrological functions. Maintain natural drainage pathways and avoid compacting soils that may alter water infiltration. Maintain wildlife and vegetation **corridors** between patches of vegetation to allow for species movement and gene flow. Plan clearing activities to avoid fragmenting large contiguous areas of vegetation and minimise the number of isolated habitat patches. Rehabilitate all disturbed areas within and adjacent to the Beekeepers Nature Reserve as quickly as possible to prevent dieback and weed establishment. Use locally sourced native plants for rehabilitation. Conduct a thorough **dieback risk assessment** to map the presence and potential spread of **Phytophthora dieback** in and around the project area and the Beekeepers Nature Reserve.	Install erosion control measures on 100% of cleared areas, especially on slopes and near water bodies, to prevent soil loss and sedimentation. Schedule 100% of clearing activities during the dry season to reduce soil compaction, erosion, and runoff that can occur during wet conditions. Implement noise, dust, and light control measures on 100% of clearing and construction equipment to minimise disturbances to nearby ecosystems. **Maintain Wildlife Corridors** **Target**: Preserve 100% of key wildlife corridors that facilitate the movement of species between habitats, especially in fragmented landscapes. **Objective**: Maintain ecological connectivity to prevent habitat isolation and ensure that wildlife can move freely between areas of undisturbed vegetation between beekeepers nature reserve **Progressive Clearing and Rehabilitation**	**Monitoring**: Monitor dust levels and noise pollution during peak clearing periods and adjust equipment use to minimise emissions. **Monitoring**: Monitor compliance with restricted access rules through regular site audits and surveillance. Conduct annual revegetation success surveys to ensure native plants are establishing and outcompeting weeds Conduct monthly inspections during clearing activities and implement post-clearing monitoring for at least two years to track indirect impacts on vegetation. **Monitoring and Early Detection** **Regular Vegetation Health Assessments**: Conduct frequent health checks of vegetation within and adjacent to the Beekeepers nature Reserve to detect early signs of vegetation impacts or weed infection.	Provide detailed monitoring reports to stakeholders and environmental authorities, highlighting areas of concern and any detected spread of dieback.

Ensure water drainage systems direct flow away from **Phytophthora-Sensitive Areas**. Avoid working in wet conditions to prevent the spread of dieback through waterlogged soils. **Restricted Access to High-Risk Areas** **Action**: Limit access to areas identified as high-risk for **Phytophthora dieback spread**, particularly during wet weather when the risk of transmission through soil movement is highest. Establish **buffer zones** of 50-100 meters around the Beekeepers Nature Reserve where weed control is intensified to prevent weed spreading into the reserve. Collaborate with local environmental groups, government bodies, and the community to gain insights and advice on best practices for dieback and weed management.	**Target**: Use progressive clearing methods, limiting active clearing areas to no more than 10% of the total site at any given time, followed by immediate rehabilitation. **Objective**: Reduce the duration that any part of the site is left exposed to indirect impacts by quickly restoring vegetation and stabilizing the soil. **Target**: Implement noise, dust, and light control measures on 100% of clearing and construction equipment to minimise disturbances to nearby ecosystems. **Objective**: Reduce the impact on wildlife and nearby vegetation by controlling emissions and disturbances caused by clearing activities. **Erosion and Sediment Control** **Target**: Ensure 100% of erosion control measures are effectively preventing soil loss and runoff into the Beekeepers Nature Reserve.	**Sampling and Testing**: Collect samples from suspect plants and soil for laboratory testing to confirm the presence of Phytophthora. Conduct monthly inspections to ensure buffer zones are maintained and undisturbed. **Monitoring**: Conduct inspections after each rainfall event and adjust controls as necessary. **Monitoring**: Conduct quarterly vegetation health assessments and track the progress of revegetation efforts	

	Objective: Install silt fences, sediment traps, to prevent erosion and sedimentation in adjacent areas. **Revegetation and Habitat Restoration** **Target**: Achieve at least 80% **native vegetation cover** within rehabilitated areas adjacent to the reserve within two years post-construction. **Objective**: Use locally sourced native species for revegetation to stabilize soil, reduce weed spread, and restore habitat connectivity.		

5. Key Factor: Terrestrial Fauna

Management Provisions to Minimise Impacts to Terrestrial Fauna

EPA Notice Requiring Information for Assessment Section 2

Table 5 Terrestrial fauna – Management provisions

EPA Objective: *To protect terrestrial fauna so that biological diversity and ecological integrity are maintained*.
Information Management Review update Objectives: Additional Detailed fauna Survey information Mitigate potential impacts to significant and threatened fauna Minimise impacts to native vegetation that impact foraging habitat, as far as practicable
Key environmental values: Terrestrial Fauna/ Moderate and high value fauna habitat, conservation significant fauna and habitats. **Key impacts and risks:** Bird(CBC)and Bat strike during wind turbine operation. Impacts on Black Cockatoo Habitat.
Terrestrial Fauna Legislation, Policy, and Guidance - Biodiversity Conservation Act 2016 - Environment Protection and Biodiversity Conservation Act 1999 - Environmental Factor Guideline Terrestrial Fauna (Environmental Protection Authority, 2016c) - Technical Guidance Sampling Methods for Terrestrial Vertebrate Fauna (Environmental Protection Authority, 2016e) - Technical Guidance Terrestrial Fauna Surveys (Environmental Protection Authority, 2020) - Survey Guidelines for Australia's Threatened Bats (Department of the Environment, Water, Heritage and the Arts, 2010) - Survey Guidelines for Australia's Threatened Mammals (Department of the Environment, Water, Heritage and the Arts, 2011a) - Survey Guidelines for Australia's Threatened Reptiles (Department of the Environment, Water, Heritage and the Arts, 2011b)

Information Management Review update Objectives: Update referral information and mapping to minimise CBC habitat loss and minimise indirect impacts to fauna as far as practicable. Additional black cockatoo habitat assessment to determine the extent and quality of foraging habitat for Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*). Identification of adequate mitigation measures during wind turbine operation (such as wind curtailment) IBSA Data Package update(See Attached)			
Direct Impacts		**Indirect impacts**	
Bird and Bat strike during wind turbine operation. Impacts to black cockatoo habitat. Impacts to surrounding nature reserve Impacts to Avifauna foraging Habitat		Fragmentation of native vegetation: Declining quality of foraging habitat for Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*). Potential reduction in vegetation health as a result of dust generation. Altered fire regimes.	
Management Action	**Management Target**	**Monitoring**	**Reporting**
Ground Disturbance/Clearing			
Prior to clearing activities, conduct monitoring of significant fauna (focusing on the Carnaby's Black Cockatoo) in accordance with the DBCA's standard operating procedures and permit/ licence conditions as required under the BC Act. Ground disturbing activities will be limited to the project Disturbance Footprint. Prior to commencing vegetation clearing activities or ground disturbance activities, allow plant machinery to idle to create fauna alert. Alert fauna of proposed activities by walking the Disturbance Footprint before clearing activities commence.	Minimise fauna habitat loss. No fauna deaths Minimise fauna injury/ death during construction and operational activities The project will prioritise minimal clearing of priority flora species and Carnaby's Black Cockatoo (CBC) foraging habitat. This target involves carefully assessing and minimising the extent of vegetation clearing to avoid or minimise impacts on priority flora species and CBC habitat No disturbance to fauna habitat or foraging areas No deaths of conservation significant	Daily inspection of clearing extents during clearing activities to confirm that no over-clearing has occurred. Site Fauna walk Pre- clearing monitoring review Daily inspections of excavations and trenches to identify trapped fauna and to enable capture and relocation. Monthly workplace inspections	Report unauthorised clearing as soon as practicable when identified. Update Fauna siting report. Annual environmental reporting. Update Induction records. Report known injuries to or deaths of conservation significant fauna species In fauna register as soon as practicable when injury or death is identified. Quarterly environmental Audit Project Monthly Environmental Report

Minimised localised disturbance to mitigate local fauna populations impacts arising from dust, noise and vibration for the duration of construction and operational activities. Optimise clearing to avoid native vegetation and CBC foraging habitat	fauna species during vegetation clearing, earthworks or construction		
Management Action	**Management target**	**Monitoring**	**Reporting**
Vehicle Impacts			
Vehicles and equipment access will be limited to designated roads/ access tracks and cleared areas to mitigate vehicle fauna strike To mitigate the risk of vehicle-fauna strikes, access for vehicles and equipment will be restricted to designated roads, access tracks, and cleared areas. This measure helps minimise the interaction between vehicles and fauna reducing the likelihood of collisions and associated impacts on fauna populations. By confining vehicle movement to specified routes and cleared zones, the project aims to safeguard fauna habitat and promote safe coexistence between construction activities and local fauna.	No Driving Outside of Designated Tracks/Roads: All vehicle movements will be targeted and confined to designated tracks and roads within the project area. This restriction will help to: - Prevent habitat destruction and fragmentation. - Reduce the risk of disturbing or harming wildlife, including ground-dwelling species. - Minimise soil compaction and erosion, which can adversely affect plant and animal habitats	Visual inspections across the Disturbance Footprint Adherence to Traffic controls	Fauna incident/viewing register. Monitoring and Reporting: Regular monitoring of wildlife activity and road use will be conducted to assess the effectiveness of these measures. Any incidents involving fauna will be reported and investigated to improve mitigation strategies.

Designated roads and access tracks will be carefully planned to avoid sensitive fauna or vegetation habitats and migration corridors wherever possible. Clear signage and barriers may also be installed to delineate approved access routes and deter vehicles from straying into areas where fauna is present. Additionally, project personnel will receive training on fauna awareness and safe driving practices to further minimise the risk of vehicle-fauna incidents. Overall, restricting vehicle and equipment access to designated areas supports the project's commitment to environmental conservation and responsible construction practices, ensuring that wildlife welfare is prioritised throughout the project lifecycle. Observations of conservation significant or threatened fauna species will be reported to the site environment representative. Night-time vehicle movements during construction will be restricted where possible to minimise the potential for vehicle strikes.	Night driving will be minimised to reduce the risk of vehicle-wildlife collisions. This is especially important for nocturnal species that are active during night-time. By limiting night driving: - Speed Limits: Strict speed limits will be enforced on all roads within the project area to further reduce the risk of vehicle-wildlife collisions.		

Detailed Fauna Impact Analysis			
Carnaby's Black Cockatoo (CBC): Calyptorhynchus latirostris (Carnaby's Cockatoo), listed as Endangered under both the EPBC Act and BC Act			
Management Action	**Management Target**	**Monitoring**	**Reporting**
Management strategies that lead to a long-term increase in the size of a population	The AHP project will include measures such as habitat restoration and the designation of no-go zones to protect critical habitats. Rehabilitation areas success	Regular Site walk and or inspection Site Avifauna Radar monitoring will be implemented to monitor critical impacts areas and assess avian activity within the project site	Report Monitoring Results and sightings Describe specific conservation programs and initiatives aimed at protecting and restoring CBC populations.
Improve the area of occupancy of the CBC species	Reduce disturbance impacts Preservation of surrounding habitats	Visual Monitoring Activity Patterns: Continuous monitoring captures daily and seasonal activity patterns, identifying peak periods of bird movement	Report and Recommend specific conservation actions, such as habitat restoration, , and public awareness campaigns.
Ensure no fragmentation of existing foraging/roosting populations	Maintenance of habitat corridors and buffer zones ensures continued movement and interaction of Cockatoo populations.	Monthly/weekly Site walk and inspection	Data: Behaviour analysis: Radar data will be analysed to assess the behaviour of migratory, such as feeding, and commuting patterns
No activities that adversely affect habitat critical to the survival of a species	Implementation of habitat protection and restoration strategies minimises adverse effects on critical habitats.	Monthly/weekly Site walk and inspection Visual Surveys: Conduct regular field surveys to observe bird activity around turbines, particularly during peak activity periods (e.g., migration seasons).	Environmental Conditions: Note any environmental conditions that could affect the species, such as recent rainfall, nearby construction activities, or seasonal variations.

Ensure project activities do not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline	Introduce Habitat restoration and enhancement measures are designed to maintain or improve habitat quality.	Monthly/weekly Site walk and inspection	Monthly and weekly CBC monitoring and native vegetation disturbance reports
Ensure invasive species that are harmful the CBC do not become established within the species' habitat	Implement effective control programs for existing invasive species will be implemented	Monthly/weekly Site walk and inspection	Monthly and weekly CBC monitoring reports
Do not introduce disease that may cause the species to decline	Continuous health monitoring of Cockatoo populations will be conducted	Monthly/weekly Site walk and inspection	
Manage impacts that do not interfere with the recovery of the species.	Target recovery plans and strategies for endangered species, ensuring no interference with their recovery efforts	Monthly/weekly Site walk and inspection	Report and Summarise ongoing research projects focused on CBCs, including ecological studies.
Ecoscape Recorded conservation significant/ conservation listed fauna and habitat identified during site surveys (Bennelongia, 2021a, 2021b; Ecoscape, 2021, 2023) IGE will store information within a centralised database to ensure that habitat areas can be easily identified during construction activities Introduce radar technology to track and monitor Threatened avifauna and bats The project will conduct ongoing assessments to protect the extent and quality of any Banksia species of concern within the project area. This assessment will involve mapping the distribution of Banksia species and evaluating their ecological significance, including their importance as foraging	Targets: No impacts to Migratory bird species: *Calidris acuminata* Sharp-tailed Sandpiper) listed under the EPBC Act) and *Merops ornatus* (Rainbow Bee-eater) listed under the EPBC Act) Minimise fauna injury/ death during construction and operational activities. Evaluate Ecological Significance: Assess the ecological value of these Banksia populations, focusing on their role as foraging habitat for Carnaby's Black Cockatoo (CBC). Avoid habitat disruption.	CBC habitat motoring weekly (development envelope S.E.) Weekly Visual monitoring (Mapped Habitat area) Site Avifauna Radar monitoring (Critical impacts area placement) Monthly Site walk and or inspection. Site Avifauna Radar monitoring will be implemented to monitor critical impacts areas and assess avian activity within the project site.	Pre-clearing and relocation if required. Record known injuries to, or deaths of conservation significant fauna species in a fauna register. Provide further black cockatoo habitat assessment to determine the extent of *Banksia sessilis* and *B. prionotes* in the Disturbance Footprint, and map updates and include an assessment of potential impacts to Carnaby's Black Cockatoo habitat. Provide Index of Biodiversity Surveys for Assessments (IBSA) data packages.

habitat for **Carnaby's Black Cockatoo (CBC).** Ecoscape Surveys: Identified the distribution of Banksia species within the project area. Ecoscape Assessed and determine the extent and quality of the CBC foraging species of concern and utilised mapping information to mitigate CBC foraging habitat impacts Manage threatened and priority species below: Threatened bird species: *Calyptorhynchus latirostris* (Carnaby's Cockatoo), listed as Endangered under both the EPBC Act and BC Act Migratory bird species: *Calidris acuminata* Sharp-tailed Sandpiper) listed under the EPBC Act) *Merops ornatus* (Rainbow Bee-eater) listed under the EPBC Act) Ecoscape utilised Transect and Plot Surveys: Using a combination of transect walks and fixed plots to systematically cover the project area. GPS Mapping: Utilised GPS technology to precisely map the location and extent of Banksia populations.		Radar technology will be strategically positioned in areas identified as critical for avifauna, such as foraging sites, migration routes, and feeding grounds. This monitoring system will continuously track and record bird movements in real-time, providing valuable data on species diversity, abundance, and behaviour. By deploying radar monitoring in critical impact areas, the project can proactively identify potential risks to avifauna and implement appropriate mitigation measures to minimise impacts. For example, if radar data indicates high bird activity in a specific area, construction activities may be temporarily halted or modified to avoid disturbance to foraging habitat areas or migratory pathways.	IBSA data packages compile biodiversity survey data from various sources, providing a comprehensive overview of the ecological conditions within a specific area or region. This comprehensive dataset allows researchers and decision-makers to assess biodiversity patterns, species distributions, and ecosystem health more effectively. Review management actions (and revise if required) Regular Surveys: Conduct frequent surveys to monitor the presence and health of Carnaby's Black Cockatoo (CBC) populations in the mapped areas. This includes both direct observation and the use of tracking technologies. Maintain detailed records of monitoring activities and findings and regularly report these to relevant environmental authorities and stakeholders.

Ecoscape Data Collection: Record detailed information on Banksia species, including population size, health,		Conduct frequent surveys to monitor the presence and health of Carnaby's Black Cockatoo (CBC) populations in the mapped areas. This includes both direct observation and the use of tracking technologies.	
Avoid current CBC foraging habitat within the AHP Disturbance Footprint Avoid current CBC habitat during infrastructure layout design, with provision for specific pre-clearance surveys. Develop construction management measures specific to CBC's habitat. Map habitat corridors ensure connectivity between fragmented habitats to support genetic diversity and movement. Map areas of potential overlap with development projects, such as wind turbines, to assess and mitigate impacts.	Minimise construction activities within current CBC habitat. Minimise construction within avifauna habitat. Map areas of potential overlap with development projects, such as wind turbines, to assess and mitigate impacts. Target: Minimise Bird Collisions Target: Achieve a 90% reduction in potential collisions between Carnaby's Black Cockatoo and wind turbines by adjusting operations based on real-time radar data during peak activity periods. Metric: Number of recorded bird collisions per year, measured against baseline data.	Monitor CBC Habitat area weekly Monitoring radar data regarding Carnaby's Black Cockatoo (CBC), and bat movements and behavior will be conducted as part of the project's environmental monitoring program. This monitoring will involve the use of radar technology to track the movements of CBC and bats within and around the project area.	Behaviour analysis: Radar data will be analysed to assess the behaviour of CBC and bats, such as feeding, roosting, and commuting patterns. This analysis can help identify critical habitat areas and inform habitat management strategies. Map areas of potential overlap with GIS development projects, such as wind turbines, to assess and mitigate impacts. Temporal analysis: Radar data will be analysed over time to detect seasonal and diurnal variations in bird and bat activity.

Radar By deploying radar monitoring in critical impact areas, IGE site personnel can proactively identify potential risks to avifauna, including birds and bats, and implement appropriate mitigation measures to minimise impacts. This advanced technology allows for real-time tracking of flight patterns, species presence, and activity levels, enabling the project team to adjust operations and turbine activity accordingly to protect vulnerable species Deploying radar monitoring systems provides a range of significant advantages for tracking and conserving Carnaby's Black Cockatoo, an endangered species with critical habitat needs in Western Australia. These systems offer advanced capabilities in monitoring bird activity, allowing for data-driven decisions that help minimise risk and enhance conservation efforts.	**Real-Time Response** Target: Ensure a response time of fewer than 5 minutes from bird detection to turbine adjustment or stoppage during critical periods to prevent collisions. Metric: Average response time for turbine adjustments or shutdowns based on radar detection alerts. **Data Collection and Accuracy** Target: Capture 100% of bird flight paths and activities within the radar monitoring area with a data accuracy rate of over 95% for species identification. Metric: Percentage of correctly identified species and flight paths, verified by spot checks or additional monitoring methods. **Full-Coverage Monitoring** Target: Provide 24/7 monitoring coverage of over 100% of critical habitat areas within the wind farm footprint. Metric: Hours of continuous radar operation without gaps or interruptions. operational impacts during breeding or migration periods by adjusting turbine operations according to radar alerts. Metric: Number of operational changes made during critical bird activity periods, measured against baseline operation without radar.	**24/7 Monitoring Capabilities** **Advantage**: Radar systems can operate continuously, providing comprehensive monitoring during day and night, as well as in poor weather conditions. **Impact**: This ensures that monitoring is not limited to visual daylight observations, enabling detection of nocturnal movements or during challenging weather, which could be critical for capturing full patterns of activity. **Foraging Activity Monitoring** Target: Identify and protect 100% of key foraging areas of Carnaby's Black Cockatoo by correlating radar data with habitat use. Metric: Number of roosting and foraging sites mapped and protected based on radar data. **Reduction of Operational Impact** Target: Achieve 95% bird strike reduction through proactive management based on radar data.	Understanding temporal patterns can help inform project scheduling and management practices to minimise disturbances during sensitive periods. Collision risk assessment: Radar data can also be used to assess the risk of collision between CBC, bats, and project infrastructure such as wind turbines. This information can inform the design and siting of project components to minimise collision risk. **General Reporting CBC Consolidated Reporting**: Reports should be compiled and submitted to relevant stakeholders, including regulatory bodies, project managers, and environmental teams, at agreed intervals (e.g., annually or quarterly). **Data-Driven Insights**: Use quantitative data (e.g., percentage of, Banksia vegetation retention rates) to provide measurable outcomes.

	Early Warning Alerts Target: Ensure 100% of significant bird movements are detected and alerts are triggered at least 10 minutes before entering high-risk areas. Metric: Number of early warnings issued compared to detected bird movements in the vicinity of turbines. Adaptive Management Plan Updates Target: Update the adaptive management plan annually based on radar data insights, ensuring that new patterns of behavior or risk are accounted for. Metric: Annual reviews and revisions made to management plans in response to data trends. Compliance with Regulatory Requirements Target: Achieve 100% compliance with all wildlife protection regulations related to Carnaby's Black Cockatoo by using radar data to demonstrate proactive mitigation efforts. Metric: Number of regulatory compliance audits passed based on radar monitoring reports. Compared with pre-project baselines. These targets ensure that radar monitoring is not only deployed effectively	Monitoring System Uptime Target: Maintain 99% uptime for radar monitoring systems to ensure continuous tracking of bird activity in critical areas. Metric: Percentage of time the radar system is operational without significant downtime. Long-Term Impact Reduction Target: Reduce the long-term impact on Carnaby's Black Cockatoo populations within the project area by at least 80% over five years Metric: Changes in local Carnaby's Black Cockatoo population trends and health,	Corrective Action Plans: Include any necessary corrective actions taken based on monitoring results, with clear timelines for implementation. Stakeholder Engagement: Regularly update local communities, landowners, and environmental groups on the progress of fire access road management to ensure transparency and maintain public trust. Regulatory Compliance: Ensure that all reporting is in line with legal and regulatory requirements, providing evidence that mitigation measures are being implemented effectively. Community Reporting and Transparency Target: Publish quarterly reports detailing radar monitoring results, including bird activity patterns and collision prevention efforts, to engage stakeholders and the public. Metric: Number of reports published and distributed, including engagement with local communities and stakeholders.

