1.0 Introduction

1.1 Purpose and Scope

The Environmental Protection Authority (EPA) has determined that the proposal to construct and operate the Asian Renewable Energy Hub will be formally assessed under Part IV of the *Environmental Protection Act 1986* (WA) (the EP Act). The proposal has also been referred and determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act), and is being assessed as an accredited assessment.

This purpose of this Environmental Review Document (ERD) is to:

- provide a comprehensive formal environmental impact assessment of the proposal in consultation with relevant stakeholders; and
- satisfy the requirements of Part IV of the EP Act and the EPBC Act.

This ERD is structured to address this purpose and provides information on:

- the proposal description (Section 2.0);
- stakeholder engagement (Section 3.0);
- consideration of environmental principles (Section 4.0);
- an assessment of the proposal activities on the key environmental factors taking into consideration survey findings, relevant policies and guidelines, EPA objectives, and assessing impacts and mitigation to determine a predicted outcome (Section 4.0);
- consideration of other environmental factors (Section 5.0);
- the requirement for environmental offsets (Section 6.0);
- Matters of National Environmental Significance (MNES) (Section 7.0); and
- concludes with a holistic impact assessment (Section 8.0).

This document has been prepared in accordance with the:

- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* (EPA 2016m);
- *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2018* (EPA 2018b);
- requirements set out in the Environmental Protection Authority (EPA) *Instructions on how to prepare an Environmental Review Document* (EPA 2017); and
- the specific requirements of the Environmental Scoping Document (ESD) for the proposal (NW Interconnected Power 2018).

1.2 Proponent

1.2.1 Development History

InterContinental Energy (ICE) was formed in 2014 to develop intercontinental RE projects around the world. After teaming up with its technology partners, ICE identified the Asian RE Hub in Western Australia as a potential project. Given the Australian location, and ICE management's long history of working with Australian RE developer CWP, a joint venture company (NW Interconnected Power Pty Ltd (NWIP)) was formed in 2015 to co-develop the project. In 2017 and 2018 respectively, Vestas and Macquarie became investors in NWIP, adding significant experience and resources to the development effort.

1.2.2 Project Consortium

The proponent for the proposal is NW Interconnected Power Pty Limited (NWIP), ACN 606 603 874, Level 2, 139 Frome Street, Adelaide SA 5000.

The contact person for the proponent is:

Mr Andrew Dickson
Project Manager, Asian Renewable Energy Hub
Level 27, St Martins Tower, 44 St Georges Terrace, Perth, WA 6000, Australia
T: +61 418 866 470
E: Andrew.Dickson@cwprenewables.com

NWIP is owned by:

- **InterContinental Energy (ICE)**: A privately-owned company focused on developing renewable energy (RE) hubs globally. It was incorporated in 2014 by a team with decades of experience developing and investing in renewable energy, technology, and infrastructure projects. ICE has founded the Asian RE Hub and the Middle East RE Hub in partnership with leading local partners;
- **CWP Energy Asia (CWP)**: Part of CWP Renewables, the most successful RE developer in Australia as measured by installed capacity. Over the last four years, CWP has developed and financed more Australian wind generation than any other company;
- **Vestas**: Listed on the Danish Stock Exchange, Vestas is the largest manufacturer of wind turbines in the world, and the number one wind turbine manufacturer in Australia by installed capacity. In 2017 Vestas had over US$10B in revenue and 20,000 employees across five continents; and
- **Macquarie**: A global investment banking and diversified financial services group with more than 14,000 staff in 28 countries, and with over $A450 billion in assets under management. Macquarie has been a pioneer in infrastructure investment, including utilities and renewable energy throughout the Asia Pacific region.

1.2.3 Experience, Capability and Track Record

ICE and CWP have a long history of delivering large and complex RE developments in different jurisdictions. Table 2.2 provides some examples of the two groups' development experience relevant to the proposal.

All projects listed have been designed, implemented and are being managed in an environmentally responsible fashion. NWIP's parent companies have sound environmental reputations and credentials.

While Vestas is not traditionally a development company, it brings unrivalled experience and capability in building and operating the world's most advanced and successful RE projects. In 2017 alone, Vestas built almost 10,000 MW of RE projects across 33 countries.

Table 1.1: Past project development experience.

Project	Role	Size	Location
The Middle East RE Hub	Development	15,000 MW	Confidential, Middle East
Sapphire Wind Farm	Development, Construction Management and Asset Management	270 MW	NSW, Australia
Sapphire Solar Farm	Development	210 MW	NSW, Australia
Boco Rock Wind Farm	Development, Construction, and Asset Management	113 MW	NSW, Australia
Hallett 1, 2, 3 and 4 Wind Farms	Development and Construction Management	400 MW	SA, Australia
Uungula Wind Farm	Development	400 MW	NSW, Australia
Malingping Wind Farm	Development	103 MW	West Java, Indonesia
Tanah Laut Wind Farm	Development	70 MW	Kalimantan, Indonesia
Hong Kong Offshore Wind Farm	Development	200 MW	Hong Kong
Fântânele-Cogealac Wind Farm	Development	600 MW	Romania

1.2.4 Technology Partners

Given the scale of the proposal, the proponent engaged large technology partners to assist in designing and specifying equipment for the project from early project development. The resulting consortium comprises world leaders in their respective fields and has the combined experience and capability to deliver the project:

- **Swire Pacific Offshore (SPO)**: Headquartered in Singapore, SPO owns and operates more than 85 offshore support vessels and is capable of supporting a wide range of offshore activities, including drilling, exploration, subsea construction, cable laying, seabed survey, and wind farm installation (through Swire Blue Ocean). SPO is part of Swire Pacific, a Hong Kong Listed conglomerate; and
- **Prysmian Group (Prysmian)**: Listed on the Milan Stock Exchange, Prysmian is the largest manufacturer of subsea cables in the world, with approximately 40% of global market share. With revenue of over US$8B in 2016 and over 20,000 employees, Prysmian has developed the longest and deepest subsea cable projects in the world. Its research and development programs keep Prysmian at the forefront of its industry.

1.2.5 Key Planning Consultants

The proponent is working with experienced and respected consultants on some of the major development aspects of the proposal. The two most significant consultants presently working on the project are Perth-based Biota Environmental Sciences (Biota) and BMT Group (BMT):

- **Biota**: One of the most experienced and well-recognised ecological consultants in WA, Biota has worked on a broad range of infrastructure development projects in the state, from large-scale LNG projects to wind farms. Biota is responsible for leading all onshore ecological work for the project, including studying potential flora and fauna impacts and working with key environmental stakeholders; and
- **BMT**: One of the leading multi-disciplinary marine consultants in the world, with a major office in Perth, BMT is responsible for assisting and leading the marine and offshore planning aspects of the project relating to the proposed subsea cables.

1.3 Environmental Impact Assessment Process

The key environmental impact assessment legislative requirements of relevance to the proposal comprise formal assessment under:

- Part IV of EP Act; and
- Section 87 of the EPBC Act (and accredited assessment).

The key dates for the assessment, including the timing of referral, determination of level of assessment and other milestones are set out in Section 2.1.1.

1.4 Other Approvals and Regulation

The proponent has been granted a Section 91 Licence under the *Land Administration Act 1997*, covering an extent of approximately 14,000 km^2, which gives it exclusive rights to develop a renewable energy project on the proposed site. The proponent has also been granted an Option to Lease under the *Land Administration Act 1997*, covering the Development Envelope and an Easement covering the proposed cable route. Table 1.2 lists the key other approvals required for various proposal activities that are identified at this time. Other DMAs that are likely to require approvals or licencing under various statutory processes for the implementation of the proposal are identified in Table 1.3.

Table 1.2: Other approvals.

Proposal Activities	**Land Tenure/Access**	**Type of Approval**	**Legislation Regulating the Activity**
Construction and operation of accommodation camp and other buildings	*Land Administration Act 1997* Section 91 Licence	Building licences	*Local Government Act 1995*
Construction and operation of prescribed premises	*Land Administration Act 1997* Section 91 Licence	Works Approvals and Operating Licences	*Environmental Protection Act 1986* (Part V)

Table 1.3: Decision-making authorities.

Decision-Making Authority	**Relevant Legislation**
Minister for Lands	*Land Administration Act 1997*
Minister for Environment	*Conservation and Land Management Act 1984* *Biodiversity Conservation Act 2016*
Chief Executive Officer, Department of Biodiversity, Conservation and Attractions	*Conservation and Land Management Act 1984*
Minister for Energy; Aboriginal Affairs	*Electricity Industry Act 2004* *Aboriginal Heritage Act 1972*
Minister for Water	*Rights in Water and Irrigation Act 1914*
Chief Executive Officer, Department of Water and Environmental Regulation	*Environmental Protection Act 1986*
Chief Executive Officer, Shire of East Pilbara	*Health Act 1911* and *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulation 1974* *Planning and Development Act 2005*
Chief Executive Officer, Shire of Broome	*Planning and Development Act 2005*
Minister for Local Government	*Local Government Act 1995*
Chief Executive Officer, Economic Regulation Authority	*Electricity Regulation Act 2004*
Chief Dangerous Goods Officer, Department of Mines, Industry Regulation and Safety	*Dangerous Goods Safety Act 2004*

2.0 The Proposal

2.1 Background

2.1.1 Assessment Progress

The proposal was referred to the EPA under Section 38 of the EP Act, and the EPA determined on 18th December 2017 that it required formal environmental impact assessment under Part IV of the Act. In addition, the proposal was referred to the Commonwealth Department of the Environment and Energy (DoEE) and deemed to be a controlled action under the EPBC Act. In that determination, the delegate of the Commonwealth Minister for the Environment and Energy assigned an assessment approach under section 87 of the EPBC Act via an accredited process under the EP Act.

The proponent subsequently prepared the ESD for the assessment (NW Interconnected Power 2018), in consultation with the WA Department of Water and Environmental Regulation (DWER), EPA Services and other relevant stakeholders. The purpose of the ESD is to define the form, content, timing and procedure of the environmental review as required by section 40(3) of the EP Act. The EPA subsequently approved the ESD on 27th August 2018.

This ERD has been prepared in consultation with EPA Services, DOEE and other decision-making authorities (DMAs), to meet the requirements of the ESD and the EPA. This ERD will undergo a six-week public review period, after which the proponent will respond to submissions received. The EPA will then prepare its assessment report, taking into account the content of this ERD, submissions received and the proponent's responses to submissions. The EPA assessment report will make recommendations to the Western Australian Minister for the Environment, and the assessment report will also be considered by the Commonwealth Minister for the Environment.

Lastly, while the site selected for the proposal and the development envelope for the proposal have remained unchanged since the approval of the ESD, the proposal has undergone changes during the course of assessment, which have been driven by the planned increase in the project's power generation. This is a function of the recent shift in focus of the project to supply renewable power to the Pilbara and generate other green downstream products. The required changes to achieve this entailed:

- an increase from two cables exporting power to four;
- an increase in the number of wind turbines; and
- an increased number of solar panel arrays and associated electrical infrastructure.

The changes to the proposal during assessment were accepted under Section 43A of the EP Act on 14th February 2019, and subsequently accepted as a variation under Section 156A of the EPBC Act on 4th April 2019.

2.1.2 Project Context

Onshore wind and solar energy are now the most cost-effective sources of new electricity generation in countries with good wind and solar resources. At the same time, technology developments now allow the efficient transmission of electricity over very long distances via High Voltage Direct Current (HVDC) cables, or the production of green hydrogen related products, which can be transported using pipelines, ships or heavy vehicles. The combination of these technological advancements has unlocked the potential for the development of RE hubs to generate clean energy at a very large scale and to send it to where it is needed, globally.

Western Australia is perfectly placed to become Asia's premier RE hub, supplying competitively priced power to local and export markets. Java and Singapore are densely populated and have limited local RE options, and can be reached via HVDC cables. Ships can deliver green hydrogen to Japan, Korea and other regional and global markets. The Pilbara has latent economic potential which can be unlocked by cheap clean energy, including new developments in the resources sector, in downstream mineral processing and in the production of green hydrogen related products for local and export markets.

The proponent has been developing the proposal since 2014. The project will consist of 1,743 turbines for wind generation and 2 GW of solar generation, together with an HVDC subsea transmission system to send the power to locations in the Pilbara and/or to SE Asia. Separate referrals will be submitted in future for the offshore electrical transmission lines, once the cable routes and offtake markets are finalised.

2.1.3 Renewable Energy

RE is no longer an "alternative" energy source. Onshore wind and solar generation are now cheaper than new fossil fuel and nuclear power generation in many markets, even without carbon pricing. Figure 2.1 shows the latest view of investment bank Lazard (2017) on the levelised cost of energy (LCOE), defined as the average price of power that a generating asset must receive to achieve a reasonable return over its lifetime for different generation technologies.

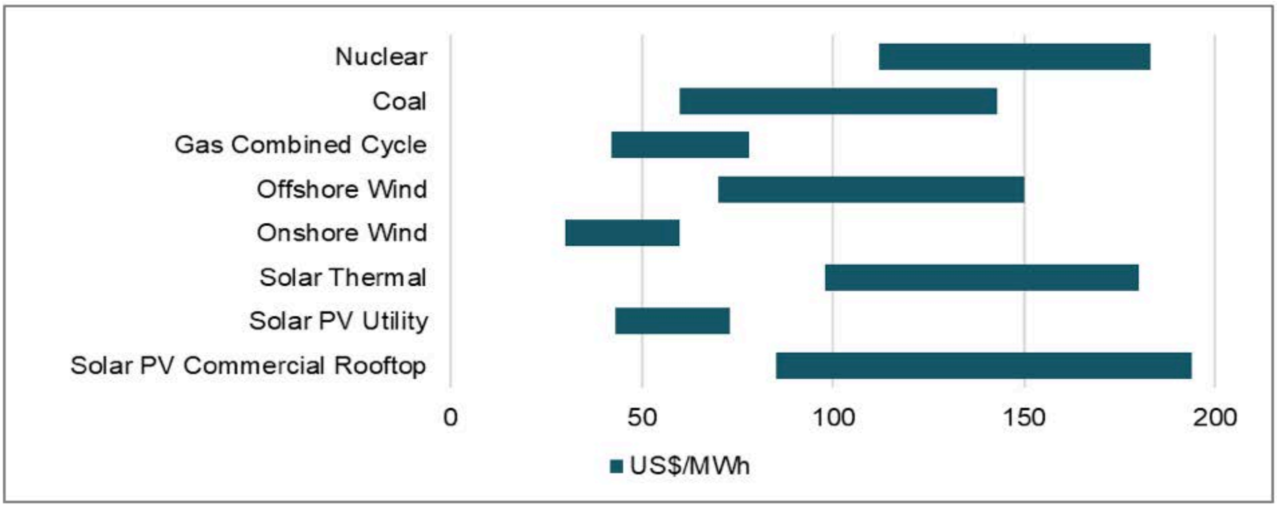

Figure 2.1: Global Levelised Cost of Energy (Lazard 2017).

British Petroleum's recent statistical review of world energy (BP 2018) sees renewable energy (primarily wind and solar power) contributing a quarter of new global energy supply growth over the next two decades (Figure 2.2).

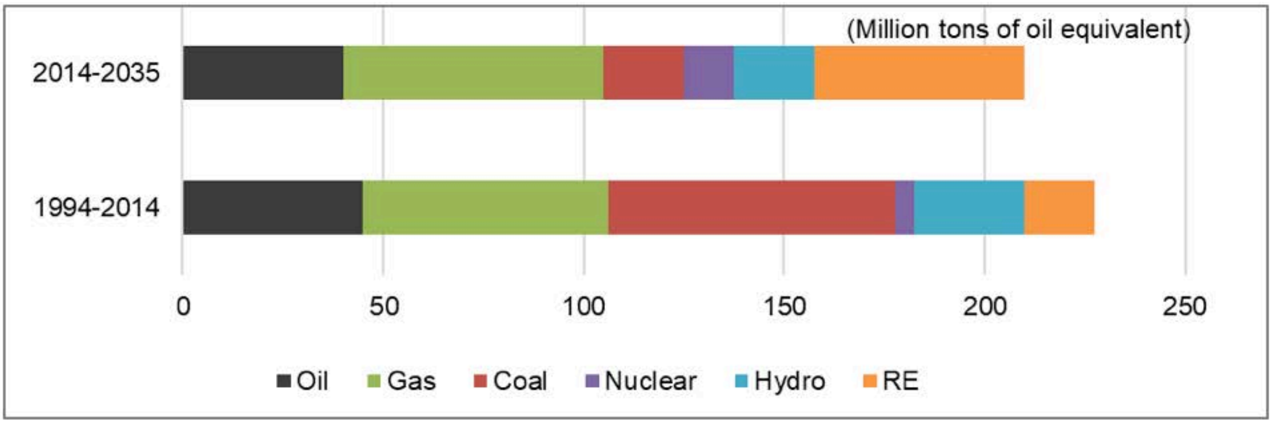

Figure 2.2: Annual demand growth by fuel type (BP 2018).

2.1.4 Wind Turbines

According to the Global Wind Energy Council, approximately 22,000 wind turbines (52 GW) were installed globally in 2017 (GWEC 2018). Wind turbine technology is considered mature, with continuing advancement focused on increasing the size of turbines to further reduce their cost of power. The Vestas V162-5.6 MW turbine is the current leading technology for large scale onshore wind farms. This turbine can have a hub height of up to 175 m and has a rotor diameter of 162 m. The Vestas V164-10 MW offshore turbine is even larger and has been specifically designed to survive cyclones. Wind turbines typically have three blades and generate power between wind speeds of 3 m/s and 28 m/s. They can be designed to survive the strongest cyclones that would impact the northwest coast of Australia and have been erected in similar arid zone settings in other parts of the world (e.g. Plate 2.1).

Plate 2.1: Typical arid zone wind farm.

2.1.5 Solar Photovoltaic

According to Bloomberg New Energy Finance[1], 98 GW of solar photovoltaic (PV) was installed in 2017, overtaking wind power to become the world's biggest new source of power generation. Solar PV technology is considered mature, with continuing advancement focused on increasing panel efficiency and reducing project costs. Solar arrays typically have a capacity of around 200 kW, and they are combined in large numbers together with inverters to create large solar PV farms. Large solar farms are being developed around the world (e.g. Plate 2.2), with multi-GW projects already under construction.

Plate 2.2: Typical arid zone solar PV farm.

[1] https://about.bnef.com

2.1.6 HVDC Transmission

HVDC is a maturing technology that was developed to transmit large amounts of electricity over long distances. While HVDC has high fixed capital costs, it has shown itself to be very cost effective for power transmission over long distances due to its very low losses (<6% over 2,000 km). The latest generation of HVDC converter stations (e.g. Plate 2.3), which are located at each end of an HVDC link, are well suited to being used with large scale, intermittent RE projects.

Plate 2.3: Typical HVDC converter station.

HVDC transmission projects are being built onshore and offshore. The highest capacity subsea project in the world is currently the UK based Western Link, which can transmit up to 2.2 GW of power from the north of Scotland, where most Scottish wind farms are located, to the Midlands, where the power is needed.

The longest HVDC subsea cable currently being built is the 730 km UK to Norway interconnector. Other much longer cable routes and higher capacity projects are being discussed, including cables from Tunisia to Italy, Iceland to the UK, Spain to the UK, and Oman to India.

Current commercial cable technology can be installed to a depth of 3,000 metres, with deeper water cables under development. 800 kV is currently the highest capacity cable commercially available, with 1,000 kV on the horizon. Higher cable voltages are important because the higher the voltage, the greater the power that can be transmitted through the same sized cable and the less the electrical losses, thus improving overall project economics.

