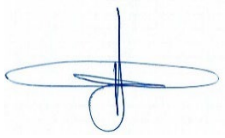
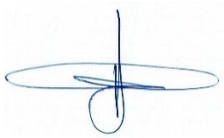
Good Earth Green Hydrogen & Ammonia (GEGHA)

Environmental Impact Statement

27 May 2025

Final

Revision Control

Revision	Date	Issue	Author	Reviewed	Approved	Signature
[1]	29/04/25	Draft	IS	FG	OH	
[2]	15/05/25	Final Draft	IS	FG	JC	
[2]	27/05/25	Final/Issued	IS	FG	JC	

Confidentiality

Disclaimer

Project Details	
Project Name	Good Earth Green Hydrogen and Ammonia ('GEGHA' Project)
Application Number	SSD-58694960
Address of the land in respect of which the development application is made	2910 and 2912 Gwydir Highway, Moree, NSW 2400 Lot 1 DP 1315847 Lot 2 DP 1315847Lot 30 DP 1040936
Application Details	
Applicant name	Hiringa Sundown Project Trust (HSPT)
Applicant address	Greenhouse Tech Hub, Level 2, Salesforce Tower, 180 George Street, Sydney, NSW 2000
Details of person by whom this EIS was prepared	
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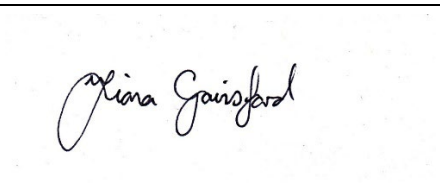
Professional qualifications	Master of Arts (Countryside & Environmental Management)
Declaration by registered environmental assessment practitioner	
Name	Fiona Gainsford
Registration number	R80002 https://www.cenvp.org/directory/#1631229805183-2c7f56e2-f8f7
Organisation registered with	Certified Environmental Practitioner Scheme

Declaration

- The undersigned declares that this EIS:
- has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021;
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates;
- does not contain information that is false or misleading;
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project;
- identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments;
- has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement;
- contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development;
- contains a consolidated description of the project in a single chapter of the EIS;
- contains an accurate summary of the findings of any community engagement; and
- contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.

Signature	
Date	27 May 2025

GEGHA Project Summary

Project Overview

Hiringa Sundown Project Trust (HSPT) is a joint venture between two entities, Hiringa Energy Pty Ltd ('Hiringa') and Sundown Pastoral Co. ('Sundown'). HSPT seeks approval for the construction and operation of a green hydrogen and ammonia production and storage facility named the Good Earth Green Hydrogen and Ammonia Project ('GEGHA Project' or 'Project'). The planned infrastructure will be located on land that is within the operational footprint of the Wathagar Cotton Gin, approximately 33 km south-west of Moree, New South Wales (NSW).

Building on the NSW Government's Hydrogen Strategy – *Making NSW a global hydrogen superpower*, the Project proposes to decarbonise the region's transport and agricultural sector via production of green hydrogen for use in refuelling of hydrogen vehicles and ammonia for use in fertiliser production.

The Project represents a valuable opportunity to demonstrate commercial, operational and technical feasibility of renewable-derived ammonia and hydrogen with the expectation that it can be more broadly adopted in NSW and Australia's agricultural regions.

The project has been sized around the immediate demand from motivated cotton farmers, the immediate heavy transport market, the electrical network capacity and the state grant capacity (partial funding will be provided by the NSW Government's 'hydrogen hub initiative').

The key production and storage components of the project include:

- 15 MW hydrogen electrolysis, allowing for material production of green hydrogen.
- 16 tonne per day ammonia plant, to convert green hydrogen feedstock into green ammonia.
- Up to 3 tonnes of hydrogen storage to balance local fuel supply and demand.
- Up to 600 tonnes of ammonia storage capacity to buffer the overall process against seasonal ammonia demand and renewable energy variability.

The 'Project Assessment Area (PAA)' comprises the proposed disturbance extent to enable safe construction and operation of the plant, evaporation pond and its ancillary power and water connections. Determination of the Project's final disturbance footprint has involved the completion of a series of detailed technical and social assessments that have been undertaken in response to the Secretary's Environmental Assessment Requirements (SEARs) issued on the 12th September, 2024.

The Project has an estimated development cost of $71,595,167 (AUD) excl. GST and is proposed to be operational by 2026.

Project Objectives

The primary objective of the GEGHA Project is to demonstrate the commercial, operational and technical feasibility of renewable-derived ammonia and hydrogen with an expectation that will drive more broadly adopted hydrogen and ammonia production in NSW and Australia's agricultural regions. Facilitating a pathway to broader use and adoption of GEGHA's model to produce green fuel and fertiliser is a primary objective of this Project.

The primary environmental objective is to utilise renewable feedstocks for the GEGHA Plant via solar energy generated adjacent to site and the beneficial reuse of the Wathagar Gin yard drainage dam as a primary water source supplemented by groundwater via an existing bore adjacent to the Plant site.

The GEGHA Project aims to deliver:

1. **Green energy:** The Project will enable its customers to access fuel and fertiliser derived entirely from renewable energy sources, providing a pathway to decarbonise agricultural production and transport supply chain.
2. **Local production:** Hydrogen and ammonia will be produced, delivered and used in the region. The GEGHA Project will save thousands of kilometres of fuel and ammonia transport to the region from Newcastle and Brisbane.

3. **Security of supply:** The GEGHA Project is focused on agriculture and heavy goods transport in the region. The Project will provide certainty and security of supply, placing priority on agricultural customers with a product that will be decoupled from fossil fuel driven supply cycles and fluctuations in price.

Subject Land and Site Selection

The Subject Land is in Lot 1 DP 1315847, Lot 2 DP 1315847 (Parish of Wathagar) and Lot 30 DP 1040936 (Parish of Wathagar). Existing land use comprises of land formerly utilised by the Wathagar Cotton Gin operation for the storage of waste cotton stalks, sticks, soil and husks, collectively known as 'cotton trash'.

The Project's site was selected specifically because of the unique opportunity to develop a local source of green hydrogen and ammonia without compromising existing agricultural production.

Selection at this location also offers the following strong advantages:

- Permissibility of the development;
- Proximity to existing infrastructure;
- Proximity to feedstock;
- Proximity to end users;
- Largely cleared site;
- Neutral impact to Productive land;
- Remote from off-farm receptors;
- Existing flood protection;
- Visual screening;
- Existing local amenity impact; and
- Existing Site Drainage and Containment of run-off.

Alternatives considered include a 'do nothing' option, an alternative technology option and an alternate location evaluation.

The GEGHA Project is the most effective way to initiate and deliver meaningful reduction in carbon intensity in the Agricultural sector whilst also building regional capacity and cementing security of supply in food and fibre production in north western NSW.

Strategic Context

The Project aligns strongly with the decarbonisation and emissions reduction policies, particularly the Australia's National Hydrogen Strategy 2024, NSW Hydrogen Strategy 2021, NSW Renewable Energy Planning Framework and the NSW Hydrogen Guideline. The operation of the GEGHA Project will unlock a pathway for regional decarbonisation by providing a model for transition to renewable derived fuel and fertiliser.

Low emissions fertiliser and fuel production will enable regional producers to lower their carbon footprint and contribute to a low-emissions agricultural industry from 2026.

The location of hydrogen and ammonia production in the Gwydir valley will displace fossil-fuel derived fuel and fertiliser that is currently sourced internationally or otherwise transported from Sydney, Brisbane or Newcastle, saving at least 64,000km per annum of loaded dangerous goods transportation in NSW with a further 64,000km of return empty loads (approximately 40,000 litres of diesel per annum).

The GEGHA Project is an overwhelming positive when considering NSW's climate targets, presenting a viable, near-term, regional project that will deliver carbon and emissions savings from the outset of production.

Statutory Context

The GEGHA Project is a permissible development, subject to consent, within the Moree Plains Local Environmental Plan 2011. The Project is consistent with the following State Environmental Planning Policies:

- State Environmental Planning Policy (Biodiversity and Conservation) 2021

- State Environmental Planning Policy (Industry and Employment) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Primary Production) 2021
- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Transport and Infrastructure) 2021.

Environmental Implications

Key Project aspects are land use risk and water supply security.

Land Use Risk

The Preliminary Hazard Analysis revealed that, left untreated, five residences owned by Sundown Pastoral Co to the south west of the Plant site and the Wathagar Manager's caretaker residence would be subjected to toxic injury risk and irritation risk in a critical failure scenario. This scenario also places a risk on site-based Wathagar gin employees.

The Project design team and specialist consultant Arriscar have made provision in plant design to reduce these risks to an acceptable level. This risk will continue to be analysed during the detailed design phase which will likely further reduce the likelihood of any major risk or hazard occurrence.

Aside from indoctrinating safety in design, the operational plant will have stringent safety measures that will be founded on the Safety case. A Safety case is a comprehensive document that outlines how a major hazard facility (MHF) in NSW manages inherent risks to ensure safe operations.

Land use risk has been reduced to an acceptable level via safety in design controls such as installation of a vapour barrier wall and water deluge system around the Ammonia storage.

Water Supply

The GEGHA Project will require an annual maximum water usage of up to 51Megalitre (ML) at a supply rate of 139 kilolitres (kL) per day of operation.

Primary water supply will be drawn from the Wathagar Dam, an existing water drainage dam, which has a capacity of 198ML and an annual recharge rate of 75ML. The calculated 'worst case' water draw for the GEGHA Project including plant use, evaporation loss and seepage is estimated at 98ML, providing a capacity of almost two years supply, allowing for the retention of the bottom 1m of water beneath the floating pump.

GEGHA Plant water supply risk has been reduced to an acceptable level by providing for augmentation through the proposed future utilisation of groundwater via the existing Wathagar bore. The use of water from the Wathagar bore would be utilised as a contingent supply in the scenario where the Wathagar drainage dam does not recharge sufficiently to enable complete supply to the GEGHA Plant.

Analysis of groundwater drawdown tested a 'worst case' scenario whereby full reliance on the Wathagar bore water for a 30 year period would result in drawdown of less than 0.37m at the nearest mapped groundwater dependent ecosystem and less than 0.27m and 0.24m at the nearest bore or active Water Access Licence.

Rejection rate of water following water treatment is 30%. Evaporation pond sizing is such that adequate contingency exists to provide containment up to a 96th percentile wet year.

Remaining Environmental Aspects and Impacts

The Project will impact on 1.4ha of Plant Community Type 39 (Derived Native Grassland Poor) and 0.4ha of Plant Community Type 39 (Derived Native Grassland Shrubby). Collectively, this level of impact requires to be offset by securing and retiring 6 ecosystem credits within the *Coolibah – Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions endangered ecological community (Biodiversity Conservation Act)* offset trading group.

All other assessed environmental aspects and impacts are considered to be negligible with practical and achievable environmental mitigation measures nominated to effectively reduce their likelihood to a satisfactory level. Social impacts, aside from the land use risk considered above, are also considered to be negligible.

Regional economic benefits

Total economic output, including all direct, supply chain and consumption effects is estimated to increase up to $76.11 million over the construction period and up to $21.29 million per annum during operation.

The added benefit will be HSPT's commitment to actively encourage and support the engagement and retention of professional skills required to support the operation of the GEGHA plant in the Moree and north west region.

Cumulative Impact

Several credible cumulative impacts were raised during the assessment of environmental aspects and impacts. Following assessment and analysis of proposed construction and operational impact and nomination of proposed management measures, all cumulative impact will be within an acceptable range or tolerable level provided mitigation measures are implemented.

Conclusion

This EIS has been prepared in accordance with Part 4 of the EP&A Act and in response to the Secretary's Environmental Assessment Requirements.

This EIS presents a clear Project need and basis for site selection. It provides a detailed description of the existing environment within the PAA and nominates a residual disturbance footprint that is considerate of minimisation of impact to those environmental values.

The potential for environmental impacts has been thoroughly considered with recommended mitigation measures nominated to adequately reduce and control those impacts. Key Project aspects include land use risk and water supply security. Land use risk has been reduced to an acceptable level via design controls such as installation of a vapour barrier wall and water deluge system around the Ammonia storage. Water supply has been augmented through the proposed future utilisation of groundwater via the existing Wathagar bore as a contingent supply should the Wathagar drainage dam not recharge sufficiently.

The social, economic and environmental benefits of the Project considerably outweigh the limited environmental and social impacts associated with its construction, operation and decommissioning.

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1 INTRODUCTION

Use of Standard Terms

Term	Definition
Adiabatic unit	The GEGHA Plant will require 6 x adiabatic units to be installed. These are industrial cooling units that provide efficient cooling using a combination of air and water to lower the temperature of the air before it passes through a heat exchanger.
Ancillary infrastructure	Roading, power and water pump/ connections, water treatment, telemetry, security camera system, switch room, control room and protective perimeter fencing
Applicant	Hiringa Sundown Project Trust (HSPT) in the context of the EIS.
Credible risk	A plausible or valid potential risk associated with the development that has a realistic chance of occurring.
Disturbance Footprint	The residual area that will be subject to ground disturbance activity during the construction and operation of the GEGHA Project.
Electrolysis/ electrolyser	The process of chemical decomposition produced by passing an electric current through a liquid or solution containing ions. References the process of making hydrogen by splitting water using an electric current.
GEGHA Project	'Good Earth Green Hydrogen and Ammonia'. This encompasses all elements of the development including solar farm and the GEGHA facility. Use in all references to the planning and construction phases.
GEGHA Facility	Term of reference to describe the hydrogen and ammonia plant, including connections and storage.
HSPT	Hiringa Sundown Project Trust. The applicant of the EIS.
MW	MegaWatt – always reference the total output of the Wathagar solar farms in DC: • Wathagar Solar Farm Stage 1 8.65 MW • Wathagar Solar Farm Stage 2 27 MW
Customer	Purchaser of the GEGHA Project's hydrogen or ammonia once operational.
Project Assessment Area – or 'PAA'	This is the outer perimeter of land that has been subject to assessment as part of the Environmental Impact Assessment. Assessment of this broader corridor of land has enabled HSPT to evaluate the overall presence of values and to develop a detailed design that avoids or minimises impact on those values.
Project Disturbance Footprint	References the residual land that will be disturbed by the project following extensive survey of the PAA and application of the principles of avoidance and minimisation.
Residual risk	Remaining risk following the application of treatment or mitigation measures. Typically risk scenarios that hold residual risk require to be actively managed through construction, operation or decommissioning to ensure that the risk remains at an acceptable level.
Wathagar Bore	Water bore GW064216.1.1 – source of groundwater drawdown for the project to supplement water supply.
Wathagar Cotton Gin	Reference to the existing Cotton Gin adjacent to the GEGHA Project site.
Wathagar Dam	Existing dam which will provide a portion of the plant's proposed water source.
Wathagar Gin Entry	Use when referring to the existing point of entry and/ or exit from the Gwydir Highway to the Wathagar Gin.
Wathagar Solar Farm Stage 1	Reference to the existing operational Solar farm within Lot 2 DP 1315847.
Wathagar Solar Farm Stage 2	Reference to the proposed Solar Farm that forms part of the overall scope of the GEGHA Project. This development is subject to a separate development application through Moree Plains Shire Council (DA2025/6).

1.1 Form and Content of this Environmental Impact Statement

The Environmental Impact Statement (EIS) has been prepared in accordance with Part 4 of the EP&A Act and in response to the Secretary's Environmental Assessment Requirements (SEARs) received on the 21st June 2023 and amended on the 12th September 2024. The purpose of the EIS is to quantify and assess potential impacts that the construction and operation of the Project may have on the existing receiving environment.

This document addresses the form and content requirements listed in sections 190 and 192 of the *Environmental Planning and Assessment Regulation 2021*. The EIS has been prepared to be consistent with State Significant Development guidelines – preparing an environmental impact statement (NSW Government 2022).

All figures and mapping presented in the main body of this EIS are presented in full detail in Appendix D. If any of the definition or detail is at a scale that is unclear, please refer to Appendix D for a fully defined version.

1.2 The Proponent - Hiringa Sundown Project Trust (HSPT)

Proponent: Hiringa Sundown Project Trust

ABN: 43 785 996 586

Address: Greenhouse Tech Hub, Level 2, Salesforce Tower, 180 George Street, Sydney, NSW 2000

Subject Land: Lot 1 DP 1315847 (Parish of Wathagar); Lot 2 DP 1315847 (Parish of Wathagar); Lot 30 DP 1040936 (Parish of Wathagar); Lot 7300 DP 1161855 (Parish of Wathagar).

Lot 7300/1161855 was included in the Project Assessment Area but is removed from the Project's disturbance footprint.

Lot 2 DP 773266 was sub-divided on the 7th May 2025 to create Lot 1 DP 1315847 and Lot 2 DP 1315847.

Lot 2 DP 1315847 applies to the area encompassing the Wathagar Solar Farm Stage 1, proposed area for Wathagar Solar Farm Stage 2 and the GEGHA Plant. This parcel has an area of 31.48 ha and is wholly owned by Sundown Pastoral Co Pty Ltd The new address for this land parcel is 2912 Gwydir Highway, Moree, NSW 2400

Lot 1 DP 1315847 encompasses the rest of the land parcel occupied by the Wathagar gin and its yard. The GEGHA Project will have roading, pipeline connections, power connections, evaporation pond and fencing within this land parcel. This parcel has an area of 134 ha and is held by Sundown Pastoral Co Pty Ltd and Namoi Cotton as tenants in common in equal shares. The address for this land parcel is 2910 Gwydir Highway, Moree, NSW, 2400.

The physical location of subject land for the GEGHA Project has not changed. Any specialist report in this EIS referring to Lot 2 DP 773266 or 2910 Gwydir Highway, Moree, NSW 2400 should be read as relating to the new Lot 1 DP 1315847 and Lot 2 DP 1315847 or 2910 and 2912 Gwydir Highway, Moree, NSW, 2400.

The GEGHA Project is being delivered by the Hiringa Sundown Project Trust ('HSPT'). The HSPT is a joint venture between Sundown Pastoral Company and Hiringa Energy Limited, managed by Hiringa Energy Pty Ltd.

- Sundown Pastoral Company ('Sundown') is a privately owned Australian agricultural and pastoral company with a renowned reputation for innovative farming techniques, sustainable agricultural production methods and environmental stewardship since establishment in 1964.
- Hiringa Energy is a privately owned hydrogen company founded in New Zealand with a physical Australian presence, and a strategic focus on hydrogen solutions for hard-to-abate sectors. Since 2016, Hiringa has been developing low-carbon hydrogen production projects to supply industry, agriculture and transport, including utility-scale wind and solar to hydrogen and ammonia production.

Hiringa Energy Pty Ltd ('Hiringa' or 'HEPL') have been engaged to prepare all Planning, Design and Engineering in relation to the GEGHA Project. HEPL has dedicated discipline-specific employees who are experienced in the design, development, commissioning and operation of hydrogen and ammonia assets.

1.3 Project Background

Sundown Pastoral Company ('Sundown') created the 'Good Earth Cotton' brand from which the GEGHA Project derives its name. Good Earth Cotton relies upon modern regenerative farming practices to generate a climate positive product that is fully audited and able to be traced digitally and physically from ground to garment.

The concept of the GEGHA Project was generated by Sundown as a way further enhance the Good Earth Cotton brand whilst additionally offering a regionally available source of green fertiliser and fuel for other regional producers as carbon accounting in agriculture grows across a number of domestic and international markets.

Hiringa are industry experts in green hydrogen and ammonia development having planned, designed, constructed and commissioned Australasia's first zero-emission green hydrogen refuelling network. Hiringa were invited to join Sundown as joint venture partners to progress the GEGHA Project. Hiringa Sundown Project Trust ('HSPT') was formed and the joint venture were successful in obtaining a portion of State funding towards the Project via the NSW Hydrogen Hubs Initiative.

1.4 Project Objectives

The Good Earth Green Hydrogen and Ammonia ('GEGHA') Project's primary objective is to safely construct, operate and deliver low-carbon hydrogen and ammonia to Project customers using a plant capable of an annual production of up to 2,200 tonnes of hydrogen and up to 4,500 tonnes of Ammonia.

The Project represents a valuable opportunity to deliver the primary objective of demonstrating commercial, operational and technical feasibility of renewable-derived ammonia and hydrogen with the expectation that it can be more broadly adopted in NSW and Australia's agricultural regions.

The project has been sized and designed in consideration of the immediate demand from motivated cotton farmers, the immediate heavy transport market and the State grant capacity (partial funding will be provided by the NSW Government's 'hydrogen hub initiative').

The primary environmental objective is to utilise renewable feedstocks for the GEGHA Plant via solar energy generated adjacent to site and the beneficial reuse of the Wathagar Gin yard drainage dam as a primary water source supplemented by groundwater via an existing bore adjacent to the Plant site.

The GEGHA Project aims to deliver:

1. **Green energy:** The Project will enable its customers to access fuel and fertiliser derived entirely from renewable energy sources, providing a pathway to decarbonise agricultural production and transport supply chain.
2. **Local production:** Hydrogen and Ammonia will be produced, delivered and used in the region. The GEGHA Project will save thousands of kilometres of fuel and ammonia/urea transport to the region from Newcastle, Sydney and Brisbane.
3. **Security of supply:** The GEGHA Project is focused on agriculture and heavy goods transport in the region. The Project will provide certainty and security of supply, placing priority on agricultural customers with a product that will be decoupled from fossil fuel driven supply cycles and fluctuations in price.

Climate Change – drive to a low-emissions scenario

The NSW Government's NARCliM2.0 projections place average temperature increase predictions in the New England and North West region of between 1.3 degrees Celsius (°c) (low-emissions scenario) to 2.1°c (high-emissions scenario) by 2050.

Low carbon innovation and substitution is required across NSW and Australia to make a meaningful inroad into fossil fuel derived production inputs in Agriculture.

The GEGHA Project will demonstrate that green hydrogen and ammonia can be successfully produced and used in hard-to-abate sectors including agriculture, industrial manufacturing and heavy transport.

The GEGHA Project, and projects like it, will provide tangible progress in the to drive towards a low-emissions rural production sector.

Unlocking a Pathway for Regional Decarbonisation

Production of green hydrogen and fertiliser in the region will provide agricultural producers with a local source of fuel and fertiliser that will allow them to meet greenhouse gas reporting requirements or to substantiate a premium on their products through carbon transparency and traceability.

The GEGHA Project will establish a pathway towards eliminating agricultural sector reliance on imported, high-carbon fuels and fertilisers whilst bringing about greater supply chain stability and pricing certainty.

Ammonia (fertiliser) use averages ~50,000 tonnes per annum in NSW and Queensland (QLD) which is 100% derived from fossil fuels. The GEGHA Project production would account for 9% of this annual usage. Beyond this immediate displacement, the GEGHA Project will undoubtedly have a catalytic effect on further displacement of fossil fuel derived ammonia across the agricultural sector.

Granular urea fertiliser usage averages 1.9 million tonnes per annum in QLD and NSW which is 100% fossil fuel derived and imported. There is excellent potential to displace the use of granular urea in favour of green ammonia over time.

The GEGHA project concept is scalable and repeatable, with feasibility underway for 50 megawatt (MW) electrolysis / 20,000 tonne per annum projects able to serve demand more broadly in agricultural valleys at low distribution cost. These would be geographically separated from the GEGHA Project and would form an entirely separate future development.

Reducing transportation need and fossil fuel reliance

In addition to abating source emissions on-farm, there would be an immediate reduction in kilometres travelled by loaded Dangerous Goods vehicles on NSW roads with a cumulative saving of at least 64,246 kilometre (km) per annum.

Broader regional decarbonisation can be achieved by displacing high-carbon fuels and feedstock in industrial manufacturing, and through heavy freight refuelling – including the logistics of moving agricultural produce to port.

The opportunity to abate diesel in the transportation industry has now arrived in Australia. Dual fuel hydrogen conversions of HGVs deliver 40% emissions savings whilst the manufacture of 100% hydrogen fuelled HGVs and plant has been established and will continue to grow. The GEGHA Project can fuel this transition in the Moree Plains region with a focus on the transportation of agricultural produce.

The following strategies have been developed to avoid and minimise environmental impact:

1. Simple, suitable site selection

Location of the GEGHA Project is highly suitable for a development of this type (refer s4.5). Site selection has been thoroughly evaluated during the preparation of this EIS to validate that suitability. Proximity to power and water feedstocks and primary product customer coupled with flood protection and a highly disturbed project footprint contrive to minimise project impacts.

2. Efficient design; Adaptive learning

Design has been optimised to derive the most efficient production of green hydrogen and ammonia. Modular design minimises construction timeframe whilst lessons learned from Hiringa's New Zealand Hydrogen refuelling station construction and commissioning have been incorporated into system design.

3. Adoption of the hierarchy of control

Where environmental values or credible risks with the potential to negatively impact the environment have been identified, the hierarchy of control has been applied. The principles of avoidance and minimisation being adopted to minimise the Project disturbance footprint with design controls being adopted to minimise duration and extent of impact. Finally, administrative controls (management plans) will be adopted to provide the expected standards and

behaviours that will be imposed during the construction and operation of the GEGHA Project. Level of compliance achieved through implementation of the administrative controls will be actively assessed and reported by HSPT.

4. Extensive consultation

Consultation has been broad and continuous through the project planning process. By consulting with the local community, adjacent landholders, elected members and regulatory stakeholders, it has afforded HSPT the opportunity to identify and analyse environmental aspects thoroughly in the preparation of this EIS. Consultation is discussed fully in chapter 5.

5. Project Components

The GEGHA Project consists of the construction and operation of a green hydrogen and green ammonia production and storage facility. The proposed development can be broken into four elements:

- Water treatment and electrolysis
- Ammonia plant
- Hydrogen and Ammonia Storage
- Ancillary infrastructure (roads, water pipelines, produced water evaporation pond, control room, electrical connections, piping connections and site fencing/ security).

1.5 Regional Overview

Building on the NSW Government's Hydrogen Strategy – *Making NSW a global hydrogen superpower*, the GEGHA Project proposes to decarbonise the region's transport and agricultural sector via production of green hydrogen for use in refuelling of hydrogen vehicles and ammonia for use in fertiliser production.

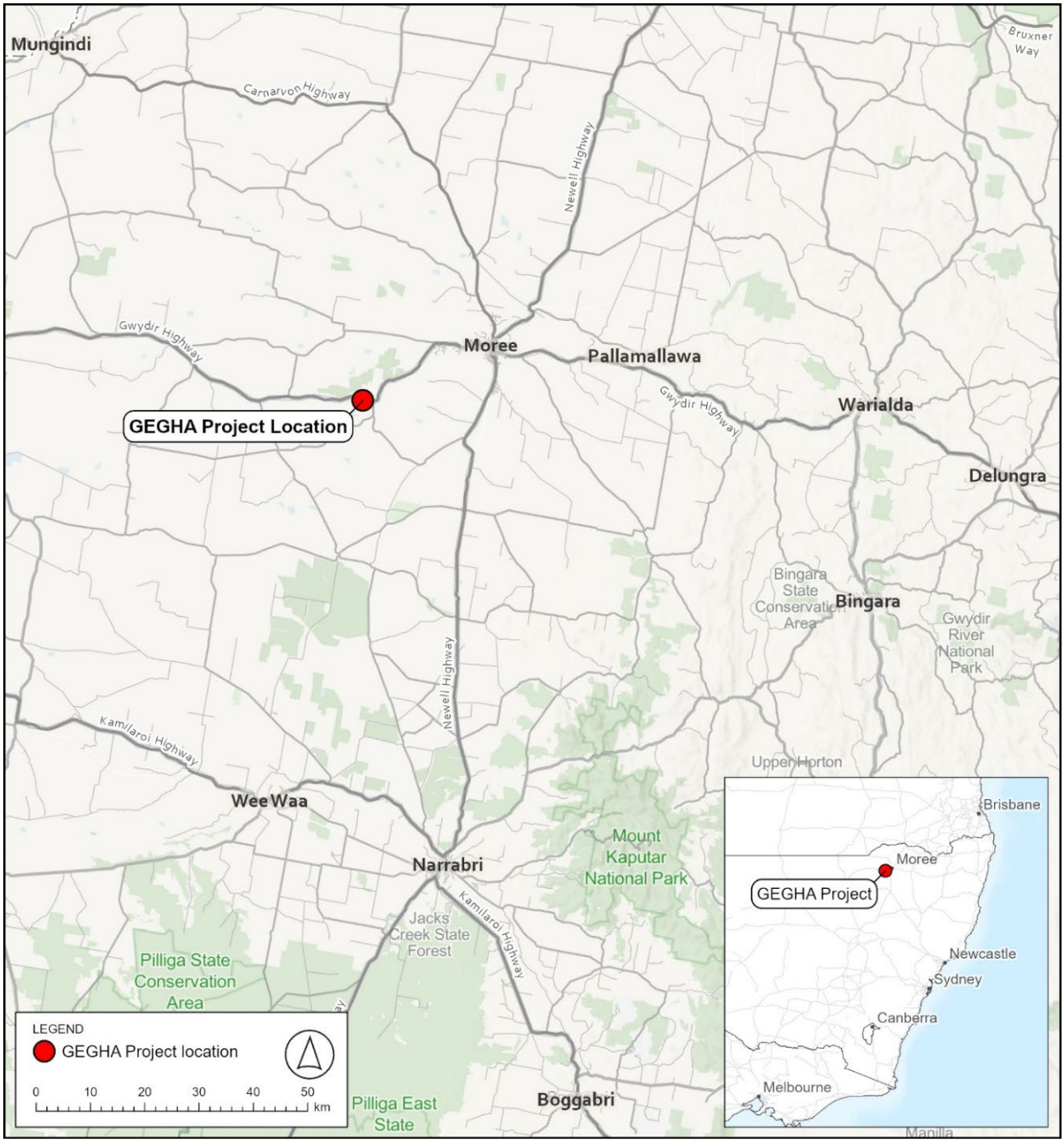
The GEGHA Project is located within the parish of Wathagar, in the Moree Plains Shire, approximately 640 km north west of Sydney, 511 km south-west of Brisbane and approximately 33 km south-west of Moree within the Gwydir Valley cotton growing region (Figure 1.1).

Agriculture is the main industry in the Moree Plains Shire Council Local Government Area (LGA). The Gwydir Valley is one of the key regions for Australian fibre production, with cotton growing perfectly suited to the soil, climate and available water resources. There is an average of 79,649 ha of dryland cotton (63 % of the NSW production) and a further 74,570 ha of irrigated cotton (40 % of NSW) planted when irrigation water is available with a Gross Regional Product of more than $750 million. This makes the Moree Plains Regional Council one of the most agriculturally productive local government areas in Australia.

The Shire is also home to manufacturing and industry in support of the agricultural economy as well as regional services including supply chain, health and educational facilities. Moree township has a population of 7,070 (2021 census) and has been earmarked as a priority growth area (Special Activation Precincts or 'SAPs') by the NSW Government, aiming to establish and enhance a new business precinct and intermodal hub specialising in high-value agriculture, logistics and food processing.

Moree is a confluence point for Heavy Goods Vehicle transport being positioned on the Gwydir, Carnarvon and Newell Highways. Consequently, Moree has the potential to be a key strategic hydrogen demand centre for agricultural and transport applications, creating new opportunities for agribusiness, logistics and food processing industries.

Figure 1.1 - Regional overview of Project location



1.6 Related Development

1.6.1 Wathagar Solar Farm Stage 2

The Wathagar Solar Farm Stage 2 (27MW Alternating Current - AC) with a 30MWh Battery Energy Storage System (BESS) is planned to be constructed immediately adjacent to the GEGHA Plant. The solar farm is being assessed by Moree Plains Shire Council under a separate development application process that was lodged with Moree Plains Shire Council on the 27th February, 2025 (DA2025/6). It is proposed that the Wathagar Solar Farm Stage 2 will be operated in conjunction with the Project.

The decision to consent Stage 2 independently of the GEGHA Plant was taken following consultation with Department of Planning and Environment (DPE), now Department of Planning, Housing and Infrastructure (DPHI), at the outset of project planning.

It is planned that construction of Stage 2 will commence in advance of the GEGHA Project as described in this EIS. Cumulative impact of this development, the continued operation of Wathagar Solar Farm Stage 1 and the continued operation of the Wathagar Cotton Gin have been considered where appropriate throughout this document.

1.6.2 Upgrade of existing access off the Gwydir Highway

The Project will utilise the existing entry/ exit ('access') to the Wathagar Gin off the Gwydir highway during construction and operation subject to a basic left / basic right turn upgrade to maintain function and safety during use for both solar farm and GEGHA Plant construction and operation.

Upgrade of the access is subject to assessment as part of the Wathagar Solar Farm Stage 2 Development Application (Moree Plains Shire Council reference DA2025/6) as construction of the solar farm is planned to commence prior to that of the GEGHA Project (the subject of this EIS).

Beyond development consent, the road upgrade would be subject to a Crown licence issued under the Crown Land Management Act 2016 and a Works Authorisation Deed issued under the Roads Act, 1993. HSPT would also be required to enter into a Works Authorisation Deed with Transport for NSW (TfNSW) to enable the works to proceed.

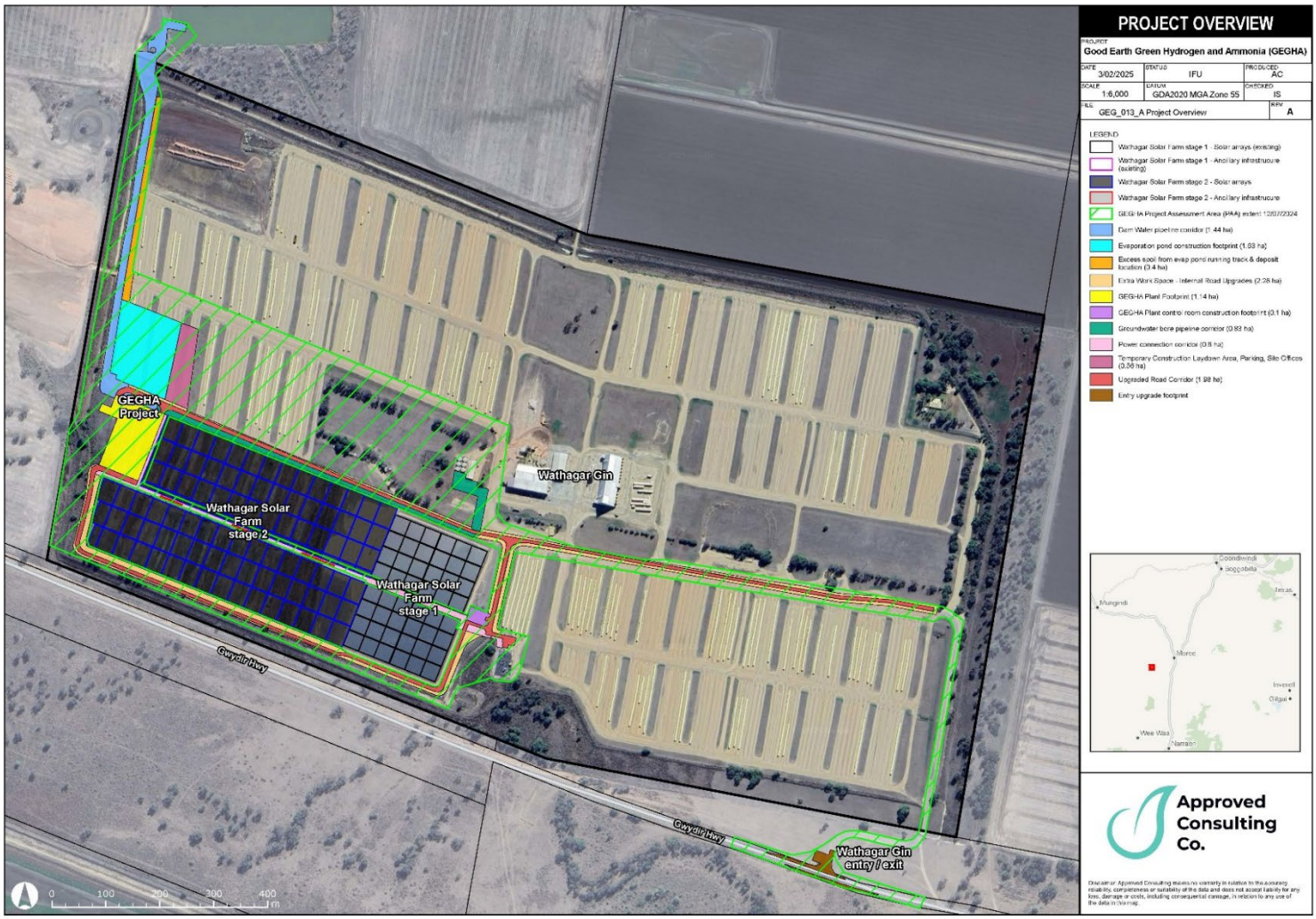
The application of Native title would be evaluated as part of the Crown licencing process.

There are four incomplete Aboriginal land claims affecting this land parcel. HSPT propose to maintain a watching brief on the progress and outcomes of these claims whilst maintaining a lawful access via the Gin entry.

Alternative construction access has been nominated should work on the GEGHA Project require to commence in advance of the consenting and construction of the upgrade.

Overview map showing the extent of the GEGHA Project, Wathagar Solar Farm Stage 1, Wathagar Solar Farm Stage 2 and proximity to the Wathagar Gin is provided in Figure 1.2.

Figure 1.2 - Overview of GEGHA Project, Wathagar Gin, Wathagar Solar Farm Stage 1 & 2 and Gin entry upgrade footprint



2 STRATEGIC CONTEXT

2.1 Project Justification

The NSW Hydrogen Strategy recognises the potential for green hydrogen to be implemented in regional areas, which will enable the decarbonisation of hard-to-abate sectors like agriculture and transport.

To overcome traditional adoption and participation barriers, these regional industries require a unique, fit-for purpose solution which currently does not exist.

The GEGHA Project represents a valuable opportunity to demonstrate commercial, operational, and technical feasibility of rapid, wide-spread hydrogen adoption in NSW's regions.

This will be achieved by demonstrating feasibility of the GEGHA operating model, which comprises all assets and infrastructure to enable place-based energy capture and generation, as well as hydrogen and ammonia production, storage, and end use.

Whilst serving as an invaluable precedent which demonstrates a commercial solution to overcome existing barriers preventing regional industry adoption, the commercial-scale GEGHA Project will deliver significant economic, environmental, and social benefits to one of NSW's key agricultural hubs.

The GEGHA Project is designed to co-locate renewable energy production with both the manufacture of green hydrogen-based substitutes for carbon-intensive fossil-derived alternatives ('grey' fertiliser, diesel and Liquefied Petroleum Gas) and the demand for these products on the Sundown acreage and the nearby proposed Moree Hydrogen Refuelling Station ('HRS').

The project provides offtake to support investment, and sector-coupling of different markets for green hydrogen and its derivatives such as green ammonia allows for larger scale, more efficient production costs for all products.

The project benefits from locating energy supply, manufacturing of hydrogen and ammonia, and substantial end-user demand in one location.

2.2 Project Need

The GEGHA Project is needed for three key reasons:

1. **Green energy:** The Project will enable its customers to access fuel and fertiliser derived entirely from renewable energy sources, providing a pathway to decarbonise agricultural production and transport supply chain.
2. **Local production:** Hydrogen and Ammonia will be produced, delivered and used in the region. The GEGHA Project will save thousands of kilometres of fuel and ammonia/urea transport to the region from Newcastle, Sydney and Brisbane.
3. **Security of supply:** The GEGHA Project is focused on agriculture and heavy goods transport in the region. The Project will provide certainty and security of supply, placing priority on agricultural customers with a product that will be decoupled from fossil fuel driven supply cycles and fluctuations in price.

2.3 Key Benefits

Immediate Impact of the GEGHA Project

The GEGHA project will demonstrate the potential for low-carbon hydrogen and ammonia adoption in regional hard-to-abate sectors including agriculture, industrial manufacturing and heavy transport.

In addition to on-farm hydrogen and ammonia use, hydrogen can support regional decarbonisation more broadly by displacing high-carbon fuels and feedstock in industrial manufacturing, and through heavy freight refuelling – including the logistics of moving agricultural produce to port.

There would be an immediate reduction in kilometres travelled by loaded Dangerous Goods vehicles on NSW roads with a cumulative saving growing by at least 64,246km per annum.

Unlocking a Pathway for Regional Decarbonisation

The GEGHA project concept is scalable and repeatable, with feasibility underway for 50 MW electrolysis / 20,000 tonne p.a. projects able to serve demand more broadly in agricultural valleys at low distribution cost. These would be geographically separated from the GEGHA Project and would form an entirely separate future development.

The two locations being investigated for larger-scale projects include Moree and the Riverina in southern NSW. These locations possess a high density of irrigated cotton growing operations, as well as other agricultural commodities likely to benefit from local low-carbon fuel and fertiliser supply.

Both the GEGHA project and future projects will establish a pathway towards eliminating agricultural sector reliance on high-carbon fuels and fertilisers whilst bringing about greater supply chain stability and pricing certainty.

2.4 Context for Development

2.4.1 Alignment with decarbonisation and emissions reduction policy

Development of the GEGHA Project is strategically aligned with National, State and Local policy on hydrogen development and energy decarbonisation. This section describes the most prominent strategic government guidance on hydrogen and emissions reduction and considers how GEGHA will reflect the intent and vision of these documents.

2.4.2 Australia’s National Hydrogen Strategy 2024

Australia's National Hydrogen Strategy aims to establish the country as a global leader in clean hydrogen production and export, leveraging its renewable energy resources to drive economic growth and decarbonisation. The Strategy sets a clear vision for a clean, innovative, safe and competitive hydrogen industry. It outlines Australia’s clean hydrogen potential, considers future opportunity for scale and industry growth and details nationally coordinated actions involving governments, industry and communities.

GEGHA represents an opportunity to embody the vision described by the Strategy, contributing to the targets for production of hydrogen for use as a chemical feedstock, in heavy transport and beyond.

2.4.3 Hydrogen Production Tax Incentive (HPTI)

The Hydrogen Production Tax aims to accelerate investment in renewable hydrogen production by offering a refundable tax offset. This incentive is designed to encourage the development of a sustainable hydrogen industry, supporting economic growth and helping to achieve net-zero emissions targets.

On 11 February 2025 the Australian Senate passed the Future Made in Australia (Production Tax Credits and Other Measures) Bill 2024, establishing the HPTI.

The HPTI will be delivered through Australia’s tax system as a refundable tax offset. The HPTI will provide the GEGHA Project with $2 per kilogram of renewable hydrogen for a 10-year period, which can be taken between 1 July 2027 and 30 June 2040.

By providing financial support for hydrogen projects, the government hopes to position Australia as a global leader in clean hydrogen production and export.

2.4.4 NSW Climate Change Policy Framework 2016

This framework aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate, current and emerging international and national policy settings and actions to address climate change. The

Project is consistent with the framework's Aspirational Objectives and Policy Directions by facilitating the development of renewable energy and hydrogen production.

2.4.5 NSW Hydrogen Strategy 2021

The NSW Hydrogen Strategy provides a comprehensive vision for the establishment and rapid scaling of hydrogen in NSW supported by clear policy settings and incentivisation of the industry. The strategy is built on three pillars:

- Enable Industry Development
- Lay Industry Foundations
- Drive Rapid Scale

Each pillar is reflected in the GEGHA project. Funding will enable the hydrogen industry to develop in Australia's 4th largest agricultural economy in proximity to Moree, a regional transport hub with a Special Activation Precinct aligned for future hydrogen-driven development. Demand for future up-scale and replication in other regions is apparent.

2.4.6 NSW Renewable Energy Planning Framework

The NSW Renewable Energy Planning Framework aims to facilitate the transition to renewable energy in New South Wales, with a focus on achieving net zero emissions by 2050. It includes guidelines for wind, solar, and hydrogen energy projects, ensuring investment certainty and community benefits.

Specifically for hydrogen, the framework supports the NSW Hydrogen Strategy, providing guidance for industry, regulators, and communities to develop the hydrogen sector. The goal is to create a clean, affordable, and reliable energy supply while fostering economic growth and reducing greenhouse gas emissions.

2.4.7 NSW Hydrogen Guideline

The NSW Hydrogen Guideline aims to support the development of a hydrogen industry in New South Wales by providing a clear framework for planning and regulatory processes.

It outlines the necessary steps for safe and sustainable hydrogen production, distribution, and use, ensuring that hydrogen projects align with environmental and community standards.

The guideline also facilitates the implementation of the NSW Hydrogen Strategy, which seeks to establish NSW as a leader in the hydrogen economy, promoting economic growth and reducing greenhouse gas emissions.

2.4.8 NSW Net Zero Plan Stage 1 2020-2030

NSW Net Zero Plan Stage 1 2020-2030 The Plan outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions whilst taking practical steps towards reaching zero emissions by 2050. The Project would assist the NSW Government in supporting:

Net Zero Priority 1

Drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living.

Net Zero Priority 2

Empower consumers and business to make sustainable choices.

Net Zero Priority 3

Invest in the next wave of emissions reduction innovation to ensure economic prosperity from decarbonisation beyond 2030.

2.4.9 NSW Future Transport Strategy

The GEGHA Project would produce up to 2,200 tonnes of hydrogen per annum which aligns with the NSW Future Transport Strategy's aim of transitioning to net zero greenhouse gas emissions, particularly within freight networks and supply chains.

The GEGHA Project provides the perfect platform to decarbonise the traditionally hard to abate heavy transport sector and doing it regionally places a focus on the agricultural industry, particularly in support of local product transportation and connection of product to port and market.

2.4.10 Alignment with NSW Hydrogen Hubs Initiative

The GEGHA project has strong alignment to the three key objectives of the NSW Hydrogen Hubs initiative.

Table 2.1 - GEGHA alignment with NSW Hydrogen Hub Initiative

NSW Hydrogen Hub Initiative Objective	GEGHA Project Alignment with Objectives
Objective 1: Establishing hubs that demonstrate 'end to end' green hydrogen supply chains, including production, distribution and use	GEGHA will support both Sundown's site operations and the Moree SAP to service a 40-50 km 'hub-and-spoke' distribution envelope. This will position the Moree region as a strategic hydrogen refuelling location, furthering regional connectivity and vital paddock-to-port logistics via key freight transport corridors; the Gwydir Highway, Carnarvon Highway and Newell Highway (the most critical transport corridor in NSW).
Objective 2: Activating new domestic markets, supporting new supply chains and testing commercial models for hydrogen in key sectors such as heavy transport and industrial	GEGHA via the increased production of hydrogen (2,200 tonnes per annum – 'tpa') and ammonia (4,500 tpa) is setting the precedent for commercial application of offtakes that will activate new markets and bolster supply chains. Supporting the viability of hydrogen to replace diesel in agriculture on-farm diesel equipment, substitute urea for ammonia in fertilisers and transition to sustainable cost-competitive transport.
Objective 3: Building foundational knowledge, skills and supply chains that accelerate the development of the hydrogen industry in NSW, enabling the state to achieve its 50% emissions reduction target by 2030 while capturing long term opportunities from the hydrogen export market.	GEGHA's operation will generate 26 Full Time Equivalents (FTEs) annually in NSW, comprising 10.5 direct FTEs and 15.5 indirect FTEs. FTEs will be created in regional NSW, including 9.3 direct FTEs. Hiringa's Expansion Plan forecasts capacity support for 800 heavy hydrogen fuel cell electric vehicles each day in NSW. GEGHA will play a key role in supporting the NSW Government target of placing 1,800 hydrogen heavy vehicles on the road by 2030. The emissions reduction that will be achieved by replacing urea fertiliser with green ammonia and either substituting or eliminating the need for burning diesel fuel in mobile equipment will deliver an average of 8,908 tonnes of CO_2-eq abatement in each year.

2.4.11 New England North West Regional Plan 2041

The New England North West Regional Plan is a 20-year strategic land use planning framework aiming to enhance the region's assets and plan for a sustainable future.

The GEGHA Project aligns strongly with a number of the Plan's strategic objectives, particularly by supporting the transition to a low carbon economy, promoting productive security, creating new skilled job opportunities and attracting investment to the area thereby enhancing the overall prosperity and resilience of the New England and North West Region.

The GEGHA Project will not only enhance economic opportunity but will also provide resilience within the agricultural sector in the Gwydir and surrounding valleys offering a green, locally manufactured fuel and fertiliser.

Table 2.2 - GEGHA alignment with New England North West Regional Plan 2041

New England North West Regional Plan 2041	GEGHA Project Alignment with Objectives
Objective 2: Protect the viability and integrity of rural land.	Developing in a redundant portion of an operational Gin means that the GEGHA Project would not impact on any actively productive agricultural land whilst enhancing the broader viability of cotton and cereal production through the manufacture of green hydrogen and ammonia.
Objective 3: Expand agribusiness and food processing sectors	The GEGHA Project will provide green fuel and fertiliser to support and expand regional agri-business through certainty of supply of a low emission feedstock.
Objective 8: Adapt to climate change and natural hazards and increase climate resilience	The GEGHA Project will support the reduction to net zero agricultural production for its customers by offering low emission hydrogen and ammonia.
Objective 9: Lead renewable energy technology and investment.	The GEGHA Project will be the largest scale renewable hydrogen and ammonia production plant in Eastern Australia. There is an excellent opportunity to leverage the success of the GEGHA Project to build the business case for future, larger plants within the region and more broadly within NSW.
Objective 10: Support a circular economy	The GEGHA Project proposes to utilise the principal of the circular economy by utilising drainage water runoff from the Wathagar Gin as a primary water supply and generating power from the adjacent Wathagar solar farm.
Objective 22: Utilise emerging transport technology	The GEGHA Project will provide a regional supply of hydrogen that can be utilised as a transportation fuel, particularly for HGV transportation. The manufacture of hydrogen in the region lowers the barrier to entry of HGV owner/operators to transition to hydrogen fuelled vehicles or to undergo hybrid conversions to reduce transport based emissions.

2.4.12 Moree Special Activation Precinct – Master Plan 2022

The Moree Special Activation Precinct (SAP) intends to attract and grow business and stimulate the local economy through adoption of a master plan that will ultimately provide lower risk and higher planning certainty to new businesses who choose to establish within the SAP with provision of infrastructure to support the growth of regional industry.

The GEGHA Project will complement the development of the agri-business focused SAP and the broader green energy credentials of the Moree Plains Shire Council, providing a feedstock option for manufacturing and processing industries as well as heavy transport conversion to hydrogen fuel cell technology.

Specifically, the GEGHA Project compliments the SAP's focus areas of *Building off Agriculture*, *Infrastructure, Energy* and *Innovation.* It also compliments the SAP's opportunities to stem population decline, broaden energy opportunity and expand environmental opportunity.

It is proposed that the hydrogen generated from the GEGHA Project can be utilised within the Moree SAP to decarbonise fuel use and provide a local source of green hydrogen to broaden green energy transition.

2.4.13 Moree Plains Shire Growth Management Strategy 2009

The GEGHA Project is generally consistent with the Moree Plains Shire Growth Management Strategy 2009. Operationally, the project intends to have seven full time staff based within the Moree Plains Region and will utilise regionally based maintenance contractors and operational support businesses. The Project will provide a platform for creation of skilled jobs within the Moree Plains Shire leading to retention of professionals and their families which will in turn contribute proportionately to regional economic stability. A full economic analysis has been undertaken and is presented in Appendix B.1.

2.4.14 Hydrogen Refuelling Station Network

Hiringa have established the Australasia's first zero-emission green hydrogen refuelling network in New Zealand in 2024 with the commissioning of three commercial scale hydrogen refuelling stations with a further fourth station being brought online in 2025.

Hiringa's Australian hydrogen refuelling network strategy incorporates the need to decarbonise the agricultural sector's product pathways to port. This places focus on key arterial heavy goods vehicle transport routes in NSW such as the Newell Highway.

Over the coming years, Hiringa will focus on the feasibility of establishing a hydrogen refuelling network in NSW which will include assessment of refuelling stations at strategic locations such as the Moree Special Activation Precinct which has provision for hydrogen refuelling.

Hydrogen refuelling stations located within a ~100km radius of the GEGHA Project would hold an advantage by having access to hydrogen to directly supply, or augment production at the new facility. Any new hydrogen refuelling station would be subject to separate development application process.

2.5 Key Features of Site that could affect or be affected

2.5.1 Existing Land Use and Community

Land use in proximity to the subject land is agricultural dominated by large landholdings focused on cotton and cereal production with legume break crops. In addition to the Wathagar Gin, there are an additional two cotton Gins in the locality which reflects the regional focus on cotton production.

The Wathagar Gin has been in operation since 1986 and the receiving environment and surrounding road users having familiarity with the agri-industrial processing of cotton and the accompanying noise, light and transport movements that accompany a relatively large scale seasonal operation.

The parish of Wathagar and its surrounds have transitioned from smaller rural communities to consolidated landholdings gradually over the last 40-50 years to the point where residences are more widespread and community structure diminished. Residences are almost exclusively inhabited by landholders and agricultural workers who rely on Moree for local services, education, healthcare and recreation.

There are three residences within a 5km radius of the subject land which are summarised in table 2.3.

Table 2.3 - Residences within 5km radius

Receiver	Distance (km)	
	GEGHA Plant boundary	Disturbance Footprint
R1	4.1	3.2
R2	4.3	2.9
R3	4.6	3.1

The proposed GEGHA Project location would assimilate with surrounding land use as agri-industrial hydrogen and ammonia production facility.

2.5.2 Natural or Built Features

The closest natural features to the subject land are the Mehi River corridor (1.3km south), the Gwydir River corridor (~15km, north) and the Gwydir wetlands State Conservation Area (~30km north west). Beyond these features, there are no other notable natural features.

The adjacent Wathagar Gin represents a notable built feature in direct proximity (~650m from the plant). The buildings comprise of the operational Gin itself, a cotton storage shed and cotton seed shed. There is an office and weighbridge ~1.3km away from the proposed GEGHA Plant and a Gin manager's residence ~1.4km away.

The Wathagar Solar Farm Stage 1 is ~0.5km from the GEGHA plant boundary and would be located between the GEGHA Plant and the control room. Electrical connections are proposed to run through the central corridor of the Solar Farm from the GEGHA Plant to the Control room. The solar farm will provide a portion of the operational power requirements of the GEGHA Electrolyser and Ammonia plant.

The Gwydir highway runs to the south the of the subject land which provides the Project with immediate access to a high quality arterial route that is well suited to Heavy Goods Vehicle transportation. This is an advantage for both construction for the transportation of plant, equipment and materials and for operations for off-farm delivery of anhydrous ammonia and hydrogen which would both be considered Dangerous Goods loads. The advantages of the Gwydir highway corridor are discussed further in the Traffic and Transport chapter (Appendix B.2).

2.5.3 Risks or hazards

The site is a robust, resilient location to construct and operate a hydrogen and ammonia plant. The region is subject to flooding cycles whilst the project disturbance footprint is also mapped as 'bushfire prone land' within the Moree Plains Shire Council Local Environmental Plan.

The subject land is protected from flooding by a levee bank installed under Flood Work Approval 90FW833508 (Appendix B.3). The levee was assessed in 2022 as part of a report that analysed the levee height in relation to a 1% annual exceedance probability flood event. The report found that there were several locations at or below the 1% AEP height with recommendations provided to elevate the height in those areas. The GEGHA Plant would be designed to be above the 1% AEP flood level. This design consideration coupled with the presence of the flood levee provides a robust flood defence. Flood risk is considered further in the Soil and Water assessment (Appendix B.3).

Provided sufficient asset protection zones of at least 50m are installed around the plant and control room, bush fire risk would be substantially mitigated. Bush fire risk has been assessed fully in the Project Bush Fire Assessment Report (Appendix B.4).

Further credible risks or hazards generated by the construction and operation of the GEGHA Project have been considered in the Project Risk Assessment (Appendix B.8) and in chapter 6.

2.6 Cumulative Impact – Other developments

Project Cumulative impact has been assessed in each individual chapter focussed on environmental aspects. There are four categories of credible potential cumulative impacts that are summarised in Table 2.4. It is not expected that the GEGHA Project would generate any cumulative impacts that would be considered to exceed the permitted or accepted criteria.

Table 2.4 - Summary of Credible Potential Cumulative Impacts

Potential Cumulative Impact Category	Description	Justification
Accommodation	There is potential for accommodation in Moree to be placed under strain with multiple projects requiring accommodation when coupled with the existing demand generated by tourism and passing business/trade. The $105million Moree Hospital upgrade received planning consent in January 2025 and is undergoing detailed design currently. Besix Watpac have been selected to construct the upgrade and are due to commence in 2025. Inland Rail – Narrabri to North Star phase 2 is also under planning. This is a 15km section of rail running from the upgraded section just south of the Mehi River to the branching of the Weemelah line to the north of Moree. This stage has not yet obtained full funding.	Hiringa estimate a construction peak of 50 personnel on site for GEGHA which is 6.25% of the available bed capacity in Moree's accommodation sector. This fits comfortably within Moree's vacancy rate throughout the year. Hiringa undertake to make contact with Besix Watpac to understand their mobilisation plan and to ensure that collectively, both projects do not encumber Moree's accommodation options. Hiringa also commit to make contact with Inland Rail to ensure awareness of Project timing and accommodation strategy.
Traffic and Transport	Potential cumulative impact 1: The GEGHA Project may have cumulative impact on traffic generated by this and other projects in the region including the Moree Hospital upgrade and Inland Rail Narrabri to North Star phase 2.	Any interaction between these projects would be over 30km from site and would be limited to a negligible increase in road traffic and transportation that would fall well within the capacity of the Newell Highway and the Gwydir Highway road networks.
	Potential cumulative impact 2: There is potential to create an operational impact from additional trucks delivering hydrogen and ammonia off site.	Operationally, the GEGHA Project has a predicted traffic generation of up to 5 light vehicles per day and up to 12 heavy vehicles per day. This is within the capacity of both the Gin entry/exit and the Gwydir Highway. It is not expected to present any cumulative impacts on existing operation of the Gin or the Gwydir highway. Overall, the GEGHA Project will deliver a net reduction in both kms travelled by dangerous goods loads and less trucks on the road. The GEGHA Project does not intend to create a new market for its products but instead to displace ammonia, urea and diesel that is transported into the region currently from Brisbane, Newcastle and Sydney. 1,700 tonnes of anhydrous ammonia that would otherwise have been transported into site from Newcastle is going to be utilised directly by Sundown Pastoral Co without any public road transportation. This is equivalent to 108 long distance truck movements per annum. The project has been estimated to save 64,246km of hazardous goods movement annually with a further 64,246km of return empty load. This equates to over 40,000litres of diesel saved per annum in transport alone.

Construction Timing	The GEGHA Project construction may overlap with Wathagar Solar Farm Stage 2 and the operation of the Wathagar Gin.	It is expected that the Wathagar Solar Farm Stage 2 will be in testing and commissioning phase when construction commences on the GEGHA Project. Solar panels, ancillary supports and batteries will be delivered in the early phase of construction commencement, leaving a maximum of up to two heavy vehicles and 12 light vehicles would be expected in the morning and evening peak hours which is manageable when combined with the GEGHA Project expected volumes and Gwydir highway capacity. The Gin would not be operational until March/April 2026, allowing the enabling works and civil works to be completed whilst out of ginning season. When in operation, volumes are predicted to be within the capacity of both the junction and the Gwydir highway.
Groundwater	The GEGHA Project will require to utilise groundwater in times of low recharge of the drainage dam. Drawing groundwater may create a cumulative impact on the local aquifer which could impact on other water users/ development in the region.	Groundwater drawdown assessment has been completed as part of this EIS and whilst the intended use of groundwater would be as a supplementary supply option, the model reflects the impact that a 100% drawdown scenario for the 25 year design life of the plant. Given that groundwater would only be drawn on where the is low or no surface water recharge into the drainage dam, it is not expected to create a cumulative impact that would materially impact other water users. It is also important to note that groundwater would be licenced and the required volume would be purchased from an existing entitlement within the Lower Mehi Water Source, meaning that any water used by HSPT would be drawn from an existing allocation and would not represent an additional cumulative impact to the target aquifer.

2.7 Site Selection and Suitability

2.7.1 Site Suitability – Key Selection Parameters

The GEGHA Project is located just off the Gwydir Highway adjacent to Sundown Pastoral's 'Keytah' property. The land forms part of the operational yard of the Wathagar Cotton Gin, owned as tenants in common with equal share between Sundown Pastoral Co. and Namoi Cotton. HSPT has received agreement from both Sundown Pastoral Co. and Namoi Cotton to construct and operate the GEGHA Project on the Subject land.

Location of the GEGHA Plant and storage has been made by optimising the following key selection parameters:

1. **Permissibility of the development.** The GEGHA Project is a permissible development, subject to consent, within the Moree Plains Local Environmental Plan 2011 and State Environmental Planning Policy (Planning Systems) 2021. Land is zoned RU1 – Rural Production.
2. **Proximity to existing infrastructure:**
    a. The Project site is in close proximity to the Wathagar Cotton Gin (an existing agri-industrial land use) as well as the power and water sources required for the plant's operation.
    b. Wathagar Solar Farm Stage 1 is on site and operational. The Project proposes to utilise excess power generated by this asset as a supply to the GEGHA Plant.
    c. An existing sub-station on site will provide an easy point of connection to enable supplementary power to be drawn from the grid for use in the GEGHA Plant.
    d. Access to the Gin is provided directly to the Gwydir Highway, an established heavy goods vehicle route with links to the broader State Highway network.

The sealed access to the Gin requires an upgrade which is proposed as part of the adjacent Wathagar Solar Farm Stage 2 development. An alternative access for construction vehicles is also proposed should the access be unsuitable for use at the outset of construction works.

e. Existing internal roads exist that link the plant location to the rest of the Keytah property.

