STATE COMMISSION ASSESSMENT PANEL
A COMMITTEE OF THE STATE PLANNING COMMISSION

SCAP Agenda Item 3.2.1
27 June 2019

#12997314

FRV Services Australia Pty Ltd
Chaff Mill Solar Farm

Chaff Mill Road, Stanley (north-east of Mintaro)
433/V003/18

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OVERVIEW

Application No	433/V003/18
Unique ID/KNET ID	APPIAN 3309, Knet 2018/14173/01
Applicant	FRV Services Australia Pty Ltd
Proposal	Construction of a 100MW solar farm and associated infrastructure including: arrays of solar panels mounted on single-axis tracker framing; inverter stations; a 50MW battery energy storage system; substation (containing a minimum 100MVA transformer); overhead line from substation to existing 132kV transmission line; site office; onsite parking; refuse storage area; internal access roads; perimeter security fencing
Subject Land	Chaff Mill Road, Stanley
Zone/Policy Area	Primary Production Zone
Relevant Authority	Minister for Planning
Lodgement Date	14 June 2018
Council	Clare and Gilbert Valleys Council
Development Plan	Clare and Gilbert Valleys Development Plan Consolidated 10 November 2016
Type of Development	Crown application
Public Notification	Section 49: Development exceeds $4 million
Representations	Twenty-three (23), ten (10) wishing to be heard
Referral Agencies	Native Vegetation Council (DEW), Commissioner of Highways (DPTI), Country Fire Service, Essential Services Commission Aboriginal Affairs and Reconciliation (DPC)
Report Author	Sharon Wyatt, Principal Project Officer

EXECUTIVE SUMMARY

The Chaff Mill Solar Farm project is a 100MW facility to be located on 380 hectares of land approximately 3.5km north-east of Mintaro. The application has been sponsored by the Department of the Premier and Cabinet as ‘public infrastructure’ pursuant to Section 49 of the *Development Act 1993*.

The development site is located adjacent to the existing Mintaro substation and consists of two parcels of land located to the east and west of Chaff Mill Road. The immediate locality is used for primary production purposes, largely cleared of native vegetation, and contains grazing and cropping land. The proposed solar farm project has been sited to take advantage of efficiencies with the existing Mintaro substation and its transmission line to Waterloo.

The Chaff Mill Solar Farm proposal underwent a public notification process from 11 July to 10 August 2018 during which time twenty-three (23) representations were received. Four (4) submissions were supportive (with qualifications) and nineteen (19) opposed the overall proposal or components of the proposal. Concerns raised related to:

- loss of productive agricultural land
- potential changes to the micro-climate, in particular possible enhanced frost events on surrounding parcels of land
- potential flooding, waterlogging and disrupted water drainage
- preferred route, traffic safety and impacts on local roads during construction phase
- potential impact on the heritage listed Catholic Church of Mary from traffic during the construction phase (dust & vibration from adjacent dirt road)
- visual impacts

- potential electromagnetic interference with mobile and data communications
- potential impacts of glare on local light aircraft (used for spraying, fertilising, firefighting and monitoring)
- devaluation of surrounding land holdings (due to visual impacts, loss of privacy and loss of opportunity to expand)

The applicant has responded to these concerns as follows:

- options to maintain productive use of the land through grazing will be considered
- the solar farm will be returned to agricultural land at the end of life
- undertaking studies to assess the potential impacts of frost
- a sediment erosion and drainage management plan will be prepared
- the applicant agrees to assume responsibility for maintaining those unsealed roads used by the development to a condition commensurate with their increased use for the duration of the construction period.
- additional road improvements, in particular intersections will be determined during the next phase of the project, and these modifications will be subject to a Road Safety Audit before implementation
- the applicant commits to install infrastructure that complies with the relevant electromagnetic emissions standards
- the applicant agrees to consult with the operators of the private airstrips to ensure any glare impacts are managed

Whilst the development will result in a marked change to the local landscape, and will remove some agricultural land from food production, the ongoing impacts are expected to be minimal. Impacts during construction can be managed through a Construction Environmental Management Plan (CEMP).

The Clare and Gilbert Valleys Development Plan promotes the protection of primary production land from encroachment of incompatible uses, however also promotes the development of renewable energy facilities in areas that provide opportunity to harvest natural resources for the efficient generation of electricity. Wind Farms and ancillary development are envisaged within the Primary Production Zone. The Development Plan is silent in respect to large-scale solar developments, with these facilities being relatively new to South Australia, however the principles related to Wind Farms can be applied.

On balance, the proposal is supportable, with a recommendation to seek the Minister's endorsement subject to appropriate conditions.

ASSESSMENT REPORT

1. BACKGROUND

On 3 April 2018, Erma Ranieri, Acting Chief Executive, Department of the Premier and Cabinet, confirmed that the Chaff Mill Solar Farm project:

a) meets the definition of public infrastructure as outlined in Section 49(1) of the *Development Act 1993*; and
b) is specifically supported and endorsed pursuant to Section 49(2)(c) of the *Development Act 1993.*

A Development Application was subsequently lodged on 14 June 2018.

2. DESCRIPTION OF PROPOSAL

Application details are contained in the ATTACHMENTS.

The proposal is for the construction of a solar plant with up to 100MW of generation capacity. The project will be located on 380 hectares of land approximately 3.5km north-east of Mintaro. The site is located adjacent to the existing Mintaro substation and consists of two parcels of land located to the east and west of Chaff Mill Road.

Components of the proposal include:

- approximately 360,000 solar panels mounted on single axis tracker framing
- inverter stations comprising 4MW and 2.66MW combined inverters
- 50MW Battery Energy Storage System (BESS), comprising medium voltage delivery station and battery containers
- substation continuing a minimum 100MVA transformer
- overhead line (within site boundaries) from substation to existing Mintaro to Waterloo transmission line
- modular site office/control building
- structural foundations for on-site buildings (inverter stations, BESS, substation control building)
- on-site parking
- refuse storage area
- internal access roads
- perimeter security fencing
- site access

The solar panels will be mounted on racks running east-west, with the panels arranged in a north-south direction. Each panel will have a tilt capability of 55 degrees in each direction from the horizontal plane. It is proposed that the panels will be arranged in 3 grouping, two (2) on the western parcel of land, and one (1) on the eastern parcel of land. Each rack is proposed to be up to 9m apart. The proposed area to be occupied by solar panels is approximately 310 hectares (81% of the overall site).

The detailed layout of the solar farm project is yet to be finalised.

The panels, including mounting structures, will not exceed 3 meters in height at maximum tilt. The panels will not have frames, reducing potential glare. Galvanised steel beams will be installed to anchor the solar panel foundations to the ground. The will be installed by direct ramming in the ground, pre-drilled or by screw foundations.

The make and model of solar panels will be determined prior to construction. Final design details should be confirmed with a condition of approval.

It is anticipated that the solar farm will require twenty-four (24) 4MW and one (1) 2.6MW invertor/transformer station. Indicative dimensions for each inverter are 2.9m high x 2.44m wide by 12.19m long. These will be distributed thought-out the solar panel arrays.

A 50MW/100MW Battery Energy Storage System (BESS) will be installed to provide further stability to this part of the grid. It will be located on the north-west corner of the site covering an area of approximately 1.5 hectares.

A substation will connect to the existing overheard transmission line via a tee-connection.

The car park, reuse storage area, substation, control building and BESS are proposed to be located in the far south western corner of the western parcel of land. The on-site control building is proposed to be 6m high x 11.83m wide and 24.51m long. The BESS is proposed to be comprised of 4 units, spaced 2 meters apart, each with indicative dimensions of 2.9m high x 2.43m wide x 12.19m long.

Site access is proposed from Wookie Creek Road, adjacent the existing substation. Internal access road are expected to be up to 4 meters wide, comprising layers of granular material, sub-base and base courses.

The proposal includes continuous wire mesh security fence, around both parcels of land, up to 3m high, topped with barbed wire.

The construction phase of the development is expected to be 18 months in duration. The main construction activities include:

- site preparation works, including fencing, preliminary civil works and drainage, access roads and internal track construction, construction of site office
- installation of concrete footings and steel mounting posts for the solar arrays
- installation of underground cabling (trenching) and connection of communication equipment
- construction of the BESS

Following construction, temporary construction facilities will be removed and disturbed areas rehabilitated.

The solar farm is expected to have an operating life of 30 years.

There is a large section of *Eucalyptus leucoxylon* ssp. *pruinosa* in the south western portion of the western parcel of land, which will for the most part, be retained. Fragmented/scattered remnant vegetation is present on the site, most of which is proposed for removal, subject to final layout of the project.

Wookie Creek runs north to south through the western parcel of land. It has been identified as ac culturally sensitive area in relation to Aboriginal anthropology due to its connection with significant Creation Ancestor stories. This area, and all associated vegetation, will be protected. No solar panels, or associated infrastructure will be constructed within this area.

An area of landscape screening is proposed along Chaff Mill Road, along the south eastern boundary of the western parcel, to help provide screening to the closest sensitive receiver. Appropriate vegetation to be determined as part of final detailed layout for site in consultation with the affected residents.

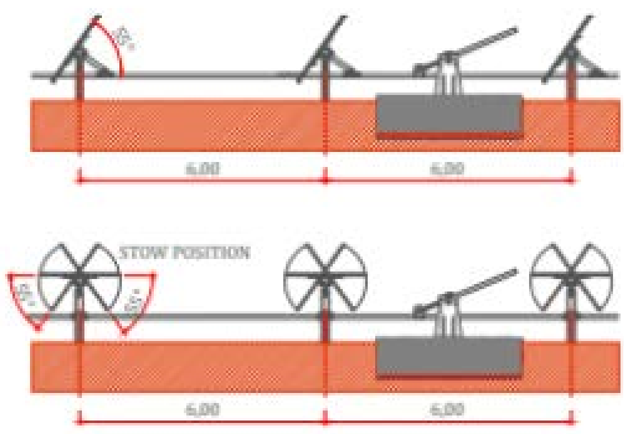


Figure 1: Indicative Solar panel dimensions

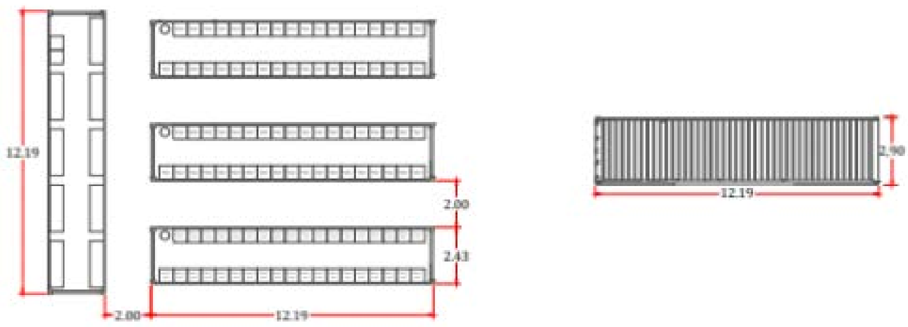


Figure 2: Indicative BESS dimensions & layout

Figure 3: Indicative western parcel layout

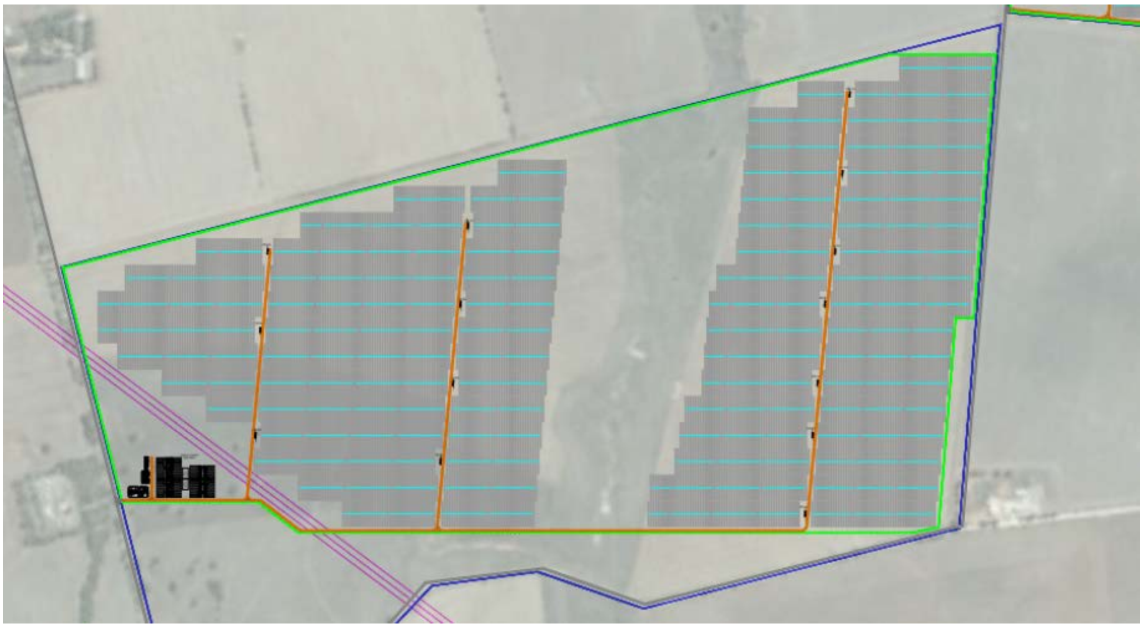


Figure 4: Indicative western parcel layout

Figure 5: Indicative Eastern parcel layout

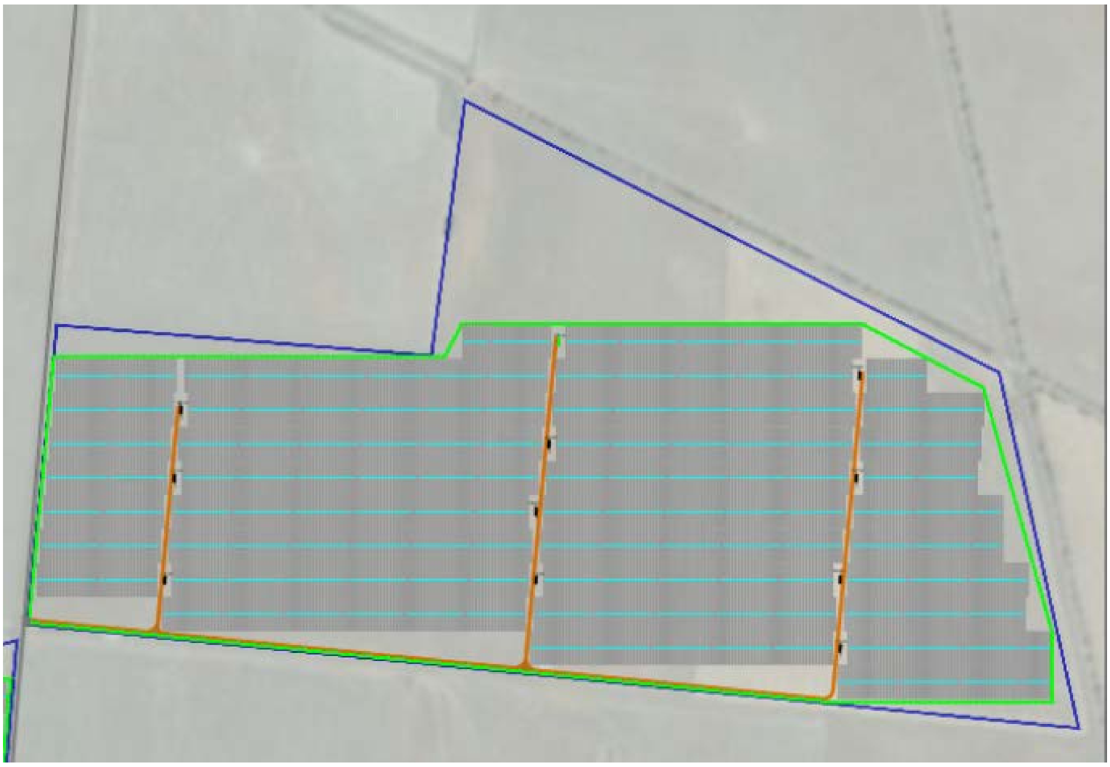


Figure 6: Indicative Eastern parcel layout

3. SITE AND LOCALITY

3.1 Site Description

The subject land consists of six (6) allotments, described as follows:

Lot/Plan	Road	Suburb	Hundred	Title Reference
A114-117, FP170301	159 Hare Road	Mintaro	Stanley	CT6081/22
A3, DP12560	Salt Creek Road	Stanley	Stanley	CT6128/160
A4, DP12560	Salt Creek Road	Stanley	Stanley	CT6128/159

The development site has been split into two separate blocks – one to the east of Chaff Mill Road and one to the west of Chaff Mill Road. The total area of both blocks is approximately 380 hectares.

The western parcel is bounded by Merildin Road to the south, Wookie Creek Road to the west, Chaff Mill Road to the east and agricultural land to the north. The eastern parcel is bounded by Faulkner Road to the north, Chaff Mill Road to the west, agricultural land to the south and a rail line to the east.

The site is an agricultural area and has been used for cropping and grazing. There is a large section of *Eucalyptus leucoxylon* ssp. *pruinosa* in the south western portion of the western parcel of land. Some scattered fragmented vegetation is present throughout the eastern parcel. Along with cropping/grazing land, the western parcel contains exotic grassland. Wookie Creek runs north to south through the western parcel and contains mostly exotic grassland.

Figure 7: Locality

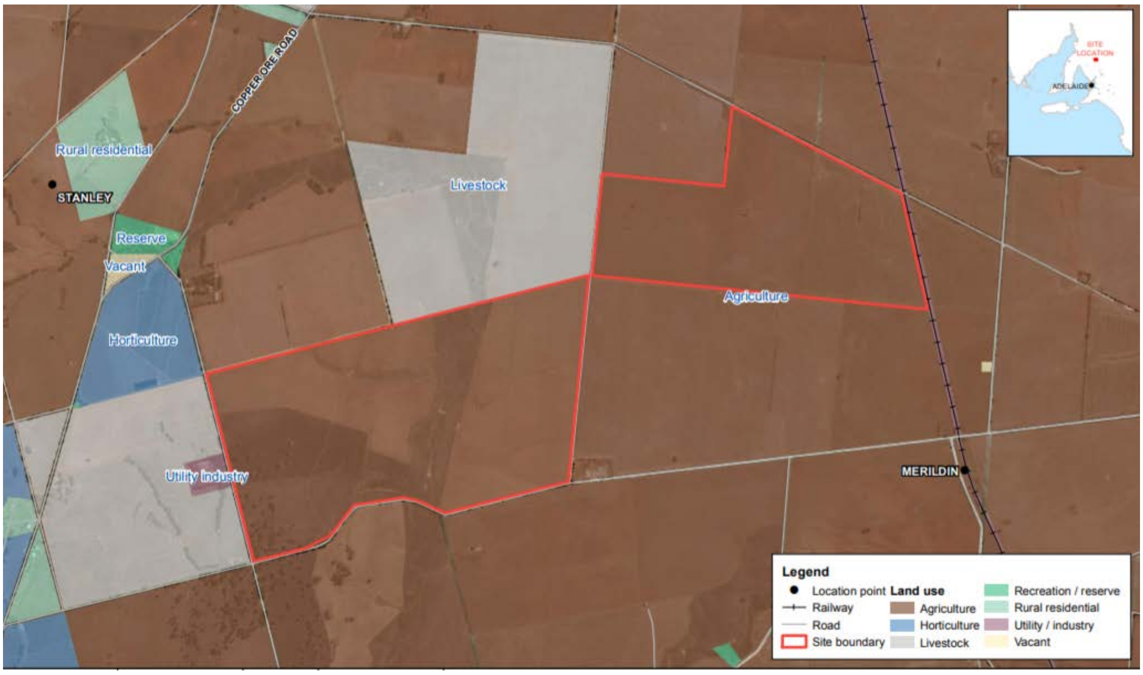


Figure 8: Land use within the project area & surrounds

The topography of the site ranges from 400 – 430m above sea level.

The western parcel includes low hills, with the highest and steepest area on the western side and the lowest area at Wookie Creek. The eastern parcel is of gentle undulation.

The western parcel is adjacent the existing Mintaro substation (to the west) and the northern railway line (to the east).

The land is privately owned by:
- Arapunya Investments Pty Ltd (CT 6081/22)
- Martindale Farm Pty Ltd (CT 6128/159 and CT 6128/160).

The proponent has agreements in place with both land owners to purchase these parcels of land subject to development approval and financial closure.

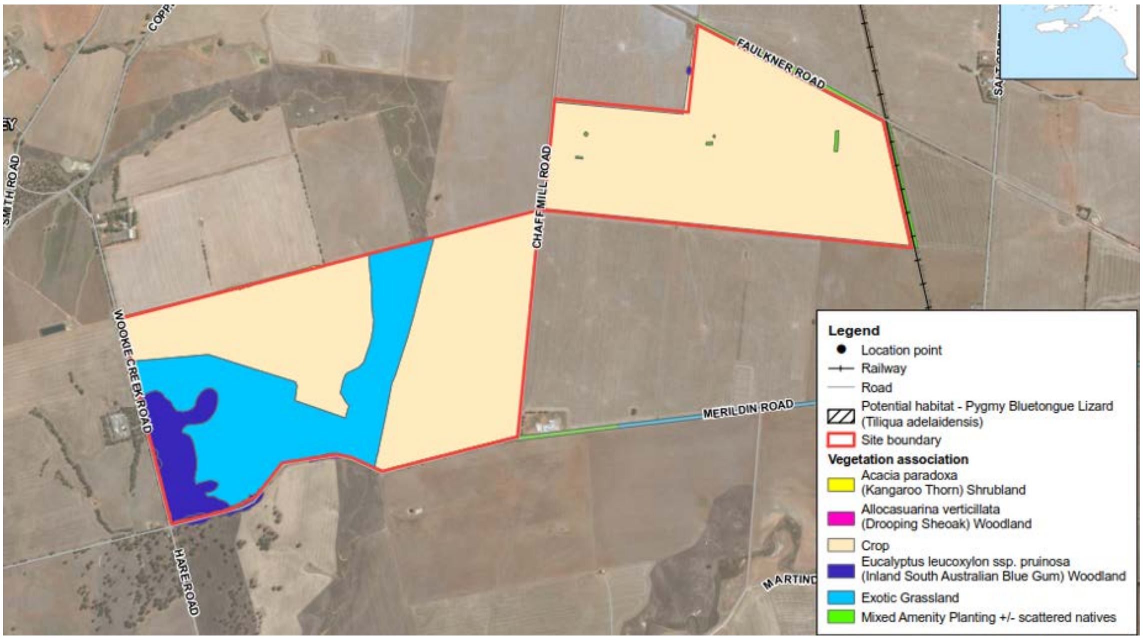


Figure 9: Vegetation associations

3.2 Locality

The subject site is located approximately 3.5km north-east of Mintaro within a Primary Production Zone. The adjacent and surrounding land use is largely agricultural, with some livestock and horticulture land use on large rural land holdings.

Eight (8) sensitive receptors were identified by the proponent, where low to minimal impacts were envisaged, however one (Sensitive Receptor #7) is located approximately 200m from the boundary of the site, at the Chaff Mill Road intersection with Merildin Road, and will incur moderate to high visual impact.

Sensitive Receptor 7 comprises of agricultural storage buildings, with a residential property soon to be constructed (development approval already granted).

Figure 10: area of proposed landscape screening adjacent sensitive receptor #7

4. COUNCIL COMMENTS

4.1 Clare and Gilbert Valleys Council

The Council did not object to the development, but raised the following points:

- Council acknowledges that facilities of this nature (renewables) can be located within the Zone and will not prevent the surrounding agricultural land from continuing to operate, however Council does not support any growth of the proposed development in the future nor other developments of this nature occupy valuable, high rainfall agricultural land. Overall Council considers that pastoral land is more appropriate to locate such developments.
- Council acknowledges that the proposal is sighted in an area which has limited surrounding visual impact with few residential properties and largely within a lower part of the valley.
- Council acknowledges and supports the applicants discussion regarding landscaping with the sensitive receiver most affected by the proposal
- Council raises concern regarding the use of security fencing round the perimeter of the entire site and the lack of perimeter landscaping in the application. Council has a preference for no perimeter fencing and the integration of landscaping around the proposal instead.
- Council raises concern that the established trees currently within the landscape may be removed to accommodate the solar panels. Council would like as many of these trees to be retained as possible, due to their ecological and amenity value, as well as agricultural value in terms of providing shade for livestock.
- Council supports the applicants preferred route (HV-2 via Horrocks Highway, Jolly Road, Catholic Church Road, Merilden Road and Wookie Creek Road) as it largely voids the Mintaro township and is mainly on sealed roads, which will avoid the generation if dust.
- Council requests that the only access to the site is via the Wookie Creek Road entrance point.

- Council would like a section of Catholic Church Road upgraded and sealed to protect the Catholic Church.
- Council would like close works and proposed rehabilitation measures to return the land to a level compatible with the surrounding landscape and to return to primary production purposes to be identified prior to construction.
- Council wants to thank FRV Services for their commitment to community engagement including early engagement with the Council and local stakeholders for this proposal, and seeks that it continues if the project is approved.

Any relevant planning matters should be taken into account in the assessment of the application (including any recommended requirements).

5. REFERRAL BODY COMMENTS

Referral responses are contained in the ATTACHMENTS.

5.1 Safety and Service Division, DPTI (Commissioner of Highways)

The Commissioner of Highways does not object to the proposed development, subject to the following conditions:

- A final Traffic Management Plan (TMP), prepared in consultation with the Commissioner of Highways (CoH) and the Clare and Gilbert Valleys Council, shall be submitted for approval by the Minister for Planning. As part of the TMP, the applicant shall engage an accredited Road Safety Auditor to undertake a safety audit of the route to be used by vehicles servicing the development. The TMP shall address matters including, but not limited to, the following:

    - Definition of roads and routes to be used for vehicles during construction and for on-going maintenance purposes;
    - Load specifications of vehicles servicing the development;
    - Identification of upgrade of roads required to accommodate all vehicles servicing the development;
    - Identification of any intersection treatment that is required to facilitate heavy traffic turning movements;
    - Specification of engineering standards for pavement and drainage design and construction;
    - A management schedule for the construction stage of the development to minimise impact on toad users;
    - A maintenance program for roads utilised by the vehicles servicing the development; and
    - An agreement with the Clare and Gilbert valleys Council (and/or the CoH where relevant) that all necessary road upgrading (including drainage and water runoff measures), intersection treatments and on-going maintenance costs are to be borne by the developer.

In addition, the following advisory note is recommended with any approval:

- Some roads identified in the Traffic Impact Assessment for use during the construction phase of the development are not gazetted for use by vehicles larger than a General Access Vehicle. The applicant will need to apply to the National Heavy Vehicle Regulator via www.nhvr.gov.au for permits to utilise the desired route/s for access by Restricted Access Vehicles if required.

5.2 Native Vegetation Council (NVC), DEW

Minor clearance of native vegetation only. The NVC advises that:
- infrastructure placement should aim to avoid native vegetation where possible.; and
- any native vegetation clearance will require approval under the *Native Vegetation Act 1991*.

Native vegetation clearance requirements need to be taken into account in any final recommendation to the Minister for Planning.

5.3 Aboriginal Affairs and Reconciliation, DPC

No entries for Aboriginal sites within the project area. The Ngadjuri Nation Aboriginal Corporation was identified as having potential interest in this project area. The applicant has undertaken an Aboriginal cultural heritage survey in consultation with Ngadjuri traditional owner representatives.

5.4 Country Fire Service (CFS)

Preliminary comments provided by the CFS included detailed requirements for access/egress roads, fire-fighting equipment during construction phase, vegetation management, bushfire safety and building fire safety.

The CFS requests that a vehicle gate be located every 2km around the perimeter of the site. At each gate a 20,000 static firewater tank is required with the relevant fire authority fittings. CFS also recommended:

- Minimum 30m buffer between natural vegetation and any infrastructure
- Internal vehicle access tracks to be a minimum of 6m wide
- A vegetation management zone (VMZ) be established within 30m of each substation, invertor and control building
- keep on-site vegetation is kept to less than 100mm (10cm) in height.

The applicant notes the CFS comments and commits to the provision static water tanks at the site and the provision, and maintenance of, fire-fighting equipment on site during the construction phase.

CFS requirements can be incorporated as part the suite of documents recommended as Conditions of Approval (specifically a Fire and Emergency Management Plan).

6. PUBLIC NOTIFICATION

The application was subject to public notification pursuant to Section 49(7d) of the *Development Act 1993* as the construction works totals more than $4 million.

Public notification was undertaken via public notice in The Advertiser, the Northern Argus and the Plains Producer on 11 July 2018. Twenty-three (23) representations were received. Four (4) provided qualified support and nineteen (19) opposed the proposal.

The issues raised, and the response from the applicant are summarised as follows:

Issue	Summary of Applicants response
Loss of productive agricultural land	- grazing of livestock will be considered between solar panel rows - farm will be returned to agricultural land at end of life (30 yrs)

Issue	Summary of Applicants response
Potential increased frost events on surrounding parcels of land	- studies undertaken to studies to determine baseline frost data and assess the potential impacts of frost - the study concluded that the solar farm is likely to contribute to a slight increase in air temperature under the arrays, which is likely to alleviate the cold near-surface air temperature, reducing the frost risk rather than increasing it on adjacent agricultural properties. - the study considered that other common agricultural practices and features in the local area (i.e. vineyards, wheat and other crops, road and rail line embankments, tree lines, sheds and building structures, areas of natural vegetation with multiple storey canopies) provide a greater potential for air flow blocking than the proposed solar farm.
Potential flooding, waterlogging and disrupted water drainage	- installation of solar panels will have negligible impact on total site runoff - a Sediment Erosion and Drainage Management Plan, including civil investigations, will be prepared in line with best practice - culvert crossings may be incorporated into internal access roads to maintain natural hydrological systems
Preferred route (HV2) not supported	- HV2 avoids dwellings immediately adjacent unsealed roads - HV2 will require less significant upgrades on a shorter length of unsealed road - the increased use of heavy vehicles movement on Jolly road is estimated to be 2-4% and not expected to significantly increase safety risk on this road. The road has advisory speed signs, barrier lines and guard rails. - Shoulder road erosion of Jolly Road was considered significantly less than that along roads on alternative routes, especially the unsealed roads - Councils preferred route is HV2
Impacts on local roads during construction phase	- The applicant is committed to maintain, and improve selected sections, of unsealed roads for the duration of the 18 month construction period - The applicant will undertake further investigations in relation to intersection upgrades
Traffic safety issues associated with of using Jolly Road and Horrocks Highway during the construction phase	- an additional 8-16 truck movements per day are predicted during the construction period - Jolly Road has tight curves and crests that restrict visibility. The road has advisory speed signs, barrier lines and guard rails. - the increased use of heavy vehicles movement on Jolly Road is estimated to be 2-4% and not expected to significantly increase safety risk on this road

Issue	Summary of Applicants response
	- Crash statistics in the report on Jolly Road were based upon official records over 2012-2016. The accidents raised in submissions are unrecorded, were not attended to by emergency services and cannot be substantiated or considered - the section of Horrocks Highway exhibits passing lanes in both directions of travel, and there are several sections of road where site distance enables safe overtaking opportunities
Potential impact on the heritage listed Catholic Church of Mary from traffic during the construction phase	- the church is set back 20m from the site boundary. DPTI recommended setbacks for construction activity (truck traffic over irregular surfaces) is 10m. - the applicant may undertake a dilapidation survey to monitor potential impacts and ensure they are remediated - sealing or re-sheeting of the road may be considered and is a recommended mitigation work in the Traffic Impact Assessment. A Road Safety Audit will include Catholic Church Road to identify additional road upgrade works required.
Visual impacts	- visual impact is subjective - 1 sensitive receptor is likely to have substantial-moderately adverse visual impacts - the introduction of the solar farm will not change the mainly pastoral nature of the locality and wider contextual landscape
Potential electromagnetic interference with mobile and data communications	- all infrastructure installed as part of the project will comply with the relevant emissions standards (DEWLP 2018) - The applicant will consult with telecommunications and other radio communications license holders in the area to ensure potential EMI impacts are addressed
Potential impacts of glare on local light aircraft	- the CFS did not raise issues in relation to the Hoyleton airstrip (used during bushfire season) - the applicant commits to consultation with the operators of the private airstrips to manage any potential impacts
Devaluation of surrounding land holdings	- It is not FRV policy to provide financial compensation to neighbouring properties - Potential adverse impacts, that may impact adjoining properties, will be mitigated as outlined in the DA report, and as may be required as conditions of approval, to reduce the likelihood of the project affecting property values.

Table 1: Issues and Response

A copy of each representation and the applicant's response is contained in the ATTACHMENTS

7. POLICY OVERVIEW

The subject site is within the Primary Production Zone as described within the Clare and Gilbert Valleys Development Plan (Consolidated 10 November 2016).

Relevant planning policies are contained in the ATTACHMENTS and summarised below.

Figure 11: Zoning

7.1 Primary Production Zone

OB 1, 3, 6, 7; PDC 1, 3, 6, 9, 11

The zone is the primary source of agriculture production in the Council area and is intended to accommodate cropping and grazing activities on large rural land holdings and viticulture on small to medium sized allotments. The rural area is characterised by rolling pastures with strands of remnant vegetation with a variety of agricultural activities.

Wind farms and ancillary development such as sub-stations, maintenance sheds, access roads and connecting power lines are an envisaged form of development in the zone. These facilities should be located in areas where they can take advantage of the natural resource upon which they rely. It is acknowledged that this type of development may need to be:

- located in visually prominent locations;
- visible from scenic routes and valuable scenic and environmental areas; and
- located closer to roads than envisaged by generic setback policy.

Development should not be undertaken unless it is consistent with the desired character for the zone. Development should not result in the conversion of agricultural land to less productive uses.

7.2 Council Wide

Renewable Energy Facilities: OB 1, 2, 3 PDC1, 2(b); **Infrastructure:** OB 2, 3 PDC 1(a), 10, 11, 12; **Interface Between Land Uses:** OB 1; **Siting and Visibility:** OB 1 PDC 1(a) , 1(b), 2, 4, 5, 8(b); **Landscape, Fences and Walls:** OB 2 PDC 2(a), 4(b); **Natural Resources:** OB 1, 4, 8, 10 PDC 1, 17, 26, 27, 30, 31, 38; **Transport and Access:** PDC 22, 23; **Design and Appearance:** OB 1, 2; **Hazards:** OB 5 PDC 1, 4, 8, 9, 12; **Energy Efficiency:** OB 2; **Orderly and Sustainable Development:** OB 2, 3, 4 PDC 1, 2, 3, 6; **Waste:** OB 1 PDC 1, 3, 6

- Development of renewable energy facilities that benefit the environment, the community and the state.
- Renewable energy facilities should be located in areas that maximize efficient generation and supply of electricity.
- The visual impact of infrastructure facilities minimised.
- The efficient and cost-effective use of existing infrastructure.
- Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.
- Protection of scenically attractive areas, particularly natural and rural landscapes.
- Buildings should be sited in unobtrusive locations and, in particular, should be grouped together.
- Landscaping should include the planting of locally indigenous species where appropriate.
- Fences and walls should be compatible with the associated development and with existing predominant, attractive fences and walls in the locality.
- Natural hydrological systems and environmental flows reinstated, and maintained and enhanced.
- Development should be undertaken with minimum impacts on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas.
- Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally vegetation to ensure that there is not a new loss of native vegetation and biodiversity.
- Development should be provided with safe and convenient access which… avoids unreasonable interference with the flow of traffic on adjoining roads.
- Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of hazards.
- Development that provides for on-site power generation including photovoltaic cells and wind power.
- Development that does not jeopardise the continuance of adjoining authorised land uses.
- The economic base of the region should be expanded in a sustainable manner.
- Land outside of townships and settlements should primarily be used for primary production and conservation purposes.
- Development should not prejudice the development of a zone for its intended purpose.
- Development should apply the waste management hierarchy.

8. PLANNING ASSESSMENT

The application has been assessed against the relevant provisions of the Clare and Gilbert Valley Development Plan (Consolidated 10 November 2016), which are contained in Appendix One.

8.1 Land Use and Character

The General Section of the Clare and Gilbert Valleys Council Development Plan encourages the development of renewable energy facilities that benefit the environmental, the community and the State (Obj 1 – Renewable Energy Facilities). Facilities should be sited in areas that provide opportunity to harvest the natural resources to maximise efficient generation and supply of electricity.

The Primary Production Zone encourages the development of wind farms and ancillary development, and acknowledges that due to the large scale of these facilities, components may need to be located in visually prominent locations; visible from scenic routes and valuable scenic and environmental areas; and located closer to roads than envisaged by general setback policy (Desired Character, Obj 7 and PDC 3 – Primary Production Zone).

Whilst windfarms and ancillary development form part of the desired character for the Primary Production Zone, other forms of renewable energy facilities are not specifically acknowledged (or precluded) in the zone provisions. The Development Plan is relatively silent with respect to large-scale solar developments, with these facilities being relatively new to South Australia.

A key objective of the Primary Production Zone is to promote economically productive, efficient and environmentally sustainable primary production, including cropping, grazing, viticulture and intensive animal keeping (Obj 1).

The subject site is a large allotment that is currently being used for primary production purposes. The proposal will therefore result in a loss of 380 hectares of primary production land while the solar farm is in operation. Whilst there may be some future opportunities for light grazing around the solar arrays (for the purposes of weed control etc), this is not guaranteed, whilst the land will no longer be available for cropping during the life of the project (30 years).

The Council advises that the subject land is '*within an area that constitutes some of the highest rainfall (600mm per annum) and productive cropping land in the State*'. However the planning policy considers all agricultural land the same and does not consider the climatic circumstance nor the quality of what can be produced from that land.

Given the large areas of productive land available, the introduction of the solar farm will not unduly change the overall productivity within the region and should not prevent the surrounding agricultural land from continuing to operate.

8.2 Design and Appearance

Primary Production Zone policies seek appropriate setbacks from allotment boundaries and clustering of new buildings to minimise visual impact on the landscape; and should be screened from public roads and adjacent land by existing vegetation or landscaped buffers (PDC 6 – Primary Production Zone).

Figure 12: western parcel

Figure 13: western parcel

Figure 14: eastern parcel

Design and Appearance policies specify that development should not exceed 2 storeys in height, other than where required to facilitate wind farms and ancillary development (PDC 6 – Design and Appearance). The external walls and roofs of buildings should not incorporate highly reflective materials which will result in glare (PDC 3 – Design and Appearance).

The application includes a Visual Amenity Assessment (Appendix J of the application) of the proposed development which considers its visual impact from several vantage points.

The solar modules will have a maximum height of 3 metres (at full tilt). The panels will not have frames, reducing potential glare. The invertor stations will be scattered thought the solar arrays, and will have a maximum height of 2.9 metres. The BESS, substation, administration/ control building and reuse area will be grouped together in the south western corner of the western allotment, adjacent to the existing Mintaro substation, on Wookie Creek Road (refer Figure 3).

The maximum height of the BESS infrastructure will be 3 metres and the maximum height of the administration/control building is 6 metres. The connecting tower for the substation will be 15 metres high. These structures will be partially obscured from Wookie Creek Road by existing vegetation bordering the site. The location of these structures, as grouped and located, are unlikely to be visually dominant features on the landscape.

Whilst the applicant is seeking flexibility for the final detailed design and layout, the indicative layout includes staggered setback from Merildin Road (southern boundary of western parcel). This is mainly due to the topography and vegetation on the site. There is also a staggered setback from Faulkner Road (northern boundary of eastern parcel).

The only landscaping proposed as part of the application is along the southern portion of Chaff Mill Road adjacent the western parcel. The primary purpose of this to provide a visual barrier for the sensitive receiver that is immediately adjacent this corner of the western parcel (refer Figure 10). The applicant has committed to work with the affected owners during the final detailed layout to determine appropriate vegetation for this landscape buffer. This landscaping will soften the appearance of the solar panels and minimise the visual impact of the panels from the adjacent property (PDC 2 – Design and Appearance). A condition of approval is recommended that any landscaping should include planting of locally indigenous species where possible (PDC 2 – Landscaping, Fences and Walls).

The proposal includes a 3m high, security fence, comprised of mesh and topped with barbed wire around the entire perimeter of both parcels of land. The applicant advises that fencing of this nature is required for safety and environmental reasons. It is considered that a fence of this nature is not consistent with an open, rural environment, where lower scale stock fencing predominates (Obj 2 – Landscaping, Fences and Walls; locality (PDC 4 – Landscaping, Fences and Walls) and will not positively reinforce existing aspects of the local environment and built form (Obj 1 – Design and Appearance).

Council has indicated a preference that no fencing be installed and that landscaping is integrated around the proposed development instead. It is recommended that security fencing (up to 3m high) should only be installed around the substation, BESS and administration/control buildings, and that a boundary fencing type that is more consistent with a post and wire specification consistent with its rural context (and if the development is approved, be 'reserved' for further assessment).

Figure 15: existing fencing in area

8.3 Heritage

The proposed siting of the project will not impact the Mintaro State Heritage Area or heritage significance of the settlement.

Representations received raised concerns regarding the potential impacts (dust, stones, vibration) of trucks passing the St Mary's Catholic Church on Catholic Church Road (a dirt road), as the preferred route (HV2) passes this site. The application indicates that 8-16 trucks and up to 200 light vehicles per day will pass this site during the construction period. Council also raised concerns that dust associated with this traffic may impact the church.

The church was built in 1852 and is sited approximately 21 metres from the road. It is not listed as either a State or Local heritage place, however sits within the boundary (on the northern edge) of the State Heritage Area overlay within the Clare and Gilbert Valleys Development Plan (Overlay Pap CGV/09) that reflects the Mintaro State Heritage Area (declared in 1982). The church is considered to be of community value.

The proposal does not compromise the Objectives of the Mintaro State Heritage Area which are to: retain the land division patterns; reinforce the rural village character; retain and conserve the historic buildings, structure and ruins; retain significant views between buildings along Burra Street to agricultural land; ensure new buildings are of a sympathetic design and form to historic buildings in the area; and retain the towns landscape character.

As the church is not State or locally listed, the policies within the Heritage Places section of the Development plan are not applicable to the church.

The road at the front of the church is bordered by large, mature trees and the church itself is set back approximately 20m from the property boundary which would help mitigate potential traffic impacts (refer Figures 16 & 17). The DPTI recommended setback to mitigate truck traffic vibration movements (over irregular surfaces) is 10m (Typical Vibration Levels from Construction Activities – DPTI 2017).

Figure 16: St Mary's Church, as viewed from Catholic Church Road

Figure 17: Aerial View of St Mary's Church, showing trees adjacent the road

The applicant advises that sealing or re-sheeting of the road may be considered and is a recommended mitigation work in the Traffic Impact Assessment. A Road Safety Audit will include Catholic Church Road to identify additional road upgrade works required.

Any impacts to the church will be temporary (during construction period) and can be managed through a Traffic Management Plan and the Construction Environmental Management Plan.

8.4 Traffic Impact, Access and Parking

The Development Plan requires that development should have access from an all-weather public road and should provide for safe and efficient movement of vehicles that avoids unreasonable interference with the flow of traffic on adjoining roads (PDC's 22 & 23 – Transport and Access).

The application comprises a Traffic Impact Assessment report for the proposed assessment, but not a Traffic Management Plan.

Access to the project site is provided by Merildin Road, Wookie Creek Road, Flagstaff Road and Chaff Mill Road, all of which are unsealed. Chaff Mill Road and Faulkner Road are suitable for dry weather access only.

Construction:

Construction of the solar farm will result in a significant proportional increase in the traffic volumes currently using the sealed and unsealed road network. The increase of traffic on unsealed roads will be on parts of these roads and do not pass by any adjacent residences. Increased traffic volumes will increase exposure to safety risks and accelerate the depreciation of the road surfaces.

Six (6) route options were investigated with the identified preferred route to the site (HV2) being via Horrocks Highway (sealed), Jolly Way (sealed), Catholic Church Road, Merildin Road and Wookie Creek Road. Council supports this preferred routes

The application estimates that 8-16 truck and up to 200 light vehicle movements per day will be required during construction.

Figure 18: Wookie Creek Road

Figure 19: Merildin Road

Figure 20: Flagstaff Road

Figure 21: Flagstaff Road

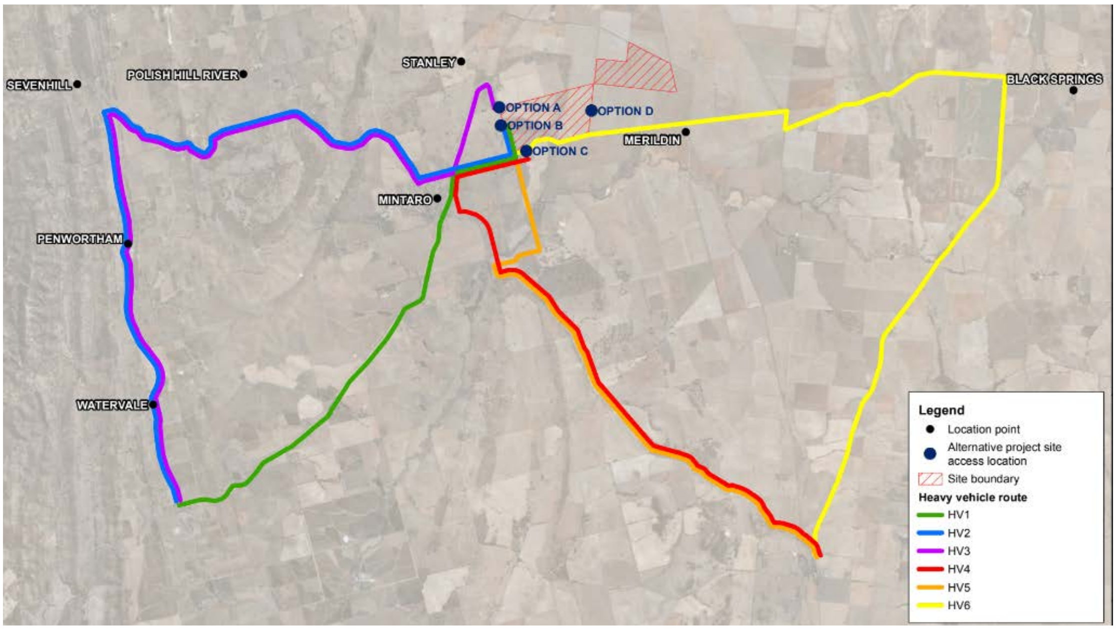


Figure 22: Heavy Vehicle access route options identified (preferred route HV2 – blue)

Further work is required to finalise the preferred traffic route.

The Commissioner of Highways has recommended that a Traffic Management Plan (TMP) be prepared in consultation with the Department and the Clare and Gilbert Valleys Council. The Commissioner also requires that the applicant engage an accredited Road Safety Auditor to undertake a safety audit of the route to be used by vehicles servicing the development. Issues raised by Council in relation to the sealing of the Road from Jolly Way, past the Catholic Church connecting to Copper Ore Road (to reduce dust) can be considered as part of the TMP and Road Safety Audit.

DPTI Transport Assessment has noted that some roads identified in the Traffic Impact Assessment for potential use during the construction phase of the development are not gazetted for use by vehicles larger than a General Access Vehicle. Permits will need to be sought from the Heavy Vehicle Regulator.

Councils' comments in relation to transport and access (i.e. access to the site via Wookie Creek Road entrance point only and upgrading and sealing a section of Catholic Church Road) can be considered and managed through the TMP and Road Safety Audit.

Traffic impacts during the construction period can be managed through a condition of approval, as recommended by the Commissioner of Highways.

<u>Operation:</u>

The solar farm will employ up to five (5) staff once operational with periodic contractors for maintenance activities. Working hours of solar farms are typically 9am to 5pm, with some out of hours presence as required. Deliveries to the site will general occur during 7am and 7pm.

Traffic movement during the operational phase are therefore expected to be low, and predominantly light vehicles. Ongoing traffic impacts are expected to be negligible.

Parking:

The Development Plan does not provide car parking rates for any form of development that is comparable to a solar farm.

Main access to the site is via Wookie Creek Road, with off street parking available within the administration/control area. It is expected that this area has sufficient space to provide adequate car parking to meet operational staffing requirements which is very low (up to 5 staff plus periodic contractors).

The ample size of the subject site also allows for adequate car parking during the construction phase of the development.

8.5 Interface between Land Uses

The General provisions of the Development Plan seek that renewable energy facilities (and developmental general) be located, designed and operated in a manner that avoids or minimises adverse impact to, and conflict with, the environment and other land uses (Obj 1 - Interface Between Land Uses; Obj 3 – Renewable Energy Facilities).

The proposed solar farm will be located in a predominantly agricultural, rural locality with low levels of existing background noise and good quality air.

Visual Impact

The application notes that solar panels are designed to absorb, not reflect, sunlight. Reflective glare should not be an issue, less than experienced from vacant agricultural lands. Additional design measures to minimise reflection from the panels include:

- panels with not have metal frames
- screen planting along the eastern boundary of the western parcel (corner of Merildin and Chaff Mill Rods), and other areas as required

Eight (8) sensitive receptors have been identified in the application, seven of which are deemed to have slight to no impact visually.

Sensitive Receptor #7 is highly impacted due to being located approximately 200m away from the subject site. The visual impact of the development is one of the key concerns raised by this representor in their submission. The applicant has committed to work with the affected owners during the final detailed layout to determine appropriate vegetation for this landscape buffer. Appropriate landscaping is considered a suitably measure to mitigate this impact.

Whilst the solar farm will be relatively low scale and contiguous along the landscape, it does represent a significant change to the appearance of the subject site.

Noise

The operation of the solar farm is unlikely to generate significant noise. Maintenance activities such as weed control and repair are not expected to generate excessive noise beyond what would already be experienced in a Primary Production Zone.

Noise impacts during construction, however, have the potential to generate nuisance for local residents. This may include noise from heavy vehicles, excavators, and general machinery noise during the installation of the solar arrays and associated equipment.

It is recommended that the applicant prepare a Construction Environmental Management Plan (CEMP). The CEMP should include mitigation measures to manage noise to within the requirements of the *Environment Protection (Noise) Policy 2007.*

Air Quality

The operation of a solar farm is unlikely to generate any significant air pollution. The maintenance of adequate ground cover under and around the solar arrays will prevent dust. The internal access roads should be constructed of an appropriate material that will not cause the creation of excessive dust. The development should not comprise any machinery or equipment that generates air emissions.

Impacts during the construction phase are likely to include dust emissions, which have the potential to generate nuisance for local residents.

It is recommended that the applicant prepare a CEMP. The CEMP should include mitigation measures to manage dust impacts.

Light Spill

Security lighting will be used in certain locations, such as access points and the site carpark. As this section of the subject site is immediately adjacent the existing Mintaro substation, impacts are expected to be negligible to nil.

The construction of the solar farm is unlikely to generate any light spill impacts, noting that hours of operation will be limited as part of the CEMP in order to address other impacts such as noise.

Change in microclimate

Several submissions received during the public consultation raised concern over the potential micro-climate impacts that may occur as a result of radiative heat loss from the solar farm, in particular, concern was raised regarding the potential exacerbation of existing frost conditions experienced on adjacent properties.

This concern is based around the belief that the solar array and its boundary fence would act as barriers to katabatic flows occurring under frost forming conditions, and that these barriers could allow cold air to accumulate on the adjacent uphill agricultural properties, exacerbating frost events and causing damage to crops.

The applicant has undertaken reasonable measures to gain data on the potential impacts, with very limited data or research being available both within Australia and internationally. There is no data that can definitively prove or disprove the impact of a solar farm on frost formation without real world measurements taken from the constructed solar farm. Only studies related to increases in temperature in and around solar farms (via the heat island effect) have been undertaken.

Additionally, DPTI contacted PIRSA, Bureau of Meteorology SA (Climate Services/ Agricultural Program), University of Adelaide’s School of Agriculture, Food and Wine, and the Australian Wine Research Institute. None of which were aware of any data or research on the impact of solar farms on micro-climate or frost conditions and had no knowledge of any incidences occurring.

Due to the lack of available data, and in response to the concerns raised by the community, the applicant commissioned a desktop and modelling analysis by Air Environment, an Australian technical research company specialising in air science, meteorology and climatology.

The primary objective of the study was to investigate the issue of potential flow-blocking as a result of the development of the proposed solar farm.

Air Environment:

- conducted a detailed study of the terrain within and surrounding the proposed solar farm site as a first pass assessment of likely drainage flow conditions during frost evets
- developed a detailed meteorological model of the site and used it to investigate drainage flows under frost forming events; and
- conducted an analysis of flow blocking potential from the solar farm array and its boundary security fence.

An analysis of BoM observations collected at the Clare High School AWS over a 24 year period, selected the year 2006 to model in detail. This year was selected due to the large anomaly infrequency of screen height (1.2m) temperatures in the -4C to 3C temperature range, suggesting that this year had the greatest potential for frost forming conditions.

Potential frost events were selected for hours when these conditions were met:

- modelled wind speed at 10m above the ground was at or below 2m/s
- modelled air temperature at 10m above the ground was at or below 5C
- modelled Pasquill Gifford Stability class F (very stable)
- there was no rain predicted.

It was identified that the creek line within the western parcel of the project area played a critical role in providing a path for the wind to flow across the landscape. It should be noted that the proposed solar farm will not alter this creek line, no development is proposed inside the creek gully, and there is a significant setback provided from the creek banks to the solar panels.

The proposed chain wire boundary fence will have the maximum 50mm pitch between the links, providing for air to move through the structure, and is therefore considered to be a minimal flow blockage.

The solar arrays are not a solid or continuous structure and the design of the solar arrays (with up to 9m spacing) encourages air flow through the site. At night the panels are stowed in a near horizontal position, approximately 2m above the ground. The near horizontally stowed panels will prevent longwave radiation emitted from the ground surface to escape to space under clear skies at night, effectively ‘closing the atmospheric window’ and absorbing and re-radiating the long wave radiation towards the ground.

Both effects will contribute to an increase in air temperature under the arrays. The slightly warmer air will drain downhill and, in the near field, is likely to slightly alleviate the cold near surface air temperature, reducing the frost risk rather than increasing it on adjacent properties.

The study considered that, by comparison, other common agricultural practices and features in the local area (i.e. vineyards, wheat and other crops, road and rail line embankments, tree lines, sheds and building structures, areas of natural vegetation with multiple storey canopies) provide a greater potential for air flow blocking than the proposed solar farm.

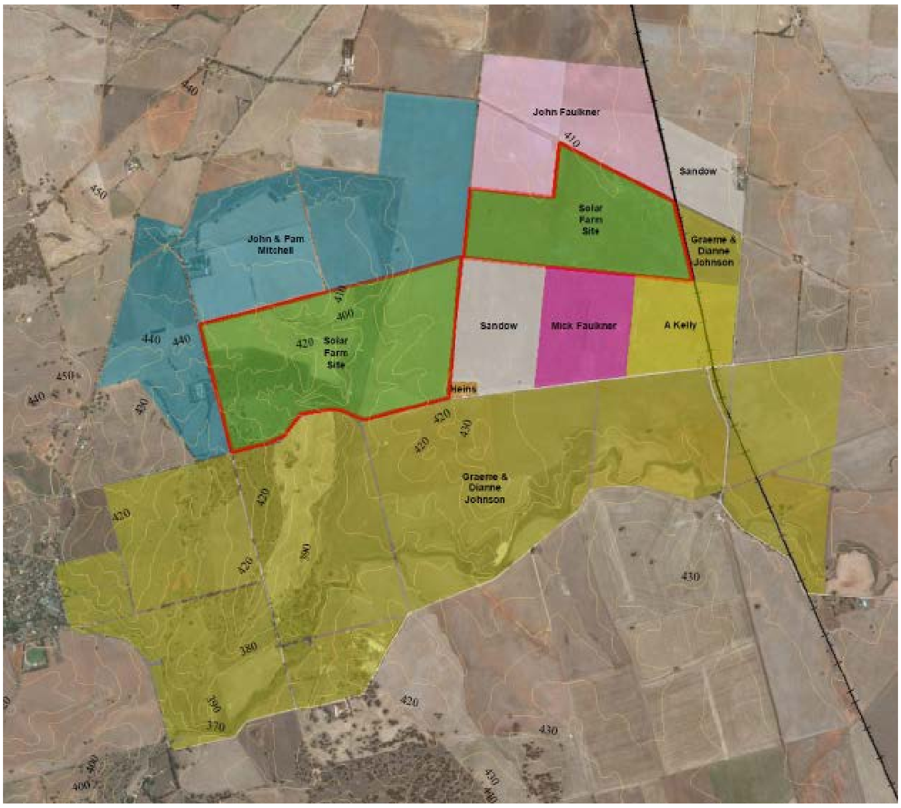


Figure 23: Chaff Mill Solar Farm site and neighbouring properties

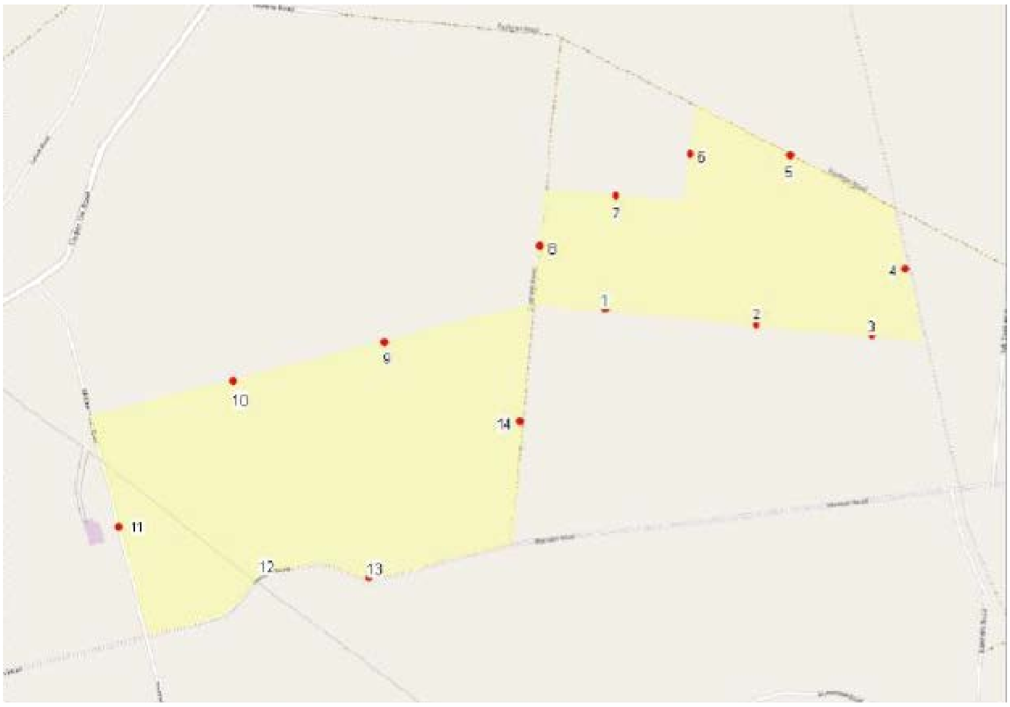


Figure 24: Locations around the solar farm site boundary selected for analysis of wind flows during predicted frost events

Taking into account that there is no available evidence that would suggest an additional impact or an exacerbation of existing conditions, the findings of the commissioned study, along with the design of the solar farm, and setbacks of the arrays to the creek line, should allow air circulation to be maintained throughout the subject site.

The risk posed by any identifiable micro-climate impacts and increased frost occurrences is considered to be negligible.

Photovoltaic Heat Island Effect (PVHI)

A 'Photovoltaic Heat Island' effect (PVHI) has recently been the subject of further study with the rapid rise in large-scale solar installations around the world, mostly sited in more open agricultural areas and pasture lands.

Studies have shown that the PVHI effect may occur within the perimeter of solar arrays, but remains a localised phenomenon, with the affect dissipating within close proximity of the solar field. Consequently, use of appropriate setbacks from property boundaries should prevent any impacts on non-involved landholders (such as to more sensitive crops, horticultural activities or areas of environmental significance).

The potential extent and impact of PVHI from larger scale solar farms has recently been considered by the Victorian Civil and Administrative Tribunal (VCAT) in the matter of *ESCO Pacific Pty Ltd v Wangaratta RCC [2019] VCAT 219 (14 February 2019)*.

A 30m setback was recommended to ensure that any potential impacts from this affect are fully contained within a solar development site, although a lesser distance could be considered based on existing vegetation, roadways or similar buffer feature to neighbouring land.

A condition requiring the submission of final plans and a minimum 30m boundary setback to solar infrastructure that would apply to all site boundaries is therefore recommended.

8.6 Landscaping

The Development Plan encourages the inclusion of landscaping to enhance amenity and the use of locally indigenous species where appropriate (Obj 1 and PDC 2 – Landscaping, Fences and Walls).

Limited landscaping is proposed as part of the development application. Landscaping is only proposed along the boundary of the western parcel that is immediately adjacent Sensitive Receptor #7. The proposal to establish a screen of native vegetation plantings was considered not appropriate by the Sensitive Receptor as the agricultural landscape is preferred, whilst concerns regarding the time taken required for screening plants to establish was also raised.

Council has recommended that existing natural vegetation be retained, and a vegetated perimeter established.

Whilst it is recognised that the establishment of new trees and vegetation throughout the solar farm may not be practical as it may create additional shading of the solar modules, resulting in loss of efficiency for the project, the retention of the existing scattered trees on site should be considered where possible as these form key resting places and critical habitat for wildlife, in particular birds. They also assist in keeping within the context of the surrounding rural landscape. A vegetated permitter should also be considered.

It is recommended that the applicant prepare a Landscape Plan in consultation with the local Council, detailing perimeter landscaping, any other proposed landscaping for the site, and the management of existing vegetation on the site. Discussions would also be encouraged with Sensitive Receptor #7 in relation to the nature and form of any landscaping related to the visual outlook from that property.

8.7 Natural Resources

The Development Plan seeks the retention and protection of natural resources, the environment and water quality (Obj 1 and 2 – Natural Resources); natural hydrological systems and environmental flows should be maintained (Obj 4 – Natural resources) with minimal disturbance and modification of the natural landform (Obj 10 – Natural Resources).

The Development Plan seeks development in line with Water Sensitive Design principles. Stormwater should be captured and re-used where practical and safe, and water quality should be protected (PDC 5 and 7 – Natural Resources).

8.7.1 Stormwater and Water Quality

Post development run-off from the subject site is expected to be substantially the same as pre-development flows for the majority of the site, as the ground around the solar arrays will remain pervious.

There may be a small increase in runoff from the additional structures and hardstand surfaces within the administration/control area. The applicant intends to manage these additional flows within the boundaries of the subject site. Any required drainage works will be designed to match existing drainage patterns as much as possible.

A water course (Wookie Creek) traverses north to south across the western parcel. There are no formalised water courses present in the eastern parcel. Construction of the solar farm will involve earthmoving activities to form the internal access tracks and minor groundworks prior to solar panel installation (including trenching for underground cables and other services).

Storm events during construction could result in sediment entering Wookie Creek watercourse if appropriate mitigation measures are not in place.

Measures to avoid and/or prevent sediment or pollutants entering natural drainage systems can be covered in a Stormwater Management Plan, a sub-plan of the recommended CEMP.

8.7.2 Native Vegetation

The proposal includes the removal of some native vegetation including scattered remnant native trees within the site, roadside vegetation at access points, and a small portion of the patch of *Eucalyptus leuccoxylon* spp. *pruinosa* in the south western portion of the western parcel.

Infrastructure placement would avoid native vegetation clearance where possible, however the exact vegetation clearance requirements are yet to be confirmed.

The Native Vegetation Council has advised that the proposed clearance is expected to be minor. Removal of native vegetation is subject to the provisions of the *Native Vegetation Act 1991.* A standard Advisory Note is recommended to remind the applicant of their obligation to seek the necessary clearance approval for the removals.

8.8 Hazards

Bushfire

Planning policies seek development that minimises the threat of bushfire (Obj 5 – Hazards).

The solar farm is to be located on a site that is predominantly cleared of vegetation (except for the area surrounding Wookie Creek) and has been used for agricultural purposes for a long period of time. The subject site will be periodically maintained to manage ground cover around the solar arrays, thereby keeping the fuel load low. The area around Wookie Creek will not have infrastructure installed.

The subject site is within a General Bushfire Protection area. The SACFS advises that there have been no recently recorded Bushfires or prescribed burn events of note.

The highest risk of ignition will be during the construction period and any maintenance activities. It is expected that appropriate firefighting equipment will be kept on the subject site at all times during the operation of the facility.

To manage potential risks, it is recommended that the applicant prepare, in consultation the SA Country Fire Service and SafeWork SA, a Bushfire Management Plan and Emergency Management Plan.

Site Contamination

A Preliminary Site Investigation (PSI) was undertaken. Based on the history of certificates of title and the historical aerial photographs, the site has operated as farm land, with several private owners, from as early as 1870 through to the present day. The most likely source of any potential contamination would be from historical use of agricultural chemicals, weedicides and termiticides. It is unlikely that the potentially contaminating activities would significantly impact the proposed future land use of the site as a solar farm.

Other hazards

With the exception of bushfire risk, the project site is not located within an area identified as being susceptible to other natural hazards, such as flooding, contamination, acid sulphate soils or landslips.

8.9 Waste Management

The Development Plan seeks the prevention or minimisation of waste generation through the application of the waste management hierarchy (PDC 1 – Waste).

The construction of a solar farm will generate significant waste streams from the surplus packaging of solar panels and various equipment and cabling products. A Waste Management Plan is recommended to ensure that these materials are appropriately collected, stored, secured and disposed of to minimise any off-site impacts and then recovered or recycled to achieve a high level of sustainable practice.

The applicant has indicated that all waste requiring offsite disposal will be sent to appropriately licensed facilities and that all waste would be recycled/disposed. Minor waste from the administration from the administration/control area can be disposed of through Council’s kerbside garbage collection service.

It is recommended that a Waste and Recycling Management Plan be prepared.

8.10 Orderly and Sustainable Development

The development of the solar farm and substation will connect with the existing Mintaro substation. This supports general Development Plan policy that development should only occur where it has access to adequate utilities and service, including electricity supply (PDC 1 - Infrastructure)

9. CONCLUSION

The proposed solar farm has been sited to minimise its visual impact, as far as reasonably possible, and to take advantage of the operational efficiencies with the existing Mintaro substation and its transmission line to Waterloo.

The existing rural landscape will be significantly modified as a result of the development, and whilst there will be opportunities to obscure or soften certain elements, the 380ha footprint will be substantial, and the solar fields will be highly visible. However, the design of the panels, including non-metal frames, helps minimise the potential impacts associated with reflection and/or glare, whilst a mandated boundary setback will also provide additional relief, in combination with the opportunity for landscape screening.

The height, extent and configuration of the perimeter fencing should be further considered, to ensure both its permeability and visibility complements its rural environment.

The greatest impacts in terms of noise, traffic generation, dust and general nuisance will be experienced during the 18 month construction period. To appropriately manage these, it is recommended that the applicant prepare a Construction Environmental Management Plan (CEMP) which demonstrate how the development will comply with the relevant environmental protection policies.

On balance, whist it is recognised that the development will result in a loss of primary production land and a visual change to the landscape, the negative impacts associated with the ongoing operation of the development can be suitably managed.

The establishment of renewable energy facilities is specially envisaged and encouraged within the Primary Production Zone, and consistent with the overall objectives of the Clare and Gilbert Valleys Development Plan to provide facilities that benefit the environment, the community and the state.

It is noted that the Council does not want to see any further growth of this proposed development in the future nor see other developments of this nature that will occupy valuable, high rainfall land within the Council area. Any cumulative impacts (or how more valuable primary production land is valued) will be a matter for future planning policy to consider – such as Phase 2 of the Planning and Design Code.

If no further information is required, and all relevant assessment matters have been considered, this planning report can be endorsed by the State Commission Assessment Panel pursuant to Section 49(7e) of the *Development Act 1993*, and a formal recommendation with appropriate conditions provided to the Minister for Planning for his further review and decision.

Sharon Wyatt
PRINCIPAL PROJECT OFFICER
PLANNING AND LAND USE SERVICES (DPTI)

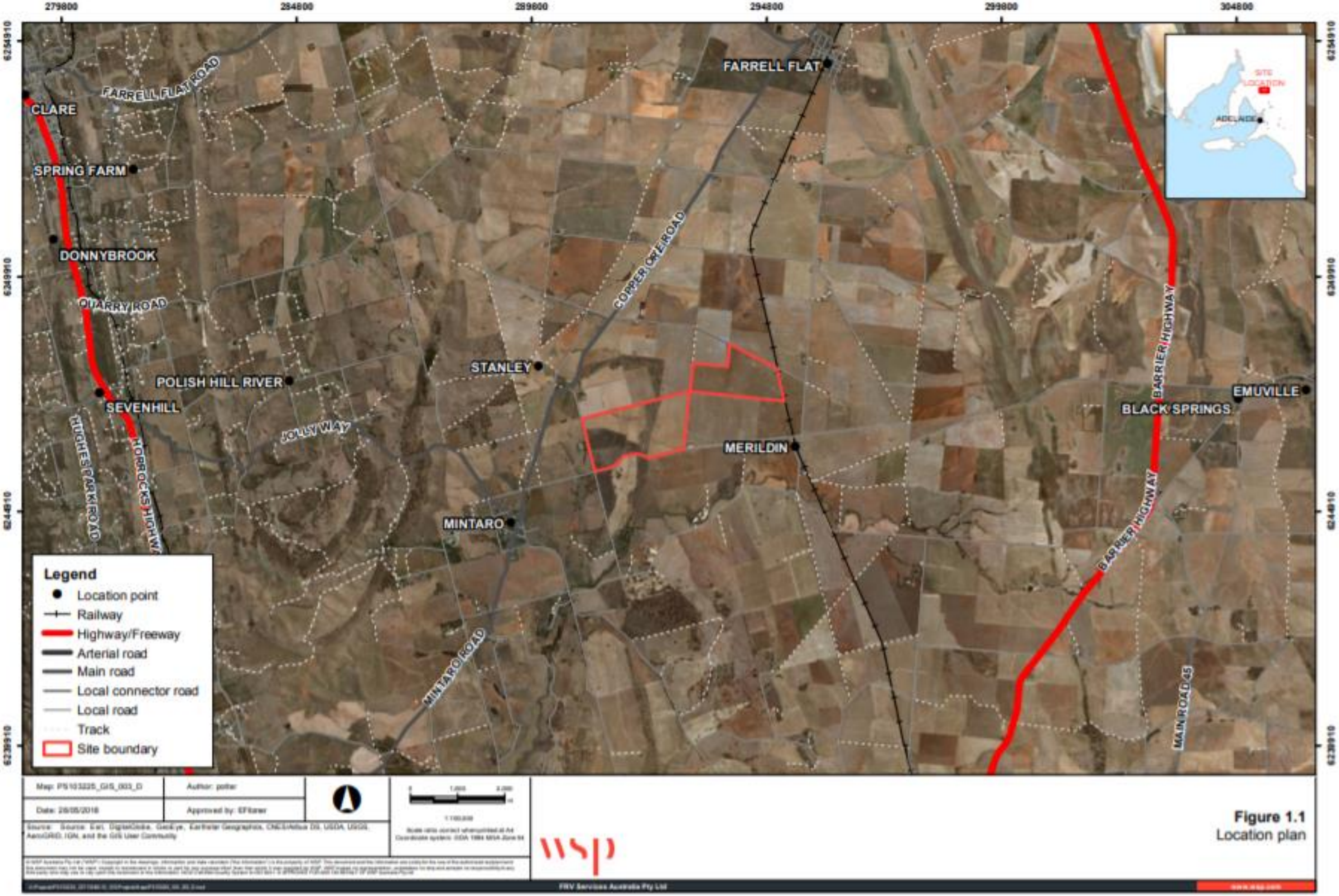


Figure 1.1
Location plan

Map: PS103225_GIS_016_A	Author: potter	
Date: 19/03/2018	Approved by: EFitzner	

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

wsp

Figure 1.2
Site Layout Plan

WSP Services Australia Pty Ltd

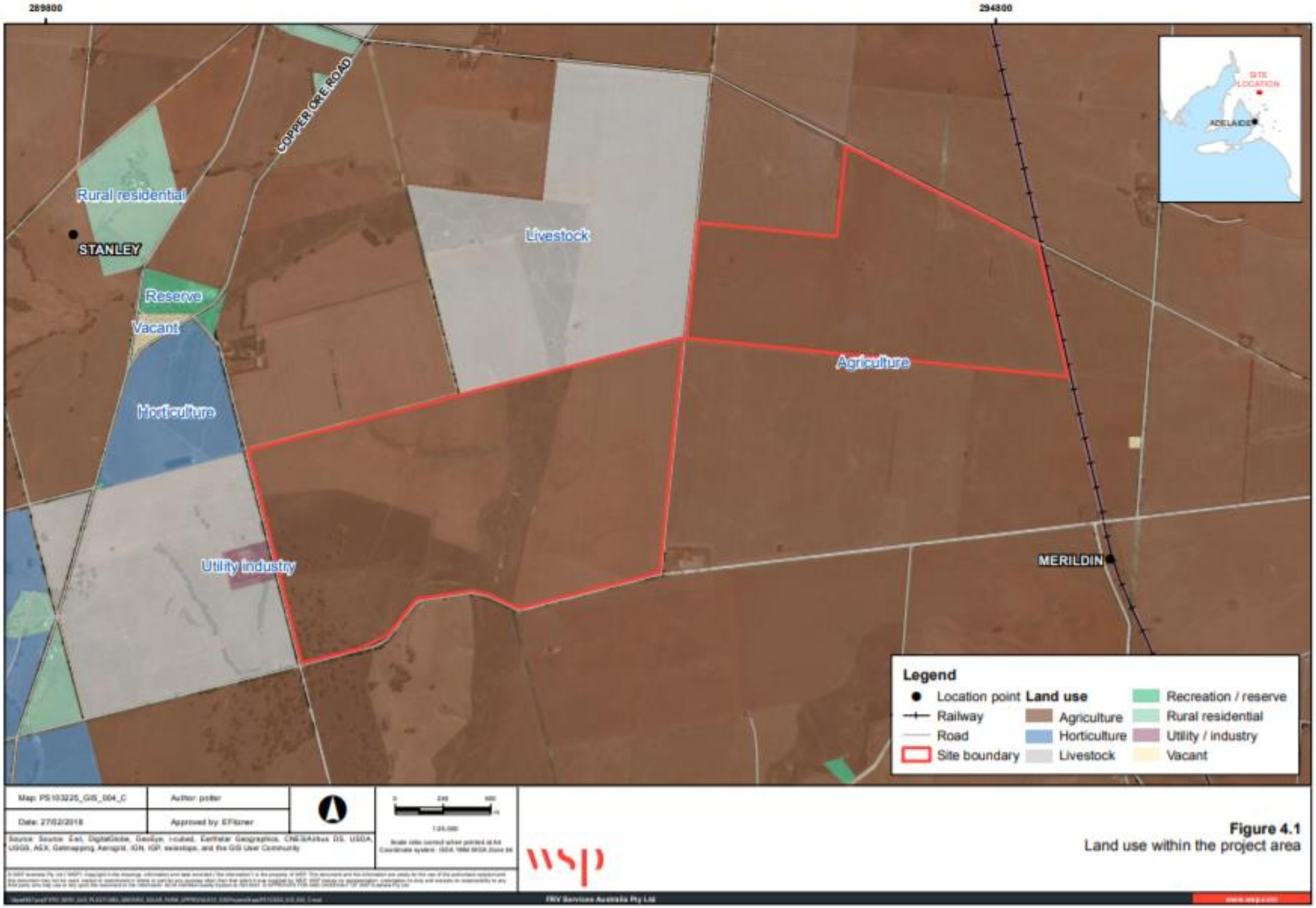


Figure 4.1
Land use within the project area

INDICATIVE SITE ACCESS DETAIL & BESS POSITION
Scale 1:2500

PV PLANT SUMMARY "MINTARO"

AC Power : 100 MWs
Peak Power: 125,007 kWp
25 Power Stations
24 3 x Ingeteam 1600 TL B615 (50°C) - 3.996 MWac
1 2 x Ingeteam 1600 TL B615 (50°C) - 2.664 MWac

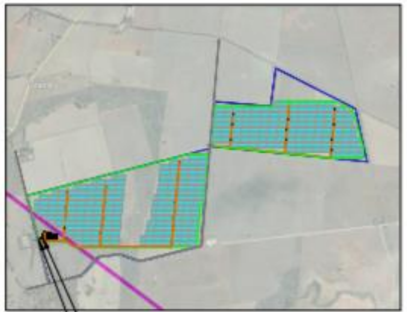
BESS Capacity: 50MW/100MWh

362,340 Modules 345 Wp

Area:	Fenced area	Fence length
	310.3 Ha	10,995 m

GEOGRAPHICAL COORDINATES

Country	Australia
Coordinates (UTM 54H)	291839.02 m E, 6246667.96 m S
Altitude	420 m



LEGEND

	Tracker (1P) x 60M
	4 MWac Inverter/Transformer Station
	2.66 MWac Inverter/Transformer Station
	Fence
	Overhead Line
	Boundary
	4m wide path (internal road)
	Access to the PV Plant

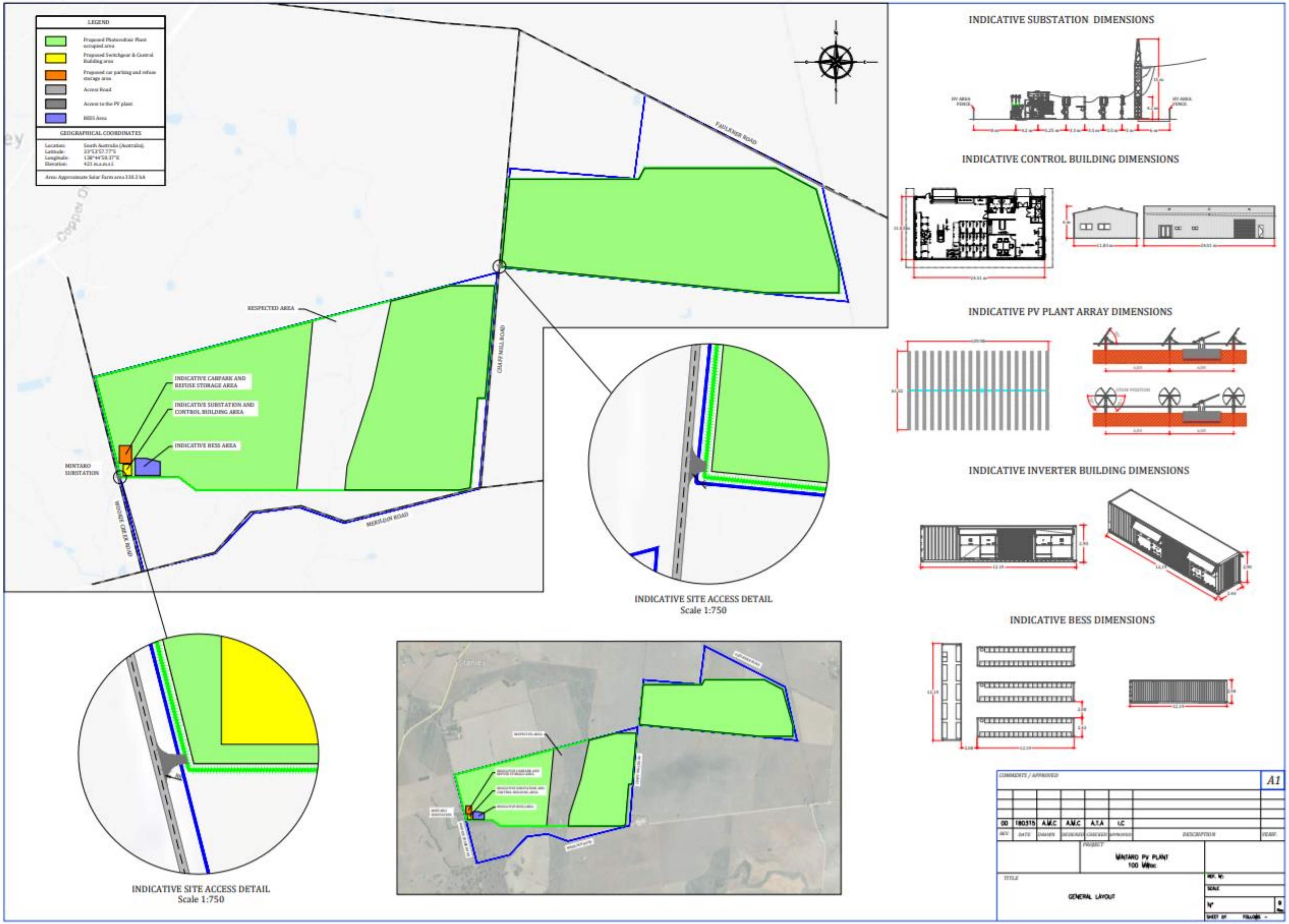
INDICATIVE SITE ACCESS DETAIL
Scale 1:800

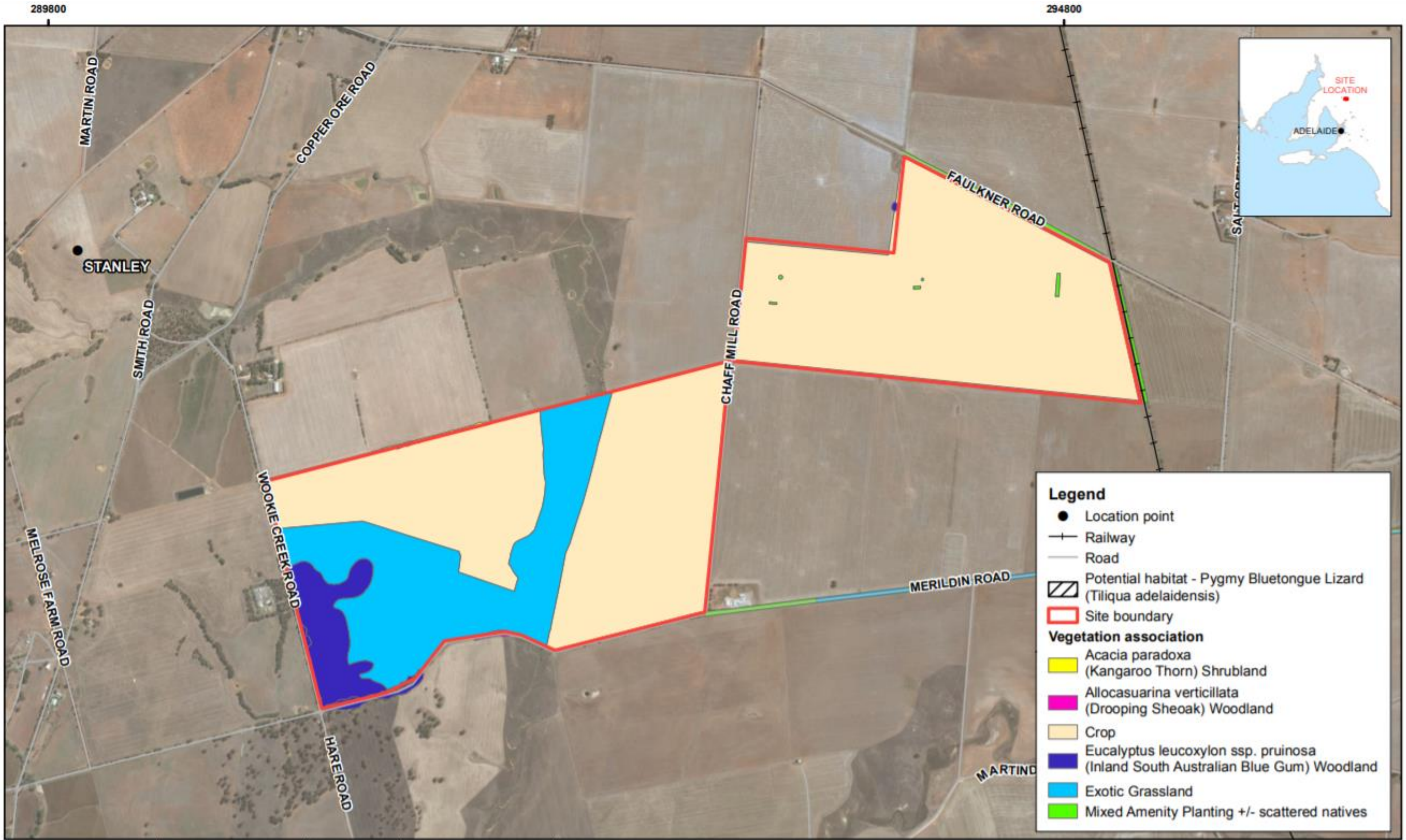
COMMENTS / APPROVED							A1
00	180315	A.M.C	A.M.C	A.T.A	I.C		
REV	DATE	DRAWN	DESIGNED	CHECKED	APPROVED	DESCRIPTION	VERIF.