	../but also contributes to meaningful conservation outcomes, reducing impacts on Carnaby's Black Cockatoo and aligning with both environmental and operational goals.		**Community Reporting and Transparency** Target: Publish quarterly reports detailing radar monitoring results, including bird activity patterns and collision prevention efforts, to engage stakeholders and the public. Metric: Number of reports published and distributed, including engagement with local communities and stakeholders

Management Action	Management target	Monitoring	Reporting
Rainbow Bee-Eater Marine bird species: Merops ornatus (Rainbow Bee-eater) listed under the EPBC Act, although not considered threatened			
Assess and determine the extent and quality of the species of concern and utilise mapping information to mitigate habitat impacts	Avoid Wetland, Riparian habitat areas	Conduct specific surveys to identify the presence of the Rainbow Bee-eater and its habitat	Maintain detailed records of monitoring activities and findings and regularly report these to relevant environmental authorities and stakeholders.
Identify and systematically characterising impacts and their effects Manage changes to hydrology as a result of water extraction that may impact on the habitat quality and therefore habitat suitability for this species	Avoid disturbance to drainage lines	Monitor production abstraction	Maintain detailed records of monitoring activities and findings and regularly report these to relevant environmental authorities and stakeholders.
Sharp-tailed and Common Sandpiper Migratory bird species: Calidris acuminata (Sharp-tailed Sandpiper), listed under the EPBC Act			
Assess and determine the extent and quality of the species of concern and utilise mapping information to mitigate habitat impacts	Avoid water bodies and wetland areas	Monitor Wetland habitat of the survey area on a seasonal basis Identify critical habitats, documenting sightings, and implementing measures to mitigate potential impacts.	Behaviour analysis: Radar data will be analysed to assess the behaviour of migratory, such as feeding, and commuting patterns

Management Action	Management target	Monitoring	Reporting
Wind Turbine Strike: Avifauna and Bats			
Implement Fauna Radar Monitoring Avoid direct loss/ mortality or injury to fauna including significant fauna and endangered species (CBC). Minimise avifauna strike during operation of wind turbines to reduce fauna deaths. (Blade painting/acoustic warnings) Ensure additional assessment of potential turbine strike mitigation measures are complete. Finalise and implement appropriate mitigation measures, including wind curtailment utilising radar **Technology Integration:** Bird Detection Systems: Incorporate automated bird detection systems that use radar data to trigger turbine shutdowns when large flocks or protected species are detected approaching. Lighting and Markings: Use radar data to inform the placement of lighting and visual markers on turbines to enhance visibility for birds. Introduce avifauna detecting radar to identify and track bird, bat species, and curtail wind turbines if required.	Accurate radar monitoring and data recording of bats and CBC within the Disturbance Footprint. No direct or indirect impacts to two significant microbats as range extensions:(*Austronomus australis* and *Vespadelus baverstocki*) or range infill: *Sminthopsis dolichura* (Little Long-tailed Dunnart Minimise Avifauna (Bird) and bat strike Objective: Establish comprehensive baseline data on bird and bat activity before the construction of wind turbines. Target: Conduct pre-construction surveys over a minimum period of one year to capture seasonal variations in bird and bat activity. Metrics: Number of bird and bat species identified, their population densities, flight paths, and behavior patterns in the proposed wind farm area. Target: Implement and monitor the effectiveness of mitigation strategies such as turbine curtailment during peak activity periods, installation of deterrent devices, and habitat management.	Avifauna Radar detection 24/7. Monitor Survey data identifying and tracking listed threatened and migratory species habitat within or adjacent to the Disturbance Footprint. Visual Monitoring Monthly/weekly Site walk and inspection Monitoring Methods Direct Observation: Visual Surveys: Conduct regular field surveys to observe bird and bat activity around turbines, particularly during peak activity periods (e.g., migration seasons). Radar Systems: Bird Strike Radar: Use radar systems to continuously monitor bird movements, flight paths, and collision data. Radars can detect birds at	Download data from radar monitoring equipment and generate fauna impact reports Report data and statistics gleaned from radar technology. Survey data identifying and tracking listed threatened and migratory species habitat within or adjacent to the Disturbance Footprint. Data Analysis and Interpretation: Collision Risk Metrics: Calculate and report metrics such as the frequency of bird flights at rotor-swept heights, proximity to turbines, and estimated collision risks. Behavioral Analysis: Analyse and report on bird avoidance behaviors and changes in flight patterns due to turbine presence. Standardised Reports: Develop standardised reporting templates that include all relevant data points, methodologies, and results. This ensures consistency and facilitates comparison across different sites and studies.

Optimise wind turbine layout to avoid bird and bat strike. Optimise wind turbine layout to avoid Cave and Karst formations Ensure Automatic Turbine curtailment when fauna within a given range Identify the ornithological receptors that could be affected by the Proposed Development Evaluate the importance (i.e., importance at the relevant geographical scale, also referred to as receptor 'sensitivity') of the receptor informed by data from baseline surveys and other appropriate sources; Identify and systematically characterize impacts and their effects (wherever possible based on best available scientific evidence), noting any uncertainties and taking a precautionary approach as appropriate; Incorporate measures to avoid and mitigate negative impacts and effects; Assess the significance of any residual effects after the beneficial effects of any proposed mitigation has been taken into account;	Target: Meet all regulatory requirements for fauna protection and reporting, including adherence to guidelines set by environmental agencies. Target: Establish a monitoring program (and post-construction) to track changes in bird and bat populations and the effectiveness of Mitigation Measures. Zero Bird or bat turbine blade strikes !00% Turbine Curtailment Success The AHP hydrogen project aims to achieve zero bird or bat turbine blade strikes, demonstrating a strong commitment to wildlife conservation and sustainable development practices	varying distances and altitudes, providing comprehensive data on bird activity around wind farms. Acoustic Monitoring: Bat Detectors: Deploy acoustic monitors to record bat echolocation calls. These devices help identify bat species present in the area and their activity levels. Possible Microphone Arrays: Use arrays of microphones to triangulate the position of calling birds or bats, improving data accuracy on species presence and behaviour. Camera Systems: High-Resolution Cameras: Install cameras on turbines to capture images or video footage of potential strikes or near misses. Cameras can provide visual confirmation and species identification. Thermal Imaging: Use thermal cameras to detect collisions, especially at night or in low-visibility conditions, by capturing heat signatures of birds and bats.	

Identify appropriate compensation measures to offset significant residual effects; and Identifying opportunities for ecological enhancement.		Automated Detection Systems: Multi-Sensor Systems: Integrate acoustic, visual, and radar sensors to automatically detect and record collision events. These systems can also provide taxonomic information and reduce false positives. AI and Machine Learning: Employ AI algorithms to analyse sensor data, improving the accuracy and efficiency of collision detection and species identification.	
Assess potential effects on sensitive bird receptors from development projects is a process that can be summarised as a series of stages, as follows: Identify the ornithological receptors that could be significantly affected by the Proposed Development (effectively part of Scoping); Evaluate the importance (i.e., importance at the relevant geographical scale, also referred to as receptor 'sensitivity') of the receptor informed by data from baseline surveys and other appropriate sources;	Minimise Avifauna (Bird) and bat strike To effectively assess and mitigate the impact of wind turbines impacting avian species: Avifauna strike prevention radar systems	Radar Monitoring Baseline studies data Activity Patterns: Continuous monitoring captures daily and seasonal activity patterns, identifying peak periods of bird movement. Flight Paths: The system tracks bird flight paths, including altitude, speed, and direction, providing detailed information on bird behaviour around wind turbines.	Radar data reports and deduction General Reporting Guidelines: Consolidated Reporting: Reports should be compiled and submitted to relevant stakeholders, including regulatory bodies, project managers, and environmental teams, at agreed intervals (e.g., annually or quarterly). Data-Driven Insights: Use quantitative data (e.g., percentage of strikes, to provide measurable outcomes. Corrective Action Plans: Include any necessary corrective actions taken based on monitoring

Identify and systematically characterising impacts and their effects (wherever possible based on best available scientific evidence), noting any uncertainties and taking a precautionary approach as appropriate; Incorporate measures to avoid and mitigate negative impacts and effects; Assessing the significance of any residual effects after the beneficial effects of any proposed mitigation has been taken into account; Identifying appropriate compensation measures to offset significant residual effects; and Identifying opportunities for ecological enhancement.		Pattern Identification: Use radar data to identify patterns in bird movements, such as migratory routes and timing, local flight paths, and areas of high bird activity. Species Identification: Although radar systems primarily detect movement, integrating data from visual observations and acoustic sensors can help identify species.	results, with clear timelines for implementation. Stakeholder Engagement: Regularly update local communities, landowners, and environmental groups on the progress of radar monitoring management to ensure transparency and maintain public trust. Regulatory Compliance: Ensure that all reporting is in line with legal and regulatory requirements, providing evidence that mitigation measures are being implemented effectively.

Noise and Vibration			
Prevent Noise Pollution: Ensure construction and operation activities do not generate harmful noise levels that can disrupt wildlife and human activities. Minimise Vibrational Impacts: Prevent vibrations from construction and operational activities from affecting local ecosystems, particularly sensitive fauna habitats. Develop noise and vibration minimisation strategies to be implemented during Proposal construction. Deploy noise and vibration monitors were required Minimise disturbance to native fauna from noise and vibration during construction and operation Ensure All site personnel are inducted regarding environmental responsibilities. Equipment Selection: Use low-noise equipment and ensure all machinery is well-maintained and fitted with noise-reducing technologies (e.g., silencers, mufflers).	No noise and vibration impacts during construction and operation. Prevent Noise Pollution: Ensure construction and operational activities do not generate harmful noise levels that can disrupt fauna and human activities. Minimise Vibrational Impacts: Prevent vibrations from construction and operational activities from affecting local ecosystems, particularly sensitive fauna habitats. Target: Ensure that construction activities comply with local noise and vibration regulations and do not exceed baseline levels by more than 10 dB or equivalent vibration metrics. Metrics: Real-time noise and vibration monitoring data, compliance with regulatory limits, and community feedback. Target: Establish a continuous noise and vibration monitoring program with real-time data collection and analysis.	Compliance with implementation of noise and vibration minimisation strategies. Site Noise and Vibration monitoring will be implemented Compliance with the implementation of noise and vibration minimization strategies will be ensured through the deployment of site noise and vibration monitoring. This monitoring system will be implemented on-site to continuously assess noise and vibration levels, allowing for prompt identification of any deviations from the established standards or mitigation measures.	Annual environmental report. Induction records. Construction Scheduling: Schedule noisy activities during daylight hours to minimise disturbance to nocturnal wildlife and nearby residents. Data Analysis: Regularly analyse monitoring data to identify trends and potential issues. Use this data to inform adaptive management practices. Reporting: Provide regular updates on noise and vibration monitoring results to stakeholders and regulatory authorities. Feedback Mechanism: Implement a feedback mechanism for stakeholders to report noise and vibration issues and ensure timely responses.

General Fauna impacts			
Pets, traps, or firearms will not be permitted within the Disturbance Footprint. Site personnel will be inducted regarding fauna management and environmental management responsibilities. Trenches will be constructed with shallow interior slope angles or exit points to allow fauna to escape if trapped. Trenches will be progressively opened and closed during construction Install Fauna egress mechanisms at all trench constructions Adherence to regulated civil design construction methods. Fauna awareness signage will be implemented at key areas around the project site Appropriate warning signage placed around Disturbance Footprint Install speed limit signs at all site entrances, exits, and key locations. Ensure speed limits are visible and comply with safety standards. Driver Training and Education Provide mandatory training sessions on the importance of adhering to speed limits. Highlight the hazards of speeding, including risks to wildlife and personnel.	No fauna deaths. No feeding or intentionally harming native fauna. No excess traffic speed on site Clearly Posted Speed Limits Install speed limit signs at all site entrances, exits, and key locations. Ensure speed limits are visible and comply with safety standards.	Open trenches (if required) will be inspected at sunrise and sunset for the presence and trapped fauna. Daily Visual Inspection By inspecting trenches at sunrise and sunset, construction crews can promptly identify and safely remove any trapped fauna, minimisng the potential for injury or mortality. This approach aligns with best practices for wildlife protection and demonstrates a commitment to environmental stewardship during construction projects. Regular Speed Monitoring Use speed monitoring equipment, such as radar guns or speed cameras. Conduct random speed checks to ensure compliance	Fauna incident register. Fauna sightings reports Maintain logs of speed monitoring activities and any speeding incidents. Include traffic speed compliance in the monthly environmental and safety reports

6. Key Factor: Inland Waters

EPA Notice Requiring Information for Assessment: Section 3
Management provisions to minimise impacts to inland waters are provided below:

Table 6 Inland Waters – Management Provisions

EPA objective: The EPA objective for this key environmental factor is to maintain the hydrological regimes and quality of groundwater and surface Water to ensure environmental values are protected
Information Management Review update Objectives: Additional surface and groundwater strategy information Mitigate potential impacts to surface water Minimise indirect impacts to GDE's, as far as practicable
Key environmental values: Inland waters/ Adjacent vegetation communities, GDE, fauna habitat, wetlands and ephemeral water bodies. **Key impacts and risks:** Groundwater Aquifer and GDE's
Legislation, policy, and guidance - Environmental Protection Act 1986 - Environment Protection and Biodiversity Conservation Act 1999 - Rights in Water and Irrigation Act 1914 - Environmental Factor Guideline Inland Waters (Environmental Protection Authority, 2018) - Operational Policy 5.12 – Hydrogeological reporting associated with groundwater well licence (Department of Water, 2009) - Northern Perth Basin: Geology, hydrogeology, and groundwater resources (Department of Water, 2017) - Arrowsmith groundwater allocation plan (Department of Water, 2010) - A 26D licence toc constructa water bore under the Rights in Water Irrigation Act 1914 from the DoW - A 5C licence to take water under the Rights in Water Irrigation Act 1914 from the DoW

Information Management Update Objective: An updated assessment of the impacts to groundwater resources, including groundwater dependent ecosystems, based on the confirmed strategy. Update referral information to clarify the proposed groundwater extraction strategy (i.e. water abstraction exclusively from the Yarragadee aquifer). Update the assessment of impacts to surface water, including impact to drainage/ water lines and wetlands, including the ephemeral waterbody. Update any surface water management strategies as required	
Direct Impacts	**Indirect Impacts**
Annual cumulative abstraction from the Yarragadee aquifer. Potential Groundwater abstraction draw down. Impacts to groundwater resources. Potential Impacts to surface water, including impact to drainage/water lines and wetlands, including the ephemeral waterbody. Potential Water Contamination from hydrocarbon or chemical spills.	Impacts to Groundwater dependent ecosystems. Alteration to surface water regimes within/without Disturbance Footprint. Surface Sedimentation and erosion impacts Superficial Aquifer impacts Potential impacts to Beekeepers Reserve

Management Action	Management Target	Monitoring	Reporting
Surface Water			
Tracking and mapping groundwater-dependent ecosystems (GDEs) involves a systematic approach to identify, delineate, and monitor these ecosystems to better understand their distribution, characteristics, and ecological functions	No direct or indirect impacts to GDE's	Monthly monitoring and inspection Visual GDE inspections	Monthly Environmental inspection Report
Modify Wind turbine layout design to avoid water bodies and drainage lines	No impacts to surface water regimes or resources	Monthly monitoring and inspection	Monthly monitoring and inspection- Report
Modify windfarm layout design to avoid wetlands and cave systems	Minimise surface water impacts	Monthly monitoring and inspection	Monthly monitoring and inspection Report

			Update project Mapping showing modified layout design to avoid wetlands
Implementing surface drainage and wetlands inspections is essential for ensuring proper functioning of drainage systems, preserving wetland habitats, and mitigating potential environmental impacts and how these inspections can be carried out effectively:	No interference with wetland, surface water lines or drainage Minimise Interruption to existing surface water flow patterns.	Monthly monitoring and inspection	Monthly monitoring and inspection Report
Implement a surface water operating strategy	No construction upon surface water drainage lines including vehicular access No water abstraction for the surface Swan limestone aquifer Avoid discharge of chemicals, including hydrocarbons,	Monthly monitoring and inspection	Monthly monitoring and inspection Report Implement a surface water operating strategy document

Groundwater			
Ensure that the production bore is accessing the Arrowsmith - Dongara - Perth - Yarragadee North aquifer The production bore will be constructed into the confined Yarragadee aquifer, and ensure the bore is not connected to the superficial aquifer Manage environmental objective for this factor Maintain the hydrological regimes, the quality of groundwater and surface water to ensure environmental values are protected. Ensure Impacts associated with water abstraction from the superficial aquifer have been avoided by abstracting from the Yarragadee aquifer for electrolysis process water supply. AHP Disturbance Footprint hydrological mapping will be consulted before construction activities commence. Consult hydrological database maps to understand the hydrological ecosystem. Implement a groundwater operating strategy Production bores will be located 1 km from Beekeepers nature reserve Optimise groundwater abstraction to limit aquifer drawdown	Comply with the EPA's environmental objective Minimizing impacts to groundwater regimes is essential for maintaining water quality, ecosystem health, and sustainable water resource management Avoiding water extraction from the superficial aquifer is crucial to prevent potential impacts to groundwater-dependent ecosystems (GDEs). GDEs rely on groundwater for their survival and are often sensitive to changes in water levels and quality. Minimise Impacts to the hydrogeological ecosystem No impact to Beekeepers nature reserve No excess water abstraction from bores: Water extraction from bores will be strictly regulated to avoid drawing more than the approved limits. This ensures sustainable use of groundwater resources, protecting both the aquifer and dependent ecosystems. Continuous monitoring and adaptive management practices will be employed to maintain compliance with permitted	A project site water monitoring strategy will be implemented. Production Bore water level monitoring Water Quality monitoring/testing Weekly production bore inspection Beekeepers reserve weekly visual inspection Weekly Aquifer water levels inspection (Bore)	Water abstraction recordings in accordance with water licence requirements. Implement Groundwater water Operating strategy document Annual: DWER groundwater license conditions and environmental reports. Reporting on exceedance of management target Aquifer Water level reporting: monthly

RO plant planned for production purposes for saltwater electrolysis processing	abstraction rates, safeguarding against any excess extraction that could impact groundwater levels or ecological health.		
impacts of infrastructure on Groundwater Dependent Ecosystems (GDEs), it is crucial to implement targeted measures to minimise negative effects. - Conducting detailed hydrogeological assessments to understand groundwater flow patterns and potential interactions with GDE's. - Implementing engineered wetland designs that account for groundwater recharge and discharge areas can help mitigate impacts on GDE''s. (part IV approvals) Additionally, regular monitoring and reporting on groundwater levels, water quality, and ecological conditions in and around the wetlands are essential for identifying any adverse impacts and taking corrective actions promptly.	Overall, the management target is to ensure that the constructed wetlands operate in a way that protects and preserves Groundwater Dependent Ecosystems, mitigating any potential negative impacts effectively.	Regular monitoring and reporting: Establishing a monitoring program to track groundwater levels, water quality, and ecological conditions within and around the constructed wetlands.	Reporting on groundwater levels, water quality, and ecological conditions
Manage Monitoring Bore network if required Tracking and mapping groundwater-dependent ecosystems (GDEs) to identify, delineate, and monitor their distribution, characteristics, and ecological functions	No direct or indirect impacts to GDE's	Monthly monitoring and inspection Visual GDE inspections	Monthly Environmental Inspection Report

Surface Water			
Limit clearing, provide adequate buffer zones between areas of disturbance and natural drainage lines. Ensure reduction of surface water runoff volume / quality in the environment downstream. Managing the impact on downstream dependent vegetation communities involves implementing strategies to minimise negative effects on vegetation downstream of project activities Ensure no pooling of water, growth of invasive vegetation in low lying areas. Locate chemical and hydro-carbon stores away from, external surface water surface water flows. Divert upstream surface water flows around structures, into downstream water courses so natural (clean) runoff water originating outside the development site does not mix with internal (disturbed) site runoff. Maintenance of existing surface water hydrological regime maintain the hydrological regimes Implement diversion structures and sediment basin interceptors to control migration Implement appropriate battering in contour drains if required Manage Sediment laden surface water runoff from disturbed areas and stockpiles	No Interruption to existing surface water flow patterns. Minimise water run-off Minimal potential for increase in surface water sediment loading No significant changes to surface water flow patterns drainage Avoid sediment diversion Avoid hydrocarbon spills or chemical contamination Minimal reduction in surface water runoff volume Maintain hydrological regimes within the Disturbance Footprint No surface sediment loading No construction on drainage channels	Monthly monitoring and inspection Visual Monitoring Water Quality monitoring/testing Monthly Monitoring and Inspection: Conduct regular monthly inspections of the project site to assess environmental conditions, identify any changes or potential issues, and ensure compliance with environmental regulations and project requirements. Document observations, noting any signs of erosion, vegetation damage, wildlife activity, or other environmental indicators. Check erosion control measures, sedimentation basins, stormwater management systems, and other infrastructure to ensure proper functioning and maintenance. Inspect construction areas, access roads, and work zones for any signs of environmental degradation or non-compliance with environmental management plans. Review monitoring data from previous months to track trends, identify areas for improvement, and evaluate the effectiveness of mitigation measures.	Monthly Environmental Report Surface water management strategy Spill incident reports

Stormwater Management: Design and implement stormwater management systems to capture, treat, and infiltrate runoff from impervious surfaces, preventing pollutants from reaching downstream vegetation communities. Incorporate green infrastructure practices such as rain gardens and vegetated swales to enhance water quality. Place structures, away from main flow channels		Visual Monitoring: Conduct visual monitoring to assess the condition of vegetation, water bodies, soil, and other environmental features within and adjacent to the project site. Use photography or video documentation to record changes in land use, habitat quality, and landscape features over time. Pay special attention to sensitive areas such as wetlands, riparian zones, and wildlife habitats, and monitor for any signs of disturbance or degradation. Compare visual observations with baseline data and reference images to detect any deviations or anomalies that may require further investigation Implement a comprehensive water quality monitoring program to assess the chemical, physical, and biological parameters of surface water and groundwater sources. Collect water samples at designated monitoring points using appropriate sampling techniques and equipment.	

		Analyse water samples in accredited laboratories to measure key parameters such as pH, dissolved oxygen, turbidity, nutrient levels, heavy metals, and microbial contamination. Monitor changes in water quality over time, identify potential sources of pollution or contamination, and take corrective actions as needed to protect water resources. Evaluate compliance with regulatory standards, assess the effectiveness of pollution control measures, and guide decision-making for environmental management and mitigation.	