2.1.7 HVAC Transmission and Distribution

HVAC is a tried and tested technology that can work both onshore and offshore. Although the losses from HVAC over long distances become large, over shorter distances and lower voltages it can be a more viable power transmission solution than HVDC. This is because no converter station is needed to ‘plug’ into an HVAC powerline. HVAC overhead powerlines (Plate 2.4) will be used to collect power from the proposal’s wind turbines and solar PV arrays for connection to the HVDC converter.

Plate 2.4: Typical HVAC overhead powerlines.

2.1.8 Batteries

Technology and cost breakthroughs in the last decade mean that batteries are rapidly becoming a regular feature of modern power grids. Large batteries are now being deployed to cost-effectively help manage power flows and quality. Batteries complement generation from intermittent sources like wind and solar farms because they allow fast reaction and storage times. South Australia recently commissioned the world's largest lithium ion battery, the Hornsdale Power Reserve (Plate 2.5), which has a total capacity of 100 MW / 129 MWh. Similar projects at larger scales are now being developed and installed around the world.

Plate 2.5: Hornsdale Power Reserve Battery Project.

2.2 Justification

2.2.1 Exporting Power to Indonesia and Singapore

Southeast Asia comprises a number of fast growing and dynamic economies. Although these countries aspire to have clean and affordable RE, many suffer from limited domestic RE resources (Figure 2.3) and land availability.

Indonesia and Singapore in particular have a formally stated desire to increase the amount of RE in their respective energy mixes, but lack large scale and competitively priced domestic RE options. Combining Australia's abundant RE resources with the latest HVDC transmission technology means that it is now possible to export competitively-priced wind and solar power from Australia to help these countries meet their RE goals. Western Australia is the perfect place to develop an RE hub, given that:

- it is one of the world's least populated regions;
- it has areas with world-class wind and solar resources (Figure 2.3);
- the WA Government is supportive of large resource projects;
- there is demand across the Pilbara for increased access to cheap, local, clean power;
- Western Australia is already a large energy exporter to ASEAN; and
- a cable route from northwest Australia is commercially and technically feasible.

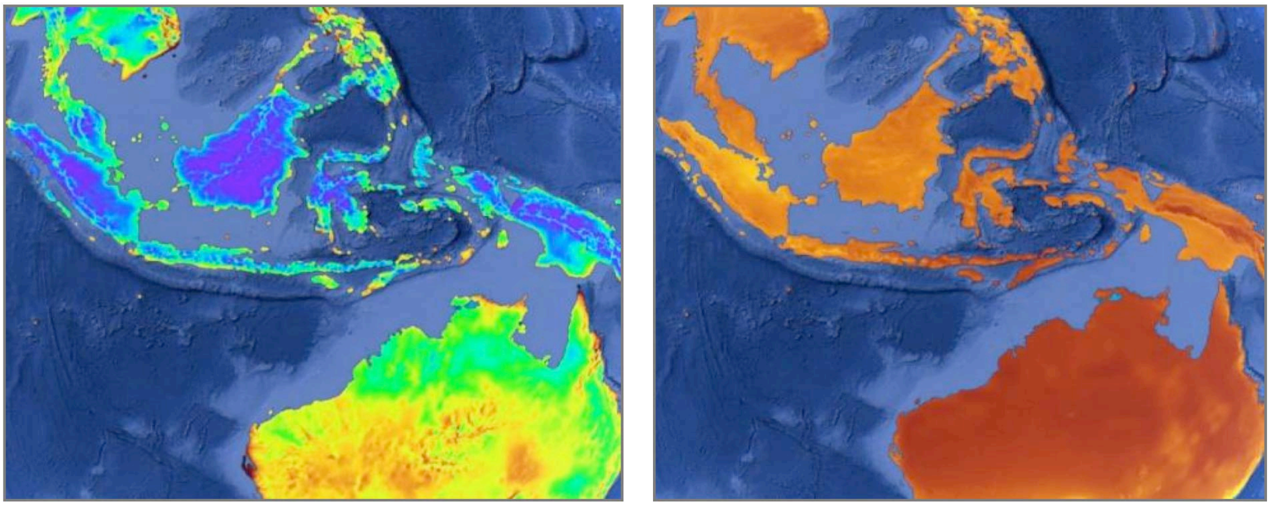

Figure 2.3: Wind and solar resource in Southeast Asia and Australia (red = higher resource).

Indonesia's future power needs are so great that they cannot be met by local resources alone, especially on Java. The proposal is the most viable way to deliver RE at scale to Jakarta, while satisfying the latest Indonesian Permen 12 and Permen 50 regulations, which mandate an energy pricing constraint of remaining under US$67/MWh.

Given Singapore's limited natural energy resources, it is almost completely reliant on imported energy. As a result, the Singaporean government is understandably careful regarding its energy policy, which has three main objectives: economic competitiveness, energy security and environmental sustainability. Including the cost of long-distance HVDC transmission, it will be possible to supply power from the project to Singapore for under US$90/MWh, making the proposal the cheapest way to supply renewable energy at scale into Singapore.

2.2.2 Green Hydrogen

All the elements exist to make the proposal part of Asia's premier production facility for green hydrogen / ammonia:

- The site output is ideal, with:
  - large-scale clean energy with long-term supply and price certainty;
  - energy cheap enough to compete with conventional hydrogen production from gas, without the negative externalities;
  - a 70% hybrid transmission capacity factor, which is much higher than from wind or solar projects alone.

- regional markets are nearby, including Japan, Korea and Singapore; and
- Australian national interest in hydrogen opportunities (both export and domestic) is growing quickly. For example, three important reports were released in August 2018:
  - CSIRO's *Hydrogen Roadmap* (Bruce et al. 2018);
  - *Hydrogen for Australia's Future*; a briefing paper for the COAG Energy Council (Commonwealth of Australia 2018); and
  - *Opportunities for Australia from Hydrogen Exports* (ACIL Allen 2018).

2.2.3 Powering the Pilbara

The current high price of power in the Pilbara is limiting economic growth by keeping the cost base very high. Given the abundant RE resources in northern Australia, there is an opportunity to lower costs and accelerate growth by harnessing these local wind and solar resources.

Solar resources are world-class in the Pilbara region, but due to the daily profile of solar generation, there are limitations to how much this can be cost-effectively deployed to support capital intensive and energy intensive industrial processes, which typically need to operate 24/7. As a wind-solar-battery hybrid, the Asian RE Hub proposal will be able to more effectively support operations, which typically require constant power supply. The forecast cost of power delivery from the proposal is well below the current cost of power in the region, which is currently provided predominantly by gas and diesel generation.

The Chairperson of the Pilbara Development Commission, Mr Brendan Hammond, summarised the need for the project as follows:

> *"The Energy Hub project capitalises on the Pilbara's natural wind and solar assets and is directly aligned with the region's vision for diversified and sustainable economic development. It is an exciting opportunity to boost the business competitiveness of the Pilbara by significantly lowering the cost of energy. Such an outcome will result in the extension of existing mineral and oil/gas reserves, bring new extractive opportunities into play, and allow a diversified downstream economy that is ultimately independent of natural resource exploitation to be built both regionally and state-wide. In addition to these commercial and economic benefits the positive environmental impact is expected to be very considerable and of national significance."* (1 May 2018)

2.2.4 Environmental Benefits

Beyond the economic business case for the proposal as a means to generate cheap and clean energy, it has the benefit of being completely renewable and CO_2 emissions free. This means that for every MWh of wind or solar energy produced, up to 0.84 tonnes of CO_2 would be displaced that would have otherwise been emitted into the atmosphere from fossil fuel power stations (Department of Climate Change and Energy Efficiency 2008).

Given the expected production of ~55 TWh of clean energy each year from the project, that would equate to annual emissions savings of ~46 million tonnes of CO_2. Over the 50-year life of the project this would be the equivalent of 2.3 billion tonnes of CO_2.

2.2.5 Opportunities and Benefits for Western Australia

2.2.5.1 Investment

Approximately A$21B of the project Capex will be deployed in WA. That Capex reflects equipment that will be imported and sourced locally, and the hiring of local contractors and skilled employees. Of this amount, approximately A$6.8B is expected to be spent directly on WA company equipment and services during construction.

During operation, approximately A$300M will be spent every year in WA, resulting in A$15B of spending during the project lifetime. The majority of this is expected to be labour costs.

2.2.5.2 Jobs

The project will create a significant number of high-quality regional jobs. Table 2.1 shows the direct job creation estimated by the proponent. World Bank projections for indirect job creation for large-scale combined wind and transmission projects have been used (Bacon and Kojima 2011), together with some conservative adjustments. The proponent will continue to refine these employment multipliers to ensure they accurately represent the specific region in which the proposal is situated.

Table 2.1: Expected job creation.

AU$ M	Construction	Operation
Direct	3,000	400
Indirect	10,500	1,000

2.2.5.3 Tourism

The project will become a major tourist attraction along the Great Northern Highway. The 20 km road from the highway to the development envelope will be sealed, and a staffed visitor center will be established so tourists can learn about the project. This will include a high viewing platform. Tourism-created jobs are considered part of the indirect jobs in Table 2.1.

2.2.5.4 Science and Innovation

The project will be at the leading edge of energy generation and transmission. By applying the latest in wind, solar and HVDC technology, WA will catapult itself to the forefront of global energy innovation.

Vestas, the number one wind energy technology company in the world, will be the major employer during both the construction and operation phases. Vestas has a global apprentice program to train regional workers, and the program will be custom tailored to train Pilbara and Kimberley staff. That will ensure technology and skills are transferred into the region, and can be used to diversify and enhance the regional economy on a sustainable basis.

2.2.5.5 State and Regional Opportunities

Regional City Development

The proponent will develop a workforce and accommodation plan that targets the hiring of local workers, and promotes living locally in the Pilbara and Kimberley regions. During operations this will involve bus-in-bus-out arrangements with staff based in Newman, Marble Bar, Port Hedland, Bidyadanga and Broome.

Accelerating RE deployment in East Pilbara and Kimberley Communities

The proponent will work with communities throughout the region to create a sustainable knowledge and industrial base so that RE hybrid systems can replace diesel generation through the region.

2.2.5.6 International Opportunities

The project offers an excellent opportunity to work with close strategic international neighbours and creates a strong link to Asia. The project would create energy export diversification and set the precedent for future expansion in Australia's energy export portfolio.

2.2.5.7 Aboriginal Community Engagement

The proponent has demonstrated its ability to work with the Nyangumarta community and is keen to also engage other Aboriginal communities in the region to promote the roll out of RE knowledge and projects. Opportunities will be explored to assist and train Aboriginal representatives in this field. Given the nearest settlement to the site is Bidyadanga, the largest Aboriginal settlement in WA, there is a perfect opportunity to engage the community living there to explore opportunities for training and employment. The proponent has already started down this route by hiring and training rangers from the Nyangumarta Ranger program to work with the expert biologists whilst the flora and fauna field survey work was conducted for the proposal.

2.2.5.8 Carbon Credits

Together with the WA Government, the proponent will explore how best to use any carbon credits generated for the benefit of WA. There is limited experience in intercontinental RE projects with direct power transfer from one country to another, so work on this front will be pioneering and will likely set a precedent for other similar projects that will potentially be adopted around the world.

2.2.5.9 Green Hydrogen Industry

The project will catapult WA into pole position in a global race to become the world's 'Saudi Arabia of green hydrogen'. This is a trillion-dollar prize for which WA has all the right ingredients. Green hydrogen has the potential to be even larger than the LNG industry for WA, and there are many possible downstream opportunities for the state.

2.3 Proposal Description

2.3.1 Key Characteristics

The proposal is located at a site approximately 220 km east of Port Hedland and 270 km southwest of Broome, in the northwest of Western Australia (Figure 2.4).

A summary description of the proposal is provided in Table 2.2, with a preliminary summary of proposal key characteristics provided in Table 2.3.

Table 2.2: Summary of the proposal.

Proposal Title	Asian Renewable Energy Hub
Proponent	NW Interconnected Power Pty Ltd
Short Description	The Asian Renewable Energy Hub is a proposal to construct a large-scale wind and solar renewable energy project, situated on the northeast boundary of the Shire of East Pilbara, approximately 220 km east of Port Hedland and 270 km southwest of Broome. The onshore components of the project will comprise a series of linear arrays of wind turbines and solar panels, with a transmission cable corridor to the coast. The offshore component of the proposal comprises inert subsea power cables, with the marine component of the current proposal only extending to the limit of State Waters (Commonwealth Waters and international permitting will be the subject of a separate referral).

Table 2.3: Location and proposed vegetation clearing extent of physical and operational elements.

Element	**Location**	**Proposed Extent**
Physical Elements		
Wind turbine hardstand	Figure 2.5	Clearing of no more than 523 ha
PV solar arrays and associated electrical infrastructure	Figure 2.5	Clearing of no more than 6,651 ha
Converter station	Figure 2.5	Clearing of no more than 23 ha
Overhead transmission lines, including associated tracks and pylons	Figure 2.5	Clearing of no more than 158 ha
Overhead distribution cable	Figure 2.5	Clearing of no more than 1,611 ha
Site access tracks	Figure 2.5	Clearing of no more than 2,303 ha
Substations	Figure 2.5	Clearing of no more than 357 ha
Control compound, warehouse and Accommodation	Figure 2.5	Clearing of no more than 337 ha
Temporary construction laydown areas	Figure 2.5	Temporary clearing of no more than 592 ha
Temporary clearing buried transmission cable section	Figure 2.5	Temporary clearing of no more than 21 ha
Offshore subsea transmission cable	Figure 2.5	Short-term disturbance to the sea floor of no more than 15.3 ha

The development envelope for the proposal, and the current conceptual project design are shown in Figure 2.5.

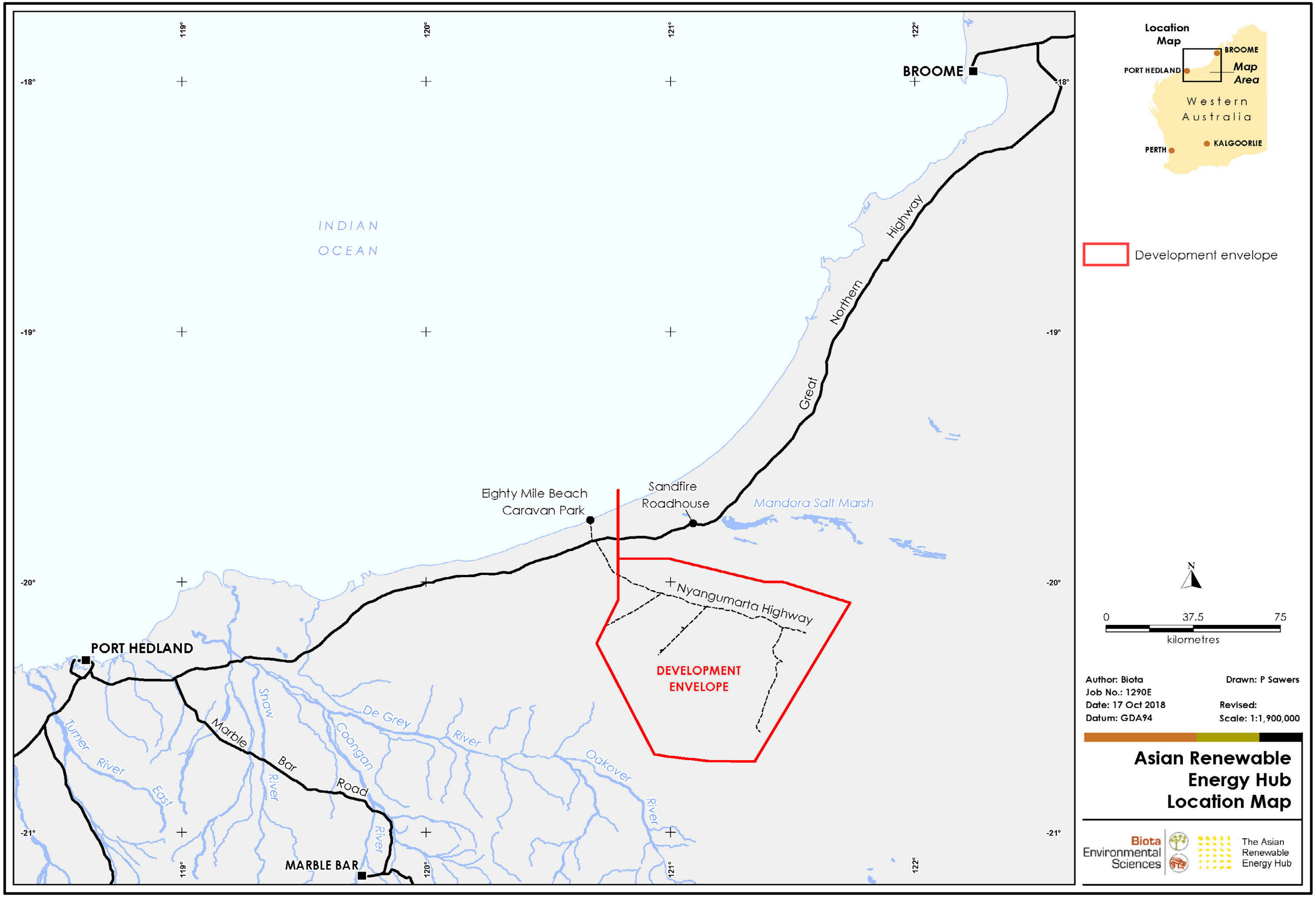

Figure 2.4: Proposal location.

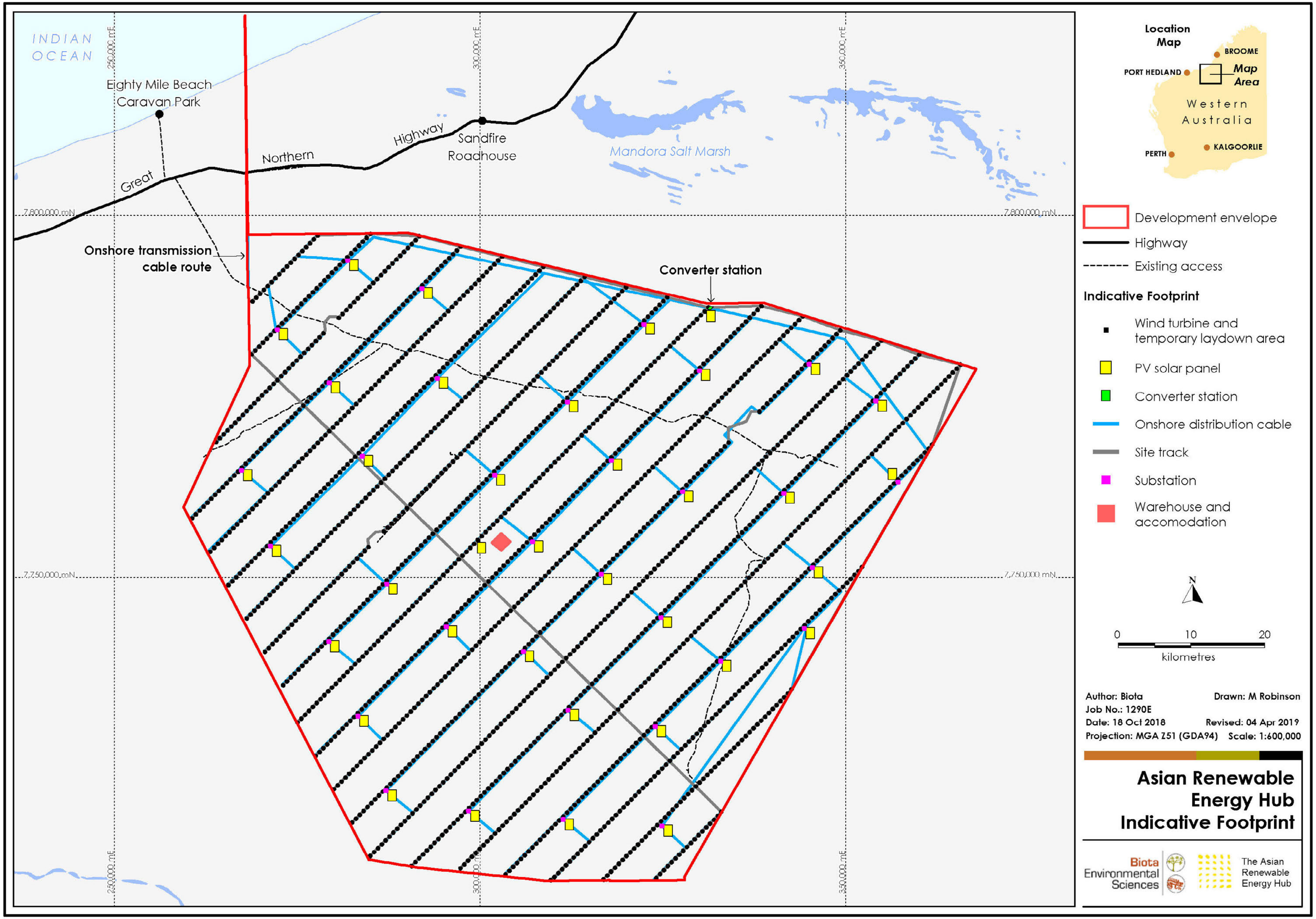

Figure 2.5: Proposal development envelope and indicative footprint.