PROJECT
MINTARO PV PLANT
100 MWac

TITLE
GENERAL LAYOUT

REF. Nº
SCALE 1:7500
Nº
SHEET OF FOLLOWS -


LEGEND
Proposed Photovoltaic Plant occupied area
Proposed Switchgear & Control Building area
Proposed car parking and refuse storage area
Access Road
Access to the PV plant
BESS Area
GEOGRAPHICAL COORDINATES
Location: South Australia (Australia).
Latitude: 33°53'57.77"S
Longitude: 138°44'58.37"E
Elevation: 421 m.a.m.s.l.
Area: Approximate Solar Farm area 338.3 ha
FAULKNER ROAD
RESPECTED AREA
CHAFF MILL ROAD
INDICATIVE CARPARK AND REFUSE STORAGE AREA
INDICATIVE SUBSTATION AND CONTROL BUILDING AREA
INDICATIVE BESS AREA
MINTARO SUBSTATION
WOOLEY CREEK ROAD
MERILDIN ROAD
INDICATIVE SITE ACCESS DETAIL
Scale 1:750
INDICATIVE SITE ACCESS DETAIL
Scale 1:750
INDICATIVE SUBSTATION DIMENSIONS
INDICATIVE CONTROL BUILDING DIMENSIONS
INDICATIVE PV PLANT ARRAY DIMENSIONS
INDICATIVE INVERTER BUILDING DIMENSIONS
INDICATIVE BESS DIMENSIONS
COMMENTS / APPROVED
A1
00 | 180315 | A.M.C | A.M.C | A.T.A | I.C
REV. | DATE | DRAWN | DESIGNED | CHECKED | APPROVED | DESCRIPTION | VERIF.
PROJECT
MINTARO PV PLANT
100 MWac
TITLE
GENERAL LAYOUT
REF. Nº
SCALE
Nº
SHEET OF FOLLOWS -

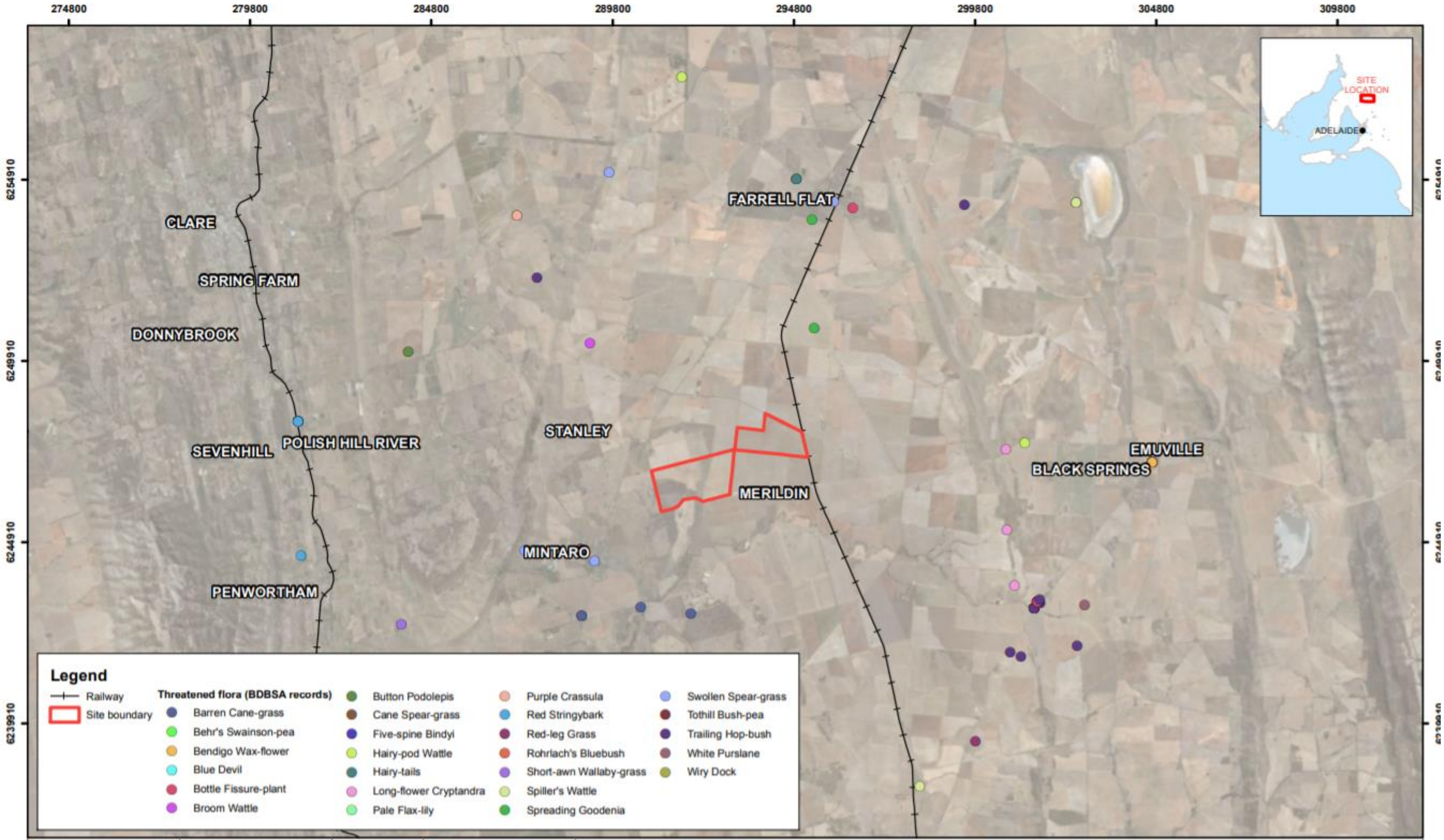


Map: PS103225_GIS_009_C	Author: brownma2
Date: 19/03/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, EBS Ecology

0 250 500 m
1:25,000
Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.1
Vegetation associations



Map: PS103225_GIS_014_C | Author: pottsr
Date: 19/03/2018 | Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, EBS Ecology

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1:140,000
Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

wsp

Figure 7.2
BDBSA Threatened Flora Species Records Within the Vicinity of the Project Area

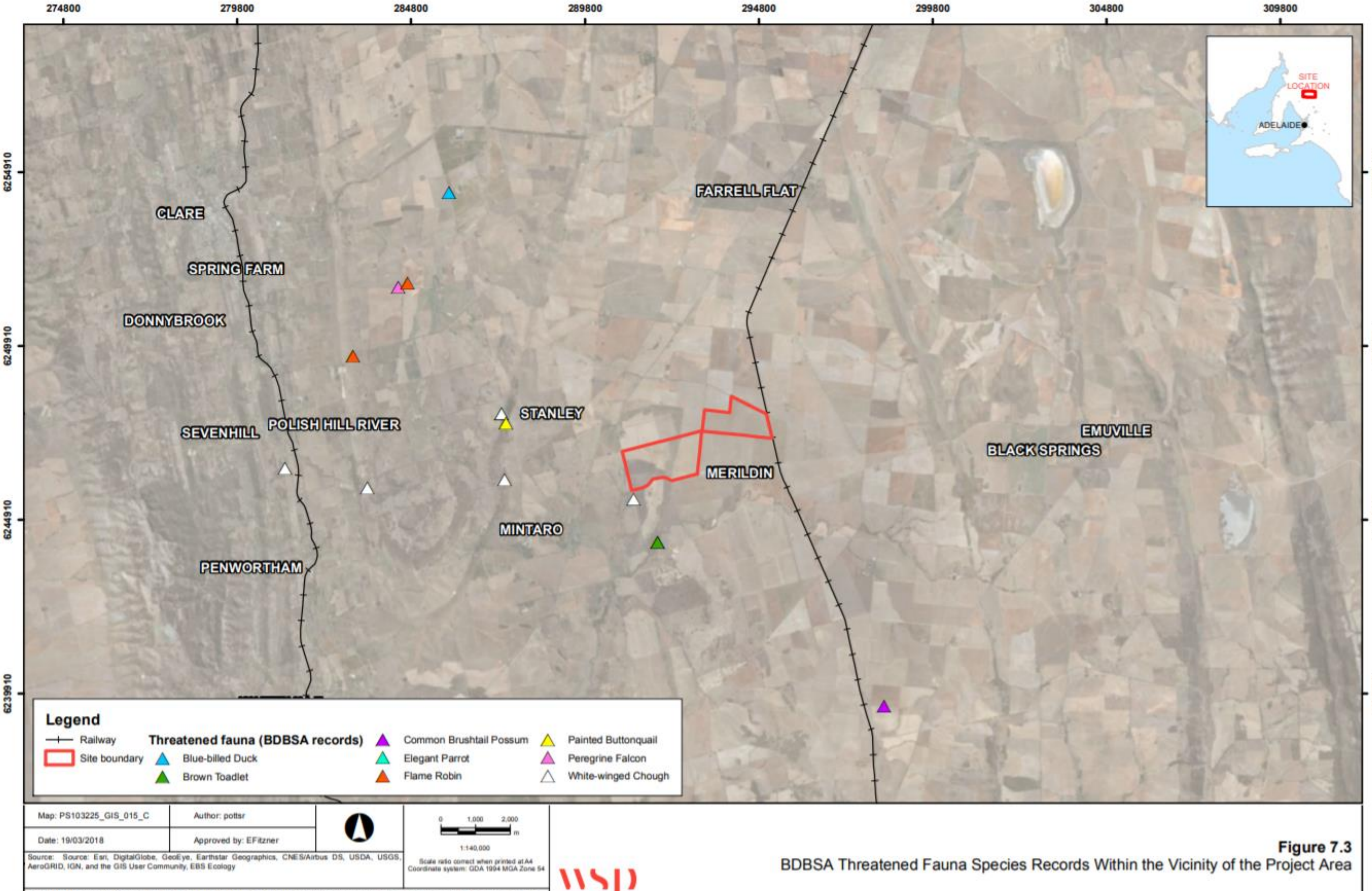


Figure 7.3
BDBSA Threatened Fauna Species Records Within the Vicinity of the Project Area

Map: PS103225_GIS_010_C	Author: brownma2
Date: 19/03/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Integrated Heritage Services Pty Ltd.

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

wsp

Figure 7.4
Aboriginal Heritage Survey Results Map

Map: PS103225_GIS_011_C	Author: brownma2	
Date: 19/03/2018	Approved by: EFitzner	

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, data.gov.au

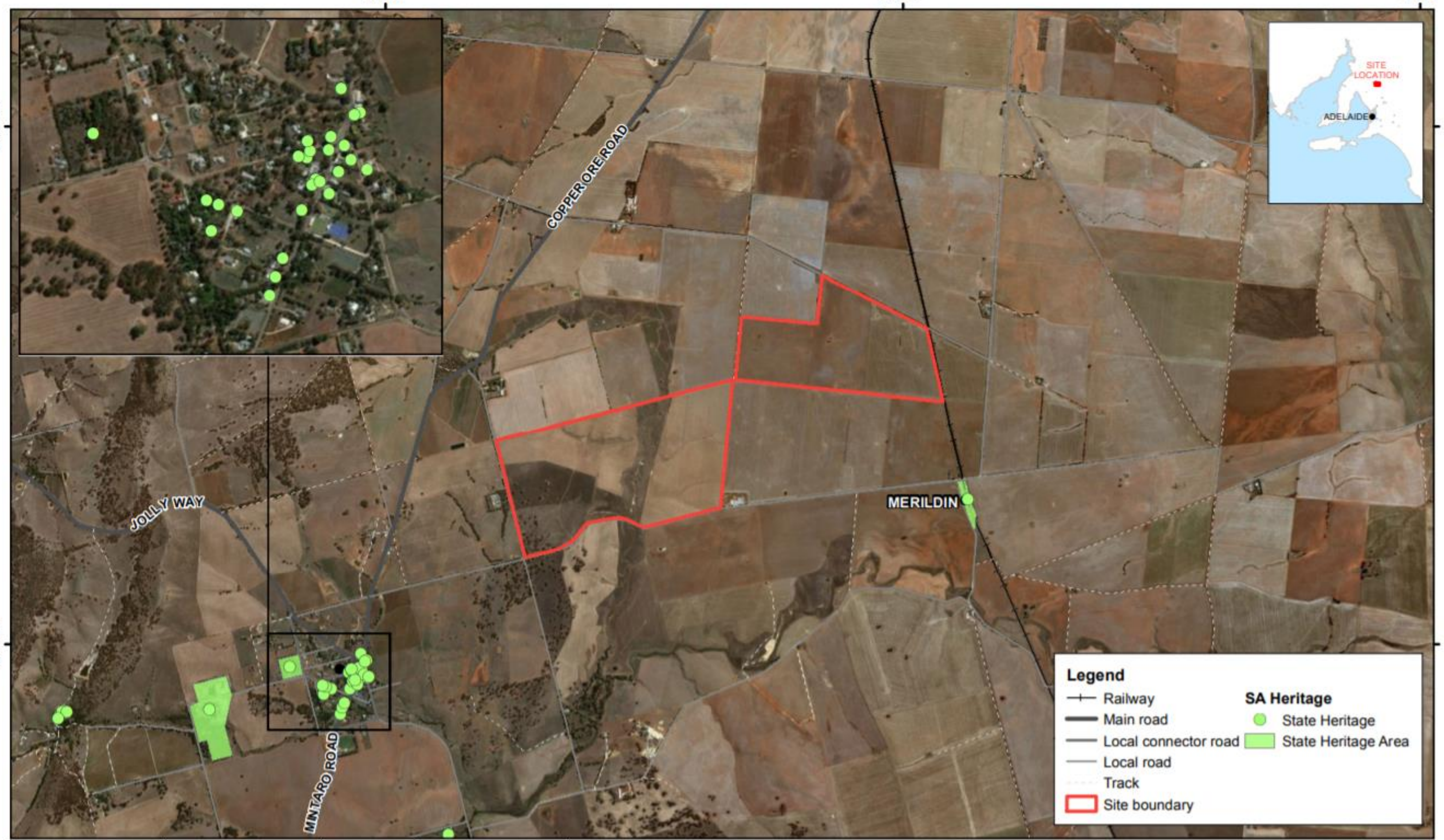
0 250 500 m

1:25,000

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

wsp

Figure 7.5
Native Title Claims

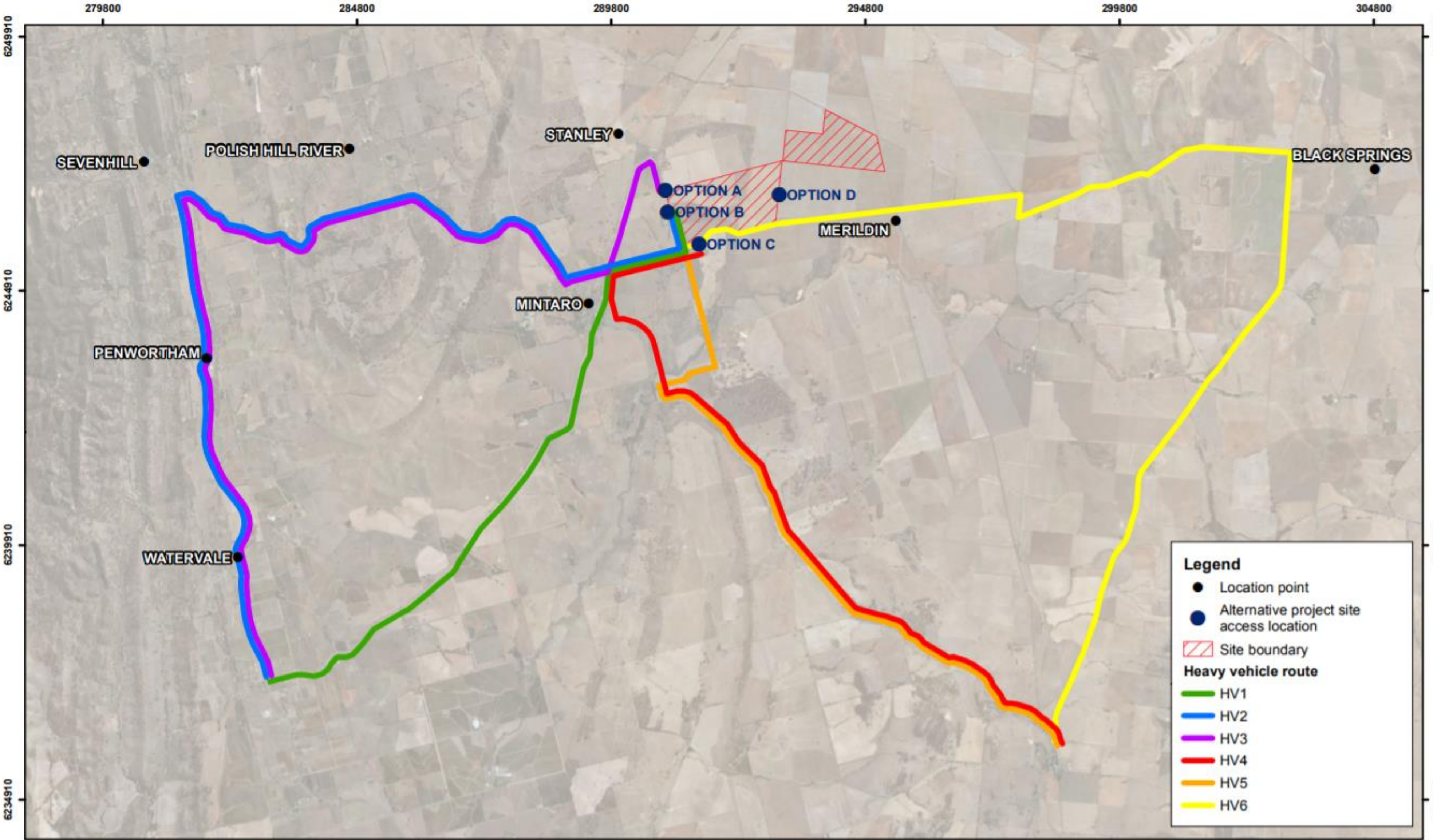


Map: PS103225_GIS_006_D	Author: pottsr	
Date: 19/03/2018	Approved by: EFitzner	

Source: Department of Planning, Transport and Infrastructure, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.6
Heritage Places in Mintaro and Surrounds



Map: PS103225_GIS_007_D	Author: pottsr	
Date: 19/03/2018	Approved by: EFitzner	

Source: Department of Planning, Transport and Infrastructure, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 1,000 2,000 m

1:100,000

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

wsp

Figure 7.16
Heavy vehicle access routes

Map: PS103225_GIS_013_C	Author: pottsr	
Date: 19/03/2018	Approved by: EFitzner	

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 250 500 m

1:25,000

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

wsp

Figure 7.17
Site Drainage Overview

FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM

DEVELOPMENT APPLICATION REPORT

JUNE 2018

CONFIDENTIAL

Question today
Imagine tomorrow
Create for the future

Chaff Mill Solar Farm
Development Application Report

FRV Services Australia Pty Ltd

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REV	DATE	DETAILS
00	19/03/2011	Draft
01	30/05/2018	Final
02	07/06/2018	Revised final

	NAME	DATE	SIGNATURE
Prepared by:	Bronte Nixon, Erin Fitzner, Tenille Anderson	07/06/2018	B. N E Fitzner Anderson
Reviewed by:	Sean Myers, Bronte Nixon	07/06/2018	B. N
Approved by:	Bronte Nixon	07/06/2018	B. N

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GLOSSARY

ARI event	Average recurrence interval (ARI) is the average or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration. It is implicit in this definition that the periods between exceedances are generally random (BOM 2018).
BDBSA	Biological Database of South Australia (BDBSA) is an integrated collection of corporate databases including data from the Department of Environment, Water and Natural Resources, Birds Australia, Birds SA, Australasian Wader Study Group, SA Museum and other State Government Agencies.
IBRA	Interim Biogeographical Regionalisation of Australia (IBRA) is a landscape based approach to classifying the land surface across a range of environmental attributes, which is used to assess and plan for the protection of biodiversity.
Commonwealth Land	Commonwealth Land includes land owned or leased by the Commonwealth or a Commonwealth agency.
Dispatchable Energy	A dispatchable source of electricity refers to an electrical power system, such as a power plant, that can be turned on or off. Dispatchable energy sources can adjust the power output supplied to the electrical grid on demand (Hanania, J. et al. ND)
Landscape characterisation	The assessment of the character and quality of the landscape. Elements comprising landscape character include landform, land use and cultural influences.
Landscape sensitivity	The degree to which a landscape can accommodate change (without detrimental impact on its character) resulting from a proposed development.
Megawatt hour	A megawatt hour (Mwh) is equal to 1,000 kilowatts of electricity used continuously for one hour.
National heritage place	Australia's national heritage comprises exceptional natural and cultural places that contribute to Australia's national identity. National heritage defines the critical moments in Australia's development as a nation and reflects the achievements, joys and sorrows in the lives of Australians. It also encompasses those places that reveal the richness of Australia's extraordinarily diverse natural heritage. National heritage places are located within Australia (DoEE ND).
OLS	The Obstacle Limitation Surfaces (OLS) are a series of surfaces that set the height limits of objects around an aerodrome. Objects that project through the OLS become obstacles.
Place attachment	The values that residents as well as various interest groups and stakeholders, place upon their environment and surrounds.
Project area	The land defined by the project boundary.
SCAP	The State Commission Assessment Panel (SCAP) is established under South Australia's Planning, Development and Infrastructure Act 2016. The SCAP has assumed the functions, powers and duties of the Development Assessment Commission.
Solar access	The ability of a property to receive sunlight without obstruction

ABBREVIATIONS

AARD-DSD	Aboriginal Affairs and Reconciliation Division – Department State Development
ACMA	Australian Communications and Media Authority
AHA	*Aboriginal Heritage Act 1988*
ASRIS	Australian Soil Resource Information System
ARENA	Australian Renewable Energy Agency
ARI event	Average recurrence interval event
ASS	Acid Sulphate Soils
BESS	Battery Energy Storage System
BDBSA	Biological Database of South Australia
CAR	*Civil Aviation Regulations 1988*
CASA	Civil Aviation Safety Authority
CEMP	Construction Environmental Management Plan
CFS	Country Fire Service
CGVC	Clare and Gilbert Valleys Council
COAG	Council of Australian Governments
CTMP	Construction Traffic Management Plan
DPA	Development Plan Amendment
DPTI	Department of Planning, Transport and Infrastructure
ECOSA	Essential Services Commission of South Australia
EMF	Environmental Management Framework
EMI	Electromagnetic Interference
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FRV	FRV Services Australia Pty Limited
FRWL	Flinders Ranges Worm-lizard
HA	Hectare
IBRA	Interim Biogeographical Regionalisation of Australia
IFR	Instrument Flight Rules
LGA	Local Government Area
LSALT	Lowest Safe Altitude

MCA	Multi Criteria Analysis
MNES	Matters of National Environmental Significance
MWh	Megawatt hour
NEM	National Electricity Market
nm	Nautical Mile
NPW Act	*National Parks and Wildlife Act 1993*
NRM Act	*Natural Resources Management Act 2004*
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
OLS	Obstacle Limitation Surface
OTR	Office of the Technical Regulator
PBTL	Pygmy Blue-tongue Lizard
PDI Act	*Planning, Development and Infrastructure Act 2016*
PPA	Power Purchase Agreement
PSI	Preliminary Site Investigation
PV Panel	Photovoltaic panel
RADCOM	Radio communication towers and radio services
RAAF AIS	Royal Australian Air Force Aeronautical Information Service
RAV	Restricted Access Vehicles
RET	Renewable Energy Target
SASP	South Australia's Strategic Plan
SAM	South Australian Museum
SCAP	State Commission Assessment Panel
SEB	Significant Environmental Benefit
SEDMP	Soil Erosion Drainage Management Plan
SIPSA	Strategic Infrastructure Plan for South Australia
TEC	Threatened Ecological Community
VFR	Visual Flight Rules
VRE	Variable Renewable Energy
WSP	WSP Australia Pty Limited

EXECUTIVE SUMMARY

PROJECT DESCRIPTION

FRV Services Australia Pty Limited (FRV) is seeking Development Approval for the construction and operation of a solar farm, at a location north-east of Mintaro in the Clare Valley, South Australia. The project is seeking approval under Section 49 (Crown Development) of the *Development Act 1993* as it is considered significant infrastructure for the State's development. The project sponsor for this application is the Department of the Premier and Cabinet (DPC) and the State Commission Assessment Panel (SCAP) is the relevant authority.

The project would generate approximately 250,000 Megawatt hours (MWh) of clean, zero emission electricity each year and would make a significant contribution to South Australia's energy production and stability of supply. The project would save approximately 132,500 tonnes of greenhouse gas emissions annually. The project would contribute to achieving renewable energy objectives within local, State and Commonwealth level planning and energy policy documents. The project will also create economic benefits to the local region, including employment, investment and tourism opportunities.

SITE DESCRIPTION

The site selection was influenced by a range of factors including availability of solar resources, proximity to grid infrastructure, community factors and environmental constraints.

The proposed 100MW solar farm would be developed on a 380 hectare (HA) site adjacent to the existing Mintaro substation and its 132 kilovolt (kV) transmission line to Waterloo.

The site is in an agricultural area and is largely cleared of native vegetation, containing grazing and cropping land. There is a large patch of remnant Eucalypts in the south-western corner of the western parcel where the land is too steep to cultivate. The roadside vegetation surrounding the site contains amenity plantings with some remnant native woodland and shrubland.

The western parcel includes low hills, with the highest and steepest area on the western side and the lowest area at Wookie Creek. The eastern parcel is of gentle undulation. The topography of the site ranges from 400-430 m above sea level. Wookie Creek, running north to south through the western parcel, is degraded with limited native flora species present.

STAKEHOLDER CONSULTATION

FRV is committed to a thorough engagement process with the community and key stakeholders and has engaged extensively with key stakeholders, neighbouring properties and the wider community to inform the planning process. Key issues raised during the consultation process have been identified and addressed in this report.

COUNCIL AREA AND ZONING

The proposed site is located within the Primary Production Zone of the Clare and Gilbert Valleys Council (CGVC). Solar farms are not specifically referred to in the CGVC Development Plan; however the development of wind farms and ancillary development are envisaged within the Primary Production Zone, in accordance with the State-wide Wind Farms Development Plan Amendment (DPA) 2012. Solar farms provide comparable benefits and may also be accepted within this zone. The adjacent and surrounding land use is largely agricultural, with some livestock and horticulture land use.

TECHNICAL ENVIRONMENTAL ASSESSMENTS AND SPECIALIST STUDIES

This Development Application was informed by a number of specialist technical reports including statutory planning, flora and fauna, Aboriginal cultural heritage, non-Indigenous heritage, visual amenity, glare, geotechnical, traffic and access, stormwater and flooding, socio-economic, site contamination and micro-climate. Potential Electromagnetic Interference (EMI) and aviation safety impacts were also reviewed. These studies assessed the potential impacts associated with construction and operation of the project and identified a range of mitigation measures to manage the identified impacts.

PLANNING AND LAND USE

A statutory planning and land use assessment was undertaken to support the Development Application. The project is considered appropriate for the project site and is not deemed at variance with the relevant Development Plan provisions. It will also provide reliable infrastructure and sustainable energy to facilitate economic growth for the region; consistent with South Australia's strategic policies. The nature of the development is recognised and provided for in the Clare and Gilbert Valleys Council Development Plan. Renewable energy facilities policy provisions are set out in both the Council Wide and Primary Production Zone. It is considered that the project will not significantly impact upon existing land uses in the local area and will not significantly impact upon the total area of productive agricultural land in the region.

FLORA AND FAUNA

A vegetation survey was undertaken across the project area and bordering roadsides in line with South Australian Native Vegetation Council requirements. Additionally, a roaming survey captured opportunistic flora and fauna observations. The project was assessed for compliance with the *Environment Protection and Biodiversity Conservation Act 1999, Native Vegetation Act 1991, National Parks and Wildlife Act 1972* and *Natural Resources Management Act 2004.*

The project area is largely devoid of native vegetation and presents few ecological constraints. No threatened flora species or threatened vegetation communities were recorded. There is a large group of Inland South Australian Blue Gum trees with high conservation significance present in the western section of the project area. The ephemeral creek line running through the western section of the project area is highly degraded but provides fauna habitat.

Only one state-threatened bird species was recorded during the survey; the White-winged Chough – a species found across most of south-eastern Australia. Habitat suitability for nationally threatened fauna species, such as the Flinders Ranges Worm-lizard and Pygmy Blue-tongue Lizard was assessed. These species are considered unlikely to occur due to lack of preferred habitat and known distribution patterns.

Impacts where there is remnant vegetation (i.e. the western section of the project area and roadsides) will be avoided. Any vegetation clearance for the project would require approval under the *Native Vegetation Act 1991*.

ABORIGINAL CULTURAL HERITAGE

An Aboriginal cultural heritage survey was undertaken for the project, comprising desktop research, an anthropological survey and an archaeological survey; in consultation with Ngadjuri traditional owner representatives.

There are no anthropological sites within the project area, although Wookie Creek was identified as culturally sensitive in relation to Aboriginal anthropology due to its connection with significant Creation Ancestor stories. Most of the project area is highly disturbed. The topography of the project area and the relatively high level of disturbance suggests a low probability for encountering Aboriginal heritage sites, objects and burials. There were no archaeological sites recorded within the project area, however ground visibility was low as the area is currently being used for cropping. Given the likelihood of buried, undisturbed soils within a region that has been demonstrably well-occupied by Ngadjuri people before and during European colonisation, the potential for encountering buried heritage sites, albeit low, does still exist.

The outcomes of the Aboriginal cultural heritage survey recommended an additional survey once the site is cleared and there is improved ground visibility, the preparation and implementation of a Cultural Heritage Management Plan for the project and inducting all construction workers undertaking ground disturbance work to typical Aboriginal site descriptions, potential indicators, the site discovery process and legislative obligations.

NON-INDIGENOUS HERITAGE

As outlined above, the Clare Valley region was inhabited by the Ngadjuri people prior to European contact. The country to the north of Gawler was occupied during the early 1840s by colonists who recognised the pastoral opportunities presented by the fertile grassy plains. Following the discovery of copper at Burra in 1845, the Burra Mine quickly became one of the richest copper mines in the world. The village of Mintaro was originally intended as a stopping place for the bullock teams (and later muleteers) which carted the copper ore from the mine to Port Wakefield and returned with coal and supplies shipped from Wales.

A significant proportion of Mintaro's buildings were built between 1850 and1870, including small cottages, shops, flour mill, blacksmiths, churches, hotels and several public buildings including a police station, a public school and the Council hall and Institute.

In 1877, the copper teams were rerouted through Riverton to the new railway terminus at Gawler, bypassing Mintaro and causing a decline although this was partially alleviated by the expansion of the slate quarries and the growing agricultural industry. The Mintaro Railway Station (renamed Merildin in 1918) was built in 1870, approximately seven km east of the township and Mintaro continued as an agricultural service centre despite the closure of the Burra Mines in 1877. The area began to decline in the 1930's although the slate quarry helped the Mintaro township survive. Mintaro has retained much of its historic character and was subsequently declared a State Heritage Area in 1982. The designation of a State Heritage Area is intended to ensure that changes to, and development within, the area are managed in a way that the area's cultural significance is maintained.

Numerous heritage database searches identified the following heritage listings:

- The Australian Heritage Places Inventory contained ten entries, two of which were state heritage places and eight listed under the Register of the National Estate (state heritage places were also recorded in the South Australian Heritage Database).
- The Australian Heritage Database contained 33 entries.
- The South Australian Heritage Places Database contained 27 entries.
- The Clare and Gilbert Valleys Development Plan did not contain any local heritage places for Mintaro (state heritage places were already covered by the South Australian Heritage Places Database).

Most of the heritage places are located within the Mintaro township and are between 1.8-2.3 km south-west of the project area. The closest heritage place to the project area is the Merildin Railway Station, approximately 1 km south of the site. The Chaff Mill Solar Farm will not impact any heritage places within the Mintaro township and surrounds. Vibration impacts of major construction projects are generally limited to 25 m. the construction of a solar farm will not comprise vibration impacts. The project area is not visible from the Mintaro township or from any key tourism areas or vistas. Construction and heavy vehicles will not be directed through the Mintaro township. All construction and site staff working on the project will be inducted as to their legal obligations regarding the protection of heritage places within and around Mintaro.

VISUAL AMENITY

A landscape character and visual impact assessment was undertaken for the project to determine existing landscape character values and the visual amenity of the project area, the sensitivity of the landscape to change and the degree of visual impact of the proposed Chaff Mill Solar Farm.

The study comprised a desktop evaluation of the topography of the area to determine the viewpoints from which the project may be visible. The assessment defined a 'Zone of Theoretical Visual Influence' from which the project may be seen. Consideration was also given to other locations outside of this zone that may be more sensitive to visual change such as elevated scenic lookouts (including the Quarry Hill Road lookout) and notable tourism routes. Site visits were undertaken as part of the assessment to photograph the area from various viewpoints. The Zone of Visual Influence was ground-truthed and consideration was given to other influencing factors such as vegetation and topography.

The visual impact assessment found that the solar farm will not be visible within the Zone of Visual Influence due a combination of the hills, ridges and specific blocks of vegetation between the viewer and the project area. Generally, areas beyond the Zone of Visual Influence are likely to be too far away from the project area to offer discernible views of the Chaff Mill Solar Farm.

The landscape character assessment is concerned with the fabric, character and quality of the countryside. The landscape fabric consists of the elements that make up the landscape, such as landform, land-use and cultural influences and the way these elements interact. Further, the characterisation process defines the landscape 'sensitivity to change' based on the ability of the landscape to absorb a development of this nature without irreparable consequences and impacts on the inherent character and visual amenity. Consideration was also given to 'sense of place' values i.e. the intrinsic character of a place, or the meaning people give to it, but, more often, a mixture of both.

The assessment found that the sense of place and landscape character of the undulating vegetated hillsides of the project area and the Mintaro township is one of moderate to high scenic quality and has a moderate to high sensitivity to change. The introduction of the solar farm will not change the mainly pastoral nature of the locality and the wider contextual landscape, nor does it impact on any significant viewpoints within the contextual landscape. The solar farm will, however, be visible at several locations including three properties. The visual impact is only considered significant enough to warrant mitigation at one of these properties – located at the corner of Chaff Mill and Merildin Roads.

GLARE

The glare impact assessment undertaken for this project included an assessment of baseline conditions and desktop mapping of potential glare at the location of sensitive receptors. No glare potential was identified for most of the surrounding rural and residential dwellings where the likely impact on sensitive receivers was considered insignificant. No glare potential was identified for Copper Ore Road and other minor roads. Glare hazard potential was identified, however, for travellers on Merildin Road, where the road adjoins the south-eastern boundary of the project area. Glare hazard potential was also identified for the intersection of Chaff Mill and Merildin Roads. The impacts of potential glare at the affected locations will be mitigated with the establishment of vegetation screen planting.

GEOTECHNICAL

The underlying geology of the location north-east of the Mintaro area comprises recent Quaternary slope alluvium including outwash and soils, with some coarse gravels derived from older alluvium. More broadly, the Mintaro area soil comprises unbleached A_2 horizon and pedal subsoils, with soils that comprise sandy and clayey red-brown earths with dark brown cracking clay and terra rossa soils. Tertiary deposits are recorded as being present in areas of Site 1, comprising sandstone, sandy gravel, ferruginous (containing iron oxide or rust) gravel, and siliceous duricrust. Watervale Sandstone Member of the Burra Group is also present underlying areas of Site 1 and is characterised by fine to coarse grained feldspathic quartzite and orthoquartzite.

The groundwater table is generally located greater than 12 metres below ground level, although the presence of Wookie Creek indicates that groundwater may be intersected at shallower depths in some locations. Very hard rock (shale and slate) could be encountered at shallow depths in the area and soft soil materials (i.e. sand and gravel) may necessitate deeper footings. It is also known that local soils can become wet and boggy during periods of rainfall. Detailed geotechnical testing will be undertaken as part of the detailed design process.

TRAFFIC AND ACCESS

A Traffic Impact Assessment was undertaken for the proposed Chaff Mill Solar Farm to identify and assess any key traffic operational and safety issues that may arise during the construction and operation of the project. The assessment was based on a desktop assessment of traffic and road corridor information (predominantly sourced from DPTI) and a site inspection of roads and current traffic operations at and around the project area. The solar farm has been proposed for two parcels of land which are accessible via a network of unsealed roads. The detailed layout of the solar farm is yet to be finalised but it will require vehicle access to both land parcels and an internal road network to allow for both its construction and maintenance.

Once operational, only a small number of staff will be in attendance daily and the vehicle trips generated will be less than 10 per day. During the construction phase though, traffic generation will be more significant. In the first stage of construction (duration 9 months) it is estimated that there will be 100 construction workers on site. This will increase to 200 in the following second stage (also 9 months). These construction workers will travel to and from the site daily using light vehicles and potentially mini buses to reduce trips. It is estimated that there will be up to 8 and 16 heavy vehicle movements daily in Stage 1 and Stage 2 respectively.

A number of alternative locations for access to the west and east sections of the project site were identified. These included access from Wookie Creek Road (north end and midway near the substation), Merildin Road and Chaff Mill Road. The advantages and disadvantages of these were assessed taking into consideration:

- The likely routes to be taken by construction workers (light vehicles) and heavy vehicles to the project site from their trip origins
- The extent of upgrading required to the unsealed roads and intersections
- The existing alignment of the unsealed roads and hence the safety risks
- The number of residential properties along the route that may be affected by the passing traffic.

On balance the preferred access location is on Wookie Creek Road adjacent to the existing substation. This would be supported by an internal road network that would allow access to Chaff Mill Road and then to the east section of the project site. Most light vehicle trips and all heavy vehicle trips would be expected to travel to the site via Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road.

The clear advantages of this option are:

- There are no residential properties along this section of Merildin Road or Wookie Creek Road
- There is a relatively short section of unsealed road to be upgraded as well as two intersections.

The use of the Mintaro-Leasingham Road by heavy vehicles (in particular) should be avoided as this takes traffic through the historic Mintaro township. The route via Manoora also takes traffic through Mintaro and the route via the unsealed Flagstaff and Riley Roads would require significant road upgrade and realignment works.

It can be noted that during the period of public consultation conducted by FRV in February 2018, it became apparent that there was Council and community support for an alternative route option (HV5 – via Barrier Highway and Mintaro-Manoora Rd) and concerns for the increased use of Jolly Way by heavy vehicles. The advantages and disadvantages of both HV2 and HV5 are discussed in this report.

The construction of the project will generate both light vehicle trips and heavy vehicle trips during the two construction phases of the project. These numbers of vehicle trips are not high in absolute terms but will represent a significant proportional increase in the traffic volumes currently using the sealed and particularly the unsealed road network. Daily traffic volumes on Jolly Way for example could increase by up to 44% during Stage 2 construction period. The increase in traffic volumes on the unsealed roads will be significantly higher than existing but only on relatively short sections of road and sections which do not pass by adjacent residences.

A range of mitigation measures are being considered to address the increased exposure to risk and the impacts on the road conditions in the local area.

STORMWATER AND FLOODING

Typical solar farm construction utilises the natural layout of the land to minimise earthwork construction costs, whilst also maintaining existing natural features, such as watercourses, across the site.

The installation of solar panels does not increase the overall runoff from the site, as runoff from each panel soaks into the ground under the adjacent downstream panel – resulting in little to no increase in the total catchment runoff.

Culverts will be provided at all locations along the access tracks that cross any water course or depression. The sizes of these culverts will also be subject to a more detailed analysis during the final design stage.

Flood mapping is not available for either site in the *Clare and Gilbert Valleys Council Development Plan*, and it is recommended that further analysis should be undertaken to assess the risk of flooding (despite the sites' occurring in the upper reaches of large catchment areas) during the later design stages.

Each site is in the upper reach of a separate stormwater catchment (Wakefield River and Broughton River catchments, respectively). As such it is highly unlikely that either site would experience any flooding issues during peak storm events. No flood plain zones are located within either site.

The northern site is relatively level, with any runoff gradually flowing northward, towards Faulkner Road. The southern site is of more undulating terrain with a central watercourse draining to the south; whereby runoff at the site enters Wookie Creek and flows south, past Merildin Road.

The proposed access road layout will incorporate culvert crossings where appropriate to ensure sub-catchment drainage is not affected. Once established, the solar farm will be re-seeded with the most suitable grass species for this particular location, which will further mitigate run-off and erosion potential. Detailed civil investigations will be undertaken as part of the detailed design process. In line with best-practice, a Soil Erosion and Drainage Management Plan (SEDMP) will be prepared prior to construction, which will be implemented in line with the Construction Environmental Management Plan.

SOCIO-ECONOMIC

Social and community impacts (both positive and negative) of the construction and operation of the proposed Chaff Mill Solar Farm to the local and regional community were investigated as part of the assessment process.

The solar farm would generate considerable environmental, economic and social benefits to Mintaro and the local region, including but not limited to:

- Providing employment for up to 200 workers during construction, drawn from the local area where possible
- Boost to the local economy through the procurement of local goods and services
- Attracting investment to the area
- Increased energy security
- Contributing to the Mid North region's reputation for renewable energy and potentially drawing increased tourism to the area
- Contributing to the achievement of local, state and national renewable energy targets
- Mitigation of climate change.

Whilst the project will provide wider benefits to the area and the region, there is also the potential for the project to cause adverse impacts to the community, including:

- An increased demand on public services and facilities - particularly accommodation and eateries
- Construction traffic and personnel
- Visual amenity – to the immediate local area – both during construction; and from several locations once operational.

Other concerns raised by the community (such as frost exacerbation and loss of productive agricultural land) have been reviewed and are not anticipated as being of significance – these issues are discussed in other sections of this information sheet.

Several mitigation measures have been recommended to minimise potential socio-economic impacts associated with the proposed project, including:

- Protocols to keep the community updated about the progress of the project
- Protocols to respond to complaints/concerns received
- Liaison with local representatives regarding business opportunities

- Liaison with local tourism industry to manage potential timing conflicts
- Liaison with local industry representatives and contractors to maximise the use of businesses and suppliers.
- The preparation of a Construction Environmental Management Plan.

SITE CONTAMINATION

A preliminary site investigation was undertaken for the project to determine any potential site contamination issues within the project area. The site has operated as farm land, with several private owners, from as early as 1870 through to the present day. It is possible that potentially contaminating activities associated with farming operations occurred on site. It is unlikely that the potentially contaminating activities would significantly impact the proposed future land use of the site as a solar farm. A baseline intrusive investigation would be undertaken in future project stages to identify if potentially contaminating activities are crystallised.

MICRO-CLIMATE IMPACTS (FROST)

To investigate community concerns that the solar farm may exacerbate frost conditions at adjacent properties (i.e. the impacts of radiative heat loss from panels on the surrounding climate); the following approach was undertaken:

1. Review of Solar Farm Assessment Guidelines.
2. Review of all other solar farm assessments, approvals and conditions of consent documents in Australia.
3. Web-based desktop assessment of solar farms and frost / radiative heat loss impacts.
4. Academic literature review of solar farms and frost / radiative heat loss impacts.
5. Discussions with agricultural, climatology and meteorological scientists in South Australia, Australia and overseas.

There is no reference to micro-climate or air temperature implications or requirements in any regulatory or policy guidelines in South Australia or interstate. In a review of other solar farm Development Applications and Environmental Impact Statements; none of them look at the issue in any detail.

A number of websites, reports and academic papers were reviewed to try and obtain an understanding of the potential radiative heat loss and frost exacerbation issues and impacts associated with solar farm development. Very little information on the topic exists but several sources stated that the potential development of thermal models for large-scale solar farms is highly problematic due to significant uncertainties associated with the multiple parameters involved including variations in albedo, climate data, cloud cover, landscape, seasonality, panel efficiency, panel design, wind speeds, vegetation cover, soil data and a number of other factors.

A review of potential academic reports and research papers was then subsequently undertaken using the University of South Australia's access to scientific journals, books and reports. There is a lack of specific studies and literature that relates to the general environmental impacts of solar farms. Literature regarding micro-climate impacts and impacts to the radiative heat exchange at solar farms is even rarer. Several studies were reviewed which had a range of findings and outcomes. Summarised relevant findings appear to be that:

- Temperatures in the centre of a solar farm may be slightly higher than ambient – particularly in warmer months
- Temperatures return to ambient several metres above a solar farm
- Temperatures may be slightly warmer directly adjacent a solar farm, gradually returning to ambient with distance away from the solar farm
- Soil temperatures at depth underneath panels may be slightly warmer during cooler months and slightly cooler in warmer months
- Air temperatures at ground level underneath panels may be slightly cooler during summer months
- Air temperatures at a two-metre height in the solar farm in the colder months would probably be similar to the surrounding areas
- Air temperatures at a two-metre height in the solar farm in the warmer months may be slightly warmer than the surrounding areas
- Air temperatures directly above solar arrays may be slightly warmer at night
- Temperatures at control sites adjacent solar farms generally had temperatures equal to ambient conditions

- Reduced temperatures adjacent a solar farm were never modelled or recorded except in the hypothetical modelling of massive solar farm scenarios of arrays with an area of 25,000,000 ha (the Chaff Mill project is 380-ha)
- Slight warming could be experienced upwind of a 250,000-km^2 solar farm scenario and slight cooling could be experienced downwind of a 250,000 km^2 solar farm scenario.

In discussion with research scientists, climatologists and meteorologists; the climate impacts of a 380-ha solar farm would not be significant and the addition of access roads within and around a solar farm would further mitigate any local climate impacts due to enhanced air flow.

ELECTROMAGNETIC FIELD LIMITS

All electronic equipment has associated electromagnetic fields. In some cases, electronic devices that are close to one another can encounter interference resulting from these fields.

Solar farms (including their ancillary infrastructure) have the potential to cause electromagnetic interference. Commercial equipment, such as solar panels, are subject to the relevant Australia regulations that determine the maximum allowable emissions limits to minimise interference impacts.

All infrastructures installed as part of the Project will comply with the relevant emissions standards. Consultation with telecommunications and other radiocommunications license holders in the area will be would be undertaken during the further design stages of the project.

AVIATION SAFETY

The main potential impact to aviation safety presented by the Chaff Mill Solar Farm is glare, although panels are designed to absorb rather than reflect energy (including light energy). Based on the proximity of the project to aviation operations and the findings of previous studies, any impacts are expected to be minimal. Communication with aviation operators in the region, via a Notice to Airmen would be undertaken to ensure they are aware of the project.

SUMMARY

The statutory planning assessment undertaken for the project found that the proposed development of a solar farm is consistent and not at variance with the relevant policy provisions set out in the Clare and Gilbert Valleys Council Development Plan (Consolidated 10 November 2016) and that the project warrants the granting of Development Plan Approval.

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1 INTRODUCTION

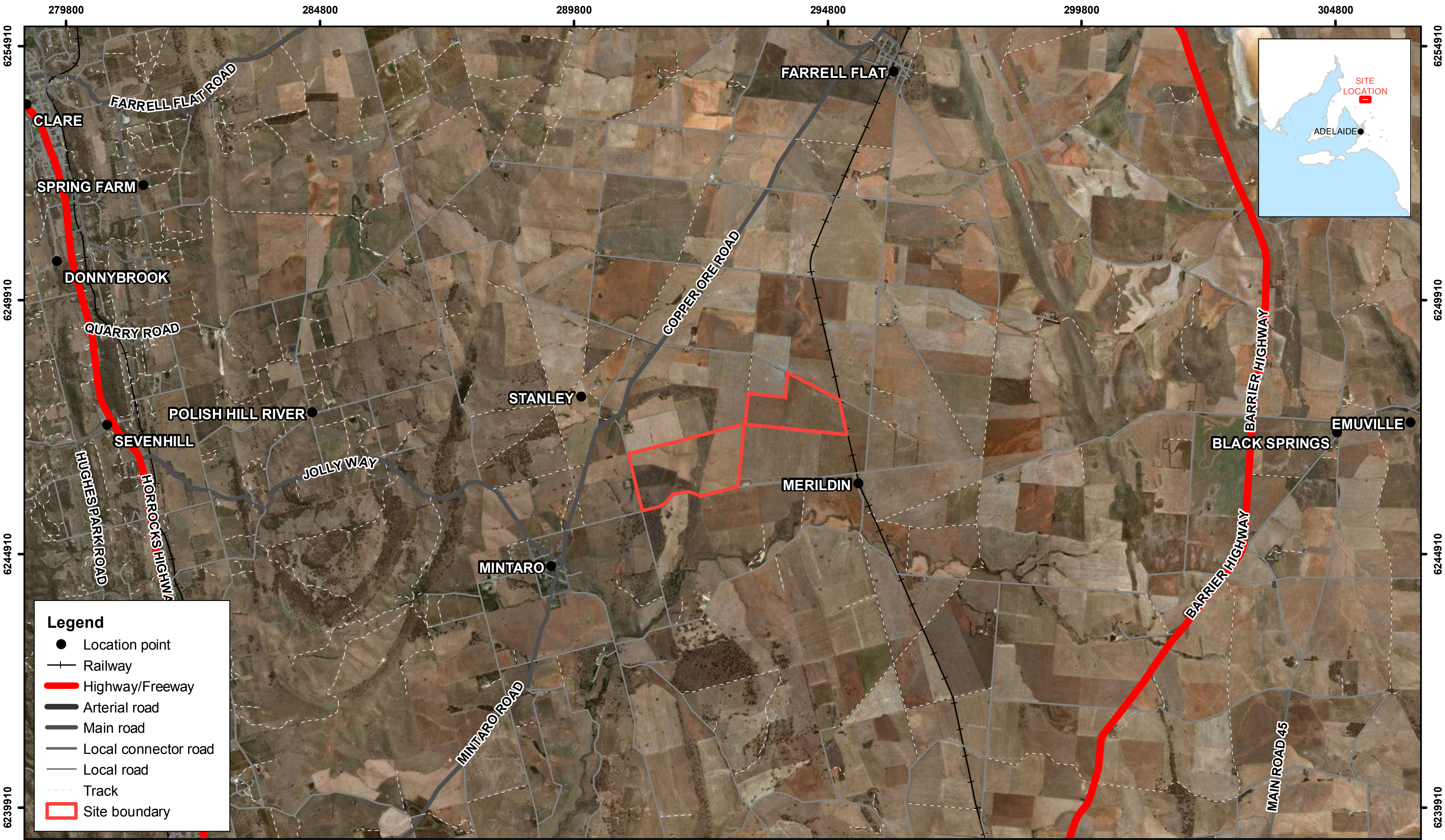
1.1 THE CHAFF MILL SOLAR FARM PROJECT

Australian solar development company FRV Services Australia Pty Limited (FRV) is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia (Figure 1.1 and). The proposed 100 MW solar farm would be developed on a 380 hectare (HA) site adjacent to the existing Mintaro substation and its 132 kilovolt (kV) transmission line to Waterloo. The project will capture solar energy and generate approximately 250,000 MWh of clean, zero emission electricity each year through the latest in solar energy generation technology. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

A Development Application is being submitted to the relevant authority, the State Commission Assessment Panel (SCAP). To support the planning approval process, a number of specialist technical studies have been undertaken.

Photo 1.1 Photo of the proposed site taken from the intersection of Wookie Creek Road and Merildin Road, Stanley

Photo 1.2 Photo of the proposed site taken from the intersection of Wookie Creek Road and Copper Ore Road, Stanley



Map: PS103225_GIS_003_D	Author: pottsr
Date: 28/05/2018	Approved by: EFitzner

0 1,000 2,000 m

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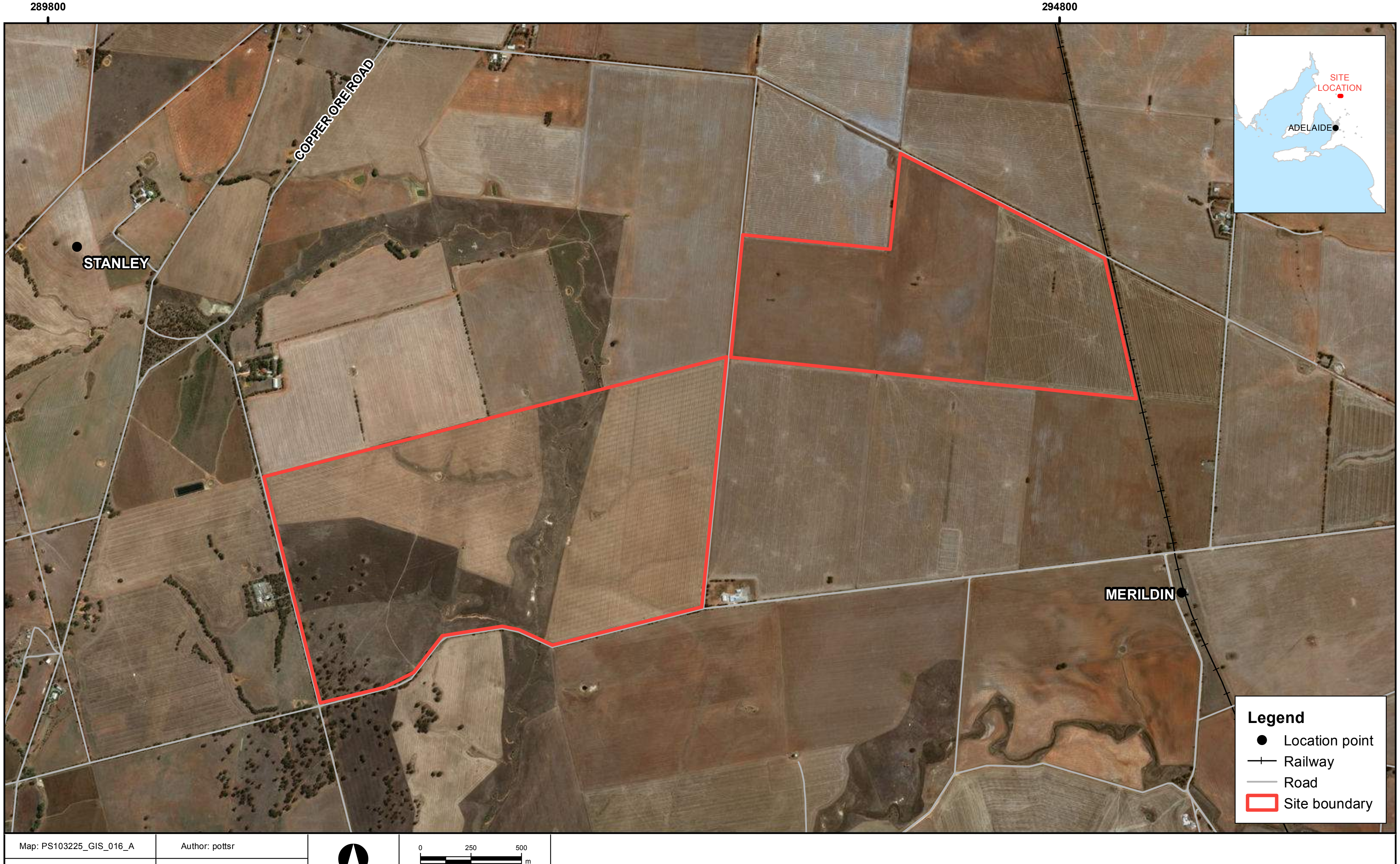
Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 1.1
Location plan



Map: PS103225_GIS_016_A	Author: pottsr
Date: 19/03/2018	Approved by: EFitzner

1:25,000

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 1.2
Site Layout Plan

1.2 SCOPE OF THIS DOCUMENT

The scope of this document is to provide an assessment of the proposal against the provisions of the Clare and Gilbert Valleys Council Development Plan, the *Development Act 1993* and *Development Regulations 2008.* Relevant aspects of the *Planning, Development and Infrastructure Act 2016* (PDI Act) have also been considered.

1.3 STRUCTURE AND CONTENT OF THIS REPORT

This report contains the necessary information for the assessment of a Development Application, pursuant to the *Development Act 1993, Development Regulations 2008* and the relevant Development Plans and Council requirements.

1. **Section 1 – *Introduction*** provides an overview of the proposal, the approval process, including approvals under Commonwealth legislation and ancillary approvals and the proponent.
2. **Section 2 – *Strategic context*** provides an overview of the rationale for the proposal and outlines the project's consistency with Commonwealth and State targets, guidelines and strategic directions. It also outlines the key benefits associated with the construction and operation of the project.
3. **Section 3 – *Alternatives considered*** provides an overview of the alternatives considered in developing the proposal to minimise potential impacts and how the current proposal was reached.
4. **Section 4 – *Project site*** provides an overview of the existing site locality and existing infrastructure present.
5. **Section 5 – *Project description*** describes the details of the proposed development, including key components of the proposal, capital investment and the power purchasing agreement.
6. **Section 6 – *Key stakeholder consultation*** provides an overview of the key stakeholders for the proposal, the consultation activities undertaken to date and the issues raised by stakeholders.
7. **Section 7– *Environmental assessment*** details the results of the environmental assessments completed for the proposal, including; statutory planning, flora and fauna, Aboriginal cultural heritage, non-Indigenous heritage, visual amenity, glare, geotechnical, traffic and access, stormwater and flooding, socio-economic, site contamination, micro-climate, electro-magnetic interference (EMI) and aviation safety issues.
8. **Section 8 – *Construction, operation and decommissioning*** has been structured to provide details on how the project will generally be managed during the construction and operation phase. These details include fire / bushfire management, emergency management, site security and safety and biosecurity measures.
9. **Section 9 – *Conclusion and recommendations*** concludes the assessment, reviewing the development against the provisions of the Clare and Gilbert Valleys Council Development Plan, the *Development Act 1993* and *Development Regulations 2008.*
10. **Section 10 – *Limitations*** identifies the limitations of the assessment undertaken for this proposal.

1.4 APPROVAL PATHWAY

The *Development Act 1993* and *Development Regulations 2008* are the main pieces of legislation facilitating planning and development in South Australia. The *Development Act 1993* requires that Development Approval must be sought and obtained prior to undertaking any form of development, generally defined as a change in the use of land, building work or the division of an allotment (Attorney-General's Department 2014).

The project has secured Section 49 (Crown Development) status under the Development Act, with the Department of the Premier and Cabinet (DPC) providing sponsorship/endorsement.

The project is located within the jurisdiction of the Clare and Gilbert Valleys Council. Therefore, assessment of the project against the relevant provisions of the Clare and Gilbert Valleys Council Development Plan (consolidated 10 November 2016); and subsequent Development Approval, is required.

It is expected that referral to the following Prescribed Bodies / Referral Authorities will be required at a minimum:

- The Environment Protection Authority (EPA)
- Department Planning, Transport and Infrastructure (DPTI) (i.e. the Minister responsible for administering the *Highways Act 1926*)
- The Aboriginal Affairs and Reconciliation Division – Department State Development (AARD-DSD) (i.e. the Minister responsible for administering the *Aboriginal Heritage Act 1988*)
- The Native Vegetation Council (NVC) within the Department of Environment, Water and Natural Resources (DEWNR) (i.e. the Minister responsible for administering the *Native Vegetation Act 1991*)
- potentially; Heritage SA (i.e. the Minister responsible for administering the *Heritage Places Act 1993*).

The development of solar farms and their ancillary infrastructure is not listed as complying or non-complying development within the relevant Development Plan zone. Therefore, the project must be assessed on its merits against the relevant objectives and principles of development control.

It should be noted that there is a possibility that a land division may be lodged in the future, over a portion of one of the allotments on the project site. Land division within the Primary Production Zone is generally not envisaged, and considered non-complying except where it does not create additional allotments or where it is a boundary realignment resulting in allotments of at least 40 hectares. Whilst discussions of a potential land division are still in early stages, the proponent is considering scenarios in which a land division could further support the economically efficient use of the land for public infrastructure – in giving the operator autonomy and greater security over the portion of the land to be used for the solar farm substation – whilst not threatening the continued use or productivity of surrounding land for primary production activities envisaged under the zone.

1.5 OTHER APPROVALS

Other environmental approvals, authorisations and permits may be required in both the pre-construction and construction phases of the project under the following acts of legislation:

- *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act)
- *Development Act 1993*
- *Environment Protection Act 1993*
- *Natural Resources Management Act 2004* (NRM Act)
- *Native Vegetation Act 1991*
- *National Parks and Wildlife Act 1972* (NPW Act)
- *Aboriginal Heritage Act 1988*
- *Native Title Act 1993.*

1.5.1 EPBC RISK ASSESSMENT

Under the EPBC Act, proponents proposing an action that may have a significant impact on a Matter of National Environmental Significant (MNES), or occurring on Commonwealth Land, must prepare a referral that will help the Commonwealth decide whether the proposal is a controlled action and requires assessment and approval.

An EPBC risk assessment was completed for the Chaff Mill Solar Farm proposal to determine the likelihood of the proposal impacting on a MNES (Appendix A). This risk assessment found that of the nine MNES prescribed under the EPBC Act, there are three which could potentially trigger a Commonwealth assessment for the Chaff Mill Solar Farm project:

- Nationally threatened species and ecological communities
- Migratory species protected under international agreements
- National Heritage Places.

The EPBC risk assessment process was informed by a desktop assessment, including generation of an EPBC Act Protected Matters Report, Biological Database of South Australia (BDBSA) data and results from the flora and fauna survey undertaken for the project by EBS Ecology (Appendix G). A non-Indigenous Heritage report was also written for the project and identifies National Heritage Places within Mintaro and surrounds (Appendix I).

No EPBC Act listed flora species or ecological communities were observed during the flora and fauna survey however three nationally threatened species were identified as potentially occurring within the project area:

- *Dodonaea procumbens* (Trailing Hop-bush)
- Pygmy Blue-tongue Lizard (PBLT) (*Tiliqua adelaidensis*)
- Flinders Ranges Worm-lizard (FRWL) (*Aprasia pseudopulchella*).

The flora and fauna report and EPBC risk assessment found that, based on the EPBC Act Significant Impact Guidelines, the project is not considered to have a significant impact on any EPBC Act listed flora, fauna or ecological communities, for the following reasons:

- No Threatened Ecological Communities (TEC) were identified within the project area
- No EPBC listed flora species were detected or considered likely to occur within the project footprint, based on available habitat
- No EPBC listed fauna species were detected during the survey or considered likely to occur.

The EPBC risk assessment also involved a review of solar farm projects that have been referred to the Commonwealth Environment Minister under the EPBC Act from 2016-2017. In this period, 17 (seventeen) solar farms have been referred. Of these projects, 12 (twelve) were assessed as ‘not a controlled action’, meaning that approval is not required if the action is taken in accordance with the referral. Four were assessed as ‘not a controlled action if undertaken in a particular manner’, meaning that approval is not required if the action is taken in accordance with the manner specified. One project is currently open for Public Comment, with the referral decision pending. These previous referrals illustrate that projects of a similar nature and scale to the Chaff Mill Solar Farm have been considered not to have a significant impact on MNES.

The risk assessment considered submission of a referral under the EPBC Act for the Chaff Mill Solar Farm project to be unnecessary due to:

- The existing land use of the site – the project area has been cleared and farmed for more than 100 years
- A lack of threatened species recorded during the flora and fauna survey
- A lack of threatened species recorded in the BDBSA
- A lack of key habitat for threatened species within the project area
- The nature of the proposed development
- The distance to National Heritage Places
- The ability to manage and mitigate potential impacts through a detailed Construction Environmental Management Plan (CEMP).

1.5.2 ANCILLARY APPROVALS

The construction of the project will be subject to secondary and ancillary environmental and project approvals under predominantly State-based legislation, including:

- A range on Environmental Authorisations (e.g. licence for earthworks drainage) for prescribed activities under the *Environment Protection Act 1993*
- Potential approvals under the *Aboriginal Heritage Act 1988* (refer section 7.3 and Appendix H)
- Applications to remove native vegetation under Regulation 12(34) – Infrastructure or Regulation 12(27) – Major Projects exemptions of the *Native Vegetation Act 1991* (refer section 7.2 and Appendix G)
- Permits under Sections 79 and 80 and Regulations 33-46 of the *Fire and Emergency Services Act 2005*
- Wells, groundwater and water-related permits under the *Natural Resources Management Act 2004*
- Road transport permits under the *Road Traffic Act 1961*
- Dangerous Goods Licences under the *Dangerous Substances Act 1979*.

1.6 THE PROPONENT

The proponent for the Chaff Mill Solar Farm project is FRV Services Australia Pty Ltd. FRV have constructed two solar farms in Australia since 2010, including the Moree Solar Farm located in northern New South Wales and the Royalla Solar Farm in the Australian Capital Territory. Current projects being constructed include the 100 MW Clare Solar Farm and the 100 MW Lilyvale Solar Farm in Queensland. FRV's parent company, Fotowatio Renewable Ventures, has developed and operated solar farms spanning 24 (twenty-four) countries and five continents (FRV 2017a). Further information about FRV is provided in Appendix B.

The FRV Project Manager for the Chaff Mill Solar Farm project is:

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Development Manager
FRV Services Australia Pty Limited

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This Development Application Report has been prepared by WSP Australia Pty Limited (WSP) on behalf of FRV. Contact details are as follows:

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2 STRATEGIC CONTEXT

2.1 PROJECT RATIONALE AND BENEFITS

2.1.1 PROJECT OBJECTIVES

The Chaff Mill Solar Farm would further the development of the Australian clean energy industry and make a significant contribution to South Australia's energy production and stability of supply.

2.1.2 BROAD PROJECT BENEFITS

The Chaff Mill Solar Farm would generate approximately 250,000 MWh of clean energy each year, equivalent to the annual consumption of 60,000 South Australian households.

The project would save approximately 132,500 tonnes of greenhouse gas emissions annually.

The Chaff Mill Solar Farm would contribute to the reliability and stability of South Australia's energy supply. It would also increase investment and jobs in renewable energy and contribute to South Australia's (particularly the Mid North region) reputation as a national leader in renewable energy and low carbon initiatives. The project would also meet the Commonwealth Government's commitment to the provision of adequate, reliable and affordable energy to meet future energy consumption needs and to underpin strong economic growth.

The project would contribute to achieving renewable energy objectives within local, State and Commonwealth level planning and energy policy documents. These objectives have been identified by the Clare and Gilbert Valley Council, the South Australian Government and the Commonwealth Government to strengthen the economy, provide a more reliable and clean source of energy and limit greenhouse gas emissions. These objectives are discussed in section 2.2 below.

2.1.3 LOCAL PROJECT BENEFITS

The Chaff Mill Solar Farm offers direct and indirect economic benefits to the local community through employment, investment and tourism opportunities.

The project would employ up to five full-time workers during operation. This workforce would be drawn from the local area where possible, providing local jobs and increased security to the local economy, an opportunity to increase the working-age population of the region and diversify employment in the area.

The Yorke and Mid North Region is becoming well known for renewable energy. The world's largest lithium battery project recently built in Jamestown to store power generated by renewables achieved recognition on a global scale. During operation, the solar farm would potentially draw visitors to the area, including scientific and academic visitors, therefore providing opportunities to increase tourist accommodation and services in the food, retail and tourism sectors.

2.2 GOVERNMENT STRATEGIC CONTEXT

2.2.1 COMMONWEALTH GOVERNMENT

The construction of the Chaff Mill Solar Farm would support the Commonwealth's 2030 climate change target under the Paris Agreement (2015) to reduce emissions to 26-28% of 2005 levels by 2030.

2.2.1.1 RENEWABLE ENERGY TARGET SCHEME

The Renewable Energy Target (RET) is an Australian Government scheme designed to reduce emissions of greenhouse gases in the electricity sector and encourage the generation of electricity from sustainable and renewable sources.

Australia's RET aims to deliver more than 23% (approximately 33,000 Gigawatt hours) of Australia's electricity from renewable sources by 2020. The RET peaks in 2020 and runs until 2030.

The RET creates a financial incentive for the establishment or expansion of renewable energy power stations, such as solar farms, through legislating demand for Large-scale Generation Certificates. Renewable energy power stations create a certificate for every megawatt hour of power generated. These certificates are purchased by electricity retailers and submitted to the Clean Energy Regulator to meet the retailers' legal obligations under the RET (DoEE 2017).

The Chaff Mill Solar Farm would be eligible to apply for accreditation to create and sell large-scale generation certificates under the Large-scale Renewable Energy Target Scheme.

2.2.1.2 INDEPENDENT REVIEW INTO THE FUTURE SECURITY OF THE NATIONAL ELECTRICITY MARKET

The Independent Review into the Future Security of the National Electricity Market (Finkel Review) was released in June 2017. The Finkel Review proposed 50 (fifty) recommendations for energy development to deliver on four key outcomes; increased security, future reliability, reward consumers and lower emissions.

The Council of Australian Governments (COAG) Energy Council has agreed on a timeline to implement 49 (forty-nine) of the recommendations from the Finkel Review. The recommendation for a Clean Energy Target (recommendation 3.2) has not been adopted. The Clean Energy Target would be implemented from 2020 and continue in the long-term to incentivise new low emissions forms of energy generation to enter the market. In late 2017, the federal government proposed the National Energy Guarantee as an alternative policy to the Clean Energy Target (CET) recommended by the Finkel Review. The National Energy Guarantee provides both a reliability and emissions guarantee:

- The reliability guarantee requires electricity retailers to invest in enough dispatchable energy resources (coal, gas, hydro, battery storage) to cover a set percentage of their peak load in each region
- The emissions guarantee requires electricity retailers to meet a defined emissions level for the electricity they purchase from the wholesale market.

The National Energy Guarantee is currently under consultation.

The Chaff Mill Solar Farm will contribute to the supply of renewable energy to lower emissions in the long-term, beyond the RET.

2.2.2 STATE GOVERNMENT

The Chaff Mill Solar Farm would contribute towards achieving South Australia's decarbonisation targets, including:

- 50% of electricity produced from renewable sources by 2025
- $10 billion investment in low carbon generation by 2025
- Achieving net zero emissions by 2050
- Establishing Adelaide as the world's first carbon neutral city.

An overview of relevant South Australian State legislation and policies is provided below.

2.2.2.1 SOUTH AUSTRALIA'S STRATEGIC PLAN, 2011

South Australia's Strategic Plan (SASP) is an overarching, cross government plan setting out the State's strategic goals and targets. The renewable energy target within SASP has already been exceeded and has since been updated by the State Government. Strategic goals and targets within SASP relevant to the Chaff Mill Solar Farm are outlined in Table 2.1.

Table 2.1 Strategic goals and targets within SASP relevant to the Chaff Mill Solar Farm

TARGET	STATUS OF TARGET	PROJECT CONTRIBUTION
Target 46: Regional population levels Increase regional populations, outside of Greater Adelaide, by 20,000 to 320,000 or more by 2020.	The population the Yorke and Mid North region has increased by 5% from the 2010 baseline data.	The construction and operation of the Chaff Mill Solar Farm would generate short and long-term employment opportunities within the local area and help to stimulate and maintain population growth in the region.
Target 47: Jobs Increase employment by 2% each year from 2010 to 2016	In October 2017, the annual employment growth rate was 1.5% (increased by 0.1% from the 2010 baseline of 1.4%).	The Chaff Mill Solar Farm would create up to 200 jobs during construction and approximately five ongoing full-time equivalent roles during operation.
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.	South Australia has achieved its Kyoto target of restricting emissions levels to less than 36.4 Mt CO2-e through to 2012 (Department of the Premier and Cabinet 2017).	The Chaff Mill Solar Farm would avoid the production of 132,500 t of CO^2 each year.
Target 64 – Renewable energy Support the development of renewable energy so that it comprises 33% of the State's electricity production by 2020.	The result for 2016-17 (48.9%) exceeds the target of 33% to be achieved by 2020.	The Chaff Mill Solar Farm would contribute 250,000 MWh into the South Australian grid each year.
Target 65 – GreenPower Purchase renewable energy for 50% of the Government's own electricity needs by 2014.	This commitment is currently being deferred. The reinstatement of GreenPower purchases is open to Government consideration in future budget processes (Department of the Premier and Cabinet 2017).	The Chaff Mill Solar Farm would increase the amount of renewable energy available for use in this program if this commitment is reinstated.
Target 66 – Emissions intensity Limit the carbon intensity of total South Australian electricity generation to 0.5 tonnes of CO^2/MWh by 2020.	In 2015, the carbon intensity of South Australian electricity generation was 0.43 tonnes of carbon dioxide equivalents emitted per megawatt hour (excluding interstate trade) (Department of the Premier and Cabinet 2017).	The Chaff Mill Solar Farm would avoid the production of 132,500 t of CO^2 each year.

2.2.2.2 SOUTH AUSTRALIAN PLANNING STRATEGY

The South Australian Planning Strategy specifies the planning and development activities that are needed to support the achievement of the SASP targets within each region of the State. The South Australian Planning Strategy is comprised of the 30-Year Plan for Greater Adelaide (covering metropolitan and peri-urban Adelaide) and Region Plans (covering the regional and remote parts of the State).

The Mid North Region Plan volume of the South Australian Planning Strategy seeks to enhance the development of renewable energy. Table 2.2 outlines the relevant principles and policies within the Mid North Region Plan.

Table 2.2 Principles and policies within the Mid North Region Plan relevant to the Chaff Mill Solar Farm

PRINCIPLE	POLICIES
Principle 4 Create the conditions for the region to adapt and become resilient to the impacts of climate change	**Policy 4.4** Provide for the development of alternative and innovative energy generation (for example, wind, solar, marine, biomass and geothermal technologies) and water supply facilities, as well as guidance on environmental assessment requirements.
Principle 5 Protect and build on the region's strategic infrastructure	**Policy 5.7** Identify land suitable to accommodate renewable energy development, such as wind farms.

2.2.2.3 STRATEGIC INFRASTRUCTURE PLAN FOR SOUTH AUSTRALIA, 2010 DISCUSSION PAPER

The Strategic Infrastructure Plan for South Australia (SIPSA) identifies strategic infrastructure priorities for 2005-2015. The 2010 Discussion Paper was prepared to initiate the preparation of an update to the SIPSA (currently underway). The Discussion Paper presents long-term strategic priorities to guide infrastructure development over the next 10-15 years and beyond. The Discussion Paper asserts that the government remains strongly committed to reducing greenhouse gas emissions by promoting the uptake of renewable energy and increasing efficiency of energy use. A strategic priority for the energy sector relevant to the Chaff Mill Solar Farm is to foster research and development and fast take-up of technological advances in renewable energy supply and use.

2.2.2.4 CLIMATE CHANGE AND GREENHOUSE EMISSIONS REDUCTION ACT 2007

The *Climate Change and Greenhouse Emissions Reduction Act 2007* sets out three targets:

- 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 as part of a national and international response to climate change
- Increase the proportion of renewable electricity generated so it comprises at least 20% of electricity generated in the State by 31 December 2014
- Increase the proportion of renewable electricity consumed so that it comprises at least 20% of electricity consumed in the State by 31 December 2014 (DEWNR 2017).

The renewable energy generation and consumption targets under this legislation have been exceeded and have since been updated by the State Government.

2.2.2.5 SOUTH AUSTRALIA'S CLIMATE CHANGE STRATEGY 2015-2050

South Australia's Climate Change Strategy 2015-2050 sets a framework for achieving the emissions reduction targets and building resilience against the impacts of climate change. The uptake of renewable energy features in several of the priority actions and recommendations outlined in the strategy.

2.2.2.6 A LOW CARBON INVESTMENT PLAN FOR SA, 2015

The Low Carbon Investment Plan for SA outlines four key strategies to achieve $10 billion in low carbon investment and 50% of electricity production by renewable energy by 2025.

2.2.2.7 OUR ENERGY PLAN, 2017

Our Energy Plan contains strategies to provide the State Government with greater local control of energy security. Of relevance to the project is the Plan's new energy security target to increase South Australia's energy self-reliance by requiring more locally generated, cleaner, secure energy to be used in South Australia.

2.2.2.8 LIBERAL ENERGY SOLUTION

The Liberal Energy Solution outlines six key reforms to be delivered through strategies under the policy:

- A single comprehensive national energy strategy
- Strengthening the network
- Making storage work
- Modernising the National Electricity Market (NEM)
- Improving retail competition and protecting vulnerable consumers; and
- Rewarding consumers for managing their own electricity demand (Marshall Liberal Team 2017).

The Chaff Mill Solar Farm aligns with relevant reforms and strategies under the Liberal Energy Solution, as outlined in Table 2.3.

Table 2.3 Reforms and Strategies within the Liberal Energy Solution relevant to the Chaff Mill Solar Farm

REFORM	RELEVANT STRATEGIES	RELEVANCE TO CHAFF MILL SOLAR FARM
Strengthening the network	Establish a $200 million Interconnection Fund, with the delivery of an interconnector between South Australia and New South Wales.	The Chaff Mill Solar Farm would generate 250,000 MWh of clean energy each year for use in South Australia, or contributed to the NEM.
Making storage work	Establish a $50 million Grid Scale Storage Fund. New Variable Renewable Energy (VRE) generation will be required to bring forward dispatchable capacity.	The Chaff Mill Solar Farm incorporates a Battery Energy Storage System (BESS), to be installed on site. The 50 MW/100 MW BESS is designed to provide further stability to this part of the electricity grid and may be eligible for the Grid Scale Storage Fund. Through the BESS, the Chaff Mill Solar Farm will have significant dispatchable capacity.
Modernising the NEM	Contribute $10 million towards integrating distributed generation assets into the network.	The Chaff Mill Solar Farm will contribute to broadening the range of generation which can be called upon during times of peak demand.

2.2.3 *LOCAL COUNCIL*

The Clare and Gilbert Valleys Council Strategic Plan 2020 identifies various outcomes, strategies, success measures and targets for the region under a range of key priority areas. A strategy within the plan is the *encouragement of alternative renewable energy production whilst protecting important landscapes from inappropriate development.*

2.3 ASSESSMENT GUIDELINES

The following guidelines were consulted in the assessment for the Chaff Mill Solar Farm:

- South Australian Planning Requirements for New Electricity Generation, July 2014
- Guide to Commercial Scale Solar Development in South Australia, September 2014
- NSW Government Draft Large-Scale Solar Energy Guideline, November 2017.

The Chaff Mill Solar Farm would be developed in accordance with the requirements of these guidelines (as relevant to South Australia). Previous solar farm studies were also reviewed to ensure potential assessment requirements were addressed.

3 ALTERNATIVES CONSIDERED

3.1 TRADITIONAL ENERGY SOURCES

In South Australia, both renewable and non-renewable sources are used to generate electricity. Natural gas-fired generation is the main non-renewable source of energy generated in South Australia. A small amount of the State's electricity supply also comes from diesel-fired power stations (Government of South Australia 2018).

South Australia's gas supply is sourced from Victoria, Queensland and the Cooper Basin (Government of South Australia 2018). The eastern Australia gas market is increasingly reliant on coal seam gas and shale gas and over the past 10 years, the retail price of gas for households has increased by 8% a year (Engineers Australia 2017). While gas-fired generation has lower emissions than coal, sourcing significant quantities of energy from gas is unlikely to achieve the greenhouse gas emission reduction levels required (Engineers Australia 2017). The lowest cost, low emission generation scenarios in 2050 source less than 20% of energy from gas with the remaining energy sourced from renewables (Engineers Australia 2017).

3.2 ALTERNATIVE SITE LOCATIONS

FRV began assessing properties near the Mintaro substation in 2016, as an investigation into the area indicated that there was sufficient capacity to connect a 100MW generator into that part of the grid. FRV then contacted landowners in relation to properties in the area that fulfilled various initial conditions, including:

- Sufficient area to accommodate a large-scale project
- Proximity to existing electrical grid infrastructure
- Sufficient levels of average irradiation
- Land relatively clear of native vegetation.

Site selection considerations identified in the assessment guidelines outlined in section 2.3 were consulted in the final selection of the site for the proposed Chaff Mill Solar Farm. Previous solar farm studies were also reviewed to identify any additional issues that require consideration. A brief review of the proposed site against key selection considerations is presented in Table 3.1. Further information on the environmental considerations is provided in section 7.

Table 3.1 Review of the proposed Chaff Mill Solar Farm site against key selection considerations

KEY SITE SELECTION CONSIDERATIONS	SITE DESCRIPTION
Solar resources	Solar irradationis sufficient for a solar farm, based on insulation levels and site solar access (orientation, configuration and topography).
Proximity to grid infrastructure	The selected site is well-placed to capture and export solar energy into the national electricity grid from the nearby Mintaro substation and its existing 132 kV transmission line to Waterloo.
Native vegetation	The site is largely cleared of native vegetation. There is a large patch or remnant Eucalypts in the western parcel however impacts to remnant vegetation will be minimised through appropriate infrastructure placement.
Access and road connections	The site is located between two major arterial roads; 13 km west of the Barrier Highway (A32) and 8 km east of the Horrocks Highway (the B82 -Main North Road). These roads are sealed two-lane undivided roads. There are six heavy vehicle route options to the site.

KEY SITE SELECTION CONSIDERATIONS	SITE DESCRIPTION
Community	The Chaff Mill Solar Farm would create up to 200 job opportunities during construction and approximately five full-time equivalent roles during operation. These positions will be filled locally where possible. The Chaff Mill Solar Farm would deliver additional indirect economic opportunities to local businesses.
Local and State government support	The Chaff Mill Solar Farm received sponsorship from the Department of the Premier and Cabinet. The development of a solar farm within the area is supported by the strategic plan of the Clare and Gilberts Valleys Council.
Geology and hydrology	The site is moderately well-drained and is unlikely to remain wet for more than a week at a time. Studies have confirmed that surface water flows associated with the Wakefield River and Broughton River catchments and Wookie Creek do not present an unacceptable flood risk. Preliminary geotechnical studies have identified that the site is geotechnically stable, subject to intrusive investigations.
Site contamination	The historical land use is agricultural. Preliminary site investigations have not identified significant contamination issues for the proposed use of the site.
Visual impact	The visual impact assessment undertaken for this project has demonstrated that the likely visual impact on nearby sensitive receptors can be mostly managed though vegetative screening.
Cultural heritage	Initial surveys have not identified Aboriginal cultural heritage sites within or immediately adjacent the project site.
Land availability	The current land owner is supportive of the project and willing to sell the land to FRV.
Decommissioning and rehabilitation	The solar farm will have an operating life of approximately 30 years. On decommissioning, the site will be rehabilitated with a suitable grass cover. The minimal native vegetation clearance required for the project will be offset separately.

4 PROJECT SITE

4.1 SITE LOCATION

The proposed Chaff Mill Solar Farm is approximately 130 km north of Adelaide, located west of the Barrier Highway and east of Main North Road. The site is located approximately 3.5 km north-east of the Mintaro township in the Mid North Region of South Australia (Figure 1.1).

The site consists of two land parcels located to the east and west of Chaff Mill Road on approximately 380 HA of privately owned land. FRV has negotiated the purchase of this land with the existing landowner, subject to Development Approval. The western parcel is bounded by Merildin Road to the south, Wookie Creek Road to the west, Chaff Mill Road to the east and agricultural land to the north. The eastern parcel is bounded by Faulkner Road to the north, Chaff Mill Road to the west, agricultural land to the south and a rail line to the east. Further site information, including Certificate of Title information, is provided in Table 4.1 below.

Table 4.1 Site information for the proposed Chaff Mill Solar Farm

SITE ADDRESS	159 HARE ROAD, MINTARO, SA, 5415
TITLE REFERENCE	CT Volume 6081 Folio 22 CT Volume 6128 Folio 159 CT Volume 6128 Folio 160
PROPERTY DESCRIPTION	Allotments 114-117, Filed Plan F170301 Allotments 3 and 4, Deposited Plan D12560 In the Area named Stanley Hundred of Stanley
PROPERTY OWNER	Arapunya Investments Pty Ltd (6081/22) Martindale Farm Pty Ltd (6128/159 and 6128/160)
COUNCIL ZONING	Primary Production (PrPro)
CURRENT SITE USE	Agricultural
PROPOSED SITE USE	Commercial/Industrial
LAND AREA	Approximately 380HA

4.2 LAND MANAGEMENT/TENURE

The allotments outlined in Table 4.1 have been secured by an option agreement with the landowner that allows for the sale of the land once the project has obtained Development Approval and reached financial close.

4.3 SITE DESCRIPTION

The site is in an agricultural area and is largely cleared of native vegetation, containing grazing and cropping land. There is a large patch of remnant Eucalypts in the south-western corner of the western parcel where the land is too steep to cultivate. The roadside vegetation surrounding the site contains amenity plantings with some remnant native woodland and shrubland.

The western parcel includes low hills, with the highest and steepest area on the western side and the lowest area at Wookie Creek. The eastern parcel is of gentle undulation. The topography of the site ranges from 400-430 m above sea level. Wookie Creek, running north to south through the western parcel, is degraded with limited native flora species present.

Soil mapping for the site indicates sandy and clayey red-brown earths to be present, with dark brown cracking clay and terra rossa soils. The site is moderately well-drained.

Both rainfall and temperature follow a typical Mediterranean seasonal climate, with cool wet winter months and warm dry summer months. The long-term mean annual rainfall for the area is 633.7 mm, with June through to August typically the wettest months.

4.4 ZONING

The proposed site is located within the Primary Production Zone of the Clare and Gilbert Valleys Council.

4.4.1 PRIMARY PRODUCTION ZONE OF THE CLARE AND GILBERT VALLEYS COUNCIL

The desired character of the Primary Production Zone of the Clare and Gilbert Valleys Council promotes cropping and grazing activities on large rural land holdings and viticulture on small to medium sized allotments. The rural area is predominantly characterized by rolling pastures with stands of remnant vegetation with a variety of agricultural activities.

Solar farms are not mentioned in the Clare and Gilbert Valleys Council Development Plan however the development of wind farms and ancillary development are envisaged within the Primary Production Zone. The Development Plan recognises that wind farms may need to be built in visually prominent locations to maximise effectiveness and states that visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy. Solar farms provide comparable benefits and may also be accepted within this zone.

4.5 EXISTING INFRASTRUCTURE

Existing infrastructure and services at the site includes:

- The Mintaro Substation
- Unsealed roads bordering the project area.

4.6 ADJACENT AND SURROUNDING LAND USE

The adjacent and surrounding land use is largely agricultural, with some livestock and horticulture land use. The Mid North region contains some of the best agricultural and pastoral land in South Australia, with 78% of land used for either cropping or grazing (Figure 4.1).

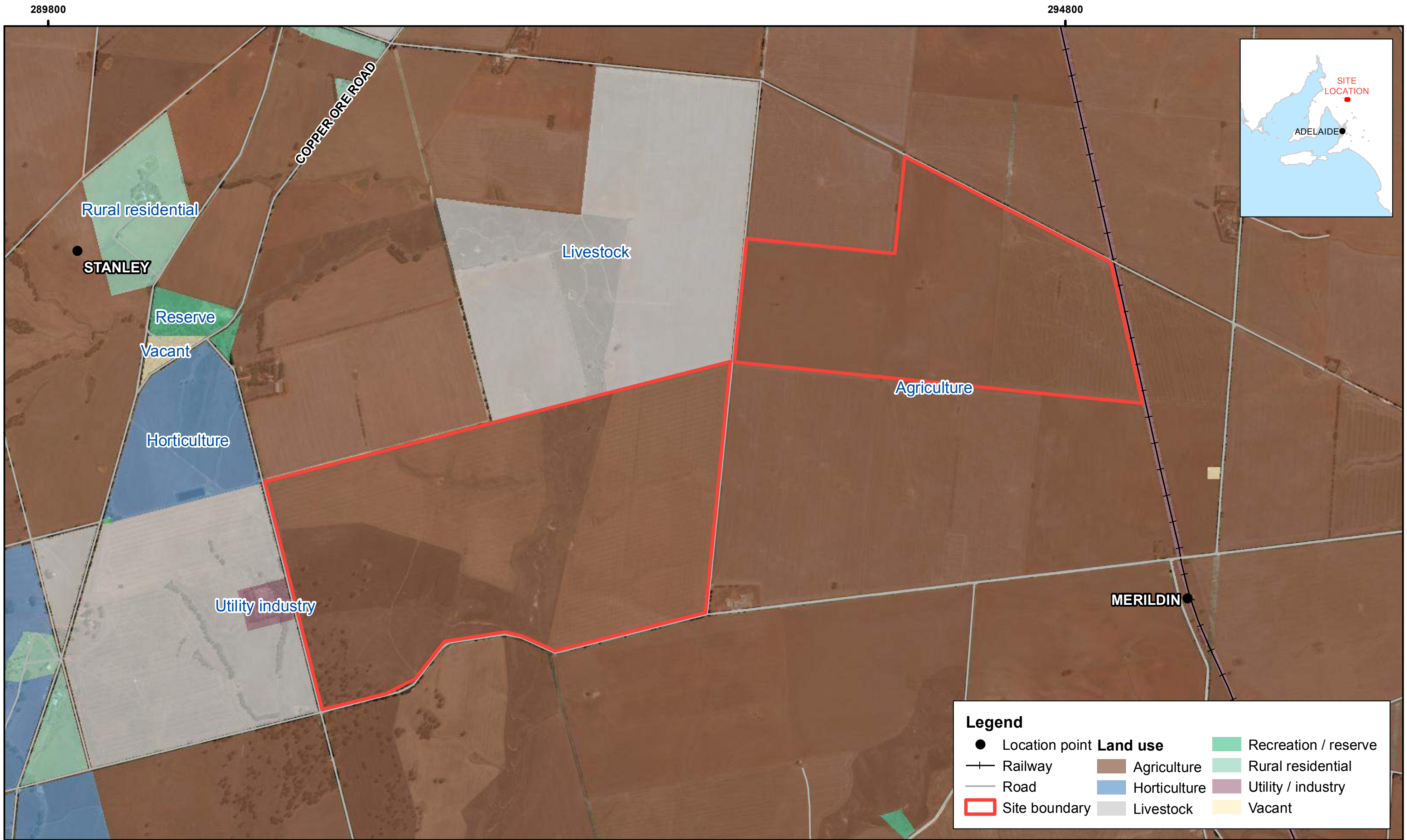
The site is adjacent the Mintaro substation (to the west) and the northern railway line (to the east).

