APPLICATION ON NOTIFICATION – CROWN DEVELOPMENT

Applicant:	DP Energy Australia Pty Ltd
Development Number:	660/V014/17
Nature of Development:	Port Augusta Renewable Energy Park - Stage 2: construction of a solar photovoltaic (PV) farm and associated infrastructure
Type of development:	Public Infrastructure – s.49
Zone / Policy Area:	Primary Industry Zone
Subject Land:	Augusta Highway, Port Augusta
Contact Officer:	Simon Neldner
Phone Number:	08 7109 7058
Start Date:	8 February 2018
Close Date:	9 March 2018

During the notification period, hard copies of the application documentation can be viewed at the Department of Planning, Transport and Infrastructure, Level 2, 211 Victoria Square, 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).

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
Fax Number: (08) 8303 0753

Government of South Australia

Department of Planning, Transport and Infrastructure

DEVELOPMENT ACT 1993

NOTICE OF APPLICATION FOR CONSENT TO DEVELOPMENT

SECTION 49 – PUBLIC INFRASTRUCTURE

Notice is hereby given that an application has been made by **DP Energy Australia Pty Ltd** for consent to undertake the construction of the Port Augusta Renewable Energy Park – Stage 2. **Development Application: 660/V014/17.**

The development will comprise the staged construction of a solar photovoltaic (pv) farm (with up to 5,000,000 solar PV modules) with an installed capacity of up to 500MW(AC), up to 400MW (AC) of battery energy storage via one or more energy storage facilities and up to 3000 MW.s of synchronous condenser capacity via one or more synchronous condenser facilities on two sites (east and west).

Associated works will include: PV inverter/ transformer stations, PV interconnector substations, switching station, overhead/underground transmission and internal cabling connections, access tracks, security fencing, site clearance, viewing area and service infrastructure. Temporary development components include the establishment of construction compounds and laydown areas.

The project area comprises 14 land parcels (a1 DP114916, s693, s701 and s720 of HP330600 under CT 6192/71; a2 DP114916 under CT 6192/72; s726, s1191, s1192 of HP330600 under CT 6077/672; and s696 to s700 and s708 of HP330600 under CT 6191/916), on vacant land to the south-east of Port Augusta.

The development sites (east and west) are bisected by the Augusta Highway, and generally defined by the Port Paterson Road to the west, Spear Creek Road to the east, and Gade Road to the south. The solar PV components (east site) are to be located to the immediate south of the Stirling North Airfield.

The subject land is located within the Primary Industry Zone of the Port Augusta (City) Development Plan (Consolidated – 7 July 2016).

The application may be examined during normal office hours at the office of the State Commission Assessment Panel, Level 5, 50 Flinders Street, Adelaide, and Port Augusta Council [Civic Centre, 4 Mackay Street, Port Augusta]. Application documentation may also be viewed on the SCAP website: https://www.saplanningcommission.sa.gov.au/scap/public_notices

Any person or body who desires to do so may make representations concerning the application by notice in writing delivered to the Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide 5001 **NOT LATER THAN FRIDAY 9 MARCH 2018.**

Submissions may also be made via email to scapadmin@sa.gov.au

Each person or body making a representation should state the reason for the representation and whether that person or body wishes to be given the opportunity to appear before the Commission to further explain the representation.

Submissions may be made available for public inspection.

Should you wish to discuss the application and the public notification procedure please contact **Simon Neldner** on 08 7109 7058.

Alison Gill
SECRETARY
STATE COMMISSION ASSESSMENT PANEL
scapadmin@sa.gov.au

PN2476

PN2476
28x2 (63mm)
Transcontinental
Adelaide Advertiser
7 February 2018

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

Applicant:	DP Energy Australia Pty Ltd
Development Number:	660/V014/17
Nature of Development:	Port Augusta Renewable Energy Park - Stage 2: construction of a solar photovoltaic (PV) farm and associated infrastructure
Zone / Policy Area:	Primary Industry Zone
Subject Land:	Augusta Highway, Port Augusta
Contact Officer:	Simon Neldner
Phone Number:	(08) 7109 7058
Close Date:	9 March 2018

My name:____

My phone number: ____

PRIMARY METHOD(s) OF CONTACT: Email address: ____________________________________

Postal address:____

________________________________Postcode____________

<u>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.</u>

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

SECTION 49 & 49A – CROWN DEVELOPMENT
DEVELOPMENT APPLICATION FORM

PLEASE USE BLOCK LETTERS

COUNCIL: Port Augusta City Council

APPLICANT: DP Energy Australia Pty Ltd

ADDRESS: 4 Marshall Road, Lake Barrine, QLD, 4884

CROWN AGENCY: Department of Premier and Cabinet

FOR OFFICE USE

DEVELOPMENT No: ______

PREVIOUS DEVELOPMENT No: ______

DATE RECEIVED: / /

CONTACT PERSON FOR FURTHER INFORMATION

Name: Gabrielle Powell

Telephone: 07 4095 2877 [work] 0427 085 998 [Ah]

Fax: ______ [work] ______ [Ah]

Email: gaby.powell@dpenergy.com

❒ Complying	Decision: ______
❒ Merit	Type: ______
❒ Public Notification	Finalised: / /
❒ Referrals	

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 public notification and advertising fees.
(2) Three copies of the application should also be provided.

	Decision required	Fees	Receipt No	Date
Planning:				
Land Division:				
Additional:				
Minister's Approval				

EXISTING USE: Primary Industry

DESCRIPTION OF PROPOSED DEVELOPMENT:

Renewable Energy Park: Solar PV farm including energy storage and synchronous condenser facilities and associated infrastructure.

LOCATION OF PROPOSED DEVELOPMENT: southeast of Port Augusta on numerous land parcels as attached.

House No: ______ Lot No: ______ Street: ______ Town/Suburb: ______

Section No [full/part] ______ Hundred: ______ Volume: ______ Folio: ______

Section No [full/part] ______ Hundred: ______ Volume: ______ Folio: ______

LAND DIVISION:

Site Area [m^2] ______ Reserve Area [m^2] ______ No of existing allotments ______

Number of additional allotments [excluding road and reserve]: ______ Lease: **YES** ❒ **NO** ❒

DEVELOPMENT COST [do not include any fit-out costs]: $ 500M

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 the DPLG website (www.dac.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.*

SIGNATURE: [signature] Dated: 19 / 12 / 2017

Location of Proposed Development:

	Description of Land			
	Volume	Folio	Section (S) / Allotment (A)	Hundred (H) / Deposited Plan (D)
East Site	6192	71	A1	D114916
			S693	H330600
			S701	H330600
			S720	H330600
	6192	72	A2	D114916
	6077	672	S726	H330600
			S1191	H330600
			S1192	H330600
West Site	6191	916	S696	H330600
			S697	H330600
			S698	H330600
			S699	H330600
			S700	H330600
			S708	H330600

Government of South Australia
Department of the Premier and Cabinet

Energy and Technical Regulation

Office of the Technical Regulator

Level 8, 11 Waymouth Street
Adelaide SA 5000

GPO Box 320
Adelaide SA 5001

Telephone: 08 8226 5500
Facsimile: 08 8226 5866

www.sa.gov.au/otr

Ref: 2017/01873.01 D17054868

6 November 2017

David Blake
DP Energy Australia Pty Ltd
4 Marshall Road,
Lake Barrine QLD 4884
By email: david.blake@dpenergy.com

Dear David,

RE: CERTIFICATE FOR DEVELOPMENT OF THE PORT AUGUSTA RENEWABLE ENERGY PARK STAGE 2

The development of the Port Augusta Renewable Energy Park Stage 2 has been assessed by the Office of the Technical Regulator (OTR) under Section 37 of the Development Act 1993.

Regulation 70 of the *Development Regulations 2008* prescribes if the proposed development is for the purposes of the provision of electricity generating plant with a generating capacity of more than 5 MW that is to be connected to the State's power system – a certificate from the Technical Regulator is required, certifying that the proposed development complies with the requirements of the Technical Regulator in relation to the security and stability of the State's power system.

In making a decision on your application, our office has taken the following information into account:

- DP Energy's letter 'Re: Port Augusta Renewable Energy Park Stage 2 – Generator Approval Certificate Request', emailed by David Blake of DP Energy to the OTR on 3 November 2017.

After assessing the information provided, I advise that approval is granted for the proposed generator, provided that the required amount of physical Inertia and/or Fast Frequency Response, as stated in the OTR's Generator Development Procedure Revision 1.1, is made available to the Network at all times.

Should you have any questions regarding this matter, please do not hesitate to call David Bosnakis on (08) 8226 5521.

Yours sincerely

Rob Faunt
TECHNICAL REGULATOR

Energy and Technical Regulations

Level 8, 11 Waymouth Street Adelaide SA 5000 | GPO Box 320 Adelaide SA 5001 | DX541
Tel (+61) 8 8226 5500 | Fax (+61) 8 8226 5866 | www.dpc.sa.gov.au | ABN 83 524 915 929

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 6077 Folio 672

Parent Title(s) CT 5887/471

Creating Dealing(s) T 11540134

Title Issued 25/05/2011 **Edition** 2 **Edition Issued** 09/06/2017 [Previous Edition]

Diagram Reference 5887471

Estate Type

FEE SIMPLE

Registered Proprietor

FLINDERS RANGES DEVELOPMENT PTY. LTD. (ACN: 148 827 525)
OF 36 ADDISON ROAD PORT AUGUSTA SA 5700

Description of Land

SECTIONS 726, 1191 AND 1192
HUNDRED OF DAVENPORT
IN THE AREA NAMED STIRLING NORTH

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (TG 9455361)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

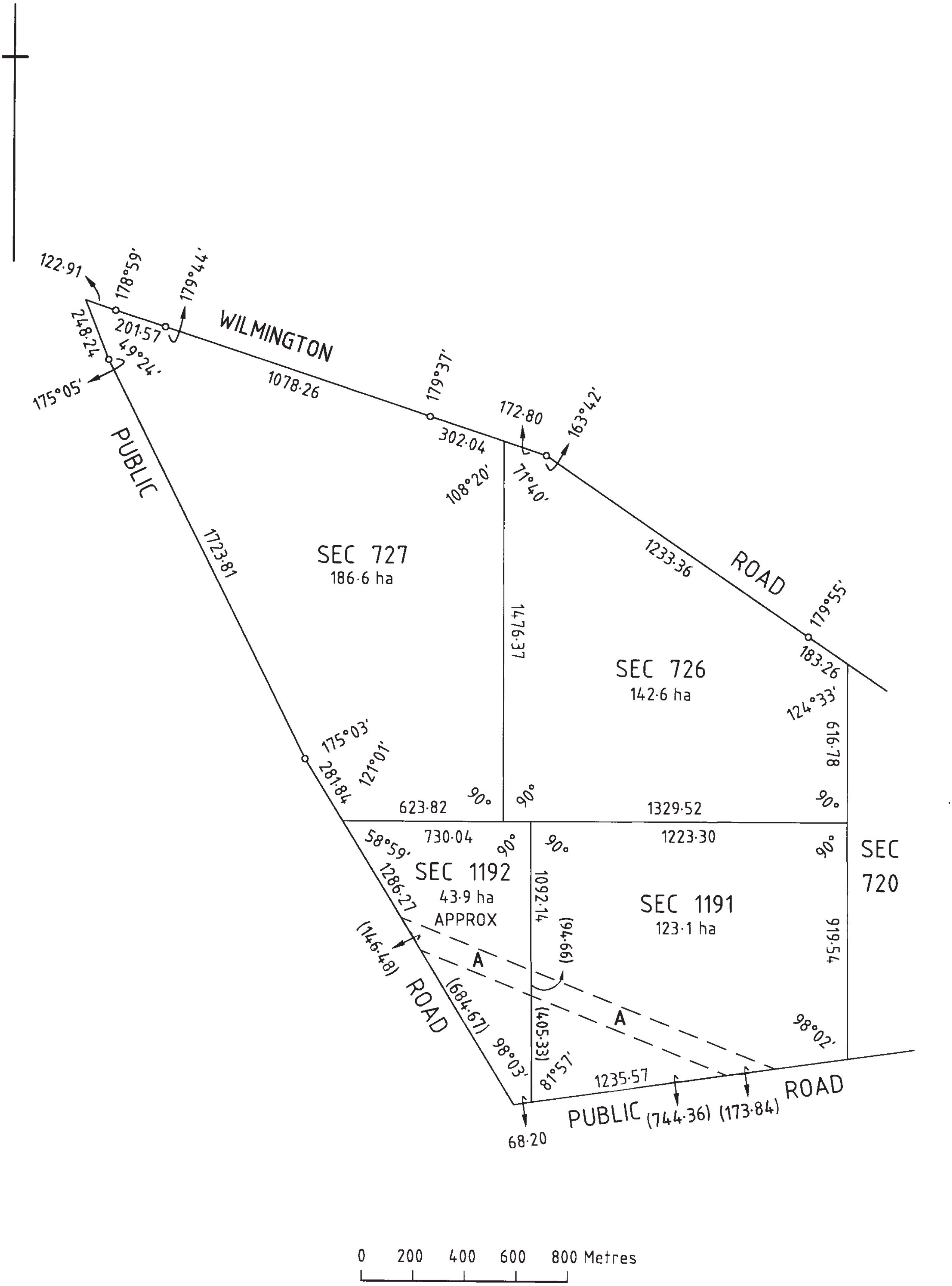
Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

APPROVED FX56886

Administrative Interests NIL


122·91
178°59'
179°44'
248·24
201·57
49°24'
175°05'
WILMINGTON
1078·26
179°37'
172·80
163°42'
302·04
108°20'
71°40'
PUBLIC
1723·81
SEC 727
186·6 ha
1476·37
1233·36
ROAD
179°55'
183·26
SEC 726
142·6 ha
124°33'
616·78
175°03'
121°01'
281·84
623·82
90°
90°
1329·52
90°
58°59'
730·04
90°
90°
1223·30
90°
SEC 720
1286·27
SEC 1192
43·9 ha
APPROX
1092·14
SEC 1191
123·1 ha
(146·48)
(94·66)
919·54
A
ROAD
(684·67)
(405·33)
A
98°02'
98°03'
81°57'
1235·57
PUBLIC
(744·36)
(173·84)
ROAD
68·20
0
200
400
600
800 Metres

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.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6191 Folio 916

Parent Title(s) CT 6151/864

Creating Dealing(s) TG 12595395

Title Issued 02/06/2017 **Edition** 1 **Edition Issued** 02/06/2017

Diagram Reference 12595395 01

Estate Type

FEE SIMPLE

Registered Proprietor

LEON ROGER MORONEY
HELEN MARGARET MORONEY
OF PO BOX 12 STIRLING NORTH SA 5710
AS JOINT TENANTS

Description of Land

SECTIONS 696, 697, 698, 699, 700 AND 708
HUNDRED OF DAVENPORT
IN THE AREA NAMED PORT PATERSON

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO THE MINISTER FOR INFRASTRUCTURE (T 1441629)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (T 5280588)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED E TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (TG 8707255)

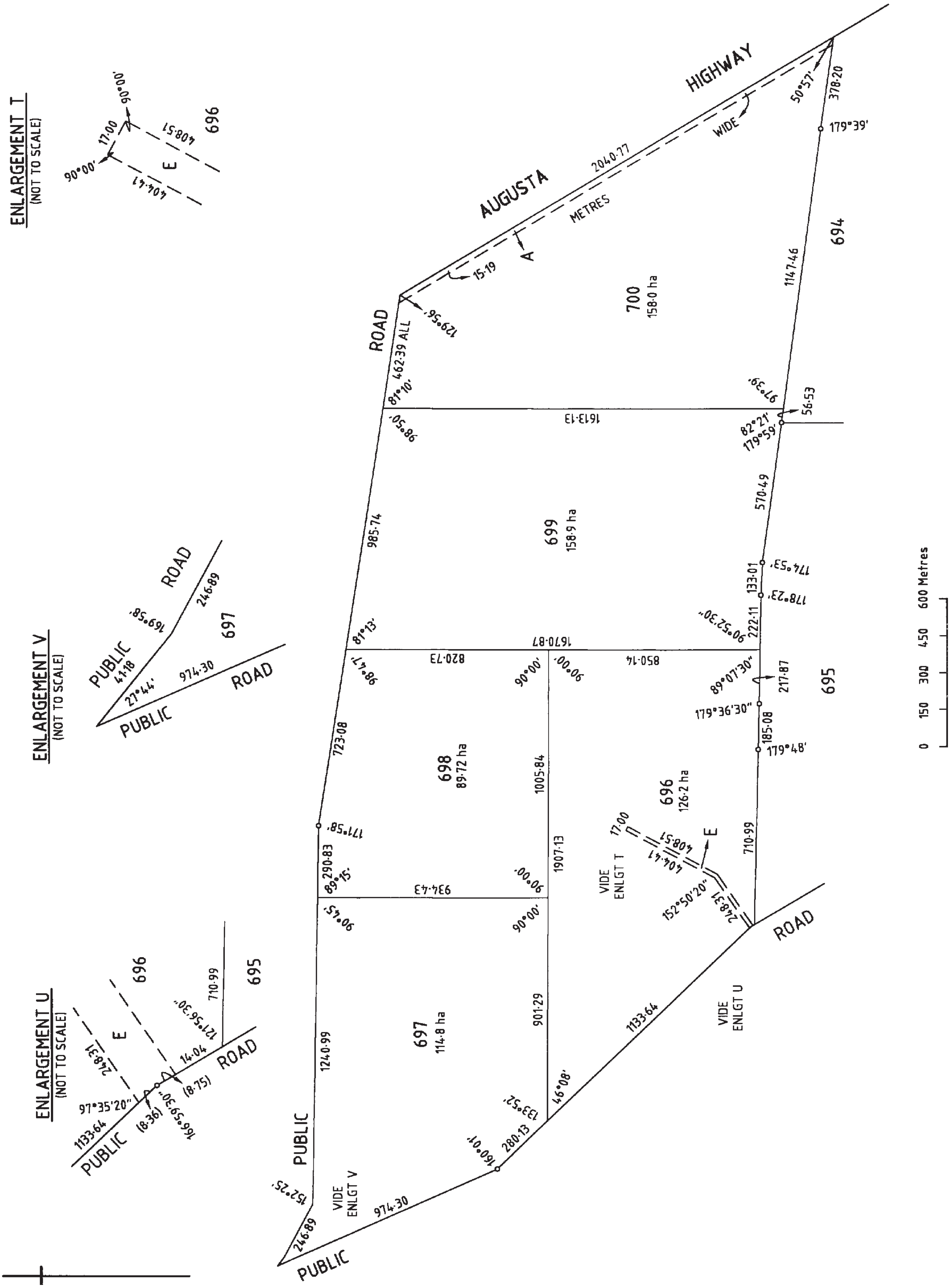
SUBJECT TO EASEMENT(S) OVER THE LAND MARKED H AND J (TG 12595395)

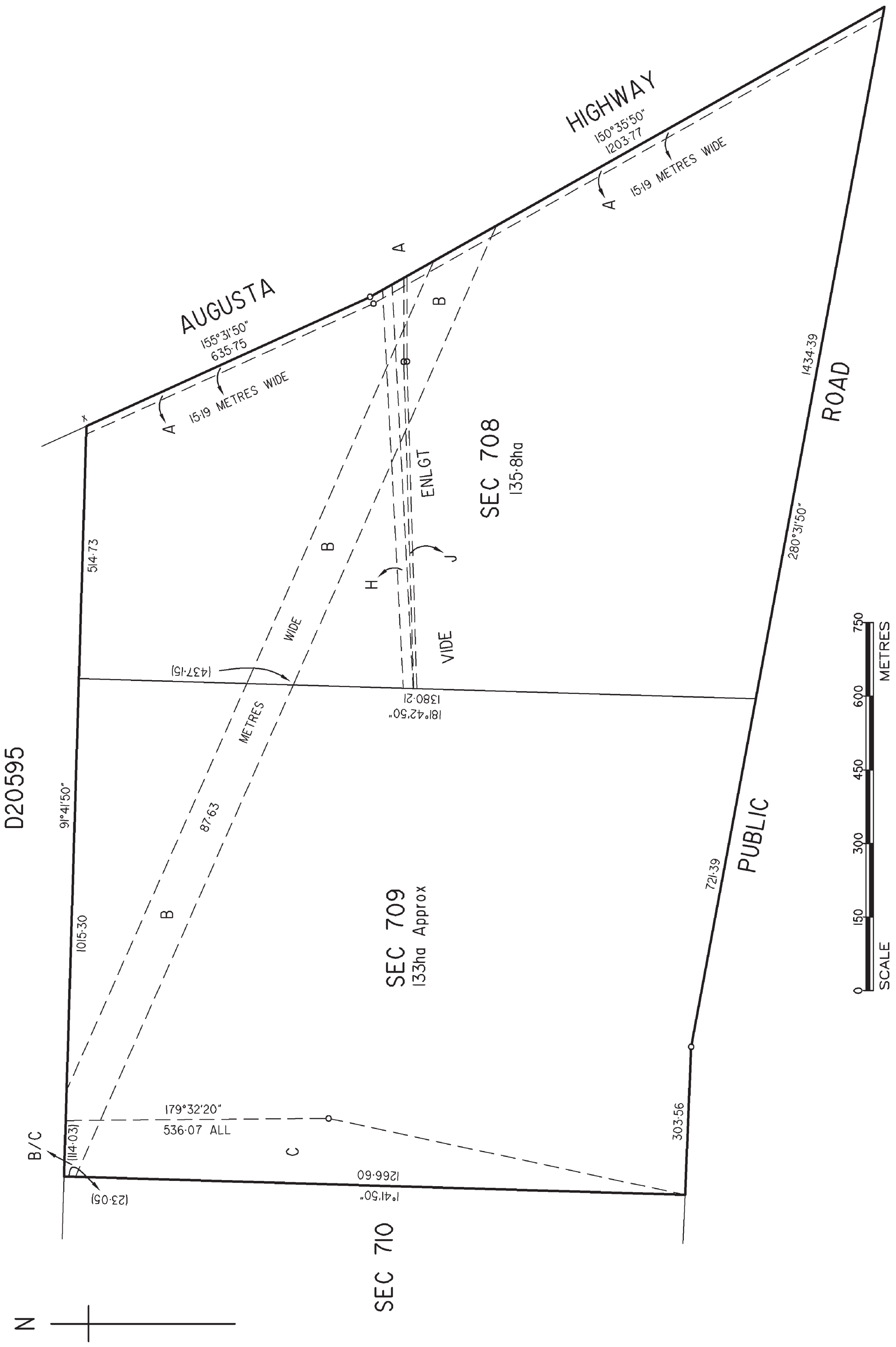
Schedule of Dealings

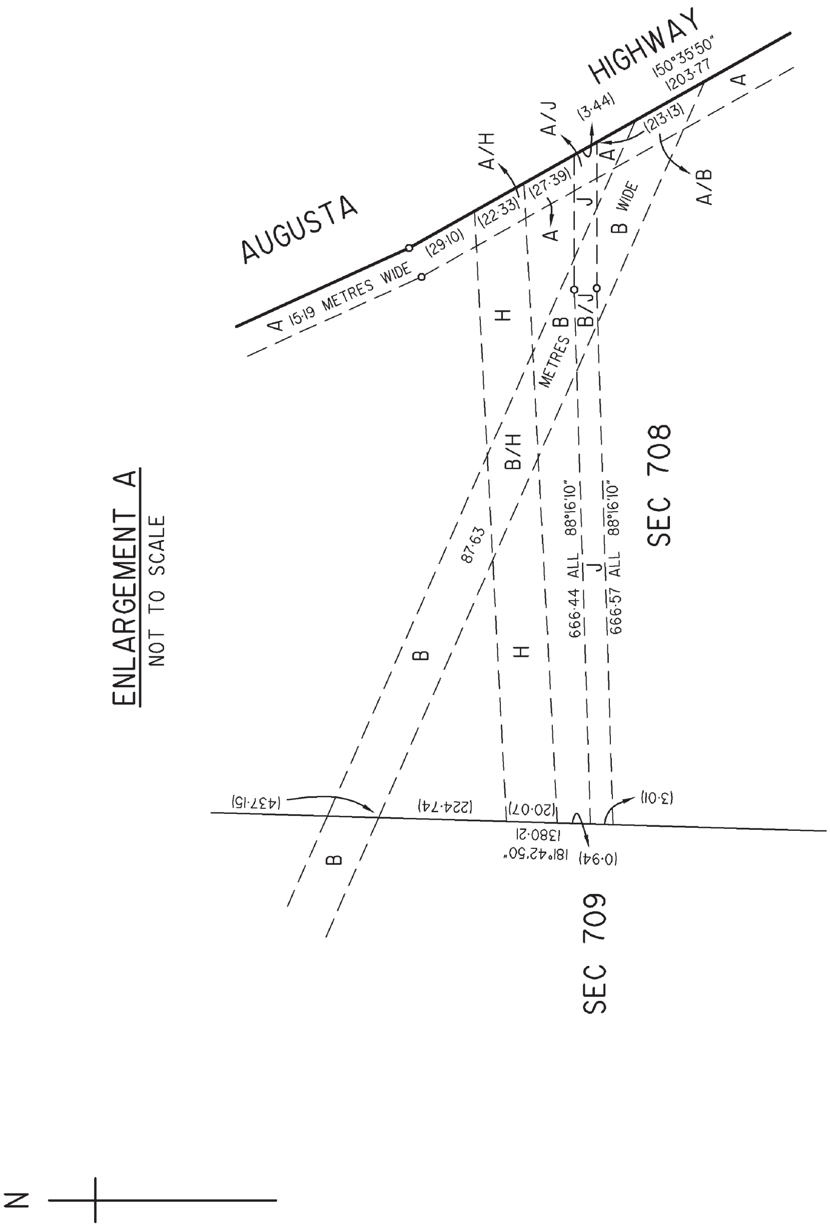
Dealing Number	Description
12034474	CAVEAT BY DP ENERGY AUSTRALIA PTY. LTD.
12034505	CAVEAT BY DP ENERGY AUSTRALIA PTY. LTD.
12243707	CAVEAT BY DP ENERGY AUSTRALIA PTY. LTD.