2.3.2 Proposal Overview

The project will consist of two independent phases:

1. a “Pilbara phase”, which will dedicate energy for large energy users in the Pilbara region, including for green hydrogen production; and
2. a “Cable Export phase”, which will dedicate generation for export to Jakarta and Singapore.

All 15 GW of generation required for the two phases will be undertaken by wind turbines and solar arrays within the same development envelope.

Either of the phases could occur first, depending on the nature and timing of power offtake agreements. Table 2.4 details the scope of key infrastructure for the total project, and which elements form part of the current assessment.

Table 2.4: Scope of proposal infrastructure.

Element	Total Project Quantity	Included in this Proposal
Wind Turbines	Up to 1,743 wind turbines	Yes
Solar PV Panels	37 PV panel arrays	Yes
HVDC Converter Stations	4 (at the site, at either Port Hedland or Dampier, at Jakarta, and at Singapore)	Only the site converter
800 kV Subsea SE Asia Export Cable	4 x 3,500 km export cables	Only the section within State Waters
800 kV Subsea Pilbara Export Cable	4 x ~300 or 4 x ~500 km export cables to Port Hedland or Dampier respectively	Only the section within State Waters near Eighty Mile Beach
Batteries	Up to 800 MW / 1 GWh battery unit to help manage power quality	Yes
Site Tracks	1,514 km	Yes
Onsite Compound and Control Centre	1, with accommodation for site-based employees	Yes
Site Substations	Up to 37 substations	Yes
Temporary Works	Up to 6 construction compounds with concrete batching and laydown areas	Yes

The project would have a 50-year plus life span. This comes from the fact that the subsea cables have a practical life of over 50 years. Since the wind turbines and solar panels will have a design life of approximately 25 years, those elements are planned to be replaced halfway through the project’s life (see Section 2.7.4).

2.3.3 Site Selection and Optimisation

2.3.3.1 Site Search and Constraints

In RE project development, as with many resource industry projects, the most important and crucial step relates to finding the best site and resource. Therefore, in 2015 a comprehensive 12-month site search was undertaken covering the entire northwest coast of Australia, as shown in Figure 2.6.

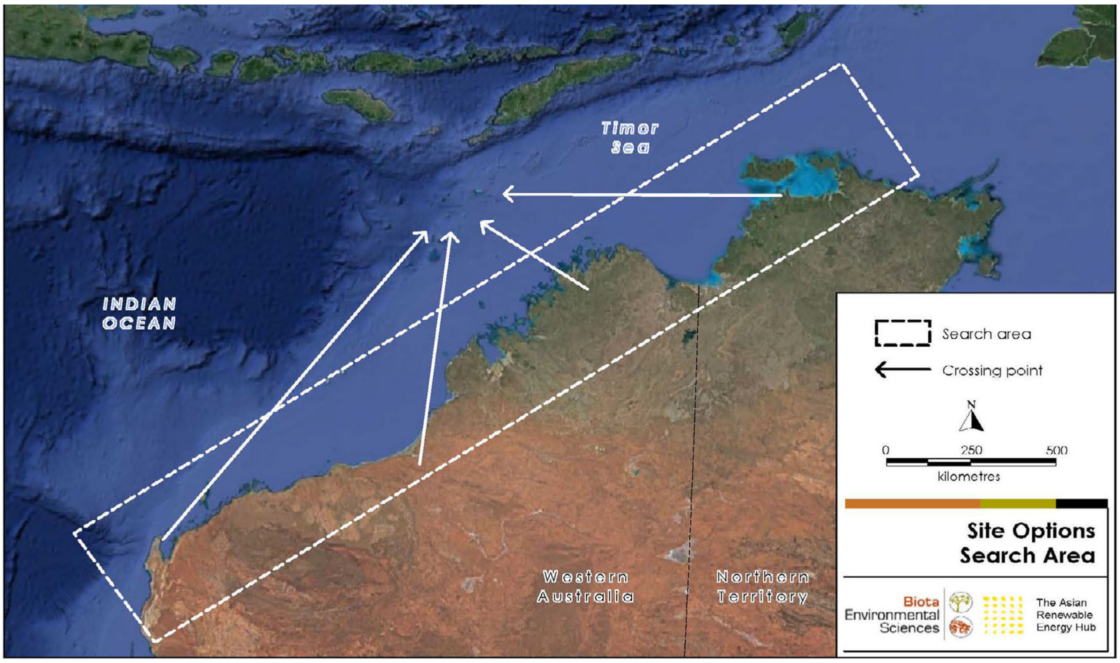

Figure 2.6: Site option search area.

Development constraints were identified to find the best possible location, considering likely planning and stakeholder issues, project economics, potential environmental impacts, and important technical and construction considerations, as outlined in Table 2.5.

Table 2.5: Site search and constraints criteria.

Aspect	Selection Criteria
Wind Resources	Wind speed data from the Bureau of Meteorology, together with high level 3Tier and Vortex mesoscale models, were used to pinpoint the most likely high wind resource areas. These were then studied in detail and were verified through the purchase of higher resolution Vortex mesoscale data. Northwest Australia is affected by cyclones, and therefore the site should be located a suitable distance inland to reduce the likelihood and impacts of storm damage.
Solar Resources	The best solar resources are near the middle of the northwest coast, as areas further northeast are subject to more cloud cover and rainfall, which reduce the available resource. Publicly available estimated solar irradiance data were obtained.
Proximity to Timor Sea Crossing	The closer to the Timor Sea crossing point the better, in order to reduce cable length and cost if power was to be exported to SE Asia.
Existing land uses and other values	Avoiding areas of potential planning concern including: • Aboriginal Reserves; • tourist areas and near towns and settlements; • military training grounds; • Marine Parks; and • known land development zones.
Environmental Considerations	Avoiding areas of potential environmental impact including: • nature reserves; • ecologically sensitive areas; and • known migratory bird habitats including buffer zones.
Oil, Gas and Mining Activity	Avoiding land with mining tenements and oil and gas activity to the extent possible in northwest Australia.
Buildability	Ensuring proximity to one of Port Hedland, Broome, Dampier or Darwin, but avoiding areas: • with shifting and very sandy ground conditions; • prone to flooding during the wet season; or • with complex terrain.
Native Title	Focus on areas with settled Native Land Title Claims.

2.3.3.2 Initial Site Selection

On completion of the site search process, one site was clearly superior to the other options under consideration (Figure 2.7 and Plate 2.6):

- at initial appraisal, it did not appear to have any significant planning or ecological constraints;
- the wind and solar resources were likely to be world class;
- there was virtually nothing in the way of mining, oil and gas exploration activity on the site;
- at 1.4 million hectares (14,000 km^2) the site was large, allowing for infrastructure flexibility and turbine spacing to reduce wind turbine-array wake effects and improve economics;
- the site was relatively flat in topography (Plate 2.6);
- the site was close to the coast but extended well inland, giving flexibility for any setbacks required due to cyclones or to allow for buffers on environmental sensitive areas; and
- there was only a single Traditional Owner group relevant to the site and their Native Title Claim had been determined.

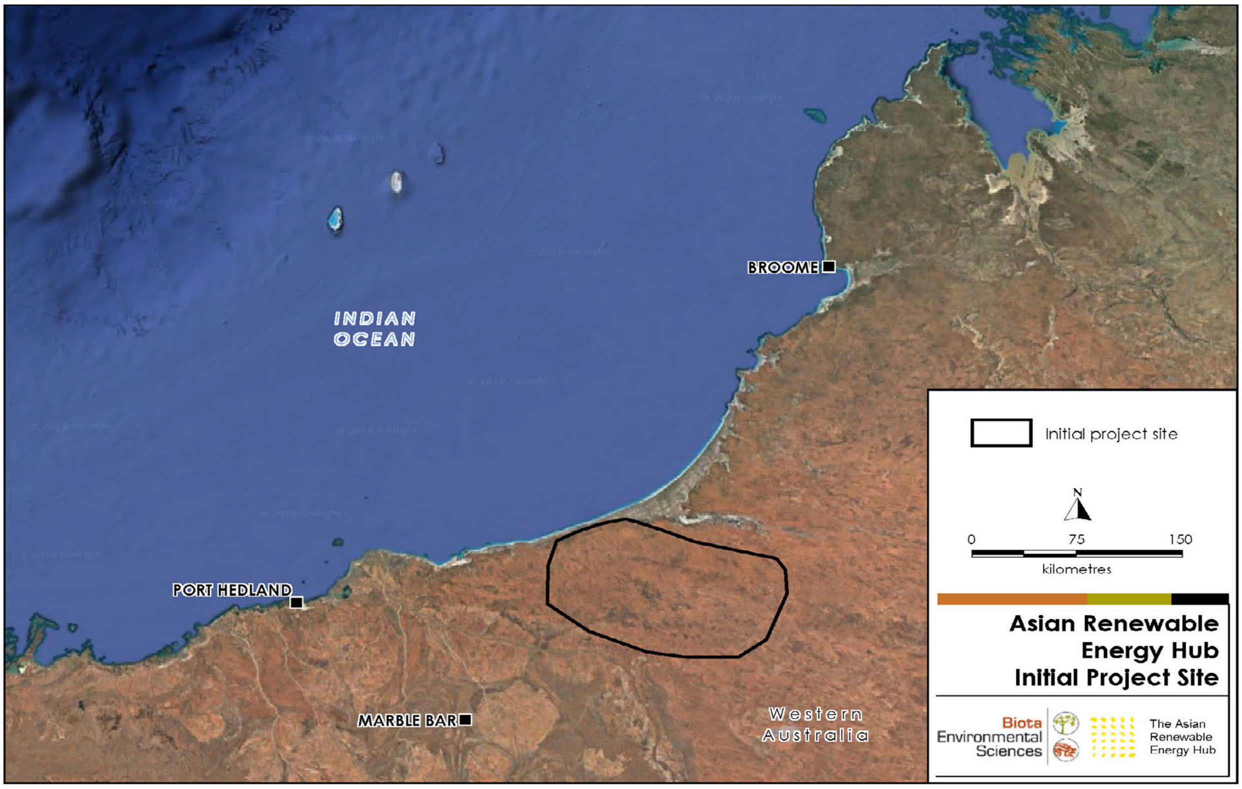

Figure 2.7: Initial project site.

Plate 2.6: Aerial view of the initial project site.

2.3.3.3 Environmental Criteria for Site Optimisation and Layout

Having selected the initial area of interest, the next step was to develop an optimum site boundary. Just as finding the right resource is critical for the proposal, so was applying suitable environmental screening tools in the planning and design stage to ensure that potential environmental impacts are minimised. This was done to the extent possible through the preferred strategy of avoidance of impacts. The methodology used was to identify potentially sensitive receivers, and then to apply a suitable buffer around them to avoid direct impacts.

Figure 2.8 to Figure 2.14 show the key environmental considerations that helped shape the site boundary, which included the following buffers:

- Terrestrial Fauna and Avifauna: a 10 km buffer from the Eighty Mile Beach and Mandora Marsh Ramsar site;
- Social Surroundings: avoiding known heritage sites; and
- Social Surroundings: a noise and visual impact 15 km buffer from local residences.

The final site boundary was selected by a multi-criteria analysis that took into account the various constraints identified in the locality, including key environmental values and other important planning aspects (see Figure 2.14).

2.3.3.4 Residual Impact Management

Because of the comprehensive site selection and boundary optimisation process undertaken, the majority of potentially significant environmental impacts were avoided from the outset. In situations where direct impacts were unavoidable at the macro-scale, the site design was optimised within the development envelope to minimise impacts (as discussed in Section 4.0). Primarily this was done via:

- minimising land take to the absolute minimum needed to operate the project safely, which has resulted in less than 2% of the development envelope actually being used for infrastructure deployment;
- designing and moving the infrastructure layout to avoid identified sensitive fauna and flora and habitats; and
- spacing turbines in long rows to provision for bird movement corridors.

Having selected the initial site, the next step was to develop an optimum site boundary. This was refined over time on the basis of information compiled regarding the site as it was investigated further. Figure 2.8 to Figure 2.14 show the key considerations that have helped shape the site boundary.

The final site boundary was selected by a multi-criteria analysis that took into account the various constraints identified in the locality, including key environmental values with appropriate buffer distances (see Figure 2.14).

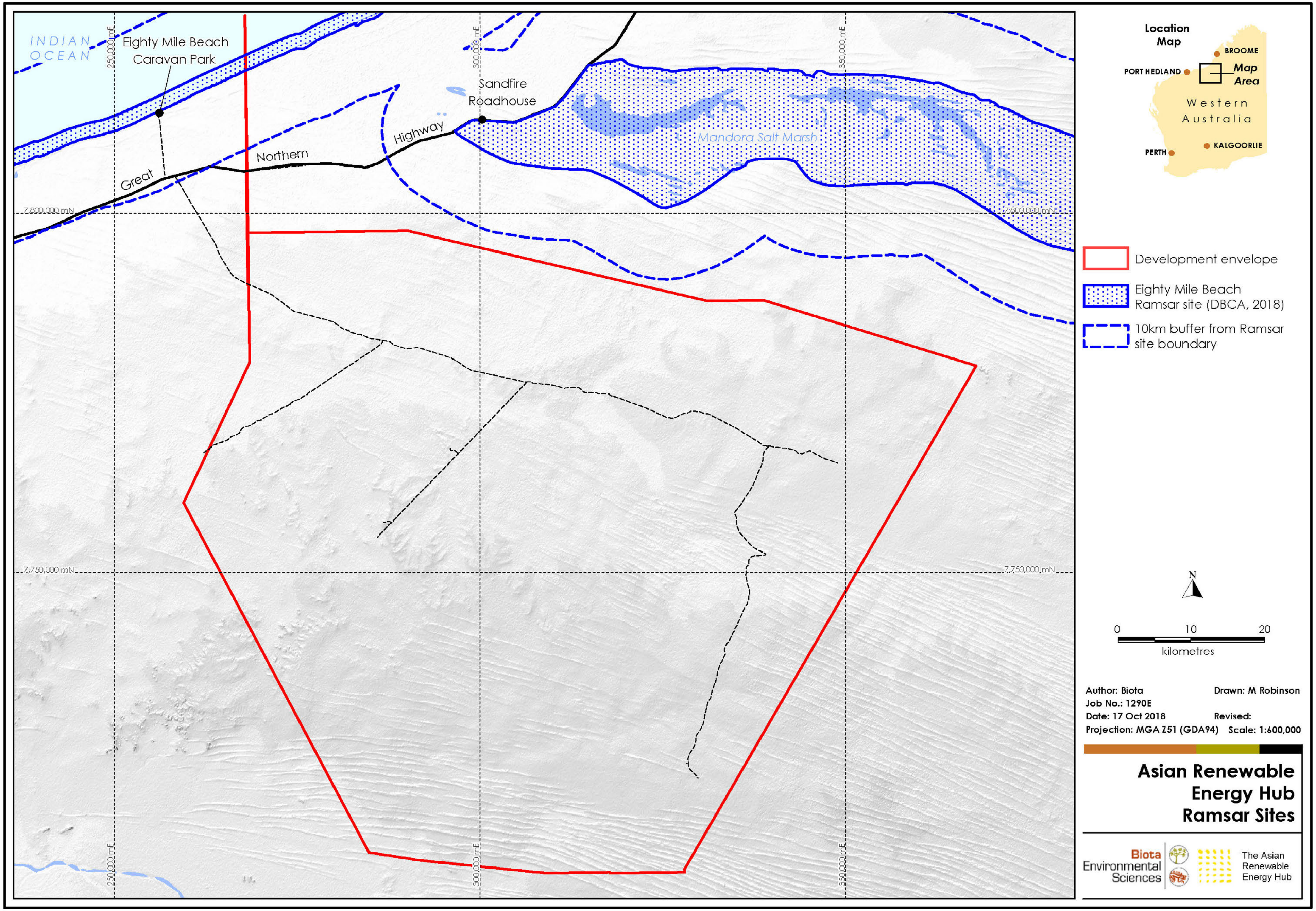

Figure 2.8: Eighty Mile Beach and Mandora Marsh Ramsar site with 10 km buffers.