Management Action	Management Target	Monitoring	Reporting
Site Selection: Choose locations that minimise impacts on natural habitats and sensitive ecosystems. Avoid areas with high biodiversity or protected species. Use appropriate vegetation species,	Utilise local vegetation species where possible	Water Quality Pathogen Transport Water Quality Monitoring: Regularly Monitor water quality parameters such as pH, dissolved oxygen, temperature, turbidity, nutrients (nitrogen and phosphorus), contaminants (e.g., heavy metals, pesticides), and microbial indicators (e.g., fecal coliforms) at inflow, outflow, and within the wetland.	Water Management plan
Implement water management practices to minimise water usage and reduce the risk of water pollution. Ensure proper treatment of wastewater before discharge into wetlands.	Manage water levels, flow regimes, and hydroperiod to mimic natural wetland processes	Hydrological Monitoring: Monitor water levels, flow patterns, and hydroperiod (duration of inundation) in different habitat types. Hydrological changes can impact habitat suitability for wetland species.	Monthly Environmental Report
Regularly monitor the wetlands' health and ecosystem dynamics. Conduct maintenance activities to prevent invasive species colonisation and maintain ecological balance.	Maintain or enhance biodiversity by promoting the presence of native plant and animal species	Monitoring and Research: Regular monitoring of ecological indicators such as species diversity, population trends, and habitat health is essential.	Monthly Environmental Report

Proper Site Design: Ensuring proper site design with appropriate slopes and drainage patterns can minimise erosion and sedimentation within the wetland.	No sediment loading Improve water quality by reducing nutrient loading, sedimentation, and contaminant levels.	Assess sedimentation rates and erosion impacts within the wetland.	Monthly Environmental Report

Management Action	Management Target	Monitoring	Reporting
Tracking and mapping groundwater-dependent ecosystems (GDEs) to identify, delineate, and monitor their distribution, characteristics, and ecological functions	No direct or indirect impacts to GDEs	Monthly monitoring and inspection Visual GDE inspections	Monthly Environmental Inspection Report
Modify wind turbine layout design to avoid water bodies and drainage lines	No impacts to surface water regimes or resources	Monthly monitoring and inspection	Monthly Monitoring and Inspection Report
Modify windfarm layout design to avoid wetlands and cave systems	Minimise surface water impacts	Monthly monitoring and inspection	Monthly Monitoring and Inspection Report
Update project mapping to show modified layout design avoiding wetlands	No interference with wetland, surface water lines, or drainage Minimise interruption to existing surface water flow patterns	Monthly monitoring and inspection	Monthly Monitoring and Inspection Report
Implement surface drainage and wetlands inspections to ensure proper drainage, preserve wetland habitats, and mitigate environmental impacts	No interference with wetland, surface water lines, or drainage Minimise interruption to existing surface water flow patterns	Monthly monitoring and inspection	Monthly Monitoring and Inspection Report
Implement a surface water operating strategy	No construction upon surface water drainage lines, including vehicular access No water abstraction for the Swan limestone aquifer Avoid discharge of chemicals, including hydrocarbons	Monthly monitoring and inspection	Monthly Monitoring and Inspection Report
Implement a surface water operating strategy document	Maintain compliance with surface water management protocols	Monthly monitoring and inspection	Monthly Monitoring and Inspection Report

Surface Water Management Options			
GHPF Excess Water			
Closed-Loop Water Recycling System - Install and maintain recycling infrastructure to ensure efficient water reuse - Monitor system for leaks or inefficiencies - Regularly test recycled water quality to meet safety standards - Implement training for operators on system maintenance	Minimise wastewater discharge by reusing water within operations	Continuous monitoring of system efficiency	Monthly Water Recycling Efficiency Report
On-Site Evaporation Ponds - Design ponds with appropriate lining to prevent groundwater contamination - Monitor water levels and salinity to optimize evaporation - Conduct regular inspections to detect any leaks or overflow risks - Install fencing to keep wildlife out of ponds	Reduce liquid waste by allowing natural evaporation	Monthly inspection and water quality testing	Quarterly Evaporation Efficiency Report
Reverse Osmosis (RO) and Brine Minimisation - Use pre-treatment filters to maximize RO system efficiency - Regularly inspect and replace membranes - Collect and store concentrated brine for controlled disposal - Monitor the RO discharge quality to meet environmental standards Excess **salt and minerals** generated during the water treatment or desalination processes can be collected, bagged, and safely removed from the site	Minimise brine and treat water for possible reuse	Continuous monitoring of RO efficiency and brine quality	Monthly RO System Performance Report

Diffuser-Based Groundwater Discharge - Install a diffuser system with proper design to ensure effective dilution - Conduct regular testing of discharge water quality - Monitor marine or groundwater health near discharge areas - Adjust discharge rate as needed to minimize ecological impact	Ensure compliant discharge with minimal environmental impact	Regular quality testing of discharged water	Monthly Discharge Compliance Report
Natural Wetlands for Discharge Treatment - Develop wetland systems with native vegetation to naturally filter discharge - Monitor wetland health and water quality regularly - Avoid any discharge that contains harmful contaminants - Conduct seasonal assessments of the wetland ecosystem	Optional Use of wetlands as a natural filtration system for treated discharge	Biannual monitoring of wetland health and discharge quality	Biannual Wetland Condition Report
Stormwater			
Stormwater Collection and Flood Mitigation - Construct collection basins with overflow systems to prevent flooding - Monitor water levels and release excess if necessary - Use sediment traps to remove debris before discharge - Maintain vegetation around basins to improve absorption and filtration	Target: Capture and manage stormwater to prevent site flooding	Inspection during rainy seasons and post-storm	Monthly Stormwater Collection Report
Zero Liquid Discharge (ZLD) System - Ensure ZLD system components are maintained to prevent leaks or failures - Regularly test final discharge quality for safety - Train personnel on ZLD operations and troubleshooting - Store and dispose of any residual solids according to regulations	Achieve complete water recycling with no liquid waste discharge	Continuous system monitoring and quality testing	Monthly ZLD System Performance Report

(Option) Soil Infiltration Basins - Design basins with suitable soil types for infiltration - Monitor soil quality to prevent clogging or contamination - Test water quality to ensure safe infiltration - Inspect basin functionality regularly, especially after heavy rainfall	Facilitate natural infiltration for treated discharge water	Monthly inspection and water quality testing	Quarterly Infiltration Efficiency Report
Stormwater Harvesting and Blending - Install and maintain storage tanks for harvested stormwater - Blend stormwater with other sources as needed, monitoring for quality - Use filtration systems to remove contaminants from harvested water - Develop a plan for distributing or using harvested water	Maximise stormwater usage to reduce dependency on external water sources	Monitoring during storm events and water quality testing	Monthly Stormwater Harvesting Report

Effluent			
Leach Drain System - Design leach drains to maximize natural infiltration - Conduct soil quality testing to ensure safe drainage - Perform regular inspections of leach fields for blockages - Rotate usage areas to prevent over-saturation	Efficient disposal of treated effluent while preventing surface contamination	Regular inspection of leach field and soil testing	Quarterly Leach Drain Performance Report
Above-Ground Sewage Treatment Plant - Ensure regular maintenance of treatment systems - Test treated effluent quality to meet environmental standards - Manage any sludge generated by the plant responsibly - Develop contingency plans for equipment failure	Treat sewage with minimal environmental impact	Regular inspection and performance checks	Monthly Sewage Treatment Report
Hybrid System: Above-Ground Treatment with Leach Drain Discharge Maintain treatment plant for effective initial processing - Test effluent quality before leach drain discharge - Inspect leach drain for infiltration capacity - Train staff on combined system management	Combination treatment and discharge approach to maximise efficiency and minimise impact	Continuous monitoring of treatment and discharge	Biannual Hybrid System Efficiency Report
Packaged Sewage Treatment Plant with Effluent Disposal (Surface Irrigation or Other Use) - Regularly monitor treated effluent quality - Use effluent for irrigation in approved areas only - Develop a system for effluent storage and controlled release - Monitor vegetation health in irrigation areas	Treat and repurpose effluent through surface irrigation or other applications	Regular water quality and disposal monitoring	Monthly Effluent Disposal Report

Advanced Filtration and Chemical Treatment Options - Install and maintain advanced filtration equipment - Regularly test chemical discharge levels - Safely store and dispose of spent chemicals - Train staff on handling chemical waste and safety protocols	Ensure high-quality water discharge and removal of contaminants	Regular water quality testing and system checks	Monthly Filtration System Performance Report
Biodiversity Conservation: Promoting biodiversity by planting a variety of native plant species can enhance ecological balance. This includes providing habitats for diverse wildlife such as birds, insects, and amphibians.	Set targets for reducing invasive species cover, preventing spread to adjacent areas, and restoring native plant communities	Conduct vegetation surveys to assess plant species composition, abundance, diversity, and health. Monitor vegetation cover, growth rates, invasive species presence, and changes in plant communities over time.	Monthly Environmental Report

Erosion Control			
Erosion control inspections within the Disturbance Footprint Ensure compliance with relevant Water Quality Protection Guidelines (WQPG) and guidance notes. If surface erosion is observed, implement erosion controls to minimise further erosion will be implemented Erosion Control Measures: Implement erosion control measures such as vegetative cover, erosion control blankets, and sediment traps to prevent sedimentation of downstream water bodies. Minimise soil disturbance during construction activities to reduce sediment runoff. design diversion structures and sediment basin interceptors	Avoid soil/surface erosion within the Disturbance Footprint. Understand variability and effects of localised water impacts Avoid sediment migration No significant changes to surface water flow patterns drainage	**Visual Observations:** During inspections, visually assess the condition of erosion control measures. Look for signs of erosion, sediment accumulation, vegetation growth, structural damage to control structures, and any areas where erosion control measures may need repair or reinforcement.	Annual environmental reports. Weekly environmental reports.

Management Action	Management target	Monitoring	Reporting
Groundwater Draw Down			
Production water abstraction and facility operations will be optimised to reduce aquifer water drawdown(Operational Controls) Manage optimised water abstraction: Reduced maximum abstraction Optimise electrolyser Procurement to reduce water usage Implement upstream water recovery management Recycle excess processing water	Target: Reduce water abstraction from the Yarragadee Groundwater Aquifer Minimise process water loss	Weekly Production Bore drawdown Monitoring Monthly Site walk and bore inspection	Monthly Production Bore water monitoring reports Weekly Process water reporting volume reports
Implement regular groundwater drawdown inspections Optimise Electrolysis processing mechanisms Implement a specialist water management team Ensure no significant groundwater level drawdown in identified areas with GDE's that are associated with groundwater abstraction Ensure Water Allocation Target is not breached as a condition of the 5C groundwater licence.	No significant groundwater level drawdown No excess water abstraction from bores No Drawdown impacts on Beekeepers reserve	Groundwater level monitoring Monthly production bore monitoring Review monitoring data Check production logs Weekly Visual GDE monitoring	Annually, within DWER groundwater license conditions Monthly bore inspection Monthly Environmental Report
Ensure Regular groundwater draw down management/ monitoring is implemented Ensure site personnel understand water quality objectives/Parameters install water meters	Avoid water use greater than DWER allocation	Monthly recording of meter readings	Annually, within DWER groundwater license conditions.
Implement regular groundwater quality monitoring/	Maintain groundwater quality	Quarterly water quality testing.	Monthly site environmental

management reporting. Assessment of water quality in the Yarragadee production bore to further determine impact. Reduce or amend pumping operation of the production bore, if appropriate. Provide an alternative source of water of similar quality and quantity to meet usage requirements to protect groundwater resources	with Water Quality Protection Guidelines parameters. Avoid excessive long-term increase in salinity and significant change in chemical composition of Yarragadee water due to abstraction Proposed Desalination Facility Construct RO plant	Analyse water samples in a certified laboratory using validated analytical methods. Test water samples for the selected parameters, including chemical analyses (e.g., nutrient concentrations, heavy metals) and biological assessments	reporting. Water Quality Reports
Implement Production bore water quality testing Water Quality within regulatory parameters Water quality measurement – selected areas Accurate Bore test readings. Groundwater use within the DWER groundwater license allocated volume Site Induction content: Water Management guidelines Track water Quality within regulatory parameters	Minimise water quality impacts Determine the key water quality parameters to monitor based on regulatory requirements, project objectives, and the specific characteristics of the aquifer and its receiving water bodies.	Daily Inspection of construction areas. Visual Inspections. Monthly Site walk and inspection Measure field pH and electrical conductivity, and obtain chemical analyses of water from production bore	Weekly Reporting
Implement Production bore abstraction monitoring. Electrolysis facility control room monitoring managed Water Pumping parameters and controls managed	Minimise water abstraction during processing	Production monitoring controls	Water Quality Reporting. Against Water Quality Guidelines
Adhere to Water allocation: Water Allocation permit limits Manage Water licenses with volumetric entitlements Water extraction data management implemented	Minimise excess groundwater extraction	Manage allocations	Extraction records.(Water online)
Update Bore license allocation.5C	No excess water extraction from bores	Review Documentation	Water Online updates

7. Key Factor: Social Surrounds

Notice Requiring Information For Assessment: Section 4
Social Surrounds

Table 7 Management Provisions to Minimise Impacts to Social Surroundings

EPA objective: To protect social surroundings from significant harm.
Information Management Review update Objectives: Additional information regarding Ethnographic aspects Additional information regarding Mitigation and potential impacts to Heritage values Identify sites relating to women's cultural practice
Key environmental values: Visual Amenity and Heritage **Key impacts and risks:** Aboriginal Heritage sites
Social Surrounds Legislation - EP Act 1986 Aboriginal Heritage Act 1972 - Heritage of Western Australia Act 1990 - State Register of Heritage Places, the National Heritage and World Heritage List\ - Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (ATSIHPA) and the Native Title Act 1993 - Environmental Factor Guideline: Social Surroundings (Environmental Protection Authority, 2016b) - Wind farm environmental noise guidelines (Song & Yorke, 2021)
Information Management update objective: Minimise impacts to social surroundings Provide evidence that meaningful engagement with the Yamatji people.(See supporting document Appendix 2) Provide the spatial data to accompany the Aboriginal heritage survey report to confirm the extent of the survey effort. Update the referral information to address all previous heritage report of the recommendations to understand the ethnographic importance of the area. Discussion of the results of the further ethnographic survey. In particular, the importance of any identified sites relevant to women's cultural practice.

Direct Impacts	Indirect Impacts
Potential heritage site disturbance. Vegetation Clearing outside demarcated boundaries.	Potential indirect impacts to known heritage sites and areas within the national heritage places as a result of project construction or operations. Potential to impact upon to heritage amenity (visual, noise and vibration).

Management action	Management target	Monitoring	Reporting
Heritage			
Evidence has been provided that meaningful engagement with the Yamatji people is ongoing and that the Yamatji Southern Regional Corporation support for the Proposal. (See Attached Stakeholder engagement table) Spatial data has been provided to accompany the updated Aboriginal heritage survey report to confirm the extent of the survey effort. (See attached Heritage Survey Appendix 2) IGE have updated the referral information to address the recommendations set out in the Aboriginal heritage survey report including further research on the caves, mounds (potential archaeological deposits) and stone arrangements referred to in the Aboriginal heritage survey report. (Sands Report Attached Appendix 2) The heritage Report was updated to address discussion regarding ethnographic aspects and findings, Including	No disturbance of known Aboriginal Heritage sites. No disturbance to National Heritage Places. By adhering to stringent protocols and regulations, collaborating with Indigenous communities and heritage authorities, and incorporating best practices in heritage protection and management, project IGE can effectively prevent disturbance to known Aboriginal Heritage sites and National Heritage Places while achieving project objectives in a culturally sensitive and environmentally responsible manner.	Pre-ground disturbance inspection of known Aboriginal heritage sites and to verify buffer and/or signage/fencing etc. Continued monthly Heritage monitoring Monitor during ground disturbance or clearing activities Yamatji Observers present during ground disturbance or clearing	Incident reports Annual environmental reports. Induction records. Monthly environmental report. Survey Report Attached Clearing reports/Mapping/GIS Review management actions (and revise if required)

ethnographic importance to Traditional Owners and relevant Knowledge Holders. IGE Provided a discussion on the results of the ethnographic survey. In particular, the importance of any identified sites to women's cultural practice. (Stakeholder engagement meeting with the Yamatji people over a 3-day period on the AHP project site) Regular engagement with the Yamatji People. Continued engagement with the Yamatji people		Having Yamatji Observers present during ground disturbance or clearing activities enhances cultural awareness and ensures respectful engagement with Indigenous heritage and values. Cultural Oversight: Yamatji Observers provide invaluable cultural knowledge and insights that can inform project planning and execution. Their presence helps identify and protect sensitive cultural sites, artifacts, and landscapes within the project area. Heritage Protection: Yamatji Observers play a crucial role in monitoring ground disturbance activities to ensure compliance with cultural heritage management plans and relevant regulations. They can identify any unexpected archaeological finds or cultural features and facilitate appropriate responses to minimise impacts.	

Management action	Management target	Monitoring	Reporting
Heritage			
Ensure All site personnel are inducted on heritage responsibilities including heritage values. Heritage Incident: Department of Planning, Lands and Heritage (DPLH) will be notified, and an incident report will be lodged within 24hrs of incident The Yamatji People will be notified within 24 hrs. if heritage material is discovered, the area cordoned, and an archaeologist will be engaged to assess the archaeological material and provide a heritage report. IGE will work with the Yamatji and archaeologist to implement an appropriate course of action.	No disturbance to heritage values No direct or indirect Impacts to Aboriginal heritage sites within the Disturbance Footprint. No disturbance of known Aboriginal Heritage sites: implement exclusion zone No disturbance to National Heritage Places.	Pre-clearing/ earth works/ walk. Pre- clearing site walk. Clearing monitoring in situ. Clearing monitors: Indigenous Yamatji and site personnel. Visual Inspection Pre-ground disturbance inspection of known Aboriginal heritage sites and National Heritage Place boundary to verify buffer zones and/or signage/fencing etc.	Incident report. Annual reporting. Report disturbance within 24 hrs. of incident. Monthly environmental report.
Monthly Heritage field inspections will be implemented Regular heritage walks with Yamatji people will be organised IGE will Communicate proposal outline and objectives, and proposed tenure, to support large-scale renewable energy projects to decarbonise operations. Consultation as required under the Native Title Act 1993. Provide ILUA Native Title Act for consultation to ensure effective engagement towards agreement.(Signed)	Minimise Heritage values Mitigation Impacts No breach of Aboriginal agreements or cultural agreements	Pre-ground disturbance inspection of Proposal footprint boundary demarcation. Conducted Heritage field study Mixed gender Yamatji heritage walk	Incident reports. Monthly environmental report. Ethnographic reports. Women's heritage and ethnographic survey report complete. Mixed gender heritage walk complete Ethnographic and

Establish frameworks and provision equitable participation, and informed consent, in progressing consultation and engagement toward agreements related to the Proposal. Participation in further environmental surveys if required. Discussion and exchange of documents moving toward and entering into relevant agreements. Maximising social, economic, and employment/contracting opportunities. Other discussion topics including proposed infrastructure and development activities. Options for appropriate siting of infrastructure, and cultural participation. IGE has undertaken meaningful and proactive consultation with the Yamatji Traditional Owners, ensuring they are fully informed of the proposed changes prior to the commencement of the public consultation period			Archaeological survey, Heritage surveys reports
Ground disturbing activities, including clearing, earthworks or Excavation must not occur within a 10 m buffer around each of the Seven Aboriginal heritage sites demarcated on maps and communicated to site personnel IGE will Engagement of Yamatji Aboriginal heritage monitors to monitor all ground disturbing earthworks and to manage Aboriginal heritage values of the site and the adjacent areas.	No disturbance of known Aboriginal Heritage sites. No disturbance of National Heritage Places. No ground disturbance without engaging Yamatji monitors during ground disturbance activities.	Daily visual inspections of heritage sites (Yamatji heritage monitors and rangers) during ground disturbance. Monthly inspections of heritage sites during project construction activities.	Heritage incident reports. Annual environmental reports. Additional ethnographic surveys have been completed, including a complementary women's cultural heritage discussion.

All AHP project site personnel to be inducted on Aboriginal heritage responsibilities including heritage values.			
Ensure Heritage Site Survey information is readily available to site personnel Prior to any place disturbance, implement a mitigative program that may include: Cultural salvage, archaeological salvage and/ or other salvage methods considered in consultation with the Yamatji people.	No heritage place disturbance	Engage Yamatji monitors during clearing activities.	Clearing procedural documentation and maps, shape files and reports. Description of proposed activities
Clearing demarcation: Ensure native vegetation clearing procedures are understood and complete before commencement clearing or earthworks Ensure- the Yamatji people are notified prior to earthworks or clearing activities Route alignment optimisation (which included avoidance of cultural sites of known Aboriginal Heritage value). Confirm Exclusion zone boundaries (identified with the Traditional Owners that encompass and protect t ethnographic sites and places) and in some instances.	No disturbance to cultural Exclusion zone boundaries	Visual monitoring. Weekly Site walk. Monthly Site walk and cultural inspection	Clearing report

8. Other Environmental Factors

Notice Requiring Information For Assessment Section 5

Potential construction and operational activities, impacts and their management associated with other environmental factors relevant to the proposal but not considered key environmental factors.

The significance of the other environmental factors is considered in accordance with:

- Values, sensitivity, and quality of the environment which is likely to be impacted;
- Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts;
- Consequence of the likely impacts (or change);
- Resilience of the environment to cope with the impacts or change;
- Cumulative impact with other existing or reasonably foreseeable activities, developments, and land uses;
- Connections and interactions between parts of the environment to inform a holistic view of impacts to the whole environment;
- Level of confidence in the prediction of impacts and the success of proposed mitigation; and
- Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and public information that informs the EPA's assessment.