Notations

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


ENLARGEMENT T
(NOT TO SCALE)
ENLARGEMENT V
(NOT TO SCALE)
ENLARGEMENT U
(NOT TO SCALE)
AUGUSTA HIGHWAY
2040·77 METRES WIDE
PUBLIC ROAD
700
158·0 ha
699
158·9 ha
698
89·72 ha
697
114·8 ha
696
126·2 ha
694
695
VIDE ENLGT T
VIDE ENLGT U
VIDE ENLGT V
600 Metres


AUGUSTA
HIGHWAY
155°31'50"
635·75
150°35'50"
1203·77
15·19 METRES WIDE
15·19 METRES WIDE
ROAD
1434·39
280°31'50"
PUBLIC
721·39
303·56
SEC 708
135·8ha
ENLGT
SEC 709
133ha Approx
SEC 710
D20595
514·73
91°41'50"
1015·30
(437·15)
1380·21
181°42'50"
WIDE
METRES
87·63
VIDE
179°32'20"
536·07 ALL
1266·60
1°41'50"
(114·03)
(23·05)
B/C
A
B
C
H
J
N
SCALE
METRES
0
150
300
450
600
750


ENLARGEMENT A
NOT TO SCALE
AUGUSTA
HIGHWAY
A 15·19 METRES WIDE
150°35'50"
1203·77
(3·44)
(1213·13)
(29·10)
(22·33)
(27·39)
A/H
A/J
A/B
B WIDE
METRES B
B/J
B/H
87·63
666·44 ALL 88°16'10"
666·57 ALL 88°16'10"
SEC 708
SEC 709
(437·15)
(224·74)
(20·07)
(3·01)
1380·21
181°42'50"
(0·94)
N

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 6192 Folio 71

Parent Title(s) CT 6077/671

Creating Dealing(s) RTD 12694486

Title Issued 08/06/2017 **Edition** 1 **Edition Issued** 08/06/2017

Diagram Reference 12694486

Estate Type

FEE SIMPLE

Registered Proprietor

FLINDERS RANGES DEVELOPMENT PTY. LTD. (ACN: 148 827 525)
OF 36 ADDISON ROAD PORT AUGUSTA SA 5700

Description of Land

SECTIONS 693 AND 701
HUNDRED OF DAVENPORT
IN THE AREA NAMED WOOLUNDUNGA

SECTION 720
HUNDRED OF DAVENPORT
IN THE AREA NAMED STIRLING NORTH

ALLOTMENT 1 DEPOSITED PLAN 114916
IN THE AREAS NAMED STIRLING NORTH AND WOOLUNDUNGA
HUNDRED OF DAVENPORT

Easements

SUBJECT TO EASEMENT(S) OVER PORTION OF ALLOTMENT 1 MARKED B ON D114916 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART (RTD 12694486)

SUBJECT TO EASEMENT(S) WITH LIMITATIONS OVER PORTION OF ALLOTMENT 1 AND SECTION 701 MARKED EASEMENT ON THE PLAN ATTACHED TO GU 5247883 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART EXPIRING ON 10/04/2083 (GU 5247883)

SUBJECT TO EASEMENT(S) WITH LIMITATIONS OVER PORTION OF ALLOTMENT 1 MARKED EASEMENT ON THE PLAN ATTACHED TO GU 2367083 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART EXPIRING ON 16/05/2061 (GU 2367083)

SUBJECT TO EASEMENT(S) WITH LIMITATIONS OVER PORTION OF SECTION 701 MARKED EASEMENT ON THE PLAN ATTACHED TO GU 2171904 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART EXPIRING ON 20/07/2058 (GU 2171904)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

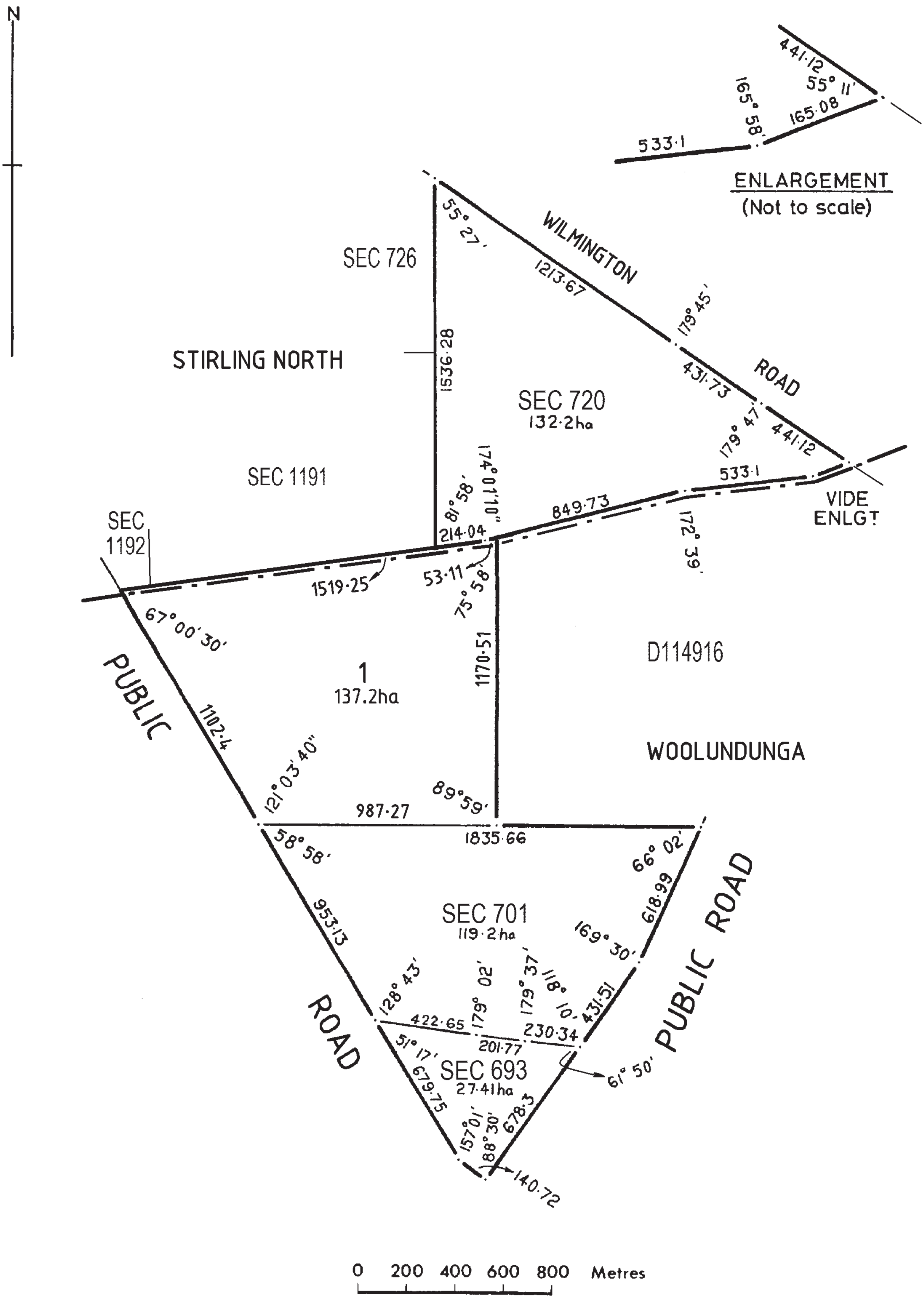
Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

APPROVED FX56886

Administrative Interests NIL


N
ENLARGEMENT
(Not to scale)
441·12
55° 11'
165° 58'
165·08
533·1
SEC 726
STIRLING NORTH
SEC 1191
SEC 1192
WILMINGTON
ROAD
SEC 720
132·2ha
55° 27'
1213·67
179° 45'
431·73
179° 47'
441·12
533·1
VIDE ENLGT
849·73
172° 39'
174° 01'10"
81° 58'
214·04
1536·28
1519·25
53·11
75° 58'
1170·51
67° 00' 30"
PUBLIC
1102·4
1
137.2ha
121° 03' 40"
987·27
89° 59'
D114916
WOOLUNDUNGA
1835·66
58° 58'
953·13
SEC 701
119·2ha
66° 02'
618·99
PUBLIC ROAD
169° 30'
431·51
118° 10'
179° 37'
179° 02'
128° 43'
422·65
201·77
230·34
ROAD
51° 17'
679·75
SEC 693
27·41ha
61° 50'
157° 01'
88° 30'
678·3
140·72
0 200 400 600 800 Metres

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.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6192 Folio 72

Parent Title(s) CT 6077/673

Creating Dealing(s) RTD 12694486

Title Issued 08/06/2017 **Edition** 1 **Edition Issued** 08/06/2017

Diagram Reference

Estate Type

FEE SIMPLE

Registered Proprietor

FLINDERS RANGES DEVELOPMENT PTY. LTD. (ACN: 148 827 525)
OF 36 ADDISON ROAD PORT AUGUSTA SA 5700

Description of Land

ALLOTMENT 2 DEPOSITED PLAN 114916
IN THE AREAS NAMED STIRLING NORTH AND WOOLUNDUNGA
HUNDRED OF DAVENPORT

Easements

SUBJECT TO EASEMENT(S) WITH LIMITATIONS OVER THE LAND MARKED EASEMENT ON THE PLAN ATTACHED TO GU 2367083 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART EXPIRING ON 16/05/2061 (GU 2367083)

SUBJECT TO EASEMENT(S) WITH LIMITATIONS OVER THE LAND MARKED EASEMENT ON THE PLAN ATTACHED TO GU 5247883 TO TRANSMISSION LESSOR CORPORATION OF 1 UNDIVIDED 2ND PART (SUBJECT TO LEASE 9061500) AND ELECTRANET PTY. LTD. OF 1 UNDIVIDED 2ND PART EXPIRING ON 10/04/2083 (GU 5247883)

Schedule of Dealings

NIL

Notations

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

Port Augusta Renewable Energy Park Stage 2

Development Application

Volume 1: Executive Summary

December 2017

DP Energy Australia Pty. Ltd. ABN: 16 140 516 196
4 Marshall Rd., Lake Barrine, QLD 4884, Australia
T: +61 (0)7 4095 2877 F: +61 (0)7 4095 2977
Email: australia@dpenergy.com Web: www.dpenergy.com

Executive Summary

Contents

1 Introduction

This development application has been prepared by DP Energy Australia Pty Ltd (DPEA) and submitted to the Department of the Premier and Cabinet, for lodgement to the State Planning Commission (SPC) under section 49 of the Development Act 1993 (SA), for the construction and operation of a solar photovoltaic (PV) farm and battery energy storage, and network support facilities to be located approximately 12km south-east of Port Augusta in South Australia (as shown in Figure V1.01) known as the Port Augusta Renewable Energy Park Stage 2 (the Project).

The Project may utilise aspects of the already consented Port Augusta Renewable Energy Park (Stage 1) electrical export connection from its main substation to the existing Davenport substation and where that situation applies, those aspects will not form part of this development application. The development application also seeks consent for infrastructure that sits outside the project site boundary, including the electrical connection between the Project and the Stage 1 project.

In order to accommodate typical lead times associated with the delivery of the various elements of a project of such scale and complexity (detailed engineering design, procurement, financing, grid connection, etc.), DPEA seeks the development timeframes provided in Table 1 below.

Table 1: Development Milestone Timeframes

Milestone	Timeframe Sought
Building Rules Consent / Development Approval	4 years from the operative date of the Development Approval
Substantial Commencement	4 years from the operative date of Development Approval
Substantial Completion	6 years from the operative date of the Development Approval

It is envisaged that the Stage 2 Project construction will flow sequentially from the Stage 1 construction in order to realise efficiencies associated with both economies of scale and with reduced demobilisation and remobilisation costs resulting from a continuous workflow model. An illustrative construction scenario is summarised in Table 2 below. However, the final construction programme will be defined by financing requirements, supply timeframes and necessary offtake (power purchase) agreements.

Table 2: Proposed Phased Project Programme

Phase	Approximate Capacity[1]	Technology	Site	Forecast Construction Start	Forecast Operation
1	400 MW	Energy Storage (Batteries)	West and/or East	Q1/20	Q4/21

[1] The figures in this table are intended to reflect possible developments in technology between submission of the Development Application and the actual time when a commitment is made to purchase the technology, recognising that the megawatt output of solar panels and battery systems for the same physical size, may

Phase	Approximate Capacity[1]	Technology	Site	Forecast Construction Start	Forecast Operation
2	100 MW	Solar PV	East	Q1/20	Q3/21
3	100 MW	Solar PV	East	Q2/20	Q4/21
4	100 MW	Solar PV	East	Q3/20	Q1/22
5	100 MW	Solar PV	East	Q3/20	Q2/22
6	100 MW	Solar PV	East	Q4/20	Q3/22
7	3000 MW.s	Network Support (Synchronous Condensers)	West and/or East	Q2/21	Q2/22

A Development Plan Assessment undertaken by Urban and Rural Planning Solutions (URPS) (provided in Volume 4: Appendix 3.1) concluded that the Project satisfies the relevant planning provisions and therefore warrants Development Plan Consent.

2 Applicant

The Development Application is made in the name of DP Energy Australia Pty Ltd although the Project will ultimately be funded, built and operated utilising one or more Special Purpose Companies (SPC) as is standard practice for funding and constructing projects of this nature.

3 DP Energy Australia

DP Energy Australia Pty Ltd (DPEA) is a renewable energy company operating in Australia, and is one of a number of DP Energy companies under the DP Group which operates worldwide to develop renewable energy projects which are both sustainable and environmentally benign. The various DP Energy companies operate in the field of renewable energy and sustainable development (principally onshore wind, solar PV and tidal energy) in Ireland, the United Kingdom, Canada and Australia.

To date DP Energy has delivered 324MW of built projects, and consented a further 490MW. Furthermore, DPE currently has approximately 1000MW of renewable energy sites currently under development around the world.

4 Project Rationale

The rationale for the Project is the generation of significant quantities of renewable energy into the electricity network with a particular emphasis on the delivery of that energy when it is needed. This objective is anchored in the combination of solar PV generation capacity, along with significant energy storage capacity in the form of batteries and synchronous condensers. This combination allows the project to provide dispatchable clean energy and the full suite of ancillary services normally associated only with conventional thermal plant.

increase from currently available designs. However, in all circumstances, the aggregate installed solar PV, battery and synchronous condenser capacity of the Project will not exceed 500MW, 400MW and 3000MW.s respectively.

The electricity demand cycle in South Australia tends to exhibit a daily cycle, rising from a low base overnight to a plateau during the day, peaking in the early evening and finally falling away overnight. By combining solar energy (with a midday peak) with large-scale battery storage, as is proposed in this development application, the generation can be tailored to the demand cycle. This, in combination with significant synchronous condenser capacity, reduces the chances of blackouts occurring as a result of network failures and provides the ability to re-start the network in the event of an islanding event similar to that experienced in September 2016.

In terms of the rationale for site selection, the Project is, like the Stage 1 project, readily accessible from the existing transport network, has relatively benign ground conditions (making construction straight-forward), and has few environmental constraints. The site also sits close to one of the strongest nodes in the South Australian electricity network, having several 275kV circuits traversing the site, as well as being 3.5km from the Stage 1 Substation and 5km from the Davenport substation, therefore giving the Project multiple connection options to a strong network through which to export the energy produced.

Additionally, the Project supports the aspirations of South Australia's strategic policy, namely:

- South Australia's Strategic Plan 2011
- South Australia's Climate Change Strategy 2015 – 2050: Towards a low carbon economy
- Renewable Energy Plan for South Australia 2011
- Low Carbon Investment Plan for South Australia
- Strategic Infrastructure Plan for South Australia 2004/5-2014/15
- South Australian Planning Strategy

5 Benefits

The first phase of the Project (100MW of Solar PV) is expected to produce approximately 245GWh of clean, renewable energy each year, equivalent to the annual consumption of 49,000 South Australian households,[2] contributing towards the National renewable energy target (RET) of 33,000GWh by 2020 and South Australian renewable energy target of 50% by 2025. From a climate change perspective, it is anticipated that the Project would displace approximately 120,000 tonnes of greenhouse gas emissions each year.[3]

The Project offers direct and indirect economic benefits to the local, regional and State economy through construction and operation expenditure and employment opportunities throughout the life of the Project. Construction will flow from Stage 1, targeting an uninterrupted deployment of the construction workforce from Stage 1 and thereby bringing continued benefit to the local community.

[2] Based on average household usage of 5000KWh per year. Essential Services Commission of South Australia (August 2015) Energy Retail Prices in South Australia, Ministerial Pricing Report 2015, p.29.

[3] Calculated on scope 2 Emission Factor of .49 for South Australia. National Greenhouse and Energy Reporting (Measurement) determination 2008) 1 July 2017, Schedule 1, Part 6.

Employment benefits associated with the first phase of Stage 2 (100MW of Solar PV) include the creation of approximately 300 local/regional full-time equivalent jobs during construction and 4 full-time equivalent operational jobs over the life of the Project (approximately 25 years) as well as indirect economic benefits for local businesses throughout construction and operation through the sourcing of local products, materials and services (such as accommodation, food, fuel, and construction supplies and materials).

6 Project Description

As illustrated in Figure V1.02, the Project is a solar PV, energy storage, and synchronous condenser development with an installed capacity of up to 500MW(AC) of PV arrays, up to 400MW(AC) of battery energy storage and up to 3000MW.s of synchronous condenser capacity.

The power generated by the solar PV development will be collected at a new sub/switching-station on the east site and exported as described in Volume 2: Chapter 6, Section 6.6.4.4. The energy storage and synchronous condenser facilities will either be constructed adjacent to the existing Stage 1 substation, or adjacent to the Stage 2 sub/switching station, or both.

The facility will allow the Project to store energy generated by Stage 1 and/or Stage 2 during times of low demand and release this energy at times of greater demand. This has a several advantages: firstly, it provides a benefit to the electricity network, by providing dispatchable renewable energy at times of high demand, offsetting expensive peaking generation; secondly, it maximises the utilisation of existing grid infrastructure, resulting in lower overall levelised cost of energy (LCOE); and finally, it also provides an improvement in the quality of power supplied to the electricity network by both stages.

The solar PV sub/switching station will be connected to the wider electricity network as described in Volume 2: Section 6.6.4. All access from the public road network will feature security barriers and the site will be contained within an approximately 2.4m high (nominal height) security fence.

A detailed construction programme will be developed post-consent. Once in commercial operation the Project will generate clean electricity for around 20 years prior to being either decommissioned or repowered.

The main permanent components of the Project are as follows:

- up to 5,000,000 solar PV modules (technology dependent);
- up to 500 solar PV inverter/transformer stations;
- up to 10 solar PV interconnector substations containing switchgear and transformers;
- one main site sub/switching station containing transformers, protection equipment, switchgear, batteries and other related equipment;
- two storage/grid support locations comprising:
    - up to 400MW of energy storage with a maximum area of 8ha and a maximum height of 20m;

    - up to 3000MW.s of synchronous condenser capacity facilities with a maximum area of 8ha and a maximum height of 20m;
- approximately 8km of overhead or underground electrical export cables;
- approximately 150km of solar PV site tracks;
- electrical cabling (linking solar arrays);
- security fencing (nominally 2.4m high) around the solar PV sites;
- two access locations from the Augusta Highway;
- one access location from Spear Creek Road;
- one water supply from the Morgan-Whyalla pipeline
- one access location from Port Paterson Road; and
- a viewing platform and visitor information facility.

The main temporary components of the Project comprise three temporary construction compounds including laydown areas.