3. **Proximity to Feedstock.**
    a. The plant location is equidistant from the Wathagar drainage dam (primary water source) and the Wathagar bore (proposed supplementary water source).
    b. The Wathagar Solar Farm Stage 2 will be constructed immediately adjacent to the GEGHA Plant, providing the primary power supply to the Project.
4. **Proximity to end user.**
    a. Sundown Pastoral Co. will take up to 4,500 tonnes of anhydrous ammonia per annum during the plant's operation. At least 1,700 tonnes of anhydrous ammonia will be utilised on the Keytah property with no need to utilise off farm roads or infrastructure to transport the product to its end use location.
    b. Site is within 40km of the Moree Special Activation Precinct which has provision for hydrogen refuelling, a future target market.
    c. Having the primary customer of ammonia directly adjacent to the Plant site coupled with an assumption that remaining customer would be located within a 100km radius of site would save 64,246km of dangerous goods transportation on NSW roads per annum with a further 64,246km saved on empty return loads. It would also save over 40,000litres of diesel per annum
5. **Largely cleared site.** The area where the main plant and equipment will be constructed is flat, largely cleared and has previously been used for waste cotton storage.
6. **Neutral impact to Productive land.** Land used to develop the plant is displacing an area of the operating Cotton Gin. The impact to agriculturally productive land use is neutral with an added indirect benefit of having proximity to green fertiliser production.
7. **Remote from off-farm receptors.** The nearest off-farm dwelling is approximately 3.9km away from the GEGHA Plant.
8. **Existing flood protection.** All above ground buildings, plant and equipment will be fully contained within the Wathagar Gin flood protection levee.
9. **Visual screening.** The flood protection levee creates a visual screening barrier from the adjacent Gwydir highway. There are no residences owned by 3rd parties with a direct line of sight to the GEGHA Plant.
10. **Existing local amenity impact.** Seasonal cotton ginning generates an existing source of impact to local amenity (air, noise, visual), trafficable movement of Gin vehicles and HGVs and generation of site run-off during rainfall events.
11. **Existing Site Drainage and Control of run-off.** The site is already encompassed by a gravity fed site drainage that leads to two release points into an existing drainage dam (the Project's primary water source). The release points have flood gates that can be opened or closed to retain water or prevent inflow during flood events.

2.7.2 Analysis of feasible alternatives

'Do Nothing' Alternative

In considering the validity of GEGHA, it is always valid to consider a 'do nothing' scenario. If conditions were to remain unchanged:

- uncertainty associated with a volatile, centralised, fossil fuel centric fertiliser market would remain.
- reliance on remotely manufactured, fossil fuel derived fuel and fertiliser would remain.
- the fourth largest agricultural economy in Australia would remain without a pathway to decarbonisation of its production and logistics network.
- the opportunity to establish a regional source of hydrogen production to compliment the development of the Moree Special Activation Precinct would remain unfulfilled.

Consideration of Alternative Technology

The basis of design for the Project has largely focused on using available technology that is known to perform for its intended use. Modularised electrolysis units and a modularised ammonia plant have been selected as they represent low installation cost coupled with high confidence in performance and operability. It also provides scalability and is easier to install and remove from site when compared to non-modularised options.

Storage vessels have been subjected to an assessment of safety, reliability and ease of transportation. The final vessels selected will be suitable for the size and scale of the intended production profile of the plant.

Consideration of Alternative Locations

Sundown Pastoral Co, as a Project partner, have had a strong preference to locate the project on the subject land to provide certainty of tenure and proximity to power and water sources.

The Wathagar site presented such overwhelming advantage that any alternative other than within the operational area of the Wathagar Gin was given only cursory attention.

The plant will be established in an area of the Wathagar Gin's operation that is no longer required due to operational efficiency and improvement of waste cotton processing at the Gin. Development of land required for construction and operation of the required infrastructure at this location will have a neutral impact on agricultural land use.

The location of site in the south-western corner of the Wathagar Gin yard is suitable as it enables Gin operation to continue unimpeded with minimal overlap of operations. It also provides sufficient spacing from the Plant to the Gin to manage operational risk.

One primary alternative was given consideration which was to locate the plant within the Moree Special Activation Precinct. Whilst there was added planning certainty, it was determined very early that location of the Plant within the SAP would add cost to the overall establishment, construction and operation of the plant given Sundown Pastoral Co's position as a key customer of anhydrous ammonia during the Plant's operation. It was not feasible to locate the plant in Moree and transport ammonia back to the Keytah property when the opportunity exists to locate the plant close to key inputs (power and water) and to the end user.

Given the excellent suitability of site generated via a combination of its strengths and uniqueness, no further alternate sites were afforded detailed consideration.

2.8 Project Agreement Summary

2.8.1 Voluntary Planning Agreement – Moree Plains Shire Council

Hiringa is in the final stages of negotiating a Voluntary Planning Agreement (VPA) with Moree Plains Shire Council for the GEGHA Project. Engagement with regard to preparing a VPA commenced in earnest in May 2024 and has progressed over the ensuing months.

The VPA will include provision for the entirety of the Project (GEGHA Plant plus Wathagar Solar Farm Stage 2) and is focused on Community benefit within the Moree Plains Shire. The VPA will be executed prior to the determination of the Project.

2.8.2 Landholder agreements – Sundown Pastoral Co.

Agreements entitling HSPT to water and access are under preparation with Sundown and Namoi Cotton with the majority of agreements expected to be in fully executed format prior to Q3 2025.

The following agreements are under preparation or have been completed:

- Water Access Agreement between Sundown Pastoral Company and HSPT to access water from the drainage dam.

- Easements to be formalised on title that would add the encumbrance of a water pipeline easement through Lot 1 DP 1315847to allow connection to the drainage dam and to the Wathagar bore (typically registered following construction with availability of 'as built' data).
- Easements to be formalised on title that would add an access encumbrance through Lot 1 DP 1315847 to formalise access to and from the control room and the GEGHA plant (completed 7th May 2025).
- Easements to be formalised on title that would allow an encumbrance for electrical connection (completed 7th May 2025).
- Access agreement between Sundown Pastoral Company, Namoi Cotton and HSPT to enable construction and operation of the GEGHA Plant within Lot 1 DP 1315847 (under preparation).
- Agreement between Sundown Pastoral Company, Namoi Cotton and HSPT to enable establishment of the evaporation pond and temporary construction area within Lot 1 DP 1315847 (under preparation).
- Water Access Agreement between Sundown Pastoral Company, Namoi Cotton and HSPT to utilise water from the Wathagar Bore (this agreement is on hold until such time as water levels within the drainage dam reduce to a level where bore water would be required to supplement water supply to the GEGHA Plant).
- Subdivision of land to incorporate the Wathagar solar farms 1 & 2 and the GEGHA plant (excluding evaporation pond and temporary construction area) (completed 7th May 2025).

2.8.3 Project Vegetation Offsets

The Project Biodiversity Development Assessment Report (BDAR) is available in Appendix B.5. Clearing of the disturbance footprint would generate 6 ecosystem credits for PCT 39: Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion. These will be obtained and secured prior to commencement of ground disturbing activities.

2.9 Matters of National Environmental Significance

Twenty-six (26) flora and fauna species recognised as Matters of National Environmental Significance under the EPBC Act were identified during database searches as potentially occurring on the Subject Land, and five (5) listed migratory species.

Only those species considered likely to utilise the Subject Land were considered further, including Superb Parrot, Grey Falcon, White-throated Needletail, Southern Whiteface and the migratory species Fork-tailed Swift.

Following completion of the biodiversity impact assessment, an EPBC Act self-assessment was prepared and is presented in Appendix B.18.

No Matters of National Environmental Significance have been identified within the subject land. The outcome of the BDAR supports the conclusion that significant impact on any MNES is unlikely, including migratory species.

Based on the outcome of the self-assessment, it is determined that a referral under the EPBC Act is not required.

3 PROJECT DESCRIPTION

3.1 Project Overview

This Environmental Impact Statement seeks consent for the construction, commissioning, operation and decommissioning of the GEGHA Project as summarised in Table 3.1 and described in this section.

Table 3.1 - Project overview summary

Project Element	Summary Description

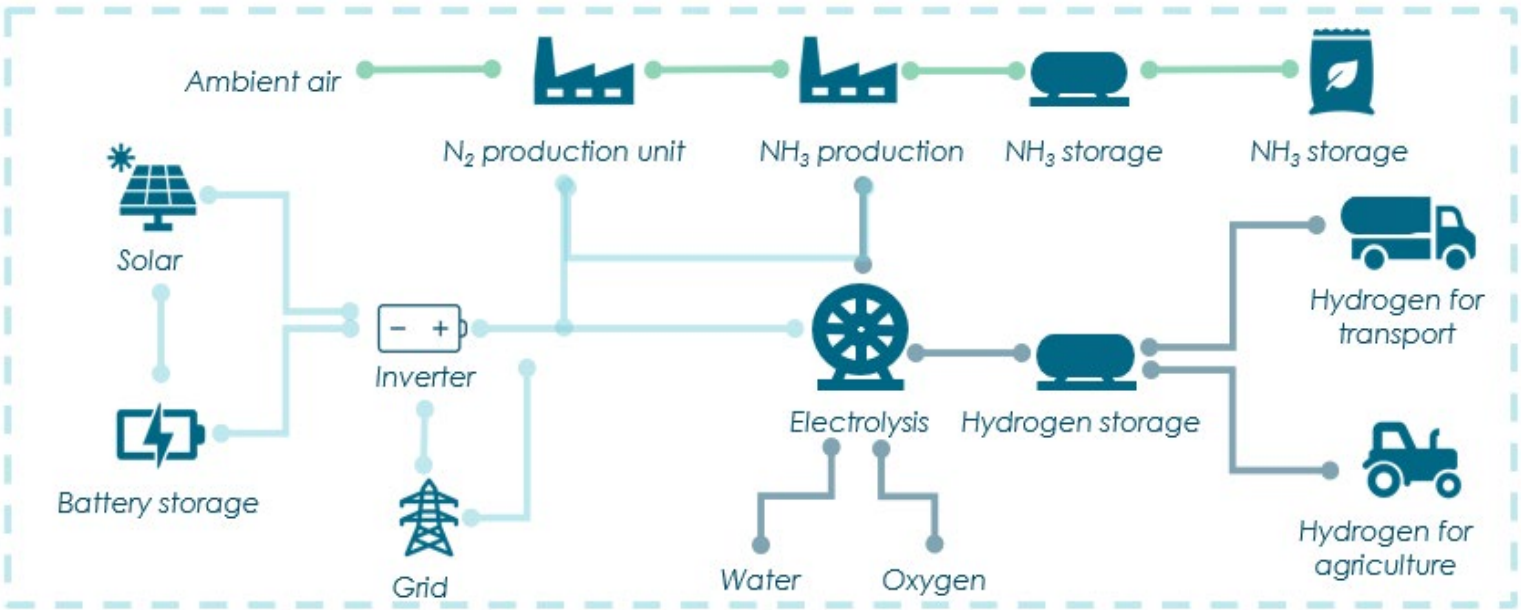
Operational function	• A 15 megawatt (MW) hydrogen electrolysis plant utilising high pressure alkaline electrolysers:
	  ○ Maximum production of 6,000kilograms (kg) per day
	  ○ Annual production of 2,200 tonnes of hydrogen per year
	• A 16 tonne per day ammonia (NH_3) plant, to convert hydrogen into ammonia.
	• Up to 3 tonnes of hydrogen storage to balance local fuel supply and demand.
	• Up to 600 tonnes of ammonia storage capacity to buffer the overall process against seasonal ammonia demand and renewable energy variability.

Power Supply	It is proposed that the ammonia and hydrogen production will be powered by: • a new 27 MW (DC) solar farm adjacent to site with 30MWh Battery Energy Storage System (subject to a separate planning application); • an existing 8.65 MW (DC) solar farm at the Wathagar Cotton Gin; • supplementary imported power supply from the existing Wathagar substation and connection.
Water Source	• Primary water supply: Drainage dam to the north of the Wathagar Gin area. The dam has a capacity of 198.8ML. • Secondary/ supplementary water supply: Groundwater drawn from an on-site water bore adjacent to the Wathagar Gin. Groundwater would be used where there has been a sustained period of low or no surface water recharge into the drainage dam.
Disturbance Footprint	11.2 hectares total disturbance footprint
Water Management	Maximum annual water requirement up to 51ML. Produced water from the plant will run into a 16,200l capacity evaporation pond. Runoff from site would be captured by the existing site drainage – a table drain that runs on the inside of the flood levee which gravity feeds back up to the drainage dam. Site is very flat and runoff velocity is expected to be low.
Waste Management	Water produced during facility operation will transpire? in the evaporation basin. The waste hierarchy will be applied to construction and operational waste materials. The control room will have an appropriately sized wastewater irrigation trench.
General Infrastructure	• Evaporation pond • Internal roads • Power supply connections • Water pump connections, water tanks, water treatment, • Telemetry, security camera system, switch room; • Protective perimeter security fencing; • HGV loading/ unloading bays adjacent to storage vessels; and • Car park and control room/ site office.
Operational Life	25 year design life.

<table>
<tr><td>Product Transport</td><td>1,700 tonnes per annum of anhydrous ammonia would be taken by Sundown Pastoral Co and used on farm without entering on to public roads. The remaining Ammonia and Hydrogen would be transported by Heavy Goods Vehicles in fit for purpose containers. It is estimated that Ammonia trucking would average two trucks per day whilst hydrogen trucks would require up to 4 trucks per day if supplying a broader refuelling network in the future.</td></tr>
<tr><td>Operational Workforce</td><td>
<table>
<tr><th>Role</th><th>Location</th><th>Work roster</th><th>FTE Count</th></tr>
<tr><td>Facility Engineer and Ops Manager / Supervisor</td><td>Sydney</td><td>Normal Week – On call</td><td>0.5</td></tr>
<tr><td>Facility Supervisor</td><td>Moree or surrounding area</td><td>Weekdays on site
Call out after hours and weekends.</td><td>1</td></tr>
<tr><td>Operator Technician</td><td>Local – On site</td><td>12 hours: 7 days on, 7 days off</td><td>5 (over 4 shifts)</td></tr>
<tr><td>Trainee - Apprentice</td><td>Local – On site</td><td>12 hours: 7 days on, 7 days off</td><td>1</td></tr>
<tr><td>Maintenance Contractors</td><td>Local - Onsite</td><td>As required</td><td>As necessary</td></tr>
</table>
</td></tr>
<tr><td>Hours of Operation</td><td>24 hours per day, 7 days per week.</td></tr>
<tr><td>Capital Investment</td><td>$ 71,595,167 (AUD, excl. GST)</td></tr>
</table>

The GEGHA Project proposes to produce hydrogen and ammonia from raw inputs of water, renewable power and nitrogen that is sourced from the air. Figure 3.1 provides a schematic overview of the process.

Figure 3.1 - GEGHA Project inputs, production and outputs



3.1.1 Power Source and Operational Usage Overview

The project will draw power primarily from the adjacent Wathagar Solar Farm Stage 1 and Wathagar Solar Farm Stage 2 which both have Battery Energy Storage Systems (BESSs). There is also provision to augment power supply from the grid via the existing Wathagar substation connection to the Wathagar Solar Farm Stage 1 to increase the robustness of power supply to key instrumentation and to make provision for grid import and export.

Power will be connected to the Control room and the GEGHA plant via buried cabling that will run through the Wathagar Solar Farm Stage 1 and Stage 2, connecting to the BESS and connecting to the existing Stage 1 connection to the Wathagar substation.

Essential Energy have agreed and signed a connection agreement, facilitating power import and export into the grid.

The general operation philosophy, starting from an empty BESS, is to allow solar to charge the BESS to a minimum value before ramping up the electrolysers. This allows BESS support to manage fast fluctuations in solar output from overhead clouds. If the BESS State of Charge (SOC) begins to fall past a threshold, the electrolysers will shutdown. The ammonia plant will be running 24 hours per day powered by BESS storage or grid imports.

Any excess BESS storage not required to run the ammonia plant night will be exported to the grid during evening peaks. On cloudy days with low solar generation, energy can be imported to run the ammonia plant and charge the BESS if required to maintain continuous ammonia plant operations.

3.1.2 Water Source

Water will be drawn from the Wathagar Gin drainage dam for use as a feedstock in the production of hydrogen. Provision has also been made to draw supplementary water from an existing bore on the property in times of low rainfall and runoff into the dam.

3.1.3 Control Room

A prefabricated control room will be delivered to site in two parts and installed on a structural steel frame and concrete foundations. Includes control room for up to five operators, kitchen & lunchroom, meeting room, first aid room, ablutions, and site car parks. Fit out of the control room is done before arrival at site, however kitchen appliances and final IT systems will be installed onsite.

It will be located at the eastern end of the solar farm to ensure there is sufficient separation distance between the control room and the production facility which is classified as a major hazard facility.

The 240Volt electrical connection to the control room will consist of a buried cable from the hydrogen and ammonia plant switch room.

The water supply for the control room will be supplied from a set of up to four 10,000 litre water tanks. The tanks will be fitted with a pressure pump to provide water for the kitchenette and amenities.

The septic system will consist of a standard septic tank and rubble drain only.

Figure 3.2 - Control room graphic

3.1.4 Hydrogen Production & Storage

The 15 MW electrolyser consists of three 5 MW systems, each capable of producing up to 2,000kg of hydrogen per day. Each 5 MW system includes three 40 foot (ft) containers housing the electrolyser stack, gas-lye treater, and hydrogen purification system. Additionally, a shared utilities container is used, totalling ten 40ft containers for the hydrogen production system.

A compression system located adjacent to the electrolysers will compress the hydrogen from electrolyser outlet pressure of 30 bar to up to 450 bar.

Hydrogen from the electrolyser unit will either be fed into the ammonia plant or stored in 40ft Multi Element Gas Containers (MEGCs), each capable of holding up to 877 kg of hydrogen at 450 bar (acknowledging the on site storage capacity of up to 3 tonnes).

3.1.5 Ammonia Production & Storage

Ammonia is created by combining nitrogen, extracted from the air, with hydrogen produced from the electrolysers. These gases are fed into a reactor where they form anhydrous ammonia via the Haber Bosch process which synthesises the ammonia via a pressure and temperature based reaction, first created in 1909.

Anhydrous ammonia is formed as a gas before being cooled and stored as a liquid at low temperature to enable a greater volume of gas to be stored on site. When it is emptied from storage, it naturally reforms as a gas when decompressed and is transported and applied as a gas.

The GEGHA ammonia package comprises of a nitrogen preparation unit, ammonia synthesis unit, ammonia compression, and ammonia refrigeration. This equipment is skid mounted but not containerised as the equipment is designed for outdoor conditions.

Three ammonia storage bullets that can each store up to 200 tonne of ambient temperature ammonia at pressures between 10 – 20 bar will be located on site. Each ammonia bullet is 32metres (m) long and 4m in diameter. There is an option to supply 6 x 100 tonne bullets in a different arrangement. Storage configuration will be determined during detailed design.

3.1.6 Balance of Plant

The electrolyser system requires ultra-pure water to produce hydrogen. Raw water will be passed through a water treatment system that is housed in two 40ft containers. The water will pass through filters, reverse osmosis and electrodeionization (EDI) treatments to remove impurities and minerals.

The electrolyser, ammonia, and compression systems require cooling water to maintain desired process temperatures. Water will go through initial treatment before transferring into the cooling system which will comprise of six adiabatic coolers. These coolers have reduced water consumption compared to evaporative cooler as they primarily use air to cool the systems. When temperatures exceed 27 °C, the coolers switch to using water to ensure effective cooling.

An instrument air package will be installed on site to provide compressed air to the ammonia plant and control of pneumatic valves around the site.

3.1.7 Scrubber, Vent and Pipework

The hydrogen package includes both an oxygen vent and hydrogen vent. The oxygen is a byproduct of the electrolysis process and will vent to atmosphere. The hydrogen vent will be utilised if the hydrogen is out of quality specifications or in start up and shut down of the units and will be vented safely to atmosphere.

A scrubbing vessel will be used for operational purposes, such as loading trucks etc. When utilised, estimated at 1 to 2 times per day, the scrubber will release small volumes of ammonia to atmosphere, via a scrubber and a vent. In addition to the scrubbing system, an emergency bypass leading straight to the vent will be installed.

The vent is approximately 10m in height and DN150mm in diameter and has been designed for specific emergency situations, such as a fire case requiring immediate depressurisation of an ammonia storage vessel.

Pipework will connect each process together, running at ground level and within designated corridors. There will be ten walkover crossings to allow site staff to easily access different areas of the plant.

3.1.8 Fire & Security Systems

Fire hydrants will be located around the perimeter of the plant and next to pipework corridors. Fire water tanks and volumes have been sized to allow for potential fire scenarios.

Security fencing will be installed around the perimeter of the plant with two cantilever gate providing vehicle access to the compound (one access, one egress). There will also be an emergency access/egress gate for light vehicles, to the south of the compound. In addition, several personnel exit gates will be provided at locations around the plant perimeter.

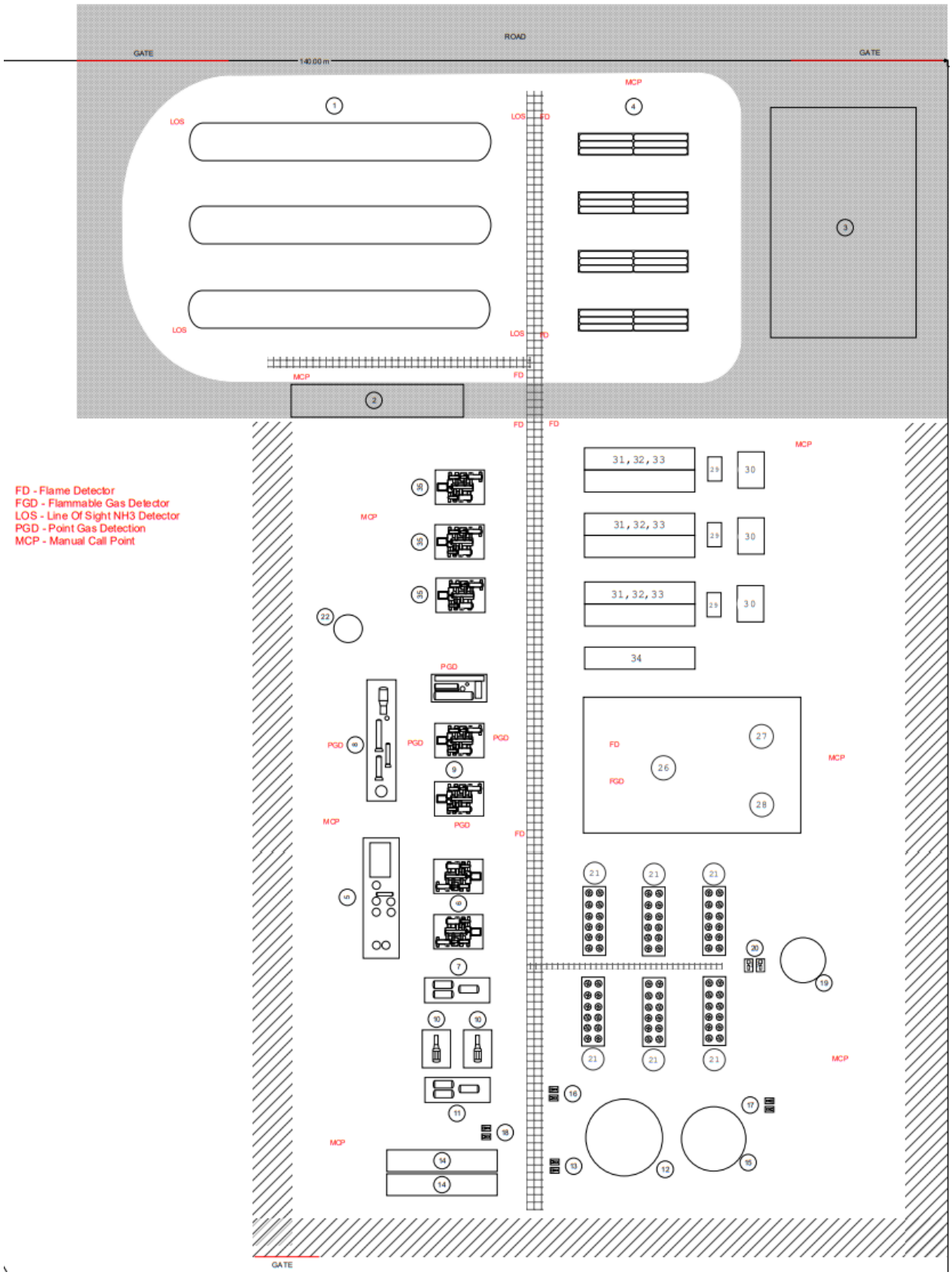
There will be up to 40 x 3m tall light poles located around the plant. Close Circuit Television (CCTV) will also be installed around the plant to give remote surveillance.

There will be at least one technician on site at all times based in the Control room to oversee plant and storage operation and continuing functionality.

Safety and Gas Detection

Figure 3.3 indicates the location of flame, ammonia and hydrogen (LEL) detection. Gas detectors will be installed within the hydrogen production containers. Ammonia line-of-sight gas detectors will be placed around the ammonia storage bullets and point detection ammonia detectors will be installed around the ammonia production equipment. If ammonia or hydrogen is detected, the associated plant will automatically initiate an emergency shutdown process. Gas storage will be isolated but not vented to prevent further escalation of a release or fire event. In addition, operating personnel can initiate an Emergency Shutdown via manual call points located around the plant.

Figure 3.3 - Flame, Ammonia and Hydrogen detection locations



3.1.9 Internal road upgrades

Within the GEGHA Compound, access from the gate to the hydrogen and ammonia load outs will have a 300 millimetre (mm) base of selected gravel with a bitumen sealing.

The following roading has been allowed for to formalise internal road upgrades:

- 420m x 5m wide bitumen roading within the plant compound to allow for access to hydrogen and ammonia refuelling load out and vehicular access.
- 1,625m x 6m wide gravel (300mm depth) from the bitumen gin entry to the GEGHA Plant entry.
- 175m x 5m wide gravelled road to the control room.
- 1,040m x 4m wide roading from the control room entry around the southern boundary of the solar farm to provide a secondary Light Vehicle access to the south of the GEGHA plant compound.
- 650m roading from the GEGHA Plant to the drainage dam and pump assembly. Gravel removed during ground preparation works for the water storage will be repurposed for use in this roading work.

3.1.10 Drainage Dam Pump Arrangement and Pipeline

A floating suction pump will be installed in the drainage dam approximately 1m below the water surface. The floating suction pump will help to maintain the water temperature inlet into the plant and minimise introduction of algae to the system. It will be designed to have a maximum draw rate that meets the water requirements of the plant 25 m^3/hour) and the water deluge system in an emergency scenario.

The pipeline from the dam to the Plant will be polyethylene and will be sized according to the water supply requirements and constructed to a minimum buried depth of 600mm.

3.1.11 Pipeline to the Wathagar Bore

Pipeline from the existing Wathagar bore to the Plant will be polyethylene and will be sized according to the water supply requirements and constructed to a minimum buried depth of 600mm. A blind flange arrangement will be installed at the Wathagar bore, allowing for future connection to the bore at a time when supplementary water is required to supply the plant.

3.1.12 Water Storage, including Fire Water provision

The site will feature multiple water storage tanks to meet various operational and safety requirements. Fire water provisions require approximately 772 kL of water storage on-site (p19, Appendix B.20). To address this, a raw water storage tank will hold at least 24 hours' supply of plant water and half of the fire water requirements.

To ensure water quality for the cooling tower system, the raw water will undergo pretreatment before being transferred to a treated water tank. This treated water tank will serve a dual purpose: it will store a day's worth of cooling water and electrolyser water, in addition to half of the fire water requirements.

Water for the electrolysers will be drawn from the treated water tank as needed and processed through a demineralisation treatment system. Because demineralised water has a short shelf life, it will be produced on-demand and stored in a relatively small holding tank located within the electrolyser container.

The cooling water system will include a small buffer tank capable of holding 40 kL of cooling water. This tank will provide the necessary buffer during system startup.

3.1.13 Water Treatment

The water treatment package will include filtration, Reverse Osmosis (RO) and EDI processes.

Whilst water supply will initially be sourced from the drainage dam, water treatment has been designed to enable water to be drawn from the dam or the Wathagar bore.

The water quality of the dam is more susceptible to fluctuations during weather events. Water sampling during the planning and design phase indicates that the drainage dam water is slightly alkaline, with moderate levels of dissolved solids and low turbidity. In contrast, the bore water has fewer dissolved solids but significantly higher turbidity.

Both sources are moderately hard, with similar ion concentrations; however, the dam water contains slightly higher levels of bicarbonate and chloride. Neither source shows significant organic pollutants. To ensure quality control, turbidity instrumentation will be installed at the inlet to continuously monitor the water.

Each water source will be pumped into a raw water storage tank, where it will undergo initial treatment to reach near-potable quality, making it suitable for use in the cooling towers and fire water system. Following this, the treated water will be fed into the demineralised water treatment system to produce ultra-pure water for the electrolyser system. Reject water from the treatment plant will be sent to an evaporation pond or recycled for use to provide water to the cooling towers.

3.1.14 Evaporation Pond and fencing

The GEGHA water treatment process has been designed with an expected rejection water rate of 30% that would go to wastewater or recycled. The remaining 70% of water will be demineralised and used for the production of Hydrogen or used in the Plant's cooling systems.

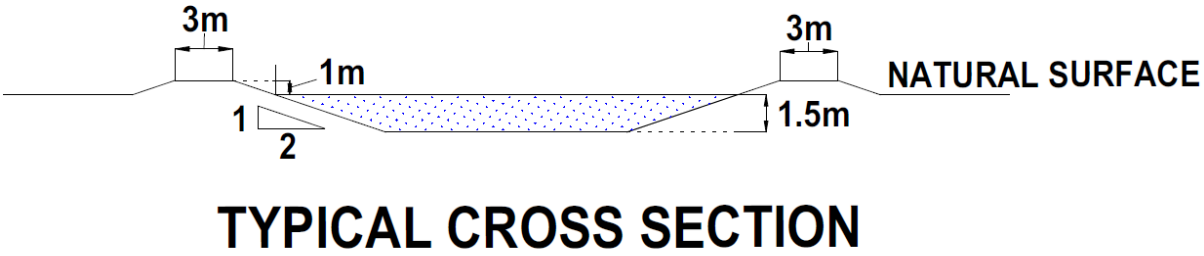
This rate of rejection would produce approximately 41,700l of water per day. The quality of this wastewater will vary; however, it is expected to have an elevated salinity level and contain concentrated minerals and salts. Discharging this wastewater to the environment is not an option.

The proposal for onsite produced wastewater management is to involve the design and operation of an evaporation pond. This will be the safest environmental outcome to ensure that external areas are not impacted by the Plant's wastewater stream.

The pond size is based on a pond capacity that exceeds the highest accumulated volume of wastewater and rainfall captured in the pond. The results indicate a maximum pond size of 91m by 120m with a depth of 1.5m to generate a surface area of 10,920 square metres and a pond volume of 16,380 KL.

A typical cross section of the evaporation pond is provided in figure 3.4.

Figure 3.4 - GEGHA Evaporation pond – typical cross section



3.1.15 Temporary Construction Requirements

The temporary construction area will be established above the designated plant site and adjacent to the evaporation pond construction footprint. This area will accommodate equipment laydown, parking, and workspaces. The following typical equipment and facilities will be utilised:

- Four Portacom units serving as a site office and break rooms.
- An ablutions block with self-contained sewage management.
- 120kVA generator for power supply.

- Two 20ft containers with dome shelter set up (figure 3.5) for covered work.
- 20 tonne Franna crane.
- 4 tonne, 17m Telehandler.
- Knuckle boom.

Figure 3.5 - Example of a covered work dome shelter

3.1.16 GEGHA Drinking Water arrangements

It is proposed that the Control room will initially be supplied by imported potable water until such time that a standard connection can be provided.

3.1.17 GEGHA Wastewater arrangements

Construction wastewater arrangement

During construction, temporary ablutions for the construction workforce will be trailered on to site. Portaloos and portacabins will be hired in and utilised on site for the duration of construction and commissioning. The units will be serviced/ emptied by the hire company.

Operation wastewater arrangement

The GEGHA Plant's control room will have facilities for up to four people to occupy and operate the plant's systems and controls. This will include toilets, shower, kitchen and boot wash station.

The associated wastewater system comprises a septic tank that will provide primary wastewater treatment, separating out suspended material via a primary settling chamber. This level of treatment is suitable for disposal via absorption trenches.

The septic tank will be placed a minimum of 1.5m from the control room with a submersible pump providing a means of emptying the treated water into the absorption trenches.

Absorption trench would be up to 25m in length and 600mm wide x 600mm deep to dispose of a peak of 300l of wastewater per day. Detail on system sizing, design and location is provided in the On-site Wastewater Management Plan (Appendix B.11).

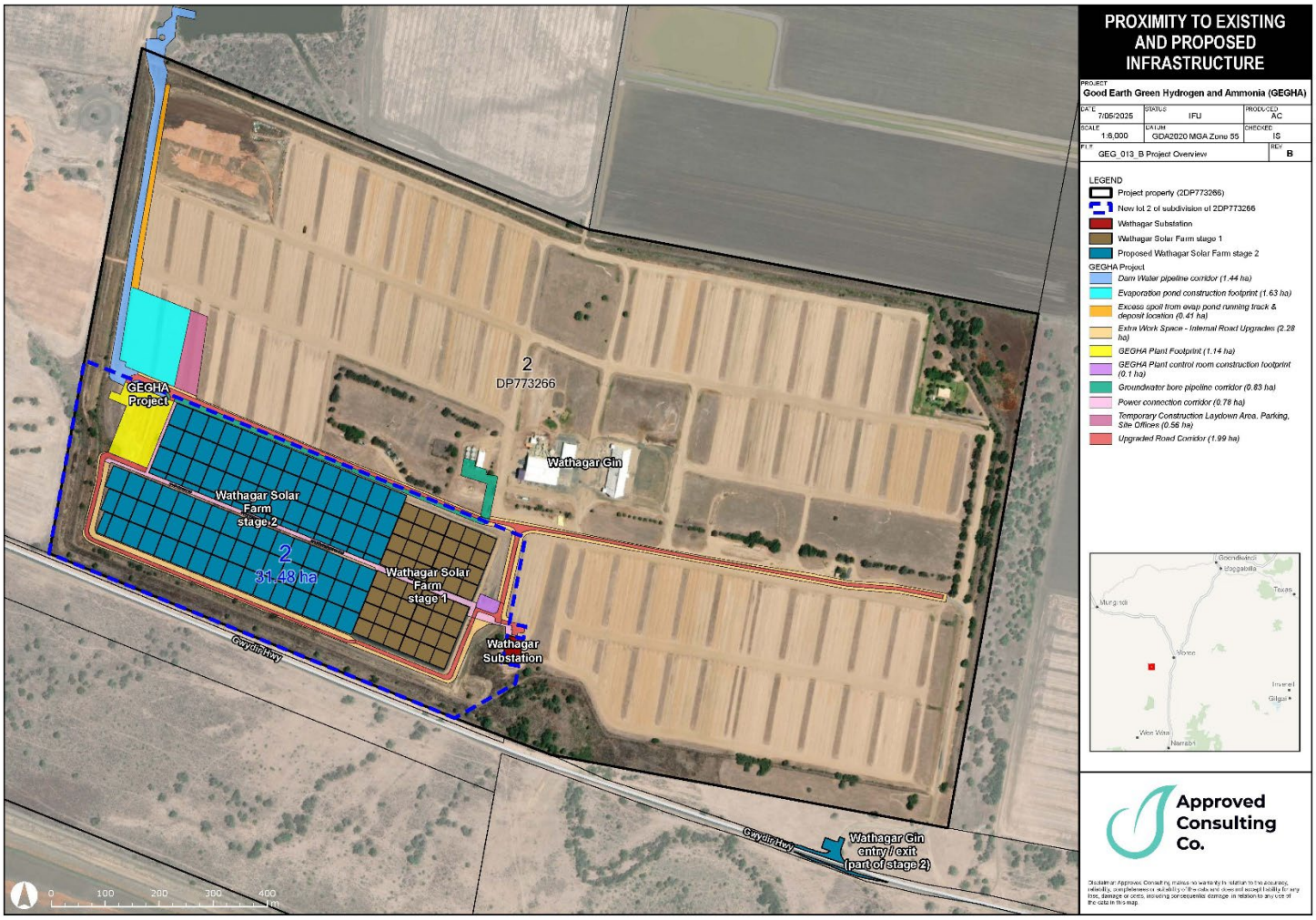
3.2 Project Assessment Area

The Project is located at 2910 and 2912 Gwydir Highway, Moree, NSW. The Gwydir Highway is one of the primary transport routes which connects the east coast with north-western New South Wales.

The GEGHA Project Area (Figure 3.6 and Appendix D) is located within Lot 1 DP 1315847, Lot 2 DP 1315847 and Lot 30/ 1040936 in the parish of Wathagar. Existing use on the site consists of store and laydown for unprocessed cotton and cotton trash from the adjacent Wathagar Cotton Gin.

A visual representation of the proposed works is provided in Appendix B.6.

Figure 3.6 - Overview of the GEGHA Project



The 'Project Assessment Area (PAA)' is an area that has been defined for the purpose of this EIS. It describes the greatest extent within which ground disturbance and development will be undertaken. The PAA forms the boundary for detailed on ground assessment including Cultural Heritage and Biodiversity.

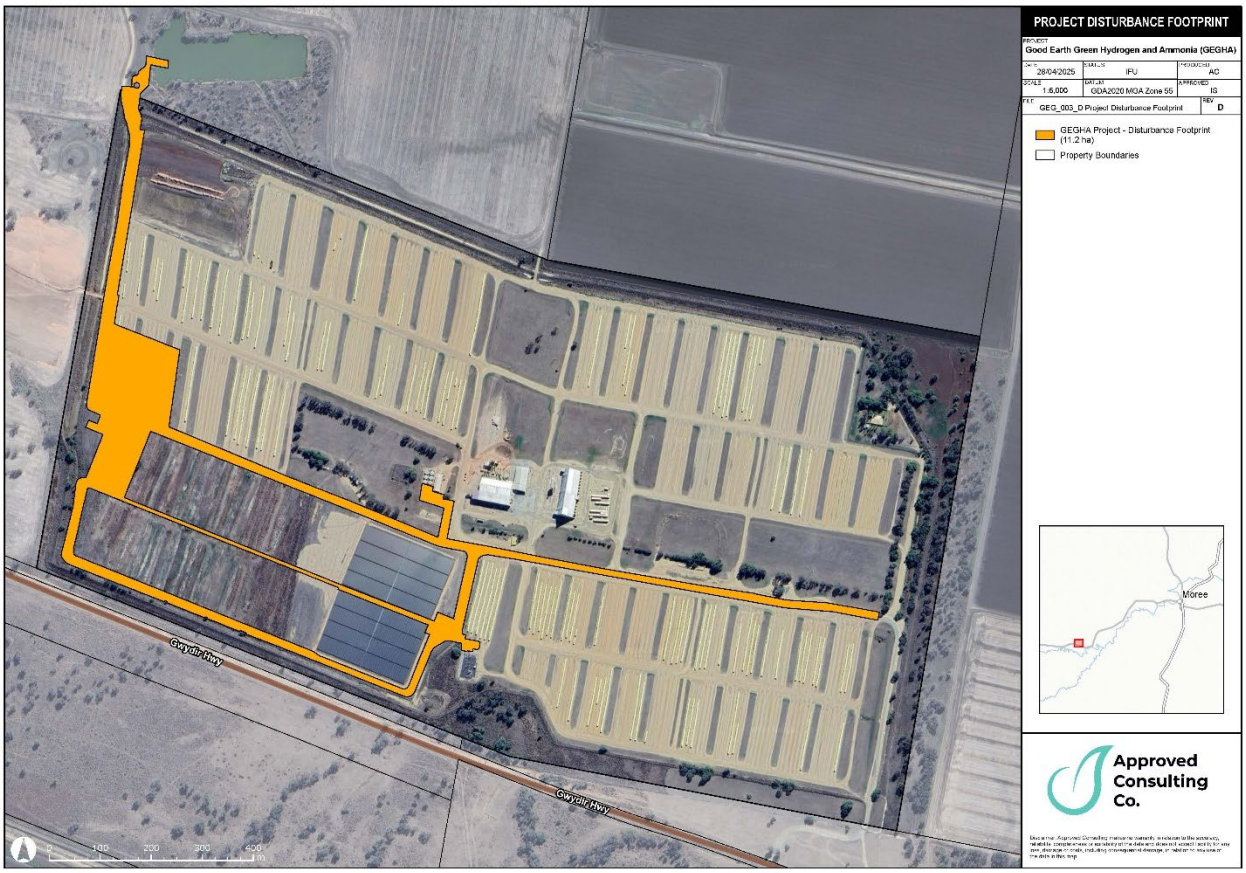
Following detailed assessment of the values and constraints on site and input from the Project's design team, the GEGHA Project's final Project disturbance footprint of 11.2 hectares has been defined and is provided in Figure 3.7.

The development footprint represents the residual area within the PAA that will be required to safely construct and operate the GEGHA Project.

Identified environmental values, primarily native vegetation, have been avoided as far as is practical with the residual impact minimised. Within the disturbance footprint, there is one Coolibah tree in Lot 30/DP1040936 that requires to be avoided through establishment of a tree protection zone with physical signage and barrier around the periphery. Additionally, there are a further four trees bordering the disturbance footprint that require to be demarcated with tree protection zones using physical signage and barriers prior to commencement of construction and removed upon completion of construction.

The disturbance footprint also borders derived native grassland that is shrubby and of value from Plant Community Type 39 in the south-west corner of site. It is proposed that the edge of the disturbance footprint be surveyed, pegged and a physical barrier and suitable signage be installed during disturbance and construction works to reinforce the extent of the disturbance footprint in this area.

Figure 3.7 - GEGHA Project disturbance footprint



3.2.1 Lot 2 / DP 1315847 (Parish of Wathagar)

On the 7th May 2025, Lot 2 / DP 1315847 (31.48ha) was created as a sub-divided parcel from the former Lot 2 / DP773266 (refer figure 3.1). Lot 2 / DP 1315847 is held in 100% ownership by Sundown Pastoral Co and will fully contain the Wathagar Solar Farm Stage 1, Wathagar Solar Farm Stage 2, the GEGHA Plant and control room.

The title has 12 notifications including 7 easements (electrical installation, underground power lines and levee and drainage of water) and one right of access.

3.2.2 Lot 1 / DP 1315847 (Parish of Wathagar)

On the 7th May 2025, Lot 1 / DP 1315847 (134.0ha) was created from the former Lot 2 / DP773266 (refer figure 3.1). The parcel is held by Namoi Cotton and Sundown Pastoral Co as tenants in common in equal shares.

This parcel encompasses land occupied by the Wathagar gin and its yard. The GEGHA Project will have roading, pipeline connections, power connections, evaporation pond, security cameras and fencing within this land parcel.

The title has 11 notifications including six easements (electricity, levee and drainage) and two rights of access, one of which formalises access to Lot 2 / DP 1315847 and extends up towards the drainage dam.

Through dialog in relation to the Project's development, Essential Energy requested that an access easement to enable access to the Wathagar substation and a 'pole and wire' easement was created to formalise the tenure for the existing power line infrastructure leading into the Wathagar substation. These encumbrances were added to the newly created Lot 1/ DP1315847 on the 7th May 2025.

3.2.3 Lot 30 DP 1040936 (Parish of Wathagar)

The Project's primary water source, a drainage dam located to the north of the Gin boundary, is located within Lot 30 DP 1040936. The Project requires to install a floating pump arrangement in the dam itself plus a pump house and a buried pipeline within the lot parcel. It is also proposed to utilise the existing access track to gain access to the pump and pipeline as required during construction, commissioning and operation.

An emergency entry/exit ('access') has been nominated through this lot also utilising existing an unsealed road that provides an alternate route to the Gwydir Highway, creating an entry/exit to the West of the GEGHA Plant (refer s3.5.5).

3.2.4 Lot 7300/1161855 (Parish of Wathagar)

Lot 7300/1161855 is a parcel of Crown land that forms part of the travelling stock route that envelops the Gwydir Highway. Crown Reserve R31046 also encompasses Lot 7300/1161855.

The existing sealed access from the Gwydir Highway to Lot 1 / DP 1315847 crosses this parcel. Access is granted under s75 of the Local Land Services Act.

This land parcel has been included in the Project Assessment Area (PAA) but does not form part of the Project's residual disturbance footprint. The access, and the proposed upgrade, has been considered in the Project's Traffic Impact Assessment (Appendix B.2) and in the Assessment of potential impacts on Crown Reserves (Appendix B.16).

3.2.5 Existing Development

The Project location sits within the footprint of the Wathagar Cotton Gin which has been in operation since 1987. The Wathagar Gin is owned in a 50:50 partnership between Project JV partner Sundown Pastoral Company ('Sundown') and Namoi Cotton. The Gin is in the process of modernising the way it deals with its cotton waste which consequently provides an allocated space within the Gin yard that is no longer required for ongoing operation.

The Gin operates under an active Environmental Protection Licence (EPL) No. 10832 (Appendix E). The GEGHA Project will require its own EPL during operation. Whilst the two EPLs would overlap, it is proposed to keep their administration separate. A review of EPL 10832 has not identified any conditions could not be complied with or upheld with the presence of the GEGHA Project.

The Wathagar Gin has an existing sealed access through Lot 1 / DP 1315847 that joins the Gwydir highway through Crown land parcel 7300/1161855. Entry is formalised under s75. of the Local Land Services Act 2014

The operational Wathagar Solar Farm Stage 1 (4.95MW AC and 11MWh of BESS) was awarded development consent DA202153 on the 3rd August 2022 and is located on the same land parcel as the GEGHA Project. It is proposed that

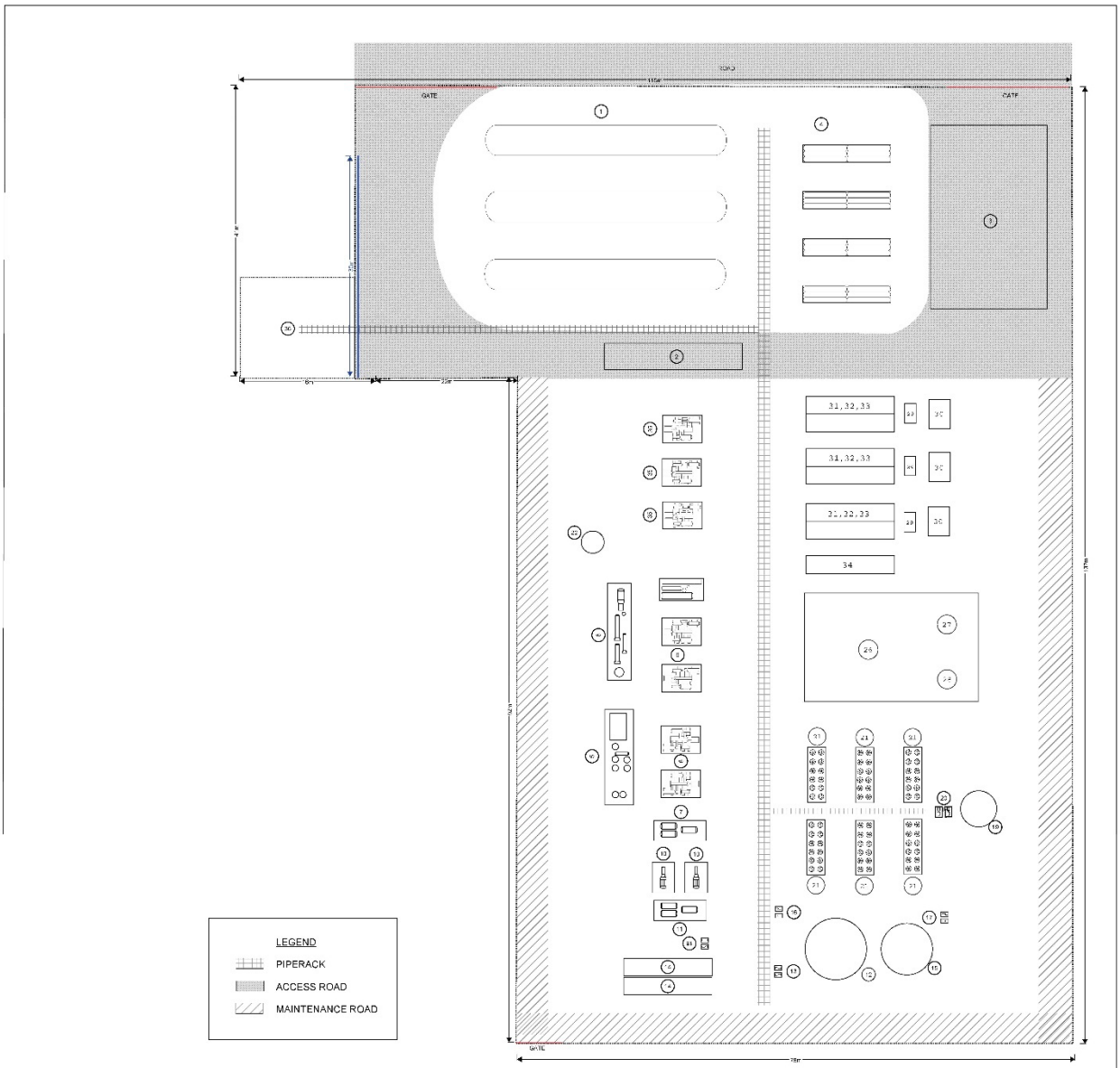
electricity generated by the solar farm will be made available to the GEGHA Plant for use in hydrogen and ammonia production.

It is proposed that the Wathagar Solar Farm Stage 1 will be operated in conjunction with the Project under Development consent 202153. A review of the conditions of consent has concluded that compliance would be unobstructed by the construction and operation of the GEGHA Project.

3.3 Site Layout

Proposed layout of the GEGHA Plant is provided in Figure 3.8. Site layout includes provision for a security fence around the perimeter of the evaporation basin and GEGHA Plant and a vapour barrier wall to the west of the ammonia storage which has been designed as a mitigation measure following completion of the Preliminary Hazard Analysis.

Figure 3.8 - GEGHA Plant Plot Layout



NO.	EQUIPMENT	NO.	EQUIPMENT
1	AMMONIA STORAGE	18	DEMIN WATER PUMPS
2	AMMONIA TRUCK LOADING	19	COOLING WATER BUFFER TANK
3	H2 TRUCK LOADING ZONE	20	COOLING WATER PUMPS
4	HP H2 STORAGE IN MEGs	21	ADIABATIC COOLING TOWERS
5	NITROGEN PREPARATION	22	NH3 SCRUBBER
6	N2 COMPRESSORS	26	PLC / MCC ROOM
7	N2 AND H2 MIDDLE TANKS	27	AUX TRANSFORMER
8	AMMONIA SYNTHESIS	28	HV SWITCHGEAR
9	AMMONIA COMPRESSORS	29	HV/LV TRANSFORMER
10	INSTRUMENT AIR COMPRESSORS	30	RECTIFIERS
11	AIR RECEIVER AND DRYER	31	ELECTROLYSER
12	RAW WATER TANK	32	GAS-LIQUID TREATER
13	RAW WATER PUMPS	33	H2 PURIFICATION
14	WATER TREATMENT	34	UTILITIES CONTAINER
15	TREATED / FIRE WATER TANK	35	H2 COMPRESSORS
16	TREATED WATER PUMP	36	NH3 VENT
17	FIRE WATER PUMPS		

PRELIMINARY - NOT FOR CONSTRUCTION

HOLDS:
1. Protection of ammonia vessels from hydrogen overpressure events are still to be investigated.
2. The evaluation of the need for a vent or flare as well as the location are still to be completed.
3. Consequence modelling needs to be completed prior to finalisation of site layout.
4. Fire safety study is still to be completed
5. Constructibility and Maintainability Assessment to be completed

HIRINGA
GHD
HIRINGA
GOOD EARTH GREEN HYDROGEN AND AMMONIA
AMMONIA PRODUCTION PLOT LAYOUT - PLANT AREA
PRELIMINARY
12628852
12628852-GHD-0000-PLT-MD-00002
A0
B

3.4 Existing Infrastructure

3.4.1 Wathagar Gin

The Wathagar Gin is owned in a 50:50 partnership between Sundown Pastoral Co. and Namoi Cotton. It has been in operation since 1988 and has a throughput capacity up to 200,00 bales per annum. Operation of the Gin is seasonal but it typically operates from April until August. The Gin has 6 permanent staff and 2 casual staff members who work year round and are joined by an additional 25 casual staff during the Gin's operational season. The Gin operates under Environmental Protection Licence 10832 (Appendix E).

3.4.2 Wathagar Levee

The site is surrounded by a ~1.5-2m high levee bank which was installed under Flood Work Approval 90FW833508 (Appendix B.3). This provides both flood defence and a visual barrier to site.

3.4.3 Wathagar Solar Farm Stage 1

Wathagar Solar Farm Stage 1 is a 4.95MW (AC)/ 8.65MW (Direct Current (DC)) Solar farm with 11MWh of Battery Energy Storage System (BESS) that received development consent on the 3rd August 2022 and received final occupation certification in November 2023. Its primary purpose is to provide the power requirements of the Wathagar Gin but it is intended to act as a supplementary power source to the GEGHA plant, utilising any redundant power generated that is not utilised by the Gin, especially outside of ginning season.

The GEGHA Project will utilise the existing power connection between the Wathagar substation and Wathagar Solar Farm Stage 1 to connect to the Plant to the grid.

3.4.4 Wathagar Solar Farm Stage 2

Wathagar Solar Farm Stage 2 involves the construction and operation of a 27 MW (DC) solar farm and 30MWh BESS adjacent to the existing Wathagar Solar Farm Stage 1. Project footprint is approximately 525m x 278m. Construction will be immediately adjacent to the GEGHA Project Plant, offset by 6m from the security fence line, and is scheduled to be constructed commencing in Q3 2024 and commissioning completed in Q3 2025.

It is anticipated that construction of the Solar Farm will commence up to 10 weeks prior to the GEGHA Plan.

Development Application was lodged with the Moree Plains Shire Council on 28th February, 2025. DA reference number for the project is **DA2025/6** with the application being available for review via the NSW Government's Planning Portal.

The potential for cumulative impacts on key environmental aspects such as traffic, noise, air quality, and visual amenity, during the construction and operational phase of both the GEGHA Plant and Solar farm has been considered as part of this EIS, particularly in relation to construction traffic, accommodation and activity timing.

3.4.5 Essential Energy Wathagar Substation

Essential Energy owns and operates the Wathagar Substation. The substation is located on the Sundown property, east of the existing solar farm and supplies the cotton Gin and other local loads. It includes a 5 MVA 66/22 kV transformer and corresponding switchgear and is supplied by the Transgrid Moree 132/66 kV substation via Essential Energy Wenna – Moree 66 kV sub-transmission lines.

The Wenna – Moree line has a summer rating of 9.5 MVA however the tee line to the Wathagar substation is only rated 6.5 MVA. The 22 kV side of the Wathagar substation is limited to the transformer rating of 5 MVA.

The GEGHA project plans to utilise the existing Wathagar Solar Farm Stage 1 connection to the existing substation infrastructure. Hiringa will undertake all power cable installation and electrical works up to the substation connection.

3.5 GEGHA Plant – Proposed Utilisation of Site Access

3.5.1 Access

HSPT is progressing a lease agreement with Namoi Cotton and Sundown Pastoral Co. to enable construction and operational access to the GEGHA Project within Lot 1 / DP 1315847. A right of access was formalised on title on the 7th May 2025.

HSPT has also entered into a separate agreement with Sundown Pastoral Co. to enable access to its infrastructure within lot 30/1040936 (water pump and associated pipework and telemetry).

These access agreements will remain valid for the operational life and decommissioning of the assets.

HSPT propose to use the existing entrance/ exit off the Gwydir Highway into the Wathagar Cotton Gin. The road will require a relatively small upgrade for use through the construction and operation of both the Wathagar Solar Farm Stage 2 and the GEGHA Project.

The upgrade forms part of DA2025/6 (Moree Plains Shire Council) for the construction and operation of the Wathagar Solar Farm Stage 2 Project as the solar farm will likely commence prior to the GEGHA Project. The Concept plan for the upgrade is outlined in figure 3.9 and provided for information in Appendix I.

The works will be subject to a Crown licence that will include assessment under the Native Title act as part of the licence application review process. GEGHA is entitled to a Right of Way over the Travelling Stock Route (Lot 7300/DP1161855) via s75 of the Local Land Services Act, 2013.

HSPT, as proponent of the Wathagar Solar Farm Stage 2, will require to enter into a Works Authorisation Deed (WAD) with Transport for New South Wales.

HSPT, as proponent of the Wathagar Solar Farm Stage 2, would also require a s138 agreement under the Roads Act 1993 prior to undertaking any active work on the Gwydir Highway.

An alternative access route to enter the subject land has been nominated as part of this EIS should the upgrade works be incomplete or delayed at the point of construction commencement.

Figure 3.9 - Overview of planned upgrade to the Wathagar Gin entry/ exit to the Gwydir Hwy (lot 7300/1161855)

This forms part of DA2025/6 – Development Application for Wathagar Solar Farm Stage 2.

The existing access to the Wathagar cotton Gin is sealed from the Gwydir Highway up to the formal entrance to the Gin, a distance of approximately 670m. The access will be upgraded with a Basic Left Turn (BAL) and Basic Right Turn BAR) turn treatment applied (this upgrade does not form part of the scope of this EIS).

Otherwise, the remainder for the sealed section of access into the Gin is fit for purpose and does not require any further modification or upgrade.

3.5.2 Internal roads

At the end of the sealed road section, ~670m in from the Gwydir highway, the following allowances have been made to formalise and upgrade internal roads to make them suitable for the GEGHA Plant's operation:

- 420m x 5m wide bitumen roading within the plant compound to allow for access to hydrogen and ammonia refuelling load out and vehicular access.
- 1,625m x 6m wide gravel (300mm depth) from the bitumen Gin entry to the GEGHA Plant entry.
- 175m x 5m wide gravelled road to the control room.
- 1,040m x 4m wide roading from the control room entry around the southern boundary of the solar farm to provide a secondary Light Vehicle access to the south of the GEGHA plant compound.
- 650m roading from the GEGHA Plant to the drainage dam and pump assembly. Gravel removed during ground preparation works for the water storage will be repurposed for use in this roading work.

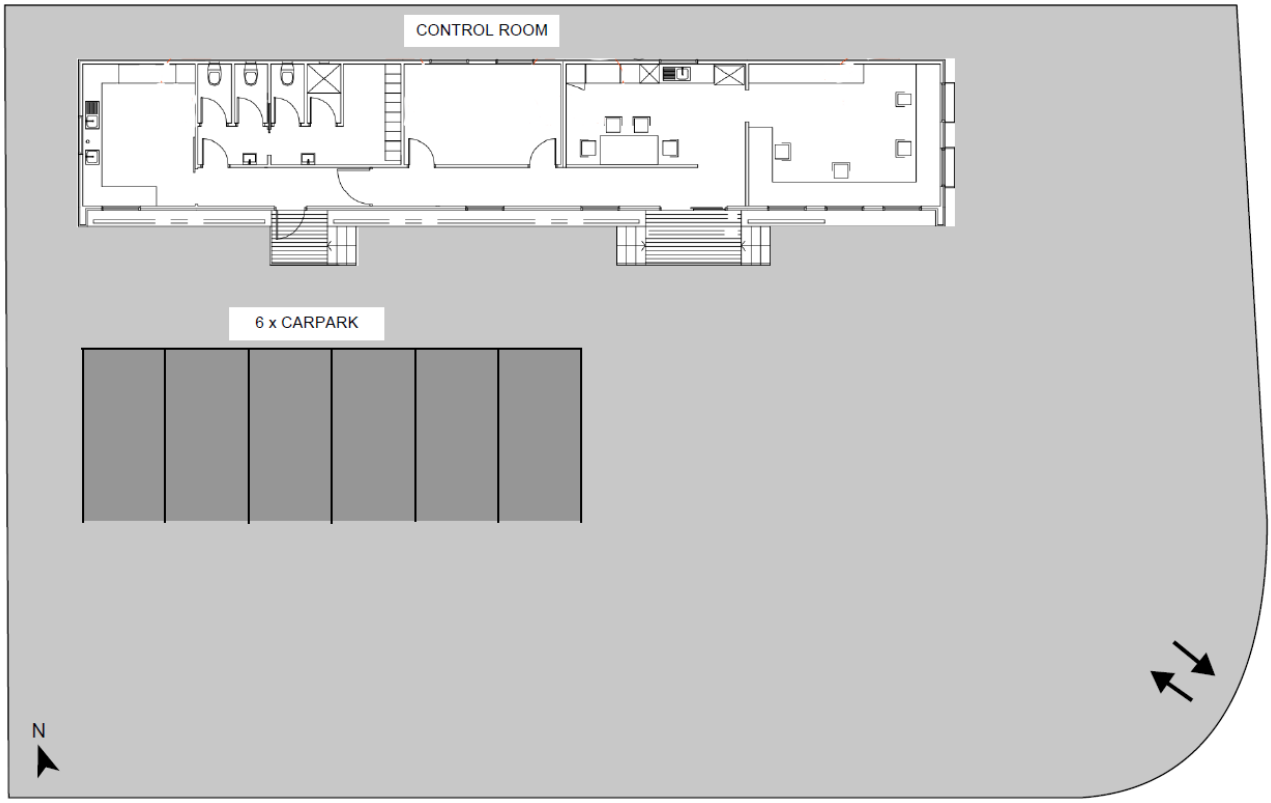
Within the GEGHA Compound, access from the gate to the hydrogen and ammonia load outs will have a 300mm base of selected gravel with a bitumen sealing.

3.5.3 GEGHA Site Parking

A temporary lay down area has been nominated directly to the east of the evaporation pond. This area will be utilised during construction for workforce parking and will contain site offices, crib room and ablutions.

Permanent parking provisions have been made as part of the control room layout as depicted in figure 3.10. There will be no formalised parking within the GEGHA Plant compound itself with all visitors and personnel reporting to the control room initially before travelling to other parts of the plant from there.