4.7 BROADER SITE CONTEXT

The Chaff Mill Solar Farm is located within the Clare Valley in the Mid North region of SA. Within the region the land use is predominantly agricultural with some horticultural and livestock land use. The nearby township of Mintaro is a State Heritage Area and contains residential, rural residential, commercial, recreation, public institution and industry land uses. The Mintaro Quarry is located approximately 3 km south-west of the project area. Spring Gully Conservation Park and Martindale Hall Conservation Park are also located in the broader region.

The Mid North Region has a regional economy underpinned by primary production and processing, light industry and tourism activities, which reflect the region's variations in climate and landscapes (Department of Planning and Local Government 2011).

The region has significant geothermal, wind and wave energy potential and is well-placed in relation to power infrastructure and links to the eastern states (Department of Planning and Local Government 2011).



Map: PS103225_GIS_004_C	Author: pottsr
Date: 27/02/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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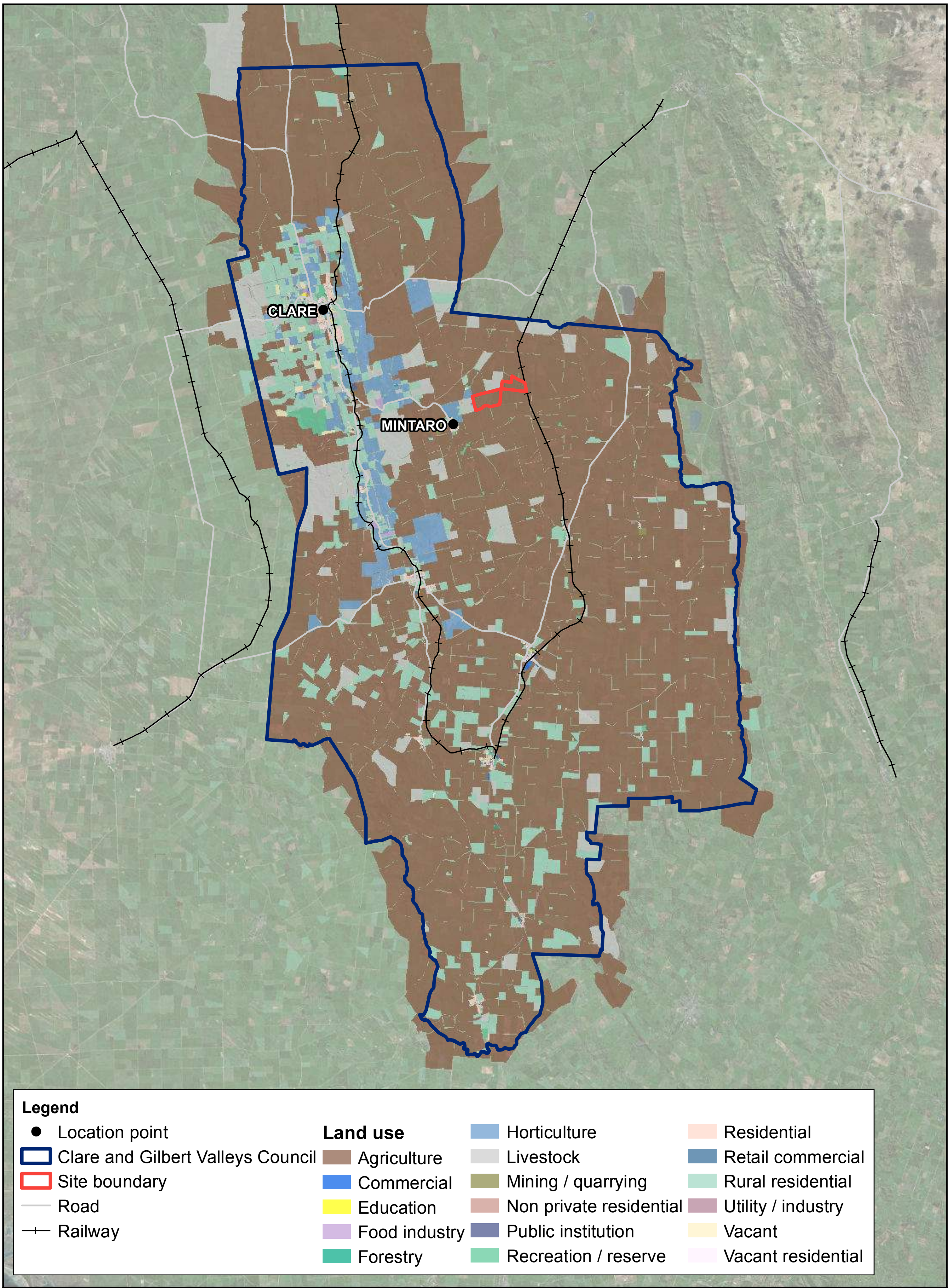
Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 4.1
Land use within the project area



Map: PS103225_GIS_005_D

Author: pottsr

Date: 16/03/2018

Approved by: EF

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate system: GDA 1994 MGA Zone 54
Scale ratio correct when printed at A4

Figure 4.2
Land use within the Clare and Gilbert Valleys Council

5 PROJECT DESCRIPTION

5.1 PROPOSED DEVELOPMENT

The proposed development is for the construction and operation of a 100 MW solar farm, on a 380-hectare site approximately 3.5 km north-east of Mintaro, South Australia. The solar farm could generate enough clean energy to power up to 60,000 South Australian homes.

5.1.1 KEY COMPONENTS OF THE PROPOSAL

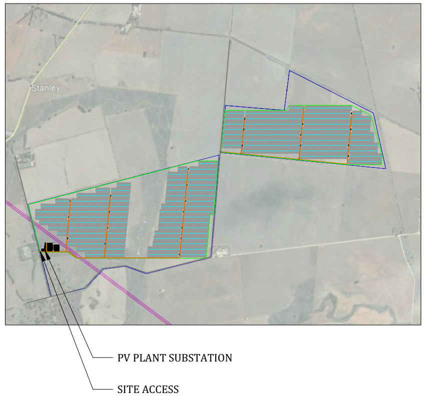
A general layout of the site is provided in Figure 5.1. Please note that this plan is indicative only and will be finalised following further detailed technical assessments and design; in line with the conditions of Development Approval (if granted). Key components of the proposal include:

- Approximately 360,000 solar panels (maximum height of 3 metres) mounted on single-axis tracker framing
- Inverter stations (MV) comprising 4 MW and 2.66 MW combined inverters
- 50 MW Battery Energy Storage Systems (BESS), comprising medium voltage delivery station and battery containers
- Substation (HV), containing a minimum 100 MVA transformer
- Overhead line (within site boundaries) from substation to existing 132 kV transmission line
- Modular site office/control building
- Structural foundations for on-site buildings (inverter stations, BESS, substation, control building)
- On-site parking
- Refuse storage area
- Internal access roads
- Perimeter security fencing
- Site access.

All components can withstand all climatic, aerodynamic and electrical induced loads during the operational design life, provided they are maintained in accordance with the manufacturers recommendations, as specified in the relevant International Electrotechnical Commission (IEC) standards.

PV PLANT SUMMARY "MINTARO"		
AC Power : 100 MWn		
Peak Power: 125,007 kWp		
25	Power Stations	
24	3 x Ingeteam 1600 TL B615 (50°C) - 3.996 MWac	
1	2 x Ingeteam 1600 TL B615 (50°C) - 2.664 MWac	
BESS Capacity: 50MW/100MWh		
362,340 Modules 345 Wp		
Area:	Fenced area	Fence length
	310.3 Ha	10,995 m

GEOGRAPHICAL COORDINATES	
Country	Australia
Coordinates (UTM 54H)	291839.02 m E, 6246667.96 m S
Altitude	420 m



LEGEND
Tracker (1P) x 60M
4 MWac Inverter/Transformer Station
2.66 MWac Inverter/Transformer Station
Fence
Overhead Line
Boundary
4m wide path (internal road)
Access to the PV Plant

COMMENTS / APPROVED — A1

REV.	DATE	DRAWN	DESIGNED	CHECKED	APPROVED	DESCRIPTION	VERIF.
00	180315	A.M.C	A.M.C	A.T.A	I.C		

PROJECT: MINTARO PV PLANT 100 MWac

TITLE: GENERAL LAYOUT

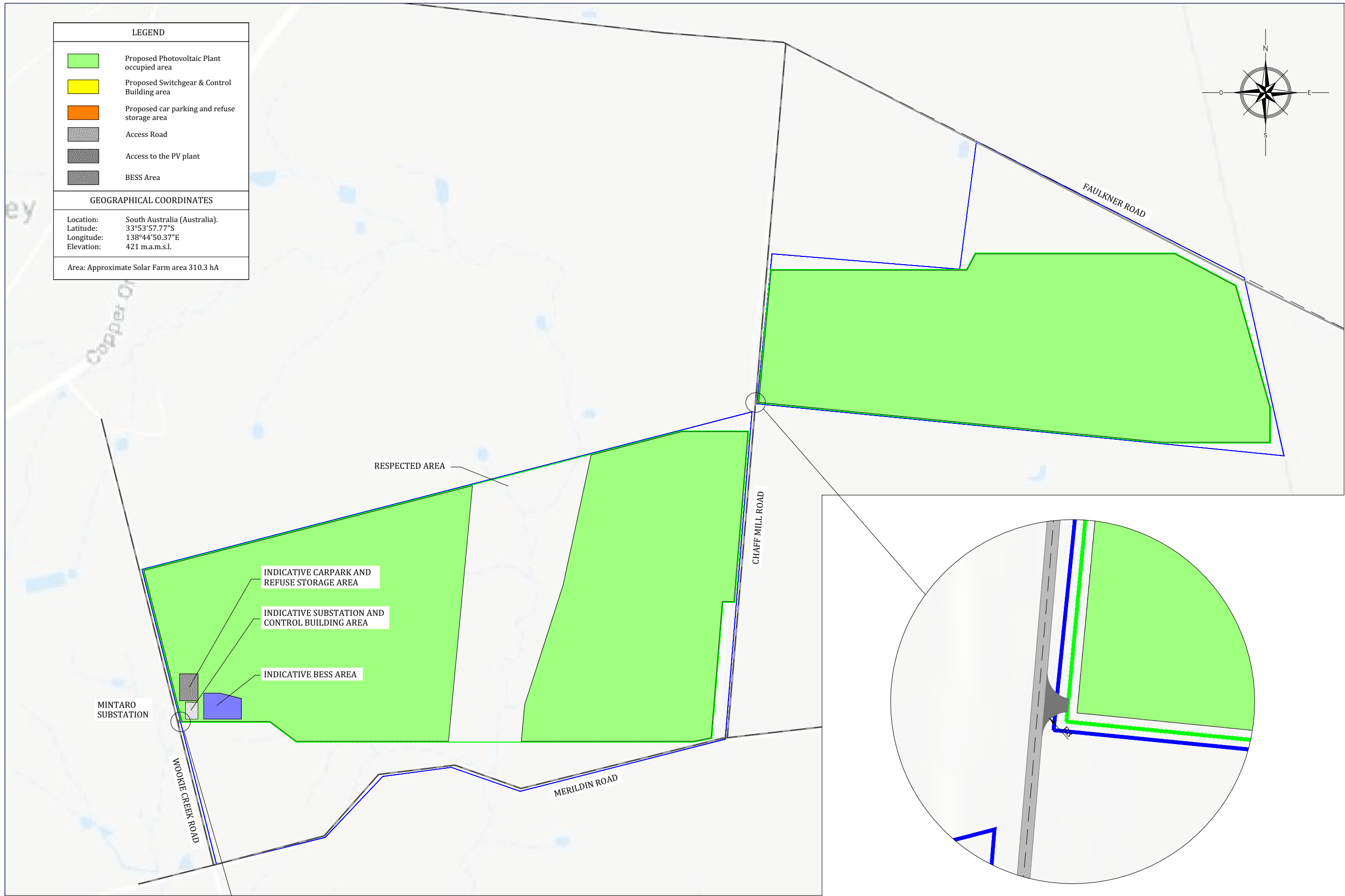
REF. N°:

SCALE 1:7500

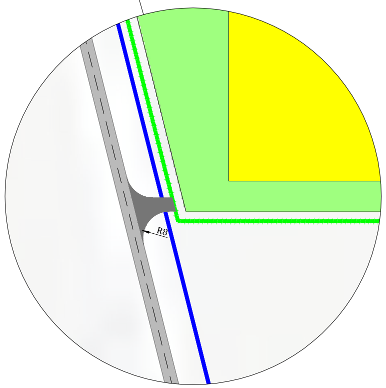
N° — 0 Rev.

SHEET 01 FOLLOWS –

180315-EP-MINTARO-PLNS-OP01-REV00.DWG



INDICATIVE SITE ACCESS DETAIL
Scale 1:750



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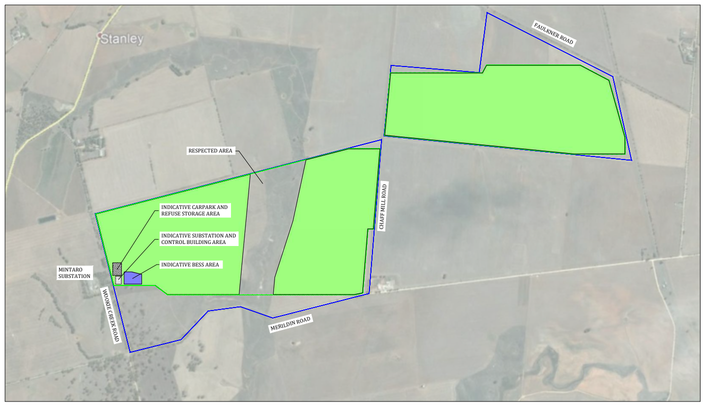
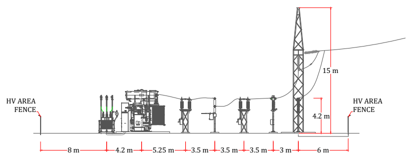
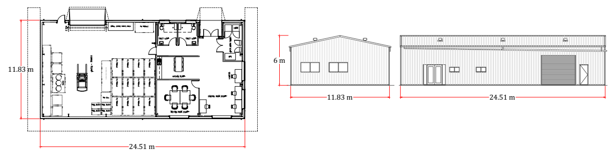


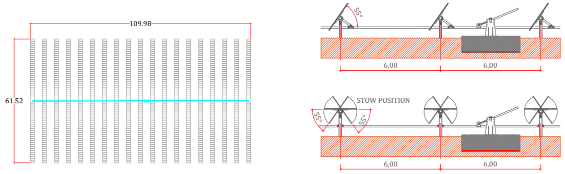
INDICATIVE SUBSTATION DIMENSIONS



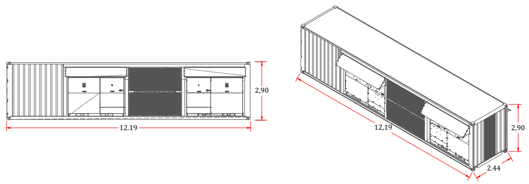
INDICATIVE CONTROL BUILDING DIMENSIONS



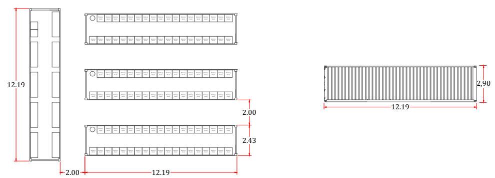
INDICATIVE PV PLANT ARRAY DIMENSIONS



INDICATIVE INVERTER BUILDING DIMENSIONS



INDICATIVE BESS DIMENSIONS



COMMENTS / APPROVED							A1
00	180315	A.M.C	A.M.C	A.T.A	I.C		
REV.	DATE	DRAWN	DESIGNED	CHECKED	APPROVED	DESCRIPTION	VERIF.

	PROJECT MINTARO PV PLANT 100 MWac	
TITLE GENERAL LAYOUT		REF. N°: SCALE N° — 0 Rev. SHEET 01 FOLLOWS –

180315-EP-MINTARO-INDICATIVE DIMENSION PLNS -OP01-REV00.DWG

5.1.1.1 CRYSTALLINE SOLAR PANELS AND TRACKING SYSTEM

Around 360,000 panels will be needed for the project. Crystalline solar panels will likely be used, which are comprised of multiple silicon cells. The panels themselves will be mounted on single axis trackers, which are made up of several metal racks arranged in a north-south direction. Single axis tracking is done though astronomical programming, where the embedded controller is responsible for operating the pusher, thus achieving optimum angle to the sun during the whole day. In this way, there is an increase of production between 15-20% compare to a conventional fixed mounting structure.

The panels, including mounting structures, would not exceed three metres in height at maximum tilt. The solar panel chosen for this project will not have metal frames in order to reduce potential glare.

The make and model of solar panel will not be decided until the period leading up to construction as prices can fluctuate significantly across suppliers over time.

Figure 5.3 Example of a typical frameless solar array, similar to that chosen for the Chaff Mill Solar Farm

5.1.1.2 INVERTER/TRANSFORMER STATIONS

The low voltage direct current (DC) output from the panels will be converted to a 3-phase alternating current (AC) using inverters on site. The current design of the solar farm indicates that it will utilise 24 (twenty-four) 4MW and one 2.6 MW inverter/transformer stations. These stations will be distributed at locations throughout the solar panel array.

5.1.1.3 BATTERY ENERGY STORAGE SYSTEM

A Battery Energy Storage System (BESS) will be installed on site to meet the Office of the Technical Regulator's (OTR) requirements and Essential Services Commission of South Australia (ECOSA) Licencing Conditions. The BESS is designed to provide further stability to this part of the electricity grid. The 50 MW/100 MW BESS area would be in the north-west corner of the site, covering an area of approximately 1.5 HA.

5.1.1.4 SUBSTATION

The 33 kV supply is increased to 132 kV via a transformer which is housed in the solar farm substation.

5.1.1.5 OVERHEAD LINE

The project will be connected from the solar farm substation to the overhead 132 kV Mintaro to Waterloo transmission line.

The new line would run adjacent the existing 132 kV transmission line within the site boundary. The network connection has been proposed by ElectraNet and involves establishing a Tee Connection, supported by a fibre optic communications system to provide a secure network connection.

5.1.1.6 MODULAR SITE OFFICE

There will be one office building on site that will be used by on-site staff during the operational period.

5.1.1.7 STRUCTURAL FOUNDATIONS

Galvanised steel beams will be installed to anchor the solar panel foundations to the ground. They would be installed by direct ramming into the ground, pre-drilled or by screw foundations.

5.1.1.8 ON-SITE PARKING

The on-site parking required for construction will be temporary and will accommodate vehicles that transport workers to and from the project site. Permanent on-site parking will be located on the western boundary of the site adjacent the site access point.

5.1.1.9 REFUSE STORAGE AREA

This area will be located on the western boundary of the project area.

5.1.1.10 INTERNAL ACCESS ROADS AND SITE ACCESS

Internal access roads would typically be 4 m wide, comprising layers of granular material, sub-base and base courses. The development of roads inside the plant involves stripping the topsoil to a depth with suitable ground characteristics, levelling and preparing the roadbed foundation. All roads would have adequate drainage and erosion control features and be engineered to withstand rain events.

Roads will be designed with the intention of decreasing site related traffic on external roads.

The most feasible option for site access is located off Wookie Creek Road, adjacent the existing substation.

5.1.1.11 PERIMETER SECURITY FENCING

A continuous fence will be constructed around the perimeter of the site for safety and environmental reasons. The height of the fence will approximately 3 m, as per Australian Standards. The fence will be wire mesh, topped with barbed wire.

5.1.2 CAPITAL INVESTMENT

The project has an estimated capital cost of $240-260 million.

5.1.3 POWER PURCHASING AGREEMENT

Should Development Approval be granted, FRV will seek agreement to supply a suitable off-taker with electricity via a Power Purchase Agreement (PPA). FRV has a successful record of executing PPAs for its previous projects (refer Appendix B).

6 KEY STAKEHOLDER CONSULTATION

FRV has been committed to a thorough engagement process with its neighbours and other key stakeholders. On the Chaff Mill Solar Farm project, FRV has engaged with key stakeholders, neighbouring properties and the wider community to inform the planning process. FRV commissioned RPS to undertake all community and stakeholder engagement for the proposed project (Appendix C).

FRV adopted a three-phased engagement process:

- Stage 1: Meet with stakeholders and the community (including all neighbouring properties) to introduce them to the project, outline its benefits, explain the Development Application process and to seek feedback.
- Stage 2: Continued engagement with stakeholders and the community, in particular with the Council, local MPs and key stakeholder groups providing an update on the Development Application process, initial findings from technical assessments and how community concerns are being addressed.
- Stage 3: Meet with all directly neighbouring properties (and some additional neighbours), the Clare and Gilbert Valleys Council, local MPs and community groups to share the findings from the specialist technical assessments and outline how concerns will be addressed in the Development Application. This phase also included a pop-up community information session at the Sevenhill Markets. A meeting with the new Minister of Trade Tourism and Investment and the advisor for the local MP following the change of South Australian government in March 2018 was also held.

This section of the Development Application summarises the engagement activities undertaken during the three phases, the feedback provided and how the project team has used and responded to this feedback.

6.1.1 COMMUNITY AND STAKEHOLDER CONSULTATION

6.1.1.1 SUMMARY OF CONSULTATION

PHASE ONE ENGAGEMENT

In September 2017, FRV undertook a process of introducing the project to key stakeholders and neighbouring property owners. The objective was to meet with both owners and lease holders of properties that neighbour the two parcels of land identified as the preferred site for the potential solar farm in Mintaro. All known property owners were contacted in the week commencing 18 September, offering them the opportunity to meet with representatives from FRV on Wednesday 27 September or Thursday 28 September. Property owners who were unable to meet on these days were emailed a copy of the FRV Chaff Mill Solar Farm fact sheet (included in Appendix D).

Six properties border the project site. A total of five meetings, and one phone meeting, were held with property owners and lease holders during this period. An additional property owner was identified during this series of meetings and a phone conversation was subsequently organised. Since this visit to Mintaro, a phone discussion has taken place with another property owner, and an offer of a face to face meeting was made as part of phase two consultation. All stakeholders will be kept updated during the specialist investigation process.

FRV also met with the Mintaro Progress Association, which is the peak body representing the Mintaro community. The association works in partnership with the Clare and Gilbert Valleys Council (CGVC) to ensure local concerns and issues are brought before the council. The meeting was held on Wednesday, 27 September and Council were represented at this meeting, with the Manager Governance and Community in attendance.

Local MPs including the Hon. Geoff Brock, Member for Frome and Minister for Regional Development and Minister for Local Government and Member for Stuart, Dan van Holst Pellekaan were also briefed about the project through their staff and/or advisors and a copy of the fact sheet sent to their offices.

The CGVC were engaged during this initial phase through a range of phone conversations and exchange of emails in September and October 2017. A meeting was also held with the Council's Manager – Development and Environment on

28 September 2017, providing an update to the project, engagement with stakeholders and timing of the Development Application.

Further conversations were also had with additional property owners who were interested in the project. Directly affected property owners provided contact details for these land owners, with FRV making contact via phone and email to ensure they were fully briefed about the project. These property owners were also added to a mailing list and provided with regular project updates. The concerns of these property owners have also been reflected in the following section outlining key issues.

PHASE TWO ENGAGEMENT

In late November 2017, FRV undertook an additional round of engagement between 23 and 24 November 2017, with FRV meeting with local MPs or their representatives. Discussions where had with Chris Hanna; the advisor to the Hon. Dan van Holst Pellekaan, Member for Stuart and Shadow Minister for Energy and Mining and Daniel Wilson; the advisor to Steven Marshall, the Leader of the South Australian Liberal Party. FRV also met with Hon. Geoff Brock, Member for Frome, Minister for Regional Development and Minister for Local Government and his ministerial advisors.

FRV has maintained regular contact with the Mintaro Progress Association since visiting in September 2017 and met again with representatives during this visit. Discussions focussed on how FRV can improve on its communication and engagement with the boarder Mintaro community and, more importantly, how FRV can potentially invest in the community in the future.

With a focus on identifying benefits to the boarder community, FRV also met with the Clare Business and Tourism Association. The Association is one for the peak bodies in the region that seeks to encourage and assist in tourism and promotion of the region, in addition to providing a platform for all businesses in the region to voice opinions on business development in the region. A range of local initiatives that FRV could present at (should the Development Application be successful) were discussed.

CGVC were engaged during this phase, through a range of emails and phone conversations in the lead up to the November 2017 visit and a formal presentation with the Mayor, acting CEO, various councillors and Council Managers in Development and Environment and Governance and Community in attendance. Through the presentation and visit to the project site, the Councillors were provided with an update on the project, engagement with stakeholders, timing of the Development Application and how specific landowner concerns were being managed.

All stakeholders were provided with a hard copy of FRV’s Chaff Mill Solar Farm project update (included in Appendix D). Neighbouring landowners and interested stakeholders were emailed a copy of this update on 22 November 2017. FRV subsequently developed a contact list for all engagement opportunities prior to the submission of the Development Application.

PHASE THREE ENGAGEMENT

The final phase of community and stakeholder engagement mostly occurred in mid to late February 2018 with an additional meeting held in May 2018. This phase focussed on sharing the findings from the specialist technical assessments that were undertaken between September 2017 and February 2018, building on the earlier engagement process, ensuring that the consultation was meaningful and inclusive of all stakeholders (directly affected landowners, broader community and key stakeholder groups). The intention was to also address any outstanding concerns that community may have and ensure that these concerns are addressed in the final Development Application.

Engagement occurred between 21 and 24 February 2018 (except for an additional meeting in May 2018) and took on three forms:

- One-on-one meetings with directly neighbouring landowners (and their neighbours who had expressed an interest in meeting)
- Meetings with key stakeholder groups and MPs (Clare and Gilbert Valleys Council, Mintaro Progress Association – committee and members and Hon. Geoff Brock MP)
- Pop-up community information session as the Sevenhill’s Producers market.

During this time, FRV met with 10 neighbouring landowners to provide them with an update on the Development Application process, the timing and opportunities to provide feedback (either directly as an individual or comments through the Council). FRV also used this opportunity to brief them on the findings from the 11-specialist technical and environmental assessments that have been undertaken to inform the Development Application. This enabled the landowners to have their concerns addressed first-hand by the project team and to ask any additional questions.

The Clare and Gilbert Valleys Council were also engaged again during this phase through a range of emails and phone conversations in the lead up to the February visit and a formal presentation with the Mayor, the new CEO, various councillors and Council Manager's in Development and Environment and Governance and Community in attendance. All in attendance were provided with an update on the project, focussing primarily on the findings from the technical and environmental assessments.

An on-site meeting was held with the Hon. Geoff Brock, Member for Frome, to provide him with a better understanding of the proposed solar farm; following on from the initial meeting in Adelaide in November 2017. FRV provided him an update on the technical and environmental assessments that had been undertaken between September 2017 and February 2018.

Also included in this phase of engagement was a presentation to the Mintaro Progress Association on 23 February, including both the committee and general association members – a total of 15 people were in attendance. A formal presentation was given highlighting the findings from the technical and environmental assessments and how various community concerns have been addressed. An update was also given on the Development Application process, including how the public can access the full studies and the Development Application submission. Fact sheets were also provided to all present.

To date, the engagement for this project has focussed on those directly associated or neighbouring the solar farm. One of the objectives of this phase of engagement was therefore to ensure the broader community about the proposed solar farm. FRV sought advice from both the Mintaro Progress Association and the CGVC on opportunities to attend events that locals usually attend. Following this advice, a decision was made to hold a pop-up community information session as the Sevenhills producers market on Saturday, 24 February between 8.30 am and 12 pm. Advertisements were placed in the Northern Argus and the Plains Producer two weeks prior to the event, inviting people to come and visit the team (copies of these advertisements are included in Appendix D). The CGVC also promoted the event for two weeks in their column in the respective newspapers. Just over 35 people visited the team at the market, with many noting they had seen the advertisements and had specifically come to meet the team. Most people visited to understand where the solar farm would be located and to identify potential business opportunities. FRV took the contact details of numerous B&B providers, a hotel, fencing contractors and individuals with previous construction experience, and will contact them in the future, should the project be approved. Overall comments from those who attended the information session were very supportive of the project.

All stakeholders and community members who spoke with FRV at any of these engagement initiatives were provided with a hard copy of FRV's Chaff Mill Solar Farm project update #2 and a range of fact sheets including frost and microclimate assessments, traffic assessments, overall technical and environmental assessments and an overview of the Chaff Mill Solar farm, including an indicative plan of where items will be located. Copies of these materials are included in Appendix D).

Following the result of the South Australian government elections and the change of government, FRV made a decision to submit the Development Application for the Chaff Mill Solar farm after March 2018 (the originally planned submission period). Emails were issued to all community members and stakeholders that FRV had previously engaged with, informing them that FRV still intended to submit the Development Application and that they would use the following weeks to speak with the new government before making a submission. They were also advised that FRV would contact them again to confirm when the application was submitted and how they could view this submission.

FRV met with the new Minister of Trade Tourism and Investment, Hon. David Ridgeway and Chris Hanna, the advisor to the Hon. Dan van Holst Pellekaan (Member for Stuart and Minister for Energy and Mining) on 23 May, briefing them on the project, the benefits to the State and the consultation to date with stakeholders and the community.

6.1.1.2 KEY MESSAGES

Throughout engagement, it was important that FRV provide key stakeholders and landowners with consistent information about the project. All stakeholders were generally advised of the following:

- Leading Australian solar developer and renewable energy company FRV Services Australia (FRV) is preparing a Development Application for a proposed 100 MW solar farm with battery storage 3.5 km north-east of Mintaro.
- FRV's parent company, Fotowatio Renewable Ventures, has developed and operated solar farms around the world over the past decade, developing 30 projects spanning 24 countries and five continents. This includes two operational solar farms in Australia; the 20 MW Royalla Solar Farm in the ACT and the 56 MW Moree Solar Farm in New South Wales. FRV is currently constructing the 100 MW Clare Solar Farm, near Ayr in QLD and the 100 MW Lilyvale Solar Farm, near Emerald in QLD.
- FRV has commissioned early environmental, traffic, civil and geotechnical studies to inform the design of the proposed Chaff Mill Solar Farm. These studies were performed from September 2017through to February 2018.
- FRV believes the proposed Chaff Mill Solar Farm could generate enough clean energy to power 60,000 homes for South Australian families.
- The proposed site, approximately 130 kilometres north of Adelaide, is well placed to capture and export solar energy into the national electricity grid from the nearby Mintaro substation and its existing 132 kV transmission line to Waterloo.
- The site of the proposed Chaff Mill Solar Farm is bounded by Wookie Creek Road, Merildin Road, Faulkner Road and Chaff Mill Road.
- This site was selected because of its proximity to grid infrastructure, good drainage and largely cleared land. The level of solar irradiation also makes it a suitable site for a solar farm.
- Development of the Chaff Mill Solar Farm is subject to Development Approvals through the South Australian Government's State Commission Assessment Planning (SCAP). FRV will submit its Development Application after March 2018 (the originally planned submission period).
- Discussions with the local council as well as community and stakeholder engagement will inform the proposed project's planning and design. FRV will meet with the community and stakeholders in late 2017 / early 2018 to share with them the proposed design of the solar farm, including layout and plant configuration, following the completion of specialist studies and reports.
- Subject to Development Approval, FRV seeks to commence construction in late 2019 and complete the project by mid-2021 (approximately 18 months)
- A final design for the proposed Chaff Mill Solar Farm will determine plant configuration, layout and specific equipment to be used should the project proceed.
- Should the project proceed, the solar farm would have an operating life of around 30 years. At the end of this period, the solar farm will be decommissioned and the land restored to its original condition. Any extensions of the solar farm would require a new Development Approval.
- Operation of Chaff Mill Solar Farm would deliver clean, zero emission electricity to meet the region's energy needs and would have significantly lower environmental impacts relative to other electricity generation methods.
- There will be little noise associated with the operation of the Chaff Mill Solar Farm. Noise from the cooling fans in the inverter cabins may be heard for short periods of time, in extreme heat conditions; however, you would need to be standing directly next to the unit to hear it.
- FRV will use PV-crystalline modules with a horizontal, single axis tracking system. The panels, including the mounting structure would be no more than three metres from ground level. With this technology, the panels no longer feature metal rims, lessening the risk of glare to neighbouring properties.

- The solar panels will be positioned in a north to south orientation and will track from east to west.
- Should the project proceed, FRV would employ up to 200 workers during construction. During the operational stage, up to five ongoing jobs will be created.
- The proposed Chaff Mill Solar Farm would attract investment to the area and deliver additional indirect economic opportunities to local businesses including local grocery stores, restaurants, cafés, accommodation providers and petrol stations.
- Should the project proceed, there would be some initial traffic impacts, with the delivery of materials of the site. This would usually occur in the first month, so short in duration. FRV will implement a construction management plan to manage traffic and other potential impacts.
- Traffic to and from the Chaff Mill Solar Farm during operation will be minimal. Vehicles will only need to access the site for maintenance purposes, and in the instance of an emergency. A Traffic Impact Statement has been prepared to support the Development Application.
- FRV is committed to minimising impacts on the environment. The trees located in the far corner on one of the identified parcels of land, near the creek, will be retained and preserved.
- FRV will work with properties who are classified sensitive receptors to consider ways to reduce the visual impact through vegetation screening.
- Committed to partnering with the local community, FRV has had discussions with local community groups to determine the best way to contribute to the community through a range of partnership opportunities both with community and sporting groups.

6.1.1.3 FEEDBACK RECEIVED

KEY ISSUES ARISING FROM PHASE THREE ENGAGEMENT

During landholder, Council and stakeholder meetings held in February 2018, key common issues raised included:

- Whether the level of frost will increase in the area
- Whether there was any opportunity for compensation from FRV due to visual changes to the area
- What measures would be undertaken to manage biosecurity
- How impacts on local roads, stormwater run-off and ground conditions would be managed during both construction and operation phases of the project
- What the benefits of the project are to the local community via local employment and use of local businesses
- What the benefits of the project are to local sporting and community groups.

SPECIFIC ISSUES RAISED DURING THE ENGAGEMENT PROCESS

Landholders and stakeholders have raised a number of specific concerns throughout the engagement process. These have been summarised in the table below.

Table 6.1 Summary of stakeholder and community concerns

CATEGORY	SPECIFIC ISSUE
Environmental	Potential for the installation of solar panels to create a barrier, reducing airflow and increasing the level of frost in the region.
	Maintenance of the creek and the associated tributary on the land which the solar farm will be located.
	Increased water run-off from the solar farm property into neighbouring properties.
	Alternations to the land which will further increase the risk flooding to the region.

CATEGORY	SPECIFIC ISSUE
Farming operations	Compromised biosecurity for neighbouring properties, with contaminants being transported on vehicles using private and public roads.
	Continued supply of water from the windmill in the parcel of land proposed for the solar farm.
	Construction activities or operation of the solar farm having impacts that will compromise neighbouring properties from being able to maintain European Union Cattle Accreditation Scheme credentials.
	Impact on neighbouring property values with the development of a solar farm both in terms of inflated value due to the price paid for the solar farm land and the impact on remaining farms on having a solar farm as a neighbour.
	Aerial restrictions over the solar farm and neighbouring properties due to the existence of the solar farm.
	Could the installation of a 3-metre chain wire fence around the solar farm potentially trap frost which will affect neighbouring properties.
	Additional restrictions that may be placed on farmers when undertaking spraying operations.
Traffic	High volume of vehicles travelling on and damaging unsealed roads.
	Heavy vehicles using Chaff Mill Road in winter, potentially damaging the road and causing vehicles to get stuck.
	Entrance to the solar farm, whether it will be off Merildin or Chaff Mill Roads and what impact it will have on neighbouring properties.
	Traffic route during construction and ensuring that the optimal route is chosen, to ensure farming operations, such as harvesting which requires a high volume of vehicles, can occur concurrently.
Noise	Increase in noise in the area due to the operation of the solar farm battery and the existing substation needing to operate longer at night.
Community	Whether FRV will directly invest in the Mintaro / Clare community through a community grants program.
	Overall benefits to the community both during construction and operations.
	Visual impacts to properties that have been, or about to be constructed to maximise local views.
	Opportunities for local businesses and trades to be involved in both the construction and operation the solar farm.
	Potential health risks to people and animals from the operation of a solar farm.
Solar farm operations	Hours of operation and potential increase in night time noise.
	Installation of overhead powerlines rather underground lines.
	Measures taken to reduce and manage fire risks.
	Number of vehicles that will access the operational solar farm.
	Ground conditions not being suitable for the operation of a solar farm. Soil can change considerably – it can expand and contract over time, as well as pooling with water.

CATEGORY	SPECIFIC ISSUE
	Visual impact from the moving panels to the neighbouring properties, and the potential risk of solar glare.
	Can the solar farm land be used for grazing during the operational phase and what happens to the land after the 30-year operational period?
	What happens if FRV sells the solar farm? What assurances will be given that the solar farm will be operated in accordance to the commitments made by FRV?
Fire risks	What measures will be taken to manage fire, both on the solar farm and from neighbouring properties?
Financial impacts	Whether financial compensation will be provided to all properties neighbouring the solar farm.
	What additional insurance will adjacent properties need to take to cover any damage they may accidentally cause to the solar farm?

Comprehensive records were made for all individual landholder and stakeholder meeting but have not been provided here for privacy reasons.

6.1.1.4 MEDIA ENGAGEMENT

FRV received four media enquiries from the ABC and the Northern Argus during the engagement process. These enquiries have focused on the economic benefits of the solar farm to the region, the Development Application process and the overall timing of the project. The articles where FRV has been contracted for comment have been primarily positive. Copies of these news stories are included in Appendix D.

There have been two negative media stories relating to the proposed solar farm. Both articles appeared in the Plains Producer and highlight concerns from landowners who are not directly affected by the solar farm, nor been involved in discussions about the project; hence raised several misconceptions about the project - including the proposed location of the solar farm. It was interesting to note that locals who were approached to make comment supported the project. FRV was not approached to provide comment in either of these articles. Copies of these articles can also be found in Appendix D.

6.1.1.5 COMMUNITY AND STAKEHOLDER SUPPORT

FRV has received letters of in principle support for the Chaff Mill Solar Farm, acknowledging the benefit to the Mintaro community and South Australia (refer Appendix E).

6.1.1.6 MOVING FORWARD

FRV has pledged to continue with the community and stakeholder engagement process for the project and will return to the region at some stage after the Development Application has been submitted. An information line remains open for the project and FRV responds to all queries lodged on this line. FRV is continuing to consider ways that they can work with the Mintaro Progress Association and local community if the project is approved. Currently, discussions are taking place regarding gold sponsorship of the MinMan Eagles (the local football and netball association) and a potential community grants program, which would be administered through the Mintaro Progress Association; if the project is approved.

7 ENVIRONMENTAL ASSESSMENT

The following chapter discusses the outcomes of all the specialist technical studies that were commissioned for the project, including:

- Planning
- Flora and fauna
- Aboriginal cultural heritage
- Non-Indigenous heritage
- Visual amenity
- Glare
- Geotechnical
- Traffic and access
- Stormwater and flooding
- Socio-economic
- Site contamination
- Micro-climate
- Electromagnetic Field Limits
- Aviation safety.

For each study, the following information is discussed:

- Legislative and policy requirements
- Assessment methodology
- Existing conditions
- Potential impacts
- Management and mitigation measures
- Key recommendations.

7.1 PLANNING AND LAND USE

7.1.1 LEGISLATIVE AND POLICY REQUIREMENTS

The following legislation and policy will be relevant to the planning assessment of the proposed solar farm:

- *Development Act 1993* – the functions of which are currently being transitioned to the *Planning, Development and Infrastructure Act 2016*. The *Planning, Development and Infrastructure Act 2016* (the PDI Act) is the State's new legislation governing development. The PDI Act is being introduced through a staged process. At the time of writing this report, the Crown development assessment pathways section of the PDI Act, being Part 9, had not come into operation. Therefore, the proposed development will be assessed under Section 49 of the *Development Act 1993*, as a State sponsored development.
- *Development Regulations 2008*.
- Clare and Gilbert Valleys Council Development Plan.

7.1.2 ASSESSMENT METHODOLOGY

A planning and land use assessment for the proposed Chaff Mill Solar Farm was undertaken to assess the proposed development against the relevant provisions of the Clare and Gilbert Valleys Council Development Plan (consolidated 10 November 2016) (Appendix F).

The planning and land use assessment was informed by a site visit, consultation with the proponent and a review of community and stakeholder engagement as well as the strategic context of the project. The specialist technical assessments undertaken for the project were also reviewed, including:

- Flora and fauna
- Aboriginal cultural heritage
- Non-Indigenous heritage
- Visual amenity
- Glare
- Geotechnical
- Traffic and access
- Stormwater and flooding
- Socio-economic
- Site contamination
- Micro-climate.

7.1.3 EXISTING CONDITIONS

The project area is within the Primary Production Zone under the Clare and Gilbert Valleys Council Development Plan and is not covered by a Policy Area or Precinct. The land is currently used for agricultural purposes which is an envisaged land use under the zone.

7.1.3.1 BROAD LANDSCAPE DESCRIPTION

The site consists of two distinct allotments; the western parcel, bound by Merildin Road to the south, Wookie Creek Road to the west and Faulkner Road to the east and the eastern parcel, bound by Faulkner Road to the north, Chaff Mill Road to the west, agricultural land to the south and a rail line to the east. The Wakefield River is approximately 2.3 km south of the site.

Several renewable energy developments have been completed in the region over recent years, including the Waterloo Wind Farm and the world's largest lithium battery recently built in Jamestown.

7.1.3.2 ISSUE-SPECIFIC SITE DESCRIPTION/BASELINE

The application is seeking approval for the construction and operation of a 100 MW solar farm. Approval will be sought from SCAP. As the proposed development is located within the CGVC area, the application will be assessed against the relevant provisions of the Clare and Gilbert Valleys Council Development Plan.

7.1.4 POTENTIAL IMPACTS

The *Development Act 1993* requires that the project be assessed against the relevant provisions of the Development Plan.

7.1.4.1 CONSISTENCY WITH THE PLANNING PROVISIONS

The Primary Production Zone envisages a range of primary production land uses, including cropping and grazing activities on large rural land holdings and viticulture operations on small to medium sized allotments. The zone recognises the significance of the area within the district in providing some of the region's most productive rural land.

The zone's desired character allows for the development of wind farms where they can take advantage of natural resources, recognising that they may need to be in visually prominent locations, visible in valuable scenic or environmental areas and may need to be closer to roads than what is outlined in the Council-wide setback policies. Based on this, whilst solar farms are not specifically identified under the zone, potential visual impacts of the project are considered acceptable in pursuit of the benefits derived from increased generation of renewable energy.

Under the Procedural Matters of the zone, solar farms and ancillary development are neither listed as complying or non-complying, therefore the project must be assessed on its merits against the relevant objectives and principles of development control. Assessment of the proposed solar farm against the relevant provisions of the Primary Production Zone is outlined in Table 7.1.

Under the Council-wide provisions of the Development Plan, the planning and land use assessment found that the proposed development generally complies with the relevant provisions under Hazards, Infrastructure, Interface Between Land Uses, Natural Resources, Renewable Energy Facilities, and Siting and Visibility. The proposed site layout and design will ensure that the facility takes advantage of the required solar resources for electricity generation. Specialist technical assessments have been undertaken and support the notion that the project will not unduly impact the environment, heritage, or people in the area, with appropriate mitigation measures having been proposed where required. Assessment of the proposed solar farm against the relevant Council-wide provisions is outlined in Table 7.2.

Table 7.1 Relevant Primary Production Zone policy provisions

PRIMARY PRODUCTION ZONE	COMMENT
Land Use Objectives 1, 2 & 3 PDCs 1 & 3	Renewable energy facilities are envisaged within and form part of the desired character of the zone. Specifically, the policy provisions recognise that such forms of development (particularly wind farms) require siting of infrastructure in visually prominent locations to effectively harness renewable energy sources. The zone envisages sustainable primary production with the solar farm not affecting agricultural efficiency within the surrounding area or not significantly impacting upon other development activities anticipated within the zone. The siting and configuration of the proposed solar panels will also not alter the size and configuration of the existing allotments. A number of specialist technical assessments have been undertaken which demonstrate that the project infrastructure can be designed and sited to minimise potential environmental impacts with specific mitigation measure proposed to address visual amenity and glare to the nearest sensitive receptor to the east through vegetative planting and screening. By virtue of established native vegetation, topography and distance the solar farm will not adversely impact the general public, surrounding landholders or the Mintaro State Heritage Area. The project is considered a compatible land use and is appropriate within the zone. A Construction Environmental Management Plan (CEMP) will be prepared for the project following the granting of development consent to outline the environmental management systems and procedures to be implemented during construction to ensure activities comply with relevant statutory requirements and provide adequate protection for the environment. The purpose of the CEMP is to provide guidance to the contractor(s) and will outline the need for a number of management plans to be developed for specific areas of potential impacts during construction, such as dust and air quality, water quality, traffic management, erosion control and stormwater management and weed and pest management.
Form and character Objectives 5, 6 & 7 PDCs 9 & 11	The desired character of the Primary Production Zone recognises renewable energy facilities as forming an integral component of the area within which the project site is located. The zone comprises agricultural areas that underpin the region's economy, primarily consisting of general farming, grazing and viticulture with associated rural based industry, services and facilities. It is intended that the dominant rural character of the zone won't be adversely affected, while as stated by Hemisphere Design "*the solar farm will introduce a new infrastructure element of an acceptable design standard that will evoke curiosity, become an 'incidental' infrastructure feature of merit and a best practice example of progressive renewable energy delivery*".

PRIMARY PRODUCTION ZONE	COMMENT
Heritage PDC 12	The proposed siting and layout of the project will not impact the Mintaro State Heritage Area or heritage significance of the settlement. Hemisphere Design concluded that the visual amenity impacts of the development would be negligible given: — the sense of place and place attachment values of Mintaro township will not be detrimentally affected — the nature and visual qualities of the Expansive Eastern Plains Character Unit will not be significantly altered — the introduction of the project does not change the mainly pastoral nature of the locality and wider contextual landscape — the project does not impact on any significant viewpoints within the contextual landscape — the project is proposed to be sited and designed to blend with the natural features of the landscape and to cause minimal damage to the natural landform; and — the likely visual impact on the identified sensitive receptor can be managed through visual mitigation introduced through vegetative screening. The project will therefore not detract from the form and character of the locality.

Table 7.2 Relevant Council Wide policy provisions

COUNCIL WIDE	COMMENT
Hazard Objectives 1, 3 & 4 PDCs 2, 3, 4, 6, 7, 8	The project is situated within a ‘general bushfire risk area’ with all infrastructure siting and access to be designed in accordance with the provisions of the ‘*Minister’s Code: Undertaking development in Bushfire Protection Area*’. With the exception of bushfire risk, the project site is not located within an area identified as being susceptible to other natural hazards, such as flooding, contamination, acid sulphate soils or landslips. Construction and operation of the solar farm shall be designed to ensure appropriate environmental management controls are implemented, such as a soil and erosion management, to ensure earthworks cut and fill minimise potential impacts to Wookie Creek and do not impede the ephemeral flows and water quality of this watercourse. All cut and fill associated with site earthworks will also ensure a geotechnically stable development site is established.
Infrastructure Objectives 1, 2 & 3 PDCs 1, 10, 11 & 13	As previously stated, the outcome of specialist studies – and the MCA process – supports the proposed siting and location of all project infrastructure to ensure that it is able to minimise potential visual and environmental impacts. The project is located some 3.5 km from Mintaro township (being a State Heritage Area) with the majority of the infrastructure components obscured from view by virtue of existing and proposed vegetation, topography and distance which effectively screen the solar farm from the view of the general public and adjacent landholders, except of the immediately adjacent property to the south-east. In addition, all access roads servicing the project site are existing with only minor upgrades (eg temporary earthworks and fill material to accommodate heavy vehicle turning paths) to accommodate project design traffic with all road works to minimise disturbance to existing native vegetation and biodiversity as far as practicable.

COUNCIL WIDE	COMMENT
Interface Between Land Uses Objectives 1, 2 & 3 PDCs 1, 2, 7, 8 & 14	Renewable energy facilities are envisaged and encouraged within the Clare region, subject to compliance with prescribed siting, design and construction management requirements that can all be complied with. The project is sited more than 3.5 km away from Mintaro township and will not impact on the heritage significance of the township, while existing native vegetation, topography, distance will effectively screen the solar farm from the view of the general public and adjacent landholders. The project will not detract from primary production in the area and forms a compatible land use given: — the project site's location is confined to a low density farming community — the installation of solar panels will not impact climatic conditions in the region — the surrounding area hosts existing renewable energy facilities to the south-east (Waterloo Wind Farm); and — impacts to sensitive receptors is able to be mitigated. It is considered that the project has been adequately informed by the completion of specialist technical assessments, comprising visual amenity, glare, ecology (flora and fauna), Aboriginal cultural heritage, traffic and surface water to assess potential impacts and propose suitable mitigation measures (where required). It is considered that the project will not detrimentally affect the amenity of the locality, whilst impacts on other land uses is minimal given the location of the project infrastructure away from sensitive receptors and the Mintaro State Heritage Area.
Natural Resources Objectives 1, 4, 6, 8, 10, 11 & 13 PDCs 1, 2, 3, 7, 8, 9, 10, 12, 13, 17, 26, 27, 31, 32, 36, 37, 38 & 39	The project is located in an area where natural solar energy will be able to be effectively and efficiently harnessed, while its location within a low density rural area ensures the development is able to be appropriately separated from residences and the Mintaro State Heritage Area. The project has been purposely sited and designed to afford as much protection as possible to the region's natural resources. There will be some disturbance to the natural landform across the project site through construction of the solar farm and ancillary infrastructure, however these will be purposefully designed and sited to avoid areas of native vegetation (as far as practicable), whilst balancing the volume of earthworks (ie cut and fill) on-site. The site will be returned to its original form following decommissioning of the project. EBS Ecology assessed the potential ecological impacts the project may have on terrestrial flora and fauna. This assessment involved both desktop and field surveys with the level of significance of the vegetation communities determined to be low. Notwithstanding this, the opportunity to avoid and or minimise impacts to remnant native vegetation has formed a key parameter adopted in the infrastructure siting and design to protect and maintain the biodiversity value of the area. All earthworks and associated vegetation clearance within the project site will be undertaken so as not to cause or exacerbate erosion or sediment, decrease soil stability or cause any deterioration in the quality of surface water runoff that may potentially impact Wookie Creek.

COUNCIL WIDE	COMMENT
Renewable Energy Facilities Objectives 1, 2 & 3 PDCs 1, 2, 3 & 4	The policy provisions actively promote renewable energy facilities (and associated infrastructure) where natural resources can be harnessed for the efficient generation of electricity that will benefit the community and State by connecting into South Australia's power grid. Whilst not specifically referencing solar farms, the policy provisions provide key siting and design considerations which are able to be satisfied as follows: — infrastructure to be sited and designed to blend with the natural features of the landscape — protect areas of scenic or conservation significance from undue damage — cause minimal damage to the natural landform; and — screen and orientate infrastructure away from public view, tourist and scenic routes. The project is considered to present a desired land use within the zone and its locality. Careful consideration has demonstrated that impacts associated with visual amenity, glare, noise, ecology (flora and fauna), Aboriginal cultural heritage, traffic and engineering design (ie geotechnical, surface water) are able to be minimised. In particular, the project's photovoltaic panels and tracking system will use quality products and best practice design to ensure impacts associated with glare will be eliminated, while vegetative planting will ensure potential impacts to the nearest sensitive receptor to the east can be appropriately minimised. The project promotes the generation and use of renewable energy for the benefit of the environment, local and regional communities and the State more generally, whilst its location has been sited to minimise impacts on the natural environment, other land uses in the locality, transport systems and natural resources.
Siting and Visibility Objective 1 & 2 PDC 1, 4, 5 & 8	The project site has been chosen due to it providing ideal conditions and transmission line connection to maximise the efficiency and power generation of the solar farm. Hemisphere Design concluded that from a visual amenity perspective the introduction of the solar farm: — does not change the mainly pastoral nature of the locality and wider contextual landscape — does not it impact on any significant viewpoints within the contextual landscape; and — will not significantly alter the nature and visual qualities of the Expansive Eastern Plains Character Unit. Hemisphere Design also stated that in their opinion "the solar farm will introduce a new infrastructure element of an acceptable design standard that will evoke curiosity, become an 'incidental' infrastructure feature of merit and a best practice example of progressive renewable energy delivery". As previously stated, the siting of the project infrastructure has been designed to minimise visual impacts and effectively screen the development from the view of the general public and adjacent landholders by virtue of established native vegetation, topography, distance and proposed vegetative planting. The project is not considered to adversely impact on the natural or rural character of the locality.

7.1.5 MANAGEMENT AND MITIGATION MEASURES

7.1.5.1 CONSTRUCTION

To comply with the relevant statutory requirements, a CEMP will be prepared for the project following the granting of Development Approval. Refer to section 8.1.4 for further details on the CEMP.

7.1.5.2 OPERATION

The project will operate in accordance with all plans and supporting documents submitted and approved under this Development Application (should Development Approval be granted).

7.1.6 KEY RECOMMENDATIONS

The proposed development of a solar farm is consistent and not at variance with the relevant policy provisions set out in the Clare and Gilbert Valleys Council Development Plan (Consolidated 10 November 2016), and that the project warrants the granting of Development Approval.

7.2 FLORA AND FAUNA

7.2.1 LEGISLATIVE AND POLICY REQUIREMENTS

The following legislation is relevant to flora and fauna matters for the proposed Chaff Mill Solar Farm:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Native Vegetation Act 1991*
- *National Parks and Wildlife Act 1972*
- *Natural Resources Management Act 2004.*

7.2.1.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It applies to all Australian territory and waters. Under the Act, actions that are likely to have a significant impact upon defined Matters of National Environmental Significance (MNES) are subject to an assessment and approval process.

Under the EPBC Act, a company proposing an action that may have a significant impact on a matter of national environmental significance must prepare and submit a Referral that will help the Commonwealth decide whether the proposal requires further assessment.

The requirement for a referral under the EPBC Act is discussed in section 1.5.1.

7.2.1.2 NATIVE VEGETATION ACT 1991

In South Australia, under the *Native Vegetation Act 1991* (NV Act), all clearance of native vegetation requires the approval of the Native Vegetation Council (NVC) unless it is covered by a specific exemption contained within the *Native Vegetation Regulations 2017*.

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with these principles:

- It contains a high level of diversity of plant species
- It is an important wildlife habitat
- It includes rare, vulnerable or endangered plant species
- The vegetation comprises a plant community that is rare, vulnerable or endangered

- It is a remnant of vegetation in an area which has been extensively cleared
- It is growing in, or association with, a wetland environment
- It contributes to the amenity of the area
- The clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding
- The clearance of vegetation is likely to cause deterioration in the quality of surface or underground water
- After clearance, the land is to be used for a purpose which is unsustainable.

The principles apply in all cases, except where the vegetation has been considered exempt under the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a Significant Environmental Benefit (SEB) to offset the clearance. The requirement for a SEB also applies to several of the exemptions.

The project area is situated within the Clare and Gilbert Valley Council region which is subject to the *Native Vegetation Act 1991* and *Regulations 2017*. The project is likely to fall under Regulation 12(34) – Infrastructure or 12(27) – Major Projects.

7.2.1.3 NATIONAL PARKS AND WILDLIFE ACT 1972

Vascular plants and vertebrate animals (e.g. mammals, birds, reptiles and amphibians) are protected in South Australia under the threatened species schedules of the *National Parks and Wildlife Act 1972* (NPW Act): Schedule 7 (endangered species), Schedule 8 (vulnerable species) and Schedule 9 (rare species). The criteria used to define threatened species in South Australia are generally based on categories and definitions from the IUCN Red List Categories and Criteria.

The current schedules do not include non-vascular plants, fish, insects, butterflies, spiders, scorpions and other invertebrates, fungi and other life forms which do not have a current legal conservation status in South Australia.

Under the NPW Act, persons must not:

- Take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land
- Take a native plant of a prescribed species on private land
- Take a native plant on private land without the consent of the owner (such plants may also be covered by the *Native Vegetation Act 1991*)
- Take a protected animal or the eggs of a protected animal without approval
- Keep protected animals unless authorised to do so
- Kill a protected animal without approval.

7.2.1.4 NATURAL RESOURCES MANAGEMENT ACT 2004.

Under the *Natural Resources Management Act 2004* (NRM Act), landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals, and activities that might result in land degradation.

A ‘duty of care’ is a fundamental component of this Act, i.e. ensuring one’s environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

The project area is situated within the Northern and Yorke Natural Resources Management Board Region.

7.2.2 ASSESSMENT METHODOLOGY

A flora and fauna assessment was undertaken for the proposed Chaff Mill Solar Farm (Appendix G). The assessment involved:

- Extensive background research – literature review on all available relevant reports and database searches
- Vegetation mapping to establish the vegetation communities present, their condition and the overall biological significance of the vegetation. The vegetation survey was performed in accordance with the Native Vegetation Council (NVC) methodology
- Opportunistic fauna survey and visual assessment of habitat value for native fauna
- Targeted Pygmy Blue-tongue Lizard (PBTL) survey in appropriate habitat. Spider holes were investigated using an optic fibre ‘burrowscope’ to determine species presence
- Targeted Flinders Ranges Worm-lizard (FRWL) survey in areas of appropriate habitat.

7.2.3 EXISTING CONDITIONS

7.2.3.1 CURRENT LANDSCAPE

Using the Interim Biogeographical Regionalisation of Australia (IBRA) zones and remnancy landscape classification, the proposed Chaff Mill Wind Farm is located within the Flinders Lofty Block bioregion, the Broughton subregion and the Hansen environmental association. Approximately 3% (3738 HA) of the association is mapped as remnant native vegetation, of which 1% is formally conserved.

The project area is mostly cleared of native vegetation and is under crop. There is a large patch of remnant *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland Blue Gum) in the western corner of the western parcel, where the land is too steep to cultivate. The understory is grazed and comprised of exotic grassland species. The creek line running through the western parcel is highly degraded with very limited native understory species present. The western parcel is bordered on the western side by a relatively steep rocky escarpment.

Amenity plantings, mostly comprised of native species, occur as small patches within the project area and as narrow strips along the roadsides. Small strips of remnant native woodland and shrubland also occur along some roadside.

7.2.3.2 VEGETATION ASSOCIATIONS

Six broad vegetation associations were recorded within the project area (refer Figure 7.1):

- *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland
- *Allocasuarina verticillata* (Drooping Sheoak) Woodland
- *Acacia paradoxa* (Kangaroo Thorn) Shrubland
- Mixed Amenity Planting +/- scattered natives
- Exotic Grassland
- Crop.

Bushland condition was assessed in two locations. The condition of the areas described as *Eucalyptus leucoxylon* ssp. *pruinosa* Woodland was poor to moderate. The condition of the areas described as *Allocasuarina verticillata* (Drooping Sheoak) was poor. Most of the land on the undulating flats and low hills has been cultivated and is highly modified. Native vegetation is generally restricted to steep hills, along the creek line and within roadside vegetation.

Photo 7.1 *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland

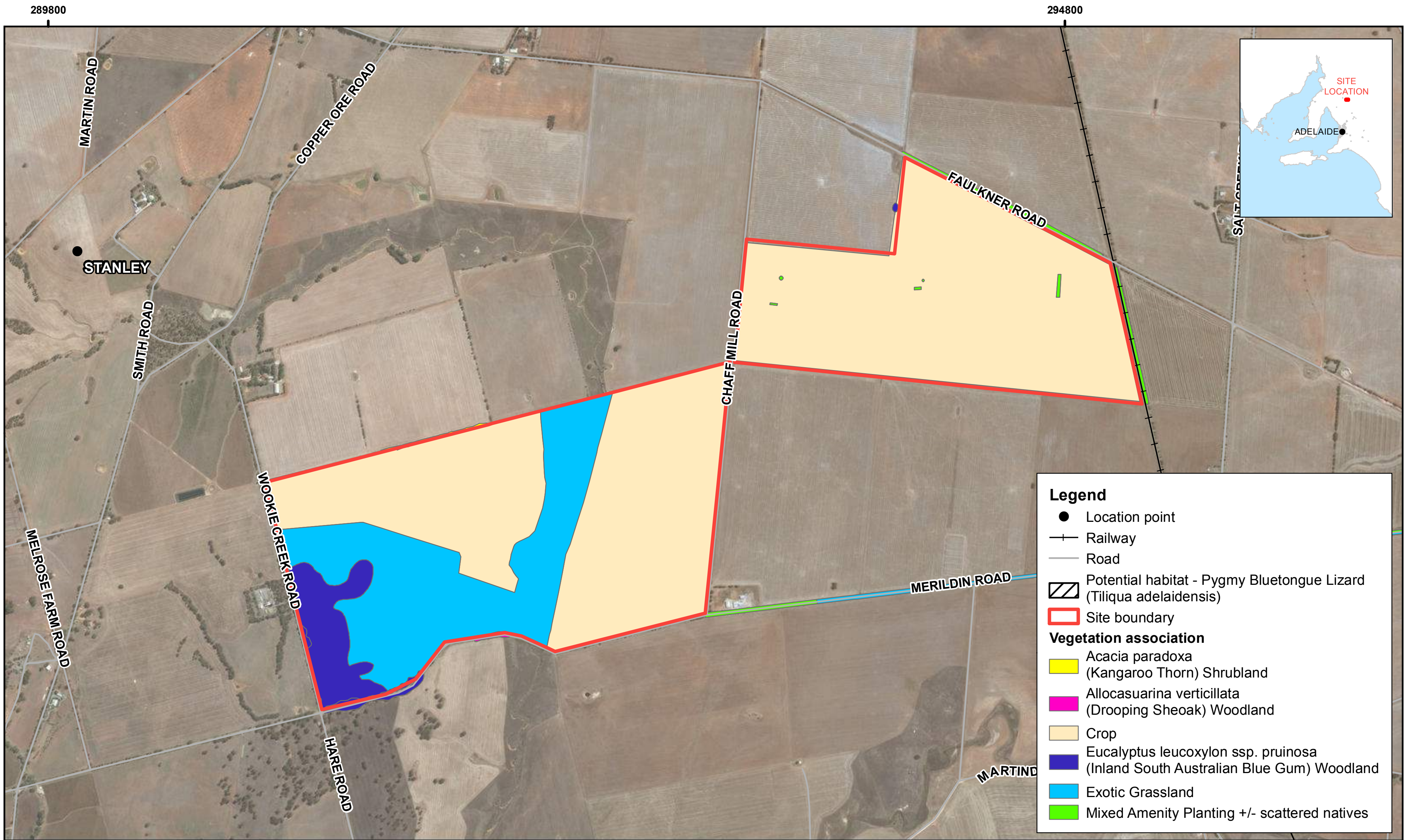
Photo 7.2 *Allocasuarina verticillata* (Drooping Sheoak) Woodland

Photo 7.3 *Acacia paradoxa* (Kangaroo Thorn) Shrubland

Photo 7.4 Mixed amenity planting +/- scattered natives

Photo 7.5 Exotic Grassland following the creek line on the western block

Photo 7.6 Crop



Map: PS103225_GIS_009_C	Author: brownma2
Date: 19/03/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, EBS Ecology

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.1
Vegetation associations

7.2.3.3 NATIONAL THREATENED SPECIES

No nationally threatened species were recorded during the field survey.

One flora species of national conservation (EPBC Act) significance, *Dodonaea procumbens* (Trailing Hop-bush) was identified as possibly occurring within the project area. This species was conservatively assessed as potentially present for areas that were rapidly assessed, such as the road and rail reserves. It is unlikely to be present within the cropped and mixed grassland areas, where it is presumed infrastructure will be focused.

One fauna species of national conservation significance, Flinders Ranges Worm-lizard (FRWL) (*Aprasia pseudopulchella*) was identified as possibly occurring within the project area. While the habitat is largely unsuitable for FRWL, this species could possibly occur along the creek line and within areas of exotic grassland where undisturbed surface, surface rock, litter/fallen trees are present. Whilst the habitat suitability is assessed as low, the presence of FRWL cannot be discounted where the soil structure remains intact and surface cover is present.

One migratory bird species, Fork-tailed Swift (*Apus pacificus*), was identified as a possible occasional visitor to the project area. This species is mostly aerial and would not be impacted by the Chaff Mill Solar Farm.

7.2.3.4 STATE THREATENED SPECIES

No threatened flora species were recorded during the field survey. Based on the background research and the species' relative inconspicuousness (and hence potential for non-detection during the broad level survey), two State listed flora species are considered as possibly occurring within the project area:

- *Dodonaea procumbens* (Trailing Hop-bush)
- *Rytidosperma tenuius* (Short-awn Wallaby-grass).

The State conservation (NPW Act) listed White-winged Chough (*Corcorax melanorhamphos*) was recorded during the field survey. Four other State threatened bird species could possibly occur based on species distribution and available habitat. The Brown Toadlet (*Pseudophryne bibronii*) could possibly be present along the ephemeral creek line within the western block. The Common Brushtail Possum (*Trichosurus vulpecula*) may occupy the established trees (remnant and planted). State threatened species and the likelihood of their occurrence within the project area is outlined in Table 7.3.

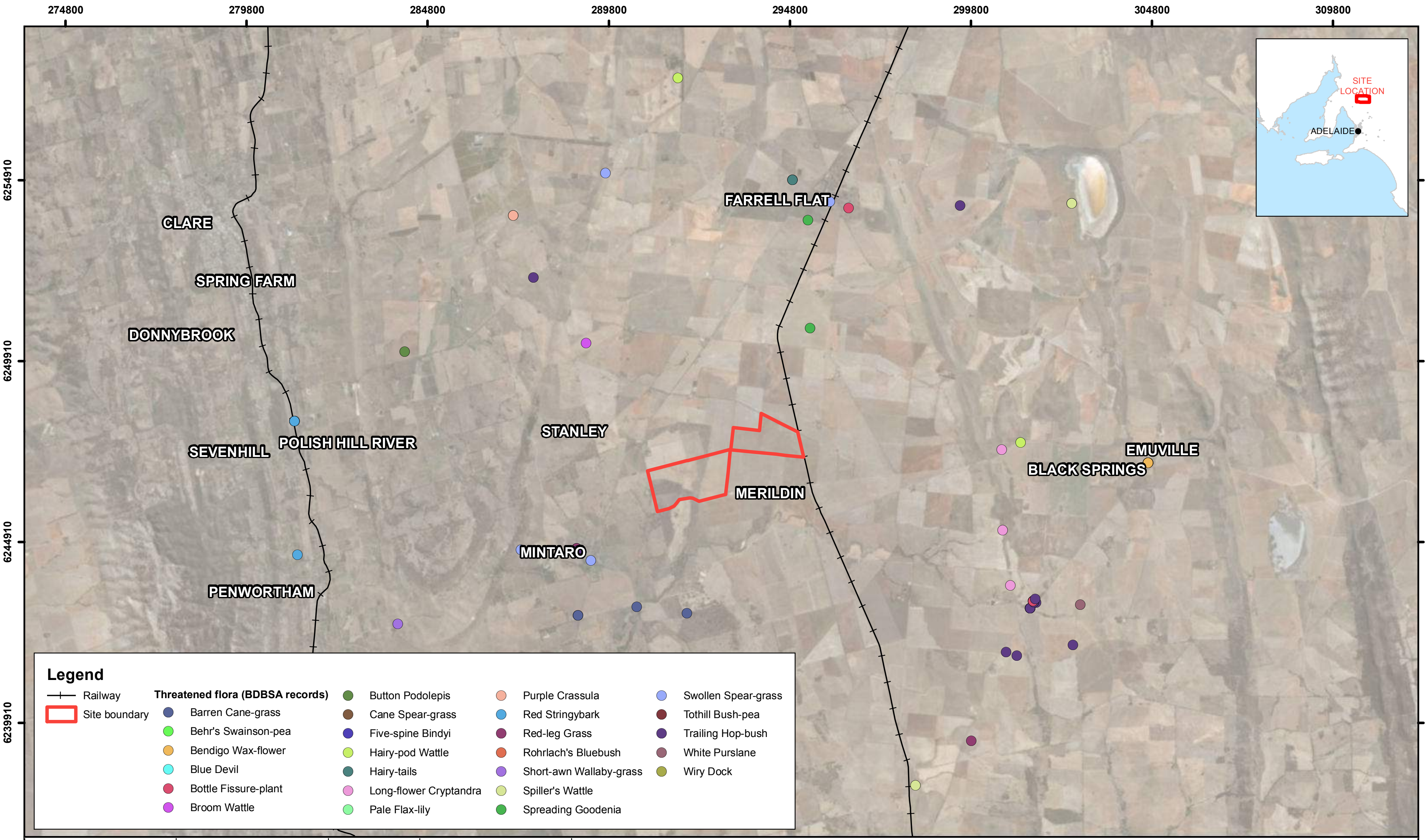
Threatened flora and fauna species records from the Biological Database of South Australia near the project area are shown in Figure 7.2 and Figure 7.3.

Table 7.3 State threatened species potentially occurring within the project area

SCIENTIFIC NAME	COMMON NAME	NPW ACT RATING*	LIKELIHOOD OF OCCURRENCE WITHIN THE PROJECT AREA
FLORA			
Dodonaea procumbens	Trailing Hop-bush	V	Possible. Discussed in Section 7.2.3.3
Rytidosperma tenuius	Short-awn Wallaby-grass	R	Possible – this species is known more generally from disturbed road verges.
AMPHIBIANS			
Pseudophryne bibronii	Brown Toadlet	R	Possible
BIRDS			
Corcorax melanorhamphos	White-winged Chough	R	Known (recorded during the field survey)
Falco peregrinus	Peregrine Falcon	R	Possible

SCIENTIFIC NAME	COMMON NAME	NPW ACT RATING*	LIKELIHOOD OF OCCURRENCE WITHIN THE PROJECT AREA
Neophema elegans	Elegant Parrot	R	Possible
Petroica phoenicea	Flame Robin	V	Possible
Turnix varius	Painted Buttonquail	R	Possible
MAMMALS			
Trichosurus vulpecula	Common Brushtail Possum	R	Possible

*As listed in the Schedules of the NPW Act version 15.3.2017



Map: PS103225_GIS_014_C	Author: pottsr		0 1,000 2,000 m 1:140,000
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Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, EBS Ecology			Scale ratio correct when printed at A4 Coordinate system: GDA 1994 MGA Zone 54

Figure 7.2
BDBSA Threatened Flora Species Records Within the Vicinity of the Project Area

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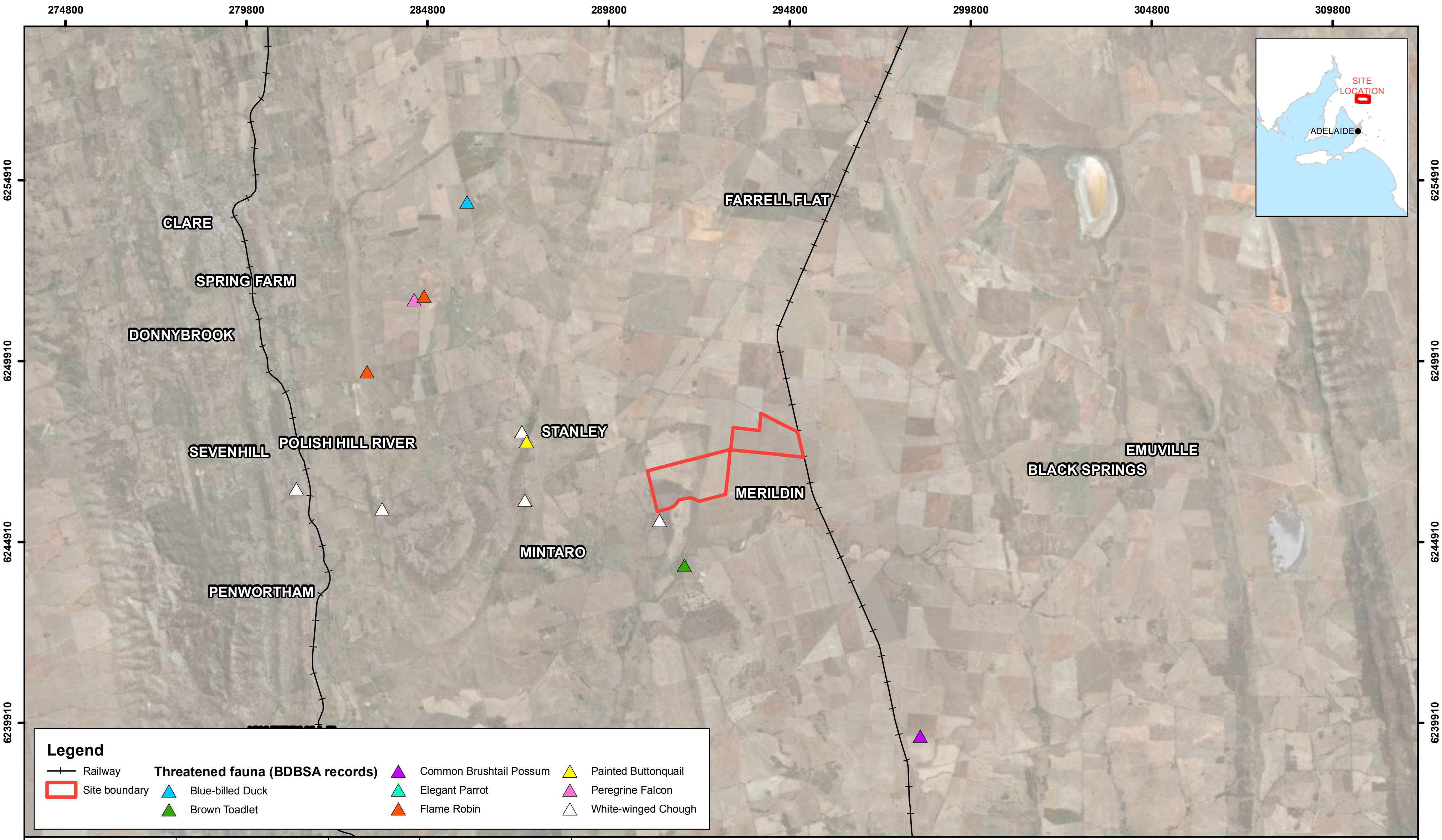

Map: PS103225_GIS_015_C	Author: pottsr
Date: 19/03/2018	Approved by: EFitzner

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Coordinate system: GDA 1994 MGA Zone 54

Figure 7.3
BDBSA Threatened Fauna Species Records Within the Vicinity of the Project Area

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7.2.3.5 WEED SPECIES

A total of 22 (twenty-two) weed species were recorded during the field survey (the full species list can be found in Appendix G), four of which are declared under the *Natural Resources Management Act 2004* (Table 7.4).

Table 7.4 Declared weed species recorded within the project area

SCIENTIFIC NAME	COMMON NAME
Echium plantagineum	Salvation Jane
Marrubium vulgare	Horehound
Olea europaea ssp.	Olive
Rosa canina	Dog Rose

7.2.4 POTENTIAL IMPACTS

7.2.4.1 FLORA

Infrastructure placement would avoid native vegetation clearance where possible, however the exact vegetation clearance requirements are yet to be confirmed. The ecological survey has collected data to calculate the area of vegetation clearance and required significant environmental benefit (SEB) offset under the *Native Vegetation Act 1991* should this be required for a Native Vegetation Clearance Application once the construction footprint has been determined.

Native vegetation was mostly restricted to the steep area on the western side of the western block and along the road and railway corridors bordering the project area. Infrastructure placement will be avoided in these areas and any clearance of roadside vegetation would only be needed at access points. Should the roads require widening for large vehicle access, native vegetation clearance should be minimised by utilising already cleared areas where possible. The ecological assessment identified appropriate locations of road widening.

The proposed Chaff Mill Solar Farm is not likely to have a significant impact on any matters of national or State conservation significance. The EPBC listed *Dodonaea procumbens* was conservatively assessed as potentially present for areas that were rapidly assessed, such as the road and rail reserves. If infrastructure placement is within the cleared areas and avoids native vegetation, it is unlikely that the species (if present) would be impacted.

7.2.4.2 FAUNA

Due to its isolation from other large areas of habitat, the remnant vegetation within the project area is expected to be most valuable for highly mobile threatened species, such as the Elegant Parrot (*Neophema elegans*) and Flame Robin (*Petroica phoenicea*), which make broad-scale movements in response to season and the abundance of food resources. The presence of highly mobile species within the project would be expected to be temporal with respect to the availability of food resources.

Many trees on the site contained hollows that are valuable for resident or nesting threatened species such as the Common Brushtail Possum (*Trichosurus vulpecula*) and the Elegant Parrot (*Neophema elegans*). The protection of trees with hollows is important for the reproductive success of nesting birds which can affect population recruitment.

Clearance of vegetation, either on the project site or along the access route, may have a direct impact on fauna through loss of habitat. The construction and operation of a solar farm may result in indirect loss of fauna through displacement due to disturbance, visual intrusion, physical barriers and altered conditions.

A small number of individual FRWL (if present) may be directly impacted (direct loss, or loss of habitat) by the construction of the solar farm. The scale of loss of potential habitat and individual FRWL is considered minor and inconsequential to the local population. Based on the criteria in the EPBC Act Significant Impact Guidelines the project is not considered to have a significant impact on FRWL.

The Fork-tailed Swift (*Apus pacificus*), listed as migratory, could occur as an occasional visitor but would not be significantly impacted by the development.

7.2.5 MANAGEMENT AND MITIGATION MEASURES

Management of project impacts to flora and fauna have followed a general principle (in order of preference) of:

- Avoiding impacts
- Minimising impacts
- Mitigating impacts
- Compensating for residual impacts.

7.2.5.1 PLANNING

The following management and mitigation measures would be implemented in the planning stage:

- Infrastructure and access routes would be aligned, where practical, with cropping/cleared land.
- Areas containing the woodland and shrubland associations and scattered trees would be avoided where possible as they offer valuable habitat for fauna species in an area largely devoid of shrubs and trees.
- Infrastructure would be located as far away from areas of native vegetation/fauna habitat as possible to reduce impacts associated with disturbance, weed invasion etc.
- If any Wedge-tailed Eagle nests are observed (none were recorded during the survey), a buffer between the nest and infrastructure/maintenance access would be implemented to avoid disturbance.

7.2.5.2 CONSTRUCTION

In general, construction activities would be managed to avoid construction or disturbance to any areas of high ecological value.

- A Construction Environmental Management Plan (CEMP) would be developed, prior to construction. This will provide specific, detailed methods to avoid environmental damage during the construction phase.
- Vegetation clearance will be restricted to a designated clearance envelope (once confirmed). A site induction session with clearance contractors will be arranged whereby the project area is defined and areas designated for clearance are delineated. The purpose of the site induction would be to prevent inappropriate clearance of vegetation not within the clearance envelope.
- Native fauna disturbed during any vegetation clearance/construction would if possible be relocated to suitable habitat nearby.
- Construction machinery would be kept clean and free from soil pathogens and any weed seed materials before entering/exiting the area.
- Any soil/material brought to site must be certified clean and free of weed propagules and soil pathogens. Suitable management measures in relation to Phytophthora would be included in the CEMP.
- Vegetative material removed from the site would be appropriately managed
- Stockpile sites, vehicle / machinery parking areas and general laydown areas would be located away from any native vegetation.
- Weed management strategies (including weed hygiene procedures) would be implemented to ensure that weed species are not introduced or spread throughout the construction area.

7.2.5.3 OPERATION

Any native vegetation clearance required will be offset by achieving an SEB for the project (Under the *Native Vegetation Act 1991)* and completing appropriate revegetation and landscaping.

7.2.6 KEY RECOMMENDATIONS

Key recommendations from the flora and fauna assessment relate primarily to legislative compliance under the *Native Vegetation Act 1991* and the *Environment Protection Biodiversity Conservation Act 1999.*

- Once the infrastructure footprint has been finalised, the extent of vegetation removal required will be determined to calculate the required SEB offset.
- The project is not considered to have a significant impact on any EPBC Act listed flora, fauna or ecological communities, and hence a referral is not required based on the current assessment area.

7.3 ABORIGINAL CULTURAL HERITAGE

7.3.1 LEGISLATIVE AND POLICY REQUIREMENTS

The central legislation to management of Aboriginal heritage in the project area is the *Aboriginal Heritage Act 1988* (AHA). Under the AHA, all Aboriginal sites, objects and remains that are of significance to Aboriginal tradition, archaeology, anthropology and/or history are protected.

The AHA provides the following definition of an Aboriginal site in section 3;

“Aboriginal site” means an area of land

a That is of significance according to Aboriginal tradition; or
b That is of significance according to Aboriginal archaeology, anthropology or history.

Any Aboriginal site or object, whether a newly discovered object or previously recorded, is covered under the blanket protection of the AHA.

It is an offence under section 23 of the AHA to damage, disturb or interfere with Aboriginal sites, objects or remains unless written authorisation is sought from the Minister for Aboriginal Affairs and Reconciliation. Penalties for an offence under this section are up to $10,000 or six months’ imprisonment in the case of an individual, or $50,000 in the case of a corporate body.

It is an offence under section 35 of the AHA to divulge information, in contravention of Aboriginal tradition, relating to an Aboriginal site, object, remains or Aboriginal tradition. Penalties for an offence against this section are up to $10,000 or six months imprisonment. Aboriginal sites are also protected by Commonwealth Legislation, namely the Aboriginal and Torres Strait Islander *Heritage Protection Act 1984.* The Commonwealth Act becomes active where there is reason to believe that the State Heritage Act is not sufficiently protecting an item, object and/or remains.

On 17 October 2017 the Minister for Aboriginal Affairs and Reconciliation introduced changes to the AHA in the form of the *Aboriginal Heritage Regulations 2017*. The main changes that may be relevant to this project going forward are discussed in Appendix H.

The following legislation is also relevant to Aboriginal cultural heritage matters for the Chaff Mill Solar Farm:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Native Title Act 1993*
- *Native Title (South Australia) Act 1994*
- *Environment Protection Biodiversity Conservation Act 1999.*

7.3.2 ASSESSMENT METHODOLOGY

The Aboriginal cultural heritage survey undertaken for the proposed Chaff Mill Solar Farm (Appendix H) involved:

- Desktop research, including searches of relevant databases, the Central Archive Register of Aboriginal Sites and Objects maintained by Aboriginal Affairs and Reconciliation Division (DSD-AAR), previous reports, relevant literature and aerial imagery and other documents relating to the development history of the area.
- Archaeological and anthropological surveys. The archaeological component and consisted of a pedestrian foot survey and the anthropological component involved broad, on site consultation with the nominated Ngadjuri traditional owners' representatives as well as a foot survey. The surveys were undertaken separately, with the anthropological survey undertaken on 1 November 2017, and the archaeological survey undertaken on 2 November 2017.

7.3.3 EXISTING CONDITIONS

7.3.3.1 BROAD LANDSCAPE DESCRIPTION

Lichen-encrusted outcrops are present within the project area, primarily along Wookie Creek and to the west. A small borrow pit was identified featuring siltstone with quartzitic inclusions including prominent quartz veins. Loose quartz ranging considerably in size was found throughout the project area.

The project area has been subject to previous disturbance by intensive farming and is subject to considerable natural erosion. Persistent clearing of the area for agricultural related activities, and then crop cultivation and livestock grazing is evident in the general area. In general, archaeological features such as burials, fire-places and ovens, middens, preserved workshop areas etc. will be destroyed by ploughing if they occur on the surface or within the plough zone. As a plough turns the soil it displaces any archaeological deposits within that depth of soil. Material buried lower within the soil profile will remain undisturbed, unless exposed by repeated ploughing and soil erosion.

7.3.3.2 PREVIOUS AND CURRENT RESEARCH

There have been no specific heritage surveys carried out relating directly to the project area.

The Central Archive, which includes the Register of Aboriginal Sites and Objects, maintained by the Department of State Development Aboriginal Affair and Reconciliation (DSD-AAR), did not contain any previously recorded Aboriginal heritage sites within the project area.

The South Australian Museum (SAM) Anthropology database identified four records of culturally sensitive material discovered in Clare (three records) and north-west of Clare (one record).

The Aboriginal cultural heritage survey of the Mintaro Solar Farm Project Area recorded no archaeological or anthropological sites as defined by the AHA.

There are landscape features within the project area that are connected to significant Creation Ancestor stories. These include rocks and outcrops that are coloured a deep purplish red and which may also have a covering of lichen, and milky quartz (Photo 7.7). Within the project area, there are outcrops of the lichen covered rocks along the western slopes which decline towards Wookie Creek (Figure 3). Milky quartz was not visible; however, it may be present. Both features have cultural significance and should not be disturbed. The Wookie Creek area, featuring rocky outcrops, was delineated as a culturally sensitive area (Figure 7.4).

Photo 7.7 Siltstone rocks feature in traditional stories and are a potential ochre source

The project area is within the country of the Ngadjuri peoples and is covered by Native Title Claims from the Kaurna Peoples and Ngadjuri Nation #2 (Location SA 2017) (Figure 7.5).

7.3.4 POTENTIAL IMPACTS

The design of the project will need to avoid culturally sensitive areas delineated in Figure 7.4.

The low ground surface visibility across much of the project area limited the potential for site identification during the field survey. Given the project area is highly disturbed farmland including a moderately disturbed minor creek system with little remnant vegetation noted, the potential for intact Aboriginal heritage sites remains low although there remains potential for subsurface archaeological sites, objects or remains as defined by the AHA, based on general research, combined with the consultation and survey results (refer Appendix H for further details).

7.3.5 MANAGEMENT AND MITIGATION MEASURES

A Cultural Heritage Management Plan would be developed by FRV, in consultation with traditional owners. The Cultural Heritage Management Plan would include a site discovery procedure to be implemented if Aboriginal heritage sites, objects or remains are discovered during civil works.

Heritage inductions will be undertaken for all work personnel, covering typical Aboriginal sites descriptions, potential indicators, site discovery process, working with monitors and legislative obligations.

7.3.6 KEY RECOMMENDATIONS

The design of the project would avoid culturally sensitive areas delineated in Figure 7.4.

Due to low visibility at the time of the survey, the site will be re-surveyed when it is cleared for construction and ground surface visibility is rendered to a state where the identification of potential Aboriginal heritage sites and objects can be undertaken confidently.

Map: PS103225_GIS_010_C	Author: brownma2	
Date: 19/03/2018	Approved by: EFitzner	

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Integrated Heritage Services Pty Ltd.