Table 8 Dust

EPA objective: To protect the Environment from significant harm.
Information Management Review update Objectives: Additional information regarding Visual Amenity Additional information regarding Mitigation and potential impacts of Bush Fire Additional information regarding Dust noise and vibration Additional information regarding spills
Key environmental values: Visual Amenity and Heritage **Key impacts and risks:** Aboriginal Heritage sites
Social Surrounds Legislation - Wind farm environmental noise guidelines (Song & Yorke, 2021) - The **Bush Fires Act 1954** is a key piece of legislation in Western Australia that regulates the management and control of bushfires, and provides guidance on fire prevention measures, firebreak maintenance, and the responsibilities of landowners. The Act sets out the powers and duties of local governments, fire officers, and the community in preventing and responding to bushfires. - **Environmental Protection (Noise) Regulations 1997**, under the **Environmental Protection Act 1986** - Key Regulations and Guidelines Governing Visual Amenity in WA: Planning and Development Act 2005 This Act provides the primary framework for land-use planning in Western Australia. It requires that new developments consider their impact on the visual environment as part of the approval process. - **Environmental Protection Act 1986** and related guidelines and policies, including the **Environmental Protection (Unauthorised Discharges) Regulations 2004**. - Environmental Protection Act 1986 (EP Act) The EP Act is the overarching legislation that governs the management of pollutants, including hydrocarbons, in Western Australia.
Information Management update objective: Minimise impacts to Visual Amenity Minmimise dust noise and vibration impacts Reduce hydrocarbon spills

Management action	Management target	Monitoring	Reporting
Dust			
Regular water cart dampening operations should be continuously implemented during project construction activities to minimise dust generation and mitigate potential environmental and health impacts. Here is why this practice is essential: Dust Suppression: Water cart dampening operations involve spraying water on disturbed surfaces to keep dust particles from becoming airborne. This helps reduce dust emissions, which can affect air quality, visibility, and respiratory health for workers and nearby communities. Environmental Protection: Dust generated from construction activities can settle on surrounding vegetation, water bodies, and sensitive ecosystems, potentially causing damage or contamination. Regular dampening operations help prevent dust from dispersing and settling in nearby natural areas, minimizing ecological impacts. Compliance with Regulations: Many authorities have regulations and standards governing dust emissions from construction sites. Implementing regular water cart dampening operations demonstrates compliance with these requirements, avoiding potential fines or penalties for environmental violations. Health and Safety: Dust inhalation poses risks to the health and safety of workers and nearby residents.	Minimise dust deposition impacting Aboriginal heritage sites. No visual dust plumes around Disturbance Footprint No clearing or earth moving on windy days No dust deposition that impacts community vegetation structures No dust deposition affecting surrounding vegetation	Visual inspections of heritage sites (Yamatji). Heritage monitors and rangers deployed during ground disturbance or clearing activities. Inspections of heritage sites (Heritage monitors and rangers) during Proposal implementation. Compliance Monitoring: Environmental reporting, conducted on a monthly and weekly basis, provides a systematic approach to monitor project activities' environmental performance. It allows tracking of key environmental indicators, such as dust emissions, noise levels, water quality, and habitat disturbance, ensuring compliance with regulatory standards and project requirements Dust suppression and dust control measures will be visually inspected in the monthly environmental compliance inspection.	Incident report. Annual environmental report. Report excess dust immediately to HSE team. Monthly environmental report. Weekly reporting. Reporting excess dust immediately to the Health, Safety, and Environment (HSE) team is crucial for prompt intervention and mitigation measures. This helps ensure the health and safety of workers and nearby communities. Additionally, regular environmental reporting, including monthly and weekly reporting, is essential for monitoring project activities' environmental impacts and compliance with regulatory requirements. Incident reporting system. .

By keeping dust levels low through dampening operations, the likelihood of respiratory issues, allergies, and other health problems is reduced, promoting a safer work environment. Community Relations: Minimising dust emissions through proactive dust suppression measures fosters positive relations with surrounding communities. Residents are less likely to experience nuisance or discomfort from dust pollution, enhancing the project's reputation and social acceptance. Site Stability: Dampening operations can also contribute to stabilizing soil surfaces, preventing erosion, and maintaining site integrity during construction. This helps reduce sediment runoff into waterways, protecting water quality and aquatic habitats. To ensure the effectiveness of water cart dampening operations, it is important to: Schedule dampening activities at appropriate intervals, considering weather conditions, wind speeds, and the frequency of construction activities. Use sufficient water pressure and volume to adequately wet surfaces and suppress dust effectively. Monitor dust levels regularly and adjust dampening operations as needed to address any areas of high dust concentration. Train personnel responsible for operating water carts to ensure proper technique and compliance with safety protocols. Vehicle speed limits will be set and enforced on nominated routes.		Daily visual monitoring of dust levels by the construction supervisor or representative.	

Implement dust suppression controls, including use of water carts on access roads, to be implemented during construction activities as required. All site personnel to be inducted regarding environmental responsibilities and potential impacts within their work areas. Ensure dust deposition is not impacting or altering community vegetation structures Minimise dust generation during ground disturbing activity Document dampening activities as part of the project's environmental monitoring and reporting requirements. By prioritizing regular water cart dampening operations, construction projects can minimise their environmental footprint, protect public health, and demonstrate responsible environmental stewardship. Ensure vehicles and equipment access limited to designated roads/ access tracks and previously cleared areas			

Table 9 Noise and Vibration

Noise and Vibration			
Minimise noise and vibration impacts during construction activities, including earth moving, transport, stockpiling or loading of materials during high winds. Optimise vehicle movement during the construction phase of the Proposal. Reduce noise emissions as far as practicable. Vibration to be minimised through planned earthworks (guided by geotechnical assessment and risk assessment. Implement impact mitigation: Designate buffer zones as required. Ensure heavy vehicle movements is controlled and minimised as far as practicable. Construction works will be undertaken in accordance with the Environmental Protection (Noise) Regulations 1997. Construction activities will be limited between 0700 and 1900 Monday to Saturday, excluding public holidays. Noise and vibration management measures will be implemented during construction and operation. Noise emissions will be subject to the noise levels assigned in the Environmental Protection (Noise) Regulations 1997.	Minimise noise impacts affecting potential receptors No regulatory noise breaches	Compliance with Environmental Protection (Noise) Regulations 1997 and/ or noise management report. Noise monitoring where required	Incident report. Complaint close-out. Annual environmental report. Induction records. Monthly environmental report.

Visual Amenity			
Management action	**Management target**	**Monitoring**	**Reporting**
Manage and understand representative receiver locations	Mitigate visual impact	Monitor Operational Infrastructure	
Reduce traffic movement and Heavy vehicle movements on site and surround as far as practicable.	Reduce vehicle movements. Minimise heavy vehicle dust plumes	Investigation and reporting of all complaints.	Monthly environmental report. Complaints procedure.
Optimise visual amenity to reduce impacts Manage site layout design and infrastructure requirements including landscape feasibility design	Minimise adverse visual amenity impacts	implementation of recommendations, where appropriate	Monthly environmental report. Annual environmental report.
Optimise turbine layout design in zones of visual influence. Ensure Selection of wind turbine design (tower, colour, anti-glare) are chosen according to landscape and environmental characteristics. Procure anti-reflective paint for towers and blades. Natural Vegetation cover around windfarm Implement a landscape perception mitigation regime Manage Installation of overground cables to mitigate ground disturbance Optimised distribution of wind turbines within the landscape and their position in relation to road networks and public visual sensitivity. Manage finishing texture/ materials of wind turbines and other facilities.	Target: Minimise turbine glare impacts when procuring equipment specs Minimise visual amenity impacts during layout design	Visual inspection. Assess visual amenity viewpoints.	Weekly environmental report.

Design of Windfarm according to site conditions and with sensitivity to the surrounding landscape.			
Solar farm layout optimisation: Ensure correct landscaping/ planting around solar Farm footprint. Implement Landscape modelling to reduce solar panel glint and glare. Obstruct Solar farm visibility from road: Vegetation/landscaping Implement Effective landscaping design. Obstruct solar Farm visibility from road by introducing landscaping barriers Landscape Integration: Design the layout of turbines and solar farm to blend harmoniously with the natural landscape. Incorporate existing landforms, vegetation, and terrain features into the project design to minimise visual contrast and maintain visual continuity with the surroundings. Screening and Buffering: Use natural and artificial screening elements such as vegetation, berms, and fencing to visually buffer the project from sensitive viewpoints or receptors. Strategic placement of vegetation can help visually frame the project and soften its appearance from key vantage points.	Zero panel glint or glare impacting road user receptors. Minimise Solar Farm visibility from road Efforts will be made to ensure zero panel glint or glare impacting road user receptors. Additionally, measures will be implemented to minimise the visibility of the solar farm from the road, mitigating potential visual impacts on road users. These measures may include strategic placement of vegetation or screening structures, as well as design considerations to minimise reflective surfaces and glare.	Visual inspections. Monitor implementation of glint and glare- report recommendations, where appropriate.	Weekly environmental report. Completion of glint and glare assessment and Report

Impacts on viewsheds and views			
Optimal layout design. Landscaping design for visual impact mitigation. Turbine type.	Minimise adverse visual amenity impacts.	identifying scenic amenity and/ or landscape values to be monitored. Regular monitoring.	National Windfarm Development Guidelines. Regulatory reporting internal reporting.

Table 10 Fire

Fire			
Key Exemptions under the Bush Fires Act 1954: Firebreaks and Fire Access Roads Exemption for Firebreaks: Landowners are required to clear and maintain firebreaks on their properties to comply with local government fire safety requirements. These firebreaks help prevent the spread of bushfires and provide access for firefighting vehicles. Under Section 33 of the Bush Fires Act 1954, landowners can clear vegetation to establish firebreaks without needing a clearing permit from the Department of Water and Environmental Regulation (DWER), as long as the clearing is in accordance with local government notices. Local Government Notices: Local governments issue notices that specify the location, size, and dimensions of firebreaks required for individual properties. These notices vary by region and are often updated annually to reflect fire risk levels. **Purpose:** The purpose of this exemption is to ensure that landowners can quickly and effectively create firebreaks to mitigate bushfire risks. Emergency Clearing for Fire Prevention Immediate Threats: If there is an immediate threat of a bushfire, landowners can clear vegetation to prevent the fire from spreading without needing prior approval or permits. This emergency clearing can include removing trees, shrubs, or other vegetation that pose a fire hazard to life, property, or critical infrastructure. Exemption under the EP Act: Under the Environmental Protection Act 1986 (EP Act), clearing that is required in an emergency to protect lives, property, or the environment from imminent danger (such as an approaching bushfire) is exempt from needing a clearing permit.			
Management action	**Management target**	**Monitoring**	**Reporting**
Wherever feasible, the original fire breaks are to be utilised to prevent further unnecessary loss of flora and fauna. This approach minimises the environmental impact while maintaining effective fire management, ensuring that natural habitats are preserved to the greatest extent possible.	Minimise Vegetation disturbance Target: Prevent unplanned fires resulting from proposal activities is paramount to ensure safety and minimise environmental damage. No inadequate signage	Monitor Daily review of DFES website for fire danger rating applicable to the Arrowsmith Development Hub. Monitor site Compliance with access requirements. Monitor compliance with hot work permits.	Incident reporting system. Hot work permit record system. Training records show that all required personnel have completed training at the required intervals; basic firefighting, site induction,

Fire break along the western and southern edges of the IGE DE, adjacent to the Beekeepers Reserve should follow the original breaks to minimise further unnecessary disruption to the vegetation. This approach ensures that the fire management infrastructure is maintained while protecting the surrounding ecosystem, reducing the impact on local flora and fauna. Preparation of a specific bushfire management plan for the Development Application **Minimise Clearing Width**: IGE will Design fire access roads with the minimal width required for safe vehicle passage to reduce the overall impact on the environment **Vegetation Retention**: Retain as much native vegetation as possible along the sides of the road to provide habitat for wildlife and to stabilize soil. **Strategic Placement**: IGE will Design fire access roads to follow natural contours where possible, reducing the need for extensive earthworks and minimizing landscape disruption. The identification of high value assets, the vulnerability of these assets to bushfire, and vegetation hazards. **Wildlife Protection Measures**: IGE will Incorporate wildlife protection measures, such as wildlife crossings or barriers, to minimise the impact on fauna movement across the fire access road. Ensure emergency fire management procedures are available and visible to all site personnel	Fire breaks are not installed in areas susceptible to flooding, such as waterways and wetlands, where practicable. This is done to prevent the fire breaks from being prone to erosion and to avoid waterlogged soils becoming un-trafficable No open flames on site No smoking outside designated areas Firebreaks and Clearing: Establish firebreaks and clear vegetation around project areas to create buffer zones that reduce the spread of fires. Clearing debris, dead vegetation, and combustible materials from work sites and access roads can also minimise fire hazards. Retain 90% of roadside native vegetation to maintain wildlife habitats and soil stability. Ensure that 100% of fire access roads in erosion-prone areas are stabilized using appropriate materials.	Development Site inspections. Audit and ensures that vehicles and equipment are maintained in accordance with service schedules to minimise risk of fire. **Monitor and Maintain Roads**: Regularly monitor and maintain fire access roads to ensure they remain clear and functional, especially after heavy rains or fire events. **Monitoring**: Conduct annual assessments to verify that the majority of the fire breaks used are existing ones. Use satellite imagery and site inspections. **Monitoring**: Conduct pre-construction surveys to map sensitive areas, and post-construction audits to ensure no road construction occurs in sensitive zones. . **Minimise Clearing Width Monitoring**: Perform routine field inspections during and after road construction to ensure the road width does not exceed the design specifications.	emergency exercises. **Rehabilitation Plans**: After the fire risk has passed, implement rehabilitation plans for any disturbed areas, including revegetation and soil stabilization efforts. Use access control logs and monitoring devices (e.g., gates or road cameras) to ensure only authorized personnel are using the roads. A summary of the percentage of reused fire breaks, comparison with the target (80% reuse), any deviations, and explanations for new breaks used. Pre-construction and post-construction audits. **Contents**: Documentation of sensitive areas identified, avoidance measures taken, and verification that no sensitive areas were disturbed. Include maps and compliance checklists.

All non-essential work will be halted or postponed in the event of a Total Fire Ban with Catastrophic fire danger ratings or when an Emergency Warning is issued for the Arrowsmith Development Hub. All vehicles undertaking clearing activities to be fitted with firefighting equipment. Vehicles and equipment access limited to designated roads/access tracks and cleared areas. Implementation of a hot work permit system. Smoking will be confined to designated smoking area only. All site personnel will be inducted regarding environmental responsibilities including fire prevention. Firebreaks shall be maintained and constructed in compliance with statutory requirements to provide protection to surrounding vegetation from a potential fire from the Project i.e. vegetation cleared to 100 mm height to the edge of the shoulder on either side of access tracks. Ensure site vehicles and machinery have serviceable fire extinguishers. Ensure daily review of DFES website for fire danger rating applicable to the Gascoyne region. Fire emergency response: site personnel induction. Maintain existing fire infrastructure, services and utilities Maintain roadside weed control Maintain access tracks and fire breaks	Ensure 100% avoidance of identified sensitive areas such as wetlands, waterways, and flood-prone zones in road placement where practicable Keep road width below 4-5 meters, or the minimum required for fire safety, to limit environmental disturbance. Develop a schedule for quarterly inspections, focusing on road conditions, accessibility, and the effectiveness of any implemented mitigation strategies.	Erosion Control Measures Monitoring: Inspect erosion control structures quarterly, and after significant rainfall events, to assess their effectiveness and perform necessary maintenance. Conduct vegetation surveys twice a year to track the retention of roadside native vegetation and to identify areas that may require additional conservation measures.	Method: Environmental surveys and post-construction assessments. Vegetation Retention Reporting Frequency: Biannual. Contents: Surveys documenting the percentage of retained vegetation along the road, changes from previous periods, and suggestions for improving retention where necessary. Method: Vegetation surveys, including photographic evidence and mapped data. Documentation of wildlife crossing usage, effectiveness of installed barriers, and any adjustments made based on monitoring results. Method: Camera trap data, visual inspection reports, and wildlife monitoring logs Reports should be compiled and submitted to relevant stakeholders, including regulatory bodies, project managers, and environmental teams, at agreed intervals (e.g., annually or quarterly).

Table 11 Spills

Liquid Spills			
Leaks and liquid spills will be immediately reported to the site environmental representative and be registered as an incident within the IGE reporting system. Spills will be cleaned-up immediately aligning with the IGE spill incident investigation procedure. Spill response Kits will be placed at key areas within the Disturbance Footprint to mitigate risk. Ensure Hydrocarbon spills mitigation management is included in the site induction Implement hydrocarbon storage and spill mitigation management measures to minimise the risk and impact of hydrocarbon spills. Implement measures to minimise the risk and impact of hydrocarbon spills. Spill kits will be located at all workshop and fuel storage areas. Service vehicles will be fitted with spill kits and trays. Regulatory compliance in relation to the storage and use of hydrocarbons and other chemical types. Appropriate design and operation of vehicle maintenance areas and facilities. Approved siting and operation of project site wastewater treatment systems.	Minimise hydrocarbon or hazardous material spills Reduce spills across the Disturbance Footprint Monitoring Target: Ensure that 100% of high-risk areas are equipped with real-time monitoring systems to detect any leaks or spills as soon as they occur. Monitoring Target: Perform daily or weekly inspections and document findings in logbooks to ensure all potential risks are identified early.	Weekly spill kit inspection checks. Daily project facility monitoring. Hydrogen facility and equipment daily checklist. Real-Time Spill Detection Systems Sensors and Alarms: Implement sensors in critical areas (e.g., near storage tanks, pipelines, loading/unloading zones) to detect leaks or spills in real-time. These sensors can be connected to automated alarms or alerts that notify personnel immediately of a spill event. Monitoring Target: Conduct drills and tests of the spill response plan quarterly to ensure readiness in case of an actual spill.	Environmental incident recording, investigation, and reporting system. Comply with WA Water Quality Protection Guidelines and guidance notes. Track and record contaminated waste transport contractors. Emergency Spill Response Plan: A well-developed spill response plan is essential for quick action when spills occur. It should include procedures for containment, cleanup, reporting, and monitoring.

Compliant waste management and storage of hydrocarbon contaminated materials, including contaminated soils. Correct receptacles type to contain liquid or contaminated waste.		**Regular Visual Inspections** **Routine Inspections**: Conduct regular visual inspections of storage areas, pipelines, and machinery to identify early signs of leaks or spills. These inspections should be part of the daily or weekly operations routine, depending on the facility's risk level. **Soil Sampling**: Regularly test soil around storage and operational areas for contaminants like hydrocarbons, heavy metals, or chemicals that could indicate a past spill or leak.	

Hydrocarbon Spills			
Spill Risk Analysis: Evaluate the potential consequences of spills in different areas of the project site, including the volume and toxicity of spilled substances, the likelihood of spills reaching sensitive receptors, and the potential environmental impacts. Ensure strategic placement of spill kits during construction and operation. Ensure emergency response spill procedures are placed around site Ensure emergency spill response procedures are part of the site Induction Ensure hydrocarbon spills are reported, cleaned up immediately and waste material is disposed of following the correct regulatory guidelines Ensure hydrocarbons are stored within bunded areas or containers Secondary Containment Systems **Bunded Areas**: Install bunds (containment systems) around storage tanks and areas handling hazardous liquids to capture any accidental spills and prevent them from spreading. Automated Monitoring and Data Logging **Automated Systems**: Use automated spill monitoring systems that continuously log data related to liquid handling operations. These systems can record flow rates, pressure, and other parameters that might indicate a spill or leak.	Minimise localised impacts from hydrocarbon spills upon flora and vegetation. No leaking pipes with the GHPF No unsuitable hydrocarbon storage management **Monitoring Target**: Ensure that 100% of storage areas are equipped with bunds and regularly inspect them for integrity and capacity. **Monitoring Target**: Implement automated logging systems with data backups to track liquid management and potential incidents. **Monitoring Target**: Conduct regular water quality tests (e.g., weekly or monthly during operational periods) to ensure no contamination from spills enters surface waters. Ensure 100% of spills are reported and documented within 24 hours of detection, in compliance with regulatory requirements.	Daily Inspections of machinery and refueling stations. Monitoring potential impacts upon flora and vegetation. Hazard Assessment: Conduct a thorough hazard assessment to identify areas where spills are most likely to occur during construction and operation activities. Consider factors such as the types of materials used, potential spill sources, and proximity to water bodies or sensitive environmental areas. Surface Water Monitoring **Runoff Testing**: In areas where liquid spills could affect surface water bodies (e.g., rivers, lakes, wetlands), monitor the quality of runoff and water in nearby catchments for contamination.	Spill Incident reporting system/Register Annual environmental reporting. Data Management and Reporting **Incident Reporting**: Keep detailed records of all spills, including their size, location, cause, response actions, and cleanup efforts. Regularly report spill incidents to the **Department of Water and Environmental Regulation (DWER)** as required by law. Contaminated Sites Act 2003 **Contaminated Site Reporting**: If a liquid spill leads to soil or groundwater contamination, it must be reported to DWER under the **Contaminated Sites Act 2003**. The site may then be classified as contaminated, and monitoring is required to assess remediation needs.

Hydrocarbon Detection Sensors Use: Install hydrocarbon sensors in areas where oil or fuel is stored or used, such as pipelines and storage tanks. These sensors detect leaks or spills by identifying hydrocarbon vapours or liquid presence in abnormal locations. Ultrasonic Leak Detection Electrolysis: Ultrasonic sensors can detect high-frequency sounds generated by leaks in pipelines or tanks. These systems are highly sensitive and can detect even minor spills before they escalate.		Water Monitoring: Liquid spills near sensitive water resources may require additional monitoring under water protection laws, particularly if the spill affects groundwater or surface water quality.	

Table 12 Weed and Hygiene Mitigation and Management

EPA Objective: To prevent the introduction or spread of weeds or dieback as a result of the Proposal activities. The hygiene provision been developed in accordance with the DBCA Phytophthora Dieback Management Manual (October 2017).			
Assessment Objective: Assess the potential impact to significant flora and vegetation.			
Key Environmental Values: Native vegetation including significant vegetation and flora. The larger proportion of construction activities for the project centring around revegetating, traffic management, and clearing. Phytophthora Dieback is a key threatening process for biodiversity of south-west Western Australia. *Phytophthora* Dieback (Dieback) refers to the disease caused by soil-borne plant pathogens from the genus *Phytophthora*. Forty-two *Phytophthora* species have been identified in Western Australia (DBCA, 2020).			
Direct Impacts		**Indirect impacts**	
Key Environmental Impacts. Contamination of vegetation and flora through earthworks activities, including significant vegetation and flora. Fragmentation and contamination of native vegetation locations. Potential impacts due to weeds.		Introduction and spread of environmental weeds. Potential reduction in vegetation health. Changes to vegetation structure and floristic composition in surrounding/ adjacent areas.	
Management action	**Management Target**	**Monitoring**	**Reporting**
Weed infested soil			
Reducing topsoil contamination is crucial for maintaining soil health and preserving environmental quality. Effective strategies to achieve this: Preventive Measures:	Establish topsoil locations. Targets: No weed impacting significant vegetation and flora outside of the Disturbance Footprint or topsoil placement locations.	Conducting visual inspections and obtaining approval of the topsoil boundary prior to ground-disturbing activities is essential for preserving soil quality and minimizing environmental impacts.	Vegetation clearing records. Annual environmental reporting. Environmental report.