Figure 3.10 - Preliminary Control Room layout

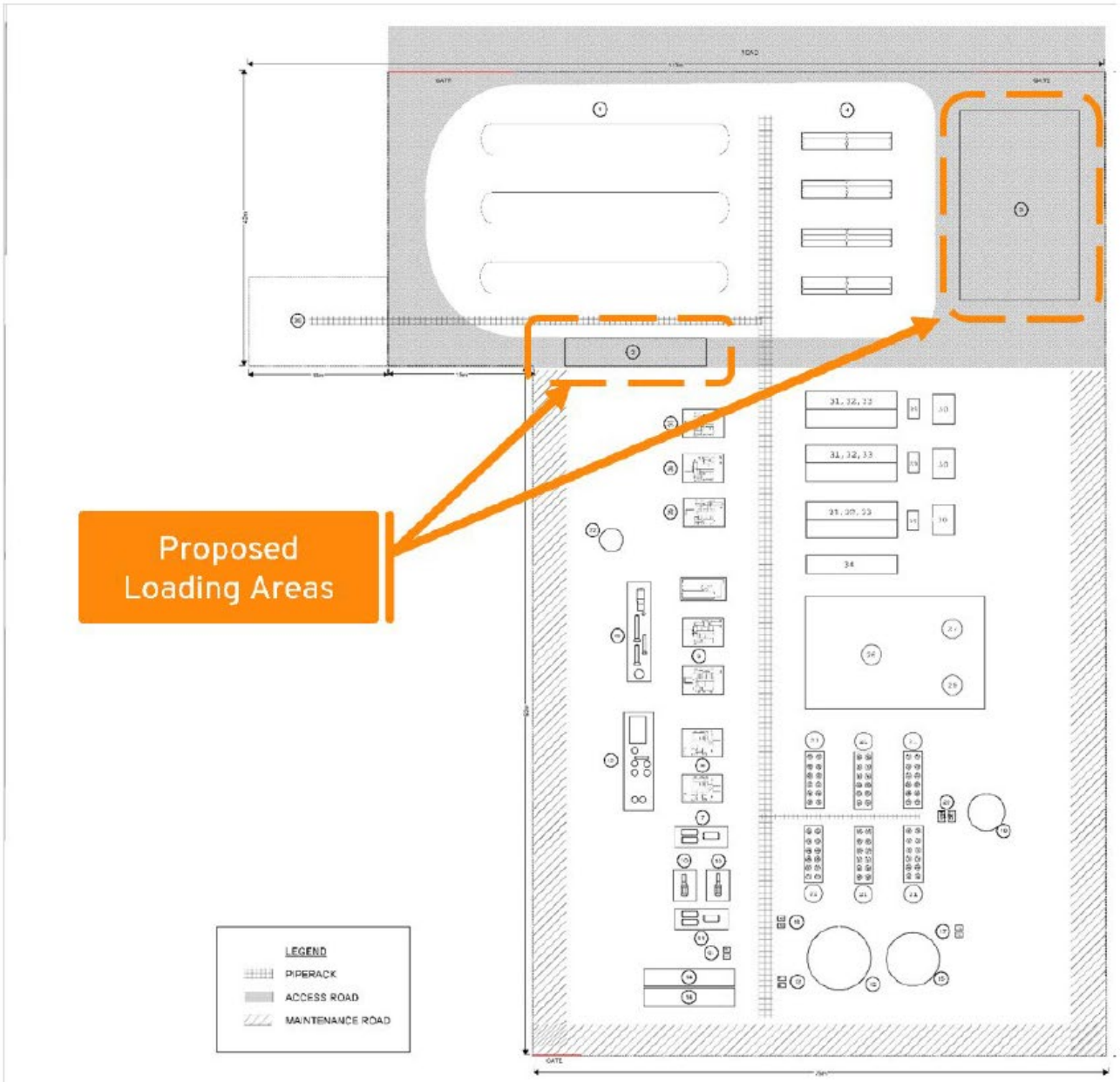


3.5.4 Plant and Product Loading area configuration

There will be two heavy goods vehicle access gates into the GEGHA Compound with an internal one-way system configured to accommodate all loading requirements on site.

Preliminary swept path assessment has been completed, allowing heavy vehicles up to a 26 metre B-double to enter and turn through the hydrogen load out and ammonia load out (reflected in figure 3.11). Detailed swept path will be undertaken as part of detailed design development of the plant and loading areas.

Figure 3.11 - GEGHA Plant site layout detailing loadout locations



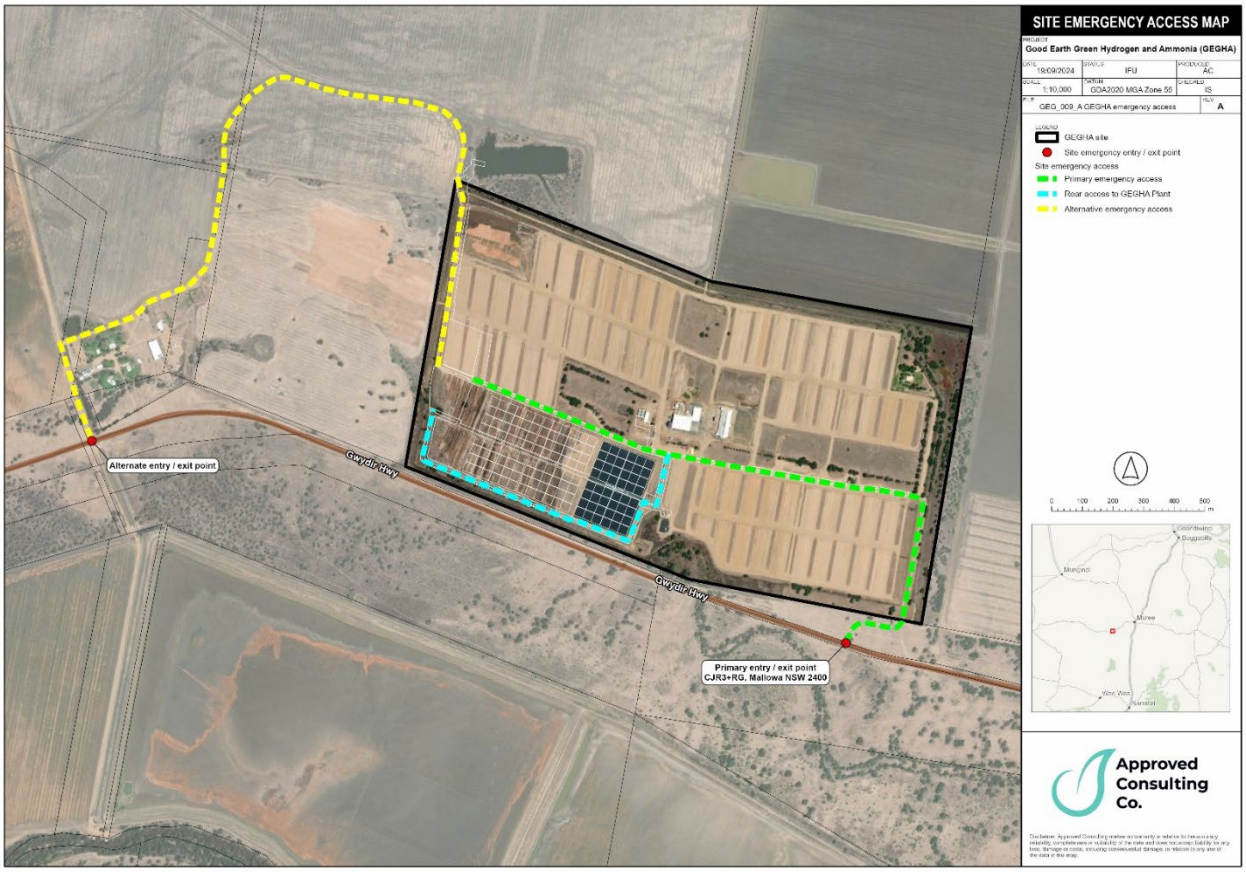
NO.	EQUIPMENT	NO.	EQUIPMENT
1	AMMONIA STORAGE	18	DEMIN WATER PUMPS
2	AMMONIA TRUCK LOADING	19	COOLING WATER BUFFER TANK
3	H2 TRUCK LOADING ZONE	20	COOLING WATER PUMPS
4	HP H2 STORAGE IN MEGs	21	ADIABATIC COOLING TOWERS
5	NITROGEN PREPARATION	22	NH3 SCRUBBER
6	N2 COMPRESSORS	26	PLC / MCC ROOM
7	N2 AND H2 MIDDLE TANKS	27	AUX TRANSFORMER
8	AMMONIA SYNTHESIS	28	HV SWITCHGEAR
9	AMMONIA COMPRESSORS	29	HV/LV TRANSFORMER
10	INSTRUMENT AIR COMPRESSORS	30	RECTIFIERS
11	AIR RECEIVER AND DRYER	31	ELECTROLYSER
12	RAW WATER TANK	32	GAS-LIQUID TREATER
13	RAW WATER PUMPS	33	H2 PURIFICATION
14	WATER TREATMENT	34	UTILITIES CONTAINER
15	TREATED / FIRE WATER TANK	35	H2 COMPRESSORS
16	TREATED WATER PUMP	36	NH3 VENT
17	FIRE WATER PUMPS		

3.5.5 GEGHA Plant - Emergency Access

Emergency access to and from the site is proposed via the existing main access. Secondary emergency access to the project is proposed via an existing access from the Gin to the Gwydir Highway, available via an internal dirt road that is maintained by Sundown Pastoral and leads out to the Gwydir Highway on the west side of the site (figure 3.12).

Emergency management, including formal instruction on emergency protocol and procedure will form part of the GEGHA Project construction safety management plan and Emergency Response Plan when the plant is operational.

Figure 3.12 - GEGHA Emergency Access Routes



3.6 Land Use and Activities

Land use will be for the production and storage of hydrogen and ammonia which is defined in planning terms in Section 3 of the EIS. Hydrogen refuelling and load out of ammonia is also planned to be undertaken at site.

Activities will be focused on the construction of the Plant and its ancillary infrastructure initially, then commissioning before entering into an operation and maintenance phase.

At the end of its productive life, the plant, storage and ancillary facilities will be decommissioned and repurposed where possible. It is assumed in this section that activities associated with construction will also be typical of the Project's decommissioning phase (except in reverse).

3.6.1 GEGHA Activities – Construction

The following activities will be undertaken during the construction phase:

- Establishment of a temporary laydown with site office, car parking, space for materials and equipment;
- Clearing and levelling of land by grader or excavator;

- Civil works to upgrade internal roads and accesses;
- Stockpiling of topsoil for use in reinstatement activities;
- Ground preparation and concreting of bases for key plant items;
- Ground preparation and construction of the evaporation pond;
- Positioning and connection of modular electrolyser units, ammonia plant and associated cooling, compression and input sources;
- Installation of Ammonia and Hydrogen storage;
- Installation of pipework, racking and electrical connections;
- Installation of load out points for ammonia and hydrogen;
- Establishment of water tanks, water treatment plant and installation of fire protection system
- Installation of vent, scrubber and connecting pipework;
- Construction of vapour barrier wall;
- Trench construction and pipe laying to connect the drainage dam and make provision for future supply from the Wathagar bore);
- Installation of floating pump and pump house system at the drainage dam;
- Bitumen sealing and gravelling of the GEGHA Plant area.
- Construction of control room compound, wastewater irrigation field, permanent parking and fencing;
- Buried power connections between the GEGHA Plant and the control room. Power connection to the Wathagar Solar Stage 1; and
- Installation of security fencing and camera system.

3.6.2 GEGHA Activities – Operation

The following operational activities will be undertaken:

- Load out of ammonia storage into trucks;
- Load out/ changeover of hydrogen Multi Element Gas Containers (MEGCs);
- Hydrogen refuelling;
- Operational monitoring and maintenance of plant function from Control room;
- Production of hydrogen and ammonia with gas being transferred to storage;
- Multiple operational cycling of the scrubber with residual release of ammonia (<10 parts per million (ppm)) via the vent; and
- Regular upkeep and site maintenance.
- Intermittent scheduled maintenance or replacement activities.

3.6.3 Scale and Intensity of Activities – Construction

Construction is expected to take up to 9 months duration with 3-4 months commissioning. Standard construction hours of Monday - Friday 7am to 6pm and Saturday 8am – 1pm will be observed, including deliveries for plant and equipment.

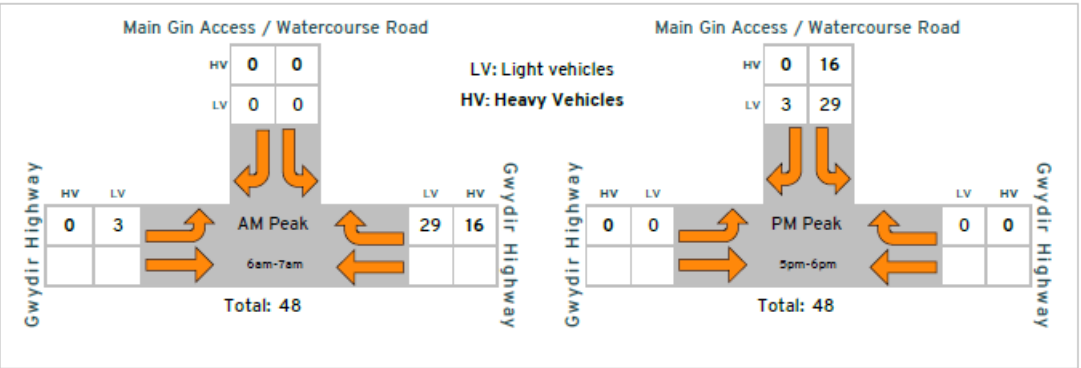
3.6.4 Scale and Intensity of Activities – Operation

Operational hours of the plant will be 24 hours per day, 7 days per week. The Plant will produce up to 6,000kg of hydrogen per day and up to 16 tonnes of ammonia per day.

A total of up to five light vehicles and up to 12 heavy vehicles are expected to enter and leave the Plant each day. HGV movements will be undertaken between 7am and 6pm.

3.6.5 Transport of materials and people to site – Construction

Figure 3.13 - Expected Construction Peak Hour Traffic Generation



3.6.6 Transport of materials and people to site – Operation

There will be an operational workforce of 7 people who will undertake shift work and cycle breaks through the week. Local maintenance contractors will be brought on to site intermittently to undertake testing and maintenance activities. Business as usual maintenance activities will be undertaken during daytime operational hours between 7am and 6pm.

Operational traffic generation is provided in table 3.2 and discussed further in chapter 8.

Table 3.2 - Operational traffic generation

Component	Traffic Generation	
	Light Vehicles per day	Heavy Vehicles per day
Site Operations	Up to 5	Up to 2
Ammonia Delivery	-	Up to 2
Hydrogen Delivery	-	Up to 4
Hydrogen Refuelling	-	Up to 4
Total	5 light vehicles	12 heavy vehicles

3.7 Project Timing

The GEGHA Project has the following estimated dates for key milestones:

- Commencement of construction: Q3/4 2025
- Commissioning: 2026
- Operation: from 2026
- Decommissioning: when the plant has reached the end of its operational life
- Rehabilitation: Would occur following completion of decommissioning

4 STATUTORY CONTEXT

4.1 How is the Project being Planned?

1. **The GEGHA Project:** The Hydrogen plant, Ammonia plant and associated storage, load out, water supply, evaporation pond, ancillary pipework, cabling, control room, car park, internal roading and perimeter fencing will be subject to development consent as a State Significant Development under Part 4 of the Environmental Planning and Assessment Act, 1979 ('EP&A Act'), involving the preparation and submission of an Environmental Impact Statement (this document) in support of the Development Application lodged through the NSW Major Project Planning Portal. The Minister for Planning is the consent authority, facilitated by DPHI.
2. **Wathagar Solar Farm Stage 2:** A 27 MW (DC) solar farm, including 30MWh BESS is the primary power supply for the GEGHA Project and is subject to a separate Development Application which was prepared and lodged with the Moree Plains Shire Council on the 27th February, 2025 (reference DA2025/6). The DA is subject to consideration by the Northern Regional Planning Panel in an advisory capacity.

4.2 Statutory Requirements

Table 4.1 - GEGHA Project Statutory Requirements

Statutory Relevance	Legislation	Project Relevance
New South Wales Legislation		
Power to grant approval	*Environmental Planning and Assessment (EP&A Act 1979)* *Environmental Planning and Assessment Regulation 2021*	Section 4.36 of the EP&A Act provides for the declaration of State Significant Development (SSD) pursuant to a State environmental planning policy 4.36(2) or by order of the Minister 4.36(3). The Project, satisfies the criteria for SSD under Division 4.7 of the EP&A Act and the following sections of the Planning Systems State Environmental Planning Policy (SEPP): ▪ section 2.6(1); ▪ paragraph 10(1)(c) of Schedule 1 (Ammonia production plant) ▪ paragraph 10(2)(b) of Schedule 1 (Hydrogen storage) ▪ paragraph 10(2)(c) of Schedule 1 (Ammonia storage) ▪ paragraph 10(3) (Ammonia storage)
	State Environmental Planning Policy (Planning Systems) 2021	Paragraph 10(1)(c) of Schedule 1 refers to Development that has an estimated development cost of more than $30 m for the purpose of manufacture or reprocessing of the following (not including labelling or packaging): pesticides or inorganic fertiliser. Paragraph 10(2)(b) of Schedule 1 refers to Development with an estimated development cost of more than $30 million for the purpose of gas storage facilities whilst paragraph 10(2)(c) refers to development with an estimated development cost of more than $30 million for the purpose of chemical storage facilities. Paragraph 10(3) refers to a development for the purpose of the manufacture, storage or use of dangerous goods in such quantities that constitute the development of a major hazard facility within the meaning of chapter 6B of the Occupational Health and Safety Regulation 2001*. All are applicable to GEGHA which has a total estimated development cost of over $30 million. * The Occupational Health and Safety Regulation 2001 has been repealed by the *Work Health and Safety Act, 2011*. The *Work*

		Health and Safety Regulations 2017 make provision for Major Hazard Facilities.
	State Environmental Planning Policy (Resilience and Hazards) 2021	Developments that are classified as potentially hazardous under the Resilience and Hazards SEPP are required by clause 3.11 to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls. chapter 4 relates to the remediation of land and the requirement for contamination and remediation to be considered in determining a development application. Appendix B.13 contains a contaminated land assessment report for the GEGHA Project. There is no evidence of pre-existing contamination on site.
Permissibility	Moree Plains Local Environmental Plan	The GEGHA Project is permissible with consent, under the Moree Plains Local Environmental Plan (LEP) 2011 and State Environmental Planning Policy (Planning Systems) 2021. The proposed Project site is zoned RU1 – Primary Production in the Moree Plains LEP. Section 3 of the Zone RU1 Land Use Table allows development of 'Heavy industrial storage establishments' and 'heavy industries' with consent.
Permissibility – considered	State Environment Planning Policy (Transport and Infrastructure) 2021	Clause 2.122 of the Transport and Infrastructure SEPP refers to traffic generating developments and Schedule 3 lists the types of developments that must be referred to Transport for NSW (TfNSW). The Proposed project's development purpose would be classified as 'industry'. The Gwydir Highway is considered a classified road and the total disturbance area for the Project exceeds 5,000m^2 which triggers 'traffic-generating development' status.
Other Planning instruments – general alignment	State Environmental Planning Policy (Biodiversity and Conservation) 2021.	Chapter 3 of the SEPP relates to Koala habitat protection. The Project Biodiversity Development Assessment Report (Appendix B.5) confirms that no Koala use trees are present on the subject land. It is highly unlikely that koalas will occur within the Project disturbance footprint.
	State Environmental Planning Policy (Industry and Employment) 2021.	Chapter 3 of the SEPP relates to signage. Project signage will be limited to temporary construction signage, instructional signage on site and signage required by law (i.e. associated with an operational plant and major hazardous facility). All Project signage will be compliant with the objectives of chapter 3 section 3.1(1)(a) and will satisfy the conditions of Schedule 5 of the SEPP.
	State Environmental Planning Policy (Primary Production) 2021.	The GEGHA project will not displace any actively productive agricultural land. By producing ammonia for use as a fertiliser in food and fibre production, the Project will enhance aims (a), (b) and (e) of chapter 2 of the SEPP. The GEGHA Project is outside of any designated areas of State Significant Agricultural land.
Other Legislation	*Protection of the Environment Operations Act, 1997 (POEO Act)*	The owner or occupier of a premises engaged in scheduled activities is required to hold an Environment Protection Licence (EPL) and comply with the conditions of that licence.

	Protection of the Environment Operations (Clean Air) Regulation 2022 *Protection of the Environment Operations (General) Regulation 2022* *Protection of the Environment Operations (Noise Control) Regulation 2017* *Protection of the Environment Operations (Waste) Regulation 2014*	HSPT require an EPL for the GEGHA Project for general chemicals storage, meaning the storage or packaging in containers, bulk storage facilities or stockpiles of any chemical substance classified as a dangerous good in the Transport of Dangerous Goods Code. This is a scheduled activity listed in Schedule 1, item 9(1) of the POEO Act. Further, the GEGHA Project addresses the criteria set out in Column 2 of clause 9(2) of Schedule 1 being general chemicals storage with capacity to store more than 20 tonnes (pressurised gases), 200 tonnes (liquefied gases) or 2,000 tonnes (chemicals in any other form). Section 4.41 of the EP&A Act provides that the application for grant of an EPL under chapter 3 of the POEO Act cannot be refused if it is necessary for carrying out SSD and is substantially consistent with the consent under Division 4 of the EP&A Act.
	Water Management Act *Water Management (General) Regulation 2018* Water Management (General) Regulation 2025 (pending)	Drainage water from the Wathagar dam would be utilised using an exemption under Clause 3, Schedule 1 of the Water Management (General) Regulations, 2018. It is noted that the 2025 Regulation will come into effect on 1st September 2025 with the proposed exemption maintaining its application for use of drainage water from the dam. A water use approval, water management work approval or activity approval would not be required, however an aquifer interference approval and water access licence may still be required should the Project trigger a requirement for one (or both) under the WM Act to extract and use groundwater as a secondary water supply.
	Work Health and Safety Act 2011 (WHS Act) *Work Health and Safety Regulation 2017 (WHSR)*	Schedule 15 of the *WHSR*) contains Hazardous chemicals at major hazard facilities (and their threshold quantities). Table 15.1 lists the threshold for Major Hazard Facility (MHF) designation for Ammonia as 200 tonnes. GEGHA will exceed this threshold and will therefore be subject to a Major Hazard Facility licencing and approval framework. Chapter 9 of the WHSR refers to the licencing and operation of Major hazard facilities including provision for risk management in Part 9.4 which states the requirements for emergency plans, a safety management system and safety case to be developed and implemented. The regulations also require operators of a licenced MHF to provide specific information to the local community. SafeWork NSW have been consulted in relation to the planning and development of the GEGHA Project and will continue to be pro-actively engaged following receipt of development consent, primarily in relation to the preparation of the Project Safety Case.
	Local Land Services Act 2013	The Project is entitled to gain access from the Gwydir highway across Lot7300 DP 1161855 under s.75 of the Local Land Services Act.
Consideration provided	*National Parks and Wildlife Act 1974*	Although there may be the potential to impact Aboriginal Heritage as part of the Project, Section 4.41 of the EP&A Act details that a Section 90 Aboriginal heritage impact permit is not required for

	National Parks and Wildlife Regulation 2019	State Significant Development that is authorised by a development consent. An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared for the Project in accordance with the Code of Practice for Archaeological Investigation in NSW (DECCW 2010), and guided by the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales (OEH 2011). The Moree Local Aboriginal Land Council were engaged and invited to review the ACHAR along with government stakeholders and registered interested parties. The ACHAR is presented in Appendix B.2.
	Aboriginal Land Rights Act 1983	Lot7300 DP 1161855 contains 4 Aboriginal Land Claims under the act. Claims 28348, 28374, 28336 and 50596 are registered across land including this parcel. These claims would be unimpacted by the construction, operation and decommissioning of the GEGHA Project.
	Dam Safety Act 2015	The Wathagar drainage dam is not a declared dam under the Act.
Commonwealth Legislation		
Other Approval - Considered	*Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*	A self-assessment has been undertaken Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (MNES) (DEWHA, 2013) and is provided in Appendix B.18. The Project is highly unlikely to impact any MNES and a referral is not required.
Other legislation - Considered	*Native Title Act 1993*	Native title has been extinguished across freehold land parcels Lot 1 / DP 1315847, Lot 2 / DP 1315847 (Parish of Wathagar) and Lot 30 DP 1040936 (Parish of Wathagar). The GEGHA Project would not affect any Native Title rights or interests.

4.3 Pre-condition to exercising the power to grant approval

Table 4.2 provides pre-conditions to exercising the power to grant approval

Table 4.2 - Pre-conditions to approval

Project Element	Summary Description
State Environmental Planning Policy (Resilience and Hazards) 2021	Developments that are classified as potentially hazardous under the Resilience and Hazards SEPP are required by clause 3.11 to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls. A PHA has been prepared for the Project and is provided in Appendix B.8.
Biodiversity Conservation Act 2016	Part 7 of the Biodiversity Conservation Act details the provisions for Biodiversity assessment and approvals under the Planning Act that an application for State Significant Development under Part 4 of the EP&A Act must address. Part 7 Division 2 Section 7.9 states that any application for State Significant Development must be accompanied by a Biodiversity Development Assessment Report (BDAR) unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values. The BDAR has been prepared and is provided in Appendix B.5.

4.4 Mandatory matters for consideration

Table 4.3 - Mandatory matters for consideration

Statutory Reference	Mandatory consideration	EIS Reference Section
Consideration under the EP&A Act and EP&A Regulation		
Section 1.3 (EP&A Act)	Applicable objects of the EP&A Act	Chapter 19 (ESD, Energy & Life Cycle) Chapter 22 (Project Justification)
Section 4.15 (EP&A Act)	Relevant environmental planning instruments: - State Environmental Planning Policy (Planning Systems) 2021 - State Environmental Planning Policy (Resilience and Hazards) 2021 - State Environmental Planning Policy (Transport and Infrastructure) 2021 - Moree Plains LEP	Chapter 6 (Hazard and risk) Appendix B.8 (PHA) Chapter 13 (Noise and Vibration) Appendix B.9 (Noise and Vibration Impact Assessment) Chapter 20 (Social Impact Assessment)
Section 4.12(8) (EP&A Act)	A development application for State significant development or designated development is to be accompanied by an environmental impact statement prepared by or on behalf of the applicant in the form prescribed by the regulations.	Appendix A (Concordance table)
Considerations under NSW Environmental Planning Instruments		
State Environmental Planning Policy (Planning Systems) 2021	Development for the purpose of: • manufacture or reprocessing of pesticides or inorganic fertiliser. • gas storage facilities • manufacture, storage or use of dangerous goods having an estimated development cost of over $30 million is considered a State Significant Development.	Chapter 2 (Strategic Context)
State Environmental Planning Policy (Resilience and Hazards) 2021	Developments that are classified as potentially hazardous under the Resilience and Hazards SEPP are required by clause 3.11 to have a preliminary hazard analysis (PHA) prepared to determine the risk to people, property and the biophysical environment at the proposed location and in the presence of controls.	Chapter 6 (Hazard and Risk) Appendix B.8 (PHA)
	S4.6 Contamination and remediation to be considered in determining development application A consent authority must not consent to the carrying out of any development on land unless it has considered whether the land is contaminated. Prior to determining an application for consent to carry out a development that would involve a change of use on the subject land, the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines.	Chapter 10 (Soil and Water) Appendix B.13 (Contaminated Land Assessment Report)

State Environmental Planning Policy (Transport and Infrastructure) 2021	S2.119(2) Development with frontage to classified road The consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that – (a) where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and (b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of – i. the design of the vehicular access to the land ii. the emission of smoke or dust from the development, or iii. the nature, volume of frequency of vehicles using the classified road to gain access to the land, and (c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.	Chapter 8 (Traffic and Transport) Appendix B.2 (Project Traffic Impact Assessment)
	S2.122(4) Traffic Generating Development Before determining a development application for development to which this section applies, the consent authority must— (a) give written notice of the application to TfNSW within 7 days after the application is made, and (b) take into consideration— (i) any submission that RMS provides in response to that notice within 21 days after the notice was given (unless, before the 21 days have passed, TfNSW advises that it will not be making a submission), and (ii) the accessibility of the site concerned, including— (A) the efficiency of movement of people and freight to and from the site and the extent of multi-purpose trips, and (B) the potential to minimise the need for travel by car and to maximise movement of freight in containers or bulk freight by rail, and (iii) any potential traffic safety, road congestion or parking implications of the development.	Chapter 8 (Traffic and Transport) Appendix B.2 (Project Traffic Impact Assessment)

Moree Plains Local Environmental Plan	Objectives and use for RU1 Primary Production Objectives of the zone • To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To encourage diversity in primary industry enterprises and systems appropriate for the area. • To minimise the fragmentation and alienation of resource lands. • To minimise conflict between land uses within this zone and land uses within adjoining zones. • To permit development for certain purposes if it can be demonstrated that suitable land or premises are not available elsewhere. • To protect significant agricultural resources in recognition of their value to the longer term economic sustainability of Moree Plains. • To maintain the rural character of the land.	Chapter 4 (Project Description) Chapters 7-21

4.5 Nominated exemption – Clause 3, Schedule 1 of the Water Management (General) Regulation 2018

Division 2 of Part 2 and Division 2 of Part 3 of the Water Management (General) Regulation 2018 establish exemptions from the requirement to hold a water access licence, a water use approval and a water supply work approval.

The use of the drainage dam water fulfils the definition of an 'excluded work' under Schedule 1 of the Regulation. Specifically, the utilisation of the drainage dam water can be described as an excluded work under clause 3 of schedule 1 which states:

Dams solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source, that are located on a minor stream.

This exemption allows landholders to construct or utilise a dam to capture, contain and recirculate drainage or effluent that would otherwise result in a water source being contaminated. 'Contaminated' in this scenario is dirty water: *Drainage or effluent water captured from active areas, run-off from infrastructure and run-off from disturbed catchments* (Interpreting excluded works dams Fact Sheet, DPE).

There are four parts to the exemption that must be justified to validate the exemption, allowing landholders to take and use the captured water on their property without a water access licence, water use approval or water supply work approval. These are provided with justification in Table 10.2.

Table 4.4 - Justification of Exemption under Clause 3, Schedule 1 of the Water Management (General) Regulation 2018

Exemption Criteria	Does the Wathagar Drainage Dam address the criteria?	Justification
The work must be a dam	Yes	Confirmed – propose to utilise an existing dam.
The dam must be used solely for the capture, containment and recirculation of drainage and/or effluent to prevent the contamination of a water source.	Yes	Dam is currently operating as a drainage containment structure under EPL 10832 to prevent entry into Tarran Creek.

Exemption Criteria	Does the Wathagar Drainage Dam address the criteria?	Justification
		The dam is not subject to any other licence, exemption, exclusion or harvestable right.
The dam must be: **(a) consistent with best management practice, or** **(b) required by a public authority (other than specified entities)** **The dam must prevent the contamination of a water source.**	Yes	The functional reuse (borrow pit turned into a drainage dam) aligns with the principles of ESD by promoting sustainable use of land and resources and generating environmental benefits through mitigating the impact of stormwater. In terms of design, the size, settling zone and sediment storage zone are far in excess of the minimum design requirements for a Type C wet basin as described in the International Erosion Control Association Best Practice Erosion and Sediment Control, Appendix B – Sediment basin design and operation.
The dam must be located on a minor stream.	Yes	The dam is located within the braided channel that feeds Tarran Creek that remains a functional part of the creek during flooding events.

5 CONSULTATION AND COMMUNITY ENGAGEMENT

5.1 Consultation and Community Engagement - Overview of this chapter

This chapter describes the extent to which stakeholders and the broader public have been consulted and engaged in relation to the Project.

Consultation has been undertaken in accordance with *Undertaking Engagement Guidelines for State Significant Projects, March 2024* and the Project's Community Consultation Plan (Appendix G).

This Section intends to:

- describe the foundation for all consultation in relation to the GEGHA Project;
- outline the purpose for consultation and associated timing;
- identify primary Project Stakeholders and establish their interests;
- provide a framework for engagement;
- detail the sequencing of consultation;
- detail how stakeholders have engaged meaningfully with the project to date;
- provide a summary of consultation recorded to date;
- provide a summary of key issues raised by stakeholders and members of the community to date.

5.2 Hiringa Sundown Project Trust Consultation Principles

(HSPT is committed to undertaking best practice engagement during the planning, construction and operation of GEGHA. This will ensure all stakeholders and the local community have meaningful opportunities to engage with the project team and contribute to the planning process and continued operation of the facility.

The consultation principles have been developed by senior management with the purpose of establishing expectation for all employees and contractors who are involved in the planning, design, construction and operation of the GEGHA Project.

These principles and commitments have been incorporated into the consultation program:

- **Act with Purpose**: Ensure that stakeholders are consulted and informed about the Project as it relates to them. Focus will be placed on the aspects of the Project that they hold interest and influence. Where concerns are raised or improvements are suggested, they will be fully considered in the design, planning, construction and operation of GEGHA.
- **Act with Integrity**: Ensure that consultation and engagement is conducted in a manner that promotes openness and transparency, fostering mutual respect and trust.
- **Act with Intent**: Ensure that consultation enables thorough communication between HSPT and all Project stakeholders through the timely engagement and distribution of project information that is clear, accurate and relevant.

5.3 Consultation Objectives

The consultation objectives for the Project are to:

- **Facilitate genuine stakeholder engagement** to maximise regional benefit and meet our commitments to the surrounding community.
- **Align with** Individual and Community expectations.
- **Increase awareness, understanding and support** of the Project, including the process of the design, approvals, construction and operation of the plant, storage and connections;
- **Minimise impacts** to stakeholders by proactively mitigating potential impacts where possible to do so; and

- **Provide timely responses** to enquiries and requests for information via easily accessible communication channels.

5.4 Consultation Guidelines

Consultation to date has been undertaken in a way that is consistent with the following guidelines:

- Undertaking Engagement Guidelines for State Significant Projects, November 2021
- Guide for Major Hazard Facilities Providing Information to the Community, March 2012
- Aboriginal Heritage Consultation Requirements for Proponents, 2010
- Social Impact Assessment Guidelines for State Significant Projects
- Moree Plains Shire Council Community Participation Plan, 2019
- IAP2 Spectrum of Public Participation, 2018

It is intended that these guideline and reference documents will continue to be utilised and referenced in all consultation during the construction, operation and decommissioning phases of the Project.

5.5 Communication and Consultation

Community consultation has been consistent throughout the planning and design phase to date.

5.5.1 Methods of Communication

Methods of consultation that have been used comprised:

- Public Community Drop-in sessions with at least 7 days published notice in local newspaper(s)
- Dedicated Stakeholder briefings, meetings and correspondence with specific interest groups
- A 'Meet the Project' Session held on Wednesday 13th November 2024 in Moree
- Issue specific meetings with regulatory agencies and directly impacted stakeholders
- Attending and supporting at regional industry forums and events such as the Moree Ag-tech panel breakfast and Pitch2Grow.
- Project updates via social media

5.5.2 Overview Methods of Engagement

HSPT have used a range of methods to consult and engage with Project stakeholders and the broader community. These are summarised in Table 5.1.

Table 5.1 - Overview of methods of engagement utilised during the planning and design phase of the GEGHA Project

Methods of Engagement	
Digital communications	
Website	GEGHA established and maintains a project-specific website that contains up to date project information and is being continually updated as the project progresses. www.gegha.com.au.
Project email	A designated project email address has been established for enquiries in respect of the Project. gegha@hiringa.com.au.
Email updates	Email communications and project updates, sent to specific recipients.
LinkedIn	Posts designed to inform, engage and update.
Printed communications	

Website Fact Sheets, FAQs and Brochures	Fact sheets and other written communications have been developed to provide updates on the Project and provide specific information based on stakeholder feedback throughout the consultation period. Fact sheets are presented in soft copy on our website and have been printed in hard copy for use as take-aways during engagement activities.
Media	Media releases and articles have been prepared for local press ahead of key project events and milestones.
Public displays/ notices	Public notices have been placed in local and regional newspapers to promote public interest and in accordance with regulatory obligations.
Direct engagement	
In person	Meeting stakeholders face-to-face (in person or virtually).
Drop-ins	Drop-in community information sessions have been targeted at local residents, industry and people from the community. Drop-in sessions have included static displays with Project information on hand. Drop-in sessions have been hosted regularly in accessible public facilities around Moree.
Community events	Attending and participating in local events including supporting, exhibiting and contributing to community events where appropriate.
Surrounding residents	Targeted consultation with adjacent residents based on their communication preferences.

5.6 Identification of GEGHA Project Stakeholders

In accordance with the Engagement Guidelines, the Proponent identified key stakeholders for further engagement with an interest in or that are likely to be affected by the Project as part of the scoping of the Project. Identified stakeholders included:

Table 5.2 - Stakeholder identification

Stakeholder Group	Stakeholder
Local Government	• Moree Plains Shire Council
Regulatory Agencies	• Australian Renewable Energy Agency – ARENA (Cth) • NSW Department of Industry, Science and Resources • Australian Energy Regulator • Department of Climate Change, Energy, the Environment and Water (Cth) • Department of Planning & Environment – DPE (NSW), now Department of Planning, Housing and Infrastructure (DPHI). • Transport for NSW • SafeWork NSW • NSW Crown Lands • NSW Environment Protection Authority – EPA • NSW Department of Primary Industries – Fisheries • NSW Department of Primary Industries – Agriculture • Heritage NSW • NSW Rural Fire Service • NSW Fire & Rescue
Elected Representatives	• Hon. Penelope Sharp MP Minister for Energy Minister for Climate Change Minister for the Environment

Stakeholder Group	Stakeholder
	Minister for Heritage • Mark Coulton – Federal Member for Parkes • Hon. Tara Moriarty MP Minister for Agriculture and Minister for Regional NSW • Hon. Brendan Moylan Member for Northern Tablelands NSW • Moree Plains Shire Council / Mayor & Councillors
Indigenous and cultural heritage	• Moree Local Aboriginal Land Council
Landowners and residents	• Nearby/neighbouring landowners and residents
Business, Industry & Special Interest Groups	• Ammonia Energy Association • Australian Hydrogen Council • Clean Energy Council • NSW Office of Regional Economic Development • Training Services NSW • Moree Chamber of Commerce and Industry • Landcare NSW
Infrastructure and Utilities Providers	• Essential Energy • Telstra
Customers	• Sundown Pastoral Co. • Regional Customers
Local Community	• Moree • Broader Moree Plains LGA • Adjacent LGAs
Media	• National media • State media • ABC local • Moree Champion • Industry media • Moree Online news • North Western guide

Additionally, the following stakeholders have been identified and engaged through the planning and development of the EIS:

- Regulatory Agencies consulted following receipt of Project SEARs:
    - Department of Climate Change, Energy, the Environment and Water, specifically the:
        - Biodiversity, Science and Conservation Division
        - Water Group
        - Environment Protection Authority
        - National Parks and Wildlife Services
        - Heritage NSW
    - NSW Health
    - Hunter New England Local Health District
    - Department of Primary Industries and Regional Development, specifically:
    - Local Land Services
- Essential Energy
- surrounding local landowners, businesses and stakeholders
- local and regional community and environmental groups
- Indigenous and heritage Stakeholders:

  - Heritage NSW
  - Moree Local Aboriginal Land Council
  - Moree Plains Shire Council
  - Northern Tablelands Local Land Services
  - NTS Corp
  - National Native Title Tribunal
  - Registrar of Aboriginal Land Rights Act 1983
  - Registered participants
- Local Contractors, service providers and suppliers with an interest in the project primarily via the 'Meet the Project' session held in Moree on the 13th November, 2024.
- Interested Community members via regular Community Information Sessions held through mid-2023 to late 2024.

5.7 GEGHA Project Communication and Consultation to date

5.7.1 Consultation During Project Scoping Phase

Scoping of the GEGHA Project was undertaken during Q1 and Q2 2023 following securing of partial funding for the Project under the NSW Government's Hydrogen Hubs Initiative (HHI).

As a key stakeholder and as required under the HHI Funding Agreement, significant engagement and consultation processes are in place with the Department of Climate Change, Energy, the Environment and Water (DCCEEW). This includes DCCEEW's participation in the monthly Project Steering Committee and formal monthly reporting. This report, covering general progress, schedule and budget, is discussed with the DCCEEW in a monthly meeting.

A Scoping Report was prepared during April and May of 2023 and a Planning Focus Meeting was held on the 19th May 2023 with attendance from representatives from the following organisations:

- Department of Planning and Environment
  - Planning – Major Projects
  - Planning – northern and north east region
  - Planning - hazards
  - Water Assessment
  - Environment NSW
  - Heritage NSW
- NSW Department of Industry
- Moree Plains Shire Council
- Essential Energy
- Department of Primary Industries
- Local Land Services – Northwest region
- Environment Protection Authority NSW
- Fire Safety NSW
- Safe Work NSW
- Health NSW
- Transport for NSW (General and Northern Region)

The Project Scoping Report was lodged with DPE on the 24th May 2023 with a request for SEARs. Project SEARs were provided on the 21st June, 2023 and included agency advice from the following regulatory referral agencies:

- Moree Plains Shire Council
- NSW EPA
- Department of Planning and Environment – Biodiversity, Conservation and Science Division
- NSW Crown Lands
- Department of Planning and Environment – Water

- Department of Primary Industries – Agriculture
- NSW Fire and Rescue
- Hunter New England Local Health District
- Heritage NSW
- Health Protection NSW
- Safework NSW
- Transport for NSW
- Water NSW

Following re-modelling of the Project, a request for amended SEARs was made to the Department of Planning, Housing and Infrastructure (DPHI) on the 16th August 2024 with revised SEARs being provided on the 12th September 2024. The revised SEARs included supplementary agency advice from the following agencies:

- Moree Plains Shire Council
- Transport for NSW
- NSW EPA

5.7.2 Consultation during Preparation of the EIS

HSPT has engaged directly with referral agencies throughout the preparation of the EIS, seeking advice and clarification where necessary or otherwise providing an insight into our experience with similar projects or providing updates of planning and design progress.

Secondary licences, permits or approvals have been discussed with several agencies to inform HSPT of broader consenting and compliance requirements.

A monthly meeting was established with DPHI Industry Assessments, Development Assessments and Sustainability group to provide an update on progress, discuss administrative requirements and other general clarifications.

HSPT has also established a monthly meeting with the NSW Office of Regional Development to discuss Project facilitation within the regions including training opportunities, skills development, regional engagement and enabling contact and discussion with other State departments.

Locally, HSPT has been in regular contact with Moree Plains Shire Council's Regional Activation Unit who have been active in assisting and supporting the Project's public events and facilitating dialogue within Council.

Public engagement has been in accordance with the Engagement Guidelines, being undertaken consistently through the Project planning period. Materials have been prepared in an easy to understand format and HSPT have been active in participating in community events and promoting engagement within the Moree Community.

Surrounding landowners have been engaged and regularly updated of project progress and community drop-in sessions using their preferred method of engagement.

5.8 GEGHA Project Consultation Summary

Appendix G lists a detailed summary of all consultation undertaken to date during the planning phase of the Project.

5.8.1 Issues Raised During Stakeholder Consultation

Other than the key issues raised by the Project's referral agencies in their advice accompanying the SEARs and amended SEARs, four additional items have been raised during more detailed consultation that can be categorised as follows:

Local accommodation availability: Queries by Council on the availability of accommodation and the potential impacts to short term rental and tourist accommodation in Moree were raised at the outset of consultation in early 2023.

The Inland Rail project was being delivered at the time, as was the Newell Highway upgrade near Moree. With the passage of time and having consulted more fully with Moree Tourism and local motel operators, the Project can demonstrate that the required workforce can comfortably fit within the post-Covid occupancy rate (refer chapter 20). This occupancy rate is not expected to increase within the next 12-15months to an extent that would place an impact on the availability of beds for tourists or other commercial users.

Transportation of Hazardous and Dangerous Goods: Transport for NSW have highlighted the risk associated with the introduction of hazardous and dangerous goods on to the regional road network. Hiringa has identified that with Sundown Pastoral Company taking approximately 40% of the plant's produced products directly on-farm, there is a net saving of dangerous goods transportation in the region. There is further upside to displace urea or ammonia fertiliser that would otherwise be trucked in from Brisbane or Newcastle. Hydrogen displacement of diesel also reduces the need for fuel to be trucked in from Brisbane. This is discussed in detail in chapter 7 with the full benefits reducing hazardous and dangerous goods transportation within NSW.

Trucking Routes through Moree: Moree Plains Shire Council have identified that trucking routes and truck driver behaviour are general concerns that they share across the transportation industry. There is no way to past through Moree from west to east without passing a vulnerable portion of the community (hospital, aged care, day care, school, etc). Hiringa have worked with Council to map a preferred dangerous goods route through Moree. In addition, the Project's Voluntary Planning Agreement includes a contribution towards road safety programs within the Moree Plains Shire. Hiringa will also prepare a dedicated operational safety program focusing on driver behaviour as part of the Plant's operation.

Attracting workforce to regional NSW: Hiringa have identified that the ideal way to establish the required workforce for the operation of the plant would be to have skilled technicians and personnel based close to Moree and ideally with existing family or community connections to the Gwydir region. There is an acknowledgement that the operation of a hydrogen and ammonia plant may require skilled personnel to move to the region, at least in the first instance. The NSW Office of Regional Development have been working closely with Hiringa to advise of any State Government assistance that may be available when the time comes to seek operating staff.

5.9 GEGHA Project Community Engagement and Consultation

Community engagement continues to be an important part of HSPT's commitment to delivering a world-leading green hydrogen and ammonia project within the region.

Engagement with community has been guided through a number of passive and active engagement methods during the Project's planning and design phase, making it easy for interested members of the public to find current and accurate information.

The Project email (gegha@hiringa.com.au) was established in May 2023 and has represents the primary method for enquiries and feedback in relation to the project from the public.

The Project website (www.gegha.com.au) was launched in July 2023 and holds Project Fact Sheets that were updated in October, 2024. Additionally, the website contains detail about the companies behind the Project, links to the project's planning documentation on the NSW Government's Major Project Portal as well as a direct contact form, project email and Planning and Engagement lead contact details.

Consultation with community has focused on servicing the general public interest as well as providing opportunities for local and regional businesses to register their interest in the Project.

5.9.1 GEGHA Project Community Drop-in Sessions

Project Community Drop-in sessions have been held consistently throughout the Project's planning and design phase to date. Sessions have been held on the following dates and locations:

- 19th July 2023 – Moree Town and Country Club, 5-7 Frome Street, Moree 3pm – 7pm
- 15th November 2023 – Moree Services Club, 3 Albert Street, Moree 11am – 7pm

- 7th March 2024 - Social Co House, 167 Balo Street, Moree 3.30pm – 6.30pm
- 18th June 2024 - Social Co House, 167 Balo Street, Moree 3.00pm – 6.30pm
- 14th November 2024 – Social Co House, 167 Balo Street, Moree 10.30am – 1.30pm

Local media was collectively used to advertise the events (Moree Champion, North Western Guide, Narrabri Courier, Moree online news) with social media adding to the distribution across the community.

The sessions recorded a low attendance with less than 20 attendees cumulatively across the five sessions. All attendees were supportive of the project with positive feedback in relation to its development and operation.

5.9.2 GEGHA Project Meet the Project Session

A 'Meet the Project' session was held on Wednesday the 13th November 2024 with the aim of inviting businesses with an interest in being involved as a contractor, supplier or service provider during the construction and operation of the hydrogen and ammonia production plant to attend a session to meet representatives from Hiringa, Sundown Pastoral and Dialog Fitzroy (principle contractor). Collectively, the HSPT team represented Project Delivery, Operations Management, Engineering and Planning.

The session was developed in consultation with the Moree Local Aboriginal Land Council and with the involvement of the NSW Office of Regional Development.

Invitations were sent to known Moree and regional businesses requesting attendance. A flyer inviting businesses to attend the event was circulated around the Moree Chamber of Commerce mailing list as well as the Moree Plains Shire Council's contact list of approximately 100 local trades and supplier businesses.

More broadly, the office of regional economic development circulated the invite to surrounding Business chambers in Inverell, Glen Innes, Tenterfield, Uralla, Walcha, Gunnedah, Wee Waa, Liverpool Plains, Narrabri and Tamworth.

Newspaper advertisements were placed in primary newspapers in Newcastle, Tamworth, Armidale, Dubbo, Narrabri and Moree with an article prepared for the Moree online news.

The event was well attended with representatives from 24 businesses and organisations attended the session with several apologies who were registered for future contact in relation to the Project. Project fact sheets were printed off and handed out during the event.

The session provided a direct link to the Project's decision makers who will be able to involve local business when construction and operational work packages are developed in 2025.

5.9.3 GEGHA Project Community Event Involvement

HSPT was involved with the Ag-tech breakfast community event held in Moree in June 2024 with short presentation on the project followed by a panel-style discussion on future agricultural industry advancement in the region. The event was coordinated by the UNE SMART Incubator and was well attended by professionals across the agricultural industry.

HSPT has also committed to sponsor and attend a Community and Energy expo coordinated by Geni Energy in Narrabri in March 2025. The focus for the expo is future fuels, renewable energy and storage.

HSPT will continue to look for opportunities to be involved with community events, particularly with a focus on education and renewable energy development.

5.9.4 Issues raised by Community

There have been no negative issues raised by the community in relation to the Project. Enquiries and questions collectively fielded from the dedicated project email inbox and community information sessions can be categorised as follows:

- General enquiries on the process of manufacturing green hydrogen and ammonia;

- Service provider, Consultancy or Contractor enquiring on how to get involved;
- Enquiries relating to opportunities for individuals to be involved;
- Accommodation for use via Air B & B.

General enquiries: the Project website continues to be actively reviewed and updated with Project information and detail on the process of creating green hydrogen. Key project staff contact details are available for further questions and feedback to be provided directly. The Project inbox is monitored regularly throughout business hours with responses provided promptly.

Local workforce opportunity: The 'Meet the Project' session was very insightful in identifying interest from both individuals and local and regional businesses who have the capability and interest to be involved with the construction and operation of GEGHA.

Accommodation: A couple attended the November community drop-in session who had recently renovated a house and were interested in short-term letting. This is a further accommodation option for itinerant workers during construction.

6 HAZARD AND RISK

The following specialist reports have been prepared to inform this chapter:

- Good Earth Green Hydrogen and Ammonia Project Preliminary Hazard Analysis, Arriscar, May 2025. (Appendix B.8)
- Bush Fire Assessment Report in relation to the proposed Good Earth Green Hydrogen and Ammonia Project, Bush Fire Consulting Services, April 2025 (Appendix B.4).

6.1 Hazard and Risk - Introduction

This chapter provides an oversight of Hazard and Risk planning and assessment in relation to the GEGHA Plant's construction and operation. The focus of this chapter is on the Plant's operation, incorporating consideration of risk and threat to public safety, including bush fire risk.

This chapter and related appendices collectively address the requirements of section 4 and 15 of the Project SEARs (Appendix A).

This chapter is focused on two risk scenarios:

- The risk of the risk of a major process incident related to plant operation
- The threat of bush fire impacting plant operation

6.2 GEGHA Project Hazard and Risk Assessment Information Sources

A PHA has been prepared for this project by Arriscar. A copy of the full report is provided in Appendix B.8

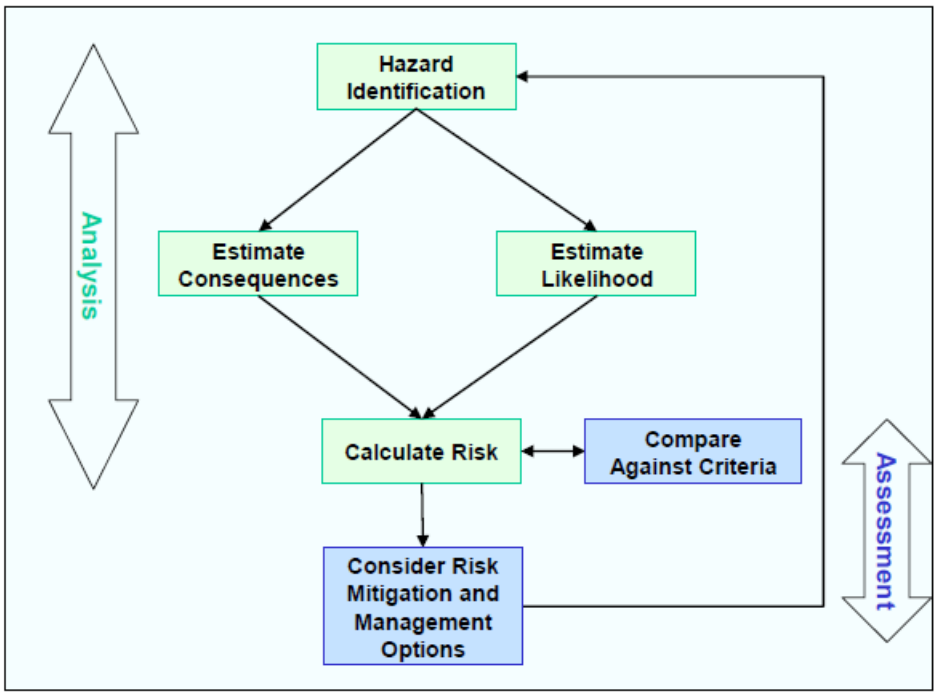
The assessment was undertaken in accordance with the following guidance documentation:

- Familiarisation with GEGHA Project Design and Planning documentation
- SEPP (Resilience and Hazards) 2021
- Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines – NSW Department of Planning 2011
- Hazardous Industry Planning Advisory Paper (HIPAP) No 4
- HIPAP No 6
- Assessment Guideline – Multi-level Risk Assessment – NSW Department of Planning and Environment 2011
- AS 4343:2005 Pressure Equipment – Hazard levels
- AS 2030 Series – Gas Cylinders Standards
- AS 2030.1 – General Requirements
- AS 2030.2 – Inspection and Testing
- AS 2030.4 – Welded and Composite Cylinders
- ISO 11119-3 – Composite Cylinders (Type 4)
- AS/NZS 2022: Anhydrous ammonia – Storage and Handling

6.3 GEGHA Project Preliminary Hazard Analysis Overview

A Preliminary Hazard Analysis (PHA) for the Project has been completed with the objective of evaluating potential hazards associated with the GEGHA Plant's operation. The PHA has been prepared by a third party (Arriscar) in line with the requirements of HIPAP No. 6 (see Figure 6.1 below).

Figure 6.1 - Overview of the QRA Process (extract from HIPAP No. 6)



6.3.1 Risk Criteria

The following quantitative risk criteria were used as a basis for assessment for the Quantitative Risk Assessment (QRA). Refer to section 6.3.3 for assessment against these criteria.

Individual Fatality Risk

The individual fatality risk imposed by a proposed (or existing) industrial activity should be low relative to the background risk. This forms the basis for the following individual fatality risk criteria adopted by the NSW DPHI.

The Individual Fatality Risk Criteria applied in the QRA are outlined in Table 6.1. These align with HIPAP No. 4. Refer to Section 6.3.3 for assessment against these criteria.

Table 6.1 - Individual Fatality Risk Criteria

Land Use	Risk Criterion [per million per year]
Hospitals, schools, childcare facilities and old age housing developments	0.5
Residential developments and places of continuous occupancy, such as hotels and tourist resorts	1
Commercial developments, including offices, retail centres, warehouses with showrooms, restaurants, and entertainment centres	5
Sporting complexes and active open space areas	10
Industrial sites	50

Injury Risk

The DPHI has adopted risk criteria for levels of effects that may cause injury to people but will not necessarily cause fatality. Criteria are included in HIPAP No. 4 for potential injury caused by exposure to heat radiation, explosion overpressure and toxic gas/ smoke/dust.

The DPHI's injury risk criterion for heat radiation is as follows:

- *Incident heat flux radiation at residential and sensitive use areas should not exceed 4.7 kilowatts per square metre (kW/m^2) at a frequency of more than 50 chances in a million per year.*

The DPHI's injury risk criterion for explosion overpressure is as follows:

- *Incident explosion overpressure at residential and sensitive use areas should not exceed 7 kilopascals (kPa) at frequencies of more than 50 chances in a million per year.*

The DPHI's injury risk criteria for toxic gas / smoke / dust exposure are as follows:

- *Toxic concentrations in residential and sensitive use areas should not exceed a level which would be seriously injurious to sensitive members of the community following a relatively short period of exposure at a maximum frequency of 10 in a million per year.*

Refer to Section 6.3.3 for assessment against these criteria.

Toxic Irritation Risk

The DPHI's toxic irritation risk criteria for toxic gas / smoke / dust exposure are as follows:

- *Toxic concentrations in residential and sensitive use areas should not cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.*

Refer to Section 6.3.3 for assessment against these criteria.

Risk of Property Damage and Accidental Propagation

Heat radiation exceeding 23 kW/m^2 may cause unprotected steel to suffer thermal stress that may cause structural damage and an explosion overpressure of 14 kPa can cause damage to piping and low-pressure equipment. The DPHI's criteria for risk of damage to property and accident propagation are as follows:

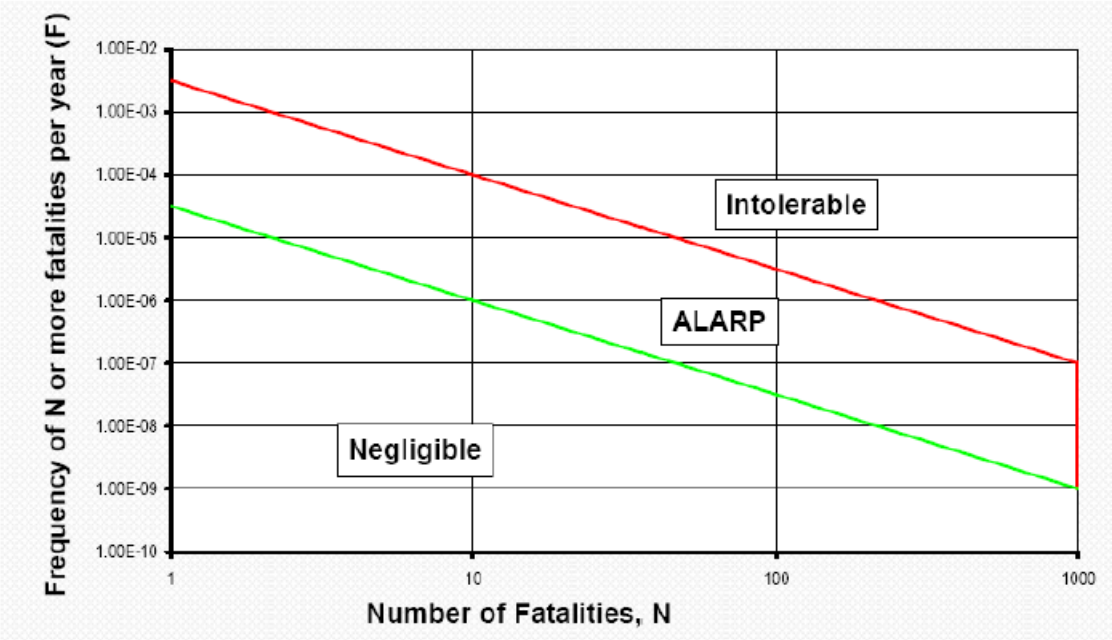
- *Incident heat flux radiation at neighbouring potentially hazardous installations or at land zoned to accommodate such installations should not exceed a risk of 50 in a million per year for the 23 kW/m^2 heat flux level.*
- *Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings should not exceed a risk of 50 in a million per year for the 14 kPa explosion overpressure level.*

Refer to Section 6.3.3 for assessment against these criteria.

Societal Risk

The DPHI's suggested societal risk criteria (Refer to Figure 6.2), recognise that society is particularly intolerant of accidents, which though infrequent, have a potential to create multiple fatalities. Below the negligible line, provided other individual criteria are met, societal risk is not considered significant. Refer to section 6.3.3 for assessment against this criteria.

Figure 6.2 - Indicative Societal Risk Criteria



6.3.2 Hazard Identification

A workshop was conducted in September 2023 to assist in identifying hazards associated with the operating phase of the proposal. As a result of this Hazard ID assessment, the following potential scenarios were identified for the proposed GEGHA plant operation:

- Accidental release of hydrogen resulting in a jet fire;
- Accidental release of hydrogen resulting in a flash fire;
- Accidental release of hydrogen resulting in an explosion;
- Accidental release of ammonia or ammonia/hydrogen mixture resulting in a jet fire;
- Accidental release of ammonia or ammonia/hydrogen mixture resulting in a flash fire;
- Accidental release of ammonia or ammonia/hydrogen mixture resulting in an explosion;
- Accidental release of ammonia or ammonia/hydrogen mixture resulting in a toxic cloud.

6.3.3 Risk Analysis Summary

The PHA analysis summary is summarised in Table 6.2. Full analysis including risk contours is provided in the full PHA in Appendix B.8. Where the presence of preventative or mitigative controls were assumed in the PHA modelling, these controls are summarised in Section 6.3.5, and have been included in proposed plant design.

Table 6.2 - PHA results summary

Risk Category	Criterion/ Criteria	Commentary
Fatality Risk	During the course of the analysis, it was identified that some mitigation for ammonia releases from ammonia storage may be required. A preliminary assessment of installing a vapour barrier to the west of the ammonia storage was conducted and accepted, incorporating the vapour barrier into the assessed design.	All fatality risk associated with land use criteria are satisfied.
Injury Risk	The extent of incident heat flux radiation of 4.7 kW/m^2 at a frequency of more than 50 chances in a million per	The criteria are satisfied.

Risk Category	Criterion/ Criteria	Commentary
	year has been modelled. Risk of receiving 4.7 kW/m^2 radiated heat flux at residential land uses is less than 50 chances in a million per year – this risk contour is contained within the plant boundaries.	
	The extent of incident explosion overpressure of 7 kPa at frequencies of more than 50 chances in a million per has been modelled. Risk of experiencing 7 kPa overpressure at residential land uses is less than 50 chances in a million per year. While this risk contour does extend slightly beyond the boundary of the facility, it impacts only on areas of cotton storage for the adjacent Gin operation, and not on an occupied buildings or sensitive areas.	The criteria are satisfied.
	For toxic gas exposure, the ammonia 30-minute Acute Exposure Guideline Level (AEGL)-2 level of 220ppm was used to assess the risk of toxic injury to residential and sensitive use areas. The extent of the 30-minute AEGL-2 concentrations at a frequency of more than 10 chances per million per year were assessed. It was determined that there is no impact on residential or sensitive use areas	The criteria are satisfied
Toxic Irritation Risk	For toxic gas exposure, the ammonia 30-minute AEGL-1 level of 30ppm was used to assess the risk of toxic irritation to residential and sensitive use areas. The extent of the 30-minute AEGL-1 concentrations at a frequency of more than 50 chances per million per year were assessed. This was assessed for both people located outdoors and people located indoors. When assessing the risk for people located indoors, the contour does not impact on any residential or sensitive use areas. When assessing the risk for people located outdoors, the contour extends beyond Keytah 1-5 residences, which are used by GEGHA Project Stakeholders as accommodation for Cotton Farm workers and their families. In this case, the risk for people located indoors is assessed to be the most applicable scenario because: 1. The occupants of the residences are farm workers (and families of) related to the cotton farm operation for which the GEGHA plant is being built and operated. As such, all occupants will be inducted into the organisation and will undergo Emergency Response Plan Training and be involved in regular drills. 2. The required Emergency Response action in the case of toxic release from the GEGHA plant is to Shelter in Place. Therefore, the occupants of these residences, if at home, will be located indoors during any incident.	Indoor Exposure Risk: The criteria are satisfied Outdoor Exposure Risk: There is potential toxic irritation impact on the area encompassing the Keytah farm workers residences (refer to figure 6.5).