As illustrated in Volume 3: Figure V3.06.04, the elements of the Stage 1 development that may form part of or be used for the Project are as follows:

- Site access tracks
- Site access from Augusta Highway
- Site Access from Gade Road
- Temporary batching plant
- Borrow Pit

A detailed construction design will be developed once post-consent geotechnical surveys have been completed, allowing the final layout to be defined.

Details of major equipment deliveries are provided in Chapter 7: Section 7.4: Traffic and Transport. It is most likely that solar PV, energy storage, synchronous condenser, substation and other equipment will arrive via Adelaide Port or Port Pirie and travel north along the A1 Augusta Highway.

7 Consultation

Stakeholder and community consultation is an important part of the project development process. DPEA's approach to consultation is based on the DP Energy Group's many years of experience and engagement with local communities, Traditional Owners, and both statutory and non-statutory stakeholders across Ireland, the United Kingdom and Canada, and supplemented by informal guidance obtained from local bodies and groups in the region and by DP Energy's experience in developing Stage 1.

The overriding objective for DPEA during its stakeholder and community engagement is to provide accurate information with openness and transparency, and specifically to undertake to:

- provide stakeholders with clear, consistent and timely information regarding the Project;

- identify and proactively communicate the potential benefits and impacts of the proposed Project to stakeholders;
- provide information to stakeholders and encourage stakeholder feedback through multiple methods of communication and contacts;
- gather stakeholder opinions and expectations of the Project in order to effectively address any concerns; and
- approach all consultation activities in a focused, inclusive, responsive, open and timely manner.

Key stakeholders and consultees engaged included:

- Project landholders;
- Adjacent landholders;
- local councils;
- state agencies and regulators;
- neighbouring aviation operator;
- Regional Development Australia;
- progress/business groups;
- community and special interest groups;
- broader community; and
- local media.

Since the Project inception several methodologies have been used to consult with local communities and interest groups including one-on-one and direct consultations, advertisements, and a dedicated project website.

A dedicated Project website was launched in April 2017 featuring Project information updates, community feedback questions or requests and advice on forthcoming events.

Looking forward, DPEA will continue to keep the regional community informed about the status of the Project throughout the Development Application process, including via the Project's website.

Should Development Approval be granted, community and stakeholder consultation will continue throughout the future stages of pre-construction, construction, operation and decommissioning.

8 Impact Assessments and Technical Studies

8.1 Physical Environment

Volume 2: Chapter 5: Site Description describes the climate, topography, geology and geomorphology of the Project site and in the surrounding area. Volume 2: Chapter 7, Section 7.5 describes the physical characteristics of the site in terms of hydrology. Geological data has been used to assess the potential for acid sulphate soils. It was concluded that the site is unlikely to contain acid sulphate soils based on its elevation above sea level. A hydrological assessment was undertaken to evaluate the flood risk associated with the development. It concluded that there are no significant constraints which would preclude the construction and operation of the Project provided appropriate mitigation measures are considered during the detailed engineering design and implemented through construction management.

8.2 Ecology

The ecology impact assessment focused on flora and fauna and was undertaken by EBS Ecology, an experienced independent ecological consultant. The scope of work associated with the assessment included database searches and background research for previous information pertaining to the site point-count (bird) and walkover surveys.

The recommendations of this assessment will be implemented in the design, construction and operational management of the site through a number of targeted management plans.

8.3 Cultural Heritage

A preliminary archaeological risk assessment, of the areas within the Stage 2 project site that are additional to those areas assessed by Australian Cultural Heritage Services (ACHM) for Stage 1, was undertaken by independent consultants Integrated Heritage Services (IHS). It included desktop research followed by a broad pedestrian and vehicular field inspection of the site designed to identify areas ranging from low to high risk in considering Aboriginal archaeological cultural heritage.

This assessment resulted in the recording of three Aboriginal archaeological sites (artefact scatters) and eight isolated artefacts. From this information, risk profile maps of the site were produced (see Volume 4: Appendix 7.2.1). These maps identified areas of medium and high sensitivity on the eastern section of the site.

Key mitigation measures proposed to protect existing and potential undiscovered sites include minimising the extent of proposed infrastructure within areas designated as being of high or medium sensitivity and further refinement of the detailed design following a cultural heritage survey involving Traditional Owner participation. Following the cultural heritage survey of the final footprint, a Cultural Heritage Management Plan will be developed to provide for the long-term management of any significant cultural heritage sites within the Project site.

8.4 Landscape and Visual Amenity

The potential visual impact of the project has been assessed against relevant Development Plan provisions, as presented within the Development Plan Assessment Report prepared by URPS, provided in Volume 3: Appendix 3.1. This assessment concludes that the visual impact of the proposed solar arrays and the associated infrastructure is considered to be sufficiently minimised and appropriate.

Photomontages have been produced representing the Stage 2 solar fields (also demonstrating Stage 1 wind turbines and solar fields). These photomontages are provided in Volume 4: Technical Appendix 7.3.1.

8.5 Traffic and Transport

A traffic impact assessment (TIA) was undertaken by independent transport specialist GTA Pty Ltd. The TIA, provided as Volume 4: Appendix 7.4.1, undertaken to assess the potential impact of the Project on transport routes and other road users in and around the site has concluded that "When comparing the additional traffic volume generated by the site during the construction and operational phases against current traffic volumes on the road network, it is not expected the site traffic will impact on the safety or function of the surrounding road network." It additionally concluded that "There is sufficient capacity on the adjacent road network to accommodate the cumulative traffic generation of any potential future developments proposed within the vicinity of the site, whilst maintaining an appropriate level of service."

8.6 Aviation and Glare

The Stage 1 solar farm aviation risk assessment determined that the potential for physical interference with aviation navigation, radar and communications systems or physical encroachment on any obstacle limit surface or restricted airspace by solar farms is negligible, leaving solar glare as the only remaining potential risk for aviation. A full glare analysis conducted to industry best practice determined that the Project will present no glare risk to aviation operators, road users, rail operators or residents.

8.7 Noise

An assessment of the potential noise impacts resulting from construction and operation of the Project was undertaken by independent noise consultant, Sonus Pty Ltd.

The assessment covers all operational aspects of the development including the noise generated by the inverters associated with the solar PV element of the Project, the transformers within the substations and the battery storage and synchronous condenser facilities (including their cooling and ventilation systems). Additionally, it also discusses the appropriate assessment methodologies for noise from construction activities.

Following the detailed assessment, it was found that the Project will easily comply with all relevant policy and legislation with respect to neighbouring residences. Further it was found that the Project will also comply with all relevant policy and legislation with respect to beneficiary residences subject to appropriate design and construction measures.

8.8 Telecommunications and Electromagnetic Interference

Solar farms, battery storage facilities and synchronous condensers (including their ancillary infrastructure) have the potential to cause electromagnetic interference (EMI). The assessment carried out for the Stage 1 project concluded that the only potential for EMI from the Stage 1 project was related to the wind turbines associated with that project.

Given that the only elements of the Project not envisaged in the Stage 1 project assessment are the battery storage and synchronous condenser facilities it was concluded that only these elements require further assessment. Similarly, given that the Stage 1 assessment concluded that the only potential EMI impacts were related to passive EMI (i.e. physical interference) and limited to point-to-point radiocommunications links, an internal assessment was made of the potential impacts of the Project on these links. This assessment found that there were zero potential impacts on any registered point-to-point links, and that that therefore no mitigation is required.

8.9 Hazards and Pollution

The potential for hazard or pollution events associated with the construction, operation and decommissioning of the Project has been assessed as part of the design process and includes reference to hazardous materials, fire management, waste management, soil and water management (sediment erosion and control and water quality management) and air quality. Potential impacts have been identified and measures to avoid and mitigate them have been outlined in Volume 2: Chapter 7, Section 7.10.

8.10 Draft Environmental Management Plan

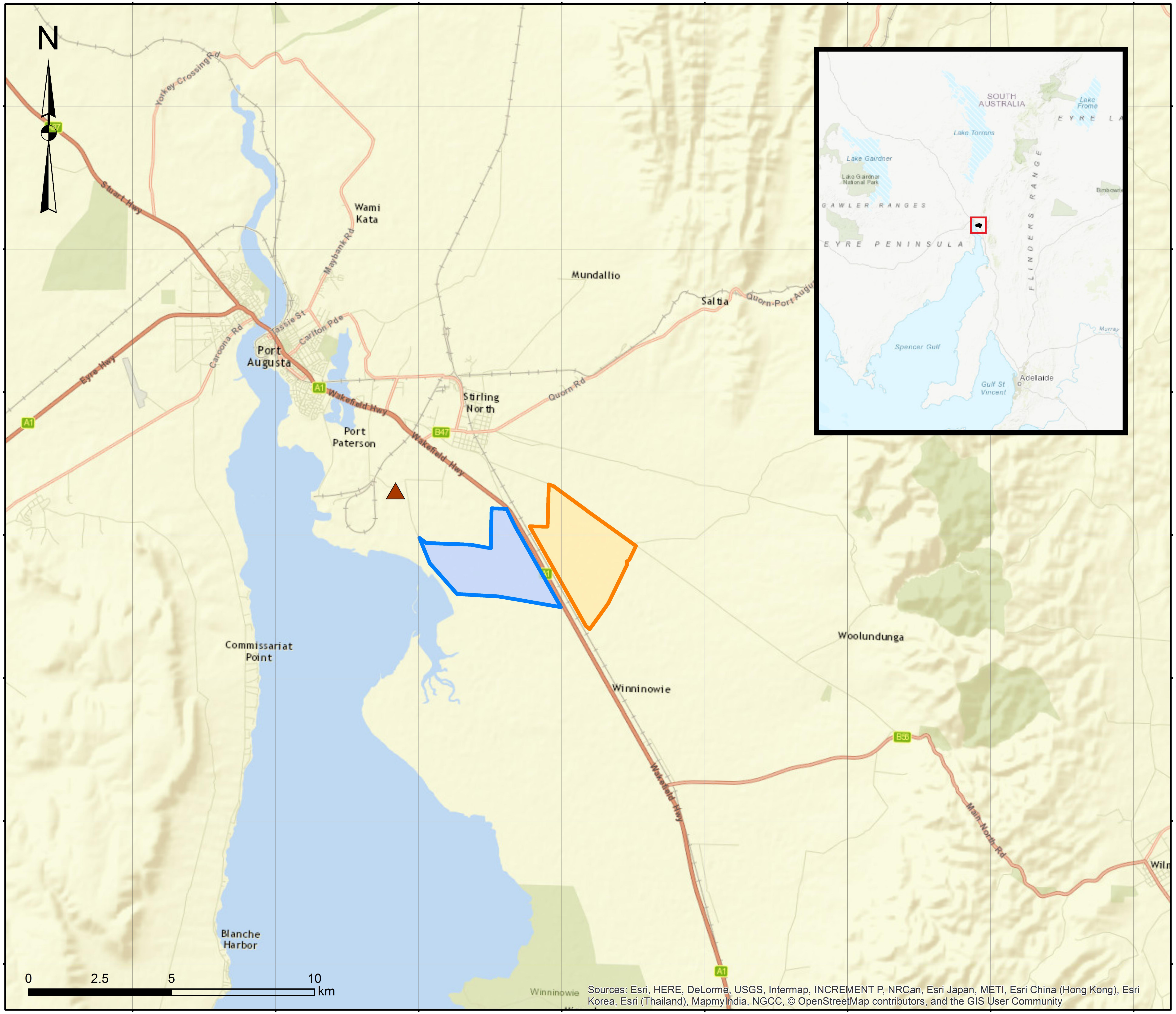
DPEA proposes various mitigation measures to be implemented during the detailed design, construction, operation and decommissioning stages of the Project and future commitments encapsulated within detailed Environmental Management Plans (EMPs) prior to commencement of construction, operation and decommissioning respectively.

The first plan (for construction) will be fully developed during the detailed design stage in conjunction with the relevant contractors and statutory authorities ensuring that contractor's construction methods statements are aligned with the EMP`s. A series of draft EMP`s have been defined based on the information currently known and represents DPEA`s current commitments. EMP`s are "live" documents regularly reviewed and updated with the latest information from either the design process, contractor CMP`s or discussion with key stakeholders.

9 Conclusion

The dedicated impact assessments and technical studies undertaken for the Project indicate that, with the adoption of proposed mitigation measures, any potential environmental impacts associated with the construction and operation of the Project can be minimised or avoided altogether. No significant adverse residual impacts are predicted to occur as a result of the Project.

A Development Plan Assessment undertaken by Urban and Rural Planning Solutions (URPS) (provided in Volume 4: Appendix 3.1) concluded that the Project satisfies the relevant planning provisions and therefore warrants Development Plan Consent.



Port Augusta Renewable Energy Park

Stage 2

Figure V1.01

Project Location

Legend

Davenport Substation

Project Site

East Site

West Site

Ver	Date	Drawn by	Checked	Approved
V1	14/12/2017	AM	LM	DB

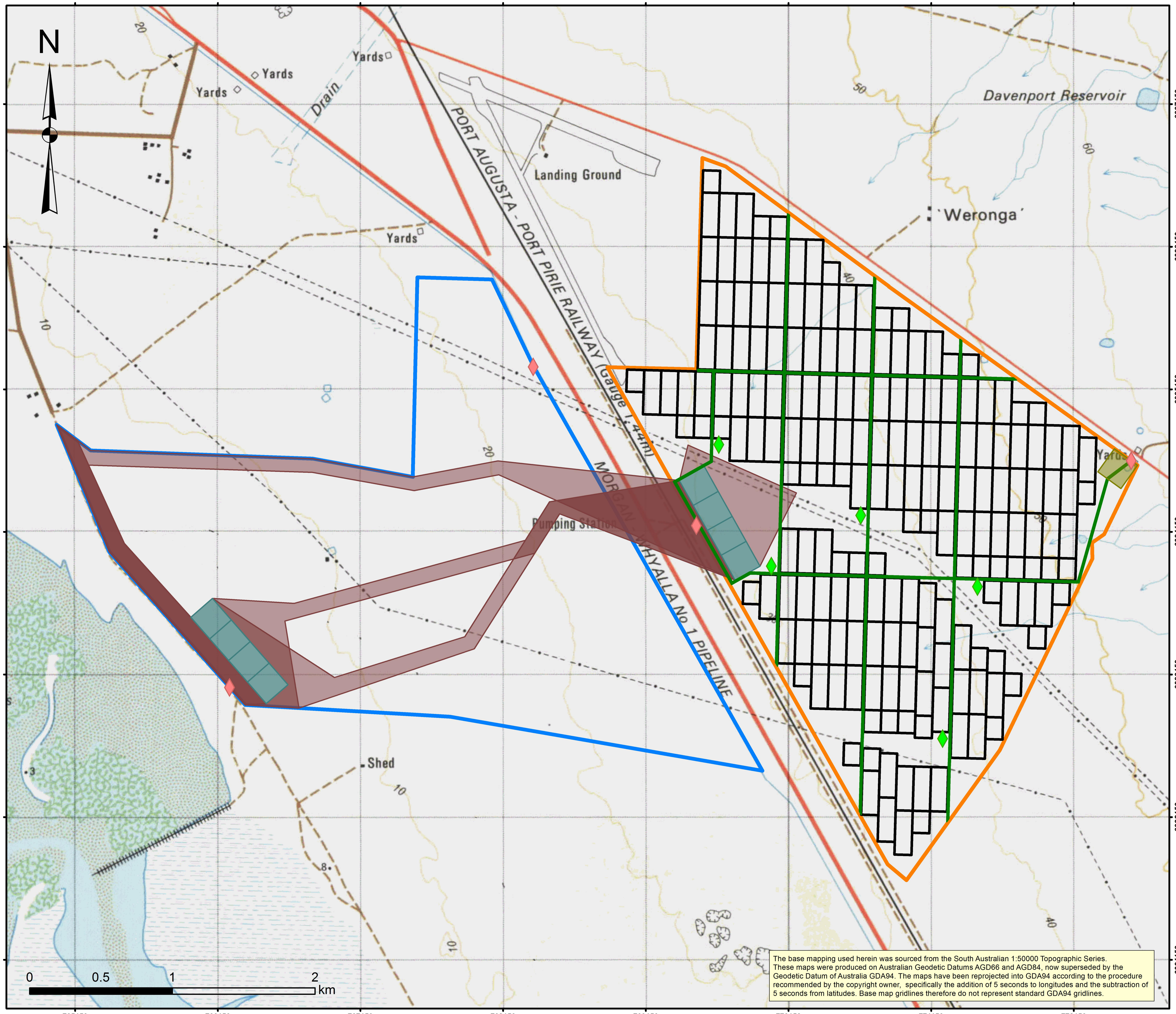
Coordinate System UTM Zone 53 Southern Hemisphere — **Size** A3

Scale 1:125,000 Printed @ A3

Filename: 1_Fig_V1_01_ProjLoc

DP ENERGY

www.dpenergy.com



Port Augusta Renewable Energy Park

Stage 2

Figure V1.02

Unconstrained Project Layout

Legend

- East Site
- West Site
- Electrical/Construction Envelopes
- Electricity Export Envelopes
- Solar Array
- Tracks
- Construction Envelopes
- PV Interconnection Substation (not to scale)
- Site Access

Notes:

LAYOUT INDICATIVE ONLY.
SUBJECT TO DETAILED DESIGN.

Ver	Date	Drawn by	Checked	Approved
V1	14/12/2017	AM	LM	DB

Coordinate System
UTM Zone 53 Southern Hemisphere

Size
A3

Scale 1:25,000 Printed @ A3

Filename:
1_Fig_V1_02_ProjDec

Photography/Cadastral/Mapping Data supplied/copyright by Mapland Department of Environment, Water and Natural Resources

DP ENERGY

www.dpenergy.com

Port Augusta Renewable Energy Park Stage 2

Development Application

Volume 2: Development Application Report

December 2017

DP Energy Australia Pty. Ltd. ABN: 16 140 516 196
4 Marshall Rd., Lake Barrine, QLD 4884, Australia
T: +61 (0)7 4095 2877 F: +61 (0)7 4095 2977
Email: australia@dpenergy.com Web: www.dpenergy.com

Index

Chapters

Preface

This Development Application Report of the Development Application (DA) has been prepared by DP Energy Australia (DPEA) in support of an application for development approval for the construction and operation of Port Augusta Renewable Energy Park Stage 2 (the Project), a solar photovoltaic (PV) farm, battery energy storage, and network support facilities to be located approximately 12km southeast of the city of Port Augusta, South Australia.

The Project is a solar photovoltaic (PV) farm with an installed capacity of up to 500MW(AC), up to 400MW(AC) of battery energy storage via one or more energy storage facility(s) and up to 3000MW.s of synchronous condenser capacity via one or more synchronous condenser facilities.

The Project has been sponsored (on 2 February 2017) by the Department of Premier and Cabinet as a development of public infrastructure as required by section 49 of the *Development Act 1993* (SA). This DA has been submitted to the Department of Premier and Cabinet for lodgement to the State Commission Assessment Panel.

The DA has been prepared in four volumes:

- Volume 1: Executive Summary
- Volume 2: Development Application Report
- Volume 3: Figures
- Volume 4: Technical Appendices

The DA can be viewed during the statutory consultation period at the following locations:

State Commission Assessment Panel
50 Flinders Street
(GPO Box 1815)
Adelaide SA 5001
Phone: 1800 752 664

Port Augusta City Council
4 Mackay Street
(PO Box 1704)
Port Augusta SA 5700
Phone: 08 8641 9100

Hard copies of the development application provided by DPEA present the documents of the development application up to A3 paper size only. Electronic copies of the development application provided by DPEA present all materials at full intended viewing size.

Responsibility	Job Title	Name	Date	Signature
Environmental Chapters	EIA Manager	Clodagh McGrath	8/12/2017	
Non-environmental Chapters	Consents Manager	Gabrielle Powell	8/12/2017	
	Development Manager	Blair Marnie	11/12/2017	
Checked	Regional Manager Australasia	David Blake	12/12/2017	
Approved	Chief Executive Officer (DP Energy)	Simon De Pietro	18/12/2017	
Copyright:	DP Energy Limited ©	Document Reference:	Port Augusta Renewable Energy Park Stage 2	

It should be noted that the DA has been prepared by DPEA with significant input from external sub-consultants on specialist chapters. A review process for quality assurance was conducted on all chapters, whether produced by external consultants or internally by DPEA.

This report has been prepared by DPEA with all reasonable skill and care and whilst every effort has been made to ensure the accuracy of the material published in this and associated documents, DPEA will not be liable for any inaccuracies.

Abbreviations

AAR	Aboriginal Affairs and Reconciliation
AC	Alternating Current
ACHM	Australian Cultural Heritage Management
ACMA	Australian Communications and Media Authority
AHA	Aboriginal Heritage Act 1988 (SA)
ALA	Authorised Landing Area
ARC	Anti-reflective coating
ARTC	Australian Rail Track Corporation
AsA	Airservices Australia
ASL	Above Sea Level
ASRIS	Australian Soil Resource Information System
bgl	below ground level
CASA	Civil Aviation Safety Authority
CEMP	Construction Environmental Management Plan
CFS	Country Fire Service
CHMP	Cultural Heritage Management Plan
CMS	Construction Method Statements
CNVMP	Construction Noise and Vibration Management Plan
Cth	Commonwealth
dB(A)	a-weighted decibels
DC	Direct Current
DEMP	Decommissioning Environmental Management Plan
DoD	Department of Defence
DPEA	DP Energy Australia Pty Ltd
DPTI	Department of Planning, Transport and Infrastructure
DSD	Department of State Development
EBS	Environment and Biodiversity Services - Ecology
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
EPC	Engineer, Procure, Construct
EPHC	Environment Protection and Heritage Council
EPP	Environment Protection (Noise) Policy 2007 (SA)
FEMP	Fire and Emergency Management Plan
FMG	FMG Engineering
GDA	Geocentric Datum of Australia
GWh	gigawatt hours
ha	hectares
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
IHS	Integrated Heritage Services Pty Ltd

km	kilometres
kV	kilovolts
Leq	Equivalent Continuous Noise Level
LPG	Liquid Petroleum Gas
LV/MV/IHV/HV	Low/Medium/Intermediate High/High Voltage
LVAC	Low-voltage Alternating Current
m	metre
MJ	megajoules
ML	megalitres
MSDS	Material Safety Data Sheet
MVA	Mega Volt Amp
MVAC	Medium-voltage Alternating Current
MW	megawatt
MW.s	megawatt seconds
NMP	Noise Management Plan
NNTT	National Native Title Tribunal
NPW	National Parks and Wildlife Act 1972
NVC	Native Vegetation Council
NVFMP	Native Vegetation and Fauna Management Plan
OEM	Original Equipment Manufacturer
OEMP	Operational Environmental Management Plan
OLR	Obstacle Lighting Review
PACC	Port Augusta City Council
PPA	Power Purchase Agreement
PPMP	Pollution Prevention Management Plan
PV	Photovoltaic
PVIS	PV Interconnector Substation
REP	Renewable Energy Plan for South Australia
RET	Renewable Energy Target
RFA	Route Feasibility Assessment
RoRL	Register of Radiocommunications Licenses
SA	South Australia
SAPS	South Australian Planning Strategy
SARIG	South Australian Resources Information Geoserver
SASP	South Australia’s Strategic Plan
SCADA	Supervisory control and Data Acquisition
SCAP	State Commission Assessment Panel
SEB	Significant Environmental Benefit
SGHAT	Solar Glare Hazard Analysis Tool
SIP	Strategic Infrastructure Plan for South Australia
SPC	State Planning Commission
SPC	Special Purpose Company
SRMP	Site Reinstatement Management Plan
ssp.	subspecies

TCC	Temporary Construction Compound
TIA	Traffic Impact Assessment
TTMP	Traffic and Transport Management Plan
URPS	Urban and Regional Planning Solutions
UTC	Coordinated Universal Time
UTM	Universal Transverse Mercator (grid co-ordinate system)
V	volts
WHO	World Health Organisation

Introduction

Contents

1 Introduction

1.1 Overview

DP Energy Australia (DPEA), part of the DP Group, has prepared this development application in support of an application for development approval for the construction and operation of the Port Augusta Renewable Energy Park Stage 2 (herein referred to as Stage 2) (the Project), a solar photovoltaic (PV) farm, battery energy storage (energy storage), and network support project to be located approximately 12km east-southeast of the city of Port Augusta, South Australia.

