



## APPLICATION ON NOTIFICATION – CROWN DEVELOPMENT

<b>Applicant:</b>	Pangea Energy Pty Ltd
<b>Development Number:</b>	660/V001/18
<b>Nature of Development:</b>	<b>Port Augusta Solar Storage Project comprising a 50MW solar photovoltaic plant, 300MWh total capacity battery energy storage system, office, substation and associated infrastructure</b>
<b>Type of development:</b>	Public Infrastructure
<b>Zone / Policy Area:</b>	Industry Zone
<b>Subject Land:</b>	Lot 350 Abbattoir Road and Lot 3 Harris Street, Stirling North
<b>Contact Officer:</b>	Lee Webb
<b>Phone Number:</b>	7109 7066
<b>Start Date:</b>	28 March 2018
<b>Close Date:</b>	20 April 2018
<p><b>During the notification period, hard copies of the application documentation can be viewed at the Department of Planning, Transport and Infrastructure, Level 5, 50 Flinders Street, Adelaide during normal business hours. Application documentation may also be viewed during normal business hours at the local Council office (if identified on the public notice).</b></p>	

Written representations must be received by the close date (indicated above) and can either be posted, hand-delivered, faxed or emailed to the State Commission Assessment Panel (SCAP). A representation form is provided as part of this pdf document.

**Any representations received after the close date will not be considered.**

Postal Address:

The Secretary  
 State Commission Assessment Panel  
 GPO Box 1815  
 ADELAIDE SA 5001

Street Address:

Development Division  
 Department of Planning, Transport and Infrastructure  
 Level 5, 50 Flinders Street  
 ADELAIDE

Email Address: [scapadmin@sa.gov.au](mailto:scapadmin@sa.gov.au)

Fax Number: (08) 8303 0753

**DEVELOPMENT ACT, 1993  
S49/S49A – CROWN DEVELOPMENT  
REPRESENTATION ON APPLICATION**

<b>Applicant:</b>	Pangea Energy Pty Ltd
<b>Development Number:</b>	660/V001/18
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<b>Contact Officer:</b>	Lee Webb
<b>Phone Number:</b>	7109 7066
<b>Close Date:</b>	20 April 2018

My name: \_\_\_\_\_

My phone number: \_\_\_\_\_

PRIMARY METHOD(s) OF CONTACT:      Email address: \_\_\_\_\_

Postal address: \_\_\_\_\_

Postcode \_\_\_\_\_

**You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.**

- My interests are:
- owner of local property
  - occupier of local property
  - a representative of a company/other organisation affected by the proposal
  - a private citizen

The address of the property affected is .....Postcode.....

The specific aspects of the application to which I make comment on are: .....

.....

.....

.....

.....

.....

.....

.....

- I
- wish to be heard in support of my submission
  - do not wish to be heard in support of my submission
- (Please tick one)

- by
- appearing personally
  - being represented by the following person : .....
- (Cross out whichever does not apply)

Date: ..... Signature: .....

**Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or [scapadmin@sa.gov.au](mailto:scapadmin@sa.gov.au)**

# SECTION 49 & 49A – CROWN DEVELOPMENT DEVELOPMENT APPLICATION FORM

**PLEASE USE BLOCK LETTERS**

**COUNCIL:** Port Augusta

**APPLICANT:** Pangea Energy Pty Ltd.

**ADDRESS:** Level 5 City Central Tower 2  
121 King William Street, Adelaide, SA 5000

**CROWN AGENCY:** Department of the Premier and Cabinet

**FOR OFFICE USE**

DEVELOPMENT No: \_\_\_\_\_

PREVIOUS DEVELOPMENT No: \_\_\_\_\_

DATE RECEIVED:        /        /

**CONTACT PERSON FOR FURTHER INFORMATION**

Name: Leo Chiang Lin

Telephone: 0884234420 [work] \_\_\_\_\_ [Ah]

Fax: 0884234500 [work] \_\_\_\_\_ [Ah]

Email: pangea@sentekenergy.com

<input type="checkbox"/> Complying <input type="checkbox"/> Merit <input type="checkbox"/> Public Notification <input type="checkbox"/> Referrals	Decision: _____ Type: _____ Finalised:        /        /
--	--

**NOTE TO APPLICANTS:**

(1) All sections of this form must be completed. The site of the development must be accurately identified and the nature of the proposal adequately described. If the expected development cost of this Section 49 or Section 49A application exceeds \$100,000 (excl. fit-out) or the development involves the division of land (with the creation of additional allotments) it will be subject to those fees as outlined in Item 1 of Schedule 6 of the *Development Regulations 2008*. Proposals over \$4 million (excl. fit-out) will be subject to an advertising fee. (2) Three copies of the application should also be provided.

	Decision required	Fees	Receipt No	Date
Planning:				
Land Division:				
Additional:				
<b>Minister's Approval</b>				

**EXISTING USE:** The project site is not being used, but it is zoned industrial.

**DESCRIPTION OF PROPOSED DEVELOPMENT:** The proposed development is a 50MW solar photovoltaic farm with energy storage of up to 300 MWh total capacity.

**LOCATION OF PROPOSED DEVELOPMENT:** \_\_\_\_\_

House No: \_\_\_\_\_ Lot No: 350 Street: \_\_\_\_\_ Town/Suburb: Stirling North

Section No [full/part] Full Hundred: Davenport Volume: 5352 Folio: 55

Section No [full/part] \_\_\_\_\_ Hundred: \_\_\_\_\_ Volume: \_\_\_\_\_ Folio: \_\_\_\_\_

**LAND DIVISION:**

Site Area [m<sup>2</sup>] 543,100 Reserve Area [m<sup>2</sup>] \_\_\_\_\_ No of existing allotments \_\_\_\_\_

Number of additional allotments [excluding road and reserve]: \_\_\_\_\_ Lease: YES  NO

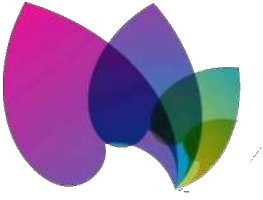
**DEVELOPMENT COST** [do not include any fit-out costs]: \$ 380,000,000

**POWERLINE SETBACKS:** Pursuant to Schedule 5 (2a)(1) of the *Development Regulations 2008*, if this application is for a building it will be forwarded to the Office of the Technical Regulator for comment unless the applicant provides a declaration to confirm that the building meets the required setback distances from existing powerlines. The declaration form and further information on electricity infrastructure and clearance distances can be downloaded from [sa.gov.au](http://sa.gov.au).

I acknowledge that copies of this application and supporting documentation may be provided to interested persons in accordance with the *Development Act 1993* and meet the requirements for lodgement under s.49 of the *Development Act 1993*.

**SIGNATURE:**  \_\_\_\_\_

Dated: 04/ Feb / 2018



# PANGEA ENERGY PTY LTD

Level 5, City Central Tower 2  
121 King William Street  
Adelaide, South Australia 5000

26 March 2018

Zoe Delmenico  
Department of Planning, Transport & Infrastructure  
GPO Box 1815  
Adelaide SA 5001

Dear Ms Delmenico,

**Subject: Port Augusta Solar Storage Project - Development Approval Application**

Please find accompanying this letter an application for Development Approval for the proposed Port Augusta Solar Storage Project (previously referred to as the Stirling North Solar Storage Project) under section 49 of the *Development Act 1993* (SA).

The Port Augusta Solar Storage Project (PASSP) proposed to be developed by Pangea Energy (Pangea), will be located at Stirling North, a suburb of Port Augusta. The project is designed to be 'battery-ready', creating a combined generation and storage facility project that prepares for the future electricity needs of South Australians.

The PASSP was discussed at meetings in June 2017 attended by Port Augusta Mayor Sam Johnson and CEO John Banks, and Minister for Investment and Trade, the Hon. Martin Hamilton-Smith to obtain in-principle government support for the project. Pangea also met with representatives of the Department for Premier and Cabinet, including personnel from the Low Carbon Economy Unit to discuss the proposal, and Chris Lim and Martyn England from DSD. At these meetings, it was indicated that Pangea should seek Section 49 status through Crown sponsorship and this endorsement has now been obtained.

The project received endorsement from Dr Don Russell of the Department of State Development on the 11<sup>th</sup> September 2017. The letter of endorsement is appended to the Development Approval application. It's also noted, that the application has been discussed with the Port Augusta Council who provided positive feedback.

I appreciate the Council, DPTI and DSD communication and facilitation during the lead up to this application, and look forward to ongoing communication as required during the development assessment process. We would be happy to answer any questions relating to the application.

Should you have any queries regarding the proposed Port Augusta Solar Storage Project or this request for assessment of our Development Application, please do not hesitate to contact me via the details below.

Regards,

Leo Chiang Lin  
Director  
Pangea Energy Pty Ltd.  
Email: [director.projects@sentekenergy.com](mailto:director.projects@sentekenergy.com)  
Mobile: 0424 588 995



PANGEA ENERGY PTY LTD

**JACOBS**<sup>®</sup>

## **Port Augusta Solar Storage Project**

Pangea Energy Pty Ltd

### **Development Application**

IW142200

1 February 2018

Rev 0



## Port Augusta Solar Storage Project

Project No: Port Augusta Solar Storage Project  
Document Title: Development Application  
Document No.: IW142200  
Revision: 0  
Date: 1 February 2018  
Client Name: Pangea Energy Pty Ltd  
Project Manager: Nicholas Bull  
Author: Kelly Briton-Jones, Nicholas Bull

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### Document history and status

Revision	Date	Description	By	Review	Approved
A	22/11/2016	Development Application Draft for Internal Review	CG	KBJ	KBJ
B	8/5/2017	Draft with updated content	KBJ	NJB	NJB
C	18/12/2017	Draft for internal review	KBJ	NJB	NJB
D	20/12/2017	Final Draft for review	NJB	LD	LD
D	20/12/2017	Final Draft for Pangea review	NJB	Pangea	NJB
0	1/2/2018	Final Development Application	KBJ / NJB	Pangea	NJB



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## Executive Summary

Pangea Energy Pty Ltd intends to develop a 50 Mega Watt (MW) solar photovoltaic plant with significant energy storage of up to 300 MWh total capacity in Stirling North, a suburb south-east of Port Augusta. The Port Augusta Solar Storage Project (PASSP), previously referred to as the Stirling North Solar Storage Project, will generate both electricity and green credits (Large-scale generation certificates) to support electricity demand in South Australia. Pangea Energy Pty Ltd (Pangea) is a special purpose company specifically dedicated to the development of the PASSP.

The development incorporates the following key elements:

- Solar panels, fixed ground mounted modules facing north with tilt angle of 18 degrees from horizontal. The typical height of the bottom of the solar modules is 0.6 m above ground; maximum height of solar modules is 2.0m above ground. Single axis tracker options will be considered.
- Inverter stations will have a typical height of 2.13 m above ground. The number of inverter stations and solar panels will be determined at the time of final design after the selection of the chosen technology.
- Proposed control room and site office will be a two storey building with a height under 9.0m located at the entrance of the site.
- Proposed battery Energy Storage System (ESS) area which would include a combination of solid structures (generally similar in size to shipping containers) and a range of cables and overhead conductors. The specific height of structures within the battery storage area is yet to be determined, but is expected not to exceed 6.0 m in height (equivalent to two containers stacked).
- Truck bay for the dispatch of energy storage facilities within the Energy Storage Systems (ESS).
- Underground cables connecting groups of solar panels to inverter stations.
- Cabling connecting the inverter stations to an associated on-site facility substation (Options for overhead and underground cabling being considered in association with ElectraNet).
- Earthworks as required to form a level platform for the proposed buildings and ESS hardstand areas.
- Control room, site office and car parking sufficient for employees and contractors during operation of the PASSP.
- Landscaping around the site office.
- Drainage works, including spoon drains and stormwater piping, a detention pond (approx. 53m x 31m x 5m) and stormwater management systems.
- A single site access point via Abbattoir Road. Pangea currently have approval in writing from the State Government (Department of Planning Transport and Infrastructure) regarding acquisition of the land identified as Deposited Plan 65715 Allotment 3 to enable development of an access road to the site (Appendix J).
- Car parking on site sufficient for employees and contractors.
- Security fencing around the perimeter of the power station and CCTV. Signage will be clearly displayed identifying hazards present within the power station.
- Security lighting to illuminate warning about hazards contained within the PASSP. Directional lighting will be utilised to minimise obstructive light spill and glare.
- Lightning rods.

The indicative layout of the proposed development is presented in Appendix C.

This development application is submitted pursuant to Section 49 of the *Development Act 1993* with the endorsement of the Department of the Premier and Cabinet (refer to Appendix A). The Section 49 process is



appropriate for electricity infrastructure such as the proposed solar plant, as generation is provided for public usage and represents a service historically provided by the State.

A number of additional approvals under other legislation will be required prior to the construction and operation of the solar project, including approval for the clearance of native vegetation, a Connection Agreement to connect the power station to the Davenport substation, and an Electricity Generation Licence application for connection to the National Electricity Market.

The Subject Site is formally described as Allotment 350, Deposited Plan 44615, in the area named Stirling North, Hundred of Davenport. The Certificate of Title Volume 5352 Folio 55 for the site is included in Appendix B. The property is located in Stirling North, approximately 275 km north-west of Adelaide, and is adjacent to, but does not abut, Abbattoir Road. The site is currently owned by Pangea, and is herein referred to as the Subject Site.

It is of significance to note the overall consideration in support of the proposed development relates to the facility being a renewable energy source with zero carbon emissions during operation. Development of the PASSP will provide a key contributor in reducing greenhouse gas emissions within South Australia, acting as an alternate source of power generation. Construction of the PASSP will directly support strategic National, State and Local Government priorities relating to the development of renewable energy facilities and the transition to a low carbon economy.

## Key Environmental Considerations

### Visual Amenity

A Landscape and Visual Impact Assessment was completed for the PASSP, which assessed the likely effect of the PASSP on landscape and visual amenity. Management strategies were identified to reduce the overall visual impact associated with the PASSP.

The locality surrounding the Subject Site is highly disturbed by existing and historical land uses, including the existing railway, numerous transmission lines and industrial activity. As such, the Subject Site is not recognised for its scenic amenity. The PASSP is not anticipated to significantly alter landscape or visual amenity within the region. Intervening topography and vegetation largely screen views of the PASSP from key receptors and highly exposed locations (i.e. areas that are highly frequented).

Visual changes will be moderated by the presence of the existing infrastructure (telecommunications, transmission lines and substation) visible in the region, and concentrated at the Subject Site.

### Traffic

A preliminary Traffic Management Plan has been prepared for the PASSP. The Traffic Management Plan addresses construction vehicle access arrangements and identifies traffic management measures proposed to address traffic safety and access issues inherent with using oversized vehicles and general construction traffic.

One access route is proposed for construction traffic accessing the Subject Site from Racecourse Road to the Abbattoir Road entrance (via an access track which crosses the allotment between the Subject Site and Abbattoir Road). Approval has been provided from State Government for purchase of the required land to enable site access (Appendix J). Based on the estimated level of construction traffic, heavy vehicle movements on Augusta Highway coming into Stirling North are not expected to greatly alter traffic movement on the existing roads.

Anticipated traffic volumes will be generated at the highest frequency during the construction phase of the Project. Operational vehicle movements are expected to be minimal, and not have any significant impact on the local road network. Once operational, staff attendance on site will be approximately 19 personnel employed on



a full time basis. Additional staff are expected to be employed on a part-time or contract basis, for specialist electrical skills, module cleaning and other maintenance requirements associated with the PASSP. Operational vehicle movements are therefore not expected to significantly impact on other road users and the local road network.

## **Flora and Fauna**

An assessment of ecological values at the Subject Site was undertaken to determine the presence of species of conservation significance (i.e. species protected under Commonwealth or State legislation).

The Subject Site has historically been used for pastoral purposes and has been disturbed by a number of internal access tracks resulting in existing disturbance of remnant native vegetation.

The western and southern portion of the Subject Site is comprised of alluvial outwash plains with Chenopod low open shrubland. An area of low sand dunes and sand plains in the north east corner of the Subject Site supports tall open shrubland. The total area of vegetation at the site was measured as 53.5 ha (using the GIS polygon of the site rather than the Certificate of Title).

The western and southern vegetation communities were assessed to be in fair to good condition, with moderate levels of disturbance including from vehicle traffic and scattered infestations of declared weeds and clearance for vehicle tracks.

The vegetation community in the north eastern corner of the Subject Site was assessed to be in poor condition with moderate to high levels of disturbance from vehicle traffic, unauthorised sand mining and with extensive infestations of Buffel Grass dominating the ground storey.

No threatened flora or fauna species nor threatened vegetation communities were recorded during the field survey of the project area. Vegetation communities that were present were assessed to be overall in moderate to poor condition and were not considered to represent preferred habitat for any threatened fauna species. It is therefore considered that the construction and operation of the proposed infrastructure will not result in significant impacts to State or Commonwealth listed species.

## **Cultural Heritage**

A desktop heritage assessment of the Subject Site was completed to determine the presence of non-Aboriginal and Aboriginal archaeological material within the boundary of the subject site.

The review of the Department of Development Aboriginal Affairs and Reconciliation (DSD-AAR) Central Archive indicated no registered or reported sites or objects of Aboriginal heritage significance within the Subject Site. There is one reported site approximately 2 km north of the Subject Site. The project will not impact on this known heritage site.

The Subject Site has been assessed as being of low Aboriginal archaeological sensitivity due to the lack of temporary or permanent water sources. In addition, the site has been subject to historic ground disturbance through pastoral, agricultural and other uses. Due to the site characteristics and existing ground disturbance at the site, the risk of finding intact Aboriginal archaeological sites or objects is considered low. It is unlikely that sub-surface Aboriginal archaeological sites or objects will be found, particularly given the shallow soils present. In the event that Aboriginal sites or objects are identified on site during construction, procedures for managing the heritage values are provided.

No non-Aboriginal (European) heritage values are present at the site.



## Stormwater

The site is located in an area with low annual average rainfall (242.6 mm) with a weak seasonal skew towards winter months. An average of 34.2 days per year receive rainfall of greater than 1 mm (data from Port Augusta, BOM). By contrast, Adelaide receives an annual average of 551.0 mm with an average of 82.7 days receiving greater than 1 mm.

Stormwater management and flood protection at the site will be achieved via inclusion of a detention pond in the project layout which will collect water from hardstanding and impermeable surfaces via spoon drains and stormwater pipes. The detention pond will have dimensions of 53 m by 31 m with a depth of 5 m, providing a capacity in excess of 8,200 m<sup>3</sup>. Design measures within the substation area will include appropriate bunding and oil water separators to minimise risk of stormwater contamination from this area. Stormwater management facilities will be compliant with local council development requirements.



## 1. Introduction

Pangea Energy Pty Ltd (Pangea), the applicant, intends to develop a 50 MW solar PV farm with a significant battery energy storage facility of up to 300 MWh total capacity in Stirling North, Port Augusta. The Port Augusta Solar Storage Project (PASSP), previously referred to as the Stirling North Solar Storage Project, represents an estimated capital investment in the order of \$380 million.

Pangea is a special purpose company specifically with the objective of developing, operating and maintaining the PASSP. Its business and technical support stems from its stakeholder companies, which are renewable energy companies with a history of developing renewables projects throughout Asia.

Pangea is a subsidiary of the Sen Tek Energy companies. Sen Tek Energy Solutions Inc. (Philippines) (STESP) is a Securities and Exchange Commission (SEC) registered renewable energy developer company in the Philippines since 2012. It has developed projects dedicated to green technologies that are clean, and efficient. It specialises in solar power systems for private, commercial and utility use. STESP has a combined project portfolio capacity of 20.45 MW.

Sen Tek Energy Solutions (Taiwan) (STEST) is an engineering company registered in Taiwan since 2015. Initially, it was formed to train and develop the technical know-how of designers and engineers of STESP. As part of its development, it developed a number solar photovoltaic, wind, and biomass projects in Taiwan. STEST has a combined project portfolio capacity of approximately 296.37 MW.

The PASSP is planned to provide both electricity and green credits (large-scale generation certificates) to support electricity demand in South Australia. Pangea has combined intelligent energy storage management with control technologies, and Vanadium Redox Flow Batteries (VRFB or VRB), thereby creating a hybrid system that is ideal for large scale energy storage use.

The PASSP will employ VRB coupled with supercapacitors (SC) as an alternative energy storage technology. By having this significant energy storage system, the project will be able to provide reserve during peak periods to the National Electricity Market.

STESP and STEST, as the major shareholders of Pangea will provide funding, but also technical and financial support. PEC will provide technical support, maintenance, and decommissioning works with regards to the VRB.

The PASSP will address South Australia's electricity needs, by reducing congestion constraints, allowing for peak shaving, providing voltage compensation, reactive power management, and frequency regulation and control through compensating for imbalances between load and generation.

Incorporating VRB as storage energy to the system essentially acts as backup power and an operating reserve. This serves as the perfect substitute for expensive peaker plants, drawing from the grid or the PV farm during off-peak periods, and discharging into the grid during peak summer periods and times of loss of generation or inter-connector capacity. Therefore, the VRB would reduce price volatility and add to security of supply, reliability and stability of current electricity grid.

This proposed project is also aligned to and contributes to South Australia's Top Ten Economic Priorities #1 ("Unlocking our resources, energy and renewables"). Not only would PASSP meet the needs of over 12,100 average South Australian homes, the PASSP will also reduce greenhouse gas (GHG) emissions by over 41,389 tonnes of CO<sub>2</sub> equivalent per annum. This contributes to South Australia's aspirations to achieve 50% of renewable energy of the state's total electricity power by 2025.

Pangea is a registered Australian company (ABN 15 613 559 470) and has an office at 121 King William Street, Adelaide, 5000.

An overview of the shareholders' solar photovoltaic assets by region is indicated in Figure 1.1 below.





Figure 1-1 : Pangea stakeholders' assets by region

This development application has been prepared by Jacobs on behalf of Pangea. The Subject Site is located approximately 275 km north of Adelaide (Figure 1-2) within the Industry Zone of the Port Augusta (City) Council Development Plan, as depicted in Figure 1-3. The Subject Site is owned by Pangea and is formally described as Lot 350 (adjacent Abattoir Road), Certificate of Title Volume 5352 folio 55 in the area named Stirling North, Hundred of Davenport (Appendix B). Pangea have written approval from State Government for the acquisition of the land identified as DP65715 A3 to enable development of an access road to the site (Appendix J). Certificate of Title volume 5937 folio 151 for this land is provided in Appendix B.

To support the preparation of this development application, consultation has been undertaken with relevant project stakeholders including Investment Attraction South Australia (IASA), Department of State Development (DSD), Department for the Premier and Cabinet (DPC), the Foreign Investment Review Board (FIRB), the Port Augusta City Council (the Council), the Department of Planning, Transport and Infrastructure (DPTI) and ElectraNet.

This document has been prepared to support the development application for the proposed PASSP at the Subject Site, and includes:

- A summary of the statutory requirements applicable to this development application and the alignment of the PASSP with State and National strategic objectives (Section 2);



- An overview of the Subject Site and Project locality (Section 3);
- A detailed description of the proposed development (Section 4);
- A summary of the environmental impact assessment studies and the anticipated environmental impacts of the project (Section 5);
- An assessment of the proposed development against the relevant principles of the Port Augusta City Council Development Plan (Section 6);
- Endorsement of the PASSP as 'public infrastructure' by the Department of State Development for assessment under Section 49 of the *Development Act 1993* (Appendix A);
- Certificate of Title of the Subject Site and access via the Right of Way held within the adjacent allotment (Appendix B);
- Site plan, locality plan, elevations and other relevant design information (Appendix C);
- Appendices, providing the outcomes of technical investigations used to inform the preparation of this development application; including Landscape and Visual Impact Assessment (Appendix D), Traffic Management Plan (Appendix F), Flora and Fauna Assessment (Appendix G), Cultural Heritage (Appendix H) and;
- Relevant Port Augusta City Council Development Plan Policy (Appendix I).



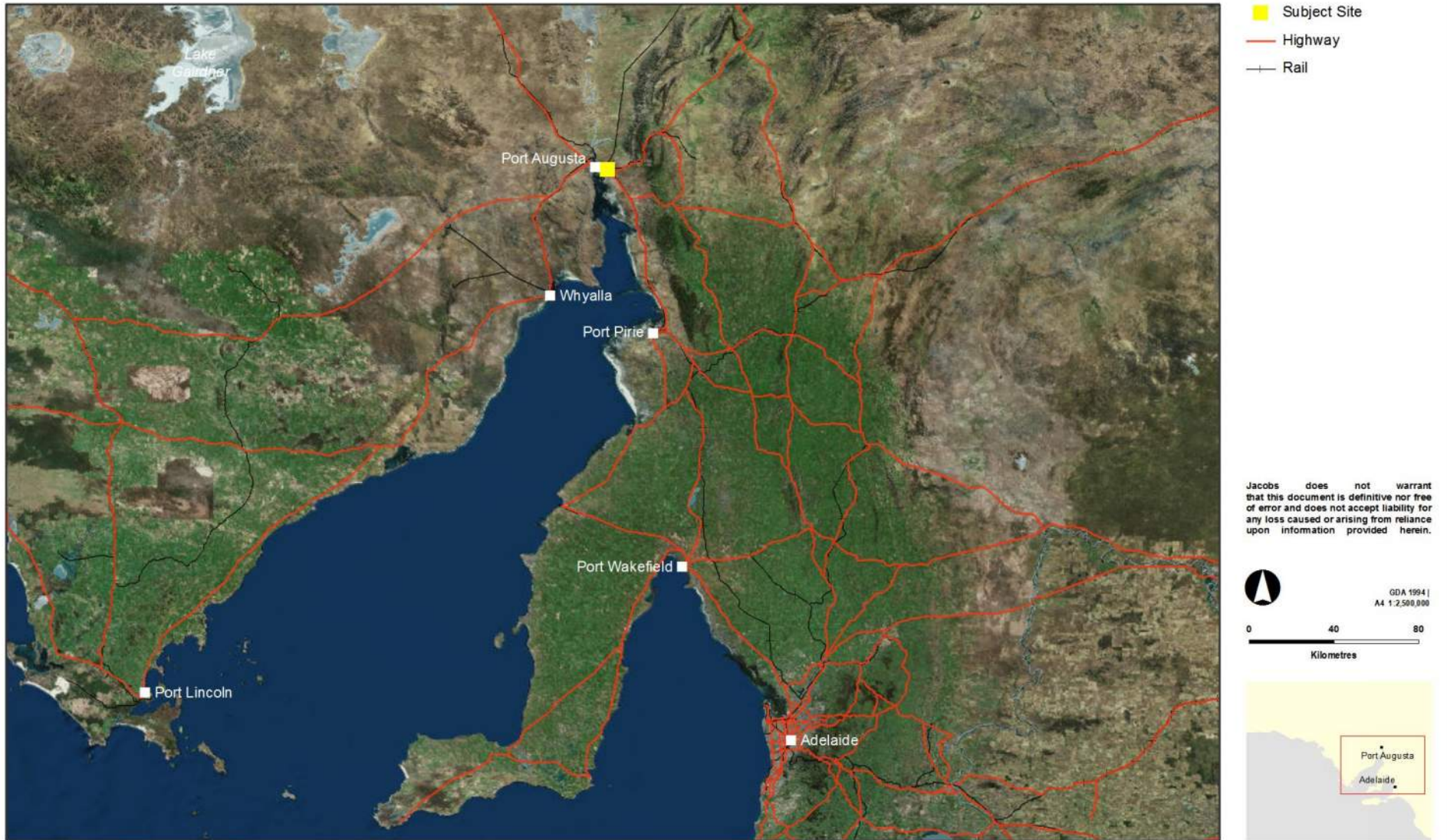


Figure 1-2 : Location of the Subject Site



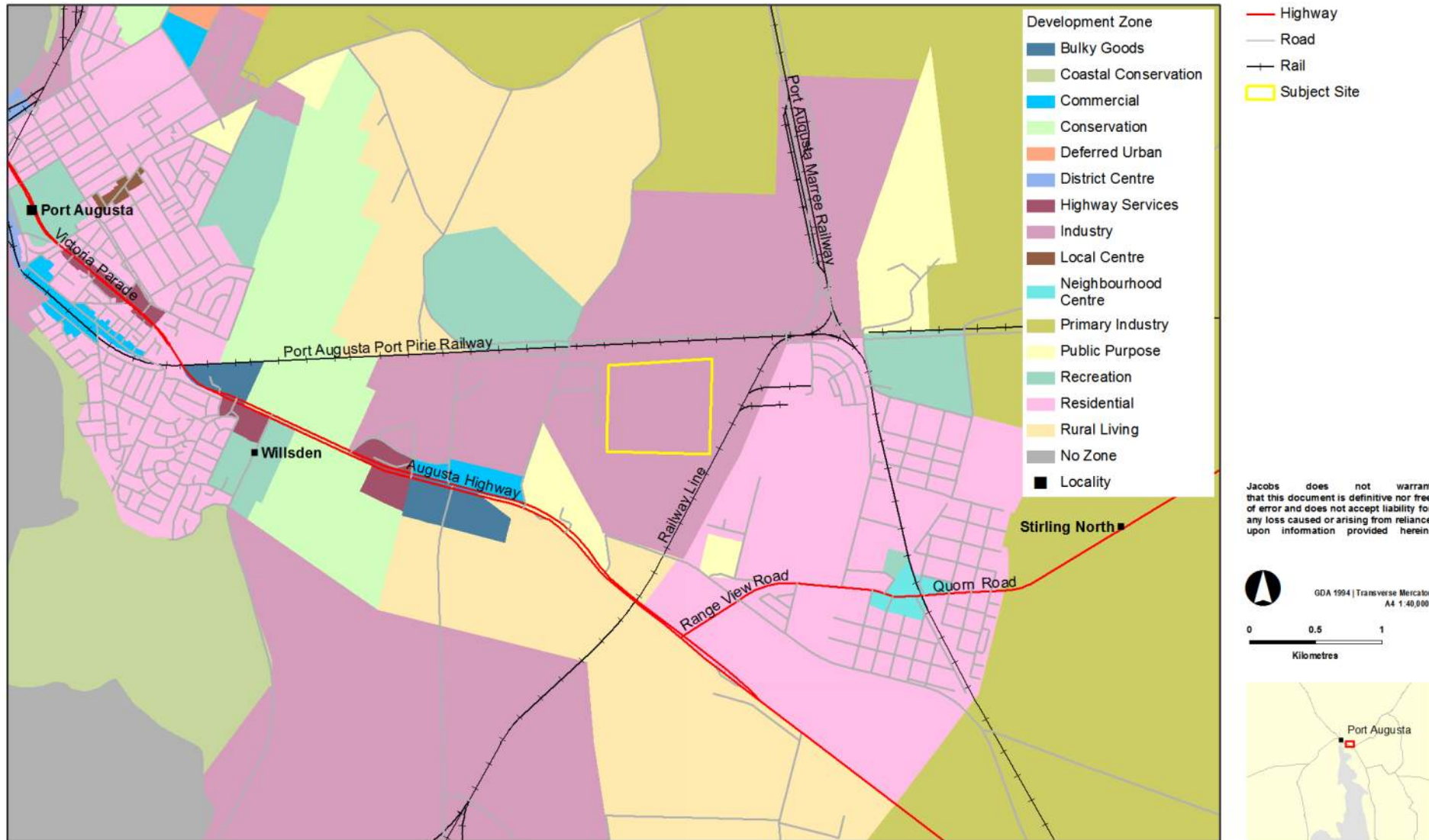


Figure 1-3 Development Plan Zoning

## 2. Statutory Requirements

This section identifies the key approval requirements for construction and operation of the PASSP. It also considers the strategic alignment of the PASSP with relevant National and State policy objectives.

### 2.1 Approval Process

The development application is submitted pursuant to Section 49 of the *Development Act 1993* (the Act) with the endorsement of the DPC (refer to Appendix A for DPC endorsement letter).

Under Section 49, public infrastructure incorporates ‘... *infrastructure, equipment, structures, works and other facilities used in or connection with the supply of... electricity...*’.

The Act defines infrastructure for the purposes of electricity generation as ‘electricity infrastructure, in accordance with the definition provided in Section 4 of the *Electricity Act 1996*’. The establishment of the PASSP at the subject site represents the development of **Electricity Infrastructure** whereby:

***Electricity Act 1996, Section 4, Electricity Infrastructure means—***

- a) *electricity generating plant; and*
- b) *powerlines; and*
- c) *substations for converting, transforming or controlling electricity; and*
- d) *equipment for metering, monitoring or controlling electricity; and*
- e) *any wires, equipment or other things (including tunnels and cavities) used for, or in connection with, the generation, transmission, distribution or supply of electricity; and*
- f) *anything declared by regulation to form part of electricity infrastructure,*

*but does not include anything declared by regulation not to form part of electricity infrastructure;*

The Section 49 process is considered the appropriate approval process for the development as the PASSP is an ‘electricity generating plant’ and includes ‘substations for converting, transforming or controlling electricity’. The electricity generated from PASSP will be provided for public usage and represents a service historically provided by the State.

The Minister (or delegate) is the relevant authority for applications submitted pursuant to Section 49. The State Planning Commission supports this process through assessment of the application and a report to the Minister. The Minister (or delegate) may, after receiving a report from the State Commission Assessment Panel, approve or refuse the development.

#### 2.1.1 Development Plan Zoning

The subject site is located within the Industry Zone of the Port Augusta City Council Development Plan (Consolidated 7 July 2016) as depicted in Figure 1-3. An assessment of the PASSP against the relevant objectives and principles of development control of the Development Plan is provided in Section 6.

#### 2.1.2 Public Notification

The proposed development has an estimated cost of construction of \$380 million. Accordingly, public notification for a period of 15 business days is required pursuant to subsection 49(7(d)) of the Act as the cost of the proposed development is greater than \$4 million.



### 2.1.3 Statutory Referrals

In accordance with Section 49 of the Act, and Schedule 8 of the Development Regulations 2008 (the Regulations), the following statutory referrals will be required:

- **Commissioner of Highways** – the PASSP may temporarily change the nature of the movement of traffic in the surrounding locality of the subject site. There will be one access point from arterial roads during the construction period to facilitate the delivery of project components.
- **Port Augusta (City) Council** – the PASSP is proposed within the Port Augusta City Council and a referral is required.

The statutory referrals will be facilitated by the State Planning Commission following lodgement of this development application.

## 2.2 Additional Approvals

A range of additional approvals (or secondary permits) will be required prior to the construction and operation of the PASSP, including:

- Approval for the clearance of native vegetation required to construct the PASSP and to create a new access point from Abbattoir Road, in accordance with Section 27 of the *Native Vegetation Act 1991*. The native vegetation clearance application will be submitted separately to the Native Vegetation Council prior to the commencement of construction, supported by the ecological site assessment conducted as part of this application (Appendix G).
- Network Connection agreement to connect the PASSP to the Davenport substation in accordance with the National Electricity Rules.
- Electricity Generation Licence for connection to the National Electricity Market in accordance with the requirements of the *Electricity Act 1996*.

Other approvals (e.g. heavy vehicle permits) may be required subject to the construction methodology of the construction contractor and will be obtained by the appointed contractor prior to the commencement of construction.

## 2.3 Strategic Alignment

The PASSP will provide various economic and energy security benefits to South Australia, which in turn support the attainment of a range of identified strategic priorities. The PASSP aligns with various strategic policies, at both a State and National level. The PASSP will not only support regional energy supplies and provide a stimulus to the local economy, but the PASSP will also contribute to the overall reduction of South Australia's greenhouse gas emissions through the growth of renewable energy sources. The PASSP aligns with the following National Policy and State strategic directions:

### 2.3.1 National

The PASSP will complement and increase the generation of renewable energy within South Australia and the broader National Electricity Market. Australia's Renewable Energy Target (RET) emphasises the need to reduce greenhouse gases, specifically in the electricity generation sector through the encouragement of additional sustainable and renewable sources. The Renewable Energy Target is targeted to both large-scale and small scale renewable generation. The RET envisages that by 2020, 20 percent of Australia's electricity supply will be derived by renewable sources. The proposed development of the PASSP supports the achievement of the RET, contributing a new source of renewable energy. The alignment of the PASSP with the various components of the RET are identified below.



**Table 2-1 : PASSP Alignment with Renewable Energy Target**

Objective/ Target	Project Alignment
20 per cent of Australia's electricity supply will be derived from renewable energy sources by 2020 Minimum of 33,000 Gigawatt-hour (GWh) of Australia's electricity comes from renewable sources by 2020	Establishment of an additional 50 MW of renewable energy generation within the South Australian market. New renewable energy generation taking advantage of SA solar resources.
15,200 new jobs between now and 2030	Job creation and opportunities for local contractors / suppliers during construction phase and ongoing maintenance. The construction workforce is estimated to have a peak of 90 people over the 18-24 month construction period. During operations, 19 full-time staff are expected to be employed at site in addition to a number of part-time and contract staff for specialist electrical skills, module cleaning and other maintenance requirements.
\$40.4 billion in new investment, \$10 billion in large-scale, \$30.4 billion in small-scale	Investment of \$380 million in regional SA. Opportunities for local contractors / suppliers during construction phase and ongoing maintenance.
Enough electricity to power the equivalent of at least 5 million average homes per year	Investment of \$380 million in regional SA. Additional local (SA) generation. Reduced reliance on interstate supply via the interconnector.

### 2.3.2 State

The PASSP will provide a number of economic and energy security benefits to South Australia which in turn supports the attainment of a range of State strategic priorities.

The State envisaged priorities are identified within the following strategic documents:

- SA Strategic Plan – the overarching strategic plan, providing a blueprint for the development of the State.
- SA's Ten Economic Priorities – the top economic focus areas identified as growth areas within the State.
- SA Low Carbon Investment Plan – the key strategies identified by the State to support current and future low carbon investments
- SA's Our Energy Plan – to source, generate and control more of South's Australia's power supply in South Australia.

The alignment with each of these plans is summarised in the table below.

**Table 2-2 : PASSP State Policy Alignment**

Document	Objective/ Target	Project Alignment
SA Strategic Plan	Target 38: Business investment Exceed Australia's ratio of business investment as a percentage of the economy by 2014 and maintain thereafter	Investment of \$380 million in regional SA. Opportunities for local contractors / suppliers during construction phase and ongoing maintenance.

Document	Objective/ Target	Project Alignment
SA Strategic Plan	<p>Target 47: Jobs</p> <p>Increase employment by 2% each year from 2010 to 2016</p>	<p>Job creation and opportunities for local contractors / suppliers during construction phase and ongoing maintenance.</p> <p>The construction workforce is estimated to have a peak of 90 people over the 18-24-month construction period.</p> <p>During operations, 19 full-time staff are expected to be employed at site in addition to a number of part-time and contract staff for specialist electrical skills, module cleaning and other maintenance requirements.</p>
SA Strategic Plan	<p>Target 49: Unemployment</p> <p>Maintain equal or lower than the Australian average through to 2020</p>	<p>Job creation and opportunities for local contractors / suppliers during construction phase and ongoing maintenance.</p> <p>The construction workforce is estimated to have a peak of 90 people over the 18-24 month construction period.</p> <p>During operations, 19 full-time staff are expected to be employed at site in addition to a number of part-time and contract staff for specialist electrical skills, module cleaning and other maintenance requirements.</p>
SA Strategic Plan	<p>Target 59: Greenhouse gas emissions reduction</p> <p>Achieve the Kyoto target by limiting the states greenhouse gas emissions to 108% of 1990 levels during 2008-2012, as a first step towards reducing emissions by 60% (to 40% of 1990 levels) by 2050</p>	<p>Additional local (SA) generation. Reduced reliance on interstate supply via the interconnector.</p> <p>Establishment of an additional 50 MW of renewable energy generation within the South Australian market.</p>
SA Strategic Plan	<p>Target 64: Renewable energy</p> <p>Support the development of renewable energy so that it comprises 33% of the state's electricity production by 2020</p>	<p>Additional local (SA) generation. Reduced reliance on interstate supply via the interconnector.</p> <p>Establishment of an additional 50 MW of renewable energy generation within the South Australian market.</p>
SA Strategic Plan	<p>Target 66: Emissions intensity</p> <p>Limit the carbon intensity of total South Australian electricity generation to 0.5 tonnes of CO<sub>2</sub>/MWh by 2020</p>	<p>Establishment of an additional 50 MW of renewable energy generation within the South Australian market.</p>
SA's Ten Economic Priorities	<p>Unlocking the full potential of South Australia's resources, energy and renewable assets</p>	<p>New renewable energy generation taking advantage of SA solar resources.</p>

Document	Objective/ Target	Project Alignment
Low Carbon Investment Plan for SA	<p>Strategy 1: Clear Policy and Efficient Regulatory Environment</p> <p>Target if \$10 billion in low carbon investment and 50 per cent of electricity production by renewable energy by 2025</p> <p>To support the uptake of solar energy</p>	<p>Investment of \$488 million in low carbon electricity generation in regional SA.</p> <p>Establishment of a large scale solar project in regional SA.</p>
Our Energy Plan	<p>Energy Security Target, Goal: Create new investment in cleaner energy to increase competition, put downward pressure on prices and provide more energy-system stability.</p>	<p>The PASSP will address South Australia's electricity needs, by reducing congestion constraints, allowing for peak shaving, providing voltage compensation, reactive power management, and frequency regulation and control through compensating for imbalances between load and generation.</p>
Our Energy Plan	<p>New Generation For More Competition, Goal: Create more electricity generation to increase competition and put downward pressure on prices.</p>	<p>As above.</p>

## 2.4 Stakeholder Engagement

Pangea have undertaken a range of government and agency stakeholder engagement regarding the PASSP during development and planning for the project. The majority of agencies engaged with have been supportive or strongly supportive of the proposed project.

A summary of the agencies which Pangea has liaised with regarding the development is provided in Table 2-3 below.

**Table 2-3 : Stakeholders Engaged by Pangea Energy**

Agency	Type	Status of Support
Foreign Investment Review Board	Federal Government	Neutral
Australian Renewable Energy Agency	Federal Government	Supportive
Clean Energy Finance Corporation	Federal Government	Supportive
Regional Development Australia Far North	Federal Government	Supportive
Minister for Investment and Trade Hon Martin Hamilton-Smith	State Government	Supportive
Department of the Premier and Cabinet - <ul style="list-style-type: none"> <li>o Energy and Technical Regulation</li> <li>o Low Carbon Economy Unit</li> </ul>	State Government	Supportive
Department of State Development (DSD) - <ul style="list-style-type: none"> <li>o Case Management &amp; Project Delivery</li> <li>o Skills and Employment</li> <li>o Investment Attraction South Australia</li> </ul>	State Government	Supportive
Department of Environment, Water and Natural Resources	State Government (via DSD Case Manager, on behalf of Pangea)	Supportive
Department for Planning, Transport and Infrastructure	State Government (via DSD Case Manager, on behalf of Pangea)	Supportive



Agency	Type	Status of Support
Environmental Protection Authority	State Government (via DSD Case Manager, on behalf of Pangea)	Supportive
Primary Resources & Regions SA	State Government (via DSD Case Manager, on behalf of Pangea)	Supportive
Industry Capability Network SA	State Government (via DSD Case Manager, on behalf of Pangea)	Supportive
Port Augusta City Council	Local Government	Strongly supportive
ElectraNet	Private / Utility Provider	Supportive



### 3. Subject Site and Project Locality

The Subject Site is located approximately 5 km south-east of Port Augusta and approximately 275 km north-west of Adelaide. The Subject Site is vacant land, as depicted in Plate 3-1 and Plate 3-2 , with the key details of the site summarised in Table 3-1.

**Table 3-1 : Details of Subject Site**

Feature	Description
Formal description:	Lot 350, Deposited Plan 44615 in the area named Stirling North, Hundred of Davenport, South Australia. Certificate of Title Volume 5352 Folio 55. The site is adjacent to, but does not abut, Abbattoir Road, in the area named Stirling North, SA, 5710.
Ownership details:	The Subject Site is currently owned by Pangea Energy Pty Ltd. A copy of the Certificate of Title for the subject site is presented in Appendix B.
Site area:	The Subject Site is an approximately rectangular shape with a frontage of approximately 780 m, setback from Abbattoir Road approximately 95 m. The Subject Site has a depth of approximately 650 m covering approximately 54 hectares.  The Subject Site will be provided access via Allotment 3, Deposited Plan D65715 (C.T. 5937/151). Figure 3-1 shows the Subject Site in relation to the required Access Land. An access track of approximately 20 m wide by 100 m long is proposed across the access land. Pangea have written approval from State Government for the purchase of this land to enable site access (see Appendix J).  The Subject Site is slightly undulating containing a mixture of low shrubland and sand dune vegetation, largely disturbed by unformed internal vehicle tracks. A small ridgeling is located on the Subject Site, running north-south through the site and slightly increased elevation in the north-eastern corner of the site
Existing land uses and infrastructure on the subject site:	The Subject Site is currently vacant land, however was previously utilised for light grazing activities, representative of a typical South Australian pastoral landscape. Numerous access tracks are located throughout the property providing access throughout the subject Site.
Surrounding land uses:	The Subject Site is bound by: The Port Augusta - Quorn (Pichi Richi Railway) and Coonamia – Port Augusta railway to the north. The Leigh Creek railway and a disused concrete batching area to the east. Tilling Road to the west (Plate 3-1).  As depicted in Figure 3-2 below, the locality surrounding the Subject Site is characterised by industrial activity in a largely flat to gently undulating landscape. Rural dwellings are concentrated within the townships of Stirling North and Port Augusta. Infrastructure development including high voltage transmission lines, substations and telecommunications facilities are scattered throughout the landscape.  Within the surrounding locality a wide range of land uses exist, including vacant land, commercial, industrial, agricultural and the Port Augusta prison. Residential allotments are located approximately 450 m south from the Subject Site. The PASSP network connection would be made to the Davenport Substation.
Sensitive receptors:	The closest sensitive receptor is a group of 10-12 dwellings on Engelsman Road and Peter Street located approximately 450 m south-west from the boundary of the Subject Site. Further scattered rural residential dwellings are present around the Subject Site as depicted in Figure 3-3 below.  Although the number of viewers at residential dwellings is lower in comparison to publically accessible locations, elements of the Project visible from private property are likely to represent a greater impact in comparison to elements visible from public roads only visible to passing motorists. The visual impact to key receptors within a study area of 10 km radius included assessment of impacts to sensitive receivers such as the dwellings depicted in Figure 3-3 is detailed in the Landscape and Visual Impact Assessment (refer Appendix E).  Consultation with the Port Augusta City Council has indicated that no additional dwellings have been approved, or are currently proposed within 1.0 km of the Subject Site. Development Approval was issued in 2013 for land division of approximately 2-300 residential allotments on allotment 5 fronting Harris Street to the east and bound to the west by the Leigh Creek railway. Consultation with the Port Augusta City Council indicated that no plan of division had been lodged (as at 15 August 2017, personal communications, K Briton-Jones).



Feature	Description
Local road network:	The Augusta Highway runs south of the Subject Site, approximately 770 m south of the nearest point of the Subject Site. An overview of the local road network is shown in Figure 3-4. The site is accessible via Allotment 3, Deposited Plan D65715, and will require development of an access road (approximately 20 m wide by 100 m long) crossing this land parcel. Pangea have written approval from State Government for the purchase of this land to enable site access (Appendix J).
Vegetation:	<p>The Subject Site has historically been utilised for light grazing purpose. Vegetation communities that were present were assessed to be in moderate to poor condition and were not considered to represent preferred habitat for any threatened fauna species. Low levels of vegetation extend across much of the site, with larger vegetation present on the ridgeline and the north-eastern corner of the site.</p> <p>No State or Commonwealth threatened flora species of plant communities were recorded during the field survey of the Subject Site. Two main vegetation community types were identified; low open shrubland and tall open shrubland.</p>



Plate 3-1 Subject site, viewed from Tilling Road looking east



Plate 3-2 Subject site viewed from Abbattoir Road looking north-east



IW142200 Stirling North Solar Project

Figure 3-1 : Subject Site and Access Land

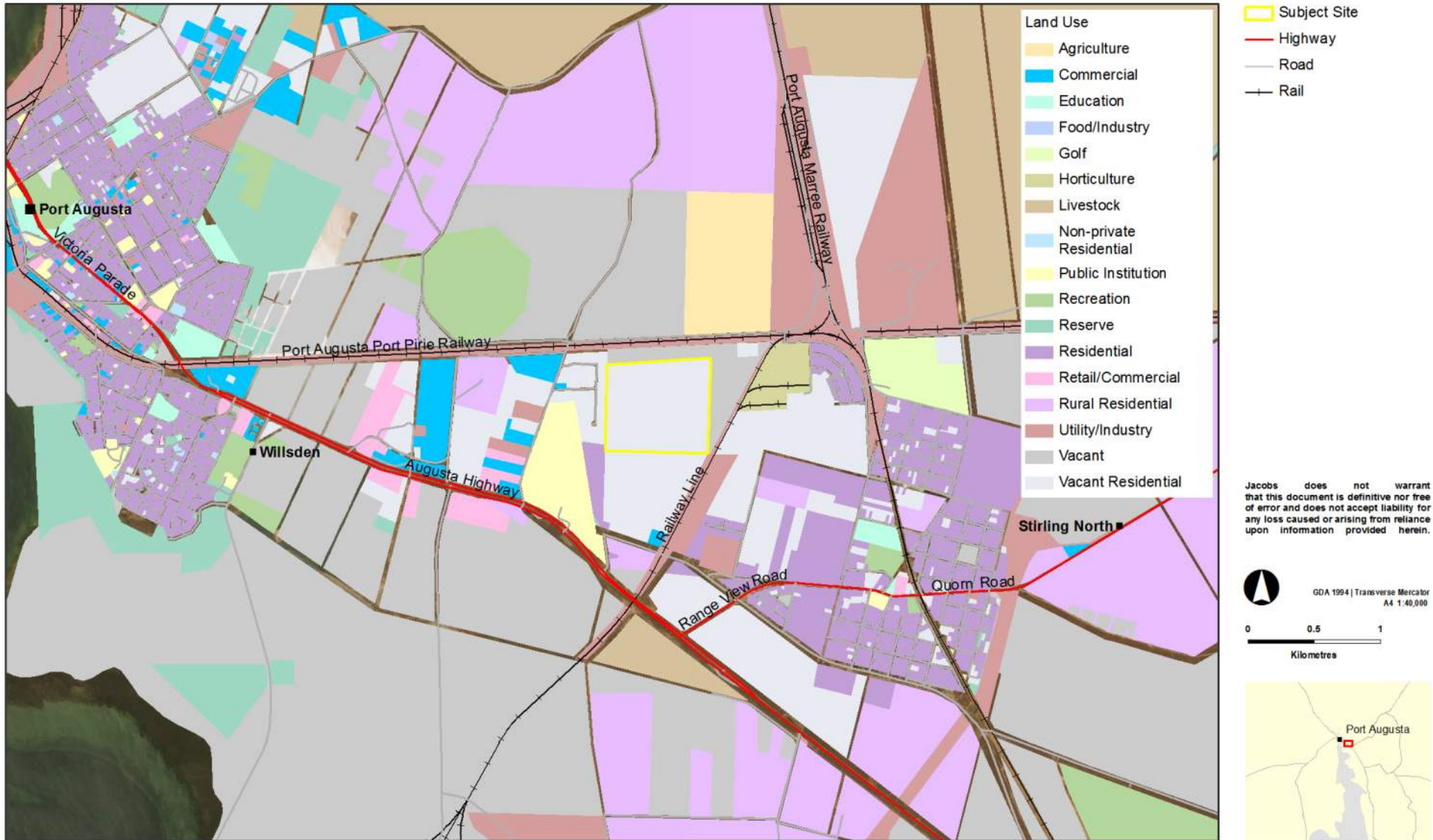


Figure 3-2 : Surrounding Land Uses



Figure 3-3 : Sensitive Receivers in close proximity to the site



IW142200 Stirling North Solar Project

Figure 3-4 : Local Road Network around the Subject Site

## 4. Description of Development

The proposed development of the PASSP will incorporate the implementation of a 50 MW solar photovoltaic farm with up to 300 MW energy storage system and ancillary developments on the Subject Site.

As previously depicted, the PASSP will service the electricity demand in South Australia. Pangea's proposed PASSP is planned to provide both electricity and green credits (large-scale generation certificates<sup>1</sup>) to support electricity demand in the South Australia region. The generation profile of the solar plant will provide significantly more generation in the summer period than in the winter and significant generation in the late afternoons due to the optimised layout of the solar modules fixed, facing north with tilt angle of 18 degrees from horizontal.

The PASSP will employ Vanadium Redox Batteries (VRB) coupled with supercapacitors (SC) as an alternative energy storage technology. This technology is detailed in Section 4.1.1. By having this significant energy storage system, the project will be able to provide reserve during peak periods to the National Electricity Market.

The PASSP will address South Australia's electricity needs, by reducing network congestion constraints, allowing for peak shaving, providing voltage compensation, reactive power management, and frequency regulation and control through compensating for imbalances between load and generation.

The indicative project layout (Appendix C) depicts the PASSP covering the entirety of the Subject Site. The PASSP will include compound areas located on the northern portion of the subject site. Ancillary infrastructure to be located in the compound areas includes the control room, administration and amenities, and car parking. A battery storage area will be located near the compound areas.

The following section provides an overview of the proposed development of the PASSP, including its layout, key project components and operating scenarios.

### 4.1 Proposed Layout and Key Components

The proposed development of the PASSP incorporates the solar plant, ESS and supporting ancillary developments, including the infrastructure connections for transmission of power generated by the project. Each major component of the proposed development is identified and discussed in further detail below.

#### 4.1.1 Summary components

The proposed development incorporates the following elements:

- Solar panels, fixed ground mounted modules facing north with tilt angle of 18 degrees from horizontal. The typical height of the bottom of the solar modules is 0.6 m above ground; maximum height of solar modules is 2.0m above ground. Single axis tracker options may be considered.
- Inverter stations will have a typical height of 2.13 m above ground. The number of inverter stations and solar panels will be determined at the time of final design after the selection of the chosen technology.
- Proposed control room and site office will be a two storey building with a height under 9.0m located at the entrance of the site.
- Proposed battery Energy Storage System (ESS) area which would include a combination of solid structures (generally similar in size to shipping containers) and a range of cables and overhead conductors. The specific height of structures within the battery storage area is yet to be determined, but is expected not to exceed 6.0 m in height (equivalent to two containers stacked).
- Truck bay for the dispatch of energy storage facilities within the Energy Storage Systems (ESS).

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<sup>1</sup> Accredited renewable energy power stations are entitled to create large-scale generation certificates based on the amount of eligible renewable electricity they produce above their baseline. As a guide, one large-scale generation certificate is equal to one megawatt hour of eligible renewable electricity.



- Underground cables connecting groups of solar panels to inverter stations.
- Cabling connecting the inverter stations to an associated on-site facility substation (Options for overhead and underground cabling being considered in association with ElectraNet).
- A guard room located at the site entrance (within the substation area) to control movement into and out of the site.
- Earthworks as required to form a level platform for the proposed buildings and ESS hardstand areas.
- Site office, including control room, and car parking sufficient for employees and contractors during operation of the PASSP.
- Landscaping around the site office.
- Drainage works, including spoon drains and stormwater piping, a detention pond (approx. 53m x 31m x 5m) and stormwater management systems within the substation area.
- A single site access point via Abbattoir Road. Pangea have written approval from State Government for the acquisition of the land identified as Allotment 3, DP65715 to enable development of a sealed access road to the site.
- Car parking on site sufficient for employees and contractors.
- Security fencing around the perimeter of the power station and CCTV. Signage will be clearly displayed identifying hazards present within the power station.
- Security lighting to illuminate warning about hazards contained within the PASSP. Directional lighting will be utilised to minimise obstructive light spill and glare.
- Lightning rods.

The indicative proposed project layout is shown Appendix C and indicative infrastructure and design details in Appendix D.

#### **4.1.2 Solar Technology**

PV technology is widely available and uses manufactured semiconductor material to absorb and convert sunlight into electricity. Individual solar panels contain a series of interconnected cells that convert sunlight into electricity in the form of direct current (DC), which is converted to alternating current (AC) via solar inverters.

Groups of solar panels are connected to each inverter and the inverters are linked together to collect the total energy being produced. Step-up transformers that increase the voltage are housed in the inverter containers. Underground or overhead lines are run from individual inverter stations to the facility substation where the voltage is again stepped up via one or more transformers to align the voltage to that of the transmission network.

The proposed PV technology has been designed to maximise generation capability with consideration for impacts from glare or glint to surrounding properties. Solar panels (modules) are designed to absorb sunlight, and therefore generally do not produce significant glare. Panels are coated with a layer of anti-reflective material that allows the sunlight to pass through but minimises outgoing reflection. Essentially, reflected light is contradictory to efficient generation of electricity, so modern panel designs incorporate features to reduce reflection. Despite this, a small proportion of light is reflected from the panels.

Design measures to minimise glare/glint impacts from the PV technology include:

- Coating the solar panels with a layer of anti-reflective material which allows for sunlight to pass through to the silicon.
- Minimising the thickness of the aluminium frame on the solar panels.





- The specific layout and orientation of the solar photovoltaic panels to face away from surrounding highways and major roads. Any glare or glint produced from the panels will be directed north of the Subject Site, therefore not having the ability to impact vehicle movements on the Augusta Highway.

The indicative fixed panel PV modules design and layout plans are shown in Figure 4-1 and are discussed in further detail below.

#### 4.1.3 Fixed Panel Solar Photovoltaic Modules

The solar PV panels will be fixed ground mounted modules facing north with tilt angle of 18 degrees from horizontal. The typical height of the bottom of the PV modules is 0.6 m above ground with a maximum height of 2.0 m above ground as shown in Figure 4-1.

The Site layout plan identifies the proposed layout of the module types to be implemented onto the Subject Site. The footing option type utilised for the modules will be dependent on geotechnical conditions and may be one of three options: hole drive, screw drive or concrete footing. The panels will be installed in parallel rows, and there will be approximately 4.0 m spacing between each row.

Inverter stations will have a typical maximum height of 3.0 m above ground with indicative designs provided in Appendix D. The number of inverter stations and solar panels will be determined at the time of final design after the selection of the chosen technology.