Risk Category	Criterion/ Criteria	Commentary
	3. The Emergency Response Actions required for Shelter in Place are clear, concise and easily understood. Therefore, there is a high likelihood of these actions being implemented correctly by the occupants of the Keytah residences if required. 4. The risk related to toxic irritation is based on AEGL-1 (30mins). Therefore, any occupants of the residences who may be located outdoors in the event of a toxic release will have 30 minutes to relocate indoors before experiencing the related irritation effects.	
Societal Risk	A F-N Curve was prepared using the modelled results.	The societal risk is below the negligible criteria line in all cases. Societal risk criteria is satisfied
Property Damage	The extent of 23 kW/m^2 heat flux level at a risk of 50 in a million per year has been modelled. Risk of receiving 23 kW/m^2 radiated heat flux at 50 chances in a million per year is contained entirely within the site. The extent of 14 kPa explosion overpressure at a risk of 50 in a million per year has been modelled. The risk of experiencing 14 kPa overpressure at industrial land uses is less than 50 chances in a million per year. While this risk contour does extend slightly beyond the boundary of the facility, it impacts only on areas of cotton storage for the adjacent Gin operation, and not on an occupied buildings or sensitive areas.	The criteria is satisfied.

6.3.4 Key Risk Analysis Contours

The key risk contours associated with Location Specific Individual Risk of Fatality, Toxic Injury and Irritation are presented in this section. Full analysis is provided in Appendix B.8.

Location Specific Individual Risk of Fatality (LSIR)

Location Specific Individual Risk of Fatality (LSIR) contours are presented in Figure 6.3.

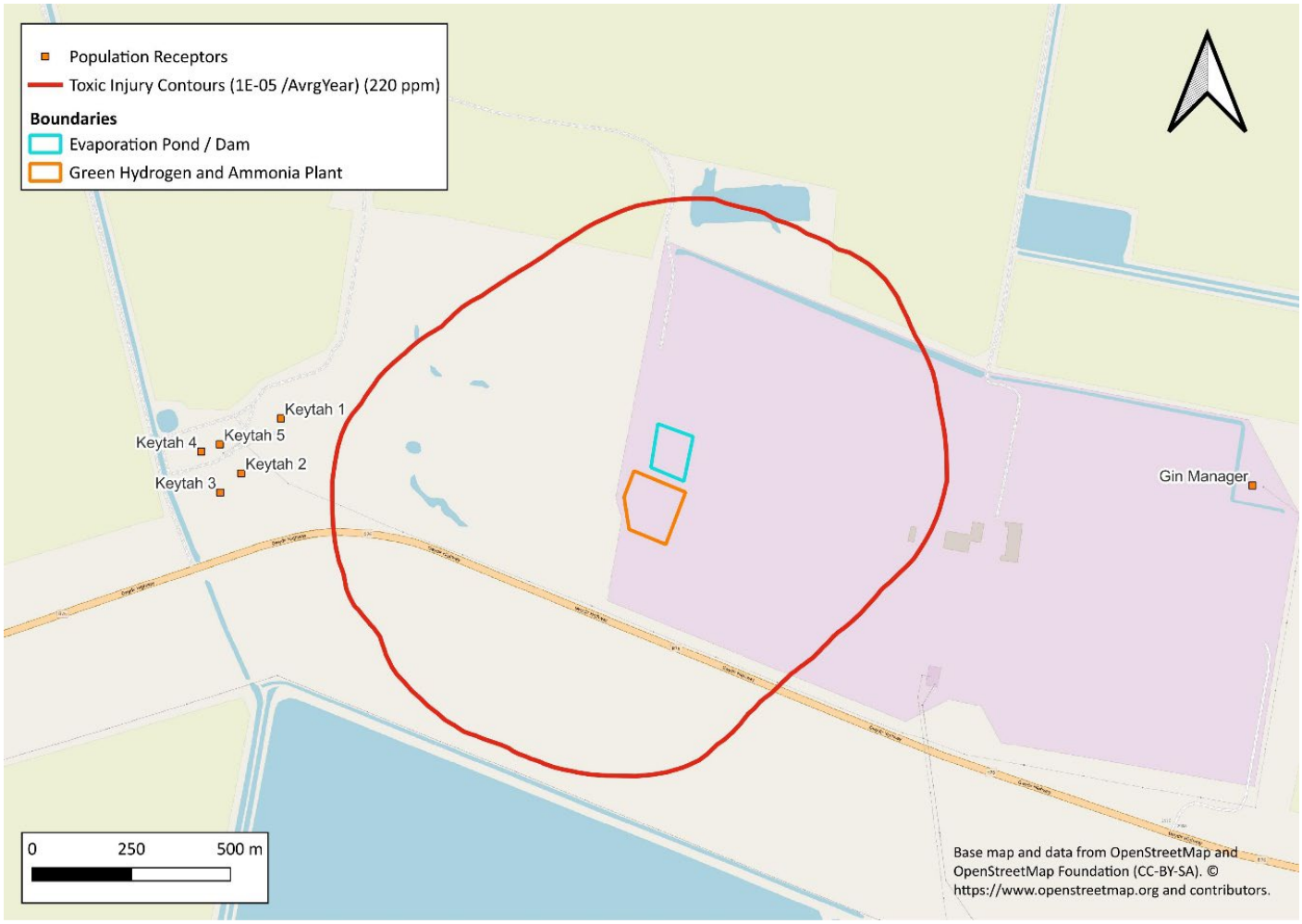
Land surrounding the GEGHA is not zoned residential, but several buildings providing rural workers' accommodation are located in adjacent properties. The buildings accommodate employees of one of the GEGHA stakeholders

Figure 6.3 - Location Specific Individual Risk of Fatality Contours with Vapour Barrier

Toxic Injury

The extent of experiencing 30-minute AEGL-2 concentrations (220 ppm) at a frequency of more than 10 chances per million per year with vapour barriers and water sprays are shown in Figure 6.4. The risk level at the Keytah rural workers' accommodation is less than 10E-06 per annum.

Figure 6.4 - Toxic Injury Risk Contours

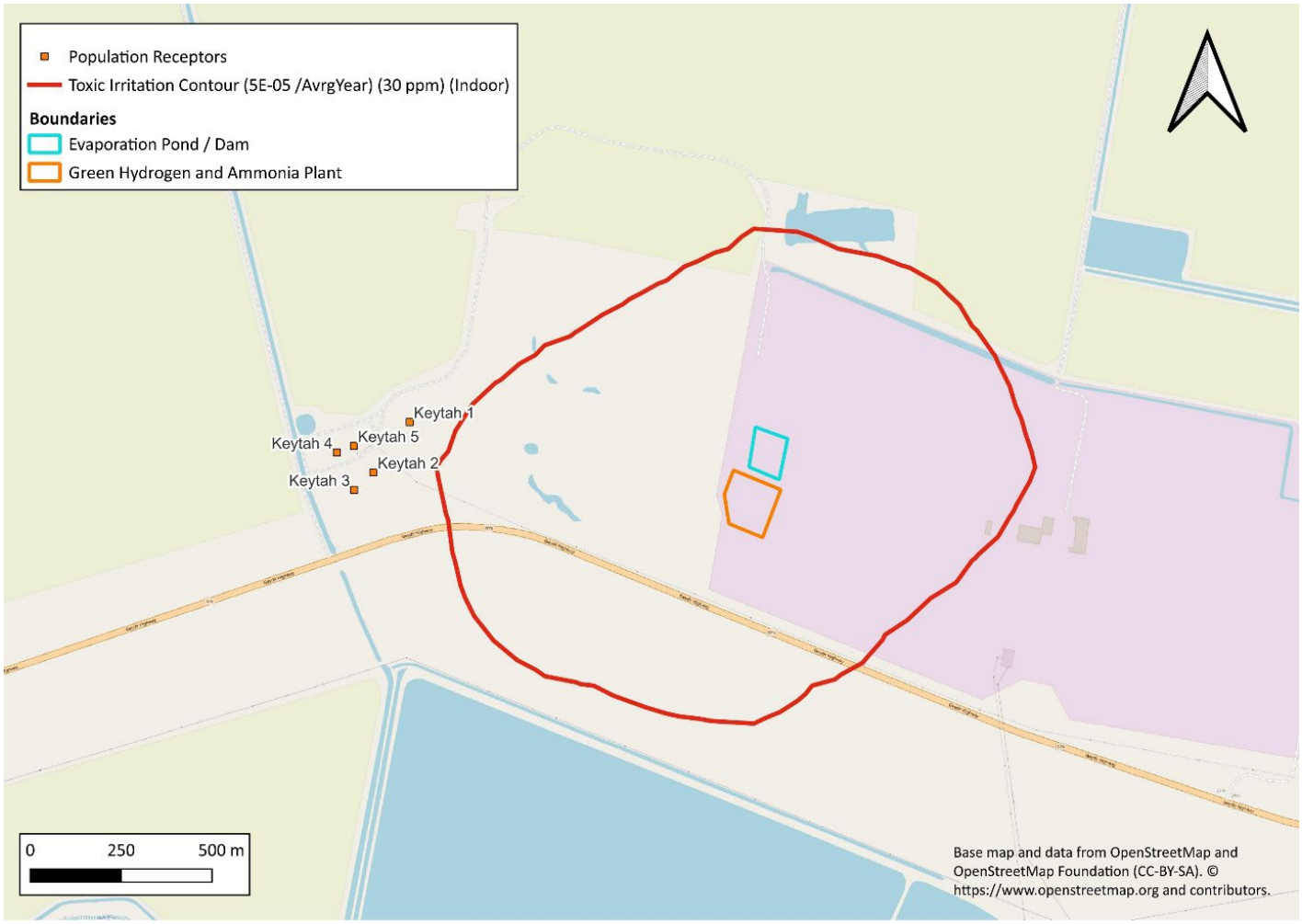


Toxic Irritation

The extent of ammonia AEGL-1 toxic concentrations at a frequency of 50 in a million per year are presented in Figure 6.5. These are with vapour barriers installed and water sprays. The risk for people located indoors is shown in Figure 6.6.

Figure 6.5 - Outdoor Toxic Irritation Risk Contours

Figure 6.6 - Indoor Toxic Irritation Risk Contours



Property Damage

The extent of 14 kPa explosion overpressure at a risk of 50 in a million per year is shown in Figure 6.7. The likelihood of locations experiencing 23 kW/m^2 radiated heat flux from jet fires lasting longer than ten minutes is shown in Figure 6.8 whilst the extent of 1% lethality from ammonia storage tank boiling liquid expanding vapor explosion is shown in Figure 6.9.

Figure 6.7 - Overpressure Property Damage Risk Contours

Figure 6.8 - Likelihood of 23 kW/m² Radiated Heat Flux from Jet Fires Lasting Longer than 10 Minutes

Figure 6.9 - Extent of 1% Lethality from Ammonia Storage Tank Boiling Liquid Expanding Vapor Explosion (Radiated Heat Flux)

6.3.5 Consideration of Specific Risks

Table 6.3 summarises site specific risks that have been given consideration

Table 6.3 - Consideration of Specific Risks

Specific Risk	Consideration/ Comment
Risk of propagation between production and storage units	The overall risk of propagation between storage and process units has been assessed as part of the overall QRA. More specifically, the likelihood of a jet fire which lasts more than 10 minutes with a heat flux of 23kW/m^2 for the plant has been assessed. Ten minute duration has been selected as a suitable time for the vessel shell temperature to rise sufficiently for failure to occur. The 23 kW/m^2 radiated heat flux is consistent with the DPHI criteria for accident propagation. It should be noted that the process units themselves have small isolatable inventories, and therefore the main area of concern for propagation is related to impact on the storage units, which have larger inventories. Coupled with the 1% lethality shown in Figure 6.8, the likelihood of fatality at the Gwydir Highway is of the order of 0.05 in a million per year, approximately 1000 times less than the criteria for sensitive land uses. This takes no credit for emergency response, including proposed water sprays on ammonia storage or other alternatives. On this basis, the separation of storage from processing units is considered adequate.
Tanker Loading and Unloading	The overall risk related to tanker loading and unloading has been assessed as part of the overall QRA. Specifically, this relates to: • Ammonia Tanker loading & unloading; and • Hydrogen transportable Multi-Element Gas Container loading & unloading.
Ammonia Storage Configuration	In the current design, the ammonia storage bullets are configured as three 200 tonne bullets. In detailed design, these may be reconfigured to six 100 tonne bullets. On review of the risk assessment, it was determined that this would have negligible impact on the risk assessment results, due to: • The increased number of units (6 bullets instead of 3) will increase the likelihood of failure given the increased number of parts which may fail. However, the impact on the resulting risk is balanced by the decreased isolatable volume (100 tonne instead of 200 tonne) which would decrease the overall impact of the scenario consequence.

6.3.6 Preliminary Hazard Analysis – Mitigation Measures

The following mitigation measures will be implemented to ensure appropriate risk reduction measures are applied to the design and operation of the GEGHA Plant:

Table 6.4 - Proposed Mitigation Measures: Hazard

Reference	Mitigation Measure	Project Phase	Responsibility
PHA01	Install vapour barriers around the pressurised ammonia storage tanks. Initial estimates are these barriers need to be at least 30 m or closer to the storage tanks, and between six to eight metres high.	Design Installation	HSPT
PHA02	Install water sprays to disperse/absorb accidental toxic ammonia releases. Sprays to automatically activate on detection of ammonia and have a water density rate of at least 1,500 l/s per 50 m.	Design Installation	HPST
PHA03	Develop and install a clear and robust means of alerting surrounding neighbours in the event of an emergency, particularly ammonia leak, at the GEGHA. The surrounding neighbours for this purpose are: • farmhouse residents to the west; • employees working at the Gin and in short term accommodation; and • residents at the Gin manager's house.	Design Installation	HSPT
PHA04	Provide emergency actions & training for all occupants of neighbouring buildings to take in the event of an emergency. Drills are to be scheduled at regular intervals and will include all relevant residence occupants.	Commissioning Operation	HSPT
PHA05	Consider the following and implement if reasonably practicable to do so: • Temporary refuge shelters and training in their use. Dedicated refuge will reduce indoor concentration of ammonia to lower number of air changes per hour than typical domestic buildings. • Emergency escape sets. These could allow occupants to reach an area of safety. • Providing building coverage (for example, large open sided shed) for equipment shown to be major contributors to risk. Containment of accidental releases may be more practicable in this situation.	Design	HSPT

6.4 GEGHA Project Bush Fire Assessment

6.4.1 Bush Fire Assessment Context and Methodology

A bushfire assessment has been undertaken for this project by Bushfire Consulting Services The full report is available in Appendix B.4}.

The report was prepared with reference to the following key information sources:

- Biodiversity Development Assessment Report
- GEGHA Plant consequence modelling
- GEGHA Project – Initial Fire Protection Study

The bushfire assessment is consistent with *Planning for Bush Fire Protection* ('PBP') {NSW Rrual Fire Service 2019).

The Project Assessment Area is mapped within bushfire prone land (Vegetation Category 3).in the Moree Plains Shire Council LEP.

The methodology involved an assessment of vegetation formations, slope and fire danger index which were then incorporated into an evaluation of the Project's location, plant and buildings against the objectives and other relevant sections of the PBP.

6.4.2 Bush Fire Assessment - Existing Environment

The site has low biodiversity value with small, isolated patches of established vegetation. Based on the site visit and determination of vegetation formation using the Keith (2004) Identification Key, the primary bushland vegetation having the potential to affect the subject building is most representative of Grassland in all directions.

The effective slope has been measured manually on site over a distance of 100m from the proposed development where accessible, under the classified vegetation community constituting the hazard. The slope in each direction is level.

The development is located in the Moree Plains Shire Council area, a part of the north-western region, which has a Fire Danger Index of 80.

6.4.3 Bush Fire Impact Assessment – Construction and Operation

The Project has been assessed against the objectives listed in chapter 1 and chapter 8 of the PBP.

Table 6.5 - Concordance with the objectives of chapter 1 of the PBP

Objective	Comment
Afford buildings and their occupants protection from exposure to a bush fire.	All elements of the development can be separated from the hazard by at least 10m (equivalent to BAL 29) ensuring that direct flame contact is not anticipated and affording buildings and occupants protection from exposure to a bush fire The Ammonia Plant is provided with a 50m Asset Protection Zone (APZ) being equivalent to the plant being located outside of Bushfire Prone Land. The ammonia plant components such as Ammonia Storage, HP H^2 Storage in MEGs, Nitrogen Preparation, N^2 Compressors, N^2 and H^2 Middle Tanks, Ammonia Synthesis and NH3 Scrubber all achieve a 50m APZ within the subject site boundaries.
Provide for a defendable space to be located around buildings.	A defendable space of at least 10m is proposed around all building footprints, which meets the requirements of PBP.
Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings.	The relevant FDI (80), vegetation formation (Grassland) and effective slope (0°) have been matched using Table A1.12.6 of PBP, and the available separation distance between the building and the hazard meets the minimum distance for APZs of 10m, indicating that direct flame contact on the building is not anticipated, see below.
Ensure that appropriate operational access and egress for emergency service personnel and occupants is available	Can comply as road widths, curvatures and grades and swept paths can be designed to enable appropriate operational access and egress for emergency service personnel and occupants
Provide for ongoing management and maintenance of BPMs.	Normal property maintenance will ensure that Bush Fire Protection Measures are maintained.

Objective	Comment
Ensure that utility services are adequate to meet the needs of firefighters.	Can comply, see above

Table 6.6 - Concordance with the objectives of chapter 8 of the PBP

Objective	Comment
Provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation.	**Can Comply**, the Lot 2/DP 773266 (now Lot 1/ DP 1315847) has vehicular access to roadways to the east and south and internal roadway construction with 6m width is proposed as part of the project to connect to 2/ 1315847. Suitable access for fire-fighting vehicles and evacuation is available.
Provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development.	**Can Comply**, the need to formulate an emergency evacuation plan is required. To do so, HSPT personnel can complete a Bush Fire Safety Plan on the NSW RFS Website http://www.rfs.nsw.gov.au/ under publications / bushfire safety
Provide adequate services of water for the protection of buildings during and after the passage of bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.	**Can Comply**, the development includes provision of approximately 700kL of fire water storage for fire hydrants around the site and deluge system around the ammonia bullets. The fire pumps will provide water at a flow 582 m3/h (based of GHD study – Appendix B.20) and will be made up of 2x diesel and 1 electric jockey (referral to NSW Fire and rescue has informed the design). Where practical, electrical transmission lines are underground.
	If applicable, reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - The storage and handling of LP Gas, the requirements of relevant authorities, and metal piping is used, all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side, connections to and from gas cylinders are metal, polymer-sheathed flexible gas supply lines are not used, and above-ground gas service pipes are metal, including and up to any outlets.
Provide for the storage of hazardous materials away from the hazard wherever possible.	**Can comply**, as wherever possible, the storage of hazardous materials will be away from the hazard. **Ammonia Storage and handling** To be in accordance with AS/NZS 2022:2003 Anhydrous ammonia-storage and handling **Hydrogen Storage and handling** To be in accordance with Australian Standard AS 2030 Series – Gas Cylinders Standards: ○ AS 2030.1 – General Requirements ○ AS 2030.2 – Inspection and Testing ○ AS 2030.4 – Welded and Composite Cylinders **Technical standard** SA TS 5359:2022 The Storage and handling of hydrogen

6.4.4 Bush Fire Assessment – Mitigation Measures

The following mitigation measures will be implemented to ensure best practice operation and management of bush fire threat.

Table 6.7 - Proposed Mitigation Measures: Bush Fire

Reference	Mitigation Measure	Project Phase	Responsibility
BF01	**Asset Protection Zones (APZ):** At the commencement of the development, and in perpetuity, the curtilage surrounding the subject buildings shall be managed as an inner protection area APZ from the from the proposal for a distance of 10m in all directions, as outlined in Planning for Bush Fire Protection (NSW Rural Fire Service, 2019) (PBP) Appendix 4. Ammonia Plant production components will maintain an APZ of at least 50m in all directions as outlined in PBP 2019 Appendix 4.	Design Construction Operation	HSPT
BF02	**Water Supply:** A 700kL litre static water supply is to be available for firefighting purposes and suitable fittings sufficient to enable firefighting, including required fire pumps. Tanks are to be concrete or metal and all exposed water pipes external to the building are metal, including any fittings. Associated hydrants are to be designed, installed and commissioned in accordance with Part E1 of the National Construction Code	Operation	HSPT
BF03	**Electricity and Gas Services:** Where practicable, electrical transmission lines are underground. Where applicable, reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used. All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side, connections to and from gas cylinders are metal. Polymer-sheathed flexible gas supply lines are not used, and above-ground gas service pipes are metal, including and up to any outlets.	Construction Operation	HSPT
BF04	**Storage of Hazardous Materials:** Wherever possible, the storage of hazardous materials will be away from the hazard. **Ammonia Storage and handling** To be in accordance with AS/NZS 2022:2003 Anhydrous ammonia- storage and handling **Hydrogen Storage and handling** To be in accordance with Australian Standard AS 2030 Series – Gas Cylinders Standards: ○ AS 2030.1 – General Requirements ○ AS 2030.2 – Inspection and Testing	Operation	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
	○ AS 2030.4 – Welded and Composite Cylinders **Technical standard** SA TS 5359:2022 The Storage and handling of hydrogen		
BF05	**Emergency Evacuation and Planning** Prepare an emergency evacuation plan with reference to Bush Fire Safety Plan guidance on the NSW RFS Website http://www.rfs.nsw.gov.au/ under publications / bushfire safety.	Construction Operation	HSPT

6.5 Hazard and Risk Further Studies and Detailed Design

The Preliminary Hazard Analysis (Appendix B.8) has been undertaken prior to detailed design for the plant being completed. As such, conservative assumptions for volumes and pressures have been used for the assessment.

The purpose of the Detailed Design phase of the GEGHA project is to continue to refine the design of the plant and ensure adequate and sufficient control measures have been implemented to minimise process risk, particularly where risk assessment has shown that there is potential for off-site effects. It is expected that risk levels and contours will reduce as the design is refined during detailed design.

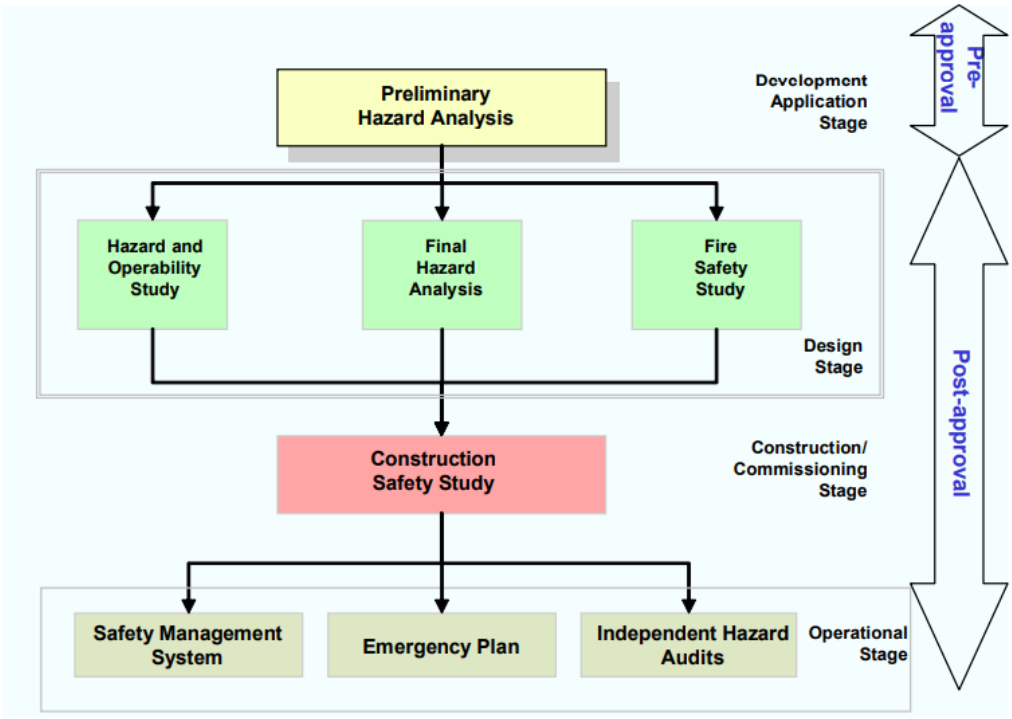
During detail design, the Preliminary Hazards Analysis will be expanded to encompass a detailed hazard identification and risk management process, which is in line with the HIPAP 6 Hazards-Rated Assessment Process (see Figure 6.10). This process is also required by the NSW Work Health and Safety Act 2011, under which the GEGHA plant will be a designated Major Hazards Facility and will be required to demonstrate the elimination or minimisation of major hazard risk in a Safety Case, which will be reviewed and assessed by SafeWork NSW.

As part of this process, the control measures in place to eliminate or minimise risk will be reviewed and may be adjusted, enhanced or increased, according to the following:

- The design philosophy of GEGHA project embraces the concept of ‘Safety in Design’ – this ensures all hazards which can be are eliminated, and ensures that the where possible, inherent safety is built into the equipment design (e.g. via design pressures, design temperatures etc exceeding the worst-case plant operational capabilities).
- In addition to this, the project recognises the importance of the balance between ‘preventative’ control measures – i.e. those that reduce the risk of a major incident occurring – and ‘mitigative’ control measures – i.e. those that reduce the risk of a major incident causing serious injury or fatality. All suitable and reasonably practicable preventative and mitigative control measures will be implemented.
- The Hierarchy of Controls will be used during detailed design to guide the prioritisation of control measures. This prioritises controls that are the most effective (e.g. engineering controls) over controls that are less effect (e.g. PPE).

If the plant changes or there are changes to control measures occur during detailed design, these changes will be implemented in such a way as to ensure that the overall risk level will remain as demonstrated by this chapter and the PHA or be further decreased.

Figure 6.10 - The Hazards-Related Assessment Process



7 TRANSPORTATION OF DANGEROUS GOODS

7.1 Transportation of Dangerous Goods - Introduction

This chapter provides an overview of the transport of dangerous goods associated with the GEGHA Project's operation with consideration of Hazardous Industry Planning Advisory Paper No 11 ('HIPAP 11') Route selection. Whilst transfer of custody of ammonia and hydrogen loads will occur at the GEGHA Plant's load out facility, it is acknowledged that by commissioning and operating a hydrogen and ammonia plant, the scope of this EIS must include an assessment to define primary dangerous goods transportation routes and describe how the products would be transported safely during the Plant's operation.

All vehicles carrying dangerous goods loads on to the public road network must be licenced to transport dangerous goods and must comply with the Dangerous Goods (Road and Rail Transport) Regulation 2022.

7.2 Dangerous Goods Considerations: Route assessment – HIPAP 11

7.2.1 Dangerous Goods Transportation Context

The transportation of ammonia and hydrogen is classified as Dangerous Goods (DG) transportation. The transportation of hazardous materials like these are strictly regulated under various legislative and statutory frameworks to ensure safety.

The primary regulations in NSW include the *Dangerous Goods (Road and Rail Transport) Act 2008* and the *Dangerous Goods (Road and Rail Transport) Regulation 2022, and which align with national standards. The storing and transportation would also comply with relevant aspects of State Environmental Planning Policy (Resilience and Hazards) 2021.*

'HIPAP 11' focuses on Route Selection for the transportation of hazardous materials. Its primary purpose is to provide guidelines for state and local government agencies, as well as industries involved in hazardous materials transport, to assess and select safe routes for the transportation of these materials.

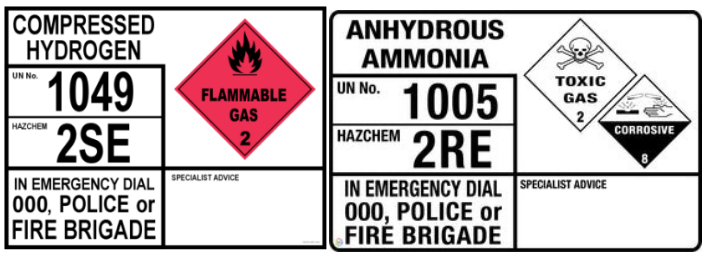
7.2.2 Application of HIPAP 11 to the GEGHA Project

GEGHA will produce up to 2,200 tonnes of Hydrogen and up to 4,500 tonnes Anhydrous Ammonia annually. Up to 30% of the hydrogen produced and stored on site would be delivered to customers in the broader Moree region.

Sundown Pastoral co. will purchase up to 4,500 tonnes of anhydrous ammonia per annum with approximately 1,700 tonnes being used on the Keytah property. The ammonia applied to the Keytah property would require transport via public roads and would instead be transported from the plant to paddock via Keytah's internal road network. The remaining 2,800 tonnes of anhydrous ammonia would be transported to regional customers via the broader public road network.

Both compressed Hydrogen and Anhydrous Ammonia constitute Dangerous Goods (figure 7.1) and their transportation is subject to further risk assessment under HIPAP 11.

Figure 7.1 - Dangerous Goods transportation example labelling for compressed hydrogen and ammonia

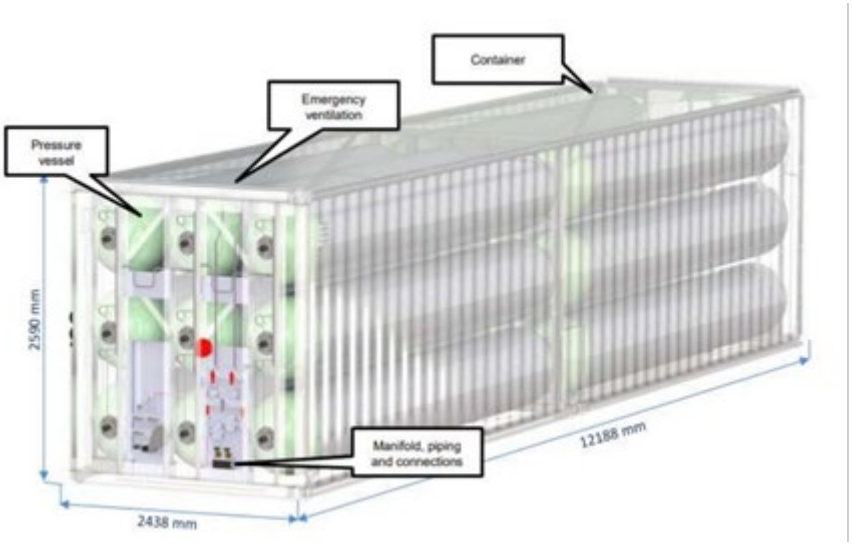


It is unlikely that HSPT will own the transportation companies or assets that will be used to transport the hydrogen and anhydrous ammonia from the GEGHA plant to the point of delivery. However, the plant will be a new source of production that will add to the local road network with Dangerous Goods loads running on the Gwydir Highway with more regularity. A preliminary review of route planning to guide and direct the transportation of Hydrogen and Ammonia off site to their respective destinations.

7.2.3 How will Hydrogen and Ammonia be transported?

Compressed hydrogen will be transported in fit-for-purpose Multi Element Gas Containers (MEGC) comprising of 18 individual symmetrical 1,667litre vessels stacked into a transportable 40 foot container (same dimensions as a standard shipping container – refer figure 7.2).

Figure 7.2 - MEGC schematic

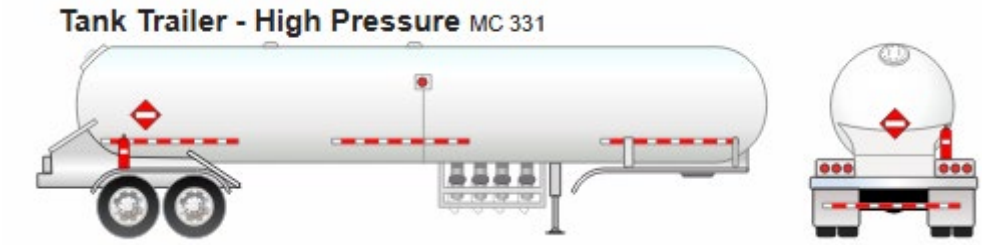


Hydrogen trucks may also be refuelled directly on site at the GEGHA Plant.

Anhydrous Ammonia transportation is common on Australia's roads, particularly in the vicinity of the Orica production plant on Kooragang Island, Newcastle where it is currently manufactured and distributed out to regional NSW and beyond.

Anhydrous ammonia produced by the GEGHA Plant will be transported on public roads using high pressure tank trailers that have been specifically manufactured for the transportation of Ammonia (see example in figure 7.3).

Figure 7.3 - Example schematic of an anhydrous ammonia tank trailer



The ADG code specifies vehicle requirements to allow safe transport of hydrogen and anhydrous ammonia. It also describes the provisions required to ensure safe transport of Dangerous Goods on public roads including driver training and awareness, emergency preparedness and public awareness.

7.2.4 Key Objectives of HIPAP 11

1. Safety Assessment: It emphasizes the importance of evaluating safety issues during the planning and design phases of transportation routes.
2. Integrated Approach: The guidelines promote an integrated assessment process that considers various factors, including environmental impacts, traffic conditions, and emergency response capabilities.
3. Best Practices: HIPAP 11 incorporates updated risk assessment techniques and best practices to ensure that hazardous materials are transported safely, minimizing risks to the community and environment.

7.2.5 Consideration of HIPAP 11 Key Aspects

In assessing the applicability of route selection aspects and considerations to the GEGHA Project, certain key aspects are more applicable than others.

All heavy goods vehicles that would be involved in the transportation of Ammonia and Hydrogen would be required to be compliant with the ADG Code.

7.2.6 GEGHA Route Selection philosophy

An advantage of site selection for the GEGHA Plant is that it adjoins the Gwydir Highway, part of the State Highway network of arterial roads. Trucks turning out on to the Gwydir Highway are limited to an east or west option in terms of direction of travel.

Whilst the location of hydrogen and ammonia customers is unknown, there are some known factors that can be considered as part of the overall route selection philosophy:

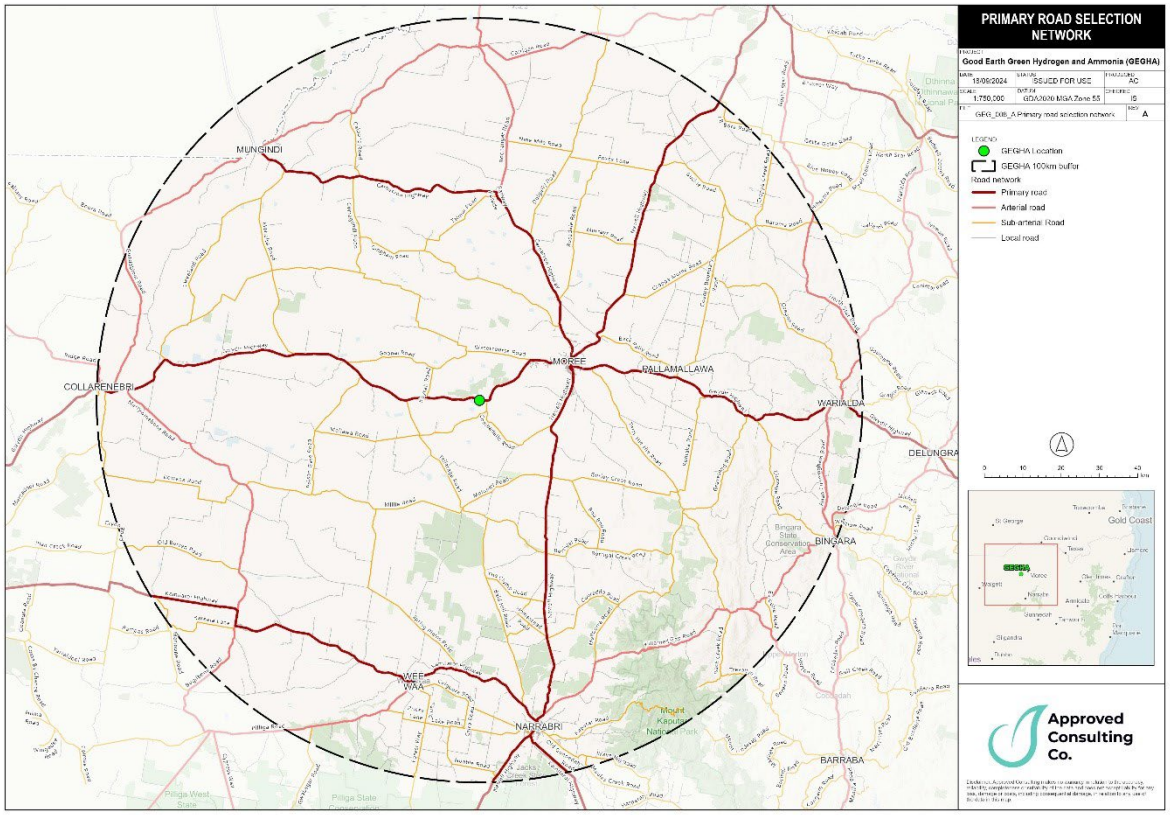
1. Road hierarchy selection is reasonably straight forward.
    a. Trucks leaving the GEGHA Plant have two route options – east or west. Both are on the Gwydir highway, an arterial road.
    b. Customers will have a higher likelihood of being located on the northern to eastern sides of Moree. Three highways lead in or out of Moree, creating five highway routes:
        i. Gwydir Hwy West;
        ii. Gwydir Hwy East;
        iii. Carnarvon Hwy Nth;
        iv. Newell Hwy Nth; and
        v. Newell Hwy Sth.
    c. Moree Plains Shire Council has advised on the most acceptable DG route through Moree (figure 7.5) which reflects the route of least impact on route selection factors and enables direct connection to each highway route entering and leaving Moree (see s7.2.7 for further detail).
    d. Prioritise the use of highways due to their high structural adequacy and tendency to minimise exposure to sensitive land uses. Highways also pass through or by towns where emergency services are located. The Gwydir, Newell and Carnarvon highways are all accessible from the nominated DG route through Moree, enabling a large portion of each DG movement to be undertaken on these primary roads.
    e. Select the remaining route to site by prioritising roads in the following order:
        i. Arterial roads
        ii. Sub-arterial roads
        iii. Local roads

    Exiting on to these lower order roads will always occur in rurally remote areas with delivery routes minimising the distance to be travelled on these roads.

f. DG routes through other regional towns follow the same principles as Moree – limiting transportation routes to the formalised arterial routes that are well established as the Newell Highway and other State Highways/ arterial roads have regular Dangerous Goods loads travelling them daily.

Hydrogen and Ammonia movements will be limited to highways through populated areas. Figure 7.4 provides an overview of the road hierarchy network within a 100km radius from the GEGHA site.

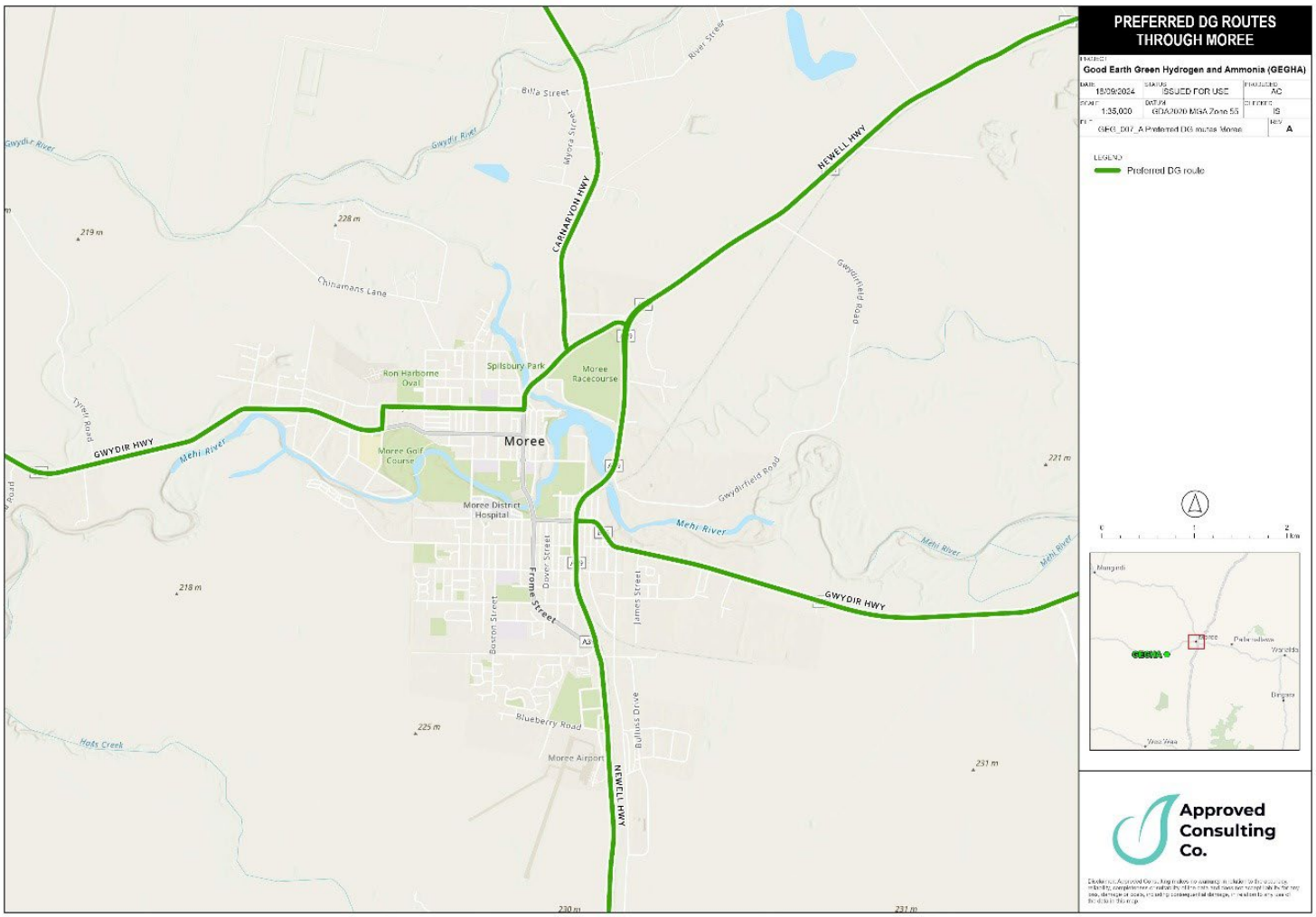
Figure 7.4 - Primary road selection network – 100km radius from the GEGHA Plant



7.2.7 Route selection through Moree

Route selection through Moree has been selected in consultation with Moree Plains Shire Council (refer Figure 7.5). The route from the west concentrates on the Gwydir Highway, following the B76 through town where trucks can exit directly on to the Kamilaroi Highway and the Newell Highway, taking advantage of the Moree bypass to head south and exiting on to the Gwydir Highway to travel east to Glen Innes.

Figure 7.5 - Moree Plains Shire Council endorsed Dangerous Goods route through Moree



The route was selected as it has no physical impediments, and rates highly when compared to the generalised factors and considerations in table 1 of HIPAP 11. The route has one subjective routing factor in that it directly passes St Philomena's School and Goodstart Early Learning, however it represents the route with least subjective routing factors through Moree traveling west-east.

It is proposed that consultation will be established with both the school and early learning centre in advance of plant operation to understand peak times of activity and develop key driver behaviours in relation to exercising additional awareness and caution when driving through this section of the B76.

7.2.8 Dangerous Goods Mitigation Measures

The following mitigation measures will be implemented to ensure appropriate risk reduction measures are applied to the transportation of dangerous goods of the GEGHA Plant:

Table 7.1 - Proposed Mitigation Measures: Hazard

Reference	Mitigation Measure	Project Phase	Responsibility
DG01	Establish contact with St Philomena's School and Goodstart Early Learning Centre to understand active periods of 'drop-off' and 'pick-up' and ensure that these times are incorporated into a driver behaviour induction and guideline.	Commissioning Operation	HSPT

8 TRAFFIC AND TRANSPORT

A traffic impact assessment has been prepared for this project by Amber and is presented in Appendix B.2.

8.1 Traffic and Transport - Introduction

This chapter provides analysis of the traffic and transportation that will be generated by the construction, operation and decommissioning of the GEGHA Project and analyses the suitability of the road network to accommodate the proposed movements.

Peak traffic generating potential will be during construction and decommissioning of the plant with trips being generated by delivery of raw materials, plant and equipment in addition to the workforce required to assemble and commission the plant (or alternatively dis-assemble and decommission the plant at the end of its operational life).

Operational traffic generation will be low with a steady recurring pattern of light vehicle and heavy vehicle movement.

This chapter assesses the GEGHA Project's direct traffic generation and models the cumulative impact created by the development when compared to other users on site and broader established road users.

This chapter and its related appendices collectively address the requirements from section 6 of the Project SEARs (Appendix A).

8.2 Traffic and Transport: Form of Assessment

Traffic and Transportation assessment consisted of a desktop review and two in-field baseline traffic count recording exercises. Estimates have been prepared to nominate heavy goods vehicle movements and light vehicle movements during construction and operational phases of the project with the involvement of the Project's Principal Contractor and the Hiringa Operations team.

Detailed assessment has been compiled in a Traffic Impact Assessment (TIA) that has been compiled by Amber, a specialist traffic sub-consultant. An overview of the methods of assessment used in the TIA is provided in Table 8.1.

Table 8.1 - Traffic Impact Assessment Approach

Element of TIA	Assessment Approach
Existing Conditions (incl. traffic volumes)	Desktop analysis Traffic count - Wathagar Gin and Watercourse Road 24/08/2024 Traffic tube count – Wathagar Gin 12/06/2024 – 19/06/2024
Project Description and access arrangements	Desktop analysis
Traffic Assessment	Consultation with HSPT and Principal Contractor Desktop Analysis
Heavy Vehicle Route Assessment	Consultation with fabricators and manufacturers Desktop analysis
Site Access Assessment	Desktop analysis Previous preliminary survey of site entrance
Traffic Management Plan	Consultation with HSPT and Principal Contractor Desktop Analysis

8.3 Traffic and Transport Study Area

The study area for the traffic and transport assessment is concentrated on the Project's impacts on the proposed access options to site.

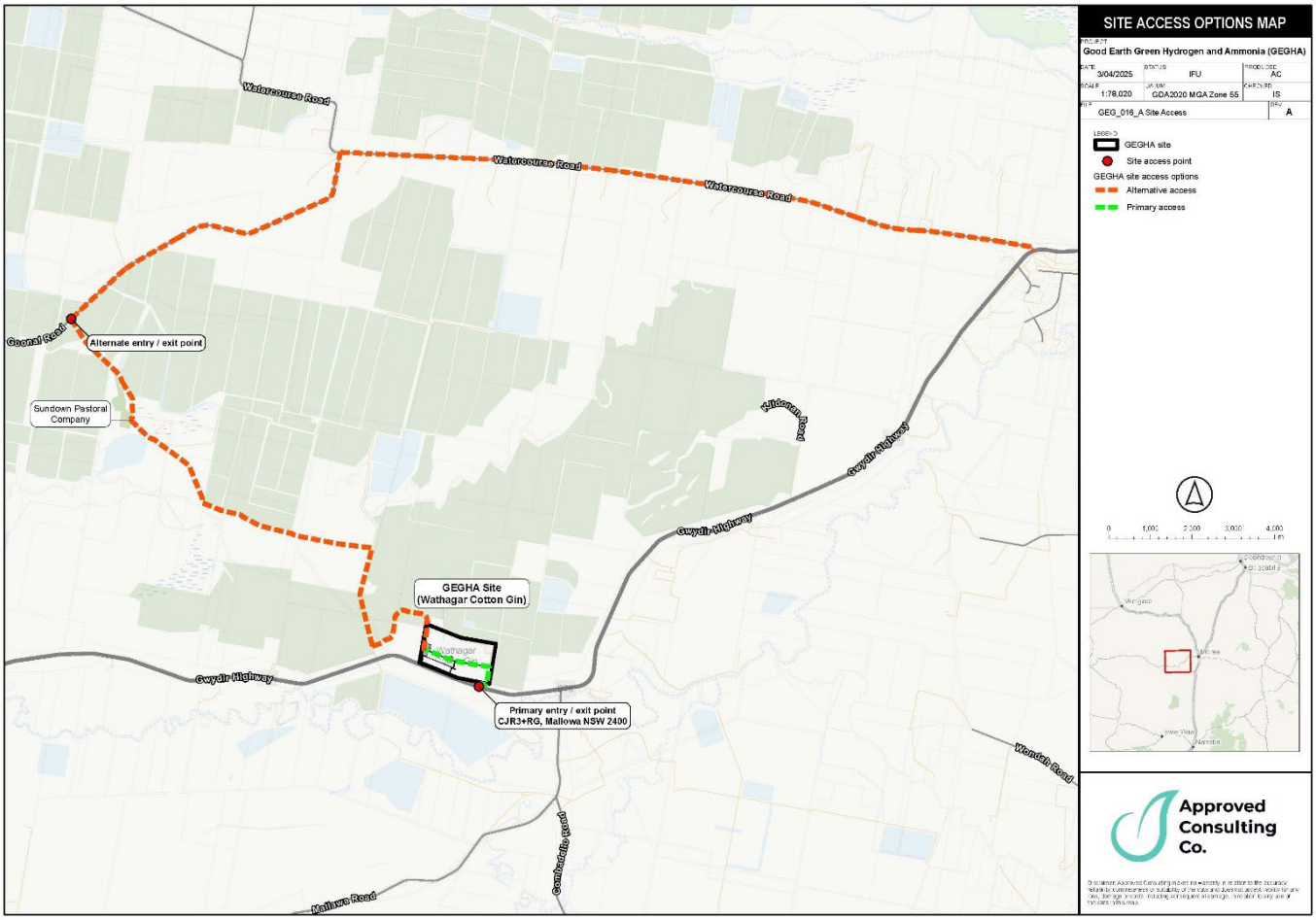
Beyond the Project's access and egress options, the scope for traffic and transport assessment includes a heavy vehicle route assessment from the Port of Brisbane (likely Port of entry for modularised and specialised plant) and an operational assessment of Ammonia and Hydrogen delivery, including consideration of dangerous goods movements, particularly nominating an agreed Dangerous Goods route through Moree.

8.4 GEGHA Project - Access Arrangements

Two options are being considered for access to the project area, as follows:

- Option 1: Utilise the main access off the Gwydir Highway into the Wathagar Cotton Gin for the purposes of the project. This would be upgraded with a Basic Left Turn (BAL) and Basic Right Turn (BAR) turn treatment for a 26 metre long B-Double design vehicle although design up to A-Double 36.5m length may also be considered to future-proof the junction. The upgrade will result in modest shoulder widening and a removal of a tree on the north (Gin) side of the intersection. The works to upgrade the access would be undertaken prior to the commencement of the project. A concept plan of the upgrade is presented in Appendix I for reference.
- Option 2: Utilise the existing unsealed private road network, Goonal Road and Watercourse Road from the Gwydir Highway, as shown in Figure 8.1. This route forms an alternate point of access for Heavy Goods Vehicles and Light Vehicles and was utilised for construction activities associated Wathagar Solar Farm Stage 1.

Figure 8.1 - Secondary Access route to the GEGHA Project site



8.5 Traffic and Transport – Existing Environment

8.5.1 Travel Routes

The Gwydir Highway is a State Road under the care and management of Transport for New South Wales (TfNSW). It runs in an east-west alignment from South Grafton and its termination with the Castlereagh Highway near Walgett. Within the vicinity of the site, it has a sealed carriageway width of approximately 6.5 metres accommodating one lane of traffic in each direction. It has a speed limit of 110 km/h with a relatively flat and straight alignment.

Watercourse Road is a local road that connects to the Gwydir Highway approximately 10 kilometres east of Moree and operates east-west on the north site of Gwydir Highway for approximately 127 kilometres before reconnecting with the Gwydir Highway in Collarenebri. In the vicinity of the site it has a sealed carriageway width of 6.0 metres accommodating two-way vehicle movement.

Goonal Road is a municipal local road that extends south from Watercourse Road then west to its connection with Gwydir Highway, providing access to properties in the area on the north side of the Gwydir Highway. A sealed carriageway width of approximately 6.0 metres accommodating two-way vehicle movement is provided on Goonal Road between Watercourse Road and private internal roads that access the site.

8.6 Traffic Volume and Users Overview

8.6.1 Gwydir Highway pneumatic tube count

The Gwydir highway is the primary route from Moree to the west which attracts a mixture of light and heavy vehicle traffic. A seven day pneumatic tube count survey was conducted on the Gwydir Highway from the 12th -19th June, 2024 on the east side and west side of the main Wathagar Gin access. June was selected as it represents a period where the Wathagar Cotton Gin and regional cotton Gins are operational.

Survey results indicate that the Gwydir highway experiences a low level of daily traffic in the order of 650 vehicles per day from which direction of travel is evenly split. The 85th percentile speed is within the 110km/hour limit and 30% of traffic volume is Heavy vehicle traffic.

The Wathagar Gin would generate approximately 29 vehicles per day entering to/from the east during its operating season (typically March – September but variable season to season).

8.6.2 Intersection volumes

Turning movement count surveys were undertaken at the intersection of the Gwydir Highway and Watercourse Road, and at the Wathagar Cotton Gin access on Thursday 24 August 2023 from 6:00am to 10:00am and from 3:00pm to 7:00pm.

The purpose of the surveys were to gain an improved understanding of road usage to establish an informed baseline from which to assess project traffic impact.

The peak hour survey results provide the following insights:

- Both intersections carry relatively low levels of traffic with approximately 110 movements recorded at Watercourse road intersection and 60 movements recorded the Wathagar Gin access intersection.
- Based on a 10% peak hour to daily traffic volume relationship, the Gwydir Highway would be expected to carry approximately 600 vehicles per day past the Wathagar Gin entry. Watercourse Road would be expected to carry approximately 400 vehicles per day.
- Whilst the peak hours recorded at the intersections varied, volumes remained relatively consistent between the two survey locations.
- The surveys showed that most traffic to Watercourse Road and the site access were to and from the east, which would be expected given the proximity to Moree and other regional centres.

Overall, the results indicate both intersections accommodate low levels of traffic.

8.6.3 Traffic users – Agricultural Activities

Heavy goods vehicle movements along the Gwydir Highway vary substantially throughout the year and are heavily influenced by the cotton season. In addition to the Wathagar Cotton Gin, the North West Cotton Gin is located approximately 5.5km to the east of Wathagar and the Brighann Cotton Gin operates off Watercourse Road.

There are a number of purposes for trucks to enter an operational Gin:

- Delivery of raw cotton bales to the Gin's storage yard
- Export of processed cotton bales from the Gin to warehousing or the broader market
- Export of cotton seed, utilised off-site for livestock feed, cottonseed oil or other industrial products
- Supply of fuel for the Gin or operational vehicles and machinery

To gain an understanding of seasonal truck movements, truck movement records from the Wathagar Gin were analysed over the 2023 season with supplementary data for the 2024 season.

The records show a defined increase in operational Gin truck movements from May to September which would be reflective across the region. In good seasons, this may stretch out from April to November with a contraction in less productive years.

8.6.4 Traffic users – public transport and recreational users

No public transport services are provided in the vicinity of the Wathagar Cotton Gin. A school bus operates along Watercourse Road (pick up and drop off) during term times.

The Gwydir highway is rarely utilised by recreational vehicles and cyclists due to its relative remoteness from Moree and 110km distance to the next town, Collarenebri, to the west.

8.6.5 Traffic Safety Analysis

The TfNSW Centre for Road Safety Crash and Casualty Statistics provides the location and severity of all injury and fatal crashes for the five-year period from 2018 to 2022. A review has been undertaken of the database for crashes that occurred on the Gwydir Highway, Watercourse Road and Goonal Road near the site.

A total of three crashes have occurred in proximity of the Watercourse Road intersection. A review of the crashes shows that they are mixed in regard to location, road user group and type, without a clear pattern that would indicate a significant existing road safety issue.

Accordingly, given the road classification and use, it is concluded that the surrounding road network is currently operating in a relatively safe manner.

8.7 Construction Traffic

Construction traffic has been broken down into light vehicles and five categories of heavy vehicle that have different configurations. It has been estimated that the project will generate up to 80 light vehicles and 62 heavy vehicles per day.

It is assumed that there will be a more formalised 'peak' of light vehicles heading into site between 6am and 7am and out of site between 5pm and 6pm whilst heavy vehicles will be more staggered in their arrival and departure through each day.

Table 8.2 provides an overview of predicted traffic generated by the Project during the Construction period.

Table 8.2 - Traffic Generation During Construction Period

Vehicle		Average Construction Period		Peak Construction Period	
		Vehicle Trips per Day (vpd)	Peak Hour Trips (vph)	Vehicle Trips per Day (vpd)	Peak Hour Trips (vph)
Light Vehicles		50	20	80	32
Heavy Vehicles	Rigid Trucks	18	2	30	10
	Truck and Dog	8	1	14	10
	Semitrailers	4	1	6	2
	B-Doubles	4	0	8	2
	Non High Risk Over Size Over Mass	2	0	4	0
	HV Subtotal	36	4	62	16
Total		**86**	**24**	**142**	**48**

Overall, the Project is expected to generate up to 48 vehicles per hour in the morning and evening peak hours during the peak construction period, which would reduce to 24 vehicles during the average construction periods.

Across a 40-week construction period, there are two estimated construction peaks between week 15 and week 17 during foundation works and equipment installation then again between weeks 27 and 30 during piping installation, electrical installation and instrumentation installation.

8.7.1 Non-High Risk Over Size Over Mass (OSOM) Vehicles

There is a mix of non-high risk OSOM vehicles required for construction activities which includes vehicles and plant such as:

- cranes
- drum rollers
- dump trucks
- concrete pumps
- excavators
- graders
- compactors
- pile driving rig
- cable trenching and laying equipment

It is anticipated that the vehicles would comply with the Class 1 exemption notices and would be able to operate on the approved NSW Special Purpose Vehicle Network. The vehicles would access the site from the which is rated to accommodate complying vehicles.

Many of the vehicles listed above would not create daily trips in and out of the Project Area. It is expected that there will be influxes of arrivals and departures from the site depending on the phase of the construction. Once arrived, they would remain until not required, before being removed from the site. The trips would be generated outside of peak site access hours.

8.7.2 Specialist Plant Movements

There is also some specialist plant that is required for the project which would be transported by OSOM vehicle combinations, as follows:

- Adiabatic units
- Cooling towers
- Control room components
- Ammonia bullets.

At the time of writing the exact type and source of the ammonia bullets are to be confirmed, with two options being contemplated. The bullets will either be transported in sections or fully constructed.

8.7.3 High-Risk OSOM Vehicles

High-risk OSOM vehicle combinations that would require traffic management plans, as defined by TfNSW, may be required for the project for the ammonia bullets. In the event that a High-Risk OSOM vehicle is required, it is recommended that a route assessment be undertaken to document potential road and infrastructure impacts, comprising:

- Details on the exact OSOM vehicle specifications including axel loading;
- Mapping of the route to site and identification of pinch points to be assessed by way of vehicle swept paths, including any at risk road structures;
- Review of overhead obstructions on the proposed route to site;
- Documentation of suitable rest areas along the proposed route to site.

The route assessment will document traffic mitigation measures or road works, modifications, or road upgrades to facilitate the movement of High-Risk OSOMs on the road network. It should be noted that High-Risk OSOM vehicles are not required for the operation of the project.

8.7.4 Construction Traffic Distribution

It is anticipated that the majority of traffic movements associated with the workforce and materials, equipment and machinery will arrive from the east. For the purpose of the TIA, the morning peak hour assumptions reflect:

- Light vehicles: 90% from the east, 10% from the west; and
- Heavy vehicles: 100% from the east.

During the morning peak all vehicle trips would be toward the site and in the evening peak all vehicle trips would be away from the site. The majority of heavy vehicle trips would be distributed throughout the day and would be split evenly between inbound and outbound trips.

8.7.5 Heavy Vehicle Route Assessment

The Port of Brisbane and Port of Newcastle have been identified as the preferred ports where most specialist plant would be imported. Tables 8.3 and 8.4 provides a summary of the roads used. The access route measures approximately 538 kilometres and utilises roads that are designated for B-Double / Class 1 OSOM vehicles as outlined within the relevant NHVR Route Maps.

Table 8.3 - Heavy Vehicle Route – Port of Brisbane Access Roads

Road Name	State	Jurisdiction	B-Double/ Class 1 Approved
Port Drive	Queensland	Department of Transport and Main Roads (TMR)	Approved
Lytton Road, Hemmant			
Port of Brisbane Motorway			
Gateway Motorway			
Logan Motorway			
Ipswich Motorway			
Warrego Highway			
Gore Highway			
Leichhardt Highway			
Cunningham Highway			
Newell Highway	New South Wales	Transport for New South Wales (TfNSW)	Approved
Gwydir Highway			

Table 8.4 - Heavy Vehicle Route – Port of Newcastle Access Roads

Road Name	State	Jurisdiction	B-Double/ Class 1 Approved
Bourke Street	New South Wales	Transport for New South Wales (TfNSW)	Approved
Cowper Street North			
Hannell Street			
Industrial Drive			
Pacific Highway			
John Renshaw Drive			
Hunter Expressway			
New England Highway			
Kamilaroi Highway			
Newell Highway			
Gwydir Highway			

The key haulage routes to site primarily utilise suitable State Roads that are rated and preapproved for up to B-Double / Class 1 OSOM vehicle combinations. These routes are suitable to accommodate the heavy vehicles to site without the need for any permanent road upgrades or changes.

Some specialist plant materials will be sourced from other locations in NSW including the Adiabatic Units and Control Room components, which are anticipated to be delivered from supplied Somersby and Wagga Wagga, respectively. The exact transportation routes are to be confirmed by would principally be via State Roads designated for Class 1 OSOM vehicles as outlined within the relevant National Heavy Vehicle Regulator (NHVR) Route Maps.

Approval would be sought prior to travel from the relevant road authorities via the NHVR prior to travel.

8.7.6 Traffic - Cumulative Impact

The primary traffic impact of the Project is generated during construction which is anticipated to commence in 2025 and will take approximately eight months to reach commissioning stage where traffic will reduce significantly.