The Project is a solar photovoltaic (PV) farm with an installed capacity of up to 500MW(AC), up to 400MW(AC) of battery energy storage via one or more energy storage facilities and up to 3000MW.s of synchronous condenser capacity via one or more synchronous condenser facilities.

Once operational, the solar PV farm will export power to the existing Davenport (Electranet) Substation throughout its expected operational life of approximately 25 years after which it will either be repowered or decommissioned.

The Project is intended to build on Port Augusta Renewable Energy Park (Stage 1), which was granted development approval in August 2016, in order to expand the scale of the Stage 1 solar PV development and to provide significant electricity storage and network support capability via integrated large-scale battery storage and synchronous condenser capacity.

The Project has been sponsored by the Department of Premier and Cabinet as a development of public infrastructure as required by section 49 of the *Development Act 1993* (SA).

This development application is for the Project as described in Chapter 6: Project Description, inclusive of all proposed infrastructure and works within the Project site.

This Development Application Report contains the information supporting the development application in four volumes:

- Volume 1: Executive Summary
- Volume 2: Development Application Report
- Volume 3: Figures
- Volume 4: Technical Appendices (including independent technical reports)

1.2 The Applicant

This development application, supported by this report, is made by DP Energy Australia Pty Ltd although the Project will ultimately be funded, built, and operated utilising a Special Purpose Company (SPC) as is normal practice for project finance.

1.3 DP Energy Australia

DP Energy Australia Pty Ltd (DPEA) is a renewable energy company operating in Australia, and is one of a number of DP Energy companies under the DP Group which operates worldwide to develop renewable energy projects which are both sustainable and environmentally benign. The various DP Energy companies operate in the field of renewable energy and sustainable development (principally onshore wind, solar PV and tidal energy) in Ireland, the United Kingdom, Canada and Australia.

To date DP Energy has delivered 324MW of built projects, and consented a further 490MW. Furthermore, DPE currently has approximately 1000MW of renewable energy sites currently under development around the world.

1.4 Site Location

The Project site is located approximately 12km to the south-east of the city of Port Augusta in South Australia in the coastal region bordering the southern Flinders Ranges as shown in Volume 3: Figures V3.01.01 and V3.01.02. The Project is divided into two parts, an east site, and a west site, lying to the east and the west of the Augusta Highway respectively. The east site sits directly opposite the NW section of the Stage 1 Project centred at approximately Easting 770823 and Northing 6394308 (UTM zone 53H, GDA94) or -32.555° 137.884° (GDA94). The west site coincides with elements of the Stage 1 Project site as illustrated in Volume 3: Figure V3.06.02.

Occupying an area of approximately 880 hectares (ha), the east site sits at an elevation of between 30m above sea level (ASL) in the north-west to 60m ASL to the east. Occupying an area of approximately 788ha, the west site sits at an elevation of approximately 11m ASL in the west to 29m ASL in the east.

The Project site located within the Primary Industry Zone of the Port Augusta City Council (see Volume 3: Figures V3.01.03 and V3.01.04) on privately owned land. The west site is used for primary production purposes (stock grazing).

1.5 Land Details

This application is being made for fourteen land parcels within the following four titles within Project site boundary as detailed in the Table 1.1 below (see Volume 3: Figure V3.01.05).

Table 1.1: Project Site Description of Land

	Description of Land			
	Volume	Folio	Section (S) / Allotment (A)	Hundred (H) / Deposited Plan (D)
East Site	6192	71	A1	D114916
			S693	H330600
			S701	H330600
			S720	H330600
	6192	72	A2	D114916
	6077	672	S726	H330600
			S1191	H330600
			S1192	H330600
West Site	6191	916	S696	H330600
			S697	H330600
			S698	H330600
			S699	H330600
			S700	H330600
			S708	H330600

1.6 Main Components of the Project

The main permanent components of the Project are as follows:

- up to 5,000,000 solar PV modules (technology dependent);
- up to 500 solar PV inverter/transformer stations;
- up to 10 solar PV interconnector substations containing switchgear and transformers;
- one main site sub/switching station containing transformers, protection equipment, switchgear, batteries and other related equipment;
- Two storage/grid support locations comprising:
  - up to 400MW of energy storage with a maximum area of 8ha and a maximum height of 20m;
  - up to 3000MW.s of synchronous condenser capacity facilities with a maximum area of 8ha and a maximum height of 20m;
- approximately 8km of overhead or underground electrical export cables;
- approximately 150km of solar PV site tracks;
- electrical cabling (linking solar arrays);
- security fencing (nominally 2.4m high) around the solar PV sites;
- two access locations from the Augusta Highway;
- one access location from Spear Creek Road;
- one water supply from the Morgan-Whyalla pipeline
- one access location from Port Paterson Road; and
- a viewing platform and visitor information facility.

The main temporary components of the Project comprise three temporary construction compounds including laydown areas.

As illustrated in Volume 3: Figure V3.06.04, the elements of the Stage 1 development that may form part of or be used for the Project are as follows:

- Site access tracks
- Site access from Augusta Highway
- Site Access from Gade Road
- Temporary batching plant
- Borrow Pit

A detailed construction design will be developed once post-consent geotechnical surveys have been completed, allowing the final layout to be defined.

1.7 Development Application

1.7.1 Development Application Form

A completed Section 49 - Crown Development Application Form is provided with this development application along with copies of the Project site's land title documentation.

1.7.2 Development Application Report

This Development Application Report contains the information supporting the development application in four volumes:

- Volume 1: Executive Summary;
- Volume 2: Development Application Report;
- Volume 3: Figures; and
- Volume 4: Technical Appendices (including independent technical reports).

This (Volume 2) Development Application Report provides the context and description of the Project including consultations undertaken, methodologies and findings of the assessments undertaken, and proposed mitigations and conclusions. An outline of each of the chapters is provided below.

Chapter 1 – Introduction
The introduction provides details of the applicant, a high-level overview of the site, land particulars, and main components of the Project. This chapter provides the scope, and matters pertaining to, the development application, and outlines the structure of the Development Application Report.

Chapter 2 – Project Rationale and Benefits
This chapter provides an overview of the strategic South Australian regional and local aspirations, targets, policy and guidance and how this relates to the Project rationale, including potential environmental and socioeconomic benefits.

Chapter 3 – Planning and Regulatory Framework
This chapter summarises the main findings of an independent Development Plan Assessment undertaken to assess the Project's setting within the context of the prevailing planning and regulatory framework.

Chapter 4 – Stakeholder and Community Consultation
This chapter describes the stakeholder and community consultations undertaken to date including targeted consultation with special interest groups and potentially affected individuals and parties within the immediate vicinity of the Project and the broader public engagement methods utilised to consult with key stakeholders, community groups, and the general public.

Chapter 5 – Site Description
This chapter provides a detailed physical description of the site in terms of its geological characteristics.

Chapter 6 – Project Description
This chapter provides the description of the entire Project including the proposed solar PV modules and associated infrastructure, including substations, energy storage facilities, network support facilities, inverter stations, access tracks, overhead and underground cables, and export connection. The chapter also outlines proposed construction methods and programme.

Chapter 7 – Impact Assessments
This chapter summarises the impact assessments undertaken against the project in relation to the following matters:

- Ecology
- Cultural Heritage
- Visual Amenity
- Traffic and Transport
- Hydrology
- Glare
- Noise
- Electromagnetic Interference
- Hazards and Pollution

Chapter 8 – Draft Environmental Management Plan
This chapter identifies potential environmental impacts associated with the construction, operation and decommissioning of the Project and outlines proposed mitigations and commitments.

Chapter 9 – Conclusion
This chapter provides a conclusion of the Development Application Report.

1.7.3 Third Party Agreements

Table 1.2 below provides a summary of the third party agreements that are expected to be required in order for the project to proceed into construction and operations relating to existing (eg. utility type) infrastructure and other third party rights on or in the vicinity of the project site.

Table 1.2: Third Party Agreements

Type of Agreement	Scope	Reason	Counterparty	Reference
Permanent and Temporary Access Licence	Augusta Highway	Site access for construction & operations	Department of Planning, Transport & Infrastructure	Volume 3: Figure V3.06.01, V3.06.13 & Volume 4: Appendix 7.4.1
Permanent and Temporary Access Licence	Roads under Council jurisdiction including Spear Creek, Gade, and Port Paterson Roads	Site access for construction and operations	Port Augusta City Council	Volume 3: Figure V3.06.01, V3.06.13 & Volume 4: Appendix 7.4.1
Easement	Power and communications cables	Interconnection of various project elements across Council land/roads	Port Augusta City Council	Volume 3: Figure V3.06.01
Easement	Power and communications cables	Interconnection of various project elements across Augusta Highway	Department of Planning, Transport & Infrastructure	Volume 3: Figure V3.06.01
Licence	Power and communications cables within the railway corridor and access across railway corridor	Interconnection of various project elements across railway	Australian Rail Track Corporation Ltd	Volume 3: Figure V3.06.01

Type of Agreement	Scope	Reason	Counterparty	Reference
Easement	Power and communications cables	Interconnection of various project elements across Crown Land	Department of Environment, Water and Natural Resources	Volume 3: Figure V3.06.01
Easement	Power and communications cables	Interconnection of various project elements across existing transmission power cables/lines	ElectraNet	Volume 3: Figure V3.06.01
Easement	Power and communications cables	Interconnection of various project elements across existing distribution power cables/lines	SA Power Networks	Volume 3: Figure V3.06.01
Easement	Power, communications cables & tracks	Interconnection of various project elements across existing distribution power cables/lines and access tracks over pipeline	SA Water	Volume 3: Figure V3.06.01
Easement	Power, communications cables & tracks	Interconnection of various project elements across existing communications infrastructure	Telstra Communications	Volume 3: Figure V3.06.01
Easement	Power, communications cables & tracks	Interconnection of various project elements across existing communications infrastructure	Nextgen Communications	Volume 3: Figure V3.06.01
Extraction Licence	Construction material	For construction of tracks and laydown areas	Department of State Development	Volume 3: Figure V3.06.04
Option Agreement	Allow DP Energy to undertake development activities on the site and submit a development application and other relevant project agreements. Plus provision to take long	Security over land tenure	Landowners	Volume 3: Figure V3.01.05

Type of Agreement	Scope	Reason	Counterparty	Reference
	term lease for construction and operation of solar project.			
Development Agreement	Exchange of information and coordination of any construction or operation activities that may interact between neighbouring developments	Facilitate continued construction and operation of the project with neighbouring concentrated solar power and tomato growing operation	Sundrop	n/a

Note: This table includes known third party infrastructure and rights at the time of writing and therefore may not be exhaustive. Any further agreements which are required would be progressed at the appropriate time.

1.7.4 Timeframes

In order to accommodate typical lead times associated with the delivery of the various elements of a project of such scale and complexity (detailed engineering design, procurement, financing, grid connection, etc.), DPEA seeks the development timeframes provided in Table 1.3 below.

Table 1.3: Development Milestone Timeframes

Milestone	Timeframe Sought
Building Rules Consent / Development Approval	4 years from the operative date of the Development Approval
Substantial Commencement	4 years from the operative date of Development Approval
Substantial Completion	6 years from the operative date of the Development Approval

1.7.5 Project Programme

An illustrative project programme has been provided in order to quantify traffic movements and to enable development assessment to be undertaken. This programme proposes that the Project will be built in seven phases, as summarised in Table 1.4 below, with construction activities expected to overlap. The final decision on build out programme will depend on the financing solution adopted for Stage 2 and potentially the procurement of appropriate power purchase agreements (PPA).

Table 1.4: Proposed Phased Project Programme

Phase	Approximate Capacity[1]	Technology	Site	Forecast Construction Start	Forecast Operation
1	400 MW	Energy Storage (Batteries)	West and/or East	Q1/20	Q4/21
2	100 MW	Solar PV	East	Q1/20	Q3/21
3	100 MW	Solar PV	East	Q2/20	Q4/21
4	100 MW	Solar PV	East	Q3/20	Q1/22
5	100 MW	Solar PV	East	Q3/20	Q2/22
6	100 MW	Solar PV	East	Q4/20	Q3/22
7	3000 MW.s	Network Support (Synchronous Condensers)	West and/or East	Q2/21	Q2/22

[1] The figures in this table are intended to reflect possible developments in technology between submission of the Development Application and the actual time when a commitment is made to purchase the technology, recognising that the megawatt output of solar panels and battery systems for the same physical size, may increase from currently available designs. However, in all circumstances, the aggregate installed solar PV, battery and synchronous condenser capacity of the Project will not exceed 500MW, 400MW and 3000MW.s respectively.

Project Rationale and Benefits

Contents

2 Project Rationale and Benefits

2.1 Strategic Policy

2.1.1 South Australia's Strategic Plan 2011

South Australia's Strategic Plan (SASP) sets out the State's strategic goals and targets. Originally released in 2004, the revised 2011 SASP affirms that South Australia is *"well positioned to take positive action to ensure environmental sustainability"*[1] and includes targets for emissions reduction and renewable energy development including:

"Target 59: Greenhouse gas emissions reduction
Achieve the Kyoto target by limiting the state's 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 (baseline: 1990)"[2]

"Target 64: Renewable energy
Support the development of renewable energy so that it comprises 33% of the state's electricity production by 2020 (baseline: 2004-05). Milestone of 20% by 2014."[3]

"Target 65: GreenPower
Purchase renewable energy for 50% of the government's own electricity needs by 2014 (baseline: 2010)"[4]

"Target 66: Emissions intensity
Limit the carbon intensity of total South Australian electricity generation to 0.5 tonnes of CO2/MWh by 2020 (baseline: 2011)"[5]

Government strategies and legislation in place to deliver on these targets include:

- the *Climate Change and Greenhouse Emissions Reduction Act 2007* (SA);
- South Australia's Climate Change Strategy 2015 - 2050;
- Renewable Energy Plan for South Australia;
- Low Carbon Investment Plan for South Australia;
- Strategic Infrastructure Plan for South Australia 2004/5-2014/15; and
- South Australian Planning Strategy.

2.1.2 Climate Change and Greenhouse Emissions Reduction Act 2007

The principal target under the *Climate Change and Greenhouse Emissions Reduction Act 2007* (SA) (the Act) is, as part of a national and international response to climate change, to reduce greenhouse gas emissions within the State by at least 60% to an amount that is equal to or less than 40% of 1990 levels by 31 December 2050. The Act includes targets for 20 per cent renewable energy generation and consumption in 2014, which targets were met ahead of schedule. In 2009, South Australia committed to increasing its renewable energy production

[1] Government of South Australia (2011) South Australia's Strategic Plan 2011, p.46.
[2] Ibid.,p.47.
[3] Ibid.
[4] Ibid.
[5] Ibid.

target to 33% by 2020. This target was achieved in 2013-2014. In 2014 a new target of 50% by 2025 was set, subject to national renewable energy policy being retained.

2.1.3 South Australia's Climate Change Strategy 2015 – 2050: Towards a low carbon economy

South Australia's Climate Change Strategy 2015 – 2050 sets a framework for new targets and commitments to South Australia's emissions reduction while stimulating economic growth and is organised into six themes:

- South Australia taking the lead on climate change action
- Towards net zero emissions
- Showcasing Carbon Neutral Adelaide
- Innovating to drive a resilient and competitive low carbon economy
- Creating a prosperous and resilient state
- Building community capacity to take action on climate change.

In achieving the Government's target of net zero emissions by 2050, one of the four pathways identified is *"Low carbon electricity – replacing existing fossil fuel-based electricity generation with renewable energy such as wind, solar, geothermal and biofuels and utilising carbon capture and storage."*[6]

2.1.4 Renewable Energy Plan for South Australia 2011

In 2011, the Renewable Energy Plan for South Australia (REP) was released, providing an agenda for the future growth of the State's renewable energy sector. The key strategies of the REP include generating quality information to inform investment, providing efficient regulation and competitive charges, addressing market failures, leading by example, and moving early to prepare for national climate change policies. The REP affirms that, *"South Australia's overall strategy is to apply policies which complement the national policy agenda and which smooth the way for growth in renewable energy."*[7]

2.1.5 Low Carbon Investment Plan for South Australia

The Low Carbon Investment Plan for South Australia was released in December 2015 and sets out how to achieve an investment target of $10 billion in low carbon generation by 2025 and help to increase the proportion of electricity generation from renewable energy sources to 50 per cent by 2025. The plan stands alongside the SA's Climate Change Strategy.[8]

[6] Department of Environment, Water & Natural Resources (2015) South Australia's Climate Change Strategy 2015 – 2050, Government of South Australia, p.33.
[7] RenewablesSA (2011) A Renewable Energy Plan for South Australia, Government of South Australia, p.12.
[8] RenewablesSA, Department of State Development (2015) A Low Carbon Investment Plan for South Australia, Government of South Australia, p.3.

2.1.6 Strategic Infrastructure Plan for South Australia 2004/5-2014/15

The Strategic Infrastructure Plan for South Australia 2004/5–2014/5 (SIP) sets out the State's long term strategic infrastructure priorities to guide infrastructure development over the next 10 to 15 years in support of SASP objectives. With regard to the energy sector, the SIP reaffirms that, *"the government is committed to reducing greenhouse gas emissions and will work with the Australian and other state governments and industry to grow the renewable energy sector"*[9]. An update of the Infrastructure Plan is currently underway.

2.1.7 South Australian Planning Strategy

The South Australian Planning Strategy (SAPS) includes plans for seven regional areas of the state. The regional volumes of the SAPS support the achievement of a range of social, economic and environmental targets in the SASP and other state-wide plans. The Port Augusta City Council (PACC) area is part of the Far North Region. Principle 14 of the Far North Region Plan is to *"foster sustainable alternative energy and water supply industries"*[10].

The Far North Region Plan includes the Port Augusta Structure Plan, which provides a coordinated and integrated vision for land use and development and identifies the planning priorities necessary to achieve that vision, including the aim to *"support emerging industries, including the renewable energy sector"*[11].

2.1.8 National Renewable Energy Target

The Renewable Energy Target (RET) is a Federal Government scheme designed to reduce emissions of greenhouse gases from the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources. In 2015, the Australian Government implemented amending legislation to the RET, setting a reduced large-scale RET of 33,000GWh by 2020. It is anticipated that the first phase of Port Augusta Renewable Energy Park Stage 2 (100MW Solar PV) will generate approximately 245GWh of renewable energy each year.

2.2 The South Australian Electricity Network

2.2.1 Overview

The increasing penetration of intermittent asynchronous renewable energy in electricity networks, coupled with the reduction of conventional synchronous generation is presenting unique challenges to the operation of stable electricity networks around the world. Traditionally, electricity networks have relied on "inertia" or "spinning reserve"; large synchronous generators with the ability to provide both real and reactive power into the network and thereby help maintain system stability. As these generators exit the market,

[9] Government of South Australia (2005) Strategic Infrastructure Plan for South Australia 2005/6 – 2014/15, p.22.
[10] Department of Planning and Local Government (2010) Far North Region Plan: A Volume of the South Australia Planning Strategy, July 2010, Government of South Australia, p.47.
[11] Department of Planning and Local Government (2010) Port Augusta Structure Plan: A Section of the Far North Region Plan, July 2010, Government of South Australia, p.7.

replaced by cheaper and cleaner renewable generators, the system becomes inherently less stable. The Project has been specifically designed to address these issues, providing all of the capability normally associated with thermal power plant making it a renewable energy fueled power station.

Energy storage coupled with synchronous condensers has the potential to meet these network needs. Synchronous condensers are able to provide instantaneous real inertia into the system, while modern power electronics associated with batteries are able to deliver "synthetic" inertia (albeit with longer response times). The combination of the two can provide all of the system services usually associated with synchronous generation; frequency and voltage control, dynamic reactive power capability, black-start capability, and the ability to act as either a load or a generator in order to balance supply and demand, over both short and long timescales. These services are becoming increasingly important, as evidenced by the fact that regulators worldwide are making changes to the way that electricity markets operate, specifically introducing changes which recognize the value of these services.

2.3 Social and Economic Benefits

2.3.1 Energy security

The Project will contribute to enhancing Australia's energy security. The Australian Government holds that *"the energy sector is fundamental to Australia's functioning and prosperity. It underpins every form of economic activity from powering our industries to turning on the lights in our homes. The secure supply of energy is essential to economic growth, jobs, and the prosperity and wellbeing of all Australians"*[12]. The Renewable Energy Plan for South Australia offers that, *"by growing its renewable energy industries, South Australia will make itself less vulnerable to the cost impacts of carbon prices. Businesses in South Australia will also be better positioned in selling their products into carbon sensitive markets."*[13]

As discussed in Section 2.2.1 above, the increasing proportion of renewable energy in the electricity grid, coupled with the exit of ageing coal-fired generators is presenting a challenge to the stable operation of the electricity network. The high penetration of renewable energy in South Australia, coupled with the closure of the state's only coal-fired generator (in Alinta's Northern and Playford power stations in Port Augusta) has placed South Australia at the forefront of the transition from a thermally dominated generation sector to a renewables dominated sector.