The PV farm area of the PASSP will cover approximately 45 ha of the 54 ha subject site (including gaps between panels and maintenance roads). The modules will be facing north, north-west on the Subject Site. All components of the solar modules will be static. Figure 4-1 provides a lateral view of the proposed panels, illustrating the relevant lateral angles and the defined spacing of the rows. The proposed PV farm layout is shown in Figure 4-2, with unit substations for voltage step-up from AC low voltage to medium voltage of 33KV on site.

The utilisation of the fixed tilt module layout allows for maximum site coverage and utilisation, which therefore allows for maximum absorption and generation of solar energy. The final design of the solar modules will be refined during detailed design and may be subject to further refinements prior to construction.

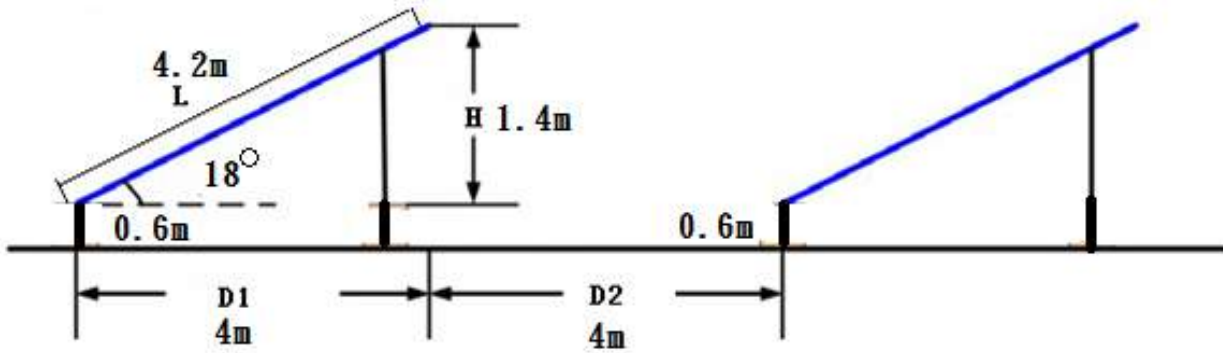


Figure 4-1 : Fixed Panel Solar Photovoltaic Modules: Lateral View (conceptual design)

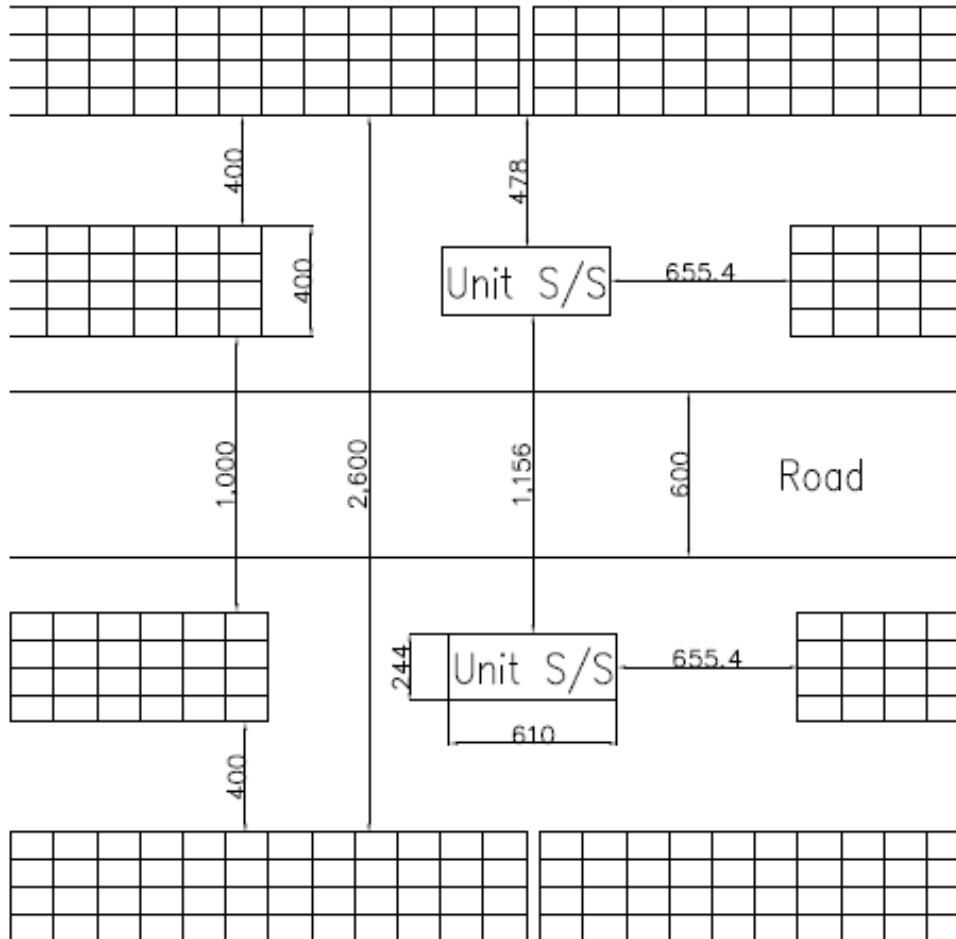


Figure 4-2 : Fixed Tilt Module Layout (conceptual arrangement). Unit substations shown.

#### 4.1.4 Module Footing

The footing type to be used for the solar modules will be either; screw pile, concrete or concrete filling pile footing (as illustrated in Figure 4-3) dependent on the geotechnical conditions across the subject site. Final footing selection will be determined during detailed design.

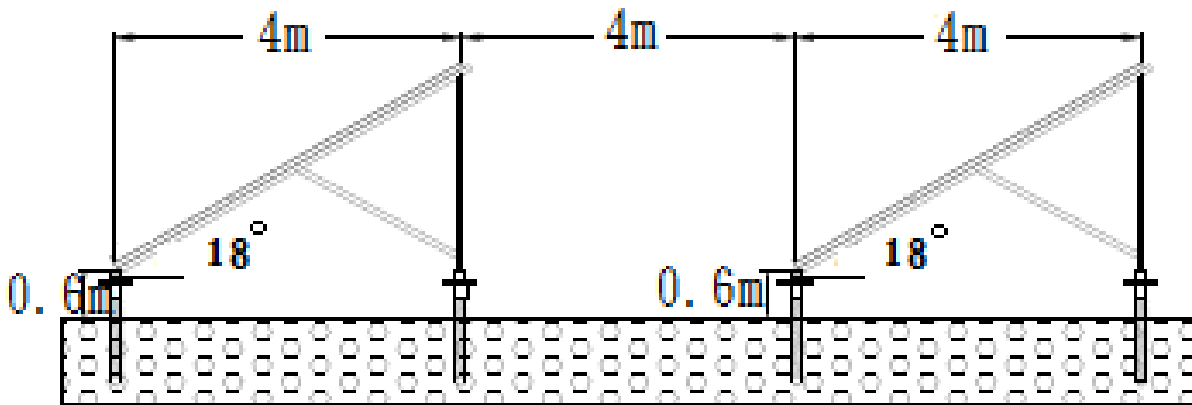


Figure 4-3 : Solar Module Footing (indicative design)

#### 4.1.1 Inverter Stations

The solar panels produce energy in the form of direct current (DC), which is converted to alternating current (AC) via a solar inverter, to allow the solar generated energy to be fed into the electricity grid or stored in the ESS. Utility-scale inverters harvest the maximum power from the solar photovoltaic array over a wide range of operating conditions (e.g. solar irradiation, temperature and shading).

The final type, design and therefore quantity of the inverter stations to be used for the PASSP are yet to be finalised. Final selection will be dependent on relative cost, efficiency and reliability of units available on the market at the time of detailed design phase. However, it is expected that the inverter units will not exceed a height of 2.13 m. The final selection of inverters will identify the units most appropriate for the site to minimise maintenance requirements and have greater reliability, including some degree of redundancy.

The indicative site layout, attached as Appendix C, identifies preliminary location of the inverters throughout the subject site. Specification sheets for indicative inverters are provided in Appendix D.

#### 4.1.2 Battery Energy Storage System

The ESS will comprise an area of approximately 2.7 hectares of Vanadium Redox Flow Batteries (VRB).

Vanadium, used in VRB as the electrolyte, is anticipated to have a long life of up to 20 years in each battery system. VRB use a circulating electrolyte solution of vanadium pentoxide to store the charge in tanks. Inherently, vanadium flow batteries are safer than Lithium-ion since they are not prone to the thermal runaway known to occur with Lithium-ion batteries. If a battery system is de-commissioned for any reason, the vanadium solution and all the contained metal can be 100% reclaimed and re-used elsewhere. The electrolyte can be safely removed, cleaned by filtration if necessary and re-used.

Incorporating VRB as storage energy to the system essentially acts as backup power and an operating reserve. This serves as the perfect substitute for expensive peaker plants, drawing from the grid or the PV plant during off-peak periods, and discharging into the grid during peak summer periods and times of loss of generation or

inter-connector capacity. Therefore, the VRB would reduce price volatility and add to security of supply, reliability and stability of current electricity grid.

Different energy storage batteries allow for a variety of features such as high power and fast response, high capacities and stable energy output. Integrating these features into a single system is challenging considering the limits of each technology.

A unique feature of the system is that it can be applied to stationary and static projects, with a significantly greater period of usage compared to mainstream options (refer Figure 4-4). In mainstream options where the same output is 50 MW the gas power plant adjustable range is only 40 MW (80% capacity), whereas the PV-hybrid ESS can reach 100 MW (up to 200% capacity).

Unlike lithium, sodium and lead acid batteries, VRB operates at room temperature and provides years of safe, reliable, low-maintenance operation. Furthermore, the electrolyte is based on vanadium, which is abundantly available, contributing to its low lifecycle cost of ownership.

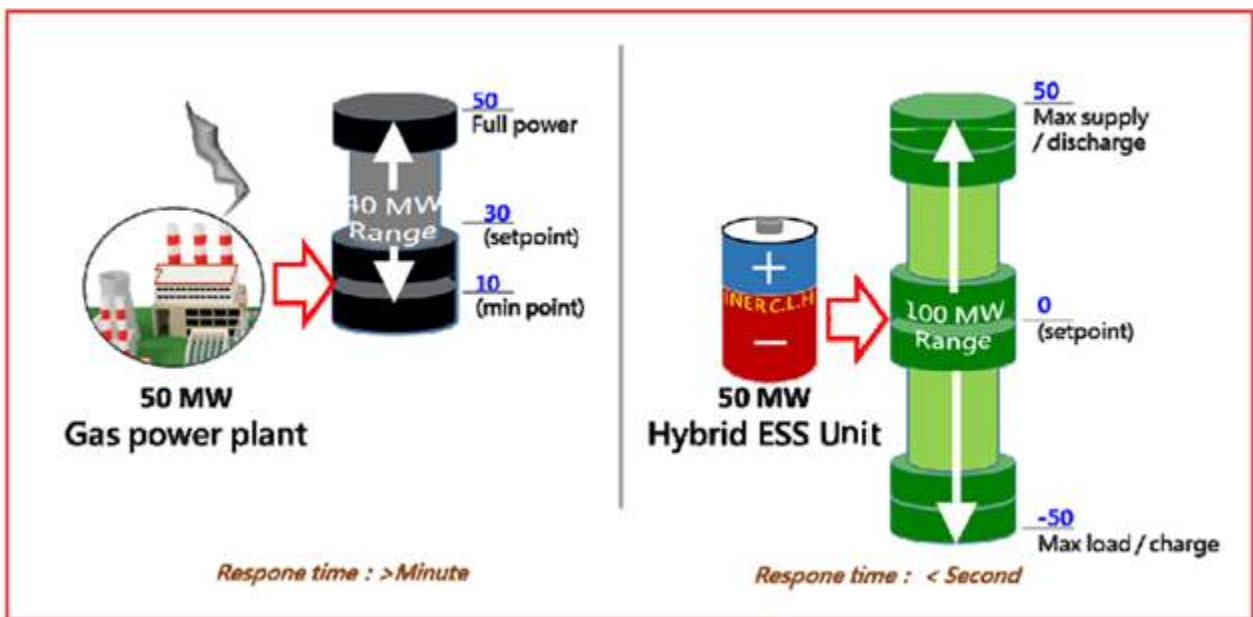


Figure 4-4 : Power supply adjustment ability for gas power plant and PV-hybrid ESS

The hybrid system addresses power supply needs, and improves the quality and stability of the vanadium batteries. The integrated heterogeneous VRB features adjustable peaks and frequency dual advantages, and larger capacity. An additional supercapacitor (SC) component allows greater power density, faster charge and discharge, and higher efficiency. This means that the VRB can reduce congestion constraints, provide voltage compensation, reactive power management, frequency regulation and backup power, leading to a more stable and reliable electric power grid.

The electrodes of both the VRB and the SC only provide conductivity; therefore, they do not participate in the reaction, so this yields a very high cycle life ( $\geq 100,000$ ) ESS.

Frequent deep discharges or long-term shutdown conditions will also not decay their life cycles. When combined with solar PV technology, this VRB hybrid storage system yields higher efficiency and an improved lifespan of around twenty (20) years. This result is significantly superior to mainstream systems such as lithium batteries. Therefore, there is reduced ESS investment costs, and a lower carbon-intensive alternative.

#### 4.1.1 Battery Storage Area

The proposed battery storage area is expected to include a combination of solid structures (generally similar in size to a 40-foot shipping container) and a range of cables and overhead conductors. An example of the battery

storage area is shown below in Figure 4-5. The specific height of structures within the battery storage area is yet to be determined but is expected not to exceed 6.0m in height, equivalent of two stacked storage containers.

This design and storage method allows for easy installation and removal, and contain all equipment in a secure area. The colouring and siting of the battery storage structures will be designed to result in minimal impacts to visual amenity on surrounding land uses, specifically the nearby rural residential areas

A truck bay for the dispatch of the energy storage systems will be located adjacent the storage area with final design to be determined.

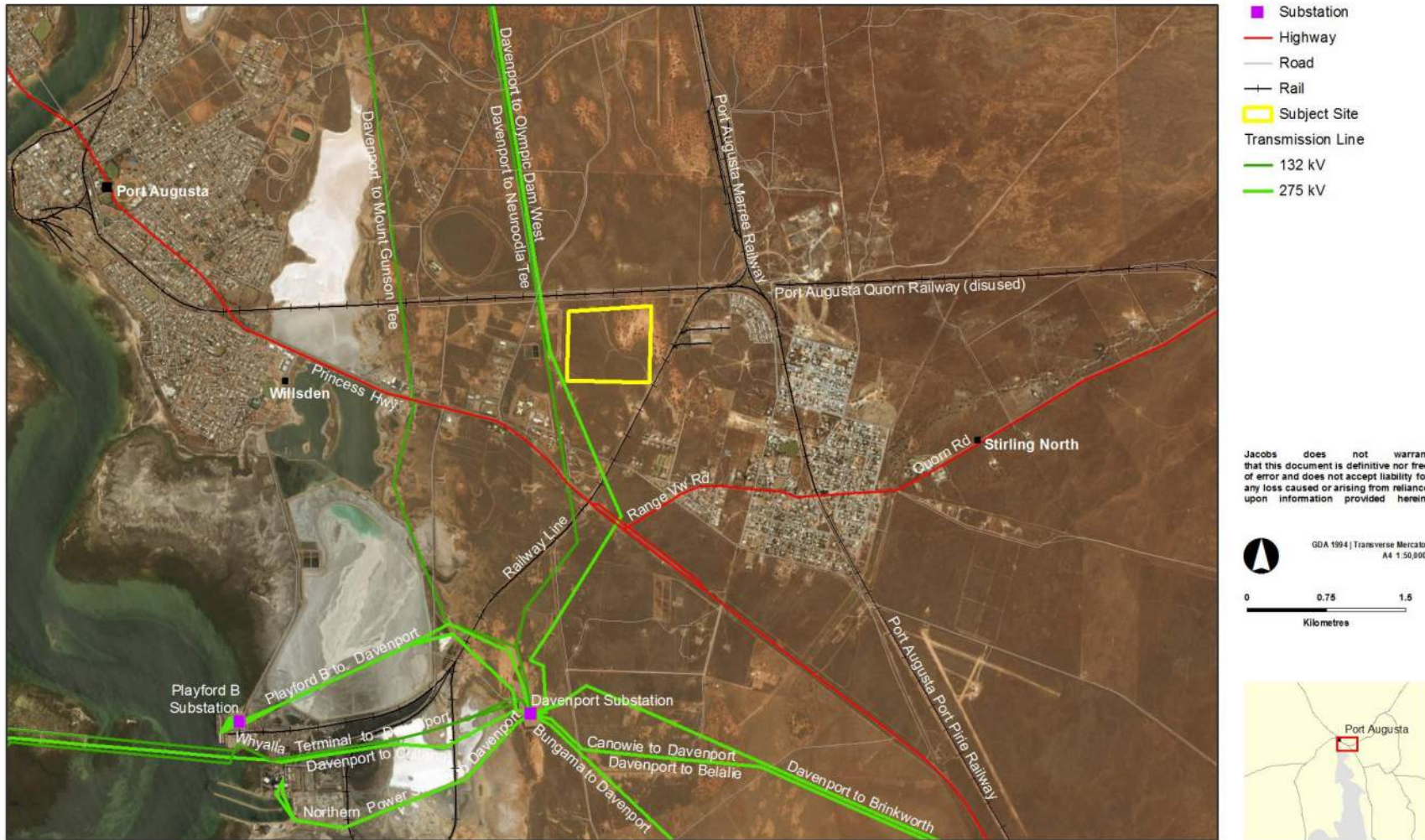


Figure 4-5 : Indicative Battery Storage Area Structure

#### 4.1.2 Facility Substation and Grid Connection

The nearest ElectraNet transmission lines (132 kV) exist to the west, approximately 70 m from the Subject Site boundary. Two substations exist nearby the proposed Subject Site; Stirling North Substation approximately 2.3 km to the east and Davenport Substation approximately 3 km to the south west (refer Figure 4-6).

Pangea will contract with ElectraNet for grid connections, and this is anticipated to be a connection at the Davenport substation. The transmission network connection negotiation process is underway with ElectraNet who have provided a number of options.



IW142200 Stirling North Solar Project

Figure 4-6 Location of Davenport Substation and existing transmission lines near PASSP

#### **4.1.3 Site office, control room and guard room**

The site office and control room will be located within one of the compound areas of the Subject Site. The proposed site office and control room is proposed to be a two story structure, with its height under 9.0 m. The control room will be the centralised control area for managing operations associated with the PASSP. The site office/control room will facilitate the central point for staff, in relation to operations associated with the PASSP. A small guard room is located adjacent the site entry point, within the area of the site substation. The guard room will enable control of access to the site by contractors, visitors and staff. An indicative layout of the site office and guard room is provided in Appendix D along with an indicative image of the design.

#### **4.1.4 Car parking**

The indicative site layout plan provided in Appendix C indicates the location of parking around the office building facility, with further details provided in Appendix D showing proposed car parking near the northern entrance to the Subject Site and surrounding the proposed site office. Provision for twenty-two (22) car parks and four (4) disabled parking spaces is proposed to cater for the nineteen (19) full-time operational staff employed on site.

#### **4.1.5 Site Access and Internal Access Roads**

Site access is proposed from the northern entrance to the Subject Site via Abbattoir Road. Pangea have written agreement from DPTI for the purchase of the parcel of land to the north of the site (Allotment 3, Deposited Plan 65715, CT5937, F151) to enable a single sealed access road to the Site to be developed (Appendix J). The indicative location of the access road is shown on Figure 3-1. Control of contractors, visitors and staff into the site will be via a guard room located at the site entry point.

An indicative internal access road layout and design is provided in Appendix C. The internal access roads will be sufficient to allow for vehicle manoeuvring including large vehicle deliveries. Indicative road design provided in Appendix D.

#### **4.1.6 Drainage works, including stormwater management system**

Drainage and stormwater management design will be finalised during the detailed design stage, but will align with requirements from the Port Augusta Development Plan. Additional information on proposed stormwater management is provided in Section 4.3.3 and includes drainage network to a detention pond from hard standing areas, with bunding and oil separators within the substation area to manage potential contaminants entering stormwater.

#### **4.1.7 Fencing and Security**

Security fencing will be installed around the perimeter of the PASSP. Signage will be clearly displayed identifying hazards present within the solar plant. A preliminary fencing design drawing is provided in Appendix D.

CCTV will also be used to manage security on the subject site. A preliminary design of the structures is provided in Appendix D.

#### **4.1.8 Lighting**

Low-level night time lighting will be installed for safety and security purposes. The lighting incorporates infra-red technology resulting in minimal light spill beyond the boundaries of the subject site.

#### **4.1.9 Lightning Protection**

Lightning protection will be incorporated into the PASSP. Lightning protection masts will be established for every third or fourth inverter station, with the final number and siting to be determined during detailed design. The lightning protection masts are thin, tubular structures, approximately 8 m high with a concrete base and earthing. An indicative lightning protection system is presented in Appendix D.

#### **4.1.10 Landscaping**

Landscaping is proposed to be established around site office and control room as depicted on the indicative site layout and detailed layout as provided in Appendix C and D respectively following the construction of the PASSP.

Given the scale of proposed developments across the Subject Site, providing landscaping which is adequate to screen the entire Subject Site is not practicable. Targeted landscaping may be established to support erosion control and improved amenity adjacent to car parking areas and control room, which will be detailed during the design stage but is anticipated to be minimal.



## 4.2 Construction Phase

### 4.2.1 Construction Program

The earliest timing considered for the proposed PASSP to be operational is by Q4 2019, dependent upon market and construction variables. Construction is expected to begin in Q3 2018, with an approximate total construction period of up to 24 months. Completion of the construction phase is therefore estimated to be in Q3 2020.

The main components of the construction programme will entail civil works, establishment of the solar modules, inverters and connecting infrastructure and commissioning of the high voltage and electrical connection.

An approximate schedule of a construction works schedule is identified in Table 4-1.

**Table 4-1 : Approximate Construction Works Schedule:**

Schedule of Works	Timeframe
Detailed design works	November 2017 – March 2018
Site civil works	June 2018 – March 2019
Delivery of equipment	June 2018 – December 2019
Installation	July 2018 – April 2020
Commissioning & Testing	April 2019 – June 2020

### 4.2.2 Construction Workforce

During the construction phase of the PASSP, an approximate peak workforce of 90 people over the 18-24 month construction period will be required. The nature of skills required during the construction phase will range from construction of the components on site, as well as transportation of the various components of the project. This will therefore create job opportunities for local contractors / suppliers and generate business within the surrounding area.

### 4.2.3 Temporary Construction Facilities

Temporary facilities will be established during construction within the Subject Site, to provide basic amenities for construction workers and temporary laydown and storage areas for construction materials. The requirements for temporary facilities will be determined by the construction contractor, however are anticipated to include:

- Site office
- Temporary toilet facilities
- Laydown area
- Temporary car parking (informal)

Due to the size of the Subject Site and available land, all temporary construction facilities will be accommodated within the property boundary.

### 4.2.4 Utilities

Construction contractors will be responsible for providing utilities to the site required to support the construction activities. It is anticipated that the first site activities will be establishment of a permanent auxiliary power supply for the power station, so it can be used to supply power during the construction period. Should this not be

possible, power will be supplied by portable generators. It is anticipated that construction water requirements will be trucked in.

#### 4.2.5 Vehicle Movements

A summary indicating the estimated number of vehicle movements that are expected to take place during construction of the proposed development is depicted in Table 4-2 : Estimated Construction Traffic below. It is important to note that dependent on the construction methodology of the contractor, traffic volumes may vary from these predicted estimates.

**Table 4-2 : Estimated Construction Traffic**

Vehicle Type		Vehicle Movements (Total Construction Period <sup>1</sup> )	Average Daily Movements (Total Construction Period <sup>1</sup> )
Material Delivery	Modules	322	-
	Posts	37	-
	Tilts	10	-
	Tables	98	-
	Electrical / Cable	49	-
	Inverters	20	-
	E-building	2	-
	DC Combiner Box	1	-
	CCTV	1	-
Construction Vehicles	Cranes and / or Earth Moving Equipment	379	-
<b>TOTAL Heavy Vehicles<sup>1</sup></b>		<b>713</b>	<b>3</b>
Light Vehicles	Personal vehicles and private transport	4,569	-
<b>TOTAL Light Vehicles<sup>1</sup></b>		<b>4,569</b>	<b>13</b>
<b>TOTAL Vehicles<sup>1</sup></b>		<b>5,282</b>	<b>16</b>

<sup>1</sup>This number represents the vehicles travelling to the subject site; therefore the total number of trips generated (in/out of the subject site) will be double what is shown in the table.

Oversized and overmass vehicles may be used to transport the major components of the PASSP including the inverters and transformers. These major components are most likely to be sourced in Adelaide and are anticipated to access the site via Augusta Highway. The majority of construction traffic (i.e light vehicles and trucks) are anticipated to access the Subject Site from Adelaide or Port Augusta.

Two access routes are proposed for construction traffic accessing the Subject Site:

- Augusta Highway is proposed to be the principal point of access to the Subject Site. Construction traffic accessing the site from Adelaide or Port Augusta would access the Subject Site via the Augusta Highway. Augusta Highway is located south of the Subject Site and would provide access to the subject Site via either Footner Road or Racecourse Road continuing to Abbattoir Road, to gain access to the Subject Site via the land identified as Deposited Plan 65715 Allotment 3 (the access land).
- The Flinders Ranges Way provides an alternative access point for vehicles travelling from northern, or central Australia. It is anticipated that this access point will be minimally utilised for PASSP.

The construction and maintenance of internal access roads shall provide for safe and orderly movement of vehicles and minimise scarring to the landscape. Internal roads will be designed to meet construction, operational safety requirements.



#### **4.2.6 Waste Management**

Construction waste management procedures will be implemented via a Construction Environment Management Plan (CEMP). Specific measures to be incorporated will include:

- Construction waste separation into different streams to facilitate recycling with waste removed from the site by a licensed contractor as appropriate.
- Liquid waste (including hydrocarbons, paints and solvents) will be stored in sealed drums or containers in a bunded area before removal from the site by an EPA licensed contractor for recycling, where possible, or disposal to a licensed facility.
- During construction, temporary ablution facilities will be serviced by pump-out tanker trucks, used with off-site disposal by a licensed contractor

### **4.3 Operation Phase**

#### **4.3.1 Operating Workforce**

During operation, it is expected that 19 permanent full time staff will be required to run the facility. The permanent staff will be located on site (in the facility site office). Specialist contractors will be on-call to assist with other activities including weed control, track maintenance or other subsidiary services. Additionally, module cleaning and maintenance will generate other forms of employment opportunities associated with the site. It is anticipated the panels will be cleaned a minimum of twice per year. The operation workforce requirements will remain consistent for the full-time on site workers throughout the year and the hours of work are not dependent on the amount of energy being generated.

#### **4.3.2 Utilities**

Once operational, the PASSP will be connected to the mains water and electricity supply present at Footner Road to provide amenities for the on-site office.

#### **4.3.3 Stormwater Management**

Runoff from the site office building, site substation, and the laydown and compound area (an overall small component of the project site) may increase compared with current levels as a result of an increase in impervious surfaces, e.g. buildings and car parks. Run-off from the majority of the site (i.e. solar arrays) is likely to remain the same or similar to current levels, as the areas beneath and surrounding the solar modules will not be impervious, but will be retained substantially in the current condition and therefore allow infiltration of rainfall. Drainage will be designed and constructed within all areas affected by the development, to ensure that there is no increase in flow intensity / frequency beyond the site boundaries.

The key principles for stormwater management at the PASSP are as follows:

- Collected surface water runoff will be discharged to match existing drainage patterns as much as possible.
- The substation area will include design and management features to enable the effective management of potential contaminants within stormwater, including appropriate bunding, presence of spill containment kits on site, and oil separation systems.
- All drainage works will be designed and constructed to prevent scour and erosion. Additional protection measures will be included as required at locations particularly susceptible to scour/erosion (i.e. check dams or rock lined channels on slopes, rock armour or rock mattresses at stormwater discharge locations).
- All drainage works will be formed to provide a consistent fall along drainage lines and to avoid flat spots, where water may be subject to collection adjacent to the PASSP infrastructure.
- A detention pond is included in the design to protect against flooding during high intensity rainfall events. The detention pond has dimensions of 53m x 31m with a depth of 5m, resulting in a capacity of over



8,200 m<sup>3</sup>. Stormwater to be directed to the detention pond via spoon drains and stormwater pipes from buildings.



## 5. Environmental Assessment

The following section summarises the outcomes of environmental investigations undertaken to determine the feasibility of the PASSP including existing site conditions relevant environmental impacts.

### 5.1 Visual Amenity

An assessment in relation to the LVIA of the Subject Site was undertaken to assess the likely effect of the PASSP on landscape and visual amenity and has been attached as Appendix E.

The LVIA considered the degree of visual change based on the construction and operation of the PASSP. The degree of visual change was considered from a number of nominated viewpoints as shown in Figure 5-1, with the outcomes of the assessment determined based on the distance of the viewpoint to the Subject Site, the level of disturbance and quality of the existing landscape, and the number of receptors expected to experience the viewpoint.

No specific guidelines relating to the assessment of landscape and visual impacts in South Australia are available. As a result, the method for this LVIA was developed with reference, where appropriate, to the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute & I.E.M.A 2013) and Visual Landscape Planning in Western Australia (Department for Planning and Infrastructure, 2007).

The LVIA was undertaken through various assessment methods, which encompassed the following:

- Assessment Method: Desktop Study, Site Visits and Photography Landscape Context Analysis and Impact Assessment.
- Existing Environment: Topography, Vegetation, Landscape Types.
- Key Receptors: Major roads, Parks and reserves, Townships, Tourist Sites.
- Impact Assessment.
- Management Strategies.

In order to minimise and mitigate changes to landscape and visual amenity, the following controls and management strategies should be incorporated into the Construction Environmental Management Plan or Operations Environmental Management Plan and implemented for relevant project components:

- Demobilisation of construction equipment from site as soon as practicable to minimise affect to visual amenity.
- Where practicable, buildings and structures will be of muted, earthen tones consistent with dominant colours in the landscape; highly reflective materials will be avoided to avoid glare and reduce the visibility of buildings and structures.
- Undertake rehabilitation of disturbed areas as soon as practicable.
- Removal of all above ground infrastructure, and rehabilitation of Subject Site following decommissioning of the Project.
- Carry out early communication with landowners within or near to the Project to inform them of the proposed development. Communication should include details on:
  - Construction timing and activities;
  - Anticipated vehicle movements; and
  - Likely operational footprint and visible elements.
- A range of measures will be incorporated to the design to minimise glare from the panels, including:

- Orientation of the panels to face north, resulting only in the rear or side of the panels being visible from Stirling North and Augusta Highway.
- The solar panels are designed with a layer of anti-reflective material that allows the sunlight to pass through, but minimises reflection.
- Current proposed solar panels reflect as little as 2 percent of the incoming sunlight.

#### **5.1.1 Existing Environment**

The region surrounding the Subject Site is characterised by pastoral activity in a largely flat to gently undulating landscape. Dwellings are concentrated within the townships of Stirling North and Port Augusta with a number of scattered rural residential dwellings surrounding the Subject Site. Infrastructure development including high voltage transmission lines, substations and telecommunications facilities are scattered throughout the landscape.

The Subject Site itself is relatively flat and largely cleared of native vegetation. Various forms of infrastructure are already present within the area surrounding the Subject Site, including unsealed roads, transmission / distribution lines and a railway line.

#### **5.1.2 Sensitive Receptors**

The key receptors (refer Figure 3-3) within the region identified as most likely to be affected by the establishment of the PASSP were identified as the surrounding residential properties, users of the major roads in the surrounding area; specifically the Augusta Highway and the Flinders Ranges Way, nearby townships including Stirling North and Port Augusta, and visitors to the Pichi Richi Railway.

#### **5.1.3 Impact Assessment**

During the construction phase, the change to visual amenity within the study area will occur as a result of earthworks, construction of additional infrastructure and an overall increase in the number of people and vehicles. The changing visual environment and activity during construction will be temporary, therefore was not considered in detail in the visual assessment.

The LVIA addressed the distance, sensitivity and exposure of the proposed developments associated with the PASSP on the existing environment. The LVIA concluded that the PASSP will not be located within areas commonly regarded as being of significant or high scenic or aesthetic value. The LVIA study area is characterised as a pastoral landscape, with low to mid height vegetation, rural dwellings, and existing electricity infrastructure scattered throughout the landscape.

Intervening topography and vegetation will largely screen views of the PASSP from key receptors and highly exposed locations (i.e. areas that are highly frequented). The greatest level of change is expected to be experienced by residents at the north-western portion of Stirling North that have clear views west towards the Subject Site.

Pangea acknowledge that there may be potential concern in relation to visual impacts generated from the development of the PASSP on the landscape character surrounding the PASSP. Pangea will endeavour to mitigate the landscape and visual impacts from the project where practicable, to complement the existing locality surrounding the Subject Site.

Overall, the Project is not anticipated to be a significant visual element in the study area. It has been determined that the Project is largely screened from view by intervening topography, vegetation and / or structures when viewed from the identified key receptors. Views of the project are typically restricted to passing motorists, and nearby rural residential dwellings. The implementation of the identified management measures will further reduce the degree of visual change associated with the Project.





Figure 5-1 : L VIA Viewpoints

## 5.2 Traffic

It is anticipated that large volumes of traffic will be generated during the construction phase of the PASSP, and is therefore one of the main issues relating to environmental impact from the project. Pangea have derived a preliminary Traffic Management Plan, to inform and support the proposed development of the PASSP. The Traffic Management Plan is attached as Appendix F, which identifies traffic management measures and strategies, proposed to address traffic safety and access issues inherent with using oversized vehicles and general daily construction traffic, which will involve high volumes of traffic movements.

### 5.2.1 Construction Traffic

Traffic to the Subject Site will have its largest volumes during the construction phase. The types of vehicles anticipated to be utilised during the construction phase are comprised of light vehicles, heavy construction vehicles and oversized vehicles. A summary of estimated number of vehicle movements that are expected to take place during the construction phase of the PASSP was presented above in Table 4-2.

There are two major roads surrounding the Subject Site, which may be utilised by construction traffic. Located east of the Subject Site is the Flinders Ranges Way linking Quorn and Port Augusta, extending from the Augusta Highway through the southern Flinders Ranges. The Augusta Highway located south of the Subject Site, connects Adelaide to Port Augusta, extending south from the Subject Site. It is predicted that the majority of construction traffic will be generated from Adelaide or Port Augusta, with construction traffic predicted to therefore predominately utilise the Augusta Highway. A second access point via Racecourse Road, located north of the Subject Site, may be utilised for construction traffic. Racecourse Road is connected to Footner Road and Abbattoir Road, with Abbattoir Road the only access point into the Subject Site via the land parcel DP65715, A3, which is to be purchased to enable development of an access road.

Based on the estimated level of construction traffic, heavy vehicles movements on the Augusta Highway and Flinders Ranges Way are not expected to greatly alter traffic movement on the existing roads. Despite this, a range of management measures are proposed to minimise impacts on other road users and the local road network:

- Regular meeting and engagement with DPTI and Council regarding upcoming construction activities, deliver schedules and any temporary speed restrictions.
- Restricting construction traffic movements during adverse or unsafe weather conditions.
- Driving to the road conditions and adhering to safe operating speeds.
- Providing way-finding signage where necessary to facilitate access along the proposed construction routes (if required).
- Undertaking dust suppression activities (if required) to minimise dust emissions from construction traffic on unsealed roads.

### 5.2.2 Deterioration of road condition from TBSP construction traffic

Pangea acknowledges that there will be wear and tear on the nominated access routes due to construction traffic associated with the PASSP. Maintenance and inspection strategies to minimise impacts to existing road conditions will be undertaken.

At the completion of the construction period Pangea propose to reasonably rehabilitate unsealed roads utilised for construction access to a condition no less than prior to the commencement of works. This level is to be agreed between Pangea and the Port Augusta (City) Council/ DPTI prior to the beginning of the construction works.

To support this process, an audit of road conditions along the nominated access routes will be undertaken prior to the commencement of construction. The condition audit will occur following the completion of any road





upgrades (if required). A post construction condition audit will be undertaken to determine any remedial action required to repair access roads degraded as a result of Project related construction traffic.

Whilst construction traffic may add to the deterioration of the road, Pangea cannot be held responsible for all damage as the roads are also used by heavy vehicles and other non-PASSP related traffic.

#### **5.2.2.1 Road Maintenance Intervention Levels**

Road Maintenance Intervention levels are identified with the Traffic Management Plan to rectify any defects to road infrastructure during the construction phase of the PASSP. The nominated PASSP Road Maintenance Intervention Levels addresses signs and delineation and road pavement, and identify the maintenance requirements and repair timeline to maintain safety of the access routes for other road users. Any changes of these levels will be agreed upon between Pangea, DPTI and the Port Augusta (City) Council during regular communications.

#### **5.2.3 Operation Traffic**

The anticipated traffic generated during the operation traffic phases of the PASSP will be limited to light vehicle movements for operations and maintenance staff. The traffic generated during the operation phase is not expected to represent a significant impact to the local road network.

### **5.3 Aviation**

There are minimal concerns in relation to aviation and the proposed developments of the PASSP. The PASSP has been designed and sited to minimise impact of glare/ glint and there are no major airports located within close proximity to the Subject Site. Desktop research indicates that the Port Augusta Airport is the closest airstrip in proximity the Subject Site, which is situated approximately 10 km from the Subject Site.

The design and siting of the PASSP is not expected to impact the Port Augusta Airport, as there are no large vertical elements that could impede air traffic and minimal glare is expected. It is therefore anticipated that there will be minimal impact upon current and future aviation operations at the Port Augusta Airport.

### **5.4 Cultural Heritage**

A desktop assessment of registered Aboriginal and non-Aboriginal cultural heritage was undertaken to determine the presence of registered places or sites of heritage significance. The assessment reviewed the following publically available registers for the presence of places or sites of significance:

- State Heritage Register
- Local Heritage Register
- Register of the National Estate (non-statutory archive)
- National/Commonwealth Heritage Register
- World Heritage Properties
- Department of State Development - Aboriginal Affairs and Reconciliation (DSD-AAR) Central Archive
- South Australian Museum Archives – review for documents or artefacts in relation to Aboriginal Places, objects or tribes in the project area

The assessment determined that no registered places of heritage significance were located within the Subject Site. Two heritage places were identified within 2 km of the Subject Site, as summarised in Table 5-2 below.



Table 5-1 : Places of Heritage Significance

Site / Description	Address	Heritage Type	Register ID	Approximate Distance to Subject Site
Port Augusta Gaol	Franks Dr, Port Augusta, SA, Australia	Removed from Register	6902	Approximately 700 m south-west
Reported Archaeological Site*	N/A	DSD-AAR Central Archive	6433_5975	2 km north

\* Note: the location of the reported archaeological site cannot be reproduced, in accordance with the requirements of the Traditional Owners and the Aboriginal Affairs and Reconciliation Division

One site of Aboriginal significance reported on the DSD-AAR Central Archive is located within 2 km of the Subject Site as outlined in the Desktop Heritage Assessment provided in Appendix H. Given the use of the land within and surrounding the proposed development is primarily pastoral and has been the subject of low intensity development, there is a potential that Aboriginal sites or objects may remain preserved within the Project site. If any sites, objects or skeletal remains that may be of heritage significance are identified during the construction period, stop work procedures will be implemented as follows:

- **Stop works** – stop all works in the vicinity of the site and no further disturbance of the site will be made.
- **Restrict access** – access to the site will be restricted to protect the site.
- **Notify authorities** – the Heritage Branch, Aboriginal Affairs and Reconciliation Division and / or the local Police (if suspected human remains have been discovered) will be notified of the finding.
- **Manage the site and ongoing access** – determine the appropriate course of action in consultation with the relevant authorities and resume works when it is appropriate to do so.

The stop work procedure will be incorporated into the CEMP and provided to all construction personnel as part of the site induction process.

## 5.5 Flora and Fauna

An assessment of ecological values at the Subject Site (Appendix G) was undertaken to determine the presence of species of conservation significance (i.e. species protected under Commonwealth or State Legislation). The following tasks were undertaken for the assessment:

- Review of Environment Protection Biodiversity and Conservation Act Protected Matters database and high level assessment of likelihood of occurrence for listed and threatened flora and fauna species within 5 km of the Subject Site.
- Review of Biological Database of South Australia (BDBSA) search extract within 30 km of the Subject Site for threatened flora, fauna and ecological community results.
- Review of DEWNR NatureMaps online database to identify any ecologically significant features that may occur at the site or surrounds.
- Surveyed the site in order to map vegetation communities present within the project area and conduct a high level assessment of their composition, condition and habitat value.
- Summarised the outcomes of the desktop reviews and site visit.
- Prepared a high level vegetation map of the study area.
- Provided further information about approval requirements if vegetation clearance is required.

Apart from minor areas that have been cleared for tracks and small disturbance, the Subject Site supports native vegetation communities as depicted in Figure 5-2 below. The western and southern portion of the Subject Site is comprised of alluvial outwash plains with Chenopod low open shrubland, which extends across the site



boundary into the area of the proposed access track to the site from Abbattoir Road. An area of low sand dunes and sand plains in the north east corner of the Subject Site supports tall open shrubland.

The majority of the Subject Site and access track area is covered in low open shrubland which was assessed to be in fair to good condition, with the tall open shrubland areas assessed as being in poor condition with moderate to high levels of disturbance.

The project final construction footprints are yet to be determined. It is likely that the final design and operation of the solar array will affect the final vegetation clearance footprint. For example, if the arrays are above the low shrubland vegetation, vegetation clearance can be confined to cabling trenches, access tracks and fire breaks and steel piles holes.

Clearance of native vegetation however, will be required to undertake the development associated with the PASSP. The size was measured as 53.5 ha using the GIS polygons during the ecological study, so this represents the maximum amount of clearance required. An application to the Native Vegetation Council for approval to clear this vegetation, and any additional vegetation clearance required for the access track, will be submitted prior to the commencement of construction, and an agreed environmental offset in the form of a Significant Environmental Benefit, as required under the *Native Vegetation Act 1991*, will be agreed. Other solar projects in the region have agreed environmental offsets based on post-construction audits of final clearance amounts, and operational audits to determine survival of vegetation beneath solar panels.

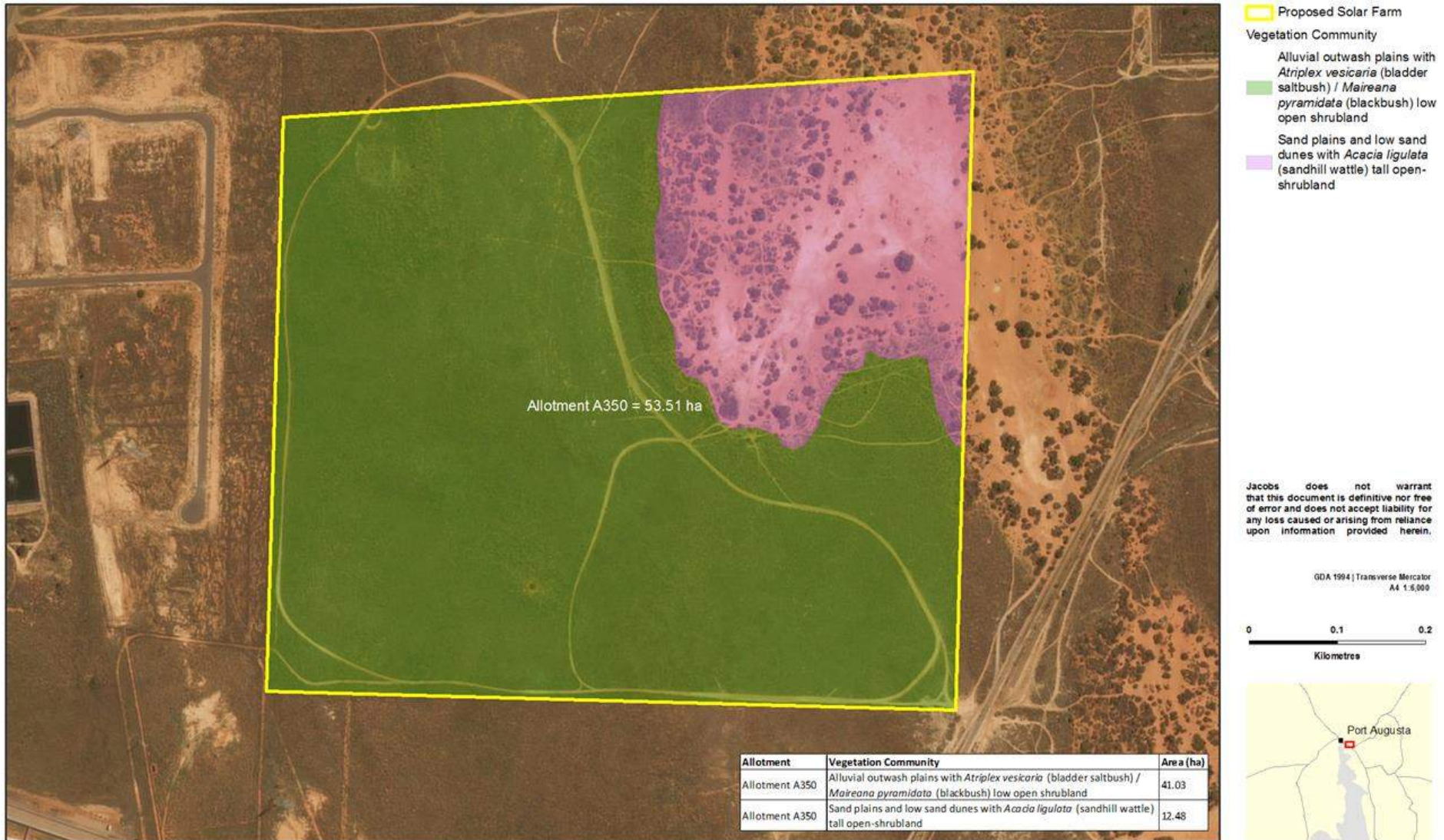


Figure 5-2 : Vegetation communities at the Subject Site

## 5.6 Air Quality

Air quality can be affected by dust caused by soil disturbance (e.g., from earthworks, vehicle traffic and site preparations) and emissions from vehicles and machinery. These impacts can be a nuisance to nearby receivers (residences, farm workers), but are not considered long term and will be restricted to the construction period where management measures should effectively control emissions. Given the nature of the PASSP, no formal air quality impact assessment has been undertaken.

### 5.6.1 Construction Air Quality

Construction air quality impacts to sensitive receivers could occur as a result of dust emissions during construction activities or as a result of exhaust emissions from construction equipment. Through the utilisation of standard environmental management controls (e.g. use of water trucks for dust suppression, use of properly maintained equipment), construction air quality impacts at sensitive receivers are expected to be negligible.

### 5.6.2 Operational Air Quality

The generation of solar energy during the operation of the PASSP would not generate any emissions or affect air quality. During operation the project would have a positive impact on emissions to air by reducing Australia's reliance on fossil fuels for electricity generation. The operating PV modules at the solar plant would emit no greenhouse gases (U.S Department of Energy 2004).

Annual maintenance activities would result in some localised, intermittent vehicle emissions and potentially some generation of dust from vehicles travelling across the access tracks, however the impact on local and regional air quality are expected to be negligible.

## 5.7 Noise

Noise emissions at the PASSP will primarily be generated during the construction period as a result of earthworks, vehicle traffic, site preparation and emissions from vehicles and machinery. These impacts can be a nuisance to nearby receivers (residences).

Through the utilisation of standard environmental management controls, construction noise impacts at sensitive receivers are expected to be negligible. Management measures include restriction of construction hours to 7 a.m. to 7 p.m. Monday to Saturday in accordance with the requirements of the *Environment Protection (Noise) Policy 2007* (EPA 2014), shutting down equipment when not in use, and utilisation of noise reduction devices.

The PASSP comprises no moving parts, or significant sources of noise once operational. As such, no noise impacts to sensitive receivers are anticipated during the operation phase of the project.

## 5.8 Site Contamination

A desktop assessment was undertaken for the Subject Site to determine if past or current activities at the site may have caused site contamination. The review included review of existing land use data provided by the South Australian Integrated Land Information System (SAILIS) and a search of the EPA register for contaminated sites (Section 7 search).

The results identified that the EPA held no historical information relating to the Subject Site in relation to the *Environment Protection Act 1993*. Further, SAILIS had not records of site contamination for the Subject Site.

A detailed site assessment was undertaken for the access land parcel (DP65715 A3) by LWC (2017), including drilling of soil bores and sampling at 15 locations across the site. No indication of existing site contamination was reported and the probability of potential contamination to be present at the site was considered to be low based on the results and historic site use.



Given the results of the soil investigations at the adjacent access property, and based on the historical information available for previous use of the Subject Site, it was considered that historical uses do not pose a significant human or environmental health risk and the likelihood of contamination across either site is very low.



## 6. Development Plan Assessment

The following section identifies the provisions of the Port Augusta (City) Development Plan relevant to the assessment and alignment of the proposed development of the PASSP. The proposed PASSP is discussed in relation to the Council wide policy in the Development Plan, including policy relevant to the establishment of renewable energy facilities, as well an assessment of the consistency of the PASSP with the Industry Zone (Port Augusta (City) Development Plan). A copy of the relevant Development Plan policy is provided in Appendix I.

### 6.1 Renewable Energy Facilities

Development Plan Section	Relevant Objectives	Principles of Development Control
Renewable Energy Facilities	119, 120, 121	392

Renewable Energy Facilities, such as the proposed PASSP, is an envisaged form of development, as defined by the Port Augusta (City) Council Development Plan. The PASSP is sited to maximise the capacity of the project and to take advantage of the regions natural solar resources for the efficient and maximal generation of electricity.

The PASSP site location has been selected as a suitable location for the proposal given the industrial zoning and close proximity to an appropriate grid connection to minimise the requirement for additional overhead lines. As outlined in Section 4.1.3, the PASSP is orientated to face north, north-west and maximise the generation capacity of the project. Battery storage is proposed to further extend the generation capacity of the PASSP. Space between the solar modules has been allocated to maximise exposure to the sun, without project infrastructure overshadowing the modules.

As previously outlined in Section 2.3, the PASSP aligns with National and State strategic directions in relation to growth in the renewable energy sector. Locally, the PASSP will result in 90 FTE jobs during the construction phase and 19 permanent FTE jobs located on site during operations.

### 6.2 Visual

Development Plan Section	Relevant Objectives	Principles of Development Control
Form of Development	9, 11	
Appearance of Land and Buildings	18, 19	41, 42, 43, 45, 46, 47, 48
Environment Protection	21, 24, 25	49
Natural Resources	32, 36, 37, 44, 45,	80, 82, 83, 86, 105, 110, 115, 116, 119, 121, 123,
Heritage	54, 55, 58	144, 145
Outdoor Advertisements	68, 69, 70	204, 205, 206, 207, 208, 213, 213
Industrial Development	88, 91	305, 310, 311
Infrastructure	97	326, 329
Interface between Land Uses	99, 100	331, 332, 336,
Renewable Energy Facilities	121	

The Subject Site is located approximately 3 km outside of the Port Augusta township, in the area of Stirling North. The Subject site is located away from densely populated areas on an Industry Zoned allotment. The PASSP intends to build a high standard solar farm and associated structures that will blend with the locality as much as possible using colours, materials and heights that are of a similar nature to the existing industrial built



form. The offices and car parking will be located at the front entrance to the Subject Site to enable direct and convenient access including landscaping.

The Development Plan seeks to maintain the amenity of the locality through the provisions of infrastructure in suitable areas, the minimisation of environmental impact and earthworks and the appropriate siting of structures within the landscape. In this regard:

- The Subject Site is considered an appropriate location given the allotment size, previous land use, current zoning and the short distance required for the grid connection (therefore minimising the need for additional overhead power lines).
- The PASSP is not proposed in an area of known visual or scenic significance.
- The Subject Site does not contain any sensitive ecological areas such as creeks or wetlands, steep slopes likely to erode or other known naturally hazardous areas including bushfire or flood prone risk areas.
- The Subject Site does not contain or is near any known cultural or historic heritage sites.
- It is expected that minimal earthworks will be required to support the proposed development as the Subject Site is relatively flat.
- It is acknowledged that the proposed development will be visible within the immediate locality, however given its low profile this impact is anticipated to diminish at greater distances.
- The PASSP propose landscaping with native vegetation species and to retain where possible rainfall and stormwater run-off.
- Signage for the PASSP will be designed to enhance the appearance of the industrial area and not impair the amenity of the area.
- The PASSP is located in an area that maximises the efficient generation and supply of electricity.

The Landscape and Visual Impact Assessment undertaken for the PASSP indicated that the PASSP is not anticipated to significantly alter the landscape or visual amenity within the region. The results identified that the PASSP will not be located in areas commonly regarded as being part of significant or high scenic or aesthetic value. The PASSP locality is characterised as industrial, with low to mid height vegetation, rural dwellings, and existing electricity infrastructure scattered throughout the landscape. Located on the fringe of Stirling North, the area is identified for future industrial development, providing an ideal location for the PASSP.

### 6.3 Traffic and Transport

Development Plan Section	Objectives	Principles of Development Control
Form of Development	9, 11	27
Transportation	102, 103	344, 345, 346, 347, 348, 349, 350, 351, 353, 355

As detailed in Section 5.2, a preliminary Traffic Management Plan has been prepared and is provided Appendix F.

One vehicle entry point is proposed to access the Subject Site during the construction and operational period, from Abbattoir Road, crossing a purpose built access track on the land identified as Deposited Plan 65715 Allotment 3 which Pangea have approval to purchase. All vehicles will enter and exit the site in a forward direction, with capacity for sufficient turning circle provided by the internal roadway and hardstand areas.





The site office and control room are proposed to be located nearby the main gate entrance point and have provision of 22 car park spaces and an additional 4 disabled spaces. The office and control room indicative total floor area is approximately 670 m<sup>2</sup>. The Industry Zone policy as per TABLE PtAu/2 require approximately 18 car park spaces for the proposed office and control room floor area.

Car parking spaces will be provided on sealed impervious material and line-marked and surrounded by landscaping acting as a buffer from the entrance point as indicated on the control room and site office plan provided in Appendix CD.

The impacts of additional vehicle movements associated with the construction of the PASSP are anticipated to be minimal as the components are essentially pre-fabricated and only require reassembly on site. The construction program is anticipated to be completed within a 18-24 month period, with heavy vehicle traffic volumes on the Augusta Highway and Flinders Ranges Way, not expected to significantly affect the traffic movement or safety.

A range of management strategies are identified to further mitigate the impacts to road infrastructure and other road users. Specifically, Pangea are committed to maintaining Council-owned unsealed roads to a standard comparable with existing site conditions. To support this, a pre-construction audit of road conditions will be undertaken. This will be followed by a post-construction audit, to determine any impacts to road infrastructure attributable to the PASSP, and undertake any required remedial actions to unsealed roads.

The PASSP does not anticipate an impact on the free flow and proper traffic circulation on the nearby Abbattoir Road as access to the PASSP from Abbattoir Road only leads to the PASSP and is not a thoroughfare to other sites.

## 6.4 Heritage

Development Plan Section	Objectives	Principles of Development Control
Form of Development	11	
Heritage Places	54, 55, 58	144, 145

The desktop heritage assessment was completed to determine the presence of non-Aboriginal and Aboriginal recordings or reports within 10 km of the boundary of the Subject Site.

A review of the Department for the Premier and Cabinet-Aboriginal Affairs and Reconciliation Division Central Archive identified one reported site located approximately 2 km north of the Subject Site boundary. A second site of non-indigenous heritage value was identified approximately 700m to the south-west of the site, the Port Augusta Goal.

The subject site has been assessed as being of low Aboriginal archaeological sensitivity due to the lack of temporary or permanent water sources along with historic land disturbance as a result of grazing.

During construction, if any Aboriginal site, object or remains are found, the applicant will not damage, disturb, interfere with or remove them and will undertake the appropriate action in accordance with the provisions of the *Aboriginal Heritage Act 1988*.

## 6.5 Flora and Fauna

Development Plan Section	Objectives	Principles of Development Control
Form of Development	9	
Infrastructure	94	326
Natural Resources	40, 42	82, 105, 110, 111



Development Plan Section	Objectives	Principles of Development Control
Renewable Energy Facilities	119, 121	

An assessment of ecological values at the Subject Site indicated that no fauna species of conservation significance are likely to utilise the Subject Site on a regular basis. No threatened flora or fauna species nor threatened vegetation communities were recorded during the field survey of the project area. Vegetation communities that were present were assessed to be in fair to good condition (low open shrubland) and moderate to poor condition (tall open shrubland) and were not considered to represent preferred habitat for any threatened fauna species. It is therefore considered that the construction and operation of the proposed infrastructure will not result in significant impacts to State or Commonwealth listed species.

Within the Subject Site itself, vegetation is comprised alluvial outwash plains with Chenopod low open shrubland. An area of low sand dunes and sand plains in the north east corner of the Subject Site supports tall open shrubland. The majority of the Subject Site covered in low open shrubland was assessed to be in fair to good condition, with the tall open shrubland assessed as being in poor condition with moderate to high levels of disturbance.

Once final construction and disturbance footprints are known, an application to clear native vegetation will be issued to the Native Vegetation Council with a commensurate environmental offset proposed for the site clearance and access track requirements. It is possible that the design and operation of the solar array will affect the vegetation clearance footprint. For example, if the arrays are designed to be above the low shrubland vegetation, vegetation clearance can be confined to cabling trenches, access tracks and fire breaks and steel piles holes.

The indicative site layout proposes landscaping around the site office (including control room) and car parking. Where possible, landscaping will utilise locally indigenous vegetation.

Clearance of native vegetation however, will be required to undertake the development associated with the PASSP. An application to the Native Vegetation Council for approval to clear this vegetation will be submitted prior to the commencement of construction.

## 6.6 Air Quality

Development Plan Section	Objectives	Principles of Development Control
Hazards	53	119
Industrial Development	91	310
Interface between land uses	100	331, 332,
Renewable Energy Facilities	119, 121	

The Subject Site is located within an industrial area, consisting of rail, rural residential, warehousing and commercial land uses. The key sources of air emissions are exhaust and dust associated with rail and industrial activities and vehicle emissions resulting from the proximity of the Augusta Highway. A number of scattered sensitive receivers (rural dwellings) were identified within the locality of the Subject Site, the closest approximately 450 m from the Subject Site.