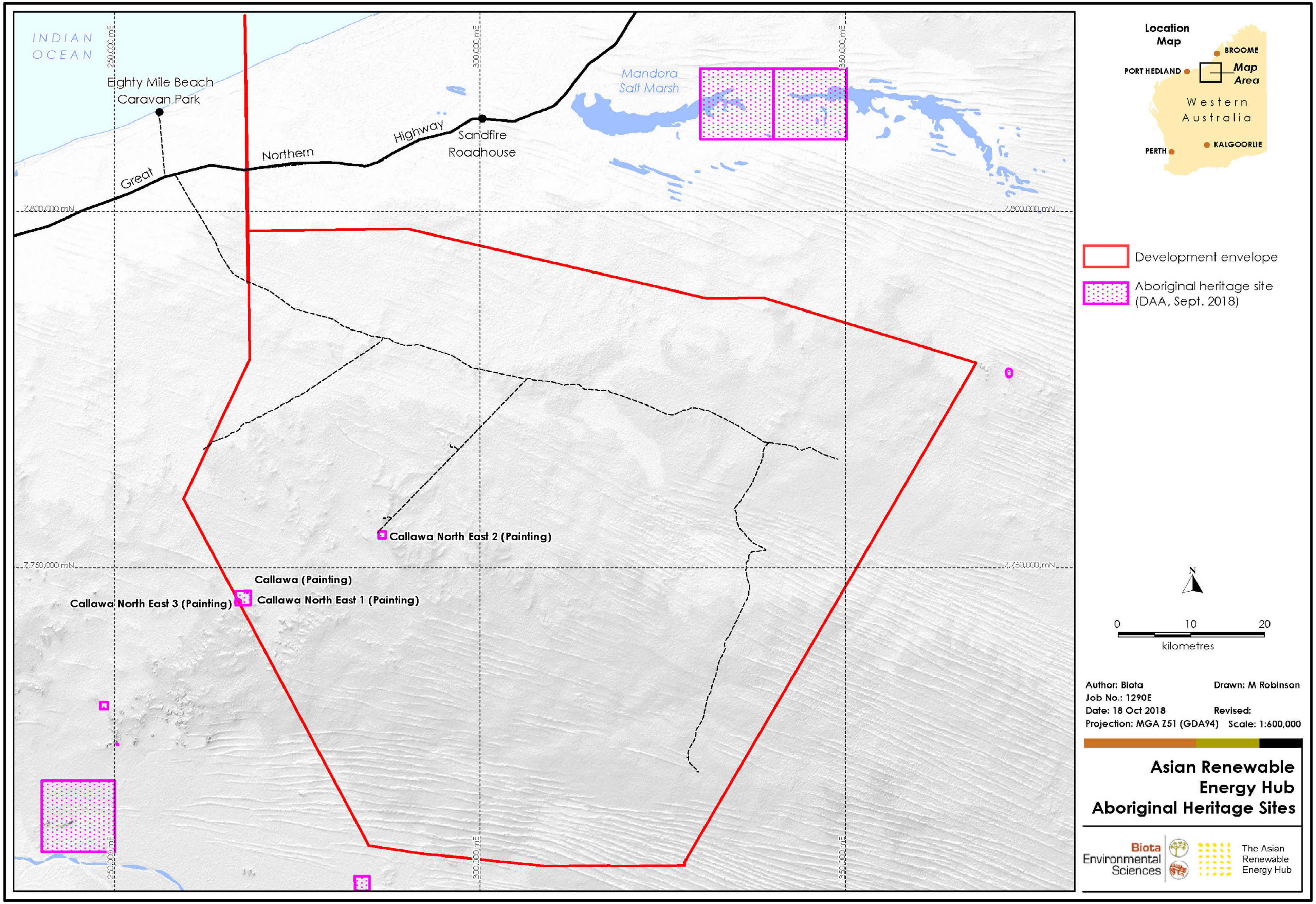

Figure 2.9: Known Aboriginal Heritage sites.

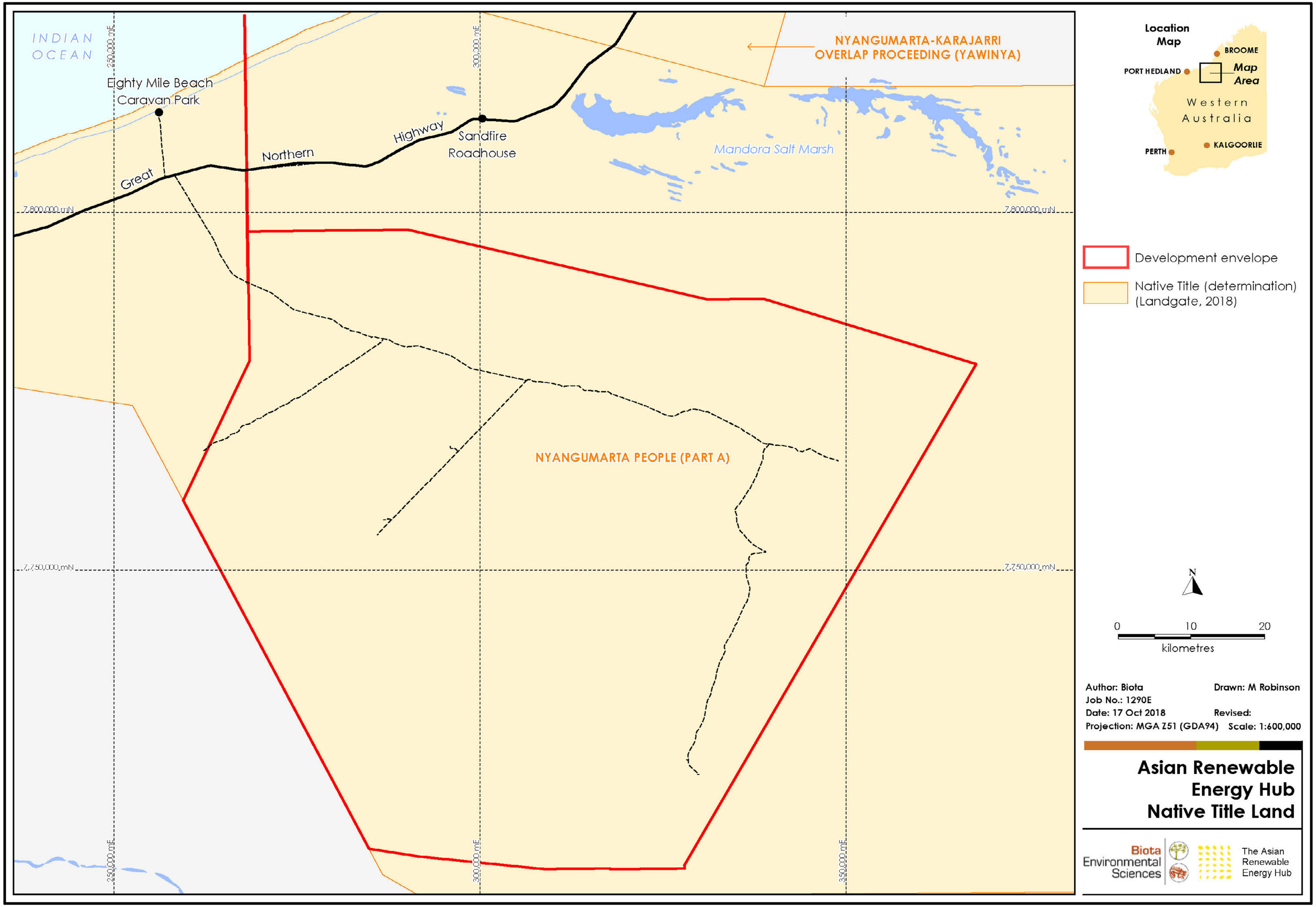

Figure 2.10: Native Title land determinations.

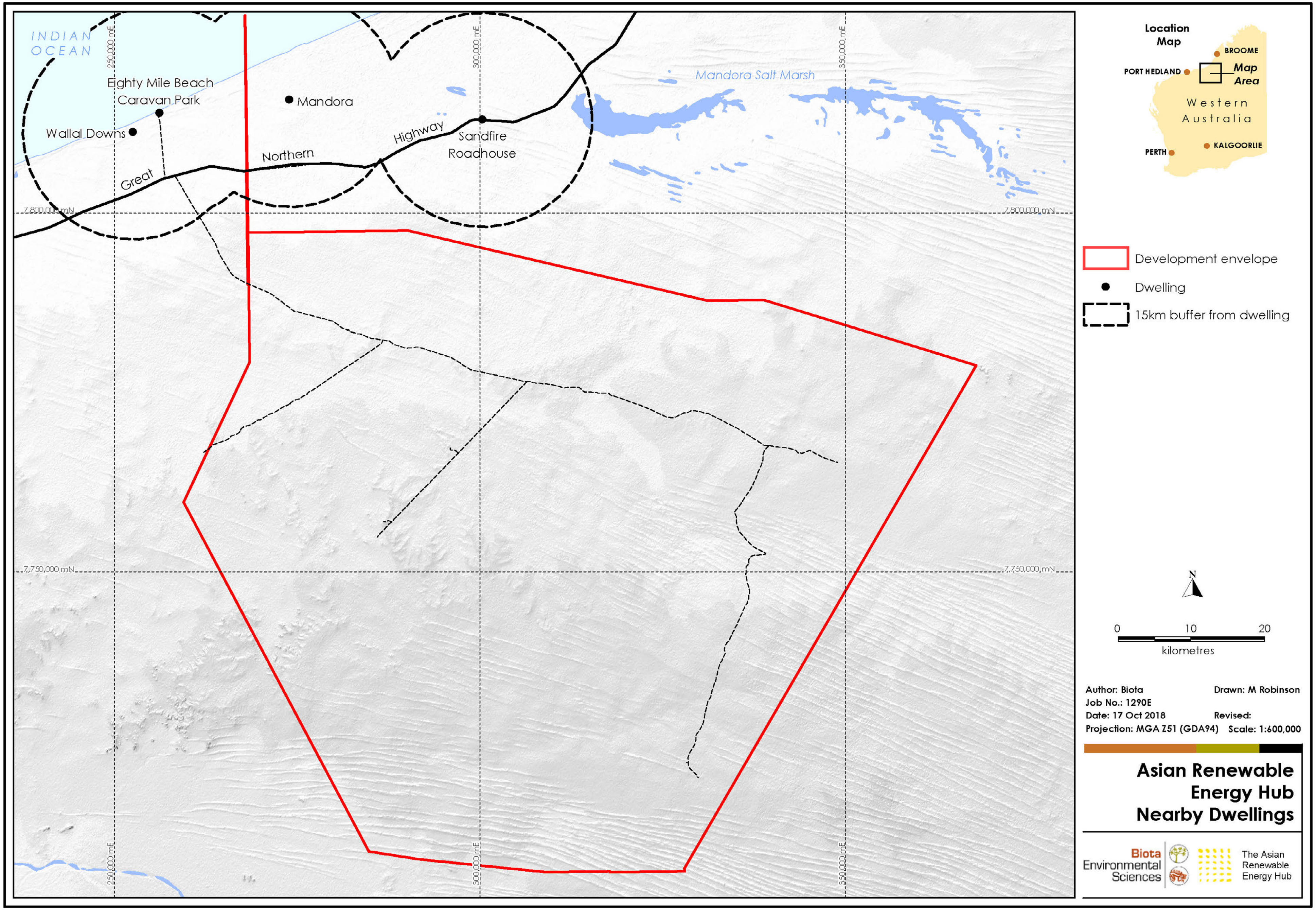

Figure 2.11: Nearby dwellings with 15 km buffers.

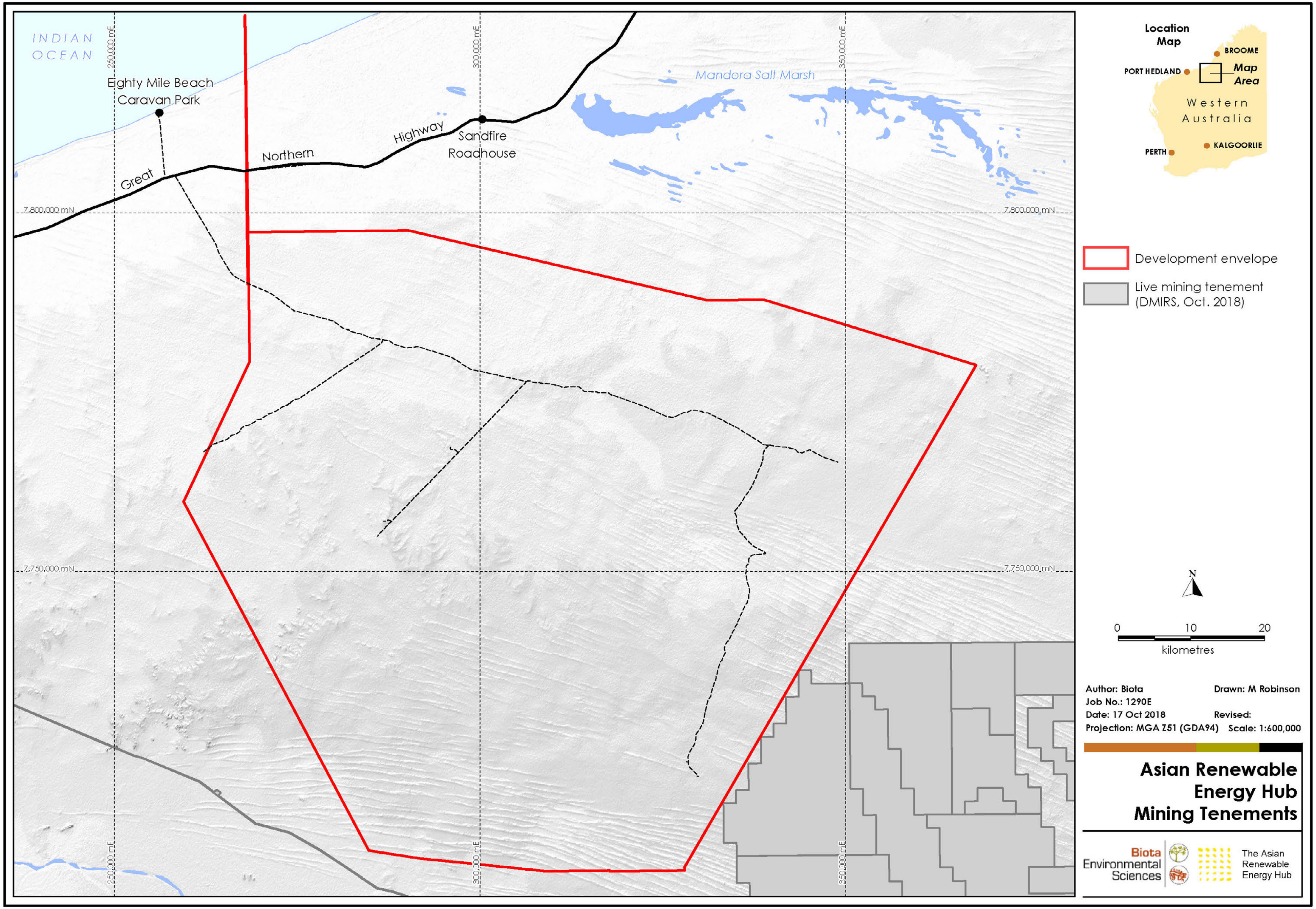

Figure 2.12: Live Mining Act tenure.

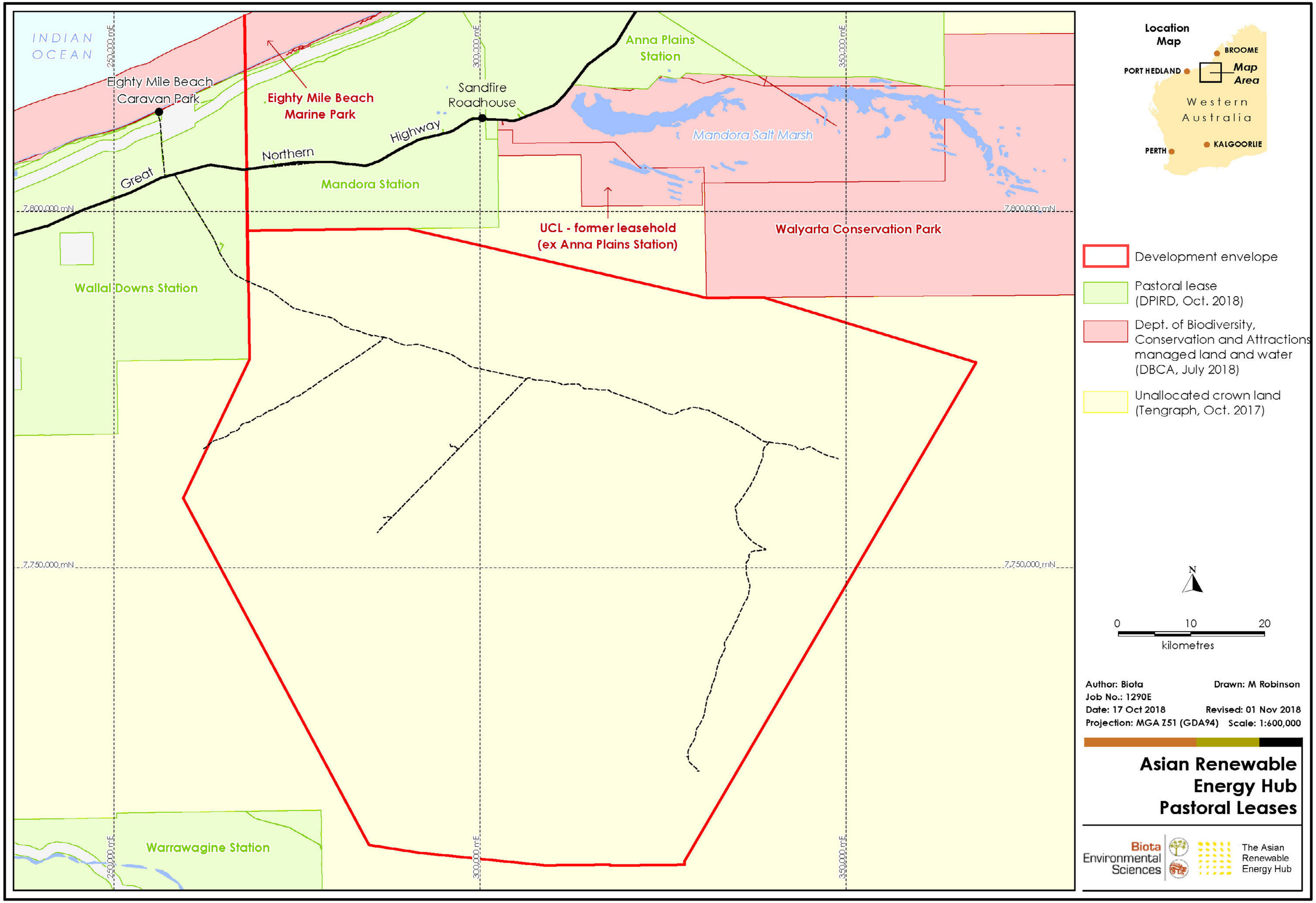

Figure 2.13: Pastoral Leases and other land uses.

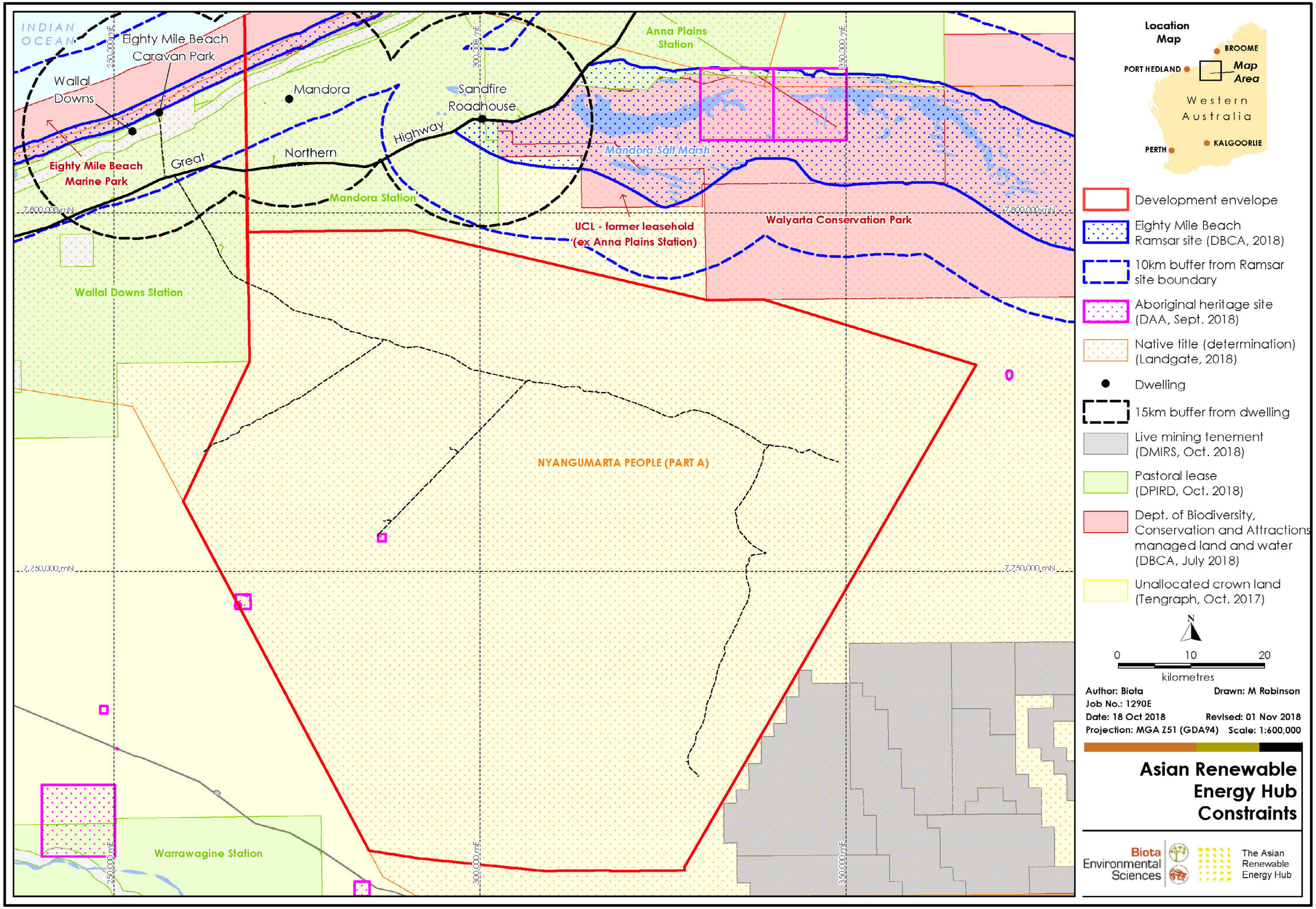

Figure 2.14: Final site boundary versus combined constraints.