Implement measures to prevent contaminants from reaching the topsoil, such as using spill containment systems, covering stockpiles, and practicing proper waste disposal. Conduct visual inspections and approval of topsoil boundary prior to ground disturbing activities. Inducting all site personnel regarding weed management environmental responsibilities is essential for ensuring that everyone understands their role in preventing the spread of invasive weeds and minimizing their environmental impact. Ensure rehabilitation areas are weed free.		Daily inspection of Disturbance Footprint. Monitor demarcation of rehabilitation areas. Pre-clearance weed inspections, and approved rehabilitation areas. Visual inspection and record of rehabilitation areas to be undertaken post-clearing to monitor weeds. Proposed disturbance footprints to be investigated for weed hygiene and issues resolved prior to clearing. Monitor potential weed impact to significant flora and vegetation.	

Weed Management			
Establishment of weed hygiene stations during site preparation activities (including lined pad with drainage sump, brushes/ brooms and weatherproof container for inspection register). If required Fill material brought to site will be certified weed free. Areas of known weed infestation within the Disturbance Footprint will be demarcated. Earthmoving equipment will be inspected and cleaned prior to mobilisation to site. Vehicles and equipment to be inspected and cleaned of excess soil, vegetative material, and seeds prior to traversing to other areas of the site. All site personnel will be inducted regarding their environmental responsibilities including hygiene management. Ensure borrow pit are managed (if required) to minimise risk of weeds (topsoil exclusion). Minimise the introduction and spread of environmental weeds that have the potential to impact significant flora and vegetation. Principally minimise the introduction and spread of environmental weeds that may have the potential to impacts to Carnaby's Black Cockatoo foraging/ roosting habitat.	Minimise the introduction and spread of environmental weeds on project site Reduce topsoil contamination Ensure that 100% of vehicles, machinery, and equipment entering or leaving the project site are cleaned to prevent the introduction of weed seeds or plant material. Limit soil disturbance to less than 10% of the total project area, particularly in areas prone to weed colonisation. Use techniques such as controlled clearing, phased construction, and erosion control measures to minimise the potential for weed establishment in disturbed soils. Target a regular monitoring schedule, such as monthly inspections during peak growing seasons, and deploy resources immediately for weed removal when new infestations are found.	Weekly spot checks of vehicles and equipment compliance during cleaning. Inspection of fill material and certification. Visual site inspection. Topsoil areas: Quarterly weed inspection and management program. Monitor potential impact to significant flora and vegetation. Particularly Monitor Declared Pest species (Echium plantagineum, Patterson's Curse) and one Weed of National Significance (Lycium ferocissimum, African Boxthorn).	Maintain records of fill material certification. Quarterly weed monitoring report. Annual rehabilitation monitoring. Weed and Seeds certificate induction record. Completed hygiene inspection logs. Weed infestation register confirming weed control completed at observed locations.

Ensure Inspection certificates for offsite inspection and clean-down of earthmoving equipment prior to mobilisation to site is available to the IGE site Manager. There is an entry on the hygiene inspection log for all vehicles following undertaking their mandatory inspection prior to entering AHP location as per the hygiene procedure	Regularly inspect buffer zones for signs of weed spread and ensure that all workers follow weed management protocols, including removing and disposing of any weed material before it can spread. Training and Awareness Target: Ensure that 100% of staff, contractors, and workers are trained in weed identification, prevention, and management procedures before beginning work on-site. Objective: Provide training sessions on recognizing high-risk weed species, the importance of biosecurity protocols, and how to correctly implement control measures. Minimise the introduction and spread of environmental weeds		
Ensure that no weed contaminated material remains within the project area.	No Unauthorised site deliveries	Validation sampling is undertaken across the Disturbance Footprint. Site walk.	Validation sample results confirm that all contaminated soil has been removed from site. Monthly weed inspections. Annual monitoring and reporting of weed cover.

Fill material brought to site is to be certified weed free. Areas of known weed infestation within the Disturbance Footprint will be flagged. Minimise the introduction and spread of environmental weeds that have the potential to impact significant flora and vegetation. Minimise the introduction and spread of environmental weeds that have the potential to impacts to Carnaby's Black Cockatoo foraging / roasting habitat. Ensure equipment washdown and hygiene inspection measures during construction. Prevent spread of pathogen Phytophthora cinnamomi and P. multivora throughout the Proposal and adjacent areas.	No contaminated fill material No unauthorised Vehicles access on development envelope	Weekly spot checks of vehicles and equipment compliance during cleaning. Inspection of fill material and certification. Topsoil areas: Quarterly weed inspection and management program. Monitor potential impact to significant flora and vegetation.	Maintain records of fill material certification. Quarterly weed monitoring report. Annual weed monitoring. Audit of hygiene records against vehicle movements. Annual rehabilitation dieback site assessment.

Table 13 Dieback

Dieback			
Prevent spread of pathogen *Phytophthora cinnamomi* and *P. multivora* throughout the Proposal and adjacent areas. Signage consistent with the Western Australian Standard Dieback Signage System will be erected at the entry to the Disturbance Footprint and access points between each dieback management area	Mitigate Dieback spread on Disturbance Footprint	Monitor development hub plant and equipment movement.	Records Register: Cleaning of equipment and hygiene measures during construction. Monthly environmental compliance audit report
Control of pathogen *Phytophthora cinnamomi* and *P. multivora* throughout the Proposal and adjacent areas.	No dieback impacts upon project Disturbance Footprint	Monitor and inspect cleaning of equipment and hygiene measures during construction.	Plant and equipment inspection records. Validation of soil sampling results/ Report

Management action	Management target	Monitoring	Reporting
Traffic Management			
Implement site traffic management signage (Including exclusion zones). Install visual warning devices like flashing lights and high-visibility markings for powered mobile plants. Driving restricted to existing tracks, access roads, firebreaks, and service corridors to prevent impact on native vegetation outside the project footprint. Avoid driving in wet conditions. Vehicles and equipment to be used only within approved project footprint. Separation between site personnel and passing traffic lanes. Establish temporary speed zones and location. Speed limits implemented and enforced Designated delivery and loading and unloading areas. Establish Traffic management requirements for special vehicles/loads including large vehicles and mobile cranes. Alert project personnel and pedestrians to potential hazards. Establish traffic zones.	No driving over restricted speed limits No driving in exclusion zones	Visual inspections. Radio Communications. Restrict access to Cave and Karst formation areas. Traffic control measures for each expected interaction. Specifically trained personnel managing traffic at site.	Establish traffic communications processes: Reports: Maps, layout of barriers, walkways, signs and general arrangements to warn and guide traffic around, past or through the workplace or temporary hazards and exclusion zones. Implement and report the effectiveness of a traffic management planning.

Establish travel pathways on routes remote from site/ workplace including places to turn, material loading, access ramps and side roads.			
Use clearly marked out pedestrian and transport zones, using physical barriers to enforce them. Establish traffic-only routes for vehicles to travel safely through the site. Apply physical exclusion zones for loading and unloading vehicles. Manage Boom gates can help to control the flow of traffic and keep pedestrians separate from vehicles as they enter and exit the site.	No driving outside demarcated traffic areas	Speed limits implemented and enforced.	Incident reporting. Vehicle safety checks.
Place traffic control stations at site entry and exit points to ensure incoming traffic is monitored and directed, and vital safety information is communicated Ensure vehicles and mobile plant are used for their intended purpose at all times. Consolidate deliveries – i.e. placing fewer, larger orders, or using fewer suppliers to reduce the volume and frequency of delivery vehicles on site. scheduled off-peak deliveries Pedestrian movements restricted during peak transport movements Introduce traffic management strategy.	traffic incident reduction targets No vehicle Parking outside designated areas	Installing visual warning devices like flashing lights and high-visibility markings for powered mobile plant.	Quarterly monitoring report. Monitoring reports Certificate of induction record. Daily Vehicle Check reports

Install visual warning devices including flashing lights, beacons and high-visibility markings for mobile plant and vehicles Alert project personnel and pedestrians to potential hazards.			
Clear and instructive traffic signage. Clear communications. Traffic routes clearly signposted. Speed limits implemented and enforced.	No driving within exclusion zones	Visual inspections.	Monthly environmental compliance inspection report.
Traffic Management Equipment A wide range of traffic management equipment can be used to enhance safety and reduce traffic hazards in construction. Below are some examples: Temporary protective barriers, booms, delineators, rails and raised kerbs help to separate pedestrians from vehicles and moving plant equipment. Traffic signs and electronic traffic management equipment can be used to alert site personnel and site visitors to hazards, and to communicate important safety information.	No driving vehicles before vehicle pre-start check No driving on site without site driving induction No driving on native vegetation Minimising Environmental Impact Targets: Minimise vehicle idling times to reduce emissions, targeting a reduction of at least 25% in carbon emissions from construction-related traffic compared to baseline estimates.	Regular visual inspections. Monitoring Frequency: Daily monitoring of key traffic areas, weekly inspections of signage and barriers, and monthly reporting on traffic flow and incident rates.	Maintain records of fill material certification. Quarterly monitoring report. Monitoring reports Certificate of induction records. Completed inspection logs Weed infestation register confirming weed control completed at observed locations. Worker Training and Certification

For example, drawing attention to: - Hazards presented by vehicles entering and exiting construction sites. - The location of dedicated zones for vehicles, pedestrians and parking - Exclusion zones for loading and unloading. - Overhead obstructions, hazards, and height restrictions. - Modified traffic conditions and site speed limits. Reversing sensors, visual warning systems (like flashing lights), and audible reversing alarms can improve spatial awareness for transport operators and pedestrians. High visibility / reflective clothing can be worn to improve visibility. Communications equipment like two-way radios facilitate vital traffic control communication.	**Objective**: Implement eco-friendly traffic flow strategies, such as encouraging carpooling, using alternative transportation options, and scheduling construction activities during off-peak hours to reduce environmental impact.		**Target**: Ensure that 100% of traffic controllers and workers involved in traffic management are certified and trained in accordance with **Main Roads WA** traffic management accreditation requirements. **Objective**: Provide regular refresher courses and training sessions for all personnel involved in traffic management, ensuring they are up-to-date with the latest traffic control measures and safety protocols.

Table 14 Soil Management

Soil			
Baseline soil samples will be taken during site preparation prior to commencement of construction, from selected areas around the site. Weed free zone: Disturbance Footprint	Non-Contaminated soil	Regular site inspections.	Monthly soil and surface water sampling.
Topsoil			
To improve the environmental mitigation measures, consider the following enhancements: - **Topsoil Contamination Testing**: Conduct comprehensive testing of the existing topsoil stockpiles for potential contaminants before use. Ensure that the testing process follows industry best practices and complies with relevant environmental standards to avoid any negative impact on the re-vegetation process. - **Weed Management**: Implement a proactive weed management strategy to mitigate potential weed impacts on topsoil rehabilitation areas. This strategy should include regular monitoring of the area, timely removal of invasive species, and the use of	No weed Infested topsoil No native vegetation clearing where possible Strip and stockpile 100% of available topsoil from all areas subject to disturbance before any construction or land-clearing activities begin. **Objective**: Ensure that topsoil is removed in a way that preserves its structure, nutrient content, and biological activity. Stockpile topsoil separately from subsoil and other materials to avoid contamination.	Ongoing flora and vegetation inspections and regular visual monitoring. **On-Site Monitoring and Management**: After the topsoil is spread, implement a monitoring program to quickly identify and address any emerging weeds. Early intervention will prevent the spread of invasive species and help maintain the integrity of the re-vegetation efforts. **Monitoring**: Regularly inspect topsoil stockpiles to ensure they are responsibly managed and protected from erosion and degradation.	Monthly Environmental report Visual inspection and approval of Disturbance Footprint boundary prior to ground disturbing activities. Visual inspection and record of rehabilitation areas to be undertaken post-clearing to ensure no over clearing. Prepare quarterly reports detailing topsoil volumes stripped, stockpiled, and replaced, as well as the condition of stockpiles, erosion control measures, and quality assessments.

native plant species to outcompete weeds naturally. - **Vegetation Redistribution and Planting**: After stockpiling, carefully spread the vegetation over the scarified topsoil, ensuring even distribution to promote natural regrowth. In areas where re-vegetation is required, select and plant species that are similar to the surrounding vegetation. - This approach will help maintain ecological continuity and support the restoration of the local habitat. - **Use of Clean Equipment**: Ensure that all machinery and equipment used in the handling and distribution of topsoil are cleaned to prevent the accidental introduction of weeds from other areas. These measures will help enhance the effectiveness of the environmental mitigation strategy, ensuring that the project aligns with sustainability goals and minimises its ecological footprint.	**Minimizing Soil Disturbance** **Target**: Limit soil disturbance to less than 10% of the project area outside the designated construction or operational zones. **Objective**: Use techniques such as restricted vehicle movement, controlled clearing, and designated access routes to minimise disturbance and preserve topsoil in undisturbed areas. **Target**: Limit topsoil stockpile heights to a maximum of 2 metres and store topsoil for no more than 12 months to maintain its viability. Use progressive rehabilitation techniques to limit the amount of topsoil stockpiled at any one time, ensuring that topsoil is returned to its original location as soon as possible after disturbance. Prevent 100% of erosion on topsoil stockpiles through the use of erosion control measures such as silt fencing, covering with vegetation, or using biodegradable matting.	Inspect stockpile height and condition monthly and use topsoil in restoration activities as soon as possible to minimise storage time. Test topsoil before and after stockpiling to monitor changes in quality, and adjust storage or handling practices if degradation is detected	

	Protect stockpiled topsoil from wind and water erosion to preserve its quality and prevent sedimentation in surrounding areas. Topsoil Conservation in Sensitive Areas Target: Ensure that 100% of topsoil in sensitive areas (e.g., riparian zones, wetlands, high-conservation-value areas) is preserved and not disturbed. Implement dust suppression measures on 100% of topsoil stockpiles during dry and windy conditions to prevent soil loss and degradation.		

Management action	Management target	Monitoring	Reporting
Landscape values			
Post-construction and Operations : Achieve a stable uncontaminated functioning landform and ecological system consistent with pre-existing and surrounding landscape and environmental values. Enable consistent ecological values and landform preservation Mitigate Disturbance Footprint weed spread. Implement design and siting principles to reduce the visual impact of buildings, roads, and other infrastructure on the landscape. Use natural topography and vegetation to screen development where possible. Restore disturbed areas with native vegetation to maintain the natural character of the landscape and support biodiversity. Prioritise the use of local plant species that blend with the existing landscape.	No introduced species No site contamination Reduce visual intrusion by integrating development into the landscape through sensitive design, appropriate materials, colors, and vegetation buffers. **Management Target**: Achieve 80-90% native vegetation cover in rehabilitated areas within two years of project completion.	Visual monitoring. Landscapes will be visually inspected for conformity Monthly environmental compliance inspection. Regularly assess the visual impact of the development and adjust screening or landscaping as needed to further reduce visibility. **Monitoring**: Conduct regular vegetation surveys to track the success of restoration efforts and ensure the establishment of native plants.	Incident reporting system Quarterly Audit Records of visual inspection and physical measurement of any points of erosion

Table 15 Surface Drainage

Surface Drainage			
Key Strategies Site Assessment and Planning: Hydrological Mapping: IGE will conduct a thorough assessment of the site's natural drainage patterns and create a hydrological map. This map will identify water flow paths, catchment areas, and potential points of impact on adjacent ecosystems. Pre-Development Baseline Data: Establish baseline data on surface water flow, quality, and drainage characteristics before any development begins. This data serves as a reference point for monitoring changes. Design and Implementation of Drainage Systems Sustainable Drainage Systems (SuDS): Implement SuDS, which will include permeable surfaces, swales, detention basins, and wetlands. These systems mimic natural drainage processes, helping to manage runoff and reduce the risk of flooding and erosion. Contour Drainage: IGE will design drainage systems that follow the natural contours of the land. This approach helps to disperse water evenly and prevent concentrated flow that could lead to erosion or habitat degradation.	Target: The primary goal of managing surface site drainage is to minimise both direct and indirect impacts on surrounding and adjacent areas that may result from altered surface water drainage and flows. This is crucial for protecting ecosystems, preventing erosion, and maintaining the natural hydrological balance of the area. No erosion riling on soil surface contours No water abstraction from Swan superficial aquifer abstraction (Sub-Surface)	Monitoring and Maintenance: Regular Monitoring: Establish a monitoring program to regularly assess the effectiveness of drainage management practices. Monitoring should include water quality testing, flow measurements, and inspections of drainage structures. Adaptive Management: IGE will be prepared to adjust drainage management strategies based on monitoring results. If issues such as erosion, sedimentation, or altered flow patterns are detected, corrective actions should be taken promptly. Maintenance of Drainage Systems: Regularly maintain drainage systems to ensure they function as designed. This includes clearing debris from drains, inspecting and repairing erosion control structures, and ensuring that SuDS are operating effectively.	Monthly environmental compliance inspection report. Rehabilitation Report Surface water Report Reports: Engage Local Communities and Stakeholders: IGE will Involve local communities and stakeholders in the planning and implementation of drainage management strategies. This ensures that concerns are addressed and that there is support for ongoing maintenance and monitoring efforts.

Buffer Zones: Establish vegetated buffer zones around watercourses and sensitive areas. These buffers act as filters for runoff, reducing sediment and nutrient load before water enters natural streams or wetlands. **Erosion and Sediment Control:** **Erosion Control Measures**: IGE intend to Implement erosion control measures such as silt fences, straw wattles, and erosion control blankets in areas where the soil is disturbed. These measures help to retain soil and prevent it from being washed away by surface water. **Sediment Basins**: Install sediment basins to capture and settle out sediments from runoff before it is released into natural water bodies. Regular maintenance of these basins is essential to ensure their effectiveness. **Flow Management**: **Flow Diversion**: Where necessary, divert surface water away from sensitive areas, such as wetlands or riparian zones, to prevent flooding and erosion. Ensure that diverted water is directed to stable, non-erosive outlets. **Controlled Discharge**: Implement controlled discharge points for surface water to reduce the velocity and volume of water entering natural drainage systems. This can help prevent downstream flooding and minimise the impact on aquatic habitats.			

Where surface water drainage requires diversion to avoid operational areas, roads and other areas, the diversion shall be managed to enable surrounding vegetation protection from long-term inundation. Minimise indirect impacts to surrounding/adjacent areas from altered surface water drainage and flows. IGE Acknowledge variability in groundwater requirements within ecological components of the GDE's and will manage specified rehabilitation areas accordingly.			
Earthworks			
Compacted imported material will be removed from laydown areas and reused on site. Recycle all materials onsite.	Target: Avoid wasting excess soil	Records of visual inspection and physical measurements.	Annual monitoring report. Rehabilitation report
Stockpile Cleared vegetation in windrows less than 2 m high and separately stockpiled topsoil is lightly compacted in windrows to a height of no more than 2 m and covered in brush. Label stockpiled with correct signage	Avoid incorrect signage management	Inspect stockpiles. Monitor stockpiles for contamination.	Stockpile register.

Manage existing topsoil stockpiles and spread evenly over the area to be rehabilitated. Lightly Scarify final surface to 20 cm depth on contour to provide a friable seedbed and the stockpiled vegetation spread over the surface. Reinstate land topography to enable integration with the surrounding landscape. Natural contours will be re-instated to pre-disturbance conditions upon rehabilitation. A Land survey report will confirm earthmoving equipment has achieved natural contours to pre-disturbance conditions	No disintegrating landscape values No active erosion rills greater than 10 m x 0.15 m three years following rehabilitation No deviating from original soil values/quality and topography No placing stockpiles on drainage lines	Preparation to be undertaken during rehabilitation to provide conditions for natural colonisation of vegetation. Site inspections identifying spill risks and contaminated soil (and its removal) are undertaken Compliance audits confirm there is no evidence of soil contamination on site	Rehabilitation report contains photos of the prepared surface and rehabilitated areas. Rehabilitation report Post-Rehabilitation report documents natural contours have been re-instated to pre-disturbance conditions
Mitigate potential for erosion by: Deep ripping to improve water infiltration and spreading mulch across the topsoil surfaces.	Integrate landform values		

Table 16 Waste Management

Waste Management			
Management Action	**Management target**	**Monitoring**	**Reporting**
Segregated Waste Bins: Install segregated waste bins at strategic locations across the site to facilitate the separation of different types of waste, such as recyclables, organic waste, and general waste.	Avoid waste cross contamination	Daily environmental site inspection. Check waste respectables	Monthly environmental report.
Site waste management procedures will be implemented to provide direction on waste reduction and disposal techniques and will outline the following requirements: - Ensure Use of waste receptacles and waste management protocols - Ensure Waste register in place to track waste removed from site - Ensure Offsite disposal through licensed contractors - Specific waste segregation on site - General, putrescible and hazardous waste receptacles coverings to deter feral fauna or pests - Deterrence for feral fauna or pests - Appropriate Septic holding tanks design (with level alarm) - Offsite disposal by controlled waste carrier for disposal - Bunding of waste hydrocarbon products, Capacity of bunds will be maintained	Target: Quarterly Compliance site audit confirming all aspects of waste management Avoid hazardous waste disposal to landfill Clear Signage: Clearly label waste receptacles to indicate the types of waste to be deposited in each bin, ensuring proper segregation by users. Placement: Position waste receptacles in high-traffic areas and near points of waste generation to encourage usage and minimise littering. Regular Maintenance: Empty and clean waste receptacles regularly to prevent overflow and ensure hygienic conditions.	Daily inspection. Visual Inspections. Comprehensive housekeeping practices on site, will be enforced throughout the Project via site inspections for the lifecycle of the Project (Performance standard below). Quarterly Audit Targets: Track waste transportation documentation Putrescible waste removal schedule Waste register in place	Compliance audit report confirms compliance with waste management requirements. Waste disposal register in place and utilised for waste disposal events as per waste management plan requirements. Completed inspection documents. Waste Audits: Conduct periodic waste audits to assess the composition and volume of waste generated, identify opportunities for waste reduction and recycling, and track progress towards waste management goals.

General refuse will be collected in green bins and removed regularly (at least weekly) for transport off-site for disposal to Landfill. Manage General waste, including food waste and packaging materials, from workshops- Correct bin types in-situ Dedicated Waste Streams Separate Receptacles: Provide separate waste receptacles for different waste streams, including recycling bins for paper, plastic, glass, and metal, as well as bins for organic waste and general waste. Specialized Containers: Use specialized containers or bins for specific types of waste, such as battery recycling bins, electronic waste collection points, and hazardous waste disposal areas.	Effective waste separation No Co-mingling Preventing co-mingling of waste is crucial for efficient recycling and waste management practices.	Visual Inspection/audits Performance Metrics: Define key performance indicators (KPIs) for waste management, such as waste diversion rates, recycling rates, and landfill diversion targets. Regular Monitoring: Monitor waste management practices and performance regularly to track progress towards targets, identify areas for improvement, and address any issues or non-compliance. Review and Adaptation: Conduct periodic reviews of waste management processes and adjust as needed based on monitoring data, changing operational requirements, and emerging best practices.	Waste management Compliance report
Recycling will be collected in blue waste containers for transport to recycling facility Co-mingled recycling (e.g. paper, card, plastics, aluminium, glass)	Effective waste separation	Visual Inspection/audits	Waste management Compliance report
The AHP construction activity areas Environmentally sensitive housekeeping practices to prevent the release of waste to surrounding environment.	No waste receptacle overflow Regular Monitoring and Emptying Scheduled Emptying: Establish a regular schedule for emptying waste receptacles based on waste generation rates, site usage patterns, and capacity of the	Site environmental waste inspections. Site inspections monitoring waste practices	Compliance audit report. Compliance audit report confirms compliance with waste management requirements.