As outlined in Section 5.6, the PASSP is not expected to result in air quality impacts to sensitive receivers in the locality. Standard environmental management strategies will be incorporated into the Construction Environmental Management Plan to control dust emissions as a result of land disturbance during the construction phase of the project (refer to Section 7 for further information).



## 6.7 Noise

Development Plan Section	Objectives	Principles of Development Control
Industrial Development	91, 92	310
Interface between land uses	99, 100	331, 332, 337, 338

As detailed above, the Subject Site is located within an industrial area, consisting of rail, rural residential, warehousing and commercial land uses, with low levels of existing background noise. The key noise sources are the Port Augusta - Quorn (Pichi Richi Railway) and Coonamia – Port Augusta railway to the north and the Leigh Creek railway to the east.

A number of scattered sensitive receivers (rural dwellings) were identified within the locality of the Subject Site, the closest approximately 450 m from the Subject Site. As identified in Section 5.7 the PASSP does not propose infrastructure components that are likely to generate any additional noise to the locality.

Through the utilisation of standard environmental management controls (e.g. restriction of construction hours, shutting down equipment when not in use and utilisation of noise reduction devices), construction noise impacts at sensitive receivers are expected to be negligible. Once operational, no noise impacts are anticipated as the PASSP does not incorporate any moving parts, nor significant sources of noise.

## 6.8 Hazards

### 6.8.1 Bushfire

Development Plan Section	Objectives	Principles of Development Control
Hazards	45, 48, 49	125, 128

With the use of appropriate management strategies, the subject site is not considered to be at a significant risk from bushfire as the established railway lines act as a built buffer from encroaching bush fire prone vegetation. Further, the area has been built up by surrounding industrial and rural residential development which further reduce vegetated areas from becoming a bushfire hazard. Vegetation structures at the site and surrounds do not result in large accumulations of leaf and bark litter layer, and grasses are restricted in surrounding areas as a result of grazing or clearance for development.

As a result the Subject Site (and surrounding area) has relatively low fuel loads. Critical infrastructure within the PASSP are located on large hardstand areas, with a number of access tracks available for vehicle access in the event of a fire.

The main fire risks posed by the PASSP are:

- Construction activities (e.g. hot work and welding) during the Fire Danger Season (as declared by the CFS).
- Fire caused by maintenance activities (hot work, other maintenance work) during the Fire Danger Season (as declared by the CFS).

Fire management procedures will be developed as part of the CEMP and will, as a minimum, include:

- Emergency response procedures.
- Timing of hot works with regard to fire weather warnings (e.g. avoiding total fire ban or equivalent days).
- Vegetation maintenance on site (i.e. maintaining vegetation clearances from electrical infrastructure, and maintaining fuel loads in accordance with existing levels). It should be noted that as a result of historical clearance, vegetation maintenance will be largely restricted to the management of weeds and introduced species.



- Induction and training of on-site personnel.
- Provision of firefighting equipment at the Site

### 6.8.2 Site Contamination

Development Plan Section	Objectives	Principles of Development Control
Hazards	44, 45, 51, 52, 53	137

Based on the proposed use of the subject site, and the absence of historic development at the site, it was considered that historical activities at the site do not pose a significant human or environmental health risk. As such, no areas of existing contamination are expected to be encountered during construction or operation of the PASSP, however any finds will be managed in accordance with the CEMP.

### 6.8.3 Water and Flooding

Development Plan Section	Objectives	Principles of Development Control
Natural Resources	35, 36, 40,	82, 83, 84, 86, 87, 88, 89, 90, 91, 93, 94, 95, 104
Hazards	44, 45, 47	119, 120, 121, 122, 123
Infrastructure	94	319, 322,

The Subject Site is not considered to be at risk of flooding as there are no watercourses or water bodies located within or adjacent to the Subject Site.

Runoff from the control room and site office area, and any laydown and compound area (which is a small area of the subject site) however, may increase compared with current levels as a result of an increase in impervious surfaces, e.g. buildings and car parks.

Runoff from the majority of the site, i.e. solar array, is likely to remain the same as current levels. The areas underneath and surrounding the solar modules will not be impervious but will be retained substantially in the current condition and allow infiltration of rainfall.

Drainage will be designed for all project-disturbed areas to ensure there is no increase in developed flow intensity/frequency beyond the site boundaries. The following key principles will be incorporated into the detailed design of the project to appropriately manage potential stormwater runoff:

- Collected surface water runoff will be discharged to match existing drainage patterns as much as possible.
- The substation area will include design features to enable the effective management of potential contaminants to stormwater.
- All drainage works will be designed and constructed to prevent scour and erosion. Additional protection measures will be included as required at locations particularly susceptible to scour/erosion (i.e. check dams or rock lined channels on slopes, rock armour or rock mattresses at stormwater discharge locations).
- All drainage works will be formed to provide a consistent fall along drainage lines and to avoid flat spots, where water may be subject to collection adjacent to the SNSP infrastructure.
- A detention pond is included in the design to protect against flooding during high intensity rainfall events. The detention pond has dimensions of 53 m x 31 m with a depth of 5 m, resulting in a capacity of over 8,200 m<sup>3</sup>. Stormwater to be directed to the detention pond via spoon drains and stormwater pipes from buildings.

Earthworks design associated with the construction and operation of the PASSP will ensure the adequate and coordinated drainage of the land is assured.



#### 6.8.4 Acid Sulfate Soils

Development Plan Section	Objectives	Principles of Development Control
Hazards	44, 45, 53	135

According to the Australian Soil Resource Information System (ASRIS 2014) the Subject Site is categorised as an extremely low probability area for occurrence of acid sulfate soils. As such, acid sulfate soils are not expected to be encountered during the construction and operation of the PASSP.

#### 6.8.5 Chemical Storage and Handling

Development Plan Section	Objectives	Principles of Development Control
Hazards	53	138, 139

Vanadium electrolyte is used within the battery storage components of the project. For 300 MWh of battery, approximately 10,590 m<sup>3</sup> will be required which is contained within the battery systems. This liquid is not considered hazardous. No significant quantities of other chemicals will be stored on the Subject Site in relation to the proposed PASSP. Where required, safe storage and handling of hazardous materials will be controlled through comprehensive and effective site management procedures (refer to Section 7 for more information).

### 6.9 Orderly and Economic Development

Development Plan Section	Objectives	Principles of Development Control
Form of Development	9	
Appearance of Land and Buildings	18, 19	41, 43, 47, 48
Outdoor Advertisements	68, 69, 70	204, 205, 206, 207, 2080, 211, 212, 213, 214, 215, 217, 219
Industrial Development	88, 90, 91, 92	305, 307,
Infrastructure	94, 98	319, 320, 326, 329, 330
Interface between Land Uses	99, 100	331, 332
Renewable Energy Facilities	119, 120, 121	392

The PASSP is considered to be an orderly development in that it is located in a suitable area, will not significantly impact the amenity of the locality and will incorporate landscaping appropriate to the region. Further the PASSP seeks to minimise the apparent bulk and scale of the project components such as the inverter stations, ESS, site office and control rooms by careful selection of façade colours and materials to be in keeping with the existing locality. Any signage proposed will be designed to not create a hazard or obscure views to be consistent with the desired character of the zone.

As described in Section 4, the proposed PASSP development will contain sufficient area for accessing the site and to enable all vehicles to enter and exit in a forward direction with the site office and car parking conveniently located near the entrance to the Subject Site.

The PASSP is proposed to meet the ongoing electricity demands for South Australia and the broader National Electricity Market thereby contributing to the objectives of the Port Augusta (City) Council Development Plan. The PASSP supports renewable energy penetration and peak energy demand in the South Australia region. The siting of the PASSP has been located so that there is minimal distance and cost to construct network connections, and utilising existing networks to accept additional generation and in a location where the operation of renewable energy can harvest the natural resource for the efficient generation of electricity.



## 6.10 Industry Zone

Development Plan Section	Objectives	Principles of Development Control
Industry Zone	1, 2	1, 2, 3, 5, 6, 10

The overarching objective of the Industry Zone envisages a wide range of industrial, warehouse, storage and transport land uses with development contributing to the desired character of the zone.

The desired character of the Industry Zone envisages an intensively developed, high quality landscaped industrial uses. The Industry zone is established to support wide range of industrial, commercial and business activities, accommodating for manufacturing, warehousing, transport and distribution. The zone does not specifically envisage renewable energy facilities, however seeks to accommodate for a wide range of industrial uses. The PASSP is considered an appropriate use in this zone as it does not limit future industrial development at the site.

The appearance of developments located adjacent to sensitive receivers within the Industry Zone, are defined to be situated surrounding vegetated buffers. The zone similarly envisages that additional tree planting and landscaping, which will break-up the views of the development, which be developed.

As previously defined, the PASSP is proposed to meet the ongoing electricity demands for South Australia and the broader Electricity network. It will provide a key renewable energy source with the siting of the PASSP in the Industrial Zone to allow for minimising distance for network connection, and the utilisation of the capacity within the network to accept additional generation.

The Subject Site does not directly abut a primary, secondary or other road, rather there is approximately 95 m distance to the nearest unformed road, Abbatoir Road. In addition, there are no buildings surrounding the Subject Site that establish setbacks for the Subject Site.

The allotment is surrounded by predominantly vacant land with the exception of the railway approximately 150 m to the north and east and Tilling Road separated by vacant smaller industry allotments to the west.

While there are no established setbacks in the locality and the Subject Site does not front any roads the PASSP seeks to contribute to the desired character of the Zone by locating the site office building and car parking near the entrance of the Subject Site, setback approximately 30 m from the site boundary.

Further, the front entrance to the building locates car parking spaces and landscaping between buildings and the internal access road to enhance the character of the development and minimise visual amenity impacts.

## 7. Environmental Management

Pangea will develop an environmental framework through implementing a Construction Environmental Management Plan and Operational Environmental Management Plan, which will be finalised to prior to the commencement of construction and operation. The environmental framework establishes objectives and targets to manage the environmental aspects of the PASSP.

The CEMP and OEMP for the proposed PASSP will address compliance with regulatory requirements, environmental protection policies and relevant guidelines and codes of practice. The specific regulatory requirements for each environmental aspect will be identified in the CEMP and/or OEMP and incorporated, where appropriate, in the performance indicators utilised for monitoring environmental compliance.

### 7.1 Construction

Pangea will develop environmental management strategies during the construction phase of the PASSP, which would be undertaken in accordance with the requirements of Construction Environmental Management Plan (CEMP). The CEMP will outline environmental management measures to be implemented, timing of their implementation, and management and monitoring of the process and procedures.

A detailed CEMP will be developed prior to construction commencing to the satisfaction of the State Commission Assessment Panel and Minister for Planning. Development of a detailed CEMP at this stage (as part of the Development Application) is not practical as the detailed management measures will be defined when the construction contractor is engaged for the PASSP. The detailed CEMP would be based on, and further developed from, the following objectives and management measures.

The key objectives of the CEMP will include:

- Ensuring that works are carried out in accordance with statutory requirements, the conditions of approval for the PASSP relevant guidelines and Pangea environmental management systems and procedures.
- Ensuring that construction minimises the likelihood of impacts to the environment.
- Ensuring that construction manages the impact of works on neighbouring land uses.
- Ensuring that all contractors engaged in construction comply with the requirements of the CEMP; providing clear procedures for management of environmental impacts including corrective actions.
- Identifying management responsibilities and reporting requirements to demonstrate compliance with the CEMP.

The CEMP will be developed prior to the commencement of construction and will serve as a working document to be used during the implementation of the provisions associated with PASSP.

Through the preparation of this Development Application and associated environmental investigations, a range of measures have been identified for incorporation into the CEMP. These measures are summarised in Table 7-1 below.

**Table 7-1 : CEMP Management Measures**

Aspect	Construction Environmental Management Measure
Noise	<ul style="list-style-type: none"> <li>• Construction activity resulting in noise will not occur at night- time, on Sundays or public holidays.</li> <li>• Manage noise to protect the environment, human health and amenity.</li> <li>• Equipment will be shut off or throttled down whenever it is not in actual use.</li> <li>• Noise reduction devices such as mufflers will be fitted and will operate effectively (where required).</li> <li>• Equipment will be serviced regularly and equipment in need of repair will not be used.</li> </ul>

Aspect	Construction Environmental Management Measure
Air Quality	<ul style="list-style-type: none"> <li>• Maintain air quality to protect the environment, human health and amenity</li> <li>• Access roads to be constructed of compacted gravel or similar and kept in good condition.</li> <li>• Use of water trucks or chemical wettings agents where appropriate on unpaved roads or exposed areas.</li> <li>• Vehicle speed limits will be managed to minimise wheel-generated dust.</li> <li>• Equipment will be serviced regularly and equipment in need of repair will not be used.</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>• Construction waste will be separated into different streams to facilitate recycling and will be removed from the site by a licensed contractor.</li> <li>• Liquid waste (including hydrocarbons, paints and solvents) will be stored in sealed drums or containers in a bunded area before removal from the site by an EPA licensed contractor for recycling, where possible, or disposal to a licensed facility.</li> <li>• During construction, temporary ablution facilities will be serviced by pump-out tanker trucks, used with off-site disposal by a licensed contractor.</li> <li>• Manage additional surface water runoff so that no adverse effects from the water are evident such as erosion outside of the Subject Site.</li> </ul>
Cultural Heritage	<p>Incorporate stop-work procedures if a site or object of Aboriginal significance is identified during construction.</p> <ul style="list-style-type: none"> <li>• Stop works – stop all works in the vicinity of the site and no further disturbance of the site will be made.</li> <li>• Restrict access – access to the site will be restricted to protect the site.</li> <li>• Notify authorities – the Heritage Branch, Aboriginal Affairs and Reconciliation Division and / or the local Police (if suspected human remains have been discovered) will be notified of the finding.</li> <li>• Manage the site and access – determine the appropriate course of action in consultation with the relevant authorities and resume works when it is appropriate to do so.</li> </ul>
Bushfire	<p>Develop fire management procedures, including:</p> <ul style="list-style-type: none"> <li>• Emergency response procedures.</li> <li>• Consideration of construction schedule with regard to fire weather warnings (e.g. total fire ban or equivalent days).</li> <li>• Vegetation maintenance on site (i.e. maintaining vegetation clearances from electrical infrastructure).</li> <li>• Induction and training of on-site personnel.</li> <li>• Provision of firefighting equipment at the Subject Site.</li> </ul>
Flora and Fauna	<p>An application will be made for the clearance of native vegetation in accordance with the <i>Native Vegetation Act 1991</i>.</p> <ul style="list-style-type: none"> <li>• Only approved areas of native vegetation will be cleared or disturbed.</li> <li>• Utilise procedures to restrict the spread of weed and pest species from the Subject Site.</li> <li>• Establishment of on-site landscaping utilising local endemic species (where required).</li> <li>• Minimise vegetation clearance and ensure that the clearance is managed strictly in accordance with approval requirements.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>• Engagement with DPTI and Council regarding upcoming construction activities, delivery schedules and any temporary speed restrictions, and consultation with potentially affected residents.</li> <li>• Development of a Traffic Management Plan for the construction period.</li> <li>• Restricting construction traffic movements during adverse or unsafe weather conditions.</li> <li>• Driving to the road conditions and adhering to safe operating speeds.</li> <li>• Providing way-finding signage where necessary to facilitate access along the proposed construction routes (if required).</li> <li>• Undertaking dust suppression activities (if required) to minimise dust emissions from construction traffic on unsealed roads.</li> <li>• Construction and maintenance of internal access roads in accordance with the CFS provisions.</li> </ul>





## 7.2 Operational

The OEMP will be finalised during the construction period prior to the commencement of commissioning activities at the PASSP.

The key objectives of the Operation Environmental Management Measure entail:

- Ensuring that works are carried out in accordance with statutory requirements.
- Ensuring that operation minimise the likelihood of the impacts to the environment.
- Ensuring that operation of the PASSP manages the impact of works on neighbouring land uses.
- Ensuring that all employees are appropriately inducted on the OEMP requirements, providing clear procedures for management of environmental impacts including corrective actions.
- Identifying management responsibilities and reporting requirements to demonstrate compliance with the OEMP.

The OEMP will be developed prior to the commencement of operation and will serve as a working document to be guide and direct the operation of the PASSP Through the preparation of this Development Application and associated environmental investigations, a range of measures have been identified for incorporation into the OEMP. These measures are summarised in Table 7.2 as summarised below:

**Table 7-2 : OEMP Management Measures**

Aspect	Operation Environmental Management Measure
Noise	<ul style="list-style-type: none"> <li>• Manage noise and vibration generation to protect the environment, human health and amenity.</li> <li>• Equipment will be shut off or throttled down whenever it is not in actual use.</li> <li>• Noise reduction devices such as mufflers will be fitted and will operate effectively (where required).</li> <li>• Equipment will be serviced regularly and equipment in need of repair will not be used.</li> </ul>
Waste Management	<ul style="list-style-type: none"> <li>• Maintain the quality of land and soils to protect ecological values</li> <li>• Manage surface water so that existing uses, including environmental are protected</li> <li>• Ensure that human health and safety is not adversely affected</li> <li>• Implement measures to minimise waster generation, to maximise their reuse and recycling, and to ensure safe and lawful disposal of all waste</li> </ul>
Cultural Heritage	<ul style="list-style-type: none"> <li>• Prevent unauthorised disturbance to Aboriginal or Non-Aboriginal heritage</li> </ul>
Bushfire	Develop fire management procedures, including: <ul style="list-style-type: none"> <li>• Emergency response procedures.</li> <li>• Vegetation maintenance on site (i.e. maintaining vegetation clearances from electrical infrastructure).</li> <li>• Provision of firefighting equipment at the Subject Site.</li> </ul>
Flora and Fauna	<ul style="list-style-type: none"> <li>• Maintain representation, diversity, viability and ecological function of flora and fauna including weed control and reporting of fauna incidents to Local Council for rescue or rehabilitation (where possible).</li> <li>• Maintain the quality of land and soils to protect ecological values.</li> <li>• Manage surface water so that existing uses, including environmental are protected.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>• Driving to the road conditions and adhering to safe operating speeds.</li> <li>• Undertaking dust suppression activities (if required) to minimise dust emissions from construction traffic on unsealed roads.</li> </ul>
Site Decommissioning	<ul style="list-style-type: none"> <li>• Maintain the quality of land and soils to protect ecological values.</li> <li>• Maintain representation, diversity, viability and ecological function of flora and fauna.</li> <li>• Rehabilitate the Subject Site to a standard suitable for future industrial use.</li> </ul>

Both the Construction Environmental Management Plans and Operational Environmental Management Plans will be implemented throughout the relevant phase of the PASSP, to ensure that potential environmental impacts to a minimum.

### **7.3 Repowering / Decommissioning**

Pangea will consider two options in regards to the PASSP once the initial lease contract time is complete. The expected life span for solar technology of a similar nature to that of the PASSP is approximately 30 years. The varying options are detailed as follows:

#### **7.3.1 Repowering**

Repowering of the PASSP beyond the initial lease agreement (of approximately 30 years) would encompass the continuation of the operations of the PASSP through extension lease options of approximately 20 years. The continuation of operation through the agreed extension would require the continuous repowering of the PASSP, through upgrading, replacing or repairing various components of the PASSP. The potential for the PASSP to operate for the full extension of a 20 year period would be reliant on the market conditions and conditions of the solar technology.

#### **7.3.2 Decommissioning**

Should the repowering of the PASSP not be a viable option relating to the given circumstances, the infrastructure associated with the PASSP would be decommissioned. If decommissioning of the PASSP were to occur the removal of all infrastructure associated with the PASSP, would be removed for sale, recycling or disposal. Access tracks and hardstand areas would be remediated in order to prepare a suitable soil profile for subsequent future industrial uses.

## 8. Conclusion

With regard to the relevant provisions of the Port Augusta (City) Council Development Plan, it is considered that the proposed PASSP located at Allotment 350, Deposited Plan 44615, Stirling North is appropriate for the subject land and the locality. The Subject Site was identified as an appropriate location for establishment of the PASSP to allow for nearby connection to existing electricity infrastructure, complying zoning, and capacity within the network to accept additional generation.

The development of electricity infrastructure is essential to meeting the electricity requirements of South Australia, and the socio-economic sustainability of communities. The development of the renewable energy facility will contribute to reducing greenhouse gas emissions and aligns with various National and State strategic targets and policies. The proposed development is considered an appropriate land use within the Industry Zone of the Port Augusta City Council Development Plan. The Industry Zone is considered to provide appropriate siting opportunity for this essential infrastructure development, thus minimising impacts on the amenity of residences within the broader locality. It is believed that the proposed PASSP will impact the local region in a positive manner, through the generation of electricity supply and employment.

It is considered that the PASSP exhibits sustainable planning merit and accords with the intention for the locality outlined in the Development Plan, specifically:

- Represents establishment of renewable energy facility, as supported and envisaged by National and State strategic policy as well as the Port Augusta City Council Development Plan
- The TBSP is proposed to be sited adjacent to existing electricity infrastructure
- The location of the Subject Site provides optimal opportunity for the proposed PASSP to utilise the region's natural solar resources for the efficient generation of renewable energy
- Impacts associated with visual amenity produced from the PASSP, will be mitigate/ minimised through the design of the solar technology implemented and the siting of the modules on the Subject Site.
- The construction program is anticipated to be completed within an 18 to 24 month period and Pangea have developed a Traffic Management Plan to manage the additional volumes of traffic during the construction phase of the PASSP.
- The closest sensitive receiver to the Subject Site is located 450 m away.
- The Subject Site is not considered to support areas of high quality native vegetation, and no State or Nationally listed threatened species are known to utilise the site. Impacts to native vegetation can be offset by a commensurate Significant Environmental Benefit, as required under the Native Vegetation Act.
- No registered places of heritage significance are located on the Subject Site, nor anticipated to be impacted by the PASSP.

Consequently, the proposed development is not seriously at variance with the overall intent of the Port Augusta City Council Development Plan and merits Development Plan Authorisation.



## 9. References

Australian Soil Resource Information System 2014. Online, accessed 27/07/2017. URL: <http://www.asris.csiro.au/>

Clean Energy Council 2014, Online, accessed 12/10/2016, URL: <https://www.cleanenergycouncil.org.au/cec.html>

Croft SJ, Pedler JA & Milne T (2009). *Bushland condition monitoring manual: Murray Darling Basin*, South Australia. Nature Conservation Society of South Australia.

Department for Planning and Infrastructure 2007. *Visual Landscape Planning in Western Australia*. West Australian Planning Commission, State of Western Australia.

Department for Planning Transport and Infrastructure, South Australian Integrated Land Information System (SAILIS) Accessed 21/08/2017  
<https://www.sailis.sa.gov.au/products/order/propertySearch/CT%7C5352%7C55%7C3>

Environment Protection Authority 2016, *Info for building and construction activities: Erosion and sediment control*: Online, accessed 02/11/2016, URL: [http://www.epa.sa.gov.au/environmental\\_info/water\\_quality/programs/stormwater/pollution\\_prevention\\_for\\_building\\_and\\_construction\\_activities](http://www.epa.sa.gov.au/environmental_info/water_quality/programs/stormwater/pollution_prevention_for_building_and_construction_activities)

Environment Protection Authority 2014, *Construction Noise Information Sheet*. Online, accessed 13/07/2017. URL: [http://www.epa.sa.gov.au/files/4773\\_info\\_noise\\_construction.pdf](http://www.epa.sa.gov.au/files/4773_info_noise_construction.pdf)

Government of South Australia, 2017, Our Energy Plan, Accessed 13/07/2017. URL: <http://ourenergyplan.sa.gov.au/>

Government of South Australia, 2016, Port Augusta (City) Development Plan, consolidated 7 July 2016.

Government of South Australia, 2016, *Economic Priorities*, Online. Accessed 12/10/2016. URL: <http://economic.priorities.sa.gov.au/>

Government of South Australia 2014, *Low Carbon Investment Plan for South Australia: Strategy Paper*, Online, accessed 11/10/2016, URL: [http://www.renewables.sa.gov.au/files/dsd\\_2015-low-carbon-investment-plan\\_web.pdf](http://www.renewables.sa.gov.au/files/dsd_2015-low-carbon-investment-plan_web.pdf)

Government of South Australia 2011, *South Australian Strategic Plan*, Online, accessed 12/10/2016. URL: [http://saplan.org.au/media/BAhbBlSgZmSSlHmJiAxMS8xMS8wNC8wMV8wMI8xNF8yMjNfZmlsZQY6BkVU/01\\_02\\_14\\_223\\_file](http://saplan.org.au/media/BAhbBlSgZmSSlHmJiAxMS8xMS8wNC8wMV8wMI8xNF8yMjNfZmlsZQY6BkVU/01_02_14_223_file)

Landscape Institute & I.E.M.A 2013. *Guidelines for Landscape and Visual Impact Assessment*. Third edition, Routledge.

Land & Water Consulting (2017) Lot 3 Harris Street, Stirling North, South Australia. Limited Soil Investigation. Report for DPTI, June 2017.

Parsons Brinckerhoff, 2006. *Phase 1 Environmental Site Assessment*. 25 July 2006. Unpublished.

U.S Department of Energy (2004), *PV FAQ's*, <http://www.nrel.gov/docs/fy04osti/35489.pdf>, viewed 24 July 2017.



## Appendix A. Section 49 Endorsement





OUR REF: B114880  
File No: DPC17/0696

GPO Box 2343  
Adelaide SA 5001  
DX 56201  
Tel 08 8226 3500  
Fax 08 8226 3535  
www.dpc.sa.gov.au

// September 2017

Mr Leo Chiang Lin  
Director  
Pangea Energy Pty Ltd  
Level 5, City Central Tower 2  
121 King William Street  
ADELAIDE SA 5000

Email: [director.projects@sentekenergy.com](mailto:director.projects@sentekenergy.com)

Dear Mr Lin

## **CROWN SPONSORSHIP STIRLING NORTH SOLAR STORAGE PROJECT**

Thank you for your letter of 6 September 2017 requesting Crown sponsorship under section 49 of the *Development Act 1993* to assist with your proposed Stirling North Solar Storage (SNSSP) project development.

This project has been considered within the Department of the Premier and Cabinet with input from the Department of Planning, Transport and Infrastructure, the Department of Environment, Water and Natural Resources, and the Environmental Protection Agency. In principle, the proposal is supported, recognising the possible environmental and community issues that will need to be addressed through the development assessment process.

On balance, the development of Pangea Energy's (SNSSP) has the potential to benefit South Australia and can be considered public infrastructure. Accordingly I, as the Chief Executive of the South Australian Department of the Premier and Cabinet, will support the development and specifically endorse the development application to construct the project comprising 50 MW solar PV capacity and up to 300 MWh of battery storage capacity as a development of public infrastructure as required by section 49 of the *Development Act 1993* (the Act).

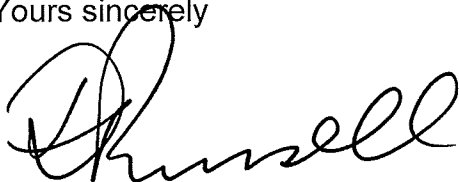
It is the responsibility of Pangea Energy to prepare all documentation as required by section 49 of the Act. All costs in the preparation of the development application, lodgement and any other subsequent action in relation to this application are the responsibility of Pangea Energy.

The Department of the Premier and Cabinet makes no representations or gives no warranties in relation to the outcome of the development application or time that it takes to secure a planning outcome. It is Pangea Energy's responsibility to obtain all other statutory approvals, licences, connection agreements and permits from relevant authorities, manage community expectations and to fund the project. The State Government makes no commitment to purchase any product or service related to the project.

A development application under this Crown sponsorship must be lodged with the Development Assessment Commission on or prior to 8 September 2018. If this is not achieved by that time, my support under Section 49(2)(c) of the *Development Act 1993* for Pangea Energy's SNSSP will lapse.

If you have any questions regarding the preparation of the material to support this section 49 variation application, please contact Mr Chris Lim, Department of State Development Case Manager on (08) 8207 8762 or via email [chris.lim@sa.gov.au](mailto:chris.lim@sa.gov.au).

Yours sincerely

A handwritten signature in black ink, appearing to read 'Dr Russell', written in a cursive style.

Dr Don Russell  
**CHIEF EXECUTIVE**

## Appendix B. Certificate of Title





REAL PROPERTY ACT, 1886



South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.



## Certificate of Title - Volume 5352 Folio 55

**Parent Title(s)** CT 5250/608  
**Creating Dealing(s)** RTC 8116057  
**Title Issued** 19/07/1996      **Edition** 3      **Edition Issued** 25/01/2017

### Estate Type

FEE SIMPLE

### Registered Proprietor

PANGAEA ENERGY PTY. LTD. (ACN: 613 559 470)  
OF TWR 2 L 5 121 KING WILLIAM STREET ADELAIDE SA 5000

### Description of Land

ALLOTMENT 350 DEPOSITED PLAN 44615  
IN THE AREA NAMED STIRLING NORTH  
HUNDRED OF DAVENPORT

### Easements

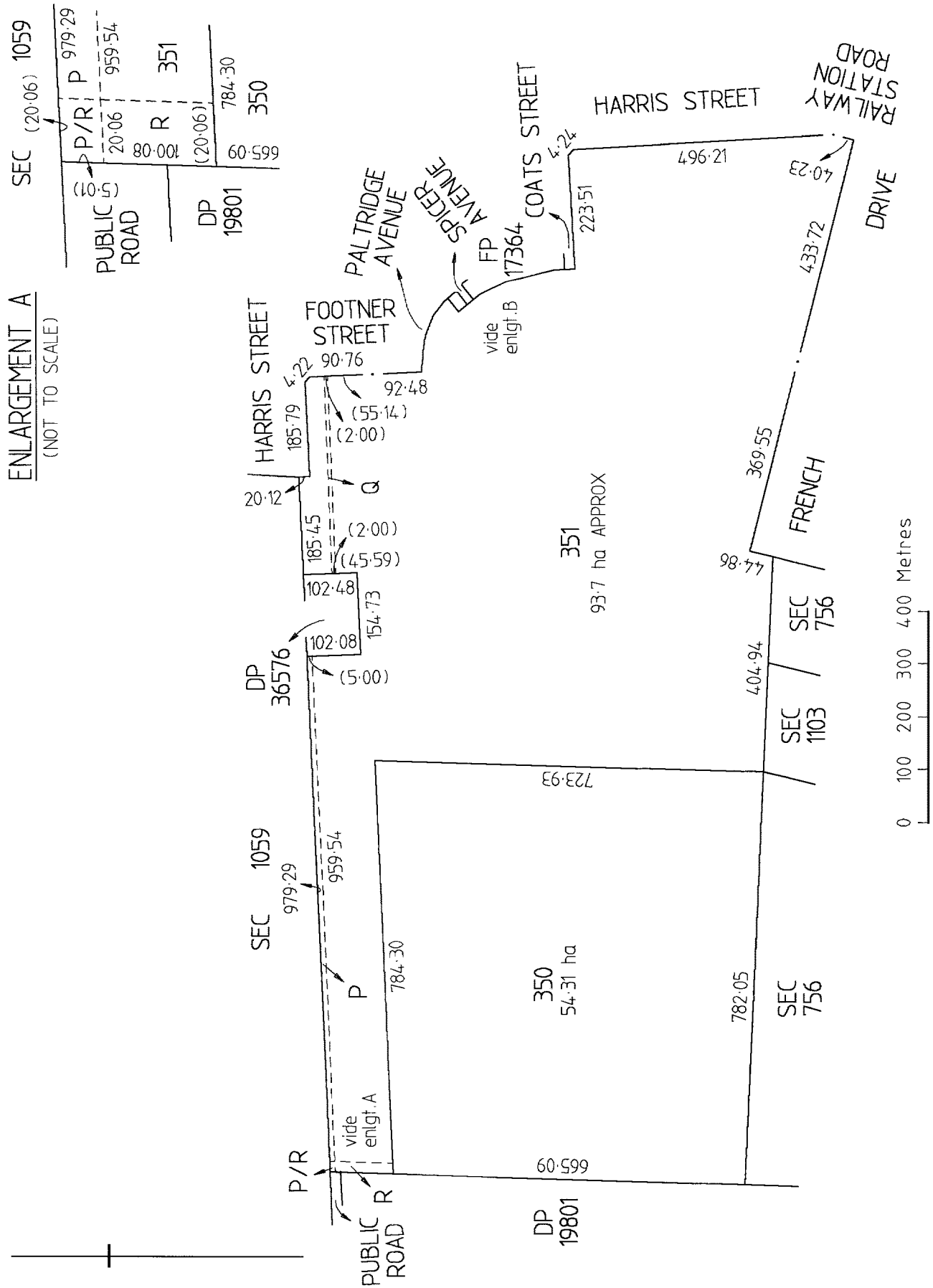
TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED R

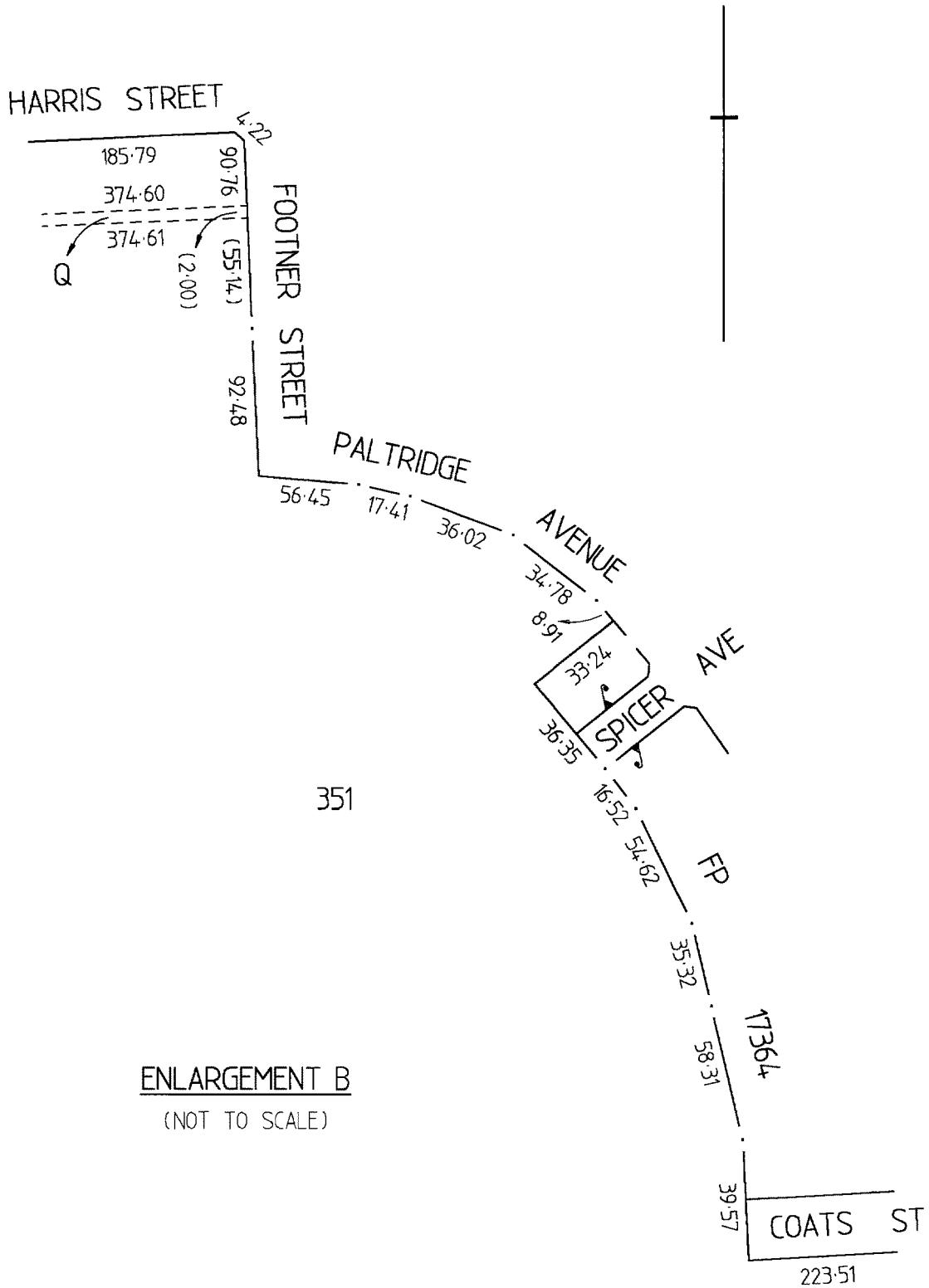
### Schedule of Dealings

NIL

### Notations

<b>Dealings Affecting Title</b>	NIL
<b>Priority Notices</b>	NIL
<b>Notations on Plan</b>	NIL
<b>Registrar-General's Notes</b>	NIL
<b>Administrative Interests</b>	NIL





ENLARGEMENT B  
 (NOT TO SCALE)



CO-ORDINATES

CORNER	LATITUDE	LONGITUDE
1	-32°30'08.96"	137°48'56.60"
2	-32°30'07.12"	137°49'26.57"
3	-32°30'30.62"	137°49'26.46"
4	-32°30'30.55"	137°48'56.50"

**LEGEND**

■ PEG, LINE PEG  
 ↔ FENCE

**NOTES :-**

THIS PLAN IS AN IDENTIFICATION SURVEY ONLY AND AS SUCH IS NOT EXAMINED FOR REGISTRATION BY THE OFFICE OF THE REGISTRAR OF TITLES.

NO RESPONSIBILITY CAN THEREFORE BE ACCEPTED FOR ANY FUTURE DIFFERENCE IN BOUNDARY DEFINITION WHICH MAY RESULT FROM RE-SURVEY OF ADJOINING LANDS OR SUBSEQUENT REGISTRATION OF NEW SURVEY PLANS.

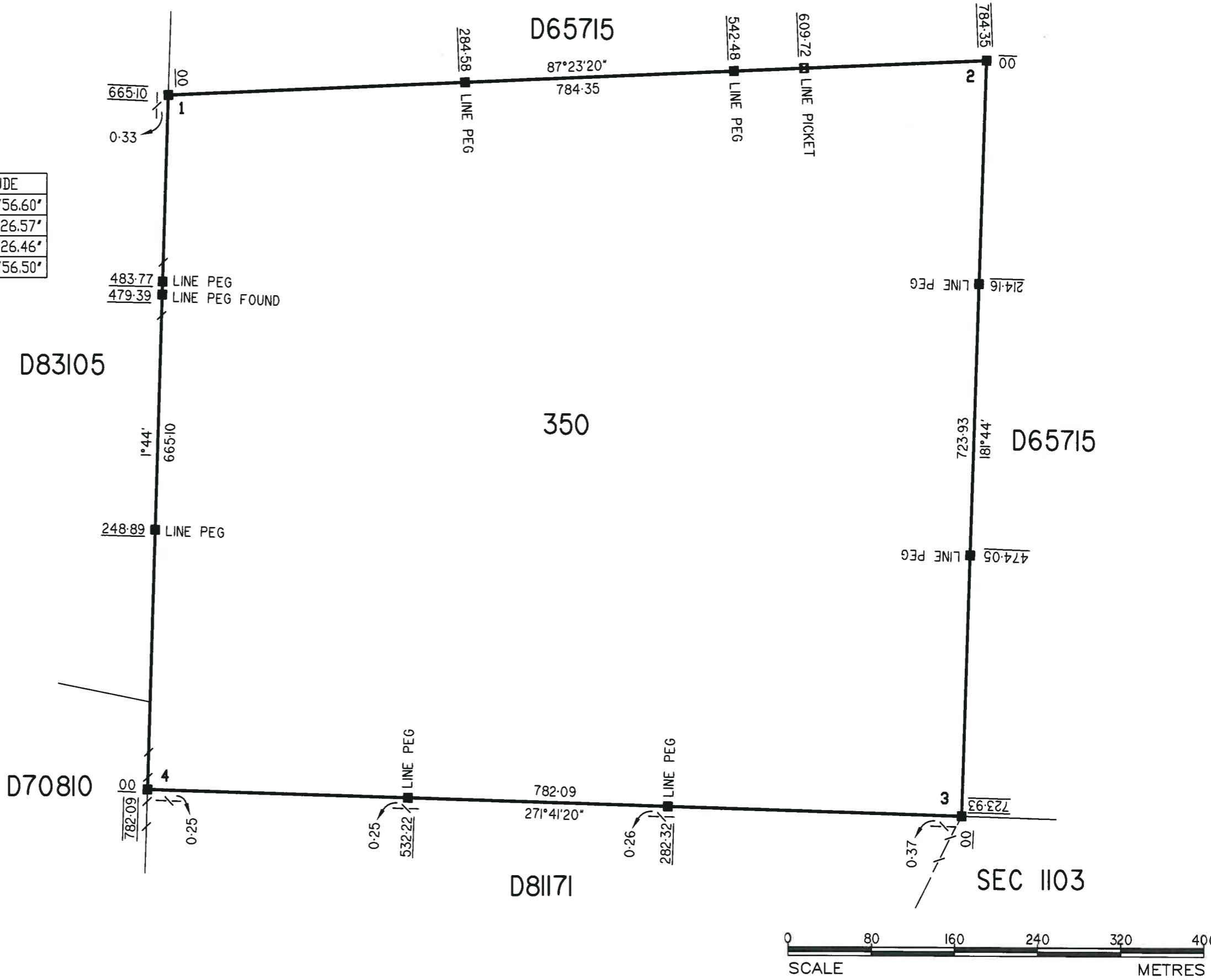
BOUNDARY DIMENSIONS SHOWN HEREON MAY DIFFER FROM CERTIFICATE OF TITLE.

OFFSETS NOT TO SCALE.

NO FENCES UNLESS OTHERWISE SHOWN.

DATED THE 10TH DAY OF OCTOBER 2016

*[Signature]*  
 LICENSED SURVEYOR



LESTER FRANKS

Surveyors | Planners | Project Managers

A | Ground Floor, 22 Chancery Ln, Adelaide  
 South Australia 5000

T | 1300 881 385 F | 08 8223 5226

E | info@lesterfranks.com.au

W | www.lesterfranks.com.au

NO	DATE	DRN	CHKD	DESCRIPTION
0	10/10/16	KS	DLG	FIRST ISSUE

This plan is not intended for attachment to sale contract documents

OUR REF: SADRPO1rev00.DWG	S00365
CONTOUR INTERVAL: -	
DATUM: -	
SCALE: 1:4000	ORIGINAL SHEET SIZE: A3
DATE OF SURVEY: 30/9/2016	TY
DRAWING No: SADRPO1	REV 00 SHEET No: 1 OF 1

**PANGEA ENERGY PTY LTD**  
**IDENTIFICATION SURVEY**  
 ALLOTMENT 350 IN D44615, CT5352/55  
 STIRLING NORTH

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.



Registrar-General

## Certificate of Title - Volume 5937 Folio 151

Parent Title(s) CT 5778/529  
Dealing(s) RTC 10159104  
Creating Title  
Title Issued 10/03/2005  
Edition 2  
Edition Issued 01/06/2012

REAL PROPERTY ACT, 1886



## Estate Type

FEE SIMPLE

## Registered Proprietor

MINISTER FOR TRANSPORT AND INFRASTRUCTURE  
OF ADELAIDE SA 5000

## Description of Land

ALLOTMENT 3 DEPOSITED PLAN 65715  
IN THE AREA NAMED STIRLING NORTH  
HUNDRED OF DAVENPORT

## Conditions

THIS CERTIFICATE OF TITLE IS ISSUED PURSUANT TO SECTION 6 OF THE NON- METROPOLITAN RAILWAYS (TRANSFER) ACT 1997 AND DOES NOT EXTINGUISH THE INTERESTS (IF ANY) WHICH A THIRD PARTY MAY HAVE IN THE WITHIN LAND

## Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED Q (RE 7839265)  
SUBJECT TO FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED P AND R

## Schedule of Dealings

NIL

## Notations

### Dealings Affecting Title

NIL



### **Priority Notices**

NIL

### **Notations on Plan**

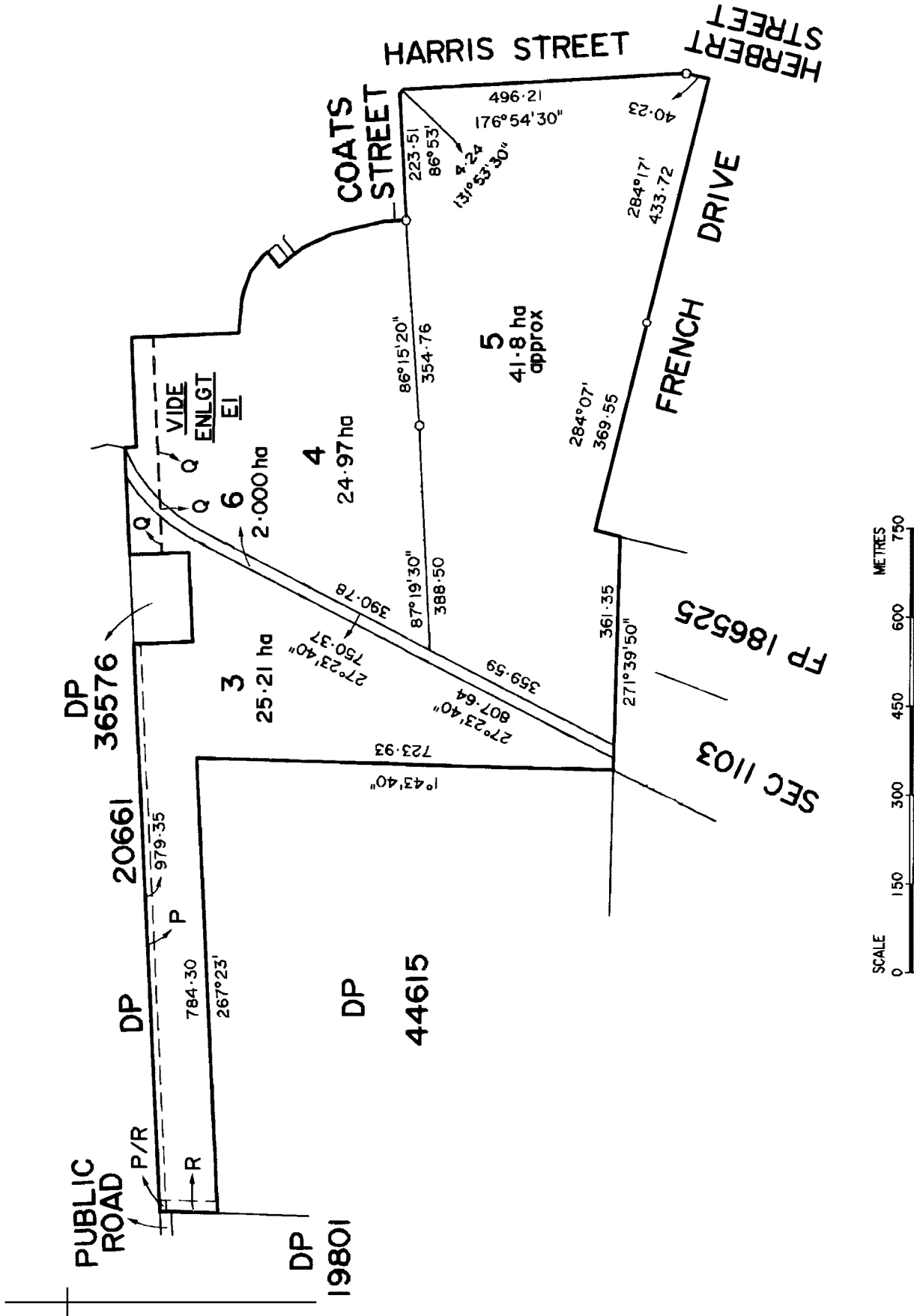
NIL

### **Registrar-General's Notes**

NIL

### **Administrative Interests**

NIL







# Property Location Browser Report - Parcel Details

Date Created:  
August 17, 2017

The Property Location Browser is available on the Land Services Website: [www.sa.gov.au/landservices](http://www.sa.gov.au/landservices)



Scale  $\approx$  1:9027 (on A4 page)

250 metres  $\approx$

## Address Details

**Unit Number:**

**Street Number:**

**Street Name:** HARRIS

**Street Type:** ST

**Suburb:** STIRLING NORTH

**Postcode:** 5710

## Property Details:

**Council:** PORT AUGUSTA CITY COUNCIL

**State Electorate:** STUART

**Federal Electorate:** Grey

**Hundred:** DAVENPORT

**Valuation Number:** 6625270358

**Title Reference:** CT5937/151

**Plan No. Parcel No.:** D65715A3

The information provided above, is not represented to be accurate, current or complete at the time of printing this report.

The Government of South Australia accepts no liability for the use of this data, or any reliance placed on it.

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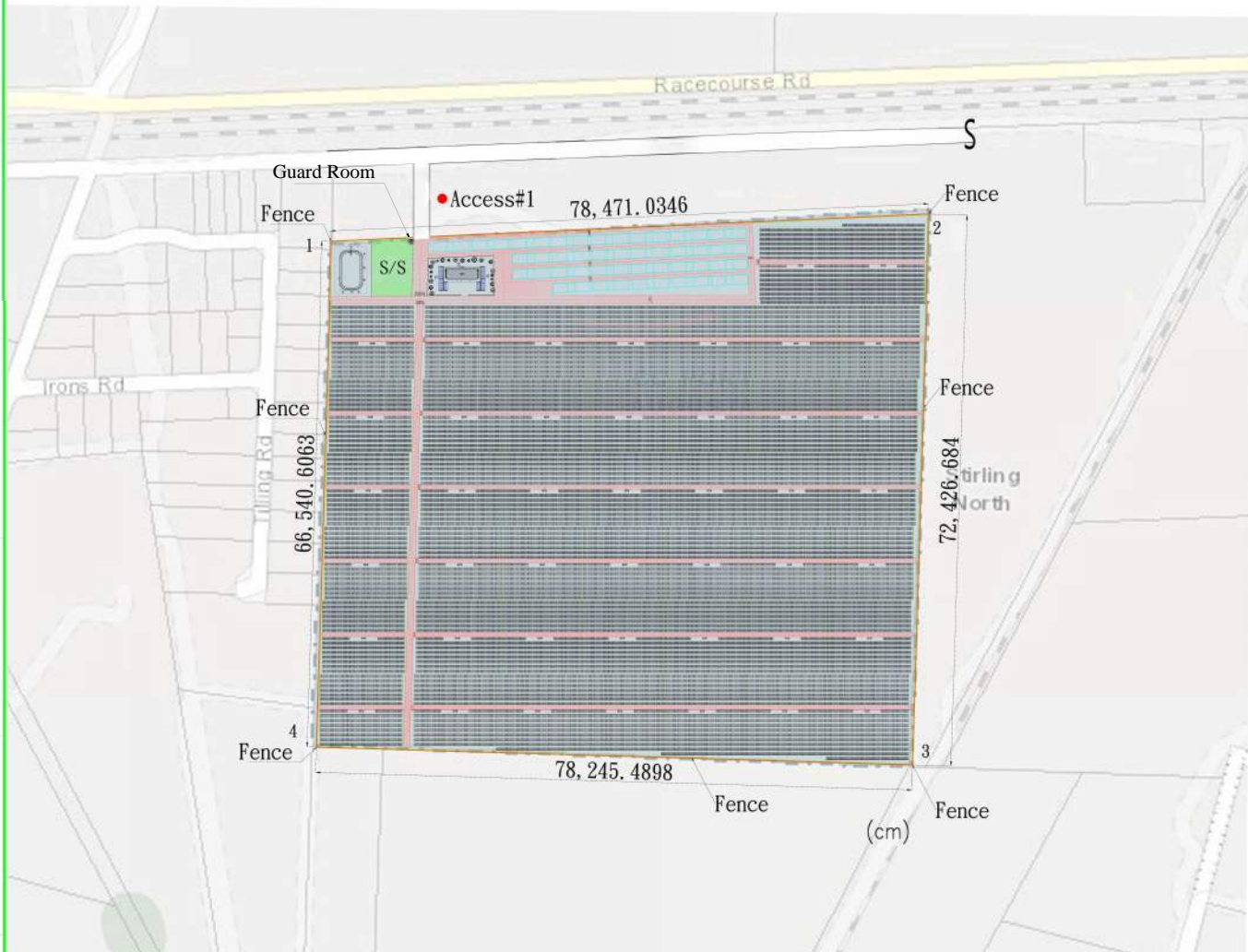
## Land Services



Government of South Australia  
Department of Planning,  
Transport and Infrastructure

## Appendix C. Proposed Development Indicative Layout





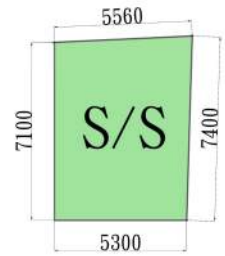
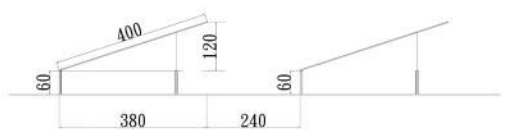
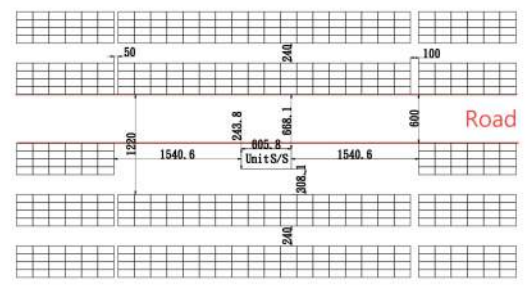
0.05 0.1  
Kilometer



- Proposed Site Access
- ESS Power Station
- S/S Facility Substation
- Detention Pond

CO-ORDINATES

CORNER	LATITUDE	LONGITUDE
1	-32°30' 08.96"	137°48' 56.60"
2	-32°30' 07.12"	137°49' 26.57"
3	-32°30' 30.62"	137°49' 26.46"
4	-32°30' 30.55"	137°48' 56.50"

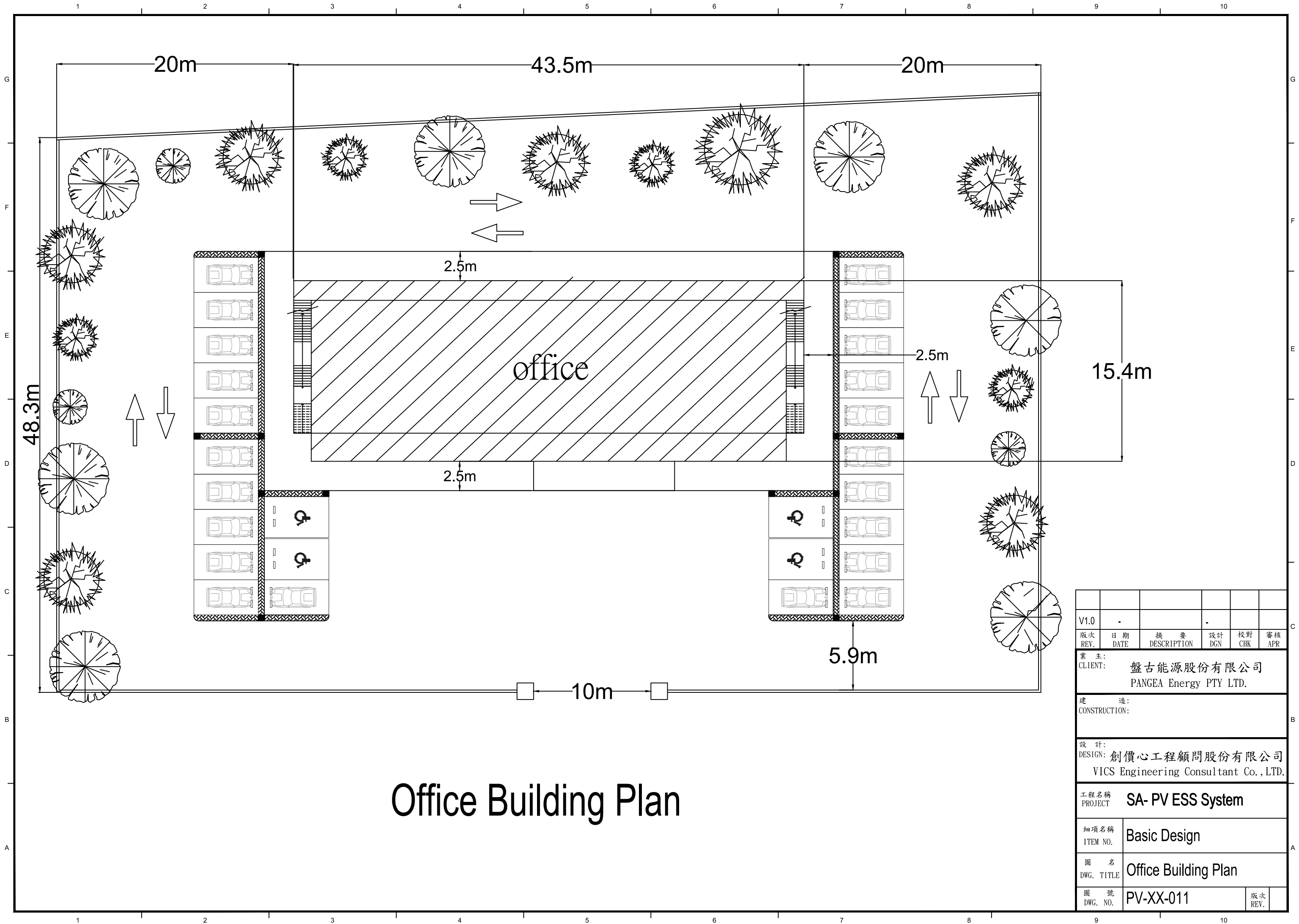


(cm)

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建造: CONSTRUCTION:					
設計: DESIGN: 創價心工程顧問股份有限公司 VICS Engineering Consultant Co., LTD.					
工程名稱	SA- PV ESS System				
PROJECT					
細項名稱	Basic Design				
ITEM NO.					
圖名	Site Layout (Draft)				
DWG. TITLE					
圖號	PV-XX-001				版本
DWG. NO.					REV.