Any potential traffic overlap would be expected on the Newell Highway or within Moree. It is not anticipated that this overlap would lead to any disruption, delay or congestion due to the low volume of traffic associated with the construction of the GEGHA Project and the broad existing road network within Moree.

Additionally, there are cumulative impacts associated with the construction and operation of the solar farm components adjacent to the GEGHA Plant, and the continued operation of the Wathagar Gin, which would interact with project construction traffic.

Table 8.6 provides a summary of cumulative impacts with an assessment of vehicle conflict.

Table 8.5 - Wathagar Cotton Gin cumulative traffic impacts

Project	Description	Potential Vehicle Conflict
Wathagar Solar Farm – Stage 1	A 8.65MW solar farm adjacent to the proposed GEGHA control room location. Facility is fenced and operating.	The operation of the solar farm is not expected to generate any traffic on a day-to-day basis.
Wathagar Solar Farm – Stage 2	A new 27MW (DC) solar farm to be constructed adjacent to the GEGHA Plant site.	Stage 2 solar is expected to be in testing and commissioning phase at the outset of the GEGHA plant construction.

Project	Description	Potential Vehicle Conflict
		Up to two heavy vehicle and 12 light vehicles would be expected to attend site in the morning and evening peak hour (arriving and departing respectively).
Wathagar Cotton Gin	Existing facility – ongoing seasonal operation typically May-September	Expected average of 29 heavy goods vehicles per day during operation.

8.7.7 Cumulative Traffic Assessment

The maximum traffic volume threshold of the Gwydir Highway is 530 vehicle trips per hour (vph). Existing rates on the Gwydir highway have a morning peak of 59 vph and evening peak of 56 vph.

Cumulative traffic volumes from construction of the GEGHA Project plus expected volumes from the Wathagar Solar Farm Stage 2 and including an allowance of 1.5% growth rate are expected to increase the daily morning peak to 121 vph and an evening peak of 116vph.

Morning and evening peak volumes are approximately 22% of the maximum traffic threshold for the Gwydir Highway.

Cumulative increase in traffic during construction created by the project would not effect the level of service on the existing road network.

8.7.8 Turn Treatment Analysis

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. An assessment has been undertaken for both site access options via the main Gin access or Watercourse Road to determine the suitable treatment for access to ensure safety at the State Road network.

Assessment incorporated a 1.5% growth rate and was based on a ‘worst-case’ scenario undertaking assessments for both the construction peak and road network peak.

The turn treatment assessments determined that both the main Gin access and the intersection of Watercourse Road of Gwydir Highway would generate requirements for Basic Left Turn (BAL) and Basic Right Turn (BAR) treatments.

The concept design for the upgrade at the main Gin access presented in Appendix I would address the requirements, with the existing Watercourse Road and Gwydir Highway intersection already provided with suitable turn treatments.

Accordingly, the intersection treatments are considered suitable to enable access via the main Gin access or via Watercourse Road and the local road network.

Figure 8.2 - Preliminary design of proposed turn treatment upgrade at the Wathagar Cotton Gin entry

8.7.9 Sight Distance

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections specifies the Safe Intersection Sight Distance (SISD) as the minimum sight distance which should be provided along the major road at any intersection.

Evaluation of both Watercourse Road intersection and the Wathagar Cotton Gin access has confirmed that vehicles are expected to be able to safely enter the state road network at both intersections.

8.8 Operational Traffic

8.8.1 Operational Traffic Volumes

Operational traffic volumes are modest with a projected flat 'peak' of up to 12 heavy vehicles and 5 light vehicles per day. The operational profile of the GEGHA Plant and storage involves an initial period of ammonia production and storage filling followed by a progressive take to on-farm storages ahead of peak usage periods (April to June).

Hydrogen off-taking is proposed to be much more regular with provision for up to 4 MEGCs stored on site and being filled and changed out regularly. This assumes utilising the Hydrogen to supplement fully operational refuelling stations in the region.

8.8.2 Delivery of Ammonia

Sundown Pastoral Co. will take 1,700 tonnes of Anhydrous ammonia directly on to farm without entering on to public roads. This is equivalent to 54 tanker deliveries and return trips to Kooragang Island, Newcastle.

The remaining 2,800 tonnes of anhydrous ammonia per annum are expected to be delivered to regionally based agricultural customers and would offset or displace the purchase and transportation of grey ammonia from Brisbane or Newcastle.

8.8.3 Operational Displacement of Fertiliser and Fuel Transport

Whilst the operation of the GEGHA Plant introduces a modest increase of transportation on to the Gwydir Highway, a regionally based production of Anhydrous ammonia and hydrogen will generate a significant benefit in displacing products and fuel that is currently trucked into the region from Brisbane, Newcastle and Sydney.

Adopting some conservative calculations, the operation of the GEGHA plant will generate an annual saving of over 40,000 litres of diesel, 64,246km of loaded Dangerous goods (anhydrous ammonia) movements through NSW with a further 64,246km of empty return loads based on the following assumptions:

- GEGHA Anhydrous ammonia use displaces anhydrous ammonia currently produced on Kooragang Island, Newcastle.
- Off-farm GEGHA anhydrous ammonia will be delivered to customers on average 100km away from the plant.
- Sundown pastoral company utilises 1,700 tonnes of Anhydrous ammonia per annum
- Fuel usage rate of 38litres/100km fully loaded
- Fuel usage rate of 25litres/100km returning

There is further upside to displace diesel with hydrogen conversions and reduce the importation of diesel into the region which is currently sourced from Brisbane or Sydney. One tonne of hydrogen displaces approximately 4,200 litres of diesel.

Aside from the direct fuel saving generated from hydrogen displacement, there would be further net transportation savings generated by local production of fuel (hydrogen) in the region. This would produce an average annual net transportation saving of approximately 62,500 litres of diesel and removal of approximately 99,200 km of loaded dangerous goods (diesel) movement with the same distance of empty return kilometres based on the following assumptions:

- Fill point is Kurnell tank farm, Sydney (667km from Moree).
- Delivery point to Moree.
- Annual GEGHA production rate of 2,200 tonnes of hydrogen.
- B-double fuel tanker capacity of 56,500 litres.
- Fuel usage rate of 38litres/100km fully loaded.
- Fuel usage rate of 25litres/100km returning.

8.8.4 Delivery of Hydrogen

It is planned that Hydrogen produced by the project would initially be utilised on farm to convert pumps and machinery with localised, infrequent transportation to access different areas of the property.

In future, hydrogen movements off site would be likely to be transported on the Gwydir Highway and Newell Highway to up to three hydrogen refuelling stations within approximately 100 to 120 kilometre radius of the plant.

Refuelling station locations are yet to be determined but would be in proximity to the Newell Highway to enable ease of access for refuelling from the existing State Road network. Delivery of hydrogen to refuelling stations would not require deviating from the highway for the entirety of their journey.

8.8.5 Decommissioning Traffic Overview

At the end of the operational life of the Project all infrastructure would be dismantled and removed from the Project Area. Internal roads, if not required for ongoing farming purposes would be removed and the site reinstated as close as possible to its original state.

Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive Traffic Management Plan would be prepared prior to the decommissioning phase in conjunction with the relevant road authorities which would ensure adequate road safety and road network operations are maintained.

8.9 Credible Residual impacts - Traffic and Transport

The environmental risk Workshop held in December, 2024 identified the following credible direct and indirect residual risks to Traffic and Transport during construction of the plant.

- High-Risk OSOM Vehicle movement delay (if required) due to Absence of route assessment
- Negative driver behaviour caused by:
  - Lack of driver behaviour direction;
  - Poor safety leadership by project management;
  - Poor application of Project engagement principles.
- Increased traffic movement related to the Project has potential to cause perceived impact to local road users due to increased traffic volumes.

The environmental risk Workshop held in December, 2024 identified the following credible direct and indirect residual risks to Traffic and Transport during operation of the plant:

- Negative driver behaviour caused by:
  - Lack of driver behaviour direction;
  - Poor safety leadership by project management;
  - Poor application of GEGHA Plant operation engagement principles.

8.10 Traffic and Transport – Mitigation Measures

Mitigation measures described in Table 8.6 are proposed to be implemented during the GEGHA Plant's construction and operation to further avoid and minimise impact on traffic and transport. The most effective framework for implementation of these mitigation measures is via a Construction Environmental Management Plan and Operational Environmental Management Plan as appropriate.

Table 8.6 - Proposed Mitigation Measures: Traffic and Transport

Reference	Mitigation Measure	Project Phase	Responsibility
TT01	Prepare a Traffic Management Plan prior to the commencement of construction in accordance with sections 5.2 and 7 of the Traffic Impact Assessment (TIA).	Construction	HSPT
TT02	Preparation of a driver Code of Conduct in accordance with s7.1 of the TIA. Code of conduct will also include guidance and provision for carpooling to site.	Construction	HSPT
TT03	Ensure that traffic and transportation are reflected in overall Community engagement program to ensure that any road works are notified to community and neighbouring properties in advance of commencement and that expected increase in traffic is communicated to the community in advance of works.	Construction	HSPT
TT04	Dedicated car parking will be provided on site within the temporary lay down area. Parking area will be delineated with appropriate space and guidance to park effectively within the dedicated area. Ensure that car parking provisions are clearly explained during site induction for all on-site personnel.	Construction	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
TT05	Any high-risk OSOM vehicle movements will be subject to the preparation of a route assessment.	Construction	HSPT
TT06	- Development of an Operational Traffic Management Plan that includes a driver Code of Conduct. - Driver Code of Conduct to be implemented via induction and regular check-ins as a measure to maintain safety within and around the site, as well as along the key routes to site. - All vehicles plant and equipment will be maintained in good working condition. - All vehicles to be cleaned on a regular basis.	Operation	HSPT

9 AIR QUALITY AND ODOUR

A specialist technical Air Quality Impact Assessment has been prepared by SoundIn and is presented in Appendix B.19.

9.1 Air Quality - Introduction

This chapter provides assessment of air quality associated with the construction and operation of the GEGHA Project. This chapter and its appendix collectively address the requirements of Key Issue 7 of the Project SEARs (Appendix A).

9.2 Air Quality: Form of Assessment

Construction and decommissioning phases of the project lifecycle have a similar low level of risk associated with dust creation and emissions. Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the "Approved Methods") (NSW EPA, 2022) sets out applicable impact assessment criteria for a number of air pollutants.

Air Quality assessment seeks to identify pollutants of interest that may be harmful to human health or create irritation and to quantify the extent to which their presence during the operation of the GEGHA Project would impact on the receiving environment.

Calculated emissions are given conservative estimates which are then modelled using well accustomed software to generate mapping of potential extent and severity of impact generated by those emissions.

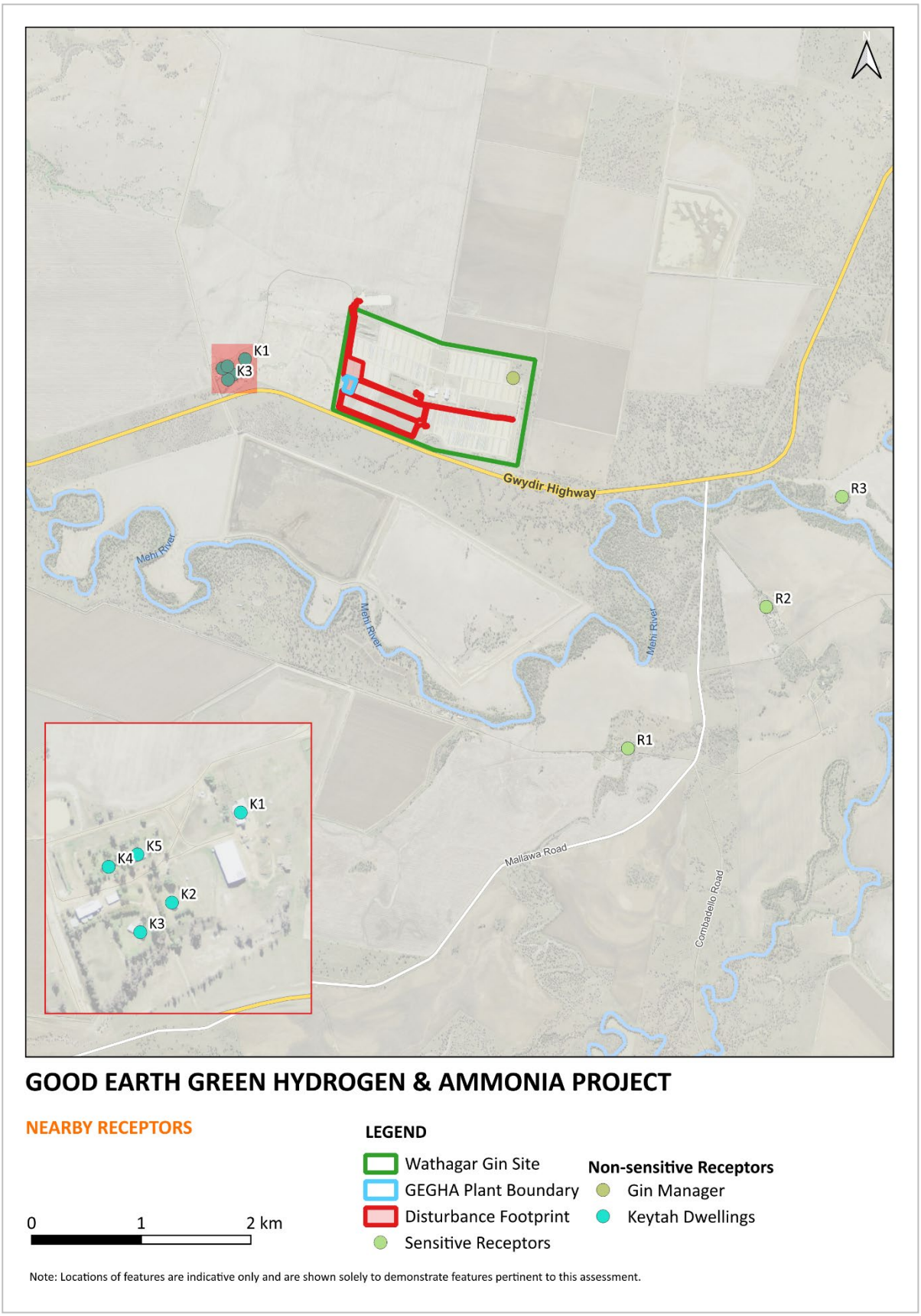
9.3 Air Quality - Receptors

Nearby receptors to the GEGHA Project are mapped in Figure 9.1. Table 9.1 summarises location and proximity of the GEGHA Project's sensitive receptors in relation to the plant boundary and disturbance footprint.

Table 9.1 - GEGHA Sensitive Receptors

Receptor ID	MGA55 Coordinates		Distance (km)	
	Easting (m)	Northing (m)	GEGHA Plant Boundary	Disturbance Footprint Extent
Sensitive Receptors				
R1	753,331	6,724,670	4.1	3.2
R2	754,593	6,725,961	4.3	2.9
R3	755,284	6,726,966	4.6	3.1
Non-sensitive Receptors				
Gin Manager	752,284	6,728,050	1.4	0.4
Keytah 1	749,837	6,728,223	0.9	0.9
Keytah 2	749,730	6,728,082	1.0	1.0
Keytah 3	749,681	6,728,036	1.1	1.1
Keytah 4	749,632	6,728,138	1.1	1.1
Keytah 5	749,677	6,728,157	1.1	1.1

Figure 9.1 - GEGHA Sensitive receptors



9.4 Air Quality Impact Assessment – Construction

Air Quality Impact during construction of the GEGHA Plant is expected to be limited to dust generation and the potential for excessive exhaust emissions from vehicles, plant, machinery or equipment.

9.4.1 Dust Generation Impact

Dust is expected to be generated by the following activities:

- Vehicle and machinery movement
- Site clearing activities within the disturbance footprint
- Movement of stockpiled materials during installation and reinstatement of the pipeline corridors
- Construction of internal roading and the evaporation pond.

Volume and severity of dust generation during construction is dependent on a number of daily factors including:

- Activities being undertaken
- Area of the disturbance footprint that has been cleared
- Volume of earth stockpiles without any vegetation or cover
- Level of shelter or protection from prevailing conditions
- Weather conditions
- Humidity
- Number of vehicles entering/ exiting through the day

Dust generation can be effectively controlled by a number of management methods or actions.

It is expected that dust generation associated with construction of the GEGHA Project would be relatively minor due to the small project footprint, low number of construction vehicles and temporary nature of the limited dust generating activities. Air quality impacts due to construction of the Project are expected to be insignificant. No odour impacts are anticipated.

Best practice methods will be used to control dust generation on site should activities and conditions contrive to create a risk to public safety on the adjacent Gwydir highway or a risk of nuisance to receptors. The Project site has good separation from sensitive receivers as such this would have negligible impact during the construction phase.

9.4.2 Exhaust emissions

Exhaust standards and emissions from motor vehicles are set out in the Protection of the Environment Operations (Clean Air) Regulation 2021, enforced by the NSW EPA. Several procedural systems including regular servicing and visual inspections will be in place to ensure that all plant, machinery, vehicles and equipment used for the construction of the GEGHA Project will be in good working order. These will be detailed in the Project Construction Environmental Management Plan. It is expected that emissions generated by the project during construction would have a negligible impact on local air quality.

9.5 Air Quality Impact Assessment – Operation

Ammonia emission is the only identified aspect of the GEGHA Plant's operation that has the potential to impact air quality. Operational vehicle movement would be speed limited on upgraded internal roads or within the bitumen sealed section of the plant, making operational dust generation negligible.

9.5.1 Ammonia modelling and analysis

Ammonia is identified in the Approved Methods as an "individual toxic air pollutant". The impact assessment criterion for ammonia is presented in Table 9.2.

Industry standard air quality modelling was used to input site specific meteorology and terrain. Assessment of odour includes an appropriate peak-to-mean ratio that is reflective of site and ensures that analysis is in accordance with the

Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales ('Approved Methods Guidelines').

There is one point source of ammonia release on site - the vent. The scrubber design aims to keep the ammonia concentration at the vent at approximately 2 parts per million (ppm). Release parameters and emission rates have been modelled at 10 ppm to provide a conservative estimate of dispersion.

Impacts of ammonia modelling are presented in Table 9.2 as predicted Ground Level Concentrations (GLC) of ammonia at identified receptors. GLC of ammonia are predicted to comply with the impact assessment criteria for both toxicity and odour at all receptors. Contour plots of the predicted ammonia concentrations are provided in Appendix B.19.

Table 9.2 - Predicted ammonia GLC at identified receptors

Impact assessment criteria Ammonia – individual toxic pollutant				
	1-hour 99.9th percentile (toxicity)		**1-hour 99th percentile (odour)**	
Criteria	330 µg/m^3	0.46 ppm	210 µg/m^3	0.00021 ppm
Receptor ID				
R1	0.01 µg/m^3	0.0000001 ppm	0.01 µg/m^3	0.0000001 ppm
R2	0.01 µg/m^3	0.0000001 ppm	0.00 µg/m^3	0 ppm
R3	0.01 µg/m^3	0.0000001 ppm	0.01 µg/m^3	0.0000001 ppm
Gin Manager	0.09 µg/m^3	0.0000009 ppm	n/a	
Keytah 1	0.21 µg/m^3	0.0000021 ppm	n/a	
Keytah 2	0.19 µg/m^3	0.0000019 ppm	n/a	
Keytah 3	0.19 µg/m^3	0.0000019 ppm	n/a	
Keytah 4	0.19 µg/m^3	0.0000019 ppm	n/a	
Keytah 5	0.20 µg/m^3	0.0000020 ppm	n/a	
Max off site	2.31 µg/m^3	0.0000231 ppm	N/A	

9.6 Greenhouse Gas Assessment

As part of the broader Air Quality assessment, a Greenhouse Gas (GHG) assessment has been conducted in accordance with the Australian National Greenhouse Accounts Factors (ANGAF) (DCCEEW, 2024).

9.6.1 Emissions Overview

Greenhouse gas assessment for the GEGHA Project considered the following emission sources associated with the Project:

- Scope 1 (direct) emission sources:
    - Combustion of fuel (petrol) in the Project-owned vehicle.
    - Fugitive emissions associated with ammonia production and electrolysis
- Scope 2 (indirect) emission sources:
    - Electricity generated off-site that is consumed by the Project.
- Scope 3 (indirect) emission sources:
    - Transmission of grid-imported electricity used at the Project site
    - Scope 3 emissions associated with on-site fuel (petrol) usage
    - Consumables used at the Project site.

9.6.2 Greenhouse Gas Emissions Inventory

A summary of annual GHG emissions for the Project is presented in table 9.3.

Table 9.3 - Predicted ammonia GLC at sensitive receptors (µg/m3)

Scope	Source/Activity	Annual GHG Emission (t $C0_2$-e)
Scope 1	Fuel usage in site-owned vehicle Fugitive emissions	0.188 0.000
Scope 2	Offsite-generated electricity	0.000
Scope 3	(Offsite) Electricity transmission Petrol usage Consumables	0.000 0.047 0.000
Total	• Scope 1 • Scope 2 • Scope 3	 0.188 0.000 0.047

The total annual GHG emission associated with the operation of the GEGHA Project are 0.235 t CO_2-e.

The facility reporting threshold under the *National Greenhouse Energy and Reporting Act 2007* (NGER Act) NGER is 25,000 t CO_2-e per annum for Scope 1 and Scope 2 emissions. The GEGHA Project's GHG emissions are negligible.

9.7 Air Quality Cumulative Impacts

Any impacts to air quality associated with construction will be temporary in nature and minor in nature. Active management of the credible risks would reduce the residual impact level to negligible.

Emission of ammonia from the GEGHA Plant is so negligible that it would be barely detectable at identified receptors. It is expected that construction, operation and decommissioning of the GEGHA Plant would not contribute to a cumulative impact to existing air quality.

Operational GHG emissions relate to the use and refuelling of the site maintenance vehicle. The plant itself will not generate any GHG emissions during its operation.

9.8 Credible Residual Risk - Air Quality

The environmental risk Workshop held in December, 2024 identified the following credible direct and indirect residual risks to Air Quality during construction of the plant.

- Dust generation from construction plant and vehicle movements negatively impact visibility on the Gwydir highway.
- Dust generation from construction activities negatively impact neighbouring residences (Keytah dwellings approximately 1km west of the Project footprint and the Gin manager's residence approximately 1.4km from the GEGHA plant boundary and approximately 360m north of the closest internal roading.

9.9 Air Quality Mitigation Measures

Mitigation measures described in Table 9.4 are proposed to be implemented during the GEGHA Plant's construction to minimise impact on Air Quality. The most effective framework for implementation of these mitigation measures is via a Construction Environmental Management Plan and Operational Environmental Management Plan as appropriate.

Table 9.4 - Air Quality Mitigation Measures

Reference	Mitigation Measure	Timing	Responsibility
AQ1	Ensure that the scrubber is designed to a maximum release parameter of Ammonia of 10ppm.	Design Operation	HSPT
AQ2	All vehicles, machinery, plant and equipment will be serviced regularly and kept in good working order in accordance with requirements in the Protection of the Environment Operations (Clean Air) Regulation 2021. The CEMP will detail how vehicles, machinery, plant and equipment will be serviced and maintained. It will include provision for daily inspection and procedure when a fault is detected.	Construction	HSPT
AQ3	Prior to commencement of works, the contractor shall ensure that: - site supervisors are aware of sensitive receptor proximity to the site. - site supervisors are monitoring weather forecasts and logging expected conditions. - plant and resources availability to effectively manage dust generation on site should be reflective of expected weather conditions.	Construction	HSPT
AQ4	From the commencement of site establishment work, prestart meetings should consider proposed activities planned for the day and their potential to impact sensitive receptor locations based on proximity and site conditions (high winds, wind direction, dry conditions). Controls must be implemented if dust is observed to be causing a hazard (such as obscuring visibility or impacting daily activities of adjacent receptors).	Construction	HSPT
AQ5	On days of high wind and dry conditions, visible monitoring should be undertaken and Water Spray Units should be used where dust is causing a hazard or nuisance off site from the following sources: - Windrowed topsoil and other loose soil stockpiles - unsealed work areas as required - during the loading and unloading of dust generating materials, i.e. Soil/sand/fill and aggregates. Controls should be monitored and supplemented, if required, to maintain effectiveness.	Construction	HSPT
AQ6	Vehicle speed within the Project disturbance area must be restricted to 20 km/hr.	Construction	HSPT
AQ7	Any mud tracked onto local roads must be cleaned to prevent damage to other road users and to maintain normal visual appearance.	Construction	HSPT

10 SOIL AND WATER

The following specialist reports have been prepared to inform this chapter:

- GEGHA Project Soil and Water Assessment, SMK Consultants March 2025 (Appendix B.3)
- GEGHA Modelled Groundwater Drawdown Assessment, Australasian Groundwater & Environmental Consultants, September 2024 (Appendix B.12)

10.1 Soil and Water - Introduction

This chapter provides insight into the geology, groundwater, soils and surface water regime within and adjacent to the Project Assessment Area. It also provides a summary of the potential impacts on, or effect of the Project on water resources.

This chapter has characterised soil and water to include the following aspects:

- Geology
- Groundwater
- Soils, including contaminated land
- Land Use
- Surface Water Quality
- Wastewater
- Hydrology and Flooding

The Project will draw on water resources from the Wathagar Gin drainage dam with provision to draw groundwater from the existing Wathagar bore, subject to applying for a water supply work and/or water us approval. Produced water from the plant will be pumped to a new evaporation pond to the north of the plant.

This chapter analyses the existing environment, soil conditions, hydrology and flood protection. Assessment includes flood risk, evaporation pond sizing and groundwater drawdown.

This chapter and its related appendices address the requirements from Key issue 8 of the Project SEARs (Appendix A).

10.2 Soil and Water: Form of Assessment

Compilation of Land and Water assessment has involved:

- desktop review of previous studies and publicly available datasets
- in-field soil and water sampling, laboratory analysis, observation and survey
- generation of modelling based on available data and conservative assumptions

An in-field soil sampling program was undertaken in September 2023 by SMK Consultants with supporting Geotechnical assessment that was prepared by Arcos in May 2024 whilst water samples were taken from the Drainage dam in November 2023 and September 2024 and the Wathagar bore in September 2024.

Survey of the drainage dam was undertaken in October 2023 to determine depth and capacity.

10.3 Soil and Water – Existing Environment

10.3.1 Topography, Geology and Soils

The proposed development site is situated on the Marra Creek Formation, a geologically young formation characterised by dark to pale grey and beige to pale yellow-grey sandy, silty clays.

The soils on the GEGHA Project site are black soil on the alluvial plains of the Gwydir River floodplain. Two main soil types are present:

a) Chromosols occur in a small portion on the western part of the proposed site area. They are typically deep, well structure red-brown earths, with some carbonate nodules present.

b) Vertosol are the major soil type present and cover the remainder of the site. They are typically deep, highly cracking, heavy black/grey clays found on floodplains in the region.

Geotechnical assessment determined that the GEGHA Project site has a profile of sandy, silty clay to a depth of approximately 2.7m with clayey silty sand and silty sand to a depth of 6m (depth of testing). The evaporation pond borehole has a silty clay and sandy silty clay profile to a depth of 4.7m with Clayey silty sand to 6m (depth of testing). These alluvial soils have high shrink swell characteristics.

There was an absence of any Acid Sulfate Soil. Soil pH is slightly alkaline (~pH8) and low in salinity (up to ~832ppm) and total soluble salts (~283ppm). Silty clay soils have moderate to high erodibility due to their fine particle size and low permeability.

The proposed site is relatively flat land associated with the Gwydir River floodplain. The elevation of the site is 188 m AHD.

Existing site condition can be described as a fallow section of the Wathagar Cotton Gin yard that was formerly utilised for the temporary storage of cotton waste or 'trash'. The trash consists of an accumulation of waste from the cotton Ginning process (droppings, strippings, fly, hull, leaf, stem and motes). It is a fibrous waste product that is stored in piles and left to partially decompose before being spread back out on the agricultural paddocks as a mulch.

There are intermittent strips of shallow clay roading that have been utilised by Gin vehicles over the years spaced between cotton trash and raw cotton bale storage sections.

Improvements in waste management of the cotton trash mean that the area will no longer be required for trash storage which enables the land availability for the construction and operation of the GEGHA Project and adjacent Wathagar Solar Farm Stage 2.

10.3.2 Hydrology and Groundwater

There are two groundwater aquifers beneath the site, the shallower Lower Gwydir Alluvium (LGA) and the deeper Great Artesian Basin (GAB).

The GAB aquifer commences below 400m and at present, there are no GAB bores within the development area. The GAB would not be affected by the GEGHA Project.

The LGA aquifer ranges up to 50m below ground level with a standing water level of up to 20m. There are three bores in proximity to the GEGHA Project site and each has a water bearing zone at a depth of approximately 20m. The standing water level will seasonally fluctuate by between 2m and 3m depend on recharge and local water extractions which is considered normal.

10.3.3 Drainage and Flooding

The local floodplain area is covered with a layer of heavy clay and therefore the area surrounding the project site is not considered an aquifer recharge area. Primary LGA recharge occurs along the Gwydir and Mehi Rivers where gravel beds are exposed within the riverbeds. Recharge occurs when the rivers are flowing. The period of natural recharge is increased by the release of irrigation water from Copeton Dam throughout the spring and summer period.

The GEGHA Project is located within the Gwydir River floodplain. The closest watercourse to the project site, the Mehi River, is located approximately 1.4km south of the Project site boundary.

Mapping of watercourses provided under the Water Management (General) Regulation 2018 Hydroline Spatial Data base identifies a flood channel from the Mehi River which traverses across the GEGHA site. The original path of this flood channel which flowed through the site during a flood event, has been redirected for some years around the perimeter of a flood levee that was constructed in the 80's to protect the Cotton Gin.

Land to the north of the site is open floodplain which is cultivated. Land to the north-east of the site has been developed for surface irrigation of various crops including cotton. This irrigation development is also flood protected by other levee banks on land owned and operated by the Sundown Pastoral Company.

There are no other named watercourses identified around the development site. The closest northern watercourse is Tarran Creek located approximately 3km to the north of the site. All streams and floodwater flow east to west which is the natural slope of the land.

During a large flood event in the Mehi and Gwydir River floodplain, flood inundation occurs on adjoining land which is not flood protected. Water depth in a 1 in 100-year flood event may be as high as 0.6m – 0.8m above natural surface level at the peak of a 1% Annual exceedance probability (AEP) flood event.

The existing levee is between 0.3m and 1m above the calculated 1% AEP flood level and has proven effective since its construction.

10.3.4 Flood Regime and Flow Path Behaviour

The Project is located on the Gwydir River floodplain. During a large flood event in the Mehi and Gwydir River floodplain, flood inundation occurs on adjoining land which is not flood protected. Water depth in a 1 in 100-year flood event may be as high as 0.6m – 0.8m above natural surface level at the peak of a 1% Annual exceedance probability (AEP) flood event.

Figure 10.1 shows an aerial image of the Wathagar Cotton Gin during a 2012 flood event (approximately 0.47m lower than a predicted 1% AEP flood event). A large body of water can be seen moving across the floodplain and through the drainage dam.

In the 2012 flood event, the existing Wathagar Cotton Gin levee bank did not fail and all floodwater was excluded.

Survey of the Wathagar Gin site following the 2012 flood event indicated that the main electrical infrastructure including the main substation, infrastructure associated with the existing solar farm and the Cotton Gin are all above the calculated 1% AEP flood level.

Figure 10.1 - Flood event image of the GEGHA Project area

During flooding events, a large body of water moves west across the floodplain. Several shallow flood depressions are present within the floodplain. These flood depressions carry the initial flow of water until completely inundated. The water then spreads across braided channels within open cultivation paddocks and inundates the whole floodplain area. The water slowly moves west.

The closest natural lagoon is approximately 6 km west of the GEGHA Project site. Once these lagoons fill, the large body of overland flow or floodwater will enter Cowbail Creek which then flows into Tarran Creek. At a distance of approximately 30.5 km west of the GEGHA Project site, other watercourses join Tarran Creek. Tarran Creek joins the Mehi River approximately 38 km west of the GEGHA Project site.

It is not proposed to alter any of the existing flood defences on site as part of the GEGHA Project construction and operation. The design of the GEGHA plant will include raising of the floor level of plant and storage vessels to ensure that it is above the 1% AEP flood level. This will ensure that it is not impacted by flood water in the event that the levee is overtopped.

10.4 GEGHA Project Water Use

10.4.1 GEGHA Water Balance

Preliminary design of the hydrogen ammonia plant indicates that it would utilise a maximum of 51 ML of water per year. This is based on a consumption rate of 5.8 kL per hour and an anticipated maximum daily consumption of 139 kL.

Preliminary analysis of the water purification system indicates that 70 percent of this water will be treated for processing through the plant and 30 percent will become 'produced' or wastewater. The water required for processing must be de-ionised to feed the electrolysis process of breaking H_2O into hydrogen.

The primary source of water will involve recycling the surface runoff from the controlled drainage area within the Wathagar Gin levee bank system. This water is captured in the drainage dam and available to be recycled through the site for various purposes including generation of hydrogen.

The drainage dam holds up to 198.8 ML of water when full. Average annual stormwater discharge from within the Wathagar Gin site is estimated to be 75 ML. The runoff generated from the site will therefore exceed the annual usage by the hydrogen and ammonia plant. The drainage has a maximum depth of approximately 10m.

Figure 10.2 - Wathagar drainage dam – primary water source for the GEGHA Project

Table 10.1 demonstrates a worst case annual water usage of 98ML allowing for evaporation, seepage and water usage at the maximum level. This equates to just under two years water storage with no surface water inflow given GEGHA's commitment to retain 1m in the dam when rainfall inflow is at a deficit.

Table 10.1 - GEGHA Project water balance utilising drainage dam as primary water source

GEGHA Wathagar Pond Balance					**Average rainfall**		**No surface water inflow**			
Month	Pan Evap	Days per month	Pan E0	Pond Evaporation (PE)	Rainfall (P)	Pond Rainfall	Seepage Loss	Water use	Water Balance	ML in Pond
Unit	mm/d	days	mm/month	KL/ Month	mm/month	KL/month	KL	KL	KL	
									198,800	199
Jan	10.1	31	313.1	8,454	78	2,340	90	4309	188,287	188
Feb	9.1	28	254.8	6,880	67.8	2,034	90	3892	179,460	179
Mar	7.7	31	238.7	6,445	63.4	1,902	90	4309	170,518	171
Apr	5.7	30	171	4,617	21.2	636	90	4170	162,277	162
May	3.7	31	114.7	3,097	29.2	876	90	4309	155,657	156
Jun	2.6	30	78	2,106	37	1,110	90	4170	150,401	150
Jul	2.7	31	83.7	2,260	32.5	975	90	4309	144,717	145
Aug	3.9	31	120.9	3,264	25.7	771	90	4309	137,825	138
Sep	5.6	30	168	4,536	35.1	1,053	90	4170	130,082	130
Oct	7.7	31	238.7	6,445	50.2	1,506	90	4309	120,744	121
Nov	9.2	30	276	7,452	72.7	2,181	90	4170	111,213	111
Dec	9.8	31	303.8	8,203	66.7	2,001	90	4309	100,612	101
			2361.4	63,758	579.5	17,385				
				Assumptions						
			Assume 90% loss from pan evaporation							
Pond Evaporation = daily evaporation times average surface area of the pond										
			Seepage loss of 0.1mm per day							
Water Use		Per day (KL)								
50 KL per day			139							

The GEGHA Project's operation will primarily rely upon surface water for manufacturing the hydrogen. In the event of a lack of surface water, it is proposed to access to a limited volume of groundwater from the Lower Gwydir Groundwater Source, subject to seeking and obtaining the required approvals and licences.

Water would be drawn, when needed, from an existing bore at the Wathagar Cotton Gin and pumped to the GEGHA Plant.

The Plant will include above ground water tanks for storage and settling of water before processing through the purification plant for production of the hydrogen.

10.4.2 Drainage Dam – Water usage

The drainage dam was created in the 1980s as it was utilised as a borrow pit for gravel that was used in the establishment of the Wathagar Gin. Since the establishment of the Wathagar Cotton Gin, it has functioned as a drainage collection dam, preventing sediment load entering Tarran Creek. The dam has two feed in points known as 'Flood Gate No.1' and 'Flood Gate No.2'. These are regulators that allow run-off from the Wathagar Gin, storage yard and cotton trash disposal areas to enter the dam.

Existing function of the Drainage Dam

The drainage dam's function is to retain run-off from the Wathagar Cotton Gin, its module yard and cotton trash disposal area. This area is contained by the Wathagar flood protection levee and is approved under Floodwork Approval 90FW833508 (a copy of the Approval is in Appendix B.3).

The retained area behind the levee is approximately 148 hectares. Water that falls inside the levee runs to internal open drains around the internal perimeter that flow via gravity back to Flood Gate No. 1 and Flood Gate No.2. Flow rate into the drainage dam can be gauged via the Flood gates.

Water quality is monitored under the Wathagar Gin's Environmental Protection Licence 10832 (Appendix E) which has two nominated Discharge Quality Monitoring locations at each of the Flood Gates.

Presently, the dam has established vegetation around its banks and it can be best described as a permanent sediment basin in the context of its function.

No other licence, exemption, exclusion or harvestable right exists over the water in the dam.

Nominated Change - Proposed Use of Water for the GEGHA Project

It is proposed that the drainage dam water is re-used for the purpose of Hydrogen and Ammonia production as the primary feedstock for the GEGHA Project. The Project will install a submersible pump that will be 'floated' approximately 1m below surface level. A HDPE pipe will flow back to a cleared area of the bank where it will be trenched back to the GEGHA Plant. No further change or modification is proposed to the dam or its functionality as a sediment drainage dam for the Wathagar Cotton Gin under EPL 10832.

The drainage dam is located on Lot 30/DP 1040936 which is owned by Sundown Pastoral Company. As a partner in HSPT, Sundown Pastoral Company has signed a licence agreement that entitles HSPT to draw and use water for the duration of the Plant's operation.

This approach is reflective of the principles of the circular economy and the principles of Ecologically Sustainable Development (ESD) (chapter 19). By preferentially re-using wastewater, it demonstrates best practice use of a required resource to protect surface and groundwater resources.

10.4.3 Need for Ground Water Extraction

Analysis of annual rainfall records has shown that there are likely to be predicted patterns of below average rainfall when the drainage dam will not refill sufficiently and the GEGHA Plant would have to rely on groundwater to supplement or wholly provide its water supply needs.

Groundwater bore GW064216 is located adjacent to the Wathagar Gin and is operational, supplying the Gin with fire water. It is proposed that HSPT will utilise the existing bore to supply water for use in the Plant.

The Lower Gwydir Alluvium is managed under the Gwydir Alluvium Water Resource Plan. Prior to connecting to the bore, HSPT would require the following licences and approvals:

1. A zero-balance Water Access Licence (WAL)
2. A Water supply work and/or water use approval (subject to the applicability of s4.41 of the EP&A Act).

It is proposed that HSPT would seek to purchase the required entitlement via a registered water broker under the governance of the Water Sharing Plan for the Gwydir Alluvium Water Resource Plan.

10.5 Groundwater Drawdown

In anticipation of the need to utilise bore GW064216 to provide water supply to the GEGHA Plant, a drawdown assessment has been undertaken (Appendix B.12). To fully analyse predicted drawdown effect of the plant's operation a worst-case scenario was modelled that assumed that the plant's full requirement of 51ML per annum would be supplied by the bore for a duration of up to 30 years.

The predictive model found that drawdown at nearby mapped Groundwater Dependant Ecosystem vegetation would be less than 0.37m over a 30 year period of full water take, less than 0.27m at the nearest active water bore and 0.24m at the nearest Water Access Licence.

Drawdown rate at the nearest GDE is modelled to decline largely in the first year before settling out into a stabilised pattern over the life of the water take. Generally, guidelines suggest that the drawdown should not exceed 0.1m over a ten-year period to avoid significant impact to GDEs. The model shows a rate that exceeds this within the first year of water take before levelling out to consistent, drawdown rate that is within the 0.1m over ten-year parameter.

By assuming a 100% groundwater sourcing for the modelled impact, it adopts a very conservative drawdown assessment. There are a number of factors external to the drawdown assessment modelling that are likely to maintain GDE health during the GEGHA Plant's operation. These include:

- Preferential use of drainage dam water over groundwater. No groundwater will be required until at least year 2 of operation. Operational philosophy is planned around the use of groundwater to supplement the primary water supply rather than rely 100% on ground water.
- Optimisation of the GEGHA Plant's operation is likely to present opportunities for water re-use and water efficiency that will lower the Plant's overall water demand.
- Beneficial recharge of aquifers supplemented by the release of high security water from the Copeton dam in drier years to the Mehi river in particular. This will likely contribute to the sustained health of adjacent GDEs.
- In drier years, it is likely that there will be a 'mirroring' effect whereby fertiliser demand will diminish, leading to a lower production rate and an overall lower water use.

Regardless of the likely lower groundwater use and supplementary aquifer recharge, the drawdown modelling confirms the need to establish suitable monitoring protocols at GDEs surrounding the plant site when groundwater is in use, particularly in the first year of drawdown.

10.6 GEGHA Wastewater Generation and Management

10.6.1 GEGHA Plant – Produced Wastewater

The GEGHA water treatment process has been designed with an expected rejection water rate of 30% that would go to wastewater. The remaining 70% of water will be demineralised and used for the production of Hydrogen or used in the Plant's cooling systems.

This rate of rejection would produce approximately 41,700l or 41.7 kL of water per day. The quality of this wastewater will vary; however, it is expected to have an elevated salinity level and contain concentrated minerals and salts. Discharging this wastewater to the environment is not an option. Reuse of this wastewater for purposes such as landscape irrigation or road watering (dust suppression) would result in dispersal of the salts and minerals in the surface soil within the Cotton Gin site. The potential then exists for these salts and minerals to wash from the site and be captured and concentrated in the drainage dam.

The proposal for onsite produced wastewater management is to involve the design and operation of an evaporation pond. This will be the safest environmental outcome to ensure that external areas are not impacted by this wastewater stream.

The following data has been used for the design of the wastewater pond:

- Average daily wastewater production of 41.7 kL based on a rejection rate of 30% to wastewater;
- Moree BOM rainfall records to determine the 96-percentile wet year;
- Average daily evaporation records for Moree BOM site;
- Limiting the evaporation loss to 90% of recorded evaporation;
- A seepage loss of 0.1mm per day;
- A pond depth of 1.5m which allows for a standard 0.5m of freeboard;
- No overflows occurred in the calculation.

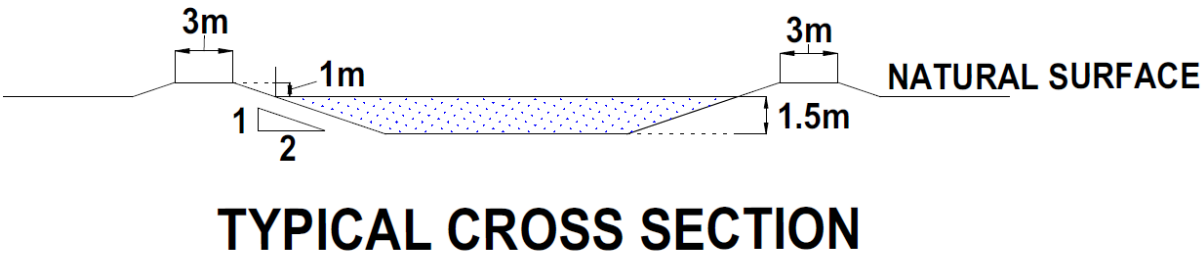
The design involved calculations to ensure that sufficient evaporation occurred to provide an overall negative water volume over a 12-month period for the 96-percentile rainfall year. An actual rainfall year was used on the basis of rainfall patterns. The year 2021 includes extensive rainfall in March and November. In 2021, a total of 883.8 mm of

rainfall was recorded. No dry months occurred. It should be noted that this rainfall year generated a significant flood through the Gwydir River system.

The pond size is based on a pond capacity that exceeds the highest accumulated volume of wastewater and rainfall captured in the pond. The results indicate a maximum pond size of 91m by 120m with a depth of 1.5 m to generate a surface area of 10,920 square metres and a pond volume of 16,380 kL.

A typical cross section of the evaporation pond is provided in figure 10.3.

Figure 10.3 - GEGHA Evaporation pond – typical cross section



10.6.2 Stormwater design provisions

The pond design will include a minimum of 1m of freeboard. Under conditions where more rain fell than what was recorded in 2021, the pond would be able to hold an additional 10,920 kL of wastewater which provides additional containment and storage buffer.

For safety purposes, the pond construction will include a gated overflow pipe set at 300mm below the top of the bank. This will have a gate valve to ensure control over discharges can be managed. The purpose of the overflow pipe is to allow the pond to discharge in the event of a rainfall event that exceeds the 96-percentile wet year and freeboard capacity.

It will ensure that surface water (primarily rainfall and produced water with low Total Dissolved Solids (TDS)) would overflow in preference to failure of the evaporation pond structure. In such an event, water would mix with other stormwater within the site. The gates on the pipe outlets from the levee bank system allowing external discharge of stormwater would be closed. This would allow capture and dilution of this water with other stormwater generated within the site. The pond would be repaired and the spilt water could be pumped back into the pond if required.

10.6.3 Wastewater generation and management

During construction, temporary ablutions for the construction workforce will be trailered on to site. Portaloos and portacabins will be hired in and utilised on site for the duration of construction and commissioning. The units will be serviced/ emptied by the hire company.

The GEGHA Plant's control room will have facilities for up to four people to occupy and operate the plant's systems and controls. This will include toilets, shower, kitchen and boot wash station.

The associated wastewater system comprises a septic tank that will provide primary wastewater treatment, separating out suspended material via a primary settling chamber. This level of treatment is suitable for disposal via absorption trenches.

The septic tank will be placed a minimum of 1.5m from the control room with a submersible pump providing a means of emptying the treated water into the absorption trenches.

Absorption trench would be 21m in length and 600mm wide x 600mm deep to dispose of a peak of 300l of wastewater per day.

Detail on system sizing, design and location is provided in the On-site Wastewater Management Plan (Appendix B.11).

10.7 Drainage, Erosion and Sediment Control

The GEGHA Project site is largely contained within the Wathagar flood levee with only the water pipe connection and drainage dam pump assembly outside of the levee's protection. Perimeter drainage is already established with an internal open table drain taking site run-off around the perimeter of the Gin yard and up to Flood Gate No.1 and Flood Gate No.2.

Prior to commencement of construction, HSPT will prepare a site erosion sediment control plan that will outline temporary erosion and sediment control structures that will be installed to contain and control the potential for erosion and mobilisation of sedimentation offsite during construction.

The majority of the disturbance footprint is within the Wathagar flood levee which provides an existing containment mechanism for most expected rainfall events.

Control of site will aim to control the increase the turbidity of water entering the Wathagar drainage dam with implementation of best practice measures that are consistent with the NSW Blue book and IECA Best Practice Erosion and Sediment Control guidelines.

The plan will be authorised by a Certified Professional in Erosion and Sediment Control (CPESC) to ensure that management controls are suitable and will be effective in reducing erosion and sedimentation risk to an acceptable level.

10.8 Water quality at discharge

There is provision for water quality testing at Flood Gate No.1 and Flood Gate No.2 under the Wathagar Cotton Gin's existing Environment Protection Licence (EPL) 10832. It is proposed that these locations would be adopted as discharge points to gauge overall water quality for the GEGHA Plant's EPL also (subject to further consultation with the NSW EPA given the crossover in EPLs). Water quality testing would be undertaken to demonstrate continued compliance with section 120 of the Protection of the Environment Operations Act 1997.

10.9 Credible Residual impacts to Soil and Water

The environmental risk Workshop held in December, 2024 identified the following credible direct and indirect residual risks to Soil and Water during construction of the plant.

- Construction activities leading to impact on soil and water including erosion and sedimentation
- Construction activities leading to impacts to surface water and stormwater quality

Impact to soil and water due to hydraulic spill or hydrocarbon spill or leak.

The environmental risk Workshop held in December, 2024 identified the following credible direct and indirect residual risks to Soil and Water during operation of the plant.

- Impact to surface water / flood water quality from operational activities (machinery use, accidental spills)
- Impact to soil quality due to operational activities (machinery use, accidental spills)
- Impact to nearby Groundwater Dependent Ecosystems caused by sustained drawdown of groundwater

10.10 Soil and Water –Mitigation Measures

Measures to manage impact to Soil and Water are provided in Table 10.2.

Table 10.2 - Proposed Mitigation Measures: Soil and Water

Reference	Mitigation Measure	Project Phase	Responsibility
SW01	- Site induction must include specific guidance on best practice in relation to refuelling and spill response.	Construction	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
SW02	- An Erosion and Sediment Control Plan (ESCP) will be prepared as part of the Construction Environmental Management Plan (CEMP). - ESCP will be prepared or authorised by a Certified Practitioner in Erosion and Sediment Control (CPESC). - ESCP measures to be in line with the Managing Urban Stormwater: Soils and construction (NSW Blue Book).	Construction	HSPT
SW03	- A construction Soil and Water Management Plan (SWMP) will be required and prepared as part of a CEMP to manage potential risks to soils and downstream water quality. - The SWMP will include as a minimum: o Drainage provisions for stormwater runoff and collection. o Plant, Machinery and Equipment inspection, service and repair protocols (or reference). o Refuelling procedure including reference to location(s) and spill prevention. o Spill preparedness and response o Measures to manage potential for contaminated runoff to occur from construction works. o Measures to ensure that excavation activities and any stockpiling are managed to minimise the potential for sedimentation and run-off. o Measures to ensure that areas of exposed soil and the time in which they are exposed are minimised as far as practicable. o Stockpile management should be included in construction site layout to demonstrate consideration of location away from drainage lines and heavily trafficked areas.	Construction	HSPT
SW04	- All stormwater run-off from disturbed areas will drain to back to the drainage dam / evaporation pond via Flood Gate No.1 or Flood Gate No.2.	Design Construction Operation	HSPT
SW05	- Evaporation pond design will be sized to allow a minimum capacity to hold all wastewater in a 96-percentile wet year.	Design Construction	HSPT
SW06	- Design will incorporate: o bunding of compressors to contain any hydraulic oil leak or burst.	Design Construction	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
	○ provision for appropriate location and storage of dangerous goods with adequate bunding, ventilation and in accordance with product storage requirements.		
SW07	- Construction and Operational Environmental Management Plans will contain provision for the storage, handling, training and use of hazardous chemicals consistent with national code of practice for the Storage and Handling of Workplace Dangerous Goods (2001).	Construction Operation	HSPT
SW08	- During operation procedures shall be developed to reduce the potential contamination of soil and surface water resulting from wastes, spills and/or emergency incidents. Suggested measures to control the potential for contamination during operation include: ○ The appropriate storage of equipment and hazardous substances during operation. ○ Ensuring that plant and stormwater control measures are maintained to prevent Contamination of soil. ○ Preparation of appropriate procedures to respond to emergency incidents, spills and leaks from the Project site, including operational equipment and maintenance activities.	Operation	HSPT
SW09	- Water quality will be measured and monitored at nominated test points to demonstrate compliance with section 120 of the Protection of the Environment Operations Act 1997.	Operation	HSPT
SW10	- Operation of the Drainage dam water extraction will cease if the level reaches 1m depth.	Operation	HSPT

11 CONTAMINATED LAND

A Contaminated Land Assessment Report has been prepared by SMK Consultants (Appendix B.13) to address the requirements of Key Issue 10 of the Project SEARs (Appendix A).

11.1 Site Contamination – background

Given the land use history of the site, potential sources of contamination are expected to be farm chemical residues from the cotton trash, primarily pesticides and herbicides. There is also a low credible risk that hydrocarbons such as oil or fuel may have been spilled as a result sustained mechanical operation across the Gin's yard since 1988.

A site inspection was conducted in September 2023 as a part of the preliminary contaminated site assessment to identify any material or object of environmental concern present on the site. This was followed up with several additional site inspections for various purposes including assessment of soils and activity on the site.

Two composite surface soil samples (0-300mm) were collected from the designated area for the GEGHA plant. One sample was obtained from the northern sector of the GEGHA plant area and one sample was obtained from the southern sector of the GEGHA plant (refer figure 3, Appendix B.13)).

These samples were sent to a NATA-accredited laboratory testing. The test parameters chosen for the soils obtained from the site include common heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn), organochlorides, organophosphates and miscellaneous herbicides and pesticides.

No hydrocarbon contamination was observed during site inspection and therefore no testing for this parameter was undertaken. Visual inspection is considered adequate to determine whether hydrocarbon residues are present on site.

11.2 Site Contamination – Impact Assessment

The results of soil testing at the GEGHA Plant site shows no contaminants of concern from farm related chemicals.

The site condition and past and current site activities indicate that no contaminant of concern is present within the GEGHA Project Disturbance Footprint. The land is considered suitable for the intended purpose of the GEGHA Project without the need for further investigation or site remediation.

Analytical results of the two soil samples obtained during the site inspection showed no parameters exceeded the soil contamination assessment criteria.

The results for metals show normal background levels for Arsenic, Cadmium, Chromium, Copper, Lead, Zinc and Nickel. Some of the parameters were recorded at the limit of reporting. No common metal contamination is present.

The range of Organochlorine Pesticides and Organophosphorus Pesticides included in the testing suite included provision for both pesticide and herbicide testing. Pesticides such as Endosulfan are considered relatively residual and can be carried through the cotton leaves in the cotton trash; however, the results show that this chemical is not present in the soil.

None of the herbicides have an extended half-life in soil. Most of the herbicides would degrade within 12-months after application if they become bound in the soil or organic matter in the soil. Most herbicides used with cotton have a short half-life of less than 24 hours when exposed to air.

11.3 GEGHA Evaporation Pond – Operation and Remediation

To ensure that the wastewater does not create a potential contaminant source for local soils, the wastewater produced by the GEGHA Project will be captured and held in an evaporation pond. The water in the wastewater stream will evaporate, leaving the concentrated solids to settle in the pond. During periods when the pond all but dries out, the dissolved solids would settle as solids on the floor of the pond.

Solids will accumulate over time. Should the volume of solids accumulate to such a mass that they require to be removed to enable continued function of the evaporation pond, it is proposed that they would be tested and removed to an appropriate local or regional waste facility during a dry period.

Produced water profile can be determined from analysis of water quality results in Appendix B.3.

A Rehabilitation Management Plan for the Project disturbance area, including the evaporation pond, has been prepared for the Project by SMK Consultants and is presented in Appendix B.17. Following completion of the GEGHA Project's operational life, methodology for remediation of the evaporation pond will be undertaken in accordance with the requirements of the Project Rehabilitation Management Plan.

11.4 Contaminated Land – Mitigation Measures

Measures to manage impact to Contaminated land are provided in Table 11.1.

Table 11.1 - Proposed Mitigation Measures: Contaminated Land

Reference	Mitigation Measure	Project Phase	Responsibility
CONTAM1	- Remediate the site in accordance with the GEGHA Rehabilitation Management Plan.	Construction Decommissioning	HSPT

12 AGRICULTURE AND CROWN LAND

The following specialist reports have been prepared to inform this chapter:

- Land Use Conflict Risk Assessment (Appendix B.14)
- Biosecurity Management Risk Assessment (Appendix B.15)
- Crown Reserves Potential Impact Assessment (Appendix B.16)
- GEGHA Rehabilitation Management Plan (Appendix B.17)

12.1 Agriculture and Crown Land – Introduction

This chapter provides an overview of agricultural production in the region and analyses the GEGHA Project's potential to impact productive agricultural land and Crown land. Collectively, this chapter and its related appendices satisfy Key Issue 7 of the Project SEARs (Appendix A).

12.2 Regional Agricultural Production

The Moree Plains region, particularly the Gwydir Valley, is renowned for its highly productive agricultural sector. Agriculture is the backbone of the local economy, employing 20-30% of the population and contributing approximately 7.8% of New South Wales total agricultural production.

The region's agricultural output is diverse, including broadacre crops such as wheat, barley, and legumes, as well as irrigated crops like cotton, pecans, and citrus

The construction and operation of the GEGHA Project is a net positive for regional agricultural production. By being constructed within the former operational footprint of the Wathagar gin, it will not displace any land under current agricultural production.

The products manufactured by the plant will provide a low carbon source of fuel and fertiliser that will lower the carbon emissions profile in the agricultural sector in regional NSW.

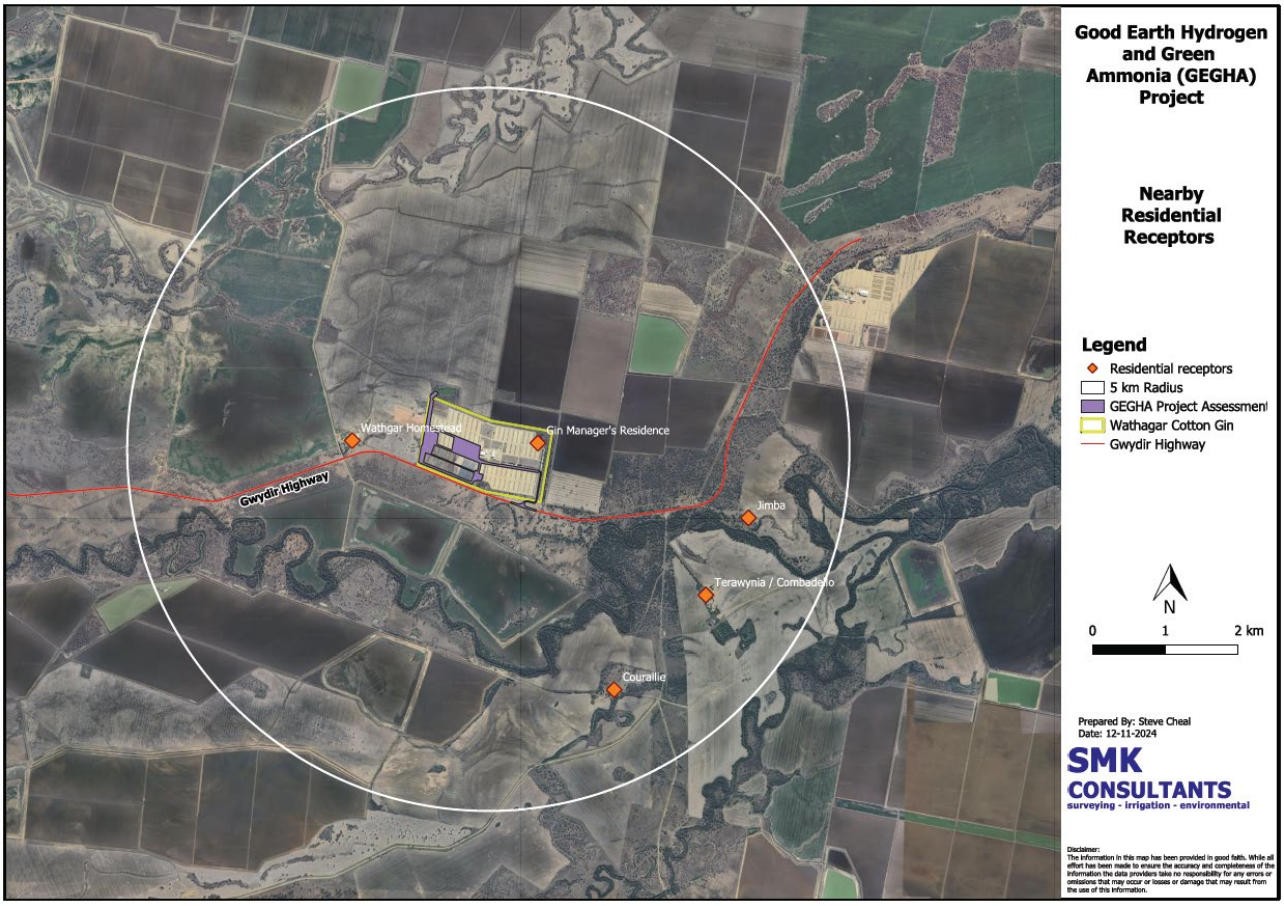
12.3 Adjacent Properties and Residences

There are five on-farm residential receptors and three off-farm residences within a 5km radius of site. The Wathagar Gin manager's residence is approximately 1.4km from the GEGHA Plant whilst a cluster of four Wathagar farm-worker residences are located approximately 1km to the west of the plant.

Surrounding private land is all in agricultural production with residences all primary homesteads or farm houses. Couralie (3.9km), Terawynia/ Combadello (4.2km) and Jimba (4.4km) are the closest off-farm residences to the GEGHA Project site (refer Figure 12.1 for proximity). All residences are associated with agricultural properties with residences actively involved in agricultural production.

All landowners and residents have been identified and consulted in relation to the Project's development, design and operational requirements. Feedback has been positive with no issues raised to date about the development and operation of the facility (please also refer to chapter 20 and Appendix G).

Figure 12.1 - GEGHA Project surrounding residential receptors



12.4 Land Capability and Existing Use

The land capability of the proposed site is classified as “class 2 - very high capability land, which has slight limitations” under the Land and Soil Capability Assessment Scheme (NSW Office of Environment and Heritage 2012). Class 2 lands are defined as those that can be managed by readily available, easily implemented management practices. The land is capable of most land uses and land management practices, including intensive cropping with cultivation.

Whilst the site is classified as Class 2 land, it hasn’t been in agriculturally productive use since 1988, having been used as a storage area for cotton waste or ‘trash’ since the commencement of Gin operations.

12.5 Land Use Conflict Risk Assessment

A Land Use Conflict Risk Assessment (LUCRA) has been undertaken by SMK Consultants and is presented in Appendix B.14. The LUCRA was prepared with reference to the ‘Living and Working in Rural Areas’ Handbook (Learmonth et al 2007) and the NSW Department of Primary Industries and Regional Development guide.

12.5.1 Credible Residual Risk - Land Use

The GEGHA Plant’s site selection and general isolation from other agricultural land users means that the credible land use conflict risks identified for the GEGHA Project are limited to:

- potential noise impacts during construction and operation on nearby residences;
- potential odours on nearby residences during operations; and
- emergence and spread of weeds to surrounding Crown Reserve Travelling Stock Route (TSR) due to site disturbance and construction traffic.

Noise and Vibration is assessed in chapter 13 with no additional mitigation measures recommended. Potential for odour is assessed as part of chapter 9. No odour is anticipated. Biosecurity risk is assessed in S12.6.