Through the use of battery storage and synchronous condenser capacity, the Project has been explicitly designed to address the challenges associated with this transition. Rather than being simply a solar farm, the Project represents a renewable energy power station, able to serve all of the traditional functions (e.g. inertia, dispatchability) normally only associated with

[12] Department of the Environment and Energy (2017) Energy Security, webpage, Australian Government, accessed August 24, 2017, http://www.environment.gov.au/energy/energy-security-office

[13] Renewables SA (2011), A Renewable Energy Plan for South Australia, Government of South Australia p.11.

conventional thermal generation. This presents a unique opportunity for South Australia, as knowledge and skills gained through this process can be exported across the country and indeed the world.

2.3.2 Employment

The Project offers direct and indirect economic benefits to the local, regional and State economy through construction and operation expenditure and employment opportunities throughout the life of the Project. Construction will flow from Stage 1, targeting a continued use of construction workforce from Stage 1 bringing continued benefit to the local community. Employment benefits associated with the first phase of Stage 2 (100MW of Solar PV) include:

- the creation of approximately 300 local/regional full-time equivalent jobs during construction;
- estimated generation of upwards of 4 full-time equivalent operational jobs over the life of the Project (approximately 25 years); and,
- indirect economic benefits for local businesses throughout construction and operation through the sourcing of local products, materials and services (such as accommodation, food, fuel, construction supplies and materials).

2.3.3 Tourism

The Project represents a potential tourism opportunity for the region both as an established tourist attraction and through increased worker residence in the region during construction and throughout operation, which offers the potential for return visitation to the region.

2.4 Environmental Benefits

2.4.1 Greenhouse Gas Abatement

When operational, the Project will contribute to improved environmental outcomes through reduced greenhouse gas emissions. It is anticipated that the first phase of the Project (100MW of Solar PV) would displace approximately 120,000 tonnes of greenhouse gas emissions each year.[14]

2.4.2 Clean Energy

The first phase of the Project (100MW of Solar PV) is expected to produce approximately 245GWh of clean, renewable energy each year. Based on the average household usage of 5000KWh per year,[15] this is enough energy to power approximately 49,000 households each year.

[14] Calculated on scope 2 Emission Factor of .49 for South Australia. *National Greenhouse and Energy Reporting (Measurement) determination 2008) 1 July 2017, Schedule 1, Part 6.*

[15] Essential Services Commission of South Australia (August 2015) Energy Retail Prices in South Australia, Ministerial Pricing Report 2015, p.29.

2.4.3 Renewable Energy Target

The Solar PV farm would contribute to South Australia's RET of 50% by 2025 and National RET of 33,000GWh by 2020.

2.4.4 Air Quality

Solar PV power generation and energy storage do not produce any air pollution. They are expected therefore to have a neutral direct effect on air quality, and, through resulting reduced demand for fossil fuel derived energy, will result in an indirect reduction of greenhouse gases thus contributing to improved local air quality.

2.4.5 Water Conservation

Solar PV modules do not require water to operate and this is one of the defining differences between renewable technology and steam generation associated with the majority of conventional generation including coal plant, and combined cycle gas turbines with heat recovery boilers.

Experience from solar farms in similar environmental conditions suggests dust settling on PV modules is adequately removed through natural processes (wind and rain) and that the cost of cleaning PV arrays outweighs the benefit gained in terms of increased power output.

By comparison, coal-fired generation consumes an average of 1.5 megalitres (ML) of water per GWh of electricity generated.[16] A coal-fired power station producing the same amount of electricity that would be generated by the proposed Project would consume approximately 370ML of water each year.

[16] Alan Smart and Adam Aspinall (2009) Water and the Electricity Generation Industry: Implications of Use, Waterlines, Report Series No. 18, August 2009, National Water Commission, Australian Government, Canberra, p.1.

Planning and Regulatory Framework

Contents

3 Planning and Regulatory Framework

3.1 Introduction

This chapter outlines the planning and regulatory framework in which the Project is to be considered and provides a summary of the findings and conclusions of the Development Plan Assessment undertaken by Urban and Regional Planning Solutions (URPS) that is provided in full in Volume 4: Appendix 3.1.

South Australia's land use planning and development system consists broadly of legislation (Development Act 1993 and Development Regulations 2008), Development Plans, and Building Rules requirements.

3.2 The Development Act 1993 and Development Regulations 2008

The *Development Act 1993* (SA) (the Act) and Development Regulations 2008 (SA) (the Regulations) are South Australia's core legislative instruments that provide the framework establishing the State's planning and development system and its statutory procedures. The Act establishes the planning and development system framework and many of the processes required to be followed within that framework (including processes for assessing development applications).

3.2.1 Section 49

The Project has been sponsored by the Department of Premier and Cabinet as a development of public infrastructure under Section 49 of the Act.

3.2.2 Development Plan

The applicable Development Plan provides the basis against which development assessment decisions are made. Development Plans highlight the particular land uses that are envisaged for various zones within each Plan area.

The Development Plan relevant to the Project and in force at the time of submission is the Port Augusta (City) Development Plan – Consolidated 7 July 2016.

3.3 Other Key Legislation

Other key legislation that has been considered as part of Project planning design, and that may be applicable to the Project includes, but is not limited to:

- Aboriginal Heritage Act 1988 (SA)
- Environment Protection Act 1993 (SA)
- Environment Protection and Biodiversity Conservation Act 1999 (Cth)

- Heritage Places Act 1993 (SA)
- National Parks and Wildlife Act 1972 (SA)
- Native Vegetation Act 1991 (SA)
- Natural Resource Management Act 2004 (SA)
- Road Traffic Act 1961 (SA)

3.4 Development Application

3.4.1 Development Approval

Pursuant to section 49(2) of the *Development Act 1993* (SA), the Project has been supported and sponsored by the Department of Premier and Cabinet for the purposes of the provision of public infrastructure.

Under this process, the development application prepared by DPEA is provided to the Department of Premier and Cabinet for lodgement with the State Planning Commission (SPC).

This process also involves public notification given in the form of a public advertisement and any person may make comment within the prescribed time period.

The SPC assesses the application, considering any comments made by the Port Augusta City Council (PACC) and other referral bodies and then prepares a report to the Minister who can approve or refuse the application.

3.4.2 Building Rules Consent

Development that involves construction, or buildings and structures, requires Building Rules Consent. Consent is considered by a building surveyor who assesses the application against the technical requirements of the Building Code of Australia, minister's specifications and any relevant Australian Standards. Together with the Development Regulations 2008 (SA) these are known as the Building Rules and they cover issues such as structural adequacy, fire safety, health and amenity, equitable access for people with disabilities, and energy efficiency.

Once assessment against the development plan and the building rules have taken place, and these consents have been granted the final development approval is issued.

3.5 Development Plan Assessment

3.5.1 Zoning

The Project is located wholly within the PACC Primary Industry Zone.

3.5.2 Development Plan Assessment

The Development Plan Assessment undertaken by URPS (see Volume 4: Appendix 3.1) assessed the Project against relevant legislative and planning provisions relevant to the following matters:

- land use and efficient energy generation
- visual appearance
- noise impact
- flora and fauna impact
- heritage impact
- transportation and access
- glare
- electromagnetic interference, and
- hydrological impacts.

3.5.3 Development Plan Assessment Conclusions

URPS concluded that the proposed development satisfies the relevant provisions of the Development Plans and therefore warrants Development Plan Consent as the Project:

- is an appropriate land use within the Primary Industry Zone
- has an appropriate visual appearance given the location and size of that development in the context of the nearest adjoining dwellings and public roads
- will achieve the requirements of the *Environment Protection (Noise) Policy 2007* at all adjoining and nearby dwellings
- will achieve the requirements of the *Environment Protection (Noise) Policy 2007* at a project beneficiary dwelling with the implementation of appropriate mitigation measures
- will have minimal and acceptable impacts on native flora and fauna
- has been designed and will be further refined in to avoid areas of archaeological significance in consultation with Traditional Owners
- has safe and convenient access and will generate traffic volumes that are capable of being accommodated on the subject road network
- will not cause any detrimental impacts by way of glare to aviation activities, road or rail users or to any dwellings
- will not have any other operational impacts on any aviation stakeholders
- is designed to minimise the potential for electromagnetic interference, and
- is designed to minimise impact on the natural environment and the flow of water across the site.

In addition to the above, DPEA has committed to all recommendations of its external consultants and will prepare a range of management plans that outline its commitments and obligations. This will ensure that, during construction and on-going site management, that the proposed development achieves compliance with all relevant legislation and standards.

Stakeholder and Community Consultation

Contents

4 Stakeholder and Community Consultation

4.1 Introduction

Stakeholder and community consultation is an important part of the project development process. DPEA's approach to consultations is based on the company's many years of experience and engagement with local communities, Traditional Owners, and both statutory and non-statutory stakeholders across Ireland, the United Kingdom and Canada. This has been supplemented by informal guidance obtained from local bodies and groups in the region and DP Energy's experience developing Port Augusta Renewable Energy Park (Stage 1).

Targeted consultation with special interest groups and potentially affected individuals and parties within the immediate vicinity of the proposed Project has been undertaken and complemented by a broader public engagement. A range of engagement methods have been employed to engage key stakeholders, community groups, and the general public as set out in Section 4.4.2 below.

4.2 Objectives

The overriding objective for DPEA during its stakeholder and community engagement is to provide accurate information with openness and transparency, and specifically to undertake to:

- provide stakeholders with clear, consistent and timely information regarding the Project;
- identify and proactively communicate the potential benefits and impacts of the proposed Project to stakeholders;
- provide information to stakeholders and encourage stakeholder feedback through multiple methods of communication and contacts;
- gather stakeholder opinions and expectations of the Project in order to effectively address any concerns; and
- approach all consultation activities in a focused, inclusive, responsive, open and timely manner.

4.3 Stakeholders and Consultees

Key stakeholders and consultees engaged include:

- Project landholders;
- Adjacent landholders;
- local councils;
- state agencies and regulators;
- neighbouring aviation operator;

- Regional Development Australia;
- progress/business groups;
- community and special interest groups;
- broader community; and
- local media.

4.4 Community Consultation

4.4.1 Approach

DPEA's approach to engagement for this Project draws on the experience and outcomes of the stakeholder and community consultations relating to the neighbouring Port Augusta Renewable Energy Park (Stage 1).

During the screening, consideration of alternatives, and site selection process, DPEA initiated one-on-one discussions with potential landholders and held preliminary consultations with local government in order to outline the proposed Project and provide preliminary details. The objective of the early consultation was to identify any key issues or local sensitivities not evident from desktop studies and early site assessments, and to establish relationships and communication channels for open dialogue going forward.

This preliminary screening led into the early stages of the Project feasibility assessment as well as a number of approaches to key stakeholders and local interest groups in the immediate area. These included most adjacent landholders, local aviators and local community groups.

A dedicated Project website[1] was published in April 2017 to provide information about the Project to the wider public and to provide the community with ways to readily contact DPEA. The Project website includes both a 'have your say' form for individuals or community groups to offer feedback and ask questions, and also contact details via a 'contact us' form for direct communication. A Project specific email address[2] was created to support this task. The Project's website is regularly maintained in order to provide the public with relevant and current information about the Project.

Additionally, DPEA has engaged with local and regional media, in order to raise community and broader public awareness about the Project.

4.4.2 Community Engagement Methods

Community consultation involved the utilisation of several different engagement methods including: one-on-one and direct consultations, advertisements, and a dedicated project website as outlined in Table 4-1 below.

[1] http://dpenergy.info/parep2/
[2] Portaugusta2@dpenergy.com

Table 4-1: Community Consultation Engagement Methods

Engagement Method	Consultee	Objective
One-on-one and direct consultations (face-to-face, email, phone or mail correspondence)	Project landholders, adjacent landholders, neighbouring aviation operator, local government, and local community and special interest groups.	Establish communication channels for open dialogue and provide information about the Project and address matters of specific concern to stakeholders.
Direct communication avenues (Phone line, email, website)	Local community and wider public.	Establish avenues for the public and community to gain direct contact with DPEA representatives and provide avenues for the public to put forward queries.
Local newspapers and other media	Local media and local community.	Provide information about the Project's status and how further information can be obtained;
Website	Local community and public	Provide information about the Project and address matters of specific concern to stakeholders, provide information about the Project's status and how further information can be obtained, and encourage feedback and provide avenues for queries

4.5 Stakeholder Consultation

In parallel with the community consultation, DPEA has consulted with a number of key local and agency stakeholders including:

- Port Augusta City Council
- District Council of Mount Remarkable
- SA Water
- Department of Transport and infrastructure
- Office of the Technical Regulator
- Department of Environment, Water and Natural Resources
- Australian Rail Track Corporation
- South Australian Country Fire Service

4.6 Commitments

DPEA will continue to keep the regional community informed about the status of the Project throughout the Development Application process via the Project's website.

Should Development Approval be granted, community and stakeholder consultation will continue throughout the future stages of pre-construction, construction, operation and decommissioning.

Site Description

Contents

5 Site Description

5.1 Introduction

This chapter describes the climate, topography, geology and geomorphology of the Project site and in the surrounding area. Geotechnical surveys referenced herein have been used to inform the infrastructure design layout and construction methodologies as described in Chapter 6: Project Description.

5.2 Climate

The following information has been provided by the Bureau of Meteorology from Port Augusta Aero Recording Station located some 16.5km NW of the proposed development.

Site name: PORT AUGUSTA AERO
Site number: 018201
Latitude: 32.51 °S Longitude: 137.72 °E
Elevation: 14 m
Commenced: 2001
Status: Open
Latest available data: 08 Jun 2017

Mean maximum temperatures from 2001 to the middle of 2017 were 34.2°C in January and 17.7°C in July giving a mean monthly maximum of 26.3°C. Mean minimum temperatures where 19.5°C and 4.7°C respectively contributing to a mean monthly minimum of 12.2°C. Mean maximum rainfall peaked at 26.0 mm in June and a minimum of 14.2 mm in January contributing to a mean annual rainfall of 219.7mm. The mean daily solar exposure peaked at 28.4 MJ/m2 in January with a minimum recorded at 9.7 MJ/m2 in June contributing to an annual average of 19.2 MJ/m2 per day (recorded over the last 27 years).

5.3 Air

Air quality in the Port Augusta region has been historically dominated by Alinta's now closed coal-fired power stations, situated approximately 7.5km north-west of the site boundary. Alinta ceased operation at the Port Augusta Power Stations on the 9 May 2016 and responsibility for decommissioning the site has passed to Flinders Power. Post closure of the Port Augusta Power Stations, air quality has been dominated by the now dry fly ash dam.

In January 2017, heavy rain washed away dust suppressant over the ash dam subsequently causing a dust event impacting the local dwellings. As part of the Ash Dam Rehabilitation Plan a layer of soil will be layered on top of the existing dam surface as a long-term dust control and rehabilitation strategy. Air quality is expected to improve after the completion of rehabilitation work at the ash dam and wider decommissioning work on the site.

Given that the dominant Project site land use is grazing and that the nearest industrial centres are the Whyalla Steelworks located some 58km to the south-west of the project area and Port Pirie's lead smelter/refinery, approximately 72km to the south of the project area, the air quality across the site is considered to be of a reasonable standard, and can only improve with the decommissioning and rehabilitation of the Flinders Power site.

5.4 Geology

5.4.1 Conducted Studies

A desk-based geological study of the area was undertaken by FMG Engineering (FMG) in support of the Stage 1 development assessment. The information from the Stage 1 report has been applied to determine the Stage 2 geology.

In addition to the desktop study by FMG, a geotechnical investigation was conducted by Golder Associates which included an onsite geotechnical investigation. Boreholes were drilled and analysed for typical location on both the west and east site of the project. This study can be found in Volume 4: Appendix 5.1. A summary of the findings are provided below.

5.4.2 Site Topography and Geomorphology

5.4.2.1 East Site

The eastern section of the site predominantly lies on aeolian sediments overlying alluvial deposits. These deposits are highly eroded forming gullies exposing conglomerate and sandy deposits. The entire section is predominantly populated by low salt bush scrub with some vegetation free areas. The east site sits at an elevation of between 30m above sea level (ASL) in the north-west to 60m ASL to the east.

5.4.2.2 West Site

The western section is dominated by coastal plains however on approach to the Spencer Gulf the geomorphology and topography consists of supratidal sand/mudflat with the presence of terrigenous muds and gypseous clay and sporadically vegetated by samphire, salt bush and grass. The west site sits at an elevation of approximately 11m ASL in the west to 29m ASL in the east.

5.4.3 Regional Near Surface Geology

The Department of State Development (DSD) South Australian Resource Information Geoserver (SARIG) indicates the regional near surface geology across the eastern site to be pleistocene sand and gravel of low angle alluvial fans and pleistocene coastal plain dune sand. The regional near surface geology across the western site is pleistocene coastal plain dune sand.

The Geological Survey of South Australia 1:100K Cultana map sheet confirms the geological interpretation in the SARIG dataset.

The Geological Survey of South Australia 1:250K Port Augusta map sheet is less detailed however it indicates that the near surface regional geology consists of Sand Sheets and sief dunes (red brown Fulham Sands and pale yellow Molineaux Sand equivalents).

5.4.4 Subsurface Geology

As part of the geotechnical investigation conducted by Golders Associates boreholes were drilled at typical conditions on the east and west site. This report was conducted in context of both the Stage 1 and Stage 2 areas. The boreholes located over the Stage 2 site are provided in Table 5.1 below.

Table 5.1: Relevant borehole locations

Borehole ID	Approximate Termination Depth (m bgl)	Project Stage	Location Description	Site	Coordinates (UTM Zone 53, GDA 94)	
					Easting (m)	Northing (m)
BH100	5	1	Typical PV – North West	West	765914	6394284
BH101	5	1	Typical PV – South East	West	768901	6393538
BH108	5	2	Substation	East	769490	6394466
BH109	5	2	Typical PV – North	East	770301	6395486
BH110	5	2	Typical PV – South	East	771207	6393192

The results of the solar farm area bore holes revealed two predominant materials:

Clayey/Silty Sand: fine to medium grained, orange brown with some pale brown/white mottling (inferred calcareous), medium dense to very dense; interbedded with
Sandy Clay/ Clay: low plasticity, orange brown with some pale brown/white mottling (inferred calcareous), very stiff to hard consistency with some dry and friable materials.

There was one exception of sandy gravel encountered in BH109 between 3.0m and 3.5m bgl.

5.4.5 Regional Basement Geology

The SARIG database indicates the regional basement geology across the entire site to be a part of the Adelaide Geosyncline and the Gawler Craton. The basement rock is comprised mostly of marine siltstones and sandstones, oolitic, sandy and stromatolic limestone overlain and underlain by glaciomarine successions of diamictite sandstone and siltstone with local Aeolian sands as well as undifferentiated metasediments and felsic and basic metavolcanic rocks.

5.4.5.1 Depths to Rock

Recent logs undertaken for a materials search for the Augusta Salt Rock Quarry have identified karstic limestone at approximately 4m depth. Conversely, boreholes drilled nearby for Augusta Salt Ltd failed to find any rock at shallow depths. Therefore it is likely that the surface profile of the underlying bedrock is highly variable.

5.4.6 Acid Sulphate Soil Assessment

The potential for acid sulphate soils was assessed using the online Australian Soil Resource Information System (ASRIS).[1] The site was assessed as: Extremely Low Probability of Occurrence, Confidence – 4 (low). In the event that any acid sulphate soils are encountered during construction, mitigation measures as recommended under the relevant guidance[2] will be adopted.

5.4.7 Borrow Pits

A borrow pit differs from a conventional quarry in that it is a temporary feature with removed building material replaced with spoil and reinstated, whereas a quarry tends to be used for excavation only without restoration. It is common practice during solar farm construction to use borrow pits as a source of road and foundation construction materials and to remediate these borrow pits with material excavated with overburden material from access track construction.

A potential borrow pit was identified within the Stage 1 Project site, as shown in Figure 5.1 below.

[1] Australian Soil Resource Information System, CSIRO http://www.asris.csiro.au/

[2] A Strategy for Implementing CPB Policies on Coastal Acid Sulfate Soils in South Australia, South Australian Coastal Protection Board 2003

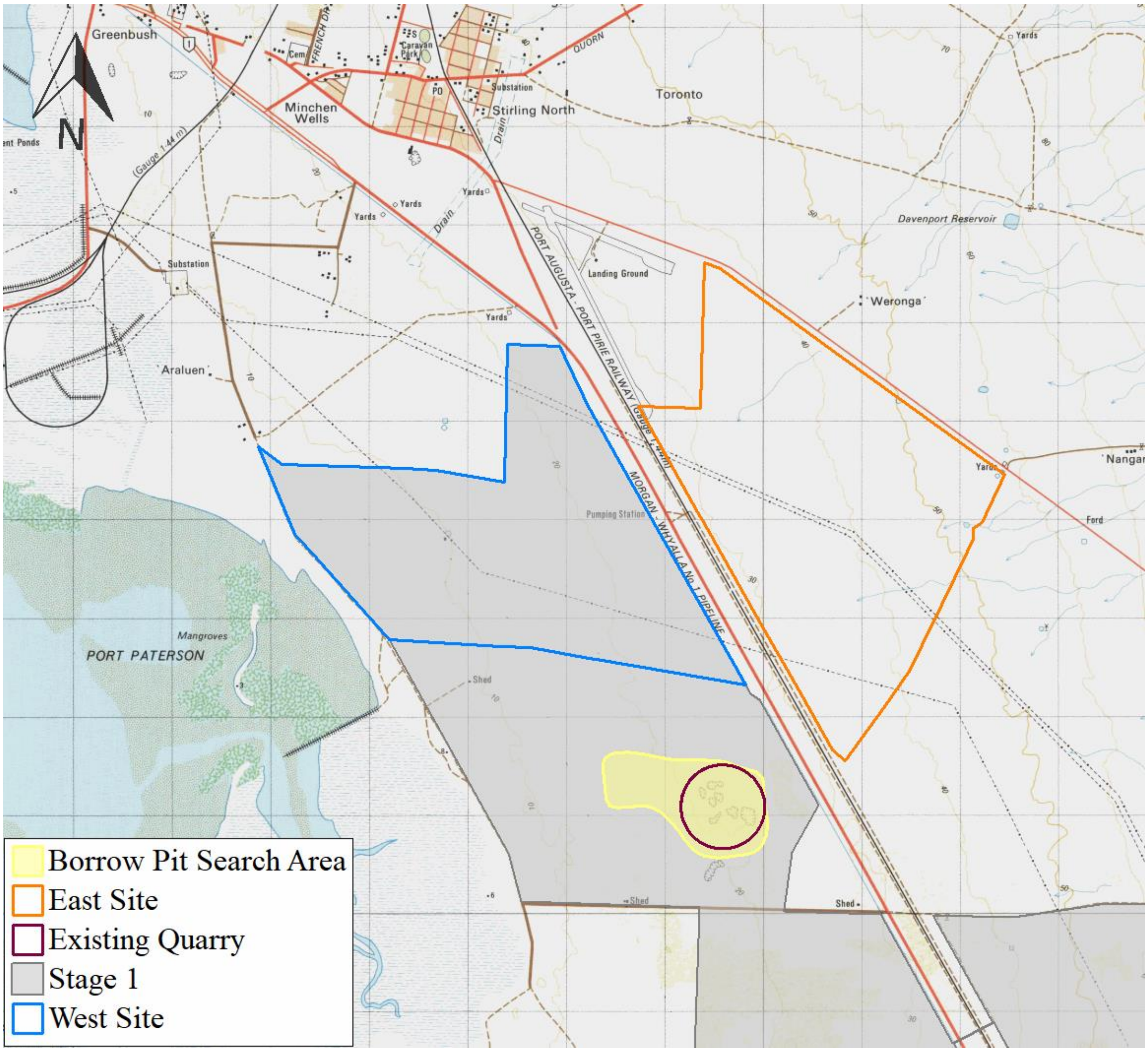


Figure 5.1: Potential Borrow Pit Location

This potential borrow pit was subjected to borehole geotechnical surveys by FMG to assess its potential for use for track construction and concrete aggregate materials. The findings of this work are summarised below.