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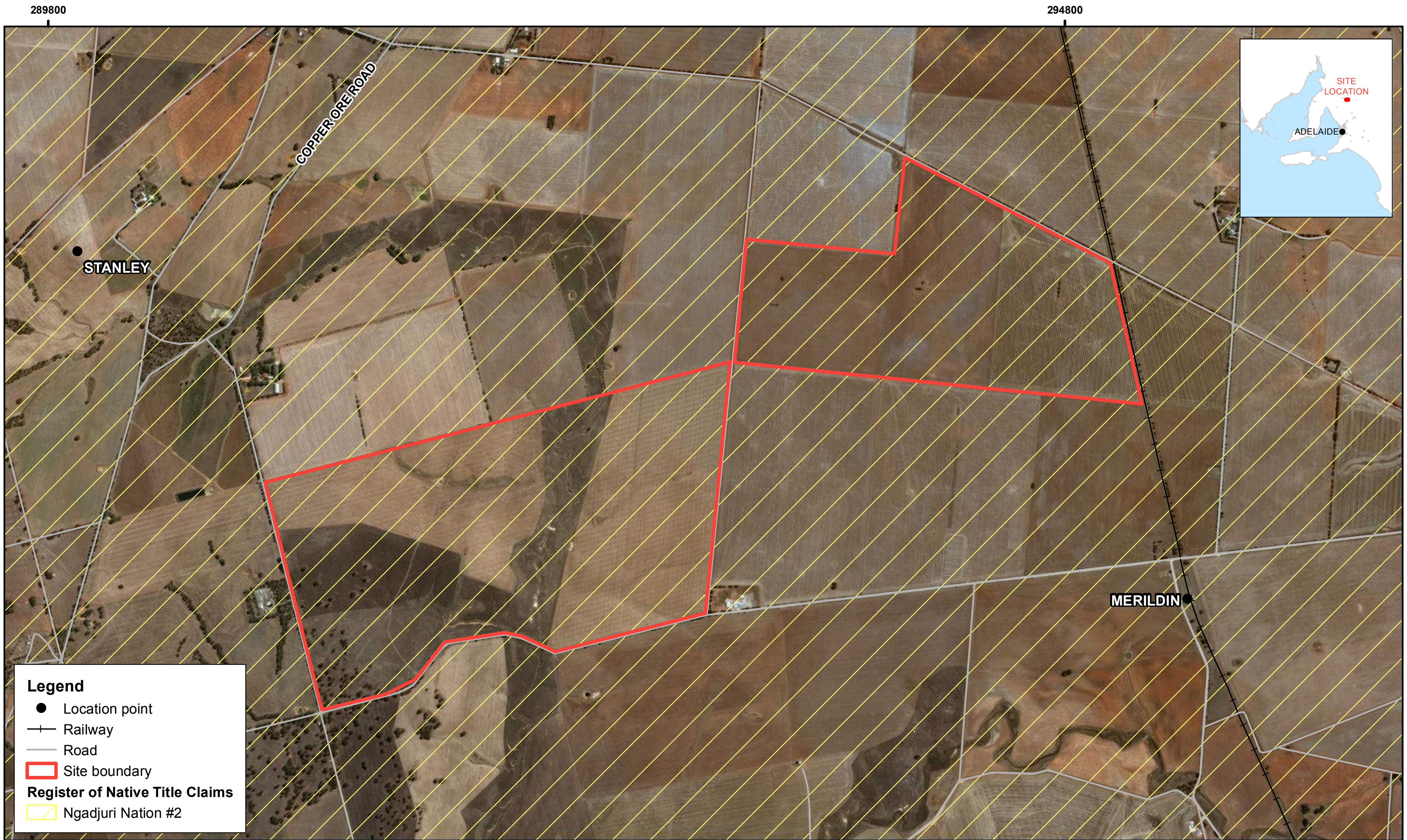
Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.4
Aboriginal Heritage Survey Results Map



Map: PS103225_GIS_011_C	Author: brownma2
Date: 19/03/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, data.gov.au

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.5
Native Title Claims

7.4 NON-INDIGENOUS HERITAGE

7.4.1 LEGISLATIVE AND POLICY REQUIREMENTS

Three pieces of legislation apply to the non-Indigenous heritage context of the site and locality, in relation to the project:

- *Environment Protection and Biodiversity Conservation Act 1999*, discussed in section 1.5.1.
- *Heritage Places Act 1993*
- *Development Act 1993*, and the *Planning, Development and Infrastructure Act 2016*.

The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Indigenous heritage significance in South Australia. The Act establishes the South Australian Heritage Council, and allows for the identification and protection of places of heritage significance under the South Australian Heritage Register, which lists all places of heritage significance in South Australia. Once registered, State heritage places are protected under both the *Heritage Places Act 1993* and the *Development Act 1993* (soon to be superseded by the PDI Act).

7.4.2 ASSESSMENT METHODOLOGY

An assessment was undertaken to determine the potential impacts of the project on any non-Indigenous heritage values within the project site and surrounding locality (Appendix I).

The assessment of non-Indigenous heritage values within the site and wider project area involved a review of the following registers, databases and documents:

- The Australian Heritage Places Inventory
- The Australian Heritage Database
- The South Australian Heritage Places Database
- The Clare and Gilbert Valleys Development Plan
- The Register of the National Estate (non-statutory)
- The Mintaro State Heritage Area: Guidelines for Development (DEWNR, Government of South Australia 2015)
- The Mintaro Conservation Study (McDougall and Vines 1988).

7.4.3 EXISTING CONDITIONS

The assessment established a baseline description of the non-Indigenous heritage values associated with the wider project area.

7.4.3.1 BROAD LANDSCAPE DESCRIPTION

As outlined in the previous section, the Clare Valley region was inhabited by the Ngadjuri people prior to European occupation (South Australian Museum 2017).

During the early 1840s, land in the region was occupied by colonists perusing pastoral opportunities. The Barossa Valley and Clare Valley were settled and the discovery of copper at Kapunda in 1844 and Burra in 1845 continued to attract settlers and investment in the lower and mid-north regions of South Australia (McDougall and Vines 1988).

The Mintaro township was shaped by early land transportation, extractive primary industry, distinctive social and community groups, and productive primary industry (McDougall and Vines 1988).

A significant proportion of Mintaro's buildings were built between 1850-1860, including small cottages, shops, flour mill, blacksmiths, churches and hotels. During the 1860s and 1870s several public buildings were built in the town including a police station, a public school and the Council hall and Institute (Department of Environment, Water and Natural Resources 2015).

The Mintaro Slate Quarry opened in 1854 and was a major source of employment. Approximately 40 men were employed at the quarry in 1860 (McDougal and Vines 1988). The Mintaro Slate Quarry continues to be one of the oldest continuously producing quarries in Australia (DEWNR 1990).

The Mintaro Railway Station (renamed Merildin in 1918) was built in 1870, approximately 7 km east of the township. Mintaro was well-placed to continue as an agricultural service centre despite the closure of the Burra Mines in 1877. The surrounding farming districts of the fertile Gilbert Valley prospered during South Australia's rural boom of the early 1870s and early 1880s (DEWNR1990).

Two large pastoral properties were built during this prosperous period; Martindale Hall (built 1879-80) and Kadlunga Homestead (purchased 1881). These properties were serviced by local labour from Mintaro. Martindale Hall continuous to be an attraction in Mintaro.

After 1930, there was a general decline in rural populations. The continuing function of the slate quarry helped Mintaro survive, however there has been limited development. Consequently, Mintaro has retained much of its historic character (DEWNR ND).

Mintaro was declared a State Heritage Area (SHA) in 1982. The designation of a State Heritage Area is intended to ensure that changes to, and development within, the area are managed in a way that the area's cultural significance is maintained (DEWNR 2015). Objectives within the Mintaro State Heritage Area include:

- Retention of the original land division pattern and orientation
- Reinforcement of the rural village character with minimal infrastructure
- Retention of significant views between buildings along Burra Street to agricultural land
- Retention and conservation of the historic buildings, structures and ruins
- Adaption of some historic buildings and structures to ensure their long-term conservation and viability
- Unity of built-form with new buildings of a sympathetic design and form to historic building
- Retention and enhancement of the town's landscape character (DEWNR 2015).

7.4.3.2 ISSUE-SPECIFIC SITE DESCRIPTION/BASELINE

The desktop search revealed a number of places of heritage interest in the subject area. In total, the search revealed 34 places on the Register of National Estate (now non-statutory), 26 State heritage places, one State Heritage Area, and no local heritage places. Most of the registered places are located within the township, approximately 1.8-2.3 km south-west of the project site; the nearest being the Merildin Railway Station, approximately 1 km south of the project site. The results of the database searches are presented in Table 7.5 and Table 7.6 below.

Table 7.5 Heritage places in Mintaro and surrounds recorded on the Australian Heritage Places Database

ADDRESS	DETAILS	CLASS	PROXIMITY TO SITE
Lot 44 Burra St	Blacksmiths Shop	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 53 Burra St	Briggs Cottage Ruins	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 38 Burra Rd	Carpenters Shop Complex	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Catholic Church Road, Mintaro	Catholic Church of Mary Immaculate	Register of the National Estate	Outskirts of Mintaro township, approximately 2km west of the project area
Lot 21 Church St	Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	PROXIMITY TO SITE
Lot 65 Church St	Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 66 Young St	Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 13 Burra St	Devonshire Hotel (former)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 5 Wakefield St	Flour Mill Ruins	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 41 Burra Rd	H Jolly House	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 80 Wakefield St	House and Outbuildings	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 35/36 Burra St	House, Outbuildings and Stone Wall	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 42 Burra St	Hunt Workshop/Barn and Stone Fence	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
	Kadlunga	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 4 Burra St	Magpie and Stump Hotel	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
	Martindale Hall	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro Rd	Merildin Railway Station Group	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 8/9 Stein St	Methodist Church Group	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro Rd	Mintaro Cemetery	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
	Mintaro Conservation Area	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 3 Burra St	Mintaro Institute and Civic Hall	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 61 Church St	Mintaro Primary School	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro Rd	Mintaro Slate Quarries	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 569 Burra Rd	Police Station (former)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area

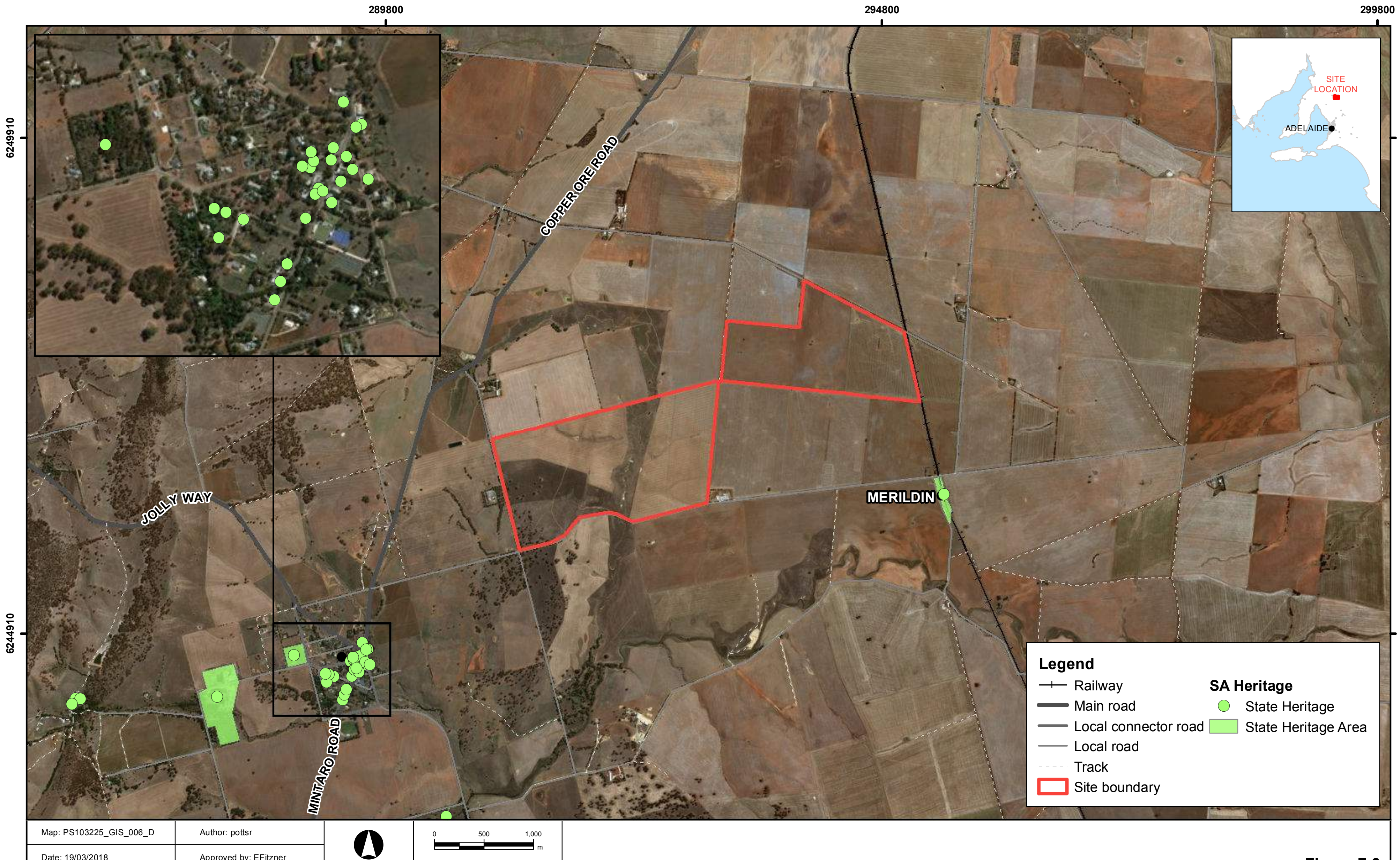
ADDRESS	DETAILS	CLASS	PROXIMITY TO SITE
Lot 34 Burra St	Reillys Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 36 and 37 Burra St	Row of shops and dwellings	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 35 Burra St	Shop and Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 37 Burra St	Shops and Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Ruin King St	Slate Farmhouse (R Alcock)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 23 Hill St	St Peters Anglican Church	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Government Rd	St Stanislaus Catholic Church (former)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 33 Hill St	Thompson Priest House and Mines Office	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 77 Wakefield St	Wakefield Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro road, Merildin	Merildin Railway Station	Register of the National Estate	Approximately 1km south of the project area

Table 7.6 Heritage places in Mintaro and surrounds recorded on the South Australian Heritage Places Database

ADDRESS	DETAILS	CLASS	STATE HERITAGE PLACE NO	PROXIMITY TO PROJECT AREA
Burra Road MINTARO	Mintaro Institute and Civic Hall	State	11650	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Dwelling (former Shop and Dwelling)	State	11647	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Dwelling - Jolly House	State	11721	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Former Carpenter's Workshop and Dwelling	State	11643	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Mintaro Mews (former Shop and Dwelling)	State	11646	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Former Blacksmith Shop	State	11718	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Former Carpenter's Workshop/Stables	State	11720	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	STATE HERITAGE PLACE NO	PROXIMITY TO PROJECT AREA
Burra Street MINTARO	Mounting Steps, Mintaro	State	10069	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Street MINTARO	Dwelling (former Mintaro Police Station)	State	10205	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 22 Burra Street MINTARO	Shop and Cottage	State	11649	Within township. approximately 1.8-2.3 km south-west of the project area
Church Street MINTARO	Dwelling	State	11645	Within township. approximately 1.8-2.3 km south-west of the project area
Church Street MINTARO	Mintaro Primary School	State	11710	Within township. approximately 1.8-2.3 km south-west of the project area
Hill Street MINTARO	Former Mintaro Slate Mine Office and Dwelling	State	11707	Within township. approximately 1.8-2.3 km south-west of the project area
Hill Street MINTARO	Dwelling, Outbuilding and Fence	State	11709	Within township. approximately 1.8-2.3 km south-west of the project area
Kadlunga Road MINTARO	'Kadlunga' House and Stone Garden Wall	State	10200	Within township. approximately 1.8-2.3 km south-west of the project area
Leasingham Road MINTARO	Devonshire House (former Devonshire Hotel and Footway)	State	10066	Within township. approximately 1.8-2.3 km south-west of the project area
Leasingham Road MINTARO	Reillys Cellar Door and Restaurant, Heritage B&B Cottages (former Shop and Dwelling)	State	11648	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 9 Leasingham Road MINTARO	Magpie and Stump Hotel	State	10201	Within township. approximately 1.8-2.3 km south-west of the project area
Manoora Road MINTARO	"Martindale Hall", Martindale Hall Conservation Park	State	10067	Approximately 2.6 km south-west of the project area
Mintaro Road MINTARO	Mintaro Cemetery	State	11715	Approximately 2.3 km south-west of the project area
Slate Quarry Road MINTARO	Mintaro Slate Quarries	State	11711	Approximately 3.1 km south-west of the project area
Wakefield Street MINTARO	Dwelling and Kitchen	State	11716	Within township. approximately 1.8-2.3 km south-west of the project area
Wakefield Street MINTARO	Dwelling ('Wakefield Cottage')	State	11714	Within township. approximately 1.8-2.3 km south-west of the project area
Wakefield Street MINTARO	Former Flour Mill	State	11644	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	STATE HERITAGE PLACE NO	PROXIMITY TO PROJECT AREA
Young Street MINTARO	Dwelling (former Mintaro Anglican Church)	State	11695	Within township. approximately 1.8-2.3 km south-west of the project area
Young Street MINTARO	Dwelling	State	11699	Within township. approximately 1.8-2.3 km south-west of the project area
MINTARO	Mintaro State Heritage Area	State Her Area	13935	Covers whole of Mintaro township. The closest boundary is approximately 1.2km from the project area.



Map: PS103225_GIS_006_D	Author: pottsr
Date: 19/03/2018	Approved by: EFitzner

Source: Department of Planning, Transport and Infrastructure, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.6
Heritage Places in Mintaro and Surrounds

7.4.4 POTENTIAL IMPACTS

7.4.4.1 CONSTRUCTION

Any potential impacts on non-Indigenous heritage interests in the area during construction are unlikely. Potential sources of impact are:

- Vibration levels generated by compactors, vibration rollers and pile driving
- Trucks accessing the site through the Mintaro township.

Whilst vibration levels can generate structural damage, this is generally limited to a proximity of 25 m. All places of heritage interest are located at least 1 km away. Measures will be put in place to ensure construction traffic does not access the site via the Mintaro township.

7.4.4.2 OPERATION

The potential for impacts on non-Indigenous heritage interests in the area during the operation stage is low. Potential impacts may be to:

- The State Heritage Area status and amenity value of the township and surrounds
- The Mintaro State Heritage Area objective for 'reinforcement of the rural village character with minimal infrastructure'.

Any impacts would be negligible due the 3.5 km distance between the development site and the township. There is no potential for vibrations resulting from the operation of the facility to structurally impact heritage places.

7.4.5 MANAGEMENT AND MITIGATION MEASURES

7.4.5.1 CONSTRUCTION

The assessment has determined that no direct impacts from construction are expected on the heritage values of the Mintaro township and surrounds. Furthermore, a Traffic Management Plan and CEMP will be prepared for the project to ensure that workers are aware of the heritage values in the area and that there are no impacts to these places.

7.4.5.2 OPERATION

Potential impacts on the State Heritage Value objectives for Mintaro will largely be mitigated through the design layout of the solar farm.

The solar plant will be low in profile, comprising of panels which do not exceed three metres in height. The model of solar panel chosen for this project will not have metal frames in order to reduce glare impacts. Visual and glare studies have been undertaken as part of the Development Application and mitigation and management measures, such as screening, have been investigated as part of these reports. Refer to section 7.5 and Appendix J for visual amenity mitigation measures.

7.4.6 KEY RECOMMENDATIONS

The Chaff Mill Solar Farm will not impact any heritage places within the Mintaro township and surrounds.

The project may impact on the objectives of the Mintaro State Heritage Area, which include limiting the development of infrastructure and retaining views to agricultural land. Any impact would be mitigated through the design of the solar farm. Visual and glare studies have been undertaken as part of the Development Application and mitigation and management measures, such as screening, have been investigated as part of these reports.

A Traffic Management Plan and CEMP will be prepared to ensure that the heritage values of Mintaro are not impacted in any way. The access route for construction vehicles will not pass through the Mintaro township. All personnel working on the project site would be informed of their legal obligations regarding the protection of non-Indigenous heritage places.

Photo 7.8 Merildin Railway Station (renamed from 'Mintaro' in 1918) – located one kilometre away from the project site boundary

Photo 7.9 Merildin Railway Station (renamed from 'Mintaro' in 1918) - located one kilometre away from the project site boundary

7.5 VISUAL AMENITY

7.5.1 LEGISLATIVE AND POLICY REQUIREMENTS

Guidance is drawn from a broad range of relevant policy items within the Clare and Gilbert Valleys Council Development Plan. Infrastructure development should:

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

Further, the State Heritage Area (Mintaro) Objectives, require:

- Objective 1. Development that does not compromise the Statement of Heritage Value and contributes to the Desired Character for the Mintaro State Heritage Area.

The qualitative landscape character assessment was undertaken consistent with best practice, as prescribed by the *Guidelines for Landscape and Visual Impact Assessment (Third Edition).*

7.5.2 ASSESSMENT METHODOLOGY

A visual amenity assessment was undertaken for the Chaff Mill Solar Farm (Appendix J). The visual amenity assessment methodology involved:

- A desktop study of the topography and determination of the likely viewpoints from which the solar farm may be apparent
- A site visit to verify desktop assessment and assess existing conditions. Photographs were taken at selected viewpoints to underpin the landscape character and visual assessment
- Identification of visual receptors potentially affected by the proposed solar farm. These are locations from where it is considered the proposed solar farm is likely to be wholly or partially visible
- Landscape character assessment. In total 19 (nineteen) waypoints were visited to determine landscape character. These location of these waypoints are displayed on Figure 7.7 below
- Definition of place attachment value. ‘Place attachment’; for the purpose of this report, is defined as a complex synergy of any number of relevant sensory and emotive qualities, which shape how individuals and communities perceive and connect to the landscape
- Identification of appropriate mitigation measures to reduce potential impacts.

7.5.3 EXISTING CONDITIONS

7.5.3.1 BROAD LANDSCAPE DESCRIPTION

The Clare Valley agricultural landscape contains fields bounded by occasional groups of scattered Eucalypts and scattered hedgerows. Sprawling traditional land holdings of pastural and cropping fields are visually punctuated by the occasional visually prominent vineyard. The presence of visually imposing, steel constructed barns and warehouses reinforce the utilitarian nature of the landscape and the growing regional focus being placed on wine production.

The landscape of the Clare Valley comprises of some of the region’s most productive rural land. Its visual qualities make the landscape a significant tourism asset to the region. The landscape of the Clare Valley is in stark contrast to the landscape of the Mt Rufus and Mount Horrocks ranges to the east, comprised of a visual expanse of open, sparsely vegetated grazing land, within which the proposed solar farm development site will be located.

7.5.3.2 ISSUE-SPECIFIC SITE DESCRIPTION/BASELINE

The landscape character of the immediate development area was assessed in two distinct localities:

- The vegetated hillsides west of the Mintaro township
- The expansive eastern plains up to the A32 Barrier Highway

The vegetated hillsides to the west of the Mintaro township, bound by Leasingham Road to the southwest, Martindale Road to the south, and Farrell Flat Road to the north, broadly characterise the landscape to the west of Mount Horrocks and Mount Rufus. The agricultural land use defines the area with pastural land, crop grazing, and vineyards. The rolling topography, combined with the presence of mature native road side vegetation, adds an element of human scale to the landscape, with a tightly defined visual enclosure. The Mintaro township itself adds a rural, historic sense of place through its built form. Through the assessment, this locality was determined to be one of moderate to high scenic quality and of moderate to high sensitivity to change.

The expansive eastern plains up to the A32 Barrier Highway, bound by Copper Ore Road to the west and north, Martindale Road to the south, and the A32 Barrier Highway to the east, is a visually simple landscape. Vegetated hillsides to the west give way to a mostly flat landform of open pastoral and cropping fields. The area is generally void of significant boundary plantings, however occasional scattered groups of mature native trees cluster around the few residential dwellings; with occasional windmills, agricultural barns and stobie poles dotting the landscape. The Waterloo Windfarm to the distant east sits prominently on the horizon. Through the assessment, this locality was determined to be of a low scenic quality and of low sensitivity to change.

7.5.4 POTENTIAL IMPACTS

7.5.4.1 CONSTRUCTION

During construction, visual amenity impacts within the locality will occur because of earthworks, construction of additional minor infrastructure and the overall increase in the number of people and vehicles. As the changing visual environment and activity during construction will be temporary, the visual impacts of this phase were not considered in detail in the visual impact assessment.

7.5.4.2 OPERATION

Of the 19 (nineteen) locations visited during the assessment, eight were sensitive receptors (refer Figure 7.7 to Figure 7.14). A summary of the likely visual impacts of the solar farm is provided in Table 7.7. At most sensitive receptors, the predicted impact was determined to be only slightly adverse or non-existent and no mitigation measures were recommended.

At Sensitive Receptor seven, predicted impacts were determined to be substantially to moderately adverse. It was recommended the mitigation measures be considered for this receptor. For reference, Sensitive Receptor seven is located at the Chaff Mill Road intersection with Merildin Road. It comprises of agricultural storage buildings, with a residential property soon to be constructed.

Table 7.7 Summary of likely visual impacts of the Chaff Mill Solar Farm

SENSITIVE RECEPTOR	WESTERN PARCEL (PARCEL ONE)			EASTERN PARCEL (PARCEL TWO)		
	DISTANCE	EXPOSURE	IMPACT	DISTANCE	EXPOSURE	IMPACT
SR #01	0.6 km	Slight to moderate	Slight adverse to no change	2.4 km	None to slight	No change
SR #02	1.0 km	Slight	Slight adverse to no change	2.4 km	Slight to moderate	Slight adverse to no change
SR #03	Approx. 1.8 km	Slight	Slight adverse to no change	Approx. 1.8 km	Slight	Slight adverse to no change
SR #04	Approx. 1.5 km	Slight	No change to slight adverse	Approx. 1.5 km	Slight	No change to slight adverse
SR #05	Greater than 3.7 km	Negligible	No change	3.7 km	Negligible	No change
SR #06	Greater than 0.6 km	Slight to negligible	No change	Approx. 0.6 km	Slight to negligible	No change
SR #07	Approx. 200+ m	High	Substantially to moderately adverse	Greater than 200 m	Slight	Slightly adverse to no change
SR #08	3.3 km to 2.7 km	Moderate	Slightly adverse	3.3 km to 2.7 km	Slight	No change

Figure 7.7 Sensitive receptor one

Figure 7.8 Sensitive receptor two

Figure 7.9 Sensitive receptor three

Figure 7.10 Sensitive receptor four

Figure 7.11 Sensitive receptor five

Extensive screen planting on the western and southern boundaries and around the dwelling will exclude all views of both the nearby Parcel Two and Parcel One which lies beyond.

Figure 7.12 Sensitive receptor six

Figure 7.13 Sensitive receptor seven

Figure 7.14 Sensitive receptor eight

7.5.5 MANAGEMENT AND MITIGATION MEASURES

Mitigation measures were recommended for SR#7. On-site opportunities should be found along the eastern boundary of the eastern parcel for the introduction of quick growing native screen planting – to be delivered when construction commences. It is recommended that this vegetation / screening plan be implemented in consultation with the residents; who have expressed a desire to be involved in the design of any vegetation mitigation program that affects their property.

It is considered unnecessary to screen views from adjacent roads within the locality as these roads are for local traffic only and the volume and frequency of traffic movement is low. It is recommended that where desirable, visual mitigation is undertaken on an individual site basis and should comprise of screen planting using indigenous and native vegetation.

7.5.6 KEY RECOMMENDATIONS

The introduction of the solar farm does not change the mainly pastoral nature of the locality and wider contextual landscape, nor does it impact on any significant viewpoints within the contextual landscape. The nature and visual qualities of the Expansive Eastern Plains Character Unit will not be significantly altered.

The solar farm will meet the Provisions of the Development Plan which requires it to be 'sited and designed to blend with the natural features of the landscape' and to 'cause minimal damage to the natural landform'.

It has been demonstrated that, where necessary, the likely visual impact on the identified sensitive receptors can be managed through visual mitigation introduced through vegetative screening.

The sense of place and place attachment values of Mintaro township will not be detrimentally impacted. As required by the Provisions of the Development Plan the development will:

- 'Protect areas of scenic or conservation significance from undue damage'
- 'Not compromise the Statement of Heritage Value'.

The solar farm would introduce a new infrastructure element of an acceptable design standard that will evoke curiosity, become an 'incidental' infrastructure feature of merit and a best practice example of progressive renewable energy delivery.

With the application of the recommended mitigation measures, the proposed Chaff Mill Solar Farm will have a negligible to slightly adverse only visual impact within a locality and character unit of low scenic quality. In saying this; FRV plan to work with the owners of the property on the corner of Merildin and Chaff Mill Roads who will be the most impacted (out of all residences in the area) by the visual appearance of the solar farm. The owners of this land / property have written to FRV expressing their desire to be involved in any decision-making regarding visual mitigation measures. Their letter is attached as Appendix K.

7.6 GLARE

7.6.1 LEGISLATIVE AND POLICY REQUIREMENTS

The assessment guidelines listed in section 2.3 cite glare as an issue to be investigated when undertaking environmental studies for proposed solar farm developments, however no legislative or policy documentation is prescribed.

The Civil Aviation Safety Authority (CASA) and the Department for Planning, Transport and Infrastructure (DPTI) have not published specific regulations regarding solar farm glare relating to aviation or road safety (refer section 7.14 for further information on glare the impacts of glare on aviation safety).

7.6.2 ASSESSMENT METHODOLOGY

A glare assessment was undertaken to assess the potential glare impact of the proposed Chaff Mill Solar Farm (Appendix L). The assessment methodology involved a viewshed analysis and the use of the Solar Glare Hazard Analysis Tool (SGHAT).

The viewshed analysis considered the location of sensitive receptors, relative to the solar farm and view lines between the two (accounting for topography).

The SGHAT (2.0 and 3.0), developed by Sandi National Laboratory, was utilised to assess potential glare caused by the Chaff Mill Solar Farm. SGHAT considers the following factors:

- Latitude and longitudinal coordinates
- Elevation
- Sun position
- Vector calculations
- PV module orientation
- Reflectance environment
- Ocular factors.

Once the potential for glare was identified through the viewshed analysis and SGHAT, a risk assessment approach was used to identify the potential significance of the risk based on the magnitude of the glare hazard generated and the sensitivity of the receptors.

7.6.3 EXISTING CONDITIONS

The baseline condition within the vicinity of the project area is characterised by flat to undulating agricultural land. The landscape is predominately cleared with some native vegetation remaining along road verges, creeks and drainage lines. Existing dwellings in the area include homesteads which are scattered across the landscape and are generally located in association with agricultural buildings. There are a small number of dams within the vicinity of the project area. The closest buildings to the project area are agricultural storage buildings located at the intersection of Chaff Mill and Merildin Roads. A proposed residential dwelling is currently under construction on this property.

There are no significant existing features in the landscape with the potential to contribute to glare.

7.6.4 POTENTIAL IMPACTS

The main elements of the solar farm with the potential to induce glare are the tilt, orientation and optical properties of the PV modules in the solar array and the rotational capabilities of the tracking system.

The results of the SGHAT modelling found that:

- No glare hazard potential is likely to affect existing rural and residential dwellings within the vicinity of the project area
- There is potential for glare hazard to occur when travelling along Merildin Road adjoining the south-east corner of the project area, notably at the intersection with Chaff Mill Road. The glare hazard potential occurs in the morning from around 5 am-11 am
- Potential glare hazard may affect the residential dwelling currently under construction adjoining the intersection of Chaff Mill and Merildin Roads
- No glare potential was identified for Copper Ore Road and other minor roads.

7.6.5 MANAGEMENT AND MITIGATION MEASURES

The sections of Merildin and Chaff Mill Roads adjoining the south-eastern corner of the project area, where potential glare hazard was identified, are currently not fully screened by existing vegetation. Proposed mitigation of this glare potential is a minimum 3.5 m high screen planting along the south-eastern boundary of the project area where it adjoins Merildin Road. The planting should extend along Chaff Mill Road, approximately 130 m from the intersection with Merildin Road, to provide sufficient screening to Chaff Mill Road and the rural dwelling under construction. The planting should be of sufficient density to screen potential glare, a minimum width of 5 m containing dense shrubs and tree planting is likely to provide the screening required. The screen planting would be undertaken prior to operation. This planting program would be designed and implemented in consultation with the property owners.

7.6.6 KEY RECOMMENDATIONS

Mitigation of potential glare on travellers along the affected Merildin Road section and intersection with Chaff Mill Road and the residential dwelling currently under construction at this intersection would be undertaken with the establishment of a vegetation screen planting. This planting would be established prior to operation of the solar farm and be maintained as a dense vegetation screen to a minimum height of 3.5 m.

7.7 GEOTECHNICAL

7.7.1 LEGISLATIVE AND POLICY REQUIREMENTS

7.7.1.1 ASSESSMENT METHODOLOGY

The geotechnical study was undertaken to better understand the likely subsurface conditions which will be encountered across the site and assist in identifying issues which may be encountered during construction.

The study involved a review of available information, including databases, industry adopted technical documents and geology maps.

7.7.2 EXISTING CONDITIONS

7.7.2.1 REGIONAL GEOLOGY

A review of the South Australian Resources Information Gateway (SARIG) database shows historic boreholes drilled within 3 km of the proposed sites encountered low to medium plasticity sandy clays and silts overlaying highly weathered shale and hard to very hard slate. The shale and slate was encountered at depths as shallow as 3.5 m below ground level in some areas.

SOILS

The Soil Map of Northern Agricultural Areas of South Australia 1: 506,880 indicates sandy and clayey red-brown earths to be present at the two sites with dark brown cracking clay and terra rossa soils (shallow residual formations, red or red-brown in colour and developed from limestones or other highly calcareous rocks).

The 1:2,000,000 Soil Map of Australia (1958-1968) indicates the Mintaro area soil comprises unbleached A2 horizon and pedal subsoils. Pedal soils are characterised as having individual particles of soil that are held together, either by chemical or organic means, creating peds, or lumps. The structure of pedal soil allows the soil to retain moisture within the ped and still allow draining and air movement between the peds.

GEOLOGY

Published information (Forbes, 1964) indicates the underlying geology of the location north-east of the Mintaro area comprises recent Quaternary slope alluvium including outwash and soils, with some coarse gravels derived from older alluvium.

Tertiary deposits are recorded as being present in areas of Site 1, comprising sandstone, sandy gravel, ferruginous (containing iron oxide or rust) gravel, and siliceous duricrust. Watervale Sandstone Member of the Burra Group is also present underlying areas of Site 1 and is characterised by fine to coarse grained feldspathic quartzite and orthoquartzite.

7.7.2.2 GROUNDWATER

A review of the South Australian Government's WaterConnect database was performed for previously investigated boreholes within a 3 km radius of the sites and indicates the groundwater table in the area is generally located greater than 12 m below ground level.

Due to the Wookie Creek watercourse and its seasonal fluctuations in water heights, there is a possibility that groundwater may be intersected at a shallower depth in this vicinity.

7.7.2.3 ACID SULPHATE SOILS (ASS)

Based on the Australian Soil Resource Information System (ASRIS), it is very unlikely that the site is underlain by ASS. ASRIS lists it as having an 'extremely low probability of occurrence' (a confidence level of 4) for ASS in the near-surface materials of the natural soil profile.

7.7.2.4 SEISMIC ACTIVITY

Potential earthquake damage at a site is related to the distance from an earthquake epicentre, its magnitude, and its intensity. Magnitude is a quantitative value computed from seismograph data, whilst intensity is a qualitative value based on how people and objects respond to an event. There have been no significant earthquakes (defined as having a magnitude of 3.5 or greater) recorded by Geosciences Australia in Mintaro area within the last 60 years.

Seismic activity recorded in the Mintaro area as measured by the Geoscience Australia Earthquake Database indicates the area generally has low seismic activity. The largest recorded earthquake within 100 km of the Mintaro area, with a magnitude of 2.5, occurred on 24 July 2017 and was found to have an epicentre located 30 km north-east of the proposed sites.

7.7.3 POTENTIAL IMPACTS

Historical data indicates hard to very hard rock (shale and slate) could be encountered at shallow depths and may require a rock breaker attachment used during construction excavation.

Soft soil materials including alluvium (sands and gravels) may impact shallow footings. Geotechnical laboratory testing would be required to assess the subsurface material for bearing capacity and settlement.

Local knowledge of the soils and topsoils indicates that the ground can become quite wet and boggy during periods of rainfall. This would present a risk for accessing the site with plant equipment for geotechnical drilling investigations and during the construction phase. Published information states the soil is moderately well drained and unlikely to remain wet for more than a week.

7.7.4 KEY RECOMMENDATIONS

WSP recommends that detailed site geotechnical investigation be undertaken once the design of the solar farm is more defined. The investigations would include analysis of the subsurface soil profile (including laboratory analysis) to obtain engineering properties and parameters of the underlying soil and geology of the sites to inform the detailed design of the solar farm infrastructure.

A Safe Work Method Statement (SWMS) and Health, Environmental, and Safety plan should be created prior to attending site and should specifically address the potential for vehicles and plant equipment getting bogged during wet weather. These documents should include the use of engineering aids for accessing the site and vehicle recovery. Site workers should have training/experience in safe operation of 4WD vehicles and vehicle recovery.

7.8 TRAFFIC AND ACCESS

7.8.1 LEGISLATIVE AND POLICY REQUIREMENTS

The following legislation and policy documents are relevant to traffic and access requirements for the Chaff Mill Solar Farm:

- *Road Traffic Act 1961*
- *Environment Protection Act 1993*
- *Heavy Vehicle National Law Act 2013*
- Clare and Gilbert Valleys Development Plan.

7.8.2 ASSESSMENT METHODOLOGY

A Traffic Impact Assessment (TIA) was prepared for the Chaff Mill Solar Farm (Appendix M). The objective of the TIA is to identify any key traffic operational and safety issues that may arise out of the construction and operational phases of the project and to suggest measures that may mitigate these. This assessment is based on a desktop assessment and site inspections (undertaken on 11 January and 15 March 2018) of roads and traffic operations at and surrounding the proposed site. The site inspections assessed current road condition to identify any existing safety hazards and determine their capacity to carry additional traffic if required. These inspections together with traffic usage provides a basis for the assessment of any impacts associated with the proposed solar farm.

The assessment approach involved:

- Determining the existing (baseline) road and traffic conditions near the project that may be impacted by the proposed project
- Developing an understanding of the construction staging and traffic generating activities
- Identifying and assessing options for access to the project site
- Estimating the volume, type, frequency and patterns of traffic movements associated with the construction and ongoing operations activities of the project
- Assessing the impacts of the traffic generated by the project on the existing (baseline) road and traffic operations
- Identifying and suggesting mitigation measures that may be implemented to minimise or eliminate these impacts.

7.8.3 EXISTING CONDITIONS

7.8.3.1 ROAD NETWORK LAYOUT AND SITE ACCESS

Mintaro is located between two major arterial roads; 13 km west of the Barrier Highway (A32 linking Gawler with Sydney via Broken Hill) and 8km east of the Horrocks Highway (the B82 – Main North Road – which joins the A32 at Giles Corner about 35 km to the south and provides access to the mid-north via Clare). These roads are sealed two-lane undivided roads.

Road access to the project area is provided by:

- Merildin Road which connects Copper Ore Road approximately 600 m north of Mintaro. The south west corner of the west section land parcel at Wookie Creek Road is approximately 1.5 km east of the Copper Ore Road intersection. The south west corner of the east section land parcel is located a further 2.1 km east along Merildin Road then 1.2 km north along Chaff Mill Road.

- Wookie Creek Road (west land parcel only) which connects with Copper Ore Road at its norther end about 3 km north of Mintaro and 800 m to the north-west corner of the west section land parcel.

- Flagstaff Road which connects the Barrier Highway to the east of the project site and about 13 km north of Manoora and then via Riley Road/Merildin Road. It is about 8.5 km from the Barrier Highway to the junction with Chaff Mill Road and a further 2.1 km to the junction with Wookie Creek Road.
- Chaff Mill Road runs between the two land parcels linking Merildin Road and Faulkner Road.

These roads are all unsealed. Chaff Mill Road and Faulkner Road are narrow unsealed roads suitable for dry weather access only.

7.8.3.2 DESCRIPTION OF ROADS

BARRIER AND HORROCKS HIGHWAYS

These two rural arterial roads are sealed with formed shoulders and (centre and edge) line marking. Both roads are gazetted B-double routes which means they have been assessed and are of an appropriate standard to allow for use by restricted access vehicles (RAV) without the need for special permits.

The subject 27 km section of the Barrier Highway passes through the townships of Saddleworth, Riverton and Manoora. The vertical and horizontal alignments through this section are of a high standard with few small radii curves.

The subject 40 km section of the Horrocks Highway passes through six towns including Auburn. The vertical and horizontal alignments through this section are also of a reasonable standard and the section includes overtaking lanes in both directions. The apparent poor physical condition of the Horrocks Highway has been the subject of adverse public comment in recent years which has been supported by the RAA. This issue relates to the more highly trafficked sections north of Gawler and less so in the section north of Giles Corner.

MINTARO-LEASINGHAM ROAD

This road is a narrow sealed road with gravel shoulders. It is generally flat (i.e. no significant vertical grades) and exhibits long straight sections with intermittent horizontal curves. Some of these curves are quite tight and reduced speeds are required to negotiate these. There are numerous trees located close to the road posing safety hazards but not unlike many other rural roads of its type. Through the Mintaro township there are no shoulders. The road is not generally considered to be conducive to significant use by large heavy vehicles (such as semi-trailers) without some improvements along parts of its length to improve curves and sight distances, widen shoulders and provide protection from roadside hazards.

MINTARO-MANOORA (MIN-MAN) ROAD

This road is a sealed road about 7.5 m wide and with minimal shoulders. The alignment consists of straight sections with intermittent curves. Many of these curves have small radii and are treated with advisory speed signs (50, 60 and 70 kph). There are numerous small crests having slight grades. The road has painted centrelines, edgelines and barrier lines (around curves and over crests). There is evidence in numerous locations of significant stormwater erosion which may appear to undermine the pavement structure. It is assumed that this would be exacerbated with further wet weather. Vehicles riding off the pavement edge at these locations may lose control.

MINTARO-FARRELL FLAT (COPPER ORE) ROAD

The inspection was limited to the section between Mintaro and the junction with Faulkner Road. The road exhibits similar characteristics to the Mintaro-Leasingham Road with some crests that restrict sight distance and warrant limits on overtaking.

JOLLY WAY (MAIN NORTH ROAD TO COPPER ORE ROAD)

The alignment of this sealed road consists of a combination of straight sections and curves having varying radii through level to undulating topography. There are sections of road where visibility of oncoming traffic is restricted and hence overtaking without care may be problematic. The road is delineated with painted centrelines, edgelines and barrier lines over some crests and around some curves (preventing overtaking), Some of the curves are signposted with advisory speed signs and other warning signs and a guardrail is located on the outside of those curves where there is a drop off. There are two curves where the advisory speed signs are 50 kph and 45 kph (S-vend). Although the design standard of the vertical and horizontal alignment of this road is lower than the posted speed limit, appropriate safety measures appear to have been implemented to both reduce the risk of crashes occurring and the severity of crashes should these occur. Overall the road did not present any foreseen significant safety issues. At the western end of the road, it is crossed by the Riesling Trail – a shared use path along a disused rail corridor. Tourist cyclists reportedly use this path and then Jolly Way to access the wineries abutting Jolly Way further to the east.

CATHOLIC CHURCH ROAD (JOLLY WAY TO COPPER ORE ROAD)

This is a narrow, unsealed road about 750 m in length with no shoulders. It is generally straight and exhibits a slight uphill grade from east to west at its western end. It connects to Jolly Way via a T-junction and to Copper Ore Road with a four-way intersection opposite Merildin Road.

MINTARO-MERILDIN ROAD

This road is a narrow unsealed road with no effective shoulders. At the time of inspection there were significant sections of road with loose gravel on the road surface. It appears likely that the road would be slippery to traverse when wet. The riding surface was corrugated in parts indicating that re-grading and possible re-sheeting is required in selective areas. Long grass and trees of varying sizes occupy the road verges, some of which pose safety hazards due to insufficient clearance from the road edge. There are unprotected drop-offs of varying heights along the road which pose a safety hazard for errant vehicles. There are several horizontal curves around which sight distance is restricted and in one location there is a dangerous combination of vertical and horizontal curves. A short 300 m section of road has been sealed around a combination S-curve.

The road does not appear to be well used by traffic. The road provides access to a small number of farming residences (east of the project site) and adjacent land and there is likely very low exposure to the safety risks identified. In its current form, the road would not be conducive to use by any significant increase in light vehicle traffic or use by heavy or long vehicles.

Photo 7.10 Mintaro – Merildin Road (looking west from intersection with Wookie Creek Road)

FLAGSTAFF ROAD/RILEY ROAD

These roads exhibit similar characteristics to Merildin Road. Flagstaff Road is misaligned at and connected by a 450 m long section of Riley Road. The horizontal curves at either end of these connections exhibit very small radii which are difficult to negotiate without encroaching onto the opposite side of the road. Sight distance is restricted in all directions.

WOOKIE CREEK ROAD

This road is a narrow, unsealed road with minimal pavement and no shoulders. It appears likely that the road would be slippery to traverse when wet. The road alignment is quite straight and is flanked by natural vegetation including some large trees close to the road which pose a safety hazard for errant vehicles. The road passes through several cuts in the natural topography and it appears there is little if no provisions to carry stormwater away from the road.

The road does not appear to be well-used by traffic. During the inspection, no other cars were observed. The road provides access to adjacent land (including the existing substation) and is a convenient link between Merildin Road and Copper Ore Road. In its current condition the road would not be conducive to use by any significant increase in traffic volumes.

CHAFF MILL ROAD

This is a narrow, earth-formed road having no shoulders. It is sign-posted as a dry weather road as it has not been raised above the natural ground level and is subject to impacts of wet weather. During the inspection, the road was quite firm but it operates as a single-lane track with worn wheel tracks evident either side of an earth mound. The road is clearly not conducive to general use in its present form.

Photo 7.11 Chaff Mill Road

MARTINDALE ROAD

Martindale Road runs west-east from Min-Man Road to Bowmans Road. It is a narrow unsealed road in a wide road reserve and is generally flat and straight apart from a low-speed S-bend between Hare Road and Mintaro-Manoora Road. The pavement condition is poor in places and there is no stormwater drainage along its length. There appears to be potential for flooding in wet weather. Martindale Hall, a key tourist attraction for the area, has driveway access off this road.

Photo 7.12 Martindale Road looking east from Min-Man Road

HARE ROAD

Hare Road runs north-south connecting Martindale Road (approximately 1 km from Min-Man Road) with Merildin Road, and is about 2.2 km in length. There is one residence (no. 159) located immediately adjacent the road. The road is straight, narrow and unsealed and there are numerous large trees close to the road edge. It is low-lying with no stormwater drainage and is clearly subject to flooding. There is a moderate uphill grade (south to north) part way along its length and pavement condition overall is quite variable.

Photo 7.13 Hare Road looking north towards the uphill grade

FAULKNER ROAD

This is another earth-formed road with no shoulders. It runs generally west-east and connects Copper Ore Road with Chaff Mill Road. The eastern end of the road abuts the boundary of the east section of land.

7.8.3.3 INTERSECTIONS

COPPER ORE ROAD-MERILDIN ROAD-CATHOLIC CHURCH ROAD

This four-way intersection of a sealed main road and two unsealed roads is in an 80 kph posted speed limit zone. Copper Ore Road exhibits a slight right-hand bend from south to north. Merildin Road is located on the inside of this curve. The visibility of oncoming traffic from both directions along Copper Ore Road is restricted by vegetation. The intersection is inconspicuous and would be difficult to identify at night time.

Photo 7.14 Intersection of Copper Ore Road and Mintaro – Merildin Road

COPPER ORE ROAD-WOOKIE CREEK ROAD

This junction of a sealed main road and an unsealed road is located in a 110 kph posted speed limit zone. Cooper Ore Road exhibits a slight crest on the southern approach to the junction and a left-hand curve on the northern approach. The visibility of oncoming traffic from both directions along Copper Ore Road is restricted by the road geometry. The intersection is inconspicuous and would be difficult to identify at night time.

BARRIER HIGHWAY-FLAGSTAFF ROAD-WINDERS ROAD

This four-way intersection of a sealed main road and two unsealed roads is located in a 110 kph posted speed limit zone. The alignment of the Barrier Highway on the approach to and through the intersection is straight and flat. There is no roadside vegetation to restrict visibility. Culverts located either side of Flagstaff Road and passing under the highway prevent vehicles from taking generous radii turns and must therefore slow down significantly to negotiate the tight right angle manoeuvre. This might lead to rear-end crashes on the main road (in particular). The intersection is inconspicuous and would be difficult to identify at night time.

BARRIER HIGHWAY – MIN-MAN ROAD

This acute angled T-junction is located on the northern side of the Manoora township in a 60kph speed zone. Approaching the junction from the north, the Barrier Highway exhibits a right-hand bend, is on moderate downhill grade and passes over a disused railway crossing. The curve restricts visibility of the junction and traffic entering the Barrier Highway from it. Min-Man Road approaches the junction at an acute angle and this combined with the curve on the northern approach of the Barrier Highway makes it very difficult for drivers entering the Barrier Highway to see oncoming traffic (refer Photo 7.15). Large trucks making a right hand turn from Min-Man Road from a standing start would take some time to accelerate and may impede southbound traffic on the main highway.

Photo 7.15 Barrier Highway – Min-Man Road junction looking north

MERILDIN ROAD-WOOKIE CREEK ROAD-HARE ROAD

This four-way intersection comprises four unsealed road approaches at right angles. There is also a gated entrance to a property located on the north-eastern corner. The alignment of all four roads is straight and visibility from Wookie Creek Road of approaching traffic on Merildin Road is reasonable. However, as the roads are unsealed there is no delineation at the intersection and the intersection is inconspicuous. It is likely that in the event of wet weather, vehicles may experience difficulties in stopping at the intersection should the need arise.

MERILDIN ROAD-CHAFF MILL ROAD

This T-junction of unsealed roads is located on a slight grade on Merildin Road. Visibility of west-bound traffic on Merildin Road from Chaff Mill Road is restricted by the slight crest on the road. The junction is inconspicuous.

HORROCKS HIGHWAY-JOLLY WAY

This T-junction is located in a 100 kph zone. The northern approach of the Horrocks Highway exhibits a left hand bend which restricts sight distance to about 200 metres. There is a short (left turn) deceleration lane on the northern approach but there is no right turn lane for traffic entering the junction from the south. Right turning vehicles may impede following traffic. There is an approximate level difference of about 1 metre between road junction and the adjoining land on the south-east corner and accordingly the left turn movement from Jolly Way is via a right angle turn. Large vehicles are likely to encroach into the adjacent traffic lanes when turning left and at the time of the inspection there was evidence of tyre marks supporting this assumption. Also in the same corner, there are small diameter trees abutting the road and a length of guard rail fence.

MIN-MAN ROAD – MARTINDALE ROAD

The T-junction is located about 100 metres north of the driveway entrance to Martindale Hall. It is quite inconspicuous from the southern approach as there is no junction warning sign. The stem of the junction is quite narrow and there is a stand of trees on both corners. The apron of the junction is unsealed and there is loose material on the surface which could hinder stopping or turning vehicles. Trucks would have to cross onto the opposite side of the roads to negotiate left and right turns out of and into the junction.

MARTINDALE ROAD – HARE ROAD

This T-junction comprises unsealed roads and is quite inconspicuous from all approaches. There is a stand of trees on the south-west corner that restricts sight distance from the west approach of Martindale Road (refer Photo 7.16). Sight distance is otherwise good. The junction pavement surface was of variable condition and there is loose materials in the junction area and on the approaches which might be a hazard for stopping and turning vehicles. Large vehicles turning at the junction would encroach into the opposite side of the road.

Photo 7.16 Martindale Road – Hare Road junction

7.8.3.4 COMMENTS

Inspection of the existing unsealed roads and junctions identified concerns regarding:

- The geometric standard of the roads
- The condition of the road pavements
- Safety hazards including trees close to the road and unprotected drop offs around curves
- Restricted visibility and inconspicuous intersections.

None of the roads described above (either sealed or unsealed) are lit and the above safety risks would be exacerbated at night time. None of the unsealed roads in their existing condition are considered suitable to accommodate any significant increase in use, particularly by large trucks.

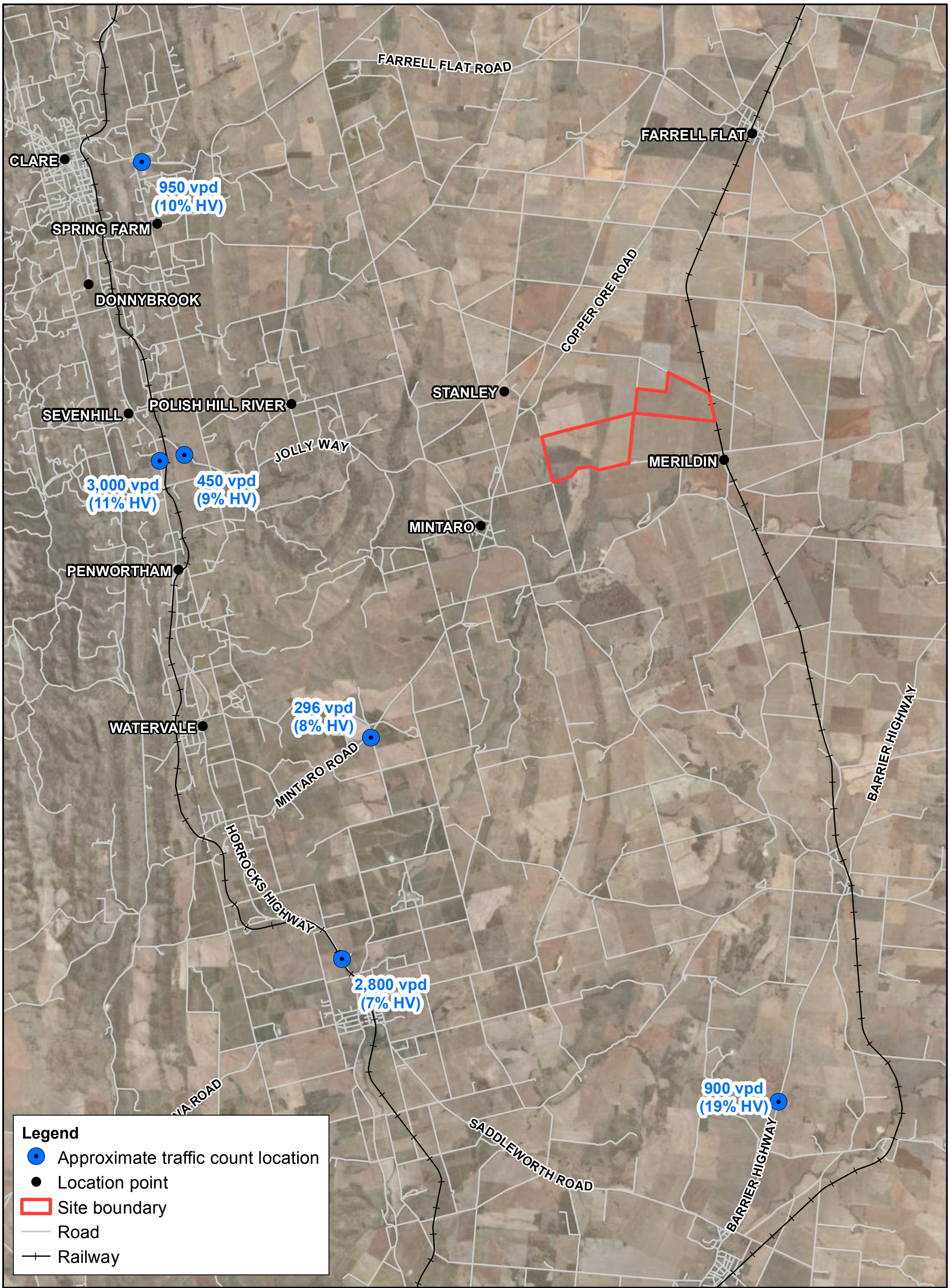
7.8.3.5 TRAFFIC

Based on observations and assessment of the surrounding land uses and the road network configuration, the overall level of traffic using the roads of interest is likely to be low. Traffic counts are shown in Figure 7.15. There is no information on traffic volumes available for the unsealed roads near the subject site. The unsealed roads in the immediate vicinity of the project site would be expected to carry no more than 50 vehicles per day (at the very most).

It is anticipated that during grain-carting season, some sections of some of these roads may experience relatively high volumes of truck traffic for a short period.

7.8.3.6 CRASHES

There are no records of road crashes on the unsealed roads. Along Jolly Way, two crashes occurred in the five years between 2012 and 2016. One crash was reported along Copper Ore Road, in the five years between 2012 and 2016.



Map: PS103225_GIS_012_C	Author: brownma2		1:125,000
Date: 19/03/2018	Approved by: EF		Coordinate system: GDA 1994 MGA Zone 54
			Scale ratio correct when printed at A4

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 7.15
Traffic Counts on Arterial Roads

7.8.4 TRAFFIC ACCESS AND IMPACTS

7.8.4.1 CONSTRUCTION

Construction of the solar farm will be undertaken in two stages; both generating light and heavy vehicle trips. The expected traffic generation from stages one and two is 50-100 and 100-200 light vehicle trips per day respectively (based on an assumption that the construction workforce will reside off site and travel to the project site daily, with some sharing rides).

The construction traffic represents a significant proportional increase in the traffic volumes currently using the sealed and unsealed road network. The increased traffic volumes on unsealed roads will be significantly higher than existing but only on relatively short sections of road and sections which do not pass by adjacent residences.

The increased level of traffic will increase exposure to safety risks and these will need to be mitigated. The increased traffic will also accelerate the deprecation of the road surfaces. The areas of greatest concern are:

- Conflicts at intersections. Vehicles turning to and from side roads onto major roads will need to select appropriate gaps in traffic to cross or enter the road
- Vehicles leaving the road on the approaches to and departures from tight radii curves
- Vehicles overtaking over crests having poor sight distance
- Vehicles travelling at inappropriate speeds along particularly unsealed road sections and losing control
- Vehicles losing control on loose gravel particularly on narrow roads and around curve.

Alternative access locations for light and heavy vehicles are discussed below and compared in Table 7.8.

LIGHT VEHICLE ACCESS

From the intersection of Copper Ore Road with Catholic Church/Merildin Road) four route/access options are considered for the project site. These are shown in Figure 7.16 and described below:

- Option A: Site access on Wookie Creek Road at the north-west corner of the west section as indicated in the layout plan. Route comprises 2.5 km along Copper Ore Road, then 750 m south along the unsealed Wookie Creek Road to the site entry.
- Option B: Site access on Wookie Creek Road near the existing substation. Route comprises 1.5 km along Merildin Road then 600 m north along the unsealed Wookie Creek Road the site entry.
- Option C: Site access on Merildin Road nominally east of the junction with Wookie Creek Road. Route comprises about 1.8 km east along the unsealed Merildin Road from the Copper Ore Road.
- Option D: Site access on Chaff Mill Road nominally 500 metres from Merildin Road. Route comprises 3.5 km east along the unsealed Merildin Road and about 500 metres along the unsealed Chaff Mill Road.

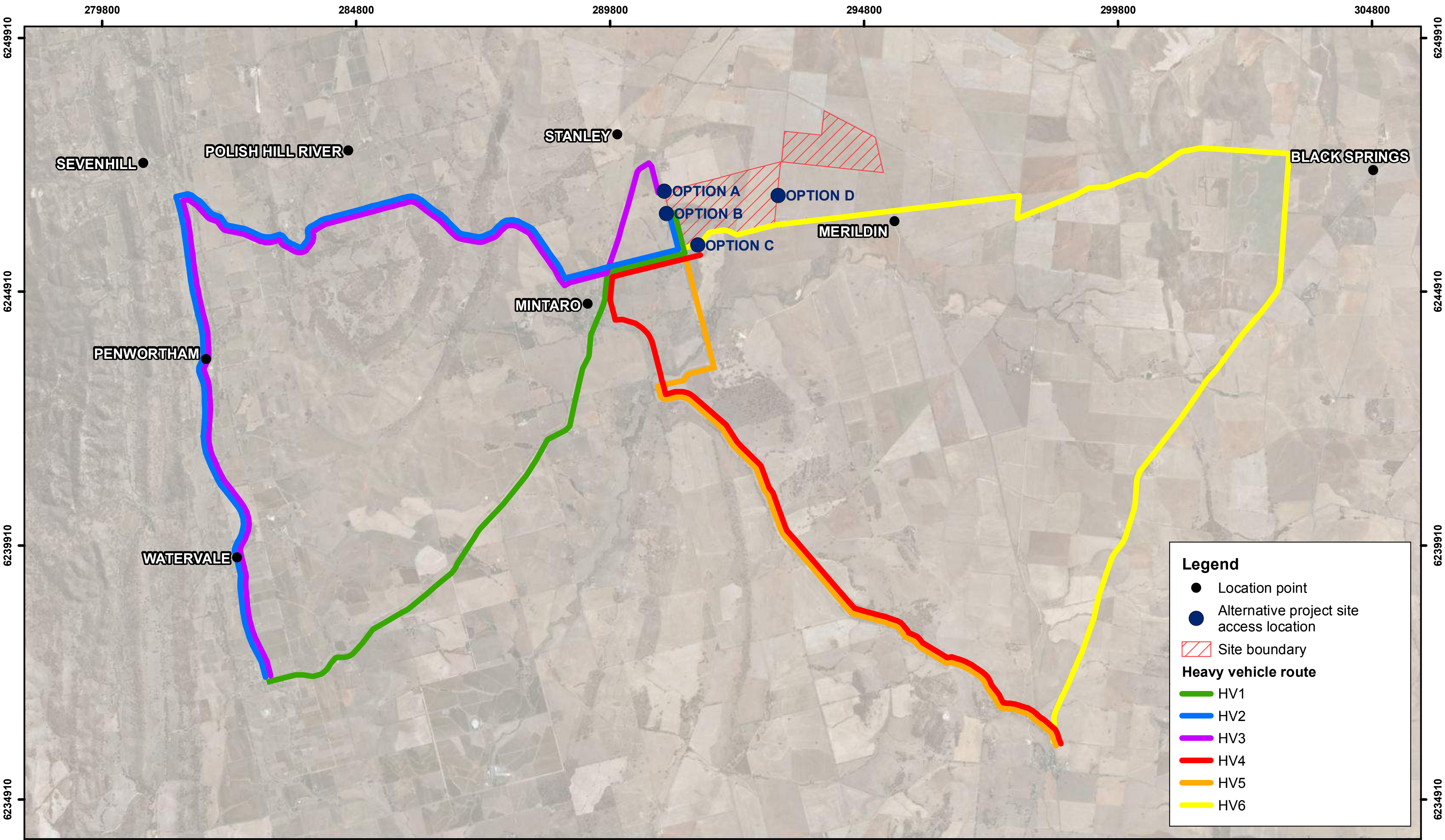
HEAVY VEHICLE ACCESS

The preferred route for heavy vehicle access would be a compromise of relevant factors including safety, vehicle operating costs (travel distance and driver time) over the duration of the construction period, the costs of upgrading and maintaining sections of any unsealed roads and the impacts of truck movements on amenity for residents and the wider community along the routes.

Six alternative routes to the project site (taken from Giles Corner where the Horrocks Highway and Barrier Highway diverge) are shown in Figure 7.16 and are:

- Option HV1: Horrocks Highway to Mintaro via the Mintaro-Leasingham Road (about 42 km) then a further 2 km along Merildin Road to Wookie Creek Road (access Option B). This route travels through Mintaro township.
- Option HV2: Horrocks Highway to Mintaro via Jolly Way (about 51 km) and then a further 2 km along Merildin Road and Wookie Creek Road (access Option B). This route avoids travel through Mintaro township.

- Option HV3: Horrocks Highway to Mintaro via Jolly Way (about 51 km) and then a further 3.2 km along Copper Ore Road and 700 m south along Wookie Creek Road (access Option A). This route avoids travel through Mintaro township and avoids travel on Merildin Road.
- Option HV4: Barrier Highway to Mintaro via Mintaro-Manoora Road (about 43 km) and then a further 2 km along Merildin Road and Wookie Creek Road (access option B). This route travels through Mintaro township.
- Option HV5: Barrier Highway to Mintaro via Mintaro-Manoora Road and then Martindale Road and Hare Road to Merildin Road (about 42 km, access Option C). This route avoids the Mintaro township incurring travel along 3.8 km of unsealed narrow roads.
- Option HV6: Barrier Highway and then via Flagstaff Road-Riley Road-Merildin Road (54 km, access Option C). This route avoids both Mintaro and Manoora townships.



Map: PS103225_GIS_007_D	Author: pottsr
Date: 19/03/2018	Approved by: EFitzner

Source: Department of Planning, Transport and Infrastructure, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 7.16
Heavy vehicle access routes

Table 7.8 Alternative access locations

ACCESS LOCATION	ADVANTAGES	DISADVANTAGES	COMMENTS
Option A Wookie Creek Road (North) As per Indicative Layout Plan	**Light vehicles:** Trips to and from Clare via Catholic Church Road involve left and right turns to/from Copper Ore Road at intersections with Catholic Church Road and Wookie Creek Road. **Heavy vehicles:** Predominantly sealed route for majority of trip via Horrocks Highway/Jolly Way. Comparative route length to Barrier Highway via Flagstaff/Merildin Road. Internal road network shown in the indicative layout could be extended to allow vehicles to access the east section via a short section of Chaff Mill Road if required. Requires upgrade of a relatively short section of unsealed road and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road). Provides direct access to the BESS and office area.	Perceived anti-directional route (for light vehicles) to access site compared with access options along Merildin Road (option C) and Wookie Creek Road (option B). All light and heavy vehicle movements will pass by a residence located on the eastern side of Wookie Creek Road for the duration of the construction period. Requires upgrade of unsealed road sections (Catholic Church Road) and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road)	Requires upgrading of the Copper Ore Road junction and approximately 1.4 km of unsealed road (including 700 metres along Catholic Church Road and 700 metres along Wookie Creek Road). Project staff and transport contractors would need to be discouraged from accessing Wookie Creek Road via Merildin Road

ACCESS LOCATION	ADVANTAGES	DISADVANTAGES	COMMENTS
Option B Wookie Creek Road adjacent to substation	**Light vehicles:** Trips to and from Clare via Catholic Church Road, then cross Copper Ore Road and most direct route via Merildin Road followed by left turn into Wookie Creek Road. **Heavy vehicles:** Predominantly sealed route for majority of trip via Horrocks Highway/Jolly Way. Comparative route length to Barrier Highway via Flagstaff/Merildin Road Internal road network could be adapted to allow vehicles to access the east section via a short section of Chaff Mill Road if required. Shorter route than Option A by 1.2 km as it uses the more direct route along Merildin Road rather than the indirect route along Copper Ore Road. Does not impact on adjacent residents along either Wookie Creek of Merildin Roads.	Cars and trucks would need to cross at right angles the Copper Ore Road junction between Catholic Church Road and Merildin Road. Requires longer section of road upgrade than access at Option A at the northern end of the road (2.8 km vs 1.4 km). Requires upgrade of unsealed road sections (Catholic Church Road) and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road)	Project staff and transport contractors would be encouraged to access Wookie Creek Road via Merildin Road. Requires upgrading of the junctions of Copper Ore Road with Merildin/Catholic Church Road and Merildin Road with Wookie Creek Road and upgrading selected sections of approximately 2.8km of unsealed road (including Catholic Church Road)
Option C Merildin Road	**Heavy vehicles:** Predominantly sealed route for majority of trip via Horrocks Highway/Jolly Way. Comparative route length to Barrier Highway via Flagstaff/Merildin Road Internal road network could be adapted to allow vehicles to access the east section via a short section of Chaff Mill Road if required. Shortest route of the four access options depending on the exact location of the access. Preferred access location is about 200-300 metres east of the Wookie Creek Road junction. Does not impact on adjacent residents along either Wookie Creek of Merildin Roads.	Cars and trucks would need to cross Copper Ore Road junction between Catholic Church Road and Merildin Road. Requires upgrade of unsealed Catholic Church Road and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road)	Requires upgrading of the junction of Copper Ore Road with Merildin/Catholic Church Road, development of a suitable access layout on Merildin Road and 2.4 km of unsealed road. An alternative access could be located about 300 metres west of the Chaff Mill Road junction.

ACCESS LOCATION	ADVANTAGES	DISADVANTAGES	COMMENTS
Option D Chaff Mill Road	Provides a single road access to both the west and east sections.	Proposed new residence on the corner of Chaff Mill Road and Merildin Road would be subjected to significant impacts of turning car and truck traffic. Cars and trucks would need to cross Copper Ore Road junction between Catholic Church Road and Merildin Road. Requires longest section of road upgrade than the other access options.	Requires upgrading of the junctions of Copper Ore Road with Merildin/Catholic Church Road and Merildin Road with Chaff Mill Road and approximately 4 km of unsealed road.

7.8.4.2 OPERATION

The solar farm will employ up to five staff once operational. It is estimated that the vehicular traffic generated by the daily operating activities will be very low, and be predominantly light vehicles. Traffic movements will represent volumes in the order of what is already being experienced on these roads and are likely to have a negligible impact on traffic operations for the surrounding road network.

7.8.5 MANAGEMENT AND MITIGATION MEASURES

7.8.5.1 SITE ACCESS LOCATION AND LIGHT VEHICLE ACCESS

On balance the preferred access location is on Wookie Creek Road adjacent to the existing substation (Option B). This would be supported by an internal road network that would allow access to Chaff Mill Road and then to the east section of the project site. Most light vehicle trips and all heavy vehicle trips would be expected to travel to the site via Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road.

7.8.5.2 HEAVY VEHICLE ACCESS

The preferred heavy vehicle route is HV2, via Horrocks Highway.

During the period of public consultation conducted by FRV in February 2018, it became apparent that there was Council and community support for the HV5 route option (via Barrier Highway and Mintaro-Manoora Road) and concerns for the increased use of Jolly Way by heavy vehicles.

Jolly Way does exhibit a vertical and horizontal alignment that requires care and attention to safely negotiate. It does attract tourist traffic and some cyclists, which might demand other regular road users to be more vigilant. On the other hand, the traffic management and controls implemented along the road would appear to adequately address any safety risks for the level of exposure. The curves have been treated with advisory speed signs, barrier lines to discourage overtaking and guard rail in places to prevent errant vehicles from leaving the road. There may be a perception that the road is not fit for use by trucks but there is already an average of 45 heavy vehicle movements per day using the road. There may also be additional trucks using the road during grain-carting season. The introduction of 8-16 extra truck movements per day is not expected to significantly increase the safety risks along the road.

The alternative route (HV5) will direct trucks onto Min-Man Road and the unsealed Martindale and Hare Roads. Min-Man Road is a lower standard road to Jolly Way and the significant stormwater drainage issues affecting the integrity of the pavement structure might be exacerbated by an increase in heavy vehicle traffic running close to the pavement edge. Tourist traffic also uses this road to access Martindale Hall. Martindale Road is narrow and subject to flooding and Hare Road would require significant upgrading in some sections. Directing trucks along these unsealed roads would pose a greater safety risk to other road users than directing them along Jolly Way where truck traffic is already evident.

On balance from a safety and amenity viewpoint, the preferred route option for access by heavy vehicles to the vicinity of the project site is via Horrocks Highway (HV2). The significant majority of the route is sealed, deploys appropriate traffic control measures to reduce the risk and severity of crashes and will be subjected to only a small number of additional heavy vehicles movements per day during the construction period. The route is also the preferred and most likely route for access by light vehicles travelling predominantly to and from the west of Mintaro.

7.8.5.3 ADDITIONAL MITIGATION MEASURES

A range of mitigation measures have been proposed to address the increased exposure to risk and the impacts on the road conditions during construction. These include:

— Improvements to the horizontal and vertical alignment at select locations
— Improvements at selected intersections to improve sight distance, make the approaches more conspicuous and reduce wear and tear by turning vehicles
— Re-sheeting of the road surface at necessary locations and regular repair and grading

- Widening of the roads particularly around curves
- Measures to protect errant vehicles from roadside hazards.

Measures to reduce the amount and intensity of travel demand (e.g. staggering shift times and promoting ride sharing), encourage appropriate driver behaviour and inform the community of construction activities that may change traffic patterns would also be implemented.

A safety audit of roads near the project site is recommended. This would be undertaken when more details of the project are known (at detailed design stage).

No construction related travel would be undertaken outside of daylight hours.

As per best-practice, a Construction Traffic Management Plan (CTMP) would be prepared to the satisfaction of DPTI (and/or the Clare and Gilbert Valleys Council) prior to construction commencement.

7.8.6 KEY RECOMMENDATIONS

The TIA also made the following key recommendations:

- The preferred location for site access is Wookie Creek Road, adjacent to the existing substation. This should be supported by an internal road network.
- The preferred light vehicle and heavy vehicle route to the site is via Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road.
- The preferred route option for access by heavy vehicles to the vicinity of the project site is via Horrocks Highway (HV2)
- Mitigation measures should be implemented to address the increased exposure to risk and the impacts on the road conditions during construction.
- Complimentary mitigation measures should be adopted to assist in reducing the amount and intensity of travel, and educate/inform to educated drivers and the community.
- A road safety audit should be undertaken of roads near the project site.
- No construction related travel be undertaken outside of daylight hours.
- A Construction Traffic Management Plan (CTMP) should be prepared prior to construction commencement.

7.9 STORMWATER AND FLOODING

7.9.1 LEGISLATIVE AND POLICY REQUIREMENTS

Legislation and policy documents relevant to stormwater and flooding requirements for the project are:

- *Environment Protection Act 1993*.
- The Environment Protection (Water Quality) Policy 2015 (under the *Environment Protection Act 1993*).
- Environmental Protection Agency Government of South Australia (EPA) 1999, *Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999*.
- Environmental Protection Authority Government of South Australia 1999, *EPA Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999*.
- Clare and Gilbert Valleys Council Development Plan.

7.9.2 ASSESSMENT METHODOLOGY

A Civil Assessment (stormwater and flooding) was undertaken to assess the topography and drainage characteristics of the site and to then identify any flooding and drainage issues which may result from the proposed development (Appendix N).

The assessment comprised of the following components:

- Desktop hydrological analysis
- Assessment of modifications to the site
- Assessment of potential risks
- Identification of mitigation measures
- Identification of potential construction impacts.

7.9.3 EXISTING CONDITIONS

7.9.3.1 BROAD LANDSCAPE DESCRIPTION

Each parcel of the project site is in the upper reach of a separate stormwater catchment (Wakefield River and Broughton River catchments for the western and eastern parcels, respectively). As such, it is highly unlikely that either site would experience any flooding issues during peak storm events. Additionally, no flood plain zones are located within the site.

A water course (Wookie Creek) traverses north to south across the western parcel. There are no formalised water courses present in the eastern parcel.

It should be noted that flood mapping is not available for the site under the relevant Development Plan.

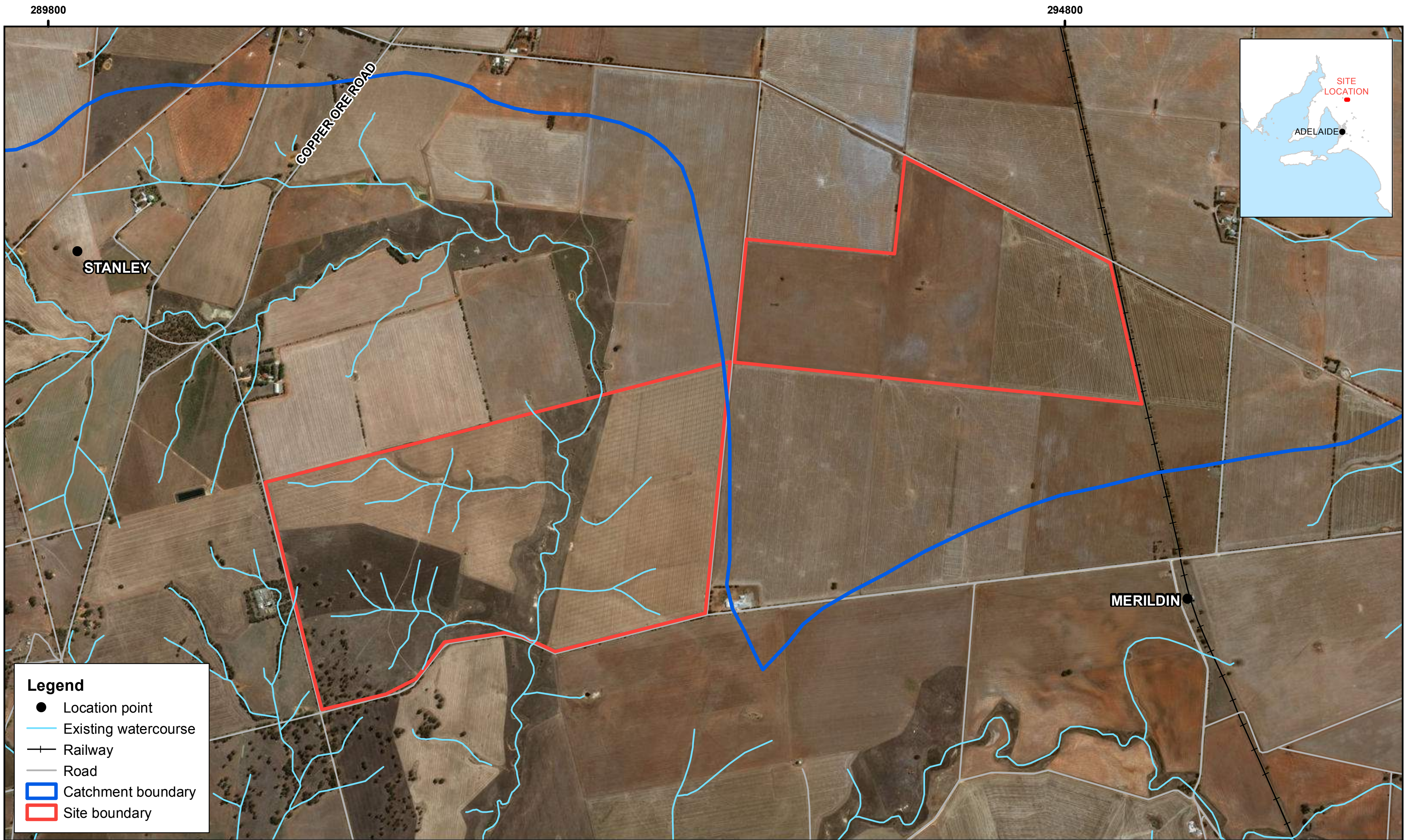
7.9.3.2 ISSUE-SPECIFIC SITE DESCRIPTION/BASELINE

The eastern parcel is relatively level, with any runoff gradually flowing northward towards Faulkner Road. The western site is of more undulating terrain, with a central watercourse draining to the south. Runoff enters Wookie Creek and flows south past Merildin Road. Three smaller sub-catchments drain into Wookie Creek, as outlined in Figure 7.17.

A summary of site characteristics relevant to stormwater and flooding is provided in Table 7.9.

Table 7.9 Site characteristics

	WESTERN PARCEL	EASTERN PARCEL
Site Area (km^2)	2.46	1.44
Catchment Area (km^2)	12.3	4.2
Existing Pervious Surface Area (%)	100%	100%
Local watercourses	Wookie Creek	nil
Highest elevation across site	430 m	415 m
Lowest elevation across site	390 m	410 m



Map: PS103225_GIS_013_C

Author: pottsr

Date: 19/03/2018

Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Figure 7.17
Site Drainage Overview

7.9.4 *POTENTIAL IMPACTS*

7.9.4.1 CONSTRUCTION

Construction of the solar farm will involve earthmoving activities to form the internal access tracks and minor groundworks prior to solar panel installation (including trenching for underground cables and other services). This will include the stripping of topsoil and localised re-grading to ensure maintenance access tracks are trafficable. Earthmoving and re-grading activities would consider potential impacts to local watercourses and catchments.

Storm events during construction could result in sediment entering the watercourse if appropriate mitigation measures are not in place.

Pollutants used during construction have the potential to enter waterways and seriously damage the wider stormwater network. Pollutants are listed under the *Environment Protection (Water Quality) Policy 2015* which states that a person must not discharge these pollutants into waterways or onto land from which it is likely they will enter a waterway.

7.9.4.2 OPERATION

The construction of hardstand zones, buildings and access tracks required for the solar farm will increase the quantity of impervious surfaces across the site, therefore increasing total runoff. The solar panels themselves are not expected to increase runoff as water collected on each panel will be able to discharge onto the permeable surface below the adjacent panel.

Due to the relatively gradual slope of the land in the eastern parcel, it is anticipated that the impacts on total site runoff would be negligible following construction of the solar farm for this portion of the site. However, the quantifiable impact from access track/hardstand provisions on the total runoff is subject to detailed drainage analysis of the site during the detailed design stage.

Flood mapping available for Mintaro indicates that the township will not be in any way impacted by the proposed development.

7.9.5 *MANAGEMENT AND MITIGATION MEASURES*

7.9.5.1 CONSTRUCTION

A Soil Erosion and Drainage Management Plan (SEDMP) must be prepared during the detailed design stage as per the '*Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999*' to the satisfaction of the Clare and Gilbert Valleys Council. The SEDMP must be lodged with the CGVC, along with engineering drawings prior to construction. All contractors onsite will need to abide by the Soil Erosion and Drainage Management Plan (SEDMP) prepared by the Construction Contractor.

The SEDMP will include the following measures to manage and mitigate impacts during the construction phase:

- Sediment and erosion controls should be implemented, including (but not limited to):
  - Preserve as much grassed area as possible
  - Construction vehicles should enter and leave the site by an access driveway to limit the tracking of mud and/or soil onto roads
  - A large gravel or aggregate should be used to establish the entry/exit point, and should only require periodic maintenance by topping up the rock
  - A guide to the design and operation of a wash area should be outlined in the documents
  - Where practical, upslope water should be diverted around the site onto stable areas and should not be diverted into neighbouring properties unless written permission is obtained from the landowner(s)
  - A guide to waste management should be outlined in the documents

  - All areas disturbed by construction should be promptly stabilised (e.g. revegetated) so they can no longer act as a sediment source
  - All construction vehicles on-site are to be fitted with a suitable oil/fuel spill kit.

- If a significant rainfall event has been forecast, all work may need to be temporarily halted until the storm has passed. It is also advisable to secure loose materials including construction waste and equipment, or to alternatively remove them from the site. Any washing of site vehicles and equipment should also be prohibited on-site to prevent stormwater contamination, unless an appropriate facility is provided.

- The Environment Protection (Water Quality) Policy 2015 must be complied with, in protecting waters and land from listed pollutants.

- If there is a risk that contaminants have entered the waterway, it is recommended that water quality tests should be undertaken immediately. If there is any trace of contamination, works should be suspended until an appropriate treatment is implemented.

- The solar farm should be re-seeded with the most suitable grass species for this particular location following completion of construction works, providing benefits to stormwater runoff quality.

7.9.5.2 OPERATION

As per the CGVC Development Plan, the location, siting, design and operation of renewable energy facilities must be completed such that the "adverse impacts on the natural environment and other land uses" are minimised. Any development must also be "located and designed to minimise the risks to safety and property from flooding" during "a minimum of a 1-in-100 year" ARI event. The project must not result in any of the following items outlined in the development plan:

- Impede the flow of floodwaters through the land or other surrounding land
- Increase the potential hazard risk to public safety of persons during a flood event
- Aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
- Cause any adverse effect on the floodway function
- Increase the risk of flooding of other land
- Obstruct a watercourse.

The proposed solar panels are located outside the principal watercourse. The proposed access road layout will incorporate culvert crossings where appropriate to ensure sub-catchment drainage is not affected.

The installation of solar panels and construction of localised earthworks would be reviewed during the future detailed design phase, to adequately consider the effects of access tracks and hardstand areas on the sub-catchments across the southern site. The design will utilise the existing topography where feasible, and allow the existing drainage network to continue to drain freely. This aligns with best management practices regarding site stormwater management for solar farm operation.

Due to the lack of flood mapping under the relevant Development Plan, it is recommended that further analysis be undertaken to assess the risk of flooding. Flood modelling of the greater site should be undertaken prior to detailed design.

A "buffer zone" may be created around waterways to prevent works being undertaken in areas which may be subject to localised flooding.

It may also be necessary to establish stormwater detention ponds to ensure post-development flows match pre-development flows from the site (subject to further detailed investigation). This is in line with South Australian Councils' typical requirements for site developments, including solar farms.

7.9.6 KEY RECOMMENDATIONS

The development of access roads, hardstand zones and buildings are likely to increase runoff amounts, particularly for the western parcel.

Prior to the commencement of the construction phase, Council must approve a SEDMP (to be submitted with the engineering design drawings). The SEDMP will include controls to manage and mitigate impacts on the surrounding watercourses during the design phase, including:

- Temporarily halt all work if a significant storm is forecast (securing any loose materials, including construction waste and equipment, or alternatively removing them from the site)
- Provide an appropriate facility for the washing of vehicles and equipment onsite, to prevent stormwater contamination
- Implement erosion and sediment controls as outlined in Section 7.9.5.1 and in both the *'EPA Handbook for Pollution Avoidance on Commercial and Residential Building Sites, 2004'* and in the *'Stormwater Pollution Prevention Code for the Building and Construction Industry, 1999'*.

It may also be necessary to establish stormwater detention ponds to ensure post-development flows match pre-development flows from the site (subject to further detailed investigation). This is in line with South Australian Councils' typical requirements for site developments, including solar farms.

It is necessary to ensure that the design satisfies the requirements outlined in section 7.9.5.2.

Further analysis should be undertaken to assess the risk of flooding (despite the sites' occurring in the upper reaches of large catchment areas) during the later design stages.

7.10 SOCIO-ECONOMIC

7.10.1 LEGISLATIVE AND POLICY REQUIREMENTS

The following pieces of legislation are relevant to the socio-economic context of the proposed Chaff Mill Solar Farm:

- *Development Act 1993*

  Through the assessment pathway, under Section 49 of the *Development Act 1993*, the application will be publicly notified for a period of at least 15 days, seeking submissions from the public. Additionally, pursuant to Section 49 (17), there are no rights of appeal against Minister's the decision on the application.

- *Aboriginal Heritage Act 1988*
- *Environment Protection Act 1993* (including policies under this Act)
- *Environment Protection Biodiversity Conservation Act 1999*
- *Heritage Places Act 1993.*

7.10.2 ASSESSMENT METHODOLOGY

A socio-economic assessment was undertaken to determine the potential impacts, both positive and negative, associated with the construction and operation of the proposed solar farm development within the local community (Appendix O).

The following qualitative and quantitative sources were utilised for the assessment:

- Statistical information from the Australian Bureau of Statistics (ABS) 2016 Census data
- Social service providers' websites including the Clare and Gilbert Valleys Council and Tourism SA
- Review of relevant reports and recent literature concerning the social and economic impacts of solar farms
- Review of FRV's current proposal for the proposed Chaff Mill Solar Farm.

Please note that the assessment relied on understanding and addressing the existing perceptions and values of stakeholders and the community. All consultation and engagement activities were comprehensively undertaken by RPS and WSP's review relied on documentation/records of these activities.

7.10.3 EXISTING CONDITIONS

7.10.3.1 BROAD LANDSCAPE DESCRIPTION

The Clare and Gilbert Valleys Council area has a permanent residential population of approximately 9,059 (ABS 2016). The median age of the council area, at 44.4 years, is moderately greater than that of both Greater Adelaide, at 38.6 years, and the whole of South Australia, at 40 years. The area has had slow but stable population growth overall since 2006, with the exception being a small population decline of two people between 2015-2016. This slow rate of population growth may be attributed to the restructuring of farming enterprises, interstate and intrastate migration, and changing industry demands.