It was fortunate that the area that avoided the known constraints also coincided with the area of the highest wind resource (Figure 2.16).

The final site area is noticeably windier than surrounding areas. The best explanation for this is because the site is located in a metaphorical funnel. Every day the extensive inland deserts of northwestern Australia heat up. This gives rise to a pressure differential between the air above the inland deserts and the air above the sea to the northwest. Since air acts to balance out pressure differentials, this results in a large body of air that moves back and forth each day, trying to balance this pressure differential on a diurnal cycle. It does so by taking the shortest route, which is this metaphorical funnel over the site (Figure 2.16).

2.3.4 Transmission System

2.3.4.1 Flexibility to Supply

At this stage it is not certain whether all the power will go from the project site to a location in the Pilbara, or whether some power will go to Indonesia and Singapore as well. However, this does not change the fact that four subsea cables will be installed from the project to the edge of State waters. The only difference the final destination makes is where the cables will go from there. That is the reason why permitting for the cables through and/or beyond Commonwealth waters to the final destination(s) will be the subject of a separate future referral.

2.3.4.2 Potential Cable Route through Commonwealth, International, and Indonesian Waters

A detailed desktop cable route survey was carried out by BMT in conjunction with the Norwegian Geotechnical Institute in early 2016. The proposed route was then reviewed by Prysmian. The conclusion was that the route shown in Figure 2.15 would be feasible.

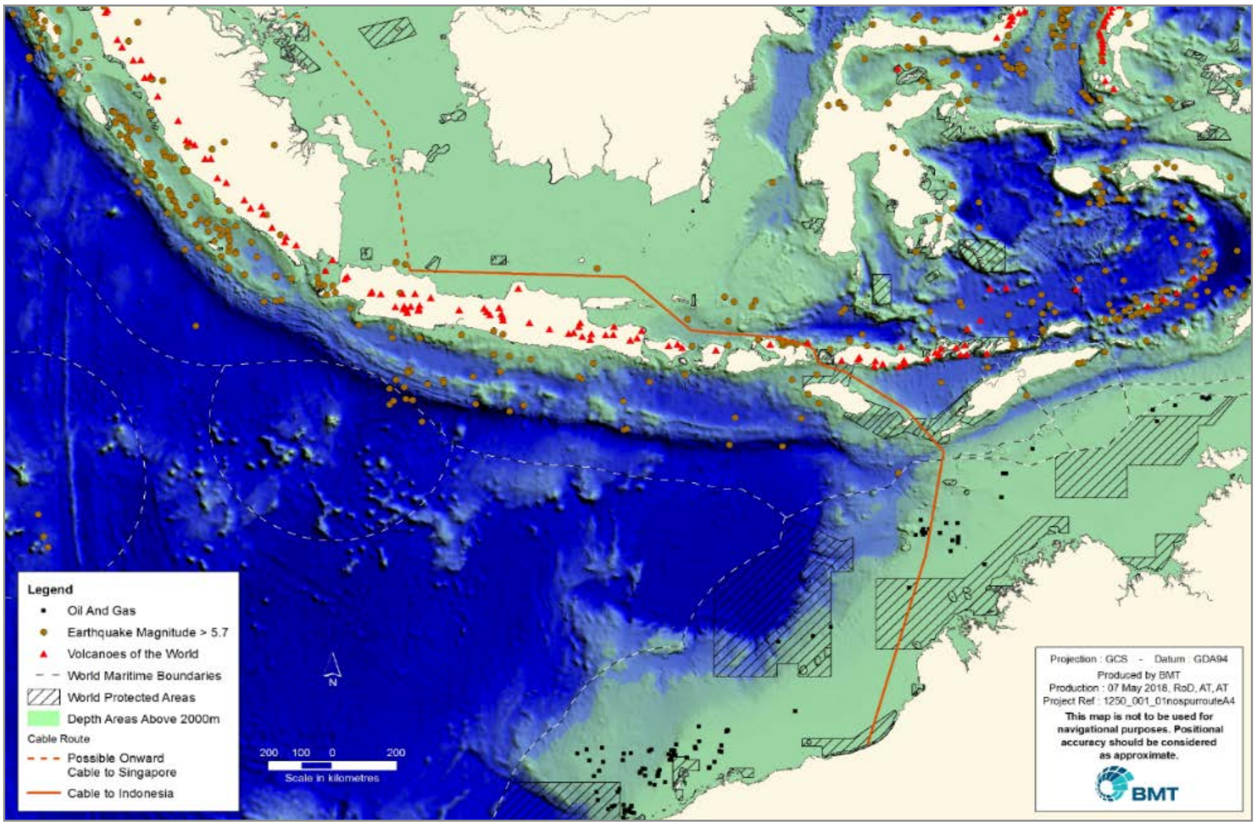

Figure 2.15: Export cable route identified through desktop marine constraints assessment (BMT 2018a).

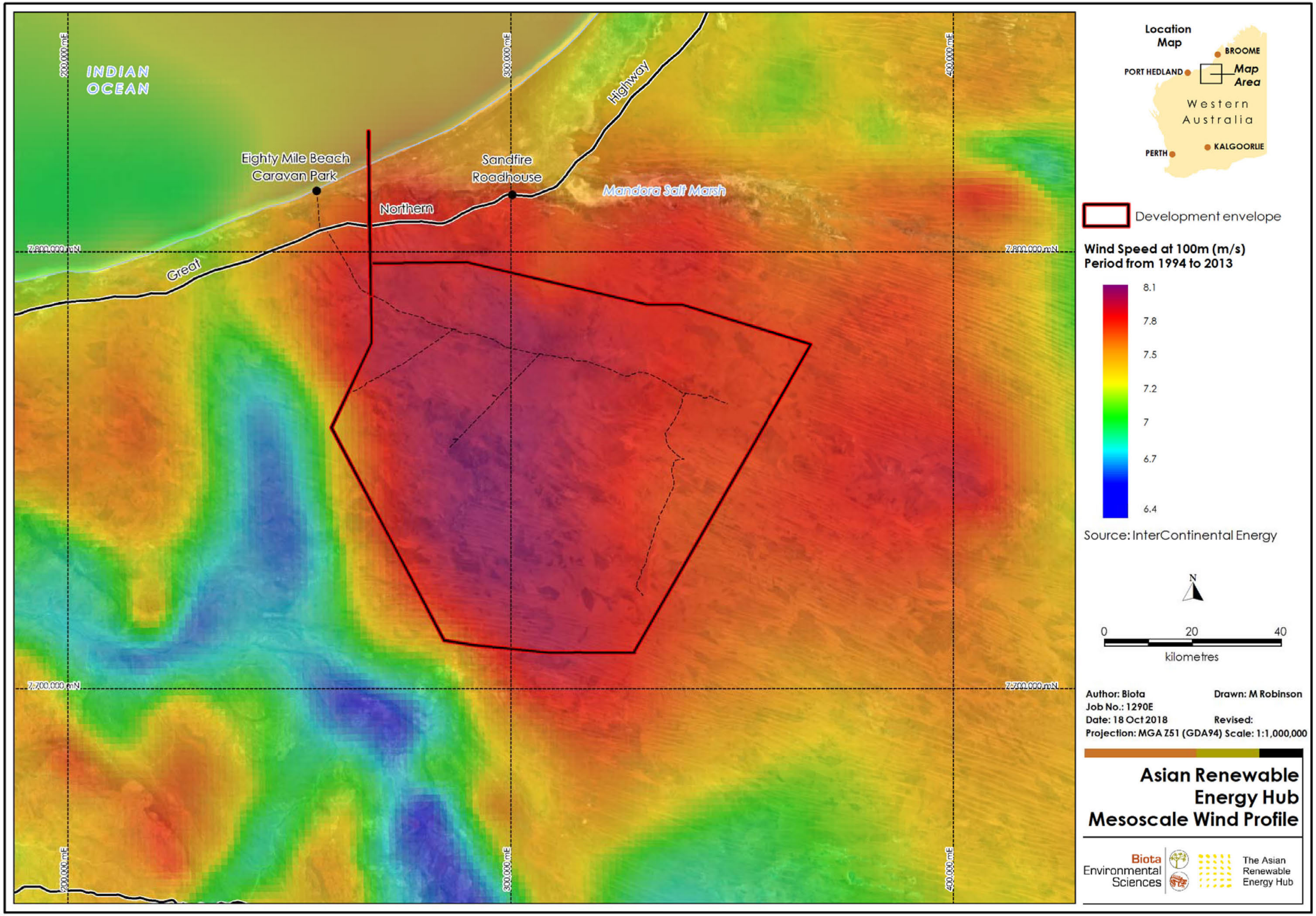

Figure 2.16: Site mesoscale wind profile (wind model output at 120 m above sea level).

Whilst a more detailed offshore cable route survey is planned for 2019, the work undertaken to date has enabled the proponent to establish where the cable will make landfall in Australia, and therefore it is possible to complete the current assessment to cover the onshore and nearshore aspects to the limit of State Waters (approximately 3 nautical miles offshore from Eighty Mile Beach).

The cables and the offshore electrodes in Commonwealth Waters will be the subject of a separate future referral.

2.3.4.3 Indonesia and Singapore Export Transmission System

The transmission infrastructure from Australia to Indonesia and Singapore would consist of a full bi-pole 600 kV HVDC transmission system using two cables rated at 1,900 MW each, together with backup electrodes to allow continued operation of one cable in the event of the other having a fault. HVDC converter stations with full redundancy will be located at each end of the cable route.

Losses calculated along the length of the cable are expected to be 7%, while losses at the converters are expected to total up to 1.5%. The total transmission system availability from Australia to Indonesia has been modelled at 95%, which allows for a cable to break every 5 years; a conservative assumption compared to existing operational projects elsewhere in the world.

2.3.4.4 Pilbara Port Transmission System

The transmission infrastructure from the site to either Dampier or Port Hedland will consist of one or two full bi-pole 600 kV HVDC transmission systems. Each system would use two cables rated at 2,000+ MW each, together with backup electrodes to allow continued operation of one cable in the event of the other having a fault. The same converter station near the generation site area can be used for exporting power to the Pilbara ports and also to export power to SE Asia.

Losses calculated along the cable are expected to be <2%, while losses at the converters are expected to total up to 1.5%.

2.3.4.5 Offshore Cable Route Selection

HVDC offshore transmission lines consisting of a total of four cables will connect the project to the Pilbara ports, and possibly also to SE Asia. The transmission cables will originate as overhead powerlines from the on-site HVDC Converter, and will be buried prior to entering the ocean, with the cables to be undergrounded from just inland of the Great Northern Highway.

Route selection was an important consideration for the proponent, as avoidance of impacts is better than mitigation of impacts, if such an option is practical and available. Three possible cable route options were considered prior to selecting the preferred route (Figure 2.17). Table 2.6 summarises the relative pros and cons of the three options.

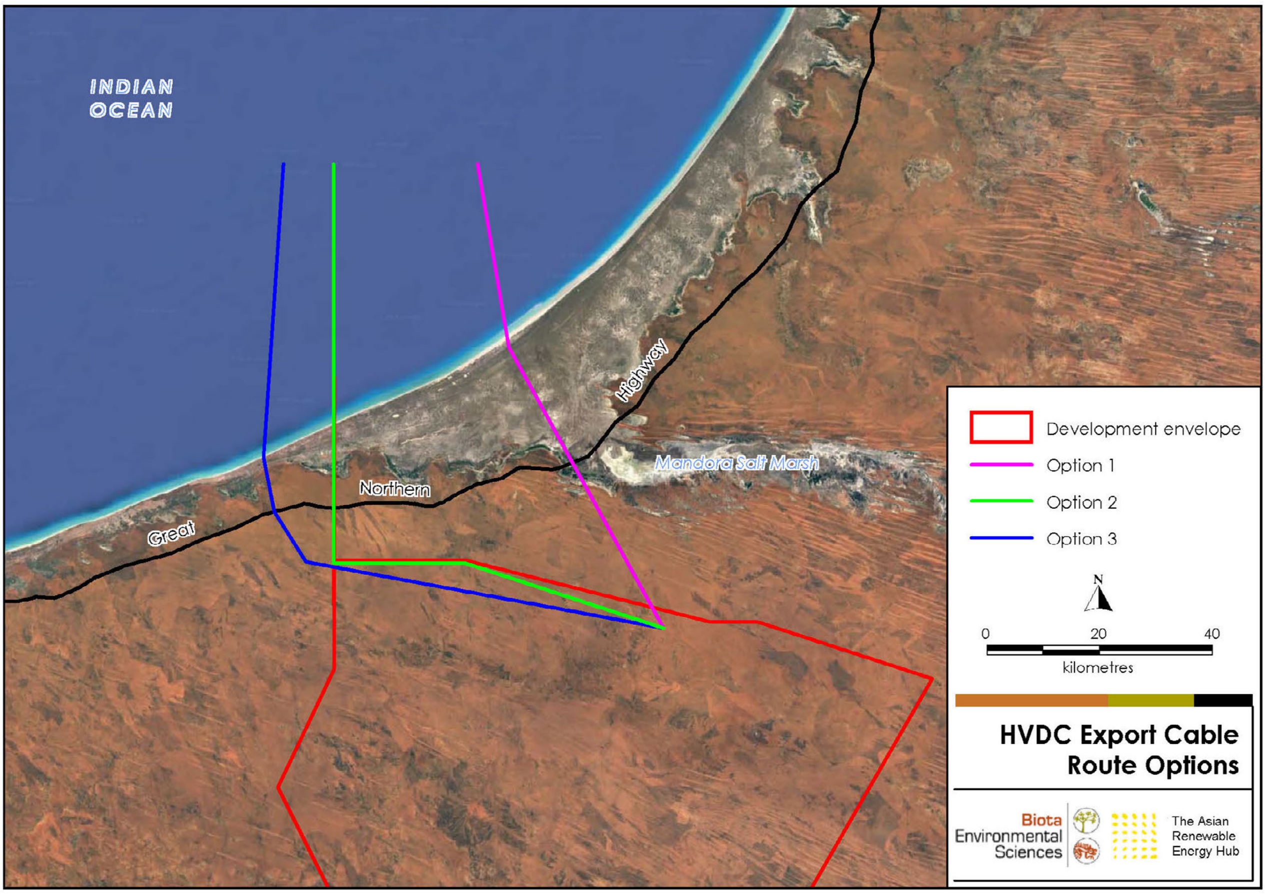

Figure 2.17: HVDC export cable route options.

Table 2.6: HVDC export cable route pros and cons.

Route	Pros	Cons
1	• The shortest route, so lowest cost • Avoids areas of concern along Eighty Mile Beach	• Will require more clearing as there is no existing track/firebreak to use • Would run through the Walyarta Conservation Park and the Ramsar site
2	• Can utilise an existing wide firebreak between the two pastoral lease boundaries for the cable to minimise vegetation clearing • Second shortest route overall • Avoids areas of concern along Eighty Mile Beach • Sufficiently removed from any existing dwellings	• No obvious issues
3	• Can utilise an existing cleared track from the highway to the beach	• Longest route • Would run through the Wallal Recreation Zone within the Eighty Mile Beach Marine Park • Would pass close by Eighty Mile Beach Caravan Park

From the above it was clear that Route 2 was the preferred cable route (Figure 2.18). The next stage of work then involved deciding which parts of the cable route would use overhead powerlines and which would use buried power lines. Overhead power lines cost less and are therefore the preferred choice from an economic perspective, but burying powerlines can sometimes be appropriate where potential impacts require mitigation.

Given the lack of dwellings and sensitive receivers near the site, overhead powerlines have been selected for as far as possible towards the coast. Nearer the coast, and offshore, it is proposed to bury the powerlines in order to mitigate several potential impacts, including:

- visual impacts on users of the Great Northern Highway;
- visual impacts on tourists using Eighty Mile Beach;
- visual impacts on Mandora Station, the nearest dwelling; and
- avifauna impacts on birds that would use the coast for feeding and migration.

A location before the Great Northern Highway has been selected as the location for cable to be undergrounded in order to strike a balance between mitigating the potential impacts and economic considerations (Figure 2.18).

The proponent is in discussions with the Department of Transport to agree on the best option for the crossing under the Great Northern Highway.