Ensure Putrescible waste is removed frequently from site to deter feral fauna or pests. Inspections will be undertaken to ensure that best practice waste management is implemented and identification of non-compliance is in accordance with the regulatory conditions.	Receptacles Overflow Prevention: Empty waste receptacles before they reach maximum capacity to prevent overflow and minimise the risk of littering and environmental contamination. No soil surface contamination	Frequent Checks: Assign personnel to conduct regular checks of waste receptacles throughout the day to identify those nearing capacity and ensure timely emptying.	
Induction of personnel outlines the following: - Waste management requirements - Oil spill contingency measures are in place including removal and disposal of contaminated soil Site Personnel: induction outlining waste management requirements and housekeeping	Site personnel inductions complete (waste Management	Audits. Site visual inspections.	Records of inductions for individuals working on site.
Site Personnel undertake activities in accordance with the construction oil spill contingency measures i.e. spill waste material are immediately controlled, contained, cleaned up and disposed of. Spills cleaned immediately and hydrocarbon waste material disposed of in the correct manner	No hydrocarbon spills Hydrocarbon waste receptacles available on site.	Check hazardous waste/ hydrocarbon receptacles.	Waste inspections post spill clean-up.
Track waste streams and identifying priority waste to be transported to landfill	Increase in materials being recycled. Target Zero -Waste processes Employee Accountability:	Waste separation success.	Compliance audit report. Report waste reduction targets for construction and operations,

Documented evidence shows that all personnel during compliance audit period have completed the induction outlining waste management requirements and housekeeping. Target Zero -Waste processes: Encompassing all our operations including direct suppliers, covering design and procurement, production, construction, service and sales, and end-of-life solutions. Clear Segregation Guidelines Educate Employees: Provide comprehensive training to all employees on the importance of waste segregation and the specific guidelines for separating distinct types of waste. Clear Signage: Install clear and visible signage near waste receptacles indicating the types of waste that should be deposited in each bin, such as recyclables, organic waste, and general waste. Color-Coding: Use color-coded waste bins or lids to differentiate between different waste streams and facilitate easy identification for users.	Establish accountability measures to hold employees responsible for adhering to waste segregation protocols, with consequences for non-compliance. Recognise and reward employees who consistently demonstrate proper waste segregation practices and contribute to the success of waste management efforts.		
Manage material excavated during bulk earthworks, access roads and site establishment Reuse all suitable material to meet fill requirements. Dispose of unsuitable or excess material in spoil dump areas.	Recycle excavated material	Monitor Waste streams	Compliance audit report. Report waste reduction targets for construction and operations,

Concrete will be stockpiled in designated storage areas for reuse (e.g., fill material) or recycling (e.g., crushed for road base) or alternatively disposed onsite. Contaminated material will be disposed to Landfill.	Waste concrete recycled	Monitor Waste streams	Waste management guidelines Waste volume reporting and tracking
Create stockpile/ Mulch zone Green waste stockpiled and mulched for reuse on site for rehabilitation, landscaping, and erosion control.	Recycle Green waste	Monitor Waste streams	Waste management guidelines Waste volume reporting and tracking
Empty drums used oil and fuel filters to be collected in containers at a waste management pad for bulk transport for processing. Filters are crushed, residual oil and fuel recycled and the metal carcass put into scrap metal. Waste tracking applies	Correct disposal: Hydrocarbon-contaminated waste	Monitor Waste streams	Waste management guidelines Waste volume reporting and tracking

Table 17 Air Quality

Air Quality			
Operation of the Green Hydrogen Production Facility(GHPF) will generate minimal gas emissions. The hydrogen production process(Alkaline Electrolysis) will include venting gases to the atmosphere as part of standard operation processes, or during an emergency shutdown, including purging of pipes and facility equipment. Hydrogen emissions are expected to be minimal, except during maintenance when every portion of the plant is purged. A hydrogen vent stack will be used to release hydrogen in an emergency or for system purging. The hydrogen facility purging process incorporates nitrogen (as an inert gas) that is vented to the atmosphere both during and after plant maintenance. The minimal quantity of vented gases released to the atmosphere from the Green Hydrogen Production Facility(GHPF) will be compliant with the relevant Australian Standards (including AS/ISP 22734, *Hydrogen generators using water electrolysis).*			
To ensure that air quality remains at acceptable levels and emissions are minimised to protect environmental values, human health, and ecosystem integrity. Key Actions: Maintain air quality and minimise emissions to protect environmental values. Reduce vehicle and plant equipment fuel use (regular servicing and checks) Seek sustainable vehicle solutions Vehicle speed limits imposed across the proposed Development Envelope to mitigate dust generation Speed limits adhered to enable dust emissions reduction Reduce Atmospheric emissions from plant are O_2 and small volumes of N_2 and H_2O (where H_2 is flared).	Minimise air quality impacts Minimise dust emissions No visual dust plumes Align emission reduction targets with long-term sustainability goals and international commitments, such as those outlined in the Paris Agreement or other relevant climate accords.	Daily Air Quality monitoring. Hydrogen facility control systems Monitoring Air quality Visual Monitoring Baseline Assessment: Conduct a comprehensive inventory of emissions from all sources, including industrial processes, transportation, and energy consumption, to establish a baseline for measurement. Identify key emission sources and prioritise areas for emissions reduction efforts based on their contribution to total emissions and potential for mitigation.	Air quality reporting. Monthly environmental report. Track and report environmental values from: - $C0_2$ and O_2 emissions during operations or venting from plant. - Diesel combustion emissions. - Dust generation from vehicles. Gas Dispersion modelling report

Excess nitrogen is to be vented. Proposed use of hydrogen fuel cell vehicles during construction or operation. Venting hydrogen: Location and height of vents will be determined by dispersion modelling/ fire and explosion modelling and regulatory safety requirements. Induction includes vehicle speed limits. The application of water (or appropriate suppressants) to access roads, working surfaces and construction stockpiles (as required). Vehicles and equipment regularly maintained. Reduce dust or vehicle emissions during construction or operational activities Reduction of GHG gaseous emissions such as carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), along with non-GHG particulate emissions such as sulphur oxides (SOX) and nitrous oxides (NOX).			
All equipment and machinery will be routinely serviced to maintain operational efficiency and thereby minimising hydrocarbon emissions. The use of stationary engines and generators will be minimised Emission Reduction Strategies: Implement targeted emission reduction strategies tailored to address the primary	Minimise hydrocarbon emissions Reduce vehicle movements Transition to Battery powered equipment	Daily air quality monitoring.	Fuel usage records are maintained in accordance with the requirements of the National Greenhouse and Energy Reporting Determination 2008 to ensure that statutory reporting is undertaken.

sources of air pollution in the region, such as improving combustion technologies, implementing pollution control measures, and promoting cleaner transportation options. Encourage the adoption of cleaner fuels, such as low-hydrogen and alternative fuels, to reduce emissions from vehicles and industrial processes.			

Table 18 Subterranean Fauna

Subterranean Fauna
Two major limestone caves are located within the Disturbance Footprint, containing subterranean fauna species. It is understood these caves formed from erosion and scouring from the continuous overflow of Arramall Lake. The Arramall Cave system is estimated to be 1,800 m long and 15 m deep, while the River Cave system is estimated to be 500 m long and 7 m deep.
Potential Impacts: Disturbance to subterranean fauna via disturbance of habitat (Human factor: Recreational Cavers accessing both cave systems). Disturbance to stygofauna from altered groundwater flow. **Subterranean Fauna** There are two types of subterranean fauna: - Stygofauna – Aquatic organisms that live in groundwater - Troglofaunal – Air breathing animals that live in caves and rock/ soil voids. Collections from Arramall Cave during a 2007 survey showed the presence of regionally significant species of troglofauna including *Neotemnopteryx douglasi*, *Protochelifer cavern arum* and *Laevophiloscia* spp. River Cave potentially contains also significant species (Susac, 2007). Karst formations on site provide suitable habitat for both troglofauna and stygofauna. Bennelongia, (2021b) found that the avoidance of impact on caves and low proposed groundwater drawdown poses a low risk to stygofauna.

Management Action	Management target	Monitoring	Reporting
Ensure the protection and preservation of sensitive karst formations and cave systems by prohibiting site personnel from entering these areas Ecological Sensitivity:	The primary objective of this directive is to ensure the protection and preservation of sensitive karst formations and cave systems by prohibiting site personnel from entering these areas. This measure is crucial for maintaining the ecological integrity, geological stability, and cultural significance of these environments.	Monitor disturbance to subterranean fauna Monitor disturbance to Stygofauna from possible groundwater altered groundwater flow or drawdown.	Monthly Environmental Report. Engage Speleologists and Environmental Scientists: Work with experts in cave and karst management to develop and refine site policies.

Maintain Biodiversity Preservation: Karst formations and caves often house unique ecosystems, including rare and endangered species of flora and fauna. Human entry can disrupt these habitats, leading to potential harm or extinction of vulnerable species. Ensure Microclimate Stability: The microclimate within caves is often delicate, with specific temperature and humidity levels that support specialized organisms. Entry by personnel can alter these conditions, negatively impacting the cave's ecological balance. Avoid Entering cave systems and surrounds Groundwater abstraction is planned from the Yarragadee aquifer, where Stygofauna are less likely to occur in relation to the superficial Tamala limestone aquifer. Ensure Geological Stability: Structural Integrity: Karst landscapes are often fragile and prone to collapse or subsidence. Human activity, including walking or handling equipment, can exacerbate these risks, leading to damage or dangerous cave-ins. Preservation of Geological Features: Caves and karst formations are significant for their geological features, such as stalactites, stalagmites, and other mineral deposits. Human contact can cause irreversible damage to these features through physical impact or contamination.	No site personnel entry into Karst formations or cave systems No alteration to groundwater regimes No residual water is to be disposed of, into Lake Arramall (that overflows into Arramall Cave) ensuring no effect on Troglofauna associated with increased salinity levels.	Monitoring and Compliance: Surveillance and Patrols: Implement regular patrols or surveillance of sensitive areas to monitor compliance with the entry prohibition. Use of cameras or motion detectors can help in areas that are difficult to access. Incident Reporting: Establish a system for reporting and addressing any unauthorised entry into karst or cave systems. This may include disciplinary actions for non-compliance. Restricted Access Protocols: If access to caves or karst systems is ever required for scientific or conservation purposes, ensure that only trained and authorised personnel are permitted entry. Such activities should be carefully planned and supervised.	These professionals can provide guidance on best practices for protecting these sensitive environments. Regular Reviews: Periodically review the entry prohibition policy in collaboration with environmental specialists to ensure it remains effective and up-to-date.

Table 19 Caves and Landforms

Caves
EPA objective: The EPA Objective for this key environmental factor is to minimise impacts to cave systems and provide evidence of consultation with the Western Australia Speleological group (WASG). The EPA Objective for this other environmental factor is to mitigation measures to meet the EPA's objective for landforms.
Management Objective: Update To minimise impacts Cave systems. Provide evidence of consultation with WASG regarding potential impacts to cave systems. **Objectives for Landforms** To maintain the variety and integrity of significant physical landforms so that environmental values are protected. Mitigation measures to meet the EPA's objective for landforms.
Key environmental value: Cave systems avoidance/protection, bat population impacts and cave sediment flow mitigation.
Legislation EP Act 1986 EFG – Landforms (EPA, 2018).
Potential impacts and Risks: Potential cave collapse Damage to cave features during construction. Bat behavioural/ population impacts. Sedimentation within caves systems. Erosion and sediment build up.

Management Action	Management Target	Monitoring	Reporting
No construction work within the River cave catchment area.	No sediment flow into the cave catchment areas.	Flood conditions Rainfall events Overall weather conditions Visual Inspections	Weekly environmental inspection. Weather observations
Avoid tracks over cave areas (Track over River cave): No access to site personnel No construction will commence within the cave areas.	No vehicle movement within this area.	Inspect and restrict access Weekly inspection	Monthly environmental report
Infrastructure layout plans reviewed. Infrastructure layout design changed to avoid cave areas and possible karst formation. Turbines relocated and relocated to avoid vulnerable cave areas. No earthworks or construction within cave areas.	Preservation of the unique geological values of the cave systems. Avoid impacts to caves.	Inspect for voids within the development envelope and the construction area Weekly Visual inspection	Monthly environmental report. Weekly environmental inspection
No trenching or civil works near the course of River or Arramall cave or in the vicinity of any of the known cave features	Avoid impacts to caves.	Monitor erosion impacts or water channelling within the development envelope and the construction area Regular site, Visual Inspections	Monthly environmental report
Clearing and construction/ earthworks survey before activity.	No construction activities within void areas	Pre-clearing and earthworks site survey walk	Monthly environmental report

All construction work including turbine placement have been relocated west of the WASG mapped-cave area. Mapping data reviewed. Site mapping and documentation updated. Layout of wind farm revised and optimised to avoid impacts to Karst/ cave locations.	No impacts to caves or sub-fauna.	Ongoing monitoring of development envelope	Monthly environmental report Weekly Report

Cave Map Areas			
Management Action (Response to Cavers Report)	**Management Target**	**Monitoring**	**Reporting**
Avoid development or construction activities within identified Cave areas highlighted within the cavers report.	No development within this area.	Monitoring cave areas Visual Inspection	Monthly environmental Ongoing radar data reports
Introduce avifauna and bat monitoring systems for wind energy project developers, owners, operators and environmental consultants for bird and Bat survey: mortality risk assessment, operational monitoring and real-time risk mitigation. Bat and Avifauna Radar installation. Radar Installation will enable survey data collection and information gathering for assessment. Radar technology will be installed to fulfil fauna survey requirements. Radar will be installed to mitigate avifauna and bat strike and turbine curtailment.	Target: Minimal disruption to bat habitats and behavioural patterns while complying with relevant environmental regulations.	Ongoing monitoring. Visual Monitoring	A survey of the bat population was completed 2021 Desk-top and field survey reports complete
Review site access.	Conditional access to the caves discussed with WASG	Monitor Cave access areas	Monthly Environmental Compliance Report
Consultation with Yamatji People. On site Cultural Heritage Survey	No unauthorised access to cave systems	Monitor Stakeholder access conditions	Monthly Environmental Compliance Report

Infrastructure Layout Optimisation	Avoidance of known cave systems and sensitive karst areas	Regular site inspections to ensure compliance with design layout	Monthly Environmental Compliance Report
Buffer Zone Implementation	Establish and maintain a protective buffer around cave entrances and sensitive areas	Boundary checks around designated buffer zones	Quarterly Environmental Performance Report
Restrict Heavy Machinery Access	Prevent cave vibrations and structural impacts by limiting heavy equipment use near caves	Onsite monitoring of access routes near caves	Monthly Site Activity Report
Install Temporary Barriers	Protect cave entrances during construction activities	Visual checks for barrier integrity and placement	Incident Report if barriers are displaced
Erosion and Sedimentation Control	Prevent sediment runoff from entering cave systems	Weekly inspections during construction, especially post-rain events	Erosion Control Log
Limit Water Discharge Near Caves	Prevent water discharge and changes in natural drainage affecting caves	Regular inspections of discharge areas and drainage paths	Monthly Water Discharge Report
Educational Briefing for Construction Personnel	Increase awareness of cave protection requirements	Verification of attendance at training sessions	Quarterly Training Summary
Engagement with Local Cave Experts & WASG	Collaborate on best practices for cave preservation	Regular consultations and field visits with cave experts	Consultation Report per engagement
Ground Vibration Monitoring	Ensure vibrations from construction do not impact cave structures	Installation of vibration sensors near critical cave areas	Vibration Monitoring Data Report

Dust Suppression Measures	Minimise dust deposition near cave entrances	Daily checks on dust suppression techniques effectiveness	Dust Monitoring Report
WASG Consultation			
Maintain Open Communication With WASG	Ensure ongoing collaboration to incorporate WASG expertise into project planning and execution.	Monitor frequency and quality of communications, including meetings, emails, and calls.	Monthly Stakeholder Engagement Report.
Regularly Schedule Meetings With WASG	Discuss project updates, environmental considerations, and concerns regarding karst systems and cave ecosystems.	Record meeting minutes and agreed actions.	Meeting summaries included in monthly reports.
Continuous Email and Written Correspondence	Share reports, gather feedback, and promptly address concerns or queries raised by WASG.	Maintain a lot of all written communications.	Weekly correspondence updates in internal communications.
Direct And Responsive Telephone Communication	Facilitate immediate discussions on urgent matters or clarifications.	Log significant phone discussions and outcomes.	Key call summaries included in bi-weekly reports.
Develop Formal Access Agreement With WASG	Ensure controlled and conditional access to sensitive cave systems for necessary inspections or studies.	Audit compliance with access agreements and restrictions.	Compliance summary included in monthly Environmental Reports.

Implement Stakeholder Feedback Mechanisms	Integrate WASG recommendations into environmental management and cave protection strategies.	Document feedback incorporation and implementation.	Quarterly Stakeholder Feedback Report.
Monitor Cave Access Areas	Protect cave systems by restricting access to approved personnel and ensuring adherence to buffer zones.	Conduct regular inspections of cave access points.	Monthly Environmental Monitoring Report.
Incorporate WASG Expertise Into Cave Management	Align cave preservation efforts with best practices as advised by WASG.	Track the implementation of agreed recommendations.	Implementation progress included in quarterly project updates.
Maintain Open Communication With WASG	Ensure ongoing collaboration to incorporate WASG expertise into project planning and execution.	Monitor frequency and quality of communications, including meetings, emails, and calls.	Monthly Stakeholder Engagement Report.
Regularly Schedule Meetings With WASG	Discuss project updates, environmental considerations, and concerns regarding karst systems and cave ecosystems.	Record meeting minutes and agreed actions.	Meeting summaries included in monthly reports.
Continuous email and written correspondence	Share reports, gather feedback, and promptly address concerns or queries raised by WASG.	Maintain a lot of all written communications.	Weekly correspondence updates in internal communications.
Direct and responsive telephone communication	Facilitate immediate discussions on urgent matters or clarifications.	Log significant phone discussions and outcomes.	Key call summaries included in bi-weekly reports.
Develop formal access agreement with WASG	Ensure controlled and conditional access to sensitive cave systems for necessary inspections or studies.	Audit compliance with access agreements and restrictions.	Compliance summary included in monthly Environmental Reports.

Implement stakeholder feedback mechanisms	Integrate WASG recommendations into environmental management and cave protection strategies.	Document feedback incorporation and implementation.	Quarterly Stakeholder Feedback Report.
Monitor cave access areas	Protect cave systems by restricting access to approved personnel and ensuring adherence to buffer zones.	Conduct regular inspections of cave access points.	Monthly Environmental Monitoring Report.
Incorporate WASG expertise into cave management	Align cave preservation efforts with best practices as advised by WASG.	Track the implementation of agreed recommendations.	Implementation progress included in quarterly project updates.

Management Action	Management target	Monitoring	Reporting
Cave Systems			
Inductions will be undertaken to ensure employees and contractors are made aware of caves and landform environmental impacts and management measures. Minimise vibrations, noise, and surface disturbances that could impact the structural integrity and ecological functions of these karst environments.	Inductions complete 100%. To protect sensitive cave systems, such as Arramall Cave and River Caves,	Ongoing Monitoring of Karst Environments Noise monitoring Traffic movement within and around these areas must be carefully monitored and managed	Monthly environmental report.
Cave features have been identified during site design and will be avoided via the understanding of geotechnical surveys. Ensure that construction activities are planned to prevent any disturbance or damage to these sensitive geological formations	Avoid caves and cave pathways. Vehicles will be restricted to designated tracks/ roads. Values, sensitivity and quality of the environment will not be impacted.	Ongoing monitoring of traffic movement management Monitor values, sensitivity and quality of the environment will not be impacted	Cave features have been identified, reported and mapped
Implement Inspection drilling to understand substrate geology to avoid impacts to cave systems. Geotechnical drilling surveys are essential preliminary investigations conducted to evaluate subsurface conditions at a project site. These surveys aim to gather data on soil composition, stability, groundwater levels, and bedrock characteristics to inform the safe and effective design of turbine foundations. The process typically involves drilling boreholes at strategic locations across the proposed construction area. Implement Engineering surveys of Surface and Sub-surface geology.	Avoid Caves and voids.	Drilling inspection Engineering inspection of Surface and Sub-surface geology.	Weekly reports

Management Action	Management Target	Monitoring	Reporting
Geotechnical Surveys: Conduct detailed geotechnical and topographical surveys to identify cave systems and sensitive areas.	Protect the integrity of cave systems by avoiding construction impacts.	Monitor survey progress and accuracy through regular data validation and quality checks.	Submit geotechnical survey results in quarterly environmental performance reports.
Cave Features Avoidance: Avoid mapped caves and cave pathways using site-specific data and geotechnical survey results.	Ensure no construction or infrastructure development within identified sensitive cave zones.	Conduct visual inspections and audits to verify adherence to restricted access areas.	Include avoidance compliance outcomes in monthly environmental monitoring reports.
Signage and Barriers: Install clear signage and physical barriers around cave entrance zones and buffer areas.	Restrict access to cave areas and prevent accidental disturbance.	Inspect signage and barriers for integrity and visibility during routine site inspections.	Report installation and maintenance status of barriers and signage in monthly site safety reports.
Traffic and Access Management: Restrict vehicle and heavy machinery movement to designated tracks and roads.	Minimise vibrations and physical impacts near sensitive cave formations.	Ongoing monitoring of traffic routes using GPS and physical inspections.	Report traffic movement and adherence to designated routes in monthly site activity logs.
Induction and Training: Conduct site inductions to educate personnel on cave systems, environmental values, and management measures.	Raise awareness and ensure personnel compliance with cave protection protocols.	Record attendance and understanding through induction quizzes and periodic refresher sessions.	Provide induction attendance and training outcomes in quarterly environmental compliance summaries.
Cave Buffer Zones: Establish and maintain protective buffer zones around cave systems as part of the site layout plan.	Avoid all physical and ecological disturbances within buffer zones.	Boundary checks to ensure compliance with established buffer zones using GPS mapping and visual inspections.	Include buffer zone compliance in monthly environmental performance reports.