Key economic assets of the Yorke and Mid North region were identified as:

- Highly productive agriculture and horticultural land
- An agriculture sector which contributes 43.7% of South Australia's GSP for Grains
- Diverse landscape and scenery
- Tourism in selected districts
- Renewable energy opportunities – in 2016 the region had nearly half of all South Australia's installed wind farm capacity (Regional Development South Australia 2016).

Within the council area, primary production industries occupy a significant portion of the land. Land occupations include:

- Agriculture – 146,246.45 ha
- Food Industry – 170.5 ha
- Livestock – 11,767.7 ha.

7.10.3.2 ISSUE-SPECIFIC SITE DESCRIPTION/BASELINE

Mintaro is characterised as a small, rural community of approximately 188 residents. The heritage status of the township is strongly valued by the community. The township relies on nearby services in Clare for critical community facilities such as education and health care. Community facilities and attractions within Mintaro include:

- Martindale Hall
- Mintaro Maze
- Mintaro Garden Rooms
- sporting clubs including the Mintaro Bowling Club, MinMan Sporting Club (Mintaro and Manoora Football and Netball teams), Mintaro Tennis Club and Auburn Mintaro Cricket Club
- Anglican Church of Australia St Peters
- St Mary's Catholic Church
- Local wineries and eateries, including the recently reopened Magpie & Stump Hotel and Reilly's Eatery on the main street
- Accommodation including Mintaro Mews, Mintaro Hideaway, Millers House, Devonshire House, The Olde Lolly Shop B&B, Reilly's Historic B&B Cottages, William hunt's Retreat, Ellenor Ivy Cottage and Irongate Studio B&B.

Mintaro has experienced significant population decline in recent years, with Census data having recorded population decline from 370 to 188 people between 2011 and 2016 (ABS 2017). This decline in population may be partly attributed to the age profile of the community which recorded a median age of 50 in the 2011 Census (compared to 39 years for South Australia in the same year). People aged 65 years and over made up 15.6% of the population in 2011 (ABS 2017). The current median age of the population, being 54 years, is significantly greater than that of the greater Mid-North region (44.4 years) (ABS 2017). Another contributing factor to the decline in population could be the restructuring or sale of agricultural properties in the area.

Mintaro sits within the Federal Electorate of Wakefield, currently held by Nick Champion MP (Australian Labor Party), and the State Electorate of Frome, currently held by the Hon Geoff Brock (Independent).

Key economic drivers for Mintaro include the production of slate, agriculture and food production, intensive livestock, viticulture and oenology, and tourism. The main land uses surrounding the area are comprised of livestock, horticulture and agriculture.

7.10.4 POTENTIAL IMPACTS

7.10.4.1 CONSTRUCTION

Potential negative socio-economic impacts on the local community during construction were identified as:

- Divided opinions, conflict and disrupted social cohesion in the community, in relation to the development, exacerbated by the small size of the community which may be reliant on connectedness
- Opposition in the community towards renewable energy developments, stemming from past renewable energy developments in the area and related media and political attention (such as the Waterloo Wind Farm)
- Public facilities and local services such as accommodation, eateries and possibly health services, being overstretched or unable to service the potential increased demand resulting from a temporary population increase during construction
- Short-term decline in tourists to Mintaro, if local services cannot accommodate increased demand (after construction, there is potential, however, for the solar farm to generate tourists)
- Increased risk of collisions, road damage/deterioration (particularly on unsealed roads) and congestion resulting from increased traffic on arterial and local roads from construction vehicles and workforce private vehicles
- Increased traffic generation and associated impacts could deter tourism during construction
- Construction noise affecting properties bordering the proposed project site. Note: The project site is located approximately three kilometres away from the Mintaro township and therefore construction noise is not expected to impact the town
- Compromised biosecurity for neighbouring properties from contaminants being transported on construction vehicles using private and public roads.

Potential socio-economic benefits to the local community during construction were identified as:

- Increased employment and investment in the area, with the project directly employing up to 200 workers during construction, from the local area where possible
- A boost in the local economy through the procurement of hospitality and retail services, driven by a temporary increase in Mintaro's population
- Potential for the project to encourage local and regional investment in the area
- The investment in renewable technologies may help to increase the security of energy supply, price transparency and encourage a lower cost of energy (Guerin 2017).

7.10.4.2 OPERATION

Potential negative socio-economic impacts on the local community during operation were identified as:

- Potential for noise generated by the battery as well as the inverter fans for the battery and inverter substations. The battery will have a low noise profile, and fans will only be in operation during warmer temperatures, and only audible within the immediate vicinity. Noise impacts are considered negligible
- Potential visual impacts and glare resulting from the visibility of the proposed development from certain viewpoints surrounding the Mintaro township
- Impediment of aerial farming operations on surrounding properties resulting from above ground infrastructure

- Impact on the value of surrounding properties. The extent (positive or negative) of the impact is largely dependent the management of other impacts
- The perceived potential for the solar farm to exacerbate the frost risk at adjacent properties. Note: research in the area is limited, however it suggests that while temperatures directly above and below solar panels are slightly affected, temperatures adjacent solar farms quickly return to ambient status
- Potential traffic impacts during operation will be minimal. Maintenance requirements will be relatively low during operation and decommissioning
- The loss of arable land in the region. On balance, the loss of a 380 ha site within the context of the Clare and Gilbert Valleys Council area comprises only a 0.24% loss of arable farming land.

Potential socio-economic benefits to the local community during operation were identified as:

- The project would employ up to five full-time workers during operation, drawing from the local area where possible, providing local jobs and increasing security of the local economy. This also brings with it the opportunity to increase the working age population of the region
- Potential to draw visitors to the area, including scientific and academic visitors. Therefore, providing opportunities to increase tourist accommodation, and services in food, retail and tourism sectors
- On a regional scale, the development of the solar farm will work to achieve several renewable energy objectives within local and State level planning documents. Additionally, the project will work with efforts to reduce global warming impacts, assist in meeting emissions reductions targets, and further reduce costs in relation to adaption to the consequences of climate change.

7.10.5 MANAGEMENT AND MITIGATION MEASURES

Where the assessment identified a potential impact as negative, appropriate management and mitigation measures have been proposed.

7.10.5.1 CONSTRUCTION

The following management and mitigation measures have been proposed for potential negative socio-economic impacts during construction:

- A Stakeholder and Community Consultation Plan could manage impacts to community stakeholders, including but not limited to; protocols to keep the community updated on the progress of the project, protocols to respond to complaints and concerns, and preparation of a Local Benefits Plan detailing the ongoing benefits to the community.
- Demand on public facilities and services could be managed through liaising with local representatives regarding business opportunities; liaising with local tourism industry to manage potential timing conflicts with local events and maximising opportunities; and, liaising with local industry representatives and contractors to maximise the use of local resources.
- Construction traffic can be managed through establishing protocols to inform relevant stakeholders of potential impacts; establishing protocols to appropriately respond to complaints and concerns received; developing a Traffic Management Plan to form part of the overall Construction Environmental Management Plan for the project; potentially operating a coach service for workers in temporary accommodation; and, maintaining the amenity of the area by way of cleanliness and maintenance, as well as the upgrading and reinstatement of roadways.
- Potential noise impacts can be managed and mitigated by complying with *Environment Protection (Noise) Policy* requirements, and timing construction activities to minimise disturbance.
- Biosecurity risks can be minimised by ensuring appropriate hygiene practices are detailed in a CEMP and followed on site.

7.10.5.2 OPERATION

The solar panels chosen for the project will be no more than three metres from ground level and will have no metal rims, lessening the risk of potential visual impacts and glare. Solar panels are designed to absorb, rather than reflect, light. Visual and glare studies have been undertaken as part of the Development Application. Appropriate mitigation and management measures, such as screening, will be implemented where required.

The use of underground cabling, as opposed to overhead powerlines, can be used to minimise any impacts to aerial farming operations. There will be a power line from one parcel of land to the other, but it won't go over neighbouring properties. It is yet to be determined if this will be an overhead or underground powerline. There will also be a powerline from the solar farm connecting to the overhead transmission line that runs across the site.

The degree to which the solar farm could impact property values is largely dependent on the effective management of physical impacts to neighbouring properties. Potential adverse impacts such as visual and glare will be mitigated where possible to reduce the likelihood of this affecting property values.

A micro-climate review and assessment was undertaken for the proposed solar farm (refer section 7.12). The assessment found that while there can be minor differences in the soil and air temperatures directly under and above solar panels on solar farms, there is no significant impact on air temperatures in the surrounding areas. Therefore, no mitigation measures are required.

Traffic impacts are expected to be low, with low maintenance requirements during operation and decommissioning. This impact does not require mitigation however upgrading and reinstatement of roadways should occur (to an equal or better higher condition) than the existing condition, in collaboration with either the Clare and Gilbert Valleys Council or the Department for Planning, Transport and Infrastructure (depending on the road caretaker) as needed for the duration of the project.

7.10.6 KEY RECOMMENDATIONS

The following key recommendations have been drawn from the assessment of the socio-economic impacts (negative and positive) to the local and regional community, associated with the construction and operation of the proposed Chaff Mill Solar Farm.

The solar farm would generate considerable environmental, economic and social benefits to Mintaro and the local region, including but not limited to:

- Providing employment for up to 200 workers during construction, drawn from the local area where possible
- Boost to the local economy through the procurement of local goods and services
- Attracting investment to the area
- Opportunities for landowners to be agents of change in contributing to new, non-fossil fuel infrastructure
- Increased energy security
- Contributing to the Mid North region's reputation for renewable energy and potentially drawing increased tourism to the area
- Contributing to the achievement of local, State and national renewable energy targets
- Mitigation of climate change.

Whilst the project will provide positive impacts to the existing social and economic environment of Mintaro, and provide broader regional and State-wide benefits, there is also the potential for the project to impact negatively on the community. Several mitigation measures are recommended to minimise potential socio-economic impacts associated with the project, including:

- Protocols to keep the community updated about the progress of the project and any potential benefits, impacts and mitigation measures
- Protocols to respond to complaints and concerns received

- Liaising with local representatives regarding business opportunities such as accommodation options for staff to minimise any adverse impacts on local services and maximise opportunities for businesses (i.e. re accommodation)
- Liaising with the local tourism industry to manage potential timing conflicts with local events and maximise opportunities for future tourism
- Liaising with local industry representatives and contractors to maximise the use of local contractors, manufacturing facilities, materials
- Preparing and implementing a CEMP to develop specific mitigation measures to manage potential impacts of the project.

7.11 SITE CONTAMINATION

7.11.1 LEGISLATIVE AND POLICY REQUIREMENTS

The primary piece of legislation for site contamination is the *Environment Protection Act 1993*. The *Environment Protection Act* requires a duty of care for the environment. This is specified under section 25 of the act: General environmental duty, and states that *a person must not undertake an activity that pollutes, or might pollute the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm* (Attorney-General's Department 2018).

This Preliminary Site Investigation (PSI) was undertaken in accordance with the following documents:

- National Environment Protection Council (NEPC) 2013, *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended in 2013 (ASC NEPM).
- Planning SA 2001, *Site Contamination.* Planning Advisory Notice 20.
- Standards Australia 2005, *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds*. AS4482.1-2005 Homebush NSW.

7.11.2 ASSESSMENT METHODOLOGY

The PSI was undertaken to determine any potential site contamination issues within the project area (refer Appendix P). The PSI methodology involved the following research components:

- Site characterisation, including site identification, site inspection, adjacent land uses and sensitive reports, regional geology, regional hydrogeology and zoning
- Review of previous site investigation reports
- Review of historical information, including history of Certificate of Titles, aerial photographs, EPA section 7 search, and the EPA public register.

7.11.3 EXISTING CONDITIONS

7.11.3.1 REGIONAL GEOLOGY

The Burra 1:250,000 geological map sheet (South Australian Department of Mines and Energy, 1964) indicates that the region is underlain by the quaternary recent low angle slope deposits. The western portion of the site is also located with the Torrensian Burra Group formation, which is characterized by quartzite and dolomite and interbedded shale.

The 1:100,00 Geology Map provided in the Lotsearch report characterises the local geology in the eastern portion of the site as Holocene claypan and lagoonal sediments. Soil types identified were predominantly loam over clay or rock in the western portion and red cracking clay in the eastern portion.

The Australian Soil Resource Information System (ASRIS) identifies the area of Mintaro as having an extremely low probability of acid sulphate soils occurring.

7.11.3.2 REGIONAL HYDROGEOLOGY

There are twelve registered groundwater bores within an approximate 2 km radius of the project area. The details of the five closest registered bores to the site are presented in Table 7.10. All registered bores were located offsite.

Wookie Creek intersects the western portion of the site in a north-south direction and runs into the Wakefield River, located approximately 2.3 km south of the site. Therefore, groundwater within the uppermost aquifer would generally be expected to flow in a southerly direction.

Table 7.10 Information regarding closest registered bores to site

BORE NO.	APPROXIMATE DISTANCE FROM SITE	DRILL DATE	DRILL/MAX DEPTH (m)	STATUS	PURPOSE	SWL (mBGL)	SALINITY (mg/L TDS)
6630-3148	20 m west	22/12/2000	80.0	-	Domestic	18.7	1,546
6630-3258	1,200 m west	22/12/2000	34.96	-	Monitoring	16.21	1,653
6630-525	350 m south-east	15/03/1972	30.48	-	-	12.19	5,273
6630-521	400 m north-east	06/06/1958	38.1	Unknown	Domestic	-	3,639
6630-522	500 m north-east	15/03/1972	19.0	-	Stock	12	6,236

7.11.4 POTENTIAL IMPACTS

Based on the history of certificates of title and the historical aerial photographs, the site has operated as farm land, with several private owners, from as early as 1870 through to the present day. It is considered possible that the following potentially contaminating activities may have occurred at the site:

- Use of imported, and potentially impacted fill materials, which were not identified as part of the site walkover. Imported fill may have been used by farmers to level the land
- Historical use of agricultural chemicals, weedicides and termiticides – including possible use of arsenic based weedicides/herbicides near the rail infrastructure at the eastern boundary of the eastern portion of the site
- Hydrocarbons associated with railway activities to the east of the site
- Use of asbestos train brakes.

A more detailed summary of the potentially contaminating activities, including potential contaminants, likely locations and possible significance, is provided in Table 7.11.

No Section 83A notifications have been recorded in the area. The nearest notifications were reported for service stations and work depots in Clare, which are located approximately 20 km to the north-west of the site. Potential contamination from these sites is considered unlikely to impact upon the site due to the distance of separation.

An EPA licence was issued to Synergen Power Pty Ltd for fuel burning – not coal or wood at the power station, located immediately adjacent the western portion of the site.

Table 7.11 Summary of potentially contaminating activities

POTENTIALLY CONTAMINATING ACTIVITY	POTENTIAL CONTAMINANTS	LIKELY LOCATIONS	POSSIBLE SIGNIFICANCE/RISK
Unconfirmed activities:			
Use of imported, and potentially impacted, fill materials	Metals, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, solvents, asbestos, OCPs/OPPs and/or PCBs.	Entire site	**Unknown but probably minor:** Uncontrolled filling or dumping may have occurred at the site. These materials are often brought in from other sites without checks. Such materials have the potential to contain concentrations of chemicals which may preclude the site for certain future land uses (i.e. depending on possible human exposure scenarios) or aesthetically and/or geotechnically unsuitable, without further assessment and/or remediation. As the land is cropped or grassed, only intrusive investigation will reveal material brought in from off-site sources to fill in undulations or build up the site.
Historical use of agricultural chemicals, herbicides and termiticides	Unknown but may have included metal or arsenic-based herbicides, triazines, phenoxyacid herbicides and, more recently, glyphosate-based chemicals, fertilizers (nitrogen, phosphorous), OCPs, OPPs	Entire site	**Unknown but probably minor:** As the allotment appears to have been used for historical agricultural/grazing purposes it is likely that various chemicals may have been used. Should any persistent chemicals have been used on the site, they are likely to have resulted in surface (if any) soil contamination and the degree of remnant contamination would be largely dependent on when they were used, the volumes used and the persistence of the individual chemical compounds. Given their low mobility, leaching of these chemicals into the groundwater is considered unlikely.
Potential use of arsenic based weedicides/herbicides in the vicinity of rail infrastructure	Arsenic, lead, organochlorines, organophosphates	Eastern boundary of eastern portion of the site	**Unknown but probably minor:** As the eastern portion of the site situated adjacent the railway line it is likely that some weed spraying may have occurred. Such contamination is likely to be confined to shallow soils in the area.
Hydrocarbons associated with railway activities	Hydrocarbons, arsenic, phenolics, heavy metals, nitrates and ammonia	Eastern boundary of eastern portion of the site)	**Unknown but probably minor:** As the eastern portion of the site situated adjacent the railway line it is likely that some soil contamination may have resulted due to dripping and spilling of hydrocarbon products. Such contamination is likely to be confined to shallow soils in the area.
Use of asbestos train brakes	Asbestos	Eastern boundary of eastern portion of the site	**Unknown:** As Parcel 2 is situated near the railway line it is possible that if asbestos brakes were used historically, some fragments may exist in the nearby soils.

7.11.5 MANAGEMENT AND MITIGATION MEASURES

The CEMP will outline controls to avoid the uncontrolled mobilisation of contaminants associated with construction activities, including:

- Any suspect material discovered during excavations will be stockpiled separately and tested for contamination prior to disposal
- Should any contaminated material be stored in construction areas it will be in accordance with recommendations made by suitably qualified persons
- Any contaminated material will be transported via an EPA licensed waste contractor and disposed of at an EPA licensed waste facility following treatment
- Waste Transport Certificates will be retained for contaminated material and made available on request.

7.11.6 KEY RECOMMENDATIONS

It is unlikely that the potentially contaminating activities would significantly impact the proposed future land use of the site as a solar farm. However, once the final site is selected a baseline intrusive investigation would be undertaken to identify if potentially contaminating activities are crystallised. This work would be undertaken in conjunction with a geotechnical intrusive investigation.

7.12 MICRO-CLIMATE IMPACTS (FROST)

An issue raised by the community regarding the proposed Chaff Mill Solar Farm was the perceived potential of the solar farm to exacerbate the frost risk at adjacent properties. This issue was later clarified as being more related to the potential impacts (either positive or negative) of radiative heat loss from the surfaces of the solar panels on the temperatures of the surrounding environments or climate.

This section first provides some context on frost and the existing climate in proximity to the proposed project site, then moves on to discuss the investigations undertaken to form a view on the potential significance of radiative heat loss from solar farm sites, and closes by summarising key findings.

7.12.1 LEGISLATIVE AND POLICY REQUIREMENTS

In South Australia, the *Guide to Commercial Scale Solar Development in South Australia* was produced for Renewables SA in September 2014. The New South Wales Government's *Draft Large-Scale Solar Energy Guidelines for State Significant Development* was produced in November 2017. However, neither of these documents provide any guidance on the potential impacts of radiative heat loss to the surrounding climates of potential solar farms or potential micro-climate impacts.

Other interstate renewable energy approval guidance documents are mainly in relation to wind farms. No other reference to solar farms and climate impacts could be located from other State documents, although new planning and community engagement guidelines are currently being developed in Queensland.

7.12.2 ASSESSMENT METHODOLOGY

To investigate community concerns that the solar farm may exacerbate frost conditions at adjacent properties (i.e. the impacts of radiative heat loss from panels on the surrounding climate); the following approach was undertaken:

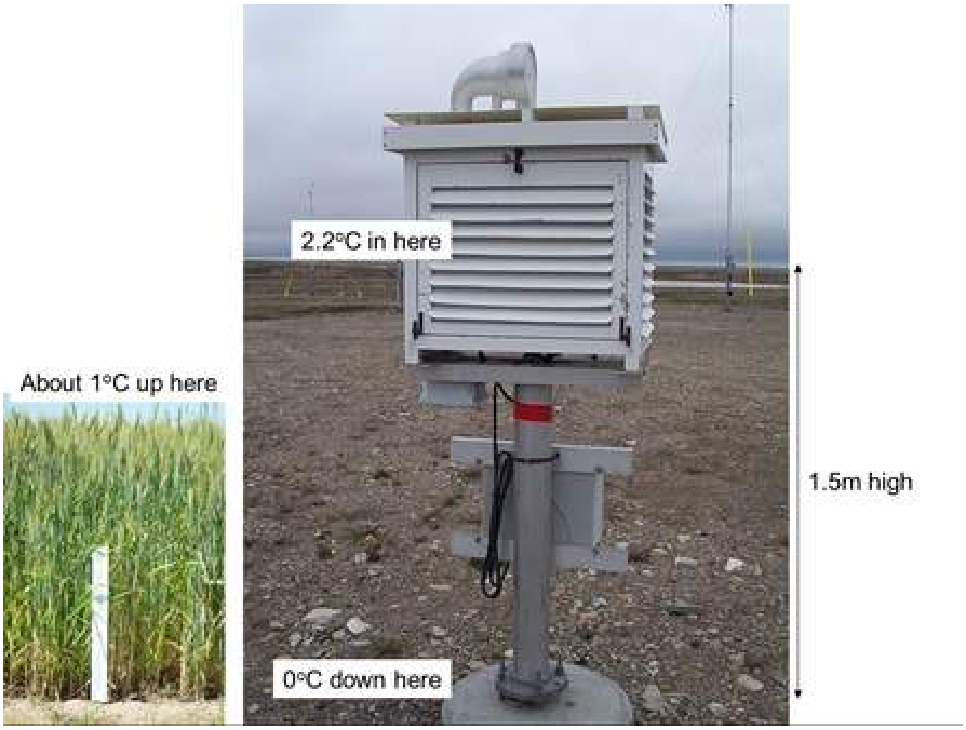
1. Review of Solar Farm Assessment Guidelines in Australia.
2. Review of all other solar farm assessments, approvals and conditions of consent documents in South Australia.
3. Web-based desktop assessment of solar farms and frost / radiative heat loss impacts.
4. Academic literature review of solar farms and frost / radiative heat loss impacts.
5. Discussions with agricultural, climatology and meteorological scientists in South Australia, Australia and overseas.

7.12.3 EXISTING CONDITIONS

7.12.3.1 FROST

The Australian Bureau of Meteorology defines frost as a deposit of white ice crystals or frozen dew which forms on objects near the ground when the surface temperature drops below freezing point (BOM 2014).

Most Bureau of Meteorology temperatures are measured 1.2 to 1.5 metres above the ground in a Stevenson Screen (refer to Figure 7.18). Frost generally occurs at ground level when it is 2.2 degrees Celsius or lower in the box, with threshold temperature for frost varying with the crop-type and season. Generally, though, when it is 0 degrees Celsius at ground level there will be a negative effect on most crops (Grey 2014). It should be noted here however that growers often experience temperatures lower than the nearest weather station so if the weather station indicates that conditions may not, or have not, reached frost conditions, there still may be the chance that frost has been experienced in cooler or lower lying areas than those around the weather station (Barr 2012).



Source: Grey 2014

Figure 7.18 BOM Frost recording system

Frost forms in two main ways:

— Radiation frost; whereby frost occurs when the ground and ambient air cools down by the loss of heat to the atmosphere. This commonly occurs under clear skies with little or no wind.
— Advection frost; also known as 'freeze', whereby frost forms when a mass of extremely cold air moves over an area; replacing warmer air. It is not affected by cloud cover and is generally never seen in Australia.

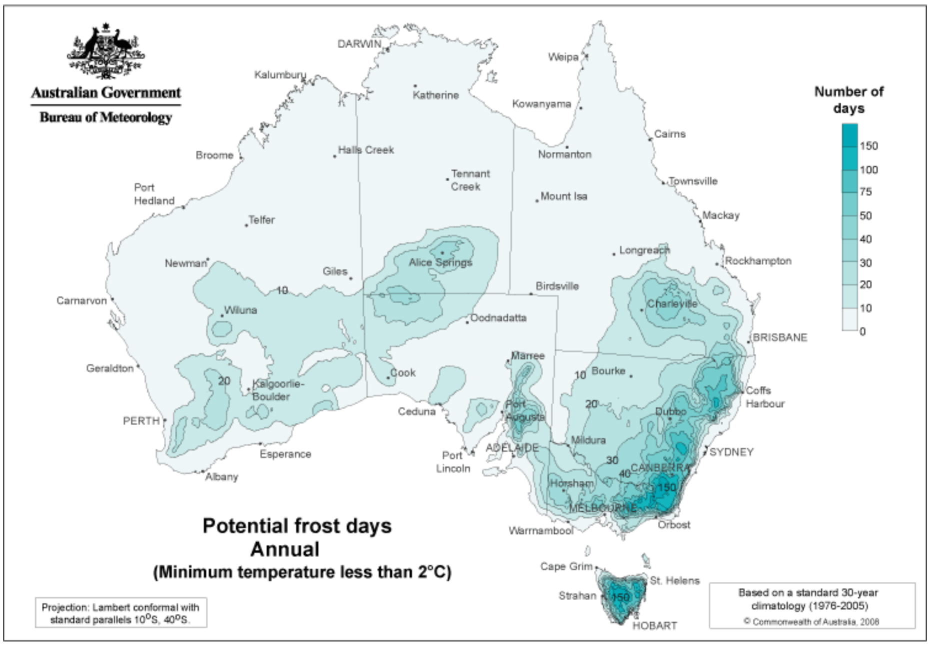
The formation of frost in Australian regions is affected by a series of factors:

— **Cloud cover:** Clear skies favour the escape of radiation (or heat) from the earth's surface.
— **Humidity:** When the air is humid, the cooling process is slowed, which decreases the likelihood of frost.
— **Surface winds:** Wind occurring at night acts to mix the cooler air near the ground with warmer air just above it. This slows radiative cooling making frost less likely to occur.

Frost in the Mintaro area is therefore defined as 'radiation frost' and is most likely to occur under a clear sky, with low humidity and light surface winds (BOM 2014).

It should also be noted that cold air is heavier than warm air and as such, it sinks and flows to low lying areas until it ponds at the bottom (Barr 2012).

Based upon these factors, the Bureau of Meteorology map annual and monthly potential frost days; as outlined in Figure 7.19.



Source: *BOM 2017*

Figure 7.19 Potential Annual Frost Days

Frost damages plants when the temperature drops below zero and the surrounding air is very dry, which may be outside of the winter season. Water between the cells of plants freezes and forms large crystals, these pop holes in the cells which cause permanent damage. Once thaw occurs, the plant is left looking floppy and discoloured and the result is detrimental to the yield (Grey 2014). Actual plant susceptibility to frost depends on its growth stage (Barr 2014).

In the Clare Valley, aspect influences the exposure of crops to the sun, with the warmest aspects being those facing north, north-east and east. Westerly aspects are the next warmest and are cool in the morning but receive harsh afternoon sun. Southerly aspects are the coolest (Davidson Viticultural Consulting Services 2012).

7.12.3.2 AVAILABLE CLIMATE DATA

The proposed Chaff Mill Solar Farm is located near the township of Mintaro in the Clare Valley, South Australia. The Clare Region is described as moderately continental with cool to cold nights and warm to hot summer days. Overall; it is a moderately warm, low rainfall region.

In 2012, a Clare Valley Climate Profile was prepared for the Grape and Wine Research and Development Corporation (Davidson Viticultural Consulting Services 2012). This profile was based upon climate data recorded from four weather stations; Clare High School, Clare Post Office, Sevenhill and Kirribilly. The closest weather station to Mintaro is Sevenhill (approximately 10 kilometres from the proposed project site); with the Kirribilly weather station being located at an elevation that is the most like Mintaro (Kirribilly – 400 m, Mintaro – 404 m). Mintaro and Kirribilly also have similar rainfall patterns.

For a number of years there was also a weather station operating at Polish Hill River, four to five kilometres to the west of the project area. It is currently unknown if this weather station still exists or is still being used for data collection, however the station was known to be located in a comparatively low-lying frosty area and there were therefore difficulties in using it for prediction of wider Clare Valley weather conditions (Davidson Viticultural Consulting Services 2012). The Polish Hill River site was known to be collecting data at least until approximately ten years ago; and would have been located in a region comparatively representative of the proposed Chaff Mill Solar Farm project (Davidson Viticultural Services 2005).

Table 7.12 outlines monthly climate statistics for the nearest available weather station – Clare Post Office.

Table 7.12 Mean monthly climate statistics

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Mean Max Temp	29.7	29.3	26.9	21.8	17.3	14.1	13.2	14.5	17.5	21.0	24.6	27.5
Mean Min Temp	13.4	13.5	11.5	8.2	5.7	3.9	3.1	3.6	5.0	7.2	9.6	11.7
Mean Rainfall	25.3	24.2	25.4	46.6	72.9	80.2	81.7	79.5	72.7	57.4	36.9	29.4
Mean No. Clear Days	12.6	12.5	12.6	8.8	7.0	5.8	5.3	5.6	6.8	8.1	8.3	9.3
Mean No. Cloudy Days	5.8	4.5	6.2	8.5	12.2	11.8	13.0	12.6	11.5	9.8	8.2	7.7

Source: BOM 2017

Table 7.13 outlines some of the key climate data discussed in climate profiles from published reports.

Table 7.13 Key climate data

	CLARE	SEVENHILL	KIRRIBILLY	POLISH HILL RIVER
Elevation	385	480	400	440
Annual rainfall	632	569	566	667
Mean Frost Incidence	7.5	0.3	13.3	9.9

Source: Davidson Viticultural Services 2005 and 2012

*Data considered unreliable

Mean Frost Incidence is the average number of times that the temperature will reach 2.2 degrees Celsius or below at the recording station in the months of September to November. This temperature reflects a ground temperature of 0 degrees Celsius.

This data shows that Kirribilly has the highest incidence of frost in the region with an average of 13 frosts in the September to November period. Polish Hill River has a mean frost incidence of 10 days. Sevenhill has only 0.3 days of Frost during the same period because it experiences easterly winds which generally disturb the pooling of any cold air (Davidson Viticultural Services 2005 and 2012).

7.12.4 POTENTIAL IMPACTS

7.12.4.1 DESKTOP ASSESSMENT AND LITERATURE REVIEW

A number of websites, reports and academic papers were reviewed to try and obtain an understanding of the potential radiative heat loss and frost exacerbation issues and impacts associated with solar farm development. Very little information on the topic exists but several sources stated that the potential development of thermal models for large-scale solar farms is highly problematic due to significant uncertainties associated with the multiple parameters involved including variations in albedo, climate data, cloud cover, landscape, seasonality, panel efficiency, panel design, wind speeds, vegetation cover, soil data and a number of other factors. One study author indicated that the potential climatic effects of one solar farm may be completely irrelevant at another solar farm due to changes in conditions and location.

A review of potential academic reports and research papers was subsequently undertaken using the University of South Australia's online access to scientific journals, books and reports. Solar farm studies; particularly the environmental impacts associated with solar farms are few and far between. Even rarer are solar farm studies relating to radiative heat loss impacts, climate impacts or air temperature impacts. In all; seven scientific papers were found which discuss relevant issues. These studies are discussed below.

1 In a 2013 study focussing on air temperature; meteorological modelling was undertaken for the Los Angeles region to evaluate the potential atmospheric effects of PV solar arrays (Taha 2012). Simulations undertaken as part pf the study showed that from a radiative balance perspective; there were no adverse impacts on air temperatures from large-scale PV solar arrays.

2 In another 2013 study into the potential for a heat island effect in large solar farms, Fthenakis and Yu (2013) developed a computational fluid dynamics capability to model the potential effects of solar farms on local micro-climates. Field data and model simulations showed that for a solar farm in North America the annual average air temperatures in the centre of the PV farm were 1.9 degrees warmer than the ambient temperatures but that the thermal energy completely dissipated to the environment several metres above the solar farm. Likewise, the data also showed that the warmer temperatures also promptly dissipated at progressive distances away from the solar farm. These authors' study found that temperatures within 300 metres of the solar farm panels were 0.3 degrees warmer than the ambient temperature. 18 months' worth of data from this study showed that solar arrays completely returned to ambient temperatures at night. The study also showed that access roads within and around the solar farm helped to keep local temperatures close to ambient. Their results did not find any cooling effects in surrounding areas.

3 In a study evaluating soil temperature in 2014, it was found that the existence of large solar arrays can increase soil temperatures directly underneath the solar farm during autumn and winter, but slightly decrease the soil temperatures during spring and summer; when compared to similar locations without solar arrays. This was attributed to the air absorbing heat from the soil when the air temperature is lower than the soil temperature; and vice versa; the air also releases this heat to the soil (Wu *et al* 2014). Once again; this study was based on large-scale solar array situations.

4 In another study looking at heat surface balance through modifications to ground surface albedo through solar array development in Golmud it was found that soil temperatures underneath the solar farm at a depth of 5 to 10 centimetres were slightly lower than areas without solar arrays on them, with the arrays obviously demonstrating thermal insulation properties (Yang *et al* 2017). It was further found that in areas with solar arrays, at a height of 2 metres above the ground; temperatures stayed the same during the winter and cooler months and increased slightly during the summer and warmer months. The effect of heating the air was found to be greater during the summer months.

5 In the same study, it was found that during the day time, temperatures at a two-metre height in the solar during winter were the same as at adjacent control areas. During the other seasons the two-metre-high air temperatures were found to be slightly warmer than the adjacent control areas. Night-time air temperatures at the two-metre height during all seasons were slightly higher than surrounding areas. The monthly average air temperatures in the solar farm were slightly higher than the surrounding areas.

6 In a recent solar park study from the United Kingdom which studied the impacts on vegetation directly underneath large-scale solar arrays, localised temperature reductions were noted when compared to control sites; but only in areas directly underneath solar panels (ground-level micro-climates) and mainly in the summer months (Armstrong et al 2016). It was found that there were no changes in temperatures in the 'control' areas directly next to the solar farm. In other words; the only changes or impacts were found to be directly underneath the panels and between the panel arrays – not adjacent or outside of the solar farm; in this instance – no impacts or changes were detected.

7 The authors of this paper studied an operating solar farm in the south of England for over 12 months by comparing temperatures under the panels with control areas. During the summer, temperatures under the panels were found to be 5.2 degrees Celsius cooler during the summer. In winter, soil temperatures were found to be 1.7 degrees Celsius

warmer. This was when compared to the area immediately surrounding the solar farm and the internal access tracks. This was due to the shading effects of panels. It was also found that during winter the solar panels acted like a blanket over the land, which reduced the incidence of frosts.

8 In a 2016 study investigating the photovoltaic heat island effect of large solar power plants, it was found that PV plants alter the way that incoming energy is absorbed due to changes in albedo, vegetation cover and terrain structure (Barron-Gafford *et al* 2016). The authors found through experimentation that temperatures over a PV plant were 3 to 4 degrees warmer than ambient temperatures at adjacent surrounding areas at night. This effect was due to the alteration in the balance of the incoming and outgoing energy fluxes due to the modified landscape. The basis of these assumptions is that within natural ecosystems, vegetation reduces heat gain and storage in soils by essentially creating a shading effect. Energy absorbed by soils and vegetation is later released as latent heat through evapotranspiration. This heat-dissipating latent exchange is hence reduced in a PV installation, which may theoretically increase soil temperatures underneath panels (Barron-Gafford *et al* 2016). The solar farm array study area in this particular study was compared to an adjacent control site (a natural desert environment which demonstrated no temperature increases) and a nearby concrete carpark which also demonstrated the heat island effect. The outcomes demonstrate the effect of altering albedo of a site in general as this alters the way that incoming energy is either reflected back to the atmosphere or absorbed by the earth. This study was undertaken in desert conditions in Arizona, USA.

9 Finally, in a recent Australian study published in 2017, a control simulation and eighty sensitivity experiments were completed for twenty massive hypothetical solar arrays that each had an area of 250,000 km^2. These experiments were set up with different array orientations and at different locations across Australia. The study showed that the climatic impact on the surrounding areas depended upon the magnitude of the albedo perturbation as well as the size and orientation of the arrays (Nguyen, Katzfey, Riedl and Troccoli 2017). Some key findings from this study included:

— Any potential changes to local climate from the introduction of solar arrays is dependent on background climatic conditions and orographic features

— Any climatic cooling would generally occur down-wind of the solar panels, due to air temperatures being colder down-wind of the solar arrays

— Up-wind, there may be some climatic warming experienced, which could lead to a slight increase in the night-time minimum temperature, which may reduce frosts and be beneficial for some types of agriculture

— Regions down-wind of the arrays may experience stronger wind flows

— Average ambient temperatures generally decrease when surface albedo is increased. So around the solar arrays; the more that sun is reflected back into space; the lower the temperature

— Generally, for the massive hypothetical solar arrays, modelling indicated slight warming up-wind and slight cooling down-wind. However the authors point out this is based on the modelled massive 250,000 km^2 arrays and the situation would not be anywhere near as significant for anything smaller (Nguyen, Katzfey, Riedl and Troccoli 2017).

10 Other studies were also reviewed, but these were found to have no relevance to the Chaff Mill project. One paper (Hu *et* al 2015) modelled the hypothetical idealistic effects of placing massive solar farms across every desert region of the world (a slight warming effect was found for Australia). A second paper (Masson *et al* 2014) investigated the impact of placing solar panels across large areas of rooves in Paris on the requirements for domestic heating (the need for domestic heating was found to decrease slightly in the buildings directly under the panels).

Please note: albedo is the fraction of solar energy being reflected from the Earth back into space. It is a measure of the reflectivity of the earth's surface. Generally, dark surfaces have a low albedo and light surfaces have a high albedo. Snow has a high albedo; with most sunlight hitting it bouncing back into space. PV panels absorb more solar insolation due to decreased albedo.

As well as investigating the potential negative effects of solar farms, a number of the authors also looked into positive benefits. Aside from the obvious benefits of solar energy as a renewable energy resource, it was also found that:

- Solar farms can be easily rehabilitated at the end of the project life
- Solar farms have large footprints, however not all of the land is actively taken up by solar panels. They are typically installed on piles or mounting structures with disturbance to the ground usually comprising less than 5% of the land area and only 40% to 50% of the land surface is over-sailed by the array panels
- As the solar modules are tilted and raised on posts to minimise shading; the land is also open to grassing and soil rehabilitation.

In order to gain perspective on these studies as they relate to the proposed Chaff Mill Solar Farm, relevant authors were contacted in an attempt to gain their opinion as to the scale of potential climate, radiative heat loss and air temperature impacts that may result from the development of the solar farm. The outcomes of these discussions are outlined in the following section.

7.12.4.2 DISCUSSIONS WITH AGRICULTURAL, CLIMATOLOGY AND METEOROLOGICAL SCIENTISTS

In order to gain perspective on these studies as they relate to the proposed Chaff Mill Solar Farm, relevant authors were contacted in an attempt to gain their opinion as to the scale of potential climate, radiative heat loss and air temperature impacts that may result from the development of the solar farm.

Two authors of relevant research papers responded to requests for opinion regarding the potential impacts of the Chaff Mill Solar Farm. One of the authors believed that it would be very unlikely that there would be significant impacts on temperatures resulting from the solar farm; in particular in adjacent neighbouring properties. The author outlined that even in the studies of much larger hypothetical solar farms, impacts were not significant. For a much smaller solar farm; the risk would be even less. The author further opined that the risk of frost exacerbation may even be slightly reduced in adjoining areas due to the potential increased mixing of the air resulting from the solar arrays. The author said that to be certain a modelling study could be undertaken based on monitoring at other constructed solar farms in areas with similar conditions, however this has never been undertaken for EIA studies previously and would be based upon too many assumptions and unknown factors. The value of the outcomes of such a study and the validity of any findings would be open to conjecture.

A second author also broadly agreed with this view, saying that theoretically, enhanced frost would only arise if it was noted that there were comparatively lower night time temperatures above the panels when compared to the air surrounding them; which could theoretically lead to a marginal local temperature-driven high pressure (in clear conditions only) potentially resulting in advected cooler air to the surroundings of the solar farm. The author specified that this could only happen if it was a clear and still night and further clarified that for a smaller solar farm (such as Chaff Mill) the effects would be minute anyway. This author also agreed that further assumptions could only be made based upon monitoring of a number of local weather, climate, landscape, albedo and soil conditions, coupled with monitoring results based on other constructed solar farms from similar projects in terms of landscape and climate. A model would then have to be designed and testing undertaken. It is believed that this is beyond the scope of what is practicable or necessary for the current project as any impacts are likely to be negligible. Generally, the papers reviewed above all found negligible temperature decreases adjacent to solar farms, and more often than not found very slight temperature increases immediately adjacent solar farms.

As part of this exercise, a number of other organisations were contacted, including the CSIRO, the Bureau of Meteorology, two State government agricultural agencies and consulting bodies, specialist consulting companies (air modelling), an international climate and energy organisation, agricultural consultants and two universities. All scientists who were spoken to were of the opinion that the issue would not be significant and that the risk would be very minor – particularly in adjacent areas; as opposed to directly under the solar panels themselves.

The majority of people spoken to also questioned the validity or justification of an expensive monitoring and modelling study; particularly with so many unknown parameters and external influences.

7.12.5 MANAGEMENT AND MITIGATION MEASURES

7.12.5.1 CONSTRUCTION AND OPERATION

The incidence of frost is a result of local climatic conditions and is most likely to occur under a clear sky, with low humidity and light surface winds. The intensity or damaging effects of frost however, are exacerbated by introducing elements into the landscape that can block cold air and inhibit it from moving towards a natural cold air drainage system.

The solar farm has been designed in a way that allows air circulation underneath and around the individual panels and arrays. The panels are supported on piles which are set directly into the ground without concrete footings or benching. The panels then tilt and track; following the sun and allowing free air flow. In additions to this, the security fencing comprises mesh fencing with no vegetation planted around the boundaries unless it is for visual impact or glint mitigation purposes.

The site will also be maintained to a high standard with grasses being kept low and weeds constantly being cleared.

7.12.6 KEY RECOMMENDATIONS

There is a lack of specific studies and literature that relates to the general environmental impacts of solar farms. Literature regarding micro-climate impacts and impacts to the radiative heat exchange at solar farms is even rarer. Several studies were reviewed which had a range of findings and outcomes. Summarised relevant findings appear to be that:

- Temperatures in the centre of a solar farm may be slightly higher than ambient – particularly in warmer months
- Temperatures return to ambient several metres above a solar farm
- Temperatures may be slightly warmer directly adjacent a solar farm, gradually returning to ambient with distance away from the solar farm
- Soil temperatures at depth underneath panels may be slightly warmer during cooler months and slightly cooler in warmer months
- Air temperatures at ground level underneath panels may be slightly cooler during summer months
- Air temperatures at a two-metre height in the solar farm in the colder months would probably be similar to the surrounding areas
- Air temperatures at a two-metre height in the solar farm in the warmer months may be slightly warmer than the surrounding areas
- Air temperatures directly above solar arrays may be slightly warmer at night
- Temperatures at control sites adjacent solar farms generally had temperatures equal to ambient conditions
- Reduced temperatures adjacent a solar farm were never modelled or recorded except in the hypothetical modelling of massive solar farm scenarios of arrays with an area of 25,000,000 ha (the Chaff Mill project is 380-ha)
- Slight warming could be experienced upwind of a 250,000- km^2 solar farm scenario and slight cooling could be experienced downwind of a 250,000 km^2 solar farm scenario.

In discussion with research scientists, climatologists and meteorologists; the climate impacts of a 380-ha solar farm would not be significant and the addition of access roads within and around a solar farm would further mitigate any local climate impacts due to enhanced air flow.

7.13 ELECTROMAGNETIC FIELD LIMITS

7.13.1 LEGISLATIVE AND POLICY REQUIREMENTS

The Clare and Gilbert Valleys Council Development Plan contains a provision for industrial development outlining that it should minimise significant adverse impact on adjoining land uses due to electronic interference.

7.13.2 ASSESSMENT METHODOLOGY

Methods used to identify potential electromagnetic interference (EMI) impacts presented by the Chaff Mill Solar Farm involved a desktop review of:

- regulatory framework related to EMI
- publicly available reports, guidelines and case studies relevant to the potential EMI impacts of solar farms
- previously completed EMI studies for other solar farm projects

7.13.3 EXISTING CONDITIONS

A search of the Australian Communications and Media Authority (ACMA) register of radio licences, radio communication towers and radio services (RADCOM) database identified eight sites within an approximate 5 km radius of the project area (refer Table 7.14 and Figure 7.20).

Table 7.14 Radio communications sites identified within an approximate 5 km search area

SITE ID	LATITUDE	LONGITUDE	RADIO SITE NAME	APPROXIMATE DISTANCE TO PROJECT AREA
24292	-33.903166	138.738749	ElectraNet site MINTARO	Adjacent the project area on Wookie Creek Road.
132783	-33.884658	138.705672	Telstra Mintaro CMTS 1 km N of MT RUFUS	5 km north-west of the project area
404290	-33.898531	138.729357	Pump Station MINTARO	1 km west of the project area
501686	-33.88711	138.675389	Pikes Wines Polish Hill River Road SEVENHILL	5 km north-west of the project area
9001664	-33.862917	138.825811	Lot 581 Section 582 Farrell Flat Road FARRELL FLAT	6 km north-east of the project area.
9010098	-33.903087	138.737865	ElectraNet Mintaro Substation Wookie Creek Road MINTARO	Adjacent the project area on Wookie Creek Road.
10002603	-33.91848	138.72409	Mill Street Mintaro	2 km south-west of the project area.
10007452	-33.92569	138.69443	NBN Co Site 209B Kadlunga Road MINTARO	3.5 km south-west of the project area

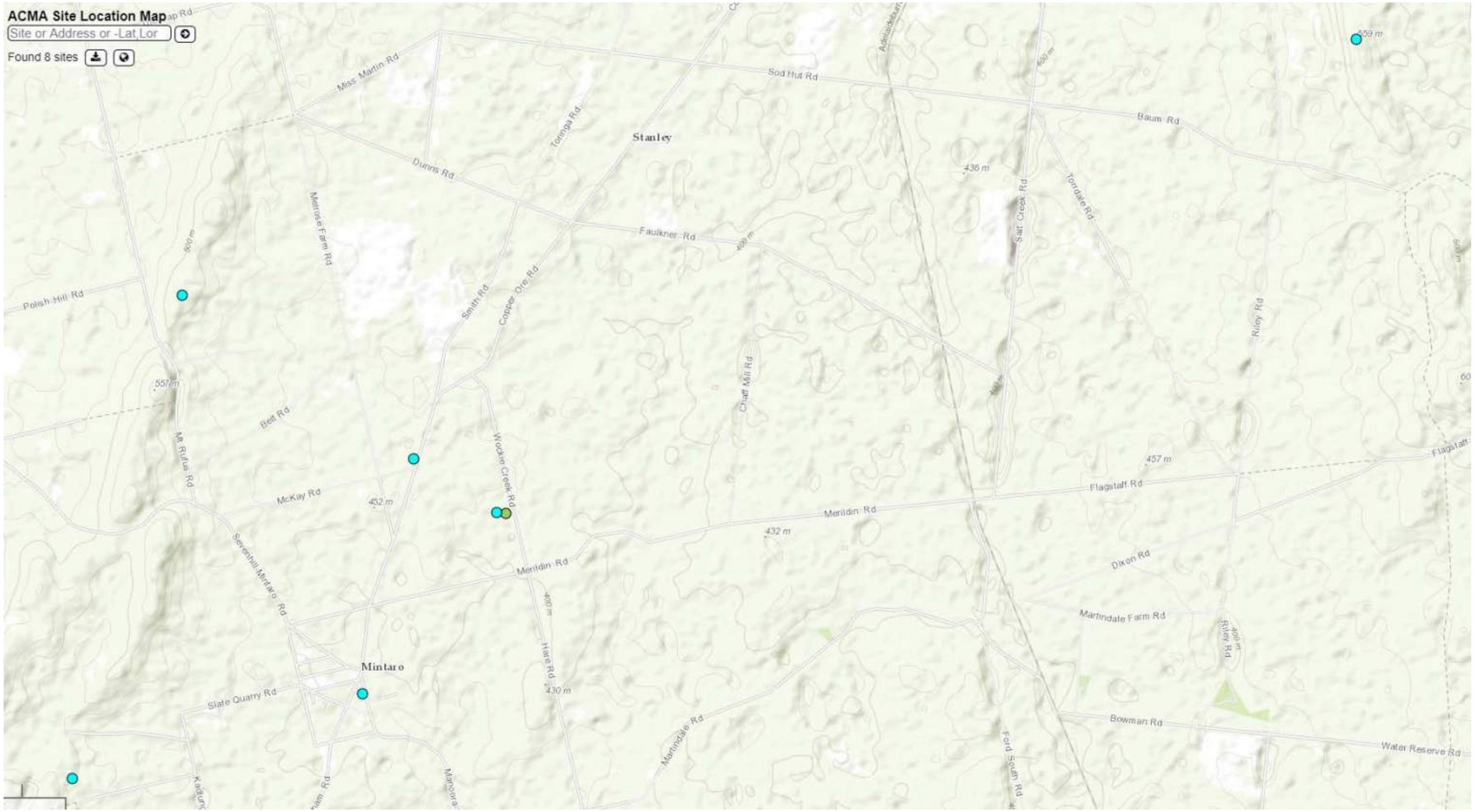


Figure 7.20 Radio communications sites identified within the approximate 5 km search area

7.13.4 POTENTIAL IMPACTS

All electronic equipment has associated electromagnetic fields. In some cases, electronic devices that are close to one another can encounter interference resulting from these fields.

Solar farms (including their ancillary infrastructure) have the potential to cause electromagnetic interference. Commercial equipment, such as solar panels, are subject to the relevant Australia regulations (such as the ARPANSA Standard) that determine the maximum allowable emissions limits to minimise interference impacts.

7.13.5 MANAGEMENT AND MITIGATION MEASURES

All infrastructures installed as part of the Project will comply with the relevant emissions standards detailed in AS/NZS 4251.1:1999 Electromagnetic compatibility (EMC) - Generic emission standard Residential, commercial and light industry.

While specific to wind farms, the Environment Protection and Heritage Council Draft National Wind Farm Development Guidelines outline the following hierarchy of mitigation measures that may be applicable to managing EMI for solar farm projects. The mitigation options (in order of most preferable to least preferable):

1. Relocation / removal of turbines (or solar panels for the purposes of the Chaff Mill Solar Farm assessment)
2. Replacement of existing radio communications service equipment with another, less affected type (e.g. replace UHF link with microwave link; replace analogue TV with digital TV).
3. Relocation of radio communications services to another existing radio communications tower.
4. Relocation of radio communications services to a new telecommunications tower.
5. Substitute radio communication for underground or overhead optical fibre.
6. Enhance radar filters (Environment Protection and Heritage Council 2010).

Construction equipment, such as cranes, may cause interference. Potential EMI impacts will be considered in the CEMP for the project.

7.13.6 KEY RECOMMENDATIONS

Consultation with telecommunications and other radiocommunications license holders in the area will be would be undertaken during the further design stages of the project.

7.14 AVIATION SAFETY

A review of potential aviation safety risks was undertaken for the Chaff Mill Solar Farm.

7.14.1 LEGISLATIVE AND POLICY REQUIREMENTS

Relevant regulatory bodies to aviation safety in Australia are the Civil Aviation Safety Authority (CASA) and Airservices Australia. CASA is primarily responsible for the safety regulation of civil air operations in Australia and the operation of Australian aircraft overseas (CASA 2018). Airservices Australia is Australia’s air navigation service provider. Neither bodies have released any specific regulations for solar farms.

The main piece of legislation relevant to aviation safety for the Chaff Mill Solar Farm is the *Civil Aviation Act 1988*. The main object of the Civil Aviation Act is to establish a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation, with emphasis on preventing aviation accidents and incidents (Australian Government 1988). The *Air Services Act 1995* is an Act to establish Airservices Australia.

The *Civil Aviation Regulations 1988* (CAR), under the Civil Aviation Act, do not have a specific regulation regarding solar farms near or en route to airfield operations. A regulation within the CAR that may be relevant to the Chaff Mill Solar Farm relates to potential glare caused by the solar farm:

Regulation 94 (1): Dangerous lights.

Whenever any light is exhibited at or in the neighbourhood of an aerodrome, or in the neighbourhood of an air route or airway facility on an air route or airway, and the light is likely to endanger the safety of aircraft, whether by reason of glare, or by causing confusion with, or preventing clear reception of, the lights or signals prescribed in Part 13 or of air route or airway facilities provided under the Air Services Act 1995*; CASA may authorise a notice to be served upon the owner of the place where the light is exhibited or upon the person having charge of the light directing that owner or person, within a reasonable time to be specified in the notice, to extinguish or to screen effectually the light and to refrain from exhibiting any similar light in the future.*

Regulations regarding height and physical obstructions to aircraft are also detailed below, however these are unlikely to be applicable to the Chaff Mill Solar Farm.

The CAR define the Lowest Safe Altitude (LSALT) for aircraft. Aircraft undertaking Visual Flight Rules (VFR) operations are required to maintain a minimum height of 500 feet above ground level outside of built up areas and 1,000 feet over built up areas. Instrument Flight Rules (IFR) or a Night VFR aircraft operation must not be flown at a height less than 1,000 feet above the highest obstacle within a 10 nm radius of the aircraft in flight.

The CAR, Part 9, Subpart 95, provide for the marking or removal of hazardous objects within the Obstacle Limitation Surface (OLS) of any aerodrome. The Obstacle Limitation Surfaces (OLS) are a series of surfaces that set the height limits of objects around an aerodrome. Objects that project through the OLS become obstacles. For major aerodromes, the OLS could extend up to 15 km from the aerodrome.

7.14.2 ASSESSMENT METHODOLOGY

Methods used to identify potential aviation safety risks presented by the Chaff Mill Solar Farm involved a desktop review of:

- Regulatory framework related to aviation
- Publicly available reports and guidelines relevant to the potential aviation safety implications of solar farms
- Previous aviation studies for projects in the region to gain an understanding of the existing aviation environment
- Previously completed aviation studies for other solar farm projects.

7.14.3 EXISTING CONDITIONS

Aviation operations identified from publicly available information within 50 km of the project area are detailed in Table 7.15. Figure 7.21 shows airports within 50 km of the project area. In addition to these aviation operations, agricultural aerial spraying and possibly fertilising may occur in the region surrounding the proposed Chaff Mill Solar Farm.

Table 7.15 Aviation operations within 50 km of the project area

AVIATION OPERATION	DISTANCE TO PROJECT AREA
Farrell Flat Airport	Approximately 6 km north of the project area
Clare Valley Aerodrome	Approximately 25 km north-west of the project area
Snowtown Airport	Approximately 36 km north-west of the project area
Balaklava Airfield	Approximately 42 km south-west of the project area
Kapunda Airport	Approximately 60 km south-east of the project area

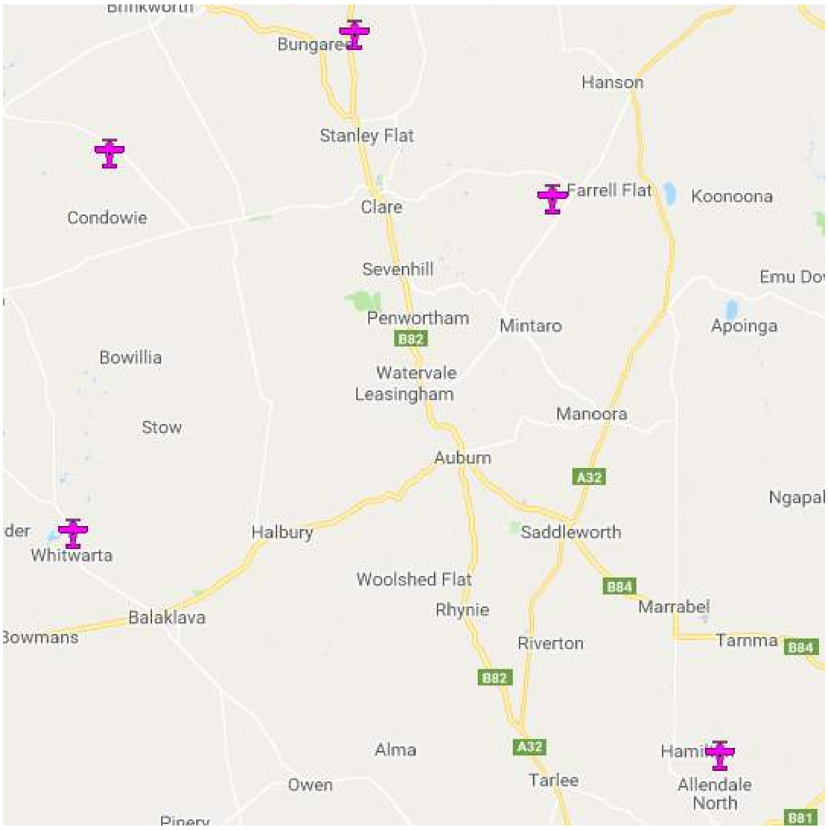


Figure 7.21 Airports within 50 km of the proposed Chaff Mill Solar Farm (Our Airports 2018)

7.14.4 POTENTIAL IMPACTS

The photovoltaic (PV) solar panels that would be used for the Chaff Mill Solar Farm are on three metre stands. The project would also comprise a substation and tee-connection to an existing transmission line. This infrastructure would be a comparable height to other transmission infrastructure in the area.

The Chaff Mill Solar Farm is not likely to require any infrastructure that would be within the Obstacle Limitation Surface (OLS) of any aerodrome. The closest airport is Farrell Flat Airport, located approximately 6 km north of the project area. The infrastructure would be below the LSALT.

Solar panels are designed to absorb, rather than reflect energy (including light energy). Typical panels are designed to reflect approximately 2% of incoming sunlight (Spaven Consulting 2011). The PV panels to be used for the project are frameless, further reducing the risk of glare.

A glare assessment was undertaken for the Chaff Mill Solar Farm using the Solar Glare Hazard Analysis Tool (SGHAT 2.0 and 3.0) (refer section 7.5.5). SGHAT has been used extensively in the United States to assess the potential impact of solar arrays located near airports. The US Federal Aviation Administration requires the use of SGHAT to demonstrate compliance with safety requirements for all proposed solar energy systems located at federally obligated airports. The glare assessment modelled glare at various sensitive receptors however glare was not modelled for aircraft.

A study undertaken by Spaven Consulting in 2011 into the potential for solar photovoltaic energy facilities to impact on aviation found that solar energy facilities located away from the vicinity of airfields are unlikely to present problems of glare to pilots. The report also found no evidence from existing solar energy projects around the world of any reported problems of glare affecting pilots (Spaven Consulting 2011).

7.14.5 MANAGEMENT AND MITIGATION MEASURES

The main potential impact to aviation safety presented by the Chaff Mill Solar Farm is glare although panels are designed to absorb rather than reflect energy (including light energy). However, based on the proximity of the project to aviation operations and the findings of previous studies, any impacts are expected to be minimal. Communication with aviation operators in the region, via a Notice to Airmen will be required to ensure they are aware of the project.

Project construction equipment and project infrastructure will be kept below the OLS of aerodromes in the surrounding region as well as the LSALT.

7.14.6 KEY RECOMMENDATIONS

Key recommendations arising from the aviation safety review are as follows:

- Aerial spraying, seeding or fertilising operations by aircraft within the vicinity of the solar farm is not recommended.
- Identification of the solar farm on relevant aeronautical charts (i.e. both the civil World Aeronautical Charts and the RAAF produced chart series) is required. Pending such identification on maps, all aviation operators would be made aware of the existence of the solar farm. This is normally communicated through a Notice to Airmen through Airservices.
- The solar farm proposal would be forwarded to the Land Planning and Spatial Information (LPSA) department within the Department of Defence. The LPSI department coordinates the Defence assessment of land use/development proposals within the vicinity of bases and facilities (Department of Defence 2017).

8 CONSTRUCTION, OPERATION AND DECOMMISSIONING

8.1 CONSTRUCTION

8.1.1 INDICATIVE TIMELINE

The proposed timing for the construction period is late-2019 to mid-2021 (approximately 18 months), pending Development Approval.

8.1.2 CONSTRUCTION ACTIVITIES

The main construction activities would include:

- Site preparation works, including fencing, preliminary civil works and drainage, access road and internal track construction, construction of site office
- Installation of concrete footings and steel posts for the solar arrays to be mounted on
- Installation of underground cabling (trenching) and connection of communications equipment
- Construction of the Battery Energy Storage System
- Removal of temporary construction facilities and rehabilitation of disturbed areas.

8.1.3 RESOURCING REQUIREMENTS

It is estimated that up to 200 workers will be required during the approximately 18-month long construction period. Local people are strongly encouraged to apply for construction related roles. Most of the workers for FRV's Lilyvale project in Queensland (currently under construction) have been sourced from the local area.

Equipment required for construction would include earth moving equipment, trucks and cranes. Materials required will include gravel, concrete (for the solar array footings) and the infrastructure components.

8.1.4 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Framework (EMF) has been prepared for the Chaff Mill Solar Farm (Appendix Q) to identify the environmental management and monitoring measures that would need to be implemented during the construction phase of the project.

- Provide a framework for the management of potential environmental impacts
- Provide guidance to the contractor(s) and help them meet their obligations; particularly under the *Environment Protection Act 1993*
- Address statutory requirements
- Provide assurance to government agencies on how potential environmental impacts will be avoided or mitigated during construction
- Detail individual environmental commitments to the project
- Provide an overview of all environmental values of the project area in association with the implications of the construction methodology
- Outline and discuss the implications of all relevant legislation and state and commonwealth guidelines that will need to be incorporated into management measures
- Guide the preparation of the Construction Environmental Management Plan (CEMP) by the contractor(s).

A CEMP will need to be prepared in line with the EMF prior to construction to manage environmental issues including:

- Aboriginal heritage – a specific Cultural Heritage Management Plan would be prepared for the project, in consultation with traditional owners, to ensure there are no impacts to Aboriginal cultural heritage
- Water quality protection, erosion and sediment control
- Noise and vibration
- Storage of hazardous substances
- Weeds, pests and diseases control
- Flora and fauna
- Air quality and dust suppression
- Materials, fuels and waste management
- Traffic and access – a specific Traffic Management Plan to manage construction traffic would be prepared for the project
- Emergency and fire management.

8.1.5 HEALTH AND SAFETY

The Chaff Mill Solar Farm would be designed in accordance with the South Australian *Work Health and Safety Act 2012*. Health and safety risks would be managed through a site Health and Safety Plan.

Road safety would be managed through the selection of an appropriate site access route for construction vehicles and personnel. This route has been proposed in consultation with the community and key stakeholders and is discussed in section 0. An information line is open for community members to report incidents, near-misses, concerns and feedback. A Construction Traffic Management Plan (CTMP) would be prepared to the satisfaction of DPTI (and/or the Clare and Gilbert Valleys Council) prior to construction commencement.

Site security would be in place prior to construction to ensure there is no risk to public safety through accessing the site.

All site personnel would be inducted on to the project, including safety requirements and responsibilities. Site personnel would be equipped with appropriate Personal Protective Equipment (PPE). Machinery and equipment used would be maintained and regularly checked for functionality and safety.

8.1.6 LAND TENURE

The site is freehold land currently owned by Mr. Graham Johnson. FRV has taken out an option to purchase the land upon financial close.

8.2 OPERATION

Once the project has been constructed and commissioned, the operation and ongoing maintenance of the solar farm would be managed through a framework which looks at the maintenance and operational requirements of the PV panels, access, roads, hazards, risks and security.

An operational environmental management plan would be developed prior to the commencement of operation, which would outline the environmental management requirements for operation of the project. This would include an emergency response plan to manage any potential emergency incidents that could occur at the solar farm.

8.2.1 HOURS OF OPERATION

The Chaff Mill Solar Farm would operate during the day time, seven days a week, with the Battery Energy Storage Systems (BESS) mostly exporting electricity at dusk and dawn and at other times as required for grid network stabilisation.

The Chaff Mill Solar Farm would have an operating life of approximately 30 years.

8.2.2 MAINTENANCE

Five permanent staff (sourced locally if possible) will be required during the operational phase for maintenance purposes. Maintenance activities are likely to involve:

- Preventative maintenance, including scheduled upgrades, cleaning and serving of infrastructure
- Corrective maintenance, including repairs or replacements of infrastructure
- Performance tests
- Maintenance/grading of access tracks
- Vegetation maintenance, including buffers between fencing, transmission lines and infrastructure as well as screening vegetation
- General inspection of the site, including fencing and security systems.

Maintenance operations are expected to be within normal business hours.

8.2.3 FIRE / BUSHFIRE MANAGEMENT

Bushfire risk would be managed through a Bushfire Management Plan developed specifically for the project, in consultation with the Country Fire Service (CFS) and surrounding landowners. Measures contained within the Bushfire Management Plan would include:

- The operation and maintenance of the site in a manner that no bushfire originates from the site and/or any approaching bushfire does not intensify because of excessive fuel loads within the site
- Maintain an Asset Protection Zone from the site boundary. No infrastructure is allowed in this space
- Requirements for water supply on site
- Fuel load reduction measures (e.g. mechanical slashing)
- Regular maintenance of on-site fire-fighting equipment and staff training
- No smoking would be permitted on site, other than in designated smoking areas
- All site personnel would be trained and have access to the appropriate emergency and safety equipment in the event of an emergency at the facility
- On-site burning will be prohibited.

If required personnel will evacuate the site in accordance with the Emergency Management Plan (refer section 8.2.4).

8.2.4 EMERGENCY MANAGEMENT

An Emergency Plan will be developed for the project detailing:

- Key responsibilities and authorities
- Emergency contacts
- Evacuation plan
- Incident and injury management
- Emergency preparedness information
- Emergency response actions
- Post emergency investigations, rehabilitation and records.

The plan is based on various relevant Australian Standards (including AS 3745:2010 “Planning for Emergencies in Facilities”). Visitors would undertake a site induction prior to entering the facility

8.2.5 SITE SECURITY AND SAFETY

A three-metre-high wire mesh fence, topped with barbed wire, will be constructed around the perimeter of the site and security gates installed at access points. Security fencing will be used in conjunction with infra-red sensors or thermal cameras to detect any night-time intrusions to the site. A specialist security contractor would be contracted to provide security monitoring and manned response services.

Alarms and cameras will be used to monitor the facility 24 hours a day, seven days a week. A buffer will be maintained between the perimeter fence and infrastructure. Security lighting will be used in certain locations, such as access points and the site carpark.

The Emergency Plan would include response actions for site security breaches.

Based on previous studies and assessments completed for developed solar farms, the hazard presented to public and site personnel from exposure to electric and magnetic fields are likely to be negligible.

8.2.6 BIOSECURITY

The Clare Valley contains highly productive agriculture and horticultural land as well as strong viticulture and oenology industries. South Australia is the only Australian mainland state that is free of fruit fly, and one of the few places in the world free of the vine-destroying pest phylloxera (PIRSA 2017).

Biosecurity would be managed at the Chaff Mill Solar Farm site through the implementation of site hygiene controls, which would be incorporated into the CEMP. These controls would also be included in the induction for all site personnel. The biosecurity measures within the CEMP would be developed in line with guidelines prepared by the Commonwealth Department of the Environment (2015) and incorporate the following steps:

1. Undertake a risk assessment for the project area to assess pathogen and weed risks through liaison with neighbouring landowners and government agencies.
2. Develop appropriate controls including which hygiene procedures are necessary to prevent the spread of pathogens and weeds, and how and where to apply them.
3. Ensure all materials taken onto the site—such as seedlings, mulch, soil, gravel, rock and sand—are certified free of weeds and pathogens. Ensure that rigorous inspections and quality checks are built into the management of the entire supply chain for materials and plant material.
4. Create a checklist of hygiene procedures for site managers.
5. Induct site personnel on the risks of spreading pathogens and weeds and risk mitigation strategies. This would include the provision of maps with the location of infested and clean areas and wash-down points.
6. The project area is within a moderate Phytopthora risk zone. Schedule earthmoving activities for the dry season as Phytopthora spreads more easily in wet and muddy conditions. If necessary, postpone activities and reschedule for a day when the soil is dry and doesn't stick to footwear, equipment and tools.
7. Where possible construction activities will be scheduled for when weed species are not in seed.
8. Vehicles will be kept clean and dry on entry and exit of the site. Movement will be restricted to formed roads and designated parking areas. Personnel will avoid driving through puddles and mud.
9. Equipment will be cleaned thoroughly and regularly.

8.3 DECOMMISSIONING

The decommissioning and rehabilitation of the Chaff Mill Solar Farm site and would involve:

1. Removal of all solar farm infrastructure (above and below ground) from the site. Materials would be sorted and packaged for removal from the site and recycling or re-use.
2. Remediation of the land to its original condition. Access roads would also be reinstated to the reasonable satisfaction of the Clare and Gilbert Valleys Council.
3. Undertake various specialist assessments of the land to confirm that FRV's obligations with respect to the property have been fulfilled.

Following rehabilitation, the land would either be leased or sold.

9 CONCLUSION AND RECOMMENDATIONS

This Development Application Report outlines FRV's proposal to develop the 100MW Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia. The proposed 100MW solar farm would capture solar energy and generate approximately 250,000MWh of clean, zero emissions electricity each year.

The project has secured Section 49 (Crown Development) status under the Development Act, with the Department of the Premier and Cabinet (DPC) providing sponsorship/endorsement.

This document provides a detailed description of the project and the site, a justification for the development and assessment of potential impacts. The Development Application Report also involved a review of the proposed Chaff Mill Solar Farm against the relevant provisions of the Clare and Gilbert Valleys Council Development Plan, as well as State and Commonwealth level policies and legislation.

The assessment found that the proposed development of a solar farm, is consistent and not at variance with the relevant policy provisions set out in the Clare and Gilbert Valleys Council Development Plan (Consolidated 10 November 2016), and that the project warrants the granting of Development Approval.

The report considers that the Chaff Mill Solar Farm is compliant with the strategic and statutory planning context of the area and there are no major environmental impacts that would result from the construction of the solar farm that could not be appropriately managed, mitigated or avoided. Key management and mitigation measures relate to infrastructure layout in the planning stage of the project as well as the development of a range of management plans.

FRV has engaged with key stakeholders, neighbouring properties and the wider community to inform the planning process for the Chaff Mill Solar Farm. FRV are committed to continuing a thorough engagement process and are considering ways that they can work with the Mintaro Progress Association and local community if the project is approved.

The Chaff Mill Solar Farm would generate considerable environmental, economic and social benefits for Mintaro, the local region and South Australia, including employment opportunities, local investment and increased energy security and reliability. The Chaff Mill Solar Farm would contribute to the South Australian and Commonwealth renewable energy targets and help to mitigate climate change. The assessment has recommended that the proposed Chaff Mill Solar Farm warrants granting of Development Approval.

10 LIMITATIONS

10.1 SCOPE OF SERVICES

This environmental site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

10.2 RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

10.3 SPECIALIST STUDIES

Any limitations relating to the findings of the specialist studies are set out in the relevant report, provided in the appendices of this document.

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APPENDIX A

EPBC RISK ASSESSMENT

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FRV AUSTRALIA

CHAFF MILL SOLAR FARM *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* RISK ASSESSMENT

JANUARY 2018

CONFIDENTIAL

Question today

Imagine tomorrow

Create for the future

Chaff Mill Solar Farm Environment Protection and Biodiversity Conservation Act 1999 Risk Assessment

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ABBREVIATIONS

EPBC Act	*Environment Protection Biodiversity Act 1999*
BDBSA	Biological Database of South Australia
DEWNR	Department of the Environment, Water and Natural Resources
DoEE	Department of the Environment and Energy
FRV	Fotowatio Renewable Ventures
FRWL	Flinders Ranges Worm-Lizard
MNES	Matters of National Environmental Significance
PBTL	Pygmy Blue-tongue Lizard
SCAP	State Commission Assessment Panel

1 INTRODUCTION

Australian solar development company Fotowatio Renewable Ventures (FRV) Australia is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia (Figure 1.1). The proposed 100 MW solar farm would be developed on a 380 ha site adjacent to the existing Mintaro substation and the associated 132 kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

Environmental studies, including an ecological survey and assessment have been completed for the project and a Development Application is currently being prepared for submission to the State Commission Assessment Panel (SCAP).

The following report assesses the likelihood of the project having a significant impact on a Matter of National Environmental Significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and therefore the requirement for a referral to the Commonwealth Environment Minister.

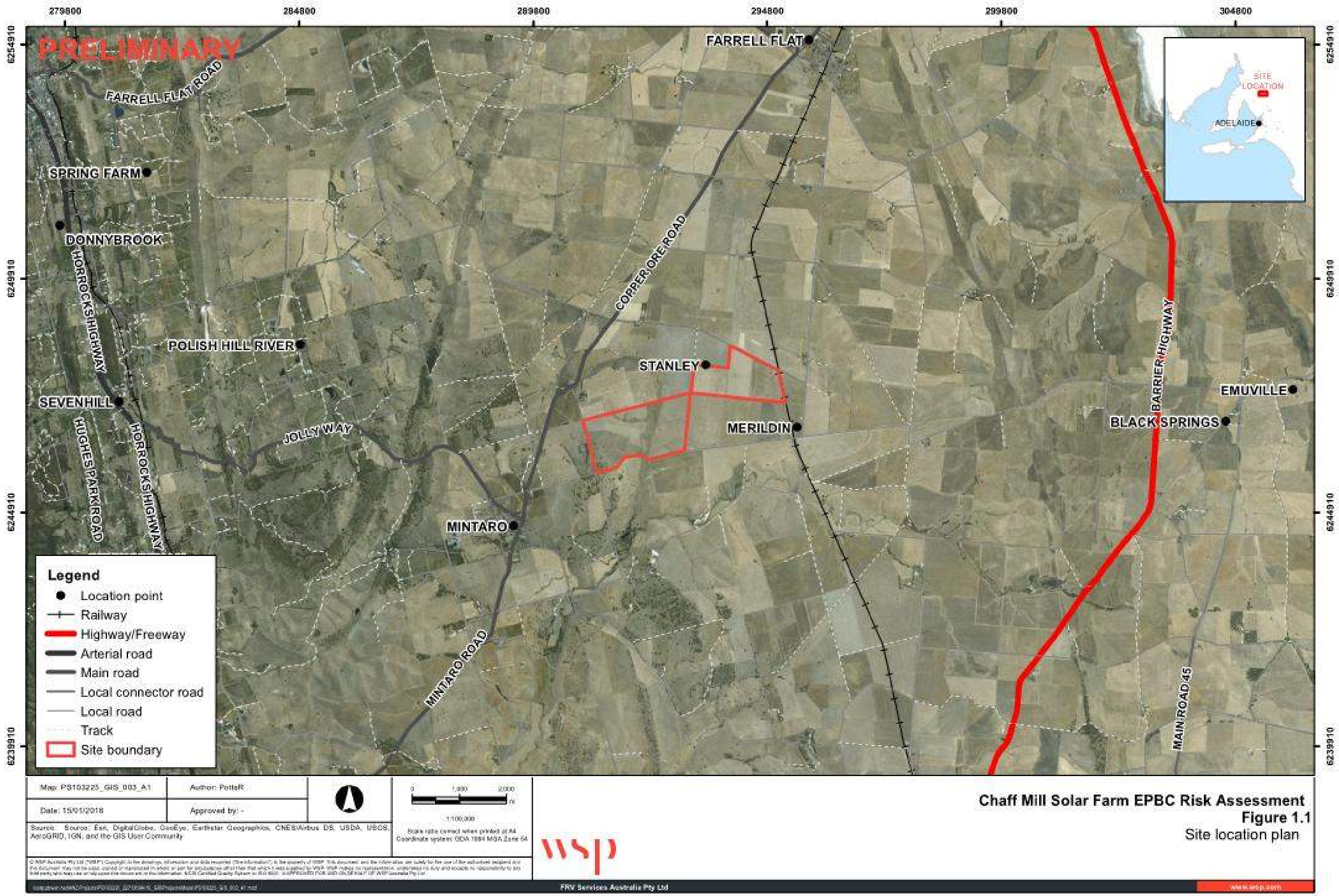

Figure 1.1 Chaff Mill Solar Farm site location

2 THE *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* (EPBC ACT)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It applies to all Australian territory and waters. Under the Act, actions that are likely to have a significant impact upon defined Matters of National Environmental Significance (MNES) are subject to an assessment and approval process. A company proposing to take an action that may have a significant impact on a MNES must refer that action to the Commonwealth Minister for the Environment.

The EPBC Act can be triggered when an action:

- is taken anywhere in Australia and has, or is likely to have a significant impact on a matter of national environmental significance; or
- is taken on Commonwealth land or in a Commonwealth marine area and has, or is likely to have a significant impact on the environment; or
- is taken outside Commonwealth land or marine areas and has, or is likely to have a significant impact on the environment on Commonwealth land or waters; or
- is taken by the Commonwealth and has, or is likely to have a significant impact on the environment.

In order to decide whether an action is likely to have a significant impact, it is necessary to take into account the nature and magnitude of potential impacts. In determining this, it is important to consider:

- all on-site and off-site impacts
- all direct and indirect impacts
- the frequency and duration of the action
- the total impact, which can be attributed to that action over the entire geographic area affected, and over time
- the sensitivity of the receiving environment
- the degree of confidence with which the impacts of the action are known and understood.

The EPBC Act prescribes nine matters of national environmental significance as triggers for Commonwealth assessment. These are:

- World Heritage sites
- National Heritage places
- Ramsar Wetlands of international importance
- nationally threatened species and ecological communities
- migratory species protected under international agreements
- the Commonwealth marine environment
- the Great Barrier Reef Marine Park
- nuclear actions, including uranium mining
- a water resource, in relation to coal seam gas development and large coal mining development.

Of these nine matters, there are three which could potentially trigger a Commonwealth assessment for the Chaff Mill Solar Farm project:

- nationally threatened species and ecological communities
- migratory species protected under international agreements
- National Heritage places.

Under the EPBC Act, a company proposing an action that may have a significant impact on a matter of national environmental significance must prepare and submit a Referral that will help the Commonwealth decide whether the proposal requires further assessment. The Commonwealth Environment Minister will consider the Referral and is required to decide within 20 business days whether the action requires approval via a higher level of assessment. This is either through:

- assessment on preliminary documentation
- assessment by public environment report
- assessment by environmental impact assessment
- assessment by Public Inquiry.

3 PROTECTED MATTERS SEARCH

An EPBC Protected Matters Report was generated for the proposed location of the Chaff Mill Solar Farm with a ten-kilometre buffer (EBS 2017). The Protected Matters Report provides guidance on MNES that may occur, or have habitat occurring, within the search area.

A search of the Biological Database of South Australia records (BDBSA), maintained by the Department for Environment, Water and Natural Resources (DEWNR), was then undertaken to determine if any of the MNES identified in the Protected Matters Report have been previously recorded within a ten-kilometre buffer of the project area (EBS 2017).

A summary of the results of the Protected Matters Search is provided in Table 3.1. Listed Marine species have not been listed as the rating is only relevant to Commonwealth Marine areas, which are not relevant to the project. A rating of the likelihood of each MNES occurring within the project area is provided based on preferred habitat, historical records and the results of the ecological survey, undertaken by EBS in September 2017 for this project.

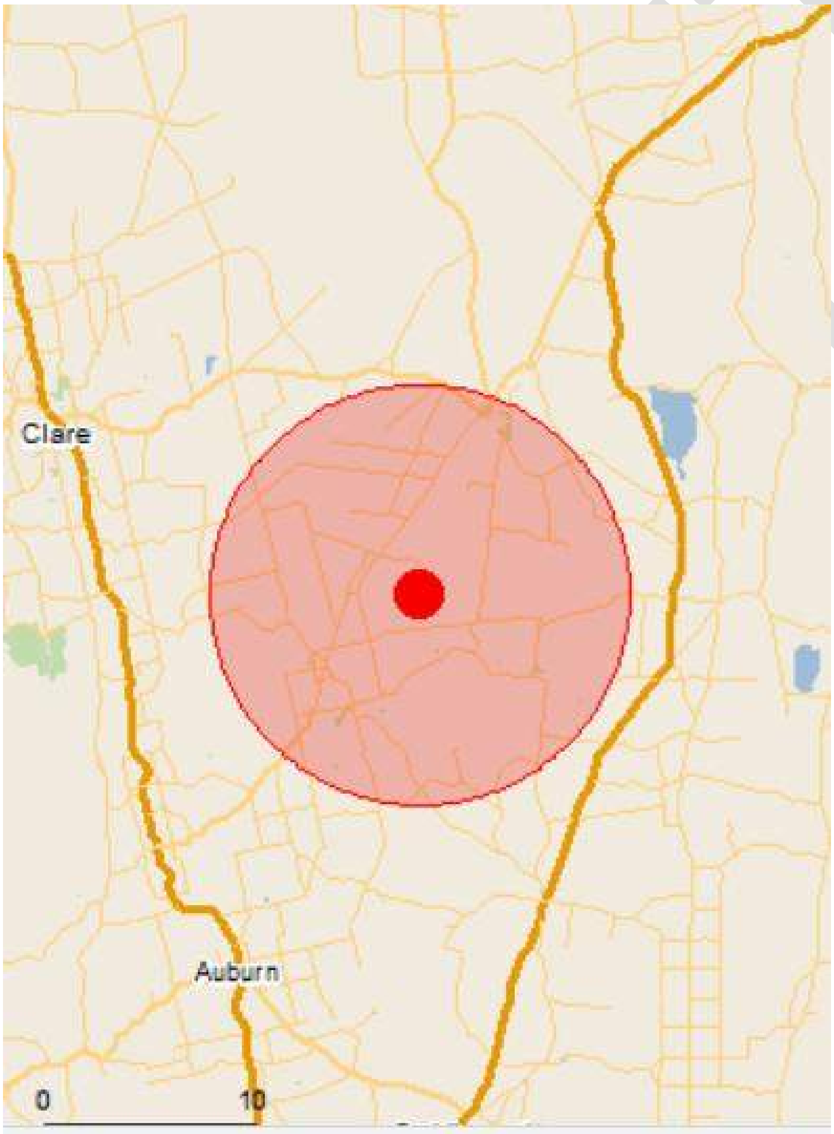

Figure 3.1 Protected Matters Search area

Table 3.1 Protected matters search results for Chaff Mill Solar Farm with a 10 km buffer

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Threatened Ecological Communities							
Iron-grass Natural Temperate Grassland of South Australia			Distribution: Main distribution is on slopes and hills of the Mount Lofty Ranges, west of the River Murray and throughout the Mid North.	N/A	No	Unlikely	No
Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia			Distribution: Extends from the southern Flinders Ranges to Lake Alexandrina. It is mostly found in the Flinders–Lofty Block Bioregion but patches also extend into the Murray–Darling Depression, Kanmantoo, Eyre–Yorke Block and Gawler Bioregions.	N/A	No	Unlikely	No
Plants							
Acacia glandulicarpa	Hairy-pod Wattle	Vulnerable	Occurs in semi-arid environments with a mean annual rainfall of 400–500 mm. Many sites coincide with gentle slopes at the transition zone between heavy clay/gravel soils on the flats and sandy soils on the rises (DoEE 2017a).	Yes	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Acacia spilleriana	Spiller's Wattle	Endangered	Grows on rocky hills, commonly along watercourses and roadsides (DoEE 2017a).	Yes	No	Unlikely	No
Caladenia argocalla	White-beauty Spider-orchid	Endangered	Preferred habitat is open grassy herbland under light, in a mixed *Eucalypt* and *Callitris* forest. The species is also noted to occur on hills and slopes in open forest dominated by Drooping She Oak and in Eucalypt woodlands with a grassy understory (DoEE 2017a).	No	No	Unlikely	No
Caladenia gladiolata	Bayonet Spider-orchid	Endangered	*Eucalyptus leucoxylon* Woodland and *Eucalyptus fasciculosa* Woodland. All extant subpopulations grow on slopes (moderate to steep) in sandy loam soils with scattered shale and quartzite.	No	No	Unlikely	No
Caladenia macroclavia	Large-club Spider-orchid	Endangered	Grows in fertile shallow loams in mallee-broombrush woodland in sandy loam.	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Caladenia tensa	Greencomb Spider-orchid	Endangered	Grows on red-brown sandy loams on rises in open woodland dominated by *Eucalyptus leucoxylon* sens. lat. and *Callitris preissii*. Also recorded in Black Box /Yellow Gum Woodland and Mallee/Heathland.	No	No	Unlikely	No
Caladenia woolcockiorum	Woolcock's Spider-orchid	Vulnerable	Typically grows in *Eucalyptus cladocalyx*, *E. goniocalyx*, *E. leucoxylon* subsp. *pruinosa* open forest or woodland. Grows on the mid to lower slopes of steep gullies, in relatively open, herbaceous understorey vegetation with loam soils. Also grows in *Eucalyptus leucoxylon* subsp. *pruinosa*, *Allocasuarina verticillata* woodland. In this habitat type, grows on gentle south facing slopes and flats with clay loam soils.	No	No	Unlikely	No
Caladenia xantholeuca	White Rabbits	Endangered	Occurs in *Callitris glaucophylla* woodland, often on south-facing slopes in heavily shaded areas, where it grows on mossy rock ledges and red-brown loam soils.	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Dodonaea procumbens	Trailing Hop-bush	Vulnerable	This species grows in low-lying, often winter-wet areas in woodland, low open forests, heathland and grasslands, on sands and clays.	Yes	No	Possible	Threats to this species include: — disturbance/destruction of habitat and individual plants — weed invasion — heavy grazing/browsing — altered fire regimes (DoEE 2017a) *Dodonaea procumbens* has been previously recorded in roadside vegetation within 10 km of the project area. Roadside vegetation will not be impacted by the project. It is unlikely to be present within the cropped and mixed grassland areas, where it is presumed infrastructure will be focused. If infrastructure placement is within the cleared areas and avoids native vegetation, it is unlikely that the species (if present) would be impacted.