5.4.8 Findings of Geotechnical Survey

5.4.8.1 General Comments

From visual logging, assessment and anecdotal evidence from land owners the Limestone encountered in the potential borrow pit is considered to be suitable for use as pavement material. However, further laboratory testing will be required to ascertain the specific strength and degradation properties of the material. If proven suitable by further testing it should be noted that any material extracted from site would require appropriate washing, crushing and screening during quarrying. Treatment of waste water and dust resulting from this process is described in Chapter 7, Section 7.10: Hazards and Pollution.

5.4.8.2 Extent and Approximate Quantities of Materials

The Limestone identified is limited to an area of approximately 70ha. Several cross-sections have been compiled from the data retrieved during the geotechnical investigation that enabled an approximate 3D model of the existing limestone deposit indicating that the total quantity of Limestone at this location is approximately 1,170,000m3. However, due to the uncertainty in limestone volumes a reduction factor of 50% has been assumed by FMG. As such it is estimated that 585,000m3 of good quality limestone would have been originally available in the potential borrow pit prior to previous material extraction.

Allowing for material that has previously been excavated (approximately a quarter of the total resource) around 438,750m3 of limestone is estimated to remain at this location, against a predicted requirement of 175,000m3 (compacted) for the Stage 1 project, leaving enough material to also accommodate the Stage 2 project estimated requirement of 150,000m3.

Approximately 430,000m3 of overburden material will need to be removed to access this resource. This material will be used to reinstate the borrow pits after construction and will not be exported from the Project site.

5.4.8.3 Off-site Supplies

If the quantities of material available are insufficient, opportunities exist to import materials from various quarries in the vicinity, most notably the nearby Stirling North Quarry. Material available at this quarry consists of Alluvial Gravels sourced from Saltia Creek.

The Department of Primary Industries and Resources SA Earth Resources Information Sheet – M38 indicates that the following resources and quantities are available from this quarry:

- construction materials, gravel (natural) - aggregate - general purpose 10,000 – 100,000 tonnes per six months;
- construction materials, gravel (natural) – ballast 10,000 –100,000 tonnes per six months;
- construction materials, gravel (natural) - concrete aggregate 10,000 – 100,000 tonnes per six months;
- construction materials, gravel (natural) – filling 10,000 – 100,000 tonnes per six months;
- construction materials, gravel (natural) - road base 10,000 – 100,000 tonnes per six months;
- construction materials, gravel (natural) – spalls 10,000 – 100,000 tonnes per six months; and
- construction materials, gravel (natural) - specification sand 10,000 – 100,000 tonnes per six months.

Other quarry sources will be investigated as part of the pre-construction evaluation and tender process.

5.4.9 Potential Cultural Heritage and Ecological Constraints

The geotechnical survey was undertaken with focus on areas with low cultural and ecological sensitivity based on findings from desk based studies and walkover surveys undertaken with both specialist consultants and with the Traditional Owners as part of the Stage 1 development.

The proposed borrow pit site lies in an area considered to be of low sensitivity due in part to historical and current stone extraction. In addition, the search area lies in heart of the Stage 1 wind farm where there will be extensive construction activities undertaken. In this respect the proposed borrow pit is ideally located due to its close vicinity of Stage 2.

5.5 Proposed Management and Mitigation

A summary of proposed management and mitigation measures relating to air and geology is detailed in Table 5.2 below.

Table 5.2: Physical Environment Proposed Management and Mitigation Measures

Mitigation Measure	Mitigation Mechanism	Phase
Air		
The potential exists for the creation of dust through construction activities and the operation of an on-site batching plant. Dust management and control measures will be incorporated into the Project's Construction Environmental Management Plan.	Construction Environmental Management Plan	Construction
Geology		
An Acid Sulphate Soil Management Plan will be developed as Part of the Project's Construction Environmental Management Plan.	Construction Environmental Management Plan	Construction
Borrow Pit		
Remediation of borrow pits will be carried out according to principles and procedures to be developed as part of the Project's Construction Environmental Management Plan	Construction Environmental Management Plan	Construction

5.6 Conclusion

Consideration of elements of the physical environment in which the project sits indicates that there are no significant constraints which would preclude the construction and operation of the Project provided appropriate mitigation measures are considered during the detailed engineering design and implemented through construction management.

Project Description

Contents

6 Project Description

6.1 Introduction

This chapter provides a detailed description of the Port Augusta Renewable Energy Park Stage 2 (the Project) including the construction, operation and decommissioning phases of the solar photovoltaic (PV) farm, energy storage facility(s) and associated infrastructure including sub/switching stations and synchronous condenser facility(s). The Project may utilise aspects of the already consented Port Augusta Renewable Energy Park (Stage 1) electrical export connection from its main substation to the existing Davenport substation and where that situation applies, those aspects will not form part of this development application. However, the elements of the Stage 1 development application which are relevant to this application are included for reference as appendices to this development application.

This development application is for a solar farm occupying an area of up to 880 hectares (ha), one or more energy storage facilities, one or more electricity substations, and one or more synchronous condenser facilities each occupying an area of up to 4ha. A design envelope approach has been adopted for the Project which for the solar element is defined by the area occupied, which will not exceed the solar PV site (east site) project boundaries. The key defining permitting parameter of both the energy storage facility design and the synchronous condenser facility design is the volume occupied (defined maximum area and height), which will not exceed the volume specified in Table 6.4 and Table 6.5 respectively.

The layout illustrated in Volume 3: Figure V3.06.01 provides indicative locations of the solar PV arrays, storage facility(s), synchronous condenser facility(s), sub/switching station(s), and other infrastructure. The final design will be subject to detailed engineering design and geotechnical investigations planned to be completed post-consent.

6.2 Project Location

The Project site is located approximately 12km to the south-east of the city of Port Augusta in South Australia in the coastal region bordering the southern Flinders Ranges. The Project is divided into two parts, an east site, and a west site, lying to the east and the west of the Augusta Highway respectively. The east site sits directly opposite the NW section of the Stage 1 Project centred at approximately Easting 770823 and Northing 6394308 (UTM zone 53H, GDA94) or -32.555° 137.884° (GDA94). The west site coincides with elements of the Stage 1 Project site as illustrated in Volume 3: Figure V3.06.02.

6.3 Site Description

Occupying an area of approximately 880ha, the east site sits at an elevation of between 30m above sea level (ASL) in the north-west to 60m ASL to the east. It is used primarily for livestock grazing and is located within the Primary Industry Zone of the Port Augusta City Council

(PACC) on privately owned land. Occupying an area of approximately 788ha, the west site sits at an elevation of approximately 11m ASL in the west to 29m ASL in the east.

The terrain is generally flat and rising gently from west to east. Due to the site's proximity to the Davenport substation, approximately 5km to the north-west, there are four major transmission network circuits crossing the site generally in a north-west to south-east direction including:

- a 275kV single circuit transmission line on steel and concrete towers to the Bungama substation approximately 75km to the south south-east;
- a 275kV double circuit transmission line on steel towers to the Belalie and Mt Lock substations some 90km south-east; and
- a 275kV single circuit transmission line on steel towers to the Brinkworth substation 70km south south-east.

The site is bisected by a number of other significant infrastructure elements including the Augusta Highway, a railway line and the Morgan-Whyalla water pipeline. Further details of the physical characteristics of the site and surrounding area can be found in Chapter 5: Site Description.

6.4 Project Description

As illustrated in Volume 3: Figures V3.06.01, V3.06.02, V3.06.03 and V3.06.04 the Project is a solar PV, energy storage, and synchronous condenser development with an installed capacity of up to 500MW(AC) of PV arrays, up to 400MW(AC) of battery energy storage and up to 3000MW.s of synchronous condenser capacity.

The power generated by the solar PV development will be collected at a new sub/switching-station on the east site and exported as described in Section 6.6.4.4 below. The energy storage and synchronous condenser facilities will either be constructed adjacent to the existing Stage 1 substation, or adjacent to the Stage 2 sub/switching station, or both.

The facility will allow the Project to store energy generated by Stage 1 and/or Stage 2 during times of low demand and release this energy at times of greater demand. This has several advantages: firstly, it provides a benefit to the electricity network, by providing dispatchable renewable energy at times of high demand, offsetting expensive peaking generation; secondly, it maximises the utilisation of existing grid infrastructure, resulting in lower overall levelised cost of energy (LCOE); and finally, it also provides an improvement in the quality of power supplied to the electricity network by both stages.

The solar PV sub/switching station will be connected to the wider electricity network as described in Section 6.6.4 below.

All access from the public road network will feature security barriers and the site will be contained within an approximately 2.4m high (nominal height) security fence.

It is envisaged that the Stage 2 Project construction will flow sequentially from the Stage 1 construction in order to realise efficiencies associated with both economies of scale and with reduced demobilisation and remobilisation costs resulting from a continuous workflow model. An illustrative construction scenario is summarised in Table 6.1 below. However, the final construction programme will be defined by financing requirements, supply timeframes and necessary offtake (power purchase) agreements.

Table 6.1: Proposed Phased Project Programme

Phase	Approximate Capacity[1]	Technology	Site	Forecast Construction Start	Forecast Operation
1	400 MW	Energy Storage (Batteries)	West and/or East	Q1/20	Q4/21
2	100 MW	Solar PV	East	Q1/20	Q3/21
3	100 MW	Solar PV	East	Q2/20	Q4/21
4	100 MW	Solar PV	East	Q3/20	Q1/22
5	100 MW	Solar PV	East	Q3/20	Q2/22
6	100 MW	Solar PV	East	Q4/20	Q3/22
7	3000 MW.s	Network Support (Synchronous Condensers)	West and/or East	Q2/21	Q2/22

A detailed construction programme will be developed post-consent. Once in commercial operation the Project will generate clean electricity for around 25 years prior to being either decommissioned or repowered.

6.4.1 Main Components of the Project

The main permanent components of the Project are as follows:

- up to 5,000,000 solar PV modules (technology dependent);
- up to 500 solar PV inverter/transformer stations;
- up to 10 solar PV interconnector substations containing switchgear and transformers;
- one main site sub/switching station containing transformers, protection equipment, switchgear, batteries and other related equipment;
- two storage/grid support locations comprising:
    - up to 400MW of energy storage with a maximum area of 8ha and a maximum height of 20m;
    - up to 3000MW.s of synchronous condenser capacity facilities with a maximum area of 8ha and a maximum height of 20m;
- approximately 8km of overhead or underground electrical export cables;
- approximately 150km of solar PV site tracks;

[1] The figures in this table are intended to reflect possible developments in technology between submission of the Development Application and the actual time when a commitment is made to purchase the technology, recognising that the megawatt output of solar panels and battery systems for the same physical size, may increase from currently available designs. However, in all circumstances, the aggregate installed solar PV, battery and synchronous condenser capacity of the Project will not exceed 500MW, 400MW and 3000MW.s respectively.

- electrical cabling (linking solar arrays);
- security fencing (nominally 2.4m high) around the solar PV sites;
- two access locations from the Augusta Highway;
- one access location from Spear Creek Road;
- one water supply from the Morgan-Whyalla pipeline
- one access location from Port Paterson Road; and
- a viewing platform and visitor information facility.

The main temporary components of the Project comprise three temporary construction compounds including laydown areas.

As illustrated in Volume 3: Figure V3.06.04, the elements of the Stage 1 development that may form part of or be used for the Project are as follows:

- Site access tracks
- Site access from Augusta Highway
- Site Access from Gade Road
- Temporary batching plant
- Borrow Pit
- Stage 1 substation

A detailed construction design will be developed once post-consent geotechnical surveys have been completed, allowing the final layout to be defined.

Details of major equipment deliveries are provided in Chapter 7, Section 7.4: Traffic and Transport. It is most likely that solar PV, energy storage, synchronous condenser, substation and other equipment will arrive via Adelaide Port or Port Pirie and travel north along the A1 Augusta Highway.

6.5 Solar Farm

6.5.1 Physical Characteristics

6.5.1.1 Array Mounting

The solar PV modules are mounted on metal frames commonly known as “racking tables”. These racking tables are in turn mounted on vertical posts which are fixed into the ground. Depending on the ground conditions, the posts may be of the “screw pile” type, they may be percussively driven, or in the case of adverse ground conditions they may be set in concrete.

6.5.1.2 Mounting Frames

The solar PV modules will be mounted in single-axis tracking configuration. Under this configuration, modules are mounted on racking tables in arrays oriented in a north-south direction. The tables are hinged in such a way as to allow them to track the sun in its path from east to west each day thereby increasing total energy production by ensuring that the maximum area is exposed to the sun at all times. They are typically driven by a mechanical actuator such as a linear actuator as illustrated in Plate 6.1 below.

Plate 6.1: Single Axis Tracking Systems

6.5.2 Design Envelope

The make and model of the solar PV module, and the mounting and racking systems, will be selected through a competitive commercial tender process post-consent. Further, the design of the mounting and racking systems will be subject to detailed geotechnical surveys and therefore cannot be specified at this stage. However, recognising that any technology selected will feature flat solar PV modules mounted on steel frames with a common set of generic design features, a "design envelope" approach has been adopted. Under this approach the key design parameters of the solar PV farm are specified, as shown in Table 6.2 below.

Table 6.2: Typical Solar Array Design Parameters

Component	Dimension (Approx.)
Max Module Height Above Ground	<6.0m
Min Module Height Above Ground	> 0.5m
Row Orientation	North-South
Angle of Modules	+/- 45 deg. (from horizontal, east/west facing)

6.5.3 Electrical Configuration

Solar PV cells are devices which can convert sunlight directly into electricity using semiconducting materials. Many different solar PV technologies are available commercially, but fall broadly into two classes; thin film and crystalline silicon. In thin film devices, the active semiconductor material is typically formed through a chemical deposition process, whereas in crystalline silicon devices the active semiconductor is physically cut into thin slices (called wafers). In either case, the active material is formed into *cells*, being either a discrete area in the case of thin-film devices, or wafers in the case of silicon devices. A single cell can provide only a very small amount of power. Individual cells can be connected together and fixed in a frame to form a *module*, which cumulatively produce more power. Modules can be connected together in series to form a *string*, and a number of strings can be connected together via *string combiners* to form an *array* to produce useful amounts of power, as shown in Figure 6.1 below.

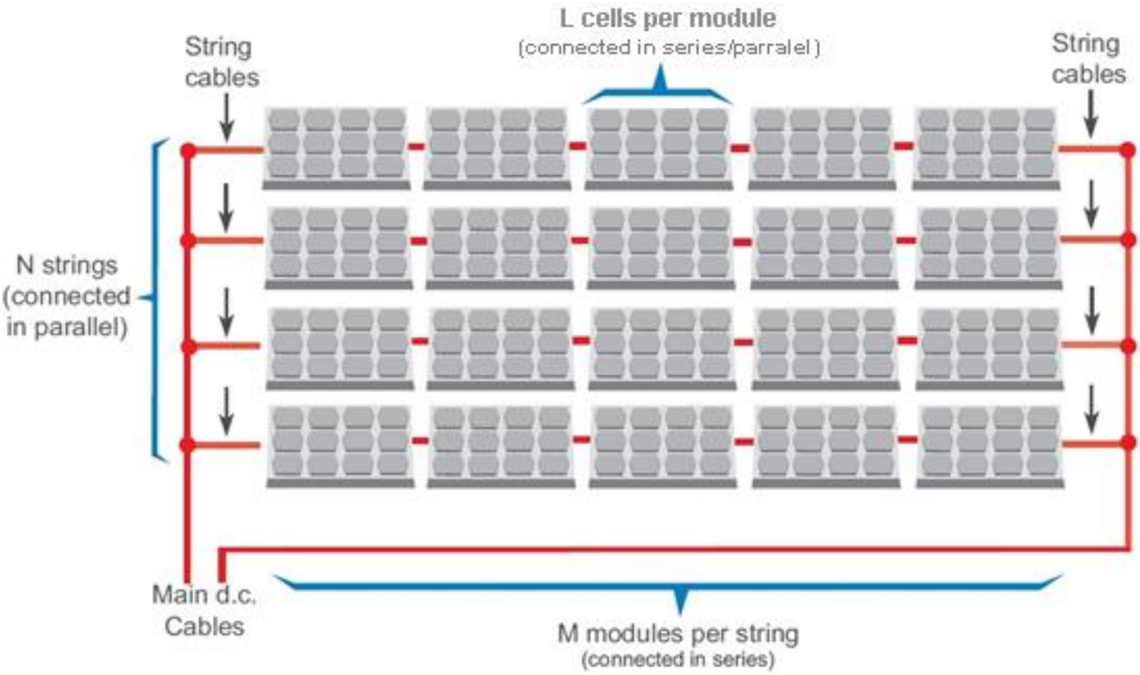


Figure 6.1: Cell, Module, String, Array Hierarchy

Finally, arrays can be grouped to form a *field*. In power terms, the relationship between cells, modules, strings, arrays and fields is shown in Table 6.3 below.

Table 6.3: Solar PV Power Production Hierarchy

Component	Dimension (Approx.)	Power (DC Approx.)
Single PV Cell	0.15m^2	5W
72 Cell Module	2m^2	360W
28 Module String	150m^2	10kW
282 String Array	4ha (with spacing)	2.8MW
25 Array Field	100ha	70MW

6.5.3.1 Solar PV String Combiner

The string combiner is a device that combines the output of multiple strings of solar PV modules for connection to the inverter. The combiner commonly houses the input overcurrent protection fuse assemblies for several strings (from as few as three strings to as many as 52). In addition, they may also house several other components for the site, such as a DC disconnect, surge protective devices and, in some cases, string monitoring hardware. A typical combiner is shown in Plate 6.2 below.

Plate 6.2: PV String Combiner

6.5.3.2 Solar PV Inverter/Transformer

Solar modules produce direct current (DC) electricity which needs to be converted to alternating current (AC) for export to the electricity grid. This conversion is done by devices called *inverters*. Large scale solar PV plants generally utilise centralised inverters as these units have a relatively high capacity, typically in the range 1MW to 4MW.

The system inverters provide power output at low-voltage AC (LVAC) levels, typically of the order of 500VAC. In order to minimise losses through the onsite cable reticulation system the output of the inverters are connected to transformers which will convert the LVAC power to medium-voltage AC (MVAC) levels, typically between 6.6kV and 33kV. The inverter stations are located at various points throughout the site and are generally housed either in a weatherproof/acoustic enclosure, or on a skid mounted system as shown in Figure 6.2 below.

Figure 6.2: Typical Skid Mounted Inverter/Transformer Station

Depending on the DC capacity of each unit, and the capacity of each solar field, there will typically be one of these units per one, two or four solar arrays. It is therefore possible that up to 500 of these units will be required. These inverters in turn may be connected to a transformer to increase the voltage of the electricity prior to connection to a *PV Interconnector Substation* (PVIS).

6.5.3.3 PV Interconnection Substations

Electricity generated from each solar field within the solar farm will typically be collected at a solar PVIS associated with that field. At these stations, the MVAC cables carrying the output of the individual fields will be combined and (depending on the reticulation voltage) potentially stepped up to a higher voltage ready for onward connection via underground cables to the Stage 2 sub/switching station. In addition to combination and transformation, each PVIS will house metering and protection equipment. Although final design details are unknown at this stage, a typical solar PVIS is shown in Plate 6.3 below.

Plate 6.3: Typical solar PV Interconnection Substation

Finally, the solar PVIS's are connected to the electricity network either directly, or via a main site substation. Figure 6.3 below illustrates a typical solar farm electrical configuration.

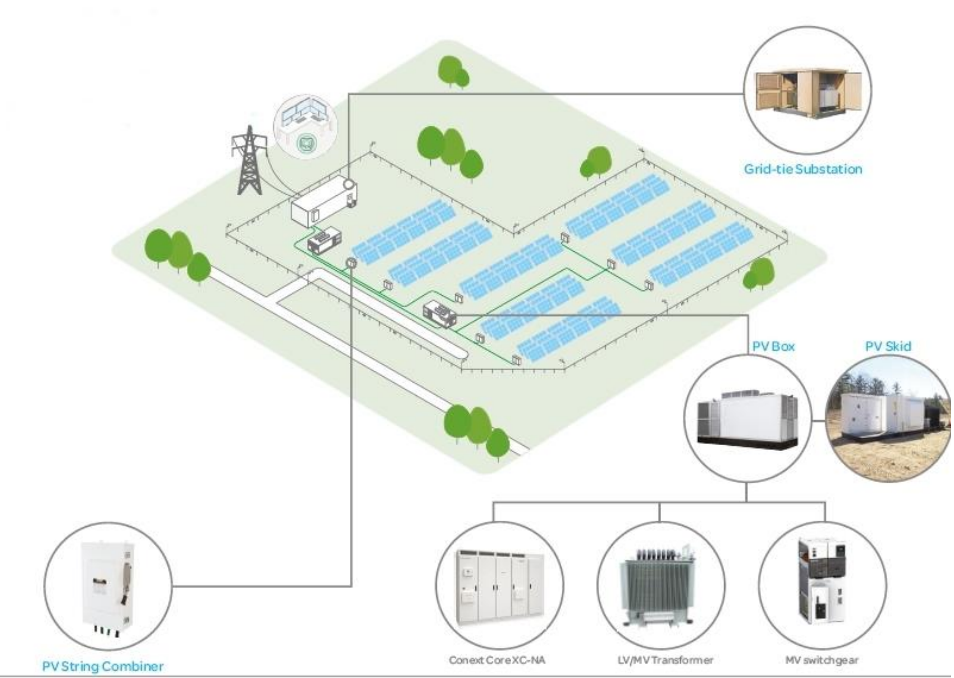


Figure 6.3: Typical Solar Farm Electrical Layout

6.5.4 Physical Layout

Based on the solar resource available at the Project location, it is estimated that approximately 2.7ha will be required for each MW (AC) of capacity (including additional infrastructure such as access tracks, cabling, inverters and switchgear). An indicative array is illustrated in Volume 3: Figure V3.06.05.