The residual risk for all identified potential land use conflicts was determined to be low to negligible.

12.6 Biosecurity Risk

Following a site inspections on the 14th September 2023 and 16th October 2023 to assess presence or absence of pest plant and animal species, a Biosecurity risk assessment has been prepared (Appendix B.15) and applied to the construction and operational phases of the Project. The risk assessment identifies the most prominent pest and plant diseases and the primary vectors that could enable their spread.

Whilst the Project site will be free of pests, listed weed species and pathogens at the outset of construction, there are a number of biosecurity risks that could lead to their importation, proliferation and spread to adjacent land. Biosecurity incorporates threats to agricultural production as well as native vegetation and vegetative community function.

The report concludes that construction and operation GEGHA Project poses only low-level biosecurity risks to surrounding land uses. With incorporation and implementation of mitigation measures that are aligned with best practices biosecurity management guidance, the construction and operation of the GEGHA Project holds a negligible risk of acting as a vector for the spread of pests, plants or pathogens.

12.7 Crown reserves

An assessment of potential impacts to these Crown reserves has been prepared (Appendix B.16).

The GEGHA Project's primary access will utilise an existing sealed entrance to the Wathagar Cotton Gin which is located within Crown reserve R31046, a travelling stock route that forms the broader Gwydir Highway corridor. Crown reserve R33572 is immediately adjacent to the southern boundary of the GEGHA plant.

Both reserves are used occasionally for stock grazing and travel, hold medium to high conservation value and have permissible compatible uses such as passive recreation and use as a cultural resource.

One physical impact to these Crown Reserves generated by the construction and operation of the GEGHA Project is the utilisation of the entry to the Wathagar Cotton Gin from the Gwydir Highway. This is considered minor and does not interfere with the functionality or value of Crown Reserve R31046.

Biosecurity and the potential for weed species to proliferate and spread to the surrounding Crown land was identified as a potential risk but ultimately would be unlikely to present a credible risk provided best practice biosecurity management measures are implemented during construction of operation of the Project.

12.8 Agriculture and Crown land – Mitigation Measures

Measures to manage impact to Agriculture and Crown land are provided in Table 12.1.

Table 12.1 - Proposed Mitigation Measures: Agriculture and Crown land

Reference	Mitigation Measure	Project Phase	Responsibility
ACL01	- Remediate the site in accordance with the GEGHA Rehabilitation Management Plan.	Construction Decommissioning	HSPT
ACL02 **(repeated as BD07)**	A Biosecurity Management Plan will be prepared to outline provisions for: - Effective prevention methods to stop introduction or spread of pest plant and pathogen species;	Construction Operation Decommissioning	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
	- Vehicle, machinery and equipment hygiene protocol, frequency and record-keeping system; - Provision for chemical spraying including seasonality and conditions for application, PPE and chemical storage.		

13 NOISE AND VIBRATION

A specialist technical Noise and Vibration Impact Assessment has been prepared by SoundIn and is provided in Appendix B.9.

13.1 Nosie and Vibration - Introduction

This chapter provides assessment of noise that will be generated by the construction and operation of the GEGHA Plant and its ancillary roading and connections. Additionally, this chapter assesses operational road noise generated by the day-to-day vehicles associated with operation of the plant and transportation of hydrogen and ammonia. Vibration has been included in the specialist scope for assessment.

Noise generation for the construction of the plant has a very similar profile to the noise generation associated with decommissioning. For the purpose of assessment, impacts and mitigation measures associated with construction should be expected and adopted during plant decommissioning.

This chapter and its appendices collectively address the requirements from section 11 of the Project SEARs (Appendix A).

13.2 Noise and Vibration: Form of Assessment

Noise generated during construction will be temporary and associated with vehicles, machinery and equipment required to successfully construct the internal roading, evaporation hydrogen and ammonia plant and associated water and electrical connections.

The control room, whilst prefabricated, will require foundations to be established and then lowered onto those foundations, before being connected and commissioned. The *Interim Construction Noise Guideline* (DECC, 2009) is the key reference document when managing and mitigating construction noise to protect the community and receiving environment.

Operational noise generated by the GEGHA Plant during the production and storage of hydrogen and ammonia will be governed by the *Noise Policy for Industry* (EPA, 2017). The Noise Policy for Industry aims to balance the need for industrial activity with the community's desire for reasonable noise amenity.

Noise generation by truck and vehicle movements associated with daily operational transport of hydrogen and ammonia has been assessed with reference to the *NSW Road Noise Policy* (DECCW, 2011). The Road Noise Policy sets criteria for assessment in the impact of road traffic noise and recommends strategies to best manage those impacts.

Table 13.1 provides an outline of assessment approach to determine noise and vibration levels generated by construction and operation.

Table 13.1 - Noise and Vibration Assessment Approach

Element of Noise and Vibration Assessment	Assessment Approach
Construction Noise	Desktop analysis and modelling. Use of typical sound power levels from construction machinery. Analysis of *Interim Construction Noise Guideline* (DECC, 2009).
Operational Plant Noise	Desktop analysis and modelling. Vendor derived sound power levels. Sound power level of vent derived from technical engineering memo. Analysis of *Noise Policy for Industry* (EPA, 2017).
Transportation Noise	Desktop Analysis Use of traffic count to model predicted Road Noise levels.

Element of Noise and Vibration Assessment	Assessment Approach
	Analysis of *NSW Road Noise Policy* (DECCW, 2011).
Vibration	Desktop Analysis of vendor information and construction methodology to identify any potential excessive vibration sources during construction and operation of the plant. Qualitative assessment of vibration.

13.3 Noise and Vibration Study Area

Construction noise assessment refers to the Project Disturbance footprint whilst operational noise assessment focuses on the GEGHA plant boundary. Transport associated with the operation of the GEGHA Plant has focused on potentially affected receivers in proximity to the Gwydir Highway.

13.4 Existing Environment

There are a number of existing noise sources adjacent to the GEGHA project footprint. The Wathagar gin operates seasonally from April to as late as November with maintenance and repair activities being undertaken in the off-season. Noise from the gin is generated from gin stands, lint cleaners, gearboxes, pre-cleaners and presses in addition to the machinery gathering raw cotton from the yard and trucks delivering raw cotton and loading out produced cotton bales and cotton seed (by-product).

The Gwydir highway is directly adjacent to the subject land and has typical traffic noise associated with a rural highway. Otherwise, the GEGHA Project footprint would be typical of a rural locality.

13.4.1 Sensitive Receivers

A manager's residence is located at the Wathagar gin and several dwellings are located on the "Keytah" property to the west of the GEGHA Project site. These dwellings are owned in full or in part by Sundown Pastoral Company, a JV partner of the GEGHA Project.

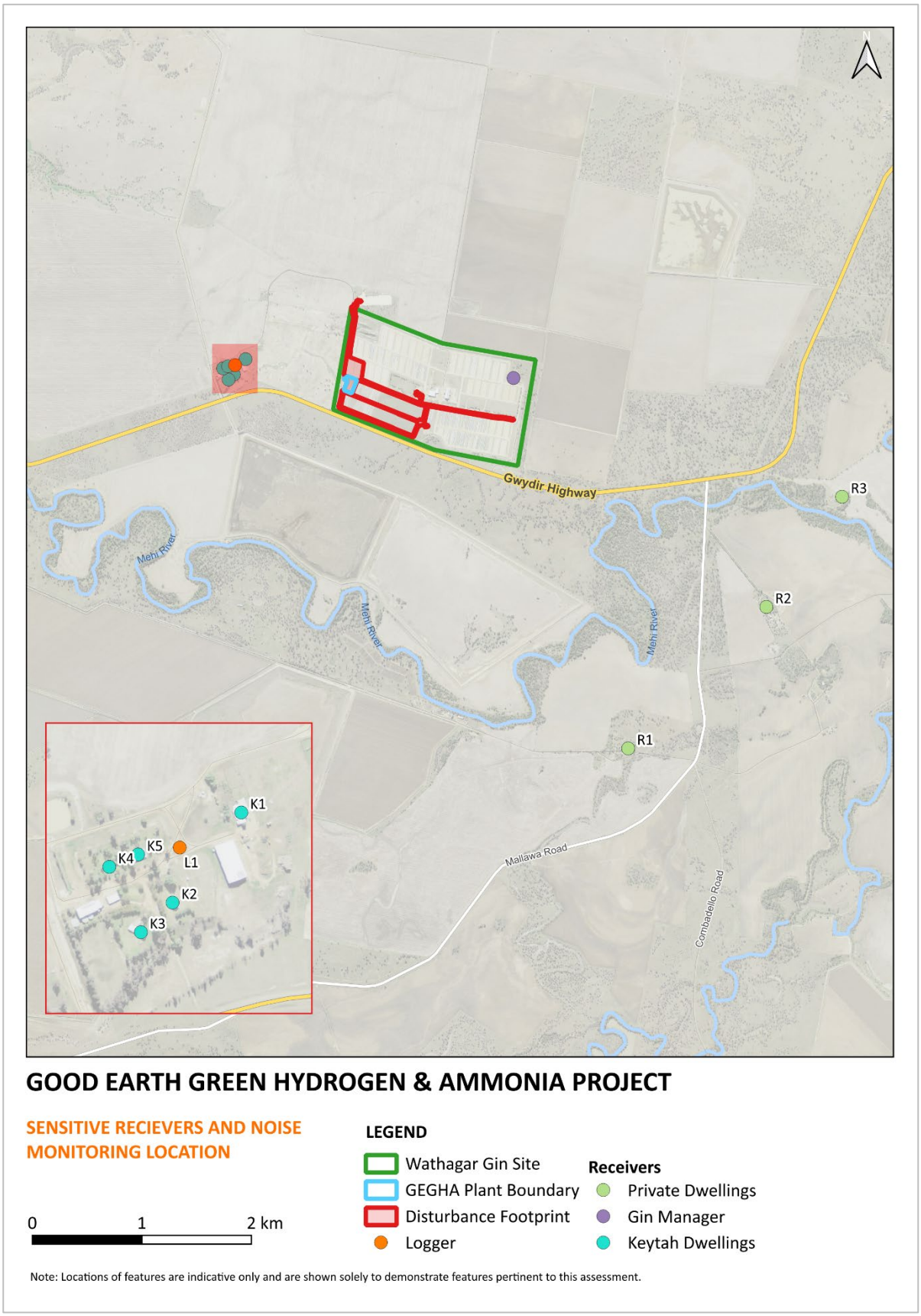
The nearest and potentially most affected sensitive receivers, comprise several isolated rural dwellings located more than 3 kilometres from the site which have been identified for assessment purposes (R1-R3).

All receptors are identified in Table 13.2 and shown in Figure 13.1.

Table 13.2 - Sensitive Receivers

ID	Receptor Type	Distance to GEGHA Plant Boundary (km)	Distance from Disturbance footprint (km)
Gin Manager	Residence	1.4	0.4
Keytah 1 (K1)	Residence	0.9	0.9
Keytah 2 (K2)	Residence	1.0	1.0
Keytah 3 (K3)	Residence	1.1	1.1
Keytah 4 (K4)	Residence	1.1	1.1
Keytah 5 (K5)	Residence	1.1	1.1
R1	Residence	4.1	3.2
R2	Residence	4.3	2.9
R3	Residence	4.6	3.1

Figure 13.1 - GEGHA Project Sensitive Receptors R1-R3



13.5 Construction Noise Assessment

The *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities. Noise generating activities would be conducted during the recommended standard hours so the project-specific NML for construction at all nearby residences would be 45 decibels (dBA) during standard daytime hours with a highly affected noise level of 75dBA.

13.5.1 Construction Noise Modelling

Construction noise emissions from the GEGHA Project have been modelled using SoundPLAN v8.2 and are presented in Appendix B.9.

13.5.2 Construction Plant, Activities and Sound Power levels

Activity Sound Power levels have been assessed based on 'worst case' sound level that could be generated by the nominated activity and equipment across a 15-minute interval (LAeq,15min).

Table 13.3 – Predicted Construction Noise Levels at Sensitive Receivers

Receiver	Predicted Construction LAeq,15min Noise Levels (dBA)			NML	Exceedance (dBA)
	S01	S02	S03		
R1	22	<20	<20	45	-
R2	23	<20	<20	45	-
R3	22	<20	<20	45	-
Gin Manager	51	33	31	-	-
Keytah 1 (K1)	39	37	35	45	-
Keytah 2 (K2)	37	36	34	45	-
Keytah 3 (K3)	37	36	34	45	-
Keytah 4 (K4)	36	35	33	45	-
Keytah 5 (K5)	36	35	33	45	-

The results indicate that construction noise levels are predicted to comply with the noise management level at all nearby sensitive receivers across the duration of the works.

Noting the very low predicted construction noise levels at nearby sensitive receivers, no specific measures to mitigate construction noise emissions are recommended beyond NV-1 nominated in Section 13.10.

13.6 Operational Noise Assessment

The *Noise Policy for Industry* (NPfI) (EPA, 2017) stipulates that project noise trigger levels are determined for the daytime (7am – 6pm), evening (6pm – 10pm) and night time (10pm – 7am) periods, as relevant. The determined trigger levels typically apply at the most affected point on or within the receiver property boundary within 30 metres of a dwelling.

The GEGHA Plant will be required to operate 24 hours per day, 7 days per week whilst associated transport with workforce movement and Heavy Goods Vehicle transport will be undertaken during standard hours of operation and across the weekend.

13.6.1 Operational Noise Sources and Assessment Scenarios

Significant continuous noise sources associated with the operation of the GEGHA Project are as follows:

- Fixed mechanical plant associated with hydrogen and ammonia production
- Trucks transporting product (ammonia and hydrogen) offsite.

Whilst the plant intends to operate 24/7, transportation will only occur during day time operations between 7am and 6pm. For assessment purposes, it is assumed that a single truck will operate along internal roads continuously for that time period (this is a very conservative assumption). Figure 13.2 shows Noise source operations.

Figure 13.2 - Operational Noise Source Locations

13.6.2 Predicted Operational Noise Levels

Following assessment of operational noise modelling, noise levels are predicted to comply with intrusiveness and amenity trigger levels at all nearby residential receivers.

Table 13.4 – Predicted LAeq,15min Operational Noise Levels at Sensitive Receivers

	Predicted Operational LAeq,15min Noise Levels (dBA)				Project Noise Trigger Level (dBA)			Complies?
	Day		Evening /Night		Day	Evening	Night	
Receiver	Calm	NE	Calm	NE				
R1	<20	<20	<20	<20	40	35	35	Yes
R2	<20	<20	<20	<20	40	35	35	Yes
R3	<20	<20	<20	<20	40	35	35	Yes
Gin Manager	31	36	22	28	53	48	43	Yes
Keytah 1 (K1)	28	33	27	33	40	35	35	Yes
Keytah 2 (K2)	27	32	26	32	40	35	35	Yes
Keytah 3 (K3)	26	32	26	31	40	35	35	Yes
Keytah 4 (K4)	26	31	25	31	40	35	35	Yes
Keytah 5 (K5)	26	32	26	31	40	35	35	Yes

No further assessment with regard to sleep disturbance is required as the night time project noise trigger level is less than 40dBA for all nearby residential receivers.

Noting the low predicted operational noise levels at nearby sensitive receivers, no specific measures to mitigate operational noise emissions are recommended beyond those nominated in section 13.10.

Contour plots of the predicted operational noise levels are presented in Section 4 of Appendix B.9.

13.7 Road Noise Assessment

Road noise assessment involves evaluating potential road noise impacts on sensitive receivers due to traffic generated by the GEGHA Project. Sensitive receivers most potentially affected by noise from traffic generated by the Proposal are residences along Gwydir Highway, east of the Site as this will be the predominant direction of travel for traffic generated during construction and operation of the GEGHA Project.

13.7.1 Traffic Generated by the Proposal

During operations, the GEGHA Project will generate approximately 10 light vehicle and 24 heavy vehicle movements per day. For assessment purposes, it is conservatively assumed that all traffic movements generate by the GEGHA Project travel to/from the east of the site. It is also assumed that the generated movements would occur in the daytime period.

Predicted road noise levels at the facades of the most potentially affected receivers along Gwydir Highway comply with the *NSW Road Noise Policy* (RNP) (DECCW, 2011) assessment criteria. Using the traffic data supplied by Project

traffic counts, road noise levels at the most potentially affected sensitive receivers along Gwydir Highway have been predicted for the no-build and build scenarios and are shown in are shown in Table 13.5. A predicted increase of 0.5 dBA as a result of the 'build' scenario is minor.

Noting the compliant predicted build scenario, no specific measures to mitigate road generated noise emissions are recommended.

Table 13.5 - Predicted LAeq, period Road Noise Levels (dBA)

Road	No-build scenario	Build scenario	NSW Road Noise Policy criterion	Difference	Complies?
Gwydir Highway	49.0	49.5	60	0.5	Yes

13.8 Noise - Cumulative Impacts

Noise generated during construction, operation or decommissioning of the GEGHA Plant would not generate any measurable cumulative noise impact to the receiving environment, including at sensitive residential receivers.

13.9 Credible Residual Impacts – Noise

The environmental risk Workshop held in December, 2024 identified the following credible direct residual risk to Noise during construction of the plant:

- Construction exceeds acceptable noise limits outlined in the Interim Construction Noise Guideline 2009.

The environmental risk Workshop held in December, 2024 identified the following credible direct residual risk to Noise during operation of the plant:

- Operational noise exceeds acceptable noise limits described in the Noise Policy for Industry (EPA, 2017).
- Operational noise exceeds acceptable road noise limits described in NSW Road Noise Policy (DECCW, 2011).

13.10 Noise - Mitigation Measures

Mitigation measures in Table 13.6 are proposed to ensure best practice is observed during construction.

Table 13.6 - Proposed Mitigation Measures: Noise and Vibration

Reference	Mitigation Measure	Timing	Responsible
NV01	Construction of the GEGHA Project will be within nominated exceedance criteria consistent with the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009). All machinery to be serviced as per manufacturers recommendations. Consultation will be maintained with residential receptors and ensure that there is a clearly specified complaints process should any noise issue occur.	Construction	HSPT
NV02	Operation of the GEGHA Project will be within Project Noise Trigger Levels as defined by the *Noise Policy for Industry* (EPA, 2017). Consultation will be maintained with residential receptors and ensure that there is a clearly specified complaints process should any noise issue occur.	Operation	HSPT

NV03	Transportation associated with the Project's Operational activities will be compliant with the *NSW Road Noise Policy* (DECCW, 2011). All transportation vehicles to be serviced as per manufacturers recommendations.	Operation	HSPT

14 INFRASTRUCTURE REQUIREMENTS

14.1 Infrastructure Requirements - Overview of this chapter

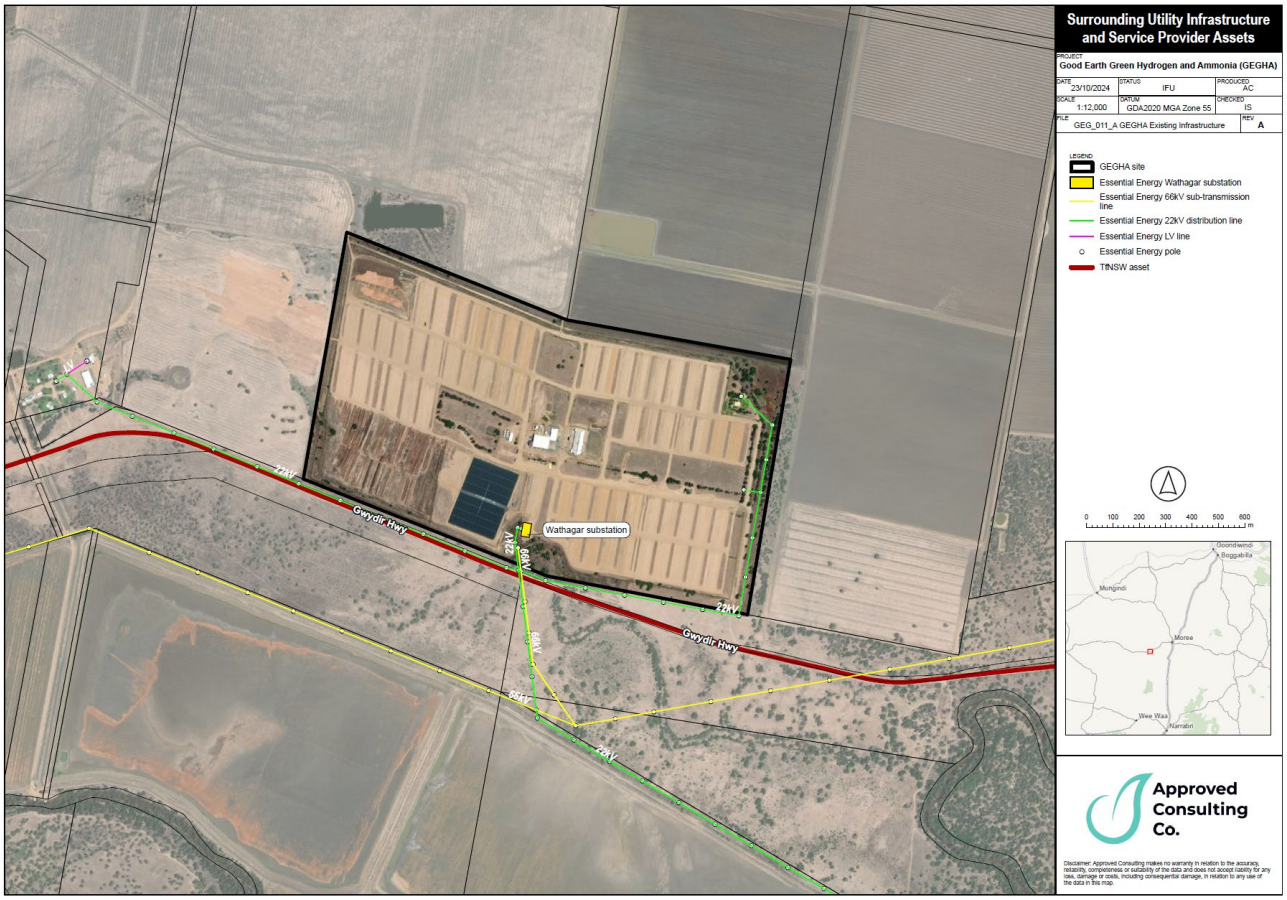
This chapter is presented in the form of an infrastructure delivery plan that includes the management and staging of the Project's construction and operation. Section headings correlate to specific requirements within Key Issues section 12 of the Project SEARs as amended and issued on 12th September 2024 (Appendix A).

14.2 Existing Utility infrastructure and service provider assets

14.2.1 Gwydir Highway – adjacent to site

Impacts on the Gwydir Highway during construction and operation of the GEGHA Project are discussed in chapter 8 and in the Traffic Impact Assessment in Appendix B.2. In addition to the Gwydir Highway, there are additional buried and above ground assets within Crown reserve R31046 adjacent to the Project site. A Before You Dig (BYD) search undertaken on 31st December 2024 identified Telstra assets (buried) and Essential Energy assets (overhead). Whilst further consultation will be undertaken to define where the Telstra assets are located, Figure 14.1 identifies the location of essential energy assets broken down into voltage capacities.

Figure 14.1 - Essential Energy assets in proximity to the GEGHA Project site



14.2.2 Wathagar Substation and Power lines

Power to the Wathagar Gin is fed from the Essential Energy Wathagar substation, which is located on Lot 1 / DP 1315847, east of the Wathagar Solar Farm Stage 1 (refer Figure 14.1). The substation is 5 MVA 66/22 KV sub

connected to the Transgrid Moree 132/66 kV substation via a tee line connect to the Essential Energy Wenna – Moree 66 kV sub-transmission lines.

The Wenna – Moree line has a summer rating of 9.5 MVA however the tee line to the Wathagar substation is only rated 6.5 MVA. The 22 kV side of the Wathagar substation is limited to the transformer rating of 5 MVA however Essential Energy will limit effective capacity to 80% (4 MVA) of this rating.

14.2.3 Intended use and connection to the Wathagar Substation

The intent is to maintain the same physical connection to the Wathagar substation that is used by the Wathagar Solar Farm Stage 1. The existing inverter will be replaced with an EPC CAB1000 with a maximum nameplate capacity of 4.95 MVA. The combined Gin and solar connection have in import limit of 2.15 MVA and an export limit of 3.325 MVA. These will be increased to 4 MVA in both directions. A runback scheme will be implemented to ensure the total export and import from the Wathagar substation does not exceed 4 MVA noting any Gin load will absorb some solar generation above the 4 MVA threshold allowing higher export levels from the inverter. This will require some changes to the existing protection settings on the upstream breakers.

The grid facing EPC1000 inverter will have a DC bus with solar PV panel and a Battery Energy Storage System (BESS) connected. This DC bus will also supply an off grid section of the GEGHA power system with addition PV panels and BESS systems.

This DC 'Tether' allows the grid connected capacity for export or import to the hydrogen and ammonia plant and can be used to charge or discharge stored energy from BESS to and from the grid. The DC tether and off grid system ensure that additional inverters and rectifiers required for the production plant do not cause any additional adverse effects on the Essential Energy network.

14.2.4 Operational Power Connection and Usage

Essential Energy have agreed and signed a connection agreement, facilitating power import and export into the grid.

The general operation philosophy, starting from an empty BESS, is to allow solar to charge the BESS to a minimum value before ramping up the electrolysers. This allows BESS support to manage fast fluctuations in solar output from overhead clouds. If the BESS State of Charge (SOC) begins to fall past a threshold, the electrolysers will shutdown. The ammonia plant will be running 24 hours per day powered by BESS storage or grid imports.

Any excess BESS storage not required to run the ammonia plant night will be exported to the grid during evening peaks. On cloudy days with low solar generation, energy can be imported to run the ammonia plant and charge the BESS if required to maintain continuous ammonia plant operations.

14.2.5 Capacity of the Existing site to contain the GEGHA Project

There is sufficient capacity for the site to contain the Project subject to the upgrade to the Wathagar gin entry (or alternative access), incorporated under DA 2025/6 and coordinated with Transport for NSW via a Works Authorisation Deed agreement. The Project proposes to utilise the existing Wathagar Solar Farm Stage 1 connection to the Wathagar substation.

14.2.6 GEGHA Drinking Water arrangements

It is proposed that the Control room will initially be supplied by imported tank water until a standard connection can be provided. Standard connection would supply a water connection the control room only.

14.2.7 GEGHA Wastewater arrangements

Construction wastewater arrangement

During construction, temporary ablutions for the construction workforce will be trailered on to site. Portaloos and portacabins will be hired in and utilised on site for the duration of construction and commissioning. The units will be serviced/ emptied by the hire company.

Operation wastewater arrangement

The GEGHA Plant's control room will have facilities for up to four people to occupy and operate the plant's systems and controls. This will include toilets, shower, kitchen and boot wash station.

The associated wastewater system comprises a septic tank that will provide primary wastewater treatment, separating out suspended material via a primary settling chamber. This level of treatment is suitable for disposal via absorption trenches.

The septic tank will be placed a minimum of 1.5m from the control room with a submersible pump providing a means of emptying the treated water into the absorption trenches.

Absorption trench would be up to 25m in length and 600mm wide x 600mm deep to dispose of a peak of 300l of wastewater per day.

Detail on system sizing, design and location is provided in the On-site Wastewater Management Plan (Appendix B.11).

14.3 Assessment of impact to existing infrastructure and operations

The utilisation of the existing power connection utilises available capacity within the Wathagar substation. There are no other users presently who draw power from the substation other than the Wathagar Gin and its ancillary operations. No further customer connections are anticipated.

The proximity of the Wathagar Gin to the GEGHA plant has been assessed in the Preliminary Hazard Assessment (Appendix B.8).

Air Quality and Noise and Vibration have been assessed in chapter 9 and 13 respectively. It is not envisaged that there will be any residual impact to visual amenity (chapter 15).

Broader impact of increase traffic during construction and operation has been assessed in chapter 8.

Adjacent land use and production on the Keytah property will benefit from the hydrogen and ammonia produced by the plant.

As part of the engagement with Essential Energy, it was identified that Essential Energy did not have a formalised easement to access the Wathagar substation. A new access easement for Essential Energy was gazetted on Lot 1 DP 1315847 on 7th May 2025.

15 VISUAL AMENITY

A specialist technical Visual Impact Assessment has been prepared by Green Bean Design and is provided in Appendix B.6.

15.1 Visual Amenity - Introduction

This chapter provides assessment of impact that the construction and operation of GEGHA Project is likely to have on visual amenity.

This chapter and its appendix collectively address the requirements of Key issue 13 of the Project SEARs (Appendix A).

15.1.1 Visual Amenity: Form of Assessment

Visual amenity is inherently subjective with different receptors holding different opinions of what is visually damaging, enhancing or neutral.

The GEGHA Project's visual impact assessment has incorporated both qualitative and quantitative analysis and references the Guidelines for Landscape and Visual Impact Assessment, Third Edition (Landscape Institute and Institute of Environmental Management and Assessment (IEMA 2013) (Guidelines) as the acceptable reference in preparing a robust methodology. The guidelines notes that professional judgement is a very important part of visual impact assessment.

The visual impact assessment methodology involved the following activities:

- desktop study addressing visual character and identification of view locations within the surrounding area
- site photograph review
- in-field assessment and determination of the GEGHA Project visual impact, and
- identification of recommended mitigation measures for the GEGHA Project.

Visual impact has been determined by combining the assessment and determination of surrounding receiver sensitivity and the magnitude of the GEGHA Project works when compared to the existing visual environment.

Assessment and determination of visual impact has been undertaken by a visual impact specialist in accordance with Transport for NSW Environmental impact assessment practice note EIA-N04 *Guideline for landscape character and visual impact assessment 2023.*

The UK Guideline notes that professional judgement is applied to several other environmental topics (e.g., ecology and cultural heritage) and that judgements made should be:

- Reasonable and based on clear and transparent methods
- Based on training and experience and
- Made, in general, by suitably qualified and experienced landscape professionals.

15.1.2 Visual Impact Study Area

The Project Assessment Area and broader surrounds formed the basis of the study area. Key view location assessment involved analysis of closest adjacent dwellings (all at least approximately 4.1km from the plant) and assessment of the view from the Gwydir highway.

15.2 Visual Impact - Existing Environment

15.2.1 Landscape Character and Value

The landscape character within and surrounding the GEGHA Project site is a relatively large scale and simple modified agricultural landscape. This landscape supports a number of farming practices including, but not limited to cotton production, cropping/arable and pastoral areas.

Some complexity in landscape pattern is provided by numerous rivers, creeks and channels that extend across the landscape including the Mehi River to the south of the GEGHA Project site and Tarran Creek to the north.

Landcover is largely simple and predictable where cleared across modified agricultural landscape, with a limited number of scattered remnant trees and plantings noted within the GEGHA Project site and broader landscape. This contrasts with a greater extent of native vegetation and tree cover alongside river and creek corridors.

There are very few dwellings in the area with dispersed farms and homesteads set back from the Gwydir Highway and nearby Mallawa Road. There are no residences with a direct view to the GEGHA plant site. The few surrounding residences are obscured by natural terrain rise and fall and the vegetation within the Gwydir Highway and Mehi River corridors.

Visible structures in the area are agriculturally related such as Gins, storage and maintenance sheds which do not present as overly dominant elements within the landscape.

Public access beyond the Gwydir Highway and Mallawa Road is largely restricted. The Gwydir Highway is a State Road managed by Transport for New South Wales (TfNSW) with a general alignment parallel to the Gin levee south of the GEGHA Project site. The highway has a posted speed limit of 110km/h with no designated stopping points or rest areas south of the Gin. There is sparse tree cover alongside the highway corridor where proximate to the GEGHA Project site and Gin; however, the existing levee (around 1.5-2m in height) provides some degree of screening of views to the north of the highway, including the Wathagar Solar Farm Stage 1 infrastructure.

15.3 Visual Absorption Capability and Landscape Impacts

Visual Absorption Capability (VAC) is a classification system used to describe the relative ability of the landscape to accept modifications and alterations without the loss of character or deterioration of visual amenity. In essence the VAC indicates the ability of a landscape setting to absorb changes associated with the GEGHA Project and is determined primarily by the degree of visual penetration (view without obstruction) and the complexity of the landscape (scale, form and line).

Landscapes with a low visual penetration and have a mix of scale will have higher visual absorption capability values. The VAC of the landscape surrounding the GEGHA Project generally exhibits a moderate to high VAC due of local features such as the levee, agricultural structures and occasional tree cover within and surrounding the GEGHA Project site.

Overall landscape impact would be minimised by surrounding landscape characteristics which contain are defined with consistent patterns and colours. Physical change to the landscape would tend to be absorbed to a high degree through generally broad and simple landscape characteristics within and beyond the GEGHA Project site. Whilst some change to skyline views from the Gwydir Highway would occur, the overall level of potential screening and restricted view opportunities would limit the extent of landscape impacts.

15.4 Key views and Visual effects

In accordance with the TfNSW practice note, the significance of visual impact that would result from the construction and operation of a project is a composite of the sensitivity of the view and magnitude of the project in that view. The combination of sensitivity and magnitude provide the rating of visual impact for a viewpoint. Table 15.1 sets out the TfNSW practice note relative visual impact grading values which combine sensitivity and magnitude.

Table 15.1 - GEGHA Project visual impact grading matrix

Sensitivity	Magnitude				
		High	**Moderate**	**Low**	**Negligible**
	High	High impact	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

15.5 Visual Impact Assessment – Construction and Operation

15.5.1 Visual Impact Assessment Baseline and Photo points

To establish a visual baseline, site assessment was undertaken in the week of the 4th October, 2023. A drone was flown across site and photo points were established across the Project footprint. The Gwydir highway was driven and photographed to enable the preparation of photomontages that established the existing visual aspect and baseline for visual assessment (refer figures 15.1, 15.2 and 15.3).

Figure 15.1 – GEGHA Project Key view and photo locations.

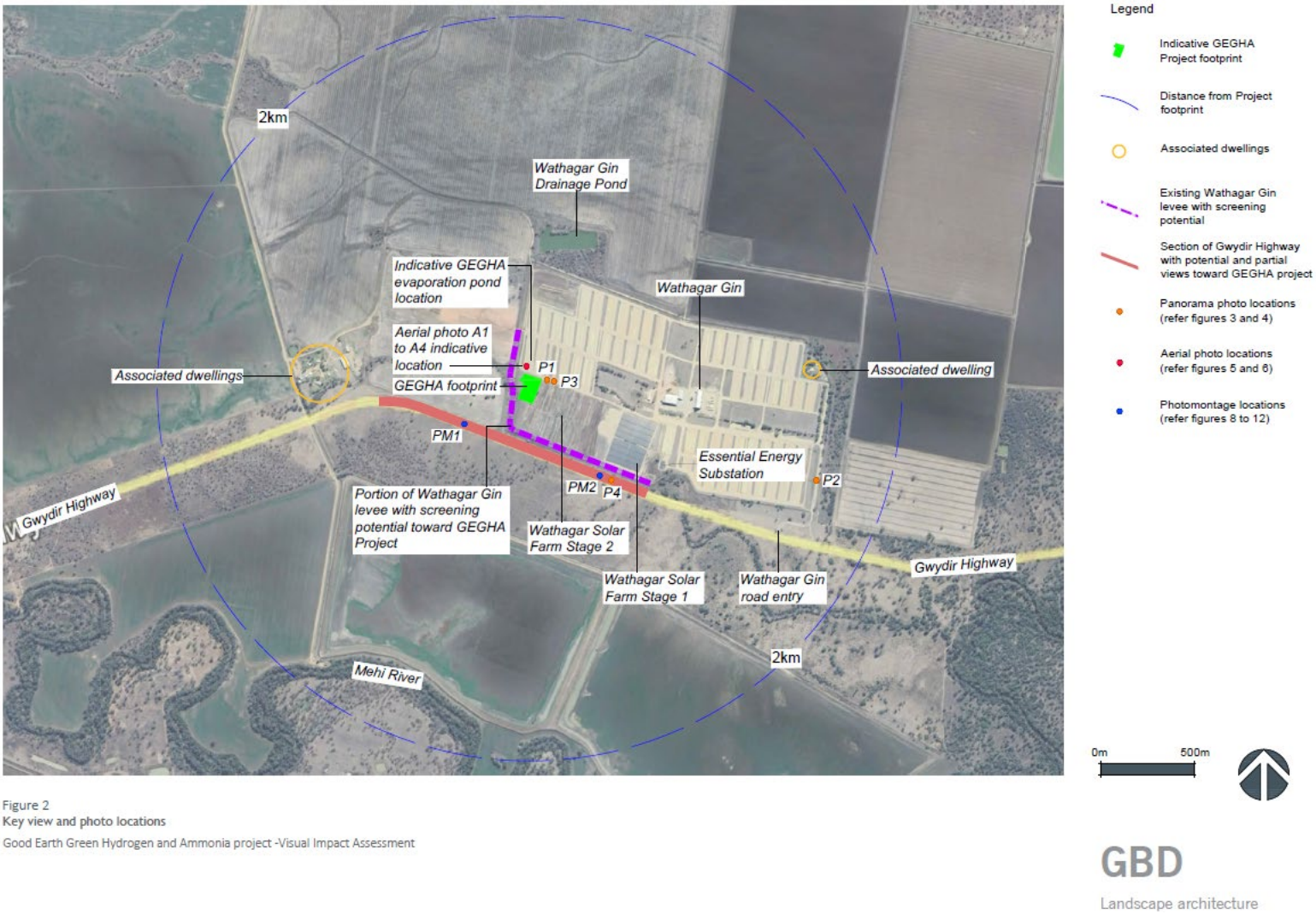


Figure 2
Key view and photo locations
Good Earth Green Hydrogen and Ammonia project -Visual Impact Assessment

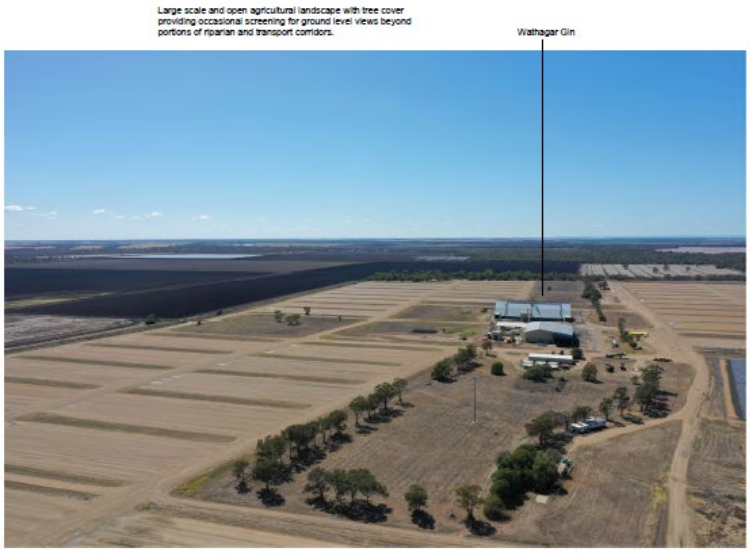
Source Appendix B.6

Figure 15.2 - GEGHA Project Photo montage from panorama photo location 3 and 4

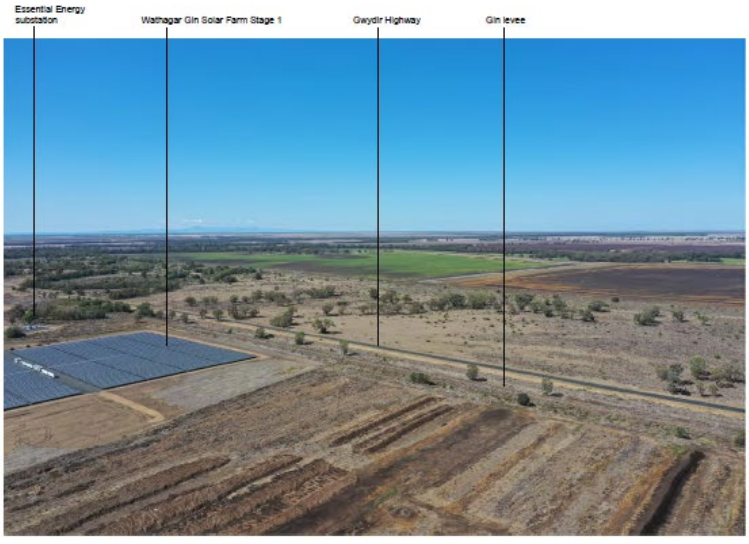
Photo Location P3- View north west to east from Wathagar Gin adjoining GEGHA Project site

Photo Location P4- View west to north east from the Gwydir Highway corridor

Figure 15.3 - GEGHA Project aerial photo locations A3 and A4



Aerial photo location A3- Existing view north west to north east from above the GEGHA Project site



Aerial photo location A4- Existing view north east to south from above the GEGHA Project site

Further site orientation, photomontages and aerial photos are provided in Appendix B.6.

15.5.2 Visual Construction Impact

There are potential visual impacts that could occur during both pre-construction and construction phases of the GEGHA Project. The GEGHA Project construction phase is likely to occur over a period of around 8 months. The key pre-construction and construction activities that will be visible from the Gwydir Highway include:

- ongoing detailed site assessment including sub surface geotechnical investigations
- various civil works to upgrade access point (subject to separate Development Application)

- temporary construction compound buildings and facilities
- temporary construction facilities, including portable structures and laydown areas
- various temporary construction and directional signage and
- excavation and earthworks.

Most of the pre-construction and construction activities, some of which would result in physical changes to the landscape are generally temporary in nature and for the most part restricted to various discrete areas within or beyond the immediate GEGHA Project site. Most pre-construction and construction activities would not result in an unacceptable level of visual impact due to their limited duration and temporary nature.

15.5.3 Visual Operation Impact

The proposed hours of operation would require lighting installation for night time work. Lighting is proposed to include mobile lighting units powered from on-site power generation. Lighting would be installed to address the Australian Standard AS4282: 1997 – Control of Obtrusive Effects of Outdoor Lighting. Whilst night lighting may be visible through 'glow' rather than direct illumination, mitigation measures including shielding light illumination and appropriate directional light control (responding to reported issues) would assist in minimising potential impacts.

Otherwise operational visual impacts reflect closely with the magnitude of the view of the plant directly from dwellings and from the adjacent Gwydir Highway and the extent to which the operating plant aligns with the existing visual environment.

15.5.4 Visual Effect Grading – Dwellings

The Visual Impact Assessment prepared a schedule of representative viewpoints which are within a reasonable distance of the GEGHA Project and within the viewshed. Following selection, the receiver viewpoints have been rated as to their sensitivity to change by the GEGHA Project.

The nearest non-associated dwelling is located around 4.1km from the plant boundary to the south east of the GEGHA Project site and accessed from Mallawa Road. This dwelling has no line of sight toward the existing Gin and would have no view toward the GEGHA Project site due to distance and tree cover. None of the off-farm dwellings would have a view toward the GEGHA Project. Table 13.2 summarises the visual effect grading of all off-farm dwellings.

Table 15.2 - Visual effect grading – Dwellings (various)

Aspect	Grading
Sensitivity of visual receiver	High
Magnitude of visual effects	Negligible
Visual Effect	Negligible (through complete screening)

15.5.5 Visual Effect Grading – Gwydir Highway

The Gwydir Highway is located around 200m to the south of the GEGHA Project site and orientated in a general east to west alignment. Indirect views toward some components of the GEGHA Project from the highway would be partially screened by the Gin levee and occasional trees alongside the highway corridor and levee structure. The posted speed limit of 110km/h would result in very short duration views from vehicles toward the GEGHA Project site of less than one minute. Given the nature of views, indirect, very short term and partially obscured, together with the low sensitivity of people travelling along the highway, the GEGHA Project will not have a significant visual impact on this view location.

Table 15.3 - Visual effect grading – The Gwydir Highway

Aspect	Grading
Sensitivity of visual receiver	High
Magnitude of visual effects	Negligible
Visual Effect	Negligible (through complete screening)

15.5.6 Landscaping not recommended

Following completion of Visual Effect Grading, the Visual Impact Assessment recommends that landscaping, including detailed landscape plans requested by the Project SEARs is not required for the GEGHA Project due to:

- Absence of non-associated dwellings with a direct line of sight to the GEGHA Plant; and
- Other locations, particularly the Gwydir Highway would experience a low to negligible visual impact from the Project's construction and operation.

It is therefore proposed to rely on the existing partial obscurity of site provided by the flood prevention levee to provide a partial screening of site. In the absence of rationale for any further visual screening, no further landscaping is proposed as part of the GEGHA Project.

15.6 Visual - Cumulative Impacts

A cumulative visual impact could result from the GEGHA Project being constructed in conjunction with other existing or proposed development which could be either associated or separate to it. Separate development could occur or be located within a local context where visibility is dependent on a journey between locations.

The GEGHA Project is considered to have a low potential to increase the significance of cumulative visual impact. This is largely due to partial visual screening surrounding the GEGHA Project site from the Gwydir Highway corridor, as well as the location of other development relative to existing infrastructure within the immediate viewshed.

15.7 Credible Residual Impacts - Visual

Distinguishable characteristics of the predominant agricultural character within and surrounding the GEGHA Project are unlikely to be significantly altered by the GEGHA Project. Existing landscape character within and surrounding the GEGHA Project site will have a relatively high capability to absorb change. The GEGHA Project would not result in the introduction of prominent elements to the surrounding landscape character.

The GEGHA Project will not form a significant visual element within the local viewshed and will not be visible from non-associated dwellings, local road corridors and sections of the Gwydir Highway corridor.

The GEGHA Project will be screened from most key view locations, including dwellings and partially from vehicles traveling along the Gwydir Highway. Where potentially visible the GEGHA Project is unlikely to form a significant visual element, with the GEGHA Project resulting in a low to negligible visual impact.

As a result, it can be concluded that there are no credible residual visual impacts. No further mitigation of visual impact is proposed beyond those provided in Table 15.4.

15.8 Visual - Mitigation Measures

Mitigation measures in Table 15.4 are proposed to ensure best practice is observed during construction.

Table 15.4 - Proposed Mitigation Measures: Visual Amenity

Reference	Mitigation Measure	Timing	Responsibility
VA01	Detailed design will consider further refinement if achievable to reduce the bulk and height of GEGHA Project structures.	Design	HSPT
VA02	Detailed design will include a review of materials and colour finishes for selected components including the use of non-reflective finishes to structures where possible.	Design	HSPT
VA03	Construction of the GEGHA Project will avoid temporary light spill beyond the construction site where temporary lighting is required.	Construction	HSPT
VA04	Progressive rehabilitation will be undertaken to disturbed areas as soon as is practical to limit the duration of disturbance.	Construction	HSPT
VA05	The operational plant will undertake an informed program of maintenance and repair of constructed elements, replacing any damaged or missing constructed elements.	Operation	HSPT

16 WASTE

16.1 Waste - Introduction

This chapter identifies and quantifies the waste that is likely to be generated during construction and operation of the GEGHA Project. This chapter adopts the principles of the circular economy where practical, characterises how waste minimisation principles have been adopted into design and provides the framework within which the Project will effectively avoid, reuse, recycle, recover, treat and dispose of generated waste.

16.2 Waste: Form of Assessment

The principles of the circular economy have been analysed and applied where possible in Project design. Estimated waste generation has been calculated with reference to Hiringa's operational hydrogen refuelling network in New Zealand. This has provided a practical insight to gain an understanding of the size, scale and capacity of equipment which has in turn informed the volume and categorisation of expected waste streams.

Where information has been partial or lacking, conservative assumptions have been made. Wastes have been classified consistent with the EPA Waste Classification Guidelines, EPA 2014 (**Waste Guidelines**).

Waste generated during construction has been considered separately to the operational phase as the expected volume and classifications will reduce following commissioning of the Project.

16.3 Waste Stream Identification

An assessment of likely waste materials and volumes for the Project has been undertaken and waste has been classified in accordance with the classes of waste defined in clause 49 of Schedule 1 of the Protection of the Environment Operations Act 1997 (NSW) and listed in Part 1 of the Waste Guidelines. Waste classification is summarised in Table 16.1.

Table 16.1 - Waste Classifications

Waste Classification	Description
Special Waste	Clinical Waste, Asbestos, Waste tyres or Anything classified as a special waste under an EPA gazettal notice.
Liquid Waste	Waste that is not a special waste but: • Has an angle of repose of less than 5 degrees above horizontal; • Becomes free-flowing at or below 60 degree Celsius or when it is transported; • Is generally not capable of being picked up by a spade or shovel; • Is classified as liquid waste under an EPA gazettal notice.
Hazardous Waste	Waste that is neither Special or Liquid but is pre-classified by the EPA as being 'hazardous waste': • containers, having previously contained a substance of Class 1, 3, 4, 5 or 8 within the meaning of the Transport of Dangerous Goods Code, or a substance to which Division 6.1 of the Transport of Dangerous Goods Code applies, from which residues have not been removed by washing or vacuuming; • coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% (by weight) of coal tar or coal tar pitch waste;

Waste Classification	Description
	• lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes); • lead paint waste arising otherwise than from residential premises or educational or child care institutions; • any mixture of the wastes referred to above.
General Solid Waste (putrescible)	Waste (other than Special, Liquid, Hazardous or Restricted Solid Waste) but is pre-classified as: • household waste that contains putrescible organics; • waste from litter bins collected by or on behalf of local councils; • manure and night soil; • disposable nappies, incontinence pads or sanitary napkins; • food waste; • animal waste; • grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids; • any mixture of the wastes referred to above.
General Solid Waste (non-putrescible)	Waste that is not Special, Liquid, Hazardous, Restricted Solid Waste or General solid waste (putrescible) but is pre-classified as: • glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal; • paper or cardboard; • household waste from municipal clean-up that does not contain food waste; • waste collected by, or on behalf of, local councils from street sweepings; • grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices and/or stormwater management systems, that has been dewatered so that they do not contain free liquids; • grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids; • garden waste; • wood waste; • virgin excavated natural material; • building and demolition waste; • asphalt waste (including asphalt resulting from road construction and waterproofing works).

16.4 Application of the Waste Hierarchy

The waste hierarchy put in place under the *Waste Avoidance and Resource Recovery Act* 2001 (NSW) will be applied in consideration of waste management on the Project. Table 16.2 describes how the waste management hierarchy will be adopted into each Project phase.

Table 16.2 - Waste management hierarchy

Project Phase	Adoption of the Waste Management Hierarchy
Detailed Design and Planning	• Ensure design incorporates the intent of the NSW Waste and Sustainable Materials Strategy (NSW DPIE, 2021) • Project design will be internally validated to ensure that the Project is fit for purpose and appropriate to the nature and scale of its intended use. • Design will reduce waste generation to a level that is as low as is reasonably practicable. • Project planning incorporates the principles of the *Waste Avoidance and Resource Recovery Act 2001* • Project EIS outlines a framework for the effective reduction and management of project waste.
Procurement and Award of construction contract(s)	• Procurement of plant and equipment will be considerate of the NSW Energy Efficiency Policy and Energy Efficiency Action Plan. • Incorporation of waste management plan into contract consistent with applicable items within *Construction and demolition waste. A management toolkit NSW EPA 2020.*
Post-award, pre-mobilisation	• Construction contractor's Construction Environmental Management Plan (CEMP) must include a Waste Management Plan that is reflective the principles of reduce, reuse, recycle and recovery of waste.
Construction	• Construction contractor implements the CEMP and Waste Management Plan effectively and remains compliant with the commitments and conditions contained within those documents.
Operation	• An Operational Waste Management Plan is prepared as part of the Operational Environmental Management Plan. • Compliance with the Operational Waste Management Plan and the Project's Environmental Protection Licence.
Decommissioning	• Waste management is key to the decommissioning of the Project with reuse, recycling and recovery at the centre of the decommissioning waste management plan. • A remediation plan would be required to articulate how the evaporation pond would be effectively decommissioned to address regulatory expectation.

16.5 Waste Impact Assessment

16.5.1 Waste Generation – Construction

Whilst the Project will be designed and constructed having regard to the waste hierarchy, residual waste generation is inevitable. Waste generation may include:

- generation of vegetation and green waste from clearing subject land requiring treatment or disposal;
- generation of spoil from site establishment and levelling activities which would be largely reused on site;
- generation of packaging wastes requiring reuse or disposal;
- generation of general building and construction wastes requiring reuse or disposal;
- generation of sewage by construction personnel.

An estimate of construction waste generation is listed in Table 16.3 below.

Table 16.3 - Annual construction waste stream estimate

Waste Stream	Project Quantity	Assumption/ Rationale
Sewage	0.52ML/ Year	Assumes 50 litres of liquid waste per person, per day; an average of 40 people on site for 260 working days.
Packaging (scrap materials, timber, cardboard)	70 tonnes	Estimate quantity based on expected packaging in relation to bill of quantities.
Other recoverable recyclables (cans, cartridges, wood, metal offcuts, etc)	20 tonnes	Estimate quantity based on expected recovery rate.
Excess spoil	Nil	Earthworks are proposed to be neutral in terms of spoil creation and use.
Other general waste to landfill (general litter, office waste, builders waste, etc)	10.4 tonnes	Allowance of 1kg/person/day for the duration of construction and general construction waste allowance.

16.5.2 Waste Generation – Operation

The operation of the Project would result in the generation of some waste that is captured and accumulated in equipment that would need to be removed from the site when reaching capacity. Other chemical wastes would also be produced in small quantities like the regeneration of the demineralised water plant and gas turbine water wash. There would also be sporadically produced chemical wastes from substances such as scale and scrapings from maintenance activities.

Some liquid waste from the operation of the Project, such as compressor wash water, would be managed as trade waste after going through the necessary treatment process on site. Trade waste volumes and quantities created by the Project would be influenced by the chosen technology, which is subject to further detailed design.

Following equipment selection during detailed design, the waste quality and composition will be defined, which will then be reviewed with local registered waste handling companies to define a suitable trade waste pre-treatment and disposal methodology. This methodology will be adopted during operation.

An estimate of operation waste generation is listed in Table 16.4 below.

Table 16.4 - Annual operations waste stream estimate

Waste Stream	Project Quantity	Assumption/ Rationale
Sewage (treated and dissipated via on site irrigation system)	0.073ML/ Year	Assumes 50 litres per person per day; assume 4 people on site for 365 working days.
Filter grit	1 tonne/ Year	High level estimate based on treatment system.
Packaging (scrap materials, timber, cardboard)	1 tonne/ Year	Estimate quantity based on expected packaging in relation to bill of quantities.
Other recoverable recyclables	200kg/ Year	General estimate.
Mechanical and electrical (power) equipment	2 tonnes / Year	Estimate based on general wear and tear.
Electronics	200kg/ year	Estimate allowance for replacement equipment

Waste Stream	Project Quantity	Assumption/ Rationale
Other general waste to landfill (general litter, office waste, builders waste, rags, greases, etc)	1,100kg/ Year	Office Waste: 200kg per person, per year. Food Waste 0.2kg per person per day.

16.6 Produced Water

Produced water from the electrolysis and cooling process will be pumped to the evaporation pond where the salts and minerals within the source water will be concentrated and would accumulate over time.

The typical water quality in the drainage dam includes a total dissolved solids of 167 mg/L and total suspended solids level of 24 mg/L. Based on the calculations provided through the water purification calculations, the wastewater stream will have a content of 557 mg/L of dissolved solids and 80 mg/L of suspended solids. Based on the predicted wastewater stream daily volume of 41.7 kL, the annual wastewater stream would contain up to 2,712 kg of dissolved solids and 390 kg of suspended solids. This would be a mix of ions, soil particles, anions, cations and a range of elements removed from the water during the purification process for Hydrogen production.

Solids will accumulate over time. Based on a 25-year design life of the GEGHA Plant, the pond will receive approximately 67.8 tonnes of dissolved solids and 9.7 tonnes of suspended solids.

Should the volume of solids accumulate to such a mass that they require to be removed to enable continued function of the evaporation pond, it is proposed that they would be tested and removed to an appropriate local or regional waste facility during a dry period when the evaporation pond is accessible.

16.7 Produced Water Residues

Water sampling of the Drainage Dam and Wathagar bore in September, 2024 confirmed presence of the Anions, Cations, Dissolved metals listed in Table 16.5.

Table 16.5 - Water sampling – Solids and Dissolved Solids

Solid/ Dissolved Solid	Drainage Dam (mg/l)	Wathagar Bore (mg/l)
Silicon (Sio2)	8.2	55.4
Calcium	13	8
Magnesium	6	6
Sodium	18	174
Potassium	7	<1
Barium	0.055	0.028
Manganese	0.026	<0.001
Strontium	0.194	0.214
Boron	<0.05	<0.05
Iron	0.57	<0.05

It is intended to use existing clay on site to form the floor and banks of the evaporation pond. The pond floor will be compacted to a minimum of 98% of dry density. Once the required compaction is achieved, the potential for percolation of the wastewater through the floor of the evaporation pond will be within acceptable threshold levels (0.1mm/day per m^2).

It is not considered that percolation of produced water represents a risk or threat to groundwater due to low expected loss rate.

The elements listed in table 16.5 will accumulate in the evaporation pond over the life of the GEGHA Plant's operation. The volume of accumulated solids has been taken into account in designing the pond's capacity and it is proposed to remediated the evaporation pond during site decommissioning.

16.8 Hazardous Waste

Certain waste products may be used or generated by the plant that would be defined as hazardous under the waste classification guideline and would require management.

16.8.1 Hazardous chemicals

Hazardous chemicals used or generated on site that may produce small volumes of waste include:

- Hydrogen
- Anhydrous Ammonia
- Nitrogen (N_2)
- Fire suppression foam
- Anticalant (S1, low silica) for water treatment
- Potash Hydrocide or Lye (KOH) for hydrogen generation
- Vanadium Oxide (V2O5) for hydrogen generation
- Herbicides containing glycophosphate used for weed control
- Hydraulic oil and grease

16.9 Waste – Cumulative Impacts

The volumes of waste expected to be generated from construction and operation of the Project would not place uncertainty or undue pressure on the operating capacity of the local/regional waste facilities.

It is important to maintain good housekeeping and waste management on-site during construction and operation of the Project.

The residual volumes of waste going to landfill or licenced waste facilities would be insignificant, provided appropriate adoption of the waste hierarchy is undertaken.

Appropriate remediation will be undertaken to ensure that the accumulation of solids within the evaporation pond is disposed of in accordance with legislative requirements and best practice guidelines.

It is not expected that Project waste generation will create any further risk or threat to the broader environment.

16.10 Credible Residual Impacts: Waste

Impact to amenity caused by inappropriate storage or handling of waste during construction and operation

16.11 Waste – Mitigation Measures

Mitigation measures described in Table 16.6 are proposed to be implemented during the GEGHA Plant's construction and operation. The most effective framework for implementation of these mitigation measures is via a Construction Environmental Management Plan and Operational Environmental Management Plan as appropriate.

Table 16.6 - Proposed Mitigation Measures: Waste Management

Reference	Mitigation Measure	Project Phase	Responsibility
WM01	A Construction Waste Management Plan must be prepared that contains the following as a minimum:	Construction	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
	• *Consideration of the waste hierarchy, providing transparency on how it will be incorporated into project delivery.* • *Definition of waste streams and estimated quantities of produced material in each waste category.* • *Inclusion of a site plan that includes detail on waste segregation and storage location on site.* • *Description of how waste generation and disposal will be managed on site.* • *Provision for concrete washdown and appropriate removal and disposal of concrete waste and any other produced wastes.*		
WM02	An Operational Waste Management Plan must be prepared prior to the commencement of operation that contains the following as a minimum: • *Consideration of the waste hierarchy, providing transparency on how it will be incorporated into operation of the GEGHA Plant.* • *Definition of waste streams and estimates quantities of produced material in each waste category.* • *Inclusion of a site plan that includes detail on waste segregation and storage location on site.* • *Description of how waste generation and disposal will be managed on site.*	Operation	HSPT
WM03	Ensure recurring focus on housekeeping during pre-start meetings and incorporation of housekeeping, waste segregation and appropriate storage whilst on into site inspection regime.	Construction Operation Decommissioning	HSPT
WM04	Remediate the site in accordance with the GEGHA Rehabilitation Management Plan.	Construction Decommissioning	HSPT

17 CULTURAL HERITAGE

The following specialist reports have been prepared to inform this chapter:

- Good Earth Green Hydrogen and Ammonia Project Aboriginal Cultural Heritage Assessment, Landskape September 2023. (Appendix B.7)
- Historical Cultural Heritage Report: Good Earth Green Hydrogen and Ammonia Project, Landskape March 2025. (Appendix B.10)

17.1 Cultural Heritage - Introduction

This chapter presents an overview of aboriginal and non aboriginal cultural heritage in the region and a summary of findings from the Aboriginal Cultural Heritage Assessment Report (ACHAR) and Historic Cultural Heritage Assessment.

17.2 Aboriginal Cultural Heritage Assessment Objectives

The specific objectives of the cultural heritage assessment were to:

- Consult the local Aboriginal community in accordance with the Aboriginal cultural heritage community consultation requirements for proponents [DECCW 2010a]), including in relation to cultural values of the Project Assessment Area.
- Conduct a desktop assessment to delineate areas of known and predicted cultural heritage potential within the Project Assessment Area.
- Undertake an archaeological survey of known and predicted Aboriginal cultural heritage potential areas identified in the desktop assessment, with representatives of the local Aboriginal community.
- Record any Aboriginal cultural heritage sites within the Project Assessment Area and assess their significance.
- Identify the nature and extent of any potential impacts of the Project on Aboriginal cultural heritage.

Devise options in consultation with the community to avoid or mitigate potential impacts of the development on Aboriginal cultural heritage sites and items.

17.3 Consultation and Engagement with Aboriginal Stakeholders

Consultation with Aboriginal people and stakeholder organisations has been undertaken and documented in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010).

This section describes the involvement by the registered Aboriginal stakeholders and demonstrates that the input of the Aboriginal community has been considered when determining and assessing impacts, developing management measures, and making final recommendations relevant to Aboriginal cultural heritage within the Project Assessment Area.

17.3.1 Aboriginal Community Participation

The registered Aboriginal stakeholders were consulted throughout the preparation of this assessment, including:

- reviewing and commenting on the Proposed Methodology;
- through participation in the field survey;
- during the review period for the draft ACHA; and,
- being encouraged to provide feedback and input throughout the assessment process.