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Euphrasia collina subsp. osbornii	Osborn's Eyebright	Endangered	This species is generally recorded growing in mallee scrubland but has also been found growing in sclerophyll forest and sclerophyll woodland. It is also found in heathy openings in wet sclerophyll forest (DoEE 2017a).	No	No	Unlikely	No
Glycine latrobeana	Clover Glycine	Vulnerable	Found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer (DoEE 2017a).	No	No	Unlikely	No
Olearia pannosa subsp. pannosa	Silver Daisy-bush	Vulnerable	Scattered throughout agricultural areas. Occurs in sandy, flat areas and in hilly, rocky areas in woodland or mallee.	No	No	Unlikely	No
Prasophyllum pallidum	Pale Leek-orchid	Vulnerable	Occurs in in well-grassed open forests from the Flinders Ranges to the Northern and Southern Lofty regions of South Australia (DoEE 2017a).	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Birds							
Calidris ferruginea	Curlew Sandpiper	Critically Endangered, Migratory (Wetland)	Intertidal mudflats in sheltered coastal areas. Also occurs inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.	No	No	Unlikely	No
Grantiella picta	Painted Honeyeater	Vulnerable	Woodland	No	No	Unlikely	No
Numenius madagascariensis	Eastern Curlew	Critically Endangered, Migratory (Wetland)	Sheltered coasts, mangrove swamps, bays, harbours and lagoons that contain mudflats and sandflats, often with beds of seagrass.	No	No	Unlikely	No
Pedionomus torquatus	Plains-wanderer	Critically Endangered	Sparse grasslands	No	No	Unlikely	No
Pezoporus occidentalis	Night Parrot	Endangered	Samphire plains, often around intermittent salt lake systems and with chenopod communities. Also occurs among spinifex on rocky ridges.	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Rostratula australis	Australian Painted Snipe	Endangered	Inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans.	No	No	Unlikely	No
Fish							
Galaxias rostratus	Flathead Galaxias	Critically Endangered	Inhabits a variety of habitats including billabongs, lakes, swamps and rivers, with a preference for still or slow flowing waters (DoEE 2017a).	No	No	Unlikely	No
Maccullochella peelii	Murray Cod	Vulnerable	Utilises a diverse range of habitats from clear rocky streams, to slow-flowing, turbid lowland rivers and billabongs (2017a).	Yes	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Reptiles							
Aprasia pseudopulchella	Flinders Ranges Worm-lizard	Vulnerable	Burrows freely in loose sand and soil, under rocks and litter. The species occurs in open woodland, native tussock grassland, riparian habitats and rocky isolates.	No	No	Possible	This species was not detected during targeted survey and searches however there is a small chance that it could be present. Therefore, a small number of individual FRWL (if present) may be directly impacted (direct loss, or loss of habitat) by the construction of the solar farm. The scale of loss of potential habitat and individual FRWL is considered minor and inconsequential to the local population (EBS 2017).
Tiliqua adelaidensis	Pygmy Blue-tongue Lizard	Endangered	Variety of habitats, ranging from highly degraded grasslands (dominated by exotic grasses) to grasslands with high native biodiversity. In addition, vegetation cover ranges from moderate to sparse or light.	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Migratory species							
Actitis hypoleucos	Common Sandpiper	Migratory (Wetland)	Occurs in coastal and inland wetlands (2017a).	No	No	Unlikely	No
Apus pacificus	Fork-tailed Swift	Migratory (Marine)	This species is almost exclusively aerial. It mostly occurs over inland plains and occasionally above foothills or in coastal areas (2017a).	No	No	Possible	No
Calidris acuminata	Sharp-tailed Sandpiper	Migratory	Intertidal mudflats in sheltered coastal areas. Also occurs inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (2017a).	No	No	Unlikely	No
Calidris ferruginea	Curlew Sandpiper	Critically Endangered, Migratory (Wetland)	Refer 'Birds' section above.	No	No	Unlikely	No
Calidris melanotos	Pectoral Sandpiper	Migratory	Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DoEE 2017a).	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Migratory (Wetland)	Occurs in permanent and ephemeral wetlands. Usually inhabits open, freshwater wetlands with low, dense vegetation (DoEE 2017a).	No	No	Unlikely	No
Hirundapus caudacutus	White-throated Needletail	Migratory (Terrestrial)	This species is almost exclusively aerial. It has been recorded flying above farmland, over partly cleared pasture, plantations or remnant vegetation at the edge of paddocks (DoEE 2017a).	No	No	Unlikely	No
Motacilla cinereal	Grey Wagtail	Migratory (Terrestrial)	Agricultural areas, forested areas as settled areas.	No	No	Unlikely	No
Motacilla flava	Yellow Wagtail	Migratory (Terrestrial)	Damp or wet habitats with low vegetation, from rushy pastures, meadows, hay fields and marshes to damp steppe and grassy tundra.	No	No	Unlikely	No
Myiagra cyanoleuca	Satin Flycatcher	Migratory (Terrestrial)	Vegetated gullies in Eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	No	No	Unlikely	No

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	PREFERRED HABITAT	IDENTIFIED IN BDBSA	IDENTIFIED IN ECOLOGICAL SURVEY	POTENTIAL PRESENCE ON SITE	POTENTIAL SIGNIFICANT IMPACT
Numenius madagascariensis	Eastern Curlew	Critically Endangered, Migratory (Wetland)	Refer 'Birds' section above.	No	No	Unlikely	No

4 DATABASES AND RELEVANT REPORTS

4.1 SOLAR FARM EPBC REFERRALS

The Commonwealth Department of the Environment and Energy (DoEE) publishes the majority of EPBC referral decisions and notices issued, as well as invitations to comment, on the EPBC Act Notices database (DoEE 2017). A review has been undertaken of solar farm projects that have been referred to the Commonwealth Environment Minister under the EPBC Act in the last two years. From 2016–2017, seventeen (17) solar farm projects have been referred Table 4.1. Of these projects:

- three referrals are currently pending and are open for invitation for Public Comment
- four have been assessed as 'not a controlled action if undertaken in a particular manner'. Approval is not required if the action is taken in accordance with the manner specified
- ten have been assessed as 'not a controlled action'. Approval is not required if the action is taken in accordance with the referral.

An overview of the size of these developments and their likelihood to impact on MNES is provided in the table below for comparison with the Chaff Mill Solar Farm.

Table 4.1 Solar farms referred to the Commonwealth Environment Minister from 2016-2017

REFERENCE #	TITLE OF REFERRAL	SIZE (ha)	LIKELY TO IMPACT ON MNES	DATE OF REFERRAL	STATUS
2017/8101	Merredin Solar Farm, WA Merredin Solar Farm Nominee Pty Ltd	4.32 ha	Yes	6/12/2017	Pending – open for invitation for Public Comment on Referral
2017/8098	Gregory Solar Farm, QLD Gregory Solar Farm Pty Ltd	872 ha	Yes	6/11/2017	Pending – open for invitation for Public Comment on Referral
2017/8055	Bulli Creek Solar Farm, QLD Bulli Creek Solar Farm Pty Ltd	5,398 ha	Yes	22/09/2017	Not controlled action
2017/8000	Haughton Solar Farm, QLD Pacific Hydro Haughton Solar Farm Pty Ltd	1,181 ha	No	6/09/2017	Not controlled action
2017/7998	Burdekin Solar Farm, QLD Cleangen Projects Pty Ltd	223.6 ha	Yes	31/07/2017	Pending – open for invitation for Public Comment on Referral
2017/7963	Majors Creek Solar Farm, QLD Edify Energy Pty Ltd	539.5 ha	Yes	14/06/2017	Not controlled action

REFERENCE #	TITLE OF REFERRAL	SIZE (ha)	LIKELY TO IMPACT ON MNES	DATE OF REFERRAL	STATUS
2017/7962	Columboola Solar Farm, QLD Luminous Energy Pty Ltd	594 ha	Yes	27/06/2017	Not controlled action if undertaken in a particular manner
2017/7942	Chinchilla Solar Farm, QLD First Solar (Australia) Pty Ltd	250.5 ha	Yes	12/05/2017	Not controlled action if undertaken in a particular manner
2017/7910	Whyalla Solar Farm Project, SA Adani Infrastructure Pty Ltd	396.5 ha	Yes	28/03/2017	Not controlled action
2017/7904	Stage 2 Solar Farm Development, QLD Edify Energy Pty Ltd	2,375 ha	Yes	16/03/2017	Not controlled action
2017/7898	White Rock Solar Farm, NSW Goldwind Capital (Australia) Pty Ltd	149.7 ha	Yes	16/03/2017	Not controlled action
2017/7885	Longreach Solar Farm, QLD Canadian Solar (Australia) Pty Limited	30.74 ha	Yes	28/02/2017	Not controlled action
2017/7879	Oakey Solar Farm, QLD Canadian Solar (Australia) Pty Limited	205 ha	Yes	15/02/2017	Not controlled action if undertaken in a particular manner
2016/7824	Solar Farm Development, QLD Edify Energy Pty Ltd/Energy Generation and Supply	455 ha	Yes	24/11/2016	Not controlled action if undertaken in a particular manner
2016/7807	Gannawarra Solar Farm Development, VIC Edify Energy Pty Ltd	535 ha	Yes	2/11/2016	Not controlled action
2016/7764	Construction and Operation of a Solar Farm, QLD Yarranlea Solar Pty Ltd	250 ha	Yes	19/08/2016	Not controlled action

REFERENCE #	TITLE OF REFERRAL	SIZE (ha)	LIKELY TO IMPACT ON MNES	DATE OF REFERRAL	STATUS
2016/7694	Darling Downs Solar Farm, QLD Origin Energy Darling Downs Solar Farm Pty Ltd	441 ha	Yes	3/05/2016	Not controlled action

4.2 CHAFF MILL SOLAR FARM ECOLOGICAL REPORT

An ecological survey was undertaken for the project by EBS Ecology. The field survey was undertaken from 24-26 September 2017 and included a vegetation survey and an opportune fauna survey.

The ecological report found that the project is not considered to have a significant impact on any EPBC Act listed flora, fauna or ecological communities, and hence a referral is not required based on the current assessment area (EBS 2017).

The below is an excerpt from the ecological report.

4.2.1 THREATENED ECOLOGICAL COMMUNITIES

The Threatened Ecological Communities identified in the EPBC Protected Matters Search Report were not detected within the project area.

4.2.2 FLORA

None of the EPBC listed flora species identified in the EPBC Protected Matters Search were detected or considered likely to occur within the project area based on the available habitat.

Dodonaea procumbens (Trailing Hop-bush), listed as nationally vulnerable, is considered as possibly occurring given nearby records and the species' relative inconspicuousness (and hence potential for non-detection). *Dodonaea procumbens* is unlikely to be present within the cropped and mixed grassland areas, where it is presumed infrastructure will be focused. If infrastructure placement is within the cleared areas and avoids native vegetation, it is unlikely that the species (if present) would be impacted.

Dodonaea procumbens has been previously recorded within the following vegetation associations:

- open *Eucalyptus camaldulensis*, *E. fasciculosa* and *E. leucoxylon* Woodlands in low-lying areas
- *Lepidosperma viscidum, Themeda triandra, Rhytidosperma* spp., *Austrostipa* spp. Native Grasslands
- with shrubs, including *Acacia acinacea*, *D. viscosa* and *Bursaria spinosa*.

There are 32 records of *Dodonaea procumbens* within 10 km of the project area, including from Mintaro Cemetery, within roadside vegetation, along the Barrier Highway, within plantation reserve east of Holm Hill and south-west of Black Springs (DEWNR 2017).

Two of the other EPBC listed flora species have BDBSA records within 10 km of the project area:

- *Acacia glandulicarpa* (Hairy-pod Wattle) – EPBC vulnerable. Two records; Flagstaff Road 3.7 km WNW of Black Springs, along roadside in Mixed Native sp. / Exotic sp. Grassland; and 5.5 km WNW of Farrell Flat.
- *Acacia spilleriana* (Spiller's Wattle) – EPBC endangered. Two records; 2.6 km NNW of Manoora, and another 1.5 km SSW of Porter Lagoon in the bed of quarry.

It is considered that these species would have been observed within the project area if present.

4.2.3 *FAUNA*

None of the fauna species identified in the EPBC Protected Matters Search have previous BDBSA records within 10 km of the project area. No fauna species protected under the EPBC Act were detected during the field survey.

4.2.3.1 PYGMY BLUE-TONGUE LIZARD

The Pygmy Blue-tongue Lizard (PBTL) was not detected during the field survey. The absence of PBTL is attributed to the large area of land that has been cropped. The area of exotic grassland/and *E. leucoxylon* Open Woodland within the western block is broadly considered potential habitat however no spider holes were detected therefore it is considered unlikely that PBTL occur.

Based on the results, there is no need for further targeted surveys or an EPBC referral for this species.

4.2.3.2 FLINDERS RANGES WORM-LIZARD

The Flinders Ranges Worm-Lizard (FRWL) was not detected during the field survey. The habitat suitability for Flinders Ranges Worm-lizard is considered low, however given the species' broad distribution across the region, it is considered as possibly present in non-cropped areas where surface rock, leaf litter and fallen timber occurs. Overall the habitat is considered as low suitability.

A small number of individual FRWL (if present) may be directly impacted (direct loss, or loss of habitat) by the construction of the solar farm. The scale of loss of potential habitat and individual FRWL is considered minor and inconsequential to the local population.

Based on the criteria in the EPBC Act Significant Impact Guidelines (Department of the Environment 2013) the project is not considered to have a significant impact on FRWL. An EPBC referral is not considered necessary for this species.

4.2.3.3 FORK-TAILED SWIFT

The Fork-tailed Swift (*Apus pacificus*), listed as migratory, could occur as an occasional visitor but would not be significantly impacted by the development.

5 EPBC RISK

5.1 RISK OVERVIEW

The Chaff Mill Solar Farm project area is mostly cleared of native vegetation and is under crop. There is a large patch of remnant *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland Blue Gum) in the western corner of the project area where it is too steep to cultivate. The understory is grazed and comprised of exotic grassland species. The creek line running through the western block is highly degraded with very limited native understory species present. The western block is bordered on the western side by a relatively steep rocky escarpment. Amenity plantings, mostly comprised of native species, occur as small patches within the project area and as narrow strips along the roadsides. Small strips of remnant native woodland and shrubland also occur along some roadside (EBS 2017).

The site falls within the Flinders Lofty Block IBRA Bioregion, the Broughton Sub-region and the Hansen Environmental Association. This Environmental Association has native vegetation comprising only 3% of its total area with a landform of gentle foot slopes forming extensive intramontane plains, with occasional narrow strike ridges on metasediments.

The ecological survey undertaken to support the Development Application for the project did not identify any nationally threatened species, or Threatened Ecological Communities (TEC) that meet required TEC criteria, although there is still potential for some of the species (predominantly *Aprasia pseudopulchella)*, to occur on site if the right habitat conditions are present.

Even if nationally threatened species of reptiles, birds and plants are present, the project is assessed as having a low risk under the EPBC Act due to the following factors:

- Surveys have located potential habitat for a limited number of threatened species but are yet to identify any recordings.
- The South Australian BDBSA does not show any relevant records for nationally threatened species.
- Even if impacted – potential impacts would not be deemed significant due to the area not comprising key habitat for any of the species (see Section 5.2).

5.2 EPBC ACT POLICY STATEMENT 1.1 SIGNIFICANT IMPACT GUIDELINES

An assessment against the EPBC Act Significant Impact Guidelines has been undertaken for EPBC Act Threatened species and Migratory species that have a possibility of being present within the project area. The purpose of these guidelines is to assist in determining whether Referrals should be prepared for projects and whether potential impacts may be significant under the Act.

Table 5.1 through to Table 5.3 outline the significant impact criteria (from the EPBC Act Significant Impact Guidelines) for Threatened and Migratory/Marine species; against each of the species that may occur in the area (based upon the information in Table 3.1).

Table 5.1 Significant impact guidelines assessment for vulnerable species

CRITERIA	SIGNIFICANT IMPACT ON *APRASIA PSEUDOPULCHELLA*	SIGNIFICANT IMPACT ON *DODONAEA PROCUMBENS*
Lead to a long-term decrease in the size of an important population of the species	No	No
Reduce the area of occupancy of an important population	No	No
Fragment an existing important population into two or more populations	No	No
Adversely affect critical habitat to the survival of a species	No	No
Disrupt the breeding cycle of an important population	No	No
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	No
Result in invasive species becoming established in the vulnerable species' habitat	No	No
Introduce disease that may cause the species to decline	No	No
Interfere substantially with the recovery of the species	No	No

Table 5.2 Significant impact guidelines assessment for endangered species

CRITERIA	SIGNIFICANT IMPACT ON *TILIQUA ADELAIDENSIS*
Reduce the extent of an ecological community	No
Fragment or increase fragmentation of an ecological community	No
Adversely affect habitat critical to the survival of an ecological community	No
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	No
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	No
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: assisting invasive species that are harmful to the listed ecological community to become established, or; causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	No
Interfere with the recovery of an ecological community	No

Table 5.3 Significant impact guidelines assessment for migratory species

CRITERIA	SIGNIFICANT IMPACT ON *APUS PACIFICUS*
Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	No
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	No
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	No

6 RECOMMENDATIONS

At this stage, it is considered unnecessary to prepare and submit a Referral under the EPBC Act for the Chaff Mill Solar Farm project. This is due to:

- a lack of threatened species recorded during the 2017 project survey
- a lack of threatened species recorded in the BDBSA
- a lack of key habitat for threatened species within the project area
- the nature of the proposed development
- the ability to manage and mitigate potential impacts through detailed Environmental Management Plans for construction and operation.

7 LIMITATIONS

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

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APPENDIX B

ABOUT FRV

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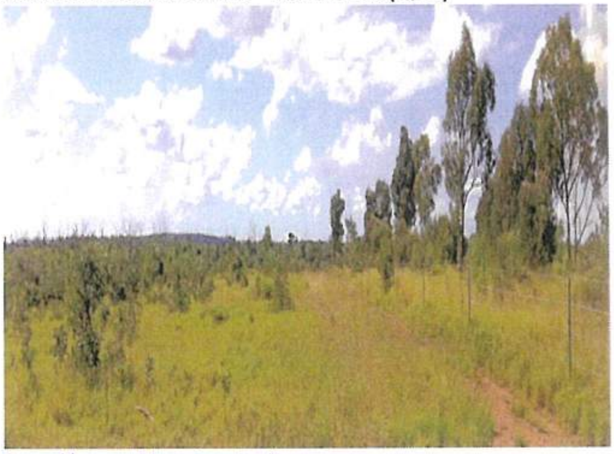
Appendix A - FRV Services Australia Pty Ltd - the Project Developer

FRV SA has extensive experience in the Australian renewable energy industry - it is a responsible and reliable developer and manager of large scale solar PV projects in three states. FRV SA's management team in Sydney, Australia is currently involved in the following projects under construction or operation:

ROYALLA SOLAR FARM - 20MWac (ACT)  http://www.royallasolarfarm.com.au/	Originally developed by the FRV Group, on 5 September 2012, the Minister for the Environment and Sustainable Development announced that FRV Royalla Solar Farm Pty Limited was successful in the 'fast-track stream' of the Solar Auction and was awarded a grant of feed-in-tariff entitlement for its 20 MW proposal to be located at Royalla in the ACT. FRV SA provided the Construction Management Services and the Royalla Solar Farm which was commissioned in late August 2014 and officially opened by the Minister on 3 September 2014. Since commissioning, FRV SA has been providing and continues to provide the Asset Management Services to the owners of the Royalla Solar Farm.
MOREE SOLAR FARM - 56MWac (NSW)   http://www.moreesolarfarm.com.au/	Moree Solar Pty Ltd is the owner and operator of the 56MWac (70.1MWdc) Moree Solar Farm located in the northern NSW. The Moree Solar Farm project was developed and is funded by the FRV Group with the support of the Australian government through a grant of AUD$101.7 million from the Australian Renewable Energy Agency (ARENA) and debt on commercial terms from the Clean Energy Finance Corporation (CEFC). FRV SA provided the Construction Management Services throughout the construction of the solar farm which started generating in February 2016. The Moree Solar Farm is now fully operational and FRV SA is providing the Asset Management Services which includes but not limited to the participation in the electricity market, wholesale trading, operations management, settlements and risk management.
CLARE SOLAR FARM - 136MWac (limited)(QLD)	Clare Solar Farm is the first utility-scale solar generation facility in Australia to secure financing purely on the basis of a commercial Power Purchasing Agreement without any additional grant funding. The Project is currently being built under an EPC Contract and FRV SA is currently providing the

 http://www.claresolarfarm.com.au/	Construction Management Services to the Owner. Once fully commissioned, FRV SA will provide all Asset Management Services to the Operator of the Project. The Solar Farm is expected to start generating in Q1 with the extension (Clare II) to follow closely behind.
LILYVALE SOLAR FARM - 100MWac (QLD)  http://www.lilyvalesolarfarm.com.au	Continuing its success of signing Power Purchase Agreements (PPA) for previous projects, FRV signed a PPA with Ergon Energy for 100% of the output from its Lilyvale Solar Farm in Queensland. Lilyvale is a project near Emerald and is currently under construction, making it FRV's 4th solar farm in construction or operation in Australia. FRV will also be installing its millionth solar panel in Australia at Lilyvale Solar Farm.

APPENDIX C

CHAFF MILL SOLAR FARM ENGAGEMENT REPORT

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REPORT

Chaff Mill Solar Farm Engagement Report (September 2017 to May 2018)

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Approval for issue

Name	Signature	Date
Alistair Kingston	Alistair Kingston	29/05/18

Contents

Appendices

1 Background

FRV Services Australia (“FRV”) is committed to being a good corporate citizen and working with its neighbours. On the Chaff Mill solar farm project, FRV has engaged with key stakeholders, neighbouring properties and the wider community to inform the planning process.

FRV is has adopted a three-phase engagement process:

- **Stage 1:** Meet with stakeholders and the community (including with neighbouring properties) to introduce them to the project, outline its benefits, explain the Development Application process and to seek feedback.
- **Stage 2:** Continued engagement with stakeholders and the community, in particular with the council, local members of parliament and key stakeholder groups by providing an update on the Development Application process, initial findings from technical assessments and how community concerns are being addressed.
- **Stage 3:** Demonstrate that FRV has listened and responded to community and stakeholder interests and concerns by meeting with all directly neighbouring properties (and various other neighbours), the Clare and Gilbert Valleys Council, local MPs and community groups and sharing the findings from the specialist technical assessments and how their concerns will be addressed in the Development Application. This phase also includes a pop-up community information session at the Sevenhill Producers market and a meeting with the new Minister of Trade Tourism and Investment, and the advisor for the local MP following the change of South Australian government in March 2018.

This document summarises the engagement activities undertaken during the three phases, the feedback provided and how FRV has used and responded to this feedback.

2 Summary of consultation

2.1 Phase one engagement

In September 2017, FRV undertook a process of introducing the project to key stakeholders and neighbouring property owners. The objective was to meet with both owners and leaseholders of properties that neighbour the two parcels of land identified as the site for the potential solar farm in Mintaro.

All known property owners were contacted in the week commencing 18 September offering them the opportunity to meet with representatives from FRV on Wednesday 27 September or Thursday 28 September 2017. Property owners who were unable to meet on these days were emailed a copy of the FRV Chaff Mill Solar Farm fact sheet (included in Appendix A).

Seven properties border the two parcels of land identified as a site for the solar farm. A total of five meetings where held with property owners over this period. FRV was not able to make contact with two of the property owners prior to the meetings. A phone discussion was had with one property owner for one of the properties, and they chose to have a fact sheet sent to them in lieu of a meeting. An email conversation was had with another of the landowners to address specific questions. An additional property owner was identified during this series of meetings, and a phone conversation has since been had with this property owner.

Since this visit to Mintaro, a phone discussion has been had with all outstanding property owners, and an offer was made to meet with them face to face as part of phase two of consultation. Stakeholders were kept updated during the specialist investigation process.

FRV also met with the Mintaro Progress Association (MPA), which is the peak body representing the Mintaro community. The association works in partnership with the Clare and Gilbert Valleys Council (CGVC) to ensure local concerns and issues are brought before the council. The meeting was held on Wednesday 27 September 2017 and the council was represented at this meeting, with the Manager Governance and Community in attendance.

Local MPs including the Hon. Geoff Brock, Member for Frome and Minister for Regional Development and Local Government, and Member for Stuart and Shadow Minister for Energy and Mining, Dan van Holst Pellekaan, were also briefed about the project through their staff and a copy of the fact sheet was sent to their offices.

The Clare and Gilbert Valleys Council was engaged during this phase, through a range of phone conversations and exchange of emails in September and October 2017. A meeting was also held with the council's Manager – Development and Environment on 28 September 2017, providing an update on the project, engagement with stakeholders and timing of the Development Application.

Further conversations were also had with additional property owner who were interested in the project. Directly affected property owners provided contact details for these land owners, with FRV making contact with them via phone and email to ensure they too were fully briefed about the project. These property owners were also added to a mailing list and provided with regular project updates. The concerns of these property owners have also been reflected in the following section outlining key issues.

2.2 Phase two engagement

In late November 2017, FRV undertook an additional round of engagement. This phase of engagement was much broader than the first round, focussing less on those directly neighbouring the proposed site, but those with a community interest.

Engagement occurred on 23 and 24 November 2017, with FRV meeting with the local MPs, or their representatives. Discussions where had with Chris Hanna, the advisor to the Hon. Dan van Holst Pellekaan, and Daniel Wilson, the advisor to Steven Marshall, the Leader of the South Australian Liberal Party. FRV also met with Hon. Geoff Brock and his ministerial advisors.

FRV has maintained regular contact with the Mintaro Progress Association since visiting in September 2017, and met again with representatives during this visit. Discussions focussed on how FRV can improve on its communication and engagement with the boarder Mintaro community and how FRV can invest in the community in the future. FRV was provided with a copy of the Mintaro Progress Association Strategic Plan 2017-2022 to provide insights into their vision for managing and developing key assets in Mintaro, and for FRV to consider how they might be able to provide support in the future.

With a focus on identifying benefits to the boarder community, FRV also met with the Clare Business and Tourism Association (CBTA). The association is one of the peak bodies seeking to encourage and assist in tourism and promotion of the region, in addition to providing a platform for all businesses in the region to voice opinions on business development. This provided an opportunity to discuss the range of local events that FRV could be participate in to discuss local business opportunities should its Development Application be successful, including CBTA's Annual General Meeting. Copies of the solar farm fact sheets were distributed at the meeting, which were then emailed to the CBTA members.

The Clare and Gilbert Valleys Council were engaged during this phase, through a range of emails and phone conversations in the lead up to the November 2017 visit and a formal presentation with the Mayor, acting CEO, various councillors and the council's Development and Environment and Governance and Community managers. Through the presentation and a visit to site, the councillors were provided with an update on the project, engagement with stakeholders, timing of the Development Application and how specific landowner concerns were being managed.

All stakeholders were provided with a hard copy of FRV's Chaff Mill Solar Farm project update (included in Appendix A). Neighbouring landowners and interested stakeholders were emailed a copy of this update on 22 November 2017. FRV developed a contact list for all engagement prior to the submission of the Development Application with all on the mailing list receiving copies of any project updates.

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2.3 Phase three engagement

The final phase of engagement occurred in mid to late May 2018 and focussed on sharing the findings from the technical assessments that were performed between September 2017 and February 2018, and to build on the earlier engagement, ensuring that the consultation was seen as meaningful and inclusive of all (directly affected landowners, broader community and key stakeholder groups). The intention was to also address any outstanding concerns that the community may have, and ensure that these concerns are addressed in the final Development Application.

Engagement occurred between 21 and 24 February 2018 during this phase and took on three forms:

- One on one meetings with directly neighbouring landowners (and their neighbours who had expressed an interest in meeting)
- Meetings with key stakeholder groups and MPs (Clare and Gilbert Valleys Council, Mintaro Progress Association – committee and members and the Hon. Geoff Brock MP)
- Pop-up community information session as the Sevenhills Producers Market.

During this time, FRV met with 10 neighbouring landowners to provide them with an update on the Development Application process, the timing and opportunities to provide feedback (either directly as an individual or comments through the council). FRV also used this opportunity to brief them on findings from the 11 technical and environmental assessments that have been undertaken to shape the Development Application. This enabled the landowners to have their concerns addressed first-hand by the WSP environmental scientist who was commissioned to manage the assessments, and to ask any additional questions. Key areas of concern continue to be whether the level of frost will increase in the area, whether there was any opportunity for compensation from FRV due to visual changes to the local amenity and what measures will be taken to manage biosecurity, impacts on local roads, stormwater run-off and ground conditions. It was noted with all of the landowners that measures to manage specific environmental and construction impacts will be addressed as part of the Construction Environmental Management Plan during the construction phase. Commitments were made to meet with these neighbouring landowners, should the project be approved.

The Clare and Gilbert Valleys Council were engaged during this phase, through a range of emails and phone conversations in the lead up to the February 2018 visit and a formal presentation with the Mayor, the new CEO, various councillors and the council's Development and Environment and Governance and Community managers. All in attendance were provided with an update on the project, focussing primarily on the findings from the technical and environmental assessments. The council acknowledged the thorough review of the issues raised both by themselves and the community during past discussions, but provided comment on a number areas such as impacts on local roads, visual amenity, and frost, and expect these issues to be further addressed in the Development Application.

An onsite meeting was held with the Hon. Geoff Brock to provide him with a better understanding of the proposed solar farm, following on from the meeting in Adelaide in November 2017. During the discussion he mentioned some a few of the concerns that his constituents had discussed with him, with the primary one being frost. FRV provided him with an update on the technical and environmental assessments that had been performed between September 2017 and February 2018.

Included in this phase of engagement was a presentation to the Mintaro Progress Association on 23 February, including both committee and general association members – a total of 15 people were in attendance. A formal presentation was given highlighting the findings from the technical and environmental assessments and how various community concerns have been addressed. An update was also given on the Development Application process, including how the public can assess the full studies and the Development

Application submission at the end of March 2018. Fact sheets were also provided to all present, reiterating this information and offering a direct link to the State Commission Assessment Panel.

During this meeting there was a discussion about the direct benefits to the community of Mintaro, including jobs available to contractors (civil contractors, fencers, and electricians for example) during construction and the indirect opportunities through catering and accommodation. In addition to this, FRV was pleased to offer the Mintaro Progress Association a community grant program over a five year period once the construction of the solar farm commences to support the strategic initiatives outlined in their Strategic Plan for Mintaro. It was noted that FRV will look at other ways to support the community, such as the MinMan Eagles, should the project be approved.

To date, the engagement for this project has focussed on those directly associated with or neighbouring the solar farm. One of the objectives of this phase of engagement was to ensure the broader community was informed about the proposed solar farm, and given the opportunity ask the FRV team questions. FRV sought advice from both the Mintaro Progress Association and the Clare and Gilbert Valleys Council on opportunities to attend events that locals usually attend. Following this advice, a decision was made to hold a pop-up community information session as the Sevenhills Producers Market on Saturday 24 February 2018 between 8.30am and 12pm. Advertisements were placed in the Northern Argus and the Plains Producer two weeks prior to the event, inviting people to come and visit the team (copies of these advertisements are located in Appendix C). The Clare and Gilbert Valleys Council also promoted the event for two weeks in their column in the respective newspapers. Just over 35 people visited the team at the market, with many noting they had seen the advertisements and had specifically come to meet the team. Most people visited to understand where the solar farm would be located and to identify potential business opportunities. FRV took the contact details of numerous B&B providers, a hotel, fencing contractors and individuals with previous construction experience, and will contact them in the future, should the project be approved. Overall comments from those who attended the information session were very supportive of the project, and commended the project and its use of renewable energy.

All stakeholders and community members who spoke with FRV at any of these engagement initiatives were provided with a hard copy of FRV's Chaff Mill Solar Farm project update #2 and a range of facts sheets on topics including frost and microclimate assessments, traffic assessments, overall technical and environmental assessments and an overview of the Chaff Mill Solar farm, including an indicative plan of where items will be located on the solar farm land. Copies of these materials are included in Appendix A.

Following the result of the South Australian government elections, and the change of government, FRV made a decision to submit the Development Application for the Chaff Mill Solar farm after March 2018 (the originally planned submission period). Emails were issued to all community members and stakeholders that FRV had previously engaged with, informing them that FRV still intended to submit the Development Application and that they would use the following weeks to speak with the new government before making a submission. They were also advised that FRV would contact them again to confirm when the application was submitted and how they could view this submission.

FRV met with the new Minister of Trade Tourism and Investment, Hon. David Ridgeway and Chris Hanna, the advisor to the Hon. Dan van Holst Pellekaan (Member for Stuart and Minister for Energy and Mining) on 23 May, briefing them on the project, the benefits to the State and the consultation to date with stakeholders and the community.

3 Key messages

Throughout engagement, it was important that FRV provide key stakeholders and the land owners with consistent information about the project. All stakeholders were advised of the following:

- Leading Australian solar developer and renewable energy company FRV Services Australia (FRV) is preparing a development application for a proposed 100MW solar farm with battery storage 3.5km north-east of Mintaro.
- FRV's parent company, Fotowatio Renewable Ventures, has developed and operated solar farms around the world over the past decade, developing 30 projects spanning 24 countries and five continents. This includes two operational solar farms in Australia, the 20MW Royalla Solar Farm in the ACT and the 56MW Moree Solar Farm in New South Wales. FRV is currently constructing the 100MW Clare Solar Farm, near Ayr in QLD and the 100MW Lilyvale Solar Farm, near Emerald in QLD.
- FRV commissioned WPS to undertake environmental, traffic, hydrological and geotechnical assessments, including surveys, to inform the design of the proposed Chaff Mill Solar Farm. These studies were performed from September 2017 through to February 2018.
- FRV believes the proposed Chaff Mill Solar Farm could generate enough clean energy to power 60,000 homes for South Australian families.
- The proposed site, approximately 130 kilometres north of Adelaide, is well placed to capture and export solar energy into the national electricity grid from the nearby Mintaro substation and its existing 132kV transmission line to Waterloo.
- The site of the proposed Chaff Mill Solar Farm is bounded by Wockie Creek Road, Merildin Road, Faulkner Road and Chaff Mill Road.
- This site was selected because of its proximity to grid infrastructure, good drainage and largely cleared land. The level of solar irradiation also makes it a suitable site for a solar farm.
- Development of the Chaff Mill Solar Farm is subject to development approvals through the South Australian Government's State Commission Assessment Panel. FRV will submit its Development Application in March or April 2018.
- Discussions with the local council as well as community and stakeholder engagement will inform the proposed project's planning and design. FRV met with the community and stakeholders on various occasions in 2017 / early 2018 to share with them the proposed design of the solar farm, including layout and plant configuration, and insights from specialist studies and reports.
- Subject to development approval, FRV seeks to commence construction in mid-2019 and complete the project by late 2020.
- A final design for the proposed Chaff Mill Solar Farm will determine plant configuration, layout and specific equipment to be used should the project proceed.
- Should the project proceed, the solar farm would have an operating life of around 30 years. At the end of this period, the solar farm will be decommissioned and the land restored to its original condition. Any extensions of the solar farm would require a new planning application.
- Operation of Chaff Mill Solar Farm would deliver clean, zero emissions electricity to meet the region's energy needs and would have significantly lower environmental impacts relative to other electricity generation methods.

- There will be little noise associated with the operation of the Chaff Mill Solar Farm. Noise from the cooling fans in the inverter cabins may be heard for short periods of time, in extreme heat conditions however you would need to be standing directly next to it to hear it.
- FRV will use PV-Polycrystalline modules with a horizontal, single axis tracking system. The panels, including the mounting structure would be no more than three metres from ground level. With this technology, the panels no longer feature metal rims, lessening the risk of glare to neighbouring properties.
- The solar panels will be positioned in a north to south orientation and will track from east to west.
- Should the project proceed, FRV would employ up to 200 workers during construction. During the operational stage, up to five ongoing jobs will be created.
- The proposed Chaff Mill Solar Farm would attract investment to the area and deliver additional indirect economic opportunities to local businesses including local grocery stores, restaurants, cafés, accommodation providers and petrol stations.
- Should the project proceed, there would be some initial traffic impacts, with the delivery of materials of the site. FRV will implement a construction management plan to manage traffic and other potential impacts.
- Traffic to and from the Chaff Mill Solar Farm during operation will be minimal. These traffic movements will generally be by private vehicles and will represent volumes in the order of what is already being experiences on the surrounding roads.
- FRV is committed to minimising impacts on the environment. The trees located in the far south-west corner on one of the identified parcels of land, near the creek, will be retained and preserved.
- FRV will work with properties who are classified sensitive receptors to consider ways to reduce the visual impact through vegetation screening.
- Committed to partnering with the local community, FRV has had discussions with local community groups to determine the best way to contribute to the community through a range of partnership opportunities both with community and sporting groups.

4 Key issues

Stakeholders and property owners were receptive to the concept of a solar farm in Mintaro, but raised a number of concerns that they expect to see FRV respond to or address in the Development Application.

Table 1 provides a summary of these concerns and the approach that FRV will take to ensure that any issues are addressed or managed accordingly.

Table 1 Summary of stakeholder and community concerns

Category	Specific issue	FRV mitigation measures
Environmental	Placement of the solar panels and the risk of restricting air flow by placing panels too close to the ground and to neighbouring fences and properties.	On most solar farms there is a gap between the end of panel arrays and the solar farm fence that is normally wide enough to allow for a vehicle to drive through. This is FRV's preferred design approach, and will be considered when finalising the detailed design. An Asset Protection Zone between the fence and solar farm infrastructure may also be required as part of the Bushfire Management Plan. The likely distance between the ground and the bottom edge of the panels (at their lowest height) will be between 0.5-1metres, although this will be confirmed during the detailed design stage following an extensive geotechnical assessment.
	Maintenance of the creek and the associated tributary on the land which the solar farm will be located.	The creek and associated riparian zone will be avoided and vegetation removal from this area will not be required. Protection measures will be outlined in the required Construction Environmental Management Plan.
	Increased water run-off from the solar farm property into neighbouring properties.	A preliminary civil assessment has shown that there will be no increase in total run-off from the site. Detailed civil and flooding assessments will be undertaken prior to construction to inform final design. A Sediment Erosion and Drainage Management Plan will be prepared for the project.
	Alternations to the land which will further increase the risk flooding to the region.	A civil assessment (stormwater and flooding) was undertaken to assess the topography and drainage characteristics of the site and to identify any flooding and drainage issues. The design of the solar farm will utilise the existing topography to allow the existing drainage network to continue to drain freely. This aligns with best management practices regarding site stormwater management for solar farm operation. Due to the lack of flood mapping in the relevant Development Plan, it is recommended that further analysis be undertaken to assess the risk of flooding. Flood modelling of the wider area would be undertaken prior to detailed design. A "buffer zone" may be created around waterways to prevent works being undertaken in areas which may be subject to localised flooding. It may also be necessary to establish stormwater detention ponds to ensure post-development flows

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Category	Specific issue	FRV mitigation measures
		match pre-development flows from the site due to potentially increased run-off (subject to further detailed investigation).
Farming operations	Compromised biosecurity for neighbouring properties, with contaminants being transported on vehicles using private and public roads and potential impact on neighbouring properties being able to maintain European Union Cattle Accreditation Scheme credentials.	Biosecurity (including weed control) would be managed at the Chaff Mill Solar Farm site through the implementation of site hygiene controls, which would be incorporated into the Construction Environmental Management Plan (CEMP). The biosecurity measures within the CEMP would be developed in line with best practice and incorporate the following steps: ▪ Undertake a risk assessment for the project area to assess pathogen and weed risks through liaison with neighbouring landowners and government agencies. ▪ Develop appropriate controls including which hygiene procedures are necessary to prevent the spread of pathogens and weeds, and how and where to apply them. ▪ Create a checklist of hygiene procedures for site managers. ▪ Induct site personnel on the risks of spreading pathogens and weeds and risk mitigation strategies. This would include the provision of maps with the location of infested and clean areas and wash-down points. ▪ Vehicles will be kept clean and dry on entry and exit of the site. Movement will be restricted to formed roads and designated parking areas. Personnel will avoid driving through puddles and mud. ▪ Equipment will be cleaned thoroughly and regularly.
	Location of the solar farm fencing and impacts on existing boundary fences	The 3 metre high chain wire security fence is normally positioned on the boundary and FRV will seek to replace the existing fencing on the boundary with the security fence if so. In some cases, if required, the existing fence and new security fence can be co-located side by side.
	Continued supply of water from windmill in the parcel of land proposed for the solar farm.	FRV will use its best endeavours to maintain the water supply to neighbouring properties from the existing windmill. FRV will have discussions with neighbouring properties on how this can be achieved once the site design is finalised. The current site layout for the project leaves that part of the site vacant, so there may not necessarily be a need to move the windmill to another location.
	Health impacts on either humans or animals as a result of electromagnetic fields (EMFs)	FRV and its consultants have undertaken research into EMFs. Through this research it has found that photovoltaic (PV) systems generate electromagnetic fields (EMF), sometimes referred to as radiation. EMF produced by electricity is nonionizing radiation, meaning

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Category	Specific issue	FRV mitigation measures
		the radiation has enough energy to move atoms in a molecule around, but not enough energy to remove electrons from an atom or molecule (ionize) or to damage DNA. Modern humans are exposed to EMF throughout their daily lives without negative health impacts. Someone outside of the fenced perimeter of a solar facility is not exposed to significant EMF from the solar facility. As such, there is no negative health impact from the EMF produced in a solar farm. Commercial equipment such as solar panels are subject to the relevant Australia regulations (such as the ARPANSA Standard) that determine the maximum allowable emissions limits.
	Impact on neighbouring property values with the development of a solar farm both in terms of inflated value due to the price paid for the solar farm land and the impact on remaining farms on having a solar farm as a neighbour.	Property values are influenced by a range of factors and it is therefore difficult to determine if solar farms (or other similar infrastructure) can cause land values on neighbouring agriculture properties to increase or decrease. There is little available research on the impact of solar farms on property value however a study undertaken in 2016 into the impacts of wind farms on the value of neighbouring agricultural properties found that: *For rural properties used for primary production, there is no direct loss of productivity resulting from wind farms; therefore, they are unlikely to negatively impact the value of such properties.* Property values for neighbouring properties within the local area may be influenced by the solar farm (potentially positively or negatively). This is difficult to quantify; however it is not expected that the Chaff Mill Solar Farm would affect productivity of neighbouring agricultural properties.
	Potential impact on the temperature inversion and an increase in cooler air in the area with the installation of the solar panels.	FRV's research found a lack of specific studies and literature that relate to the general environmental impacts of solar farms. Literature regarding micro-climate impacts and impacts to the radiative heat exchange at solar farms is even rarer. WPS reviewed several studies that had a range of findings and outcomes. Summarised relevant findings appear to be that: ▪ Temperatures in the centre of a solar farm may be slightly higher than ambient – particularly in warmer months ▪ Temperatures return to ambient several metres above a solar farm ▪ Temperatures may be slightly warmer directly adjacent a solar farm, gradually returning to ambient with distance away from the solar farm ▪ Soil temperatures at depth underneath panels may be slightly warmer during cooler months and slightly

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Category	Specific issue	FRV mitigation measures
		cooler in warmer months ▪ Air temperatures at ground level underneath panels may be slightly cooler during summer months ▪ Air temperatures at a two-metre height in the solar farm in the colder months would probably be similar to the surrounding areas ▪ Air temperatures at a two-metre height in the solar farm in the warmer months may be slightly warmer than the surrounding areas ▪ Air temperatures directly above solar arrays may be slightly warmer at night ▪ Temperatures at control sites adjacent solar farms generally had temperatures equal to ambient conditions. In discussion with research scientists, climatologists and meteorologists; the climate impacts of a 380-ha solar farm would not be significant and the addition of access roads within and around a solar farm would further mitigate any local climate impacts due to enhanced air flow.
	Increase in frost to the region following the installation of the solar panels	Research and discussions with scientists has demonstrated that there will be no significant changes to the micro-climate in areas surrounding the solar farm. The risk to the exacerbation of frost conditions in the area is also not significant. Research shows no cooling in surrounding areas; only a potential very slight warming affect immediately above and immediately next to solar panels with temperatures returning to ambient outside of the solar farm. The design of the solar farm and panels and the design of the security fencing will all ensure adequate air flow within and around the site.
	Installation of a 3 metre chain wire fence around the solar farm that could potentially trap frost which will affect neighbouring properties.	The proposed fencing is made of metal chain wire mesh, and is not expected to restrict air flow any more than the existing metal wire fences on the boundary.
	The impact of the solar farm on the inversion layer and additional restrictions that will be placed on farmers when undertaken spraying operations	FRV is unable to provide comment or advice on individual circumstances in relation to crop spraying restrictions, however would encourage crop sprayers continue to take all reasonable and practicable measures to prevent or minimise actual or potential contamination of land, animals or plants outside the target area.
	Traffic route during construction and ensuring that the optimal route is chosen, in particular to ensure	FRV through its technical assessment has considered key routes for construction to minimise the impact on existing operations. The preferred route at this stage is

Category	Specific issue	FRV mitigation measures
Traffic	farming operations, such as harvesting which requires a high volume of vehicles, can occur concurrently.	the Horrocks Highway to Mintaro via Jolly Way (about 51km) and then a further 2km along Merildin Road and Wockie Creek Road (access Option B). This route avoids travel through Mintaro township. The majority of the route is sealed, deploys appropriate traffic control measures to reduce the risk of incidents and is subjected to only a small number of additional heavy vehicles movements per day during the construction period. The route is also the preferred and most likely route for access by light vehicles travelling predominantly to and from the west of Mintaro. FRV will work with the council to confirm the route and any upgrades to the roads that need to be undertaken prior to the use of this route.
	Entrance to the solar farm, whether it will be off Merildin or Chaff Mill Roads and what impact it will have on neighbouring properties.	The initial design has indicated that the key entry point to the solar farm will be from Wockie Creek Road, noting that the road will require some upgrades for this to occur.
	High volume of vehicles travelling on and damaging unsealed roads	FRV will undertake a dilapidation survey of council road infrastructure on the designed traffic route prior to commencing works to assess and agree the existing condition of the relevant sections of road. Follow up surveys will be undertaken upon the completion of the works and use of the designated traffic route to demonstrate the level and scope of remedial works to be undertaken to restore the roads to their original condition. FRV will also put in place a range of measures to address potential impacts on road condition during construction including: ▪ improvements to the horizontal and vertical alignment at selected locations ▪ improvements at intersections to improve sight distance, make the approaches more conspicuous and reduce wear and tear by turning vehicles ▪ re-sheeting of the road surface, repair and grading – in identified locations widening of selected roads particularly around curves ▪ measures to protect errant vehicles from roadside hazards. A road safety audit of roads near the project area would be undertaken during detailed design. Any required mitigation measures would be developed in consultation with the council. Measures would also be taken to reduce the amount and intensity of travel demand on the local roads by staggering shift times and promoting ride sharing with the workforce. FRV will also encourage appropriate driver behaviour and inform the community of construction activities that may change traffic patterns.

Category	Specific issue	FRV mitigation measures
		It should also be noted that no construction related travel would occur outside of daylight hours. A Construction Traffic Management Plan (CTMP) would also be prepared to the satisfaction of DPTI and / or the Clare and Gilbert Valleys Councils prior to construction commencing.
Noise	Increase in noise in the area due to the operation of the solar farm battery and the existing substation needing to operate longer at night.	There will be little noise associated with the operation of the Chaff Mill Solar Farm. Noise from the cooling fans in the inverter cabins may be heard for short periods of time in extreme heat conditions, however you would need to be standing directly next to it to hear it.
	Increased noise and other environmental impacts such as dust during construction	Construction of the solar farm would be undertaken during normal working hours (Monday-Friday). As the Mintaro township is located approximately 3.5km away, there are unlikely to be any impacts to the township of Mintaro. Impacts to adjoining properties will be managed through a CEMP and any noise impacts will comply with EPA guidelines.
Community	Visual impacts to properties that have been, or about to be constructed to maximise local views.	FRV has worked closely throughout the environmental and specialist technical assessment phase and the production of the Development Application, with the

Category	Specific issue	FRV mitigation measures
		property owners classified as sensitive receptors and visually impacted by the solar farm. Discussions will continue with these property owners to agree a vegetation screening solution to meet their needs.
	Overall benefits to the community both during construction and operations.	Should the project proceed, FRV would employ up to 200 workers during construction. The proposed Chaff Mill Solar Farm would attract investment to the area and deliver additional indirect economic opportunities to local businesses including local grocery stores, restaurants, cafés, accommodation providers and petrol stations. In the operational phase, the project would employ up to five full-time workers during operation. This workforce would be drawn from the local area where possible. There would also be opportunities for those with expertise in weed control, grass cutting, electrical services and operations and maintenance. FRV also continuing to consider ways that they help share the benefits to the broader community and are speaking with local community groups about potential partnerships.
	Timing of the Development Application and how many days the community has to respond to the application.	The project will be assessed under the Crown development approval pathway (lodged under s49 / s.49A of the *Development Act 1993*). For these applications, a longer period of time is provided for representations to be received (which must not be less than fifteen (15) business days from the date of notification). FRV has advised the community and stakeholders of the State Commission Assessment Panel site under Public Notices at https://www.saplanningcommission.sa.gov.au/scap/public_notices
	Opportunities for local businesses and trades to be involved in both the construction and operation the solar farm.	FRV has created a register of businesses, individuals and contractors that have expressed an interested in being involved in the solar farm construction, and / or can provide services to workers during the construction phase. FRV will contact those who have expressed interest should the project obtain approval and progress to the delivery phase. FRV has also committed to hosting a Business Breakfast in the lead up to construction, briefing locals on the opportunities and how they can become involved. The intention is that FRV will involve the Mintaro Progress Association, Clare and Gilbert Valleys Council and the Clare Valley Business and Tourism Association in the planning for the Business Breakfast, based on previous discussions on maximising opportunities for local businesses and employment for individuals.

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Category	Specific issue	FRV mitigation measures
	Whether local businesses can tender for the solar panel cleaning business	FRV encourages local business involvement. Businesses with equipment suitable to clean the panels and that comply with the manufacturers' requirements are welcome to tender for these works. Other jobs that will be sourced locally include grass cutting, weed spraying, vegetation maintenance, civil works and electrical services as an example.
	Potential increase in crime in the area	A 3 metre high chain wire security fence will be constructed around the solar farm to deter trespassers onto the site. FRV will not be providing security systems for neighbouring properties, although the operations and maintenance workers on the solar farm site will be able to report any suspicious activity in the local area.
	Whether there will be any infra-red cameras on the security fencing	The security system on the solar farm is likely to include infra-red sensors or thermal cameras that will operate at night to alert the security contractor of breaches of the security fence.
Solar farm operations	Installation of overhead powerlines rather underground lines.	There are not expected to be overhead lines installed outside of the site boundaries. It is proposed that an underground cable running beneath Chaff Mill Rd will connect the west and east land parcels comprising the project site.
	Number of vehicles that will access the operational solar farm.	Traffic to and from the Chaff Mill Solar Farm during operation will be minimal. These traffic movements will generally be by private vehicles and will represent volumes in the order of what is already being experienced on the surrounding roads.
	Solar panels being able to withstand high wind (potentially cyclonic) conditions.	In cyclone prone areas where the loads are very high, the solar panel tracker can be engineered to resist speeds of up to 120 km/h, although the tracker can be designed for even higher wind speeds. As per the Australian standards, FRV will design the structure to resist the worst case wind speed scenario in Mintaro. If those wind speeds are actually reached, the tracker will go to "stow-position", which consists of 0 degrees of tilt where the tracker is in defence position and the impact on the tracker is minimised.
	Ground conditions not being suitable for the operation of a solar farm. Soil can change considerably – it can expand and contract over time, as well as pooling with water.	A geotechnical overview was undertaken to support the Development Application process. Detailed geotechnical investigations, including soil and groundwater testing, will be undertaken as part of the detailed design phase. Feedback on the changeable conditions of the soils was received from many community members and this will be taken into account during future investigations.
	Visual impact from the moving panels to the neighbouring properties, and	Where a direct and prominent visual impact is experienced by a nearby residence, FRV will consider

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Category	Specific issue	FRV mitigation measures
	the potential risk of solar glare.	ways to reduce the visual impact (such as vegetation screening). FRV has agreed to provide vegetation screening along part of the southern section of Chaff Mill Road to mitigate the visual impact to the property near the corner of Merilden and Chaff Mill Roads. FRV has had initial conversations with owners of this property regarding both the location and the species of vegetation. These conversations will continue with the property owners to ensure they are involved in the final screening solution, should the project proceed
	How the solar farm land will be used for grazing during the operational phase and what happens to the land after the 30 year operational period.	FRV will consider the option of grazing livestock on the solar farm, however no commitment has been given as to who will manage the livestock should they proceed with grazing. Following the conclusion of the 30-year operational period, the land will be reinstated and returned to the original condition and either sold or leased.
	What happens if FRV sells the solar farm? What assurances will be given that the solar farm will be operated in accordance to the commitments made by FRV?	Should FRV sell the solar farm, the new owner and operator will be subject to the conditions that were put on FRV as part of the original Development Application.
Fire risks	What measures will be taken to manage fire, both on the solar farm and from neighbouring properties	Bushfire risk would be managed through a Bush Fire Management Plan developed specifically for the project, in consultation with the Country Fire Service (CFS) and surrounding landowners. Measures contained within the Bushfire Management Plan would include: ▪ The operation and maintenance of the site in a manner that no bushfire originates from the site and/or any approaching bushfire does not intensify because of excessive fuel loads within the site. ▪ Maintain an Asset Protection Zone from the site boundary, if required. No infrastructure is allowed in this space. ▪ Requirements for water supply on site. ▪ Fuel load reduction measures (e.g. mechanical slashing). ▪ Regular maintenance of on-site fire-fighting equipment and staff training. ▪ No smoking would be permitted on site, other than in designated smoking areas. ▪ All site personnel would be trained and have access to the appropriate emergency and safety equipment in the event of an emergency at the facility.

Category	Specific issue	FRV mitigation measures
		▪ On-site burning will be prohibited. ▪ If required personnel will evacuate the site in accordance with the Emergency Management Plan developed for the project. Consultation will be undertaken with the CFS and Emergency Services to determine how best to respond to a fire emergency.
Financial and insurance aspects	Whether financial compensation will be provided to properties neighbouring the solar farm.	It is not a FRV policy to provide financial compensation to neighbouring properties. FRV will manage direct and prominent visual impacts on nearby dwellings through screening, and in accordance with the conditions of the Development Application.
	What additional insurance will neighbouring properties need to take cover any damage they may cause to the solar farm. Note these farmers currently have $20 million in public liability insurance.	FRV will have its own insurance policy in place to provide coverage in the unlikely event that solar farm equipment is damaged by fire. A Bush Fire Management Plan will include procedures to deal with a fire on site, and normally requires water to be kept on site for that specific purpose. The Environmental Management Plan will include obligations that prevent the spread of fire across the site (such as grass cutting and an asset protection zone if required.). FRV recommends that farmers on nearby properties also take all maximum precautions to prevent the ignition and spreading of fires, and seek advice from their insurance providers on individual insurance policy matters.
	Purchase of additional properties	FRV has secured a sufficient amount of land to progress the development of a 100MW solar project. No additional land is required for this project.

5 Media engagement

FRV received four media enquiries the engagement process, from the ABC and the *Northern Argus*. These enquiries have focused on the economic benefits the solar farm to the region, the Development Application process and the overall timing of the project. The articles where FRV have been contracted for comment have been primarily been positive. Copies of these news stories are included in Appendix B – Media Coverage.

There have only been two negative media stories relating to the proposed solar farm. Both of these articles appeared in the *Plains Producer* and highlighted concerns from landowners who are not directly affected by the solar farm. These landowners were not involved directly in discussions with FRV about the project. Locals who were approached to make comment supported the project. FRV was not approached to provide comment in either of these articles. Copies of these articles can also be found in Appendix B.

Appendix A

Communication collateral

RPS

Fact Sheet – September 2017

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

Chaff Mill Solar Farm: A plan to harness the power of the sun and create jobs in your community

Leading Australian solar developer Fotowatio Renewable Ventures (FRV) is preparing a development application for a proposed 100MW solar farm 3.5km north-east of Mintaro.

FRV is working on a preliminary design for the proposed solar farm, which could generate enough clean energy to power up to 60,000 homes for South Australian families. This would be achieved by connecting the farm to the electricity network via a Tee Connection to an existing 132kV transmission line running from the adjacent Mintaro substation to the Waterloo substation, which is owned and managed by AEMO-ElectraNet.

FACT SHEET

Planning and environmental considerations

The proposed Chaff Mill Solar Farm is subject to development approvals through the South Australian Government's Development Assessment Commission.

Environmental studies have commenced. These will be completed during the design phase to ensure that any potential impacts on native vegetation, birds or animals are minimised.

Subject to development approval, FRV seeks to commence construction late 2019 and start generating energy 12 to 18 months later. The solar farm would have an operating life of 30 years.

An ideal location to generate energy for South Australians

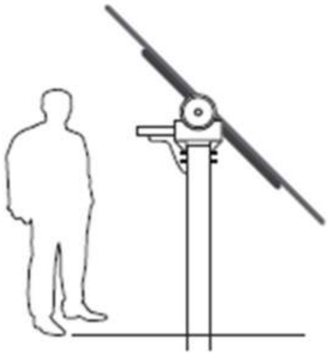
South Australia is nationally recognised as a leader in clean energy production.

The proposed Chaff Mill Solar Farm can further the development of the Australian clean energy industry and make a significant contribution to South Australia's energy production.

The 380 hectare site is approximately 130 kilometres north of Adelaide, is well placed to capture and export solar energy into the national electricity grid from the nearby Mintaro substation and its existing 132kV transmission line to Waterloo. This site was selected because of its proximity to grid infrastructure, good drainage and largely cleared land. The level of solar irradiation also makes it a suitable site for a solar farm.

Operation of Chaff Mill Solar Farm would deliver clean, zero emissions electricity to meet the region's energy needs and would have significantly lower environmental impacts relative to other electricity generation methods.

FRV plans to use the latest in solar energy generation technology: PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would be no more than three metres from ground level.



RPS

PROPOSED PROJECT TIMELINE

September – October 2017	September – November 2017	December 2017 – March 2018	Late 2018	2019
Complete specialist studies.	Stakeholder and community engagement.	Finalise and submit development application report to Development Assessment Commission.	Development application considered by SA Government.	Planned commencement of project construction (if approved).

Figure 1: Development of the Chaff Mill Solar Farm is subject to development approvals through the South Australian Government's Development Assessment Commission. This indicative timeline sets out the development application process and proposed construction, including current community and stakeholder consultation.

Economic benefits

Should the project proceed, FRV would employ up to 200 workers during construction. Operation of Chaff Mill Solar Farm would create up to five ongoing jobs.

In addition, the project would attract investment to the area and deliver additional indirect economic opportunities to local businesses including local grocery stores, restaurants, cafés, accommodation providers and petrol stations.

About FRV

FRV has developed and operated solar farms spanning 24 countries and five continents.

FRV has had a presence in Australia since 2010.

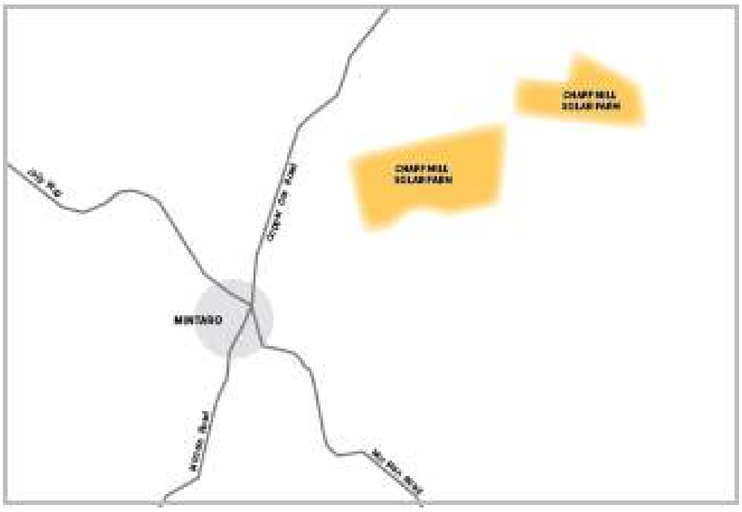
A leader in its field, FRV uses the latest technology and design solutions to generate and deliver sustainable and clean energy.

FRV's track record of achievements includes two operational solar farms in Australia, the 20MW Royalla Solar Farm in the ACT and the 56MW Moree Solar Farm in New South Wales. FRV is currently constructing the 100MW Clare Solar Farm, near Ayr in QLD and the 100MW Lilyvale Solar Farm, near Emerald in QLD.

Find out more

Community and stakeholder engagement on the proposed Chaff Mill Solar Farm is underway. Engagement will inform the planning process and encourage the community to offer feedback, including an alternative name for the proposed solar farm.

FRV will have discussions with State Parliamentary members, as well as the local council, community interest groups and local people as planning progresses.



If you would like more information, email infoaustralia@frv.com or call the project team on (03) 9417 9711.

FRV

RPS

Project Update – November / December 2017

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

Project update – November 2017

Leading Australian solar developer, FRV, has identified an area of land, 3.5km north-east of Mintaro in South Australia, for a 100MW solar farm.

FRV began discussions with neighbouring properties and community interest groups in September this year, making them aware of the proposed Chaff Mill Solar Farm. Feedback from these discussions, along with initial site investigations and specialist studies will inform the preliminary design and the development application for the proposed 380 hectare solar farm. This update provides an overview of what FRV have heard from the community, the investigations performed to date, and the next steps.

Environmental assessment and specialist studies

Through specialist consultants, FRV will undertake a range of environmental and technical studies to inform its development application. To date the following studies have been kicked off:

- Flora and fauna
- Aboriginal cultural heritage
- Visual impact and landscape assessment
- Solar glare impact assessment
- Planning, zoning and land use (still being assessed)
- Traffic and access (still being assessed)
- Social and community (still being assessed)
- Site contamination
- Geotechnical assessment
- Stormwater and flooding (still being assessed)
- Non-Indigenous heritage assessment (still being assessed).

FRV has obtained initial findings in a number of these areas including flora and fauna, Aboriginal cultural heritage, visual impact and landscape assessment, site contamination and geotechnical assessment. Further investigations will occur in December 2017, with findings to be discussed with the local community and other interested stakeholders in early 2018.

Proposed project timeline

September – December 2017	September – November 2017	January – February 2018	January – March 2018	Late 2018	Early 2019
Complete specialist studies	Initial stakeholder and community engagement	Finalise and submit development application report to Development Assessment Commission	Stakeholder and community engagement	Development Application considered by SA Government	Planned commencement of project (pending outcome of Development Application)

RPS

What we've heard

Community and stakeholder feedback will shape FRV's development application and inform the plant configuration, layout of the proposed solar farm and construction mitigation measures. Since September 2017, FRV has met with members of the community, local council, community interest groups and parliamentary members face-to-face and have continued these discussions on the phone and via email in October and November.

Key areas of interest include:

- risk that radiative heat loss will accelerate change in ambient air conditions and accelerate frost conditions
- damage to the local road network
- rehabilitation and usage of the solar farm land at the end of the 30 year operation period
- why this location
- the visual impact from the solar panels on the local amenity
- condition of the existing soil and the ability to support the solar panel structures.

FRV through its consultants, have undertaken a range of specialist studies to not only manage the environmental and technical requirements but to address community concerns. Studies carried out to date, indicate that there is minimal impact from the proposed development. However, FRV wants to confirm the accuracy of the information before presenting feedback to the community in late January / early February 2018.

Next steps

Over the coming months FRV will prepare its development application. Prior to submitting the application to the South Australian Government's Development Assessment Commission in 2018, FRV will engage with the community with more detail on the plant configuration and layout and findings of the environmental and technical studies.

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711.

FRV

Project Update – February 2018

FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

Project update–February 2018

Over the last two months, FRV, leading Australian solar developer, has consolidated the findings from recent environmental and technical studies and feedback from discussions with the community and key stakeholders to further refine its development application for the proposed 100MW Chaff Mill Solar Farm, located 3.5km north-east of Mintaro in South Australia.

This update provides an overview of the status of FRV's development application and additional opportunities to obtain community feed.

Completion of environmental assessment and specialist studies

Specialist consultants, WSP have now completed the environmental and technical assessments that are needed to inform the development application for the proposed Chaff Mill Solar Farm. Fact sheets have been developed to provide specific information on these studies. Copies of these fact sheets can be requested by contacting the team at infoaustralia@frv.com.

FRV will ensure that the preliminary design and development application for the solar farm address the recommendations made in these assessments, in particular taking into consideration the preferred routes and screening to properties identified as being visually impacted by the solar farm or that will experience glare.

Engaging with the community

FRV values feedback from the local community and key stakeholders. Through meetings with the local community, council and community interest groups, FRV have identified key areas of concern and have used these to inform the preliminary design and development application for the Chaff Mill Solar Farm.

In February, FRV will meet again with landowners directly neighbouring the site of the proposed solar farm, interested stakeholder groups, Clare and Gilbert Valleys Council and local MPs in late February 2018 to provide them with an update on the development application and findings from the environmental and technical assessments. FRV will also be present at the Sevenhill Producers Market on Saturday, 24 February from 8.30am to 12.00pm, providing an opportunity to meet with the team and view the proposed layout of the solar farm.

Feedback will be taken into consideration and incorporated into the final development application, where possible.

For those who are unable to attend this information session, they are welcome to contact the project team by email at infoaustralia@frv.com or calling (03) 9417 9711.

RPS

Development application timeline

Next steps

FRV is on schedule to submit the application for the Chaff Mill Solar Farm in late- March 2018 to the South Australian Government's State Commission Assessment Panel (SCAP). The Clare and Gilbert Valley Council are provided with a copy of this application, along with detailed reports as part of this process. The State Commission Assessment Panel will publicly advertise the application and make the documentation available online: https://www.saplanningcommission.sa.gov.au/scap/public_notices

FRV expect the State Commission Assessment Panel to make a decision on this application in mid to late 2018, and will advise the boarder the community of the outcomes soon after.

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

FRV

RPS

Fact Sheet – Frost and Micro-Climate Impact Assessment

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

FROST AND MICRO-CLIMATE IMPACT ASSESSMENT

FACT SHEET

FRV recognises the importance of working with the community in the development of the proposed Chaff Mill Solar Farm. During engagement last year, there was community concern that the solar farm might accelerate frost conditions in the local area. To address this, FRV and its consultants conducted a frost and micro-climate review and assessment.

Key findings

Frost is defined by the Bureau of Meteorology as a deposit of white ice crystals or frozen dew which forms on objects near the ground when the surface temperature drops below freezing point. In Mintaro, frost is most likely to occur when the sky is clear with light winds and low humidity.

The assessment concluded that while there can be minor differences in the soil and air temperatures directly under and above solar panels on solar farms, there is no significant impact on air temperatures in the surrounding areas.

Methodology

Literature review

A review of scientific literature and studies relating to the environmental impacts of solar farms was carried out. A number of studies and academic papers from Australia and around the world were reviewed and the findings were analysed and compared.

In response to community feedback and interest, this also included a review of two specific research papers published in 2016 – *Solar Park Microclimate and Vegetation Management Effects on Grassland Carbon Cycling by Alona Armstrong et al* published in Volume 11 of the Environmental Research Letters journal and *The Photovoltaic Heat Island Effect: Larger Solar Power Plants Increase Local Temperatures by G Barron-Gafford et al* published in Volume 6 of Scientific Reports (Nature).

Both studies included scientific monitoring and assessment at constructed solar farms and found that there were slightly increased temperatures directly above solar panels and slightly decreased temperatures directly beneath solar panels (as would be expected). Importantly, the studies did not note any significant changes to temperatures at progressive locations next to the solar farms. Other solar farm impact studies based on hypothetical modelling also generally reflected these findings.

RPS

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

Discussions with scientists

Acknowledging the limited scientific research available, FRV's consultants contacted scientists from relevant government agencies, meteorology and climate organisations, specialists in air modelling, agricultural scientists and universities.

Although not able to provide informed or definitive advice regarding the Chaff Mill Solar Farm, scientists spoken to were of the opinion that there would be no significant micro-climate impacts from a solar farm of this size. Further, some of those contacted were of the view that air flow from the road network in and around the solar farm would also help mitigate any potential local climate impacts.

More information and next steps

FRV is planning to submit its application to the South Australian Government's State Commission Assessment Panel in March 2018. This application will include the frost and micro-climate study findings and other specialist study reports, which can be accessed following submission on the State Commission Assessment Panel site under Public Notices at:

www.saplanningcommission.sa.gov.au/scap/public_notices

FACT SHEET

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

FRV

Fact Sheet – Traffic Impact Assessment

FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

TRAFFIC IMPACT ASSESSMENT

FACT SHEET

Traffic impact studies were undertaken between September and December 2017, to inform FRV's development application for the proposed Chaff Mill Solar Farm, which is intersected by Chaff Mill Road and bounded by Wockie Creek Road, Merildin Road, Chaff Mill Road and Faulkner Road. Current vehicle access to the east and west sections of the proposed site is by a network of unsealed roads.

Below is a summary of the traffic study report.

Traffic study

The purpose of the traffic study was to:

- Understand the likely extent of light and heavy vehicle traffic impacts during the construction and operation of the solar farm
- Identify alternative routes for light and heavy vehicles to access the site
- Recommend a preferred route to be used by vehicles as the primary access to the site.

FRV and its consultants conducted a site inspection of local road conditions and a desktop assessment of traffic and road corridor information from the Department of Planning, Transport and Infrastructure.

Traffic generation

Vehicular access would be required to both sections of the proposed site during the construction and operation of the solar farm. Construction of the proposed solar farm is expected to take approximately 18 months and will be completed in two stages.

FRV estimates there would be up to 100 workers on the site during the first stage of construction. For the second stage the number of workers would increase to up to 200 on site. These workers would be expected to travel to and from the site in light vehicles. Most likely, workers would share rides with each other to the remote site.

FRV has estimated that between eight and 16 heavy vehicle movements a day will transport construction plant and equipment to the site during both stages of construction.

Once operational, it is estimated up to five ongoing staff would need to access the site. The vehicle movements would be significantly reduced during the operational period, with around ten trips per day.

Route and access options

The preferred access to the west section of the site is from Wockie Creek Road. Preferred access to the east section of the site via a road within the solar farm.

A short section of Chaff Mill Road would be upgraded to allow traffic to pass between the west and east sections.

RPS

FRV TOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

FACT SHEET

Alternative traffic routes were identified for vehicles to access the west (Wockie Creek Road) section of the proposed site including:

- Route A – via Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wockie Creek Road
- Route B – via Barrier Highway, Mintaro-Manoora Road, Copper Ore Road, Merildin Road and Wockie Creek Road
- Route C – via Barrier Highway, Mintaro-Manoora Road, along Martindale and Hare Roads to Merildin Road and Wockie Creek Road
- Route D – via Barrier Highway, Flagstaff and Riley Roads and Merildin Road.

Route A was considered the most suitable for both light and heavy vehicles to access the site for the following reasons:

- It avoids travel through the Mintaro and Manoora townships
- There are no residential properties along Merildin Road and Wockie Creek Roads between Copper Ore Road and the preferred access
- Access to the eastern section of the site is available via a short section of Chaff Mill Road
- It includes the shortest length of unsealed roads to be upgraded including two intersections.

Vehicles would travel to the site via Horrocks Highway, then Jolly Way Road and along Catholic Church and Merildin Roads to access the western section of the site on Wockie Creek Road.

Traffic impacts

FRV acknowledges there would be an increase in light and heavy traffic volumes on sealed and unsealed roads in vicinity of the project site during the construction stage.

To manage the traffic impacts during construction, FRV will develop a Construction Management Plan that details vehicle routes and measures to maintain road conditions. This plan would be developed by FRV's appointed construction contractor.

More information and next steps

FRV is planning to submit its application to the South Australian Government's State Commission Assessment Panel in March 2018. This application will include the traffic impact report and other specialist study reports, which can be accessed on the State Planning Commission Assessment Panel site under Public Notices at:

www.saplanningcommission.sa.gov.au/scap/public_notices

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

FRV TOTOWATIO RENEWABLE VENTURES

Fact Sheet – About the Chaff Mill Solar Farm

CHAFF MILL SOLAR FARM

ABOUT THE CHAFF MILL SOLAR FARM

FACT SHEET

The proposed 380-hectare, 100 MW Chaff Mill Solar Farm is located near Mintaro in South Australia and is approximately 130 kilometres north of Adelaide. The solar farm could generate enough clean energy to power up to 60,000 homes for South Australian families.

Leading Australian solar developer FRV Services Australia (FRV) selected the site because of its proximity to grid infrastructure, good drainage and largely cleared land. The level of solar irradiation at the site during the year also makes it suitable for a solar farm.

Location and layout

The proposed 380-hectare site is 3.5km north – east of Mintaro. The site is bounded by Copper Ore Road, Wockie Creek Road, Merildin Road, Faulkner Road and Chaff Mill Road.

The proposed layout of the solar farm would comprise of approximately 360,000 solar panels and a battery storage unit with containers. FRV plans to build a three-metre-high wire mesh fence around the site, topped by barbed wire.

FRV is considering the use of solar PV – Polycrystalline modules that would be no higher than three metres high at maximum tilt to capture solar energy.

Construction and traffic management

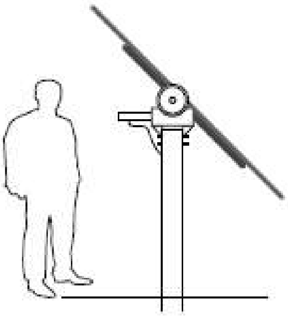
Subject to development approvals through the South Australian Government's State Commission Assessment Panel, FRV seeks to commence construction in late 2019 and start generating energy 12 to 18 months later.

Before construction commences FRV will develop a Construction Management Plan, including a traffic plan for vehicle access to the site during construction. This plan would be approved by the Clare and Gilbert Valleys Council.

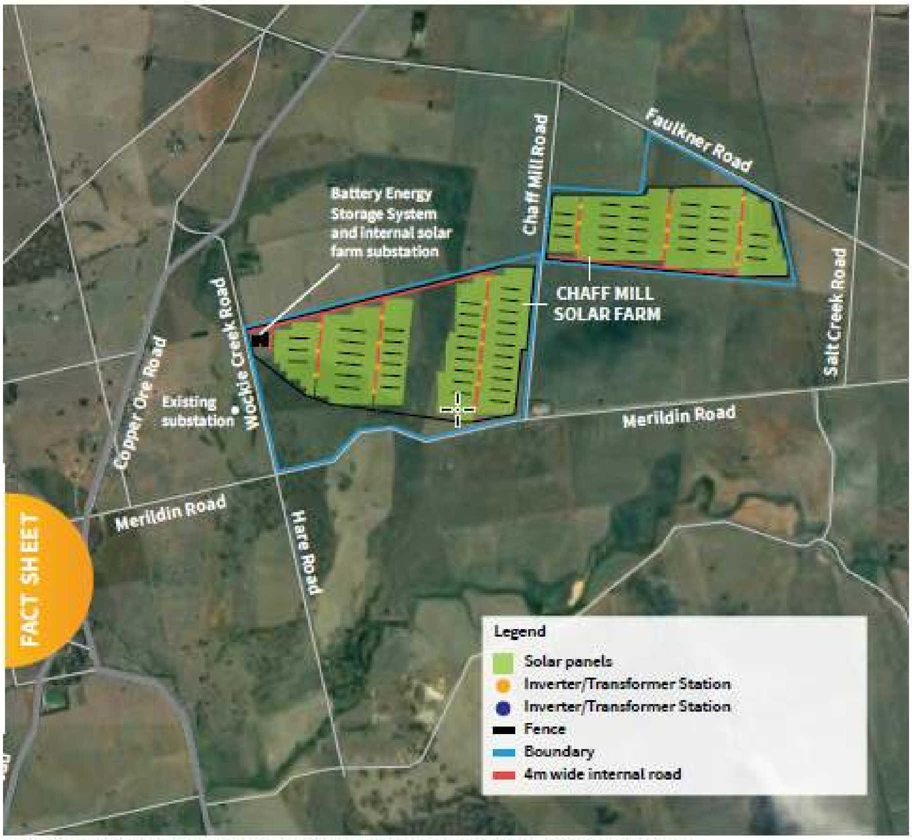
Traffic assessment has found that access to the site will be via Horrocks Highway, then Jolly Way Road and along Catholic Church and Merildin Roads to access the western section of the site on Wockie Creek Road.

Operation after 30 years

Should the project proceed, FRV will own and operate the solar farm. The plant will have an operating life of around 30 years. Following this period, the land would be restored to its original state and either leased or sold. The restoration would take approximately 12 months.



CHAFF MILL SOLAR FARM

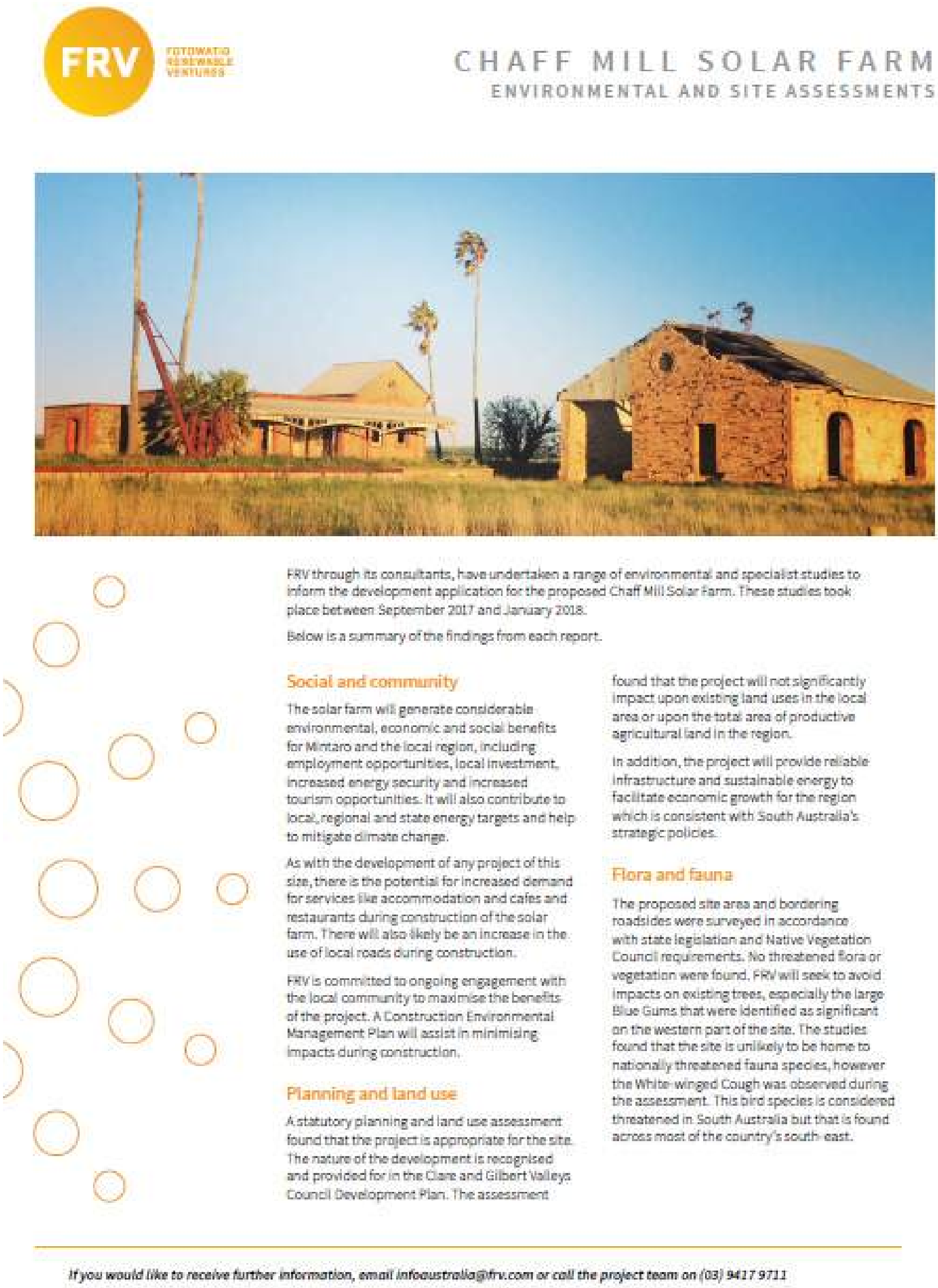


* This design is indicative and is subject to change until a final design is submitted to Clare and Gilbert Valleys Council.

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

RPS

Fact Sheet – Environmental and Site Assessment



FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM
ENVIRONMENTAL AND SITE ASSESSMENTS

FRV through its consultants, have undertaken a range of environmental and specialist studies to inform the development application for the proposed Chaff Mill Solar Farm. These studies took place between September 2017 and January 2018.

Below is a summary of the findings from each report.

Social and community

The solar farm will generate considerable environmental, economic and social benefits for Mintaro and the local region, including employment opportunities, local investment, increased energy security and increased tourism opportunities. It will also contribute to local, regional and state energy targets and help to mitigate climate change.

As with the development of any project of this size, there is the potential for increased demand for services like accommodation and cafes and restaurants during construction of the solar farm. There will also likely be an increase in the use of local roads during construction.

FRV is committed to ongoing engagement with the local community to maximise the benefits of the project. A Construction Environmental Management Plan will assist in minimising impacts during construction.

Planning and land use

A statutory planning and land use assessment found that the project is appropriate for the site. The nature of the development is recognised and provided for in the Clare and Gilbert Valleys Council Development Plan. The assessment found that the project will not significantly impact upon existing land uses in the local area or upon the total area of productive agricultural land in the region.

In addition, the project will provide reliable infrastructure and sustainable energy to facilitate economic growth for the region which is consistent with South Australia's strategic policies.

Flora and fauna

The proposed site area and bordering roadsides were surveyed in accordance with state legislation and Native Vegetation Council requirements. No threatened flora or vegetation were found. FRV will seek to avoid impacts on existing trees, especially the large Blue Gums that were identified as significant on the western part of the site. The studies found that the site is unlikely to be home to nationally threatened fauna species, however the White-winged Cough was observed during the assessment. This bird species is considered threatened in South Australia but that is found across most of the country's south-east.

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

Landscape and visual impacts

The studies recognised the 'sense of place' and character of the Mintaro township. FRV understands visual impact is important to the community. It was confirmed that the proposed solar farm will not be visible from Mintaro due to the surrounding hills, ridges and vegetation. FRV will work with direct neighbours of the site to minimise any visual impacts.

Stormwater and flooding

The installation of solar panels is not expected to increase the overall runoff of stormwater and the potential for flooding is considered very low but will be assessed in more detail during later design stages. Once established, the solar farm will be re-seeded with native grass species, which will mitigate what little run-off there is and reduce the potential for erosion.

Geotechnical

A regional geology soils and ground water overview was prepared for the project.

It is known that local soils can become wet and boggy in a rainfall event. Detailed site geotechnical investigations will be undertaken during the detailed design phase.

Glare

The highly absorbent dark glass of solar panels is designed to take in sunlight instead of reflecting it. The study found potential for glare at only two sites – on Merildin Road, which joins the south-eastern boundary of the site and at the intersection of Chaff Mill and Merildin Roads. FRV will plant vegetation in these locations to minimise any impact.

Aboriginal cultural heritage

Studies were carried out in consultation with Ngadjuri traditional owner representatives but did not identify any Aboriginal heritage sites, objects or burials. The site will be re-surveyed when it is cleared for construction and FRV will work with traditional owners to implement a Cultural Heritage Management Plan.

Heritage

The heritage assessment found there would be no impact to the protection of heritage places in and around Mintaro during construction and operation of the solar farm, with the closest heritage asset more than a kilometre away. Construction and heavy vehicles will not be directed through the Mintaro township and all construction and site staff working on the project will be inducted as to their legal obligations regarding the protection of heritage places within and around Mintaro.

Preliminary site assessment

A preliminary site assessment was undertaken to investigate potential site contamination issues in the project area. The assessment identified only extensive agricultural use of the land and assigned a subsequent low site contamination risk.

More information

FRV is planning to submit its application to the South Australian Government's State Commission Assessment Panel in March 2018. This application will include detailed copies of these technical reports, which can be accessed on the State Commission Assessment Panel site under Public Notices at:

https://www.saplanningcommission.sa.gov.au/scap/public_notices

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

Appendix B

Media Coverage

RPS

Plains Producer – October 2017 (no comment sought)

News AFTER LAST MEETING www.plainsproducer.com.au

Residents will have their say on solar farm

Chaff Mill Road

Salt Creek Road

Meridian Road

GAS

Proposed solar farm

RESIDENTS and council will have an opportunity to provide a response to the proposed Chaff Mill Solar Farm at Mintaro when the development application is lodged with the state planning department.

Renewable Energy firm, FRV, is yet to lodge a development application on a 400 hectares of farming land near he Clare Valley town but has een consulting with the comunity and Clare and Gilbert alleys Council.

The company met with GVC elected members and ior staff last week to discuss proposal.

Les Pearson reports:

"It was mainly to update us as to where they were at, plus fill us in on ongoing discussions with the Mintaro Progress Association and landowners in the area," CGVC acting CEO, John Coombe said.

A development application should be lodged early next year, possibly January or February.

"Once it is lodged, the plans are put on public exhibition and there is a six to eight week opportunity to comment on the application," Mr Coombe confirmed.

The Department of Planning confirmed council's development plan would be a factor in its deliberations.

"Any proposal lodged would need to be assessed having regard to the relevant provisions of council's development plan," a department spokesperson explained.

"Public notification would be undertaken in accordance with the requirements of the Development Act.

"In general terms, and noting an application has not been lodged, local residents would be consulted and provided time to lodge a representation.

"Once lodged, and should they wish to be heard, they would also have opportunity to attend an assessment hearing to talk to their submission."

Several property owner neighbouring the proposed sola farm location have raised co cerns about potential impac to the climate and their ov property values.

"The company is working finishing a lot of investigati and studies surrounding t queries, including visual im increased traffic levels, ap priate land use, all the t that form part of the pro Mr Coombe confirmed.

RPS

Northern Argus – 1 November 2017 (no comment sought)

Wednesday November 01, 2017 NORTHERN ARGUS 5

NEWS

Solar farm proposed for Mintaro

BY CHELSEA ASHMEADE

IF A development application is approved, a 380-hectare solar farm could be established in Mintaro.

Renewable energy company Fotowatio Renewable Ventures is currently preparing a development application for the proposed solar farm 3.5km north-east of the town.

They are also completing both visual and environmental impact studies.

A spokesperson for FRV said subject to development approval, FRV seeked to commence construction late 2019 and complete the project by late 2020.

The spokesperson said FRV was committed to working with the local community, landholders and Mintaro Progress Association, and would keep them informed through all phases of the project – this had already begun.

Further consultation is planned in late November 2017 and again in early 2018, prior to submitting the DAP.

"FRV believes it is important to understand the community's views on its proposal and will continue to engage with local residents, businesses and community groups and key stakeholders to inform planning and design as part of the development application process."

Clare and Gilbert Valleys Council manager development and environment Andrew Christiansen said council had met with the group on a couple of occasions.

"They will come out again next month to meet with councillors and show them the site," Mr Christiansen said. The development application will go direct to the State Planning Assessment Commission.

Mr Christiansen said council could make comment on the project but they were not the approving body.

"From my perspective they are doing a really good job of community consultation and engagement. It's good that they are engaging from the git-go and that's important to us."

The proposed site has been chosen due to its close proximity to existing grid infrastructure and the largely clear land.

Other land was investigated for potential use, but it was deemed unsuitable. The project could create 200 jobs during construction and five ongoing jobs.

RPS

Northern Argus – 13 November 2017 (comment sought)

Fotowatio Renewable Ventures propose Chaff Mill Solar Farm

Chelsea Ashmeade

Royalla Solar Farm (ACT), Photovoltaic Plant, this solar farm is in operation and covers 50ha.

A proposed solar farm in Mintaro – Chaff Mill Solar Farm – could potentially create up to 200 jobs during its construction.

Although in consultation and research stages, the company Fotowatio Renewable Ventures is positive about its potential impact on the region.

A spokesperson told Northern Argus 200 jobs could be created during the construction with (up to) five ongoing positions once in operation.

This is subject to the proposal going ahead.

The spokesperson said benefits to the local community would be maximised and this would be key for the company.

"...with considerable opportunities being available during the construction of the solar farm. If approved, FRV will hold industry briefings to understand and identify local contractors," the spokesperson said.

FRV is working closely with Clare and Gilbert Valleys Council and another community consultation will be held in late November.

The Advertiser – 22 November 2017 (no comment sought)

Snowtown and Mintaro to be site of three major solar farms which would generate hundreds of jobs during construction

THREE solar farms capable of generating enough electricity to power more than 100,000 homes are planned for the state's Mid North promising hundreds of jobs during construction.