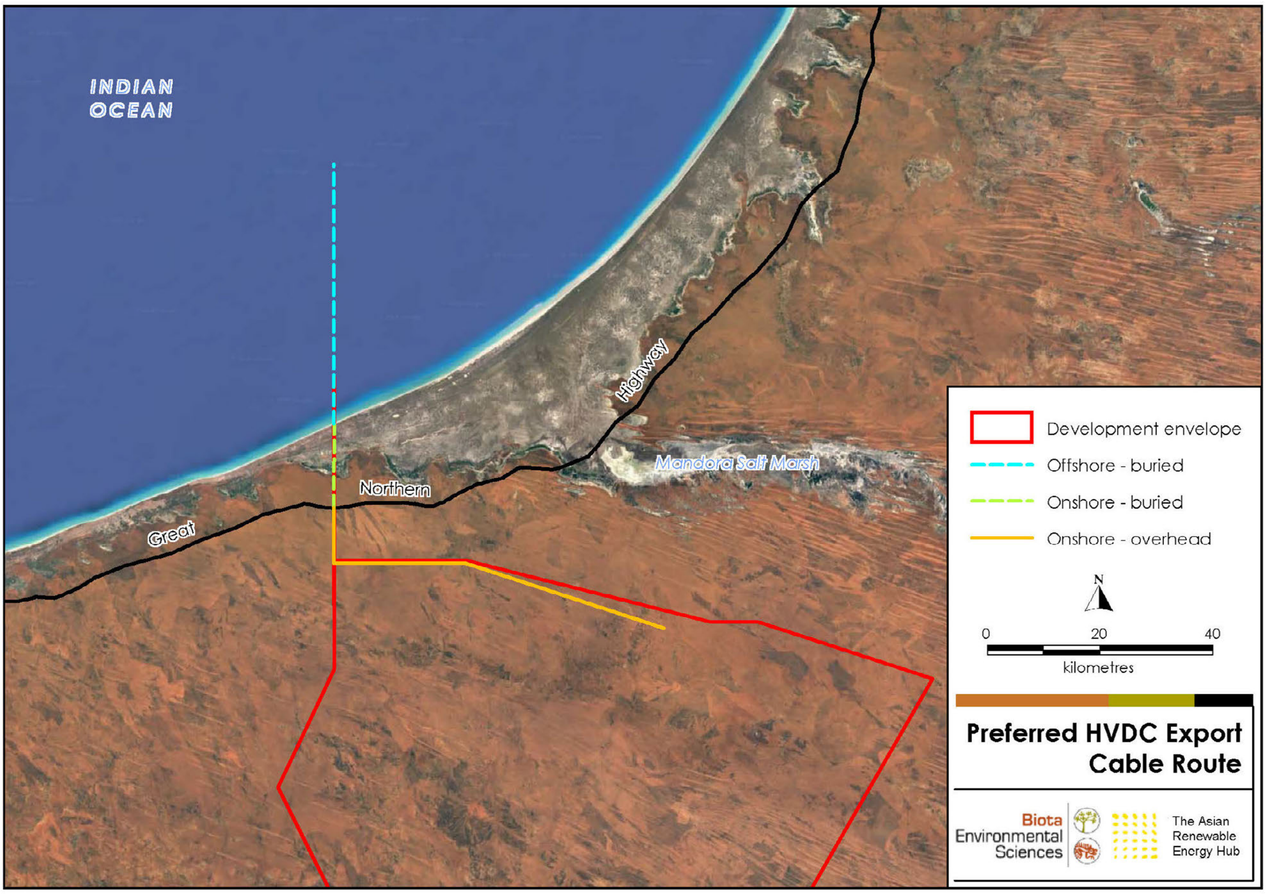

Figure 2.18: Preferred HVDC export cable route.

2.3.5 Resource Assessment

Modelling of the total forecast site generation output, including the wind and solar generation combined, was carried out using 30-minute data bins over a forecast typical year to arrive at a total site Annual Energy Production (AEP), taking into account the transmission capacity limits for each stage of the project. The data for the analysis were collected from onsite wind and solar monitoring equipment that has been deployed on site since the end of 2015.

The project's wind and solar generation profiles combine very well, given the daily drop in wind during the middle of the day when solar generation is most active (Figure 2.19). Wind and solar generation combine to produce a relatively consistent total generation output, which allows the transmission capacity to be selected to achieve high utilisation, which results in improved capital efficiency, a more predictable energy source, and a lower power purchase agreement (PPA) price for the project's energy customers.

As an example, where 11 GW of combined generation capacity is combined with 8 GW of transmission export capacity, curtailment (excess generation) is expected to be under 10% of total generation in a typical year. This results in technical and commercial efficiencies.

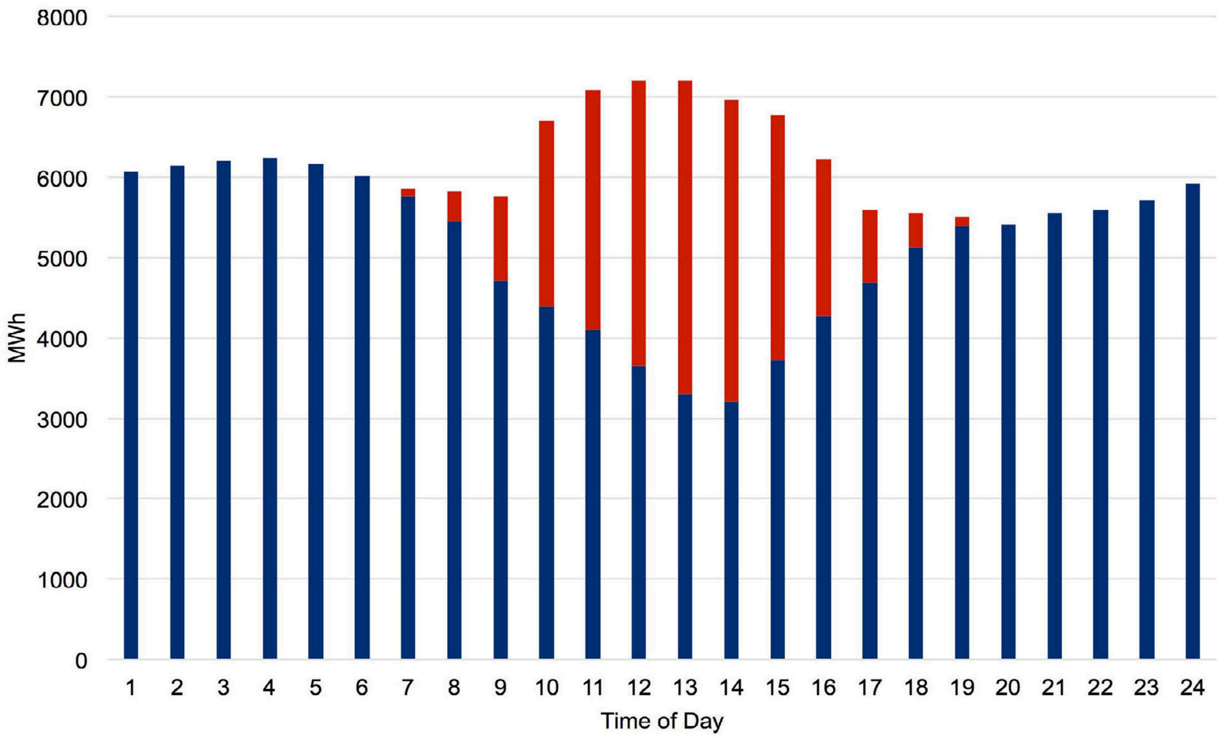

Figure 2.19: Average daily forecast power exports (blue = wind, red = solar).

2.4 Local and Regional Context

2.4.1 Land Use

The majority of the proposed project infrastructure is located within the Shire of East Pilbara, with the cable export route passing through the Shire of Broome (Figure 2.20). The development envelope that will accommodate the proposed project is entirely Unallocated Crown Land and intersects three oil and gas exploration permit applications (STP-EPA-0106, STP-EPA-0107 and STP-EPA-0131). Whilst there are no live exploration permits inside the site boundary, four exploration license applications have recently been filed which cover the vast majority of the project site area. There are currently no pastoral or other relevant land uses within the development envelope.

The cable export route part of the development envelope traverses an existing pastoral lease, and also makes a short, straight line crossing of the Kujungurru-Warrarn Nature Reserve (Figure 2.20) and the proponent has been granted an Easement covering the proposed cable route (see Section 2.4.1.1).

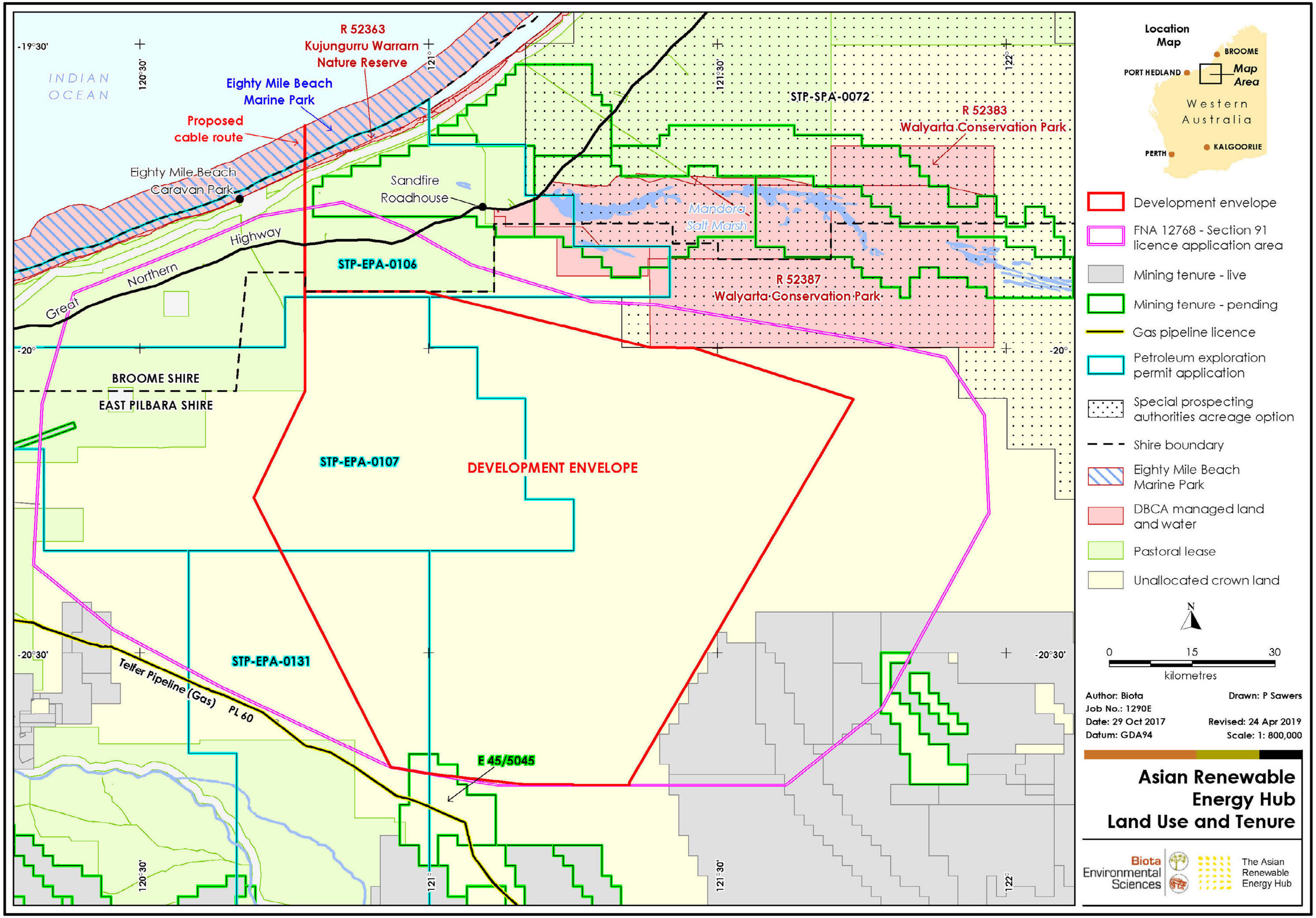

Figure 2.20: Land use and tenure.

The offshore section of the cable route then passes through State Waters vested as the Eighty Mile Beach Marine Park (Figure 2.20). The next closest conservation estate to the development envelope is the recently vested Walyarta Conservation Park, situated to the immediate north (R52387; Figure 2.20). This Conservation Park was announced after the development of the project, and the boundaries were drawn right up to the boundaries of the proposal. Both are managed by the Department of Biodiversity Conservation and Attractions (DBCA).

2.4.1.1 Tenure

In May 2016 the proponent was granted a Section 91 Licence under the *Land Administration Act 1997*, covering an extent of approximately 14,000 km^2, which gives it exclusive rights to develop a renewable energy project on the proposed site (FNA 12768 on Figure 2.20).

In December 2018 the proponent entered into an Option to Lease under the *Land Administration Act 1997*, covering an extent of approximately 6,446 km^2, being the area of land within the license area that was considered to be the best from a renewable energy resource perspective. The Option allows the proponent to enter into a 50-year lease. The proposed Option to Lease area represents the development envelope for the proposal for the purposes of the EP Act (Figure 2.20), and includes an Easement covering the proposed cable route.

2.4.1.2 Native Title

The proposed project lies within the Nyangumarta Native Title Claim (WCD2009/001). The Proponent commenced engagement with the Nyangumarta people early in the development process and is currently negotiating an Indigenous Land Use Agreement (ILUA), following four years of consultation. This ILUA will formally govern ongoing obligations such as land access, tenure acquisition, heritage surveys, environmental management, community support, consultation and ongoing communication between the parties.

2.5 Project Timeline

The project consortium has extensive experience developing wind and solar farms in Australia, as well as installing subsea power cables in various jurisdictions. This combined expertise, together with input from knowledgeable consultants, has been used to prepare the expected project timeline (Figure 2.21).

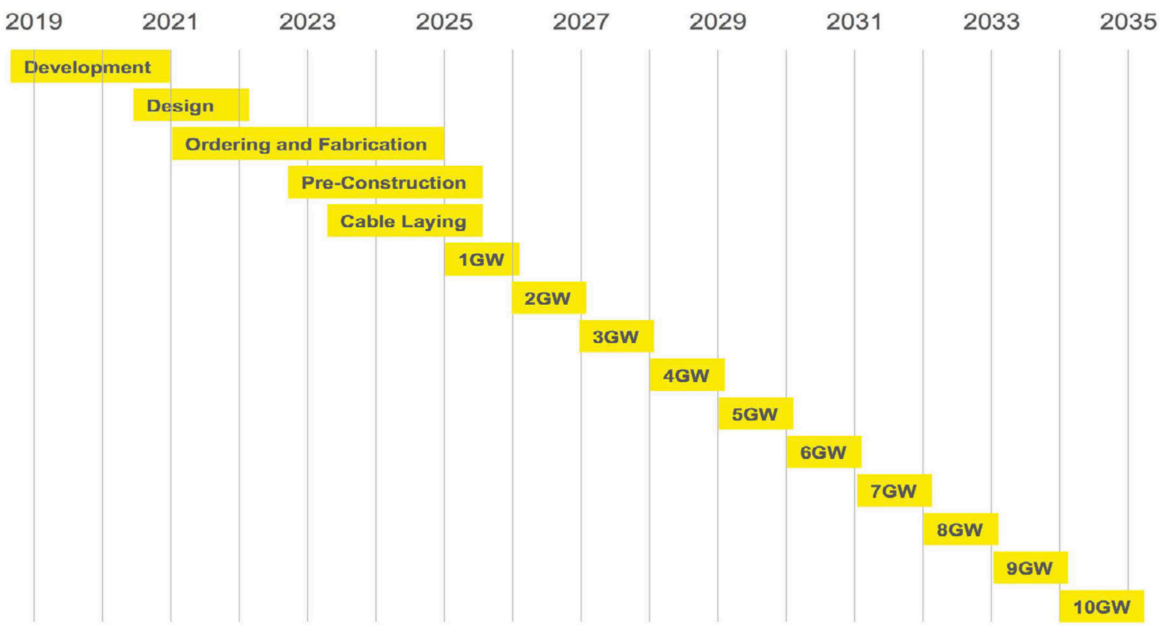

Figure 2.21: Project timeline.

The next two years will focus on progressing the development to the point where all major aspects have been de-risked, where large investors can consider co-investing, and Financial Close can be achieved in 2021.

The project will be built in phases to allow for efficient use and development of equipment supply chains and a skilled workforce. This will create more stable work during the construction period, helping contractors and WA companies with a more sustainable workload.

The requirement for supply chain expansion means that although Financial Close is expected to occur in 2021, construction at the site will only start by 2024/25. The proponent will encourage as much localisation of the supply chain as possible, to maximise local economic development opportunities in the Pilbara and WA.

2.6 Construction

2.6.1 Pre-Construction Works

Prior to the commencement of construction and installation works, a number of enabling works and further site planning would be undertaken, including:

- Survey of critical boundaries and pegging of infrastructure locations;
- Detailed cultural heritage and flora and fauna surveys across the entire proposed footprint, with adjustments of road and infrastructure placement if required;
- Engineering design works and submission for Building Licence;
- Preparation of works procedures;
- Development of Health and Safety Plan, Cultural Heritage Management Plan, Traffic Management Plan and any other documentation as required under the planning authorisation;
- Detailed site investigation including geotechnical investigations involving a series of trial pits and/or boreholes;
- Sealing the Nyangumarta Highway up to the proposed Visitor Centre, and then upgrading and widening the rest of the track, including road realignments and profile corrections where appropriate;
- Grading of a new access track to the proposed construction compound, if required;
- The construction of a secure onsite construction compound; and
- Erection of signage on the Great Northern Highway.

2.6.2 Site Access Tracks

A 1,541 km network of site access tracks will be established to connect the infrastructure and also act as firebreaks for infrastructure protection. Corridors 15 m in width will be cleared, within which compacted gravel pavements approximately 10 m in width will be centrally finished (Plate 2.7).

Preparation of access tracks will involve the grading and potential excavation to a suitable depth, prior to the laying of a compactable interlocking stone base and top dressing. It is anticipated that any soil and rock that is removed will be stored on-site at convenient locations for re-use within the development area or immediate vicinity where appropriate. Site access points would be gated and secured, and appropriate warning signs erected.

2.6.3 Wind Turbine Hardstand and Laydown Areas

A total of 1,743 wind turbines will be constructed and commissioned for the proposal, each of which will be up to 260 m high (for example, a 175 m high tower with a rotor diameter of 170 m). At each wind turbine location, 0.36 ha will be required for crane tables and hardstands for use during construction (Plate 2.8). This will involve grading and potential excavation to a suitable depth, prior to the laying of a compactable interlocking stone base and top dressing. It is anticipated that any soil and rock that is removed will be stored on-site at convenient locations for re-use within the development area or immediate vicinity where appropriate.

At each turbine location, up to a further 0.36 ha may be cleared during construction and prepared to provide suitable space for the assembly of the turbines, although these areas will be immediately rehabilitated upon completion of the assembly of the turbines.

Plate 2.7: Example site access track.

Plate 2.8: Example hardstand and laydown area.

2.6.4 Wind Turbine Foundations

The wind turbines will be installed in longitudinal rows, which will be spaced at least 4 km apart (Figure 2.5) and aligned perpendicularly to the predominant wind direction, in order to maximise power output. Turbine pads themselves will be spaced approximately 800 m apart within the rows. Turbine towers will be made of tubular steel and may or may not have guy wires, depending on future tower technical development and structural load studies.

If “slab” turbine foundations are required, subject to detailed geotechnical investigations, the construction of the foundation for each turbine would involve the excavation of approximately 1,000 m^3 of ground material (of which 300 m^3 would be used as back fill around the turbine bases) to a depth of approximately 2 m. Shuttering and steel reinforcement would then be put in place and concrete poured to form the base in-situ (e.g. Plate 2.9). The upper surface of each base would finish approximately 1 m below ground level with either a central column with bolts to support the tower, or the base section of the tower set into the concrete.

If “slab plus rock anchor” turbine foundations are required, the construction of the foundation for each machine would involve the excavation of approximately 600 m^3 of ground material to a depth of approximately 2 m. Shuttering and steel reinforcement would then be put in place and concrete poured to form the base in-situ. The upper surface of each base would finish at ground level with either a central column with bolts to support the tower, or the base section of the tower set into the concrete. The rock anchor piles would be drilled prior to concrete pour, to a depth of approximately 20 m. The steel rock anchors would be stressed and secured once the concrete has cured sufficiently.

If “mono-pile turbine” foundations are required, the construction of the foundation would involve the excavation of approximately 50 m^3 (of which 30 m^3 would be used as back fill) of ground material to a depth of approximately 10 m, using a rock drill. A tubular section with tower connection flanges would then be inserted in the hole and concrete then poured in-situ. The flange would finish slightly above the surface of the ground to allow connection of the tower.