These arrays will typically be grouped together to form a field, and the power from each field will typically be collected at a PVIS, serving that field. An indicative field is illustrated in Volume 3: Figure V3.06.06. Included in the layouts are provision for temporary laydown facilities which will later be occupied by a solar PV field and/or PVIS.

The final layout of the solar farm will be the subject of a detailed design exercise and a competitive tendering process post-development consent.

6.6 Balance of Project

6.6.1 Introduction

The balance of the Project can be grouped into five categories:

- Energy Storage Facility(s)
- Synchronous Condenser Facility(s)
- Sub/switching station(s)
- Temporary Construction Compounds (TCCs)
- Export Connection

Employing again an overarching design envelope approach, two electrical/construction envelopes (one on the east site and one on the west site, of which either or both will be developed) of approximately 16ha have been defined each to contain energy storage facility(s), synchronous condenser facility(s), sub/switching station(s), and temporary construction compounds as illustrated on Volume 3: Figure V3.06.01. Options within the development approval are being sought to build within either or both electrical/construction envelopes, and to vary which elements are built within the individual envelopes.

Similarly, in terms of the export connection, there are several potential export options which cannot be explicitly defined at this point (as discussed in Section 6.6.4 below). Consent is sought for each of these options although the likelihood is that only one will be constructed.

6.6.2 Energy Storage Development

6.6.2.1 Physical Characteristics

Whilst there are a large number of electrochemical and other battery technologies available on the market, the two most common technologies at scale are presently metal-ion based systems (typically lithium-ion) and flow battery based systems with metal/lithium-ion currently becoming the dominant technology at scale.
The electricity storage industry is presently undergoing a period of fast change and rapid advancement and a degree of flexibility is required within the Development Approval to

ensure that the best technology can be utilized at the time of construction. Final technology choice therefore will be made post-consent following a detailed optimization exercise and a competitive commercial tender process. For the purpose of the environmental assessment for the Project the storage technologies considered will either be some form of metal/lithium-ion technology, or flow-battery technology.

6.6.2.1.1 Lithium-Ion Batteries

The smallest working unit in a lithium-ion battery is the electrochemical cell, consisting of a cathode and an anode separated physically but connected electrically by an electrolyte. The electrolyte conducts positive ions but inhibits the flow of electrons between the anode and the cathode. In a charged state, the anode contains a high concentration of intercalated lithium while the cathode is depleted of lithium. During the discharge, a lithium ion leaves the anode and migrates through the electrolyte to the cathode while its associated electron is collected by the current collector and transported via an external circuit where it does work.

There are a great many different lithium-ion cell types on the market, however they can generally be distinguished in terms of their chemistries. Both the battery electrodes (which are inevitably solid-state materials), and the electrolytes (which may be liquid, gel, or solid-state) have a variety of chemistries, exhibiting different performance characteristics and costs. Individual cells are typically packaged into a module, which in turn are packaged together to make a battery pack. These packs are then coupled together to make a storage system of a scale suitable for use in utility-scale applications.

6.6.2.1.2 Flow Batteries

A flow battery is a type of rechargeable battery where rechargeability is provided by two chemical components dissolved in liquids contained within the system and most commonly separated by a membrane. The fundamental difference between conventional batteries and flow batteries is the energy storage medium itself. In the case of conventional batteries, energy is stored by virtue of chemical changes in the electrode material whereas in flow batteries it is stored by virtue of chemical changes in the electrolyte.

Numerous different flow batteries are under development including hybrid, membraneless, and more commonly, redox. Redox flow batteries utilise a chemical reduction and oxidation reactions to store energy in liquid electrolyte solutions which flow through a battery of electrochemical cells during charge and discharge. During discharge, an electron is released via an oxidation reaction from a high chemical potential state on the negative or anode side of the battery. Finally, the electron is accepted after moving through an external circuit via a reduction reaction at a lower chemical potential state on the positive or cathode side of the battery. The direction of the current and the chemical reactions are reversed during charging.

6.6.2.1.3 Construction Methodologies

Utility-scale battery storage facilities are typically constructed according to two design methodologies; modular systems and building-based systems. Modular systems can be housed in outdoor weatherproof enclosures such as shipping containers or weatherproof cabinets. Building-based systems are housed in standard commercial/industrial style buildings. The final methodology will be subject to post-consent detailed design works following a competitive tendering process.

6.6.2.1.3.1 Modular Systems

One of the most common construction methodologies employed for utility-scale battery storage facilities is that of modular systems. These systems have a natural advantage by virtue of their inherent modularity. They typically consist of discrete "blocks" of storage, installed in shipping containers (as shown in Figure 6.4 below) or outdoor cabinet-style solutions (as shown in Figure 6.5 below).

Figure 6.4: Example Containerised Battery Storage Module

Figure 6.5: Example Cabinet-Based Storage Module

These systems have several advantages over building-based systems, namely:

- ease and cost of construction;
- scale flexibility; and
- re-useability.

Containerised systems are fast to construct. Site preparation civil works are minimal, with containers typically being mounted on pre-cast concrete plinths, mounted on point-foundations. Each battery module can be pre-assembled and tested in the factory, transported to site, connected to the site reticulation network and commissioned over very short timescales.

These features infer other advantages, being scale flexibility and re-useability. Electricity systems are undergoing significant change with the decline in conventional synchronous generation and the rise of intermittent, asynchronous renewable generation. This means that the need for network support is quite dynamic, both temporally and spatially. Containerised systems can be scaled up or down or moved to other locations on the network very quickly as the network dynamics change.

6.6.2.1.3.2 Building-based Systems

Building-based construction methodologies tend to be more bespoke and lack the flexibility and cost advantages of containerised methodologies. Despite this they are naturally better suited to flow-battery systems, as they are better able to accommodate and facilitate the complexities associated with flow batteries (liquid electrolyte storage, pumps, plumbing etc). Buildings will typically be of the standard industrial/warehouse variety, constructed on concrete foundations with appropriate bunding (for the containment of chemical spills). Plate 6.4 below shows a typical industrial building of the type that would be suitable for a large-scale battery storage system, of either the flow battery type or the lithium-ion type.

Plate 6.4: Example Energy Storage Building

6.6.2.2 Design Envelope

With the rapid advancements being seen in energy storage technologies, the choice of technology for the Project will be deferred until detailed economic and engineering studies have been undertaken. The final technology choice will then be made through a competitive commercial tendering process. Recognising however that any energy storage facility will be substantially similar to that described in Sections 6.6.2.1.3.1 and 6.6.2.1.3.2 above, a design envelope approach similar to that adopted for the solar PV element of the Project will again be adopted for the storage element of the Project. Detailed engineering designs will be developed post-consent as part of the EPC (Engineer, Procure, Construct) tendering process. These designs will then be submitted for building rules consent prior to construction.

In the case of the energy storage facility, the design envelope is defined in terms of the maximum dimensions of the facility, as specified in Table 6.4 below.

Table 6.4: Energy Storage Facility Design Envelope

Parameter	Dimension (Maximum)
Length	200 m
Width	200 m
Height	20 m
Perimeter	1000 m
Building Area	40000 m^2
Building Volume	800000 m^3

This volume is sufficient to house either: a containerised or weatherproof enclosure type storage facility, which might include control, welfare and maintenance buildings, switchgear, transformers etc.; or a building-based system, where many of these elements may be incorporated into the main building.

6.6.2.3 Electrical Configuration

For a generic large scale Lithium-ion energy storage system, the components typically consist of:

- multiple battery sets;
- terminal boards;
- thermal management system;
- automatic fire control equipment;
- power control systems;
- inverters;
- transformers;
- switchgear;
- main controller; and
- SCADA system.

A block diagram of a generic (containerized) 1MW lithium-ion energy storage system is given in Figure 6.6 below.

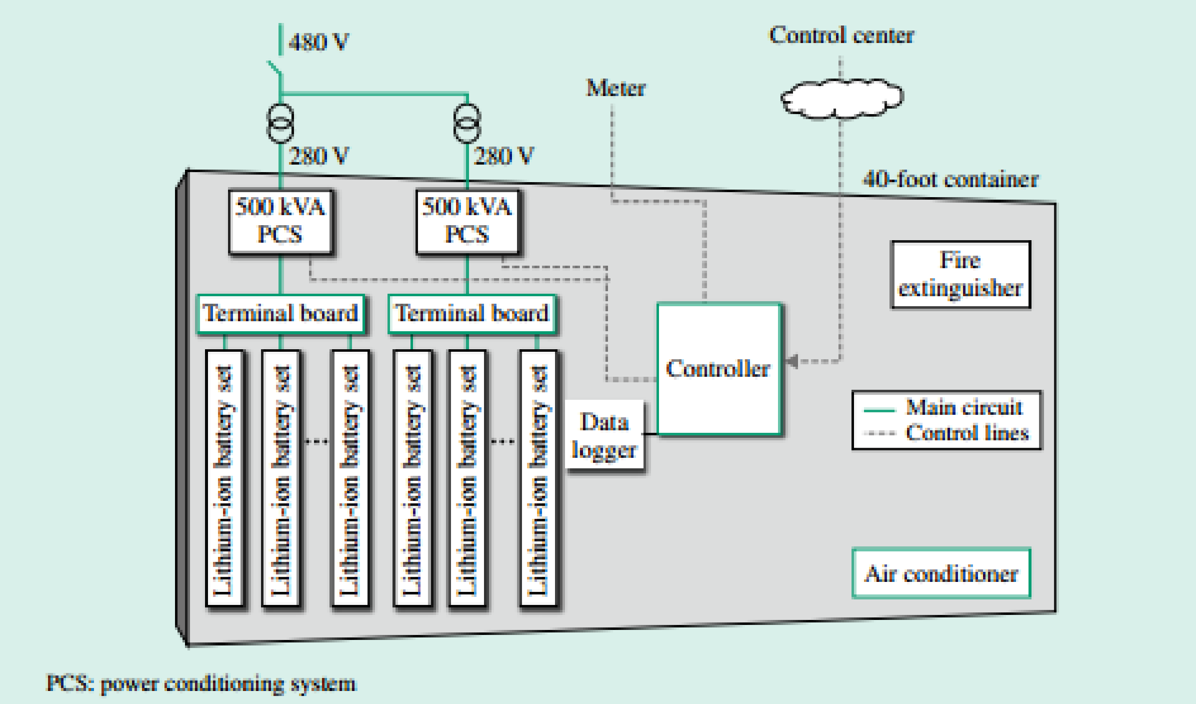


Figure 6.6: Generic Containerised Lithium-Ion Storage System Schematic

For a generic large scale flow battery energy storage system, the components typically consist of:

- electrolyte storage tanks;
- pumping systems;
- terminal boards;
- thermal management system;
- automatic fire control equipment;
- power control systems;
- inverters;
- transformers;
- switchgear;
- main controller; and
- SCADA system.

6.6.2.4 Storage Facility Layout

The final internal layout of the storage facility will be subject to detailed design works and tendering post-consent, as discussed in 6.6.2.2 above. Similarly, the final location of the storage facility will be subject to the detailed electrical design of the overall Project, specifically the location of the step-up transformer(s) required to convert the site reticulation voltage (typically 33kV) to the final export voltage. This issue is discussed at length in Section 6.6.4.3 below, but suffice to say the storage facility will be located either adjacent to the Stage 1 main substation, or adjacent to the Stage 2 site sub/switching station, or both, as shown in the indicative Project layout provided in Volume 3: Figure V3.06.01.

6.6.3 Synchronous Condenser Development

6.6.3.1 Physical Characteristics

Synchronous condensers have been in wide use in electricity grids for many years. Fundamentally, a synchronous condenser is simply a large generator similar to those found in thermal power plants, with the difference being that rather than being powered from an external source such as a gas or steam turbine, the generator can be operated as an electric motor. In this way, the synchronous condenser stores rotational energy (inertia). The synchronous condenser can therefore instantaneously absorb/deliver both real and reactive power from/to the grid in order to maintain grid stability.

Some synchronous condensers are designed to be installed outdoors and are typically located within substations, others are placed in containment buildings such as that shown in Plate 6.6.5 below.

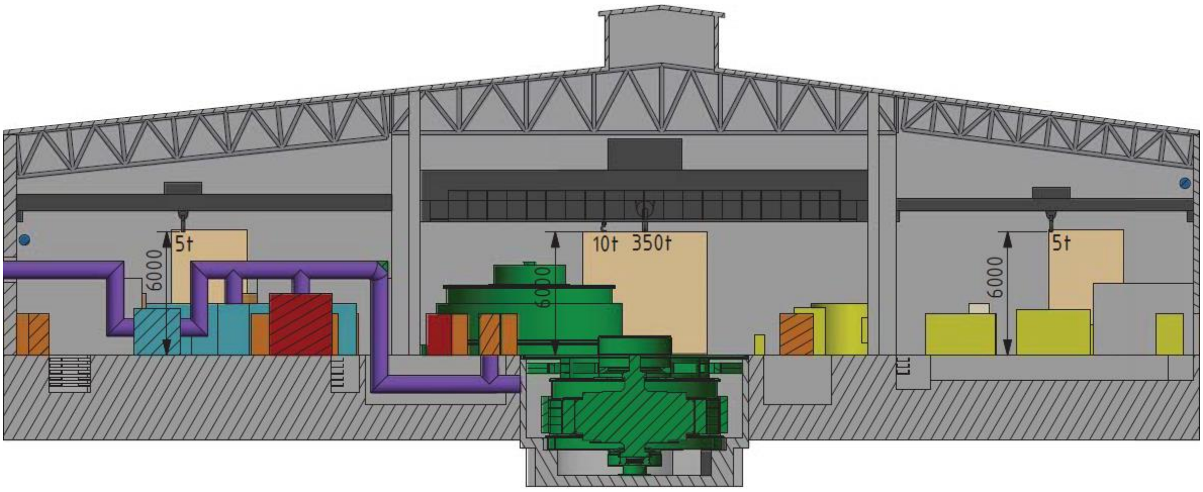


Plate 6.6.5: Example Synchronous Condenser Building[2]

6.6.3.2 Design Envelope

The choice of synchronous condenser technology and number of units for the Project will be deferred until detailed economic and engineering studies have been undertaken. The final technology choice will then be made through a competitive commercial tendering process. A design envelope approach similar to that adopted for the battery storage element of the Project will again be adopted for the synchronous condenser element of the Project. Detailed engineering designs will be developed post-consent as part of the EPC tendering process. These designs will then be submitted for building rules consent prior to construction.

In the case of the synchronous condenser facility, the design envelope is defined in terms of the maximum dimensions of the facility, as specified in Table 6.5 below.

Table 6.5: Synchronous Condenser Facility Design Envelope

Parameter	Dimension (Maximum)
Length	200 m

[2] Image courtesy Andritz Hydro

Parameter	Dimension (Maximum)
Width	200 m
Height	20 m
Perimeter	1000 m
Building Area	40000 m^2
Building Volume	800000 m^3

This volume is sufficient to house a synchronous condenser facility, which might include control, welfare and maintenance buildings, switchgear, transformers etc., or a building-based system, where many of these elements may be incorporated into the main building.

6.6.3.3 Electrical Configuration

The final electrical configuration of the synchronous condenser facility will be subject to detailed design works and tendering post-consent, as discussed in 6.6.2.2 above.

6.6.3.4 Synchronous Condenser Facility Layout

The final internal layout of the synchronous condenser facility will be subject to detailed design works and tendering post-consent, as discussed in 6.6.2.2 above. Similarly, the final location of the synchronous condenser facility will be subject to the detailed electrical design of the overall Project but suffice to say the synchronous condenser facility will be located either adjacent to the Stage 1 main substation, or adjacent to the Stage 2 site sub/switching station or both as shown in the indicative Project layout provided in Volume 3: Figure V3.06.01. A schematic representation of a typical building-based "turbo" synchronous condenser facility is presented in Volume 3: Figure V3.06.07, and a typical "hydro" synchronous condenser facility is presented in Volume 3: Figure V3.06.08.

6.6.4 Export Connection

6.6.4.1 Physical Characteristics

The export connection of the Project comprises those components which (electrically speaking) form the interface between the site reticulation voltage and the final connection voltage (i.e. the network voltage). Typically this includes some form of sub/switching station (including transformers, switching, control and protection equipment), control, maintenance and welfare facilities etc.) and some form of transmission line (overhead or underground) to connect the substation to the local electricity network.

The final electrical configuration of the Project's grid connection needs to retain flexibility in order to accommodate both the requirements of the network operator and any changes to the network and its operating standards which may occur between the granting of development consent and the commencement of construction. The final connection configuration will be the subject of a detailed design exercise post-consent. By the same rationale applied to the description of the solar PV, energy storage and synchronous condenser elements of the Project, a "design envelope" approach will be adopted for the export connection element.

6.6.4.2 Design Envelope

This section describes the broad principles that will shape the final design of the export connection and hence determine the precise location and nature of the various elements of the Project's electrical components, including substations and switching stations, transformers, underground and overhead electrical cabling, protection, equipment, control and welfare facilities etc., as well as the final grid connection arrangement.

6.6.4.3 Electrical Configuration

Electrical energy generated by the solar element of the Project will need to be transformed from the medium voltage (MV) solar site reticulation voltage level to the final high voltage (HV) export level for onward connection to the Davenport substation, potentially via an intermediate high voltage (IHV) level. The final location of the storage element will be heavily influenced by the final design of the electrical export connection of the solar farm. This export connection could take one of several forms as discussed in Section 6.6.4.4 below.

6.6.4.3.1 Substation/Switching Station(s)

The sub/switching station(s) are expected to consist of one or more MV/IHV/HV transformers mounted outdoors in a switchyard and surrounded by a security fence (approximately 2.4m high). Each transformer will be mounted in a concrete bund capable of containing the full volume of transformer cooling oil (typically in excess of 110% volume). A facility is required to house the main site substation, control, protection and metering equipment, control room, office facilities including communications, welfare facilities and a maintenance workshop containing front line spares.

The substation building located adjacent to the switchyard will house control and metering equipment and LV electrical switchgear. The building will also include protection and communication equipment with associated battery power supplies to enable disconnection of equipment and cables in the event of onsite power failure. An image of a typical twin 33/132kV transformer switchyard is shown in Plate 6.6 below with a general arrangement drawing of a combined switchyard and control building in Volume 3: Figures V3.06.09.

Plate 6.6: Image of a Typical Substation/Switchyard

6.6.4.3.2 Transmission Lines

The electricity produced by the Project will be transported from the sub/switching station to the electricity network either via underground or overhead transmission lines, typical examples of which are shown in Plate 6.7 and Plate 6.8 below respectively.

Plate 6.7: Typical Underground Cable Arrangement

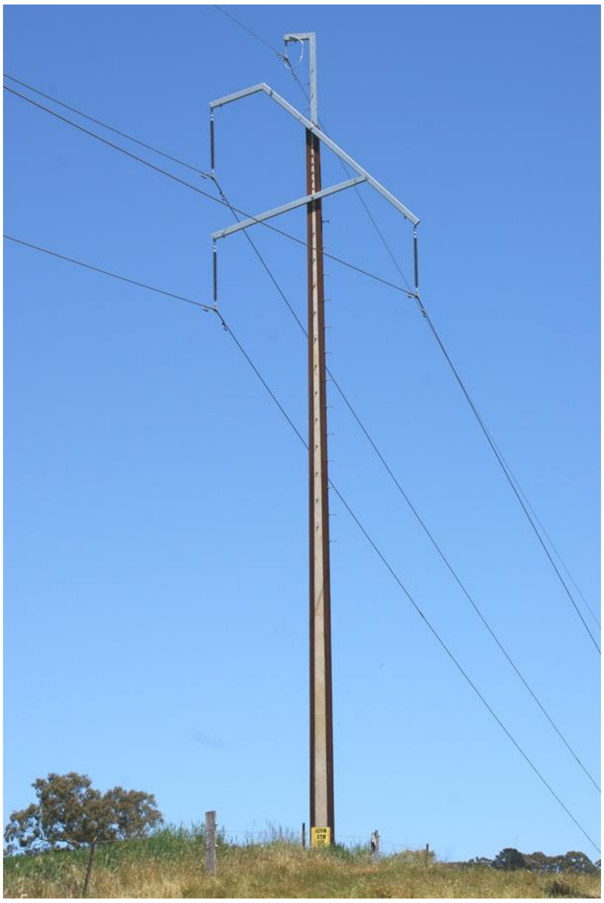


Plate 6.8: Typical Overhead Cable Arrangement

6.6.4.4 Export Connection Options

The export connection could take several forms:

- export via an extension to the existing Stage 1 substation and utilising the Stage 1 export cable (connecting Stage 1 to Electranet's Davenport substation); or
- export directly to Davenport substation and utilising the Stage 1 export cable (i.e. bypassing the Stage 1 substation); or
- export directly into one of or more of the transmission lines traversing the site; or
- export directly to Davenport substation via a new overhead route[3].

In order to accommodate these various options, a design envelope has been defined. This design envelope describes several export corridors of approximately 100m in width, flaring at each substation/storage/synchronous condenser compound to enable design flexibility. Explicit consent is sought for each of these corridors on the understanding that ultimately only one of them will be constructed. Indicative layouts of the various potential export connection configurations are provided in Volume 3: Figure V3.06.10.

[3] This last and least likely option would involve a new section of transmission line (to the Davenport substation) external to those routes presented in Volume 3: Figure V3.06.10. Consent for this section of transmission line, if required, would be sought under a separate, dedicated development application at an appropriate time.

6.6.5 Temporary Construction Compounds (TCCs)

There will be a requirement for temporary compounds during the construction phase of the Project. Following handover to commercial operation these facilities will be removed and the areas reinstated unless permanent facilities are required at their location. The first construction activity will be the establishment of temporary access roads and temporary construction compounds.

The west site TCC will be located beside the Stage 1 substation and will be accessed either from within the Stage 1 internal track network or from the Port Paterson Road access point. There will be two east site TCCs. The first will be located within the designated construction envelope at the eastern extreme of the east site. A temporary access track will be constructed from Spear Creek Road to this TCC. Once in place this TCC will be used for the construction of the main east site access point from the Augusta Highway. A second TCC will be located within the east site electrical/construction envelope as shown in Volume 3: Figure V3.06.11. This TCC will act as the main TCC during construction. These compounds will include the following facilities:

- temporary demountable-type structures to be used for site office, the monitoring of incoming vehicles and welfare facilities including toilets;
- parking for construction staff, visitors and construction vehicles;
- secure storage for tools and parts;
- tool store and workshop in lockable containers;
- receiving area for incoming vehicles;
- welfare facilities; and
- waste, refuelling, power, water supply and chemical/material storage.

Measuring approximately 200m x 200m a typical TCC layout is shown in Volume 3: Figure V3.06.12.

Following completion of construction the east site TCC adjacent to the Augusta Highway access point will be converted to a public parking and viewing area. Site offices, workshop and spares stockholding will be contained in the main substation complex.