Dust and Sedimentation Control: Implement dust suppression, sediment traps, and erosion control measures.	Prevent dust and sedimentation from impacting cave entrances and internal ecosystems.	Conduct weekly inspections of sediment traps, dust control systems, and erosion-prone areas, especially during and post-rain events.	Document dust and sedimentation control performance in monthly environmental management logs.
Hydrology Management: Design stormwater and drainage systems to prevent water discharge or redirection into cave systems.	Maintain natural hydrological patterns and avoid alterations that could impact cave ecosystems.	Monitor water flow patterns using hydrological sensors and periodic visual inspections of drainage pathways.	Submit water management performance data in monthly water resource monitoring reports.
Construction Layout Optimisation: Relocate infrastructure (e.g., turbines, solar arrays, hydrogen facility) to avoid cave areas.	Minimise physical and visual impact on cave systems by avoiding proximity.	Review and audit infrastructure design to ensure compliance with avoidance strategies.	Include layout compliance details in quarterly environmental compliance reports.
Restrict Human Access: Implement strict no-access policies for non-essential personnel in cave areas.	Prevent unauthorized human activity near caves.	Conduct security patrols and monitor access points using surveillance systems where feasible.	Report any access breaches in incident reports with corrective actions outlined.
Monitoring Equipment Installation: Install vibration and environmental sensors near cave systems to track impacts.	Identify and mitigate vibrations or other disturbances caused by construction activities.	Continuous data collection and analysis of vibration levels and environmental conditions near cave systems.	Summarize monitoring data in bi-annual environmental impact assessments.

Regular Stakeholder Engagement: Maintain open communication with WASG and other stakeholders regarding cave preservation.	Incorporate stakeholder feedback into management practices and ensure transparency.	Conduct monthly stakeholder meetings and maintain correspondence logs.	Provide summaries of stakeholder engagement in quarterly environmental reports.
Rehabilitation Plans: Develop and implement rehabilitation measures for any disturbed areas near caves post-construction.	Restore land and ecological balance in areas impacted by construction activities.	Monitor rehabilitated areas for vegetation regrowth and soil stability through monthly inspections and photographic evidence.	Include rehabilitation progress and effectiveness in annual environmental compliance reports.

Outcomes

The environmental values will be protected as part of this proposal by maintaining the variety and integrity of significant physical landforms. There will be no significant impact to significant landforms as part of this proposal.

- Geotechnical drilling surveys to be undertaken before turbine construction.
- No Cave systems formation impacted due to construction activities.
- Minimal turbine fauna blade strike.
- No construction conducted upon cave systems.
- All stakeholders engaged and outstanding matters were resolved with ongoing dialogue throughout the project lifecycle

Bat Mortality Risk Mitigation Features:

The proposed Robin radar monitoring system can be used at operating wind farms to function as an “early warning” system providing advance detection of cave and terrestrial bat activity that presents mortality risk, automatically engaging response mitigation actions up to and including idling or curtailment of turbines until the risk passes.

Radar Technology installation include access to company specialists, highly knowledgeable radar ornithologists, bat biologists, engineers and statisticians that comprises the remote sensing team– with specific expertise in design, construction and operation of wildlife detection systems for real-time turbine safety and environmental management.

Table 20 Greenhouse Gas (GHG) Emissions

Greenhouse Gas (GHG) Emissions			
IGE Objective: Reduce total Scope 1 emissions associated with the Proposal			
Greenhouse gas emissions. Greenhouse gas effect. Ozone impacts. Human health.			
Management Action	**Management target**	**Monitoring**	**Reporting**
To reduce net greenhouse gas emissions across the AHP project to minimise the risk of environmental harm associated with climate change. Reduce electrolysis plant emissions: oxygen, water and vented hydrogen emissions. Utilise low-emission plant and machinery/ equipment. Introduce hydrogen powered transport. Utilise a solar energy feed to connect an onsite battery to energise the site, Target: Activity Scope 1 and 2 emissions 14,365 t CO2-e for construction of 24 months and 7,900 t CO2-e for the remainder of project operations (25 years), Vehicles and machinery during construction will be maintained regularly according to recommended maintenance schedules,	Target: Activity Scope 1 and 2 emissions reduction Operational strategies for electrolysis: Aim to provide computationally trackable, near-optimal operating scheme management. Minimise GHG Emissions Target: Lower the carbon footprint/Emissions of the hydrogen manufacturing infrastructure	Electrolyser modelling and real-time facility control for optimised production of hydrogen gas. Daily plant monitoring. Electrolysis plant operating control system infrastructure. Energy conversion system identification. Overload limiting controller dynamics. Hydrogen gas output prediction. Daily/ weekly environmental monitoring.	Daily/ weekly environmental emissions reporting.

Vehicles utilised during operation will be hydrogen powered, Water Recycling: 100 %, Recycle hydrogen venting gas, Zero hydrogen emissions to atmosphere, Ensure vegetation clearing is within the extents required. Construct building designs for efficiency. Recycle and reuse materials. Recycle reclaimed cement products. Sourcing local materials to reduce transportation emissions. Sourcing plant and equipment that operates on carbon-neutral biofuels or renewable energy.			
Hydrogen production and storage facilities will be equipped with venting systems for normal operating requirements and emergency situations A hydrogen vent stack will be employed to release hydrogen when required Possible recycling of hydrogen gases from vent stack	Reduce fugitive Emissions	Daily Green Hydrogen Production Facility(GHPF) inspection	Monthly Emissions Report

Maintain vehicles and equipment in accordance with service schedules to minimise vehicle emissions.	Fuel usage/stores volumes are documented in the daily construction report.	Vehicle and equipment logbooks showing servicing is current. Daily vehicle inspections	Fuel usage (to the nearest 100 L) is documented in site management. Fuel cumulative total on monthly construction report.
Sustainable equipment sourcing. Source Improved piping technology and design requirements Investigating new recycling pathways for difficult to recycle materials. Comprehensive procurement mapping, waste value optimisation, and digitalisation of product handling. Optimised hydrogen piping construction: Solar and wind turbine energy system will be utilised to supply site energy requirements. Renewable energy for construction and operational activities - Reduce CO2 emissions. - Reduce costs. - Improve working conditions. - Improve energy up-time.	Target: Decrease in the waste intensity of the IGE supply chain.		Procurement tracking reports.

Zero carbon emissions from construction and operational activities on site. Utilise energy from solar and wind turbine farm to power project infrastructure. Utilising battery storage systems to energise the required sectors. Install a modular battery system onsite: Battery energy storage system utilisation. Renewable energy for construction and operational activities Solar and wind turbine energy system will be utilised to supply site energy requirements.	Utilise Renewable energy for construction and operational activities - Reduce CO2 emissions. - Reduce costs. - Improve working conditions. - Improve energy up-time.	Solar and wind energy supply monitoring. Tracking site emissions usage. Energy Management Centre (EMC): Monitoring energy consumption.	Track energy usage from renewable sources. Tracking data: Energy usage reporting.
Optimised Hydrogen Piping Construction: Key Strategies and Best Practices Objective The goal of optimising hydrogen piping is to ensure the safe, efficient, and cost-effective transportation of hydrogen. This involves selecting the right materials, implementing advanced construction techniques, and adhering to stringent safety and quality standards. Material Selection: Hydrogen-Compatible Materials: Use materials specifically designed for hydrogen service, such as high-grade stainless steel (e.g., 316L) or	Target: Achieve zero hydrogen emissions from leaks. Ensure zero contamination of water resources. Improve energy efficiency of the hydrogen piping system No net loss of biodiversity as a result of hydrogen piping infrastructure Achieve a minimum of 90% recycling of construction and maintenance waste	Leak Detection Systems: Hydrogen Sensors: Install hydrogen-specific sensors along the piping system that can detect even minute concentrations of hydrogen gas. These sensors should be placed at critical points, such as joints, valves, and potential weak spots. Acoustic Leak Detection: Utilize acoustic sensors to detect the sound of leaks. These sensors can pick up the ultrasonic noise generated by escaping gas, even at low pressures.	Documentation and Reporting: Data Logging: Ensure that all monitoring data is logged and stored for analysis, reporting, and compliance purposes. This historical data is essential for understanding trends and making informed maintenance decisions. Regulatory Compliance: Maintain detailed records of monitoring activities and system performance to comply with industry regulations and standards. Leak Detection Logs: IGE will maintain records of all detected

specialised polymers that resist hydrogen embrittlement and leakage. Pipe Sizing and Thickness: Optimise pipe diameter and wall thickness based on hydrogen flow rates, pressure requirements, and safety margins. Proper sizing minimises pressure drops and ensures efficient flow. Advanced Hydrogen plant Piping Design: Minimizing Joints and Welds: Design electrolysis and piping systems with as few joints and welds as possible to reduce potential leak points. Where welds are necessary, employ high-quality welding techniques and conduct thorough inspections. Routing and Layout: Optimise piping routes to minimise length, reduce pressure drops, and avoid unnecessary bends or elbows, which can increase turbulence and pressure loss. This also reduces material costs and potential weak points. Regulatory Compliance and Standards: Adherence to Codes and Standards: Ensure that the piping and electrolysis equipment design, materials, and construction methods comply with relevant industry standards (such as ASME B31.12 for hydrogen piping) and local regulations.	Limit noise levels and air pollutant emissions during construction and operation to below regulatory thresholds. Ensure hydrogen piping systems are resilient to climate change impacts, such as extreme weather events.	Optical Gas Imaging (OGI): Use OGI cameras that visualise gas leaks. These cameras can detect hydrogen leaks in real-time, allowing for quick identification and response. Data Integration and Analysis: Real-Time Monitoring Systems: Integrate all monitoring data into a centralised real-time monitoring system that can analyse the data continuously. This system should have alert capabilities to notify operators of any abnormalities immediately. Predictive Analytics: Utilise predictive analytics software that uses historical data and machine learning algorithms to predict potential failures or maintenance needs before they occur.	leaks, including location, size, detection method, and time of detection. Repair Records: Document all repair actions, including the method used, time taken, and verification of leak resolution. Sensor Calibration Records: Keep logs of calibration and maintenance activities for hydrogen sensors to ensure accuracy and reliability. Reporting: Monthly Emissions Report: Provide a detailed report of detected and repaired leaks, including the estimated amount of hydrogen released and the actions taken to mitigate future occurrences. Annual Compliance Report: Summarize the overall performance against the zero emissions target, including trends, challenges, and improvements made. Resilience Planning Report: Provide an annual report on the measures taken to enhance the climate resilience of the hydrogen piping and electrolysis system, including adaptations made in response to new climate data.

Documentation and Certification: Maintain thorough documentation of the construction process, including material certifications, weld logs, and test results, to ensure compliance and facilitate future inspections. **Energy Recovery**: IGE will integrate energy recovery systems where pressure drops can be harnessed to generate power, improving the overall efficiency of the hydrogen transportation system. **Leak Detection Systems**: IGE will Install advanced hydrogen leak detection systems along the piping to quickly identify and address any leaks. This includes sensors that can detect even small leaks, ensuring prompt response.			**Emergency Preparedness Report**: Include information on emergency response drills, infrastructure upgrades, and any incidents related to climate impacts. **Key Performance Indicators (KPIs)**: IGE will track KPIs such as hydrogen production rate, energy consumption per unit of hydrogen, and system efficiency. Use this data to optimise operation and plan upgrades.

9. Beekeepers Impact Management Measures

DBCA considerations regarding potential indirect impact to Beekeepers Nature Reserve.

9.1 Beekeepers Nature Reserve

The Proposal is located immediately adjacent to Beekeepers Nature Reserve along part of the western and southern boundaries of the Disturbance Footprint, which is an unclassified reserve, for the purpose of protection of apiculture and the conservation of flora. The site Disturbance Footprint does not intersect any conservation estates (i.e. National Parks, Nature Reserves or other lands vested for conservation.

The Beekeepers nature reserve is vested within the Conservation and Parks Commission and managed by the Department of Biodiversity, Conservation and Attractions (DBCA.), established in 1979. The area of the nature reserve is approximately 69,161 ha.

9.2 Impacts to Beekeepers Nature Reserve

The vegetation within the Northern Beekeepers Reserve is described as being in excellent condition, with no evidence of Dieback Disease detected during field observations (Woodman Environmental Consulting, 2005). Additionally, the reserve contains large areas of intact native vegetation.

Records from NatureMap (DBCA, 2021) lists 23 occurrences of Acacia vittata, primarily found in disjunct populations across the Geraldton Sandplains and Avon Wheatbelt IBRA regions. While Acacia vittata has been recorded within the adjacent Beekeepers Nature Reserve, it has not been identified within the IGE development envelope. Given the species' distant location from the development area, it is not expected to be affected by clearing activities (Ecoscape, 2021).

Although some degraded vegetation communities are mapped within the reserve, the majority of the vegetation remains in good condition. IGE has actively engaged with DBCA representatives to assess and mitigate potential impacts on the Beekeepers Nature Reserve. As part of these efforts, wind turbines have been relocated to avoid the reserve's eastern boundary. Additionally, anticipated water abstraction volumes for the electrolysis process will be optimised, leading to an abstraction reduction.

These actions reflect IGE's commitment to minimising environmental impacts and preserving the ecological integrity of the Beekeepers Nature Reserve, demonstrating a proactive approach to sustainable development and conservation.

Rehabilitation Schedule

Table 21 AHP Rehabilitation Schedule

Activity	Indicative Timing
Finalise Rehabilitation	On Issue of Ministerial Statement
Rehabilitation	Progressive Demobilisation of Construction Equipment
Remove borrow material	(Construction Rehabilitation Commencement Date (CRCD))
Deep ripping and surface cultivation if possible (Cap Rock)	(CRCD)
Complete, topsoil return and vegetation material spreading	(CRCD)
Initial establishment monitoring for erosion, weeds and plant establishment	(CRCD + 3 months)
Conduct weed control if required	(CRCD + 3 months and 6 months)
Establish rehabilitation performance monitoring quadrats and assess	(Spring after CRCD)
Year 2 Post Rehabilitation Activity – Monitoring Program	(Year following Spring after CRCD)
Year 3 Post Rehabilitation Activity – Monitoring Program	(Two years following Spring after CRCD)
Year 4 Post Rehabilitation Activity	Anticipate completion criteria achieved in Year 3 Contingency for rectification and further monitoring

Thresholds and Triggers

Table 5 provides the threshold criteria that provide a limit beyond which the rehabilitation outcomes are deemed not yet achieved. It provides the trigger criteria that will provide an early warning that rehabilitation outcomes are not likely to be met, how the criteria will be monitored and contingency measures to be implemented.

Table 22 : Threshold and Trigger Criteria for Rehabilitation Outcomes

	Threshold Criteria	Trigger Criteria	Monitoring	Contingency Measures
1.	No contamination of soil, groundwater or surface water	Surveillance monitoring shows an analyte above baseline levels	Soil and surface water sampling. Site inspections identifying spill risks and contaminated soil (and its removal) are undertaken Compliance audits confirm there is no evidence of soil contamination on site	Implement spill response measures and Investigation into potential source of leak Continue remediation and sampling program until confirmation of contamination has been removed
2.	No permanent markers, infrastructure or litter abandoned at rehabilitating sites on completion of rehabilitation	Permanent markers, infrastructure or litter is abandoned at rehabilitation site at any time	Monthly inspections of rehabilitating sites confirm no foreign materials	Remove foreign materials from the rehabilitating site
3.	Natural contours are re-instated to pre-disturbance conditions upon rehabilitation as per pre-project survey	Contours do not appear to be similar to pre-disturbance condition	Land survey confirms earthmoving equipment has achieved natural contours to pre-disturbance conditions	Earthworks will be undertaken again before proceeding with ripping and spreading of topsoil and vegetation
4.	No exposed vegetation areas greater than 10 m^2 after 3 years	Exposed surface areas are larger than 10 m^2 after 12 months	Annual rehabilitation monitoring confirms no exposed surface >10 m^2 after 12 months	Re-rehabilitation options investigated with the potential for vegetation propagation introduction
5.	Foliage cover of environmental weeds on rehabilitated areas should not be greater than surrounding areas after 3 years	Weed control program is not reaching weed to foliage cover < 80% of surrounding areas	Annual rehabilitation monitoring confirms environmental weeds are not greater than on surrounding areas	Weed control program instigated within two weeks after each rainfall event

	Threshold Criteria	Trigger Criteria	Monitoring	Contingency Measures
6.	Total native vegetation percentage cover of perennials should reach at least 50% of the control after 3 years for VTs	Total native vegetation percentage cover of perennials is < 40%	Annual rehabilitation monitoring confirms total native vegetation percentage cover of perennials is at least 50% of the control	Re-rehabilitation options investigated
7.	Native vegetation cover shows a pattern of increasing over time	Native vegetation cover is not increasing over time	Annual rehabilitation monitoring confirms native vegetation cover is increasing over time	Re-rehabilitation options investigated
8.	The species richness of keystone species per monitoring plot is at least 50% of the control monitoring plot within 3 years	Species richness of keystone species is less than 40% of the control monitoring plots	Annual rehabilitation monitoring confirms species richness of keystone species is at least 50% of the control monitoring plot	Re-rehabilitation options investigated with the potential for propagule introduction
9.	At least one of the keystone species is represented (as % cover) in >90% of monitoring quadrats within each VT within 3 years	There are no keystone species represented (as % cover) in >25% of monitoring quadrats within each Vegetation type	Annual rehabilitation monitoring confirms at least one of the keystone species is represented (as % cover) in >90% of monitoring quadrats within each VT	Re-rehabilitation options investigated with the potential for propagule introduction
10.	The occurrence of dieback within the project is no greater than prior to the project within 3 years of initiating rehabilitation	Suspect *Banksia sessilis* deaths	Monthly inspections of project area vegetation confirm no suspect *Banksia sessilis* deaths Annual rehabilitation monitoring checks for visual signs of dieback Triennial dieback interpretation of vulnerable areas in project area	Hygiene measures implemented to protect susceptible areas

Table 23 Rehabilitation and Revegetation

EPA Objective: To re-establish pre-existing or comparable vegetation types consistent with adjacent undisturbed remnant vegetation.	
Assessment Objective: Assess the potential impact to significant flora and vegetation. Provide summary and outcomes. Rehabilitation management: Progressively on completion of use at each area of construction. Rehabilitation covering the rehabilitation of temporary areas accessed during the construction of the AHP. turbine construction assembly areas.	
Key environmental values: Native vegetation rehabilitation including significant vegetation and flora. Revegetating the wind turbine assembly areas Laydown areas: Plant and equipment	
Direct Impacts	**Indirect impacts**
Key environmental impacts. Loss of vegetation and flora through clearing and earthworks activities, including significant vegetation and flora. Fragmentation of native vegetation.	Introduction and spread of environmental weeds. Potential reduction in vegetation health. Changes to vegetation structure and floristic composition in surrounding/adjacent areas.

Management action	Management Target	Monitoring	Reporting
Progressive Rehabilitation			
Turbine base areas will be progressively rehabilitated as required. Demarcate rehabilitation boundaries using appropriate visual markers prior to ground disturbing activities. Visual inspection and approval of topsoil boundary prior to ground disturbing activities. Visual inspection and record of rehabilitation areas to be undertaken post-clearing. All site personnel to be inducted on environmental responsibilities. No impact to significant vegetation and flora outside of Disturbance Footprint from topsoil placement. Rehabilitating the disturbed vegetated areas to native vegetation comparable to the surrounding vegetation.	No Introduced flora or vegetation species onsite No topsoil contamination No disturbance to topsoil areas No deviating from original soil quality values Do not place topsoil outside of, or encroaching upon demarcated areas No clearing outside clearing extents	Daily inspection of Disturbance Footprint boundary demarcation of rehabilitation areas. Site visual inspection. Pre-clearance inspections, with any variations between pegged disturbance footprint and approved rehabilitation areas to be investigated and resolved prior to clearing. Inspection of clearing extents during clearing activities to confirm no over clearing. Monitor potential impact to significant flora and vegetation.	Vegetation clearing records and annual environmental reporting.
Soil and water			
Taking baseline soil samples during site preparation prior to the commencement of construction is a fundamental step in environmental management for any IGE. These samples serve as a critical reference point, offering insights into soil quality, nutrient levels,	No soil contamination.	Water monitoring. By prioritising soil protection and contamination prevention measures, construction projects can mitigate environmental risks and ensure the long-term sustainability of the project site.	Soil and surface water sampling report.

and potential contamination before any ground-disturbing activities occur			
Water samples will be taken from Lake Arramall, if possible, prior to commencement of construction. Regular sampling.	No water contamination	Water monitoring.	Soil and surface water sampling report.
Topsoil			
Excavation of substrate requires considerable effort and the reinstatement of vegetation in these areas will involve a shallow substrate topsoil replacement and possible re- seeding program of approved native shrubs. The existing topsoil stockpiles will be spread evenly over the area to be rehabilitated. Topsoil will be spread back into areas with similar vegetation types to maximise reinstatement. The final surface will be lightly scarified to 20 cm depth on contour to provide a friable seedbed and mitigate potential surface erosion. The stockpiled vegetation will be spread over the surface of the scarified topsoil. The vegetation will be spread back into areas with the same vegetation types to maximise the similarity with adjacent vegetation.	No topsoil contamination Ensuring no soil contamination is a critical aspect of environmental management for any construction project. Contaminated soil can pose significant risks to human health and the environment if left untreated or improperly managed Clearly demarcated topsoil zones Avoid deviating from original vegetation values and species richness	Ongoing flora and vegetation inspections and ongoing monitoring. Site visual inspection. Annual rehabilitation monitoring confirms environmental weeds are not greater than on surrounding areas Monitor exposed vegetation	Environmental Report. Visual inspection and approval of Disturbance Footprint boundary prior to ground disturbing activities. Visual inspection and record of rehabilitation areas. . Soil Quality Report: Validation Sample results confirm that all contaminated soil has been removed from site

The completion criteria and performance indicators included in the rehabilitation strategy will be in place prior to rehabilitation commencement to ensure that rehabilitation as far as practicable achieves a stable and functioning landform and ecological system consistent with pre-existing and surrounding landscape and environmental values. Manage Topsoil and landscape values for effective rehabilitation Managing topsoil and landscape values is integral to the successful rehabilitation of disturbed areas during and after construction. Preservation of topsoil is prioritised to retain essential nutrients and microorganisms crucial for vegetation growth. Erosion control measures will be implemented to prevent soil loss, while landscape restoration techniques aim to restore natural landforms and vegetation cover.	Minimise deviating from original soil quality type and consistency Decrease deviation from original landforms No deviation from landform topography Minimise deviating from landscape shapes and contours	Visual monitoring and managing rehabilitation	

Management action	Management Target	Monitoring	Reporting
Ensure that rehabilitation as far as practicable achieves a stable and functioning landform and ecological system consistent with pre-existing and surrounding landscape and environmental values.	Minimise deviating from original landform values and contours	Daily visual monitoring of dust levels by the construction supervisor or representative. Dust suppression and dust control measures will be visually inspected in the monthly environmental compliance inspection. Site inspections identifying spill risks and contaminated soil (and its removal) are undertaken Compliance audits confirm there is no evidence of soil contamination on site	Incident reporting system. Rehabilitation report
Rehabilitation Completion Criteria			
Remove contaminated material within the project area. Ensure that all visual disturbances are removed by immediate remedial action to the greatest extent practicable.	No waste abandoned on site No permanent markers, infrastructure or litter left on site. No active erosion rills greater than 10 m x 0.15 m three years following rehabilitation	Validation sampling is undertaken across the Disturbance Footprint. Site walk.	Validation sample results confirm that all contaminated soil has been removed from site. Visual site inspection.