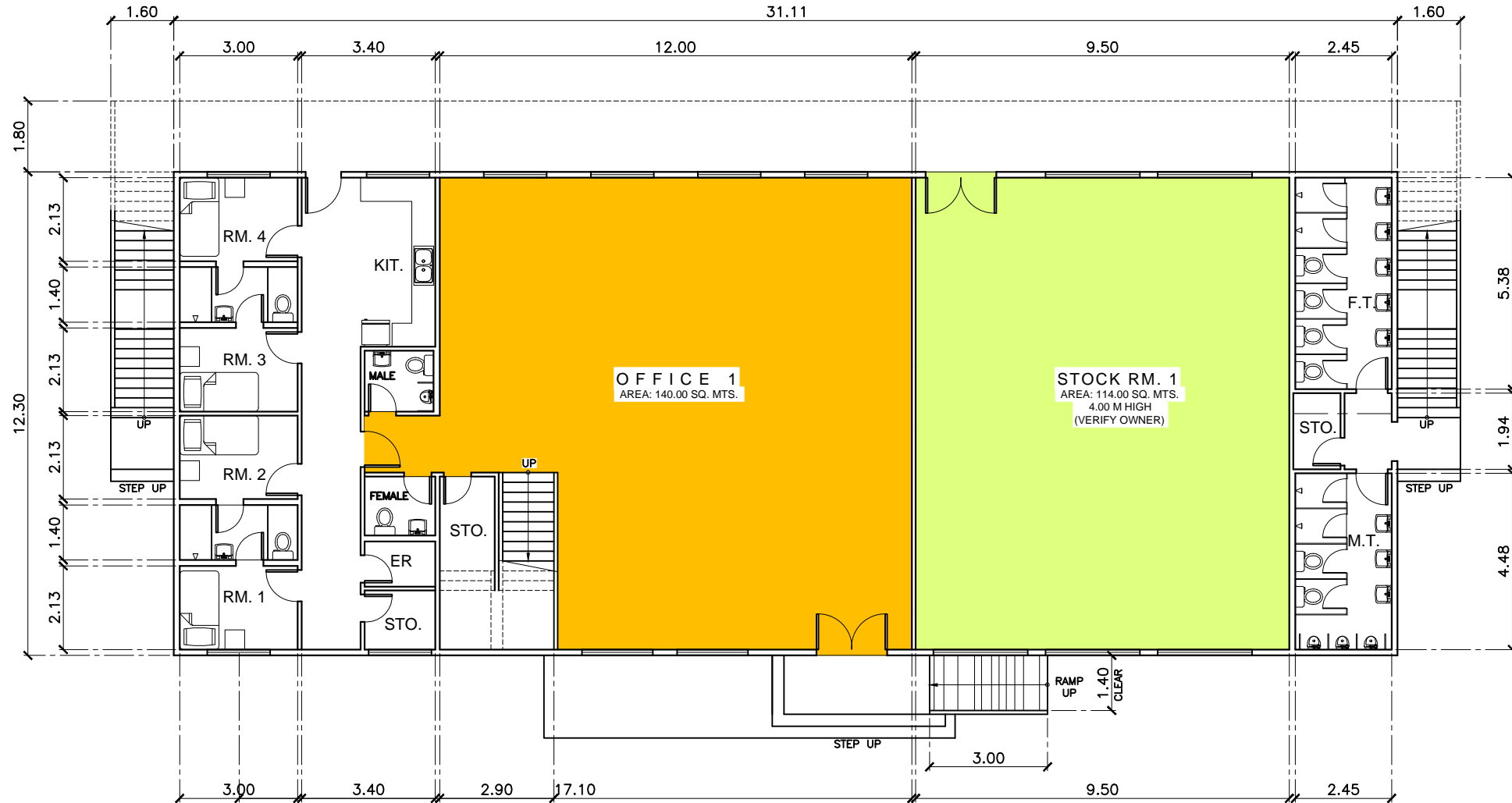
## Appendix D. Indicative Infrastructure and Design Details





# Office Building Plan

V1.0	-	-	-	-	-
版次 REV.	日期 DATE	摘要 DESCRIPTION	設計 DGN	校對 CHK	審核 APR
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建造: CONSTRUCTION:					
設計: DESIGN:	創價心工程顧問股份有限公司 VICS Engineering Consultant Co., LTD.				
工程名稱 PROJECT	SA- PV ESS System				
細項名稱 ITEM NO.	Basic Design				
圖名 DWG. TITLE	Office Building Plan				
圖號 DWG. NO.	PV-XX-011			版次 REV.	

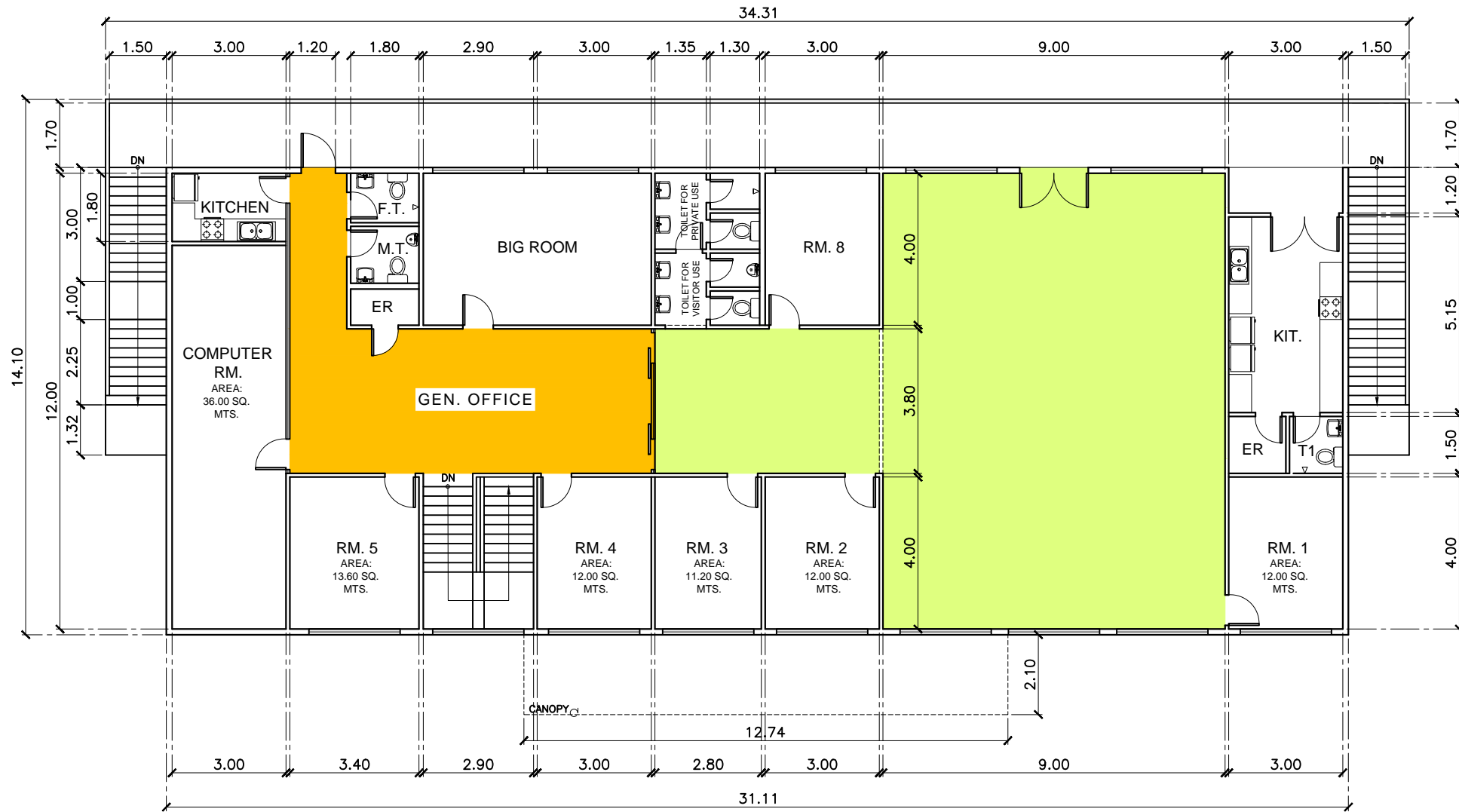


PRELIMINARY PLAN  
**GROUND FLOOR PLAN**  
 SCALE 1:150MTS.

 **ARCH. PETERJOHN SO**  
 914 - 916 G.M. Tolentino (Cataluna) Street, Sampaloc, Manila.  
 TEL. NOS. : 735-7342, 735-7346 FAX : (632) 735-6796

PROJECT TITLE: PROPOSED 2-STOREY COMM'L BLDG.  
 PROJECT OWNER: PANGEA ENERGY  
 DRAWN BY: APJSO\_NESTEE\_120516

NOTE:  
 PRELIMINARY PLAN IS FOR STUDY ONLY BASED ON  
 INITIAL REQUIREMENT FORWARDED BY OWNER TO  
 ARCHITECT.  
 PRELIMINARY PLAN IS SUBJECT FOR CHANGE.



PRELIMINARY PLAN  
**2ND FLOOR PLAN**  
 SCALE 1:150MTS.



**ARCH. PETERJOHN SO**

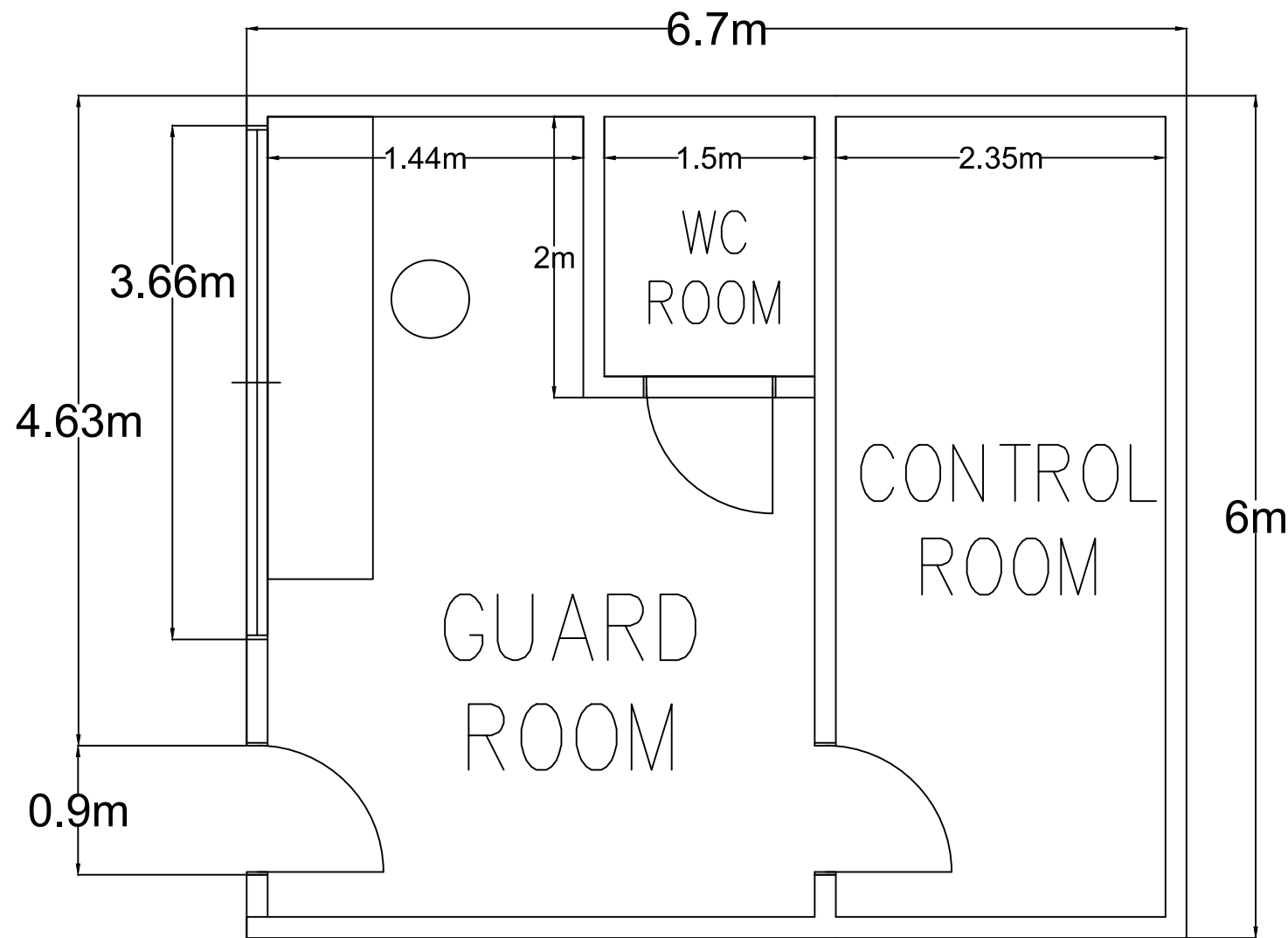
914 - 916 G.M. Tolentino (Cataluna) Street, Sampaloc, Manila.  
 TEL. NOS. : 735-7342, 735-7346 FAX : (632) 735-6796

PROJECT TITLE: PROPOSED 2-STOREY COMM'L BLDG.  
 PROJECT OWNER: PANGEA ENERGY

DRAWN BY: APJSO\_NESTEE\_120516

**NOTE:**  
 PRELIMINARY PLAN IS FOR STUDY ONLY BASED ON  
 INITIAL REQUIREMENT FORWARDED BY OWNER TO  
 ARCHITECT.

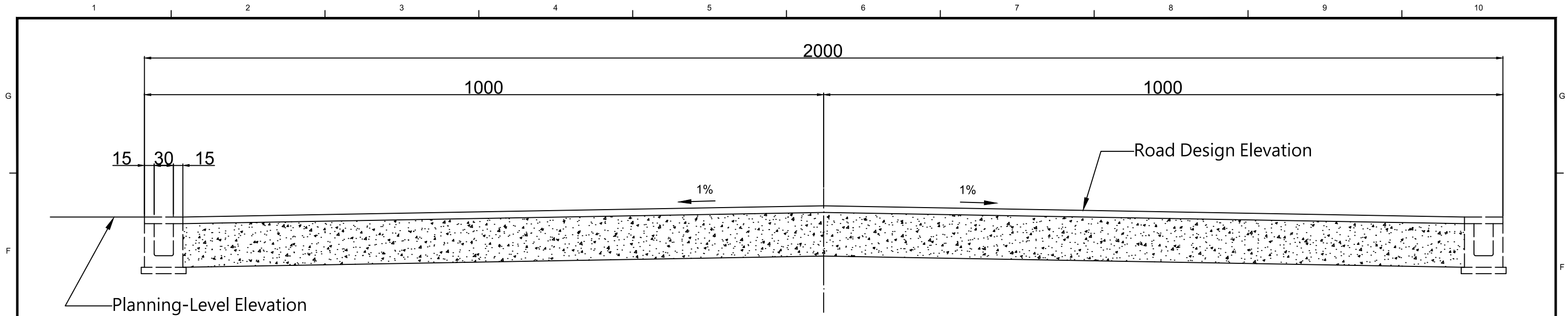
PRELIMINARY PLAN IS SUBJECT FOR CHANGE.



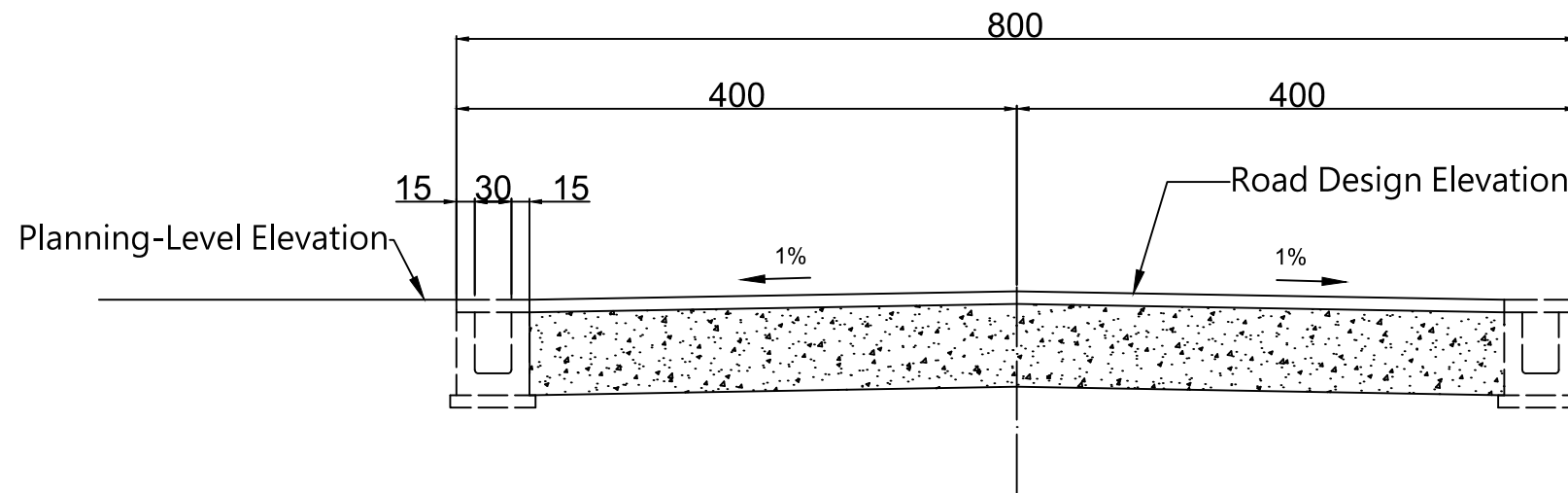
# Guard Room Building Plan

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建造: CONSTRUCTION:					
設計: DESIGN: 創價心工程顧問股份有限公司 VICS Engineering Consultant Co.,LTD.					
工程名稱 PROJECT		SA- PV ESS System			
細項名稱 ITEM NO.		Basic Design			
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圖號 DWG. NO.		PV-XX-013			版次 REV.

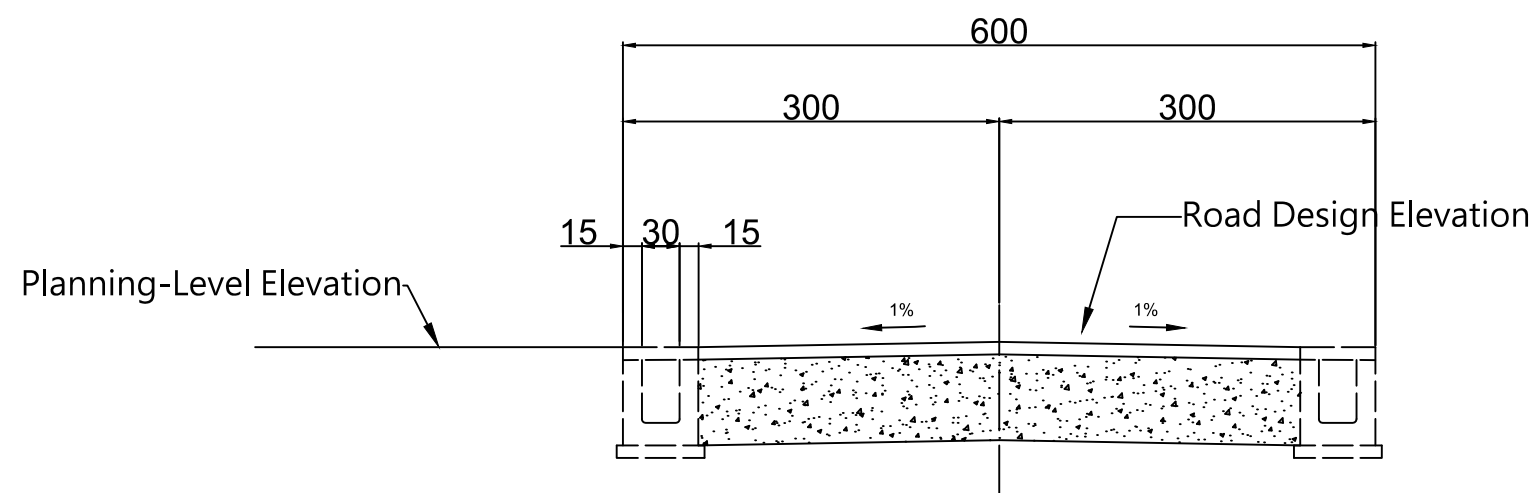




Cross-Section View Of 20m Road

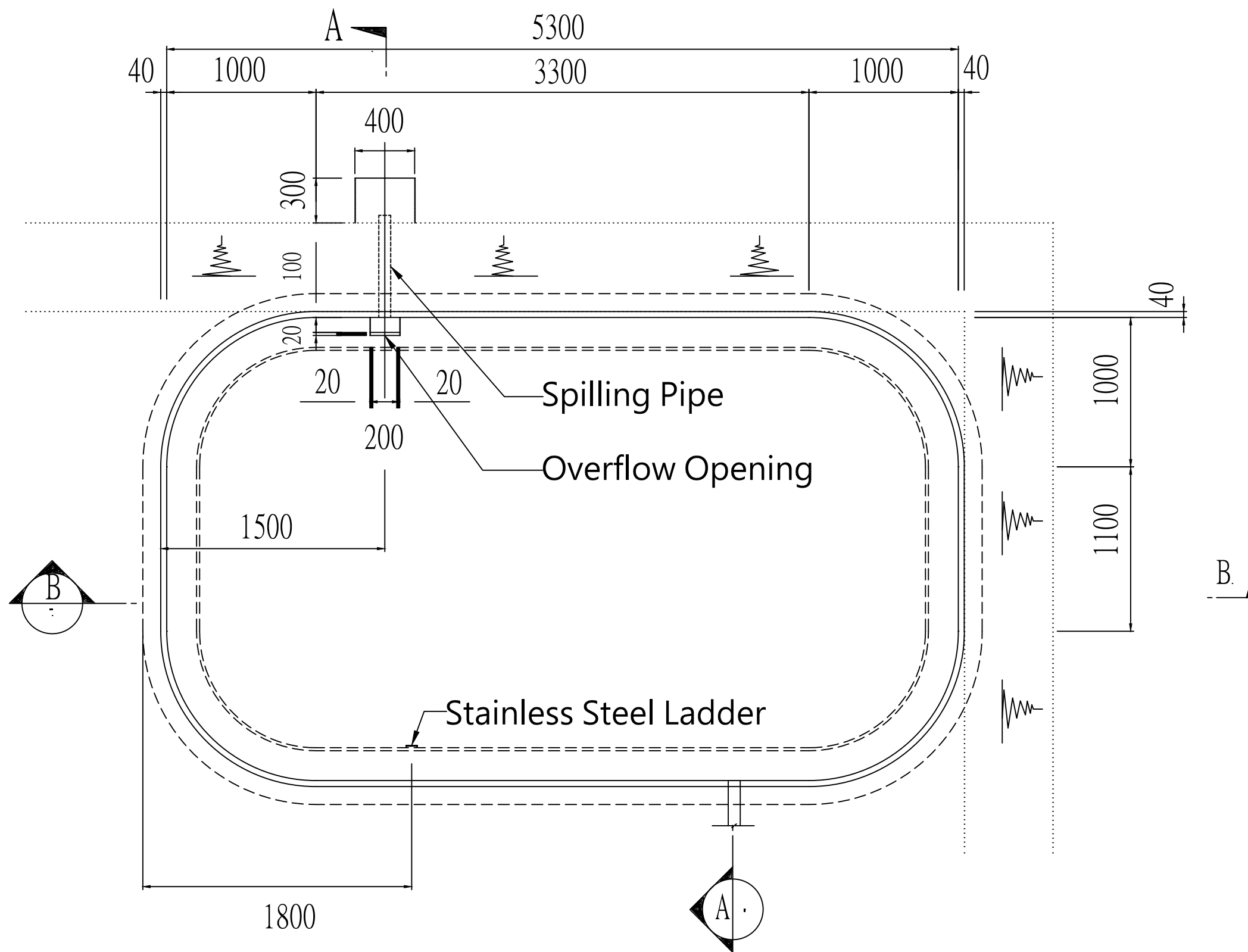


Cross-Section View Of 8m Road



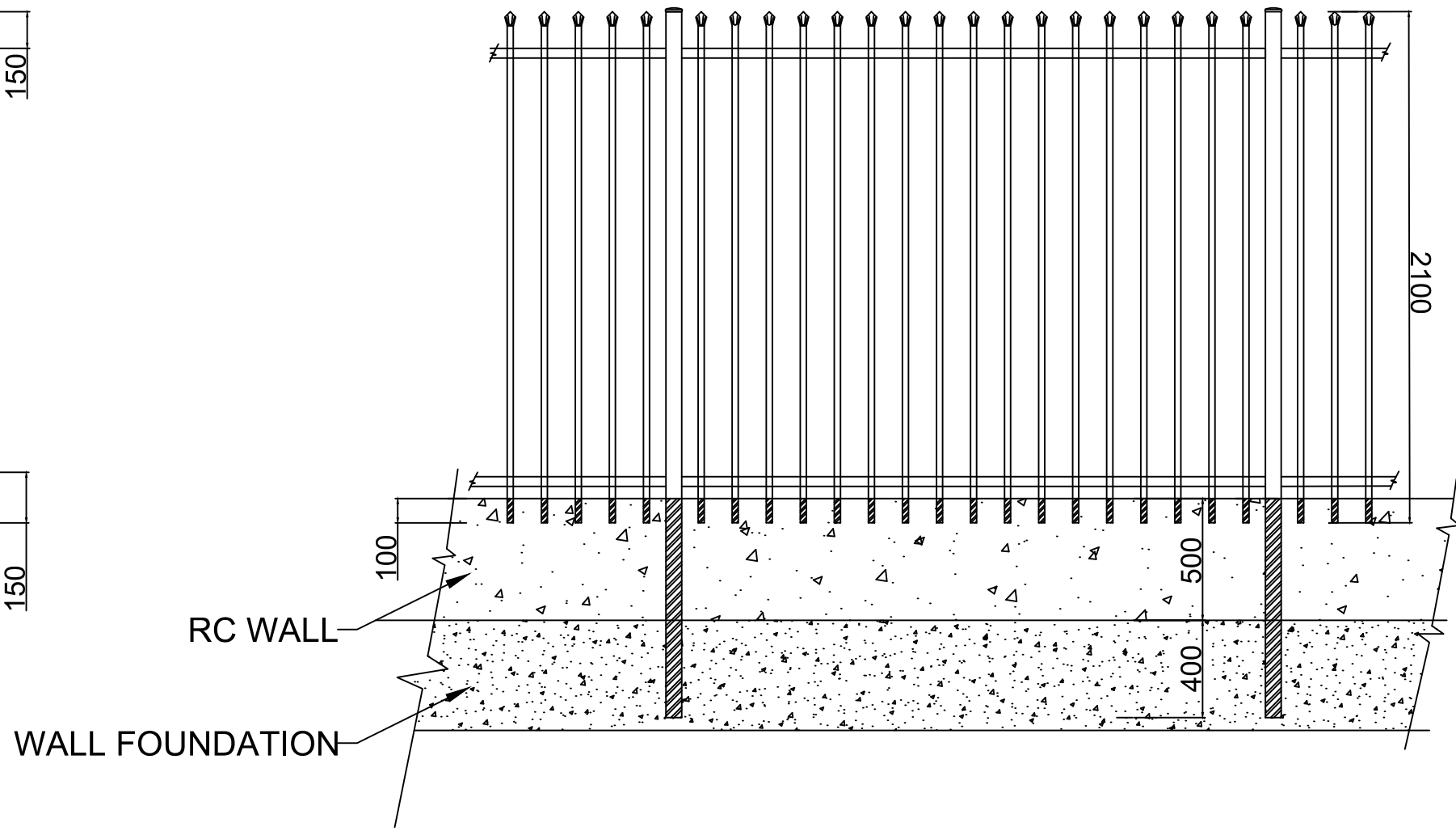
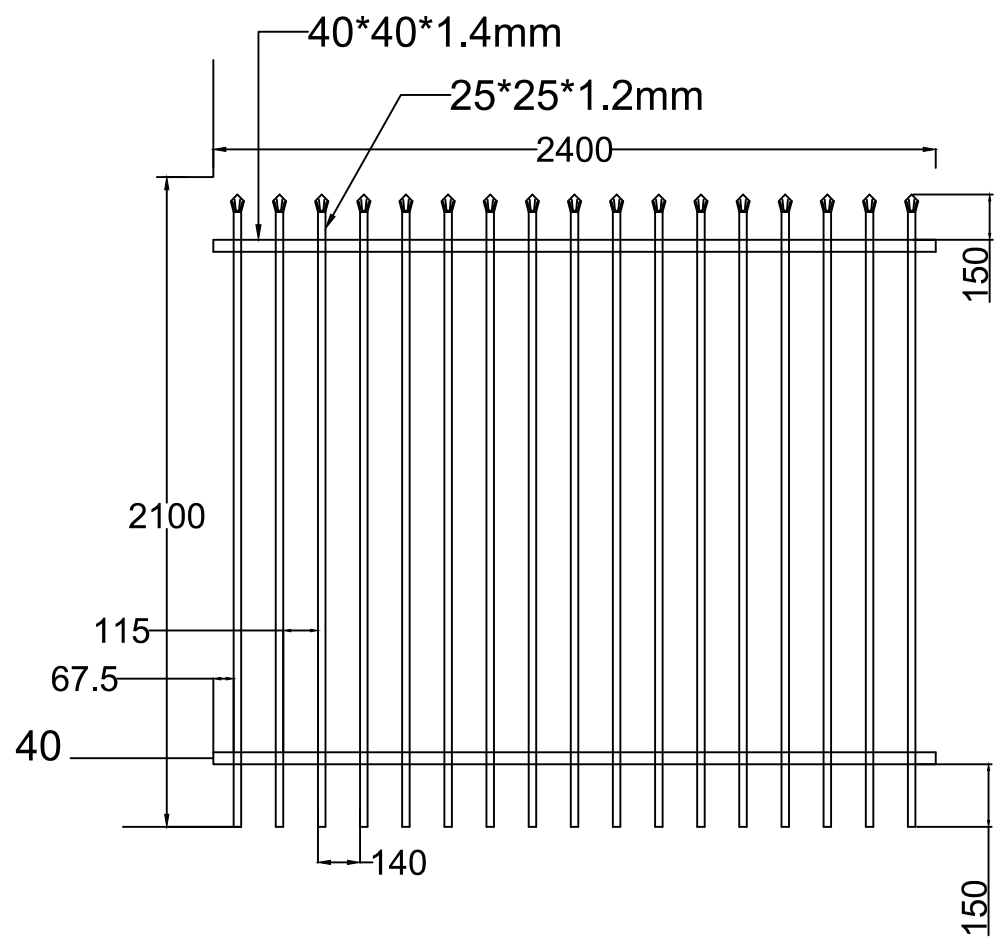
Cross-Section View Of 6m Road

V1.0	-	-	-	-	-
版次 REV.	日期 DATE	摘要 DESCRIPTION	設計 DGN	校對 CHK	審核 APR
業主: CLIENT:		盤古能源股份有限公司 PANGEA Energy PTY LTD.			
建造: CONSTRUCTION:					
設計: DESIGN:		創價心工程顧問股份有限公司 VICS Engineering Consultant Co.,LTD.			
工程名稱 PROJECT		SA- PV ESS System			
細項名稱 ITEM NO.		Basic Design			
圖名 DWG. TITLE		Road Cross-Section			
圖號 DWG. NO.		PV-SE-013			版次 REV.



Plan View Of Detention Pond

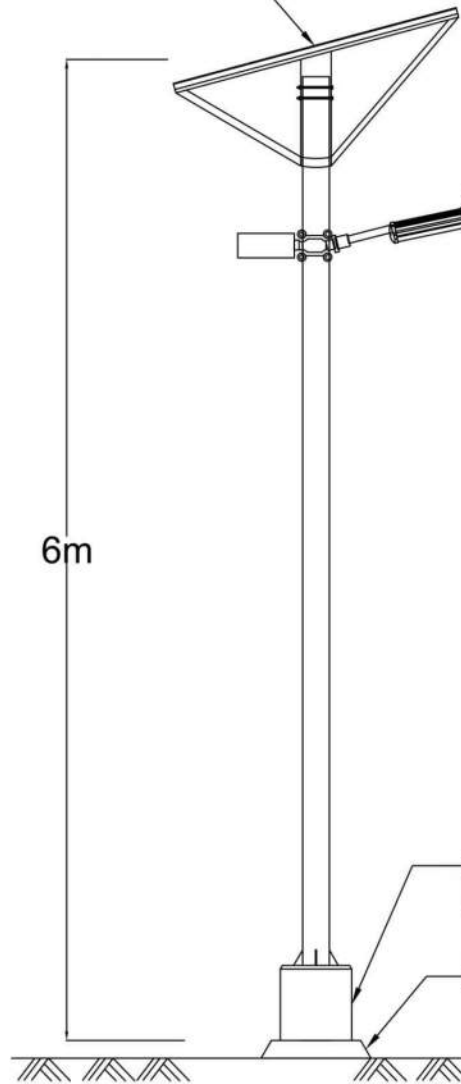
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V1.0	-	-	-	-	-
業主: CLIENT: 盤古能源股份有限公司 PANGEA Energy PTY LTD.					
建造: CONSTRUCTION:					
設計: DESIGN: 創價心工程顧問股份有限公司 VICS Engineering Consultant Co., LTD.					
工程名稱 PROJECT		SA- PV ESS System			
細項名稱 ITEM NO.		Basic Design			
圖名 DWG. TITLE		Plan View Of Detention Pond			
圖號 DWG. NO.		PV-SE-019			版次 REV.



# Fence Detail

V1.0	-	-	-	-	-
版次 REV.	日期 DATE	摘要 DESCRIPTION	設計 DGN	校對 CHK	審核 APR
業主: CLIENT:		盤古能源股份有限公司 PANGEA Energy PTY LTD.			
建造: CONSTRUCTION:					
設計: DESIGN:		創價心工程顧問股份有限公司 VICS Engineering Consultant Co.,LTD.			
工程名稱 PROJECT	SA- PV ESS System				
細項名稱 ITEM NO.	Basic Design				
圖名 DWG. TITLE	Fence Detail				
圖號 DWG. NO.	PV-SE-061			版次 REV.	

PV MODULE



LED STREET LIGHT  
(Minimised glare)  
(passive infra-red,  
PIR Sensor,timer)

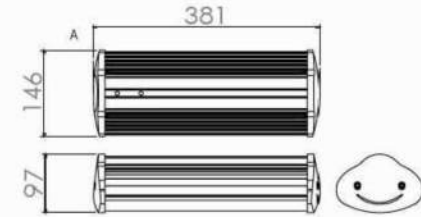
BATTERY  
CONTROLLER

RC BASE

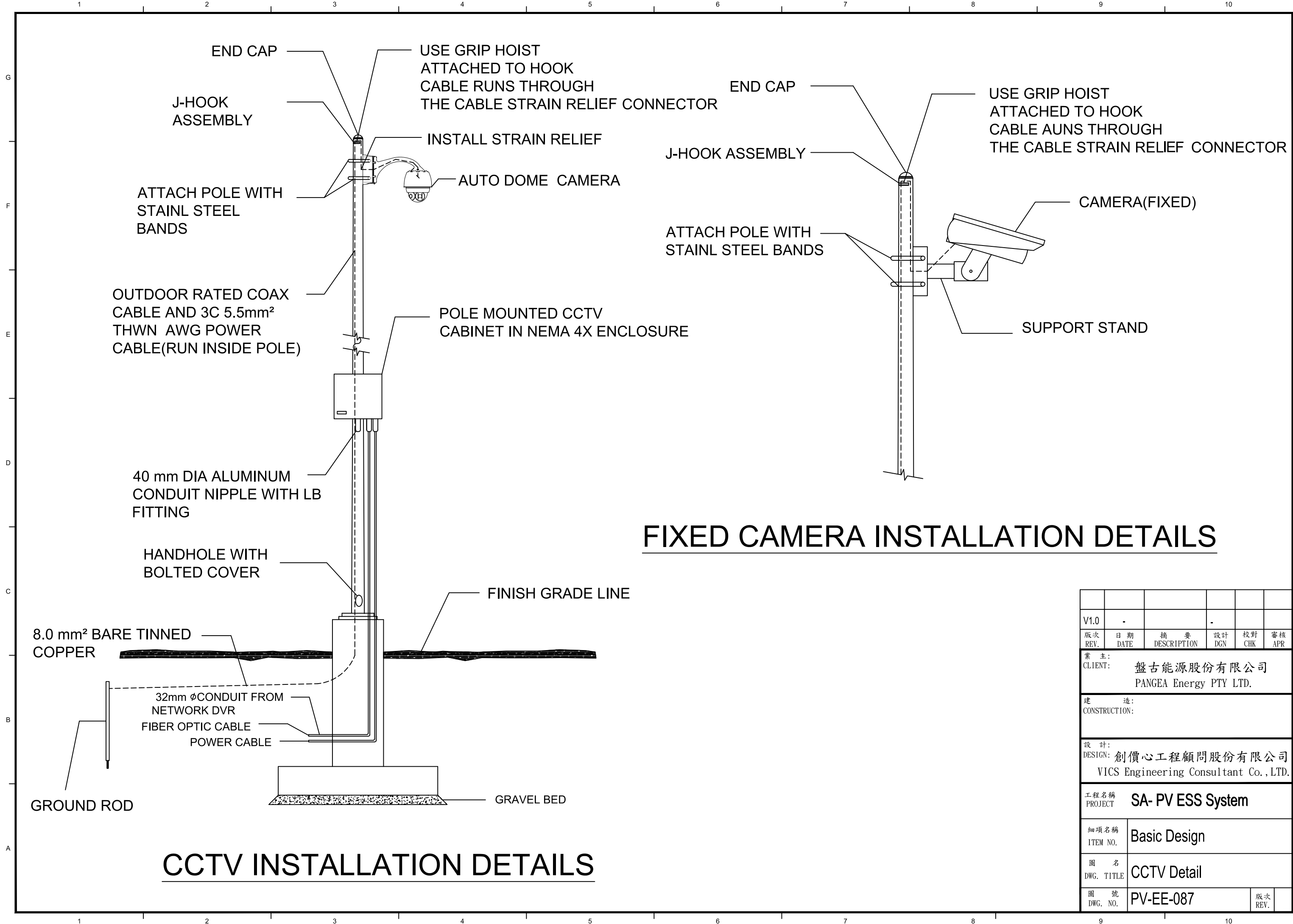
Sustainable Green Street Light

全系列 / All Series

- ◆ 輸入電壓 / Input Voltage :100 ~ 240VAC
- ◆ LED 燈粒 / LED Light Source : CREE / Nichia lamp
- ◆ 工作溫度 / Operation Temperature : -40°C ~ 50°C
- ◆ 防塵防水等級 / IP Level : 65



V1.0	-	-	-	-	-
版次 REV.	日期 DATE	摘要 DESCRIPTION	設計 DGN	校對 CHK	審核 APR
業主: CLIENT: 盤古能源股份有限公司 PANGEA Energy PTY LTD.					
建造: CONSTRUCTION:					
設計: DESIGN: 創價心工程顧問股份有限公司 VICs Engineering Consultant Co., LTD.					
工程名稱 PROJECT		SA- PV ESS System			
細項名稱 ITEM NO.		Basic Design			
圖名 DWG. TITLE		LED Streetlight Detail			
圖號 DWG. NO.		PV-EE-071			版次 REV.



8.0 mm<sup>2</sup> BARE TINNED COPPER

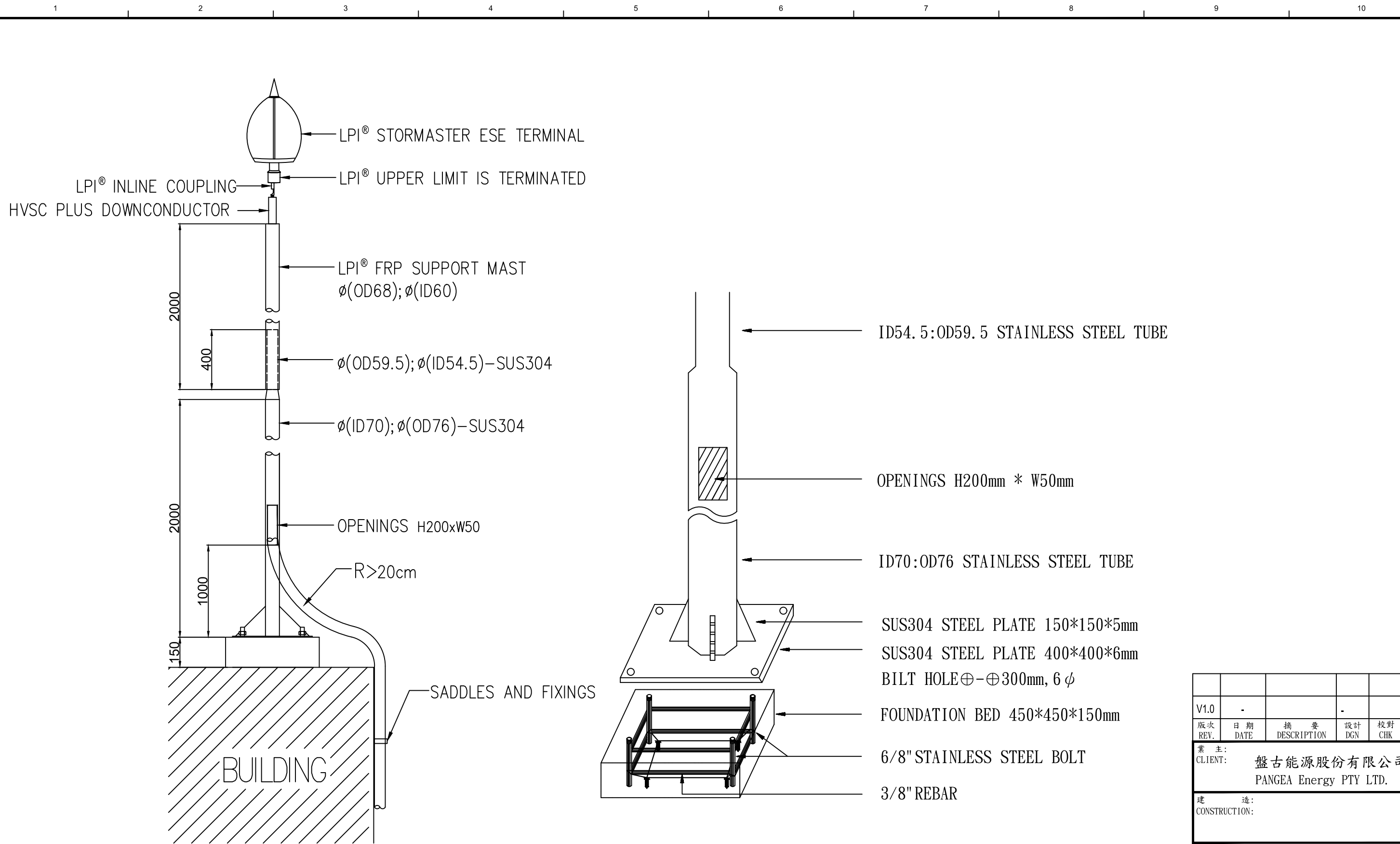
32mm Ø CONDUIT FROM NETWORK DVR  
FIBER OPTIC CABLE  
POWER CABLE

GROUND ROD

**CCTV INSTALLATION DETAILS**

**FIXED CAMERA INSTALLATION DETAILS**

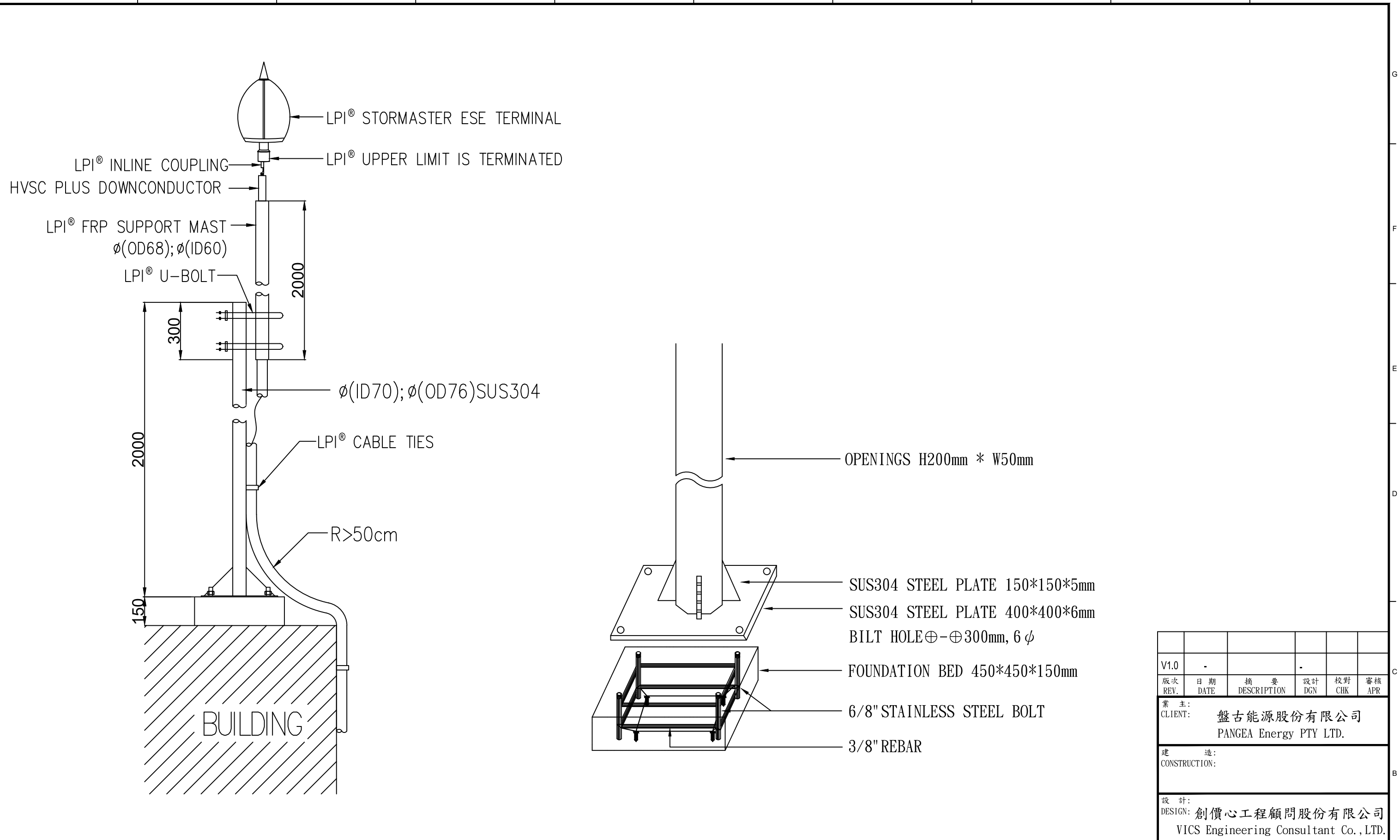
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V1.0	-	-	-	-	-
業主: CLIENT: 盤古能源股份有限公司 PANGEA Energy PTY LTD.					
建造: CONSTRUCTION:					
設計: DESIGN: 創價心工程顧問股份有限公司 VICS Engineering Consultant Co.,LTD.					
工程名稱 PROJECT		SA- PV ESS System			
細項名稱 ITEM NO.		Basic Design			
圖名 DWG. TITLE		CCTV Detail			
圖號 DWG. NO.		PV-EE-087			版次 REV.



LIGHTNING ROD GROUP ILLUSTRATION

SOCKET SUPPORT FRAME AND BASE

V1.0	-	-	-	-	-
版次 REV.	日期 DATE	摘要 DESCRIPTION	設計 DGN	校對 CHK	審核 APR
業主: CLIENT: 盤古能源股份有限公司 PANGEA Energy PTY LTD.					
建造: CONSTRUCTION:					
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工程名稱 PROJECT	SA- PV ESS System				
細項名稱 ITEM NO.	Basic Design				
圖名 DWG. TITLE	LA Detail (1)				
圖號 DWG. NO.	PV-EE-081				版次 REV.



LIGHTNING ROD GROUP ILLUSTRATION

FRP TOWER SUPPORT FRAME AND BASE

V1.0	-	-	-	-	-
版次 REV.	日期 DATE	摘要 DESCRIPTION	設計 DGN	校對 CHK	審核 APR
業主: CLIENT: 盤古能源股份有限公司 PANGEA Energy PTY LTD.					
建造: CONSTRUCTION:					
設計: DESIGN: 創價心工程顧問股份有限公司 VICS Engineering Consultant Co., LTD.					
工程名稱 PROJECT	SA- PV ESS System				
細項名稱 ITEM NO.	Basic Design				
圖名 DWG. TITLE	LA Detail (2)				
圖號 DWG. NO.	PV-EE-082				版次 REV.

Solar inverters

# ABB central inverters PVS800 100 to 1000 kW



**ABB central inverters raise reliability, efficiency and ease of installation to new levels. The inverters are aimed at system integrators and end users who require high performance solar inverters for large photovoltaic (PV) power plants. The inverters are available from 100 up to 1000 kW, and are optimized for cost-efficient multi-megawatt power plants.**

#### **World's leading inverter platform**

The ABB central inverters have been developed on the basis of decades of experience in the industry and proven technology platform. Unrivalled expertise from the world's market and technology leader in frequency converters is the hallmark of this solar inverter series.

Based on ABB's highly successful platform and the most widely used frequency converters on the market – the inverters are the most efficient and cost-effective way to convert the direct current (DC) generated by solar modules into high-quality and CO<sub>2</sub>-free alternating current (AC) that can be fed into the power distribution network.

#### **Solar inverters from ABB**

ABB central inverters are ideal for large PV power plants but are also suitable for large-sized power plants installed in commercial or industrial buildings. High efficiency, proven components, compact and modular design and a host of life cycle services ensures ABB central inverters provide a rapid return on investment.

#### **Highlights**

- High total performance
- Modular and compact product design
- Extensive DC and AC side protection
- Full grid support functionality
- Fast and easy installation
- Complete range of industrial-type data communication options, including remote monitoring
- Life cycle service and support through ABB's extensive global service network



# Maximize yields without losing a watt



## Maximum energy and feed-in revenues

ABB central inverters have a high total efficiency level. Optimized and accurate system control and a maximum power point tracking (MPPT) algorithm together with high efficiency power converter design ensure that maximum energy is delivered to the power distribution network from the PV modules. For end users this generates the highest possible revenues from the feed-in tariffs.

## Proven ABB components

The inverters comprise proven ABB components with a long track record of performance excellence in demanding applications and harsh environments. Equipped with extensive electrical and mechanical protection, the inverters are engineered to provide a long and reliable service life of at least 20 years.

## Compact and modular design

The inverters are designed for fast and easy installation. The industrial design and modular platform provides a wide range of options like remote monitoring, fieldbus connection and modular and flexible DC input cabinet. The integrated DC cabinet saves space and costs as the solar array junction boxes can be connected directly to the inverter DC cabinet fused busbars. The inverters are customized to meet end user needs and are available with short delivery times.

## Effective connectivity to power distribution network

ABB's transformerless central inverter series enables system integrators to design the PV power plant using optimum combination of different power rating inverters. Inverters are connected to the medium voltage (MV) power distribution network either centrally or in a distributed manner depending on the plant size and shape and network connection position.

## Advanced grid support features

ABB central inverter software includes all the latest grid support and monitoring features including active power limitation, low voltage ride through (LVRT) with current feed-in and reactive power control. Active and reactive power output can be limited by using an external source. Active power can also be limited automatically as a function of grid frequency.

All grid support functions are parameterized allowing easy adjusting for local utility requirements. ABB central inverters are also able to support grid stability even at night by providing reactive power with the DC input disconnected.

# ABB central inverters

PVS800

100 to 1000 kW



---

## High total performance

- High efficiency
- Low auxiliary power consumption
- Efficient maximum power point tracking
- Long and reliable service life of at least 20 years

---

## Modular industrial design

- Compact and easy-to-maintain product design
- Fast and easy installation
- Integrated and flexible DC input cabinet

---

## Full grid support functionality

- Reactive power compensation also during the night time
- Active power limitation
- Low voltage ride through with current feed in

---

## Extensive protections

- DC and AC side protection with built-in fuses, surge protection and filters
- Increased reliability and safety with DC and AC side contactors
- Heavy-duty surge protection

---

## Grid code compatibility

- Wide country-specific grid code compliance
- Adjustability to various local utility requirements

---

## Proven technology

- Based on ABB's market-leading technology platform used in frequency converters

---

## Life cycle service and support

- ABB's extensive global service network
- Extended warranties
- Service contracts
- Technical support throughout the service life

---

## Wide communication options

- Complete range of industrial-type data communication options
- Ethernet/Internet protocol
- Remote monitoring

# ABB central inverters

## PVS800

### 100 to 1000 kW



#### Technical data and types

Type designation PVS800-57	-0100kW-A 100 kW	-0250kW-A 250 kW	-0315kW-B 315 kW	-0500kW-A 500 kW	-0630kW-B 630 kW	-0875kW-B 875 kW	-1000kW-C 1000 kW
<b>Input (DC)</b>							
Maximum input power ( $P_{PV, max}$ ) <sup>1)</sup>	120 kWp	300 kWp	378 kWp	600 kWp	756 kWp	1050 kWp	1200 kWp
DC voltage range, mpp ( $U_{DC, mpp}$ )	450 to 825 V	450 to 825 V	525 to 825 V	450 to 825 V	525 to 825 V	525 to 825 V	600 to 850 V
Maximum DC voltage ( $U_{max(DC)}$ )	1000 V	1000 V	1000 V	1100 V	1100 V	1100 V	1100 V
Maximum DC current ( $I_{max(DC)}$ )	245 A	600 A	615 A	1145 A	1230 A	1710 A	1710 A
Number of protected DC inputs	1 (+/-) / 4 <sup>2)</sup>	2, 4, 8 (+/-)	2, 4, 8 (+/-)	4 to 15 (+/-)	4 to 15 (+/-)	8 to 20 (+/-)	8 to 20 (+/-)
<b>Output (AC)</b>							
Nominal power ( $P_{N(AC)}$ ) <sup>3)</sup>	100 kW	250 kW	315 kW	500 kW	630 kW	875 kW	1000 kW
Maximum output power <sup>4)</sup>	100 kW	250 kW	345 kW	600 kW	700 kW	1050 kW	1200 kW
Power at $\cos\phi = 0.95$ <sup>3)</sup>	96 kW	240 kW	300 kW	475 kW	600 kW	830 kW	950 kW
Nominal AC current ( $I_{N(AC)}$ )	195 A	485 A	520 A	965 A	1040 A	1445 A	1445 A
Nominal output voltage ( $U_{N(AC)}$ ) <sup>5)</sup>	300 V	300 V	350 V	300 V	350 V	350 V	400 V
Output frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Harmonic distortion, current <sup>6)</sup>	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%	< 3%
Distribution network type <sup>7)</sup>	TN and IT	TN and IT	TN and IT	TN and IT	TN and IT	TN and IT	TN and IT
<b>Efficiency</b>							
Maximum <sup>8)</sup>	98.0%	98.0%	98.6%	98.6%	98.6%	98.7%	98.8%
Euro-eta <sup>8)</sup>	97.5%	97.6%	98.3%	98.2%	98.4%	98.5%	98.6%
<b>Power consumption</b>							
Own consumption in operation	310 W	310 W	310 W	490 W	490 W	650 W	650 W
Standby operation consumption	60 W	60 W	60 W	65 W	65 W	65 W	65 W
External auxiliary voltage <sup>9)</sup>	230 V, 50 Hz	230 V, 50 Hz	230 V, 50 Hz	230 V, 50 Hz	230 V, 50 Hz	230 V, 50 Hz	230 V, 50 Hz
<b>Dimensions and weight</b>							
Width/Height/Depth, mm (W/H/D)	1030/2130/690	1830/2130/680	1830/2130/680	2630/2130/708	2630/2130/708	3630/2130/708	3630/2130/708
Weight appr. <sup>10)</sup>	550	1100	1100	1800	1800	2320	2320

<sup>1)</sup> Recommended maximum input power

<sup>2)</sup> Optional MCB inputs, 80 A inputs

<sup>3)</sup> 100 and 250 kW units at 40 °C. 315 and 630 kW at 45 °C. 500, 875 and 1000 kW at 50 °C.

<sup>4)</sup> At 25 °C. See the user manual for details.