6.7 Ancillary Elements

6.7.1 Site Entry and Exit Points

The construction delivery and return strategy and site access points are shown in Volume 3: Figure V3.06.13. A detailed description of proposed traffic movement is provided in Chapter 7, Section 7.4: Traffic and Transport.

6.7.2 Water Supply

A permanent high-volume water supply will be required on both the east and west sites for the following:

- construction dust suppression (as required);
- wheel washing (minimal);
- concrete mixer wash down (minimal);
- welfare facilities (minimal); and
- firefighting.

The Morgan-Whyalla Number 1 water pipeline bisects the site running parallel to the A1 north on the west side of the highway. Existing tapping points are located at approximately 350m intervals along this pipeline. A permanent water supply abstraction point will be established and provide a high-volume water supply to both east and west sites.

The final location of the abstraction point will be subject to detailed design and consultation with SA Water and the railway owner, the Australian Rail Track Corporation (ARTC) post-consent and prior to lodgement of a building rules consent application pre-construction. Once again, a design envelope is proposed for the location of the water abstraction point and highway crossing, as shown in Volume 3: Figure V3.06.03.

6.7.3 Construction Materials

6.7.3.1 Concrete

As discussed in Section 6.5.1.1, the preferred construction methodology for the solar farm involves the use of either screw or driven piles. Only under adverse geotechnical conditions would the use of concrete foundations be contemplated. It is therefore envisaged that there would be minimal need for concrete involved in the construction of the solar farm.

Construction of the Energy Storage facility, Synchronous Condenser Facility and sub/switching station will require concrete supply. It is envisaged that this concrete will be supplied either from the existing Stage 1 batching plants, provided they are still in operation, or from local concrete suppliers. No new batching plant is envisaged as part of the Stage 2 development. The preferred option will be detailed fully in the Project's Construction and Environmental Management Plan (CEMP) to be submitted as part of building rules consent.

6.7.3.2 Stone

The construction of the solar farm will require approximately 150km of site tracks. Material for these tracks will either be sourced from the existing stage 1 borrow pits (if they are still in operation), or from local quarry operators. The preferred option will be detailed fully in the Project's CEMP to be submitted for building rules consent in advance of the commencement of construction.

6.7.4 Public Viewing Area

Following handover to commercial operation the east site temporary construction compound will be converted into a viewing area for members of the public interested in viewing the solar farm. This will feature a vehicle parking area and an information facility which will display information about the development including key facts, time lines, cumulative electricity generated, and CO2 displaced.

Signs will be placed at regular intervals on the northbound carriageway of the A1 between Mambray Creek and Nectar Brook advising of the viewing area in order to discourage road users from parking adjacent to the highway. Further details of the site design locations and size will be discussed with appropriate transport authorities and local councils, and provided prior to commencement of construction.

6.7.5 Permanent Site Office

Following completion of construction activities and handover to commercial operation, a permanent site office will be established as part of the east site sub/switching station. Details of a generic design layout are shown in Volume 3: Figure V3.06.09 in conjunction with the substation and control room details.

6.8 Construction, Operation & Decommissioning

6.8.1 Solar Farm

The following information is provided in the chronological order of the construction activity including operation and decommissioning to inform the detail activities required to construct the Project based on the illustrative phasing.

Operational and decommissioning activities have been grouped together reflecting the low-level activities required in operation and 'reverse of construction' activities in decommissioning.

6.8.1.1 Construction

Construction will occur in two phases, site preparation and installation.

6.8.1.2 Site Preparation

Site preparation is required to ensure that the site is in a condition which enables all equipment to be installed. This includes securing the site, establishing TCC's, establishing temporary access roads, levelling (if required), installation of site tracks and drainage facilities, setup of construction staging areas, storm-water management works and preparation of land areas for array installation if required.

A temporary water supply will be required on both the east and west sites for the following:

- construction dust suppression (as required);
- wheel washing (minimal);
- concrete mixer wash down (minimal); and
- welfare facilities (minimal).

It is unlikely that sufficient ground water could be extracted from the site without significant impacts. However, as highlighted in Section 6.3, the Morgan-Whyalla Number 1 water pipeline bisects the site running parallel to the A1 north on the west side of the highway. Existing minor tapping points are located at approximately 350m intervals along this pipeline with more substantial tapping points with isolation capability at less frequent intervals. Under a licence agreement with SA Water, water will be abstracted from the pipeline for use.

Solar PV arrays require a relatively level and stable surface for installation. Topographic, geotechnical, and hydrological studies will be undertaken to determine if any levelling or compaction is necessary to ensure safe and efficient solar PV array installation although based on preliminary field and desk based studies it is considered that a large portion of the site will be able to accommodate solar PV arrays with limited ground preparation. However, it remains possible that grading and compaction may be required in selected areas.

Site grading if required will occur for the construction of the access track, solar module areas, temporary facilities, staging area, inverter foundations, and trenches for electrical cabling and instrumentation control. Grading involves the excavation and on-site stockpiling of topsoil at designated areas determined in consultation with the landowner. Topsoil will remain on site and will be used for site restoration following completion of construction activities.

6.8.1.3 Installation

Foundation construction for electrical equipment, substation, and oil containment basin comprises excavation and removal of in-situ material, placement of granular material, formwork, reinforcing steel, grounding, and placement of concrete. Solar PV modules will be securely mounted on a table structure supported by a driven pile foundation, helical pile, micro-pile, ground screw and/or CIDH (Cast-In-Drilled-Hole) pile depending on the soil conditions within the site. These underground support structures will be driven to a design depth, capable of supporting the structure as shown in Plate 6.9 below. Ready-mix concrete will be delivered by transit mixer truck from a local supplier if required although based on current core samples evaluated during the preliminary geological study the ground appears suitable for a driven pile foundation with no requirement for alternative methods including concrete.

Plate 6.9: Array Support Structures

Electrical cabling including DC cables from the modules to the inverter and AC cables from the inverter to the transformer will generally be trenched but may be routed over ground in cable trays or conduit. Where trenching is required they will have a sand base layer below and above the cabling, and will be backfilled with excavated or suitable imported material. The layout of the trenches will be such that it will have minimum impact on the existing drainage. Trenches will typically be 1m deep by 0.5m wide and will be excavated by using a 'ditch-witch' plough, or similar equipment.

The structural support for the system will comprise a steel and/or aluminium table structure supported by a pile foundation. This table structure will be assembled on site, and mounted on the piles. Modules will then be mounted on the structural support system as shown in Plate 6.10 below.


Plate 6.10: Installing Modules on Framework

Each inverter station site will be graded and compacted to an approximately level grade. Several cement pads will be constructed as foundations for electrical equipment and the remaining area will be gravelled. Electrical switchgear, dead end line structures, and related facilities will be present. There will also be trenching within the stations for grounding grid installation, buried power cables, and control cables.

Cables at this intermediate voltage will run underground to the solar PV interconnector substation.

Upon completion of construction, the solar farm will undergo a final system validation and commissioning process. The SCADA and monitoring systems are brought online, the equipment is tested, and operational readiness is verified. The Project will be brought online and connected to the grid sequentially, in increments.

6.8.1.4 Operation

Operation and maintenance requirements on solar PV farms are very low. If and when problems arise most faults will be electrical in nature requiring the minimum of personnel and equipment to resolve.

6.8.1.5 Decommissioning

All construction material, equipment, temporary facilities, and waste will be removed from the site. Topsoil will be backfilled where required, including landscaping to achieve proper drainage. Most of the major Original Equipment Manufacturers (OEM`s) have commercial-scale recycling operations in place at their manufacturing facilities. Approximately 95% of the semiconductor material and 90% of the glass are usually recovered. The remaining materials (e.g. glass fines, dust) are collected and properly disposed of according to local regulations.

6.8.2 Energy Storage Facility

The energy storage facilities will be located adjacent to the Stage 1 and/or the Stage 2 substations which will allow the power from both stages to be time managed prior to export.

6.8.2.1 Construction

Construction of the energy storage facility(s) will follow a general pattern of activities as follows:

- establishment of secure compound and facilities;
- earthworks and site preparation;
- electrical cable installation;
- foundation installation;
- construction of containments;
- electrical plant installation;
- commissioning of installations; and
- reinstatement of perimeter and removal of any temporary works.

6.8.2.2 Earthworks

The total footprint of the area will be set out and stripped of topsoil which will be stored in a temporary stockpile. In order to create a level flat construction platform, suitably graded aggregate will be placed in layers and compacted. This work will include provision for local patterns of drainage to be retained and drainage measures will be incorporated as required. Cable trenching and laying will be undertaken and building and/or module foundations will be excavated as defined by reinforcing, waterproofing and formwork to enable foundation concrete to be poured.

6.8.2.3 Electrical Cable Installation

The storage facilities internal (reticulation) and external (export) electrical cabling will be installed underground using standard trenching techniques as described in Section 6.8.5 below prior to the construction/installation of the storage containment building/module.

6.8.2.4 Containment Construction/Installation

Building-based systems will be constructed using normal industrial building construction techniques, for example, using brickwork, pre-form concrete or profiled steel cladding. Modular systems will be constructed offsite and installed on pre-prepared foundations.

6.8.2.5 Commissioning

Following completion of the works there will be a period of commissioning and testing.

6.8.2.6 Operation

The facility will typically not be constantly staffed and will operate semi-autonomously, controlled either from the sub/switching station control room or remotely by an Operation and Maintenance (O&M) contractor.

6.8.2.7 Decommissioning

All storage technologies have a limited lifespan and it is typical that components are replaced in a rolling maintenance program for the life of the Project. Depending on the prevailing market conditions at that time, the facility will either be refurbished, or it will be dismantled and the site re-instated. Any permanent buildings may remain for re-use for other purposes not envisaged under this development application subject to the approval of the Minister for Planning.

6.8.3 Synchronous Condenser Facility

The synchronous condenser facilities will be located adjacent to the Stage 1 and/or the Stage 2 substations.

6.8.3.1 Construction

Construction of the synchronous condenser facility(s) will follow a general pattern of activities as follows:

- establishment of secure compound and facilities;
- earthworks and site preparation;
- electrical cable installation;
- construction of control/containment building;
- electrical plant installation;
- commissioning of installations; and
- reinstatement of perimeter and removal of any temporary works.

6.8.3.2 Earthworks

The total footprint of the area will be set out and stripped of topsoil which will be stored in a temporary stockpile. In order to create a level flat construction platform, suitably graded aggregate will be placed in layers and compacted. This work will include provision for local patterns of drainage to be retained and drainage measures will be incorporated as required. Cable trenching and laying will be undertaken and building and/or module foundations will be excavated as defined by reinforcing, waterproofing and formwork to enable foundation concrete to be poured.

6.8.3.3 Control Building

Building-based systems will be constructed using normal industrial building construction techniques, for example, using brickwork, pre-form concrete or profiled steel cladding. Outdoor systems would be installed on appropriate concrete foundations.

6.8.3.4 Electrical Plant and Cable Installation

The synchronous condenser facilities internal (reticulation) and external (export) electrical cabling will be installed underground using standard trenching techniques as described in Section 6.8.5 below prior to the construction/installation of the storage containment building/module.

6.8.3.5 Commissioning

Following completion of the works there will be a period of commissioning and testing.

6.8.3.6 Operation

The facility will typically not be constantly staffed and will operate semi-autonomously, controlled either from the sub/switching station control room or remotely by an Operation and Maintenance (O&M) contractor.

6.8.3.7 Decommissioning

The synchronous condenser facility would be decommissioned by removing the electrical and mechanical infrastructure and disposal/recycling of this equipment according to appropriate standards. Any equipment plinths will be removed to a depth of 1.0m including cables. Any permanent buildings may remain for re-use for other purposes not envisaged under this development application.

6.8.4 Sub/switching Station

6.8.4.1 Construction

Construction of the main sub/switching station, and PV Interconnector Substations will all follow a similar pattern of activities as follows:

- earthworks and concrete base to form construction platform;
- construction of control building;
- electrical plant and cable installation;
- establishment of secure compound and facilities;
- commissioning of installations; and

- reinstatement of perimeter and removal of any temporary works.

6.8.4.2 Earthworks

The total footprint of the area will be set out and stripped of topsoil which will be stored in a temporary stockpile. The building foundations will be excavated as defined by reinforcing, waterproofing and formwork to enable foundation concrete to be poured as shown in Plate 6.11 below. In order to create a level flat construction platform, suitably graded aggregate will be placed in layers and compacted. This work will include provision for local patterns of drainage to be retained and drainage measures will be incorporated as required.

Plate 6.11: Typical Substation Foundations

6.8.4.3 Control Building

The control buildings will be single storey and constructed using normal construction techniques, for example, using brickwork, preform concrete or profiled steel cladding.

6.8.4.4 Electrical Plant and Cable Installation

The equipment forming the network within the compound including busbars, insulator supports and disconnectors will be delivered on normal heavy goods vehicle (HGVs) and will be assembled and prepared on the pre cast foundations as required. The transformers will be delivered by specialist HGVs and located within the substations. The electrical connections within the substations and switchyard will be completed using large diameter tubular conductors and cabling. The connections to the overhead lines on the strain gantries will be made to complete the required electrical connections.

Switchgear is normally installed in the control room and switchyard using a mobile crane before being connected, tested and commissioned prior to roof trusses and the main roof sections being installed. A typical switchyard under construction is shown in Plate 6.12 below.

Plate 6.12: Typical Switchyard Installation

6.8.4.5 Commissioning

Following completion of the works there will be a period of commissioning and testing.

6.8.4.6 Operation

The facility will be in constant use by site operators situated in the control room and operation and maintenance staff who will utilise the welfare area when on site. The area will also be available for main equipment contractors acting as a base for routine and unplanned servicing of equipment. Clear demarcation and permitting will be in place to ensure that only suitably trained and qualified personnel are allowed access to the HV and LV equipment.

6.8.4.7 Decommissioning

The substation and control building would be decommissioned by disconnecting and dismantling all the surface equipment. Buildings and equipment plinths will be removed to a depth of approximately 1.0m including cables. The transformers and other major electrical equipment would be decommissioned typically in the reverse order of installation, removed from site and either refurbished for future work or disposed of including oil residue in line with appropriate decommissioning requirements.

6.8.5 Electrical Reticulation Network

The reticulation cabling between the solar PV fields, storage facility and synchronous condenser facility and the sub/switching station will be installed underground in trenches in flat configuration as shown in Plate 6.13 below.

Plate 6.13: Example Export Cable Trench

The trench is excavated using either conventional excavators or special trenching machines as shown in Plate 6.14 below.

Plate 6.14: Underground Reticulation Cable Trenching Machine

Exposed material and spoil would be either re-used or disposed of in accordance with Environmental Protection Authority (EPA) Guidelines and the Project's CEMP.

Horizontal directional drilling (HDD) may be used to lay cable where it crosses other services.

6.8.6 Electrical Connections Linking Sites

There are several options available and a detailed design and construction methodology will be developed as part of the overall design package in conjunction with the Transmission Connection Agreement with ElectraNet. Whichever option is chosen, all activities will be compliant with all relevant legislation or guidelines. Options currently under consideration include:

- multiple circuit overhead cable;
- multiple cables carried underground installed by conventional trenching techniques;
- multiple cables carried underground in multiple conduits installed by HDD techniques;
- a single cable with triple cores carried underground in a single conduit installed by conventional trenching techniques;
- a single cable with triple cores carried underground in a single conduit installed by horizontal direct drilling; and
- combinations of the above.

6.8.6.1 Construction – Overhead Line

Access for construction requires an area at least 600m^2 (nominally 30m x 20m) at pole sites (to be fenced off/demarcated to limit construction activities to this area) and an approximately 5m wide swathe under the conductors along the route, whilst conductor stringing is in progress. Where required this area will be locally levelled to allow installation of the poles.

The erection of poles requires excavation (typically 3m^2 and 2m deep) to allow the pole brace blocks and/or steel foundation braces to be positioned in place. Each support's earth mat is installed, comprising two earth conductors laid at the base of the pole in an 'X' arrangement horizontally, about 600mm deep. Earth rods are inserted vertically along the route of these conductors.

The excavation is then backfilled and consolidated in layers, normally with the original materials. Topsoil is reserved for the top layer and any surplus subsoil or rock is removed from the site. Any turf or similar vegetative covering will have been carefully removed and stored for the duration of the works and will be used to complete the reinstatement. Where required the poles are stayed using galvanised wires located with earth anchors or "dead men" as appropriate to the ground conditions.

Once all poles within the section of line under construction have been erected, all poles are fitted with insulator supports. Running blocks are fitted to the top of the insulator support and the conductors are fitted using the following techniques.

Drums of conductor and a tensioner with a hydraulic brake are located in a working area at one end of the line section, with the pulling winch at the other. The conductor is joined to a single, heavy-duty pilot wire and drawn through the section, one conductor at a time, under constant tension. During stringing, radio communication is maintained between the operators of the pulling winch, the tensioner, hydraulic brake and intermediate observation points so the pulling can be stopped if problems arise. By using the 'Continuous Tension Stringing' method the conductors are held aloft at all times and do not touch the ground or any other structures.

6.8.6.2 Construction – Conventional Trenching

Where possible, conventional trenching techniques similar to those described in Section 6.8.5 for inter-array cabling will be used to connect the sites. This could involve controlled traffic movement or temporary diversion of traffic to one side of the road where required. The road will be re-instated to the original condition with no change in the level and serviceability of the road once the cable installation is completed. The developer will consult and liaise with PACC Infrastructure and Operation staff and/or Department of Planning, Transport and Infrastructure (DPTI) to ensure roads are reinstated to appropriate specifications.

6.8.6.3 Construction – Horizontal Directional Drilling (HDD)

Routing a single or multiple cables under the Augusta Highway, the ARTC rail line and any other services (e.g. SA Water pipelines, communications lines) would likely require HDD to be undertaken to link the east and west sites at a distance of around 500m. According to SA Power Networks guidelines, *"An electrical conduit should be installed a minimum of 2.0m deep under any rail line for a 3.0m distance beyond the outer rails."*[4]

The principle of HDD is straight forward:

- from the entry point at one side of the crossing a steerable drill bit is pushed through the ground to the exit point on the other side of the obstacle;
- the pilot bore is then enlarged with one or more reaming passes until the bore hole has reached its required diameter;
- a pre-prepared conduit pipe is pulled back by the drill rig to case the hole; and
- power and communications cables are drawn through the conduit as required.

On both sides of the crossing a limited area is defined as the "rig side" where the drill rig will be installed and the "pipe side" where the conduit will be pulled back.

On the drill side a small entry pit approximately 2m deep is excavated and adjacent a larger storage pit for the drilling suspension is excavated. A separation plant, buffer tank, mixing unit for the lubricant, pump and power packs, pipe skid and control cabin complete the equipment required which is delivered in standard containers as shown in Figure 6.7 below.

[4] SA Power Networks (2012) Technical Standard – TS-085: Trenching and Conduit Standard for Underground Distribution Cable Networks, 3 September 2012, p.25.

Figure 6.7: Schematic of Drill Side Equipment Requirements

Trailer mounted drill rigs are ideal for this application with the rig mounted in position and bolted to an anchor plate as shown in Figure 6.8 below.

Figure 6.8: Drill Rig in Position

When drilling straight the drill bit rotates and the lubricant pumped through the drill string to the nozzles hydraulically cutting the soil in front. Drilling mud mixed with soil flows back into the entry pit where the cuttings and slurry are separated to enable the cleaned fluid to be reused in a closed loop cycle as shown in Figure 6.9 below.

Figure 6.9: Removal and Separation of Lubricant

Similar separation equipment is required on the pipe side. In order to enlarge the pilot hole a series of reamers is pulled back through the pilot hole by the drill rig. The final operation uses a “pull back” assembly consisting of swivels, shackles, reamers, U joint and conduit to pull back though the predrilled hole as shown in Figure 6.10 below.

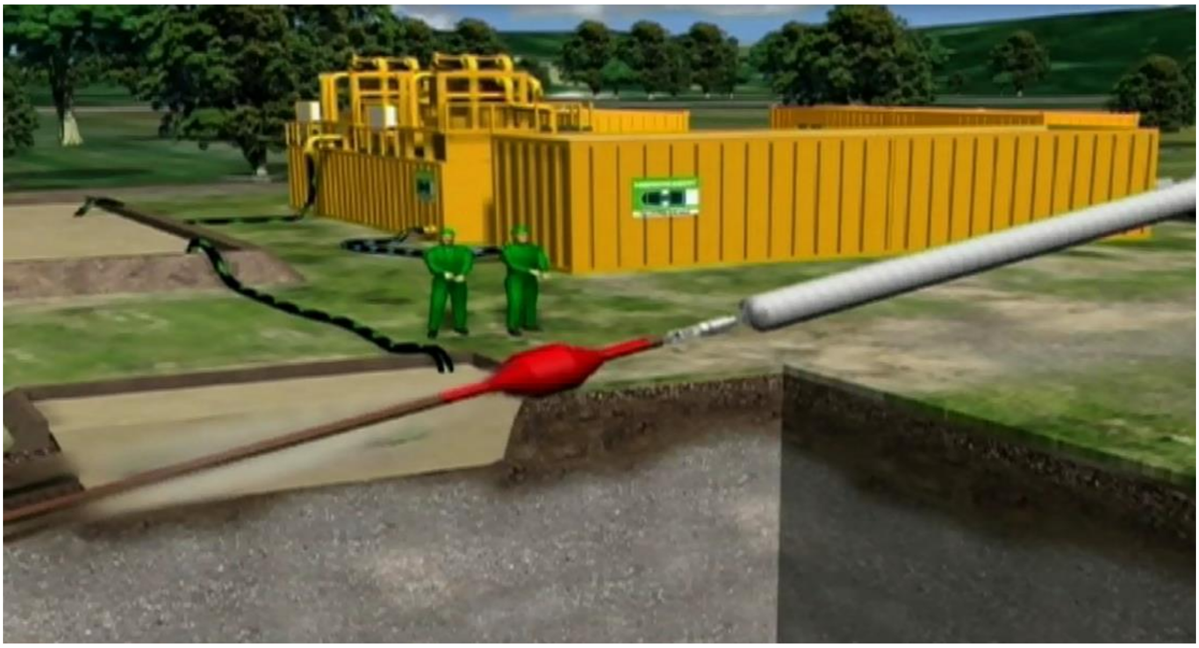


Figure 6.10: Conduit Being Drawn Back Through Hole

Once lined the equipment is removed including drill cuttings and soil from the drill process.

6.8.6.4 Operation

There are no operational issues associated with the cable installation

6.8.6.5 Decommissioning

As part of the decommissioning process a decommissioning plan would be agreed with relevant consultees and landowners prior to works commencing. However, it is expected that if no longer required, the cable ends would be excavated and cut before being backfilled. Concrete markers would be removed.