17.3.2 Identification of GEGHA Project Aboriginal Stakeholders

In accordance with Section 4.1.2 of the Consultation Guidelines (DECCW 2010), notifications regarding the Project were sent to statutory agencies on 28 July 2023. Responses were received from the following organisations:

- Heritage NSW (8 August 2023);
- Office of the Registrar, Aboriginal Land Rights Act 1983 (1 August 2023);
- Native Title Tribunal (1 August 2023);
- Moree Plains Shire Council (2 August 2023); and
- Native Title Services Corporation Limited (18 August 2023).

A full record of all correspondence received from and sent to the Aboriginal community and the Project Aboriginal Stakeholders is presented in Appendices 2, 3 and 4 of the Aboriginal Cultural Heritage Assessment Report.

In accordance with Sections 4.1 and 4.2 of the Consultation Guidelines (DECCW 2010), all individuals and organisations identified through the above correspondence were contacted in writing on 15 August 2023 and were invited to register an interest in the Project.

An advertisement inviting the registration of Aboriginal persons or groups who hold cultural knowledge relevant to, or who have a right or interest in, determining the cultural heritage significance of Aboriginal object(s) and/or place(s) in the Project Assessment Area was published in the Moree Champion newspaper on 17 August 2023.

Seven organisations or individuals nominated as registered Aboriginal Stakeholders for the Project. A copy of the list of registered Aboriginal stakeholders for the Project was provided to Heritage NSW and Moree LALC, in accordance with Section 4.1.6 of the Consultation Guidelines (DECCW 2010).

17.3.3 Presentation of Project Information

Information regarding the Project was provided in writing to the registered Aboriginal stakeholders on 4 September 2023. The correspondence included a copy of the Proposed Methodology provided for review and comment and an invitation to attend the field survey for the Project.

Input was sought in regard to:

- the nature of the Proposed Methodology.
- any Aboriginal objects or places of cultural value within the Project Assessment Area, or issues of cultural significance.
- any restrictions or protocols considered necessary in relation to any information of sensitivity that may be provided.
- any other factors considered to be relevant to the heritage assessment.

The period for commenting on the Proposed Methodology was open between 4 September 2023 and 4 October 2023. Two responses were received and provision for involvement of both male and female participants was incorporated into the survey methodology as a result of the feedback.

17.3.4 Involvement of Aboriginal stakeholders in field survey

All registered Aboriginal stakeholders were invited to provide a representative for involvement in the field survey for the Project. Three Aboriginal stakeholders were involved in the in-field survey on 18th October, 2023 with a further two stakeholders advising that they were unable to provide a representative.

17.3.5 Aboriginal Community Information About Cultural Significance

As part of the review of the Proposed Methodology and during the field survey, the registered Aboriginal stakeholders were asked to contribute their knowledge on the Project Assessment Area and surrounds.

This information contributed to the assessment of the cultural heritage significance of the Project Assessment Area.

17.3.6 Review of the draft ACHAR

A draft of the ACHAR was provided to all registered Aboriginal stakeholders for their review and comment on 18 September 2024, in accordance with Sections 4.3 and 4.4 of the Consultation Guidelines (DECCW 2010). No responses were received by 28 October 2024.

17.4 Cultural Heritage - Description of Existing Environment

17.4.1 Historic Land Use and Current Site Condition

Overall, the environments of the Project Assessment Area have been extensively modified by past European land use practices. The entire area has been previously cleared of the original vegetation and used for sheep and cattle grazing and agricultural cropping following European settlement in the nineteenth century. Extensive earthworks have occurred across the proposed Project Assessment Area during past soil stripping and excavations to construct existing hardstands associated with storage of raw cotton bales cotton ginning by-product or “cotton trash”.

17.5 Cultural Heritage Context

Aboriginal people of the Gamilaroi (or Kamilaroi) language group occupied the North West Slopes at the time of first contact with Europeans (Günther 1837-1842, Mitchell 1839, Fison and Howitt 1867, Howitt 1904, Parker 1905, Tindale 1974). This language group comprised people who spoke the sub-dialects Yuwaalaraay, Yuwaaliyaay (Euahlayi), Gamilaraay, Gawambaraay, Wirayaraay (Wiriwiri) and Walaraay (O’Rourke,1995 1997).

These tribes shared similar language and kinship systems, notably the division of members into exogamous moieties (two-part social classification) known as Gubadhin (Kupathin) and Dhilbay (Dilbi) (Frazer 1994, O’Rourke 1997).

At the time of first contact with European observers the Gamilaroi were hunter-fisher-gatherers and appear to have had a semi-sedentary lifestyle. Surveyor-General of NSW, Major Thomas Livingstone Mitchell (1839) described an abandoned village of circular huts with conical roofs made from reeds, grass and boughs on the Gwydir River, near where Moree is now located. O’Rourke (1997) estimates that there were at least 60 Gamilaroi clans, with perhaps 160 adult men, women, adolescents and children in each, suggesting a total regional population in north central NSW of around 10,000 people. Each clan probably resided most of the year at a small number of established, favourable locations within their estate.

The Gamilaroi caught fish including eels, freshwater crayfish, yabbies, tortoises and freshwater mussels in the Namoi River and other streams and wetlands in the region (Mitchell 1839, Parker 1905, O’Rourke 1997). Watercraft were manufactured from large slabs of bark cut from river red gum trees. Fish were caught using fishing lines and nets made from reed fibre (Mathews 1903).

Nets were used to catch waterbirds, whose eggs were also collected. Some of the other animals that Aboriginal people of the North West Slopes hunted include kangaroos, wallabies, koalas, possums, emus, echidnas, lizards, snakes and frogs (Mitchell 1839, Fison and Howitt 1867, Parker 1905 O’Rourke 1997). Plant foods included grass seeds, wild orange, emu apple, melons, tubers, yams and roots (Mitchell 1839, Parker 1905, Gott 1983, O’Rourke 1997).

Within a decade of the first contact many of the Gamilaroi were living adjacent to pastoral homesteads, often working as shepherds or stockmen or engaged in other labouring activities (O’Rourke 1997). Traditional social networks collapsed. The last Gamilaroi bora ceremony is recorded to have occurred in 1905 on the Namoi River at Wee Waa, approximately 100 km south of the Project Assessment Area (O’Rourke 1997). Other social structures, such as marriage laws, were also abandoned.

In the early twentieth century, Aboriginal reserves were gazetted on 20-acre allotments of land at Boomi (approximately 100 km north of the Project Assessment Area) and Boggabilla (approximately 150 km north-east of the Project Assessment Area). Euraba Aboriginal Reserve operated between 1912 to 1927 near Boomi and Toomelah Aboriginal Reserve at Boggabilla from 1927 to 1938 (Heritage Concepts Pty Ltd 2009).

Many of the contemporary Aboriginal people of the North West Slopes live in regional centres such as Moree, which has a population of around 1500 Aboriginal people.

Further detail including references and prehistoric context is contained within Appendix B.7 (Aboriginal Cultural Heritage Assessment Report).

17.6 Types of Aboriginal Cultural Heritage Sites in the Region

The following types of Aboriginal Cultural Heritage sites are found in the region:

- Stone Artefact Scatters;
- Hearths;
- Freshwater shell middens;
- Earth Mounds;
- Quarry Sites;
- Modified Trees;
- Axe-grinding Grooves;
- Rock Shelter Sites;
- Rock Art Sites;
- Stone Arrangements, Ceremonial Rings, Ceremony and Dreaming Sites; and
- Burials.

Description of each site type and indicative site conditions where each site type is typically located is detailed within Appendix B.7 (Aboriginal Cultural Heritage Assessment Report).

17.7 Previously Recorded Aboriginal Cultural Heritage Sites

No Aboriginal cultural heritage sites were recorded within the Project Assessment Area.

17.8 Cultural Heritage Field Survey

The archaeological field survey was based on the sampling strategy developed in accordance with the Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011) and Requirement 5a of the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010).

The objective of the field survey was to identify sites of Aboriginal cultural significance within the Project Assessment Area.

Survey was conducted over one day on 18 October 2023 and involved three aboriginal field representatives (two individuals representing the Gomeroi Native Title Claim and one individual from Gomery Cultural Consultants). The Project Assessment Area was inspected on foot by the project archaeologist and Aboriginal community representatives. The field team examined the ground surface for any archaeological traces such as stone artefacts, hearths, hearthstones, shells, bones and mounds. All mature trees in the areas of proposed disturbance were inspected for scarring or carving by Aboriginal people.

Particular attention was paid to areas with high ground surface visibility such as along stock and vehicle tracks and in scalds, gullies and other eroded areas. The team members walked abreast across the surveyed areas in a series of closely spaced transects. These were evenly distributed over the areas of proposed disturbance and approximately 10 metres apart. Due to the general openness of the landscape it was usually possible to identify likely site locations from at least 10 metres and deviate from the transects to make closer inspections.

Conditions of ground surface visibility were typically around 90 %. Grass and herbaceous plant growth was sparse and the ground surface was exposed by erosion through scalding and stock and vehicular traffic.

17.8.1 Cultural Heritage Survey Results

Following thorough and intensive assessment, no Aboriginal cultural heritage sites were identified within the PAA. Survey results can be attributed to the landscape setting (removed from permanent water source), absence of rock outcrops, absence of landforms such as lunettes and the extent of existing ground disturbance within the PAA.

17.8.2 Historic Heritage Assessment Results

Following completion of desktop assessment, including a search of statutory registers, and field assessment, it was concluded that no previously recorded historical cultural heritage sites are known from the PAA. Field survey confirmed absence of historical cultural heritage features or sites whilst noting extensive past earthworks on site in the development of the Wathagar Gin.

17.9 Cultural Heritage Impact Assessment – Construction

17.9.1 Credible Direct Impacts to Cultural Heritage

The GEGHA Project construction would disturb the current land surface and theoretically would directly impact any archaeological material associated with the affected landforms and their landscape context (although no Aboriginal cultural heritage is known in the Project Assessment Area).

Impacts are theoretical but would fall into three categories:

- Category 1: the loss of information which could otherwise be gained by conducting research today;
- Category 2: the loss of the archaeological resource for future research using methods and addressing questions not available today; and
- Category 3: the permanent loss of the physical record.

These impacts can usually be mitigated to various degrees, depending on the nature and significance of the cultural heritage. Where sites are of low significance, their destruction (without salvage) may have little consequence. This could be due to the lack of useful information that could be gained from research, or the availability of many equivalent and alternative sites for study.

Any cultural heritage sites with greater significance are typically subject of archaeological investigation prior to their disturbance. This allows for the salvage of information, and the recovery of a sample of artefactual materials according to current methods and research priorities. Sites and site groupings that are common elsewhere may not require the same degree of salvage attention as those which are rare, of high significance, and subject to active deterioration. Salvage investigations can provide for the discovery of new knowledge about the Aboriginal occupation of an area. Despite the loss of physical evidence involved, the information gained can in turn aid the interpretation and better management of the remaining archaeological resource.

17.9.2 Credible Indirect Impacts

In areas where the proposed works for the Project would not involve significant earthmoving, impacts may be limited to minor surface disturbance, limited disturbance of the associated substrates or landforms and no significant alteration of the landscape context.

Theoretically, potential indirect impacts to archaeological sites could include the following:

- deposition of dust generated by earthworks and vehicular traffic;
- accidental disturbance by peripheral activities; and
- inappropriate visitation including the unauthorised removal of Aboriginal or historical objects.

17.9.3 Potential for Previously Unidentified Aboriginal Cultural Heritage to Occur in the Study Area

All of the Project Assessment Area was inspected for cultural heritage sites during the field survey. It is possible but improbable that some archaeology was obscured by grass, leaf-litter or soil. Such previously unidentified features, should they occur, would probably be isolated finds of stone artefacts (based on the predictive model and informed by the results of the in-field survey).

Further sites of a type or significance not previously encountered in the Project Assessment Area are improbable. This is partly attributable to the degree of land surface modification that has occurred since European settlement, as such past disturbance associated with pastoralism and agriculture may have obliterated many archaeological features, had

they occurred previously. For example, previous tree clearing and land levelling could have destroyed scarred trees and earthen features such as mounds and hearths and stone arrangements including ceremonial rings. Shell middens were not encountered because most occur within 100 m of sources of permanent freshwater, absent from the Project Assessment Area.

No old growth trees were present in the areas of proposed disturbance, so no trees would bear any evidence of having had bark or wood removed or carved by Aboriginal people. The shallow soils of the alluvial plains that comprise the Project Assessment Area, coupled with the degree of past disturbance from land clearing and soil cultivation for pastoralism and agriculture, means that significant *in situ* subsurface cultural deposits are improbable.

The Project Assessment Area does not contain culturally sensitive landforms such as lunettes or source-bordering sand dunes where subsurface Aboriginal cultural deposits (e.g. burials) have been recorded previously.

A strategy for managing any newly identified Aboriginal objects during the life of the Project is outlined in Section 11.3 of the Aboriginal Cultural Heritage Assessment Report (Appendix B.7).

17.9.4 Cultural Heritage Impact Assessment – Operation

The operation of the Project is unlikely to impact Aboriginal cultural heritage places and values, as any impacts would result principally from the construction phase of the Project.

17.10 Cultural Heritage Cumulative Impacts

In evaluating the extent to which construction and operation of the GEGHA Project would contribute to cumulative impact of cultural heritage values in the region, it is important to consider the nature and scale of previous and ongoing land disturbance processes in the region (predominately due to past pastoral and agricultural activities).

In consideration of the absence of any identified Aboriginal heritage sites and low archaeological potential in the Project Assessment Area and the nature and scale of impacts associated with the Project, the Project would not add to cumulative impacts to Aboriginal heritage in the region.

17.11 Cultural Heritage Mitigation Measures

This section presents proposed strategies for the management of cultural heritage values within the Project Assessment Area that may be subject to direct impacts by the Project.

Mitigation measures to manage potential cultural heritage impacts of the Project's construction and operation are summarised in Table 17.1.

Table 17.1 - Mitigation measures to manage potential cultural heritage impacts

Reference	Management Commitment	Project Phase	Responsibility
CH01	A Heritage Management Plan will be prepared prior to commencement of site-based construction activities and will: • define the Cultural Heritage induction methods and content for construction and operation of the GEGHA Project; • include provision for discovery of Aboriginal cultural heritage or suspected human skeletal remains; • include protocol for discovery of historic heritage; and • remain active for the Project life.	Construction Operation	HSPT
CH02	Aboriginal cultural heritage training will be provided to all on-site personnel prior to each individual's commencement of site-based activities.	Construction Operation	HSPT

	Training will include cultural awareness and accidental discovery protocols. Training must be appropriate to the individual's work tasks (i.e. training is not expected to extend to delivery drivers and supervised site visitors).		
CH03	If any previously unidentified Aboriginal objects are encountered during construction of the Project, all works likely to affect the material must cease immediately and Heritage NSW and the registered Aboriginal stakeholders consulted about an appropriate course of action prior to recommencement of work. A minimum 10 m buffer should be established around the site and work can continue outside the exclusion area.	Construction	HSPT
CH04	In the unlikely event that human skeletal remains are encountered during construction of the Project, all work with the potential to impact the remains must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. If the remains are thought to be less than 100 years old the Police or the State Coroner's Office (tel: 02 9552 4066) must be notified. If there is reason to suspect that the skeletal remains are more than 100 years old and Aboriginal, Hiringa Sundown Project Trust should contact the Environmental Line (tel: 131 555) for advice. In the unlikely event that an Aboriginal burial is encountered, strategies for its management would need to be developed with the involvement of the local Aboriginal community.	Construction	HSPT
CH05	Any new Aboriginal heritage sites identified during the development of the Project will be registered with Heritage NSW in consultation with the Aboriginal community.	Construction	HSPT
CH06	Hiringa Sundown Project Trust will involve relevant registered Aboriginal stakeholders in matters pertaining to the Project. Ongoing consultation with each registered Aboriginal stakeholder will continue throughout the life of the Project in the form of an emailed annual project update.	Construction Operation	HSPT
CH07	Erosion and sediment control works will be undertaken in accordance with the requirements of the development consent and in consideration of the Heritage Management Plan (i.e. avoiding harm to any newly identified Aboriginal cultural heritage).	Construction	HSPT
CH08	A record of any known Aboriginal cultural heritage sites in the Project Assessment Area, their status and location will be maintained by Hiringa Sundown Project Trust.	Construction Operation	HSPT
CH09	If any previously unidentified historical cultural heritage places or items are encountered during construction of the Project all works likely to affect the material must cease immediately and Heritage NSW consulted about an appropriate course of action prior to recommencement of work.	Construction	HSPT

18 BIODIVERSITY

The following specialist reports have been prepared to inform this chapter:

- Biodiversity Development Assessment Report Good Earth Green Hydrogen and Ammonia Project, Premise, April 2025 (Appendix B.5)
- Good Earth Green Hydrogen and Ammonia Project Environmental Risk Assessment (Appendix C)

18.1 Biodiversity - Introduction

This chapter details the assessment methodology and survey rigour that has been undertaken to evaluate the potential impacts to Biodiversity values within the GEGHA Project Assessment Area and within its broader range of influence.

This chapter and its related appendices collectively address the requirements from section 18 of the Project SEARs (Appendix A).

18.2 Form of Biodiversity Assessment

Biodiversity assessment involved an initial desktop assessment that enabled an informed series of in-field site assessments to gather site data and validate presence or absence of plant community types, threatened flora and threatened fauna that were identified as likely to be present during desktop assessment.

18.3 Biodiversity Assessment Methodology

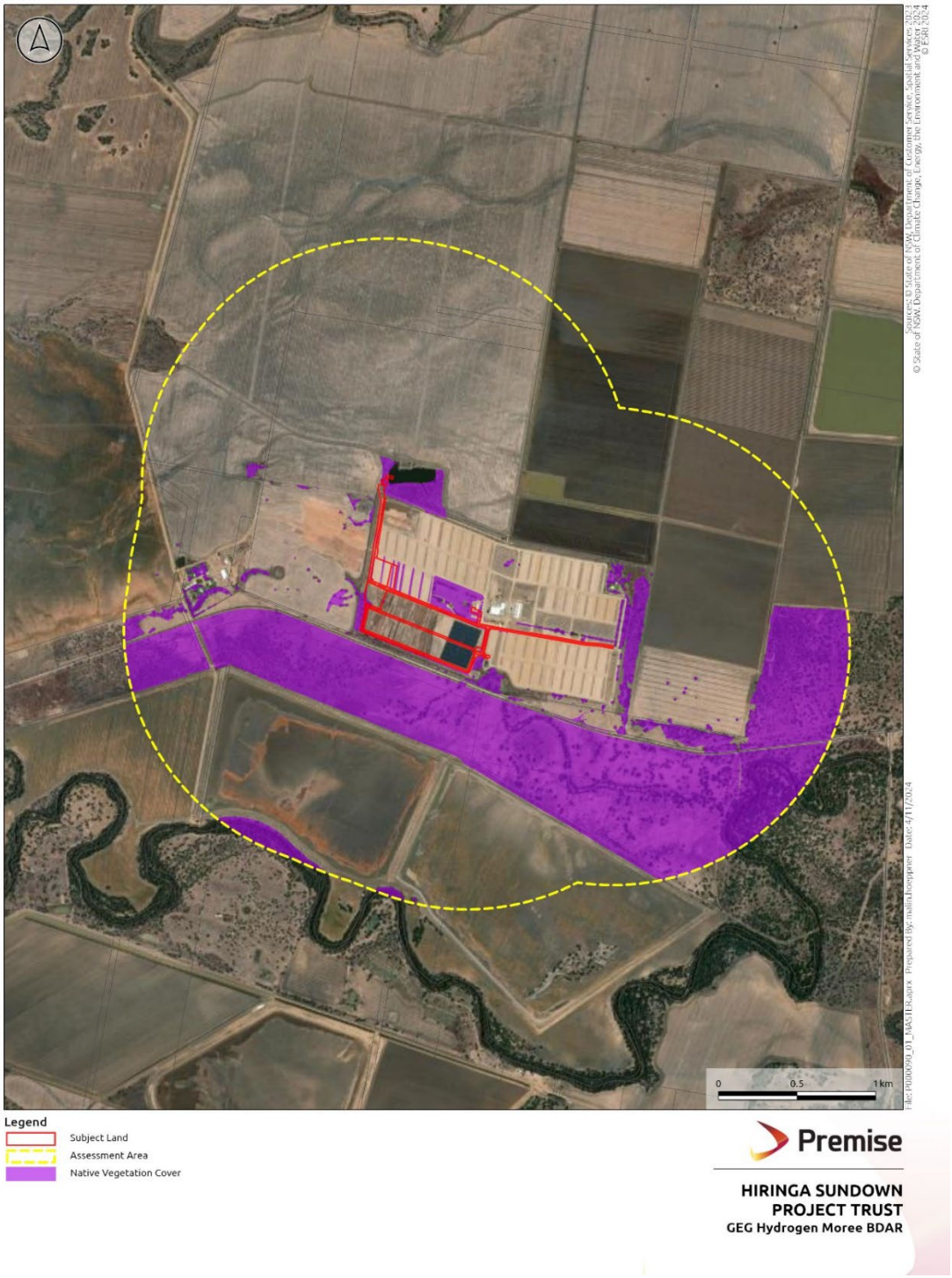
18.3.1 Desktop Biodiversity Assessment

Desktop review was undertaken at project inception and was utilised to identify landscape features, possible Plant Community Types (PCTs) and any associated Threatened Ecological Communities (TECs).

The assessment area for the Project disturbance footprint (encompassing a 1,500 m buffer surrounding the Subject Land – refer figure 18.1) is 1,464.2 ha and includes:

- 1,136 ha of mapped non-native vegetation
- 122.7 ha of mapped derived native grassland
- 205.5 ha of mapped woody vegetation.

Figure 18.1 - Biodiversity assessment area extent



18.3.2 Data Capture and Determination of extent

Native vegetation extent on the Subject Land was mapped using the latest available aerial imagery and digitised using GIS. The initial vegetation maps were ground-truthed in the field on 26 October 2023. Native vegetation within the broader 1500 m buffer Assessment Area was identified using Google Satellite imagery and State Vegetation Type Mapping (Darling Riverine Plains Region) (NSW Government 2023). GIS was used to calculate the total area of native vegetation on the Subject Land and within the Project Assessment Area.

18.3.3 Habitat Constraints Assessment

A comprehensive review of databases and literature was undertaken to compile a list of species with potential to occur on the subject land.

A total of nine (9) candidate flora species were identified via desktop analysis as having the potential to occur on the subject land. The likelihood of occurrence of each candidate flora species was assessed based on distribution records in the NSW BioNet Atlas (NSW DCCEEW, 2024), and information in both the Threatened Biodiversity Data Collection (NSW DCCEEW, 2024) and referenced scientific publications.

Following analysis of habitat constraints/ values and records of occurrence, a retained list of three threatened flora species were subjected to targeted survey during in-field assessment. These were *Atriplex infrequens* (A Saltbush), *Phyllanthus maderaspatensis* (Madras leaf-flower) and *Sida rohlenae* (Shrub Sida).

No candidate threatened fauna species were initially identified for targeted assessment.

18.3.4 Additional Species Targeted Assessment

During the passage of time following initial site assessment in October 2023, one threatened flora species (*Digitaria porrecta*, Finger Panic Grass*) and one threatened fauna species (Hemiaspis damelii*, Grey snake) were identified as potentially likely to occur on subject land. This prompted further targeted species assessment during January, 2025 to form an overall completeness of assessment with regard to threatened species assessment.

18.3.5 GEGHA Biodiversity Assessment In-field Surveys

In-field survey involved one primary survey followed by three secondary targeted surveys as outlined in table 18.1.

Table 18.1 - In-field survey program overview

Survey Date(s)	Survey Effort	Survey Effort	
Spring **26th October, 2023**	2 people; 1 full day on the Subject Land	Mapped vegetation, assessed for habitat constraints. Conducted 2 VI plots and completed threatened species surveys (*Atriplex infrequens, Sida rohlenae, Phyllanthus maderaspatensis*).	Rainfall in the preceding three (3) months (July, August and September) was 22.4 mm which is significantly lower than the long-term average of 93.3 mm over the same period). Conditions during survey were sunny and clear.
Spring **17th October, 2024**	2 people; 1 full day on the Subject Land	Completed threatened species surveys (*Atriplex infrequens, Sida rohlenae, Phyllanthus maderaspatensis*).	Rainfall in the preceding 3 months was 112.6 mm which was higher than the average of 93.9 mm for the period. Rainfall in the month prior (30.2 mm) was similar to the monthly average of 34.9 mm.
Summer **17th – 18th January, 2025**	1 person; 4 nights – 120mins per night on the Subject Land.	Completed threatened species surveys: *Hemiaspis damelii* (Grey Snake).	Rainfall in the preceding 3 months (January, December and November) was 143.2mm, which was somewhat lower than the average total rainfall

Survey Date(s)	Survey Effort	Survey Effort	
			of the same period (215mm).
Summer 23rd January, 2025	2 people; 1/2 day on the Subject Land	Completed threatened species surveys *Digitaria porrecta.*	Rainfall in the preceding 3 months (January, December and November) was 143.2mm, which was somewhat lower than the average total rainfall of the same period (215mm).

Threatened flora species surveys were undertaken in accordance with the BAM (DPIE 2020a) and the methods described in the NSW Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method (Threatened Flora Survey Guideline) (DPIE 2020d). Threatened flora surveys were conducted over the Subject Land within suitable habitat.

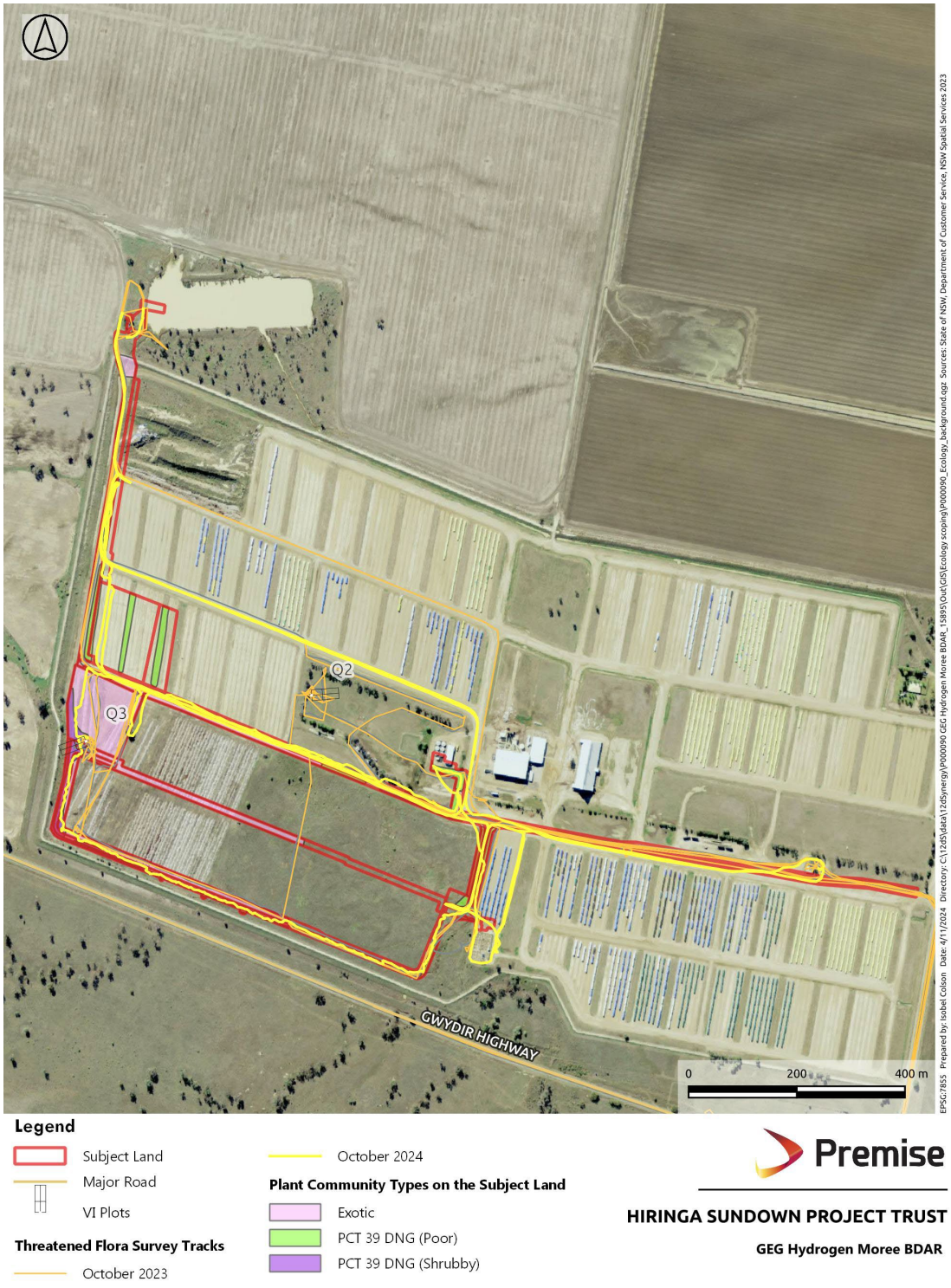
Habitat Constraints Assessment involved detailed recording and analysis of fauna habitat features over the project investigation area including:

- Live and dead scattered trees;
- Koala feed species including *Eucalyptus coolabah* (Coolibah);
- Trees with hollows ranging from 7–15 cm in diameter, greater than 5 m above the ground;
- Water courses and dams;
- Surface rocks;
- Mistletoe;
- Fallen and/or standing dead timber and
- Cracking clay soils.

Incidental observations of non-target threatened flora as well as threatened fauna species, weeds and habitat features were recorded simultaneously while undertaking targeted survey.

Field surveys were conducted on foot. Targeted surveys within potentially suitable habitat included 10 m parallel transects. All threatened flora species searches were conducted by Premise ecologists experienced in threatened plant detection and identification. Tracks were recorded using a GPS and survey effort is displayed on Figure 18.2.

Figure 18.2 - Biodiversity survey GPS record



18.4 GEGHA Biodiversity Survey Results

18.4.1 Native Vegetation

Vegetation on the site was categorised into three condition zones:

1. Exotic vegetation

Plant Community Type 39 - Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion in two condition states:

2. VZ1: Derived Native Grassland (DNG) Poor
3. VZ1a: Derived Native Grassland (DNG) Shrubby

18.4.2 Plant Community Type 39

PCT 39 on the subject land (Figure 18.1) is associated with *Coolibah-Black Box Woodland in The Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain And Mulga Lands Bioregions Endangered Ecological Community* (EEC) under the *Biodiversity Conservation Act* (2016), but does not conform to the criteria for the *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions EEC* under the EPBC Act 1999.

18.5 Absence of Threatened Flora and Fauna species

Targeted surveys were completed for the following Threatened species on the subject land:

- *Atriplex infrequens* (A Saltbush)
- *Phyllanthus maderaspatensis* (Madras leaf-flower)
- *Sida rohlenae* (Shrub Sida)
- *Digitaria porrecta* (Finger panic grass)
- *Hemiaspis damelii* (Grey snake)

No threatened species were recorded on site during targeted survey.

18.6 Residual impacts, their mitigation and offsetting

18.6.1 Residual vegetation removal/ Irreversible impacts

Following application of the principles of avoidance and minimisation, residual impacts on vegetation removal will require the permanent removal of:

- Exotic vegetation (3.4 ha)
- PCT 39 DNG Poor (1.4 ha)
- PCT 39 DNG Shrubby (0.4 ha)

18.7 Biodiversity Offset Requirements

The NSW Biodiversity Offsets Scheme (BOS) is designed to promote the principles of avoidance and minimisation in relation to land clearing associated with development. The primary purpose of the BOS is to ensure that any negative impacts on biodiversity are compensated for by creating or enhancing biodiversity values elsewhere.

Following demonstrated avoidance and minimisation to the GEGHA Project footprint, the following residual impacts to native vegetation requiring an offset are detailed in Table 18.2.

Table 18.2 - Impacts that require an offset – ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of Ecosystem credits required
VZ1a	39	Coolibah Black Box EEC	0.4	6

18.8 Credible Residual impacts to Biodiversity

18.8.1 Biodiversity Construction Risk Assessment summary

The environmental risk Workshop held in December, 2024 identified the following credible direct and indirect residual risks to Biodiversity during construction of the plant.

- **Impact to native fauna species due to:**
  - initial vegetation clearing works
  - land disturbance
  - operation of vehicles, machinery and equipment movement (noise, dust and light spill)
  - transit to and from work (fauna strike)
- **Potential to impact flora and Native Vegetation (not subject to clearing) due to:**
  - accidental clearing outside of project disturbance envelope
  - vehicle and machinery movement outside of project disturbance envelope
  - Spread of weeds and pathogens from the site to adjacent vegetation
  - lowering of water table frum use of groundwater sources impacting GDEs

18.8.2 Biodiversity Operations Risk Assessment summary

The environmental risk Workshop held in December, 2024 identified the following credible residual risk to Biodiversity during operation of the plant.

- **Project construction activities impacting on native flora and fauna species, caused by:**
  - Land disturbance/ soil movement
  - Dewatering activities
  - Operation of vehicles, machinery and equipment movement (noise, dust and light spill)
  - Transit to and from work (fauna strike)

18.9 Biodiversity - Cumulative Impact

Cumulative impact caused by construction and operation of the GEGHA Project is considered negligible due to the majority of the subject land being located within the operating footprint of a Cotton Gin. The impact to within the Project footprint is low and native vegetation connectivity is unaffected by the development.

Additional controls applied during the Project's construction and operational phases would reduce the likelihood of unanticipated/ unintended impact to a low risk rating, provided they are implemented accordingly.

18.10 Biodiversity – Recommended Mitigation Measures

Mitigation measures described in Table 18.3 are proposed to be implemented during the GEGHA Plant's construction and operation to further avoid and minimise impact on biodiversity values. The most effective framework for implementation of these mitigation measures is via a Construction Environmental Management Plan and Operational Environmental Management Plan as appropriate.

Table 18.3 - Proposed Mitigation Measures: Biodiversity

Reference	Mitigation Measure	Project Phase	Responsibility
BD01	Timing of works will be considerate of impact to fauna: - No clearing to occur immediately prior to storm events to prevent impact to the White-throated needletail. - Evening/night work should generally be avoided and should be risk assessed against impact to fauna if they are required. - Clearing to avoid dawn and dusk to reduce risk of fauna interaction and disruption to roosting behaviour. - High intensity work will be consolidated where possible into short durations.	Construction	HSPT
BD02	Vegetation clearing and soil disturbance: - Pre-clearing surveys will be undertaken prior to initial ground disturbance activities. - Clearing activities will be implemented in accordance with the RMS Biodiversity Management Guideline (2004). - An environmental representative will monitor and inspect clearing activities, including actively inspecting cleared vegetation for fauna. - Where appropriate, relocate cleared vegetation where it can be used to enhance existing habitat.	Construction	HSPT
BD03	Protection of flora and fauna: - Clearly demarcate land to be cleared - Clearly define Tree Protection Zones with exclusion barriers. - Utilise signage to identify site extent, tree protection zones or any 'no-go' areas.	Construction	HSPT
BD04	Dust suppression – use of dust suppression measures outlined in mitigation measures for Air Quality (chapter 9) and Land and Water (chapter 10)	Construction	HSPT
BD05	Noise management – construction to be restricted to recommended standard hours as per EPA Draft Construction Noise Guidelines (NSW EPA 2020)	Construction	HSPT
BD06	Light spill management – use of warm coloured light bulbs, directional lighting below the horizontal plane, shielding of lights, use of low-reflective materials throughout the Project.	Construction Operation	HSPT
BD07	Prepare a Biosecurity Management Plan to outline provisions for: - effective prevention methods to stop introduction or spread of pest plant and pathogen species;	Construction Operation Decommissioning	HSPT

Reference	Mitigation Measure	Project Phase	Responsibility
	- Vehicle, machinery and equipment hygiene protocol, frequency and record-keeping system; - Provision for chemical spraying including seasonality and conditions for application, Personal Protective Equipment and chemical storage.		
BD08	Prepare a Traffic Management Plan prior to commencement that is reviewed and updated as needed and contains the following: - Speed limits (internal & public roads) - Definition of positive driver behaviour - Consideration of driving to avoid vehicle strike/ impact.	Construction Operation	HSPT
BD09	Any land disturbance or dewatering activity should include consideration of potential fauna impact or interaction.	Construction Operation	HSPT
BD10	Project Safety Management Plan will contain provision to raise awareness of positive behaviour and seasonal risks during pre-start meetings, shift changeovers or as part of dedicated toolbox talks.	Construction Operation	HSPT
BD11	Groundwater dependent ecosystems will be protected via: - Leaving a minimum of 1m level at the drawdown location of the drainage dam. - Development of a Trigger Action Response Plan (TARP) prior to commencement of drawdown.	Operation	HSPT
BD12	Operational noise shall be in accordance with requirements of the Project Environmental Protection Licence.	Operation	HSPT

19 ECOLOGICALLY SUSTAINABLE DEVELOPMENT, ENERGY EFFICIENCY AND RESILIENCE

19.1 ESD, Energy Efficiency and Resilience - Introduction

This chapter analyses the Project's alignment with the Principles of Ecologically Sustainable Development (ESD). It also analyses the Project's commitments to Energy Efficiency and its Emissions profile throughout the life of the Project.

This chapter and its related appendices collectively address the requirements of section 19 of the Project SEARs (Appendix A).

19.2 Alignment of the GEGHA Project with the Principles of ESD

The chapter defines the pillars of ESD as the following elements, consistent with section 1.3 of the EP&A Act and section 6(2) of the POEO Act:

- the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. This would be determined by:
    - evaluation to determine serious or irreversible damage to the environment
    - assessment of risk-weighted consequences of various options.
- inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
- conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration
- improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as—
    - polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
    - the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
    - environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Table 19.1 provides evaluation of the Project against each pillar of ESD.

Table 19.1 - Evaluation of the GEGHA Project against the Principles of Ecologically Sustainable Development

Principle of ESD	How has the Principle been assessed and incorporated into Project Planning and Design?
The precautionary principle	There are no identified threats of serious or irreversible environmental damage associated with the GEGHA Project. The existing environment is well understood and the Project's aspects and impacts relating to construction and operation have been comprehensively assessed. The Project's impacts have been evaluated against their extent, severity and duration. Whilst the GEGHA Plant has been designed using the latest available technology, the processes upon which the generation of hydrogen and ammonia is based is well known and has been applied commercially for over 100 years.

Principle of ESD	How has the Principle been assessed and incorporated into Project Planning and Design?
	The project will utilise electrolysis to produce hydrogen from water which has been in use since 1800. Ammonia will be made using Haber Bosch process which was first commercialised in 1910. A slightly smaller but similar plant is being constructed in WA which will be Australia's first plant to generate green hydrogen for the purpose of producing green ammonia. No element of the Project would be considered new or novel. The individual components are well founded in industry and are in use in other countries globally. All negative impacts have minimal extent, low severity and are largely restricted to the disturbance footprint.
Inter-generational equity	The operation of the GEGHA Project signifies an important advancement in the decarbonisation of fertiliser and fuel in NSW. It represents an opportunity to meet the needs of the present without compromising the ability of future generations to meet their own needs. The Project will produce a low emission product that will provide the feedstock for cereal and fibre production and regional transportation. Localised production of fuel and fertiliser provides certainty of supply to the rural sector, enabling rural customers to plan effectively for the future whilst saving transport emissions in bringing alternative products in from further afield. The consumption effect of the Project's products will enhance agricultural productivity and assist in the regional sustainability of the agricultural sector. By reducing the emissions profile of cotton and cereal production and providing hydrogen to be utilised as a fossil fuel alternative, the project will serve to lead the transition to renewable energy and a more sustainable energy future.
Conservation of biological diversity and ecological integrity	Development of the GEGHA Project within the yard of an existing operational Cotton Gin has ensured that there would be a minimal impact on biological diversity and ecological integrity In all, total clearing of vegetation for the project amounts to: - Exotic vegetation (3.4 ha) - PCT 39 DNG Poor (1.4 ha) - PCT 39 DNG Shrubby (0.4 ha) There will be no impact to threatened flora, fauna or threatened ecological communities. The 0.4ha of PCT 39 DNG Shrubby will be offset. Measures will be in place within the CEMP and OEMP to ensure best practice in relation to prevention of impact to fauna during construction and operation of the GEGHA Project, particularly during site clearing activities. During operation, the displacement of grey Ammonia with green ammonia will indirectly benefit the broader environment through reduction of reliance on fossil fuels and through savings in emissions during product transportation.
Improved valuation, pricing and incentive mechanisms	The GEGHA Project's construction and operation will create a net positive environmental benefit which has been quantified in the Project's life cycle analysis. Pricing of the energy produced by the plant will reflect the full environmental costs and benefits. This will assist by providing end consumers and businesses to make more environmentally informed choices.

19.3 GEGHA Project - Energy Efficiency and Energy Use

19.3.1 GEGHA Behind the Meter Solar Option Efficiency

The behind the meter solar solution includes more batteries and on-site power generation. This enables the operation to:

- use less grid imported energy
- consume more energy at the point of generation
- avoid importing energy at peak demand times
- lose less solar energy to clipping

19.3.2 GEGHA Plant Energy Efficiency

The GEGHA Project has been designed with an emphasis on energy efficiency. Plant selection included several criteria including operational energy efficiency and manufacture location. High pressure alkaline electrolysers have been selected. These systems off DC efficiencies of 50.6 kWhr per kg of hydrogen compared to approximately 54 kWh/kg for PEM equivalent. The stack arrangement with two smaller sized stacks provides for higher outlet pressure which reduces compression energy downstream. Using onsite power generation means less energy is imported from the grid which incurs electrical losses from transmission lines.

Large motors for pumps and compressors will be powered by variable speed drives which allows energy consumption to be reduced to match process needs rather than relying on control valves to restrict process conditions. The project has also opted for pressurised ammonia storage which does not require energy for refrigeration.

19.3.3 GEGHA Plant Energy Consumption

Table 19.2 provides a summary of the Plant's energy consumption. The hydrogen and ammonia plant will have a total annual electricity consumption of 62.574 Gigawatt hours (GWh).

Table 19.2 - GEGHA Plant Annual energy consumption

Energy Consumer	Site total	H_2 Sales		NH_3 Sales	
	Annual electricity (GWh)	Percentage	Annual electricity (GWh)	Percentage	Annual electricity (GWh)
Water Pumping	0.017	21.90%	0.004	78.10%	0.013
H_2 Processing Plant	56.892	21.90%	12.457	78.10%	44.435
H_2 Compression Plant	0.926	21.90%	0.203	78.10%	0.723
NH_3 Plant	4.590	0%	0.000	100%	4.590
Site electrical infrastructure losses	0.149	21.90%	0.033	78.10%	0.116
Total Electricity	**62.574**	**20.29%**	**12.696**	**79.71%**	**49.878**

19.3.4 Energy Generation and Imports

The GEGHA Project will be powered predominately by the adjacent Wathagar solar farm Stage 1 and Stage 2, which will have a capacity of 35.65 MW. The solar farm will also be coupled with a 41 MWh Battery Energy Storage System (BESS) to smooth peak solar energy production into the evenings with the hope of increasing the utilisation of the solar-generated electricity at the facility.

The solar farm is estimated to produce 54.859 GWh/annum, of which the GEGHA Project will consume 45.796 GWh/annum. The excess electricity generated from the solar farm will be sold to Wathagar Cotton Ginning facility and exported to the grid. The remaining 16.778 GWh/annum required to operate the GEGHA project will be imported from the local electricity grid. Table 19.3 provides an overview of generation and grid export/import.

Table 19.3 - Summary of GEGHA energy generation and grid imports

Electricity Generator/ Consumed	Total Quantity (GWh)	Quantity consumed by H_2 sales (GWh)	Quantity consumed by NH_3 Sales (GWh)
Generated on site	54.859	N/A	N/A
Generation consumed by GEGHA	45.796	9.292	36.504
Generation consumed by Others	2.832	N/A	N/A
Generation exported to the Grid	6.231	N/A	N/A
Imported electricity from the NSW grid	16.778	3.404	13.374
Total Consumed by GEGHA	62.574	12.696	49.878

19.3.5 Hydrogen Production via Electrolysis

An electrolyser unit will use electricity to split water into hydrogen and oxygen. The electrolyser has an efficiency of 54.5 MWh/tonne of H2.

Initially, the project will produce a total of 1,023 tonnes of H2 per annum, of which 799 tonnes will be used to produce the NH_3.

After it is produced, the hydrogen will be compressed to meet site specifications and requirements. The compression technology has an efficiency of 2 MWh/tonne of H2 compressed.

19.3.6 Anhydrous Ammonia Fertiliser Production

A traditional Haber-Bosch process will be used to react the hydrogen produced by the facility with nitrogen extracted from the air to produce NH_3. The elements undergo a chemical reaction in the Haber-Bosch process to produce gaseous NH_3. Once the gaseous NH_3 has been produced, it must be cooled and compressed into a liquid form for ease of storage. This process consumes approximately 1.02 MWh/tonne of NH_3.

19.3.7 Fugitive emissions

HSPT's engineering team have not identified any gases that will be released from the facility that have a global warming potential.

19.3.8 Transportation

Upstream Transportation

The proximity of solar energy generation and water source means that there is no upstream energy usage to be quantified. Water pumping has been included in the Plant energy use calculation.

Transportation within the GEGHA facility

The GEGHA Project will have a single petrol vehicle that will be used as a site maintenance vehicle. The vehicle is expected to travel a maximum of 2 km per day. All other vehicles have been assumed to be electric vehicles, and their energy use is included in the Plant energy use calculation.

Downstream transportation and distribution

Operation of the GEGHA Project would create a net saving of at least 40,000 litres of diesel emissions per annum. Fuel and fertiliser presently has to be transported into the region primarily from Brisbane, Newcastle and Sydney. The

plant will not be growing the market for fuel and fertiliser but rather displacing the existing imported fossil fuel derived products.

Assuming that the GEGHA Project's customers average a delivery distance of 100km, the displacement created by Ammonia alone would total over 128,000km of travel by heavy goods vehicle, enabling a substantial annual net saving downstream transportation and distribution.

19.3.9 Emissions Analysis

Hiringa will use a market-based approach to calculate the emissions associated with electricity consumed to produce NH_3 to avoid any potential double counting issues. Adopting the Australian Government's National Greenhouse Accounts Factors will enable Hiringa to attach a Large-scale Generation Credit (LGC) to every MWh of electricity imported from the grid.

This is critical to maintaining a zero balance on Scope 2 and Scope 3 emissions. HSPT's operational site vehicle is estimated to generate 0.235 tCO_2-e per annum which is the only emission generated from the operation of the plant.

An alternate scenario whereby no solar was used to generate power would generate approximately 39,861 tCO_2-e per annum whereas a scenario where Large-scale Generation Certificates (LGCs) were only attached to Behind the Meter activities (i.e. LGCs were not attached to imported power), the GEGHA Plant's power consumption would generate approximately 6,097 tCO_2-e per annum in emissions.

19.4 GEGHA Project - Climate Resilience

19.4.1 GEGHA Project and Climate Resilience – Overview

The climate resilience of the GEGHA Project has been evaluated using the NSW Government's NSW and Australian Regional Climate Modelling ('NARCliM') Project. This evaluation has been undertaken with reference to the Adapt NSW interactive climate change projections map.

Whilst the GEGHA Project would contribute towards a 'low emissions' future, this analysis provides the 'high emissions' and 'low emissions' range and incorporates discussion broadly in relation to climate resilience over the design life of 25 years (2026-2051).

In this section, any text in italics is a direct impact from the NSW Government's NARCliM New England and North West Climate Change Snapshot report, August 2024.

Throughout this section, the assumption has been made that cotton and cereal production will remain resilient and continue to be grown productively. This section places focus on the GEGHA Project and its resilience to a changing climate in terms of its ongoing function and its primary inputs of electricity and water.

Table 19.4 provides an outline of the baseline climate from the report. The commentary in this section is heavily weighted on the proposed operational life of the Plant, using the 2050 values as the expected guide on low emissions and high emissions values.

Table 19.4 - Observed and Historical model data from the New England and North West region

	Average temperature	Hot Days	Cold Nights	Rainfall	Severe Fire Weather Days
Observed	17.0°C	20.5	50.2	728mm	1.7
Historical Model	17.0°C	20.7	49.0	623mm	3.6

19.4.2 Temperature

Under a low-emissions scenario, the average temperature increase across the region is projected to be less than 0.1°C between 2050 and 2090 (Table 19.5). However, a major temperature increase of 2.0°C is expected during the same period under a high-emissions scenario. Notably, the temperature projections for 2050 under a high-emissions scenario are expected to exceed the projections for 2090 under a low-emissions scenario.

Table 19.5 - Projected annual average temperature increase – New England and North West

	2050		2090	
	Low-Emissions	High-Emissions	Low-Emissions	High-Emissions
Temperature	1.3° (0.6-1.9°C)	2.1° (1.2-3.1°C)	1.4° (0.6-2.3°C)	4.1° (3.0-5.7°C)
Max. Temperature	1.3° (0.6-2.0°C)	1.5° (1.3-3.2°C)	1.5° (0.6-2.5°C)	4.0° (3.1-5.6°C)
Min. Temperature	1.2° (0.7-1.8°C)	1.4° (1.1-2.9°C)	1.4° (0.7-2.1°C)	4.1° (2.9-5.6°C)

For the planned operational phase of the plant, temperatures are predicted to rise between 1.3 and 2.1 degrees Celsius. Increased temperatures have the potential to impact on cotton production in addition to increasing evaporation rates of the drainage dam.

Increased evaporation would require an increased recharge rate from rainfall events. It is difficult to predict whether warmer temperatures alone would be detrimental to the GEGHA Plant's production without analysing rainfall.

19.4.3 Hot days

Hot days are described as days where maximum temperatures are 35°c or above.

Generally, the number of hot days in the New England and North West region increases from the east to the west of the region…. The number of hot days will increase for the New England and North West region by 2050 for both a low-emissions and a high-emissions scenario… The number of hot days is projected to increase during spring, summer and autumn, with the largest increase in summer.

Table 19.6 - Projected increase in average annual number of hot days – New England and North West

2050		2090	
Low-Emissions	High-Emissions	Low-Emissions	High-Emissions
13.6 days (5.8 to 20.6 days)	20.9 days (8.9 to 35.3 days)	14.6 days (5.8 to 28.7 days)	43.5 days (26.7- 66.9 days)

Hot days have the potential to increase evaporation from the GEGHA Project's water supply and increase bush fire danger. Impact to operation can only be considered with the input of projected rainfall pattern including frequency and intensity.

19.4.4 Cold nights

Low-elevation areas of the region such as Moree, Narrabri and Gunnedah had on average 15–25 cold nights per year during the baseline period….

Table 19.7 - Projected decrease in average annual number of cold nights – New England and North West

2050		2090	
Low-Emissions	**High-Emissions**	**Low-Emissions**	**High-Emissions**
13.2 days (7.8 to 18.6 days)	20.9 days (12.5 to 29.4 days)	14.6 days (7.9 to 22.3 days)	43.5 days (31.1- 44.8 days)

Cold nights would not have a meaningful impact on the operability of the GEGHA Plant.

19.4.5 Rainfall

Modelling rainfall is more difficult than modelling temperature due to the complexities of the weather systems that generate rain. Annual average rainfall in the region is projected to remain variable throughout this century. By 2090, on average, annual rainfall is projected to decrease by 9% under a low emissions scenario and by 8% under a high emissions scenario.

Table 19.8 - Projected change to average rainfall – New England and North West

	2050		2090	
	Low-Emissions	**High-Emissions**	**Low-Emissions**	**High-Emissions**
Annual	-9.5% (-22.4% to +7.9%)	-12.3% (29.9% to +14.7%)	-9.3% (-19.9% to +8.6%)	-8.4% (-36.2% to +39.4%)
Summer	-8.4% (-24.7% to +19.6%)	-13.9% (-42.0% to +17.2%)	-12.6% (-31.9% to +9.6%)	+3.3% (-22.6% to +40.4%)
Autumn	-12.1% (-28.1% to +3.3%)	-12.4% (-24.1% to +34.1%)	-6.3% (-18.6% to +24.5%)	-12.8% (-35.2% to 39.7%)
Winter	-12.5% (-29.5% to +16.2)	-14.9% (-43.6% to 33.2%)	-5.3% (-27.2% to +39.5%)	-24.2% (-61.3% to +63.2%)
Spring	-6.5% (-30.9% to +28.9%)	-7.6% (-37.1 to +34.2%)	-10.0% (-26.3% to +32.7%)	-10.8% (-38.4% to +48.1%)

Overall, rainfall directly effects the ability to utilise drainage dam water from the Wathagar dam as a primary source of water. The seasonality of rainfall is not as important to the plant's ongoing ability to utilise drainage water.

An increase in rainfall intensity would see a higher rate of runoff and quicker recharge of the dam, however consistency is key to retaining a constant water supply in the dam. If rainfall were to diminish, the frequency and intensity of rainfall would then play a large part in the ongoing ability for the drainage dam to supply the GEGHA plant. Evaporation rate would also play a part in available volume of water from the dam.

The NARCliM report states that it is difficult to predict and model rainfall pattern and frequency. There is plenty of difference in frequency and volume of rainfall in the records over the past 120 years which gives an indication that future rainfall patterns will be subject to cyclical periods of wetter years and dryer years.

19.4.6 Severe fire weather

The number of severe fire weather days will increase for the New England and North West region by 2050 for both a low-emissions and a high-emissions scenario, with an even greater increase projected by 2090 under a high-emissions scenario (Table 6). The number of severe fire weather days is projected to increase during spring and summer, with the largest increase in summer.

Table 19.9 - Projected increase in average annual number of severe fire weather days – New England and North West

2050		2090	
Low-Emissions	High-Emissions	Low-Emissions	High-Emissions
1.6 days (0.5 to 3.1 days)	2.0 days (0.0 to 5.9 days)	1.2 days (-0.4 to 3.5 days)	3.8 days (1.1- 9.4 days)

Severe fire weather presents as a risk to the operational GEGHA Plant. Maintenance of vegetation load in proximity of the plant is particularly important in managing that risk. Chapter 6 discusses Bush Fire assessment and threat mitigation in full.

19.4.7 Climate Resilience – GEGHA Project Evaluation

Whilst there is inherent variation and unpredictability in modelling across broad datasets and projecting level of impact for up to 65 years, the trend under both low-emission and high-emission modelling is that the North West of NSW is going to be warmer and drier with more unpredictable rainfall patterns and a higher level of bush fire danger through spring and summer.

It is expected that the GEGHA Plant would maintain operation in a warmer, drier climate. The GEGHA plant itself would be robust enough to maintain production with the projected increased temperature range. The acceleration of evaporation caused by more intense, hotter days coupled with uncertainty in rainfall regularity would place more pressure on the recharge rate of the drainage dam as the primary feedstock of water for the GEGHA Plant. It remains unclear as to whether intensity and frequency of rainfall events may offset the rate of recharge vs the increased evaporation rate of the dam.

In any case, in consideration of the outlook to 2050, having an available source of groundwater to supplement the primary drainage dam is essential in enabling the GEGHA Plant to remain robust and resilient in a changing climate.

The establishment and operation of the GEGHA Project will be an incredibly important milestone in the context of demonstrating commercial scale green fuel and fertiliser production in a changing climate.

The commencement of production of green fuel and fertiliser in the North West is paramount to driving NSW and Australia down the low-emissions pathway. The GEGHA Project offers a route to decarbonisation that can ultimately grow at scale in this and other regions to displace large volumes of fossil fuels in hard to abate sectors (transport and agriculture). The strategic importance of the GEGHA Project in the context of our changing climate portrayed in the NARCliM – New England and North West Climate Change Snapshot is significant.

20 SOCIAL IMPACT ASSESSMENT

20.1 Social Impact – Introduction

This Social Impact Assessment chapter has been prepared in accordance with the NSW Government's Social Impact Assessment Guideline (February 2023) and the associated Technical Supplement (February 2023). The level of assessment is commensurate with the level of impact of the project.

Initial scoping stage identified that the Project is likely to have a minor social impact with a greater level of positive impact to the locality and the broader region. A desktop assessment of social impact has been undertaken, supplemented by regular stakeholder engagement and community information sessions during the Project's Planning and Design phase to assist in measuring the level of community sentiment.

This chapter has been prepared by Hiringa's Planning and Engagement lead who has suitable experience and involvement in rurally based State Significant Infrastructure (linear infrastructure) and State Significant Development (energy/ renewable projects) that is suited to a project with minor social impact. The signed declaration provided on the cover page applies to entirety of this EIS, including this chapter.

20.1.1 Assessment Methodology

Social impact assessment methodology comprised the following analysis:

- establishing a study area or social locality;
- describing the baseline conditions for the existing social environment from which to assess the potential impacts of the Project;
- assessing the potential impacts of the Project – both positive and negative impacts;
- developing appropriate and justified responses (e.g., avoidance, mitigation and enhancement measures) to potential social impacts and identifying and explaining any residual social impacts; and
- proposing arrangements, where necessary, to monitor and manage residual social impacts over the life of the Project.

20.1.2 SIA Scoping and Methods of assessment and design consideration

At the outset of the Project, a SIA scoping exercise was undertaken to identify those aspects of the Project that could have a Social Impact on the locality or the broader region. The intent of the initial scoping was to define the size and scale of potential social impacts that could be generated by the Project.

The initial scoping identified the following potential positive benefits and negative social impacts that would have the potential to impact the locality around site or the broader Moree Plains region:

Initial Scoping: Potential positive Social Benefits:

1. Way of Life:
    a. Hydrogen and ammonia produced regionally will offer local agri-business the opportunity to decarbonise, enabling continuation of sustained production in the region.
    b. A green fuel source presents an opportunity to decarbonise the trucking and transport industry which plays a crucial role in supporting agricultural production and secondary production in the region.
2. Livelihoods:
    a. The Project's construction and operation will bring local / regional benefits through direct engagement of personnel and businesses in the region who have the skill set and capabilities to contribute to the Project.
    b. Project value add and indirect creation of new roles in the support and logistics associated with the new plant.

c. Accommodation and service industries would likely benefit from housing the construction workforce provided that there is sufficient capacity.
d. Local production of green hydrogen and ammonia provides energy security. Production is independent to fossil fuel derived market, providing stability and certainty on pricing.

3. Community:
    a. The GEGHA Project operational workforce will likely be recruited from outside the area bringing skilled jobs and families into the region and increasing demand for local goods and services, generating growth.
    b. There is an opportunity for training and skills development locally to provide retention of young people in the region.
    c. The GEGHA Project operational workforce will likely integrate into the local community and contribute to local sports, community interest groups and other community-focused voluntary organisations.

Initial Scoping: Potential Negative Social Impacts:

1. Way of life:
    a. Project may contribute a greater number of vehicles on the road during construction and operation
    b. Plant operation may generate noise, odour or visual impact to neighbouring landowners
2. Community:
    a. Construction workforce may be too large for local accommodation and services to sustain.
    b. Construction may inflate local rentals due to a temporary increase in demand for housing.
    c. Incoming operational personnel may the change character and composition of community.
    d. Incoming operational workforce may increase demand on local goods and services, placing pressure on finite or limited products, services or resources.
3. Health and wellbeing
    a. Project water use may impact surrounding environment and other water users;
    b. Plant production may produce odour that could affect or impact surrounding receptors.
    c. Plant's Major Hazard Facility status and pressurised storage may create community angst or uncertainty.
4. Decision Making Systems:
    a. Members of the community may not have the opportunity to have their say on the proposed development.
    b. Elected members of the community may not be fully informed of the project and its social impact(s).
    c. Key regulatory and community stakeholders may not be fully informed of the project and its social impact(s).

20.1.3 Influence of Preliminary Analysis on Project Impact Analysis and Design

The preliminary analysis influenced the following aspects of impact analysis and design:

- Economic Impact Analysis – an updated appendix to the original EIA
- Groundwater drawdown assessment – analysis of other groundwater users and potential impact to Groundwater Dependent Ecosystems through potential use of groundwater.
- Noise and vibration assessment – noise contouring and measurement in proximity to receptors
- Air Quality – inclusion of odour and its potential to effect receptors
- Preliminary Hazard Assessment: analysis of public safety risk and safety in design
- Consultation – Community engagement, stakeholder engagement and project representation in community events.

20.1.4 Research Methods utilised in undertaking Social Impact Assessment

The following research methods were utilised during the data gathering and analysis of social impact:

- Secondary Data Analysis: Australian Bureau of Statistics (ABS) Census data, technical specialist reports
- Ethnography: ACHAR review and reference
- Stakeholder engagement: consultation in relation to areas of interest or discipline
- Community engagement: consulted and conversed with interested members of the community
- Representation at events: projected the project to a wide range of business owners and community members.

20.1.5 Community Consultation informing Social baseline and impacts

A combination of methods of engagement with the community have been used to inform the development of the social baseline and the identification and consideration of impacts.

Regional scale social baseline

To inform social baseline at a regional scale, a series of community drop-in sessions in Moree have been held throughout the Project planning period to enable interested members of the public to attend, find out more about the Project and share their insights into the existing communities within Moree, regional towns and rural properties.

This has been augmented with meetings with community-focused stakeholders such as the Moree Local Aboriginal Land Council, Moree Plains Shire Council, members of the Moree Chamber of Commerce and engagement with local businesses to determine and understand the social profile of Moree and the surrounding district.

This on-ground, face-to-face interaction with community and stakeholder groups over a period of almost two years to date has enabled the understanding of Moree Plains resident's collective values, traditions and aspirations to secure Moree as a progressive centre for the agricultural industry. There is a collective sense of pride in the region's ability to produce high quality food and fibre with an intent to innovate and progress through utilisation of technology to inform positive land use decision making. Overall, there is respect for the country way of life and a collective motivation towards inclusion, knowledge sharing and betterment for the regional community.

Wathagar locality social baseline

To gain an understanding of the local social baseline, in addition to numerous visits to site and face to face meetings, informal conversations and phone calls with Sundown Pastoral Co and Namoi Cotton on-ground personnel, introduction and consultation has been undertaken with neighbouring property owners.

This consultation has been enhanced by face to face meetings, site walkovers and phone calls with traditional owners and community-focused organisations such as Crown Lands NSW and Local Land Services.

There is collective focus on continuity of land use traditions and sustaining agricultural production whilst protecting natural values. There is a strong collective theme of stewardship in the locality, enabling future generations to enjoy the locality through a combination of protection and progression.

Community consultation informing evaluation of potential social impacts

Collectively, community consultation has raised no concerns over negative social impacts associated with the construction and operation of the GEGHA Project. Consultation in relation to the Project has been positive at both regional scale and within the Wathagar locality.