<sup>5)</sup> +/- 10%

<sup>6)</sup> At nominal power

<sup>7)</sup> Inverter side must be IT type

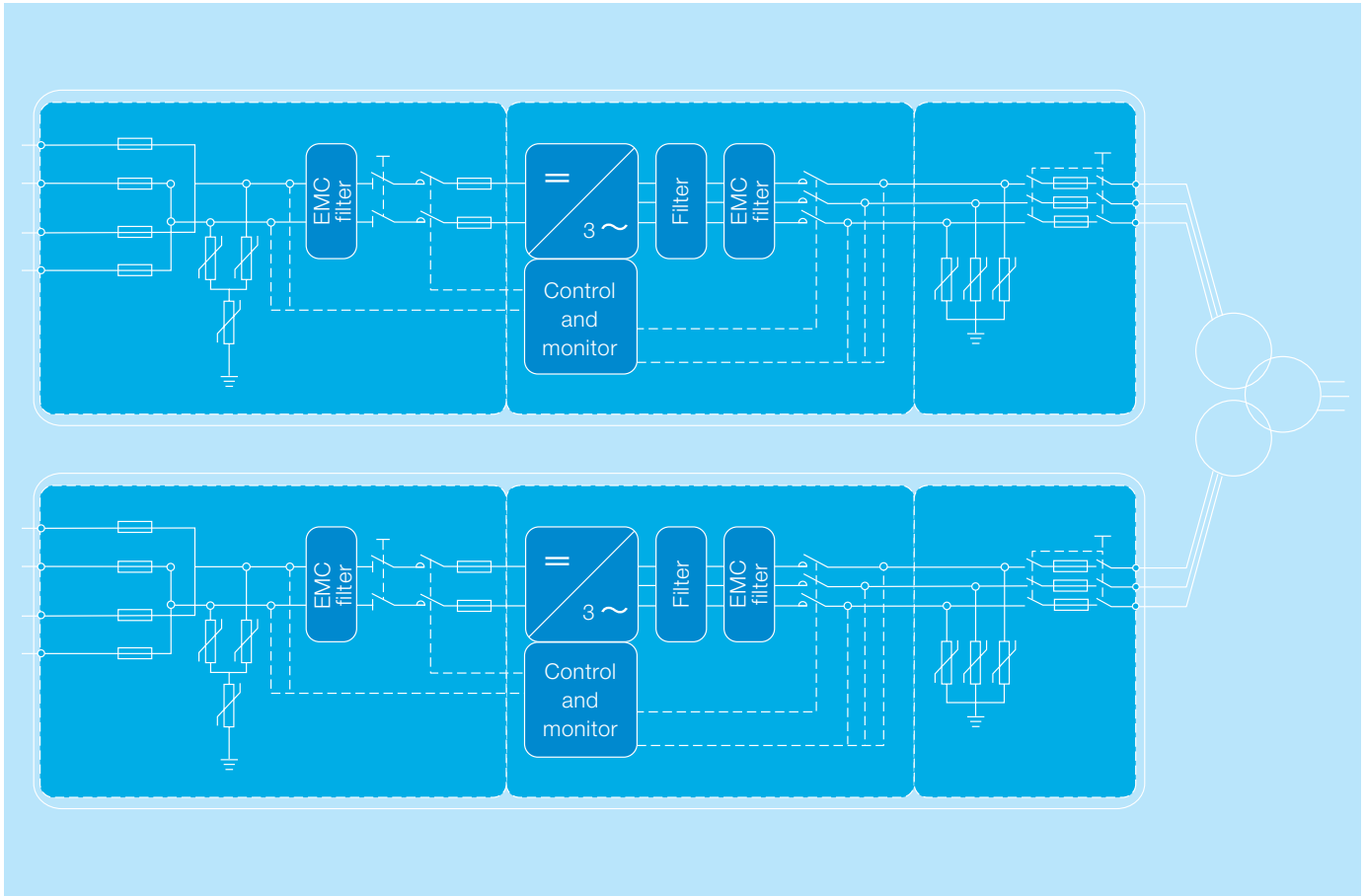
<sup>8)</sup> Without auxiliary power consumption at min  $U_{DC}$

<sup>9)</sup> 115 V, 60 Hz optional

<sup>10)</sup> For the smallest number of protected inputs.

See the user manual for details.

## ABB central inverter design and power network connection



### Technical data and types

Type designation	-0100kW-A	-0250kW-A	-0315kW-B	-0500kW-A	-0630kW-B	-0875kW-B	-1000kW-C
PVS800-57	100 kW	250 kW	315 kW	500 kW	630 kW	875 kW	1000 kW
<b>Environmental limits</b>							
Degree of protection	IP42	IP42	IP42	IP42	IP42	IP42	IP42
Ambient temp. range (nom. ratings) <sup>11)</sup>	-15 to +40 °C	-15 to +40 °C	-15 to +45 °C	-15 to +50 °C	-15 to +45 °C	-15 to +50 °C	-15 to +50 °C
Maximum ambient temperature <sup>12)</sup>	+50 °C	+50 °C	+55 °C	+55 °C	+55 °C	+55 °C	+55 °C
Relative humidity, not condensing	15 to 95%	15 to 95%	15 to 95%	15 to 95%	15 to 95%	15 to 95%	15 to 95%
Maximum altitude (above sea level) <sup>13)</sup>	2000 m <sup>14)</sup>	2000 m <sup>14)</sup>	2000 m <sup>14)</sup>	4000 m	4000 m	4000 m	4000 m
Maximum noise level	75 dBA	75 dBA <sup>15)</sup>	75 dBA <sup>15)</sup>	75 dBA <sup>15)</sup>	75 dBA <sup>15)</sup>	75 dBA <sup>15)</sup>	75 dBA <sup>15)</sup>
Maximum air flow of the inverter section	1300 m <sup>3</sup> /h	2500 m <sup>3</sup> /h	2500 m <sup>3</sup> /h	5000 m <sup>3</sup> /h	5000 m <sup>3</sup> /h	7950 m <sup>3</sup> /h	7950 m <sup>3</sup> /h
<b>Protection</b>							
Ground fault monitoring <sup>16)</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Anti-islanding	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DC reverse polarity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AC and DC short circuit and over current	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AC and DC over voltage and temperature	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>User interface and communications</b>							
Local user interface	ABB local control panel						
Analog inputs/outputs	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Digital inputs/relay outputs	3/1	3/1	3/1	3/1	3/1	3/1	3/1
Fieldbus connectivity	Modbus, PROFIBUS, EtherNet						
<b>Product compliance</b>							
Safety and EMC	CE conformity according to LV and EMC directives						
Certifications and approvals <sup>17)</sup>	VDE, CEI, UNE, RD, EDF, P.O. 12.3, BDEW, GOST, AS, ZA						
Grid support and grid functions	Reactive power compensation <sup>18)</sup> , Power reduction, LVRT, HVRT, Anti-islanding						

<sup>11)</sup> Frosting is not allowed. May need optional cabinet heating.

<sup>12)</sup> Power derating after 40 °C/45 °C/50 °C

<sup>13)</sup> Power derating above 1000 m

<sup>14)</sup> With option 2000 to 4000 m

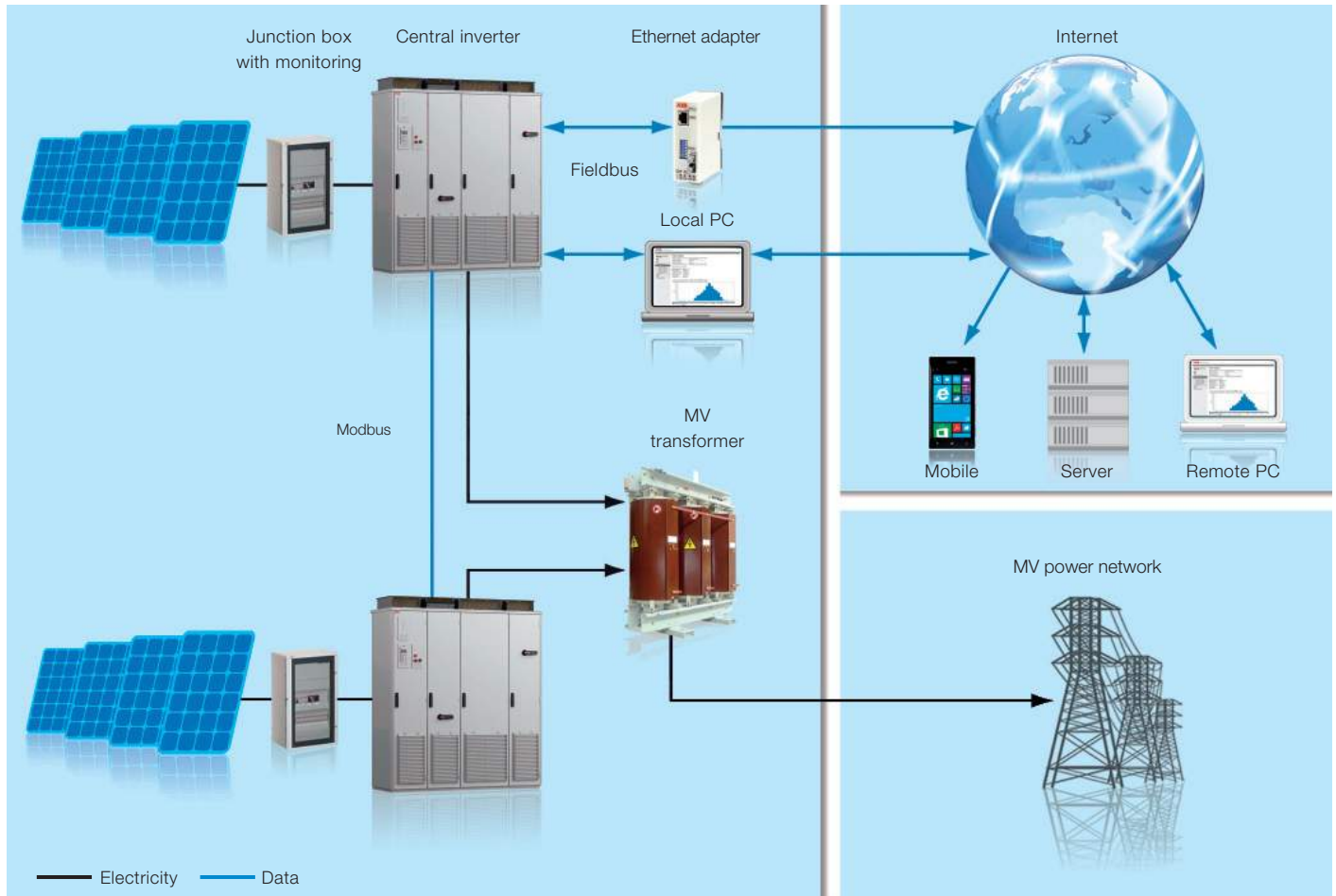
<sup>15)</sup> At partial power typically < 70 dBA

<sup>16)</sup> Optional

<sup>17)</sup> More detailed information, please contact ABB

<sup>18)</sup> Also during the night

## Data communication principle for ABB central inverters



### Options

- Integrated and flexible DC input extension cabinets
- Cabinet heating
- I/O extensions
- DC grounding (negative and positive)
- Fieldbus and Ethernet connections
- Current measurement to each DC input
- Warranty extensions
- Solar inverter care contracts

### Accessories

- Solar array junction boxes with string monitoring
- Remote monitoring solutions

### Support and service

ABB supports its customers with a dedicated service network in more than 60 countries and provides a complete range of life cycle services from installation and commissioning to preventative maintenance, spare parts, repairs and recycling.

For more information please contact your local ABB representative or visit:



[www.abb.com/solarinverters](http://www.abb.com/solarinverters)  
[www.abb.com](http://www.abb.com)

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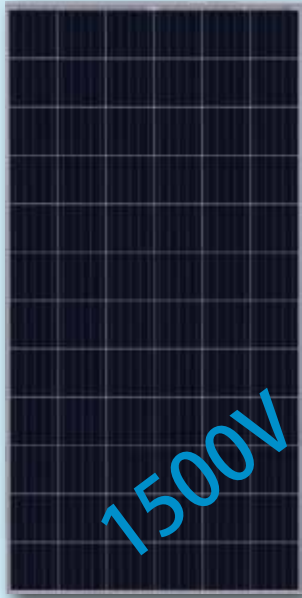


EXTERIOR PERSPECTIVE

 <b>ARCH. PETER JOHN C. SO</b> ARCHITECTS + PLANNERS + DESIGNERS + INTERIORS	DESIGNED BY: <b>APJ88</b>	REVISION:	PROJECT TITLE AND LOCATION:	OWNER'S APPROVAL:	SHEET NO.
	DRAWN BY: <b>JGP</b>		<b>2 STOREY COMMERCIAL BUILDING</b> (COLOR IS SUBJECT TO CHANGE)	 <b>PANGEA ENERGY PTY LTD.</b>	<b>1</b>
	DATE: <b>12.01.2016</b>				
	CHECKED:				
	DATE:				

# JAP72S01

315-335 1500V Cypress Series  
MULTICRYSTALLINE SILICON SOLAR MODULE



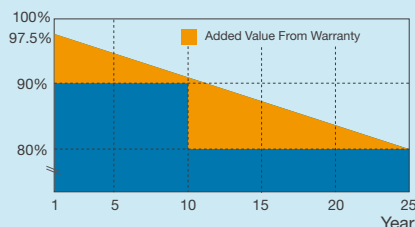
## JA Solar Holdings Co., Ltd.

JA Solar Holdings Co., Ltd is a world leading manufacturer of high-performance solar power products that convert sunlight into electricity for residential, commercial and utility-scale power generation. The company was founded in May 2005 and publicly listed on NASDAQ in February 2007. JA Solar has been the world's leading cell producer since 2010, and has firmly established itself as a tier 1 module supplier since 2012. Capitalizing on our strength in solar cell technology, we are committed to provide modules with unparalleled conversion efficiency, yield efficiency, and reliability to enable you to maximize your returns on PV projects. With its leading industry experience, continuous effort on R&D, customer-oriented service and solid financial status, JA Solar is your best choice of long-term trustworthy partner.

Address: Building No.8, Nuode Center, Automobile Museum East Road, Fengtai District, Beijing, China  
Tel: +86 (10) 63611888  
Fax: +86 (10) 63611999  
Email: sales@jasolar.com market@jasolar.com

## Superior Warranty

- 12-year product warranty
- 25-year linear power output warranty



## Key Features



5BB design reduces cell series resistance and stress between cell interconnectors to improve module reliability and conversion efficiency



High output, up to 17.25% module conversion efficiency



Certified with 1500V DC IEC standard  
50% more strings and fewer components enable lower BOS costs



Anti-soiling surface reduces power loss from dirt and dust



Outstanding performance in low-light irradiance environments



Excellent mechanical load resistance: Certified to withstand high wind loads (2400Pa) and heavy snow loads (5400Pa)



Strong salt and ammonia resistance certified by TÜV NORD

## Reliable Quality

- Positive power tolerance: 0~+5W
- Modules binned by current to improve system performance
- Potential Induced Degradation (PID) Resistant in accordance to IEC62804

## Comprehensive Certificates

- IEC 61215, IEC 61730, UL1703, CEC Listed, MCS and CE
- ISO 9001: 2008: Quality management systems
- ISO 14001: 2004: Environmental management systems
- BS OHSAS 18001: 2007: Occupational health and safety management systems
- Environmental policy: The first solar company in China to complete Intertek's carbon footprint evaluation program and receive green leaf mark verification for our products



Specifications subject to technical changes and tests. JA Solar reserves the right of final interpretation.

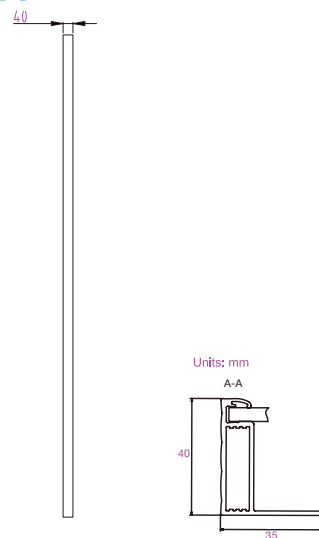
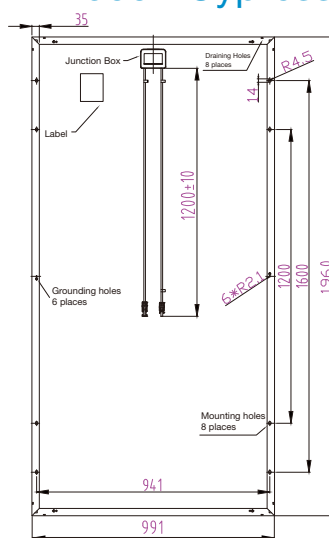
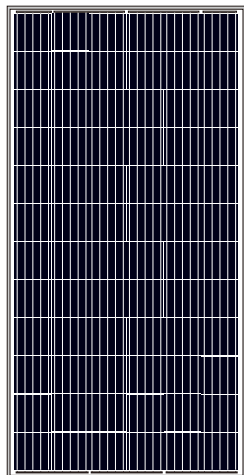
# JAP72S01

315-335/SC

1500V Cypress Series

JA SOLAR

## MECHANICAL DIAGRAMS



■ customized cable length available upon request

## SPECIFICATIONS

Cell	Poly 156.75×156.75mm
Weight	22.5kg±3%
Dimensions	1960×991×40mm
Cable Cross Section Size	4mm <sup>2</sup>
No. of Cells	72 (6×12)
Junction Box	IP67, 3 diodes
Connector	PV-ZH202B
Packaging Configuration	27 Per Pallet

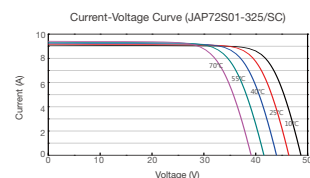
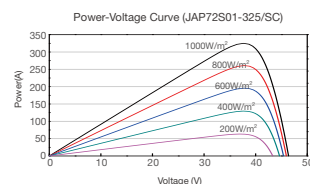
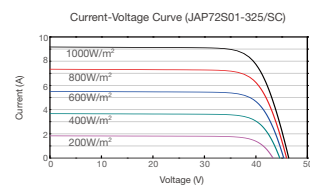
## OPERATING CONDITIONS

Maximum System Voltage	1500V DC (IEC)
Operating Temperature	-40°C ~ +85°C
Maximum Series Fuse	20A
Maximum Static Load, Front Maximum Static Load, Back	5400Pa 2400Pa
NOCT	45±2°C
Application Class	Class A

## ELECTRICAL PARAMETERS AT STC

TYPE	JAP72S01 -315/SC	JAP72S01 -320/SC	JAP72S01 -325/SC	JAP72S01 -330/SC	JAP72S01 -335/SC
Rated Maximum Power (P <sub>max</sub> ) [W]	315	320	325	330	335
Open Circuit Voltage (V <sub>oc</sub> ) [V]	45.85	46.12	46.38	46.40	46.70
Maximum Power Voltage (V <sub>mp</sub> ) [V]	37.09	37.28	37.39	37.65	37.83
Short Circuit Current (I <sub>sc</sub> ) [A]	9.01	9.09	9.17	9.28	9.35
Maximum Power Current (I <sub>mp</sub> ) [A]	8.49	8.58	8.69	8.77	8.87
Module Efficiency [%]	16.22	16.47	16.73	16.99	17.25
Power Tolerance	-0~+5W				
Temperature Coefficient of I <sub>sc</sub> (α <sub>Isc</sub> )	+0.058%/°C				
Temperature Coefficient of V <sub>oc</sub> (β <sub>Voc</sub> )	-0.330%/°C				
Temperature Coefficient of P <sub>max</sub> (γ <sub>Pmp</sub> )	-0.410%/°C				
STC	Irradiance 1000W/m <sup>2</sup> , cell temperature 25°C, AM1.5G				

## CHARACTERISTICS



## ELECTRICAL PARAMETERS AT NOCT

TYPE	JAP72S01 -315/SC	JAP72S01 -320/SC	JAP72S01 -325/SC	JAP72S01 -330/SC	JAP72S01 -335/SC
Max Power (P <sub>max</sub> ) [W]	233	237	241	244	248
Open Circuit Voltage (V <sub>oc</sub> ) [V]	42.84	43.04	43.24	43.41	43.63
Max Power Voltage (V <sub>mp</sub> ) [V]	34.45	34.64	34.82	35.03	35.21
Short Circuit Current (I <sub>sc</sub> ) [A]	7.23	7.29	7.35	7.40	7.46
Max Power Current (I <sub>mp</sub> ) [A]	6.77	6.84	6.91	6.97	7.04
NOCT	Irradiance 800W/m <sup>2</sup> , ambient temperature 20°C, wind speed 1m/s, AM 1.5G				

Electrical data in this catalog do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.



## Appendix E. Landscape and Visual Impact Assessment





# **Stirling North Solar Storage Project**

Pangea Energy Pty Ltd

## **Landscape and Visual Impact Assessment**

IW142200 | Rev 0

27 July 2017



## Tailem Bend Solar Project

Project No: IW142200  
Document Title: Landscape and Visual Impact Assessment  
Revision: Rev 0  
Date: 2 December 2017  
Client Name: Pangea Energy Pty Ltd  
Project Manager: Nick Bull  
Author: Chris Gosling, Kelly Briton-Jones

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### Document history and status

Revision	Date	Description	By	Review	Approved
A	15/12/2016	Un-reviewed draft issued for information	CG	Kelly Briton-Jones	NJB
B	20/07/2017	Draft for internal review	KBJ	Lara Daddow	NJB
C	27/7/2017	Draft for Pangea review	KBJ	Leo Chiang Lin	NJB
0	20/12/2017	Final for Development Application	NJB		

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## **Important note about your report**

The sole purpose of this report and the associated services performed by Jacobs is to prepare an assessment of landscape and visual change in accordance with the scope of services set out in the contract between Jacobs and Pangea Energy Pty Ltd (here after referred to as Pangea). That scope of services, as described in this report, was developed with Pangea.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by Pangea and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from Pangea (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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It should be noted that this assessment did not incorporate the preparation of photomontages or other digital representations. The degree of visual change was determined based on an analysis of viewpoints from publically accessible key receptors and vantage points of the proposed additional visual elements, and an on-site analysis of the surrounding landscape and its capacity to absorb additional visual elements. The assessment of visual change is highly subjective and the individual consideration of visual change from a given receptor may differ from the findings presented in this report.

## Executive Summary

A landscape and visual impact assessment was undertaken for the proposed Stirling North Solar Storage Project (SNSSP) located at Lot 350 Paltridge Avenue, Stirling North (the Subject Site). The Subject Site is vacant, with no structures present. Several access tracks are located throughout the property providing access throughout the Subject Site. The Subject Site is largely flat, with a small ridgeline running north-south through the site and a slightly increased elevation in the north-eastern corner of the site. Low vegetation extends across much of the site, with larger vegetation present on the ridgeline and the north-eastern corner of the site. The SNSSP will incorporate the implementation of a 50 MW solar photovoltaic farm with a 200 MW energy storage system and ancillary developments on the Subject Site covering a total site of approximately 54.31 hectares.

The landscape and visual impact assessment considered the degree of visual change based on the construction and operation of the SNSSP. The degree of visual change was considered from a number of nominated viewpoints, with the outcomes of the assessment determined based on the distance of the viewpoint to the Subject Site, the level of disturbance and quality of the existing landscape, and the number of receptors expected to experience the viewpoint.

The region surrounding the Subject Site is characterised by rural living, industrial land uses and pastoral activity in a largely flat to gently undulating landscape. Residential areas are concentrated within the townships of Stirling North and Port Augusta. Infrastructure development including high voltage transmission lines, substations and telecommunications facilities are scattered throughout the landscape. As a result of historical agricultural activity, native vegetation coverage is largely confined to road reserves and designated conservation parks.

The Subject Site is relatively flat and boarded by the Port Augusta - Quorn (Pichi Richi Railway) and Coonamia – Port Augusta railway on northern and the Leigh Creek railway on the eastern side, with vacant industrial zoned land to the south and west. Various forms of infrastructure are already present within the area surrounding the Subject Site, including unsealed roads, transmission / distribution lines and a railway line.

The key receptors within the region identified as most likely to be affected by the establishment of the SNSSP were identified as the surrounding rural residential properties, users of the major roads in the surrounding area; specifically, the Augusta Highway and the Flinders Ranges Way, nearby townships including Stirling North and Port Augusta, and visitors to the Pichi Richi Railway.

The Project is not anticipated to significantly alter the landscape or visual amenity within the study area. Intervening topography and vegetation will largely screen views of the Project from key receptors and highly exposed locations (i.e. areas that are highly frequented). The greatest level of change is expected to be experienced by residents at the north-western portion of Stirling North that have clear views west towards the Subject Site. Where visible, the Project solar farm components which cover the bulk of the Subject Site will appear as a low profile, contiguous element extending across the Subject Site, and is not expected to be visually dominant.

The Zone of Theoretical Visual Influence (ZTVI) identified that views of the Project from Stirling North and Port Augusta are largely screened from view by intervening topography. Further analysis indicated that existing vegetation will almost completely screen the Project from view at these locations. Sporadic views of the Project will be available through breaks in the topography and vegetation. The ZTVI also identified areas on the opposite side of the Spencer Gulf, and elevated regions towards the Flinders Ranges offering views towards the Project. Given the distance from these locations to the Subject Site and the low profile nature of the Project and surrounding existing infrastructure the SNSSP is expected to readily blend into the horizon and will not represent a dominant visual element within the landscape.

Overall, the Project is not anticipated to be a significant visual element in the study area. It has been determined that the Project is largely screened from view by intervening topography, vegetation and / or structures when viewed from the identified key receptors. Views of the project are typically restricted to passing motorists, and nearby rural residential dwellings. The implementation of the identified management measures will further reduce the degree of visual change associated with the Project.

## 1. Introduction

Pangea Energy Pty Ltd (Pangea) intend to develop the SNSSP (the Project) approximately 3 km east of Port Augusta, on a property commonly known as Lot 350 Paltridge Avenue, Stirling North (CT5352/55). The SNSSP will incorporate the implementation of a 50 MW solar photovoltaic farm with a 300 MWh energy storage system and ancillary developments on the Subject Site covering a total site of approximately 54.31 hectares. Infrastructure required on site will include solar panels, inverter stations, battery storage containers, a control room and site office, and internal access tracks for maintenance vehicles.

The Subject Site (Lot 350 Paltridge Avenue Stirling North) is currently vacant. The Subject Site is relatively flat and largely surrounded by vacant shrubland. Various forms of infrastructure are already present within the area surrounding the Subject Site, including unsealed roads, transmission / distribution lines and a number of railway lines to the north and east.

This report has been prepared to support a Development Application for the Project and provides an overview of the existing environment relevant to visual amenity in the area of the Project based on the existing scenic quality, sensitivity of the landscape to change, degree of visual exposure and degree of visual change as a result of the proposed development.

Establishment of the Project has the potential to result in change to the existing rural character and amenity of the locality. The scale of change to existing environmental and amenity values is discussed and, where relevant, management and / or mitigation measures that would minimise the degree of visual change are identified.

This assessment of change to landscape and visual amenity did not incorporate the preparation of photomontages or other digital representations. The degree of visual change was determined based on an analysis of viewpoints from publically accessible key receptors and vantage points of the proposed additional visual elements, and an on-site analysis of the surrounding landscape and its capacity to absorb additional visual elements. It should be noted that assessment of visual change is highly subjective and the individual consideration of visual change from a given receptor may differ from the findings presented in this report.

### 1.1 Stirling North Solar Storage Project

The SNSSP will incorporate the implementation of a 50 MW solar photovoltaic farm with a 300 MWh energy storage system with a truck bay for the dispatch of energy storage systems (ESS), control room and administration office with landscaping and associated carparking, solar panels, inverter stations and security fencing covering a total site of approximately 54.31 hectares. The preliminary layout of the Project is provided in **Error! Reference source not found..**

The solar panels will be ground mounted on fixed angled racks facing north with tilt angle of 18 degrees from horizontal. The typical height of the bottom of the solar modules will be 0.6 m above ground and maximum height of solar modules is 2.0 m above ground. Inverter stations will have a typical maximum height of 2.130 m above ground. The proposed control room and site office will be a three (3) storey building with heights under 9.0 m.

The final dimensions and number of inverter stations and solar panels will be determined at the time of final design after the selection of the chosen technology.

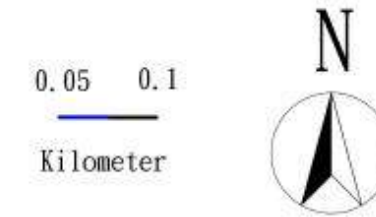
The proposed battery storage area is expected to include a combination of solid structures (generally similar in size to shipping containers) and a range of cables and overhead conductors. The specific height of structures within the battery storage area is yet to be determined, but is expected to not exceed 2.13 m in height.

Most of the off-peak electricity generated will be stored in the vanadium batteries for future discharge, contributing to increased grid-system integrity, and preventing load shedding events. During periods of low solar energy, the vanadium redox flow battery system will draw from the grid during off-peak periods.

Electricity generated will mostly be for wholesale trade in the National Electricity Market.

It is proposed that construction will begin in Q1 of 2018 and completion in Q4 of 2019.

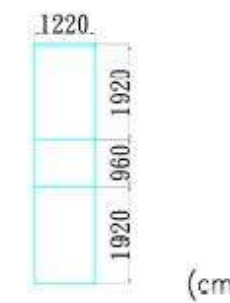
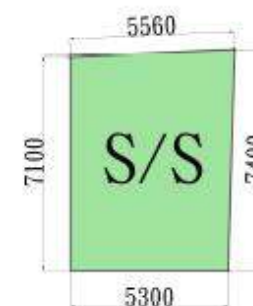
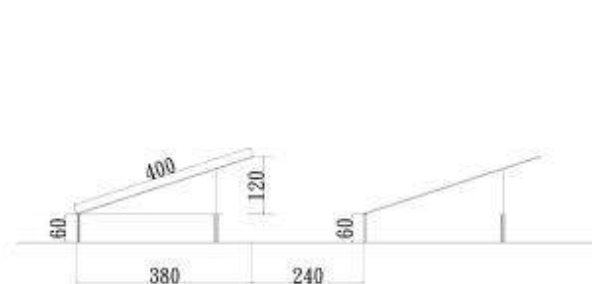
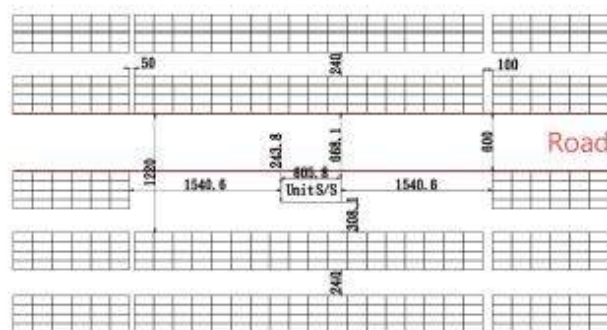




- Proposed Site Access
- ESS Power Station
- S/S Facility Substation & Diesel Power Station
- Detention Pond

CO-ORDINATES

CORNER	LATITUDE	LONGITUDE
1	-32°30' 08.96"	137°48' 56.60"
2	-32°30' 07.12"	137°49' 26.57"
3	-32°30' 30.62"	137°49' 26.46"
4	-32°30' 30.55"	137°48' 56.50"



V1.0					
版次 REV.	日期 DATE	摘要 DESCRIPTION	设计 DGN	校核 CHK	审核 APR
客户: CLIENT: 盘古能源股份有限公司 PANGEA Energy PTY LTD.					
建造: CONSTRUCTION:					
设计: DESIGN: 创信心工程顾问股份有限公司 VICS Engineering Consultant Co., LTD.					
工程名称 PROJECT	SA- PV ESS System				
细项名称 ITEM NO.	Basic Design				
图名 DWG. TITLE	Site Layout (Draft)				
图号 DWG. NO.	PV-XX-001				版本 REV.

Figure 1-1 Preliminary Project Layout

## 2. Assessment Method

A landscape and visual impact assessment (LVIA) was completed for the Project. The LVIA assesses the likely effect of the Project on landscape and visual amenity, considering the sensitivity of the landscape to change, the presence of publically accessible locations, vantage points and key tourist viewing areas, and identified mitigation measures to reduce the overall visual change.

No specific guidelines relating to the assessment of landscape and visual impacts in South Australia are available. As a result, the method for this LVIA was developed with reference, where appropriate, to the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute & I.E.M.A 2013) and Visual Landscape Planning in Western Australia (Department for Planning and Infrastructure, 2007). Previous investigations into landscape quality in the Flinders Ranges (Lothian 2009), and more broadly in South Australia (Lothian 2000) have been undertaken and are referenced where appropriate in this assessment.

In addition, the relevant Development Plan (Port Augusta) outlines a broad range of policy relevant to the design and appearance of the Project. In particular, the Development Plan identifies that infrastructure development should:

- Be of a high architectural standard.
- Be sited and designed to blend with the natural features of the landscape.
- Protect areas of scenic or conservation significance from undue damage.
- Cause minimal damage to the natural landform.
- Screen and orientate infrastructure away from public view, tourist and scenic routes.

The guidelines used form the basis of this assessment and are considered representative of standard industry practice. The LVIA was completed in a four step assessment process:

- Desktop study
- Site visit and photography
- Landscape context analysis
- Assessment of visual change

Each of the four step LVIA assessment methodology is discussed in the following sections.

### 2.1 Desktop Study

A desktop study was undertaken to determine the most visually prominent components of the Project and determine a suitable study area for assessment. To define the LVIA study area, a zone of theoretical visual influence (ZTVI) was established. The ZTVI establishes the areas from which the Project is theoretically visible based on the height of project elements and the regional topography. The ZTVI does not take into account the presence of other intervening elements (e.g. vegetation or structures) that may obscure views to the Project; therefore it provided a conservative indication of the visibility of the Project.

The ZTVI study area was defined based on the region within which a modification to the landscape will be easily discernible to the naked eye. At distances where landscape modifications blend into the background, the visual change will be negligible and these areas were therefore not considered. Given that the maximum height of the panels associated with the Project is approximately 2 m when mounted, a maximum distance of 10 km was utilised for the furthest extent of the ZTVI. This distance is considered to be conservative, as the maximum distance visible in a flat landscape (as is typical in the study area) is approximately 5 km. Other elements of the project will be greater in height (e.g. transmission connection, control room and site office), however it is expected that these elements will have a limited visual impact in comparison to the land area coverage of solar modules. The study area for the Project is depicted in Figure 2-1.

The desktop study also identified locations that may be more sensitive to visual change, including elevated scenic lookouts, public recreation areas, state and national parks, townships, major thoroughfares and tourist sites.

## **2.2 Site Visit and Photography**

A site visit was completed 8 December 2016 to photograph and document the study area. A number of locations surrounding the Project (viewpoints) were selected for analysis to provide a representative assessment of visual change at publically accessible locations in terms of distance and direction.

Photographs and an analysis of the landscape gathered during the site visit formed the primary basis for the LVIA. Panoramas have been presented for each of the viewpoints to simulate the wider horizontal field of view that a person typically experiences, as opposed to what is represented in a single photograph. In all cases, the LVIA has been based on site observations – photos and field notes served as a record only.

## **2.3 Landscape Context Analysis**

The capacity of the landscape to absorb additional visual elements was considered with reference to geology, landform and vegetation coverage. This analysis was undertaken to gain an understanding of elements available to restrict line of sight to the Project, as well as the existing level of visual amenity.

The study area was categorised into landscape types based on the visual absorption capacity, land use, topography and level of existing visual amenity. Landscape categories were grouped together with other areas displaying similar visual characteristics and similarly sensitive to the introduction of alternate visual elements. The landscape types are described in Section 3.3.



<ul style="list-style-type: none"> <li>■ Locality</li> <li>■ Proposed Solar Farm</li> <li>○ LVIA Study Area Limit</li> <li>■ Zone of Theoretical Visual Influence (ZTVI)</li> </ul>	<ul style="list-style-type: none"> <li>— Highway</li> <li>— Road</li> <li>— Rail</li> </ul>	<p>Jacobs does not warrant that this document is definitive nor free of error and does not accept liability for any loss caused or arising from reliance upon information provided herein.</p> <p>GDA 1994   Transverse Mercator A4 1:120,000</p> <p>0 2 4 Kilometres</p>	
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Figure 2-1 LVIA Study Area

## 2.4 Impact Assessment

Changes to landscape and visual amenity were assessed at each of the nominated viewpoints surrounding the Project. Visual change was assessed based on three key criteria, each of which were assigned a value of 'high', 'medium', or 'low' to form a rating of overall visual change. The three key criteria and value rankings are:

- **Distance:** the distance of a viewpoint from an introduced visual element.
  - High: where the proposed development would be a highly dominant element in the view
  - Medium: where the proposed development would be a moderately dominant element in the view
  - Low: where the proposed development would be difficult to discern as it is in the far distance
- **Sensitivity:** the existing level of visual amenity at the viewpoint, in relation to the ability to absorb the visual changes of the proposed infrastructure. Generally, a highly modified landscape with many artificial elements will have low sensitivity and therefore a greater visual absorption capacity when compared to a natural landscape:
  - High: relatively undisturbed, naturalistic landscapes of high visual amenity
  - Medium: moderately disturbed landscape, displaying remnant natural features and limited introduction of artificial elements with medium visual amenity
  - Low: highly modified or disturbed landscapes with low visual amenity

It should be noted that sensitivity of a landscape to change is highly subjective, and the level of visual change on a given landscape will vary between viewers.

- **Exposure:** the degree of visual exposure relates to the comparative number of people that are likely to experience the change of visual qualities of the landscape brought about by the construction and operation of the Project Infrastructure:
  - High: public areas which experience a high degree of visitation, including populated areas. Public locations with high exposure include areas such as major roads, parks and recreation reserves, scenic lookouts and townships. High sensitivity is generally assigned to locations with the express purpose of observing and appreciating the landscape
  - Medium: public areas which experience a lower degree of visitation and are not necessarily utilised for the express purpose of appreciating the landscape. Includes secondary roads / areas such as Kulde Road and Jervios Road
  - Low: infrequently visited locations which are separated from populated areas and major thoroughfares, including local roads

Based on the distance, sensitivity and exposure ratings assigned to each viewpoint, an overall visual change is determined. The overall rating is determined on a case-by-case basis taking into consideration the individual criteria and site specific conditions at the viewpoint. Typically, viewpoints that are highly exposed or highly sensitive experience a greater level of change. The degree of visual change tends to decrease with distance as visual elements blend into the horizon and the surrounding landscape. Site specific conditions that may influence overall visual change include the presence of intervening vegetation (which may reduce the level of change) or the presence of unique landscape features (which may increase the level of change). The scale of visual change at each viewpoint is considered as follows:

- High: a significant and detrimental change to the landscape characteristics and visual amenity
- Medium: a moderate detrimental change to the landscape characteristics and visual amenity
- Low: a minor detrimental change that is noticeable, however would not result in a substantial change to the visual characteristics of the landscape
- Negligible: the level of visual change would be virtually unnoticeable
- Nil: the development would not be visible, therefore would not have a visual change

A summary of the criteria utilised to determine the degree of visual change is presented in Table 2-1.

**Table 2-1 Summary of Visual Impact Assessment Criteria**

Rating	Rating Criteria			
	Distance	Sensitivity	Exposure	Degree of Change
<b>High</b>	The Project is a highly dominant element in the view	Relatively undisturbed, naturalistic landscapes of high visual amenity	Public areas that experience a high degree of visitation, including populated areas	A significant and detrimental change to the landscape characteristics and visual amenity
<b>Medium</b>	The Project is a moderately dominant element in the view	Moderately disturbed landscape, some remnant natural features and limited introduction of artificial elements	Public areas that experience a lower degree of visitation and are not utilised for the express purpose of appreciating the landscape	A moderate detrimental change to the landscape characteristics and visual amenity
<b>Low</b>	The Project would be difficult to discern as it is in the far distance	Highly modified or disturbed landscape	Infrequently visited locations which are separated from populated areas and major thoroughfares	A minor detrimental change that is noticeable, but would not result in a substantial change to the landscape
<b>Negligible</b>	-	-	-	The level of visual change would be virtually unnoticeable
<b>Nil</b>	-	-	-	The development would not be visible

### 3. Existing Environment

The following section provides an overview of the existing environment within the study area in relation to visual amenity. Topography, vegetation coverage and landscape types are discussed, as well as identified receptors sensitive to the introduction of new visual elements.

#### 3.1 Topography

The landscape east of Port Augusta, and the proposed location of the Project is typically flat, with elevations ranging from 10 to 30 m AHD. To the east of the Subject Site is a north-south running ridgeline comprising Mount Brown Conservation Park which is within the southern Flinders Ranges (refer Plate 3-1). The ridgeline is approximately 17 km north-east of the Subject Site, with the summit at an altitude of 970 m, only accessible via a 12 km round trip hike.

The largely flat pastoral landscape extends to the north, south, and west of the Subject Site (Plate 3-2 and Plate 3-3). This landscape comprises a series of ephemeral watercourses and water bodies that are subject to occasional flooding. The flat to gently undulating nature of the terrain across much of the LVIA study area permits clear views across the landscape from most locations. In landscapes such as this, constructed features have the potential to be seen from a broader area as compared with hilly country, where views of particular features have greater potential to be constrained by intervening terrain.

The presence of north-south ridgelines (the southern Flinders Ranges) within an otherwise flat landscape offers the chance to take in panoramic views of the surrounding landscape. It is from locations such as this that visual impact is potentially greatest, if high exposure occurs, as compared with views from lower elevations. This ridgeline also forms a barrier to extended views of the Subject Site, restricting visibility from receptors east of the ridgeline.

The topography of the LVIA study area is depicted in Figure 3-1.



Plate 3-1 Southern Flinders Ranges



**Plate 3-2 Landscape - Tilling Road**



**Plate 3-3 Landscape – Footner Street, Stirling North**



### 3.2 Vegetation

The landscape east of Port Augusta primarily consists of low to mid-height shrubland, open grasslands, or low, open eucalypt woodland. The landscape has been subject to disturbance since its occupation including agricultural activities (grazing) and urban development, resulting in minimal vegetation coverage at the Subject Site.

Within the nearby Mount Brown Conservation Park (17 km east of the Subject Site), significant remnant vegetation remains, including low open scrub, steep hills with an open woodland cover and grassland areas (Department for Environment, Heritage and Aboriginal Affairs 1999).

In conjunction with topographic variation, vegetation has the greatest capacity to constrain views toward the Project in a rural landscape. Low, open vegetation, particularly within pastoral areas, has less capacity to constrain views toward the proposed development as it mainly consists of low shrubs and grasses. Conversely, where it occurs, dense stands of taller vegetation are high enough to inhibit views of the constructed elements (Plate 3-4). It is noted however, that there are limited locations where dense vegetation suitable to constrain views across the landscape occur. Vegetation coverage in the study area based on high level Department of Environment Water and Natural Resources data at a scale of 1:120,000 and therefore only provides an indication of vegetation cover and does not provide an indication of density or quality of native vegetation. A broad overview of the vegetation coverage is presented in Figure 3-2. A separate ecological site assessment has been conducted to support a development application for the Project.



Plate 3-4 Roadside Vegetation – Railway Station Road, Stirling North

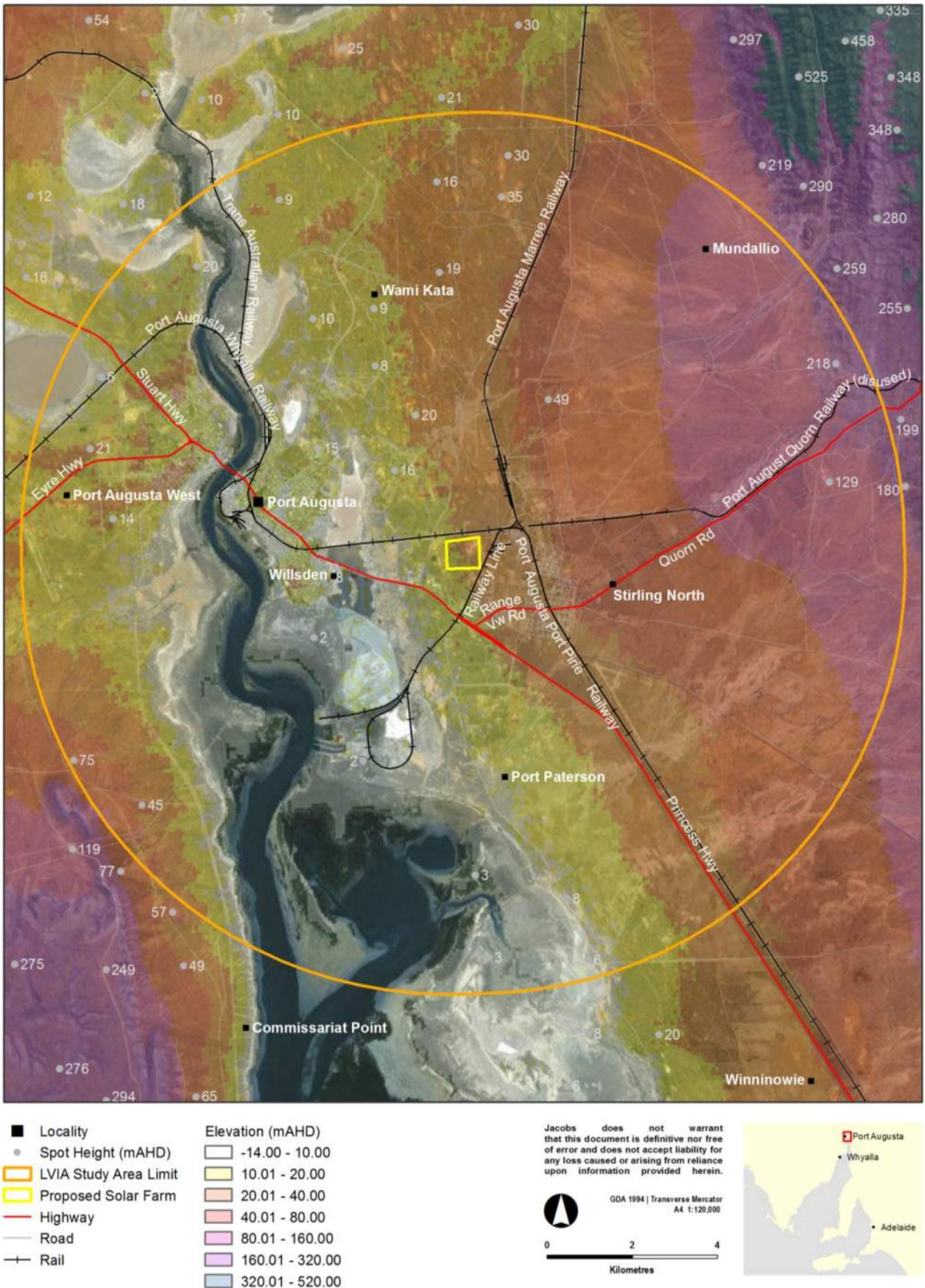


Figure 3-1 Topography



Figure 3-2 Vegetation Coverage

### 3.3 Landscape Types

Three key landscape types were identified within the LVIA study area, namely:

- Pastoral / Agricultural
- Parks and Reserves
- Townships

Landscape types were collated according to areas with similar visual characteristics in terms of vegetation cover, landform, amenity value, level of modification and unique site characteristics. Each landscape type has an associated level of sensitivity to the construction and operation of the Project. A summary of the landscape types within the study area and their associated sensitivity to visual modification is provided in Table 3-1.

**Table 3-1 Summary of Landscape Types**

Landscape Type	Description	Sensitivity to Change
Pastoral / Agricultural	The most prevalent landscape type within the LVIA study area. Relatively flat pastoral land consisting of low vegetation. Low exposure with limited visitation and few constructed elements. The constructed elements present within this landscape are typically electricity infrastructure (transmission lines) or structures associated with historical pastoral activities. The pastoral landscape within the study area is not unique, and is consistent with much of the landscape surrounding Port Augusta.	Low to Medium (depending on the quality and extent of vegetation coverage and the extent of disturbance to the existing landscape)
Parks and Reserves	Areas of high landscape (experiential) as well as visual (scenic) value. May include recreational parks and reserves with hiking trails, conservation parks and scenic lookouts.  Generally, vegetation in these areas is dense and, with very few modifications made to the landscape. Access into and within this landscape is usually limited to minor roads and access tracks.	Medium to High (depending on topographical diversity, the level of utilisation and the availability of views toward the Project)
Township	Comprising areas of settlement (e.g. Port Augusta and Stirling North), with a relatively higher number of viewers. Typically sensitive to visual changes in surroundings.	Medium to High due to the increased number of potential receptors. Views within a township are generally restricted by buildings, infrastructure and vegetation to act as a visual barrier between a particular vantage point and the Subject Site.

The extent and location of landscape types are depicted in Figure 3-3, and a representative image of each landscape type is presented in Plate 3-2 and Plate 3-3 (pastoral / agricultural), Plate 3-1 (parks and reserves) and Plate 3-5 (township).



Plate 3-5 Township Landscape Type (Port Augusta)



Figure 3-3 Landscape Types

### 3.4 Key Receptors

Key receptors are localities and travelling routes within the study area that are more highly frequented by people and hence have greater potential to be visually impacted by the Project as compared with less frequented areas. The inclusion of viewpoint analysis locations from key receptors assists with the completeness of the assessment by covering the areas with the greatest risk of impact. The following section provides an overview of key receptors within the study area including roads, parks, reserves, townships and tourist sites.

#### 3.4.1 Major Roads

The Flinders Ranges Way links Quorn and Port Augusta, extending from the Augusta Highway through the southern Flinders Ranges. The western portion of the Flinders Ranges Way (i.e. closest to the Subject Site) supports an average of 5100 vehicle movements per day (DPTI 2015).

The Augusta Highway connects Adelaide to Port Augusta, extending south from the Subject Site. The Augusta Highway supports an average of 8200 vehicle movements per day (DPTI 2015).

#### 3.4.2 Parks and Reserves

As previously outlined, the Mount Brown Conservation Park is located approximately 17 km east of the Subject Site, within the southern Flinders Ranges. Significant remnant native vegetation remains within the Conservation Park, including low open scrub, steep hills with an open woodland cover and grassland areas (Department for Environment, Heritage and Aboriginal Affairs 1999). Mount Brown Conservation Park is mainly utilised for conservation purposes rather than recreation, however several walking trails and picnic spots are located within the Park.

#### 3.4.3 Townships

Port Augusta the principal township identified within the LVIA study area. It is located approximately 10 km south of the Subject Site at the top of the Spencer Gulf. Port Augusta is a major regional township, with a population of 13,504 (ABS 2011).

Stirling North is located adjacent to the Subject Site and is primarily a satellite town to Port Augusta, offering limited facilities with a population of 1,940 persons (ABS 2011a)

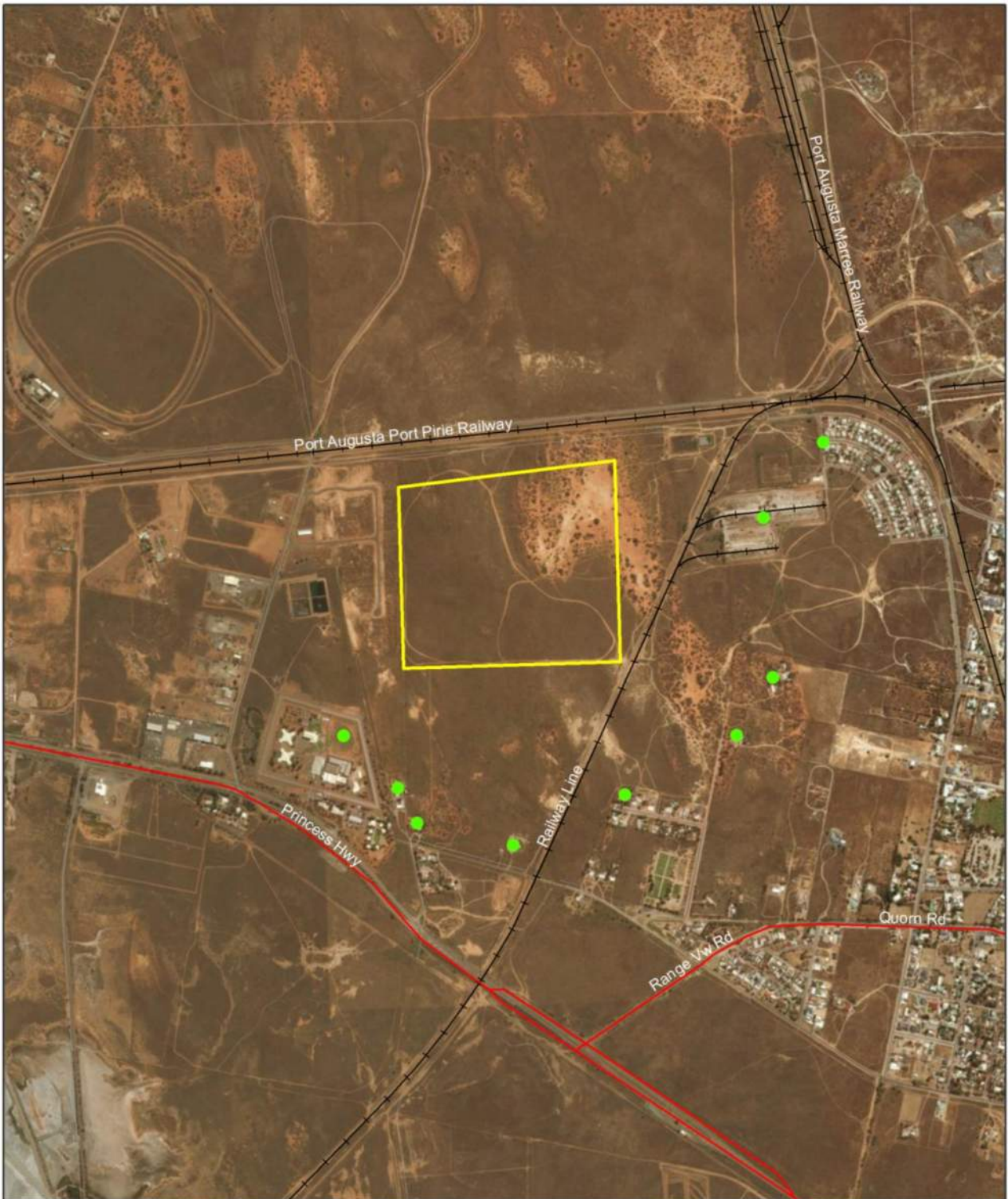
#### 3.4.4 Tourist Sites

Two tourist sites were identified within the LVIA study area; the Pichi Richi Railway and the Australian Arid Lands Botanic Gardens. The Pichi Richi Railway runs between Port Augusta and Quorn, predominately parallel to the Flinders Ranges Way. The Pichi Richi Railway operates a restored steam or heritage diesel train on select dates between March and November each year. The Australian Arid Lands Botanic Gardens is located on the Stuart Highway adjacent to Port Augusta and showcases a range of arid zone habitats over an area of more than 250 ha.

#### 3.4.5 Residential Dwellings

Scattered rural residential dwellings are present around the Subject Site, and the closest dwellings are depicted in Figure 3-4 with the closest rural dwelling is approximately 500m south of the Subject Site. Although the number of viewers at residential dwellings is lower in comparison to publically accessible locations, elements of the Project visible from private property are likely to represent a greater impact in comparison to elements visible from public roads only visible to passing motorists.

Views of the Project from private property are considered long term impacts as they are visible every day, as opposed to short term impacts experienced in public locations which are only experienced for the duration that a receptor is visiting that location.



- Locality
- Sensitive Receptor
- ▭ Proposed Solar Farm
- Highway
- Road
- +— Rail

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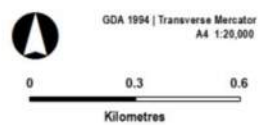


Figure 3-4 Residential Dwellings



## 4. Visual Assessment

Activities undertaken during construction and operation of the Project will result in changes to the landscape and visual amenity of the study area. These changes to the visual environment will occur as a result of:

- Removal of vegetation
- Earthworks, soil disturbance and stockpiling
- Development of buildings and infrastructure in areas where they do not currently exist
- Increase in the number of people, vehicles and machinery

### 4.1 Construction Phase

During the construction phase, the change to visual amenity within the study area will occur as a result of earthworks, construction of additional infrastructure and an overall increase in the number of people and vehicles. The changing visual environment and activity during construction will be temporary, therefore is not considered in detail in the visual assessment.

### 4.2 Operation Phase

Viewpoint locations utilised for the purposes of the LVIA are summarised and presented spatially in Figure 4-1. The viewpoints have been selected to be representative of the degree of change from each of the landscape types identified in Section 3.3 and the key receptors identified in Section 3.4. An analysis of each viewpoint was undertaken in accordance with the methodology outlined in Section 2; distance, sensitivity and exposure.

In total, ten viewpoints were assessed, with the outcomes of the viewpoint assessment presented below.

Changes to the visual environment from residential dwellings were also considered, and viewpoints were selected to align with the approximate locations of the nearest dwellings. The Project will represent a significant visual change for properties immediately surrounding the Subject Site. Dwellings further away from the Subject Site are less likely to be impacted by visual alterations, as visibility is reduced as a result of intervening topography and vegetation.

#### 4.2.1 Glare Impacts

Solar panels are designed to absorb sunlight, not reflect and are coated with a layer of anti-reflective material that allows the sunlight to pass through, but minimizes reflection. The operation of solar technology requires minimal glare, as reflected light is contradictory to efficient generation of electricity. Despite this, a small proportion of light (approximately 2%) is reflected from the panels and as a result this LVIA has focussed on the impact of the solar panels that will make up the bulk of the site coverage.

#### 4.2.2 Lighting Impacts

Low-level night time lighting is proposed for safety and security purposes. The proposed lighting incorporates infra-red technology that results in minimal light spill beyond the boundaries of the Subject Site. As such, night time lighting impacts are expected to be minimal.

Viewpoints



IW142200 Stirling North Solar Project

Figure 4-1 LVIA Viewpoints

**Viewpoint 1: Footner Road, near the intersection of Augusta Highway**

**EXISTING VIEW**



<b>Location</b>	Footner Road, near the Intersection of the Augusta Highway Latitude: 32; 30; 41, Longitude: 137; 48; 32	
<b>View Direction</b>	North-east	
<b>Landscape Type(s)</b>	Pastoral, Township	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 720 m
<b>Sensitivity</b>	<b>Low</b>	Numerous signs of disturbance including the Port Augusta Prison in for foreground, and various industrial uses located along the length of Footner Road. Planted vegetation is present east of Footner Road, providing a visual screen to the Prison.
<b>Exposure</b>	<b>High</b>	The viewpoint is located adjacent to the Augusta Highway, and is representative of the landscape viewed by approximately 8200 motorists per day (DPTI 2015). Footner Road forms part of the heavy vehicle bypass to Port Augusta.



**Viewpoint 1: Footner Road, near the intersection of Augusta Highway**

<b>Description</b>	The viewpoint encompasses an industrial type landscape characteristic of the built form adjacent to the Augusta Highway at the fringe of Port Augusta. Scattered low to medium height vegetation is observable in the foreground, providing partial screening of the Port Augusta Prison, with the Prison visible between gaps in the vegetation. The southern Flinders Ranges are visible on the horizon to the north-east.	
<b>Comments</b>	The Project will be largely screened from view at this location as a result of intervening vegetation, and a small ridgeline adjacent to Footner Road. Intermittent views to the Project are expected in gaps between the vegetation. Where visible, the Project will represent a uniform, low profile element extending across the Subject Site that is not anticipated to represent a dominant visual element.	
<b>Visual Change</b>	<b>Negligible</b>	Although this viewpoint is highly frequented it provides only intermittent views toward the Project, largely restricted by intervening topography and vegetation. Views from this location are primarily experienced by passing vehicles on the Augusta Highway, visible out the window when passing by at 110 km/hr. When visible through gaps in vegetation, the Project will appear as a uniform, low profile element extending across the subject site. The presence of industrial activity along the length of Footner Road, electricity infrastructure within the road reserve, and the adjacent Port Augusta Prison moderates the degree of visual change to the existing landscape proposed by the Project.