If guyed towers are used, then three guy wires will be attached to the turbine tower and then anchored to the ground at a distance of up to 100 m from the turbine tower base. Each anchor would involve a foundation solution similar to the turbine tower foundations outlined above, but they would be smaller, with each guy wire anchor requiring up to 200 m^3 of excavation.

2.6.5 Wind Turbine Erection

The turbine components would be delivered to the site on extended and regular semi-trailers. The method of construction would involve the use of a small mobile crane for the ground assembly operation. A larger 600-1,000 tonne mobile crane (or alternatively a 300-400 tonne crawler crane), together with the smaller tailing crane, would be required to erect the turbines once ground assembly is complete (e.g. Plate 2.10). Erection is likely to take approximately 2-3 days per turbine, with multiple turbine erection crews operating simultaneously across the site at any one time.

Plate 2.9: Example turbine foundation.

Plate 2.10: Example turbine erection.

2.6.6 Solar Array Clearance and Installation

The solar PV panels will be deployed in 37 arrays of 55 MW, with each array taking up to 180 ha of land immediately adjacent to the site substations. The PV panels will be mounted on low impact steel frames with single axis tracking (Plate 2.11). At each array there will be up to 37 inverters and up to 10 MW in Lithium-ion batteries co-located throughout the array.

The solar PV panels will be attached to mounting racks and connected through electrical panel wiring with the inverter stations and batteries (e.g. Plate 2.12). The panel wiring will either be installed underground in shallow insulated trenches not deeper than 1 m, or above ground at a height equal to or below the panels. The inverters and batteries will be housed in weather resistant shelters.

Plate 2.11: Typical solar panel rack installation.

Plate 2.12: Example completed solar panel array.

2.6.7 Onsite Operational Control Compound

The site compound will be utilised by operations personnel and support services for the life of the project. Buildings and warehouse facilities will be established on crushed rock platforms constructed from rock material excavated from the site or imported from nearby quarries. The platform will be designed to sit above the predicted flood level, and further ground profiling will ensure that any surface water flows are directed away from the compound buildings.

Some of the buildings may require reinforced concrete footings. The buildings, warehouses, accommodation and any protective sheds will be finished in unobtrusive colours which complement site soil and vegetation colours.

2.6.8 Temporary Construction Compounds

Due to the size of the site, up to six temporary construction compounds may be established. These will be decommissioned after construction is complete and will not result in any lasting environmental impacts.

Each temporary compound will accommodate from 300-1,000 workers for 2-3 years and may be up to 25 ha in size. General temporary facilities required for each compound will include site parking, storage sheds and offices, accommodation, ablution facilities, crib rooms, fluid and fuel stores, and covered external areas and laydown areas (e.g. Plate 2.13).

A temporary concrete batching plant facility will be required at each compound to facilitate the continuous pouring of concrete for the turbine and solar frame footings (Figure 2.22). Raw materials including cement, aggregate and fly ash will be trucked to the site, and stockpiled adjacent to the batching facilities. Aggregate, sand and cement will be stored within the concrete batch plant area for use as required. Cement would be delivered on-site in enclosed container trucks as needed and stored in enclosed silos. Aggregates and sand will be delivered in standard bulk material delivery trucks and stockpiled for use as required. Concrete manufactured on-site in temporary batch plants would be loaded into concrete agitators for transport to the required locations on-site.

Plate 2.13: Example on-site accommodation camp.

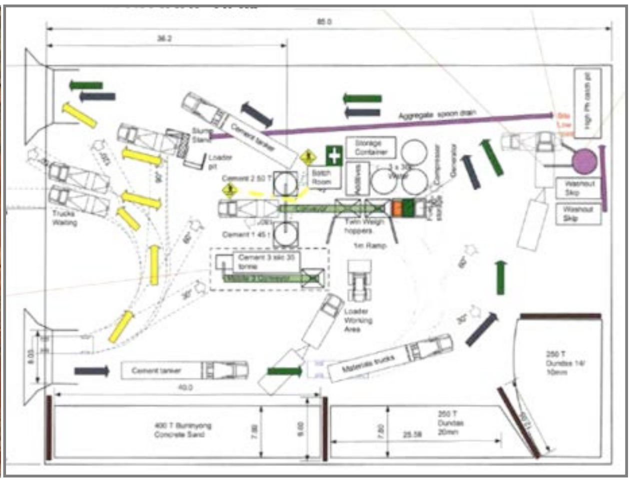

Figure 2.22: Typical construction site plan for concrete batching plant setup.

Concrete batching works are considered prescribed premises under Part V of the EP Act. This classification requires any such operations to have a Works Approval and Licence where the capacity of production of concrete exceeds 100 tonnes or more per year.

2.6.9 HVDC Converter Station and Distribution Substations

The HVDC converter station area (Plate 2.14) will be established on a crushed rock platform constructed from rock material excavated from the site or imported from nearby quarries. Reinforced concrete footings will then be constructed to support electrical infrastructure and buildings. The platform will be designed to sit above the predicted flood level, and further ground profiling will ensure that any surface water flows are directed away from the converter station site.

The main outside area of the core platform will function much like a normal electrical substation, accommodating open metal busbar structures up to 15 m high. There will also be a substation control room. The high voltage equipment for controlling the HVDC circuit will be contained within a large metal-clad building approximately 110 m long, 65 m wide, and up to 20 m in height (the converter station). The converter station will also house stores, workshops, control rooms, staff welfare facilities and storage for spare equipment.

The main buildings and any protective sheds will be finished in an unobtrusive colour. The site will not be permanently lit during darkness and the orientation of lighting will prevent lights shining out of the site.

During the construction phase of the project, a contractor compound will be located just to the northeast of the excavated platform area. The compound will contain offices, mess rooms, chemical toilets and parking for around 30 light vehicles. Areas for storage of materials such as topsoil, sand, stone and equipment will also be established.

There will be up to 37 onsite electrical substations (Plate 2.15). Each substation area will be 300 m x 345 m and the yard will be surfaced with compacted quarry rubble to form a hardstand area. Reinforced concrete footings will then be constructed to support electrical infrastructure and buildings. Infrastructure required within the yard will include: off-take tower, switchgear, power conditioning equipment, operations office and other ancillary infrastructure.

Plate 2.14: Example HDVC converter station.

Plate 2.15: Example distribution substation.

Infrastructure requirements will be partly determined by the contractor at the time of final site design, and final details will be submitted for approval to relevant statutory agencies.

2.6.10 Onsite Electrical Distribution System

During construction of the turbine footings, the overhead site electrical system will also be installed. This will require a 10 m track and laydown areas around each pylon. This will involve installing two separate electricity networks:

- 33 kV or 66 kV distribution system for connecting the wind turbine and solar PV array to one of the 37 distribution substations; and
- 220 kV (or similar) collection system that will connect the substations to the HVDC converter.

Both systems will, to the greatest extent possible, run alongside the site access tracks. This will reduce further disturbance of vegetation and make long-term maintenance easier. However, for the purpose of land impact calculations, it is assumed that the power lines will require their own 10 m wide track to be cleared, thus allowing a worst-case scenario to be assessed. The construction methodology will include:

- Clearing of native vegetation to pegged limits.
- Construction of the foundation for each pylon. The methodology employed will be similar to the wind turbine foundations as outlined in Section 2.6.4 and will depend on the ground conditions of each pylon location.
- Erection of the pylon. The pylons will be delivered to site in modules on the back of trucks and a crane will hoist each section into place.
- The conductors will be strung up in sections depending on the cable length and installation methodology selected by the contractor. This may involve the use of pulleys and wire tension machines, cherry pickers, cranes or helicopters (e.g. Figure 2.23).

The pylons for the 33 kV / 66 kV network could be up to 30 m high, while the pylons for the 220 kV network could be up to 50 m high (Figure 2.23). Either tubular steel or lattice pylons might be used, depending on the final contractor specification.

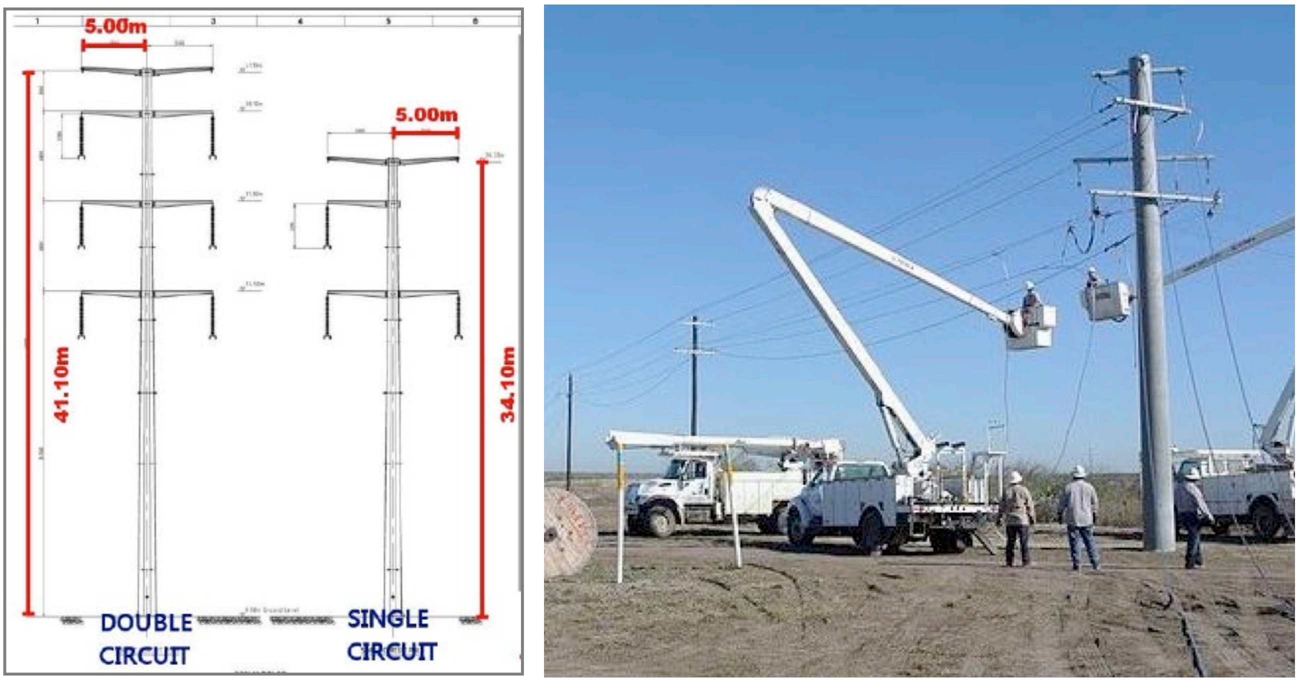

Figure 2.23: Example distribution and collection system pylons.

2.6.11 Export Transmission Power Lines

2.6.11.1 Overhead Power Lines

Two overhead HVDC transmission lines with two cables and a conductor each will leave the site HVDC converter station and head towards Eighty Mile Beach (Figure 2.5). The overhead lines are currently planned to follow an existing firebreak, and will be situated 100 m apart. If the existing firebreak has been recolonised by native vegetation by the time construction starts, it will be re-established and then rehabilitated after the electrical system has been commissioned.

The power line construction methodology will be similar to that used in Section 2.6.10 for the distribution and collection systems. At each pylon a temporary laydown area of 30 m x 60 m will initially be cleared. The pylons will be supported by reinforced concrete foundations to a depth determined by the contractor, taking into account the local geotechnical conditions. The pylons are likely to be lattice and up to 50 m high (e.g. Figure 2.24). Two conductor wires (single phase) and an earthing wire would be strung from the head frame on each of the pylons.

The cables would be undergrounded before crossing of the Great Northern Highway and the crossing of the highway itself will be effected by directional drilling below the road formation. To the north beyond the highway, the powerline will be buried (Section 2.6.11.2).

2.6.11.2 Buried Onshore Power Lines

The buried onshore powerlines will consist of an approximately 14 km section that ends just inland of Eighty Mile Beach. The proposed powerline corridor is predominantly along tracks and firebreaks that cross pastoral land, and during severe flooding events the majority of the area is prone to flooding.

Figure 2.24: Example overhead HVDC pylon and cable burial jointing bay.

Two trenches will be dug approximately 50 m apart. Each trench will be approximately 2 m wide and 1 m deep. In each trench two underground conducting cables will be laid, together with an earthing cable. The cables will be laid following a standard sequence of events involving the following:

- Establishment of an approximate 20 m wide temporary working corridor.
- Excavations of trench and joint bays (in which the sections of cables will be joined together; Figure 2.24). Joint bays must be clean and dry and will be formed by building a concrete floor box in the base of the trench, with a temporary cover to create the required conditions. Once the joints are finished, the joint bays will be buried with no structure visible at ground surface.
- Detailed design of the cable trench and its fill materials will depend on local ground conditions to ensure appropriate heat conduction and cable protection.
- Pumping equipment and wastewater facilities may be required to deal with discharged water from trench works to the wider environment.
- Deployment of cable markers at regular intervals along the route once installation is complete.

Once installed, a cable section would only need to be excavated if a fault develops, in which case repair or replacement of a section would require its excavation and reburial.

2.6.11.3 Offshore Export Transmission Power Line

The cables will be trenched through the beach using excavators to a suitable depth (Plate 2.16), which will be determined by the contractors in due course and agreed with the relevant authorities. The beach works are only expected to last a few weeks and will be scheduled at a time of year to minimise disturbance to turtles, marine mammals and migratory shorebirds.

Once the cable reaches the tidal boundary, a hydro-plough (Plate 2.16) or equivalent low impact installation technique will be used to bury the cable to the required depth (expected to be 5-10 m below seabed), in a disturbance area up to 5 m wide, all the way out to the edge of State Waters (approximately three nautical miles from the lowest astronomical tide). A single cable installation vessel would be used, and it could take approximately one week to install each cable through the nearshore waters. Of the four cables to be laid, no more than two would be laid in the same year.

Plate 2.16: Example Beach Trenching.

Plate 2.17: Example Hydro-plough.

2.6.12 Construction Traffic

2.6.12.1 Traffic Management Plan

A formal Traffic Management Plan (TMP) will be prepared prior to construction commencement. This will provide detailed information on transportation issues based on more defined parameters, and it will propose strategies to minimise traffic impacts, risks and disruption to users of the Great Northern Highway. The TMP will cover all the requirements stipulated by the Shire, Main Roads Western Australia (MRWA), the Department of Transport, and other stakeholders as appropriate.

2.6.12.2 Construction

Construction traffic associated with project is expected for a period of up to 10 years. During this period, the most significant transport impacts are likely to occur during the installation of the wind turbines. Due to the size and weight of the wind turbine equipment, it is expected that many of the delivery vehicles will be 'over-size', 'over-mass', or both. These vehicles will be regarded as Restricted Access Vehicles (RAVs) and will require operating permits to allow them to travel on public roads. 'Over-size' vehicles are those over 19 m in length, 2.5 m in width and/or 4.3 m in height and their operating permits will require one or more escort vehicles to accompany them. 'Over-mass' vehicles are those with a gross mass in excess of 42.5 t.

The components will be carried on specially designed trailers that meet MRWA requirements. Each of the turbines will require three or four escorted, extendable trailers for the tower, up to three for the blades and one for the nacelle. One or more licensed haulage contractors with experience in transporting heavy and over-size loads will be engaged for the long haulage task. The contractors will be responsible for obtaining all required approvals and permits from MRWA and the Shire and for complying with any conditions specified in these approvals.

A significant component of the construction traffic will be related to delivery of gravel / road stone, cement, aggregate, fly ash, steel reinforcement and other construction materials. Additional vehicles that would be expected to visit the site will include:

- semi-trailers;
- tipper trucks;
- transporters delivering bulldozers, graders, excavators, smooth and rough drum rollers and cranes;
- water trucks;

- concrete mixers; and
- light vehicles.

2.6.12.3 Transportation Route

Equipment will be brought onto the site from the Nyangumarta Highway, which is directly connected to the Great Northern Highway (GNH). Most equipment and contractors are expected to come to site from either Broome or from Port Hedland / Karratha / Dampier / Newman. The GNH is regularly used by over-sized vehicles and is designated for heavy and wide loads.

MRWA has indicated that it is likely that a minor modification will be required at the intersection of the GNH and the Nyangumarta Highway to allow for the safe turning of vehicles into, and out of, the project. The details have yet to be agreed, but such arrangements are typical in the Pilbara where long and heavy vehicles are regularly turning off the main highways for resource projects.

The Nyangumarta Highway, an unsealed track, runs through the proposed project site west to east, and all site tracks will branch off from it. Consequently, the track will be widened and will be subject to road realignments and profile corrections where necessary, particularly where proposed to avoid identified Rock-wallaby habitat (see Section 4.7.6). The track is managed by the Nyangumarta people and is open to tourists who buy online permits. Since it was inaugurated in 2015, the number of permits sold each year is the equivalent of about one vehicle a week, including the following numbers of issued permits to date:

- 2015 – 36;
- 2016 – 48; and
- 2017 – 53.

The existing primary users of the Nyangumarta Highway are the Nyangumarta Rangers, the local pastoralist, and any contractors related to mining and oil & gas exploration activities further inland.

Notices will be sent to regular users. Tourists applying for permits to use the Nyangumarta Highway will be advised of construction activities taking place during their planned trip, and traffic signage required as part of traffic safety during construction will be installed by the contractor, in compliance with relevant regulations and in accordance with any permits obtained for traffic management.

2.6.12.4 Operations

Traffic during the project's operations phase will be restricted to maintenance and inspection vehicles, employee transfer buses, or other approved traffic use (e.g. visitors), which will make periodic visits to the site. Vehicles used will typically be standard 4WD vehicles, sedans or vans.

Occasionally there may be the need for larger vehicles such as cranes, semi-trailers and bulldozers/graders: the first two needed for significant component repairs; the latter for road maintenance. These events will be infrequent.

2.6.12.5 Tourist Centre

As the largest wind and solar hybrid renewable energy project proposed in the world, the project will become a tourist attraction along a stretch of road that currently has few tourists. A Tourist Centre and viewing platform will be established, and the section of the

Nyangumarta Highway leading to the Centre will be sealed to make it easier and safer for non-4WD vehicles to visit. Appropriate signage and procedures will be put in place.

2.6.13 Construction Sequencing

2.6.13.1 Yearly Construction Plan

Due to the size of the project, limits in the supply chain and limits on the availability of skilled personal, construction and installation is anticipated to take place over 10 years (Table 2.7 and Figure 2.25).

Table 2.7: Expected yearly construction progress.

Milestone	1	2	3	4	5	6	7	8	9	10
Wind turbines installed (by number of turbines)	174	174	174	174	174	174	174	174	174	177
PV capacity installed (by MW)	200	200	200	200	200	200	200	200	200	200
Site tracks commissioned (by km)	154	154	154	154	154	154	154	154	154	154
HVDC converter	-	1	-	-	-	-	-	-	-	-
Electricity distribution network erected (by km)	206	206	206	206	206	206	206	206	206	206
Substations commissioned	4	4	4	4	4	4	4	3	3	3

Each year, up to four vertically-integrated construction and installation teams will work in parallel, building out the civil works, and installing the wind turbines, solar arrays and electricity infrastructure. The HVDC converter and command compound will be built within the first two years of the construction program (Table 2.7).