Whilst low in attendance, community drop-in sessions held in Moree between 19th July, 2023 and 14th November 2024 collectively reflected a willingness for the Project to proceed to with a primary focus on opportunities for local individuals and businesses.

Neighbouring property owners to the Wathagar gin were also supportive of the development with enquiries for green ammonia stemming from one introduction and general interest being received by the others.

These interactions have been valuable in determining the level of interest in the Project from a social/ community aspect. The general public interest has been limited to business owners, educators, technically minded individuals and general interest parties who were all very supportive of the GEGHA Project's development and showed enthusiasm for its development.

Accordingly, the community feed-in to the social impact assessment has focused on the potential to create positive benefits without compromising traditional values or way of life.

20.2 Social Locality

The Moree Plains LGA has been used as the basis to determine and describe the Social Locality. This extent was selected using the following rationale:

- The Project is located within the Moree Plains Shire Council (MPSC) boundary;
- Market: MPSC contains the largest target market for Project customers which means that the majority of product manufacture, transportation and end use are likely to be undertaken within the boundary of the MPSC;
- Service centre: Moree is the focal point in the region with all local services, recreation trades and businesses. It will also be a focal point for the Project during construction and operation.
- Impacts: MPSC will be subject to the impacts associated with the construction and operation of the Project;
- Benefits: The population within the MPSC boundary will be the recipients of Project benefits associated with the Project including accommodation, employment and enhancement to rural enterprise; and
- Voluntary Planning Agreement: The Project's Voluntary Planning Agreement has been developed in close consultation with MPSC officers and is focused on delivering contributions to public infrastructure within the MPSC.

Assessment at LGA level also enables a holistic overview of statistical data and enables a robust assessment of potential social impacts.

20.2.1 Social groups that may be affected by the Project

The following social groups have the potential to be affected by the Project:

- Local residents:
    - On-property Gin Manager's residence (1.4km from the Plant)
    - 4 x residences on Sundown pastoral's property and one seasonal accommodation block in the old Keytah woolshed (~1km from the plant). These properties are collectively referred to as Keytah 1 – Keytah 5 in previous chapters (chapters 9 and 15)
    - 3 x off farm neighbouring landholders (3.9km, 4.2km and 4.4km from the plant)
- Traditional Owners – the Gamilaroi people, custodians of country.
- Project stakeholders identified in chapter 5.
- Businesses who have registered an interest in being involved with the Project's construction and operation.
- Small group of interested community members.

20.3 Social Baseline (Existing Environment)

20.3.1 Regional Context

The Gamilaroi People are the traditional owners and custodians of land and water in the Moree Plains region. Geographically located in the State's north-west, Moree is intrinsically tied to the regions agricultural industry and is a regional centre for social services and local business.

The town is located on the Mehi River and beyond the core commerce of agri-businesses, accommodation, professional services and consumer goods/services has a growing tourism industry based on the town's artesian mineral pools, local artisan products and proximity to nature and heritage rich locations such as Waa Gorge and the Gwydir wetlands.

The redevelopment of Moree Hospital to enhance healthcare facilities and modernise clinical services reflects a commitment by the NSW State government to anchor regional health services in Moree.

More broadly, public administration, education, community development and recreation are all focused within Moree, supporting the broader region with social services and facilities.

20.3.2 Community Profile

An analysis of Moree Plains LGA population and demographics as compared to Regional NSW and the State of NSW is provided in Table 20.1.

Source: https://www.abs.gov.au/census/find-census-data/quickstats/2021/LGA15300

Table 20.1 - Summary of key population and demographic data for Moree Plains LGA, Regional NSW and NSW

Characteristic	Moree Plains LGA	Regional NSW	NSW
Estimated resident population	12,757	2,829,637	8,072,161
Median Age	38 years	43 years	39 years
0-14 years	20.5%	17.9%	18.2%
15-64 years	62.8%	59.8%	64.1%
65+ years	16.7%	22.3%	17.7%
Aboriginal and/or Torres Strait Islander peoples	19.9%	6.6%	3.4%
Australian born	73.2%	81.3%	65.4%
Speaks language other than English at home	5.7%	8.4%	29.5%
Family households	67.5%	68.8%	71.2%
Dwelling owned outright or owned with a mortgage	56.5%	69.2%	64.0%
Dwellings rented	34.3%	26.8%	32.6%

20.3.3 Social Trends and Changes Overview

Based on the 2021 census, communities within the Moree Plains LGA had:

- A population profile closely aligned with NSW but slightly younger profile than Regional NSW, with an average age that is 5 years younger than Regional NSW.
- A significantly higher proportion of people who identified as Aboriginal and/or Torres Strait Islander. Moree has one of the highest indigenous populations in NSW.
- A higher number of Australian born members of the population than NSW but lower than Regional NSW.
- A low rate of population who speak a language other than English at home.
- A 5% lower number of family households than the NSW average.
- A slightly higher rental rate and notably lower ownership rate of housing when compared to Regional NSW and NSW.

Politically, Moree has had Nationals representation for several decades at State and Federal level. Growth. The economy is broadly in a modest growth phase with agriculture being the key barometer to economic performance and output.

The region could be broadly described as being conservatively progressive in its approach to new business, new technology and renewable energy development.

Moree is incubating a modest ag-tech industry with a thirst to adapt technology to better enhance production and performance in the agricultural sector.

Overall, there is a shared strong connection to country and the rural/ country way of life which has a stabilising effect on the region's cultural continuity.

20.3.4 Community, Environment and Way of Life

The broader Project locality comprises the traditional lands of the Gamilaroi people, collectively the custodians of an area of land approximately 75,000km^2 in NSW and south-west Queensland. Most country in the Gwydir valley is now in agricultural production interspersed with Crown land extending along the Gwydir and Mehi River corridors and road corridors, including the Travelling Stock Reserves adjacent to the GEGHA site that form part of the Gwydir Highway road reserve. The Gamilaroi people have a rich cultural heritage including traditional foods, cultivation, stories, songs, dances and arts.

The Gwydir Wetlands State Conservation area is located approximately 29km north-west of the GEGHA site. Created in 2011, the conservation area preserves the terminal delta wetland of the Gwydir River which is one of the few remaining examples of an inland terminal delta in the Murray-Darling basin. Also a Ramsar-listed wetland, the system provides critical wetland habitat to over 75 waterbird species, 50 of which are known to breed there.

Moree, approximately 33km north-east of the GEGHA site can be characterised by having a strong sense of community spirit, resilience and ongoing connection to land and country. Aside from the essential services and businesses serving the community, the town has a healthy population of locals doing enterprising things both inside and outside of the agricultural industry. There are a number of public clubs and open spaces with active and progressive volunteers and advocates. Sport is a unifying theme in the town's recreation and the local aquatic centre is making the most of the artesian hot pools and small lap pool whilst the Olympic size swimming pool is being rebuilt.

The town has a history of reconciliation efforts and is supported by a number of programs focused on overcoming disparities within the community by engaging through sport and education.

The Moree community is served by a wide range of social infrastructure and community services including education, sport and recreation, health care and social services. These are augmented by a variety of community-focused private business and local not-for-profit or volunteer run organisations with a focus on improving quality of life or other social improvement.

The local community in proximity to Wathagar is limited to a small number of landholders and agri-industry workers who are focused on rural production or Gin operations. There is a seasonal influx of short-term, casual workers to assist with the cotton harvest and associated ginning and the cereal harvest. Seasonal work is often undertaken by international workers as well as seasoned or semi-retired locals.

Landholders in the Gwydir Valley are known to possess a progressive attitude towards agriculture and adopting innovative agricultural practices. There is active engagement in improving irrigation efficiency, adopting technology to improve soil science and crop yield as well as adoption of sustainable farming techniques to enhance stewardship of the land.

The majority of residents in the locality work on the land although some smaller landholders have primary jobs off-farm. School age children are either educated locally in Moree (via school bus pick up/drop off) or attend boarding schools in other towns/ cities. Local sport, broader learning and interest is focused in Moree.

Road usage increases modestly around harvest periods with transportation of tractors, headers and other agricultural machinery and equipment common on public roads when transiting between consolidated land holdings.

The Mallowa Picnic Races (horse races) is the most well-known annual event in the locality, held in June at the Mallowa race track approximately 31km south-west of the GEGHA Project footprint. The most direct route from Moree along Mallowa Road avoids the Wathagar Gin and GEGHA Project location. Moree has its own calendar of annual social events, including business networking and learning/ knowledge sharing opportunities.

More broadly, organisations such as the Gwydir Valley Irrigators Association (GVIA) are active in advancing the advocacy of interests for local landowners to support and progress agricultural growth and sustainability. The Young Aggies group

is active in the region, providing an opportunity for young people in agriculture to socialise and knowledge share via a series of meetings culminating in the annual ball in Moree.

Economically, in addition to the regions agricultural production, Moree has a defined Special Activation Precinct (SAP) that aims to maximize development by creating a new hub focused on agribusiness, logistics, food processing and associated industries.

The SAP Master Plan outlines a 40-year vision for the area located just to the south of Moree, adjacent to the airport. The State Environmental Planning Policy (Precincts-Regional) 2021 applies to the SAP and provides a streamlined planning framework to reduce cost and time whilst increasing investor certainty in the area.

A number of infrastructure improvements are proposed leading into and within the SAP including an intermodal hub, rail overpass and East-West connection that would bypass the Moree town centre. There is provision for future hydrogen industry, including hydrogen refuelling within the SAP master plan which aligns very well with the GEGHA Project and future expansion.

20.3.5 Social Infrastructure

There is no social infrastructure located within proximity of the GEGHA Project. All social infrastructure is concentrated in Moree township. The primary interaction with social infrastructure during the Project construction and operation would be:

- Transport of materials, equipment and plant through Moree during construction;
- Transport of dangerous goods (ammonia and hydrogen) through Moree during operation;
- Accommodation of up to fifty construction personnel in Moree for a period of at least 41 weeks;
- Attraction of up to 6 new people and families to Moree during operation.

20.3.6 GEGHA Project Access

The level of social impact associated with site access is negligible. Access is 33km from Moree and will utilise an existing sealed entry with a minor upgrade to formalise basic left and right turns.

An alternative access has been nominated for construction has been nominated via Watercourse Road, Goonal Road and the Keytah property. This is provided as an alternative should the planned upgrade to the Gwydir Highway entrance not be completed prior to mobilisation to site ahead of construction of the GEGHA Plant.

A school bus operates along the Gwydir Highway to Watercourse Road and continues up Watercourse Road during term times. There are no public transport services operating within the vicinity of the site and no other regular recreational activity undertaken within proximity to site.

20.4 Social Impact Assessment Data Gathering Methods and Sources

The following methods and data sources were used in the compilation of the Social Impact Assessment:

- Australian Bureau of Statistics – 2021 Census data for the Moree LGA region
- Australian Bureau of Statistics – 2021 Census employment and population data for Moree
- Engagement with neighbouring landholders within a 5km radius of site.
- Hosted a ‘Meet the Project’ session in November 2024 to meet interested local businesses with an interest in supporting the Project’s construction and/or operation.
- Regular community focused events and hosted public ‘drop-in’ sessions in Moree
- Technical assessment of potential to generate negative impact to amenity (air, noise, odour)
- Technical assessment of hazard and risk associated with the GEGHA Plant
- Evaluation of sourcing and displacement of Ammonia production and importation into the area.

20.5 Evaluation of Social Impact Assessment

Following evaluation of the preliminary social benefits and negative social impacts against measured impacts following completion of specialist assessment, community and stakeholder engagement, one element (Health and Wellbeing) has been identified as having the potential to have a measurable effect on social impact categories. This applies particularly to the employees at the Wathagar gin, the Gin Manager (with reference to their caretaker's residence) and the residents of Keytah 1 – Keytah 5.

20.5.1 Health and Wellbeing Consideration – Wathagar Gin and Keytah residences

Within the terms of Social Impact Assessment, a 'key precinct' is an area that will experience a higher level of impact. Whilst the Wathagar gin, Gin Manager's residence and Keytah properties 1-5 would not be subject to a higher level of impact under typical construction, operation or decommissioning of the GEGHA Project, these receivers are located in proximity to the GEGHA hydrogen and ammonia plant. This brings additional risk should there be a critical failure that leads to a release of ammonia from one of the ammonia storage vessels.

The Preliminary Hazard Analysis (Appendix B.8) revealed that left untreated, these properties would be subjected to toxic injury risk and irritation risk in a critical failure scenario which would pose a threat to public health and wellbeing to nearby residents and the Wathagar gin employees. The Project design team and specialist consultant Arriscar have made provision in plant design to reduce these risks to an acceptable level (refer Appendix B.8). Risk will continue to be analysed during the detailed design phase which will likely further reduce the likelihood of any major risk or hazard occurrence.

Because the risk of a higher level of impact is associated with an emergency scenario involving a critical failure within the plant, it is not considered appropriate to nominate this area as a key precinct on account of its circumstantial nature. There is an ingrained commitment to consult and inform with workers and residents as part of the operating safety case.

Aside from indoctrinating safety in design, the operational plant will have a number of stringent safety measures that will be founded on the Safety case. A Safety case is a comprehensive document that outlines how a major hazard facility (MHF) in NSW manages inherent risks to ensure safe operations.

The core elements of each safety case are:

- Identification of Major Incidents and credible risk scenarios
  Identifies what could go wrong (risks and hazards) and what the potential consequences could be.
- Safety Assessment Summary
  Summarises safety assessment detailing the risks associated with the identified hazards and the measures in place to control credible risks.
- Emergency Plan
  Outlines the procedures to follow in case of an incident to minimise harm to people and the environment.
- Safety Management System
  Details the policies, procedures and practices designed to ensure ongoing safety and compliance.
- Security Arrangements
  This part of the Safety Case details the security measures in place to protect the facility from external threats.
- Consultation and Communication
  It includes information on how the facility has consulted with workers and the community in preparing the safety case.

The residents of Keytah 1-5 and the Gin Manager's residence are associated with Sundown Pastoral Co being workers, or families of workers, on the Sundown property or, in the case of the gin manager, at the Wathagar gin.

Residents of the Keytah properties were briefed of the risk associated with the GEGHA plant on Wednesday 2nd May, 2025 in an open Q and A session. They will continue to be engaged through detailed design, construction and operation of the plant and will form a key consideration in the plant's emergency response planning and continuity of communication about all relevant aspects of the Safety Case.

The Gin Manager and Wathagar gin employees will form a separate important stakeholder group in relation to maintaining health and wellbeing during plant operation. Given the seasonal operation of the gin and transience of casual workers, safety briefings and induction will be provided on an annual basis as part of Plant emergency response planning and readiness.

Beyond participating in emergency response training and annual refresher sessions, the residents if Keytah 1-5, the Gin Manager and employees of the Wathagar gin will not experience any measurable level of impact by the GEGHA Project's construction and operation.

The Project Safety Case and continued regulation of the GEGHA Plant as a Major Hazard Facility will ensure that risk to public health and wellbeing is actively managed to ensure continued safe operation throughout the Plant's lifecycle.

20.5.2 Social Impact Categories described as 'not relevant'

Rationale for those that have been evaluated as 'not relevant' is provided in Table 20.2.

In the context of the SIA guidance, 'not relevant' is described as:

The project will have no social impact, or the social impacts of the project will be so small that they do not warrant consideration.

It should be noted that each category that has been nominated as 'not relevant' specifically relates to the context of its description as a social impact. This is consistent with the SIA scoping worksheet *Glossary of* categories.

In the instance of culture for example, a full Aboriginal Cultural Heritage Impact Assessment Report (ACHAR) has been prepared to quantify and evaluate the full extent of impact associated with the disturbance footprint required by the Project.

Similarly, whilst the Project has a number of social benefits including employment and associated supporting business opportunities, the quantification of that social benefit is a small increment in terms of overall employment and economic output in the region.

Table 20.2 - Summary of 'not relevant' social impacts and rationale

Social impact category	Rationale of why the social impact is 'not relevant'	Reference
Way of life	There will be a minimal impact on way of life with likely truck movements through Moree on the Newell and Gwydir highways. There may be temporary overlap between school bus pick up/drop off on Watercourse Road and its nominated use as an optional access to site during construction. It is considered that the majority of traffic movement would be conducted outside of school bus pick up hours and that any residual Project related traffic would be infrequent and consistent with existing road use. Operationally, the GEGHA Plant will offset the road transportation import of ammonia from Brisbane and Newcastle, saving trafficking on the Newell Highway but increasing truck movement marginally on the Gwydir highway. Otherwise, way of life would remain unaffected. The introduction to a local green source of fertiliser and fuel source will create a social good, offering support to the region's agricultural producers in meeting their future emission profile commitments and offering a ready-made source of hydrogen to fuel the transition of heavy goods vehicles away from fossil fuel usage. Ammonia (fertiliser) use averages ~50,000 tpa in NSW and QLD. Additionally, Ammonia can directly displace granular urea which averages 1.9 million tpa.	Traffic and Transport chapter 8 Appendix B.2 Traffic Impact Assessment
Community – Construction	Construction of the GEGHA Plant will require a maximum of up to 50 personnel on site. Assuming that they are all sourced from	Moree Tourism consultation

	outside of the Moree region, a maximum accommodation requirement would be 50 beds out of at least 800 available beds (conservatively 6.25% of available accommodation) for a period of approximately 22 weeks. This Project need is quantified and assessed in further detail as part of the Accommodation Strategy (section 20.7). It can be demonstrated that the Project's worst-case accommodation need can fit comfortably within the available vacancy rate and the approach to accommodate itinerant workers within available accommodation in Moree is supported by Moree tourism and local motel operators. Beyond the inflow of temporary workers during the construction period, there are no other Social impacts associated with community.	
Community – Operation	Operationally, it is expected that a maximum of up to six new employees and their families (if applicable) would be required to relocate to Moree or the surrounding area. Population of the greater Moree area in the 2021 census was 7,845 people. Assuming six families move to the area to undertake operational roles at the GEGHA plant (assume 2 adults, 2 children), that represents a 0.3% population increase which does not warrant further consideration.	ABS Census data 2021.
Access	There will be a marginal increase in traffic through Moree during construction and operation of the GEGHA Plant, particularly along the B76. This includes passing St Philomena's Catholic Schook and the Goodstart Early Learning Centre on Gwydir Street. From a social impact perspective, the majority of traffic movement would be outside of hours when school crossings are active. The importance of positive and respectful driver behaviour has been raised by the Project's Traffic Impact Assessment (Appendix B.2). The site access itself and proposed traffic volumes for construction and operation have also been thoroughly considered by the Traffic Impact Assessment and would represent a negligible social impact overall.	Traffic and Transport chapter 8 Appendix B.2 Traffic Impact Assessment
Culture	Whilst the culture and traditions of the Gamilaroi people is acknowledged and their connection to country is respected, the construction and operation of the GEGHA Project does not impact or influence cultural values, customs or beliefs associated with the site. Based on the outcomes of the ACHAR, there is no associated physical or intangible harm associated with the development.	Heritage chapter 15 Appendix B.7 Aboriginal Cultural Heritage Impact Assessment.
Health and Wellbeing	Health impacts associated with noise, dust, odour, vibration, lighting, etc have been considered and their effects avoided. Impact to adjacent residents has been assessed by technical specialists in relation to Air Quality, Odour, Noise and Vibration and Risk/ Safety with appropriate controls and mitigations being adopted to ensure safety and reassurance during construction and operation, including the eventuation of a failure scenario. Surrounding residents (Keytah 1-5) were briefed on the Project, including the potential for generation of dust during construction. The briefing also included construction and operational noise and odour as well as its status as a Major Hazard Facility that will produce, store and load out dangerous goods (ammonia and hydrogen).	Noise and Vibration chapter 11 Appendix B.9 Noise and Vibration Assessment. Air Quality chapter 9 Appendix B.19 Air Quality Assessment. Hazard and Risk chapter 6 Appendix B.8 Preliminary Hazard Assessment

	The briefing was held as an open Q & A forum where residents could raise any questions or concerns at any point during an overview presentation. There was no concern from any residents in relation to the development. The connection to Sundown Pastoral Co means that should there be any unforeseen issue with amenity (noise, dust, odour, etc), it would be able to be raised internally for investigation and appropriate action. The broader community has also shown no issue or concern to date with the Project or its Major Hazard Facility status through the Project's Information Sessions or via any of the Project's external communication methods.	Consultation and Community Engagement chapter 5 Appendix G GEGHA Consultation Record and Community Consultation Plan
Surroundings	Impacts on water demand/use, visual amenity and existing site condition has been evaluated by technical specialists with marginal effects being determined. The likelihood of a negative social impact being caused to surroundings by the construction and operation of the GEGHA Project is negligible.	Soil and Water chapter 10 Appendix B.12 Groundwater Drawdown Assessment
Livelihoods	Whilst employment and retention of skills in the local workforce are two areas of social good, the scale of the GEGHA plant's construction is small. The Economic Impact Analysis (Appendix B.1) attributes a total direct and indirect addition of 16.1 jobs to the Project during construction and 16.9 jobs during operation. In the 2021 census, Moree had a total of 3,214 employed people. The jobs created by the Project, whilst positive to Moree and the Moree Plains region, amounts to 0.5% of the local employment total. In terms of GDP, Total output and value add from the Plant's construction amounts to ~$12million whilst the Project's total output and value add during operation is estimated at $20.63 million. This represents 0.0000017% of the region's economic output. Social impact on livelihoods is therefore discounted from further assessment due to its marginal positive impact.	ABS Census data 2021
Decision-making systems	Neighbouring properties are remote from site (closest off-farm receptor is 3.9km away). Landholders and residents have been engaged and provided with Project information. Regular stakeholder engagement and community engagement has been undertaken during the planning and design of the Project. Community engagement has centred around informal 'drop-in' style sessions augmented by attendance at broader community events and forums. Collectively, Project interest has been positive with no negative sentiment recorded to date. Community forum attendance has been low with those who have attended interested in the opportunities that would be created by the Project. HSPT will continue to be present in the community, attending future public events in the region and will continue to maintain the Project website and dedicated project email for members of the public with a general interest, enquiry, feedback or complaint to register their details and nature of contact. The Emergency Response Plan (ERP) is provisioned to contain a clear procedure to identify potentially affected receptors and make provision to promptly notify those receptors in the event of an unplanned release or failure event.	Project website (www.gegha.com.au) Consultation chapter 5

20.6 Social Impact Data Limitations

Conducting a Social Impact Assessment (SIA) for the GEGHA Project presents some regional challenges. The sparse population density and remote nature of the Project often result in limited baseline data, making it difficult to establish a baseline or measure changes accurately.

Additionally, the small community size within the Moree Plains LGA can lead to limited statistical significance, complicating the ability to draw robust conclusions.

The availability of relevant and up-to-date data is often constrained by resource limitations, lack of detailed previous social impact and the relative remoteness of the area.

These factors collectively contribute to the complexity of accurately assessing the social impacts of developments in North West NSW.

In preparing this SIA, HSPT has referenced available desktop data and validated findings via community engagement and stakeholder consultation.

20.7 Accommodation Strategy

Housing and accommodation in Moree has been analysed when developing the Project's workforce accommodation strategy. Evaluating the capacity and capability of existing accommodation options in Moree is central to determining whether construction of the GEGHA Plant can be completed by housing itinerant workers in hotel or motel accommodation without disrupting availability for tourists or other business travellers.

20.7.1 Commercial Accommodation

Moree has at least 23 short-term accommodation options available with a cumulative available bed total of over 800 beds per night. The accommodation options are a mixture of motels (primarily), hotels and caravan parks with cabin accommodation options.

The Newell Highway, Gwydir Highway and Carnarvon Highway all pass through Moree with the majority of accommodation being sought by those travelling interstate, on business in the region or travelling to visit family, friends or attend the Moree artesian baths.

Occupancy rates post-COVID typically operate up to 70% capacity during the week from Tuesday to Thursday, reflecting most demand from those travelling for business. Occupancy then drops from Friday to Monday.

To avoid impacting adversely on accommodation availability in Moree, the recent Inland Rail project accommodated workers in a construction camp on the south side of Moree. The section between Narrabri and North Star was completely refurbished with workforce peaking at 350 personnel (seven times larger than the planned GEGHA peak construction workforce). This facility was temporary for the duration of the work and has since been decommissioned.

20.7.2 Private Accommodation

Private accommodation such as holiday homes and investment properties may be used to house construction workers. ABS Census Data (2021) indicates that 18.3% of dwellings in the social locality were unoccupied which was higher than the number of unoccupied dwellings in Regional NSW of 11.2% and the State average at 9.4%.

Source: https://www.abs.gov.au/census/find-census-data/quickstats/2021/LGA15300

Table 20.3 - Private Accommodation

	No. of Occupied Dwellings	No. Unoccupied Dwellings	Total No. Dwellings	Unoccupied Dwelling Share
Moree Plains LGA	4,042	906	4,948	18.3%
Regional NSW	1,071,609	134,891	1,206,500	11.2%
NSW	2,900,468	299,524	3,199,992	9.4%

A search of realestate.com.au in January 2025 returned 17 properties available to rent in Moree ranging from 1 to 3 bedrooms. A further three properties are known to be available for short-term rental.

20.7.3 GEGHA Project Accommodation Needs Analysis

Construction - Accommodation Needs

It has been estimated that the Project will have a construction period of at least 41 weeks with a peak of up to 50 people on site. The Peak is estimated to occur between week 9 and week 31 of the construction program with at least 12 weeks having a site-based requirement of up to 50 people. There will be a constant fluctuation of trades, operators and services.

This estimate is inclusive of the construction contractor's management personnel and HSPT site representatives.

Operation – Accommodation Needs

During operation, the plant's staffing requirements are provided in Table 20.4.

Table 20.4 - GEGHA Plant crew summary

Role	Location	Work Roster	FTE Count
Facility Engineer and Ops Manager/ Supervisor	Sydney	Normal Week – on call	0.5
Facility Supervisor	Moree Region	Weekdays on site. Call out after hours and weekends.	1
Operator Technician	Local – on site	12 hours: 7 days on, 7 days off	5 (over 4 shifts)
Trainee – Apprentice	Local – on site	12 hours: 7 days on, 7 days off	1
Maintenance Contractors	Local – on site	As Required	As necessary

Other indirect roles that will arise from operation of this Project include:

- Truck drivers for offtake/logistics transport.
- Earthworks and civils contractors.
- Specialist engineering contractors.

20.7.4 Impact Assessment – Construction

Construction Phase – Moree Accommodation Capacity

The Project will have a construction peak of up to 50 people on site. Some of these personnel may be Moree (or Moree regional residents) and would not require a bed but to be conservative, the Project can estimate a need for 50 beds per night from at least 23 weeks.

Using a conservative hotel and motel capacity of 800 beds per night and a conservative occupancy rate of 75%, that creates a capacity of 200 available beds in Moree each night. This leaves at least 150 available beds for any additional 'last minute' or 'unexpected' accommodation seekers per night.

Consultation has been undertaken with Moree Tourism and motel operators who have confirmed their support of an accommodation strategy of ustilising existing accommodation options in Moree. There is a greater potential for

throughflow of expenditure in food and consumable purchases to Moree businesses when located in town compared to other options such as a site-based construction camp.

It is proposed that workers would be accommodated across several different premises so as to spread the benefit and utilise vacant capacity across a number of establishments.

Operation Phase – Moree Accommodation Overview

It is expected that the operational workforce would require up to six new individuals, potentially with families, to move to the region. There are a range of accommodation options in Moree and surrounding region with properties available to both rent and buy. A search of realestate.com.au in January 2025 returned 17 available property rentals and 121 properties for sale within a 10km radius of Moree.

HSPT is in discussions with the Regional NSW, DPIE and Department of Education, who are offering support to assist in attracting and locating personnel locally.

20.8 Social Impact - Cumulative Impacts

In consideration of the size and scale of project construction and operational workforce, there are no negative cumulative social impacts associated with the GEGHA Project.

HSPT is aware that the $105 million Moree Hospital upgrade project is likely to be ongoing during the GEGHA Project construction period. No detailed information exists as to the Project's local content strategy or need for accommodation.

It is not immediately apparent that the two projects will be competing directly for resources or accommodation.

HSPT undertake to contact the Project's management team to ensure that there is mutual awareness relating to project timing and peak periods where on site personnel will be higher.

20.9 Social Impact - Mitigation Measures

Mitigation measures to manage potential social impacts caused by the Project's construction and operation are summarised in Table 20.5 below.

Table 20.5 - Proposed Mitigation Measures

Reference	Mitigation Measure	Timing	Responsibility
SIA01	Establish contact with Project Management leading the Moree Hospital upgrade project to determine local content planning and accommodation strategy.	Construction	HSPT
SIA02	Confirm accommodation providers prior to mobilisation to site.	Construction	HSPT
SIA03	Ensure that the Construction Environmental Management Plan contains provision for recording and response to enquiries, feedback and complaints. Where complaints are received, HSPT must have a robust and responsive mechanism to engage with the complainant and take all reasonable action to remedy the complaint as soon as is practicable.	Construction	HSPT
SIA04	Include provision for feedback, enquiry and complaint via maintenance of the Project website with enquiry form and the project email.	Construction Operation	HSPT
SIA05	Operational EMP shall have provision for enquiries, feedback and complaints.	Operation	HSPT

	HSPT must have a robust and responsive mechanism to engage with the complainant and take all reasonable action to remedy the complaint as soon as is practicable.		
SIA06	Work with Regional NSW, DPHI and Department of Education to identify and locate an operational workforce in Moree and the surrounding area.	Operation	HSPT
SIA07	Operational Emergency Response Plan will have provision for the prior identification of potentially impacted receptors and a clear procedure for notification and management in the event of an unplanned event on site.	Operations	HSPT

21 ECONOMIC IMPACT

A Project Economic Impact Assessment (EIA) was originally prepared for the GEGHA Project in August 2022 by Remplan in support of the Project's successful funding application to the NSW State Government Hydrogen Hubs Initiative program.

An addendum was added in October 2024 to reflect the change in basis of design and progression in construction delivery method and operational asset management framework.

Whereas the 2022 EIA incorporated the Project as a whole (GEGHA Plant + Wathagar Solar Farm Stage 2), the 2024 addendum focuses on the scope of this Environmental Impact Statement and is presented in Appendix B.1.

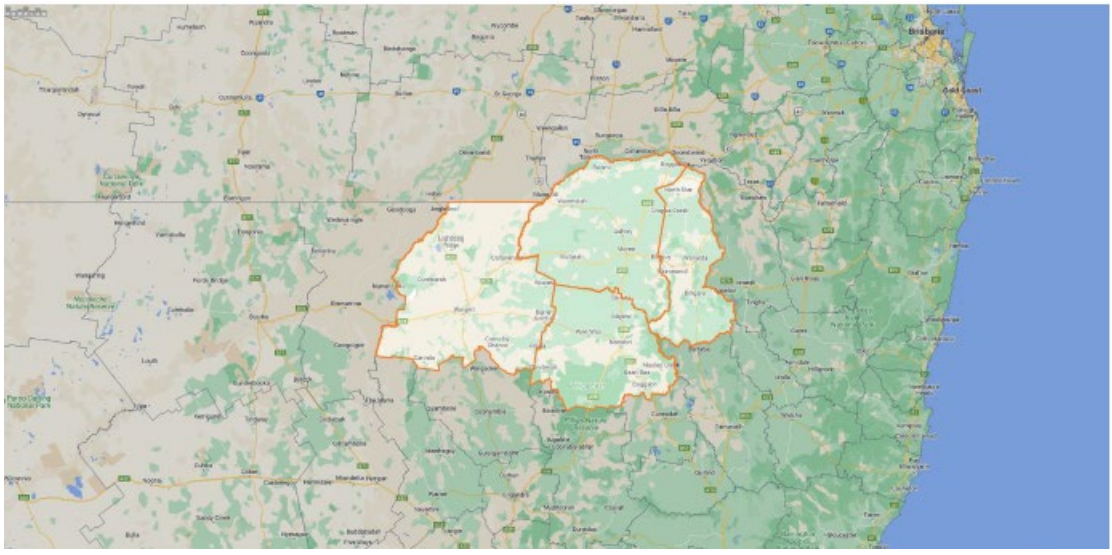
21.1 Economic Impact - Introduction

This chapter outlines the economic impacts and benefits that the GEGHA Project will have to the Moree Plains Region and the State of NSW. This chapter and its related appendix collectively address the requirements of section 21 of the Project SEARs (Appendix A).

21.2 Economic Impact Assessment Methodology

The EIA applies economic data from the defined regions of Upper North West functional economic region (figure 21.1) and the State of New South Wales. It incorporates data sourced from the ABS 2016 Census (Place of Work), 2018/19 ABS National Input / Output Tables and the ABS Gross State Product (June 2021).

Figure 21.1 - Upper North West Functional Economic Region (FER)



Assessment has been broken into Construction and Operational phases. Construction estimates are calculated over a 21 month period (construction and commissioning). Operational assessment has been calculated over 20 years to align with Hiringa's detailed revenue and cost estimates.

Economic impacts are reported in terms of:

- Output/ Revenue ($M)
- Value-added ($M)
- Employment (Jobs).

21.3 Economic Impact Assessment

21.3.1 Estimated Development Cost

An independent estimated development cost for the project has been prepared (Appendix J) in accordance with the Environmental Planning and Assessment Regulation 2021 and as per the Planning Circular PS 24-002 titled '*Changes to how development costs are calculated for planning purposes'* issued by the NSW Government dated 27 February 2024 and the *Standard Form of Estimated Development Cost Report (State significant projects) – October 2024* issued by the DPHI.

The estimated construction cost has been used as a baseline document in the preparation of the EIA addendum (Appendix B.1).

21.3.2 EIA Construction Phase

Construction Output

The direct local expenditure of $33.63 million within New South Wales on construction and set-up costs will generate an additional demand for intermediate goods and services of $23.19 million. These supply chain effects include multiple rounds of flow-on effects, as servicing sectors increase their own output and demand for local goods and services in response to the direct change to the economy. The consumption effects under this scenario are estimated at $19.30 million.

Total output, including all direct, supply chain and consumption effects is estimated to increase up to $76.11 million over the construction period.

Construction Value-added

From a direct increase in revenue for local businesses $33.63 million, the corresponding increase in direct value-added in New South Wales is estimated at $11.08 million. Flow-on supply chain effects in terms of local purchases of goods and services (indirect impacts) would result in a further increase to value-added of $9.13 million.

The consumption effects under this scenario are expected to further boost value-added by $9.87 million. Total value-added, including all direct, supply chain and consumption effects is estimated to increase by up to $30.07 million.

Construction Employment

The construction expenditure corresponds to the creation of 59.6 direct FTE jobs. The indirect impacts would result in a further 45.6 jobs.

The consumption effects under this scenario are estimated to further boost employment by 40.3 jobs. Total employment, including all direct, supply chain and consumption effects is estimated to increase by up to 145.5 FTE jobs across the State.

It is important to note that these are not annual job numbers, but the number that would be supported across the total construction period.

Construction Phase Summary

Total economic impacts in New South Wales over the construction phase, including all direct and indirect economic effects, are anticipated to support up to:

- $76.11 million in increased output/revenue for local business
- $30.07 million in value-added
- 146 jobs in the State's economy over construction phase.

Table 21.1 Summarises the Construction phase impacts within New South Wales and the Upper North West FER.

Table 21.1 - Construction Phase Summary – New South Wales and Upper North West FER

New South Wales				
Impact Summary	**Direct Effect**	**Supply Chain Effect**	**Consumption Effect**	**Total Effect**
Output ($M)	$33.63	$23.19	$19.30	$76.11
Value-Added ($M)	$11.08	$9.13	$9.87	$30.07
Employment (FTE Jobs)	59.6	45.9	40.3	145.5
Upper North West Functional Economic Region				
Impact Summary	**Direct Effect**	**Supply Chain Effect**	**Consumption Effect**	**Total Effect**
Output ($M)	$5.66	$2.35	$0.98	$8.99
Value-Added ($M)	$1.54	$0.86	$0.58	$2.98
Employment (FTE Jobs)	8.5	5.2	2.3	16.1

21.3.3 EIA Operational Phase

Operational Output

From a direct increase in annual output of $12.82 million it is estimated that the demand for intermediate goods and services in New South Wales would increase by $5.56 million. These annual supply chain effects include multiple rounds of flow-on effects.

The increases in output typically correspond to the creation of additional jobs and payment of wages and salaries in the region. A proportion of these wages are typically spent on consumption and a proportion of this expenditure is captured in the New South Wales economy. The consumption effects under this scenario are estimated at $2.91 million.

Total output, including all direct, supply chain and consumption effects is estimated to increase by up to $21.29 million per annum.

Operational Value-added

From a direct increase in annual output of $12.82 million, the corresponding increase in direct value-added in New South Wales is estimated at $2.35 million. Flow-on supply chain effects in terms of local purchases of goods and services (indirect impacts) would result in a further increase to value-added of $2.08 million.

The consumption effects under this scenario are expected to further boost value-added by $1.49 million. Total value-added, including all direct, supply chain and consumption effects is estimated to increase by up to $5.92 million per annum.

Operational Employment

The new facility will support 10.5 direct jobs, including 7.5 jobs on-site for the ammonia facility, 2.3 additional jobs at Sundown Pastoral, and 0.7 additional jobs in management and admin roles at Hiringa Energy.

From a total of 10.5 direct jobs supported in New South Wales, with the indirect impacts resulting in a further 9.6 jobs. The consumption effects under this scenario are estimated to further boost employment by 6.1 jobs.

Total employment, including all direct, supply chain and consumption effects is estimated to increase by up to 26.2 jobs.

Operational Phase Summary

Total annual operational economic impacts from 2026 (Table 21.2), including all direct and indirect economic impacts, in New South Wales is anticipated to support up to:

- $21.29 million per year in revenue for local businesses and organisations each year
- $5.92 million per annum in value-added
- 26.2 FTE jobs within the State's economy.

For every new ongoing job created through the operation of the facility, it is estimated that around 1.5 jobs are supported throughout the New South Wales economy. This high multiplying effect is largely a result of the productive nature of the facility which is able to generate relatively high revenue from a smaller number of on-site employees.

Table 21.2 - Operational Phase Summary – New South Wales and Upper North West FER

New South Wales				
Impact Summary	**Direct Effect**	**Supply Chain Effect**	**Consumption Effect**	**Total Effect**
Output ($M)	$12.82	$5.56	$2.91	$21.29
Value-Added ($M)	$2.35	$2.08	$1.49	$5.92
Employment (FTE Jobs)	10.5	9.6	6.1	26.2
Upper North West Functional Economic Region				
Impact Summary	**Direct Effect**	**Supply Chain Effect**	**Consumption Effect**	**Total Effect**
Output ($M)	$12.82	$2.96	$0.91	$16.70
Value-Added ($M)	$2.35	$1.03	$0.55	$3.93
Employment (FTE Jobs)	9.3	5.5	2.2	16.9

21.4 Economic Cumulative Impact

Cumulatively within the Upper North West FER and in the State of NSW, construction and operation of the GEGHA Project is an overwhelming economic benefit.

22 PROJECT JUSTIFICATION

22.1 Project Justification – Overview of this chapter

This chapter provides justification and evaluation of the GEGHA Project as a whole following social, economic and technical assessment. This chapter condenses the rationale for the Project, providing a succinct summary of compliance, risks, negative aspects and benefits.

22.1.1 Project Justification - Project Rationale

The GEGHA Project is needed for three key reasons:

1. **Green energy:** The Project will enable its customers to access fuel and fertiliser derived entirely from renewable energy sources, providing a pathway to decarbonise agricultural production and transport supply chain.
2. **Local production:** Hydrogen and Ammonia will be produced, delivered and used in the region. The GEGHA Project will save thousands of kilometres of fuel and ammonia transport to the region from Newcastle and Brisbane.
3. **Security of supply:** The GEGHA Project is focused on agriculture and heavy goods transport in the region. The Project will provide certainty and security of supply, placing priority on agricultural customers with a product that will be decoupled from fossil fuel driven supply cycles and fluctuations in price.

The NSW Hydrogen Strategy recognises the potential for green hydrogen to be implemented in regional areas, which will enable the decarbonisation of hard-to-abate sectors like agriculture and transport.

The GEGHA Project represents a valuable opportunity to demonstrate commercial, operational, and technical feasibility of rapid, wide-spread hydrogen adoption in NSW's regions.

This will be achieved by demonstrating feasibility of the GEGHA operating model, which comprises all assets and infrastructure to enable place-based energy capture and generation, as well as hydrogen and ammonia production, storage, and end use.

Whilst serving as an invaluable precedent which demonstrates a commercial solution to overcome existing barriers preventing regional industry adoption, the commercial-scale GEGHA Project will deliver significant economic, environmental, and social benefits to one of NSW's key agricultural hubs.

22.1.2 Consistency with Objectives of the EP&A Act

Table 22.1 - Consideration of the GEGHA Project's consistency with the Objectives of the EP&A Act

EP&A Act Objective	Consistency of GEGHA Project with the Objective
to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	Production of green hydrogen and green ammonia creates a better environment by virtue of direct abatement of fossil fuel derived fuel and fertiliser alternatives. The GEGHA Project provides overwhelming positives in relation to economic outcome in regional NSW. Social impact will have a positive influence on retention of skilled workers in the North West region during operation. This EIS demonstrates that the Project can be constructed and operated effectively whilst conserving the State's natural and other resources.
to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically Sustainable Development has been considered in section 17.3 of this EIS and summarised in section 20.3.

EP&A Act Objective	Consistency of GEGHA Project with the Objective
to promote the orderly and economic use and development of land	Intended land use is seen as both orderly and economic. Subject land for the construction and operation of the Project utilises a redundant portion of an operational Gin yard which importantly does not displace high quality agricultural land. The land is zoned RU1 – Primary production however it has not been utilised for agricultural production (i.e. growing crop) for 40 years. The location of the Project has an unrivalled advantage of being proximate to power source, water source and its largest customer, making its location ideal for this type of development.
to promote the delivery and maintenance of affordable housing.	The construction and operation of the Project would have a neutral effect on the delivery and maintenance of affordable housing. Whilst the Project would encourage the relocation or retention of up to 10.5 FTE directly (26.2FTE overall effect) within the Functional Economic Region, it is not anticipated that the core function of the Project would be impactful on delivery and maintenance of affordable housing.
to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Following completion of ecological assessments, the principled of avoidance and minimisation have been applied to residually impact on 0.4ha of derived shrubby woodland associated with PCT 39.
to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Cultural heritage assessment has been completed and no items of historical or sites of cultural heritage will be impacted by the construction and operation of the Project. Accidental discovery protocols have been nominated and will be adopted should any suspected accidental discovery be uncovered during earthworks. It is expected that construction and operation of the Project would be neutral towards sustainable management of built and cultural heritage (including Aboriginal cultural heritage).
to promote good design and amenity of the built environment.	Distinguishable characteristics of the predominant agricultural character within and surrounding the GEGHA Project are unlikely to be significantly altered by the GEGHA Project. Existing characteristics within and surrounding the GEGHA Project site will have a moderate to high capability to absorb visual change without significantly modifying views beyond the GEGHA Project site.
to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	A Preliminary Hazard Analysis was undertaken for the Project which demonstrates that the risks from the Project comply with all quantitative and qualitative land use safety risk criteria in HIPAP No.4. Design of the Project will be in accordance with all relevant design standards.
to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	All relevant local and State environmental planning instruments and legislation have been considered in preparing the EIS. Moree Plains Shire Council has been, and will continue to be, consulted as a key referral agency in the planning process.

EP&A Act Objective	Consistency of GEGHA Project with the Objective
	The EIS addresses issues raised by the Council in relation to the movement of dangerous goods through Moree.
to provide increased opportunity for community participation in environmental planning and assessment.	HSPT has been particularly active in offering public information sessions and opportunity for engagement with the Project team throughout the Project's planning and preliminary design phase. This EIS will be publicly exhibited and HSPT welcome any submissions in relation to the Project. Any submissions would be considered by HSPT and responded to appropriately. The Minister for Planning would ultimately consider public interest when determining the development application.

22.1.3 Consistency with principles of ESD

The Project aligns closely with the principles of ESD. Section 17.3 of this EIS provides a full evaluation of the Project against the principles of ESD. These are summarised in Table 22.2.

Table 22.2 - Summary of the Project's consistency with the Principles of ESD.

Principle of ESD	Summary of GEGHA Project alignment
The precautionary principle	Thorough assessment of environmental aspects and impacts of the full project life cycle has been completed. There are no identified threats of serious or irreversible environmental damage. All negative impacts have minimal extent, low severity and are largely restricted to the disturbance footprint.
Inter-generational equity	The operation of the GEGHA Project signifies an important advancement in the decarbonisation of fertiliser and fuel in NSW. The operation of the GEGHA Project fulfils the following inter-generational equity objectives: • meet the needs of the present without compromising the ability of future generations to meet their own needs. • Localised production of a low emission product that will abate carbon emissions in the fuel and transport industries. • Enhancement of agricultural productivity and regional agricultural sustainability. • Strategic commercial operation that will lead the energy transition in NSW.
Conservation of biological diversity and ecological integrity	Development of the GEGHA Project within the yard of an existing operational Cotton Gin has ensured that there would be a minimal impact on biological diversity and ecological integrity. There will be no impact to threatened flora, fauna or threatened ecological communities. The 0.4ha of PCT 39 DNG Shrubby will be offset. Effective implementation of the CEMP and OEMP will ensure clearing is limited to the disturbance footprint.
Improved valuation, pricing and incentive mechanisms	The GEGHA Project's construction and operation will create a net positive environmental benefit which has been quantified in the Project's life cycle analysis (Appendix B.19).

Principle of ESD	Summary of GEGHA Project alignment
	Pricing of the energy produced by the plant will reflect the full environmental costs and benefits. This will assist by providing end consumers and businesses to make more environmentally informed choices.

22.1.4 Strategic Context

The NSW Hydrogen Strategy recognises the potential for green hydrogen to be implemented in regional areas, which will enable decarbonisation of hard-to-abate sectors like agriculture and transport.

The Project is supported by the NSW Government Hydrogen Hubs Initiative which is a key action under the NSW hydrogen strategy with the ultimate aim to increase the production and availability of green hydrogen across the State with a green hydrogen capacity target of 700MW by 2030.

The development is permissible on the subject land, zoned RU1 - Rural Production under the Moree Plains LEP. Section 3 of the Zone RU1 Land Use Table allows development of 'Heavy industrial storage establishments' and 'heavy industries' with consent.

The Project is consistent and generally aligns with all planning instruments

22.1.5 Site Selection and alternatives

In addition to a 'do nothing' option, section 2.7.2 also considers the use of alternative technology and alternative Project location within the Moree Special Activation Precinct.

The Project's site within the operational footprint of the Wathagar Gin was selected specifically because of the unique opportunity to develop a local source of green hydrogen and ammonia without compromising existing agricultural production.

Selection at this location also offers the following strong advantages:

- Protection: the site is located within an existing flood levy which acts as a flood prevention device and provides the indirect benefit of a visual screening to site from the Gwydir Highway
- Proximity to Plant feedstock (Power and Water):
    - The Wathagar Solar Farm will be immediately adjacent to the Plant
    - Water is available from an existing 198ML drainage dam and an existing groundwater bore.
- Proximity to infrastructure:
    - Site is immediately available to the Gwydir Highway and directly accessible via the broader NSW Highway network.
    - The Wathagar substation is already located on the same land parcel as the GEGHA Plant. This will enable direct power connection as backup to the solar farm for critical instrumentation.
- Proximity to market:
    - Sundown Pastoral Co. will be able to access and deliver 1,700 tonnes of anhydrous ammonia per annum without the need to enter on to public roads. This will generate a net saving of 54 return truckloads of fossil fuel derived Ammonia per annum – a direct saving of 28,782km of loaded DG movement and 28,782km empty return load on the NSW public road network. This equates to a saving of approximately 18,132 litres of diesel by deriving a local supply of ammonia.
    - The sale of the remaining 2,800 tonnes per annum of anhydrous ammonia to a broader network of agricultural customers would create a net annual reduction of 35,464km of loaded DG movement on the NSW public road network and a further net reduction of 35,464km in returning empty loads. This equates to a saving of approximately 22,342 litres of diesel by deriving a local supply of ammonia – based on a delivery area of 100km from the GEGHA Plant.
    - Total fuel savings amount to 40,474 litres of diesel per annum.

Given the excellent suitability of site generated via a combination of its strengths and uniqueness, no further alternatives were considered.

22.1.6 Social Analysis

As part of the initial Project Social Impact scoping in chapter 20, a number of potential positive and negative impacts associated with the Project were identified across 'Way of Life', 'Livelihoods', 'Community' and 'Health and Wellbeing'.

Following evaluation of the preliminary social benefits and negative social impacts against measured impacts following specialist assessment and community and stakeholder engagement, one element, health and wellbeing, was identified as a matter for consideration for local residents living in Keytah 1- Keytah 5 residences, owned by Sundown Pastoral Co. in the unlikely event of a catastrophic plant failure focused on the ammonia storage. This impact was evaluated as being highly circumstantial with negligible likelihood given the focus on safety in design and stringent regulatory framework led by the Project's safety case that will be implemented, actively monitored and enforced during the GEGHA Project's operation.

The remainder of elements were defined as 'not relevant' with no elements identified as having a measurable effect on social impact categories.

In the context of the SIA guidance, 'not relevant' is described as:

The project will have no social impact, or the social impacts of the project will be so small that they do not warrant consideration.

It should be noted that each category that was nominated as 'not relevant' specifically relates to the context of its description as a social impact. This is consistent with the SIA scoping worksheet Glossary of categories.

Assessment of 'not relevant' applies to both positive and negative social impacts. Whilst the Project has a number of social benefits including employment and associated supporting business opportunities, the quantification of that social benefit is a small increment in terms of overall employment and economic output in the region.

22.1.7 Economic Analysis

The GEGHA Project has a very positive economic outlook which is detailed in chapter 21 and summarised in this section. Total economic impacts in New South Wales over the GEGHA Project's construction phase, including all direct and indirect economic effects, are anticipated to support up to:

- $76.11 million in increased output/revenue for local business
- $30.07 million in value-added
- 146 jobs in the State's economy over construction phase.

Total annual operational economic impacts from 2026, including all direct and indirect economic impacts, in New South Wales is anticipated to support up to:

- $21.29 million per year in revenue for local businesses and organisations each year
- $5.92 million per annum in value-added
- 26.2 FTE jobs within the State's economy.

For every new ongoing job created through the operation of the facility, it is estimated that around 1.5 jobs are supported throughout the New South Wales economy. This high multiplying effect is largely a result of the productive nature of the facility which is able to generate relatively high revenue from a smaller number of on-site employees.

22.1.8 Environmental Analysis

In consideration of all technical reports provided in Appendix B, the GEGHA Project will have a net environmental benefit for the locality, the region and the State of NSW.

The project disturbance footprint is largely located within an operational Cotton Gin with impact being limited to 0.4 hectares of derived shrubby PCT 39 that will be offset prior to the commencement of construction.

No items of Cultural heritage or non-aboriginal heritage were located on site and no land contamination was detected.

Public safety is within an acceptable range of tolerance whilst air quality, noise and visual impacts are all described as having a low to negligible impact on the receiving environment.

Access is appropriate for both construction and operational phases whilst traffic volumes generated by the project is well within the capacity of the Gwydir Highway and local road network.

There is little land use conflict or opportunity to impact adjacent Crown land parcels. Bush fire risk has been assessed and is manageable subject to establishment and maintenance of sufficient asset protection zones.

The operation of the GEGHA Plant would require the construction and operation of an evaporation pond that will require remediation during its decommissioning, however this is expected to be a routine action.

Operational water needs can be sustained largely via the existing Wathagar drainage dam with supplementary supply option from groundwater via an existing water bore (subject to further licencing and approval).

22.1.9 Proposed Compliance Framework

Construction Compliance Framework

A Construction Environmental Management Plan (CEMP) is proposed to be prepared and implemented during construction to establish the environmental framework that clearly defines the effective management controls for the construction of the GEGHA Project.

The CEMP will:

- defines environmental performance objectives and environmental performance standards, against which environmental performance shall be measured;
- describes consultation that will be undertaken with relevant stakeholders;
- identify and assess the environmental risks arising directly or indirectly from the construction and potential unexpected scenarios;
- describe an implementation strategy that will be used to ensure the environmental risks are eliminated or minimised as far as reasonably practicable.
- minimise disturbance to surrounding landholders and sensitive receptors; and
- ensure all relevant legal and regulatory environmental requirements are documented, communicated to the project team, complied with and reported against.

Operational Compliance Framework

An Operational Environmental Management Plan (OEMP) will be prepared and implemented during the GEGHA Project's operation.

The OEMP will:

- defines environmental performance objectives and environmental performance standards, against which environmental performance shall be measured;
- identify and assess the environmental risks arising directly or indirectly from the GEGHA Project's operation;
- describe an implementation strategy that will be used to ensure the environmental risks are eliminated or minimised as far as reasonably practicable.

- provide management measures to effectively implement best practice environmental management in relation to operational environmental aspects such as waste management, water use and energy use.
- detail ongoing stakeholder consultation commitments;
- ensure all relevant legal and regulatory environmental requirements are documented, communicated to the project team, complied with and reported against.

A decommissioning environmental management plan will be prepared prior to commencement of any decommissioning activities.

22.1.10 Residual Uncertainties

There are a number of residual uncertainties relating to the construction and operation of the GEGHA Plant and its potential to impact the receiving environment. The uncertainty can be defined by the following categories:

- Environmental Factors affecting site (rain, wind, extreme weather events, etc).
- Fauna interaction (entering on to site).
- Workforce behaviour and culture.
- Adequate supply of resources to enable site preparedness and compliance.
- Supply Chain disruption delaying schedule and duration of construction.
- Accidental discovery of aboriginal cultural heritage.
- Incident involving machinery or equipment failure (i.e. hydraulic hose break, etc).
- Regulatory delays or changes that may add time to the schedule.
- Unavailability of materials, plant, equipment, machinery or labour causing delays to schedule.
- Rainfall intensity and consistency during operation.

It is proposed that all residual uncertainty associated with environmental impacts can be effectively managed.

Uncertainty around water supply from the Wathagar drainage dam can be managed by supplementing supply with groundwater as a secondary supply option.

22.1.11 Public Interest

The GEGHA Project holds significant public interest given its potential to deliver environmental, economic and social benefits. These can be summarised into the following categories:

Environmental Impact: With minimal environmental impacts associated with the construction and operation of the Project, it will deliver overwhelmingly positive environmental outcomes for the Moree Plains region.

Economic Benefit: Whilst remote from population centres, the Project will have a more far-reaching impact in terms of adding to the demand for support services in Moree and feeding the local, regional and statewide supply chain.

Agricultural Sustainability: The outputs of production, hydrogen and ammonia, will provide regional landowners with the opportunity to produce using locally manufactured, sustainable inputs, providing security for food and fibre production in the Moree Plains region.

More broadly, the establishment of the GEGHA project will not only commence carbon abatement from the first day of production but will more importantly provide a blueprint for future development of the hydrogen industry in agriculture.

Technological Innovation: The integration of green technology into conventional agricultural production showcases the pathway to meaningful carbon abatement and changing the status quo of reliance upon fossil fuel derived production inputs. Regionalising production is an additionally important innovation in reducing the energy intensity of agricultural production inputs.

Community and Social Impact: The Project demonstrates a commitment to sustainable development and environmental stewardship, fostering a culture of responsibility within the community. It also has the potential to

improve the quality of life and inter-generational equity by reducing pollution and promoting the transition to green production in agriculture.

Overall, the plant represents a significant step towards a sustainable future, offering environmental, economic, and social benefits that resonate with the public's growing concern for climate action and sustainable development.

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Managing Urban Stormwater: Soils & Construction (Landcom, 2004)

NSW BioNet Atlas available at About BioNet Atlas | Biodiversity | Environment and Heritage

NSW BioNet Threatened Biodiversity Profile Data Collection available at NSW Bionet Threatened Biodiversity Profile Data Collection | Dataset | SEED

SSD-58694960 Good Earth Green Hydrogen and Ammonia Project Secretary's Environmental Assessment Requirements amended 12th September 2024.

Referenced Specialist Technical Reports (refer to Appendix B)

Referenced Australian and NSW Policies and Guidelines

- Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)
- Applying SEPP 33 – Hazardous and Offensive Development Application guidelines (NSW Planning, 2011)
- Approved methods for measurement and analysis of environmental noise in NSW (EPA, 2022)
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2022)
- Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (EPA, 2022)
- Ask First; A Guide to Respecting Indigenous Heritage Places and Values (Australian Heritage Commission, 2002)
- Australia's National Hydrogen Strategy (DCCEEW, 2024)
- Biosecurity Risk Management in Land Use Planning and Development (Department of Primary Industries, 2020)
- Cumulative Impact Assessment Guidelines for State Significant Projects (DPIE, 2022)
- EPA Climate Change Policy (EPA, 2023)
- Flood Impact and Risk Assessment Flood Risk Management Guide (LU01) (DPE, 2022)
- Future Transport Strategy 2056 (TfNSW, 2018)
- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (DECCW, 2011)
- Guide to Traffic Generating Development (RTA, 2002 as updated)
- Guide to Traffic Management – Pt 12: Traffic Impacts of Development (Austroads, 2016)
- Gwydir Alluvium Water Resource Plan, DPE 2022
- Hazardous Industry Planning Advisory Paper No 11 Route Selection (NSW Planning, 2011). Online at Hazardous Industry Planning Advisory Paper No 11 – Route Selection
- Hydrogen Hubs Initiative (NSW) available at https://www.nsw.gov.au/grants-and-funding/hydrogen-hub-initiative
- Infrastructure Proposals on Rural Land (Department of Primary Industries, 2013)
- Interim Construction Noise Guideline (DECC, 2009)
- Interpreting excluded works dams Fact Sheet, DPE available at Interpreting excluded works dams
- Land Use Conflict Risk Assessment Guide (Department of Primary Industries, 2011)

- National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC, 2000)
- Net Zero Plan Stage 1: 2020-2030 (DPIE, 2020)
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- NSW Aquifer Interference Policy (NOW, 2012)
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- NSW Waste and Sustainable Material Strategy 2041 (EPA, 2021)
- Planning for Bush Fire Protection (RFS, 2019)
- Social Impact Assessment Guideline for State Significant Projects (DPIE, 2021)
- Standards for Managing Construction Waste in NSW (EPA, 2018)
- State Significant Development Assessment Guidelines (DPIHI, 2024)
- State significant development guidelines – preparing an environmental impact statement Appendix B to the state significant development guidelines DPIE July 2022
- Storing and Handling Liquids: Environmental Protection (DECC, 2007)
- Undertaking Engagement Guide – Guidance for State Significant Projects (DPHI, 2024)
- Waste Classification Guidelines (EPA, 2014)
- Water Sharing Plan for the Gwydir Unregulated River Water Sources 2012

Referenced Commonwealth Legislation, available at https://www.legislation.gov.au/acts

- Environment Protection and Biodiversity Conservation Act 1999
- Native Title Act 1993

Referenced NSW State Based Legislation, available at In force legislation - NSW legislation

- Biodiversity Conservation Act 2016
- Environmental Planning and Assessment Act 1979
    - Environmental Planning and Assessment Regulation 2021
- Environmentally Hazardous Chemicals Act 1985
- Heritage Act 1977
    - Heritage Regulations 2012
- National Parks and Wildlife Act 1974
    - National Parks and Wildlife Regulation 2019
- Protection of the Environment Operations Act 1997
    - Protection of the Environment Operations (Clean Air) Regulation 2022
    - Protection of the Environment Operations (General) Regulation 2022
    - Protection of the Environment Operations (Noise Control) Regulation 2017
    - Protection of the Environment Operations (Waste) Regulation 2014
- Roads Act 1993
    - Road Transport (General) Regulation 2021
- Water Management Act 2000
    - Water Management (General) Regulation 2018
    - Water Management (General) Regulation 2025 – draft version for public exhibition
- Work Health and Safety (WHS) Act
    - Dangerous Goods Safety (Major Hazard Facilities) Regulations 2007

- Work Health and Safety Regulation 2017

Referenced NSW State Based Planning Policies available at: In force legislation - NSW legislation

- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Transport and Infrastructure) 2021

Moree Plains Local Environmental Plan 2011, available at
https://legislation.nsw.gov.au/view/html/inforce/current/epi-2011-0646

Appendix A GEGHA Project Planning Secretary's Environmental Assessment Requirements and Concordance Table

Appendix B Specialist Assessment Reports

Appendix B.1 GEGHA Project Economic Impact Analysis

Appendix B.2 GEGHA Project Traffic Impact Assessment

Appendix B.3 GEGHA Project Soil and Water Assessment

Appendix B.4 GEGHA Project Bush Fire Assessment Report

Appendix B.5 GEGHA Project Biodiversity Development Assessment Report

Appendix B.6 GEGHA Project Visual Impact Assessment

Appendix B.7 GEGHA Project Aboriginal Cultural Heritage Assessment Report

Appendix B.8 GEGHA Project Preliminary Hazard Analysis

Appendix B.9 GEGHA Project Noise and Vibration Impact Assessment

Appendix B.10 GEGHA Project Historical Cultural Heritage Memorandum

Appendix B.11 GEGHA Project On-site Wastewater Management Plan

Appendix B.12 GEGHA Project Groundwater Drawdown Assessment

Appendix B.13 GEGHA Project Contaminated Land Assessment Report

Appendix B.14 GEGHA Project Land Use Conflict Risk Assessment

Appendix B.15 G EGHA Project Biosecurity Management Risk Assessment

Appendix B.16 GEGHA Project Crown Reserves Potential Impact Assessment

Appendix B.17 GEGHA Project Rehabilitation Plan

Appendix B.18 GEGHA EPBC Self-Assessment

Appendix B.19 GEGHA Project: Air Quality Impact Assessment

Appendix B.20 GEGHA Project Initial Fire Protection Study

Appendix C GEGHA Project Environmental Risk Assessment

Appendix D GEGHA Project Detailed Maps and Plans

Appendix E Wathagar Cotton Gin Environmental Protection Licence

Appendix F GEGHA Project Landholder Letter of Authority

Appendix G GEGHA Project Community Consultation Plan and Consultation Record

Appendix H GEGHA Project Mosquito risk assessment and management plan

Appendix I Wathagar Gin Entry Upgrade - Concept Plan

Appendix J GEGHA Project Estimated Development Cost

Appendix K GEGHA Project Consolidation of Mitigation Measures