**Viewpoint 2: Footner Road, near the intersection of Racecourse Road**

**EXISTING VIEW**



<b>Location</b>	Footner Road, near the intersection of Racecourse Road Latitude: 32; 30; 6, Longitude: 137; 48; 45	
<b>View Direction</b>	South-east	
<b>Landscape Type(s)</b>	Pastoral	
<b>Distance to Subject Site</b>	<b>Medium</b>	Approximately 320 m
<b>Sensitivity</b>	<b>Low</b>	Low level vegetation coverage typical of a pastoral landscape with minimal topographic variation. Numerous signs of disturbance dominated by the presence of existing electricity infrastructure (transmission lines).
<b>Exposure</b>	<b>Low</b>	The viewpoint is located on Footner Road, adjacent to Racecourse Road and forms part of the heavy vehicle bypass to Port Augusta. Viewers at this location are expected to be limited to passing vehicles and persons utilising the businesses and services on Footner Road.



**Viewpoint 2: Footner Road, near the intersection of Racecourse Road**

<p><b>Description</b></p>	<p>The viewpoint encompasses a typical pastoral landscape comprising the Subject Site in the middle distance, and adjoining property in the foreground. Scattered low height vegetation is observable across the landscape. A ridgeline in the middle-distance restricts extended views to the east, with the southern Flinders Ranges running north-south across the horizon. Street lighting associated with the (currently vacant) Flinders Industrial estate is also visible in the foreground and middle distance. The two transmission lines in the foreground are a dominant visual element and extend north and south of this viewpoint.</p>	
<p><b>Comments</b></p>	<p>The Project will be visible from this viewpoint on the western side of the ridgeline passing through in the middle distance. The Project itself will represent a uniform, low profile element extending across the Subject Site that is not anticipated to represent a dominant visual element in comparison to the large vertical elements associated with existing electricity infrastructure that characterises this viewpoint.</p>	
<p><b>Visual Change</b></p>	<p><b>Low</b></p>	<p>The Project will be clearly visible from this viewpoint, however the location is not highly exposed, nor is the location recognised for its scenic amenity or utilised for appreciating the landscape. Views from this location are expected to be primarily experienced by passing vehicles utilising businesses and services on Footner Road. The Project will appear as a uniform, low profile element, partially obscured from view by the north-south running ridgeline present in the centre of the Subject Site. The Project is expected to be significantly less visually dominant than the large scale electricity infrastructure that is currently present. The presence of numerous elements associated with electricity infrastructure moderates the degree of visual change to the existing landscape proposed by the Project.</p>

Viewpoint 3: Footner Street, Stirling North

EXISTING VIEW



<b>Location</b>	Footner Street, near the intersection with Racecourse Road, Stirling North Latitude: 32; 30; 3, Longitude: 137; 49; 55	
<b>View Direction</b>	West, south-west	
<b>Landscape Type(s)</b>	Pastoral, Township	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 750 m
<b>Sensitivity</b>	<b>Medium</b>	Located on the fringe of Stirling North, however the view incorporates low level vegetation coverage typical of a pastoral landscape with minimal topographic variation. Numerous signs of disturbance including transmission line visible in the middle distance.
<b>Exposure</b>	<b>High</b>	The viewpoint is located on the fringe of the Stirling North township and will be experienced by residents on an ongoing basis.



**Viewpoint 3: Footner Street, Stirling North**

<p><b>Description</b></p>	<p>The viewpoint is located at the north-western edge of Stirling North, and primarily encompasses a pastoral landscape. Larger vegetation is observable in the foreground and partially restricts views across the landscape. The Stirling North effluent ponds are immediately west of this location (obscured by a tree in the foreground). A transmission line is visible running north-south in the middle distance, with a railway line extending west from this location toward Port Augusta, and observable on the horizon. Small dunal ridgelines in the foreground and middle distance partially obscure views of the subject site.</p>
<p><b>Comments</b></p>	<p>The Project will be visible from this viewpoint on the eastern side of the ridgeline passing through the subject site in the middle distance. Larger vegetation in the foreground will partially restrict views of the Project. The Project will represent a uniform, low profile element extending across the subject site in the middle distance. The existing transmission line will continue to be visible above the Project, and these large vertical elements are expected to be more visually dominant, extending above the horizon of the landscape.</p>
<p><b>Visual Change</b></p>	<p><b>Medium</b></p> <p>The Project will be readily noticeable from this viewpoint, and will extend across the landscape in the middle distance as a low profile, contiguous element. Views from this location are primarily experienced by residents of Stirling North, and any visual changes will be observed on an ongoing basis. Existing large vegetation and minor topographic variation will provide partial screening of the Project. Visual changes are further moderated by the presence of existing infrastructure visible at this location including the effluent ponds, transmission line and railway line. Nevertheless, the Project represents a noticeable visual alteration to the existing landscape for local residents.</p>

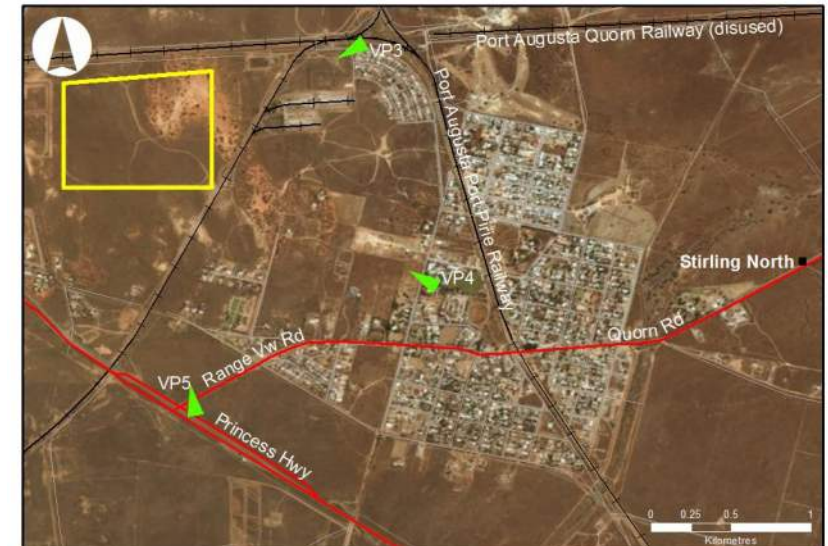


**Viewpoint 4: Railway Station Road, Stirling North Primary School**

**EXISTING VIEW**



<b>Location</b>	Railway Station Road, adjacent to the Stirling North Primary School Latitude: 32; 30; 49, Longitude: 137; 50; 9	
<b>View Direction</b>	North-west	
<b>Landscape Type(s)</b>	Pastoral, Township	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 1.25 km
<b>Sensitivity</b>	<b>Medium</b>	Located within Stirling North, a highly modified landscape with areas largely cleared of vegetation. Where vegetation is visible, highly representative of a typical pastoral landscape. Numerous signs of disturbance including electricity infrastructure and buildings.
<b>Exposure</b>	<b>High</b>	The viewpoint is located on the fringe of the Stirling North township, adjacent to the Stirling North Primary School and will be experienced by residents and students on an ongoing basis.



**Viewpoint 4: Railway Station Road, Stirling North Primary School**

<b>Description</b>	The viewpoint comprises an agricultural landscape with scattered vegetation and several structures. A north-south running ridgeline in the middle distance restrict extended views towards the subject site, with a transmission line visible above the ridgeline and between gaps in the vegetation.	
<b>Comments</b>	The Project will be largely screened by intervening topography and vegetation from this viewpoint. Small elements may be visible between gaps in the vegetation. Given the low profile nature of the Project, any elements visible are not anticipated to be readily discernible.	
<b>Visual Change</b>	<b>Negligible</b>	This viewpoint is highly frequented, and is representative of the view afforded to residents of Stirling North and students at the Primary School. Despite this, the viewpoint provides only intermittent views toward the Project, largely restricted by intervening topography and vegetation. Where visible between gaps in the vegetation, the Project is anticipated to readily blend into the horizon as a result of its low profile nature, dark colour that is comparable to existing vegetation, and the overall distance from the viewpoint. Intervening topography at this location is consistent with the outputs of the ZTVI which indicated that views within this area of Stirling North are largely obscured.

**Viewpoint 5: Flinders Ranges Way, near intersection of Augusta Highway**

**EXISTING VIEW**



<b>Location</b>	Flinders Ranges Way, near intersection of Augusta Highway Latitude: 32; 31; 14, Longitude: 137; 49; 22	
<b>View Direction</b>	North	
<b>Landscape Type(s)</b>	Pastoral	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 1.3 km
<b>Sensitivity</b>	<b>Low</b>	Low level vegetation coverage typical of a pastoral landscape within a highly modified environment. Numerous signs of disturbance including a large transmission line extending north, and buildings associated with the fringe of the Stirling North township.
<b>Exposure</b>	<b>High</b>	High: the viewpoint is located adjacent to Flinders Ranges Way, near the intersection with the Augusta Highway, and is representative of the landscape viewed by approximately 5100 motorists per day (DPTI 2015).



**Viewpoint 5: Flinders Ranges Way, near intersection of Augusta Highway**

<p><b>Description</b></p>	<p>Existing electricity infrastructure is visually dominant from this location, with a series of transmission lines and distribution lines characterising the view. These large vertical elements extend above the horizon and are the prevailing feature observed from the viewpoint. Within the foreground is low vegetation, typical of a pastoral landscape, with larger vegetation and structures associated with Stirling North visible immediately east. As a result of distance, minor topographic variation and intervening vegetation, views toward the subject site are limited.</p>
<p><b>Comments</b></p>	<p>The Project will be largely screened by intervening topography and vegetation from this viewpoint. Where visible, the Project will extend as a low profile, linear element across the horizon. Given the distance to the subject site, the Project is not expected to be readily discernible.</p>
<p><b>Visual Change</b></p>	<p><b>Negligible</b></p> <p>This viewpoint is highly frequented, and is representative of the view afforded to motorists utilising Flinders Ranges Way and residents of Stirling North. However, the viewpoint provides restricted views toward the Project, screened by intervening topography and vegetation as indicated by the ZTVI. Where visible, the project is anticipated to extend as a low profile, linear element along the horizon. Existing transmission lines and distribution lines will moderate the degree of visual changes associated with the Project, and will remain the dominant visual feature at this location.</p>

**Viewpoint 6: Ritma Road, near intersection of Augusta Highway**

**EXISTING VIEW**



<b>Location</b>	Ritma Road, near intersection of Augusta Highway Latitude: 32; 30; 30, Longitude: 137; 47; 46	
<b>View Direction</b>	East	
<b>Landscape Type(s)</b>	The viewpoint primarily encompasses the Pastoral landscape type, however a truck stop / service station associated with the Township landscape type is visible in the foreground.	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 1.8 km
<b>Sensitivity</b>	<b>Low</b>	Low level vegetation coverage typical of a pastoral landscape within a highly modified environment. Significant disturbance in the foreground associated with the presence of the truck stop / service station.
<b>Exposure</b>	<b>High</b>	The viewpoint is located adjacent to the Augusta Highway, and is representative of the landscape viewed by approximately 11100 motorists per day (DPTI 2015).



**Viewpoint 6: Ritma Road, near intersection of Augusta Highway**

<b>Description</b>	The viewpoint encompasses the typical pastoral landscape east of Port Augusta. Low vegetation extends in all areas, with the exception of several small clusters of larger trees. A service station / truck stop is prominent within the foreground, as is the southern Flinders Ranges, extending north-south along the horizon. Large vertical elements associated with transmission lines and telecommunications facilities are visible in the middle distance.	
<b>Comments</b>	The Project is not expected to be visible from this location. The ZTVI indicates that as a result of intervening topography views toward the subject site are largely obscured from view. Additional vegetation and structures further restrict views toward the Project. The existing large vertical elements (transmission line and telecommunications facilities) will remain as the dominant visual elements from this location.	
<b>Visual Change</b>	<b>Nil</b>	The Project will be screened from view as a result of intervening topography, vegetation and structures.

Viewpoint 7: Racecourse Road

EXISTING VIEW



<b>Location</b>	Racecourse Road, near the intersection of Carlton Parade Latitude: 32; 28; 55, Longitude: 137; 47; 40	
<b>View Direction</b>	South-east	
<b>Landscape Type(s)</b>	Pastoral	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 3 km
<b>Sensitivity</b>	<b>Low</b>	Low level vegetation coverage typical of a pastoral landscape within a highly modified environment. Significant disturbance in the foreground associated with the presence of electricity infrastructure (transmission lines and distribution line).
<b>Exposure</b>	<b>Low</b>	The viewpoint is a minor road forming part of the heavy vehicle bypass, at the fringe of Port Augusta. At this location Racecourse Road is expected to be utilised as largely an alternate route through Port Augusta avoiding the Highway by heavy vehicles, or persons accessing residences or businesses.



**Viewpoint 7: Racecourse Road**

<b>Description</b>	The viewpoint incorporates a largely pastoral landscape with scattered semi-rural dwellings and ancillary structures. A ridgeline in the middle distance restricts views to the south-east with the exception of the southern Flinders Ranges extending above the ridgeline. Several transmission lines and distribution lines are prominent in the foreground and middle distance. The Port Augusta Power Station (former) is visible immediately south of this location (not shown in above image).	
<b>Comments</b>	The Project is not expected to be visible from this location. The ZTVI indicates that as a result of intervening topography views toward the subject site are largely obscured from view. Additional vegetation and structures further restrict views toward the Project. The existing large vertical elements (transmission lines) will continue as the dominant visual elements from this location.	
<b>Visual Change</b>	<b>Nil</b>	The Project will be screened from view as a result of intervening topography and vegetation.



Viewpoint 8: Flinders Ranges Way

EXISTING VIEW



<b>Location</b>	Flinders Ranges Way Latitude: 32; 28; 58, Longitude: 137; 54; 55	
<b>View Direction</b>	West	
<b>Landscape Type(s)</b>	Pastoral, Parks and Reserves	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 9 km
<b>Sensitivity</b>	<b>Medium</b>	This viewpoint primarily comprises the pastoral landscape type (low sensitivity), however is located directly adjacent to the southern Flinders Ranges (high sensitivity) and provides extended views across the upper Spencer Gulf.
<b>Exposure</b>	<b>High</b>	The viewpoint is located on the Flinders Ranges Way, and is representative of the landscape viewed by approximately 800 motorists per day (DPTI 2015), in addition to tourists aboard the Pichi Richi Railway.



**Viewpoint 8: Flinders Ranges Way**

<p><b>Description</b></p>	<p>This viewpoint is located on Flinders Ranges Way and provides extended views across the landscape towards the Project. The Pichi Richi Railway is located immediately north-east of this location and the view is representative of tourists aboard the Pichi Richi Railway. Topographic variation partially restricts extended views across the landscape. Low vegetation, typical of a South Australian pastoral landscape is prevalent from this location. Modifications to the landscape are readily observable from this location including a small quarry in the foreground immediately west of the viewpoint, Port Augusta, Stirling North, the Port Augusta Power Station (former) and Sundrop Farms all visible in the middle distance to horizon, as well as numerous transmission and distribution lines traversing the landscape.</p>
<p><b>Comments</b></p>	<p>The Project will be largely obscured from this viewpoint as a result of intervening vegetation and structures. The Project represents a low profile element that will readily blend into the horizon at this distance, and will not represent a dominant element within the landscape. Larger vertical elements associated with Sundrop Farms, the Port Augusta Power Station (former) and electricity transmission / distribution lines represent the dominant constructed elements from this location. The viewpoint is characterised by the expansive low-lying pastoral landscape and the upper Spencer Gulf that dominates views. Inclement weather will quickly reduce visibility at this distance.</p>
<p><b>Visual Change</b></p>	<p><b>Negligible</b></p> <p>This viewpoint is anticipated to be highly frequented and provides a scenic lookout across the Port Augusta and upper Spencer Gulf region. Despite this, given the low profile nature of the Project, it is not expected that any degree of visual change will be readily observable at this distance. The degree of visual change to the existing landscape would be moderated by the presence of existing constructed elements; specifically Sundrop Farms, the Port Augusta Power Station (former) and electricity transmission / distribution lines visible throughout the landscape.</p>

**Viewpoint 9: Australian Arid Lands Botanic Gardens**

**EXISTING VIEW**



<b>Location</b>	Red Cliff lookout, Australian Arid Lands Botanic Gardens Latitude: 32; 27; 42, Longitude: 137; 45; 12	
<b>View Direction</b>	South-east	
<b>Landscape Type(s)</b>	Pastoral, Township	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 7.5 km
<b>Sensitivity</b>	<b>Medium</b>	Medium: this viewpoint primarily comprises the pastoral landscape type (low sensitivity), however is located on the fringe of the Port Augusta township (high sensitivity) and is a local tourist attraction. The southern Flinders Ranges are also visible on the horizon.
<b>Exposure</b>	<b>High</b>	This viewpoint is located within the Australian Arid Lands Botanic Gardens and is anticipated that from this viewpoint a comparatively higher number of people will experience the visual change.



**Viewpoint 9: Australian Arid Lands Botanic Gardens**

<b>Description</b>	The viewpoint is observed from Red Cliff lookout, within the Australian Arid Lands Botanic Gardens. The Flinders Red Cliffs are visible in the foreground, with low to medium height vegetation apparent throughout the landscape. The waters of the Spencer Gulf and the northern extent of Port Augusta are visible in the middle distance, with the southern Flinders Ranges and a transmission line visible on the horizon. The stacks of the Port Augusta Power Station (former) extend above the horizon immediately south of this location.	
<b>Comments</b>	The Project will be largely obscured from this viewpoint as a result of intervening topography and vegetation. The Project will be a low profile element that will readily blend into the horizon at this distance, and will not dominate the landscape. Inclement weather will also quickly reduce visibility at this distance.	
<b>Visual Change</b>	<b>Negligible</b>	This viewpoint is anticipated to be highly frequented and utilised as a scenic lookout. Despite this, given the low profile nature of the Project it is not expected that any degree of visual change will be readily observable at this distance. Intervening topography and vegetation are expected to partially screen views of the Project. In its current state (i.e. green and highly vegetated) it is anticipated the landscape would readily absorb the visual elements of the Project. In drier periods, the Project is likely to be more prominent and more easily identified on the horizon. The degree of visual change to the existing landscape would be moderated by the presence of existing electricity infrastructure (transmission lines and Port Augusta Power Station) visible.

Viewpoint 10: Shacks Road

EXISTING VIEW



<b>Location</b>	Shacks Road Latitude: 32; 32; 44, Longitude: 137; 44; 41	
<b>View Direction</b>	North-east	
<b>Landscape Type(s)</b>	Pastoral, Township	
<b>Distance to Subject Site</b>	<b>Low</b>	Approximately 7.8 km
<b>Sensitivity</b>	<b>Low</b>	Minimal vegetation coverage or topographic variation. Highly modified landscape including the Port Augusta Power Station (former), Sundrop Farms and numerous transmission lines observable in the middle distance.
<b>Exposure</b>	<b>Low</b>	The viewpoint is located on Shacks Road, the western side of the Spencer Gulf providing accessibility to scattered dwellings.



**Viewpoint 10: Shacks Road**

<p><b>Description</b></p>	<p>Open, flat pastoral land largely clear of structures extends across the landscape from this location. The waters of the upper Spencer Gulf are visible in the middle distance. The dominant visual elements observable at this location are the southern Flinders Ranges extending north-south across the horizon, and numerous elements of electricity infrastructure. Specifically, the Port Augusta Power Station (former), numerous transmission lines, and the solar tower associated with operations at Sundrop Farms are all highly visible. Structures and larger vegetation within Port Augusta and Stirling North are visible north-east of this location.</p>	
<p><b>Comments</b></p>	<p>The Project is not expected to be visible from this location. The ZTVI indicates partial views toward the project may be available, however as the viewpoint and Shack Road is within a low elevation, the subject site is not discernible at this distance. In addition, structures and larger vegetation within and adjacent to Port Augusta and Stirling North further screen the Project. The existing large vertical elements (transmission line, Port Augusta Power Station (former) and Sundrop Farms) will continue as the dominant visual elements from this location.</p>	
<p><b>Visual Change</b></p>	<p><b>Nil</b></p>	<p>The ZTVI indicated that the Project may be visible from this location with partially interrupted views. The largely flat topography supports extended views across the landscape; however at this distance the subject site is not discernible. Larger vegetation and structures within and surrounding Port Augusta and Stirling North restrict views east of the Spencer Gulf and limit views toward the Project.</p>

## **5. Management Strategies**

In order to minimise and mitigate changes to landscape and visual amenity, the following control and management strategies should be incorporated into the Construction Environmental Management Plan or Operations Environmental Management Plan and implemented for relevant project components:

- Demobilisation of construction equipment from site as soon as practicable to minimise affect to visual amenity.
- Where practicable, buildings and structures will be of muted, earthen tones consistent with dominant colours in the landscape; highly reflective materials will be avoided to avoid glare and reduce the visibility of buildings and structures.
- Undertake rehabilitation of disturbed areas as soon as practicable.
- Removal of all above ground infrastructure, and rehabilitation of subject site following decommissioning of the Project.
- Carry out early communication with landowners within or near to the Project to inform them of the proposed development. Communication should include details on:
  - Construction timing and activities;
  - Anticipated vehicle movements; and
  - Likely operational footprint and visible elements.
- A range of measures will be incorporated to the design to minimise glare from the panels, including:
  - Orientation of the panels to face north, resulting only in the rear or side of the panels being visible from Stirling North and Augusta Highway.
  - The solar panels are designed with a layer of anti-reflective material that allows the sunlight to pass through, but minimises reflection.
  - Current proposed solar panels reflect as little as 2% of the incoming sunlight.

## 6. Findings and Conclusion

The LVIA conducted for the Project identified that it will not be located within areas commonly regarded as being of significant or high scenic or aesthetic value. The LVIA study area is characterised as a pastoral landscape, with low to mid height vegetation, rural dwellings, and existing electricity infrastructure scattered throughout the landscape. The subject site is located on the fringe of Stirling North, in an area identified for future industrial development between Stirling North and Port Augusta.

The key receptors in the area considered most sensitive to visual change include:

- Major roads
  - Augusta Highway
  - Flinders Ranges Way
- Parks and Reserves
  - Mount Brown Conservation Park
  - Southern Flinders Ranges
- Townships
  - Port Augusta
  - Stirling North
- Tourist sites
  - Pichi Richi Railway
  - Australian Arid Lands Botanic Gardens
- Residential dwellings

An analysis of visual change at ten viewpoints was undertaken to provide a representative assessment of visual alterations from publically accessible locations across the study area. The findings of this viewpoint analysis are presented in Table 6-1.

**Table 6-1 Viewpoint Analysis Summary**

Viewpoint	Degree of Change	Summary
Viewpoint 1: Footner Road, near the intersection of Augusta Highway	Negligible	Although this viewpoint is highly frequented it provides only intermittent views toward the Project, largely restricted by intervening topography and vegetation. Views from this location are primarily experienced by passing vehicles on the Augusta Highway, visible out the window when passing by at 110 km/hr. When visible through gaps in vegetation, the Project will appear as a uniform, low profile element extending across the subject site. The presence of industrial activity along the length of Footner Road, electricity infrastructure within the road reserve, and the adjacent Port Augusta Prison moderates the degree of visual change to the existing landscape proposed by the Project.
Viewpoint 2: Footner Road, near the intersection of Racecourse Road	Low	The Project will be clearly visible from this viewpoint, however the location is not highly exposed, nor is the location recognised for its scenic amenity or utilised for appreciating the landscape. Views from this location are expected to be primarily experienced by passing vehicles utilising businesses and services on Footner Road. The Project will appear as a uniform, low profile element, partially obscured from view by the north-south running ridgeline present in the centre of the subject site. The Project is expected to be significantly less visually dominant than the large scale electricity infrastructure that is currently present. The presence of numerous elements associated with electricity infrastructure moderates the degree of visual change to the existing landscape proposed by the Project.
Viewpoint 3: Footner Street, Stirling North	Medium	The Project will be readily noticeable from this viewpoint, and will extend across the landscape in the middle distance as a low profile, contiguous element. Views from this location are primarily experienced by residents of Stirling North, and any visual changes will be observed on an ongoing basis. Existing large vegetation and minor topographic variation will provide partial screening of the



Viewpoint	Degree of Change	Summary
		Project. Visual changes are further moderated by the presence of existing infrastructure visible at this location including the effluent ponds, transmission line and railway line. Nevertheless, the Project represents a noticeable visual alteration to the existing landscape for local residents.
Viewpoint 4: Railway Station Road, Stirling North Primary School	Negligible	This viewpoint is highly frequented, and is representative of the view afforded to residents of Stirling North and students at the Primary School. Despite this, the viewpoint provides only intermittent views toward the Project, largely restricted by intervening topography and vegetation. Where visible between gaps in the vegetation, the Project is anticipated to readily blend into the horizon as a result of its low profile nature, dark colour that is comparable to existing vegetation, and the overall distance from the viewpoint. Intervening topography at this location is consistent with the outputs of the ZTVI which indicated that views within this area of Stirling North are largely obscured.
Viewpoint 5: Flinders Ranges Way, near intersection of Augusta Highway	Negligible	This viewpoint is highly frequented, and is representative of the view afforded to motorists utilising Flinders Ranges Way and residents of Stirling North. However, the viewpoint provides restricted views toward the Project, screened by intervening topography and vegetation as indicated by the ZTVI. Where visible, the project is anticipated to extend as a low profile, linear element along the horizon. Existing transmission lines and distribution lines will moderate the degree of visual changes associated with the Project, and will remain the dominant visual feature at this location.
Viewpoint 6: Ritma Road, near intersection of Augusta Highway	Nil	The Project will be screened from view as a result of intervening topography, vegetation and structures.
Viewpoint 7: Racecourse Road	Nil	The Project will be screened from view as a result of intervening topography and vegetation.
Viewpoint 8: Flinders Ranges Way	Negligible	This viewpoint is anticipated to be highly frequented and provides a scenic lookout across the Port Augusta and upper Spencer Gulf region. Despite this, given the low profile nature of the Project, it is not expected that any degree of visual change will be readily observable at this distance. The degree of visual change to the existing landscape would be moderated by the presence of existing constructed elements; specifically Sundrop Farms, the Port Augusta Power Station (former) and electricity transmission / distribution lines visible throughout the landscape.
Viewpoint 9: Australian Arid Lands Botanic Gardens	Negligible	This viewpoint is anticipated to be highly frequented and utilised as a scenic lookout. Despite this, given the low profile nature of the Project it is not expected that any degree of visual change will be readily observable at this distance. Intervening topography and vegetation are expected to partially screen views of the Project. In its current state (i.e. green and highly vegetated) it is anticipated the landscape would readily absorb the visual elements of the Project. In drier periods, the Project is likely to be more prominent and more easily identified on the horizon. The degree of visual change to the existing landscape would be moderated by the presence of existing electricity infrastructure (transmission lines and Port Augusta Power Station) visible.
Viewpoint 10: Shacks Road	Nil	The ZTVI indicated that the Project may be visible from this location with partially interrupted views. The largely flat topography supports extended views across the landscape; however at this distance the subject site is not discernible. Larger vegetation and structures within and surrounding Port Augusta and Stirling North restrict views east of the Spencer Gulf and limit views toward the Project.

The project is not anticipated to significantly alter landscape or visual amenity within the study area. Intervening topography and vegetation will largely screen views of the Project from key receptors and highly exposed locations (i.e. areas that are highly frequented). The greatest level of change is expected to be experienced by rural residents at the north-western portion of Stirling North and scattered rural dwellings to the south that have clear views west towards the Subject Site, albeit beyond the railway line.

Where visible, the Project will appear as a low profile, contiguous element extending across the Subject Site, and is not expected to be visually dominant. A range of management strategies have been identified to further mitigate the visual impact of the Project.

The Zone of Theoretical Visual Influence (ZTVI) identified that views of the Project from Stirling North and Port Augusta are largely screened from view by intervening topography. Further analysis indicated that existing vegetation will almost completely screen the Project from view at these locations. Sporadic views of the Project will be available through breaks in the topography and vegetation. The ZTVI also identified areas on the opposite side of the Spencer Gulf, and elevated regions towards the Flinders Ranges offering views towards the Project. Given the distance from these locations to the subject site and the low profile nature of the Project, infrastructure within the subject site is expected to readily blend into the horizon and will not represent a dominant visual element within the landscape.

Overall, the Project is not anticipated to be a significant visual element in the study area. It has been determined that the Project is largely screened from view by intervening topography, vegetation and / or structures when viewed from the identified key receptors. Views of the project are typically restricted to passing motorists, and nearby residential dwellings. The implementation of the identified management measures will further reduce the degree of visual change associated with the Project.

## 7. References

- ABS 2011. *2011 Census QuickStats: Port Augusta*. Australian Bureau of Statistics. Online, accessed 30/11/2016. URL: [http://www.censusdata.abs.gov.au/census\\_services/getproduct/census/2011/quickstat/UCL413004?opendocument&navpos=220](http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/UCL413004?opendocument&navpos=220)
- ABS 2011a. *2011 Census QuickStats: Stirling North*. Australian Bureau of Statistics. Online, accessed 30/11/2016. URL: [http://www.censusdata.abs.gov.au/census\\_services/getproduct/census/2011/quickstat/SSC40693?opendocument&navpos=220](http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/SSC40693?opendocument&navpos=220)
- Department for Environment, Heritage and Aboriginal Affairs 1999. *Mount Brown Conservation Park Management Plan*. Government of South Australia.
- Department for Planning and Infrastructure 2007. *Visual Landscape Planning in Western Australia*. West Australian Planning Commission, State of Western Australia.
- Department of Planning, Transport and Infrastructure, 2015. *Traffic Volumes*. Online, accessed 15/12/2016. URL: [http://www.dpti.sa.gov.au/traffic\\_volumes](http://www.dpti.sa.gov.au/traffic_volumes)
- Landscape Institute & I.E.M.A 2013. *Guidelines for Landscape and Visual Impact Assessment*. Third edition, Routledge.
- Lothian 2000. *Landscape Quality Assessment of South Australia*. Department of Geographical & Environmental Studies, University of Adelaide.
- Lothian 2009. *Flinders Ranges Landscape Quality Assessment Project*. Scenic Solutions.

## Appendix F. Traffic Management Plan





# Stirling North Solar Storage Project

Pangea Energy Pty Ltd

## Preliminary Traffic Management Plan

Rev 0

20 December 2017



## Stirling North Solar Project

Project No: IW142200  
Document Title: Preliminary Traffic Management Plan  
Revision: 0  
Date: 20 December 2017  
Client Name: Pangea Energy Pty Ltd  
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B	25/5/2017	Draft report for client	C Gosling	N Bull	N Bull
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0	20/12/2017	Final Version for Development Application	N Bull		

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## 1. Introduction

This Preliminary Traffic Management Plan has been prepared by Jacobs on behalf of Pangea Energy Pty Ltd (Pangea) to inform and support a development application for a solar plant station in Stirling North, Port Augusta.

Pangea intends to develop the Stirling North Solar Storage Project (the Project) west of Stirling North. The Project is proposed to be developed on a property (the subject site) commonly known as Lot 350 Paltridge Avenue, Stirling North (CT5352/55).

The proposed Stirling North Solar Storage Project will be a 50MW solar PV farm with a significant vanadium redox flow battery system (total capacity of 300MWh) developed at the subject site, which is owned by Pangea.

Pangea will own and operate the project. The solar PV farm will generate clean, renewable electricity, most of which would be captured by the vanadium batteries. The solar panels are ground mounted with the optimised layout of the solar modules fixed, facing north with tilt angle of 18 degrees from horizontal. The generation profile of the SNSSP will produce significantly more electricity during the summer and afternoons.

Most of the off-peak electricity generated will be stored in the vanadium batteries for future discharge, contributing to increased grid-system integrity, and preventing load shedding events. During periods of low solar energy, the vanadium redox flow battery system will draw from the grid during off-peak periods.

Electricity generated will mostly be for wholesale trade in the National Electricity Market.

The aim of this Preliminary Traffic Management Plan (TMP) is to:

- Manage the safety of all road users associated with the Project
- Minimise the risk of damage to road infrastructure during construction of the Project
- Identify likely construction vehicle access arrangements
- Identify likely vehicle access arrangements during operations
- Address the potential concerns of residents and businesses utilising vehicle access routes.

This plan identifies traffic management measures and strategies proposed to address traffic safety and access issues inherent with using oversized vehicles and general daily construction and operational traffic.

### 1.1 Scope of Work

The routes within this TMP include traffic management for roads under the care and maintenance of both the Department of Planning Transport and Infrastructure (DPTI) and Port Augusta (City) Council. The internal roads and access tracks within the subject site are not addressed in this TMP.

This report contains the following:

- A consolidated TMP for access routes to the subject site for heavy and oversized construction traffic and light vehicles
- Construction vehicle access routes
- General measures to minimise impacts associated with traffic movements during construction
- Maintenance and inspection strategies to minimise impacts to existing road conditions

This TMP does not identify infrastructure upgrades required to facilitate vehicular access to the subject site. Pangea are currently in negotiation with State government for purchase of a parcel of land to the north of the site which would enable an access road to be developed to the site. It is anticipated that any infrastructure upgrades will be determined by Pangea (or its contractor) prior to construction in conjunction with DPTI and Council.



## **1.2 References**

The following documents and standards have been used in the development of this TMP:

- Traffic Volumes (DPTI 2015)
- AS1742 – Manual of uniform traffic control devices
- Austroads guide to road design (Austroads 2009)
- RAVnet – South Australian Heavy Vehicle Access Network
- DPTI Restricted Vehicle Access Framework (DTEI 2011)
- DPTI Code of Practice for the Transport of Oversize and Overmass Indivisible Loads and Vehicles (DTEI 2008)
- The Port Augusta (City) Development Plan – General Section, Transportation and Access



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Prepared by : HM  
Checked by : NB

Figure 1.1 : Local Road Network

## 2. Traffic Conditions

### 2.1 Existing Traffic Volumes

Traffic counts are available for the DPTI roads in the area and are presented in Table 2-1.

Table 2-1 DPTI Road Traffic Volumes

Road Section	AADT <sup>1</sup> Estimate	Commercial Vehicles
Augusta Highway (Port Paterson Road to Flinders Ranges Way)	4300	890 (20.7%)
Augusta Highway (Flinders Ranges Way to Northern Power Station Road)	8200	960 (11.5 %)
Augusta Highway (Northern Power Station Rd to Edinburgh Tce)	9100	1000 (11.0 %)
Flinders Ranges Way (Augusta Highway to Stirling North)	4800	280 (5.8%)
Flinders Ranges Way (Stirling North to Quorn)	800	95 (11.9%)

<sup>1</sup>Average Annual Daily Traffic

#### 2.1.1 Heavy Vehicle Routes

A number of roads leading from Augusta Highway to the Project are gazetted heavy vehicle routes (DPTI, 2016). A summary of the vehicle types gazetted on each of these roads is presented in Table 2-2.

Table 2-2 Gazetted Heavy Vehicle Routes

Vehicle Type	Augusta Highway	Racecourse Road	Footner Road
26m B Double	Ü	Ü	Ü
23m Vehicle Carrier	Ü		
25m Vehicle Carrier	Ü		
Rigid Truck and Dog (23m)	Ü		
25m, 59.5t Low Loader	Ü	Ü	Ü
6 Axle Crane (Day Travel)	Ü	Ü	Ü
PBS Level 2A Vehicles	Ü	Ü	Ü

<sup>2</sup>Access by all vehicles is restricted to between 7am and 7pm every day

<sup>3</sup>Applies only to Carlton Parade north-east of Rogers Street

### 2.2 Construction Vehicle Requirements

The types of vehicles that will be used during construction are described in the following sections. These comprise light vehicles, heavy construction vehicles and oversized vehicles. A construction traffic estimate for the Project is provided in Section 2.2.4.

During construction, adequate temporary parking shall be provided adjacent to the construction site office. Once operational, car parking spaces are provided for operational and maintenance staff. No parking on DPTI or Council roads will be required as there is sufficient space within the subject site for construction vehicle parking and marshalling.

#### 2.2.1 Light Vehicles

Light vehicles will be used daily to transport personnel and equipment to the subject site. Light vehicles will have a minimal impact on the roads compared to the heavy construction traffic. As such it is proposed that this type of vehicle can use a greater selection of roads / access routes compared to heavy vehicles.

Light vehicles will travel along the designated heavy vehicle routes, where practical to minimise the disruption on other roads. When travelling from the subject site to Port Augusta or Stirling North, light vehicles will travel on the available public roads.

### **2.2.2 Oversize Vehicles**

Oversized and overmass vehicles (vehicles exceeding the mass and dimension limits for general access vehicles (DTEI 2006)) will be used to transport the major components of the Project including the inverters and transformers. All contractors that use oversized vehicles shall consult with, and obtain a permit from the DPTI Safety and Regulation Division prior to the commencement of transportation and will provide escort vehicles in accordance with legal and DPTI requirements.

Any oversized and overmass vehicles shall abide by the DPTI Code of Practice for the Transport of Oversize and Overmass Indivisible Loads and Vehicles (DTEI 2008) and have appropriate permits (DPTI Vehicle Permits Team).

### **2.2.3 Heavy Construction Vehicles**

Heavy construction vehicles (Vehicles exceeding 4.50 tonnes Gross Vehicle Mass (DTEI 2006)) that will travel on the transport routes include:

- Earth moving equipment
- Trucks to deliver materials such as cabling, building materials, electrical equipment, etc.
- Trucks delivering aggregate, sand, cement and water.

Heavy construction vehicles that use public roads (DPTI or Council) need to be road registered otherwise they shall be required to be transported using an appropriate road registered transporter (i.e. by low loader).

### **2.2.4 Estimated Construction Traffic Volumes**

A high level estimate of material quantities and number of loads to be transported to the subject site has been completed by Pangea. While total material volumes will be large, given the scale of the site, it is considered unlikely that daily or peak hourly volumes of generated traffic will exceed any relevant traffic capacity thresholds. The primary impacts of the Project will be on pavement wear and road condition.

A summary of the estimated number of vehicle movements that are expected to take place during the construction period is shown in Table 2-3. The estimated construction traffic volumes presented below are for a solar project with a capacity of up to 50MW with vanadium storage system up to 200MWh, to be constructed over an 18 month period (320 construction days).

It should be noted that depending on the construction methodology of the contractor, and later detailed design, construction traffic volumes may vary from the estimates.

Table 2-3 Estimated Construction Traffic

Vehicle Type		Vehicle Movements (Total Construction Period <sup>1</sup> )	Average Daily Movements (Total Construction Period <sup>1</sup> )
Material Delivery	Modules	322	
	Posts	37	
	Tilts	10	
	Tables	98	
	Electrical / Cable	49	
	Inverters	20	
	E-building	2	
	DC Combiner Box	1	
	CCTV	1	
Construction Vehicles	Cranes and / or Earth Moving Equipment	173	
<b>TOTAL Heavy Vehicles<sup>1</sup></b>		<b>713</b>	<b>3</b>
Light Vehicles	Personal vehicles and private transport	4,569	
<b>TOTAL Light Vehicles<sup>1</sup></b>		<b>4,569</b>	<b>13</b>
<b>TOTAL Vehicles<sup>1</sup></b>		<b>5,282</b>	<b>16</b>

<sup>1</sup>This number represents the vehicles travelling to the subject site; therefore the total number of trips generated (in/out of the subject site) will be double what is shown in the table.

## 2.3 Operational Vehicle Requirements

### 2.3.1 Vehicle Types

The types of vehicles that will be used during Project operation comprise light vehicles for staff and periodic maintenance. A compacted hardstand area will be used for vehicle parking. As such, no parking or areas for marshalling on DPTI or Council roads will be required during operations.

### 2.3.2 Estimated Operational Traffic Volumes

The Project is designed to operate with minimal workforce requirements. Staffing on site will typically be up to 19 full time equivalents, 9 associated with the solar facility and 10 for the storage facility, who will perform routine operation, maintenance and repairs. Staff presence will generally be between the hours of 9am to 5pm Monday to Friday, and on occasions when required outside of those times. Staff will not be required to be on site during all periods of operation. It is anticipated that the panels will be cleaned on a minimal basis, as required depending on the soiling conditions of the panels and the annual rainfall. Consequently, once operational the traffic generated by the proposed development will be negligible.

### 3. Access Routes

As previously highlighted, oversized and overmass vehicles may be used to transport the major components of the Project including the inverters and transformers. These major components are most likely to be sourced Adelaide and are anticipated to access the site from the Augusta Highway. The majority of construction traffic (i.e. light vehicles and trucks) are anticipated to access the site from Port Augusta or Adelaide.

The TMP route map depicts access arrangements for construction traffic accessing the subject site from the Augusta Highway and is shown in Figure 3.1. The Augusta Highway is proposed to be the principal point of access to the subject site. The access route has been selected to minimise construction traffic passing through the residential areas, roads capable of handling the construction vehicles (e.g. length, mass, turning circles) and clear of vegetation or overhead constraints.

The access route has been inspected and the condition is documented in the following sections. A route assessment will be carried out of both routes prior to construction when the dimensions of the largest delivery vehicle are known.

Light vehicles may access Port Augusta or Stirling North via alternate routes for day to day access to additional services within the towns (e.g. food and beverage, or minor service providers).

Site Access / Construction Route



IW142200 Stirling North Solar Project

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Prepared by : HM  
Checked by : NB

Figure 3.1 : Site Access/ Construction Route


### 3.1 Augusta Highway Access (Primary)

Construction traffic would access the Project from the Augusta Highway. From the Augusta Highway, traffic will turn onto Footner Road and a right turn to Abattoir Road prior to accessing the subject site. A summary of the roads proposed to be utilised by the Project for access from the Augusta Highway are presented in Table 3-1 and Figure 3.1.

Table 3-1 Summary of Augusta Highway Access

Name	Description	Photo
Augusta Highway	<p>Main highway connecting Port Augusta to Adelaide.</p> <p>Sealed, with two lanes in both directions separated by a vegetated median strip.</p> <p>Slip lane available for vehicles accessing Footner Road in both directions.</p> <p>No identified overhead or vegetation constraints.</p> <p>No identified sight distance, safety or geometric constraints.</p>	
Footner Road	<p>Sealed road, single lane in each direction.</p> <p>Clear line of site at intersection with Augusta Highway.</p> <p>Forms part of the heavy vehicle bypass for Port Augusta (via Yorkeys Crossing, avoiding the Joy Baluch AM Bridge).</p> <p>Adjoining land predominately industrial or vacant.</p> <p>No identified overhead or vegetation constraints.</p> <p>No identified sight distance, safety or geometric constraints.</p>	



Name	Description	Photo
Abattoir Road	<p>Minor local road, largely unmade.</p> <p>No identified overhead or vegetation constraints.</p> <p>No identified sight distance constraints.</p> <p>Existing road geometry and condition suits low volumes only.</p>	

## 4. Traffic Management

This section sets out the traffic management for both construction and operational traffic.

### 4.1 DPTI / Council Involvement

Regular communications shall be held prior to the commencement of construction until the conclusion of construction, between representatives of DPTI, Council and Pangea (or contractor).

This communication shall include the following traffic management and maintenance items:

- Permitting requirements (if applicable)
- Planned DPTI / Council maintenance activities
- Road signage and safety including 'way-finding' signs and temporary speed restrictions
- Delivery schedule for oversize and overmass items
- Any other particular issues that may arise during construction.

### 4.2 Traffic Requirements

The requirements detailed within this TMP and in particular this section will form an important part of the site induction for all personnel working at the subject site to ensure that important safety information, and any regulatory or permitting requirements, are communicated and strictly adhered to.

#### 4.2.1 Driving

Driving to the existing road conditions shall apply at all times and vehicles shall be followed at a safe distance in accordance with Australian Road Rules and guidelines.

Overtaking is not encouraged on the transportation routes for construction vehicles. If a driver is in a situation where they are required to overtake a vehicle then it is the driver's responsibility to ensure it is safe to do so and will not put any passengers, drivers or other road users at risk.

Exhaust brakes, or air brakes shall not be utilised by oversized or overmass on local roads within the proposed access routes (i.e. the Council owned roads).

Drivers on the site shall be fit for work and abide by their licensing requirements and any additional requirements provided at the site induction.

Any vehicle accident or collision, including collisions with animals, involving construction shall be reported to Pangea as well as to the police in accordance with the road rules.

#### 4.2.2 Site Access – Construction

Oversized and overmass vehicle access to the subject site will only occur via the nominated access routes.

Construction activities and deliveries to the subject site will occur in daylight hours, typically between 7 a.m. and 7 p.m.

#### 4.2.3 Weather

Adverse weather conditions can affect the condition of unsealed roads; this could include storms, prolonged wet weather conditions and strong winds. Pangea shall inspect the road condition of unsealed roads following adverse weather events. Any issues shall be reported to Council and a log of occurrences shall be maintained including photos and any remediation.

In consultation with the Council, Pangea will either restrict construction movements or recommend that the road be closed if unsafe road conditions result due to severe weather conditions.

#### **4.2.4 Speed**

Through site inductions, all personnel shall be made aware that the posted speed limit is the maximum speed for safe driving in ideal circumstances. This speed should be adjusted where conditions dictate. The safe operating speeds for oversized and over mass vehicles should be adhered to at all times as dictated by the vehicle type operating manual.

During times of increased heavy and oversized vehicle movements, discussion will take place between Pangea, DPTI and Council during the regular communications to determine whether any temporary speed restrictions should be implemented.

#### **4.2.5 Communication**

Pangea and all contractors shall ensure that clear communication protocols are in place for communication between drivers (heavy and light vehicles). This protocol shall be described as part of the site induction.

Pangea and their contractors shall communicate any proposed changes to traffic management practices to DPTI and/or Council at the regular meetings.

#### **4.2.6 Way-finding Signage**

Signage shall be provided where necessary to direct construction traffic along the approved transport routes to access the subject site entry. The specific location of any way-finding signage will be determined prior to construction in accordance with safety and regulatory requirements. Locations of the signage are to be provided by Pangea or contractor and discussed with DPTI and Council if any changes occur. These temporary 'way-finding' signs shall be installed in accordance with AS1742.

#### **4.2.7 Road Delineation**

Guide posts are used to delineate the edge of the road formation, particularly where horizontal and vertical curves are present. No new guideposts are proposed to be installed as part of this Traffic Management Plan.

#### **4.2.8 Overhead Utilities**

Although no overhead constraints have been identified, a follow up survey of overhead services will be undertaken prior to the first movements of oversized vehicles. The operators of oversized vehicles shall the survey of the routes to be used and obtain relevant clearances from the local utility companies where required, including (but not limited to):

- SA Power Networks
- ElectraNet
- Telstra.

#### **4.2.9 Dust Suppression**

Dust suppression shall be applied to unsealed roads where considered necessary (i.e. during an increase in construction vehicle numbers or after a prolonged period with no rain). This may be done using water, or an appropriate dust suppressant subject to the site specific nature of the road surface. In some cases a reduction in speed may also be an appropriate dust control measure.

### **4.3 Infrastructure Maintenance**

Pangea acknowledges that there will be wear and tear on the approved access routes due to construction traffic associated with the Project.

At the completion of the construction period Pangea propose to reasonably rehabilitate unsealed roads (Abattoir Road) to a condition no less than prior to the commencement of works. This level is to be agreed between Pangea and Council / DPTI prior to the beginning of the construction works.

Council / DPTI should acknowledge that whilst construction traffic may be adding to the deterioration of the road, Pangea cannot be held responsible for all damage as the roads are also used by heavy vehicles and other non- Project related traffic.

To support this process, an audit of road conditions along the nominated access routes will be undertaken prior to the commencement of construction. The condition audit will occur following the completion of any road upgrades (if required). A post construction condition audit will be undertaken to determine any remedial action required to repair access roads degraded as a result of Project related construction traffic.

When work is being undertaken on the council roads, traffic management signage should be in place according to AS1742.3.

A level of inspections on the condition of the access routes is outlined in Section 5, along with maintenance intervention levels.

## 5. Road Maintenance Intervention Levels

The maintenance intervention levels and maintenance requirements for the Project are shown in Table 5-1. The level of inspection proposed for the transport route is shown in Table 5-2. Any changes to these levels shall be agreed to between Pangea, DPTI and Council during the regular communications.

Table 5-1 : Project Road Maintenance Intervention Levels

Item No.	Defect	Intervention Level	Maintenance Requirement	Repair Timeline
<b>1.0 Signs and Delineation</b>				
1.1	'Way-finding' signage to be visible and legible.	Dirty signage (sign to be clearly legible from 150m at night with low beams)	Clean signs	1 week
		Missing or damaged signs	Repair or replace signs	1 week
1.2	Delineation as necessary to enhance safety.	Damaged guideposts where damage is due to construction traffic	Replace/fix guideposts	2 weeks
<b>2.0 Unsealed Road Pavement</b>				
2.1	Wheel rutting	Wheel ruts at a depth of 80mm	The application of gravel or crushed rock to the wearing surface to strengthen and reshape the surface and/or; Light formation grading	2 weeks
		Wheel ruts at a depth of 150mm	Gravel/material supply – heavy formation grading	2 weeks
2.2	Potholes	Potholes to a depth of 80mm or greater than 300mm diameter	The application of gravel or crushed rock to the wearing surface to strengthen and reshape the surface	2 weeks
2.3	General pavement defects (Windrows or materials, scour channels, corrugation, course surface material, loose material)	Safe travelling speed is reduced to $\leq 80\%$ of the posted speed	Light formation grading or; Remove and replace formation material or; Formation resheeting (50 to 100mm depth)	2 weeks
<b>3.0 Sealed Road Pavement</b>				
3.1	Loose Material	Loose material (i.e. road base from unsealed roads) deposited onto sealed sections of road	Removal of loose material from sealed roads.	1 week

Table 5-2 : Levels of Inspection

Type of Inspection	Level of Inspection
Inspections	Passive inspection by site personnel, with any issues being reported to the site superintendent -daily
During/After heavy rain event	Inspecting the road condition to see if: <ul style="list-style-type: none"> <li>· Work is required (i.e. intervention level) or;</li> <li>· A temporary closure or speed restriction should be recommended to the Council</li> </ul>
Prior to oversized loads	General road condition inspection including clearances and sight distances (may be incorporated in weekly inspection)
Final inspection & handover to Council	Overall inspection at the completion of the construction period to agree the final level of remediation of the route with a Council representative

## References

Austrroads 2009. *Guide to Road Design*. Published 21 December 2009. URL: <https://www.onlinepublications.austrroads.com.au/items/AGRD>

Department of Planning, Transport and Infrastructure, 2015. *Traffic Volumes*. Online, accessed 15/12/2016. URL: [http://www.dpti.sa.gov.au/traffic\\_volumes](http://www.dpti.sa.gov.au/traffic_volumes)

Department of Planning, Transport and Infrastructure, 2016. *RAVnet*. Online, accessed 15/12/2016. URL: <http://www.dpti.sa.gov.au/ravnet>

Department of Transport, Energy and Infrastructure (now DPTI), 2006. *Mass and Dimension Limits for General Access Heavy Vehicles Operating in South Australia*. Online, accessed 15/12/2016. URL: [https://www.sa.gov.au/\\_data/assets/pdf\\_file/0010/17956/mass\\_dimension.pdf](https://www.sa.gov.au/_data/assets/pdf_file/0010/17956/mass_dimension.pdf)

Department of Transport, Energy and Infrastructure (now DPTI), 2008. *Code of Practice for the Transport of Indivisible Items in South Australia*. Online, accessed 10/03/2016. URL: [https://www.sa.gov.au/\\_data/assets/pdf\\_file/0018/73611/Code-of-Practice-for-Indivisible-Items.pdf](https://www.sa.gov.au/_data/assets/pdf_file/0018/73611/Code-of-Practice-for-Indivisible-Items.pdf)

Department of Transport, Energy and Infrastructure (now DPTI), 2011. *Heavy Vehicle Access Framework*. Online, accessed 10/03/2016. URL: [https://www.sa.gov.au/\\_data/assets/pdf\\_file/0004/44356/Heavy\\_Vehicle\\_Access\\_Framework\\_-\\_Revised\\_October\\_2011.pdf](https://www.sa.gov.au/_data/assets/pdf_file/0004/44356/Heavy_Vehicle_Access_Framework_-_Revised_October_2011.pdf)

## Appendix G. Flora and Fauna Assessment





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## **Stirling North Solar Storage Project**

Pangea Energy

### **Ecological Assessment**

IW142200 | 0

20 December 2017



## Stirling North Solar Storage Project

Project No: IW142200  
 Document Title: Ecological Assessment  
 Revision: 0 (Final)  
 Date: 20 December 2017  
 Client Name: Pangea Energy  
 Project Manager: Dr Nick Bull  
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A	28 Mar 2017	Draft for internal review	ZB / RB	KF	NB
B	21 Apr 2017	Draft for Client Review	NB	Leo Chiang Lin	NB
C	8 Jun 2017	Updated Draft reflecting removal of land parcel A20 Client reviewed	NB	NB Leo Chiang Lin	NB
0	20 Dec 2017	Final report for Development Application	NB		

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**Appendix A. EPBC PMST Results**

**Appendix B. Stirling North Flora Species**

**Appendix C. Threatened fauna and flora tables (within 30 km)**

## **Important note about your report**

*The sole purpose of this report and the associated services performed by Jacobs was to provide details regarding vegetation clearance required for the Stirling North Solar Project near Port Augusta South Australia, in accordance with the scope of services set out in the contract between Jacobs and the client, Pangea Energy. That scope of services, as described in this report, was developed by Jacobs.*

*In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and / or from other sources (e.g. DEWNR). Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.*

*Jacobs derived the data in this report from information available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.*

*This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.*

*This report has been prepared on behalf of, and for the exclusive use of, Pangea Energy, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and Pangea Energy. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.*

## 1. Introduction

Pangea Energy Pty Ltd (herein Pangea Energy or the client) propose to develop a photovoltaic solar power generation and battery storage facility (Stirling North Solar Storage Project) on a site located approximately 6 kilometres east of the township of Port Augusta in South Australia. The proposed location for project infrastructure is shown on Figure 1-1 below. The site includes land parcel Lot 350, comprising approximately 53.5 hectares (measured using GIS polygon for site, noting the Certificate of Title indicates 54.31 hectares).

This preliminary environmental report includes maps and descriptions of the vegetation communities present within the broader project area and includes information derived from a desktop study and site walkover. An assessment of the likelihood of the presence of listed species within the potential disturbance footprint has been undertaken and a preliminary assessment of potential environmental impacts and implications for compliance and approvals under Commonwealth and State legislation are discussed.

The purpose of this report is to support a future Development Application and Native Vegetation Clearance Application. This prefeasibility report will also inform the design process (e.g. location of site access point). The report provides baseline ecology information established during the site walkover and high level desktop information.



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Figure 1-1 Proposed Stirling North Solar Storage Project Site Overview

## 2. Relevant Legislation

If fully developed, the proposed development will require the clearance of up to 53.5 hectares of native vegetation. State and Commonwealth legislation, particularly the *Native Vegetation Act 1991* (SA) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, Commonwealth) will apply to this development and the relevant provisions are described below.

### 2.1 Commonwealth Legislation

#### ***Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

The *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the environmental provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of National Environmental Significance are identified as 'controlled actions' and cannot be undertaken without referral to the Department of the Environment and Energy (DotEE) for consideration and approval under the EPBC Act.

The nine matters of national environmental significance identified in the EPBC Act are:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Threatened species and ecological communities
- Migratory species as listed under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining) and
- A water resource, in relation to coal seam gas development and large coal mining development.

If an action has the potential to have a significant impact on a MNES, the proposed action is referred to the Department of the Environment and Energy to determine the requirement for formal assessment and approval under the EPBC Act.

A preliminary assessment of the potential for this development to significantly impact on MNES is provided in Section 5 below.

### 2.2 South Australian Legislation

#### ***Native Vegetation Act 1991 (SA)***

The *Native Vegetation Act 1991 (NV Act)* controls the clearance of indigenous remnant vegetation and provides incentives and assistance to landholders in relation to the preservation and enhancement of native vegetation. All vegetation clearance and pruning required for the construction of the Stirling North Solar Project is likely to be subject to assessment against the requirements of the *Native Vegetation Act*, and if clearance is approved, is likely to result in a commensurate Significant Environmental Benefit (SEB) payment or set aside area to offset the impacts of clearance. It is worth noting that the SEB policy is under reform, and significantly higher offsets are required compared with the previous policy. A media release will be sent out two months prior to the introduction date of the new policy in order to announce the official date. The policy and guide will only apply to clearance applications received after the 'official' introduction date.

A preliminary assessment of the requirements and application of the NV Act to this development is provided in Section 6 below.



**National Parks and Wildlife Act (SA)**

The *National Parks and Wildlife Act 1972* (NPW Act) allows for the protection of habitat and wildlife through the establishment of parks and reserves (both on land and in State waters) and provides for the use of wildlife through a system of permits allowing certain actions, i.e. keeping, selling, trading, harvesting, farming, hunting and the destruction of native species.

The NPW Act assigns flora and fauna species to state conservation categories (i.e. threatened species); Endangered (Schedule 7), Vulnerable (Schedule 8), and Rare (Schedule 9).

**Natural Resources Management Act 2004**

The *Natural Resources Management Act 2004* (NRM Act) is to assist in the achievement of ecologically sustainable development in the State by establishing an integrated scheme to promote the use and management of natural resources that recognises and protects the intrinsic values of natural resources. The NRM Act combines critical elements of the now repealed *Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986*, the *Soil Conservation and Land Care Act 1989* and the *Water Resources Act 1997*.

It further legislates for designated control requirements for a series of 'Declared' plants (as specific to each region or statewide), which effectively:

- Bans the sale of Declared weeds
- Controls the movement of Declared weeds
- Requires landowners / managers to destroy or control infestations of Declared weeds
- Requires further notification of authorities when an infestation is detected.

**Development Act 1993**

An Act to provide for planning and regulate development in the State; to regulate the use and management of land and buildings, and the design and construction of buildings; to make provision for the maintenance and conservation of land and buildings where appropriate; and for other purposes.