Tilt Renewables is proposing to build a 45MW solar farm and a 70MW solar farm next to South Australia's largest wind farm project at Snowtown.

The company this month lodged plans with the State Development Commission for the $60 million 45MW Snowtown North Solar Energy farm, which will feature 180,000 panels, battery storage of up to 25MW and is expected to generate up to 200 jobs during construction.

The second larger is still in planning stages and the company said would likely be lodged for approval in the first half of next year.

The company said both projects are capable of powering up to 46,000 homes.

An artist's impression of Tilt Renewable's proposed $60 million Snowtown North Solar Energy Farm. Picture: Tilt Renewables

Tilt renewable development general manager Clayton Delmarter said the Snowtown North Solar Energy Farm could be operating within 12 months of approval.

"The solar farm will hook into the existing network connection saving us some costs there," he said.

"We have been looking for solar at Snowtown for some time, I guess it's been delayed a little bit while we work through some of network changes."

The farm will be located 10km west of Snowtown on 100ha of cleared farming land next to the existing Snowtown Stage 1 Wind Farm substation.

Mr Delmater did not expect too much opposition to the project.

"I think in our view it's a relatively benign development for that part of the world," he said.

"We love developing in South Australia because it's a great place to develop, there's good support from stakeholders generally and it makes it a smooth and enjoyable process."

It comes as Spanish renewable energy developer FRV is proposing a 100MW farm — paired with 50MW battery — capable of powering up to 60,000 homes which would be located 3.5km north east of Mintaro.

The company said up to 200 jobs would be created during construction which could start in 2019 pending approvals.

Magic 105.9 – 16 November 2017 (no comment sought)

Mintaro solar farm could soon be a reality

A new solar farm in Mintaro, could open as many as 200 possible jobs for the region.
It's called the Chaff Mill Solar Farm. It's only in research and consultation stage at the moment, but the company behind it, FRV, thinks it'll have a big impact on the region.
They'll need 200 jobs for construction and up to five for operation once it's all built-but the proposal needs to go ahead before any of that becomes a reality.
Apart from the obvious benefit of job openings, it'll also mean more investment is pulled to the area.
Local businesses like grocery stores, restaurants, cafes, accommodation providers and petrol stations are just some that can be looking forward to it getting the green light.

Below is the project overview from the FRV factsheet.

This project would comprise the construction and operation of a grid connected solar farm using solar PV modules similar to those used on houses. The final design of the project prior to construction will determine the plant configuration, layout and specifi c equipment to be used, as well as the solar farm's electricity generating capacity. While a final investment decision has not yet been made, it is envisaged that construction could commence sometime in 2016 to 2017 and would take between 12 to 18 months. It is currently intended to utilise a tracking system where the PV panels rotate from east to west, following the sun across the sky, maximising the electricity production. The height of the structures including the PV modules would be no more than approximately 3m from ground level. Inverters that are typically housed in shipping container sized structures would be used to convert the direct current electricity generated by the PV modules into alternating current. A transformer would be installed to step up the voltage to a level suitable for injection into the national electricity grid. The solar farm is proposed to connect into the electricity grid via the existing Clare South substation located immediately adjacent to the solar farm site.

RPS

Plains Producer – 22 November 2017 (no comment sought)

SOLAR FLARE

Mintaro farmers raise solar farm worries

Les Pearson reports:

NEIGHBOURING farmers to the proposed site of a solar farm near Mintaro have a long list of concerns surrounding the development but the owner of the land in question feels similar ventures will be commonplace in coming years.

Renewable energy firm, FRV Australia, is the proponent behind the Chaff Mill Solar Farm, a proposed 100MW solar farm and 50 MW battery located 3.5km north-east of Mintaro on land farmed by local man, Graham Johnson.

Several adjoining landowners have raised concerns since behind contacted by FRV Australia, citing potential increases to frost risk, increased local traffic, fire hazard and general aesthetic issues amongst a raft of questions.

Debbie Baum, one of those with adjacent land to the proposed site, has already quizzed the company.

"I'm not against renewable energy, it definitely has a place now and in the future," Mrs Baum said.

"I'm just not convinced this has been planned in the right place.

"From what I've read on solar farms, the three main parameters are it needs to be mostly cleared, flat land close to the electrical grid for connection, so I think they've only ticked one of those three boxes."

Continued Page 6

Farmers claim solar proposal has its grey areas

• From Page 1

With an annual rainfall of about 450mm and about half of the land in question "fairly undulating", which includes partial catchment of the Wakefield River, it is quality agricultural land.

The proposal does contravene some points within the Clare and Gilbert Valleys Council's Strategic Plan surrounding protection of local farmland from such developments but the sheer value of the development takes the application out of council hands and lands it with the state planning department.

Council will have the opportunity to review the development application once it is submitted.

Mrs Baum included the expected visual impact in her questions to FRV Australia, which may well impact on the price of her own land.

"The valley is a fabric of colour and vibrancy and to see it broken up by a bunch of mirrored panels would be disappointing," she said.

Fellow neighbour, John Faulkner, said their land is prone to frost at times and the installation of the solar panels may disrupt the microclimate, triggering an increase in frosts.

"Also the biosecurity and control of weeds in the area is a worry, we don't know what's going to happen," Mr Faulkner explained.

"It has a projected lifespan of 20 years assuming they buy the land and don't leave it, so how are they going to rehabilitate it after that?

"I don't want to be a stick in the mud but I've got more questions than answers at this stage."

Mr Johnson felt the development was just a sign of the times as the state sought more energy security.

"These things happen, they're happening elsewhere too, not just here," he said.

"It isn't the first, it won't be the last.

"The idea behind it would be it increases the state's ability to meet its power demands."

> **"I don't want to be a stick in the mud but I've got more questions than answers at this stage." - John Faulkner**

FRV contacted Mr Johnson some six months ago seeking land near the Waterloo substation, an electricity network heading directly to Adelaide.

Mr Johnson, who owns and operates about 3500 hectares in the region, agreed to an option land deal with FRV Australia on about 400ha, where the company can opt to buy the land after a certain period or decline to take it over.

When asked if Mrs Baum would be tempted by a similar offer, she was diplomatic.

"You can never say never, there will always be a price," she said.

"I don't begrudge anyone getting a good price for their property."

That said, Mr Johnson claimed he encouraged FRV Australia to contact neighbouring landowners to gauge their interest.

"I told them to speak to the neighbours and see if there was a deal there for them," he said.

"Some saw the opportunity and were tempted to sell but they wanted to sell more than the company wanted, and they didn't want the excess land."

FRV Australia will be meeting with Clare and Gilbert Valleys Council staff and affected landowners on Friday in a bid to allay concerns and address the questions raised.

Plains Producer, Wednesday, November 22, 2017

Northern Argus – 16 February 2018 (comment sought)

Chaff Mill Solar Farm proposal

Solar: Royalla Solar Farm (ACT). Photo: royallasolarfarm.com.au

FRV have recently spent time in the community of Mintaro to discuss with key stakeholders their plans for the proposed Chaff Mill Solar Farm.

A spokesperson for FRV said the company valued community and stakeholder feedback and had met with neighbouring property owners, stakeholders, Clare and Gilbert Valley Council, local MPs and community interest groups since September 2017 to discuss the proposed solar farm.

"From 21 February, FRV has planned to meet again with landowners directly neighbouring the site of the proposed solar farm, interested stakeholder groups, Clare and Gilbert Valleys Council and local MPs to provide them with an update on the development application and findings from the environmental and technical assessments."

The spokesperson said FRV was on schedule to submit the application for the Chaff Mill Solar Farm in late March 2018.

This submission will go to the South Australian Government's State Commission Assessment Panel – this will then be publicly advertised and documentation will be made available online for people to see.

Clare and Gilbert Valleys Council are provided with a copy of this application.

FRV expect the State Commission Assessment Panel to make a decision on this application in mid to late 2018, and will advise the broader community of the outcomes soon after.

FRV will be at the Sevenhill Producers Market on Saturday, February 24 from 8.30am to 12pm, providing an opportunity to meet with the team and view the proposed layout of the solar farm.

Where possible, feedback will be taken into consideration and incorporated into the final development.

RPS

Appendix C
Advertisements

Northern Argus advertisement (appeared on 8 February 2018)

Plains Producer advertisement (appeared on 8 February 2018)

APPENDIX D

PUBLIC RELATIONS AND MEDIA MATERIAL

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COMMUNICATION MATERIAL

FACT SHEET – SEPTEMBER 2017

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

Chaff Mill Solar Farm: A plan to harness the power of the sun and create jobs in your community

Leading Australian solar developer Fotowatio Renewable Ventures (FRV) is preparing a development application for a proposed 100MW solar farm 3.5km north-east of Mintaro.

FRV is working on a preliminary design for the proposed solar farm, which could generate enough clean energy to power up to 60,000 homes for South Australian families. This would be achieved by connecting the farm to the electricity network via a Tee Connection to an existing 132kV transmission line running from the adjacent Mintaro substation to the Waterloo substation, which is owned and managed by AEMO-ElectraNet.

FACT SHEET

Planning and environmental considerations

The proposed Chaff Mill Solar Farm is subject to development approvals through the South Australian Government's Development Assessment Commission.

Environmental studies have commenced. These will be completed during the design phase to ensure that any potential impacts on native vegetation, birds or animals are minimised.

Subject to development approval, FRV seeks to commence construction late 2019 and start generating energy 12 to 18 months later. The solar farm would have an operating life of 30 years.

An ideal location to generate energy for South Australians

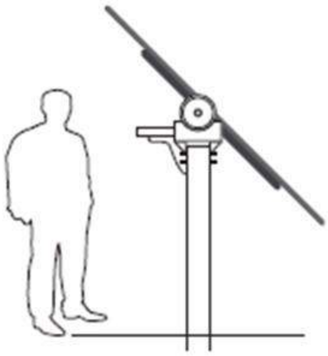
South Australia is nationally recognised as a leader in clean energy production.

The proposed Chaff Mill Solar Farm can further the development of the Australian clean energy industry and make a significant contribution to South Australia's energy production.

The 380 hectare site is approximately 130 kilometres north of Adelaide, is well placed to capture and export solar energy into the national electricity grid from the nearby Mintaro substation and its existing 132kV transmission line to Waterloo. This site was selected because of its proximity to grid infrastructure, good drainage and largely cleared land. The level of solar irradiation also makes it a suitable site for a solar farm.

Operation of Chaff Mill Solar Farm would deliver clean, zero emissions electricity to meet the region's energy needs and would have significantly lower environmental impacts relative to other electricity generation methods.

FRV plans to use the latest in solar energy generation technology: PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would be no more than three metres from ground level.



PROPOSED PROJECT TIMELINE

- **September - October 2017** — Complete specialist studies.
- **September - November 2017** — Stakeholder and community engagement.
- **December 2017 - March 2018** — Finalise and submit development application report to Development Assessment Commission.
- **Late 2018** — Development application considered by SA Government.
- **2019** — Planned commencement of project construction (if approved).

Figure 1: *Development of the Chaff Mill Solar Farm is subject to development approvals through the South Australian Government's Development Assessment Commission. This indicative timeline sets out the development application process and proposed construction, including current community and stakeholder consultation.*

Economic benefits

Should the project proceed, FRV would employ up to 200 workers during construction. Operation of Chaff Mill Solar Farm would create up to five ongoing jobs.

In addition, the project would attract investment to the area and deliver additional indirect economic opportunities to local businesses including local grocery stores, restaurants, cafés, accommodation providers and petrol stations.

About FRV

FRV has developed and operated solar farms spanning 24 countries and five continents.

FRV has had a presence in Australia since 2010.

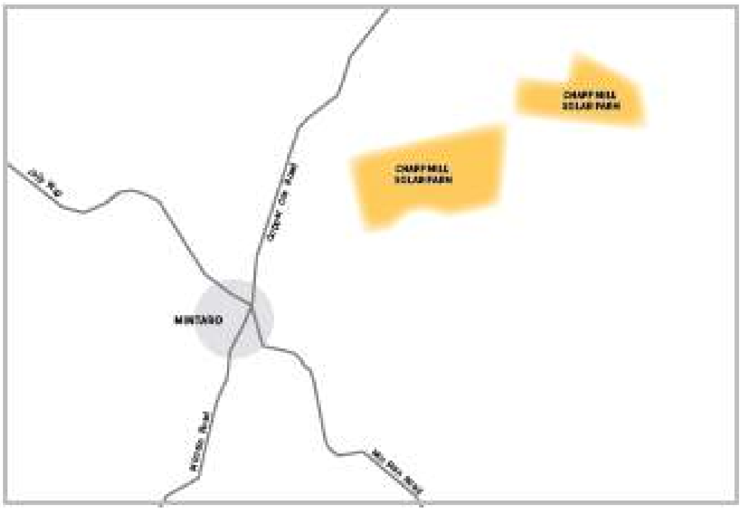
A leader in its field, FRV uses the latest technology and design solutions to generate and deliver sustainable and clean energy.

FRV's track record of achievements includes two operational solar farms in Australia, the 20MW Royalla Solar Farm in the ACT and the 56MW Moree Solar Farm in New South Wales. FRV is currently constructing the 100MW Clare Solar Farm, near Ayr in QLD and the 100MW Lilyvale Solar Farm, near Emerald in QLD.

Find out more

Community and stakeholder engagement on the proposed Chaff Mill Solar Farm is underway. Engagement will inform the planning process and encourage the community to offer feedback, including an alternative name for the proposed solar farm.

FRV will have discussions with State Parliamentary members, as well as the local council, community interest groups and local people as planning progresses.



If you would like more information, email infoaustralia@frv.com or call the project team on (03) 9417 9711.

PROJECT UPDATE – NOVEMBER / DECEMBER 2017

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

Project update – November 2017

Leading Australian solar developer, FRV, has identified an area of land, 3.5km north-east of Mintaro in South Australia, for a 100MW solar farm.

FRV began discussions with neighbouring properties and community interest groups in September this year, making them aware of the proposed Chaff Mill Solar Farm. Feedback from these discussions, along with initial site investigations and specialist studies will inform the preliminary design and the development application for the proposed 380 hectare solar farm. This update provides an overview of what FRV have heard from the community, the investigations performed to date, and the next steps.

Environmental assessment and specialist studies

Through specialist consultants, FRV will undertake a range of environmental and technical studies to inform its development application. To date the following studies have been kicked off:

- Flora and fauna
- Aboriginal cultural heritage
- Visual impact and landscape assessment
- Solar glare impact assessment
- Planning, zoning and land use (still being assessed)
- Traffic and access (still being assessed)
- Social and community (still being assessed)
- Site contamination
- Geotechnical assessment
- Stormwater and flooding (still being assessed)
- Non-indigenous heritage assessment (still being assessed).

FRV has obtained initial findings in a number of these areas including flora and fauna, Aboriginal cultural heritage, visual impact and landscape assessment, site contamination and geotechnical assessment. Further investigations will occur in December 2017, with findings to be discussed with the local community and other interested stakeholders in early 2018.

Proposed project timeline

September – December 2017	September – November 2017	January – February 2018	January – March 2018	Late 2018	Early 2019
Complete specialist studies	Initial stakeholder and community engagement	Finalise and submit development application report to Development Assessment Commission	Stakeholder and community engagement	Development Application considered by SA Government	Planned commencement of project (pending outcome of Development Application)

What we've heard

Community and stakeholder feedback will shape FRV's development application and inform the plant configuration, layout of the proposed solar farm and construction mitigation measures. Since September 2017, FRV has met with members of the community, local council, community interest groups and parliamentary members face-to-face and have continued these discussions on the phone and via email in October and November.

Key areas of interest include:

- risk that radiative heat loss will accelerate change in ambient air conditions and accelerate frost conditions
- damage to the local road network
- rehabilitation and usage of the solar farm land at the end of the 30 year operation period
- why this location
- the visual impact from the solar panels on the local amenity
- condition of the existing soil and the ability to support the solar panel structures.

FRV through its consultants, have undertaken a range of specialist studies to not only manage the environmental and technical requirements but to address community concerns. Studies carried out to date, indicate that there is minimal impact from the proposed development. However, FRV wants to confirm the accuracy of the information before presenting feedback to the community in late January / early February 2018.

Next steps

Over the coming months FRV will prepare its development application. Prior to submitting the application to the South Australian Government's Development Assessment Commission in 2018, FRV will engage with the community with more detail on the plant configuration and layout and findings of the environmental and technical studies.

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711.

FRV
FOTOWATIO RENEWABLE VENTURES

PROJECT FACT SHEETS – FEBRUARY 2017

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

FROST AND MICRO-CLIMATE IMPACT ASSESSMENT

FACT SHEET

FRV recognises the importance of working with the community in the development of the proposed Chaff Mill Solar Farm. During engagement last year, there was community concern that the solar farm might accelerate frost conditions in the local area. To address this, FRV and its consultants conducted a frost and micro-climate review and assessment.

Key findings

Frost is defined by the Bureau of Meteorology as a deposit of white ice crystals or frozen dew which forms on objects near the ground when the surface temperature drops below freezing point. In Mintaro, frost is most likely to occur when the sky is clear with light winds and low humidity.

The assessment concluded that while there can be minor differences in the soil and air temperatures directly under and above solar panels on solar farms, there is no significant impact on air temperatures in the surrounding areas.

Methodology

Literature review

A review of scientific literature and studies relating to the environmental impacts of solar farms was carried out. A number of studies and academic papers from Australia and around the world were reviewed and the findings were analysed and compared.

In response to community feedback and interest, this also included a review of two specific research papers published in 2016 – *Solar Park Microclimate and Vegetation Management Effects on Grassland Carbon Cycling by Alona Armstrong et al* published in Volume 11 of the Environmental Research Letters journal and *The Photovoltaic Heat Island Effect: Larger Solar Power Plants Increase Local Temperatures by G Barron-Gafford et al* published in Volume 6 of Scientific Reports (Nature).

Both studies included scientific monitoring and assessment at constructed solar farms and found that there were slightly increased temperatures directly above solar panels and slightly decreased temperatures directly beneath solar panels (as would be expected). Importantly, the studies did not note any significant changes to temperatures at progressive locations next to the solar farms. Other solar farm impact studies based on hypothetical modelling also generally reflected these findings.

FACT SHEET

Discussions with scientists

Acknowledging the limited scientific research available, FRV's consultants contacted scientists from relevant government agencies, meteorology and climate organisations, specialists in air modelling, agricultural scientists and universities.

Although not able to provide informed or definitive advice regarding the Chaff Mill Solar Farm, scientists spoken to were of the opinion that there would be no significant micro-climate impacts from a solar farm of this size. Further, some of those contacted were of the view that air flow from the road network in and around the solar farm would also help mitigate any potential local climate impacts.

More information and next steps

FRV is planning to submit its application to the South Australian Government's State Commission Assessment Panel in March 2018. This application will include the frost and micro-climate study findings and other specialist study reports, which can be accessed following submission on the State Commission Assessment Panel site under Public Notices at:

www.saplanningcommission.sa.gov.au/scap/public_notices

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

CHAFF MILL SOLAR FARM

TRAFFIC IMPACT ASSESSMENT

FACT SHEET

Traffic impact studies were undertaken between September and December 2017, to inform FRV's development application for the proposed Chaff Mill Solar Farm, which is intersected by Chaff Mill Road and bounded by Wockie Creek Road, Merildin Road, Chaff Mill Road and Faulkner Road. Current vehicle access to the east and west sections of the proposed site is by a network of unsealed roads.

Below is a summary of the traffic study report.

Traffic study

The purpose of the traffic study was to:

- Understand the likely extent of light and heavy vehicle traffic impacts during the construction and operation of the solar farm
- Identify alternative routes for light and heavy vehicles to access the site
- Recommend a preferred route to be used by vehicles as the primary access to the site.

FRV and its consultants conducted a site inspection of local road conditions and a desktop assessment of traffic and road corridor information from the Department of Planning, Transport and Infrastructure.

Traffic generation

Vehicular access would be required to both sections of the proposed site during the construction and operation of the solar farm. Construction of the proposed solar farm is expected to take approximately 18 months and will be completed in two stages.

FRV estimates there would be up to 100 workers on the site during the first stage of construction. For the second stage the number of workers would increase to up to 200 on site. These workers would be expected to travel to and from the site in light vehicles. Most likely, workers would share rides with each other to the remote site.

FRV has estimated that between eight and 16 heavy vehicle movements a day will transport construction plant and equipment to the site during both stages of construction.

Once operational, it is estimated up to five ongoing staff would need to access the site. The vehicle movements would be significantly reduced during the operational period, with around ten trips per day.

Route and access options

The preferred access to the west section of the site is from Wockie Creek Road. Preferred access to the east section of the site via a road within the solar farm.

A short section of Chaff Mill Road would be upgraded to allow traffic to pass between the west and east sections.

CHAFF MILL SOLAR FARM

FACT SHEET

Alternative traffic routes were identified for vehicles to access the west (Wockie Creek Road) section of the proposed site including:

- Route A – via Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wockie Creek Road
- Route B – via Barrier Highway, Mintaro-Manoora Road, Copper Ore Road, Merildin Road and Wockie Creek Road
- Route C – via Barrier Highway, Mintaro-Manoora Road, along Martindale and Hare Roads to Merildin Road and Wockie Creek Road
- Route D – via Barrier Highway, Flagstaff and Riley Roads and Merildin Road.

Route A was considered the most suitable for both light and heavy vehicles to access the site for the following reasons:

- It avoids travel through the Mintaro and Manoora townships
- There are no residential properties along Merildin Road and Wockie Creek Roads between Copper Ore Road and the preferred access
- Access to the eastern section of the site is available via a short section of Chaff Mill Road
- It includes the shortest length of unsealed roads to be upgraded including two intersections.

Vehicles would travel to the site via Horrocks Highway, then Jolly Way Road and along Catholic Church and Merildin Roads to access the western section of the site on Wockie Creek Road.

Traffic impacts

FRV acknowledges there would be an increase in light and heavy traffic volumes on sealed and unsealed roads in vicinity of the project site during the construction stage.

To manage the traffic impacts during construction, FRV will develop a Construction Management Plan that details vehicle routes and measures to maintain road conditions. This plan would be developed by FRV's appointed construction contractor.

More information and next steps

FRV is planning to submit its application to the South Australian Government's State Commission Assessment Panel in March 2018. This application will include the traffic impact report and other specialist study reports, which can be accessed on the State Planning Commission Assessment Panel site under Public Notices at:

www.saplanningcommission.sa.gov.au/scap/public_notices

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

FRV FOTOWATIO RENEWABLE VENTURES

CHAFF MILL SOLAR FARM

ABOUT THE CHAFF MILL SOLAR FARM

FACT SHEET

The proposed 380-hectare, 100 MW Chaff Mill Solar Farm is located near Mintaro in South Australia and is approximately 130 kilometres north of Adelaide. The solar farm could generate enough clean energy to power up to 60,000 homes for South Australian families.

Leading Australian solar developer FRV Services Australia (FRV) selected the site because of its proximity to grid infrastructure, good drainage and largely cleared land. The level of solar irradiation at the site during the year also makes it suitable for a solar farm.

Location and layout

The proposed 380-hectare site is 3.5km north-east of Mintaro. The site is bounded by Copper Ore Road, Wockie Creek Road, Merildin Road, Faulkner Road and Chaff Mill Road.

The proposed layout of the solar farm would comprise of approximately 360,000 solar panels and a battery storage unit with containers. FRV plans to build a three-metre-high wire mesh fence around the site, topped by barbed wire.

FRV is considering the use of solar PV - Polycrystalline modules that would be no higher than three metres high at maximum tilt to capture solar energy.

Construction and traffic management

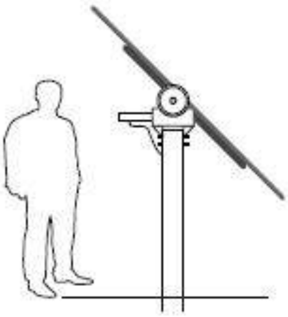
Subject to development approvals through the South Australian Government's State Commission Assessment Panel, FRV seeks to commence construction in late 2019 and start generating energy 12 to 18 months later.

Before construction commences FRV will develop a Construction Management Plan, including a traffic plan for vehicle access to the site during construction. This plan would be approved by the Clare and Gilbert Valleys Council.

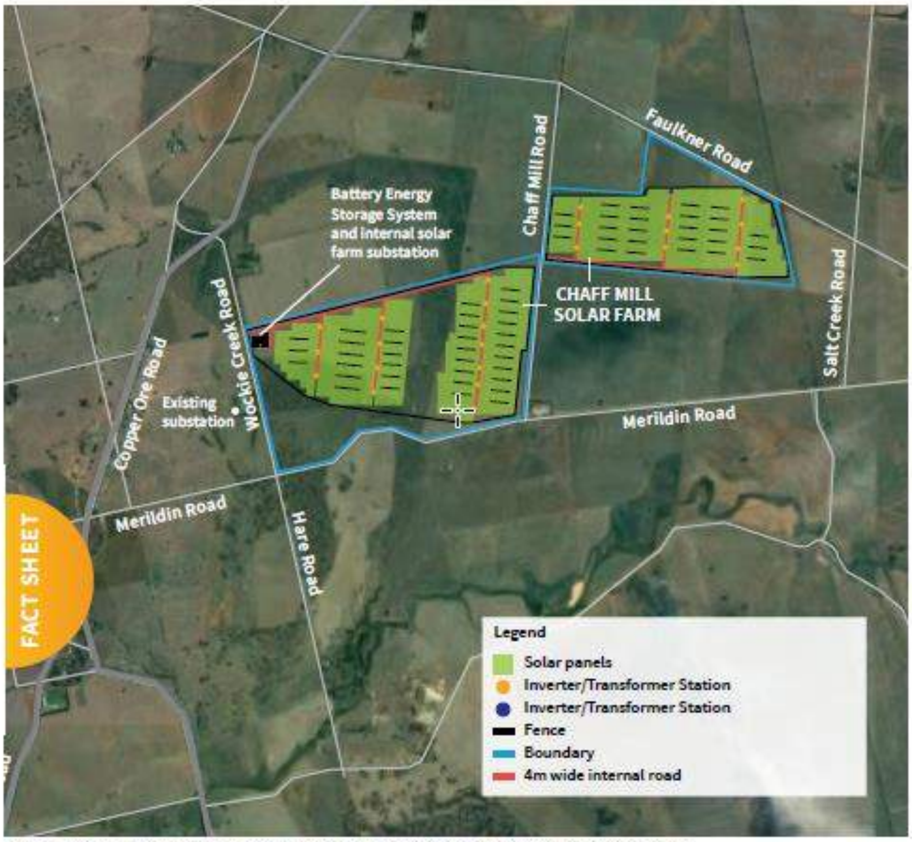
Traffic assessment has found that access to the site will be via Horrocks Highway, then Jolly Way Road and along Catholic Church and Merildin Roads to access the western section of the site on Wockie Creek Road.

Operation after 30 years

Should the project proceed, FRV will own and operate the solar farm. The plant will have an operating life of around 30 years. Following this period, the land would be restored to its original state and either leased or sold. The restoration would take approximately 12 months.



CHAFF MILL SOLAR FARM



FACT SHEET

* This design is indicative and is subject to change until a final design is submitted to Clare and Gilbert Valleys Council.

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

Landscape and visual impacts

The studies recognised the 'sense of place' and character of the Mintaro township. FRV understands visual impact is important to the community. It was confirmed that the proposed solar farm will not be visible from Mintaro due to the surrounding hills, ridges and vegetation. FRV will work with direct neighbours of the site to minimise any visual impacts.

Stormwater and flooding

The installation of solar panels is not expected to increase the overall runoff of stormwater and the potential for flooding is considered very low but will be assessed in more detail during later design stages. Once established, the solar farm will be re-seeded with native grass species, which will mitigate what little run-off there is and reduce the potential for erosion.

Geotechnical

A regional geology soils and ground water overview was prepared for the project.

It is known that local soils can become wet and boggy in a rainfall event. Detailed site geotechnical investigations will be undertaken during the detailed design phase.

Glare

The highly absorbent dark glass of solar panels is designed to take in sunlight instead of reflecting it. The study found potential for glare at only two sites – on Merildin Road, which joins the south-eastern boundary of the site and at the intersection of Chaff Mill and Merildin Roads. FRV will plant vegetation in these locations to minimise any impact.

Aboriginal cultural heritage

Studies were carried out in consultation with Ngadjuri traditional owner representatives but did not identify any Aboriginal heritage sites, objects or burials. The site will be re-surveyed when it is cleared for construction and FRV will work with traditional owners to implement a Cultural Heritage Management Plan.

Heritage

The heritage assessment found there would be no impact to the protection of heritage places in and around Mintaro during construction and operation of the solar farm, with the closest heritage asset more than a kilometre away. Construction and heavy vehicles will not be directed through the Mintaro township and all construction and site staff working on the project will be inducted as to their legal obligations regarding the protection of heritage places within and around Mintaro.

Preliminary site assessment

A preliminary site assessment was undertaken to investigate potential site contamination issues in the project area. The assessment identified only extensive agricultural use of the land and assigned a subsequent low site contamination risk.

More information

FRV is planning to submit its application to the South Australian Government's State Commission Assessment Panel in March 2018. This application will include detailed copies of these technical reports, which can be accessed on the State Commission Assessment Panel site under Public Notices at:

https://www.saplanningcommission.sa.gov.au/scap/public_notices

If you would like to receive further information, email infoaustralia@frv.com or call the project team on (03) 9417 9711

MEDIA COVERAGE

PLAINS PRODUCER – OCTOBER 2017 (NO COMMENT SOUGHT)

News

AFTER LAST MEETING

www.plainsproducer.com.au

Residents will have their say on solar farm

Proposed solar farm

RESIDENTS and council will have an opportunity to provide a response to the proposed Chaff Mill Solar Farm at Mintaro when the development application is lodged with the state planning department.

Renewable Energy firm, FRV, is yet to lodge a devel-opment application on a 400 hectares of farming land near the Clare Valley town but has been consulting with the community and Clare and Gilbert Valleys Council.

The company met with CGVC elected members and senior staff last week to discuss proposal.

Les Pearson reports:

"It was mainly to update us as to where they were at, plus fill us in on ongoing discussions with the Mintaro Progress Association and landowners in the area," CGVC acting CEO, John Coombe said.

A development application should be lodged early next year, possibly January or February.

"Once it is lodged, the plans are put on public exhibition and there is a six to eight week opportunity to comment on the application," Mr Coombe confirmed.

The Department of Planning confirmed council's development plan would be a factor in its deliberations.

"Any proposal lodged would need to be assessed having regard to the relevant provisions of council's development plan," a department spokesperson explained.

"Public notification would be undertaken in accordance with the requirements of the Development Act.

"In general terms, and noting an application has not been lodged, local residents would be consulted and provided time to lodge a representation.

"Once lodged, and should they wish to be heard, they would also have opportunity to attend an assessment hearing to talk to their submission."

Several property owners neighbouring the proposed sola[r] farm location have raised con[cerns] about potential impac[ts] to the climate and their ow[n] property values.

"The company is working [on] finishing a lot of investigati[ons] and studies surrounding th[e] queries, including visual imp[act], increased traffic levels, ap[pro]priate land use, all the th[ings] that form part of the proc[ess]," Mr Coombe confirmed.

NORTHERN ARGUS – 1 NOVEMBER 2017 (NO COMMENT SOUGHT)

Wednesday November 01, 2017 NORTHERN ARGUS 5

NEWS

Solar farm proposed for Mintaro

BY CHELSEA ASHMEADE

IF A development application is approved, a 380-hectare solar farm could be established in Mintaro.

Renewable energy company Fotowatio Renewable Ventures is currently preparing a development application for the proposed solar farm 3.5km north-east of the town.

They are also completing both visual and environmental impact studies.

A spokesperson for FRV said subject to development approval, FRV seeked to commence construction late 2019 and complete the project by late 2020.

The spokesperson said FRV was committed to working with the local community, landholders and Mintaro Progress Association, and would keep them informed through all phases of the project – this had already begun.

Further consultation is planned in late November 2017 and again in early 2018, prior to submitting the DAP.

"FRV believes it is important to understand the community's views on its proposal and will continue to engage with local residents, businesses and community groups and key stakeholders to inform planning and design as part of the development application process."

Clare and Gilbert Valleys Council manager development and environment Andrew Christiansen said council had met with the group on a couple of occasions.

"They will come out again next month to meet with councillors and show them the site," Mr Christiansen said. The development application will go direct to the State Planning Assessment Commission.

Mr Christiansen said council could make comment on the project but they were not the approving body.

"From my perspective they are doing a really good job of community consultation and engagement. It's good that they are engaging from the git-go and that's important to us."

The proposed site has been chosen due to its close proximity to existing grid infrastructure and the largely clear land.

Other land was investigated for potential use, but it was deemed unsuitable. The project could create 200 jobs during construction and five ongoing jobs.

NORTHERN ARGUS – 13 NOVEMBER 2017 (COMMENT SOUGHT)

Fotowatio Renewable Ventures propose Chaff Mill Solar Farm

Chelsea Ashmeade

Royalla Solar Farm (ACT), Photovoltaic Plant, this solar farm is in operation and covers 50ha.

A proposed solar farm in Mintaro – Chaff Mill Solar Farm – could potentially create up to 200 jobs during its construction.

Although in consultation and research stages, the company Fotowatio Renewable Ventures is positive about its potential impact on the region.

A spokesperson told Northern Argus 200 jobs could be created during the construction with (up to) five ongoing positions once in operation.

This is subject to the proposal going ahead.

The spokesperson said benefits to the local community would be maximised and this would be key for the company.

"...with considerable opportunities being available during the construction of the solar farm. If approved, FRV will hold industry briefings to understand and identify local contractors," the spokesperson said.

FRV is working closely with Clare and Gilbert Valleys Council and another community consultation will be held in late November.

THE ADVERTISER – 22 NOVEMBER 2017 (NO COMMENT SOUGHT)

Snowtown and Mintaro to be site of three major solar farms which would generate hundreds of jobs during construction

THREE solar farms capable of generating enough electricity to power more than 100,000 homes are planned for the state's Mid North promising hundreds of jobs during construction.

Tilt Renewables is proposing to build a 45MW solar farm and a 70MW solar farm next to South Australia's largest wind farm project at Snowtown.

The company this month lodged plans with the State Development Commission for the $60 million 45MW Snowtown North Solar Energy farm, which will feature 180,000 panels, battery storage of up to 25MW and is expected to generate up to 200 jobs during construction.

The second larger is still in planning stages and the company said would likely be lodged for approval in the first half of next year.

The company said both projects are capable of powering up to 46,000 homes.


An artist's impression of Tilt Renewable's proposed $60 million Snowtown North Solar Energy Farm. Picture: Tilt Renewables

Tilt renewable development general manager Clayton Delmarter said the Snowtown North Solar Energy Farm could be operating within 12 months of approval.

"The solar farm will hook into the existing network connection saving us some costs there," he said.

"We have been looking for solar at Snowtown for some time, I guess it's been delayed a little bit while we work through some of network changes."

The farm will be located 10km west of Snowtown on 100ha of cleared farming land next to the existing Snowtown Stage 1 Wind Farm substation.

Mr Delmater did not expect too much opposition to the project.

"I think in our view it's a relatively benign development for that part of the world," he said.

"We love developing in South Australia because it's a great place to develop, there's good support from stakeholders generally and it makes it a smooth and enjoyable process."

It comes as Spanish renewable energy developer FRV is proposing a 100MW farm — paired with 50MW battery — capable of powering up to 60,000 homes which would be located 3.5km north east of Mintaro.

The company said up to 200 jobs would be created during construction which could start in 2019 pending approvals.

MAGIC 105.9 – 16 NOVEMBER 2017 (NO COMMENT SOUGHT)

Mintaro solar farm could soon be a reality

A new solar farm in Mintaro, could open as many as 200 possible jobs for the region.
It's called the Chaff Mill Solar Farm. It's only in research and consultation stage at the moment, but the company behind it, FRV, thinks it'll have a big impact on the region.
They'll need 200 jobs for construction and up to five for operation once it's all built-but the proposal needs to go ahead before any of that becomes a reality.
Apart from the obvious benefit of job openings, it'll also mean more investment is pulled to the area.
Local businesses like grocery stores, restaurants, cafes, accommodation providers and petrol stations are just some that can be looking forward to it getting the green light.

Below is the project overview from the FRV factsheet.

This project would comprise the construction and operation of a grid connected solar farm using solar PV modules similar to those used on houses. The final design of the project prior to construction will determine the plant configuration, layout and specifi c equipment to be used, as well as the solar farm's electricity generating capacity. While a final investment decision has not yet been made, it is envisaged that construction could commence sometime in 2016 to 2017 and would take between 12 to 18 months. It is currently intended to utilise a tracking system where the PV panels rotate from east to west, following the sun across the sky, maximising the electricity production. The height of the structures including the PV modules would be no more than approximately 3m from ground level. Inverters that are typically housed in shipping container sized structures would be used to convert the direct current electricity generated by the PV modules into alternating current. A transformer would be installed to step up the voltage to a level suitable for injection into the national electricity grid. The solar farm is proposed to connect into the electricity grid via the existing Clare South substation located immediately adjacent to the solar farm site.

PLAINS PRODUCER – 22 NOVEMBER 2017 (NO COMMENT SOUGHT)

SOLAR FLARE

Mintaro farmers raise solar farm worries

Les Pearson reports:

NEIGHBOURING farmers to the proposed site of a solar farm near Mintaro have a long list of concerns surrounding the development but the owner of the land in question feels similar ventures will be commonplace in coming years.

Renewable energy firm, FRV Australia, is the proponent behind the Chaff Mill Solar Farm, a proposed 100MW solar farm and 50 MW battery located 3.5km north-east of Mintaro on land farmed by local man, Graham Johnson.

Several adjoining landowners have raised concerns since behind contacted by FRV Australia, citing potential increases to frost risk, increased local traffic, fire hazard and general aesthetic issues amongst a raft of questions.

Debbie Baum, one of those with adjacent land to the proposed site, has already quizzed the company.

"I'm not against renewable energy, it definitely has a place now and in the future," Mrs Baum said.

"I'm just not convinced this has been planned in the right place.

"From what I've read on solar farms, the three main parameters are it needs to be mostly cleared, flat land close to the electrical grid for connection, so I think they've only ticked one of those three boxes." Continued Page 6

Fraud Investigation Depart-

Farmers claim solar proposal has its grey areas

• From Page 1

With an annual rainfall of about 450mm and about half of the land in question "fairly undulating", which includes partial catchment of the Wakefield River, it is quality agricultural land.

The proposal does contravene some points within the Clare and Gilbert Valleys Council's Strategic Plan surrounding protection of local farmland from such developments but the sheer value of the development takes the application out of council hands and lands it with the state planning department.

Council will have the opportunity to review the development application once it is submitted.

Mrs Baum included the expected visual impact in her questions to FRV Australia, which may well impact on the price of her own land.

"The valley is a fabric of colour and vibrancy and to see it broken up by a bunch of mirrored panels would be disappointing," she said.

Fellow neighbour, John Faulkner, said their land is prone to frost at times and the installation of the solar panels may disrupt the microclimate, triggering an increase in frosts.

"Also the biosecurity and control of weeds in the area is a worry, we don't know what's going to happen," Mr Faulkner explained.

"It has a projected lifespan of 20 years assuming they buy the land and don't leave it, so how are they going to rehabilitate it after that?

"I don't want to be a stick in the mud but I've got more questions than answers at this stage."

"I don't want to be a stick in the mud but I've got more questions than answers at this stage." - John Faulkner

Mr Johnson felt the development was just a sign of the times as the state sought more energy security.

"These things happen, they're happening elsewhere too, not just here," he said.

"It isn't the first, it won't be the last.

"The idea behind it would be it increases the state's ability to meet its power demands."

FRV contacted Mr Johnson some six months ago seeking land near the Waterloo substation, an electricity network heading directly to Adelaide.

Mr Johnson, who owns and operates about 3500 hectares in the region, agreed to an option land deal with FRV Australia on about 400ha, where the company can opt to buy the land after a certain period or decline to take it over.

When asked if Mrs Baum would be tempted by a similar offer, she was diplomatic.

"You can never say never, there will always be a price," she said.

"I don't begrudge anyone getting a good price for their property."

That said, Mr Johnson claimed he encouraged FRV Australia to contact neighbouring landowners to gauge their interest.

"I told them to speak to the neighbours and see if there was a deal there for them," he said.

"Some saw the opportunity and were tempted to sell but they wanted to sell more than the company wanted, and they didn't want the excess land."

FRV Australia will be meeting with Clare and Gilbert Valleys Council staff and affected landowners on Friday in a bid to allay concerns and address the questions raised.

NORTHERN ARGUS – 16 FEBRUARY 2018 (COMMENT SOUGHT)

Chaff Mill Solar Farm proposal

Solar: Royalla Solar Farm (ACT). Photo: royallasolarfarm.com.au

FRV have recently spent time in the community of Mintaro to discuss with key stakeholders their plans for the proposed Chaff Mill Solar Farm.

A spokesperson for FRV said the company valued community and stakeholder feedback and had met with neighbouring property owners, stakeholders, Clare and Gilbert Valley Council, local MPs and community interest groups since September 2017 to discuss the proposed solar farm.

"From 21 February, FRV has planned to meet again with landowners directly neighbouring the site of the proposed solar farm, interested stakeholder groups, Clare and Gilbert Valleys Council and local MPs to provide them with an update on the development application and findings from the environmental and technical assessments."

The spokesperson said FRV was on schedule to submit the application for the Chaff Mill Solar Farm in late March 2018.

This submission will go to the South Australian Government's State Commission Assessment Panel – this will then be publicly advertised and documentation will be made available online for people to see.

Clare and Gilbert Valleys Council are provided with a copy of this application.

FRV expect the State Commission Assessment Panel to make a decision on this application in mid to late 2018, and will advise the broader community of the outcomes soon after.

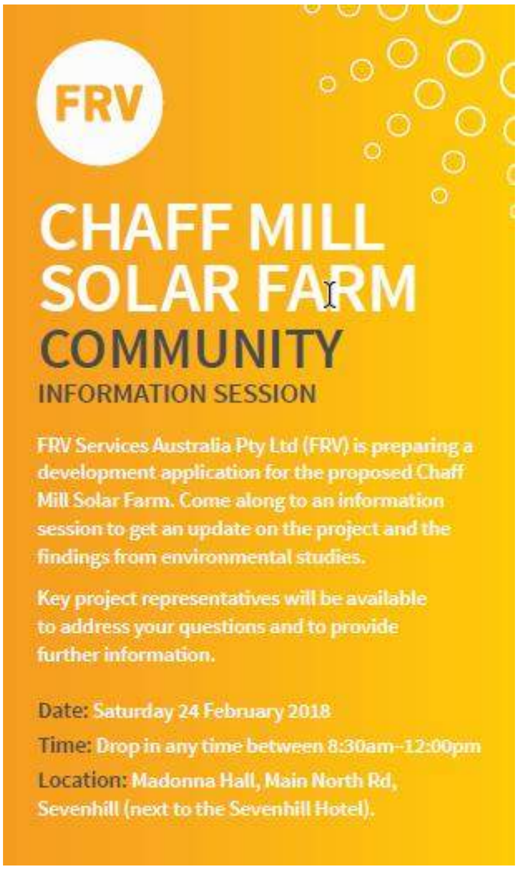
FRV will be at the Sevenhill Producers Market on Saturday, February 24 from 8.30am to 12pm, providing an opportunity to meet with the team and view the proposed layout of the solar farm.

Where possible, feedback will be taken into consideration and incorporated into the final development.

ADVERTISEMENTS

NORTHERN ARGUS ADVERTISEMENT (APPEARED ON 8 FEBRUARY 2018)

PLAINS PRODUCER ADVERTISEMENT (APPEARED ON 8 FEBRUARY 2018)



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APPENDIX E

LETTERS OF IN-PRINCIPLE SUPPORT

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MINTARO
SOUTH AUSTRALIA

Mintaro Progress Association Inc.
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26 May 2018

Carlo Frigerio
Managing Director
FRV Services Australia Pty Ltd
Level 22, 6 O'Connell Street
SYDNEY NSW 2000

Attention: Damien Hegarty

Dear Damien,

Thank you for your recent information session regarding questions about the proposed Chaff Mill Solar Farm near Mintaro and also the letter proposing FRV's partnership with the Mintaro Progress Association (MPA) to provide targeted benefits to the local community.

At the MPA general meeting on 11 April 2018 the following motion was put to the meeting and carried. 'That the Mintaro Progress Association gives "in principle" support to the Chaff Mill Solar Farm project acknowledging that it will be of considerable benefit to the Mintaro community'.

The MPA Committee have considered the proposed FRV/MPA partnership agreement and are very supportive of it as an opportunity for community members to engage with FRV in ways to 'deliver positive social change within the community.' We feel there is general community goodwill to working closely with FRV for the benefit of the community but just as importantly for the benefits it will bring to the State as a whole.

On behalf of the Mintaro Progress Association I would like to extend the Association's support for the proposed Chaff Mill Solar Farm project and accept your offer.

Sent: Wednesday, 21 March 2018 11:02 AM
Subject: [EXT] Chaff Mill Solar Farm proposal Mintaro South Australia

To whom it may concern

Following on from a number of meetings, various discussions and with feedback being given to the community about the proposed Solar Farm to be built North East of Mintaro. I am happy to support this new venture.

Not only will it contribute to the state of South Australia, with its challenged power supply. The village of Mintaro and surrounding district will also benefit from this project.

Mintaro although a small community, is a tightly knit group and prides itself on the future of the village and I believe the Solar Farm will contribute to that.

TO WHOM IT MAY CONCERN

Re: FRV Chaff Mill Solar Farm proposal Mintaro

I have been very well informed about the proposal to develop this large scale solar farm near Mintaro.

My understanding is that, in the event of the project proceeding, this development will contribute positively to the State's power supply. Let's hope that the very recent change to a conservative State Government will not hamper this progress.

I have no doubt that an innovative project such as this will bring some tangible benefits to Mintaro.

As the state's first declared "State Heritage Area" (in 1984), Mintaro welcomes many tourists and travellers who in turn support a small but active business community. It is indeed very positive yet ironic that a project at the vanguard of technology be based in this Heritage town.

Mintaro is the home to many retired professionals who have chosen this town as a place to enjoy, in an active sense, their post work years. The residents include retired Doctors, Lawyers, Engineers, Journalists, Business people, farmers, vignerons and many others. And of course there are many folk still working that call Mintaro home. Do not ignore the intellect and expertise on the project's doorstep.

As a resident of nearly 30 years, and one that believes in encouraging sustainability, I welcome the project and give it my full support.

19th March 2018

TO WHOM IT MAY CONCERN

Re: FRV Chaff Mill Solar Farm proposal Mintaro

We have been very well informed about the proposal to develop this large scale solar farm near Mintaro.

Our understanding is that, in the event of the project proceeding, this development will contribute positively to the State's power supply.

It should, as we understand it, also bring some tangible benefits to Mintaro and it's population.

As a heritage listed village, Mintaro welcomes many tourists and travellers who in turn support a small but active business community.

It is envisaged that businesses including bed & breakfast accommodation, gift shops, entertainment, food & beverage, art galleries et al should all benefit, directly and/or indirectly.

The newly refurbished Magpie & Stump hotel which re-opens on the 24th March should also benefit considerably.

As residents of 6.5 years, we are very pleased to add our support for this project.

APPENDIX F

PLANNING ASSESSMENT

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Chaff Mill Solar Farm - Planning and Land Use Assessment

Prepared for WSP Australia Pty Ltd | 5 February 2018

Chaff Mill Solar Farm - Planning and Land Use Assessment

Prepared for WSP Australia Pty Ltd | 5 February 2018

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Chaff Mill Solar Farm - Planning and Land Use Assessment

Final

Report S17158RP1 | Prepared for WSP Australia Pty Ltd | 5 February 2018

Prepared by	**Paul Gibbons**	Approved by	**Brett McLennan**
Position	Associate Environmental Planner	Position	Director
Signature		Signature	
Date	5 February 2018	Date	5 February 2018

Document Control

Version	Date	Prepared by	Reviewed by
V1	22/11/17	P. Gibbons	B. McLennan
V2	5/02/18	P. Gibbons	B. McLennan

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1 Introduction

FRV Services Australia Pty Ltd (FRV) proposes to develop the Chaff Mill Solar Farm (the project) at a location north-east of Mintaro in the Clare Valley, South Australia (the project site).

The project will capture solar energy and generate approximately 250,000 Megawatt hours (MWh) of clean electricity each year, enough to power up to 60,000 homes.

This planning and land use assessment has been prepared to support a Section 49 (Crown Development) Development Application to the State Commission Assessment Panel (SCAP) and provides an assessment of the project against the relevant policy provisions of the Clare and Gilbert Valleys Council Development Plan (consolidated 10 November 2016).

EMM Consulting Pty Ltd (EMM) has been engaged by WSP Australia Pty Ltd (WSP) to prepare this planning and land use assessment.

1.1 The project

The project would be developed on a 380 hectares (ha) site adjacent to the existing Mintaro substation and its 132 kilovolt (kV) transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; photo-voltaic (PV) Polycrystalline modules with a horizontal, single-axis tracking system.

The modules, including the mounting structures, would not exceed 3 metres (m) in height. The project site is well-placed to capture and export renewable solar energy into the South Australian power grid.

1.2 Project site

The project site is located 3.5 kilometres (km) north-east of Mintaro in the Clare Valley, 130 km north of Adelaide, within the Clare and Gilbert Valleys local government area (LGA). The project site in its regional and local context can be seen in Figures 1.1 and 1.2.

The project site is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. A site layout is illustrated in Figure 1.3.

The existing land use is agricultural.

Figure 1.1 Project site - regional location

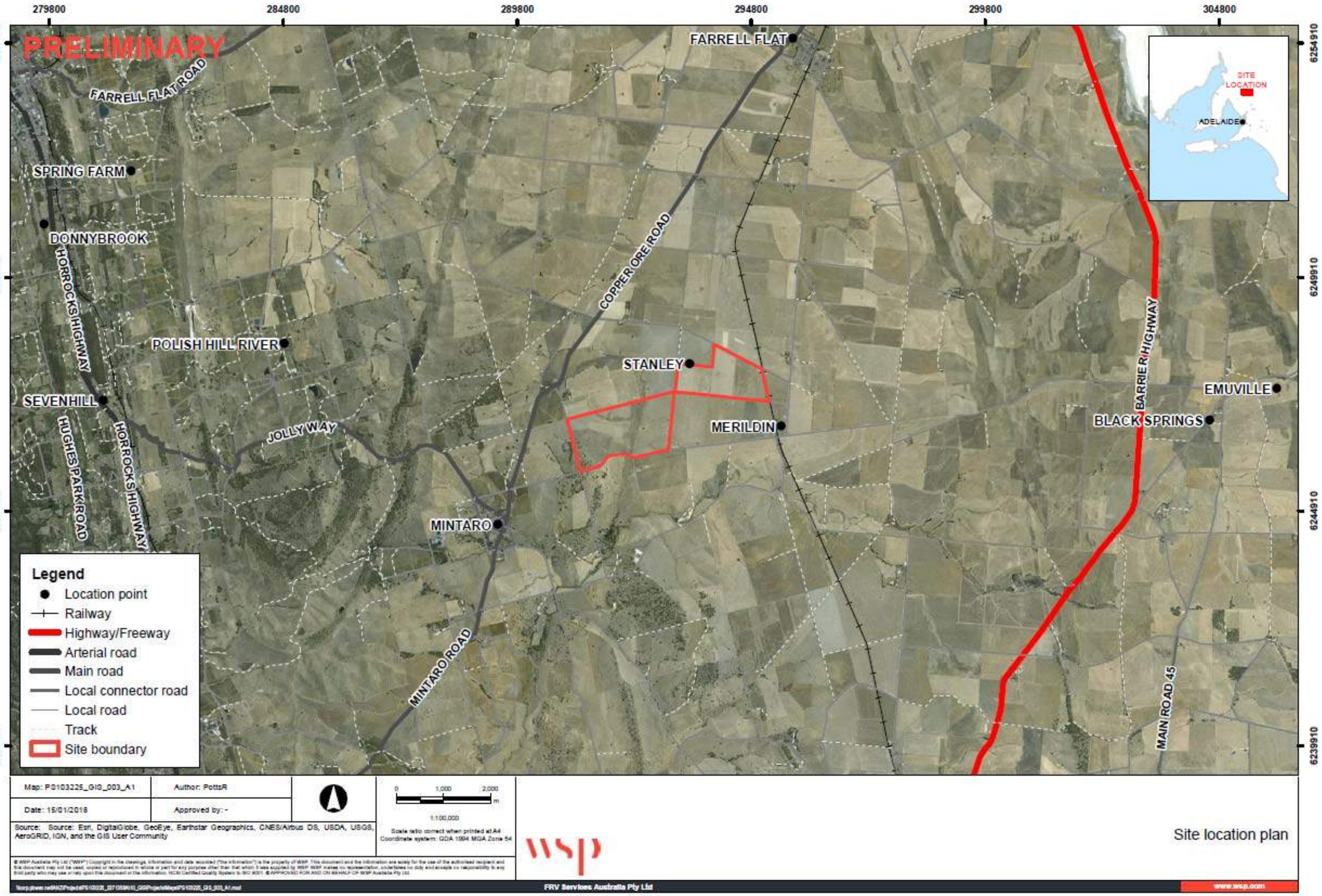


Figure 1.2 Project site - local location

Photograph 1.1 Project site looking east from Wookie Creek Road

Photograph 1.2 Project site access road (Wookie Creek Road) looking south

Figure 1.3 Indicative project layout

1.3 Legislative and policy requirements

The South Australia *Development Act 1993* (the Act) and South Australia *Development Regulations 2008* (the Regulations) are the main pieces of legislation facilitating planning and development in South Australia.

The project is currently in the process of securing Section 49 (Crown Development) status under the Act with State Government agency sponsorship/endorsement to be provided by Office of the Technical Regulator (OTR).

FRV is seeking approval from the State Commission Assessment Panel (as the relevant planning authority) for the following components of the project:

- construction and operation of a 100 MW solar farm, comprising:
    - photovoltaic solar panels, tracking system, inverter/transformer stations;
    - 50 MW/100 megawatt hours (MWh) Battery Energy Storage System (BESS) Area;
    - Medium Voltage (MV) Delivery Station;
    - battery containers (up to 54);
    - substation and tee-connection to existing 132 kV transmission line within the project site;
    - internal underground and/or above ground (overhead) electrical connections and cabling;
    - external electrical connections and cabling;
    - modular site office for FRV personnel;
    - internal access roads and on-site parking for operational staff vehicles (including one disabled parking space);
    - new formalised vehicular access onto Wookie Road; and
    - security fencing (up to 2.1 m) around the perimeter of the project site.

1.3.1 Assessment methodology

This planning and land use assessment has been informed by:

- attending the project site and locality on 10 August 2017;
- consultation with proponent and WSP on the project;
- review of issues and concerns raised during community and stakeholder engagement;
- project assessment against State Government strategies and policy initiatives;

- review of specialist technical assessments to be submitted with the Section 49 (Crown Development) Development Application assessing potential project impacts and mitigation measures from a planning and land use perspective, including:

  - landscape character and visual impact assessment;
  - glare impact assessment;
  - noise assessment;
  - ecology (flora and fauna) assessment;
  - Aboriginal cultural heritage assessment;
  - traffic and transport assessment;
  - surface water investigation;
  - soil and geotechnical desktop assessment;
  - engineering design and preliminary site layout design; and

- assessing the project against the relevant objectives and policies of the Clare and Gilbert Valleys Council (consolidated 10 November 2016).

2 Government strategic context

A number of State and Local Government strategic plans and policy documents are of relevance in providing context and justification for the project. These are summarised below.

2.1 State Government strategies

2.1.1 Our Energy Plan, 2017

The South Australian State Government released the *Our Energy Plan* in 2017 to provide the State with greater local control of energy security by generating capacity, greater competition, increased public ownership of assets, more renewable energy with battery storage, more gas supplies and more job opportunities.

Of relevance to the project is the Plan's new energy security target to increase South Australia's energy self reliance by requiring more locally generated, cleaner, secure energy to be used in South Australia. The goal of the target is to stimulate new investment in cleaner energy to increase competition, put downward pressure on prices and provide more energy system reliability.

The project will use the latest solar energy generation technology to maximise the generation of clean energy that will be connected into the South Australian power grid and enhance local energy-system security for the Clare and Gilbert Valleys region. Specifically, the solar panels will utilise a horizontal, single-axis tracking system to maximise renewable energy generation of 100 MW of electricity that could power up to 60,000 South Australian homes.

2.1.2 South Australia's Strategic Plan, 2011

South Australia's Strategic Plan (2011) is the key planning document of the South Australian Government. It sets the strategic direction for the State across a wide range of social, economic and environmental areas.

For the purpose of the project, the Plan provides strategic context through the identification of the goal and targets with those of the greatest relevance to the project identified in Table 1.1 below.

Table 2.1 Relevant South Australian Strategic Plan targets and project contribution

Goal	Target	Project contribution
Ensure South Australia has a sustainable population	Target 46: Regional population levels Increase regional populations, outside of Greater Adelaide, by 20,000 to 320,000 or more by 2020	The project would generate short and long term employment opportunities thus helping maintain and stimulate population growth in the region
Provide all South Australians with job opportunities	Target 47: Jobs Increase employment by 2% each year from 2010 to 2016	The project is estimated to provide up to 5 full-time equivalents (FTE) employment positions during operations and 200 jobs during construction to the regional economy

Table 2.1 Relevant South Australian Strategic Plan targets and project contribution

Goal	Target	Project contribution
We reduce our greenhouse gas emissions	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	The project will maximise renewable energy generation of 100 MW of electricity that could power up to 60,000 South Australian homes. Generation of renewable energy will reduce
Ensure South Australia has reliable and sustainable energy sources, where renewable powers our homes, transport and workplaces	Target: 64 Renewable energy Support the development of renewable energy so that it comprises 33% of the State's electricity production by 2020	The project would maximise the use of renewable by connecting clean solar energy into South Australia's grid and enhance local energy-system security

2.1.3 Mid North Region Plan, 2011

The Mid North Region Plan (2011) is a regional volume of the South Australian Planning Strategy and provides strategic context and specifically directs land use and development, provision of services and infrastructure while setting out policies to manage changes in population and climate.

The Clare Valley region is dominated by a diverse and rich landscape that is internationally recognised for its quality wines and primary produce which has attracted steady population growth.

The following key issues are identified as critical to the region's future:

- Environment – scenic landscapes
  - retaining the significant landscapes of the Clare wine region when planning and designing development;
  - avoid development within significant landscapes that can be viewed from tourist routes, walking trails, unless the development requires such as location in which case the scale, height, design and siting must:
    - protect views;
    - minimise the alteration of natural landforms;
    - be visually compatible with the character of the surrounding area; and
    - restore and enhance visual quality in degraded areas where possible.
  - avoid adverse impacts of development on landscapes through site selection and design that reduces the height or bulk of structures.

The project is located 3.5 km from Minarto township with the majority of the infrastructure components obscured from view by existing and proposed vegetation, topography and distance which effectively screen the solar farm from the view of the general public and the majority of adjacent landholders.

- Agriculture and horticulture

  - prevent loss of productive agricultural land and potential conflict with incompatible land uses.

  The project will lead to a minor reduction in agricultural production, but the benefits of the production of clean energy outweigh the loss of this small amount of land, while the desired character of the Primary Production Zone within the Clare and Gilbert Valleys Council Development Plan in which the project site is located recognises renewable energy facilities as forming an integral component of the area.

  Given careful consideration of infrastructure siting and design the project, it is considered to form a compatible land use. The installation of the solar panels will occupy approximately 3 ha and would not remove a significant area of agricultural land from the regional area, while the site layout presents the opportunity for livestock grazing between solar panel rows site conditions.

- Renewable energy

  - increasing renewable and low emission energy generation; and

  - support the renewable energy in appropriate locations.

The project will use the latest clean energy technology to generate renewable solar electricity that supports the State Government's objective to meet the climate change challenge and reduces the State's reliance on carbon-based energy supply.

It should be noted that the Mid North Region Plan is currently under review but its strategic directions, as applicable to the project and project site, is unlikely to change.

3 Nature of development

3.1 Development application

The approval process under Section 49 (Crown Development) of the South Australia *Development Act 1993* for the project with the Clare and Gilbert Valleys Council is outlined in Table 3.1.

Table 3.1 Approval process

Relevant authority	State Commission Assessment Panel
Relevant development plan	Clare and Gilbert Valleys Council Development Plan (consolidated 10 November 2016)
Zone	Primary Production Zone
Nature of development	Proposed 100 MW Chaff Mill Solar Farm with infrastructure components and ancillary development as outlined in Section 1.3

3.2 Site selection

The project site was selected based upon the following key considerations:

- solar profile and terrain of land;
- proximity and connection to existing electricity transmission network;
- infrastructure footprint;
- land availability and accessibility;
- proximity to sensitive receptors;
- minimising visual impact;
- minimising environmental impacts; and
- protecting cultural heritage.

A Multi Criteria Analysis (MCA) was undertaken during the project feasibility phase to identify the preferred site. The MCA process included an analysis across engineering, economics, environmental and cultural heritage indicators of the options. Constructability and the capacity of the solar farm to meet the operational efficiencies required for the project also shaped the choice of the project site.

The outcome of the MCA process supports the proposed siting and location of all project infrastructure.

3.3 Specialist technical assessments

This planning and land use assessment has been informed taking into consideration the findings and recommendations of a number of specialist technical assessments, including:

- landscape character and visual impact – Hemisphere Design concluded that the project would not significantly alter or impact amenity values or the landscape character of the area;
- glare – Environment Ethos found no glare potential was identified for the surrounding rural and residential dwellings, major or minor roads. The exception was Merildin Road adjoining the project site's south-eastern boundary that could be mitigated by vegetation screen planting;
- ecology (flora and fauna) – EBS Ecology determined the significance of vegetation communities, species and habitat value within the project site to be low. Notwithstanding this, recommendations to minimise impacts forms a key design parameter for the future placement of solar panels and ancillary infrastructure;
- Aboriginal cultural heritage – IHS confirmed that no Aboriginal cultural heritage sites are located within or immediately adjacent the project site;
- traffic and transport – WSP determined that potential construction and operational impacts of traffic could be managed by minor upgrades to the existing local road network to accommodate vehicle types and volumes;
- geotechnical – WSP confirmed the project site to be geotechnically stable with further geotechnical investigations recommended to determine the subsurface soil profile during detailed engineering design (eg bearing capacity, settlement); and
- surface water management – WSP confirmed that surface water flows associated with the Wakefield River and Broughton River catchments (within which the project site resides) and Wookie Creek (that traverses the southern portion of the project site) do not present an unacceptable flood risk with potential impacts to be managed through best practice design and construction (ie Sediment Erosion Drainage Management Plan, Construction Environment Management Plan).

4 Planning and land use assessment

This chapter provides an assessment of the project against the relevant provisions of Clare and Gilbert Valleys Council Development Plan (consolidated 10 November 2016).

4.1 Desired Character

The project resides within the Primary Production Zone of the Clare and Gilbert Valleys Council Development Plan.

The desired character of the zone promotes a wide range of farming practices, including cropping and grazing activities on large rural land holdings and viticulture on small to medium sized allotment. The zone is of significant asset to the district and comprises some of the region's most productive rural land which is capable of supporting a wide range of agriculture.

The landscape to the east of the Clare Valley contrasts with the surrounding district with predominantly open, sparsely vegetated, grazing land, while the old homesteads, small settlements and churches reflect the historical development of the district. In particular the small settlement of Mintaro, was established to service the Burra to Port Wakefield bullock trail and the slate quarry, and has retained much of its nineteenth century character.

The climate, soil and landform characteristics of the zone favour the continuance of agricultural production and livestock grazing. Significant tracts of native vegetation and areas of bushland are scattered throughout the district and along the road reserves which form important natural features that are expected to be protected as they contribute to the character and attractiveness of the rural landscape.

Whilst solar farms are not specifically identified, renewable energy facilities and wind farms in particular are envisaged within and constitute a component of the zone's desired character. The zone provisions recognise the need for such forms of development to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence it is recognised that wind farm infrastructure may need to be:

- located in visually prominent locations;
- visible from scenic routes and valuable scenic and environmental areas; and
- located closer to roads than envisaged by generic setback policy.

Subject to implementation of management techniques set out by the council wide policy regarding renewable energy facilities, visual impacts of such forms of development are interpreted to be acceptable in pursuit of benefits derived from increased generation of renewable energy.

The development of solar farms and their ancillary infrastructure is neither listed as complying nor non-complying within the relevant Development Plan zone, and therefore the project must be assessed on its merits against the relevant objectives and principles of development control.

The following planning analysis provided in Tables 4.1 and 4.2 assesses the project against the relevant planning provisions.

Table 4.1 Council wide – relevant policy provisions

Council Wide	Comment
Hazard Objectives 1, 3 & 4 PDCs 2, 3, 4, 6, 7, 8	The project is situated within a 'general bushfire risk area' with all infrastructure siting and access to be designed in accordance with the provisions of the *'Minister's Code: Undertaking development in Bushfire Protection Area'.* With the exception of bushfire risk, the project site is not located within an area identified as being susceptible to other natural hazards, such as flooding, contamination, acid sulphate soils or landslips. Construction and operation of the solar farm shall be designed to ensure appropriate environmental management controls are implemented, such as a soil and erosion management, to ensure earthworks cut and fill minimise potential impacts to Wookie Creek and do not impede the ephemeral flows and water quality of this watercourse. All cut and fill associated with site earthworks will also ensure a geotechnically stable development site is established.
Infrastructure Objectives 1, 2 & 3 PDCs 1, 10, 11& 13	As previously stated, the outcome of specialist studies – and the MCA process – supports the proposed siting and location of all project infrastructure to ensure that it is able to minimise potential visual and environmental impacts. The project is located some 3.5 km from Minarto township (being a State Heritage Area) with the majority of the infrastructure components obscured from view by virtue of existing and proposed vegetation, topography and distance which effectively screen the solar farm from the view of the general public and adjacent landholders, except of the immediately adjacent property to the south-east. In addition, all access roads servicing the project site are existing with only minor upgrades (eg temporary earthworks and fill material to accommodate heavy vehicle turning paths) to accommodate project design traffic with all road works to minimise disturbance to existing native vegetation and biodiversity as far as practicable.
Interface Between Land Uses Objectives 1, 2 & 3 PDCs 1, 2, 7, 8 & 14	Renewable energy facilities are envisaged and encouraged within the Clare region, subject to compliance with prescribed siting, design and construction management requirements that can all be complied with. The project is sited more than 3.5 km away from Minarto township and will not impact on the heritage significance of the township, while existing native vegetation, topography, distance will effectively screen the solar farm from the view of the general public and adjacent landholders. The project will not detract from primary production in the area and forms a compatible land use given: • the project site's location is confined to a low density farming community; • the installation of solar panels will not impact climatic conditions in the region; • the surrounding area hosts existing renewable energy facilities to the south-east (Waterloo Wind Farm); and • impacts to sensitive receptors is able to be mitigated. It is considered that the project has been adequately informed by the completion of specialist technical assessments, comprising visual amenity, glare, ecology (flora and fauna), Aboriginal cultural heritage, traffic and surface water to assess potential impacts and propose suitable mitigation measures (where required). It is considered that the project will not detrimentally affect the amenity of the locality, whilst impacts on other land uses is minimal given the location of the project infrastructure away from sensitive receptors and the Mintaro State Heritage Area.

Table 4.1 Council wide – relevant policy provisions

Council Wide	Comment
Natural Resources Objectives 1, 4, 6, 8, 10, 11 & 13 PDCs 1, 2, 3, 7, 8, 9, 10, 12, 13, 17, 26, 27, 31, 32, 36, 37, 38 & 39	The project is located in an area where natural solar energy will be able to be effectively and efficiently harnessed, while its location within a low density rural area ensures the development is able to be appropriately separated from residences and the Mintaro State Heritage Area. The project has been purposely sited and designed to afford as much protection as possible to the region's natural resources. There will be some disturbance to the natural landform across the project site through construction of the solar farm and ancillary infrastructure, however these will be purposefully designed and sited to avoid areas of native vegetation (as far as practicable), whilst balancing the volume of earthworks (ie cut and fill) on-site. The site will be returned to its original form following decommissioning of the project. EBS Ecology assessed the potential ecological impacts the project may have on terrestrial flora and fauna. This assessment involved both desktop and field surveys with the level of significance of the vegetation communities determined to be low. Notwithstanding this the opportunity to avoid and or minimise impacts to remnant native vegetation has formed a key parameter adopted in the infrastructure siting and design to protect and maintain the biodiversity value of the area. All earthworks and associated vegetation clearance within the project site will be undertaken so as not to cause or exacerbate erosion or sediment, decrease soil stability or cause any deterioration in the quality of surface water runoff that may potentially impact Wookie Creek.
Renewable Energy Facilities Objectives 1, 2 & 3 PDCs 1, 2, 3 & 4	The policy provisions actively promote renewable energy facilities (and associated infrastructure) where natural resources can be harnessed for the efficient generation of electricity that will benefit the community and State by connecting into South Australia's power grid. Whilst not specifically referencing solar farms, the policy provisions provide key siting and design considerations which are able to be satisfied as follows: • infrastructure to be sited and designed to blend with the natural features of the landscape; • protect areas of scenic or conservation significance from undue damage; • cause minimal damage to the natural landform; and • screen and orientate infrastructure away from public view, tourist and scenic routes. The project is considered to present a desired land use within the zone and its locality. Careful consideration has demonstrated that impacts associated with visual amenity, glare, noise, ecology (flora and fauna), Aboriginal cultural heritage, traffic and engineering design (ie geotechnical, surface water) are able to be minimised. In particular, the project's photovoltaic panels and tracking system will use quality products and best practice design to ensure impacts associated with glare will be eliminated, while vegetative planting will ensure potential impacts to the nearest sensitive receptor to the east can be appropriately minimised. The project promotes the generation and use of renewable energy for the benefit of the environment, local and regional communities and the State more generally, whilst its location has been sited to minimise impacts on the natural environment, other land uses in the locality, transport systems and natural resources.

Table 4.1 Council wide – relevant policy provisions

Council Wide	Comment
Siting and Visibility Objective 1 & 2 PDC 1, 4, 5 & 8	The project site has been chosen due to it providing ideal conditions and transmission line connection to maximise the efficiency and power generation of the solar farm. Hemisphere Design concluded that from a visual amenity perspective the introduction of the solar farm: • does not change the mainly pastoral nature of the locality and wider contextual landscape; • does not it impact on any significant viewpoints within the contextual landscape; and • will not significantly alter the nature and visual qualities of the Expansive Eastern Plains Character Unit. Hemisphere Design also stated that in their opinion *"the solar farm will introduce a new infrastructure element of an acceptable design standard that will evoke curiosity, become an 'incidental' infrastructure feature of merit and a best practice example of progressive renewable energy delivery".* As previously stated, the siting of the project infrastructure has been designed to minimise visual impacts and effectively screen the development from the view of the general public and adjacent landholders by virtue of established native vegetation, topography, distance and proposed vegetative planting. The project is not considered to adversely impact on the natural or rural character of the locality.

Table 4.2 Primary Production Zone – policy provisions

Primary Production Zone	Comment
Land Use Objectives 1, 2 & 3 PDCs 1 & 3	Renewable energy facilities are envisaged within and form part of the desired character of the zone. Specifically, the policy provisions recognise that such forms of development (particularly wind farms) require siting of infrastructure in visually prominent locations to effectively harness renewable energy sources. The zone envisages sustainable primary production with the solar farm not affecting agricultural efficiency within the surrounding area or not significantly impacting upon other development activities anticipated within the zone. The siting and configuration of the proposed solar panels will also not alter the size and configuration of the existing allotments. A number of specialist technical assessments have been undertaken which demonstrate that the project infrastructure can be designed and sited to minimise potential environmental impacts with specific mitigation measure proposed to address visual amenity and glare to the nearest sensitive receptor to the east through vegetative planting and screening. By virtue of established native vegetation, topography and distance the solar farm will not adversely impact the general public, surrounding landholders or the Mintaro State Heritage Area. The project is considered a compatible land use and is appropriate within the zone. A Construction Environmental Management Plan (CEMP) will be prepared for the project following the granting of development consent to outline the environmental management systems and procedures to be implemented during construction to ensure activities comply with relevant statutory requirements and provide adequate protection for the environment. The purpose of the CEMP is to provide guidance to the contractor(s) and will outline the need for a number of management plans to be developed for specific areas of potential impacts during construction, such as dust and air quality, water quality, traffic management, erosion control and stormwater management and weed and pest management.
Form and character Objectives 5, 6 & 7 PDCs 9 & 11	The desired character of the Primary Production Zone recognises renewable energy facilities as forming an integral component of the area within which the project site is located. The zone comprises agricultural areas that underpin the region's economy, primarily consisting of general farming, grazing and viticulture with associated rural based industry, services and facilities. It is intended that the dominant rural character of the zone won't be adversely affected, while as stated by Hemisphere Design *"the solar farm will introduce a new infrastructure element of an acceptable design standard that will evoke curiosity, become an 'incidental' infrastructure feature of merit and a best practice example of progressive renewable energy delivery".*
Heritage PDC 12	The proposed siting and layout of the project will not impact the Mintaro State Heritage Area or heritage significance of the settlement. Hemisphere Design concluded that the visual amenity impacts of the development would be negligible given: • the sense of place and place attachment values of Mintaro township will not be detrimentally affected; • the nature and visual qualities of the Expansive Eastern Plains Character Unit will not be significantly altered; • the introduction of the project does not change the mainly pastoral nature of the locality and wider contextual landscape; • the project does not impact on any significant viewpoints within the contextual landscape; • the project is proposed to be sited and designed to blend with the natural features of the landscape and to cause minimal damage to the natural landform; and • the likely visual impact on the identified sensitive receptor can be managed through visual mitigation introduced through vegetative screening. The project will therefore not detract from the form and character of the locality.

4.2 Assessment against key policy provisions

The following section provides further assessment against key policy provisions in the Clare and Gilbert Valleys Council Development Plan given it does not specifically reference solar farms per-se, but instead references renewable energy facilities and wind farms. In this regard, planning consideration has been given to:

- the capacity of the project to generate renewable energy;
- the siting and design of the project within the locality; and
- construction and operation of the project.

4.2.1 Capacity

The project will capture and generate 100 MW of clean energy to power up to 60,000 South Australian homes.

The 100 MW capacity will be achieved through the installation of photovoltaic solar panel that have been modelled by the proponent to maximise the electricity potential of the locality. The project site provides an ideal landscape and solar conditions with its gentle undulating topography and east-west allotment orientations which is predominantly clear of remnant native vegetation to maximise solar tracking as the sun moves across the sky during the day and throughout the year. These conditions will ensure that the solar panels are able to effectively and efficiency generate renewable energy for the South Australian power grid.

The proposed site layout and design will ensure the project maximises and harnesses the available natural solar resource for electricity generation. This outcome is a key objective of the renewable energy facilities provisions of the Clare and Gilbert Valleys Council Development Plan.

The specialist technical assessments undertaken to support the project have shown that the solar farm will not unduly impact the environment (ie flora and fauna), heritage (ie historic and Aboriginal site, places or objects) or people (ie visual amenity, gare, emissions, geotechnical, surface water, traffic and transport), while appropriate mitigation measures have been proposed to minimise impacts (where required).

The project site's proximity to ElectraNet's 132 KV transmission line and the South Australian grid provides an opportunity to connect renewable energy generated from the project directly into the transmission network for the State's domestic and commercial use.

The project is consistent with the relevant planning policy provisions to ensure renewable energy facilities maximise and harness the available natural solar resource for electricity generation.

4.2.2 Siting and design

The project is proposed to be located more than 3.5 km north-east of Mintaro in the Clare Valley.

Whilst Mintaro township is identified as a State Heritage Area, Hemisphere Design determined that the landscape character of the area is of a low scenic quality, while the sense of place and place attachment value would not be detrimentally affected by the project. This assessment also concluded that the visual amenity impacts of the project would be negligible given:

- the sense of place and place attachment values of Mintaro township will not be detrimentally affected;
- the nature and visual qualities of the Expansive Eastern Plains Character Unit will not be significantly altered (refer Figure 4.1);
- the introduction of the project does not change the mainly pastoral nature of the locality and wider contextual landscape, nor does it impact on any significant viewpoints within the contextual landscape;
- the project is proposed to be sited and designed to blend with the natural features of the landscape and to cause minimal damage to the natural landform; and
- the likely visual impact on the identified sensitive receptor can be managed through visual mitigation introduced through vegetative screening.

Environmental Ethos's glare assessment similarly concluded that no glare potential was identified for surrounding residences, Copper Ore Road and other minor roads for road users (refer Figure 4.2). The exception was a potential glare hazard for the nearest sensitive receptor to the east and travellers on Merildin Road with vegetative planting recommended to mitigate impacts.

The project has also assessed potential environmental impacts associated with ecology (flora and fauna), non-Aboriginal and Aboriginal cultural heritage, traffic and engineering design (ie geotechnical, surface water). All impacts are able to be avoided or managed through siting and best practice design and engineering.

By virtue of established native vegetation, topography and distance the project will not adversely impact the general public, adjacent landholders (with the exception of receptors that will be appropriately mitigated through vegetative planting) or the Mintaro State Heritage Area.

The project is considered a compatible land use and is appropriate within the locality.

Figure 4.1 Hemisphere Design visual assessment

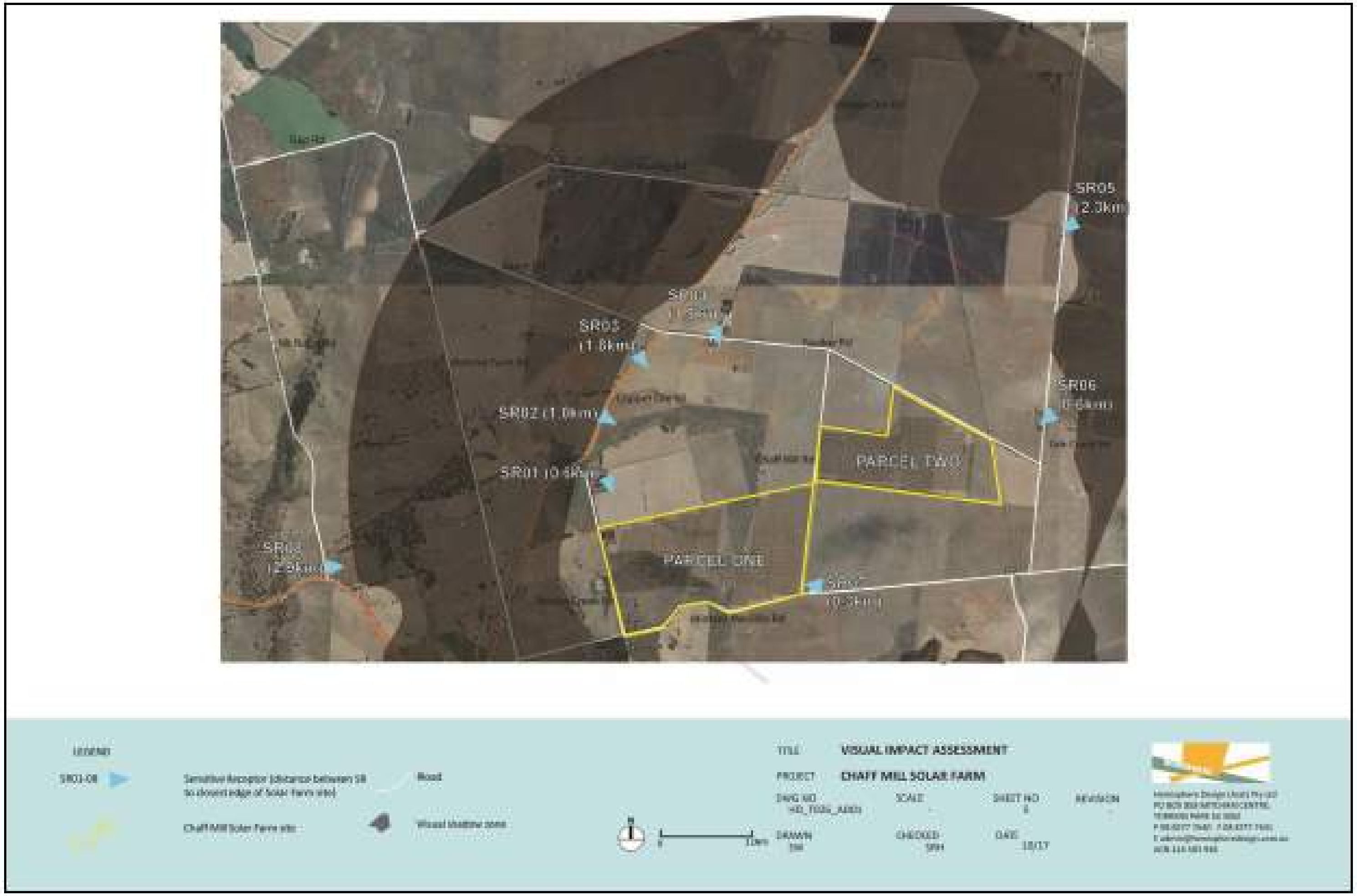
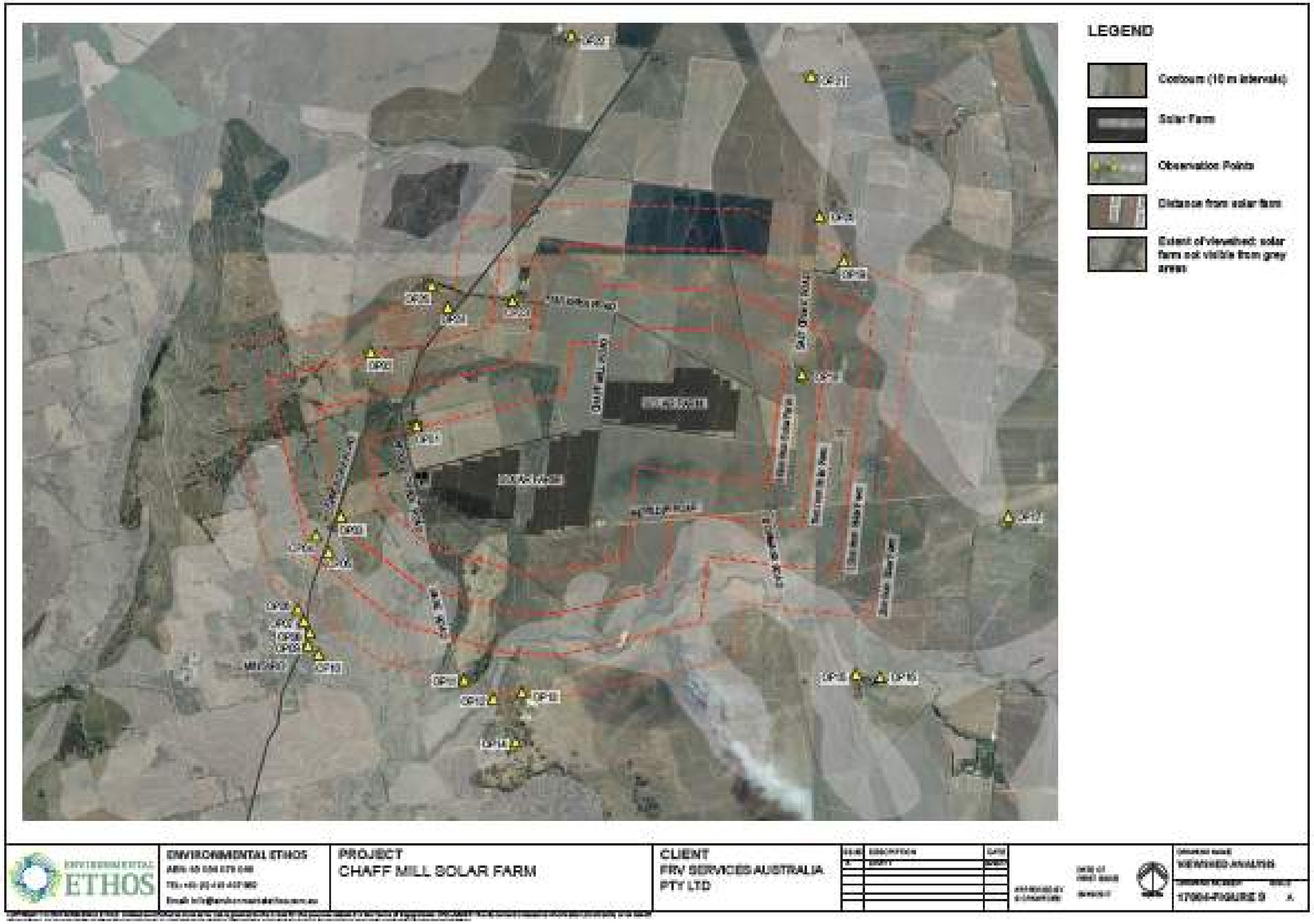


Figure 4.2 Environmental Ethos glare assessment



4.2.3 Construction and operation

A CEMP will be prepared for the project following the granting of development consent to outline the environmental management systems and procedures to be implemented during construction to ensure activities comply with relevant statutory requirements and provide adequate protection for the environment.

The purpose of the CEMP will provide guidance to the contractor(s) and will outline the need for a number of management plans to be developed for specific areas of potential impacts during construction, such as dust and air quality, water quality, traffic management, erosion control and stormwater management and weed and pest management.

Key environmental considerations and management measures to be implemented during construction will include (but are not limited to):

- **vegetation clearance** – vegetation removal to be kept to a minimum; no vegetation (native and non-native) disturbance or clearance to occur without approval; the stockpiling of vegetation/topsoil profiles for rehabilitation works;

- **Aboriginal cultural heritage** – no cultural sites, objects or places were identified within or adjacent to the project site. The CEMP will include a stop work procedures in the event that an aboriginal artefact is encountered during construction;

- **noise and vibration** – construction hours Monday to Saturday (ie 7.00 am to 7.00 pm), unless out of hours works approved; plant, vehicles and construction equipment would be properly maintained to reduce the potential of excessive noise emissions and comply with regulatory requirements; work generating high vibration levels would be scheduled during less sensitive time periods;

- **traffic and transport** – preparation of a Traffic Management Plan to address traffic and safety arrangements during construction; developing routes for the delivery of materials and parking of vehicles; vehicle and machinery movements during construction to be restricted to designated areas; and traffic movements to be monitored if any community complaints/concerns are received;

- **air quality** – vegetation clearance and disturbance areas to be stabilised as soon as possible to prevent or minimise wind-blown dust; dust generating activities (particularly clearing and excavating) to be avoided or minimised during dry and windy conditions; water to be applied to aggregate storage piles, internal unsealed access roadways and work areas with application rates reflective of weather conditions and the intensity of construction operations; vehicles transporting material to and from the site to be covered to prevent wind-blown dust emissions and spillages;

- **water quality** – preparation of a Sediment, Erosion and Drainage Management Plan to mitigate erosion and stormwater management issues during construction, particularly in and around Wookie Creek;

- **bushfire** – no construction work of any kind to be conducted on days rated as Catastrophic; for days rated as Extreme or Severe, consideration to be given to suspending activities or changing plans – work hours, work location, alternative access routes; establishment of a site evacuation plan which includes muster points, communication schedule, access and escape routes and emergency services notification forms to be prepared; all equipment bought to site to be inspected to ensure no faults which may pose an ignition source;

- **waste** – all waste requiring offsite disposal will be sent to appropriately licensed facilities; all waste would be recycled/disposed at an appropriately licensed facility; and
- **stakeholders** – a mechanism for receiving and responding to any complaints to be put in place for the duration of the construction phase.