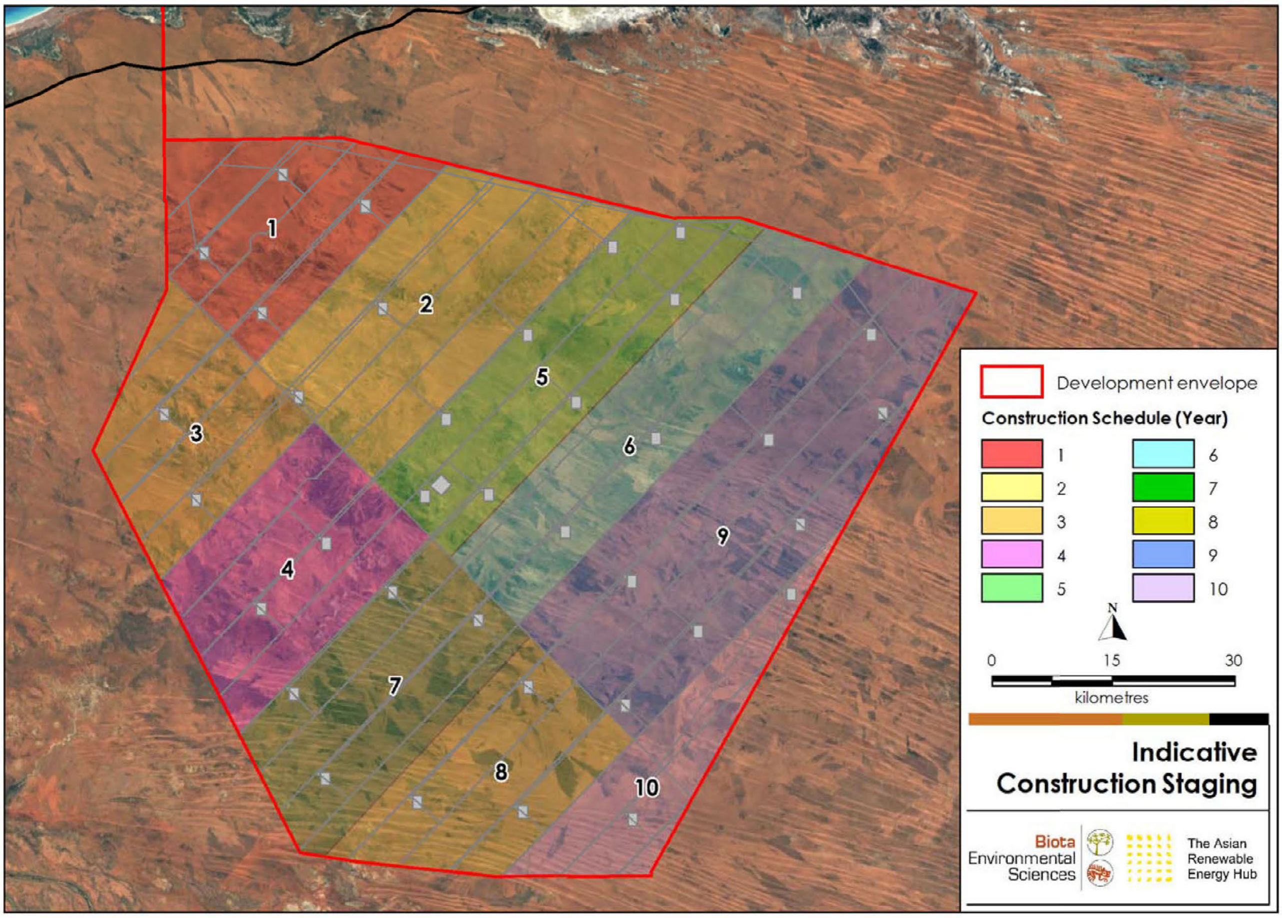

Figure 2.25: Indicative construction staging within the development envelope.

2.6.13.2 Quarterly Construction Plan

Construction and installation activities will be scheduled to take place over eight months of the year, to avoid the hot and wet conditions present from December to March (Table 2.8).

Table 2.8: Expected quarterly construction progress.

Milestone	Q1	Q2	Q3	Q4
Wind turbines installed (by number of turbines)	0	70	70	34
PV capacity installed (by MW)	0	100	100	0
Site tracks commissioned (by km)	0	60	60	34
Electricity distribution network erected (by km)	0	82	82	42
Substations commissioned	0	1	2	1

If deemed safe and efficient, some works may continue over the summer period.

2.7 Operations and Maintenance

2.7.1 Operations and Maintenance

Once operational, the project would be staffed 24/7 by a dedicated team of technicians and maintenance personnel operating from a control compound housing a control centre, spare parts stores and accommodation.

The control compound will store waste, fuel and fluids required for operational purposes. Diesel will be stored on-site for the fleet of maintenance vehicles, together with a small amount of aviation fuel for re-fuelling helicopters that may be required for specific works or emergency medi-vac. All fuel will be stored in bunded facilities in a manner that complies with relevant environmental and health and safety regulations.

Scheduled servicing of the wind turbines will occur once or twice a year, and a maintenance team will be present on-site to respond to any unscheduled maintenance that may be required.

The cleared area under the solar panels will be maintained throughout the life of the proposal. Waterless cleaning technology will be used if appropriate for cleaning the solar panels at night, and the on-site maintenance team will also respond to unscheduled maintenance.

Although the converter and substations will essentially be unstaffed, the on-site maintenance team will also be available to respond to any unscheduled issues for those components of the proposal.

2.7.2 Workforce

The proposal will create a significant number of jobs in the Pilbara and Kimberley regions. These will comprise approximately 3,000 new full time equivalent (FTE) jobs during the 10 year construction period and approximately 400 new, and ongoing, FTE jobs will be created during the 50+ year operational life of the proposal (see Section 2.2.5.2).

The workforce and accommodation plan will target the hiring of local workers and will promote living locally in the Pilbara and Kimberley regions. Ideally this will involve bus-in / bus-out arrangements with staff based in Bidyadanga, Newman, Marble Bar, Broome and Port Hedland.

The proponent is also committed to working with Aboriginal communities in the region to promote the development of renewable energy knowledge, skills and projects. Opportunities will be explored to assist and train Aboriginal representatives to work on the proposal, both during construction and ongoing operations.

2.7.3 Hazardous Materials and Waste

Construction activities will require the storage of minor amounts of certain hazardous chemicals and wastes, such as fuels, oils and other machinery lubricants and liquids. Bulk storage of cement and other construction materials may also be required.

Chemicals, lubricants or fluids will be managed by the same systems and procedures that Vestas uses at its projects across Australia. All contractors must specify whether any substances brought on-site are classified as Hazardous Substances or Dangerous Goods as defined by the relevant Australian codes. If so, then defined work methodologies and storage and handling protocols will be implemented to manage such goods in a manner that is safe and environmentally responsible. A more comprehensive description of management strategies for hazardous materials, waste and bulk storage will be outlined in the Construction Environmental Management Plan (CEMP) for the proposal (Appendix 1).

Septic tanks will be used for wastewater management and a septic tank clearance service contract entered into with a licensed contractor for maintenance and clearing. Other putrescible and recyclable waste streams will be managed, temporarily stored, and removed from site by a licensed contractor.

2.7.4 Re-powering

The project would have a 50-year plus life, determined by the practical life of over 50 years of the subsea HVDC electrical cables. Since the wind turbines and solar panels typically have a design life of approximately 25 years, those elements, or parts of those elements, are expected to be replaced halfway through the project's operational life.

Any material change to the project as a result of this equipment renewal will be discussed with the necessary authorities well in advance of the activity taking place, to ensure that impacts are understood, and relevant regulations and guidelines of the day are taken into account. Refurbishment and replacement of wind turbine and solar PV panels will require similar construction methodologies as the original installation of the equipment as outlined in Section 2.6 above.

2.7.5 Decommissioning

At the end of the operational life of the project, all above-ground infrastructure relating to the wind turbines, solar PV arrays and electrical infrastructure will be dismantled and removed from the site. In the case of the wind turbine foundations, the tower bases would be cut back to 1 m below ground surface, and the rest of the inert concrete foundations themselves would be left in-situ. The land will be returned to prior condition. A compressor and rock breaker would be needed to carry out the cutting work if necessary.

The access tracks, if not required for other uses, would be removed and the site reinstated to original condition (or as close as practicable). All such decommissioning work would be the responsibility of the project owner and would be subject to the relevant regulations of the day. Experience in Denmark and The Netherlands shows that the sale of scrap metal and other valuable items salvaged from turbines and electrical components would more than meet the cost of decommissioning.

3.0 Stakeholder Engagement

3.1 Key Stakeholders

The proponent has been actively engaging stakeholders since the project's inception in 2014, with the list of stakeholders consulted gradually expanding to include a wider range of interested parties. Responses from stakeholders have helped guide the environmental impact assessment and the design of the proposal.

Stakeholder analysis was carried out early in the development process, and a list of key stakeholders was drawn up. The stakeholders listed in Table 3.1 have been consulted prior to the preparation of this ERD, and further consultation will take place during the ongoing development of the project. Additional stakeholders will be included in the consultation in the future as required.

Table 3.1: Key stakeholders.

Stakeholder	Interest / Context
Department of Jobs, Tourism, Science and Innovation (DJTSI)	Supporting the proposal under the Lead Agency Framework. The department is Western Australia's lead agency for economic development, international trade and investment, and tourism.
Environmental Protection Authority (EPA)	Responsible for assessing and advising on all environmental aspects of the proposal, including relevant environmental factors and survey and assessment requirements.
Department of Water and Environmental Regulation (DWER)	Interest in managing water resources. It supports the EPA in conducting environmental impact assessments and developing policies to protect the environment.
Department of the Environment and Energy (Federal) (DoEE)	Responsible for managing the EPBC Act.
Department of Biodiversity, Conservation and Attractions (DBCA)	Manager of Eighty Mile Beach Marine Park and Walyarta Conservation Park, in addition to specialist expertise in threatened fauna and flora species occurring in the development envelope.
Department of Planning, Lands and Heritage	Important stakeholder for several aspects of the proposal. The department is responsible for planning and managing land and heritage for all Western Australians.
Department of Foreign Affairs and Trade (DFAT)	The proposal represents a major initiative with strategic international neighbours.
Yamatji Marlpa Aboriginal Corporation (YMAC)	Representing the Traditional Owners of the land.
Nyangumarta People Representatives	Traditional Owners of the land.
Shire of East Pilbara	The proposal is located in the Shire of East Pilbara.
Shire of Broome	A section of the cable route passes through the Shire of Broome.
All neighbouring properties within 30 km of the development envelope	Closest commercial and residential neighbours to the proposal: Sandfire Roadhouse, Eighty Mile Beach Caravan Park, Wallal Downs Station and Mandora Station.
Department of Mines, Industry Regulation and Safety (DMIRS)	Representing mining, oil and gas interests and responsible for Mining Act tenure overlapping and adjacent to the development envelope.

Stakeholder	Interest / Context
Department of Primary Industries and Regional Development (DPIRD)	Interest in regional development.
Department of the Premier and Cabinet (DPC)	Key interest in the proposal and its successful progress.
Office of the Minister for Asian Engagement	The proposal represents a major initiative with strategic international neighbours.
Pilbara Development Commission (PDC)	Interested in promoting investment in the Pilbara.
Broome Bird Observatory	An environmental group based in Broome with major interest in migratory avifauna in the area, including expert opinion on migratory species.
Environs Kimberley	An environmental group based in Broome and with interests in the Kimberley and Pilbara regions.
Kimberley Development Commission	Interested in promoting investment in the Kimberley.
Department of Transport (DoT), Main Roads Western Australia (MRWA)	Heavy vehicles will be using the Great Northern Highway to access the site from whichever port is selected along the coast of WA.
Public Utilities Office	Advises the Minister for Energy and the Government of WA on energy matters.
Western Australia Repeater Group	Ensuring the project will not adversely affect telecommunications.
Broadcast Australia	Ensuring the project will not adversely affect telecommunications.
Telstra Corporation	Ensuring the project will not adversely affect telecommunications.
Australian Communications and Media Authority	Ensuring the project will not adversely affect telecommunications.
Aerial Agricultural Association of Australia	Ensuring the project will not adversely affect operations.
Airservices Australia	Ensuring the project will not adversely affect aviation interests.
Civil Aviation Safety Authority (CASA)	Ensuring the project will not adversely affect aviation interests.
Royal Australian Air Force / Department of Defence	Ensuring the project will not adversely affect operations.
Royal Flying Doctor Service	Ensuring the project will not adversely affect operations.
Australian National University (ANU)	ANU is working as a research partner of the proponent. Advice during this phase of development has focused on best practice for ILUA negotiations and ensuring an excellent outcome for the Traditional Owners of the land.

3.2 Stakeholder Engagement Process

Consultation methods varied, with the most appropriate form of consultation adopted for each stakeholder. These took the form of:

- letters of notification to various stakeholders, local, State and National groups and agencies;
- a visit from the proponent to all residences within 30 km of the proposal, together with ongoing follow-up letters and calls;

- consultation meetings with various stakeholders and community groups and council planners;
- setting up a project-specific website detailing updated information about the project (www.asianrehub.com);
- speaking at conferences;
- using social media (www.twitter.com/asianrehub); and
- print, radio and podcast interviews to disseminate information across wider media channels.

It should be noted that correspondence with consultees will continue as required throughout the various stages of the project. More specifically than wider stakeholder analysis, community consultation has been an important aspect of the project. Activities carried out to date include:

- visits to all neighbouring properties within 30 km of the development envelope boundary to brief them on the proposal; and
- briefing the Councils of the Shire of East Pilbara and the Shire of Broome on the proposal.

Aboriginal Heritage is an important consideration for the proposal, and the proponent has been in regular contact with the Nyangumarta people since 2015. This has included:

- attending regularly scheduled Directors meetings every six months over the last four years to provide regular updates on project progress;
- working with Nyangumarta representatives to carry out clearance surveys prior to disturbing any ground for installing resource monitoring equipment;
- participation of the Nyangumarta Rangers in baseline terrestrial fauna and flora and vegetation surveys; and
- commencing in early 2018, negotiating an ILUA to formalise a long-term partnership between the proponent and the Nyangumarta people, including visits to an operating wind farm and visiting the Nyangumarta communities across the Pilbara.

3.3 Stakeholder Consultation

The responses from stakeholders to date have been used to help guide development of the proposal (Table 3.2). It should be noted that so far consultations have on the whole been very supportive of the project, with the majority of responses focusing on suggested studies or mitigation and management procedures, rather than any objection or questioning the need for the proposed development. Stakeholder consultation will continue as the project progresses.

Table 3.2: Stakeholder consultation.

Stakeholder	Role and Key Comments
Department of Jobs, Tourism, Science and Innovation (DJTSI)	Has emphasised the need to create local manufacturing and jobs and has encouraged the proponent to consider ways to add value in WA and the Pilbara/Kimberley regions specifically.
Department of Planning, Lands and Heritage (DPLH)	Has emphasized the need to optimize the infrastructure to reduce land requirements and disturbance. It has also been working with the Proponent to ensure that the Native Title Act requirements are met.

Stakeholder	Role and Key Comments
Department of Foreign Affairs and Trade (DFAT)	The Department has been aiding with discussions in Indonesia and Singapore.
Yamatji Marlpa Aboriginal Corporation (YMAC)	YMAC has represented the Nyangumarta and has been facilitating a dialogue so that an ILUA can be negotiated.
Nyangumarta People Representatives	Traditional Owners of the land. The Nyangumarta have had strong input into how they see the project benefiting their people. Rangers have been engaged, Elders have assisted with site clearance surveys, and the proponent and the representatives are currently in advanced discussions on an ILUA.
Environmental Protection Authority (EPA)	Has had significant input in determining the scope of the environmental studies that have been conducted, and has provided advice on key aspects of the project.
Shire of East Pilbara	Has been supportive of the project, emphasising the need to develop the Shire of East Pilbara.
Shire of Broome	Has been supportive of the project, emphasising the need to develop the Shire of Broome.
All neighbouring properties within 30 km of the development envelope	The Eighty Mile Beach Caravan Park owners have expressed concern over the potential for a large number of contractors to disturb holiday guests during the construction phase in particular. The proponent will therefore ensure rules are put in place to protect the peaceful environment around the caravan park during construction and operation. This could include a ban on contractors staying at the caravan park, for example. The Sandfire Roadhouse owners welcome the development. The manager of Wallal Downs is being regularly consulted given the potential for the transmission line to run along the boundary of their pastoral lease. The views of the station manager will continue to be sought to ensure the development minimizes impacts on the pastoral operations. The manager of Mandora has asked to be kept up to date on developments.
Department of Mines, Industry Regulation and Safety (DMIRS)	DMIRS requires that the proponent co-exist with potential exploration activities for oil, gas and minerals. Given the proposed infrastructure would only occupy 1.81% of the land area within the site boundary, the proponent is confident it can co-exist with future mining and oil and gas activities if the site turns out to have valuable resources beyond wind and solar.
Department of Primary Industries and Regional Development (DPIRD)	Has emphasised the need to create local manufacturing and jobs related to the project and has encouraged the proponent to consider ways to add value in WA and the Pilbara/Kimberley regions specifically. The Department has also asked the proponent to consider local power supply in the region.
Department of the Premier and Cabinet (DPC)	Has emphasised the need to work with all stakeholders to maximise the positive outcomes for WA.
Department of Water and Environmental Regulation (DWER)	Has had the primary input in determining the scope of the environmental studies that have been conducted and has been regularly consulted during the course of the assessment.
Department of Biodiversity, Conservation and Attractions (DBCA)	Biota has been in contact with DBCA in regard to survey permitting and threatened species survey and management.
Department of the Environment and Energy (Federal) (DoEE)	Responsible for the EPBC Act assessment and working with the state EPA with input into determining the scope of the environmental studies that have been conducted.

Stakeholder	Role and Key Comments
Pilbara Development Commission (PDC)	Has emphasised the need to create local manufacturing and jobs related to the project and has encouraged the proponent to consider ways to add value in the Pilbara. The PDC was instrumental in convincing the proponent to increase the project size and focus more on supplying the Pilbara to unlock jobs and investment in WA.
Broome Bird Observatory	Has had significant input in determining the scope of the avifauna work and working with the proponent's consultant in conducting some of the bird-related studies.
Environs Kimberley	Has highlighted the significance of Bilby and Rock-wallaby sightings and will review proposed mitigation strategies to ensure these aspects are managed correctly.
Kimberley Development Commission	Waiting on response.
Department of Transport (DoT)	Nearer to construction, MWRA will work with the proponent to ensure traffic management plans are suitable.
Public Utilities Office	Waiting on response.
Western Australia Repeater Group	No objection; has highlighted known offshore cables that the proponent should consider when designing the cable route to Indonesia.
Broadcast Australia	Waiting on response.
Telstra Corporation	Waiting on response.
Australian Communications and Media Authority	Requested more information to determine whether the proposed submarine power cable may intersect with other active or proposed submarine cables and, if so, provide the proponent with the relevant contact details of those cable operators.
Aerial Agricultural Association of Australia	Requested that the proponent follow the National Airports Safeguarding Advisory Group (NASAG) National Guideline D and engage with any local aerial applicators.
Airservices Australia	Has requested an Aviation Impact Assessment. This assessment has been completed and discussions are ongoing. No objection has been raised.
Civil Aviation Safety Authority (CASA)	Has requested an Aviation Impact Assessment. This assessment has been completed and discussions are ongoing. No objection has been raised.
Royal Australian Air Force / Department of Defence	CASA is liaising.
Royal Flying Doctor Service (RFDS)	CASA is liaising.
Australian National University (ANU)	ANU is working as a research partner of the Proponent. Advice during this phase of development has focused on best practise for ILUA negotiations and ensuring an excellent outcome for the Traditional Owners of the land.

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