**Environment Protection Act 1993**

The Environment Protection Act 1993 (EP Act) provides for the protection of the environment and defines the Environment Protection Authority's (EPA) functions and powers. The Act promotes ecologically sustainable development and the use of precautionary principles to minimise environmental harm. It requires polluters to bear an appropriate share of the costs and responsibilities of protecting the environment from their activities.

## 2.3 South Australian Policies and Plans

The South Australian government follows guidelines relating to the conservation of native habitats, communities and species via the implementation of a range of policies including the following:

**No Species Loss - A Nature Conservation Strategy for South Australia 2007-2017 (DEH, 2007)**

The 'No Species Loss' Strategy provides a State wide nature conservation strategy aimed at setting objectives and targets for the conservation and management of State biodiversity assets while also providing guidelines on how targets can be met.

**Guidelines for the Management of Roadside Vegetation**

The guidelines discuss specific issues regarding the management of roadside vegetation. Some issues, such as road construction, will be of direct relevance to local government; while others, such as boundary fencing, may be of concern to adjoining landholders. Another category within the guideline refers to power lines and other services, which relates to government agencies and service providers (Native Vegetation Council, 2012).

The guidelines generally involve three options for assessment:

- Works that may be undertaken without reference to the Native Vegetation Council or Native Vegetation and Biodiversity Management Unit
- Works requiring at least consultation with and endorsement by the Native Vegetation and Biodiversity Management Unit (NVBMU)

Works that require the consent of the Native Vegetation Council (NVC), by means of a clearance application or application to clear under one of the Native Vegetation Regulations 2003 (also under review).

### 3. Methods

As part of the recent desktop and field assessment (January 2017) Jacobs have undertaken the following tasks:

- Review of EPBC Act Protected Matters database search results and high level assessment of likelihood of occurrence for listed and threatened flora and fauna species.
- Review of Biological Database of South Australia (BDBSA) search extract within 10 km of the site for threatened flora, fauna and ecological community results.
- Review of DEWNR NatureMaps online database to identify any ecologically significant features that may occur at the site or surrounds.
- Surveyed the site in order to map vegetation communities present within the project area and conduct a high level assessment of their composition, condition and habitat value. The project area is delineated as the study area in Figure 4-1 below.
- Summarised the outcomes of the desktop reviews and site visit.
- Prepared a high level vegetation map of the study area.
- Provided further information about approval requirements if vegetation clearance is required.

#### 3.1 Field Survey Methodology

A Jacobs' ecologist (Rick Barratt) undertook a high level environmental survey of the proposed site via vehicle and foot traverse on 19 January and 7 February 2017 in order to:

- Describe and map native vegetation communities present on and adjacent to the proposed development site and transport corridor, including existing disturbance levels and condition
- Identify any threatened species / ecosystems present, or important wildlife habitat
- Identify any environmental management issues which will require further consideration, including declared weed species
- Discuss the application of the EPBC Act (Commonwealth) and the SA NV Act (and Regulations) to the proposed development.

#### 3.2 Desktop Methodology

Searches of publicly available information about the site area included:

- The EPBC Protected Matters Search Tool with a buffer of 5 km (see Appendix A)
- DEWNR's NatureMaps (2017)
- General ecology flora and fauna reference material (see Section 8).

In addition, data obtained from the Biological Database of South Australia (BDBSA) (30 km buffer) was also reviewed.

## 4. Desktop Study and Field Survey Results

### 4.1 Site Background

The site is located within the Natural Resources Northern and Yorke Board Area. A brief summary of the site's environmental values as indicated by a desktop search of DEWNR's NatureMaps (2017) database is as follows:

- Landuse is defined as 'Vacant Urban Land'
- No vegetation Heritage Agreement areas are on the site or within 5 km
- No Indigenous Protection Areas are on the site or within 5 km
- No National Parks or Reserves are on the site or within 5 km; the nearest being Mount Brown Conservation Park located more than 15 km from the site
- SA Vegetation mapping defines the site as "Chenopod Shrubland". Nearby vegetation is mapped as "Hummock Grassland"
- No significant fauna colonies occur on or near the site
- There are no Ramsar Wetlands or Nationally Important Wetlands (NIW) on site, but the nearest NIW is located 1.7 km west of the site; the Upper Spencer Gulf (see EPBC Act summary below, Section 4)
- There are effluent ponds located with 1 km west of the site. Some wetland bird species and predatory raptors utilise effluent ponds as part of their habitat
- The site occurs in the Torrens Basin Groundwater Province, which features a shallow sedimentary basin
- There are no major drainage lines, or surface water areas within the site or within the immediate surrounds.



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Figure 4-1 Stirling North Study Area

## 4.2 Field Survey Results

A summary of the field assessment is provided below.

### 4.2.1 Vegetation Communities

Apart from minor areas that have been cleared for tracks and small scale sand mining, Allotment A350 supports native vegetation communities. The western and southern portion of Allotment A350 is comprised of alluvial outwash plains with Chenopod low open shrubland. An area of low sand dunes and sand plains in the north east corner of Allotment A350 supports tall open shrubland.

The vegetation communities have been delineated in Figure 4-2 and are described below.

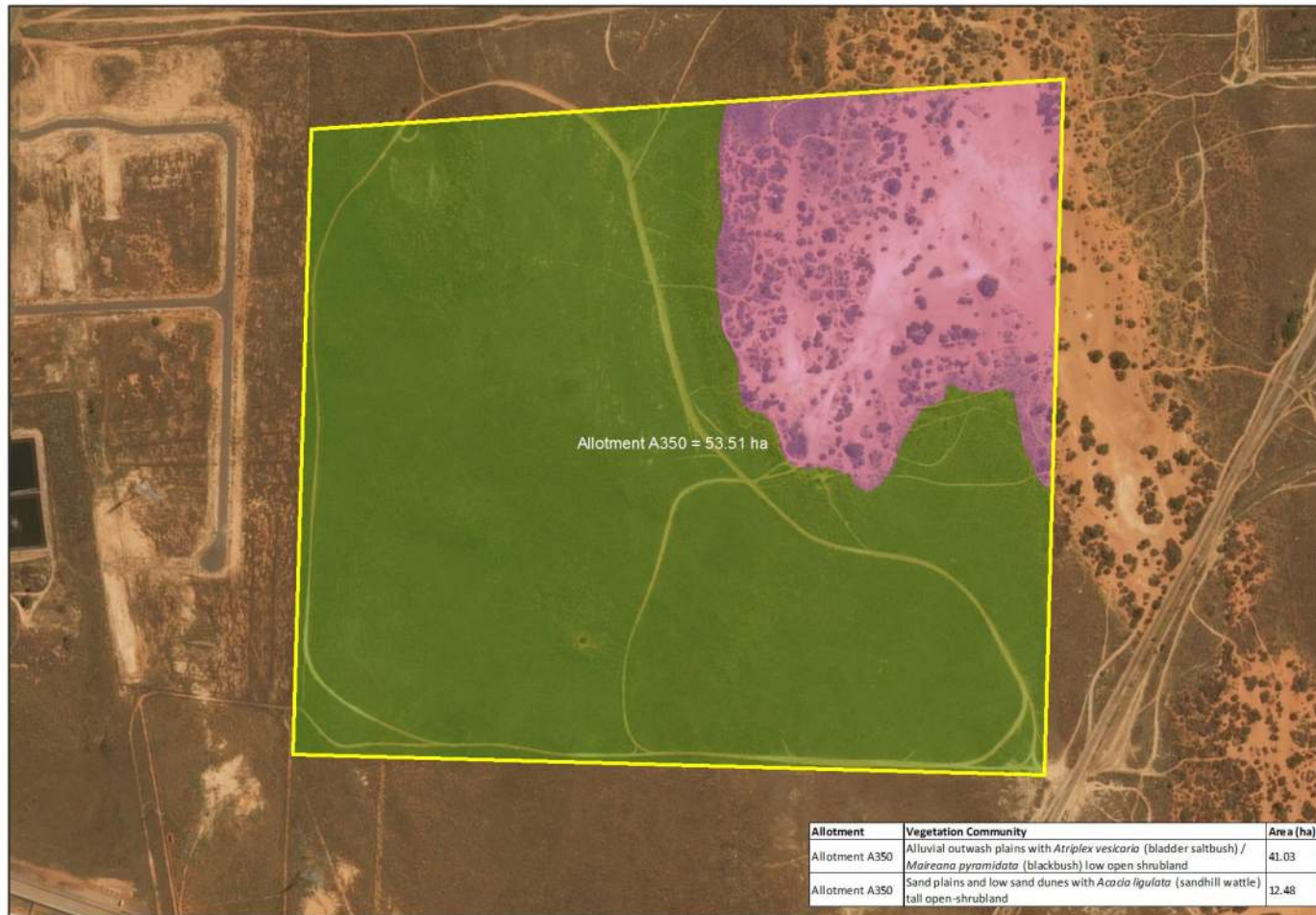
#### ***Atriplex vesicaria* (Bladder Saltbush) / *Maireana pyramidata* (Blackbush) low open shrubland**

##### **Allotment A350**

*Atriplex vesicaria* (Bladder Saltbush) / *Maireana pyramidata* (Blackbush) low open shrubland dominates on clay loam soils of the alluvial outwash plains found in the western and southern portions of the site of Allotment 350. Other low shrub species are scattered throughout and include *Minuria cunninghamii* (Bush Minuria), *Maireana oppositifolia* (Salt Bluebush) and *M. turbinata* (Top-fruit Bluebush) and a moderately dense cover of woody forbs including *Sclerolaena divaricata* (Tangled Bindyi) and *S. patentiuspis* (Spear-fruit Bindyi). The ground storey is dominated by *Atriplex spongiosa* (Pop Saltbush), *Tetragona tetragonoides* (Native Spinach) and *Erodium spp.* (Native Stork's-bill) and introduced annuals including *Carrichtera annua* (Ward's Weed) and *Medicago minima* (Burr Medic) (Plate 4-1).

This community was assessed to be in fair to good condition, with moderate levels of disturbance including from vehicle traffic, scattered infestations of declared weeds and clearance for vehicle tracks

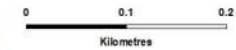
Vegetation Communities



- Proposed Solar Farm
- Vegetation Community
  - Alluvial outwash plains with *Atriplex vesicaria* (bladder saltbush) / *Maireana pyramidata* (blackbush) low open shrubland
  - Sand plains and low sand dunes with *Acacia ligulata* (sandhill wattle) tall open-shrubland

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Allotment	Vegetation Community	Area (ha)
Allotment A350	Alluvial outwash plains with <i>Atriplex vesicaria</i> (bladder saltbush) / <i>Maireana pyramidata</i> (blackbush) low open shrubland	41.03
Allotment A350	Sand plains and low sand dunes with <i>Acacia ligulata</i> (sandhill wattle) tall open-shrubland	12.48

IW142200 Stirling North Solar Project

Figure 4-2 Vegetation communities at the Stirling North project site



**Plate 4-1** *Maireana pyramidata* (Blackbush) / *Atriplex vesicaria* (Bladder Saltbush) / *Maireana pyramidata* (Blackbush) low open shrubland is dominant on Allotment A350

#### ***Acacia ligulata* (Sandhill Wattle) tall open-shrubland**

Low dunes and sand plains found in the north eastern portion of Allotment A350 support *Acacia ligulata* (Sandhill Wattle) tall open shrubland over a variable understorey. The sparse mid-storey species includes *Pimelea microcephala* (Shrubby Rice Flower), *Rhagodia spinescens* (Thorny Saltbush) and *Maireana pyramidata* (Blackbush). The understorey is dominated by exotic species including dense stands of Buffel Grass (*Cenchrus ciliaris*) and scattered patches of Wild Turnip (*Brassica tournefortii*) and Saffron Thistle (*Carthamus lanatus*). Native understorey species included *Brachyscome ciliaris* var. *ciliaris* (Variable Daisy) and *Salsola kali* (Buckbush) (Plate 4-2).

This community was assessed to be in poor condition with moderate to high levels of disturbance from vehicle traffic, unauthorised sand mining and with extensive infestations of Buffel Grass dominating the ground storey (Plate 4-3).





**Plate 4-2** *Acacia ligulata* tall open shrubland with *Maireana pyramidata* (Blackbush) low open shrubland mid-storey and Buffel Grass dominating the understorey of Allotment A350



**Plate 4-3** Vehicle tracks traverse the dunes with Buffel Grass in the foreground of Allotment A350

#### 4.2.2 Disturbance

##### Vegetation Clearance and Vehicle Traffic

Vehicle tracks traverse Allotment A350 and are frequently used by 4WD vehicles and motor bikes (R. Barratt pers. obs). Disturbance from vehicles together with what appears to be unauthorised sand mining, has resulted in large bare blow-outs in the sand dunes and sand plains in the north east of the study area.

##### Weeds

Three weed species declared under the NRM Act were recorded during the field survey together with numerous introduced agricultural weed species (refer Table 4-1, Appendix B). One species, African boxthorn (*Lycium ferocissimum*), is also a Weed of National Significance (WONS) and was recorded as scattered individual plants in the Chenopod plain and sand dune communities. Another five weeds have been recorded within 30 km of the site (BDBSA); *Austrocyllindropuntia cylindrica* (Cane Grass), *Echium plantagineum* (Salvation Jane), *Emex australis* (Three-corner Jack), *Juncus acutus* (Sharp Rush), *Marrubium vulgare* (Horehound) and *Silybum marianum* (Variegated Thistle).

**Table 4-1 Declared Weeds recorded on the proposed project site**

Scientific Name	Common Name	Occurrence <sup>1</sup>	Declared Status Northern & Yorke Region <sup>2</sup>
<i>Cenchrus ciliaris</i>	Buffel Grass	3	C, Priority weed
<i>Lycium ferocissimum</i> *	African Boxthorn	1	WONS, C, Priority weed
<i>Tribulus terrestris</i>	Caltrop	2	C

\* = Weed of National Significance (WONS)

<sup>1</sup> 1= scattered plants, 2 = scattered small infestations, 3 = large/widespread infestations

<sup>2</sup> C = Control required in part of the State, S = Banned for sale (SA Natural Resources Management Act 2004)

##### Condition

Vegetation communities located within the study area were assessed to be in moderate condition for the low open shrubland areas of Allotment A350 area through to poor condition for the sand dune and sand plain areas. Observations made during the field survey include:

- Weed infestations including Declared species African Boxthorn, Buffel Grass and Caltrop recorded and agricultural weeds dominant in the ground storey in both allotments,
- Patches of moderate erosion in low dunes and sandplains on allotment A350 with large bare blow outs as a result of clearance for tracks, ongoing 4 wheel drive and motor-bike use and unauthorised sand extraction.

Fill has been deposited in the north western portion of allotment A350.

## 5. Preliminary Environmental Assessment

### 5.1 EPBC Threatened Species and Protected Matters

The EPBC Act Protected Matters database was interrogated via the online Protected Matters Search Tool for the project area plus a 5 km buffer. Results are provided in Appendix A. This list includes a large number of marine and coastal species due to the relative proximity of the site to northern Spencer Gulf. No suitable habitat for these species is present on the site and as such they will not be impacted directly or indirectly by the proposed development. Marine and coastal species are therefore not considered further by this report. Table 5-1 below lists threatened flora and fauna species identified in the protected matters search (excluding marine and coastal species) and provides a high level assessment of the likelihood of their presence on the proposed site.

#### 5.1.1 Threatened Ecological Communities

The EPBC Act PMST results suggested that the Vulnerable ecological community Subtropical and Temperate Coastal Saltmarsh may be present at the project site. There were however no BDBSA data records for this community at the site. In addition, as discussed in Section 4.2, the site visit confirmed that the community does not occur and there is no habitat for that community at the site (i.e. no connection for intertidal area and no groundwater influence or depressions).

Similarly, the BDBSA results suggested that the EPBC Act Critically Endangered Iron-grass Natural Temperate Grassland of SA (INTG) and Peppermint Box Grassy Woodland of SA (PBGW) may occur in the area. The site visit confirmed that these communities do not occur at the site and only common vegetation communities were present.

#### 5.1.2 Nationally Important Wetlands

The EPBC Act PMST results suggested that a Nationally Important Wetland occurs within 5 km of the site. The Upper Spencer Gulf region is considered a National Important Wetland and occurs 1.7 km west of the site. The Pangea site is a terrestrial site, and the current landuse is urban open space that is not connected to the Upper Spencer Gulf wetland area. The site may provide occasional roosting or flyover habitat for wetland fauna that occur in the region, including shorebirds and migratory birds. However the site is not considered to provide core breeding, roosting or feeding habitat for wetland species and the site is contiguous with well over 100 km of similar habitat that such fauna could visit occasionally, if required. Effluent ponds located west of the site, may provide occasional habitat for wetland fauna.

#### 5.1.3 Threatened Flora and Fauna

The EPBC PMST (Appendix A) results suggested a range of EPBC Act listed flora and fauna species as potentially present within the project area (search results are attached as Appendix A). Table 5-1 below provides an assessment of the likelihood of the presence of these listed species or habitat suitable for them, on or adjacent to the Project area. As mentioned above marine and coastal species have been excluded (e.g. Listed Marine Species, Whales and other Cetaceans, Oceanic birds such as Albatrosses, Petrels and Prions, Fish, Sharks, Marine Turtles, Seals and Sea-lions).

**Table 5-1 Likelihood of EPBC PMST listed ecological communities, flora and fauna at the project site**

Species	Common Name	EPBC Act <sup>1</sup>	SA NPW Act <sup>2</sup>	Likelihood of occurrence	Justification of likelihood of occurrence <sup>3</sup>
<b>Threatened Ecological Communities</b>					
-	Subtropical and Temperate Coastal Saltmarsh	VU	-	Not present in area surveyed	Suggested by EPBC Act PMST, but not present on or adjacent to project area (based on field assessment, BDBSA records, NatureMaps).

Species	Common Name	EPBC Act <sup>1</sup>	SA NPW Act <sup>2</sup>	Likelihood of occurrence	Justification of likelihood of occurrence <sup>3</sup>
-	Iron-grass Natural Temperate Grassland of SA and Peppermint Box Grassy Woodland of SA	CE	-		Suggested by BDBSA, but not present on or adjacent to project area (based on field assessment and NatureMaps).
<b>Birds</b>					
<i>Arenaria interpres</i>	Ruddy Turnstone	MW	-	Unlikely	No record within 5 km, records within 30 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Apus pacificus</i>	Fork-tailed Swift	MM	-	Possible	Possible as overfly visitor. No historic BDBSA records, but wide ranging aerial species. No suitable habitat at site.
<i>Amytornis textilis myall</i>	Thick-billed 'Western' Grasswren (Gawler Ranges)	VU	-^	Possible	Suitable shrubland community on sand plains, but no records within 30 km
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MW	-	Unlikely	No records within 30 km. No suitable habitat observed on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Calidris alba</i>	Sanderling	MW	-	Unlikely	No records within 30 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Calidris canutus</i>	Red Knot	EN, MW	-	Unlikely	No record within 5 km. Records within 30 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, MW	-	Unlikely	Records within 5 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Calidris ruficollis</i>	Red-necked Stint	MW	-	Unlikely	Records within 5 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe	MW	R	Unlikely	No records within 30 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Leipoa ocellata</i>	Malleefowl	VU	V	Unlikely	No records within 30 km. No suitable mallee habitat on site or corridors to suitable mallee habitat. Site surrounded by industrial use.
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	VU	-	Unlikely	No suitable shoreline habitat present
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit	CR	-	Unlikely	No suitable shoreline habitat present
<i>Limosa lapponica</i>	Bar-tailed Godwit	MW	R	Unlikely	No records within 5 km. No suitable shoreline habitat present.
<i>Limosa limosa</i>	Black-tailed Godwit	MW	R	Unlikely	Records within 5 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important

Species	Common Name	EPBC Act <sup>1</sup>	SA NPW Act <sup>2</sup>	Likelihood of occurrence	Justification of likelihood of occurrence <sup>3</sup>
					Wetland (1.7 km west).
<i>Motacilla cinerea</i>	Grey Wagtail	Migratory Terrestrial		Unlikely	No records within 30 km. Migratory species.
<i>Motacilla flava</i>	Yellow Wagtail	Migratory Terrestrial		Unlikely	No records within 30 km. Migratory species.
<i>Numenius madagascariensis</i>	Eastern Curlew	CE, MW	V	Unlikely	Records within 5 km. No habitat on site. Suitable habitat occurs in the Upper Spencer Gulf Nationally Important Wetland (1.7 km west).
<i>Pandion haliaetus</i>	Osprey	MW	E	Unlikely	No BDBSA records within 30 km. No preferred roosting or feeding habitat within site.
<i>Pedionomus torquatus</i>	Plains-wanderer	CR	E	Unlikely	No suitable ephemeral grassland/herbfield habitat present. No records within 30 km. Highly nomadic species seldom recorded in region
<i>Pezoporus occidentalis</i>	Night Parrot	EN	E	Not present	Species considered extinct in SA
<i>Rostratula australis</i>	Australian Painted-snipe	EN	-	Unlikely	No records within 30 km. No suitable wetland habitat present
<i>Sternula nereis nereis</i>	Fairy Tern	VU	E	Unlikely	Records within 5 km. PMST suggested breeding occurred in the area. Breeds on sandy beaches and sandy spits. No suitable habitat present at the site.
<i>Tringa nebularia</i>	Common Greenshank, Greenshank	MW	-	Unlikely	Records within 5 km, but no preferred wetland habitat within the site.
<i>Tringa stagnatilis</i>	Marsh Sandpiper, Little Greenshank	MW	-	Unlikely	No records within 5 km, and no preferred wetland / marsh habitat within the site.
<b>Mammals</b>					
<i>Petrogale xanthopus xanthopus</i>	Yellow-footed Rock-wallaby	VU	V	Unlikely	No records within 5 km. Records within 30 km. No suitable rocky slope or outcrop habitat present on site
<b>Plants</b>					
<i>Caladenia macroclavia</i>	Large-club Spider-orchid	EN	E	Unlikely	Nearest known population 170 km to south. No suitable mallee habitat present on site. No BDBSA records within 30 km.
<i>Caladenia tensa</i>	Green Spider-orchid	EN	-	Unlikely	No suitable eucalypt woodland habitat present on site, record within 30 km (6.6 km NNE of Mundallio).
<i>Caladenia woolcockiorum</i>	Woolcock's Spider-orchid	VU	E	Unlikely	No suitable eucalypt woodland habitat present on site. No BDBSA records within 30 km.
<i>Frankenia plicata</i>		EN	V	Unlikely	Unlikely, nearest record more than 200 km to north. No records within 30 km.
<i>Malacocera gracilis</i>	Slender Soft-horns	-	V	Unlikely	Although there are records within 2 km from 2010 (NatureMaps), there is no preferred deep gilgai or saline mound habitat present on site, therefore presence is unlikely.
<i>Senecio megaglossus</i>	Superb Groundsel	VU	E	Unlikely	No preferred rocky gorge habitat present on site. No records within 30 km.

<sup>1</sup> Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* Status: Endangered (EN), Vulnerable (V), Migratory Wetland (MW), Migratory Marine (MM), Migratory Terrestrial (MT), Extinct (EX).

<sup>2</sup> South Australian *National Parks and Wildlife Act 1972* (NPWA) Status: Endangered (E); Vulnerable (V); Rare (R);

<sup>^</sup> Status change, previously vulnerable

<sup>3</sup> Records refer to BDBSA records and suitable habitat based on field observation, and fauna / flora habitat textbooks

Threatened species with recent BDBSA records (i.e. within 25 years) are also included in Table 5-2 (Fauna), and Table 5-3 (Flora) below. Threatened species recorded within 30 km are provided in Appendix C. Full BDBSA records can be provided on request (i.e. 30 km search radius results; 315 fauna records, 695 flora records), noting that duplicate records and records for marine species (e.g. whales, dolphins and sea turtles) are not included. In summary the BDBSA records within a 5 km buffer (unless otherwise mentioned) from the site included:

- Five (5) common frog species (none threatened under EPBC Act or NPW Act). There is no suitable habitat on site to support frogs. Two additional common frog species were recorded within a 30 km buffer.
- One hundred and fourteen bird (114) species, including 18 threatened species (see Table 5-2 below for the likelihood of these species occurring at the site). A total of 40 threatened birds have been recorded within 30 km) (see Appendix C for a full list of threatened species only).
- Seven mammals within 5 km; including one extinct (Burrowing Bettong) and six common mammals. Twenty eight mammals occur within 30 km of the site, including two threatened species; Yellow-footed Rock-wallaby, *Petrogale xanthopus xanthopus* (Vulnerable, EPBC Act); and Eastern Quoll, *Dasyurus viverrinus* (Endangered, EPBC Act and NPW Act). There is no suitable habitat to support these threatened species at the site.
- Twenty three (23) common reptiles (no threatened species within 5 km of the site). Sixty eight (68) common reptiles recorded within 30 km of the site, including three threatened species; Flinders Worm-lizard, *Aprasia pseudopulchella* (Vulnerable, EPBC Act), Lace Monitor, *Varanus varius* (Rare, NPW Act), and Carpet Python, *Morelia spilota* (Rare, NPW Act).

No areas of tall Chenopod shrubland, preferred habitat for the Thick-billed Grasswren (*Amytornis textilis myall*, Gawler Ranges sub-species, Vulnerable under the EPBC Act) are present within the study area. This species, has not been recorded within 30 km of the study area (BDBSA, 2017).

No threatened flora or fauna species nor threatened vegetation communities were recorded during the field survey of the project area. Vegetation communities that were present were assessed to be in moderate to poor condition and were not considered to represent preferred habitat for any threatened fauna species. It is therefore considered that the construction and operation of the proposed infrastructure will not result in significant impacts to State or Commonwealth listed species.

**Table 5-2 Threatened Bird Species with BDBSA records within 5 km of the site**

Species	Common Name	EPBC Act <sup>1</sup>	NPW Act <sup>2</sup>	Likelihood of occurrence at site
<i>Haematopus longirostris</i>	Australian Pied Oyster Catcher		R	Unlikely. Shorebird, no suitable habitat at site.
<i>Cladorhynchus leucocephalus</i>	Banded Stilt	-	V	Unlikely Shorebird, no suitable habitat at site.
<i>Limosa limosa</i>	Black-tailed Godwit	M	R	Unlikely. Shorebird, no suitable habitat at site.
<i>Ardea ibis</i>	Cattle Egret	M	R	Unlikely. Shorebird / wader, no suitable habitat at site.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR		Unlikely. Shorebird, no suitable habitat at site
<i>Neophema elegans</i>	Elegant Parrot	-	R	Possible. Occasional foraging habitat at site, no suitable nesting or core

				habitat on site.
<i>Sternula nereis</i>	Fairy Tern	VU	V	Unlikely. Marine / beach nesting bird, no suitable habitat at site.
<i>Stictonetta naevosa</i>	Freckled Duck	-	V	Unlikely. Waterbird, no suitable habitat at site
<i>Podiceps cristatus</i>	Great Crested Grebe		R	Unlikely. Waterbird, no suitable habitat at site
<i>Strepera versicolor</i>	Grey Currawong	-	ssp	Unlikely. Woodland bird, limited habitat on site
<i>Falco hypoleucos</i>	Grey Falcon		Rare	Possible. Raptor, potential foraging habitat on site
<i>Microeca fascinans</i>	Jacky Winter	-	ssp	Unlikely. Woodland bird, limited habitat on site
<i>Egretta garzetta</i>	Little Egret		R	Unlikely. Shorebird / wader, no habitat on site
<i>Biziura lobata</i>	Musk Duck		R	Unlikely. Waterbird, no suitable habitat at site
<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western)		R	Possible. Prefers chenopod shrubland, suitable habitat at site, but poor to moderate condition.
<i>Haematopus fuliginosus</i>	Sooty Oyster Catcher		R	Unlikely. Shorebird, no suitable habitat at site
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		E	Unlikely. Raptor, prefers coastal areas and rivers / creeklines. No suitable roosting or foraging habitat at site.
<i>Climacteris affinis</i>	White-browed Treecreeper		R	Unlikely. Woodland bird, no suitable habitat on site.

<sup>1</sup> Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* Status: Critically Endangered (CR), Endangered (EN), Vulnerable (V), (ssp.) subspecies protected only, Migratory (M),

<sup>2</sup> South Australian *National Parks and Wildlife Act 1972* (NPWA) Status: Endangered (E); Vulnerable (V); Rare (R); (ssp.) subspecies protected only.

**Table 5-3 Threatened Flora Species with BDBSA records within 5 km of the site**

Species	Common Name	EPBC Act	NPW Act	Likelihood of occurrence at site
<i>Pycnosorus globosus</i>	Drumsticks	-	V	Possible. Suitable bladder saltbush on heavy soil habitat present however not recorded during survey. BDBSA records within 1 km.
<i>Calotis lappulacea</i>	Yellow Burr-daisy		R	Unlikely. No preferred loamy soils present. BDBSA records within 5 km
<i>Eucalyptus cajuputea</i> (previously <i>Eucalyptus viridis</i> ssp. <i>viridis</i> )	Green Mallee		R*	Unlikely, no suitable habitat present. BDBSA records within 5 km

<sup>1</sup> Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* Status: Critically Endangered (CR), Endangered (EN), Vulnerable (V), (ssp.) subspecies protected only

<sup>2</sup> South Australian *National Parks and Wildlife Act 1972* (NPWA) Status: Endangered (E); Vulnerable (V); Rare (R); (ssp.) subspecies protected only. \* Listed under previous name.

## 5.2 Proposed Clearance Footprint

The project is in the early concept phase and therefore construction footprints are yet to be determined. It is possible that the design and operation of the solar array will affect the vegetation clearance footprint. For example, if the arrays are designed to pivot above the low shrubland vegetation, vegetation clearance can be confined to cabling trenches, access tracks and fire breaks and steel piles holes. If arrays are installed in the north east portion of allotment A350, clearance of tall shrubland vegetation will be required.

For the purpose of this report, it is assumed that clearance of native vegetation from all of both allotments is required.

Allotments A350 is approximately 53.5 ha (as measured by GIS polygon).

**Table 5-4 Vegetation Clearance Estimates**

Allotment	Vegetation Community Area (ha) <sup>1</sup>		Total (ha)
	<i>Atriplex vesicaria</i> (Bladder Saltbush) / <i>Maireana pyramidata</i> (Blackbush) low open shrubland	<i>Acacia ligulata</i> (Sandhill Wattle) tall open-shrubland	
A 350	41.0	12.5	53.5



## 6. Application of the Native Vegetation Act 1991

### 6.1 Approval to Clear Native Vegetation

The provisions of the NV Act provide for the clearance of native vegetation either by application to the NVC for consent to clear or under exemptions contained in the *Regulations 2003*.

#### 6.1.1 Clearance Application under the Native Vegetation Act 1991

Proposed clearance of native vegetation that is protected under the NV Act is subject to assessment of Principles of Clearance as listed under the Act. If the proposed vegetation clearance is considered to be seriously at variance with the principles, clearance is generally not permitted to proceed. The Principles of Clearance considered for all native vegetation subject to a clearance application are whether:

- It comprises a high level of diversity of plants
- It has significance as a habitat for wildlife
- It includes plants of a rare, vulnerable or endangered species
- The vegetation comprises the whole, or a part, of a plant community that is rare, vulnerable or endangered
- It is significant as a remnant of vegetation in an area which has been extensively cleared
- It is growing in, or in association with, a wetland environment
- It contributes significantly to the amenity of the area in which it is growing or is situated.

In addition, Section 27(2) of the NV Act states that the (Native Vegetation) Council cannot give its consent to the clearance of native vegetation under subsection (1)(a) if the vegetation comprises, or forms part of a stratum of, native vegetation that is substantially intact (namely, the stratum has not been seriously degraded by human activity during the immediately preceding period of 20 years).

It is considered that an application to clear the native vegetation present at the site for this project would result in significant scrutiny by the Native Vegetation Council, as it is likely to be considered at variance with several of the Principles of Clearance, particularly related to habitat for wildlife and threatened species. In addition, the vegetation is likely to be considered *intact strata*.

However, approval to clear vegetation for this development may potentially be granted under Clearance Exemptions 5 (1)(C) or 5 (1)(d) which are discussed below, but a significant environmental offset would likely be required. Clearance of native vegetation for the construction and operation of other solar farms has recently been approved by the NVC under Exemption 5 (1)(d), and it is anticipated that this project will be processed under similar provisions.

#### **Exemption 5(1)(c) Development subject to Section 46 of the Development Act (Major Project Status)**

This exemption applies to proposed developments that are declared to be socially, economically and environmentally significant by the relevant Minister and require the preparation of an Environmental Impact Statement (EIS), Public Environment Report (PER) or Development Report (DR) prepared under the *Development Act 1993*.

NVC approval is not required for clearance of vegetation as part of the proposal however the NVC are invited to provide comment.

A Significant Environmental Benefit (SEB) offset applies to vegetation clearance under this exemption.

#### **Exemption 5 (1)(d) Clearance incidental to the construction of infrastructure in the public interest**

Regulation 5(1)(d) permits clearance of vegetation for the construction or expansion of a building or infrastructure that the Minister for Sustainability, Environment and Conservation considers to be in the public interest.

Approval to clear native vegetation under the provisions of exemption 5(1)(d) must be obtained from the NVC prior to construction. The NVC Exemption Guidelines (NVC, 2009) indicate the following broad provisions apply to clearance of native vegetation under exemption 5(1)(d):

- the clearance is incidental to the construction or expansion of a building or infrastructure and the Minister has, by instrument in writing, declared that he or she is satisfied that the clearance is in the public interest; or
- the clearance is required in connection with the provision of infrastructure or services to a building or proposed building, or to any place; and
- any development authorisation required by or under the *Development Act 1993* has been obtained; and
- the Council is satisfied (on the basis of information provided to the Council by the person seeking the benefit of this paragraph and such other information as the Council thinks fit) that, after taking into account the need to preserve biological diversity and the nature and purposes of any proposed building or infrastructure that is yet to be constructed, the proposed site of the building or infrastructure is the most suitable that is available; and
- the Council is satisfied (on the basis of information provided to the Council by the person seeking the benefit of this paragraph and such other information as the Council thinks fit) that there is no other practicable alternative that would involve no clearance or the clearance of less vegetation or the clearance of vegetation that is less significant or (if relevant) the clearance of vegetation that has been degraded to a greater extent than the vegetation proposed to be cleared; and
- An approved Vegetation Management Plan is provided
- An SEB offset applies to vegetation clearance under this exemption.

An application to the NVC under this Regulation will need to show that vegetation clearance has been minimised through implementing measures in the design and construction phases.

## 6.1 Significant Environmental Benefit (SEB)

The provision of a Significant Environmental Benefit (SEB) is required if approval to clear native vegetation is granted either through an application to clear or through exemptions under the NV Act. An SEB may be in the form of a set aside area (land put under an agreement which protects the vegetation within into the future) or by making a cash payment into a native vegetation management fund as stipulated under the Act. The SEB offset policy has recently been revised and implemented under the Native Vegetation Regulations, 2017.

### 6.1.1 SEB Options

Under the revised environmental offsetting policy, SEB Offsets can now be achieved in four ways:

- Establishing and managing native vegetation on land (approved by the Native Vegetation Council)
- Protecting and managing existing areas of native vegetation on land (approved by the NVC)
- Entering into Heritage Agreements which provide for the ongoing protection of native vegetation on land (approved by the NVC)
- Monetary payments into the Native Vegetation Fund

On-ground offsets (those not resolved through a monetary payment) may be undertaken via another person or corporate entity, or by an accredited third party provider who can achieve the SEB offset obligation on the proponent's behalf.

An environmental offset for the project which is commensurate with the final clearance requirements will be developed and documented in a Native Vegetation Management Plan for consideration by the Native Vegetation Council. Third party offsets or monetary payment will be considered.

The Native Vegetation Council has considered two options for addressing the final SEB requirement for similar solar farm projects in South Australia recently:

- Agreement to an initial SEB offset (either monetary payment or land set-aside) for the entire site to be provided within 6 months of the NVC decision and before any vegetation clearance occurs. A post-construction audit is subsequently undertaken to determine the actual vegetation clearance footprint and the SEB is reduced to reflect any reduction in clearance footprint (including if vegetation persists beneath solar panels).
- The SEB is calculated based on the spatial layout of the final design construction footprint. A post construction audit is also apply and finer adjustments made to the SEB quantum with this option.

## 7. Summary and Recommendations

The desktop study, field survey and subsequent discussions with Pangea Energy confirmed that the infrastructure footprint for the Stirling North Solar Project will be up to 53.5 ha (for total clearance of the site, based on area measured via GIS polygon). Clearance of native vegetation will be required for the installation and maintenance of solar arrays, cabling, transmission lines and access tracks with the potential vegetation clearance footprint dependent on a number of factors including the positioning and shape of the solar arrays, the type of vegetation community within which the infrastructure is located, and the measures adopted to minimise clearance employed in the design and construction phases.

Approval to clear native vegetation in South Australia is required under the NV Act either by application to the NVC, or by Exemptions under the Regulations of the Act.

It is considered that the following exemptions under the NV Regulations of the Act may be applicable to this project:

- **Exemption 5(1)(c) Development subject to Section 46 of the Development Act (Major Project Status)**  
Exemption 5(1)(c) will require Ministerial declaration of Major Project Status for the proposed development and the provision of more detailed environmental survey and assessment as part of the approval process.
- **Exemption 5 (1)(d) Clearance incidental to the construction of infrastructure in the public interest**  
Exemption 5(1)(d) stipulates that the NVC must be satisfied that the proposed development cannot be located at a site where vegetation clearance can be avoided or minimised. As outlined above, with appropriate siting and measures implemented in the design and construction phases, vegetation clearance will be minimised.

Native vegetation clearance approval for similar projects in recent times have been processed under the exemption 5 (1)(d).

Regardless of which provision of the NV Act applies, an SEB in the form of a set aside area or a monetary payment will be required.

As outlined in Section 5, a preliminary assessment of the application of the EPBC Act to the proposed development indicated that the construction and operation of the proposed infrastructure will not result in significant impact to threatened species or other Protected Matters under the EPBC Act, therefore a formal referral under the Act is not required.

## 8. References and Bibliography

Department of Environment (1999), Environment Protection and Biodiversity Conservation Act 1999

Department of Environment (2013a), EPBC Act Significant Impact Guidelines 1.1 Matters of National Environmental Significance

Australian Weeds Committee (AWC) (2012) Weeds of National Significance, <http://www.weeds.org.au/WoNS/> (Accessed online April 2016).

Department of Water, Land and Biodiversity Conservation (DWLBC) (2005) Guidelines for a native vegetation significant environmental benefit policy for the clearance of native vegetation associated with the minerals and petroleum industry. Prepared for the Native Vegetation Council, DWLBC, South Australia.

Simpson K and Day N (2004) Field Guide to the Birds of Australia (7th Edition). Penguin Books Australia.

SPRAT (Species Profile and Threats Database) Department of the Environment. Access online at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl> Accessed February 2016.

Strahan R (1995) The Mammals of Australia. Reed Books, NSW.

Threatened Species Scientific Committee (TSSC) (2008)  
<http://www.environment.gov.au/biodiversity/threatened/communities/pubs/l-effusa.pdf>

NatureMaps online database, accessed February 2017:  
<http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps>

## Appendix A. EPBC PMST Results



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 31/01/17 13:01:33

[Summary](#)

[Details](#)

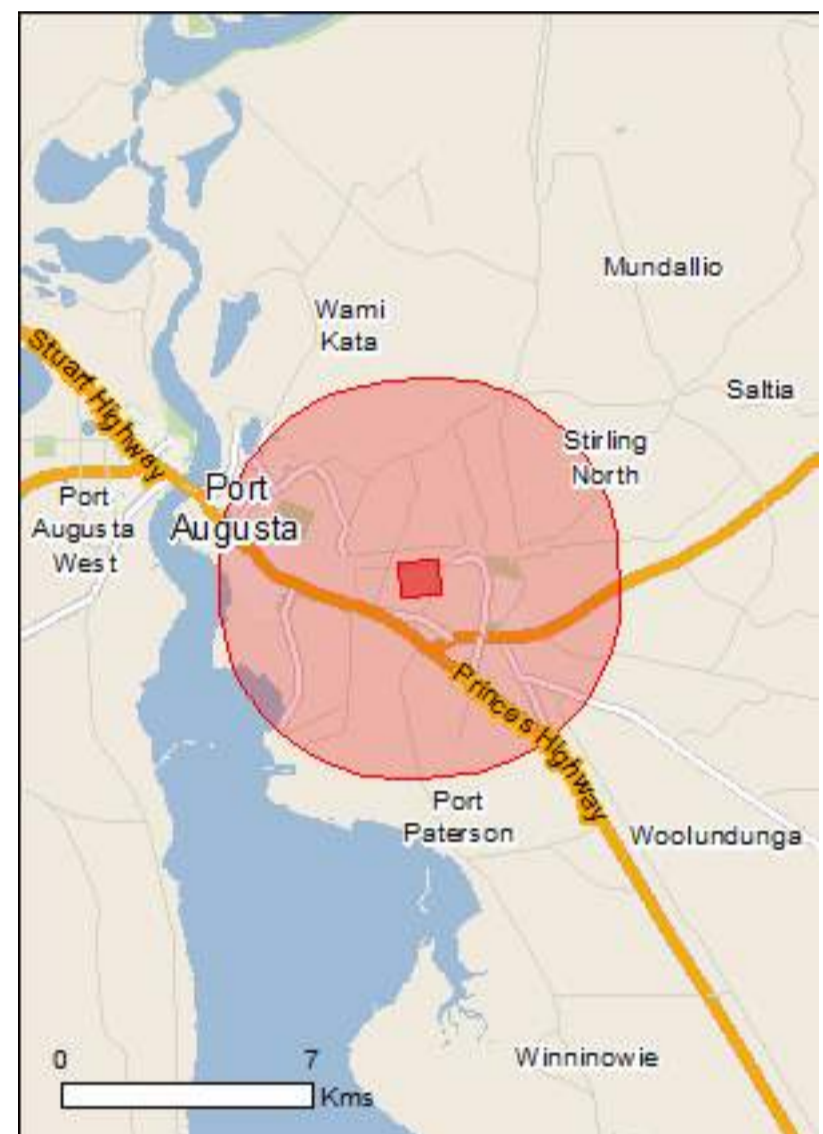
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

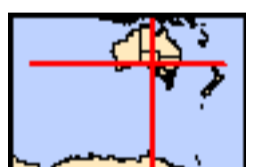
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 5.0Km



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	1
<a href="#">Listed Threatened Species:</a>	36
<a href="#">Listed Migratory Species:</a>	38

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	68
<a href="#">Whales and Other Cetaceans:</a>	8
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine:</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">State and Territory Reserves:</a>	None
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	28
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	None



# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities

[ [Resource Information](#) ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area

### Listed Threatened Species

[ [Resource Information](#) ]

Name	Status	Type of Presence
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#### Birds

[Amytornis textilis myall](#)

Western Grasswren (Gawler Ranges) [64454]	Vulnerable	Species or species habitat may occur within area
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[Calidris canutus](#)

Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
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[Calidris ferruginea](#)

Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
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[Diomedea antipodensis](#)

Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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[Diomedea epomophora \(sensu stricto\)](#)

Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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[Diomedea exulans \(sensu lato\)](#)

Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
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[Diomedea sanfordi](#)

Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
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[Leipoa ocellata](#)

Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
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[Limosa lapponica baueri](#)

Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
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[Limosa lapponica menzbieri](#)

Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
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[Macronectes giganteus](#)

Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within
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Name	Status	Type of Presence area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pedionomus torquatus</a> Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Extinct within area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
<a href="#">Petrogale xanthopus xanthopus</a> Yellow-footed Rock-wallaby (SA and NSW) [66646]	Vulnerable	Species or species habitat likely to occur within area
<b>Plants</b>		
<a href="#">Caladenia macroclavia</a> Large-club Spider-orchid [55012]	Endangered	Species or species habitat may occur within area
<a href="#">Caladenia tensa</a> Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
<a href="#">Caladenia woolcockiorum</a> Woolcock's Spider-orchid [55023]	Vulnerable	Species or species habitat may occur within area
<a href="#">Frankenia plicata</a> [4225]	Endangered	Species or species habitat may occur within area
<a href="#">Senecio megaglossus</a> Superb Groundsel [13374]	Vulnerable	Species or species habitat likely to occur within area

#### Reptiles

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

#### Sharks

<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
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#### Listed Migratory Species

[ [Resource Information](#) ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleishy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or

Name	Threatened	Type of Presence
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	related behaviour likely to occur within area Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Species or species habitat likely to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species

Name	Threatened	Type of Presence
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	habitat likely to occur within area Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian National Railways Commission

### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Species or species habitat likely to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat likely to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Species or species habitat known to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora (sensu stricto)</a> Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans (sensu lato)</a> Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Himantopus himantopus</a> Black-winged Stilt [870]		Species or species habitat known to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat may occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat likely to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
<a href="#">Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Thalassarche cauta (sensu stricto)</a> Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
<b>Fish</b>		
<a href="#">Acentronura australe</a> Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
<a href="#">Filicampus tigris</a> Tiger Pipefish [66217]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Heraldia nocturna</a> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
<a href="#">Histiogamphelus cristatus</a> Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
<a href="#">Hypselognathus rostratus</a> Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
<a href="#">Kaupus costatus</a> Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
<a href="#">Leptoichthys fistularius</a> Brushtail Pipefish [66248]		Species or species habitat may occur within area
<a href="#">Lissocampus caudalis</a> Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
<a href="#">Lissocampus runa</a> Javelin Pipefish [66251]		Species or species habitat may occur within area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area
<a href="#">Notiocampus ruber</a> Red Pipefish [66265]		Species or species habitat may occur within area
<a href="#">Phycodurus eques</a> Leafy Seadragon [66267]		Species or species habitat may occur within area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
<a href="#">Pugnaso curtirostris</a> Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
<a href="#">Solegnathus robustus</a> Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
<a href="#">Stigmatopora olivacea</a> a pipefish [74966]		Species or species habitat may occur within area
<a href="#">Stipecampus cristatus</a> Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
<a href="#">Vanacampus phillipi</a> Port Phillip Pipefish [66284]		Species or species habitat may occur within area
<a href="#">Vanacampus poecilolaemus</a> Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
<a href="#">Vanacampus vercoi</a> Verco's Pipefish [66286]		Species or species habitat may occur within area

## Mammals

<a href="#">Arctocephalus forsteri</a> Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
<a href="#">Arctocephalus pusillus</a> Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
<a href="#">Neophoca cinerea</a> Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area

## Reptiles

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

## Whales and other Cetaceans

Name	Status	Type of Presence
<a href="#">[ Resource Information ]</a>		
<b>Mammals</b>		
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Breeding known to occur within area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Extra Information

### Invasive Species [\[ Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
<i>Alauda arvensis</i> Skylark [656]		Species or species habitat likely to occur within area
<i>Anas platyrhynchos</i> Mallard [974]		Species or species habitat likely to occur within area
<i>Carduelis carduelis</i> European Goldfinch [403]		Species or species habitat likely to occur within area
<i>Columba livia</i> Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
<i>Passer domesticus</i> House Sparrow [405]		Species or species habitat likely to occur within area
<i>Streptopelia chinensis</i> Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
<i>Struthio camelus</i> Ostrich [1097]		Species or species habitat likely to occur within area
<i>Sturnus vulgaris</i> Common Starling [389]		Species or species habitat likely to occur within area
<i>Turdus merula</i> Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Mammals</b>		
<i>Capra hircus</i> Goat [2]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Austrocylindropuntia spp. Prickly Pears [85132]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat likely to occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk,		Species or species

Name	Status	Type of Presence
Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		habitat likely to occur within area
Nationally Important Wetlands		[ Resource Information ]
Name		State
<a href="#">Upper Spencer Gulf</a>		SA

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-32.50153 137.814913,-32.501602 137.814955,-32.501602 137.814955,-32.500914 137.824483,-32.508696 137.824998,-32.509203 137.815127,-32.50153 137.814913

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

## Appendix B. Stirling North Flora Species

## Stirling North Flora Species List December 2016/January 2017

Species Name	Common Name	A20	A350	A350
		1	1	2
<i>Acacia oswaldii</i>	Umbrella Wattle			x
<i>Atriplex holocarpa</i>	Pop Saltbush	x	x	
<i>Atriplex vesicaria</i>	Bladder Saltbush	x	x	
<i>Austrostipa scabra</i>	Spear-grass	x	x	
<i>Brachyscome ciliaris</i> var. <i>ciliaris</i>	Variable Daisy			x
<i>Brassica tournefortii</i> *	Wild Turnip	x	x	x
<i>Carpobrotus rossii</i>	Pig-face	x	x	
<i>Carrichtera annua</i> *	Ward's Weed	x	x	
<i>Carthamus lanatus</i> *	Saffron Thistle		x	x
<i>Centaurea melitensis</i>	Maltese Star		x	
<i>Cenchrus ciliaris</i> *	Buffel Grass	x		x
<i>Cynodon dactylon</i> *	Couch Grass			
<i>Dactyloctenium radulans</i>	Button Grass	x		
<i>Dissocarpus paradoxa</i>	Cannonball	x		
<i>Dissocarpus biflorus</i>	Many-horned Copperburr		x	
<i>Enchylaena tomentosa</i>	Ruby Saltbush	x		x
<i>Enneapogon avenaceus</i>	Common Bottle-washers	x		
<i>Galenia pubescens</i>	Coastal Galenia		x	
<i>Lycium ferocissimum</i> *	African Boxthorn	x	x	x
<i>Maireana georgei</i>	Satiny Bluebush	x	x	
<i>Maireana oppositifolia</i>	Opposite leaf Bluebush	x	x	
<i>Maireana pyramidata</i>	Blackbush	x	x	x
<i>Medicago minima</i> *	Burr Medic		x	
<i>Mesembryanthemum crystallinum</i>	Common Iceplant	x	x	
<i>Minuria cunninghamii</i>	Bush Minuria		x	x
<i>Nitraria billardieri</i>	Nitre Bush	x	x	x



Species Name	Common Name	A20	A350	A350
		1	1	2
<i>Olearia pimelioides</i>	Pimelea Daisy-bush			x
<i>Osteocarpum acropterum</i>	Bonefruit	x	x	
<i>Pimelea microcephala</i>	Shrubby Rice Flower			x
<i>Pittosporum angustifolium</i>	Native Apricot			x
<i>Rhagodia spinescens</i>	Thorny Saltbush			x
<i>Salsola kali</i>	Buckbush	x	x	x
<i>Sclerolaena brachyptera</i>	Short-winged Copperburr		x	
<i>Schinus molle</i> *	Peppertree			x
<i>Sida intricata</i>	Twiggy Sida	x		
<i>Sonchus oleraceus</i> *	Sow Thistle	x	x	x
<i>Tecticornia indica ssp leiostachya</i>	Brown-head Samphire		x	
<i>Tecticornia tenuis</i>	Slender Samphire		x	
<i>Tribulus terrestris</i> *	Caltrop	x		
<i>Zygophyllum eremaeum</i>	Climbing Twin-leaf		x	

## Appendix C. Threatened fauna and flora tables (within 30 km)

**BDBSA RECORDS of THREATENED FAUNA within 30 km of the Stirling North site**

<b>Species</b>	<b>Common Name</b>	<b>EPBC Act Status</b>	<b>NPW Act Status</b>	<b>Location</b>
<b>Birds</b>				
<i>Haematopus longirostris</i>	(Australian) Pied Oystercatcher		R	Winninowie (CP)
<i>Ardeotis australis</i>	Australian Bustard		V	
<i>Cladorhynchus leucocephalus</i>	Banded Stilt		V	
<i>Ninox connivens</i>	Barking Owl		R	
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard		R	
<i>Limosa limosa</i>	Black-tailed Godwit		R	
<i>Northiella haematogaster</i>	Bluebonnet		ssp	
<i>Neophema chrysostoma</i>	Blue-winged Parrot		V	
<i>Ardea ibis</i>	Cattle Egret		R	
<i>Calamanthus (Hylacola) pyrrhopygius</i>	Chestnut-rumped Heathwren	ssp	ssp	Mount Brown (CP)
<i>Actitis hypoleucos</i>	Common Sandpiper		R	
<i>Falcunculus frontatus</i>	Crested Shrike-tit		R	Mount Brown (CP)
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR		
<i>Stagonopleura guttata</i>	Diamond Firetail		V	The Dutchmans Stern (CP)
<i>Neophema elegans</i>	Elegant Parrot		R	
<i>Sternula nereis</i>	Fairy Tern	VU	E	
<i>Numenius madagascariensis</i>	Far Eastern Curlew	CR	V	
<i>Stictonetta naevosa</i>	Freckled Duck		V	The Dutchmans Stern (CP)
<i>Pachycephala inornata</i>	Gilbert's Whistler		R	The Dutchmans Stern (CP)
<i>Podiceps cristatus</i>	Great Crested Grebe		R	
<i>Strepera versicolor</i>	Grey Currawong		ssp	
<i>Falco hypoleucos</i>	Grey Falcon		R	
<i>Melanodryas cucullata</i>	Hooded Robin		ssp	
<i>Microeca fascians</i>	Jacky Winter		ssp	
<i>Larus dominicanus</i>	Kelp Gull		R	
<i>Egretta garzetta</i>	Little Egret		R	
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo		R	
<i>Biziura lobata</i>	Musk Duck		R	
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CR	E	Winninowie (CP)
<i>Turnix varius</i>	Painted Buttonquail		R	Mount Brown (CP)
<i>Falco peregrinus</i>	Peregrine Falcon		R	The Dutchmans Stern (CP)
<i>Calidris canutus</i>	Red Knot	EN		
<i>Myiagra inquieta</i>	Restless Flycatcher		R	
<i>Neophema petrophila</i>	Rock Parrot		R	
<i>Arenaria interpres</i>	Ruddy Turnstone		R	Winninowie (CP)
<i>Petroica boodang</i>	Scarlet Robin		ssp	Mount Brown (CP)
<i>Neophema splendida</i>	Scarlet-chested Parrot		R	
<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western ssp)		R	
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher		R	
<i>Macronectes giganteus</i>	Southern Giant Petrel	EN	V	
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		E	Winninowie (CP)
<i>Climacteris affinis</i>	White-browed Treecreeper		R	
<b>Mammals</b>				
<i>Dasyurus viverrinus</i>	Eastern Quoll	EN	E	
<i>Petrogale xanthopus xanthopus</i>	Yellow-footed Rock-wallaby	VU		
<i>Bettongia lesueur</i>	Burrowing Bettong	EX	E	

<b>Reptiles</b>				
<i>Aprasia pseudopulchella</i>	Flinders Worm-lizard	VU		
<i>Morelia spilota</i>	Carpet Python		R	
<i>Varanus varius</i>	Lace Monitor		R	

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Status: Critically Endangered (CR), Endangered (EN), Vulnerable (V), Migratory Wetland (MW), Migratory Marine (MM), Migratory Terrestrial (MT), Extinct (EX);

South Australian National Parks and Wildlife Act 1972 (NPWA) Status: Endangered (E); Vulnerable (V); Rare (R);

**BDBSA RECORDS of THREATENED FLORA within 30 km of the Stirling North site**

Species	Common Name	EPBC Act Status	NPW Act Status	Location
<i>Caladenia tensa</i>	Inland Green-comb Spider-orchid	EN		
<i>Leptorhynchos scaber</i>	Annual Buttons		R	
<i>Maireana excavata</i>	Bottle Fissure-plant		V	
<i>Austrostipa breviglumis</i>	Cane Spear-grass		R	Mount Brown (CP)
<i>Pycnosorus globosus</i>	Drumsticks		V	
<i>Eucalyptus polybractea</i>	Flinders Ranges Box		R	
<i>Thysanotus tenellus</i>	Grassy Fringe-lily		R	Mount Brown (CP)
<i>Eucalyptus cajuputea</i>	Green Mallee		R*	
<i>Deyeuxia densa</i>	Heath Bent-grass		R	Mount Brown (CP)
<i>Cryptandra campanulata</i>	Long-flower Cryptandra		R	Mount Brown (CP)
<i>Austrostipa pilata</i>	Prickly Spear-grass		V	
<i>Acacia quornensis</i>	Quorn Wattle		R	The Dutchmans Stern (CP)
<i>Olearia picridifolia</i>	Rasp Daisy-bush		R	
<i>Eucalyptus percostata</i>	Ribbed White Mallee		R	
<i>Logania saxatilis</i>	Rock Logania		R	
<i>Ozothamnus scaber</i>	Rough Bush-everlasting		V	The Dutchmans Stern (CP)
<i>Echinopogon ovatus</i>	Rough-beard Grass		R	Mount Brown (CP)
<i>Santalum spicatum</i>	Sandalwood		V	
<i>Lepidium pseudotasmanicum</i>	Shade Peppercross		V	Mount Brown (CP)
<i>Rytidosperma tenuius</i>	Short-awn Wallaby-grass		R	
<i>Veronica decorosa</i>	Showy Speedwell		R	
<i>Malacocera gracilis</i>	Slender Soft-horns		V	
<i>Rytidosperma laeve</i>	Smooth Wallaby-grass		R	
<i>Asperula syrticola</i>	Southern Flinders Woodruff		R	
<i>Rumex dumosus</i>	Wiry Dock		R	
<i>Calotis lappulacea</i>	Yellow Burr-daisy		R	The Dutchmans Stern (CP)
<i>Brachyscome ciliaris</i> var. <i>subintegrifolia</i>			R	Mount Brown (CP)
<i>Austrostipa tenuifolia</i>			R	Mount Brown (CP)

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Status: Endangered (EN), Vulnerable (V);

South Australian National Parks and Wildlife Act 1972 (NPWA) Status: Endangered (E); Vulnerable (V);

Rare (R); R\* = Rare status under previous name

## Appendix H. Cultural Heritage Assessment



# Stirling North Solar Storage Project

PANGEA ENERGY PTY LTD

## Desktop Heritage Assessment

Rev 0

IW142200

20 December 2017

### Document history and status

Revision	Date	Description	By	Review	Approved
A	23/11/2016	Draft for internal review	TD	KBJ	KBJ
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## Stirling North Solar Storage Project

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Client no: IW142200  
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The sole purpose of this report and the associated services performed by Jacobs is to prepare a Desktop Heritage Assessment in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

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## Abbreviations

DPC-AARD	Department of Premier and Cabinet-Aboriginal Affairs and Reconciliation Division
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
Jacobs	Jacobs Group (Australia) Pty Ltd
Pangea	Pangea Energy Pty Ltd
The Project	Stirling North Solar Storage Project
SAM	South Australian Museum

## **1. Introduction**

### **1.1 Background to the project**

Pangea Energy Pty Ltd (Pangea) intend to develop the Stirling North Solar Storage Project (SNSSP) (the Project) approximately three kilometres (km) east of Port Augusta, on a property commonly known as Lot 350 Paltridge Avenue, Stirling North (CT5352/55), herein referred to as the Subject Site. The Project will have a capacity of approximately 50 MW, and cover a total site area of approximately 54.31 hectares. Infrastructure required on site will include solar panels, inverter stations, a control room and site office, and internal access tracks for maintenance vehicles.