The existing topsoil stockpiles will be spread evenly over the area to be rehabilitated. Natural contours will be re-instated to pre-disturbance conditions upon rehabilitation. Reinstate the land topography to integrate with the surrounding landscape. Ensure Preparation undertaken during rehabilitation to provide conditions for natural colonisation of vegetation.	Minimise deviating from original landforms values and contours Avoid deviating from original landforms values and topography	Annual rehabilitation monitoring confirms environmental weeds are not greater than on surrounding areas	Rehabilitation report contains photos of the required restored areas. Reports on quadrant assessment. Annual monitoring report.
Reinstate the land topography to integrate with the surrounding landscape. Earthworks undertaken during to rehabilitation re-instate pre-disturbance contours.	The area to be rehabilitated will be ripped to a depth of approximately 20 cm depending on soil availability	Earthworks monitoring during rehabilitation to ensure the re-instatement pre-disturbance contours.	Monthly inspections of landforms and earthworks, including borrow pits.
Revegetation			
Replant similar existing vegetation.	Plant native vegetation, similar to surrounding landscape.	Weekly Monitoring. Visual site inspection.	Rehabilitation closeout report.
To re-establish pre-existing or comparable vegetation types consistent with adjacent undisturbed remnant vegetation.	Total native vegetation percentage cover of perennials should reach at least 50% of the control after 3 years for vegetation type	Monitoring success and establishment. Annual rehabilitation monitoring confirms no bare patches larger than 10 m^2 after 12 months	Annual monitoring report. Monthly inspections project report: including reporting rehabilitation

Enhance potential for plant growth through: - Spreading of stockpiled topsoil over the soil surface. - Spreading of mulch over the spread topsoil surface. - Application of slow-release complete fertiliser. Ensure Native vegetation cover shows a pattern of increasing over time. The species richness of keystone species per monitoring plot/ transect will be at least 50% of the control transects within three years. At least one of the keystone species should be represented (as % cover) in >90% of monitoring quadrats within each vegetation type within three years	No exposed vegetation cover larger than 10 m^2 after 3 years No deviating from original vegetation values and species richness No deviation from original vegetation cover values	Annual rehabilitation monitoring confirms species richness of keystone species is at least 50% of the control monitoring plot Monthly inspections of project area vegetation confirm no suspect *Banksia sessilis* deaths Annual rehabilitation monitoring checks for visual signs of dieback Triennial dieback interpretation of vulnerable areas in project area Cleared areas inspection to be undertaken post-clearing to ensure no over clearing	area vegetation species richness . Rehabilitation closeout report. Confirm minor *Banksia sessilis* or *B. prionotes* impacts.
Enhance potential for plant growth through: - Spreading of stockpiled topsoil over the soil surface - Spreading of mulch over the spread topsoil surface and application of slow-release complete fertiliser.	Total native vegetation percentage cover of perennials should reach at least 50% of the control after 3 years for VTs. Native vegetation cover will show a pattern of increasing over time.	Visual site inspection Continue remediation and sampling program until confirmation contamination has been removed	Rehabilitation closeout report after 3 years

Enhance potential for species introduction through: - Return of stockpiled topsoil from the same VT - Spread of stockpiled mulch from the same VT and, Application of seed collected from the same VT (where rehabilitation deferred for more than 2 years) Provide conditions for natural colonisation of vegetation	Keystone species a)The species richness of keystone species per monitoring plot / transect is at least 50% of the control transects within three years. b) At least one of the keystone species should be represented (as % Cover) in >90% of monitoring quadrats within each vegetation type within three years NOTE: the list of keystone species for each vegetation type listed in the Ecoscape(2022)vegetation report may be revised following survey of control transects in adjacent undisturbed vegetation.	Visual site inspection Regular monitoring Native vegetation cover shows a pattern of increasing over time	Annual Monitoring Report reports on quadrat assessment Rehabilitation closeout report after 3 years Annual rehabilitation monitoring confirms total native vegetation percentage cover of perennials is at least 50% of the control Monthly site inspection record forms confirm no permanent markers, infrastructure or litter abandoned on site

Solar Farm Revegetation			
Implement revegetation screening along Brand Highway Revegetation screening along Brand Highway will be implemented to minimise the visual impact of the project and enhance the aesthetic appeal of the area. This will involve planting native vegetation, including trees, shrubs, and grasses, along the roadside to create a natural barrier and screen the view of the project site from passing motorists. Develop a long-term monitoring and maintenance plan for the revegetated areas to ensure vegetation health and ecosystem recovery. This includes monitoring vegetation growth, replacing dead plants, and controlling weeds. By utilising native species that are adapted to the local climate and soil conditions, the revegetation efforts can enhance biodiversity, provide fauna habitat, and contribute to the overall ecological integrity of the landscape	Target: Planti native vegetation similar to the surrounding landscape, specifically Eucalyptus erythrocorys low open woodland (EeLOW), will be undertaken as part of the habitat restoration efforts. This involves selecting and planting native species that are characteristic of the EeLOW woodland ecosystem, aiming to recreate the natural vegetation composition and structure of the surrounding area. Ensure 80-90% vegetation cover is achieved within two years of planting, with no more than 10% of plants requiring replacement.	Monitoring success and establishment Monitoring the success and establishment of replanted species will be conducted to assess the effectiveness of habitat restoration efforts, particularly in the context of solar farm screening and revegetation. This monitoring program will involve regular assessments of replanted areas to evaluate factors such as plant survival rates, growth patterns, biodiversity levels, and overall ecosystem functionality. By closely monitoring these indicators, project stakeholders can gauge the success of the revegetation efforts and make any necessary adjustments to enhance habitat restoration outcomes.	Monthly inspections project report: including reporting rehabilitation area vegetation species richness . These inspections will involve thorough assessments of the vegetation within the rehabilitation area to monitor species richness, abundance, and overall ecosystem health. Data collected during these inspections will be included in the monthly project report to provide stakeholders with insights into the progress of vegetation restoration efforts. **Monitoring Frequency**: Monthly inspections during the first year of revegetation, with biannual inspections in subsequent years. **Reporting**: Provide annual reports to stakeholders and regulatory authorities detailing the progress of revegetation, plant survival rates, weed control efforts, and the success of wildlife habitat restoration.

Management action	Management Target	Monitoring	Reporting
PEC and Priority Flora Disturbance Revegetation			
To target priority vegetation types consistent with adjacent undisturbed remnant vegetation The goal is to re-establish pre-existing priority vegetation types consistent with adjacent undisturbed remnant vegetation. This involves replanting native vegetation species that were present in the area prior to disturbance, aiming to recreate the same vegetation composition and structure as the adjacent undisturbed remnant vegetation. The selection of plant species will be based on their compatibility with the local ecosystem and their ability to thrive in the specific environmental conditions of the site. Replant priority listed species where possible five Priority-listed flora: (*Eucalyptus foecunda* subsp. *aeolica*, P2; *Scholtzia calcicola*, P2; *Beyeria cinerea* subsp. *cinerea*, P3; *Dampiera tephrea*, P3; *Eucalyptus zopherophloia*, P4)	**Key Objectives of Solar Farm Revegetation:** **Biodiversity Restoration**: Support local flora and fauna by planting native vegetation that provides habitat and food sources. **Erosion Control**: Prevent soil erosion and degradation by stabilizing disturbed soils with vegetation cover. **Aesthetic Integration**: Blend the solar farm into the surrounding landscape by using appropriate plant species and landscape design elements. **Carbon Sequestration**: Use vegetation to capture and store carbon, offsetting emissions from construction and operation. Select native plant species that are well-adapted to the local climate and soil conditions. Priority should be given to species that were present on the site before disturbance, as well as plants that support local biodiversity (e.g., pollinators, birds, and small mammals).	Monitoring the success and establishment of replanted species will be conducted to assess the effectiveness of habitat restoration efforts. This monitoring program will involve regular assessments of replanted areas to evaluate factors such as plant survival rates, growth, biodiversity, and ecosystem functionality. Data collected from monitoring activities will be analysed to determine the overall success of the replanting program and identify any areas for improvement. By monitoring the establishment of replanted species, project stakeholders can ensure the long-term viability and resilience of restored habitats.	Monthly inspections project report: including reporting rehabilitation area vegetation species richness . These assessments reports will provide valuable insights into the effectiveness of habitat restoration efforts and help determine the overall health and resilience of the replanted ecosystems.

To quantify pre-existing priority PEC/P1vegetation types consistent with adjacent undisturbed remnant vegetation The priority is to delineate/replant/ revegetate flora species listed as PEC's Priority 1 (P1), which are considered importance for conservation efforts. These species may include native plants that have specific ecological significance within the local ecosystem.	Minimise Native vegetation Disturbance To Coastal sands dominated PEC vegetation: - Acacia rostellifera, - Eucalyptus oraria and - Eucalyptus obtusiflora (Representative of Geraldton area coastal sands) P1 PEC	Monitoring success and establishment	Monthly inspections project report: including reporting rehabilitation area vegetation species richness .

The priority is to replant species characteristic of Priority vegetation, specifically Eucalyptus obtusiflora, Eucalyptus oraria, and Eucalyptus zopherophloia, which are typically found in mid-open mallee forest/mallee shrubland ecosystems on near-coastal dunes and swales. These species are native to the region and play a crucial role in the ecological integrity of the coastal landscape. Vegetation Assessment Targeted Survey and Assessment: Conduct a survey to identify pre-existing priority P1 vegetation types, including Acacia rostellifera, Eucalyptus oraria, and Eucalyptus obtusiflora, in adjacent undisturbed remnant vegetation. Ecological Significance: Evaluate the ecological significance of these vegetation types, considering factors such as biodiversity, habitat value, and ecosystem services.	EobEorEzMOMF; *Eucalyptus obtusiflora*, *Eucalyptus oraria* and *Eucalyptus zopherophloia* mid open mallee forest/mallee shrubland on near coastal dunes and swales	Monitoring success and establishment Monitoring the success and establishment of replanted vegetation will be a critical aspect of the project's ecological restoration efforts. This monitoring will involve regular assessments to evaluate various factors	Monthly inspections will be conducted as part of the project report, which will include reporting on the vegetation species richness in the rehabilitation area. These inspections will involve thorough assessments of the vegetation within the rehabilitation area to monitor species richness, abundance, and overall ecosystem health

Table 24 Beekeepers Nature Reserve

DBCA Objective: To protect flora and vegetation and to ensure biological diversity and ecological integrity are maintained within the Beekeepers nature reserve.	
Assessment Objective: Assess the potential residual impacts to fauna, flora, and vegetation. Provide a summary and outcomes. Consultation with the DBCA regarding potential indirect impact to the adjacent Beekeepers Nature Reserve.(See Attached Appendix)	
Key environmental values: Native vegetation including significant vegetation and flora. Carnaby's Black Cockatoo foraging flora and vegetation.	
Direct Impacts	**Indirect impacts**
Nill direct impacts: No native vegetation will be cleared within Beekeepers Reserve. No impacts from sedimentation and erosion as clearing will occur at significant distance to the reserve boundary.	- Introduction and spread of environmental weeds. - Potential reduction in vegetation health as a result of dust generation. - Possible changes to vegetation structure and floristic composition in surrounding/ adjacent areas due to changes in surface water flow. - Potential material impacts terrestrial fauna habitat from fire, weeds, dieback, feral animals, vehicle strikes, light pollution, noise, and dust.

Management action	Management Target	Monitoring	Reporting
Clearing			
Demarcate Disturbance Footprint boundary using appropriate visual markers in case of ground disturbing activities adjacent to Beekeepers Reserve. Visual inspection and approval of AHP Disturbance Footprint boundary prior to ground disturbing activities. Visual inspection and records of cleared areas to be undertaken post-clearing to ensure no impact to Beekeepers Reserve. No clearing of vegetation outside of the Disturbance Footprint during and attributable to construction. No impact to significant vegetation and flora outside of Disturbance Footprint. Vehicles and equipment access limited to designated roads/access tracks and cleared areas. All site personnel to be inducted on environmental responsibilities.	Vegetation outside of the Disturbance Footprint will not be cleared as part of the project activities. This ensures that areas beyond the designated disturbance zone remain untouched and undisturbed, preserving the natural habitat and ecosystem integrity outside of the project's immediate footprint. This commitment to limiting vegetation clearance to only the designated areas helps minimise environmental impact and maintains the biodiversity and ecological balance of surrounding landscapes. Minimise impacts to Carnaby's Black Cockatoo foraging habitat. No material impact or be inconsistent with the EPA objective provided minimisation measures are implemented.	Daily inspection of Disturbance Footprint boundary demarcation during clearing activities. Pre-clearance inspections, with any variations between pegged disturbance footprint and approved plans to be investigated and resolved prior to clearing. Inspection of clearing extents during clearing activities to confirm no over clearing. Monitor potential impacts to significant flora and vegetation surrounding the disturbance footprint.	Report unauthorised clearing as soon as practicable after identified. Vegetation clearing records and annual environmental reporting. Induction records.

Surface/Groundwater Drainage			
Groundwater-Dependent Ecosystems (GDE). Consider the groundwater requirements for components of a GDE within the Disturbance Footprint. Groundwater modelling has shown no impacts from the proposed groundwater take on environmental values within the reserve. (Cardno 2021)	Minimise indirect impacts to surrounding/ Beekeepers reserve from altered surface water drainage and Flows. Zero impacts to water flow. Minimise indirect impacts to surrounding/ adjacent areas from altered surface water drainage and flows.	Monthly visual inspections for environmental compliance. Groundwater monitoring bores. Visual drainage line inspections. Regular site monitoring: Groundwater/ surface water. Vegetation monitoring.	Environmental; weekly report. Audits.
Establish protective buffer zones around the project site.	Maintain buffer zones around Beekeepers Reserve (e.g., 50-100 meters) to prevent direct disturbance and control erosion.	Weekly site inspections to ensure buffer zones are intact and undisturbed.	Submit buffer zone compliance reports bi-monthly.
Implement erosion and sediment control measures.	Prevent runoff and sedimentation into the reserve using erosion control (e.g., silt fences, sediment traps).	Monitor erosion control structures after significant rainfall and assess runoff impacts.	Report erosion control effectiveness quarterly, especially after rain.
Restrict access for heavy machinery in sensitive areas.	Prohibit access to the reserve for heavy machinery to avoid habitat disruption.	Continuous surveillance and access control monitoring.	Include access restriction compliance in monthly site activity reports.

stall fencing to protect local fauna.	Install fauna protection fencing to reduce wildlife disturbance from construction activities.	Inspect fencing and access points bi-weekly to ensure integrity.	Record and report any incidents or fence breaches immediately.
Execute a weed management plan to control invasive species.	Prevent the spread of invasive species into the reserve.	Monthly inspections of the site perimeter for invasive species, with immediate treatment if detected.	Submit bi-annual reports on weed control and monitoring efforts.
Maintain existing fire breaks, avoid new breaks in sensitive areas.	Avoid creating new fire breaks within sensitive areas of the reserve.	Regular fire break inspections before and after the fire season.	Provide fire break maintenance reports to stakeholders annually.
Apply dust suppression methods on-site.	Minimise dust generation through regular site watering and dust suppression measures.	Daily dust level monitoring during peak construction activity periods.	Include dust suppression and air quality data in monthly environmental reports.
Limit noise and light pollution through mitigation measures.	Reduce noise and light pollution by using noise barriers and restricting working hours.	Continuous noise and light level monitoring during construction phases.	Include noise and light level assessments in monthly environmental impact reports.
Manage water runoff and usage to protect nearby hydrology.	Prevent contamination and disturbance to natural hydrology near the reserve.	Weekly water quality testing of adjacent waterways and drainage systems.	Submit water quality and usage reports quarterly.
Reserve wildlife corridors adjacent to the reserve.	Minimise habitat fragmentation by preserving key wildlife corridors adjacent to the reserve.	Regular wildlife monitoring and camera trap assessments to track fauna movement.	Report wildlife corridor integrity in bi-annual biodiversity reports.

10. Cumulative impacts upon Beekeepers Nature Reserve

IGE is aware that there is an increasing number of proposals for resource extraction within and adjacent to Beekeepers Nature Reserve, including petroleum projects, extractive industry, and renewable energy project developments. It is important to ensure that the conservation values of the Nature Reserve are not adversely impacted by surrounding cumulative development activity within the Arrowsmith Development Hub (ADH).

The IGE proposal will monitor and manage surrounds to avoid or minimise impacts to fauna and native vegetation within Beekeepers Nature Reserve or the underlying groundwater aquifers.

Should any residual impacts remain, then appropriate environmental offset measures may be considered with the aim of ensuring that there is no net loss of biodiversity values within Beekeepers Nature Reserve.

10.1 Residual Impact Assessment

IGE's management approach includes anticipating no significant residual impacts to the Beekeepers Nature Reserve during both project construction and operations. However, recognizing the importance of ongoing environmental stewardship, IGE will implement continuous monitoring of the surrounding environment. This proactive monitoring strategy ensures that any potential impacts are promptly identified and addressed, maintaining the integrity of the Beekeepers Nature Reserve and surrounding ecosystems throughout the project lifecycle. By prioritizing ongoing environmental monitoring, IGE demonstrates its commitment to responsible environmental management and sustainability practices.

Decision-Making Authority: Chief Executive Officer, Department of Biodiversity, Conservation and Attractions
Decision-Making Authority Legislation (and approval): Conservation and Land Management Act 1984 (section 101 granting a licence to use the land reserved as Nature Reserve)

Previous environmental approvals have been granted in the Beekeepers reserve that include:

- Seismic survey by Norwest Energy NL which disturbed 55 ha of native vegetation.
- Seismic survey by ARC Energy Limited and Origin Energy Developments Pty Ltd Limited which disturbed up to 117 ha of native vegetation.
- Exploration well by Origin Energy Resources Limited which disturbed up to 6.5 ha of native vegetation.

10.2 Groundwater Recharge within Beekeepers Reserve

Groundwater recharge into the Yarragadee aquifer primarily occurs through direct rainfall infiltration over outcrop areas and downward leakage from overlying aquifers. Additionally, concentrated recharge from rivers and streams plays a significant role in certain areas. This multi-faceted recharge process ensures the replenishment of the Yarragadee aquifer, maintaining its water levels and sustainability. Understanding these mechanisms is crucial for effective groundwater management and ensuring the continued availability of this vital water resource.

Within the Arrowsmith region, low groundwater salinity and groundwater mounding near and west of Badgingarra suggests substantial groundwater recharge. Significant recharge is also likely where sand beds of the Yarragadee Formation are exposed at the surface (Commander 1981), which is most prevalent over the western portion of the aquifer. In the Arrowsmith region, recharge is likely to be concentrated within the river valleys (Commander 1981) that receive runoff from hill slopes.

A large downward hydraulic gradient at Eneabba Line EL5 suggests groundwater recharge rates may be higher in that area because the Yarragadee aquifer is unconfined west of the outcrop of the Otorowiri Formation (Commander 1981). (See Attached Supporting document S38 update: Appendix 1 (DBCA Consultation)

10.3 Incident Reporting

10.3.1 Environmental incidents / non-compliance

Environmental incidents and non-compliances will be identified and recorded as soon as practicable by the relevant responsible persons. Incidents will be mitigated or rectified where possible within 48 hours of being identified. Non-conformances will be reported to the Construction Manager or equivalent within 48 hours of identification and added to the incident site register.

10.3.2 Reporting

Environmental performance during construction/operational activities and the identification of auditing requirements will be assessed by IGE prior to and throughout the construction and operational period. All documents pertaining to environmental management will be required to be maintained within the document control system.

Reporting requirements will be undertaken in accordance with regulatory requirements, including necessary annual reporting. If a significant non-conformance transpires, the regulator will be notified immediately regarding the non-compliance and a subsequent investigation will be initiated

10.4 Environmental Monitoring and Corrective Actions

Internal monitoring of environmental factors, as outlined within this document, will commence during both the project's construction and operational phases. In the event of project non-conformance or incidents, immediate investigation, rectification, or mitigation actions will be undertaken to ensure effective environmental mitigation measures are in place. Relevant company procedures will be adjusted as necessary, and induction content will be reviewed to enhance workforce awareness.

Furthermore, corporate and site communication protocols will be revised and implemented as needed to minimise the risk of recurrence of any incidents or non-conformance events. This proactive approach to internal monitoring and communication underscores the project's commitment to environmental stewardship and continuous improvement throughout all phases of its lifecycle.

10.5 Management Review

Amendments to management actions and targets will be adaptive as required. This strategy may include revision and amendments to management targets that fail to achieve the desired environmental or sustainability outcomes. Monitoring, changes to relevant legislation or improvements to management practices that achieve improved environmental results will be ongoing to meet energy transitions.

Sustainable technology and service providers, both globally and within Australia, are expected to adapt continually to government energy transition trends and future net-zero targets. These adaptations will provide solutions to meet customer demands for environmentally friendly and sustainable energy options. By leveraging industry-leading technology, sustainable technical expertise, and advanced construction capabilities, along with integrated power and service solutions, IGE is poised to deliver this project effectively.

IGE is committed to contributing to the achievement of net-zero carbon emissions targets in Western Australia and Australia as a whole. By embracing cutting-edge technology and sustainable practices, the project aims to make significant strides towards reducing carbon emissions and promoting environmental sustainability. Through collaboration with stakeholders, leveraging expertise in sustainable development, and adhering to stringent environmental standards, IGE is dedicated to delivering a project that aligns with the nation's goals for a greener and more sustainable future.

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