Jacobs Group (Australia) Pty Ltd (Jacobs) was engaged by Pangea to undertake a desktop heritage assessment. The purpose of the desktop heritage assessment is to summarise and provide comment on heritage sites and objects potentially impacted by the development of the proposed Project, approximately 300 km north-west of Adelaide.

Prior to construction of the Project, Pangea requires the identification of any heritage sites or objects that may be located within the Project study area. Identification of heritage sites or objects is required such that Pangea is compliant with legislative requirements associated with the protection of Aboriginal and non-Aboriginal historical heritage. The proposed development footprint and study area for the heritage assessment are shown below in Figure 1-1.

### **1.2 Study area**

The Subject site, owned by Pangea is currently vacant. The Subject site is relatively flat and largely cleared of native vegetation. Various forms of infrastructure are already present within the area surrounding the Subject site, including unsealed roads, transmission / distribution lines and a railway line.

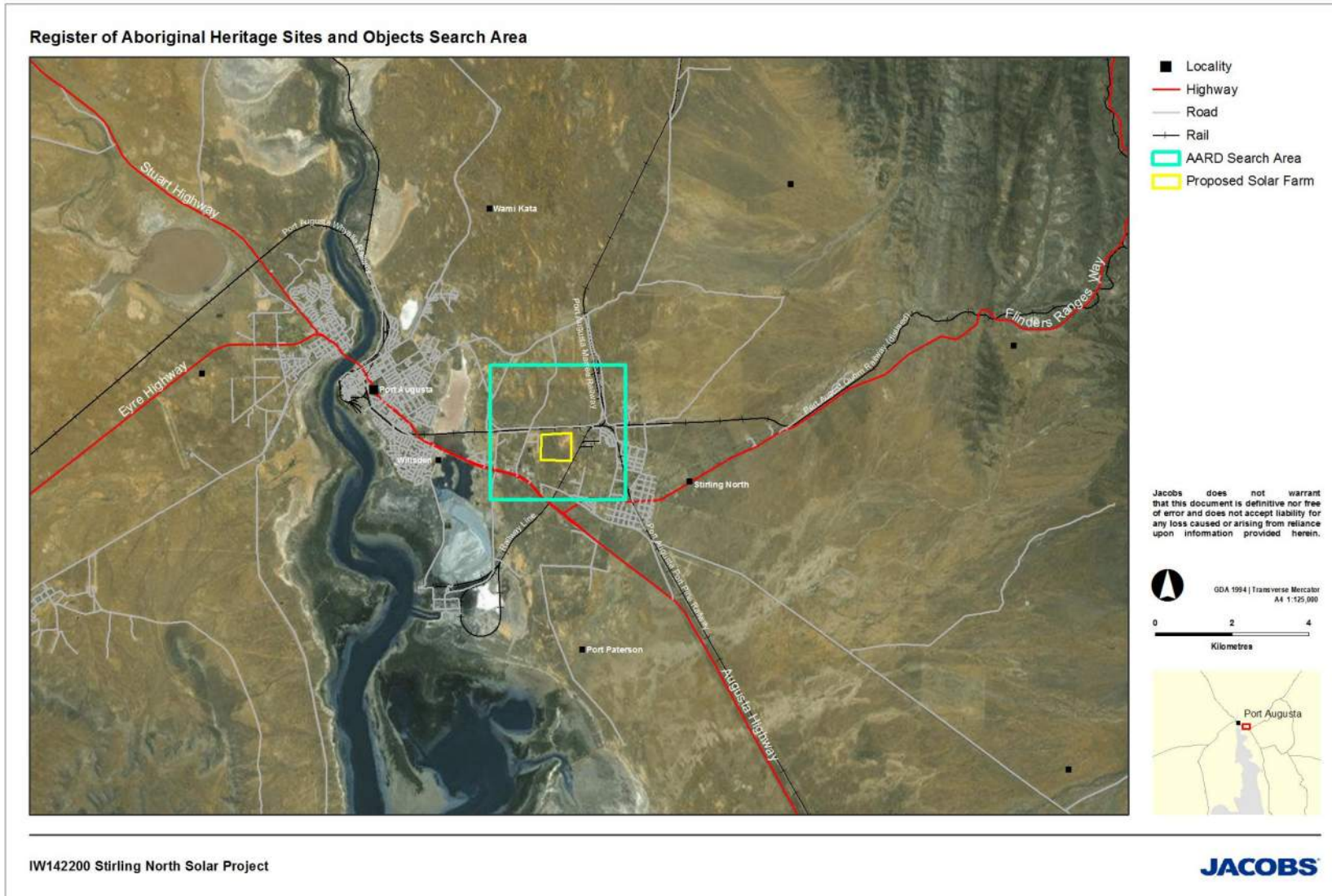


Figure 1-1 : Location of the Project site and study area for desktop heritage assessment

### 1.3 Legislative context

Within South Australia, the main legislation covering the protection of Aboriginal heritage sites and objects is the *Aboriginal Heritage Act 1988* (the Act). The Act stipulates that it is an offence to damage, disturb or interfere with any Aboriginal site or damage any Aboriginal object (registered or not) without the authority of the Minister for Aboriginal Affairs and Reconciliation. Section 20 of the Act requires that any Aboriginal sites, objects or remains, discovered on the land, need to be reported to the Minister. Penalties apply for failure to comply with the Act. A more comprehensive interpretation of the Act is provided in Appendix A.

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* is a Commonwealth Act that enables the Australian Government to respond to requests to protect traditionally important areas and objects that are under threat, if it appears that state or territory laws have not provided effective protection. The government can make special orders (declarations), to protect significant Aboriginal areas, objects and classes of objects from threats of injury or desecration.

The *Native Title Act 1993* is a Commonwealth Act that recognises and protects native title. “*Native title is the recognition by Australian law that some Indigenous people have rights and interests to their land that come from their traditional laws and customs*” (National Native Title Tribunal 2011a). It also sets out in what conditions Native Title is extinguished (e.g. on private freehold land).

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides protection to places on the National and Commonwealth Heritage Registers. The Act requires that any action that may have a significant impact on the heritage values of a listed place must be approved.

The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance, through the establishment of State Heritage Places. The Act establishes approval requirements for the disturbance of any such places and objects of non-Aboriginal heritage significance.

The Register of the National Estate (RNE) was formerly compiled as a record of Australia’s natural, cultural and Aboriginal heritage places worthy of protection for future generations. Places on the RNE that are in Commonwealth areas, or subject to actions by the Australian Government, are protected under the EPBC Act by the same provisions that protect Commonwealth Heritage places. The RNE was frozen on 19 February 2007, which means that no new places have been added or removed since that time. From February 2012 all references to the RNE were removed from the EPBC Act and the *Australian Heritage Commission Act 1975*. The RNE is maintained on a non-statutory basis as a publicly available archive. Although items listed on the RNE no longer have any statutory protection, the RNE provides a database for places and objects that may have heritage significance, and may be valued by the local community.

## 2. Methodology

This desktop assessment comprises a compilation of known items or objects of heritage significance. No consultation with relevant Aboriginal groups or site walkover was undertaken.

Identification of known sites and objects was achieved through the following:

- Review of the Commonwealth heritage registers (Register of the National Estate, World Heritage List, National Heritage List and Commonwealth Heritage List, all administered by the Department of the Environment) to determine whether any National or World Aboriginal heritage sites were within the study area.
- Request provided to Department of Premier and Cabinet-Aboriginal Affairs and Reconciliation Division (DPC-AARD) for a search of the Central Archive, which includes the Register of Aboriginal Sites and Objects. The Archive only includes sites that have been registered or reported to DPC-AARD.
- Review of the South Australian Museum (SAM) Archives for any documents relating to Aboriginal places, objects or tribes in the study area. This search provides an additional check to determine whether any historical data exists in archived documents that are not mentioned in the DPC-AARD search. The following key words were used in archival searches:
  - Port Augusta
  - Wami Kata
  - The Dutchmans Stern
  - Ostrich Farm
  - Mundallio
- Search of the National Native Title Tribunal's application database to determine whether there are any relevant Native Title claims over the study area.
- Review of the State and Local Heritage Registers

The results from these searches and information requests are presented in Section 4.

### 3. Environmental context

#### 3.1 Land systems and landforms

The following brief description of the landscape surrounding the study area provides the basis for determining the predicted archaeological sensitivity.

The most extensive, albeit broad scale environmental description of the land resources of South Australia has been undertaken by Laut et al (1977). Each identified environmental province in South Australia has been categorised into regions, associations and units. Subsequent delineation of land resources has been undertaken with the identification of 89 bioregions (Department of the Environment 2016). The Subject site is located on the border of the Gawler and Flinders Lofty Block Bioregions.

The Flinders Lofty Block bioregion is typically defined by mountain ranges, ridges and wide, flat plains. Vegetation corresponds to landforms, with eucalypts on hills and ranges that receive higher rainfall, mulga in the drier areas, and sparse low shrubs or spinifex on stony areas. The range to the east of the study area is typical of the landscape within the Flinders Lofty Block bioregion (refer Plate 3-1).



**Plate 3-1 : Southern Flinders Ranges**

The Gawler bioregion is characterised by rounded rocky hills, plains and salt encrusted lake beds. Vegetation types include spinifex grasslands, open woodlands and chenopod shrubs (Commonwealth of Australia 2008). The proposed Project site is typical of the landscape within the Gawler bioregion (refer Plate 3-2 Plate 3-2).

The landscape east of Port Augusta, and the proposed location of the Project is typically flat, with elevations ranging from 10 to 30 m AHD. To the east of the subject site is a north-south running ridgeline comprising Mount Brown Conservation Park which is within the southern Flinders Ranges (refer Plate 3-2). The ridgeline is approximately 17 km north-east of the subject site, with the summit at an altitude of 970 m, accessible via 13 km round trip hike.

The largely flat pastoral landscape extends to the north, south, and west of the subject site and comprises a series of ephemeral watercourses and water bodies that are subject to occasional flooding and may have previously been utilised by Aboriginal populations. The Spencer Gulf extends into the study area itself, the nearest point approximately 4 km south-west of the Subject site. No major watercourses, permanent or semi-permanent water bodies have been identified within the Subject site.





Plate 3-2 : Landscape typical of the Gawler bioregion (the Project site)

### 3.2 Land use

The landscape east of Port Augusta primarily consists of low to mid-height shrubland, open grasslands, or low, open eucalypt woodland. The broader landscape has been subject to disturbance since its occupation including agricultural activities (grazing), unformed access tracks and urban development, resulting in minimal vegetation coverage surrounding and within the subject site. There are no major watercourses in the study area as depicted in Figure 3-1. Other infrastructure including roads, railways, fencing and transmission lines are also present throughout the landscape.

These activities have resulted in ground disturbance and the clearance of vegetation across the Subject site. These activities may have disturbed any Aboriginal sites which might be present in the study area.

The Subject site is bound by private properties, and a State owned property on the north and east sides, under the administration of Department of Planning, Transport and Infrastructure (DPTI). A variety of land uses surround the Subject site, including agricultural, industrial, commercial, rural residential and the Port Augusta Prison.

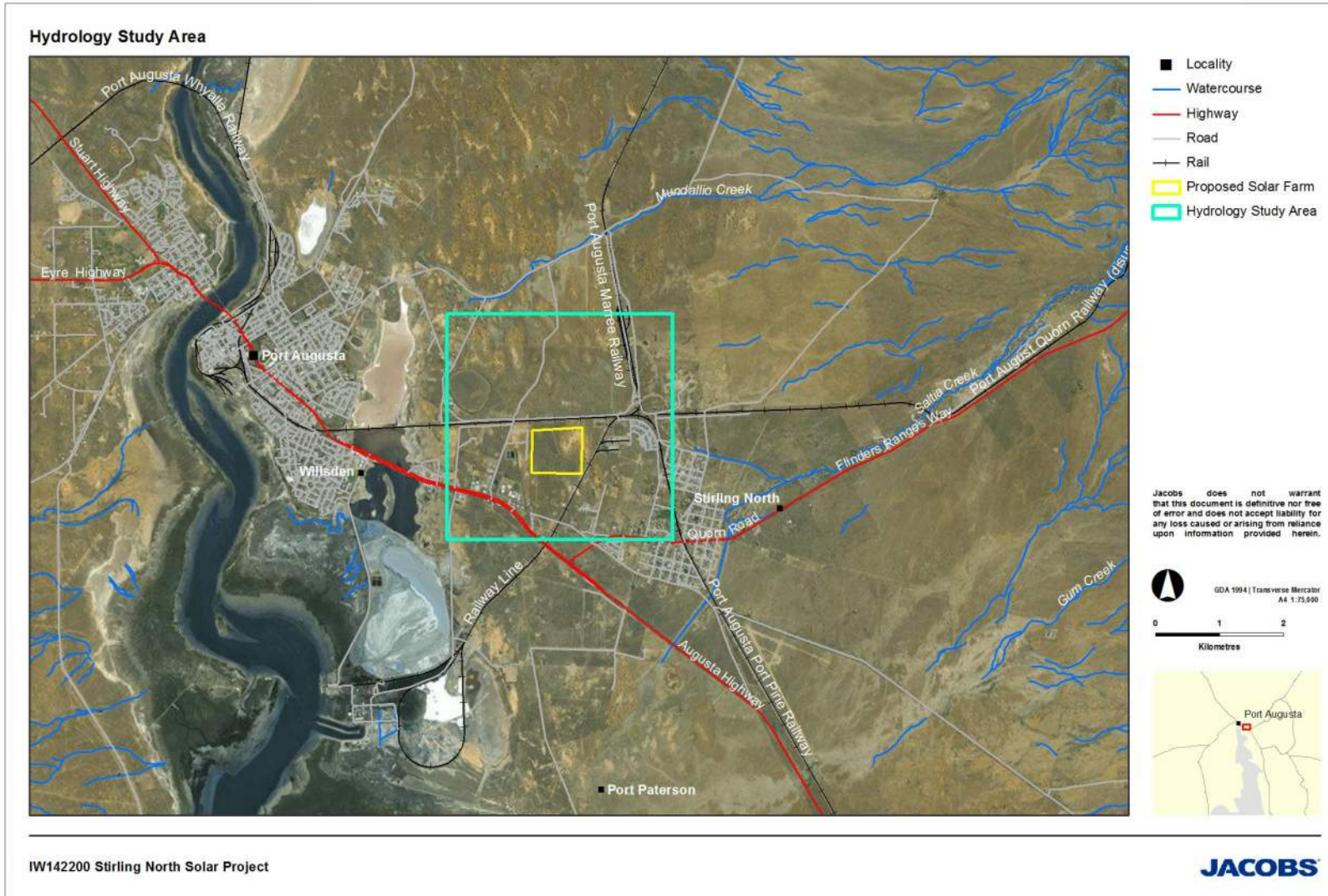


Figure 3-1 Watercourses in the Study Area

## 4. Results

This section details the results of the desktop investigations described in Section 2.

### 4.1 Database search results

#### Online register searches

Heritage items / places identified within the study area identified on the Register of the National Estate, State, Local or National/Commonwealth Heritage Register, or World Heritage Properties are summarised in Table 4.1. No World Heritage Places, National Heritage, or Commonwealth Heritage Properties were identified within the 10 km study area.

**Table 4.1 : Results from register searches**

Site / Description	Address	Heritage Type	Register ID	Distance from Project
Ostrich Farm (former)	Yorkeys Crossing Rd, Emeroo via Port Augusta, SA	Indicative Place (Register of the National Estate (Non-statutory archive)	17791	Approximately 12 km north of the study area
Smokers Bridge, Port Augusta	Quorn Railway, Stirling North, SA, Approximately 4km north-east of Stirling North on Port Augusta – Quorn Railway over Saltia Creek.	Registered on the National Estate (Non-statutory archive)	16001	Approximately 4 km north-east of study area.
Stone Culverts 3	Wilmington Rd, Stirling North, SA, Australia	Register of the National Estate (Non-statutory archive)	6942	Approximately 13 km south-east of study area.
Pichi Richi Railway, A three foot gauge railway with historic equipment still in operation by amateurs.	Railway Tce, Quorn, SA, Australia	Register of the National Estate (Non-statutory archive)	6903	Approximately 20 km north-east of the study area.
Port Augusta Gaol	Franks Dr, Port Augusta, SA, Australia	Removed from Register or IL	6902	Approximately 700 m south-west of the study area

### DPC-AARD search

The DPC-AARD search of the Central Archive identified 1 reported site within the study area, however, none were within the Subject site (see Table 4.2 and Figure 4-1). The only site found was located approximately 2 km north of the Subject site. Additional sites or objects may exist within the study area that have not been discovered or reported to AARD. It is important to note that the Central Archive is not considered a comprehensive record of all Aboriginal sites and objects in South Australia. In addition, locational data provided through the search may not be precise and may differ from the actual location of the site.

**Table 4.2 : Results from DPC-AARD search of the Central Archive**

DPC-AARD Site Number	Site Status	Site Type
6433_5975	Reported	Archaeological

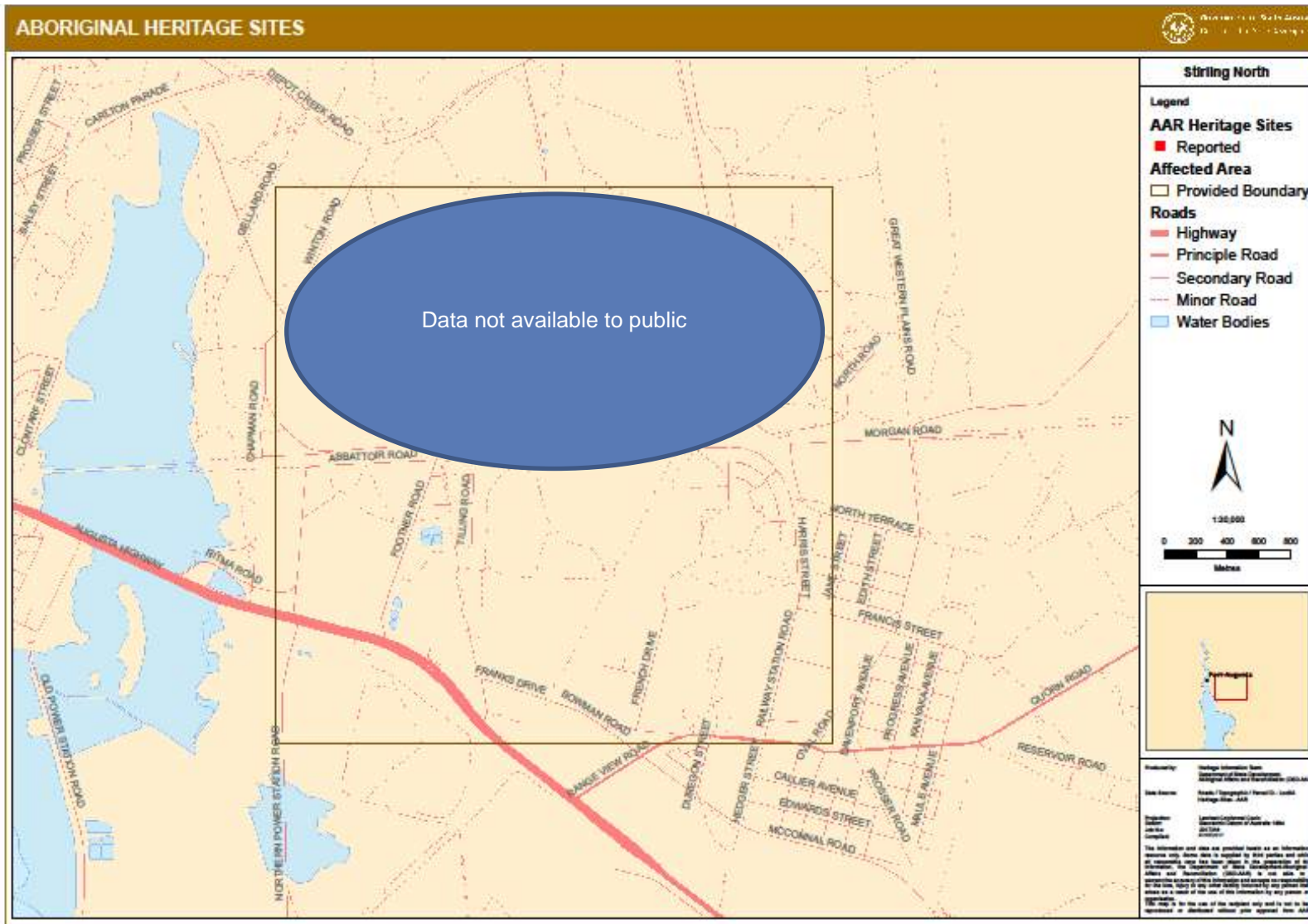


Figure 4-1 : Map provided by DPC AARD showing listed Aboriginal sites in relation to the study area

## SAM search

The SAM database was searched using criteria as defined in Section 2. Eleven records that may be relevant to the Project were identified (Table 4.3).

**Table 4.3 : SAM records**

Location	Inventory Identifier	Date	Collector	Description
Port Augusta	AA 338/5/5	1925	Tindale	Photo "Aborigines of Pt Augusta man & wife"
Port Augusta	AA 338/43/419	1970	Tindale	"Tribal Map Port Augusta"
Port Augusta	AA 357/2/63/44 D	1923 - 1929	Walker	Photo annotated "tea and sugar weekly supply train between Port Augusta and Kalgoolie"
Port Augusta	AA 338/5/5 38	1925	Tindale	Black and white acetate positive, annotated "Shell & Chippings Campsite 1 m W. of Port Augusta"
Port Augusta	AA 31/6/1 24	1943 - 1945	Black	Campsite photograph near Port Augusta
Port Augusta	AA 31/1/1 3	1943 - 1945	Black	Notebook relating to campsite photograph (above)
Davenport	AA 31/7/1 8-10	-	Black	Map of Davenport area showing locations of some Australian Aboriginal campsites
Port Augusta	AA 338/23/5	1940- 1974	Tindale	Sketch map showing 'tribes' in southeastern South Australia
Port Augusta	AA 362/3/1	-	Weathersbee	Photographs relating to Australian Aboriginal sites
Port Augusta	AA 1/1/190	-	Aborigines 'Friends' Association	Map showing reserves, missions and settlements for Aborigines
Port Augusta	AA 3 57/11/5/15 B	1923 - 14929	Walker	News clippings – 'Working among Aborigines'

It should be noted that, like the DPC-AARD database, the SAM database is not a complete list of Aboriginal sites or objects within the study area. The SAM database should be considered as a guide only to the types of sites and objects found in the region. The presence of these items indicates that there is a possibility of discovering sites or objects of significance within the study area.

## Native Title

There is currently one registered Native Title claim over the area, the Nukunu Native Title Claim (SC1996/005). In accordance with SC1996/005 'Description of the areas within the external boundaries that are not covered by the application, Attachment B of the application, this Native Title is, however, extinguished where the creation of a dedicated road; and an authorised valid Crown Grant, vesting or other interest.

## Previous archaeological assessments

It has been impossible to establish if any previous archaeological assessments of the study area have been undertaken however, previous assessments from the wider Project region indicate that the most common archaeological sites located here will be stone artefacts and stone arrangements. Aboriginal sites will most likely be located within 200 m of ephemeral and permanent waters sources. There are no major water sources

located in the study area as depicted in Figure 3-1, however, any ephemeral water sources may possess sparse scatters of stone artefacts.

### **Summary and predictive statement**

No registered or reported Aboriginal sites were identified within the subject site, and there was no information on whether any previous archaeological assessments within or close to the subject site have been undertaken. There are no semi-permanent or permanent water sources located in the subject site or study area. There are, however several ephemeral streams located in the wider surroundings approximately 1.5 km from the study area as shown in Figure 3-1.

Therefore any Aboriginal use of the study area is likely to have been transient and resulted in archaeological evidence comprising sparse stone artefact scatters located within 200 m of an ephemeral watercourses, outside of the study area.

Given the use of the land within and surrounding the proposed development is primarily pastoral and has been the subject of low intensity development, it is anticipated that any Aboriginal sites or objects may remain preserved within the subject site.

## 5. Conclusion and Recommendations

### 5.1 Aboriginal heritage

The DPC-AARD search of the Central Archive identified one reported site within the study area, and none within the subject site (see Table 4.2 and Figure 4-1). The single reported site is located north of the railway.

Previous assessments from the wider Project region indicate that the most common archaeological sites that may be present within the Subject site will be stone artefacts and stone arrangements. Aboriginal sites will most likely be located within 200 m of ephemeral and permanent water sources. There are no major water sources located in the Subject site, however there are a number of ephemeral water sources approximately 1.5 km outside of the study area Figure 4-1. Therefore, there is a low potential that Aboriginal sites and objects may exist in the subject site footprint.

The *Aboriginal Heritage Act* 1988 provides blanket protection for all Aboriginal sites in South Australia whether registered or not. Prior to construction, consultation with the Traditional Owners (Nukunu native title claimants) in conjunction with a field survey to identify whether any Aboriginal sites of significance are present in the Subject site is recommended to ensure there are no constraints to the Project during the construction phase.

If any sites, objects or skeletal remains that may be of Aboriginal significance are identified during the construction period, stop work procedures should be implemented as follows:

- **Stop works** – stop all works in the vicinity of the site and no further disturbance of the site will be made.
- **Restrict access** – access to the site will be restricted to protect the site.
- **Notify authorities** – the Heritage Branch, Aboriginal Affairs and Reconciliation Division and / or the local Police (if suspected human remains have been discovered) will be notified of the finding.
- **Manage the site and ongoing access** – determine the appropriate course of action in consultation with the relevant authorities and resume works when it is appropriate to do so.

The stop work procedure should be incorporated into the Construction Environment Management Plan and provided to all construction personnel as part of the site induction process.

### 5.2 Non-Aboriginal historical heritage

No non-Aboriginal heritage places were identified within the study area, or subject site.

It is an offence Section 36 of the *Heritage Places Act 1993* makes it an offence to damage a heritage place entered onto the SA Heritage Register. Offences under Section 36 provides penalties ranging from \$50,000 to \$120,000. Section 36(5) of the Act provides exclusion to penalties based on authorisations and approvals given under other listed pieces of legislation (including authorisations made under the *Development Act 1993*).

If there is a risk that the proposal may impact the registered site, consultation with the State Heritage Branch must be undertaken to determine management strategies, or siting requirements that should be incorporated to a future development application.



## 6. References

Commonwealth of Australia 2008. *Extract from Rangelands 2008 — Taking the Pulse 4. Focus Bioregions - Gawler bioregion (SA)*. National Land & Water Resources Audit

Department of the Environment 2017. *Australia's bioregions (IBRA)*. Online, accessed 28/06/2017. URL: <https://www.environment.gov.au/land/nrs/science/ibra>

Laut, P, Heyligers, PC, Keig, G, Lijffler, E, Margules, C, & Scott, RM 1977, *Environments of South Australia*, Division of Land Use Research, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia.

National Native Title Tribunal 2011a, 'Exactly what is native title?', <http://www.nntt.gov.au/Information-about-native-title/Pages/Nativetitleightsandinterests.aspx> and [http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC\\_details.aspx?NNTT\\_Fileno=SC1996/005](http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC_details.aspx?NNTT_Fileno=SC1996/005)

National Native Title Tribunal 2016, 'Claimant application summary – Nukunu Native Title Claim', [http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC\\_details.aspx?NNTT\\_Fileno=SC1996/005](http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC_details.aspx?NNTT_Fileno=SC1996/005)

Department of Planning, Transport and Infrastructure, *Heritage Places Database*, Accessed 28/06/2017. URL: [http://maps.sa.gov.au/heritagesearch/SearchResultPage.aspx?p\\_searchtype=LOCATION&p\\_suburb=STIRLING%20NORTH&p\\_lga=Port%20Augusta&p\\_class=ALL](http://maps.sa.gov.au/heritagesearch/SearchResultPage.aspx?p_searchtype=LOCATION&p_suburb=STIRLING%20NORTH&p_lga=Port%20Augusta&p_class=ALL)

Department of the Environment and Energy, *Australian Heritage Database*, accessed 28/06/2017. URL: [http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=search\\_form;list\\_code=RNE](http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=search_form;list_code=RNE)

## Appendix A. Interpretation of *Aboriginal Heritage Act 1988*

The *Aboriginal Heritage Act 1988*, provides blanket protection for all Aboriginal sites and objects in South Australia. An Aboriginal site is defined by the Act as being an area of land:

- a) that is of significance according to Aboriginal tradition; OR
- b) that is of significance to Aboriginal archaeology, anthropology or history.

An Aboriginal object is defined by the Act as an object:

- a) that is of significance according to Aboriginal tradition; OR
- b) that is of significance to Aboriginal archaeology, anthropology or history.

The Aboriginal Affairs and Reconciliation Division (AARD) is required to keep a Register of Sites but it should be noted that all sites are protected, irrespective of whether they are on the Register or not.

Section 7 of the Act establishes an Aboriginal Heritage Committee, now referred to as the State Heritage Committee. This committee is comprised of representatives from local heritage committees and its functions are to advise the Minister on the significance of sites and objects, their preservation and protection and other matters relating to the Act.

Under Section 6 (2) the Minister must, at the request of the traditional owners of an Aboriginal site or object, delegate the Minister's powers under sections 21, 23, 29 and 35 to the traditional owners of the site or object. A 'traditional owner' of an Aboriginal site or objects means an Aboriginal person who, in accordance with Aboriginal tradition, has social, economic or spiritual affiliations with, and responsibilities for, the site or object.

Under Section 23 of the Act, it is an offence for any person, without the authority of the Minister to:

- a) damage, disturb or interfere with any Aboriginal site;
- b) damage any Aboriginal object; OR
- c) where any Aboriginal object or remains are found:
  - (i) disturb or interfere with the object or remains; OR
  - (ii) remove the object or remains.

The penalty for such an offence is \$10,000 or imprisonment for six months in the case of an individual and \$50,000 in the case of a corporate body. Where a corporate body commits an offence against the Act, each member of the governing body is guilty of the same offence and is liable to the same penalty as an individual.

Under Section 24, the Minister may prohibit or restrict access to a site and also prohibit or restrict activities at or near a site. Prohibitions and restrictions made under this section require the approval of the Governor.

Section 12 allows for a person who proposes undertaking action near a site to apply for a determination from the Minister as to the site's significance. Under Section 12(6), the Minister may then accept advice from an 'expert' on this matter and then make a determination as to whether the site is to be retained on the Register of Aboriginal Sites or whether it should be removed from the Register. Sites or objects that are determined not to be significant may be excluded from the operations of the Act (Section 13). Partial disturbance or clearance of a site as, for example, would be required in the case of a proposal to erect a powerline or excavate a trench across part of a site may be possible through the determination process.

Section 20 states that all people who 'discover' Indigenous sites or objects must report them to the Minister, through AARD. Details providing particulars of the nature and location of the site, object or remains must be included. The penalty for such an offence is \$50,000 for a body corporate, or \$10,000 or imprisonment for 6 months in the case of an individual.

## Appendix I. Relevant Development Plan Policy

### Form of Development

#### OBJECTIVES

- 9) Industrial, commercial, retail and office development located in suitable areas.
- 11) A coastal city that retains, protects and enhances the environment, heritage, coast and community lifestyle, whilst encouraging tourism and business development, as illustrated on the Structure Plan Map PtAu/1 (Overlay 1), and by strengthening its identity.

#### Roads and Access

- 27 Road reserves should be of a width and alignment that can:
- (a) provide for safe and convenient movement and parking of projected volumes of vehicles and other users;
  - (c) allow vehicles to enter or reverse from an allotment or site in a single movement allowing for a car parked on the opposite side of the street;
  - (e) accommodate the location, construction and maintenance of stormwater drainage and public utilities;
  - (g) allow for the efficient movement of service and emergency vehicles.

### Appearance of Land and Buildings

#### OBJECTIVES

- 18) The amenity of localities not impaired by the appearance of land, buildings and objects
- 19) Development landscaped in a manner appropriate to the region

#### PRINCIPLES OF DEVELOPMENT CONTROL

- 41) Development should display a high standard of design, appearance, amenity and site layout
- 42) Development should enhance the amenity of the townscape, public streets and spaces in its locality and reflect the townscape character sought in the respective areas
- 43) The apparent bulk, height or scale of any large buildings which may be required for specific functional reasons should be minimised by the careful articulation and composition of building forms and facades
- 45) Buildings should be set-back from road and side boundaries a distance dependent on the scale and height of the building relative to other buildings in the locality
- 46) Buildings and structures should be set-back from the road frontage no less than the adjacent building expect where the adjacent allotment is vacant, buildings and structures should be set-back eight metres from the front boundary and three metres from the side boundary
- 47) Building development should be landscaped in a manner which requires minimal artificial watering, utilises rainfall and run-off, provides shade, reduces dust and acts as a wind break. Such landscaping should promote a pleasant character in the locality and aid in the climatic control of building temperatures.
- 48) Landscaping should:



- (a) not result in the introduction or increased spread of scheduled pest plants or environmental weeds
- (b) predominantly be comprised of indigenous species relevant to Port Augusta and its environs
- (c) include species that are appropriate for the environmental conditions surrounding the development; and
- (d) when required to screen development, be of suitable height, growth rate and year round foliage to facilitate the screening function

## Environment Protection

### OBJECTIVES

- 21) The conservation, preservation and enhancement of scenically attractive areas including land adjoining water or scenic routes
- 24) The conservation, protection and enhancement of natural systems and areas of conservation significance including areas of vegetation, reserves, the coast, rivers, lakes, wetlands, mangroves, floodplains and marine resources
- 25) The retention and reuse, where possible, of rainfall and stormwater run-off

### PRINCIPLES OF DEVELOPMENT CONTROL

- 49) Development should not have an adverse effect on natural features, land adjoining water, scenic routes, or scenically attractive areas.

## Natural Resources

### OBJECTIVES

- 32) Protection of the quality and quantity of South Australia's surface waters, including inland, marine and estuarine and underground waters.
- 33) The ecologically sustainable use of natural resources including water resources, including marine waters, ground water, surface water and watercourses.
- 34) Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.
- 35) Development consistent with the principles of water sensitive design.
- 36) Development sited and designed to:
  - a) protect natural ecological systems
  - b) achieve the sustainable use of water
  - c) protect water quality, including receiving waters
  - d) reduce runoff and peak flows and prevent the risk of downstream flooding
  - e) minimise demand on reticulated water supplies
  - f) maximise the harvest and use of stormwater
  - g) protect stormwater from pollution sources.
- 37) Storage and use of stormwater which avoids adverse impact on public health and safety.
- 40) Minimal disturbance and modification of the natural landform.
- 41) Protection of the physical, chemical and biological quality of soil resources
- 42) Protection of areas prone to erosion or other land degradation processes from inappropriate development



43) Protection of the scenic qualities of natural and rural landscapes

#### **PRINCIPLES OF DEVELOPMENT CONTROL**

- 80) Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.
- 82) Development should not significantly obstruct or adversely affect sensitive ecological areas such as creeks, wetlands, estuaries and significant seagrass and mangrove communities.
- 83) Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.

#### **Water Sensitive Design**

- 84) Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.
- 86) Development should be sited and designed to:
  - a) capture and re-use stormwater, where practical
  - b) minimise surface water runoff
  - c) prevent soil erosion and water pollution
  - d) protect and enhance natural water flows
  - e) protect water quality by providing adequate separation distances from watercourses and other water bodies
  - f) not contribute to an increase in salinity levels
  - g) avoid the water logging of soil or the release of toxic elements
  - h) maintain natural hydrological systems and not adversely affect:
    - i) the quantity and quality of groundwater
    - ii) the depth and directional flow of groundwater
    - iii) the quality and function of natural springs.
- 87) Water discharged from a development site should:
  - i) be of a physical, chemical and biological condition equivalent to or better than its pre-developed state
  - j) not exceed the rate of discharge from the site as it existed in pre-development conditions.
- 88) Development should include stormwater management systems to protect it from damage during a minimum of a 1-in-100 year average return interval flood.
- 89) Development should have adequate provision to control any stormwater over-flow runoff from the site and should be sited and designed to improve the quality of stormwater and minimise pollutant transfer to receiving waters.
- 90) Development should include stormwater management systems to mitigate peak flows and manage the rate and duration of stormwater discharges from the site to ensure the carrying capacities of downstream systems are not overloaded.
- 91) Development should include stormwater management systems to minimise the discharge of sediment, suspended solids, organic matter, nutrients, bacteria, litter and other contaminants to the stormwater system.
- 93) Stormwater management systems should:
  - k) maximise the potential for stormwater harvesting and re-use, either on-site or as close as practicable to the source



- l) utilise, but not be limited to, one or more of the following harvesting methods:
  - i) the collection of roof water in tanks
  - ii) the discharge to open space, landscaping or garden areas, including strips adjacent to car parks
  - iii) the incorporation of detention and retention facilities
  - iv) aquifer recharge.
- 94) Where it is not practicable to detain or dispose of stormwater on site, only clean stormwater runoff should enter the public stormwater drainage system.
- 95) Artificial wetland systems, including detention and retention basins, should be sited and designed to:
  - (a) ensure public health and safety is protected;
  - (b) minimise potential public health risks arising from the breeding of mosquitoes.
- 104) Development should comply with the current Environment Protection (Water Quality) Policy.

### **Biodiversity and Native Vegetation**

- 105) Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species.
- 106) Development should be designed and sited to minimise the loss and disturbance of native flora and fauna, including marine animals and plants, and their breeding grounds and habitats.
- 110) Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity.
- 111) Development should be located and occur in a manner which:
  - a) does not increase the potential for, or result in, the spread of pest plants, or the spread of any non-indigenous plants into areas of native vegetation or a conservation zone

### **Soil Conservation**

- 115) Development should not have an adverse impact on the natural, physical, chemical or biological quality and characteristics of soil resources.
- 116) Development should be designed and sited to prevent erosion.
- 117) Development should take place in a manner that will minimise alteration to the existing landform.
- 118) Development should minimise the loss of soil from a site through soil erosion or siltation during the construction phase of any development and following the commencement of an activity.

## **Hazards**

### **OBJECTIVES**

- 44) Maintenance of the natural environment and systems by limiting development in areas susceptible to natural hazard risk.
- 45) Development located away from areas that are vulnerable to, and cannot be adequately and effectively protected from the risk of natural hazards.
- 47) Development located and designed to minimise the risks to safety and property from flooding.
- 48) Development located to minimise the threat and impact of bushfires on life and property.
- 49) Expansion of existing non-rural uses directed away from areas of high bushfire risk.
- 51) Protection of human health and the environment wherever site contamination has been identified or suspected to have occurred.



- 52) Appropriate assessment and remediation of site contamination to ensure land is suitable for the proposed use and provides a safe and healthy living and working environment.
- 53) Minimisation of harm to life, property and the environment through appropriate location of development and appropriate storage, containment and handling of hazardous materials.

#### **PRINCIPLES OF DEVELOPMENT CONTROL**

- 119) Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of hazards.
- 120) There should not be any significant interference with natural processes in order to reduce the exposure of development to the risk of natural hazards.

#### **Flooding**

- 121) Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.
- 122) Development should not be undertaken in areas liable to inundation by tidal, drainage or flood waters unless the development can achieve all of the following:
  - a) it is developed with a public stormwater system capable of catering for a 1-in-100 year average return interval flood event
  - b) buildings are designed and constructed to prevent the entry of floodwaters in a 1-in-100 year average return interval flood event.
- 123) Development, including earthworks associated with development, should not do any of the following:
  - c) impede the flow of floodwaters through the land or other surrounding land
  - d) increase the potential hazard risk to public safety of persons during a flood event
  - e) aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
  - f) cause any adverse effect on the floodway function
  - g) increase the risk of flooding of other land
  - h) obstruct a watercourse.

#### **Bushfire**

- 125) Buildings and structures should be designed and configured to reduce the impact of bushfire through designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.
- 128) Buildings and structures should be designed and configured to reduce the impact of bushfire through using designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings.

#### **Salinity**

- 132) Development should not increase the potential for, or result in an increase in, soil and water salinity
- 133) Preservation, maintenance and restoration of locally indigenous plant species should be encouraged in areas affected by dry land salinity

#### **Acid Sulfate Soils**

- 135) Development and activities, including excavation and filling of land, that may lead to the disturbance of potential or actual acid sulfate soils should be avoided unless such disturbances are managed in a way that effectively avoids the potential for harm or damage to any of the following:
  - a) the marine and estuarine environment
  - b) natural water bodies and wetlands



- c) agricultural or aquaculture activities
- d) buildings, structures and infrastructure
- e) public health.

#### **Site Contamination**

137) Development, including land division, should not occur where site contamination has occurred unless the site has been assessed and remediated as necessary to ensure that it is suitable and safe for the proposed use.

#### **Containment of Chemical and Hazardous Materials**

138) Hazardous materials should be stored and contained in a manner that minimises the risk to public health and safety and the potential for water, land or air contamination.

139) Development that involves the storage and handling of hazardous materials should ensure that these are contained in designated areas that are secure, readily accessible to emergency vehicles, impervious, protected from rain and stormwater intrusion and other measures necessary to prevent:

- a) discharge of polluted water from the site
- b) contamination of land
- c) airborne migration of pollutants
- d) potential interface impacts with sensitive land uses.

## **Heritage**

### **OBJECTIVES**

54) The conservation of land, buildings and structures and their settings, which are of aesthetic, architectural, historical, cultural, archaeological, geological, palaeontological, technological or scientific significance.

55) The conservation and maintenance of the integrity of places of identified state and local heritage value.

58) The preservation of buildings or sites of architectural, historical, cultural heritage or scientific interest.

### **PRINCIPLES OF DEVELOPMENT CONTROL**

144) Development should conserve and retain the cultural significance of a local heritage place or State heritage place based on a respect for the existing fabric and should involve the least possible physical intervention. Conservation of places of heritage value should include provision for their security, maintenance and future conservation.

145) Development should conserve the heritage value of the heritage place and require the maintenance of an appropriate visual context, eg siting, form, scale, colour, texture and materials. New construction, demolition or modification should not adversely affect the setting and context of places of heritage value.

## **Outdoor Advertisements**

### **OBJECTIVES**

68) An urban environment and rural landscape not disfigured by advertisements

69) Advertisements in retail, commercial and industrial urban areas, and centre zones, designed to enhance the appearance of those areas.

70) Advertisements not hazardous to any person.





## **PRINCIPLES OF DEVELOPMENT CONTROL**

204) The location, siting, size, shape and materials of construction, of advertisements should be:

- (a) consistent with the desired character of areas or zones as described by their objectives;
- (b) consistent with the predominant character of the urban or rural landscape; or
- (c) in harmony with any building or site of historical significance or heritage value in the locality.

205) Advertisements should not detrimentally affect by way of their siting, size, shape, scale, glare, reflection or colour the amenity of areas, zones or localities in which they are situated.

206) Advertisements should not impair the amenity of areas, zones or localities, in which they are situated by creating, or adding to, clutter, visual disorder and the untidiness of buildings and spaces.

207) Advertisements should not obscure views of attractive landscapes or particular trees or groups of trees.

208) The scale of advertisements should be compatible with the buildings on which they are situated and with nearby buildings and spaces.

211) Advertisements should not be erected in positions close to existing electricity mains so that potentially hazardous situations are created.

212) Advertisements should not create a hazard to persons travelling by any means.

213) Advertisements should not obscure a driver's view of other road vehicles, of rail vehicles at or approaching level crossings, of pedestrians and of features of the road such as junctions, bends, changes in width, traffic control devices and the like, that are potentially hazardous.

214) Advertisements should not be so highly illuminated as to cause discomfort to an approaching driver, or create difficulty in their perception of the road, or of persons or objects on it.

215) Advertisements should not be liable to interpretation by drivers as an official traffic sign or convey to drivers information that might be confused with instructions given by traffic signals or other control devices, or impair the conspicuous nature of traffic signs or signals.

217) An outdoor advertisement should be displayed only on land upon which the business to which it relates is conducted unless it is of particular value to the public as an information sign.

219) Free standing advertisements and advertising displays:

- (a) should be limited to only one major identification advertisement or advertising display per site or complex, or two per site or complex where the primary road frontage exceeds 100 metres;
- (b) should be of a consistent design theme with other advertising on buildings within the site or complex where multiple advertisements are appropriate;
- (c) may incorporate the name or nature of each business or activity within the site or complex in the single advertisement.



## Industrial Development

### OBJECTIVES

- 88) Industrial, warehouse, storage, commercial and transport distribution development on appropriately located land, integrated with transport networks and designed to minimise potential impact on these networks.
- 90) Industrially zoned allotments and uses protected from encroachment by adjoining uses that would reduce industrial development or expansion.
- 91) Industrial development occurring without adverse effects on the health and amenity of occupiers of land in adjoining zones.
- 92) Compatibility between industrial uses within industrial zones.

### PRINCIPLES OF DEVELOPMENT CONTROL

- 305) Offices and showrooms associated with industrial, warehouse, storage, commercial and transport development should be sited at the front of the building with direct and convenient pedestrian access from the main visitor parking area.
- 307) Industrial development should enable all vehicles to enter and exit the site in a forward direction, where practical.
- 310) Industrial development should minimise significant adverse impact on adjoining uses due to hours of operation, traffic, noise, fumes, smell, dust, paint or other chemical over-spray, vibration, glare or light spill, electronic interference, ash or other harmful or nuisance-creating impacts.
- 311) Landscaping should be incorporated as an integral element of industrial development along non-industrial zone boundaries.
- 312) Fencing (including colour-coated wire mesh fencing) adjacent to public roads should be set back in one of the following ways:
- (a) in line with the building façade
  - (b) behind the building line
  - (c) behind a landscaped area that softens its visual impact.

## Infrastructure

### OBJECTIVES

- 94) Infrastructure provided in an economical and environmentally sensitive manner.
- 95) Infrastructure, including social infrastructure, provided in advance of need.
- 96) Suitable land for infrastructure identified and set aside in advance of need.
- 97) The visual impact of infrastructure facilities minimised.
- 98) The efficient and cost-effective use of existing infrastructure.

### PRINCIPLES OF DEVELOPMENT CONTROL

- 319) Development should not occur without the provision of adequate utilities and services, including:
- a) electricity supply



- b) water supply
- c) drainage and stormwater systems
- d) waste disposal
- e) effluent disposal systems
- f) formed all-weather public roads
- g) telecommunications services
- h) social infrastructure, community services and facilities
- i) gas services.

320) Development should only occur only where it provides, or has access to, relevant easements for the supply of infrastructure.

322) Development should not take place until adequate and coordinated drainage of the land is assured.

326) Electricity infrastructure should be designed and located to minimise its visual and environmental impacts.

328) Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.

329) Utility buildings and structures should be grouped with non-residential development where possible.

330) Development in proximity to infrastructure facilities should be sited and be of a scale to ensure that adequate separation is provided to protect people and property while also ensuring that the infrastructure provider is able to easily gain access to the facility for maintenance and upgrade purposes.

## Interface between Land Uses

### OBJECTIVES

99) Development located and designed to minimise adverse impact and conflict between land uses.

100) Protect community health and amenity and support the operation of all desired land uses.

### PRINCIPLES OF DEVELOPMENT CONTROL

331) Development should not detrimentally affect the amenity of the locality or cause unreasonable interference through any of the following:

- a) the emission of effluent, odour, smoke, fumes, dust or other airborne pollutants;
- b) noise;
- c) vibration;
- d) electrical interference;
- e) light spill;
- f) glare;
- g) hours of operation;
- h) traffic impacts.

332) Development should be sited and designed to minimise negative impacts on existing and potential future land uses considered appropriate in the locality.

333) Development adjacent to a Residential Zone or residential area within a Township Zone should be designed to minimise overlooking and overshadowing of nearby residential properties

336) Development on land that adjoins a railway corridor should:



(a) not obstruct the visibility of trains as they approach crossings;

(b) include appropriate fencing to reduce the potential for pedestrians or vehicles to access the corridor;

to ensure that the continued operation of the railway is not compromised.

### **Noise**

337) Development should be sited, designed and constructed to minimise negative impacts of noise and to avoid unreasonable interference.

338) Development should be consistent with the relevant provisions in the Environment Protection (Noise) Policy.

## **Transportation**

### **OBJECTIVES**

102) The maintenance of the natural and scenic qualities of the region by having special regard to the location of roads and the accessibility they provide.

103) The free flow of traffic on roads by minimising interference from adjoining development

### **PRINCIPLES OF DEVELOPMENT CONTROL**

#### **Car Parking**

344) Car parking spaces should be established on the site at the rate indicated in the Table PtAu/4; but a lesser number of parking spaces may be established on the site if the balance is made up and provided on a site nearby which will be available for car parking purposes for the duration of the development and which can be used for those purposes without detriment to the amenity of the locality or the safety of the public.

345) Car parking spaces, vehicular loading spaces and associated access aisles and manoeuvring areas, should be sealed with a impervious material or paved to a suitable standard to minimise any dust and mud nuisance, be drained to the watertable of an adjacent public road and have individual spaces line marked and maintained thereafter.

346) Car parking areas should:

(a) incorporate existing trees in the layout; and

(b) be landscaped with the landscaping located and maintained in such a manner that the areas are screened to prevent a view of them from any road or abutting properties, and so that the car parking spaces have some shade.

347) Car parking spaces associated with a business should be located adjacent to a public road so that those car parking spaces are readily apparent and accessible to customers. For ease of identification by customers, a sign indicating the location and availability of such car parking spaces should be displayed at the access points to the land.

348) Development should have vehicular access which is not liable to be affected adversely by floodwaters or heavy rains.

349) The layout of access aisles and manoeuvring areas on an allotment should allow for vehicles to enter the parking area, and any public road, in a forward direction.



350) Vehicular access points to and from each allotment and the layout of car parking spaces should provide for safe vehicle movement which will not detrimentally affect traffic safety and vehicular movement on adjoining streets, or the safety of pedestrians.

351) The number of vehicle crossing should be kept to a minimum and development should have a solid immovable barrier along road boundaries to restrict access onto and off an allotment other than by way of approved crossovers.

353) Access lanes and aisles, other than those associated with residential development which are required to carry two-way traffic should not be less than six metres wide and where required to carry one way traffic, not be less than 3.5 metres wide.

355) Parking areas, particular those likely to be used during evening should provide site lighting, directed and shaded in such a manner to cause no nuisance to adjacent occupier; entrance and exit points should be floodlit with similar shading.

## Renewable Energy Facilities

### OBJECTIVES

119) Development of renewable energy facilities that benefit the environment, the community and the state.

120) The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide the opportunity to harvest natural resources for the efficient generation of electricity.

121) Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

### PRINCIPLES OF DEVELOPMENT CONTROL

392) Renewable energy facilities including wind farms and ancillary development, should be:

- a) Located in areas that maximize efficient generation and supply of electricity; and
- b) Designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

## INDUSTRY ZONE

### OBJECTIVES

- 1) A zone primarily accommodating a wide range of industrial, warehouse, storage and transport land uses.
- 2) Development that contributes to the desired character of the zone.

### DESIRED CHARACTER

The Industry Zone will be an intensively developed, high quality, landscaped industrial area. The zone will accommodate a wide range of industrial, commercial and business activities including manufacturing, warehousing, transport and distribution. The zone will be protected from the intrusion of residential and other inappropriate uses which will reduce the land resource for industrial uses or create potential for land use conflicts. High impact industrial uses will be located well away from residential areas.

Development within the Industry Zone will achieve generous set-backs from roads and residential development in adjoining zones in order to minimise visual amenity and environmental impacts. The appearance of the zone will be improved by additional tree planting and landscaping which 'break-up' views to buildings and structures



form adjoining roads. Where industrial development is proposed adjacent to a more sensitive use, vegetated buffers will be provided within individual development sites.

Industrial builds will be designed to meet the needs of the intended use, however the mass and scale of the building will be located and designed to minimise the visual impact as viewed from public roads and surrounding properties.

Building mass will be well articulated, using smaller building modules, variation on the facades and varying roof form and pitch. Building materials and colours will reduce the apparent bulk of the buildings and will reflect the nature of the surrounding area, particularly for sites that are more publicly visible.

## **PRINCIPLES OF DEVELOPMENT CONTROL**

### **Land Use**

1) The following forms of development are envisaged in the zone:

Industry

Public infrastructure in the form of a waste water treatment plant

Transport distribution

Warehouse.

2) Development listed as non-complying is generally inappropriate and not acceptable unless it can be demonstrated that it does not undermine the objectives and principles of the Development Plan.

### **Form and Character**

3) Development should not be undertaken unless it is consistent with the desired character for the zone.

5) Development should be set back at least 8 metres from any road frontage except where fronting a Primary or Secondary Arterial Road in which case development should be set back at least 20 metres.

6) In areas where a uniform street setback pattern has not been established, buildings should be set back in accordance with the following criteria (subject to adequate provisions of car parking spaces and landscaping between buildings and the road):

(a) buildings up to a height of 6 metres should be sited at least 8 metres from the primary street alignment;

(b) buildings exceeding a height of 6 metres should be sited at least 10 metres from the primary street alignment.

7) Building facades facing land zoned for residential purposes should not contain openings or entrance ways that would result in the transmission of noise that would adversely affect the residential amenity.

8) Any plant or equipment with potential to cause an environmental nuisance (including a chimney stack or air conditioning plant) should be sited as far as possible from adjoining non-industrially zoned allotments, and should be designed to minimise its effect on the amenity of the locality.

10) Advertisements and advertising hoardings should not include any of the following:

(a) flashing or animated signs;

(b) bunting, streamers, flags, or wind vanes;



- (c) roof mounted advertisements project above the roofline;
- (d) parapet-mounted advertisement projecting above the top of the parapet.



## Appendix J. DPTI Approval for Land Purchase







*In reply please quote  
Enquiries to Jack O'Loughlin  
Telephone 08 8343 2123*

**DEVELOPMENT DIVISION  
PROPERTY**

50 Flinders Street  
Adelaide SA 5000

GPO Box 1533  
Adelaide SA 5001

Telephone: 08 8343 2222  
Facsimile: 08 8343 2768

ABN 92 366 288 135

*Without Prejudice.*

Mr Leo Chiang Lin  
Pangea Energy Pty Ltd  
Level 5 City Central Tower 2  
121 King William Street  
ADELAIDE SA 5000

Dear Mr Leo Chiang Lin,

***PANGEA ENERGY REQUEST TO PURCHASE ALLOTMENT 3 IN  
DEPOSITED PLAN 65715, HARRIS STREET, STIRLING NORTH***

Thank you for your letter dated 5 October 2017 in relation to your company's offer to purchase allotment 3 Harris Street, Stirling North to facilitate access to the proposed Stirling North Solar Storage Project (SNSSP).

I am pleased to inform you that Cabinet has approved the sale of the above land to Pangea Energy Pty Ltd, to enable the development of the SNSSP, subject to your unconditional agreement to the following conditions;

1. Pangea Energy Pty Ltd paying a purchase price of \$85,000 (exclusive of GST) to the Minister for Transport and Infrastructure for the purchase of allotment 3 in deposited plan 65715 Harris Street, Stirling North, as described in Certificate of Title volume 5937 folio 151;
2. Pangea Energy will pay all administrative costs incurred by the State including but not limited to:
  - Valuation Cost (\$2,750 (exclusive of GST));
  - Administrative Fee of \$5,000 (exclusive of GST) payable to Department of Planning, Transport & Infrastructure (DPTI) for the project management of the transaction to settlement;
  - All State Crown Solicitor's Office fees associated with the preparation of formal contracts for sale, form 1 statements, section 7 searches and subsequent conveyancing charges incurred by the State to administer the transfer;
  - Pangea Energy will be responsible for all other transfer costs including its own conveyancing/solicitor's charges, stamp duty, registration fees and any other fees associated with the transfer of the subject land and the project;

3. The sale of the subject land is on the basis that your company acquires the property on an 'as is' basis acknowledging that this land was former railway land owned by the former Australian National Railways Commission;
4. Pangea Energy Pty Ltd acknowledge receipt of the Land and Water Consulting Preliminary Site Soil Investigation report dated June 2017 and will ensure a copy of this report is provided to any subsequent property owners of the subject land;
5. The enclosed Annexure A – Special Conditions will form part of the final contract for sale and the South Australian Government or its agents make no warranties or guarantees that the land/ground water is free of any contamination nor that the subject land is suitable for your intended use and all things associated with any further investigations including costs, shall be Pangea Energy or any of its subsequent assignees or owners of the subject land responsibility;
6. Any remediation of the site (if any required) shall be at the expense of Pangea Energy or any of its subsequent assignees/owners of the subject land and the parties will fully indemnify the South Australian Government from any liability or associated costs;
7. The sale is conditional on the following;
  - o The Minister for Planning (or his delegate) granting development approval on or prior to 7 March 2019 for the project;
  - o Foreign Investment Review Board (FIRB) granting foreign investment approval to purchase allotment 3 within deposited plan 65715.
8. Settlement of the property will take place either on 7 June 2019, (unless otherwise agreed in writing) or within 30 days after SCAP development approval and Premier and Cabinet and the Minister for Transport & Infrastructure (or his delegate) approvals are granted (whichever is the later);
9. Should you agree to the terms and conditions of this offer, your written unconditional acceptance must be received by this department on or prior to 16 March 2018, upon which time a contract for sale will be prepared by the State Crown Solicitor's Office between the Minister for Transport and Infrastructure and Pangea Energy Pty Ltd.

If you could please provide your registered company details, registered address, registered ABN at the time of sending through any written acceptance to proceed with the purchase based on this letter of offer, that would be greatly appreciated.

We look forward to hearing from you.

Yours sincerely,



Cameron MacLeod  
Team Leader – Property Projects

} | January 2018