5 Conclusion

The proposed 100 MW Chaff Mill Solar Farm presents a significant opportunity to enhance, diversify and achieve the region and State's renewable energy targets and regional economic development objectives.

The nature of development is recognised and provided for in the Clare and Gilbert Valleys Council Development Plan. Renewable energy facilities policy provisions are set out in the both the Council Wide and Primary Production Zone with such development considered a desired land use and activity within the project site.

This Development Application is seeking development approval from the State Commission Assessment Panel (as the relevant planning authority) for the construction and operation of the project, comprising:

- photovoltaic solar panels, tracking system, inverter/transformer stations;
- 50 MW/100 MWh BESS Area;
- MV Delivery Station;
- battery containers (up to 54);
- substation and tee-connection to existing 132 kV transmission line within the project site;
- internal underground and/or above ground (overhead) electrical connections and cabling;
- external electrical connections and cabling;
- modular site office for FRV personnel;
- internal access roads and on-site parking for operational staff (including one disabled parking space);
- new vehicular access onto Wookie Road; and
- security fencing (up to 2.1 m) around the perimeter of the project site.

The investigations and analysis supporting this planning and land use assessment have been underpinned by a number of specialist technical reports and concept designs, including visual amenity, glare, noise, ecology (flora and fauna), Aboriginal cultural heritage, traffic and engineering (ie geotechnical, surface water) to assess potential impacts and recommend mitigation measures (where required). In addition, a CEMP will be prepared by the proponent to provide guidance to contractor(s) to address environmental management during construction.

The project is considered appropriate for the project site and is not deemed at variance with the relevant Development Plan provisions and will provide reliable infrastructure to facilitate economic growth for the region, consistent with South Australia's strategic policies.

The purposeful location of the project away from sensitive receptors and the Mintaro State Heritage Area effectively minimises the potential impacts on residents of, and visitors, to the region, while proposed vegetative planting should mitigate visual impact and glare to the nearest sensitive receptor and road users on Merildin Road.

In summary, the project, when considered on its merits, warrants the granting of development consent.

References

Clare and Gilbert Valleys Development Plan (consolidated 10 November 2016)

IHS (2017), Aboriginal Cultural Heritage Assessment for Chaff Mill Solar Farm

EBS Ecology (2017), Ecological Assessment for Chaff Mill Solar Farm

Environmental Ethos (2017), Glare Impact Assessment for Chaff Mill Solar Farm

Hemisphere Design (2017), Landscape Character and Visual Assessment for Chaff Mill Solar Farm

WSP (2017), Geotechnical Desktop Study for Chaff Mill Solar Farm

WSP (2017), Engineering (Surface Water) Desktop Study for Chaff Mill Solar Farm

WSP (2017), Traffic and Transport Assessment for Chaff Mill Wind Farm

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APPENDIX G

FLORA AND FAUNA ASSESSMENT

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Chaff Mill Solar Farm

Ecological Assessment

Chaff Mill Solar Farm Ecological Assessment

11 January 2018

Version 3

Prepared by EBS Ecology for WSP Australia Pty Limited

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Cover photograph: Remnant *Eucalyptus leucoxylon* ssp. *pruinosa* in the western block.

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ABBREVIATION OF TERMS

BDBSA	Biological Databases of South Australia
CEMP	Construction Environmental Management Plan
DEWNR	Department of Environment, Water and Natural Resources (SA Government)
DOE	Department of the Environment (Australian Government)
DOEE	Department of the Environment and Energy (previously DOE) (Australian Government)
DPTI	Department of Planning, Transport and Infrastructure (SA Government)
EBS	EBS Ecology
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FRWL	Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*)
FRV	FRV Services Australia Pty Ltd
IBRA	Interim Biogeographical Regionalisation of Australia
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act 1972*
NRM	Natural Resources Management
NRM Act	*Natural Resources Management Act 2004*
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
PBTL	Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*)
SA	South Australia
SEB	Significant Environmental Benefit
spp.	Species (plural)
ssp.	Subspecies
TEC	Threatened Ecological Community
WSP	WSP Australia Pty Limited
+/-	Refers to flora species being present within a vegetation association but not in all locations surveyed.

EXECUTIVE SUMMARY

A desktop and field assessment were undertaken to identify the ecological constraints for the proposed Chaff Mill Solar Farm project area, northeast of Mintaro, in the Clare Valley of South Australia. The project area, approximately 380 ha, was split into an “eastern block” and a “western block”.

A vegetation survey was undertaken across the project area and bordering roadsides, using the 2017 Bushland Assessment Manual and Scattered Tree Assessment Manual, in line with the Native Vegetation Council (NVC) requirements. This methodology enables the calculation of a Significant Environment Benefit (SEB) area and a value for payment into the Native Vegetation Fund, once the native vegetation clearance requirement for the project is known. Additionally, a roaming style survey approach was adopted, opportunistically recording flora and fauna species as they were observed within the project area.

Native vegetation clearance requirements for the project will either fall under Native Vegetation Regulation 12(34) – Infrastructure, or 12(27) - Major projects. Both follow Approval Pathway 4 - Risk Assessment, requiring NVC approval and a SEB offset.

The project area was largely devoid of native vegetation and had few ecological constraints. No threatened flora species or threatened vegetation communities were recorded. A large group of remnant *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) occurred on the western side of the western block. These large trees have high conservation significance, with many containing hollows providing important fauna habitat. An ephemeral creek line runs through the western block; from a vegetation and habitat perspective this creek line is highly degraded, but provides habitat for birds and water-dependent fauna when water is present. A few isolated amenity trees were present within the paddocks. The roadsides were lined with a mix of native remnants and native amenity plantings. All roadside and rail corridors were very weedy with no native understorey species present.

Six vegetation associations were recorded:

- *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland
- *Allocasuarina verticillata* (Drooping Sheoak) Woodland
- *Acacia paradoxa* (Kangaroo Thorn) Shrubland
- Mixed Amenity Planting +/- scattered natives
- Exotic Grassland
- Crop.

A scattered tree assessment was undertaken for the large patch of *Eucalyptus leucoxylon* ssp. *pruinosa* within the western block. Many of these trees contained hollows of various sizes and were considered of high biodiversity value. The total tree score ranged from 0.36 to 8.13.

Two Bushland assessments were performed on the perimeter of the western block along Merildin Road. The condition of the areas described as *Eucalyptus leucoxylon* ssp. *pruinosa* Woodland was poor to moderate. The condition of the areas described as *Allocasuarina verticillata* (Drooping Sheoak) was poor.

Fifty-four flora species were recorded during the field survey (32 native, 22 exotic). None of these species had a conservation rating. Four of the exotic species were declared weeds.

Two listed flora species identified from database searches were assessed as possibly occurring, based on the proximity to known records and the species' relative inconspicuousness (and therefore potential for non-detection given the broad nature of the survey):

- *Dodonaea procumbens* (Trailing Hop-bush) – nationally vulnerable
- *Rytidosperma tenuius* (Short-awn Wallaby-grass) – state rare.

Thirty-six fauna species were recorded during the field survey (32 native, four exotic). One rated bird species was recorded: the state rare White-winged Chough (*Corcorax melanorhamphos*). Based on database search results, it is possible that a range of other listed fauna species could utilise the area, such as:

- Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*) – nationally vulnerable
- Brown Toadlet (*Pseudophryne bibronii*) – state rare
- Common Brushtail Possum (*Trichosurus vulpecula*) – stare rare
- Elegant Parrot (*Neophema elegans*) – state rare
- Flame Robin (*Petroica phoenicea*) – state rare
- Painted Buttonquail (*Turnix varius*) – state rare
- Peregrine Falcon (*Falco peregrinus*) – state rare.

The suitability of habitat for the nationally endangered Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*) and nationally vulnerable Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*) was assessed.

It was considered unlikely that Pygmy Blue-tongue Lizard would be present given the soil structure was impacted by cropping and the lack of spider burrows in the non-cropped area. A few spider holes were observed along the roadside in an area of remnant vegetation and were checked with a burrowscope. No Pygmy Blue-tongue Lizards were observed.

The habitat suitability for the Flinders Ranges Worm Lizard is considered low, however given the species' broad distribution across the region, it may possibly be present where suitable habitat characteristics (e.g. surface rock, leaf litter and fallen timber) occur.

Recommendations

Given the low remnancy within the region, all native vegetation is considered important to conserve. Impact where remnant vegetation is present should be avoided (i.e. the western corner of the project area and the roadsides). Impact on the creek line should also be avoided.

An EPBC referral is not considered to be required for the proposed development as no EPBC Act listed flora species or ecological communities were observed, and the only EPBC Act listed fauna species considered as potentially occurring in the area, the Flinders Ranges Worm-lizard and Fork-tailed Swift, will not be significantly impacted by development. The EPBC listed flora species, *Dodonaea procumbens* was conservatively assessed as potentially present for areas that were rapidly assessed; if infrastructure placement avoids native vegetation areas it is unlikely that the species (if present) would be impacted.

Any vegetation clearance that may be required needs approval under the *Native Vegetation Act 1991*. EBS Ecology can calculate the clearance requirements and Significant Environmental Benefit (SEB) offset once the infrastructure design is finalised.

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1 INTRODUCTION

Australian solar development company FRV Services Australia Pty Ltd (FRV) is proposing to develop the Chaff Mill Solar Farm north-east of Mintaro in the Clare Valley, South Australia. The proposed 100MW solar farm would be developed on a 380 hectare site adjacent to the existing Mintaro substation and its 132kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The solar farm will connect into the existing powerline which runs on the western boundary of the site. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

EBS Ecology was contracted by WSP to undertake an ecological assessment of the proposed Chaff Mill Solar Farm site. The assessment involved desktop research and field survey. The field survey was performed on 24th to 26th September 2017 and included a vegetation survey in line with the Native Vegetation Council (NVC) methodology (Government of South Australia 2017b, 2017c).

This report summarises the data collected from the desktop and field study and provides an overview of:

- the type and condition of vegetation within the project site, including threatened ecological communities, threatened species and declared weeds;
- fauna species present or likely to occur, including targeted surveys for birds;
- the significance of vegetation as wildlife habitat;
- any ecological constraints associated with the project.

1.1 Project area

The proposed Chaff Mill Solar Farm project is located 3.5 kilometres north-east of Mintaro in the Clare Valley, 130 kilometres north of Adelaide. The project area is approximately 380 hectares, comprised of an “eastern” and a “western” block of land (Figure 1). The project area is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. The site falls within the District Council of Clare and Gilbert Valleys. The project area is zoned as Primary Production. The existing land use is agricultural, including part grazing and part cropping land.

EBS assessed the vegetation and fauna habitat within the eastern and western land blocks and along the bordering roadsides. In addition, EBS undertook a rapid vegetation survey along Merildin Road and Flagstaff Road, to the east of the project area, to determine potential impacts in the event that the road required widening for vehicle access purposes.

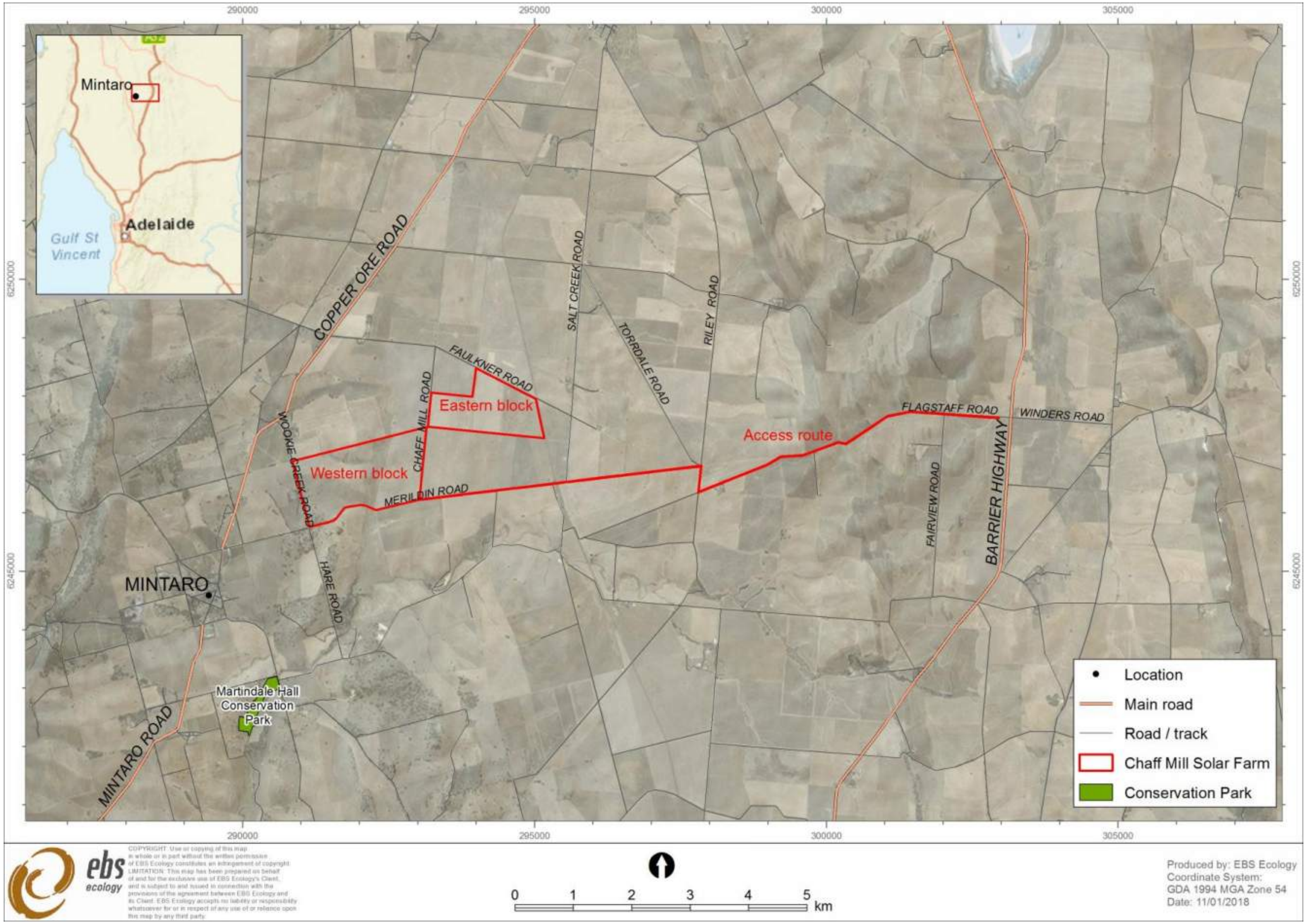


Figure 1. Location map of the Chaff Mill Solar Farm project area

1.1.1 Topography

The topography of the site ranges from approximately 400 to 430 m above sea level. The western block includes low hills with the highest and steepest area on the western side and the lowest area being the Wookie Creek. The eastern block is of gentle undulation.

1.1.2 Climate

The most comprehensive available climate dataset is from Clare, approximately 14 km north-west of the Chaff Mill project area. Both rainfall and temperature follow typical Mediterranean seasonal climate, with cool wet winter months and warm dry summer months (Figure 2). The long-term mean annual rainfall for the area is 633.7 mm, with June through to August typically the wettest months. The data used to create the graph displayed in Figure 2 is provided by the Bureau of Meteorology (Commonwealth of Australia 2017).

The mean annual rainfall (1976 – 2005) is mapped for the project area as being 537 mm (Commonwealth of Australia 2017).

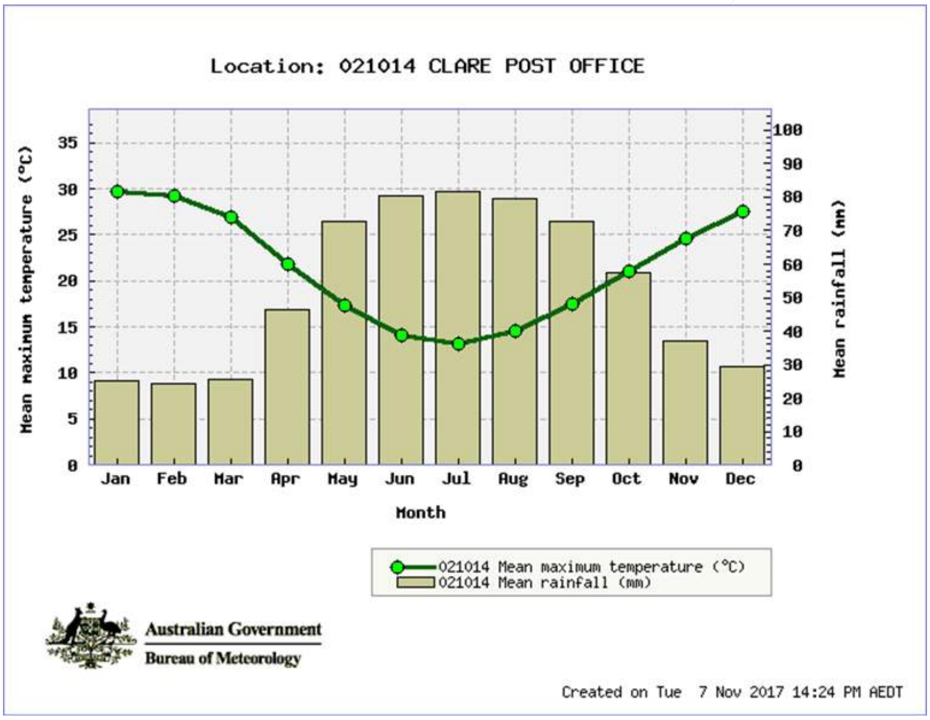


Figure 2. Long term means for temperature and rainfall for Clare Post Office (1926-1994).

1.2 Previous surveys

This is the first ecological survey specifically undertaken for the proposed Chaff Mill Solar Farm. To EBS' knowledge, no previous ecological survey has been undertaken within the project area.

DEWNR has undertaken flora and fauna surveys at selected bushland sites within the region as part of the Mid North and Yorke Peninsula Survey (2003), Mid North Survey (1992) and Burra Hills Survey (1994). These surveys form part of the broader Biological Survey of South Australia program, which aims to improve our knowledge of the state's vegetation and vertebrate fauna through systematic survey, assisting our ability to measure ecological change and manage nature conservation into the future. The nearest DEWNR flora survey sites are located in a patch of *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland approximately 1.9 km northwest of the western block (ID10729) and in *Eucalyptus camaldulensis* var. *camaldulensis* Woodland along the river approximately 1.5 km south of the western block (ID10730, 19624). There is also a DEWNR flora site directly north of Flagstaff Road within *Allocasuarina verticillata* (Drooping Sheoak) Low Woodland (APO1901). The nearest DEWNR fauna sites are along the river, approximately 1.6 km south (ID19624), and 3.4 km northwest of the western block (ID19622) (DEWNR 2017b).

Vegetation mapping has previously been undertaken along the rail corridor (2000) on the eastern boundary of the eastern block, as part of the Mid North Transport SA Railway Corridor Survey (Gawler to Burra). The vegetation was described as exotic/native grassland in poor condition. Vegetation mapping was undertaken along Merildin Road (east of Salt Creek Road intersection), Riley Road and Flagstaff Road (2001) as part of the Clare and Gilbert Valley District Council Standard Roadside Survey. The vegetation was described as a mix of mixed grassland, plantation, *Acacia paradoxa* (Kangaroo Thorn) Shrubland and *Allocasuarina verticillata* Woodland (DEWNR 2017b).

Bushland condition monitoring (BCM), as developed by the Nature Conservation Society of SA, has been undertaken in the Northern and Yorke region since 2007. BCM provides a cost effective method to identify, assess and score key environmental indicators of bushland condition. These indicators are benchmarked using available data and provide objective measures of change in the condition of vegetation. The nearest bushland condition monitoring sites are along the river directly south of the eastern block, and approximately 1.25 km south-east of the western block (DEWNR 2017b).

2 COMPLIANCE AND LEGISLATIVE SUMMARY

The following section is a summary of the relevant legislation that applies to this project.

2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as 'matters of national environmental significance'. The nine matters of national environmental significance protected under the Act are:

- World Heritage properties
- National Heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development

Any action that has, will have, or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act.

This report is focused on listed threatened species and ecological communities which are recognised as a matter of national environmental significance. Consequently, any action that is likely to have a significant impact on listed threatened species and ecological communities under the EPBC Act must be referred to the Minister and undergo an environmental assessment and approval process.

The EPBC Act Significant Impact Guidelines (DOE 2013) provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance. In terms of nationally threatened species, the guidelines define an action as likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long term decrease in the population
- Reduce the area of occupancy of the species
- Fragment an existing population
- Adversely affect critical habitat
- Disrupt breeding cycles
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in the establishment of invasive species that are harmful to the species
- Introduce disease that may cause the species to decline

- Interfere with the recovery of the species.

2.2 Native Vegetation Act 1991

In South Australia, under the *Native Vegetation Act 1991* (NV Act), all clearance of native vegetation requires the approval of the Native Vegetation Council (NVC) unless it is covered by a specific exemption contained within the *Native Vegetation Regulations 2003*.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

"Clearance", in relation to native vegetation, means:

- the killing or destruction of native vegetation
- the removal of native vegetation
- the severing of branches, limbs, stems or trunks of native vegetation
- the burning of native vegetation
- any other substantial damage to native vegetation including the draining or flooding of land.

Approval must be obtained before performing any activity that could cause substantial damage to native plants. This also applies to dead trees that may provide habitat for animals. These activities include but are not limited to:

- the cutting down, destruction or removal of whole plants
- the removal of branches, limbs, stems or trunks (including brushcutting and woodcutting)
- burning
- poisoning
- slashing of understorey
- drainage and reclamation of wetlands
- grazing by animals (in some circumstances).

Under the NV Act, the NVC considers applications to clear native vegetation under ten principles. Native vegetation should not be cleared if it is significantly at odds with the principles outlined below:

- it contains a high level of diversity of plant species
- it is an important wildlife habitat
- it includes rare, vulnerable or endangered plant species
- the vegetation comprises a plant community that is rare, vulnerable or endangered
- it is a remnant of vegetation in an area which has been extensively cleared
- it is growing in, or association with, a wetland environment
- it contributes to the amenity of the area
- the clearance of vegetation is likely to contribute to soil erosion, salinity, or flooding

- the clearance of vegetation is likely to cause deterioration in the quality of surface or underground water
- after clearance, the land is to be used for a purpose which is unsustainable.

The principles apply in all cases, except where the vegetation has been considered exempt under the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a Significant Environmental Benefit (SEB) to offset the clearance. The requirement for a SEB also applies to several of the exemptions. Potential SEB offsets include:

- the establishment and management of a set-aside area to encourage the natural regeneration of native vegetation.
- the protection and management of an established area of native vegetation.
- entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity.
- a payment to the Native Vegetation Fund (only where the above options are not possible).

The project area is situated within the Clare and Gilbert Valleys Council region which is subject to the *Native Vegetation Act 1991* and *Regulations 2017*. The project is likely to fall under Regulation 12(34) – Infrastructure or 12(27) - Major Projects. The process to undertake clearance and requirements are outlined in Section 7.

2.3 National Parks and Wildlife Act 1972

Vascular plants and vertebrate animals (e.g. mammals, birds, reptiles and amphibians) are protected in South Australia under the threatened species schedules of the *National Parks and Wildlife Act 1972* (NPW Act): Schedule 7 (endangered species), Schedule 8 (vulnerable species) and Schedule 9 (rare species). The criteria used to define threatened species in South Australia are generally based on categories and definitions from the IUCN Red List Categories and Criteria.

The current schedules do not include non-vascular plants, fish, insects, butterflies, spiders, scorpions and other invertebrates, fungi and other life forms which do not have a current legal conservation status in South Australia.

Under the NPW Act, persons must not:

- take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land
- take a native plant of a prescribed species on private land
- take a native plant on private land without the consent of the owner (such plants may also be covered by the *Native Vegetation Act 1991*)
- take a protected animal or the eggs of a protected animal without approval

- keep protected animals unless authorised to do so
- kill a protected animal without approval.

2.4 Natural Resources Management Act 2004

Under the *Natural Resources Management Act 2004* (NRM Act), landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals, and activities that might result in land degradation.

A 'duty of care' is a fundamental component of this Act, i.e. ensuring one's environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

The project area is within the Northern and Yorke Natural Resources Management Board Region.

3 BACKGROUND INFORMATION

3.1 Environmental setting

3.1.1 Interim Biogeographical Regionalisation of Australia (IBRA) zones and remnancy

Interim Biogeographical Regionalisation of Australia (IBRA) is a landscape based approach to classifying the land surface across a range of environmental attributes, which is used to assess and plan for the protection of biodiversity (DEWNR 2011). The survey area is located within the Flinders Lofty Block IBRA bioregion, the Broughton sub-region and the Hansen environmental association (Table 1).

Table 1. IBRA bioregion, subregion, and environmental association environmental landscape summary.

Flinders Lofty Block IBRA bioregion	
Temperate to arid Proterozoic ranges, alluvial fans and plains, and some outcropping volcanics, with the semi-arid to arid north supporting native cypress, black oak (*belah*) and mallee open woodlands, *Eremophila* and *Acacia* shrublands, and bluebush/saltbush chenopod shrublands on shallow, well-drained loams and moderately-deep, well-drained red duplex soils. The increase in rainfall to the south corresponds with an increase in low open woodlands of *Eucalyptus obliqua* and *E. baxteri* on deep lateritic soils, and *E. fasciculosa* and *E. cosmophylla* on shallower or sandy soils.	
Broughton IBRA subregion	
This subregion is characterised by a series of wide undulating intramontane basins with red duplex soils, separated by low but distinct northerly trending strike ridges. In the north the region leads into the Southern Flinders Ranges with no sharply defined landform boundary but a land use boundary marking the northern extremity of wheat cultivation. Due to widespread clearing for farming the only significant remnant of native vegetation is found in the Mt Remarkable area, where an open forest dominated by *Eucalyptus cladocalyx* or by *E. goniocalyx* and *E. leucoxylon* on reddish dense loams remains. Degraded remnants of *E. leucoxylon* and *E. odorata* woodlands can still be found on stony crests and steep slopes.	
Remnant vegetation	Approximately 10% (106330 ha) of the subregion is mapped as remnant native vegetation, of which 3% (3064 ha) is formally conserved
Landform	Hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south, hilly dissected tableland
Geology	Dissected lateralised surface in south
Soil	Hard setting loams with red clayey subsoils, Highly calcareous loamy earths, Hard setting loams with mottled yellow clayey subsoil, Coherent sandy soils, Cracking clays
Vegetation	Assumed native vegetation cover
Conservation significance	55 species of threatened fauna, 113 species of threatened flora. 0 wetlands of national significance.
Hansen IBRA environmental association	
Remnant vegetation	Approximately 3% (3738 ha) of the association is mapped as remnant native vegetation, of which 1% (28 ha) is formally conserved
Landform	Gentle foot slopes forming extensive intramontane plains, with occasional narrow strike ridges on metasediments.
Geology	Colluvium, metasediments and alluvium.
Soil	Hard pedal red duplex soils, reddish powdery calcareous loams, brown self-mulching cracking clays and black self-mulching cracking clays.

Vegetation	Low shrubland of samphire.
Conservation significance	24 species of threatened fauna, 43 species of threatened flora. 0 wetlands of national significance.

Source (DEWNR 2011).

3.1.2 Protected areas

The nearest NPW Act reserve is Martindale Hall Conservation Park, 2.6 km southwest of project area and Spring Gully Conservation Park, 11.8 km west of the project area (DEWNR 2017b).

Within the project area and surrounds, there are no existing heritage agreements, clearance applications or SEB offset areas under the *Native Vegetation Act 1991*. There are no DPTI road or rail significant sites (DEWNR 2017b).

3.1.3 Other

The project area is within a medium risk area for Phytophthora. There are no nearby records of Phytophthora (DEWNR 2017b).

4 METHODS

4.1 Database searches

A Protected Matters Report was generated on 4 October 2017 to identify matters of national environmental significance under the EPBC Act that may occur or may have suitable habitat occurring within the project area. A buffer of 10 km was applied for this search (DOEE 2017).

A Biological Database of South Australia (BDBSA) search was obtained from the Department of Environment Water and Natural Resources (DEWNR) on 27 September 2017, to identify flora and fauna species previously recorded within and around the project area (10 km buffer) (DEWNR 2017a). The BDBSA is comprised of an integrated collection of corporate databases which meet DEWNR standards for data quality, integrity and maintenance. In addition to DEWNR biological data the BDBSA also includes data from partner organisations (Birds Australia, Birds SA, Australasian Wader Study Group, SA Museum, and other state government agencies). This data is included under agreement with the partner organisation for ease of distribution but they remain owners of the data and should be contacted directly for further information.

Existing spatial datasets, relevant literature, aerial imagery and previous survey information where relevant was reviewed. This information was used to build a picture of:

- native vegetation cover within the project area and immediate surrounds;
- previous survey effort in the area;
- vegetation associations present (including associations of significance) and their condition;
- flora and fauna species (including species of national or state conservation significance) known or likely to occur in the area.

Any threatened species previously recorded within the area, or highlighted as potentially occurring in the area, were researched (if necessary) to determine whether suitable habitat for these species exists within the project area.

4.2 Field survey

4.2.1 Vegetation

A field survey was undertaken on 24th to 26th September 2017. The project area was traversed via vehicle and on foot to map vegetation associations. A roaming-style survey approach was adopted, opportunistically recording flora species as they were observed within the project area. The locations of any threatened flora species (if present) and significant weed infestations were recorded. Species nomenclature used in this report follows that used in the Biological Database of South Australia (BDBSA) as at November 2017.

A vegetation survey was performed in accordance with the Native Vegetation Council (NVC) methodology as outlined in the following documents:

- Bushland Assessment Manual (Government of South Australia 2017b)
- Scattered Tree Assessment Manual (Government of South Australia 2017c).

Representative patches of intact native vegetation were assessed using the Small Site Bushland Assessment Scoresheet. Scattered remnant trees (where <5 % native understorey was present) were assessed individually or as clumps.

Once the clearance footprint is known; and if clearance of scattered trees is proposed, the SEB offset will be calculated using the DEWNR Scattered Tree Assessment Scoresheet. Where clearance of remnant vegetation patches is proposed, the SEB offset area will be calculated using the DEWNR Bushland Assessment Scoresheet.

4.2.2 Fauna

The project area was traversed via vehicle and on foot where accessible. All fauna species opportunistically observed (including scats, tracks and heard) were recorded. A visual assessment was undertaken of the habitat value of the project area for native fauna. The suitability of habitat was assessed for the nationally endangered Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*) and the nationally vulnerable Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*). Rocks and fallen trees were flipped and the loose soil underneath raked to check for the presence of Flinders Ranges Worm-lizard. Spider holes were checked with a burrowscope in areas with appropriate habitat for the presence of Pygmy Blue-tongue Lizard.

Species nomenclature used in this report follows that used in the Biological Database of South Australia as at November 2017.

4.3 Constraints and limitations

4.3.1 Desktop assessment

BDBSA flora and fauna records were limited to a 10 km buffer around the project area. It is acknowledged that the presence of species, including species of conservation significance, may not be adequately represented by database records.

4.3.2 Field survey

The findings, observations and conclusions expressed by EBS Ecology are based solely upon site conditions and information in existence at the time of the investigation.

Rapid assessment was undertaken along the roadsides. The railway line was not driveable. Vegetation data was estimated for this area based on walking the first 100 m and a visual assessment of the remainder. Given the low likelihood of this area being impacted and the lack of native species observations, estimate data only was recorded for the amenity trees present.

The October timing of the survey was suitable for the detection and identification of many plant species however some species could only be identified to genus level due to a lack of distinguishing features. It is possible that some species were not visibly present and therefore not detected. The fauna survey was limited to opportunistic records and represents a limited snapshot of the fauna that would utilise the site.

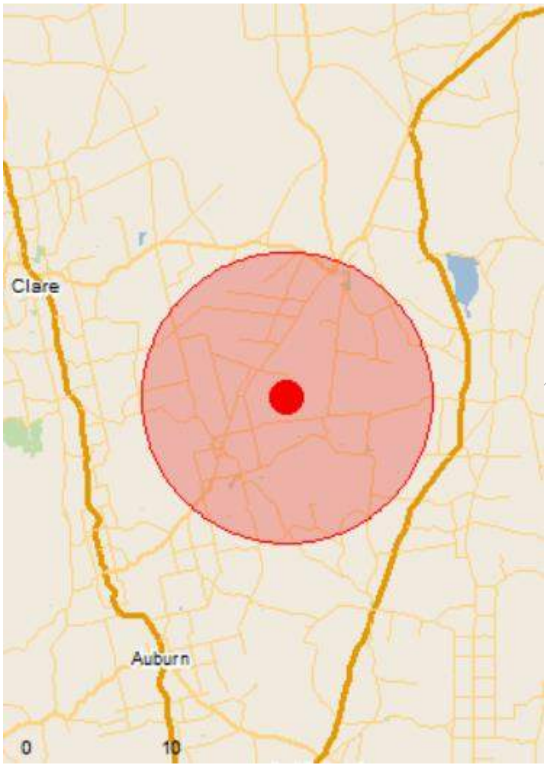
The field assessment combined with database records was however considered adequate to make a reasonable assessment of potential impacts of the project.

5 RESULTS

5.1 Matters of national environmental significance

The results of the EPBC Protected Matters Search are summarised in Table 2 and the relevant matters of national environmental significance (MNES) further discussed below.

Table 2. Summary of the results of the EPBC Act Protected Matters Search.

Search area (10 km buffer around centroid of project area)	**Matters of national environment significance under the EPBC Act 1999**	**Identified within the search area**
	World heritage properties	None
	National heritage properties	None
	Wetlands of international significance	None
	Great Barrier Reef Marine Park	None
	Commonwealth marine areas	None
	Threatened ecological communities	2
	Threatened species	23
	Migratory species	12
	Commonwealth land	None
	Commonwealth heritage places	None
	Listed marine species	17
	Whales and other cetaceans	None
	Critical habitats	None
	Commonwealth reserves terrestrial	None
	Commonwealth reserves marine	None
	State and territory reserves	2
	Regional forest agreements	None
	Invasive species	33
	Nationally important wetlands	None
	Key ecological features (Marine)	None

5.1.1 Threatened ecological communities

Two Threatened ecological communities (TECs) were identified in the Protected Matters Search:

- Iron-grass Natural Temperate Grassland of South Australia - Critically Endangered
- Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia - Critically Endangered.

The field survey found that neither vegetation community was present within the project area.

5.1.2 Threatened flora species

Sixteen EPBC listed flora species were identified in the EPBC Protected Matters Search as potentially occurring or having habitat potentially occurring within the vicinity of the project area (Table 3). None of these species have been detected or are likely to occur within the project area.

One of the species, *Dodonaea procumbens* (Trailing Hop-bush), listed as nationally vulnerable, is considered as possibly occurring given nearby records and the species' relative inconspicuousness (and hence potential for non-detection given the broad nature of the survey). *Dodonaea procumbens* has been previously recorded within the following vegetation associations:

- Open *Eucalyptus camaldulensis*, *E. fasciculosa* and *E. leucoxylon* Woodlands in low-lying areas
- *Lepidosperma viscidum*, *Themeda triandra*, *Rhytidosperma* spp., *Austrostipa* spp. Native Grasslands
- With shrubs, including *Acacia acinacea, D. viscosa* and *Bursaria spinosa*.

There are 32 records of *Dodonaea procumbens* within 10 km of the project area, including from Mintaro Cemetery, within roadside vegetation, along the Barrier Highway, within plantation reserve east of Holm Hill and south-west of Black Springs (DEWNR 2017a).

Dodonaea procumbens was conservatively assessed as potentially present for areas that were rapidly assessed, such as the road and rail reserves. It is unlikely to be present within the cropped and mixed grassland areas, where it is presumed infrastructure will be focused.

Two of the other EPBC listed flora species have BDBSA records within 10 km of the project area:

- *Acacia glandulicarpa* (Hairy-pod Wattle) – EPBC vulnerable. Two records; Flagstaff Road 3.7 km WNW of Black Springs, along roadside in Mixed Native sp. / Exotic sp. Grassland; and 5.5 km WNW of Farrell Flat.
- *Acacia spilleriana* (Spiller's Wattle) – EPBC endangered. Two records; 2.6 km NNW of Manoora, and another 1.5 km SSW of Porter Lagoon in the bed of quarry.

Neither species was observed during the field survey.

Table 3. Threatened flora species identified by EPBC Protected Matters Search as possibly occurring within the project area.

Scientific name	Common name	Conservation status		Likelihood of occurrence within project area
		Aus.	SA	
Acacia glandulicarpa	Hairy-pod Wattle	VU	E	Unlikely
Acacia spilleriana	Spiller's Wattle	EN	E	Unlikely
Caladenia argocalla	White-beauty Spider-orchid	EN	E	Unlikely
Caladenia gladiolata	Bayonet Spider-orchid	EN	E	Unlikely
Caladenia macroclavia	Large-club Spider-orchid	EN	E	Unlikely
Caladenia tensa	Greencomb Spider-orchid	EN		Unlikely
Caladenia woolcockiorum	Woolcock's Spider-orchid	VU	E	Unlikely

Scientific name	Common name	Conservation status		Likelihood of occurrence within project area
		Aus.	SA	
Caladenia xantholeuca	White Rabbits	EN	E	Unlikely
Dodonaea procumbens	Trailing Hop-bush	VU	V	Possible
Euphrasia collina subsp. osbornii	Osborn's Eyebright	EN	E	Unlikely
Glycine latrobeana	Clover Glycine	VU	V	Unlikely
Olearia pannosa subsp. pannosa	Silver Daisy-bush	VU	V	Unlikely
Prasophyllum pallidum	Pale Leek-orchid	VU	R	Unlikely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

5.1.3 Threatened fauna species

Ten EPBC listed fauna species were identified in the EPBC Protected Matters Report as potentially occurring or having habitat potentially occurring within the vicinity of the project area (Table 4). This includes six bird, two fish and two reptile species. None of these species have BDBSA records within 10 km of the project area. None of the bird species identified are likely to occur based on species records, known distribution, lack of preferred habitat and survey results.

Both threatened fish are considered unlikely to occur within the ephemeral creek line. Flathead Galaxias (*Galaxias rostratus*) is considered extinct in SA in the Action Plan for South Australian Freshwater Fishes (Hammer et al. 2009). There is a single record of Murray Cod (*Maccullochella peelii*) from the Hutt River at the main road crossing south of Spalding, from 2002. This record represents an outlier in the known distribution of the species (ALA 2017).

Pygmy Blue-tongue Lizards (PBTL) are considered unlikely to occur based on the habitat conditions within the project area (see Section 5.3.6 and Section 6.2.1). The Flinders Ranges Worm-lizard (FRWL) could possibly occur along the creek line and within areas of exotic grassland where undisturbed surface, surface rock, litter/fallen trees are present (see Section 5.3.7 and Section 6.2.2).

Table 4. Threatened fauna species identified by EPBC Protected Matters Search as possibly occurring within the project area.

Scientific name	Common name	Conservation status		Likelihood of occurrence within project area
		Aus	SA	
Birds				
Calidris ferruginea	Curlew Sandpiper	CE, Mi (W)		Unlikely
Grantiella picta	Painted Honeyeater	VU	V	Unlikely
Numenius madagascariensis	Eastern Curlew	CE, Mi (W)	V	Unlikely
Pedionomus torquatus	Plains-wanderer	CE	E	Unlikely
Pezoporus occidentalis	Night Parrot	EN	E	Unlikely
Rostratula australis	Australian Painted Snipe	EN	V	Unlikely
Fish				
Galaxias rostratus	Flathead Galaxias	CE		Unlikely
Maccullochella peelii	Murray Cod	VU		Unlikely
Reptiles				
Aprasia pseudopulchella	Flinders Ranges Worm-lizard	VU		Possible

Tiliqua adelaidensis	Pygmy Blue-tongue Lizard	EN	E	Unlikely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. Mi: Migratory (Ma: Marine, T: Terrestrial, W: Wetland).

5.1.4 Migratory species

Twelve bird species listed as migratory under the EPBC Act were identified in the EPBC Protected Matters Search as potentially occurring or having habitat potentially occurring within the vicinity of the project area (Table 5). None of the twelve species have been recorded during surveys. The Fork-tailed Swift (*Apus pacificus*) could possibly occur as occasional visitors to the project area.

Listed Marine species have not been listed as the rating is only relevant to Commonwealth Marine areas, which is not relevant to the project.

Table 5. Migratory bird species identified by EPBC Protected Matters Search Tool as possibly utilising or flying over the project area.

Scientific name	Common name	Conservation status		Likelihood of occurrence within project area
		Aus	SA	
Actitis hypoleucos	Common Sandpiper	Mi (W)		Unlikely
Apus pacificus	Fork-tailed Swift	Mi (Ma)		Possible
Calidris acuminata	Sharp-tailed Sandpiper	Mi		Unlikely
Calidris ferruginea	Curlew Sandpiper	CE, Mi (W)		Unlikely
Calidris melanotos	Pectoral Sandpiper	Mi		Unlikely
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Mi (W)	R	Unlikely
Hirundapus caudacutus	White-throated Needletail	Mi (T)		Unlikely
Motacilla cinerea	Grey Wagtail	Mi (T)		Unlikely
Motacilla flava	Yellow Wagtail	Mi (T)		Unlikely
Myiagra cyanoleuca	Satin Flycatcher	Mi (T)	E	Unlikely
Numenius madagascariensis	Eastern Curlew	CE, Mi (W)	V	Unlikely
Pandion haliaetus	Osprey	Mi (W)	E	Unlikely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. Mi: Migratory (Ma: Marine, T: Terrestrial, W: Wetland).

5.2 Matters of state environmental significance

This section summarises the BDBSA search results for flora and fauna that are matters of state environment significance.

5.2.1 Flora

The BDBSA search identified 25 state conservation rated flora species with records within 10 km of the project area (Figure 3) (DEWNR 2017a). These species are shown in Table 6 with an assessment of their likelihood of occurrence within the project area.

No threatened flora species were recorded during the field survey. Based on the database records and the species' relative inconspicuousness (and hence potential for non-detection during the broad level survey), two state listed flora species are considered as possibly occurring within the project area:

- *Dodonaea procumbens,* discussed above in Section 5.1.2
- *Rytidosperma tenuius* – one record is known from 1.3 km WSW of Mount Horrocks. This species is known more generally from disturbed road verges

Table 6. Threatened flora species identified from the BDBSA search.

Scientific name	Common name	Conservation status		Last sighting (year)	Likelihood of occurrence within project area
		Aus	SA		
Acacia genistifolia	Broom Wattle		E	1990	Unlikely
Acacia glandulicarpa	Hairy-pod Wattle	VU	E	2001	Unlikely
Acacia spilleriana	Spiller's Wattle	EN	E	1989	Unlikely
Austrostipa breviglumis	Cane Spear-grass		R	1953	Unlikely
Austrostipa gibbosa	Swollen Spear-grass		R	2005	Unlikely
Bothriochloa macra	Red-leg Grass		R	1988	Unlikely
Crassula peduncularis	Purple Crassula		R	1993	Unlikely
Cryptandra campanulata	Long-flower Cryptandra		R	1997	Unlikely
Dianella longifolia var. grandis	Pale Flax-lily		R	1992	Unlikely
Dodonaea procumbens	Trailing Hop-bush	VU	V	2008	Possible
Eragrostis infecunda	Barren Cane-grass		R	1987	Unlikely
Eryngium ovinum	Blue Devil		V	1997	Unlikely
Eucalyptus macrorhyncha ssp. macrorhyncha	Red Stringybark		R	1980	Unlikely
Goodenia heteromera	Spreading Goodenia		R	1995	Unlikely
Maireana excavata	Bottle Fissure-plant		V	1994	Unlikely
Maireana rohrlachii	Rohrlach's Bluebush		R	1994	Unlikely
Montia australasica	White Purslane		R	1993	Unlikely
Philotheca verrucosa	Bendigo Wax-flower		V	1962	Unlikely
Podolepis muelleri	Button Podolepis		V	1992	Unlikely
Ptilotus erubescens	Hairy-tails		R	1997	Unlikely
Pultenaea kraehenbuehlii	Tothill Bush-pea		R	1971	Unlikely
Rumex dumosus	Wiry Dock		R	1993	Unlikely
Rytidosperma tenuius	Short-awn Wallaby-grass		R	2013	Possible

Scientific name	Common name	Conservation status		Last sighting (year)	Likelihood of occurrence within project area
		Aus	SA		
Sclerolaena muricata var. villosa	Five-spine Bindyi		R	1993	Unlikely
Swainsona behriana	Behr's Swainson-pea		V	1996	Unlikely

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

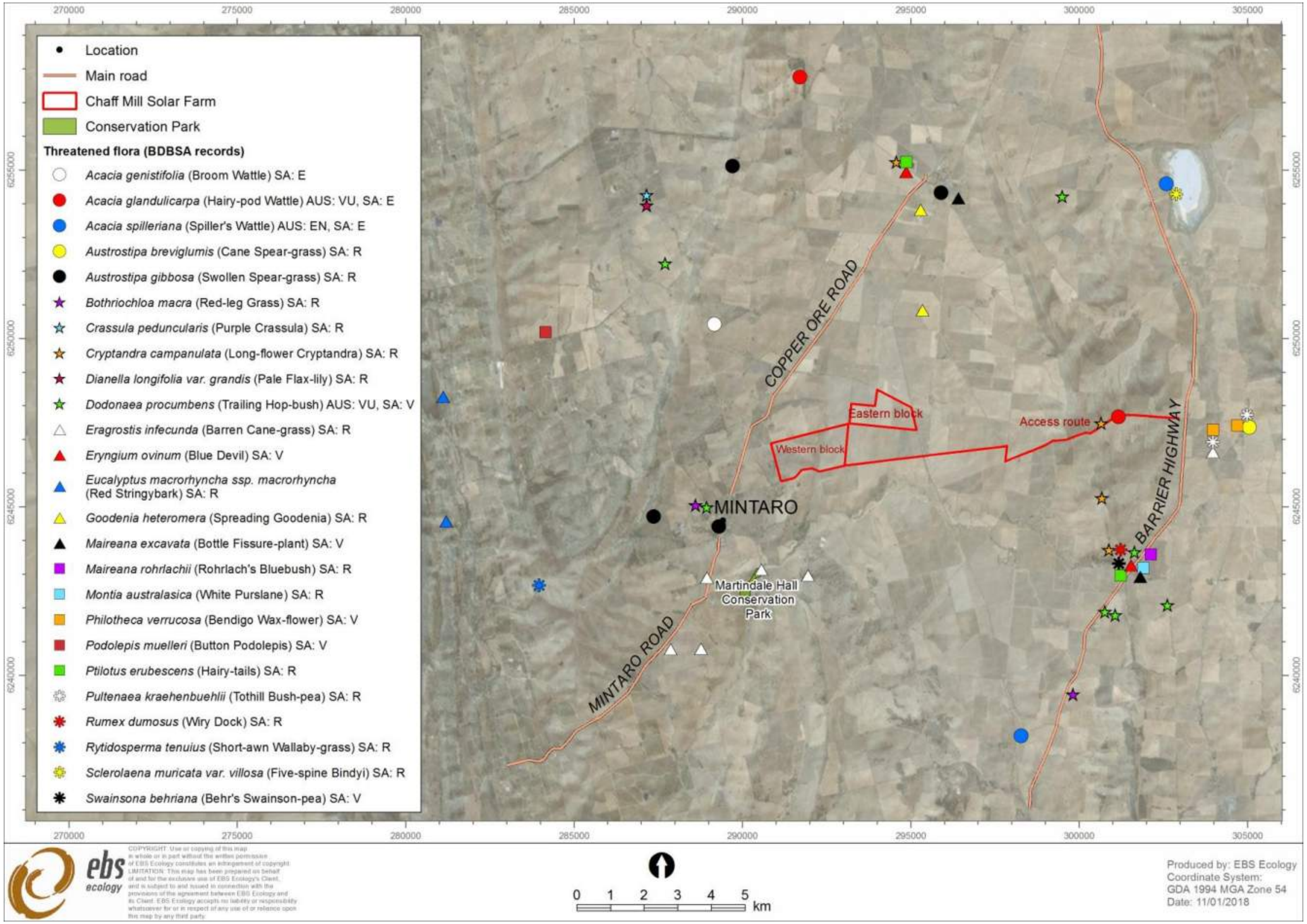


Figure 3. Location of threatened flora species records identified with the BDBSA search.

5.2.2 Fauna

The BDBSA search identified six state threatened bird species, one state threatened mammal and one state threatened amphibian with records within 10 km of the project area (Figure 4) (DEWNR 2017). These species are shown in Table 7 with an assessment of their likelihood of occurrence within the project area. The White-winged Chough (*Corcorax melanorhamphos*) was recorded during the field survey. Four other bird species could possibly occur based on species distribution and available habitat. The Brown Toadlet (*Pseudophryne bibronii*) could possibly be present along the ephemeral creek line within the western block. The Common Brushtail Possum (*Trichosurus vulpecula*) may occupy the established trees (remnant and planted).

Table 7. Threatened fauna species identified from the BDBSA search.

Scientific name	Common name	Conservation status		Last sighting (year)	Likelihood of occurrence within project area
		Aus	SA		
Amphibian					
Pseudophryne bibronii	Brown Toadlet		R	2003	Possible
Bird					
Corcorax melanorhamphos	White-winged Chough		R	2006	Known
Falco peregrinus	Peregrine Falcon		R	2003	Possible
Neophema elegans	Elegant Parrot		R	2006	Possible
Oxyura australis	Blue-billed Duck		R	2003	Unlikely
Petroica phoenicea	Flame Robin		V	2001	Possible
Turnix varius	Painted Buttonquail		R	2003	Possible
Mammal					
Trichosurus vulpecula	Common Brushtail Possum		R	2003	Possible

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Park and Wildlife Act 1972*). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare.

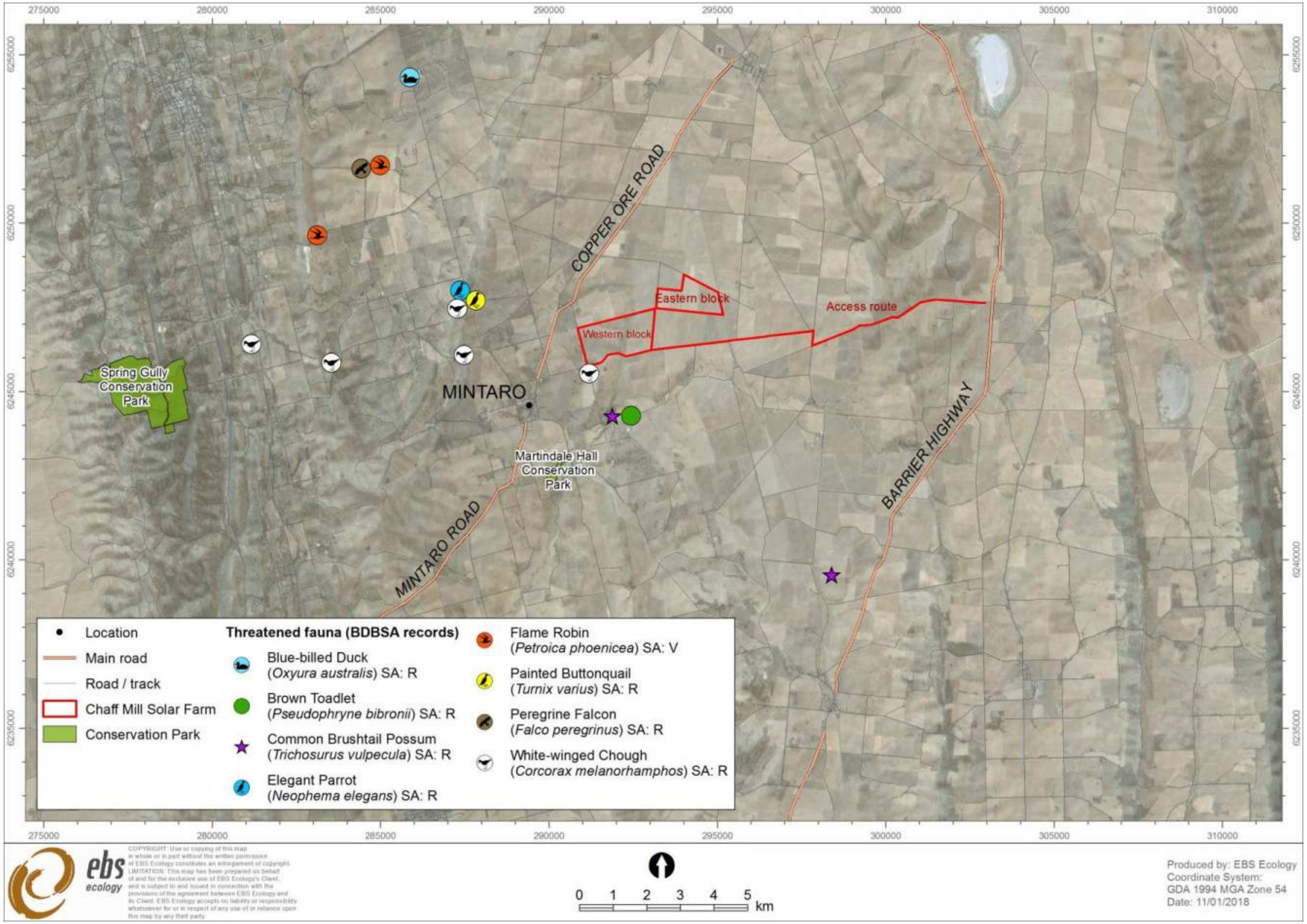


Figure 4. Location of threatened fauna species records identified with the BDBSA search.

5.3 Field survey

5.3.1 Landscape summary

The project area is mostly cleared of native vegetation and is under crop. There is a large patch of remnant *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland Blue Gum) in the western corner of the project area where it is too steep to cultivate. The understory is grazed and comprised of exotic grassland species. The creek line running through the western block is highly degraded with very limited native understory species present. The western block is bordered on the western side by a relatively steep rocky escarpment. Amenity plantings, mostly comprised of native species, occur as small patches within the project area and as narrow strips along the roadsides. Small strips of remnant native woodland and shrubland also occur along some roadside.

5.3.2 Vegetation associations

Six broad vegetation associations were recorded within the project area:

- *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland
- *Allocasuarina verticillata* (Drooping Sheoak) Woodland
- *Acacia paradoxa* (Kangaroo Thorn) Shrubland
- Mixed Amenity Planting +/- scattered natives
- Exotic Grassland
- Crop.

Table 8 summarises the extent and location of the surveyed vegetation associations.

Table 8. Location and area (ha) of vegetation associations surveyed.

Vegetation association	Location			Total (ha)
	Access route	**Eastern block**	**Western block**	
1. *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland		0.09	19.87	**19.96**
2. *Allocasuarina verticillata* (Drooping Sheoak) Woodland	1.50		0.32	**1.82**
3. *Acacia paradoxa* (Kangaroo Thorn) Shrubland	0.81		0.54	**1.36**
4. Mixed Amenity Planting +/- scattered natives	7.38	3.06	1.03	**11.47**
5. Exotic Grassland	12.29		76.43	**88.71**
6. Crop		141.66	146.26	**287.92**
Total (ha)	**21.98**	**144.82**	**244.44**	**411.24**

The vegetation associations are further described below and are shown within the eastern block (Figure 5), western block (Figure 6) and the access route along Flagstaff Road (Figure 7).

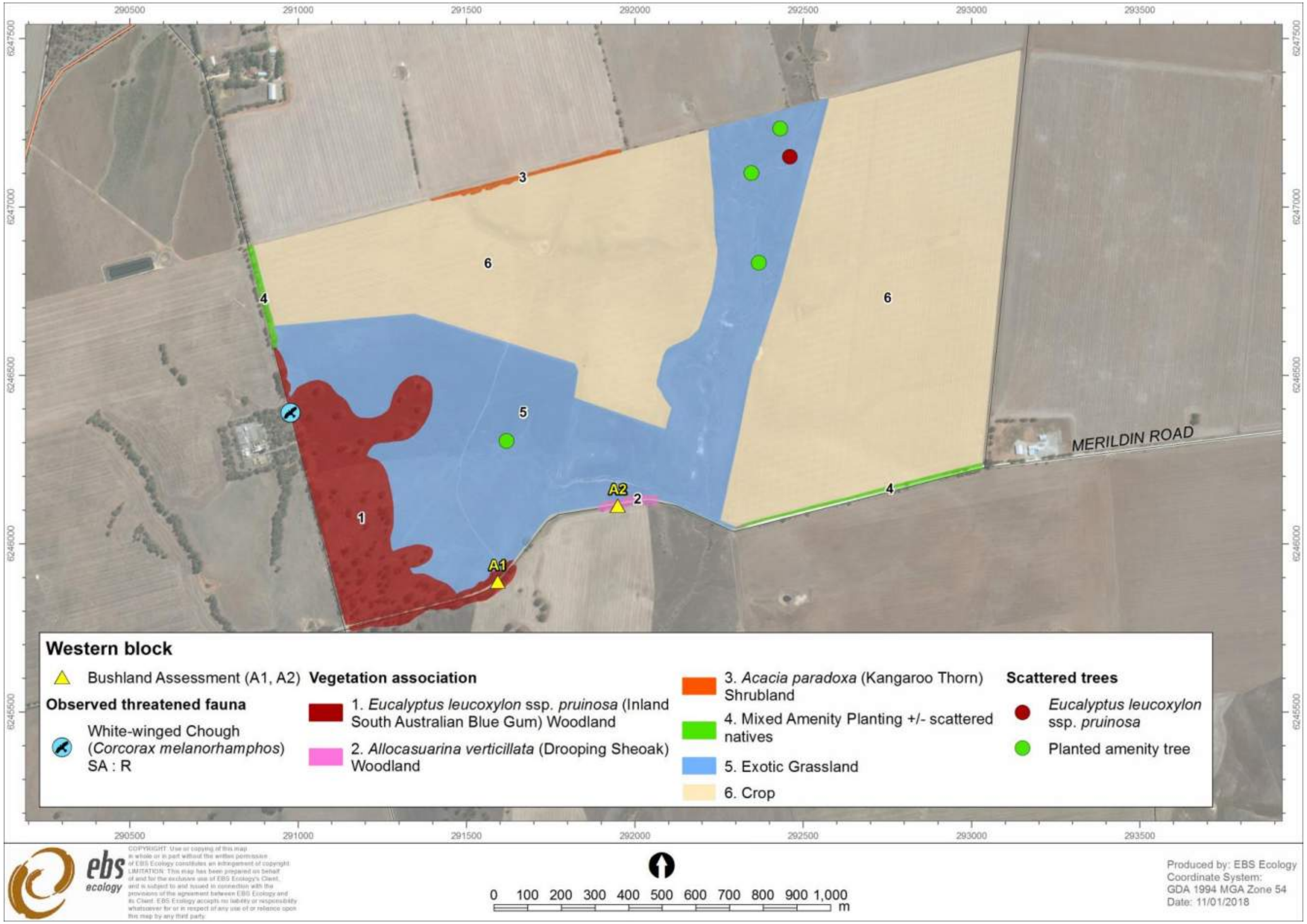


Figure 5. Vegetation associations across the western block of the project area.

Figure 6. Vegetation associations across the eastern block of the project area.

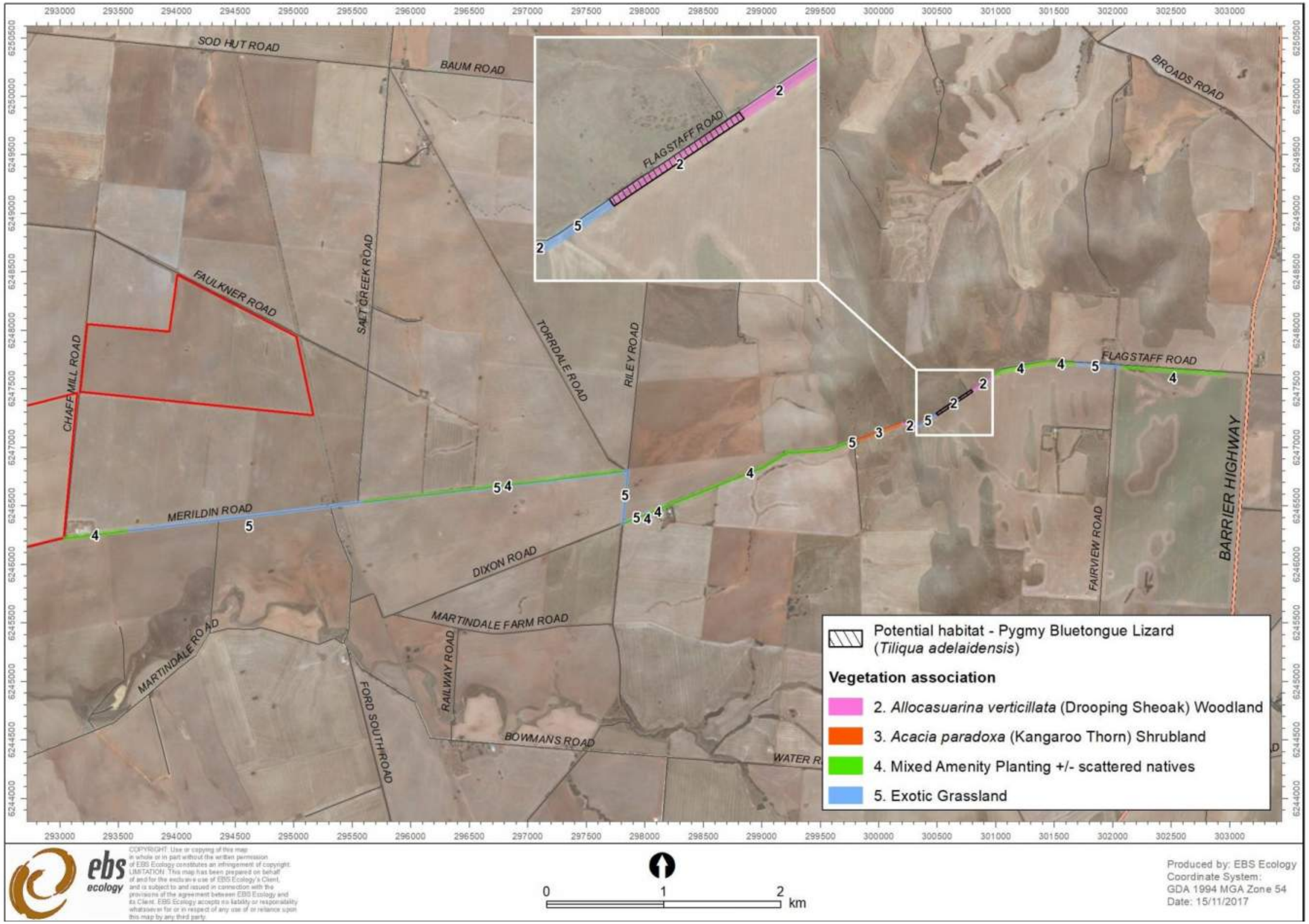


Figure 7. Vegetation associations along the access route of the project area.

Vegetation Association 1: *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland

Remnant *Eucalyptus leucoxylon* were present in the SW corner of the western block. These provide excellent bird habitat with lots of hollows in the mature trees. No recruitment of young trees was observed. The scattered remnant *E. leucoxylon* extended into *Eucalyptus leucoxylon* ssp. *pruinosa* Woodland over *Acacia paradoxa* at the southern end of Wookie Creek Road and continued into Merildin Road where a bushland assessment was performed. A small patch of remnant *Eucalyptus leucoxylon* ssp. *pruinosa* Woodland occurred on the western boundary of the eastern block.

Impact to this remnant vegetation should be avoided (i.e. the south western corner with remnant trees and the roadsides). On the western block, the *Eucalyptus leucoxylon* ssp. *pruinosa* Woodland occurred on a steep and rocky slope.

Figure 8. Vegetation Association 1: *Eucalyptus leucoxylon* ssp. *pruinosa* Woodland, SW corner of the western block.

Vegetation Association 2: *Allocasuarina verticillata* (Drooping Sheoak) Woodland

Three patches of remnant *Allocasuarina verticillata* Woodland occurred on the project area along Flagstaff Road. One remnant patch contained *A. verticillata* over native understorey species +/- introduced grasses. A second group contained *A. verticillata* over *Xanthorrhoea quadrangulata* and had a good diversity of native understorey species. This area would require further investigation if clearing was proposed due to the conservation value of the vegetation and potential for spider holes (PBTL habitat). The third patch contained *A. verticillata* and *Acacia pycnantha* over exotic grasses. The condition of this association was primarily determined by the presence of native understorey species and varied from poor to moderate.

Another group of remnant *Allocasuarina verticillata* over *Lomandra multiflora dura* occurred on the southern boundary of the western block along Merildin Road. The condition of the understorey was assessed as poor.

Figure 9. Vegetation Association 2: *Allocasuarina verticillata* Woodland over *Xanthorrhoea quadrangulata* along the access route Flagstaff Road.

Vegetation Association 3: *Acacia paradoxa* (Kangaroo Thorn) Shrubland

One patch of remnant *Acacia paradoxa* Shrubland occurred within the project area along Flagstaff Road. This association consisted of *A. paradoxa* over exotic grasses and herbs. A second patch of *Acacia paradoxa* over *Lycium ferocissimum* was observed on the northern boundary of the western block but this area was not accessible and was therefore not assessed.

Figure 10. Vegetation Association 3: *Acacia paradoxa* Shrubland along the access route, Flagstaff Road.

Vegetation Association 4: Mixed Amenity Planting +/- scattered natives

The perimeter of the project area around both the eastern and western blocks mostly contained roadside vegetation comprised of mixed amenity plantings.

Around the eastern block the amenity plantings occurred along Faulkner Road and the railway corridor as well as within the paddock. These plantings included *Eucalyptus leucoxylon* over exotic grasses and herbs, one *Pinus* tree species and groups of deciduous trees over cropping. Around the western block, Wookie Creek Road contained amenity planted *Eucalyptus camaldulensis* and *E. leucoxylon* over *Acacia paradoxa*, *Acacia notabilis* and other native and exotic grasses and herbs.

The roadside vegetation along Meridlin Road contained:

- remnant *Acacia pycnantha*, *Allocasuarina verticillata* and *Acacia* spp.
- amenity planted *A. paradoxa* and *Eucalyptus* spp. over exotic species
- *E. leucoxylon*, *A. pycnantha* and *Eucalyptus* spp.
- *A. verticillata* over exotic grasses.

The roadside vegetation along Flagstaff Road contained:

- *Casuarina cunninghamiana*, *A. verticillata*, *Bursaria spinosa*, *Pinus* spp., *Melaleuca* spp., *Eucalyptus* spp. and *Fraxinus* spp.
- *Callitris* spp. and *Eucalyptus* spp. over *Acacia* spp. and exotic grasses.
- *A. verticillata*, *Eucalyptus* spp., *A. pycnantha*, *Callitris* spp. and *Melaleuca* spp.

Figure 11. Vegetation Association 4: Mixed Amenity Planting +/- scattered natives along Faulkner Road, the northern perimeter of eastern block.

Vegetation Association 5: Exotic Grassland

Exotic Grassland covered a large proportion of the western block. Exotic Grassland bordered a creek line that passes through the western block and surrounded a group of remnant *Eucalyptus leucoxylon* ssp. *pruinosa*. The groundcover in the Exotic Grassland was pasture grass used for grazing and contained the exotic species *Rosa canina* (Dog rose), which is state listed as a declared plant. There were small areas of native grass and sedge that were extremely degraded as they were surrounded by weeds. Some native and non-native amenity plantings were also present within the Exotic Grassland near the creek line. The Exotic Grassland had a few stony outcrop areas that contain spider holes however these did not occur in habitat suitable for Pygmy Blue-tongue Lizards. Although Flinders Ranges Worm-lizard was not detected in this area, the habitat is suitable for this species. Apart from the remnant scattered *Eucalyptus leucoxylon* ssp. *pruinosa*, the Exotic Grassland was surrounded by cropping and roadsides containing native and non-native amenity plantings.

A large proportion of the access route along Meridlin Road also contained Exotic Grassland.

Figure 12. Vegetation Association 5: Exotic Grassland following the creek line on the western block.

Vegetation Association 6: Crop

The cropping area dominated the landscape across both blocks within the project area. The eastern block was completely covered with cropping and over 50% of the western block was cropped. There is no native vegetation present within the cropped areas however there are four areas of amenity plantings within the eastern block. The areas surrounding this association comprise Exotic Grassland and roadside/rail corridors. The surrounding roadside/rail corridors contain either weeds with no native understorey species or a mix of native and non-native amenity plantings.

Figure 13. Vegetation Association 6: Crop along SW corner of eastern block.

5.3.3 Bushland and scattered tree assessment scores

A scattered tree assessment was performed on the large patch of Vegetation Association 1: *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland. A total of 200 trees that were all *Eucalyptus leucoxylon* ssp. *pruinosa* were assessed. Many of these trees contained hollows of various sizes and were considered of high biodiversity value.

Two Bushland assessments were performed on the perimeter of the western block along Meridlin Road. The first assessment (A1) determined that the condition of the vegetation within Vegetation Association 1:

Eucalyptus leucoxylon ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland was poor to moderate. The second assessment (B1) determined that the condition of the vegetation within Vegetation Association 2: *Allocasuarina verticillata* (Drooping Sheoak) Woodland was poor.

5.3.4 Flora

A total of 54 flora species were recorded during the survey, this included 32 native species and 22 exotic species (Appendix 1). None of the native species recorded have a conservation rating. Four of the exotic species recorded are listed as declared under the *Natural Resources Management Act 2004* (Table 9).

Table 9. Declared species recorded within the project area.

Family name	Species name	Common name
BORAGINACEAE	*Echium plantagineum*	Salvation Jane
LABIATAE	*Marrubium vulgare*	Horehound
OLEACEAE	*Olea europaea* ssp.	Olive
ROSACEAE	*Rosa canina*	Dog Rose

5.3.5 Fauna

A total of 34 bird species were recorded across the project area (Appendix 2). One species had a conservation rating under the NPW Act: *Corcorax melanorhamphos* (White-winged Chough) is listed as rare in SA and was found in Vegetation Association 1: *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland South Australian Blue Gum) Woodland. All other species observed are considered to be common and widespread.

One mammal species was observed in the project area (Appendix 2): *Macropus fuliginosus* (Western Grey Kangaroo). This species is also considered to be common and widespread.

Frogs (unknown species) were observed within the creek line where water was present.

5.3.6 Pygmy Blue-tongue Lizard

The Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*), herein referred to as PBTL, is listed as Endangered under the EPBC Act and the NPW Act.

The PBTL is a moderate sized skink with short limbs, a relatively heavy body and large head, with a total length of less than 20 cm (Duffy et al, 2012). It is endemic to South Australia and occurs within the mid-north region of the state. The Pygmy Blue-tongue Lizard had been considered extinct until it was rediscovered near Burra in 1992 (the first record for 36 years). Since this time other small isolated populations of this species have been found in the mid-north region of South Australia, from north of Port Wakefield in the Hummocks to south of Peterborough and west of Clare.

The PBTL relies on spider burrows (made by wolf spiders and trapdoor spiders) as refuge sites and this can be used as an indicator of the species' potential presence. Availability of suitable spider holes which are stable and not subject to winter flooding has proven to restrain the species distribution (Milne 1999;

Milne et al. 2003; Souter et al. 2004). Suitable spider holes utilised as burrows are typically vertical and circular up to 20 mm in diameter (Milne et al. 2000) and 23 cm deep, although burrows as short as 12 cm have been utilised (Milne 1999). This species is known to occupy native grassland habitats (Milne 1999) and even highly degraded grasslands (dominated by exotic species) are potential habitat, providing that the area is unploughed and the soil structure remains intact (J. Schofield pers. comm. 2008).

The nearest known records of PBTL are approximately 15 km west (near Spring Gully Conservation Park) and 20 km south-west and north-east of the project area (DEWNR 2017b; Duffy et al. 2012).

The likelihood of PBTL being present is considered low given that most of the area was cropped and hence unsuitable and targeted searches revealed a lack of spider burrows in the remaining parts of the project area. Some spider burrows were observed along the access route on Flagstaff Road. These were checked with a burrowscope for PBTL occupancy but no PBTLs were observed.

5.3.7 Flinders Ranges Worm-lizard

The Flinders Ranges Worm-lizard *(Aprasia pseudopulchella*), herein referred to as FRWL, is listed as vulnerable under the EPBC Act.

The FRWL is a small cryptic legless lizard endemic to SA. It was delisted under the state *National Parks and Wildlife Act 1972* in 2008 as it is now believed to be relatively common and widespread in the region. At the time (approximately 1993) when the national conservation rating was assigned, little was known about the habits and abundance of the species (Threatened Species Scientific Committee 2008).

The preferred habitat of FRWL is open woodland, native tussock grassland, riparian habitat and rocky isolates within stony or clay soils with a stony surface. It can occur in quite degraded areas but surface rock, leaf litter, grass clumps and fallen timber are key habitat features. It can also burrow in sand and loose soil and may be found under debris or logs (Cogger *et al.* 1993, Cogger 2000), or under rocks (Wilson and Swan 2003).

FRWL is difficult to survey systematically because if the temperature is too hot or cold, the species will generally retreat underground. Temperatures between 24ºC and 30ºC are considered ideal as worm-lizards will come to the near surface for warmth in autumn and winter. Due to its nature, this species is not readily trapped in pitfall traps or funnel traps. Active search is considered the most efficient means of survey. This involves lifting rocks and searching through leaf litter and fallen timber in areas considered as potential habitat.

The nearest FRWL records are approximately 14.7 km east and 15.5 km northeast of the project area (DEWNR 2017b).

The habitat is largely unsuitable for FRWL with most of the soil structure disturbed due to cropping, and the lack of surface rock in grassland areas. FRWL could possibly occur along the creek line and within areas of exotic grassland where suitable habitat characteristics exist. A few stony outcrops and some loose rocks were present; these were actively searched however no Flinders Ranges Worm-lizards were observed. The temperature at the time of the survey was suitable for detection of FRWL.

Whilst the habitat suitability is assessed as low, the presence of FRWL cannot be discounted where the soil structure remains intact and surface cover is present.

6 POTENTIAL IMPACTS AND MITIGATION MEASURES

6.1 Vegetation

Native vegetation was mostly restricted to the steep area on the western side of the western block and along the road and railway corridors, either bordering the project area or on the proposed access route to the project area. The vegetation was generally in poor condition with the understory dominated by exotic species.

It is recommended that the infrastructure and access routes are aligned with cropping land where practical, as this vegetation association covers a high proportion of the project area, is of negligible value for fauna and occupies the flatter land. Areas of native woodland and shrubland (Associations 1, 2 and 3) and scattered trees should be avoided as they offer habitat for a range of fauna species within a surrounding landscape largely devoid of shrubs and trees.

The EPBC listed *Dodonaea procumbens* was conservatively assessed as potentially present for areas that were rapidly assessed, such as the road and rail reserves. If infrastructure placement is within the cleared areas and avoids native vegetation, it is unlikely that the species (if present) would be impacted.

6.2 Fauna

The fauna survey recorded one threatened species, the state rare White-winged Chough (*Corcorax melanorhamphos*). Given the isolation of the project area (4 km) from large remnants >50 ha (DEWNR 2017b), the habitat present may be non-preferable for species that are moderately or highly sensitive to remnant size and isolation. The remnant vegetation within the project area is expected to be most valuable for highly mobile threatened species, such as the Elegant Parrot (*Neophema elegans*) and Flame Robin (*Petroica phoenicea*), which make broad-scale movements in response to season and the abundance of food resources. The presence of highly mobile species within the project would be expected to be temporal with respect to the availability of food resources.

Many trees on the site contained hollows that are valuable for resident or nesting threatened species such as the Common Brushtail Possum (*Trichosurus vulpecula*) and the Elegant Parrot (*Neophema elegans*). The protection of trees with hollows is important for the reproductive success of nesting birds which can affect population recruitment.

Clearance of vegetation, either on the project site or along the access route, may have a direct impact on fauna through loss of habitat. The construction and operation of a solar farm may result in indirect loss of fauna through displacement due to disturbance, visual intrusion, physical barriers and altered conditions.

Research on impacts to birds and bats from solar farms is currently limited. A review of the current literature (Natural England 2017) suggests that solar farms have a low impact to birds and bats through collision with the solar panels. Overhead power lines may pose a risk of collision but this is considered minor and is no different to the collision risk for other transmission lines. The only overhead line proposed for the project is a short connection line to the existing overhead transmission line. It is possible that the reflected polarised light from solar panels may attract insects that impact the behaviour of specific guilds of birds and bats, and birds may mistake the solar panels for drinking water. The client has advised that the solar panels are designed to absorb rather than reflect light and new models do not have reflective metals frames as in the past.

The mid-north has become a hub for clean energy projects, with the focus to date being wind generated power. The cluster of wind turbines and associated infrastructure across the region could have a cumulative effect on habitat utilisation of birds in the area.

Ideally, provision of a buffer between infrastructure and stands of native vegetation is recommended to reduce the level of interaction and potential impact on fauna utilising the area.

6.2.1 Pygmy Blue-tongue Lizard

The absence of PBTL is attributed to the large area of land that has been cropped. The area of exotic grassland/and *E. leucoxylon* Open Woodland within the western block is broadly considered potential habitat however no spider holes were detected therefore it is considered unlikely that PBTL occur. Some spider burrows were observed along the access route on Flagstaff Road but given the small and isolated nature of the area it is also considered unlikely that they occur. Based on the results, there is no need for further targeted surveys or an EPBC referral for this species. If

6.2.2 Flinders Ranges Worm-lizard

The habitat suitability for Flinders Ranges Worm-lizard is considered low, however given the species' broad distribution across the region, it is considered as possibly present in non-cropped areas where surface rock, leaf litter and fallen timber occurs. Overall the habitat is considered as low suitability.

A small number of individual FRWL (if present) may be directly impacted (direct loss, or loss of habitat) by the construction of the solar farm. The scale of loss of potential habitat and individual FRWL is considered minor and inconsequential to the local population.

Based on the criteria in the EPBC Act Significant Impact Guidelines (Department of the Environment 2013) the project is not considered to have a significant impact on FRWL. An EPBC referral is not considered necessary for this species.

6.2.3 Fork-tailed Swift

The Fork-tailed Swift (*Apus pacificus*), listed as migratory, could occur as an occasional visitor but would not be significantly impacted by the development.

7 VEGETATION CLEARANCE

EBS Ecology is advised that the project will be assessed through a Section 49 approval process (Crown Development / Public Infrastructure) under the *Development Act 1993*. The project has received sponsorship. FRV wants to avoid as much native vegetation clearance as possible.

The vegetation clearance requirements for the project are not yet known. EBS has collected the necessary data to calculate the area of vegetation clearance and required significant environmental benefit (SEB) offset under the *Native Vegetation Act 1991* should this be required for a Native Vegetation Clearance Application once the construction footprint has been determined.

It should be possible to avoid the clearance of the vast majority of native vegetation within the project area. The area of most value from a native vegetation perspective is the western side of the western block. Given the steepness of this part of the project area, it is envisaged that infrastructure placement in this area will be avoided anyway.

It is envisaged that clearance along the bordering roadside would only be needed at access points, and should therefore be micro-sited to avoid vegetation where possible. If the assessed roads require widening for large vehicle access, native vegetation clearance should be minimised by utilising already cleared areas where possible. The southern side of the road is the best option along Merildin Road. The best option for widening of Flagstaff Road varies depending on the specific location.

Additional survey is required should there be impacts outside of the assessed area.

7.1 Vegetation clearance approval process

The project will likely fall under **Native Vegetation Regulation 12(34) – Infrastructure**. This regulation applies to clearance of vegetation incidental to the construction or expansion of a building or infrastructure (and associated services) where the Minister has declared that the clearance is in the public interest. If clearance falls under Regulation 12(34) it follows the process to undertake clearance for “other activities” as follows:

Process to undertake Clearance for c) 'Other activities'

- Part 3, Division 5, Regulation 12 & 16

Table 16. Requirements of the proponent to undertake clearance for 'Other activities'

General process	Requirements of proponent
Application to NVC	Application to the NVC via email nvc@sa.gov.au, or in accordance with an NVC-approved Standard Operating Procedure (SOP). *Note, you must submit the written permission of the landowner if you are acting on behalf of the landowner for any clearance activity.*
Assessment	When making a decision for these activities in relation to the information to be provided by an applicant to inform whether approval should be granted, the NVC will assess the level of risk to biodiversity presented by the clearance proposal. The NVC will also assess the proposed clearance against whether there are any other alternatives that involve no clearance, less clearance or clearance of vegetation that is less significant (or has been degraded to a greater extent than the vegetation proposed to be cleared). If an NVC-approved SOP exists, the assessment approach will occur in accordance with the SOP.
Approval	NVC approval required, or in accordance with the approval process outlined in the NVC-approved SOP. Proponent is required to develop an SEB Management Plan that will be approved by the NVC for implementation. Clearance is only permitted for these activities if any conditions (including the SEB) that apply to the approval are complied with. *Conditions imposed in connection with an approval are binding and enforceable against the person to whom the approval is granted as well as subsequent owners and occupiers of the land.* *Permitted clearance must be undertaken 2 years within approval being granted, unless otherwise specified.*
Significant Environmental Benefit (SEB)	SEB required in accordance with the Management Plan (or payment into the Native Vegetation Fund). If an NVC-approved SOP exists, the approval of the SEB will occur in accordance with the SOP.

Source: Government of South Australia (2017a).

If the project is awarded major development status under the *Development Act 1993*, then it may fall under **Regulation 12(27) – Major projects**. This regulation is to facilitate the interactions between the *Native Vegetation Act 1991* and the *Development Act 1993* in relation to the approvals for projects of major social, economic or environmental significance. The NVC will comment on the proposal as part of the assessment for major projects as to whether it avoids and minimises clearance a far as practicable, and at the same time determine the SEB required to offset the impact of the clearance. If clearance falls under Regulation 12(27) the process is as follows:

Process to undertake Clearance for a) Major Developments and Projects

- Part 3, Division 5, Regulation 12 & 13

Table 12. Requirements of the proponent to undertake clearance for Major Developments and Projects.

General process	Requirements of proponent
Notification or application to NVC	In accordance with the *Development Act 1993*, the NVC is provided an environmental impact statement, public environment report or development report for comment. *Note, you must submit the written permission of the landowner if you are acting on behalf of the landowner for any clearance activity.*
Assessment	The NVC will assess the clearance against whether there are any other alternatives that involve no clearance, less clearance or clearance of vegetation that is less significant (or has been degraded to a greater extent than the vegetation proposed to be cleared).
Approval	Clearance can occur if development consent is granted under the *Development Act 1993* and the provision of an SEB (on-ground or payment) is approved by the NVC. For an on-ground SEB, an NVC-approved management plan is required.
Significant Environmental Benefit (SEB)	Required as per SEB approval (or payment into the Native Vegetation Fund).

Source: Government of South Australia (2017a).

Under the *Native Vegetation Regulations 2017*, the project will fall under approval pathway 4: risk assessment. The risk assessment pathway is designed to streamline the approval process for activities with low or undefined levels of risk to biodiversity to be identified early, so that the focus of the NVC's assessment can be on activities that pose a high risk to biodiversity. The purpose of performing a risk assessment is to ensure that assessment and approval processes are consistent with the objects of the *Native Vegetation Act 1991*, defensible, transparent and at a level commensurate with the level of risk. The risk assessment determines the level of assessment to be undertaken, and therefore the SEB which will offset the impact of the clearance (Government of South Australia 2017a).

Applications are risk-assessed against criteria that categorises four (4) levels of clearance according to the significance of the vegetation proposed to be cleared (Figure 14). The risk level determines the level of assessment required. There are several escalating factors that will raise the clearance assessment to the next level if found to be positive (Government of South Australia 2017a).

For more information on how the NVC assesses applications, see the Guide for applications to clear native vegetation under the *Native Vegetation Act 1991* or the *Native Vegetation Regulations 2017*.

	Agricultural (AMLR, EP, N&Y, SAMDB, KI and SE Region)		**Pastoral** (SAAL and AW NRM regions)		**Escalating matters** Clearance assessment will be raised to the next level if;	**Approval**
	Patches - clearance	**Trees - clearance**	**Patches - clearance**	**Trees - clearance**		
Level 1	**0.05 ha** or less	**5 trees** or less	**3 ha** or less	**5 trees** or less	Clearance involves **any** trees with a trunk circumference measured at 1m above the ground of (for multi-stemmed trees, measure the largest trunk/stem): - 50cm or more for Agricultural zone, or - 30cm of more for the Pastoral zone, *or* There is an associated application within the last 5 years *or* There is a high likelihood (as determined by NVC delegate) that the site contains or is habitat for a species listed under the NP&W Act or a threatened community under EPBC Act	**Delegation:** NVMU, DPC Mining, SOPs
Assessment	Desktop assessment (Applicant to provide information) **–** a map of area of impact, site photographs, explanation of the purpose of clearance, why there is no alternative and whether there has been any other clearance application in the last 5 years					
SEB	$500 payment into the Native Vegetation Fund					
Level 2	**>0.05 ha to 0.5 ha**	**6 - 20 trees**	**>3 ha to 10 ha**	**6 - 20 trees**	The clearance is seriously at variance with Principle of Clearance b, c or d.	**Delegation:** NVMU, DPC Mining, SOPs
Assessment	Field assessment (Accredited consultant) **–** Bushland or Rangeland assessment method or Scattered tree assessment					
SEB	Determined as per SEB Policy and Guide					
Level 3	Total Biodiversity Score of less than or equal to **250**		Total Biodiversity Score of less than or equal to **2500**.		The clearance is seriously at variance with Principle of Clearance b, c or d.	**Delegation:** NVMU, DPC Mining
Assessment	Field assessment (Accredited Consultant) **-** Bushland, Rangeland or Scattered tree assessment and a documented Fauna survey.					
SEB	Determined as per SEB Policy and Guide					
Level 4	Total Biodiversity Score of greater than **250**		Total Biodiversity Score of greater than **2500**			**Delegation:** NVAP, DPC Mining
Assessment	Field assessment (Accredited Consultant) **-** Bushland, Rangeland or Scattered tree assessment and a documented Fauna Survey. Application made available to the public and referred to relevant agency or body for comment					
SEB	Determined as per SEB Policy and Guide					

Figure 14. Criteria, assessment process and SEB for levels of clearance to be risk-assessed (Government of South Australia 2017a).

7.2 Mitigation hierarchy

The *Native Vegetation Regulations 2017* place a great emphasis on the proponent applying the Mitigation Hierarchy, a fundamental principle which encourages proponents to consider all possible ways to avoid and minimise clearance to reduce the level of clearance required. Reducing the level of clearance also reduces the SEB offset (where required) and associated cost to the proponent. EBS can address the mitigation hierarchy and principles of clearance once the proposed construction layout is known.

7.3 Significant Environment Benefit

Approval for native vegetation clearance is conditional on providing a Significant Environmental Benefit (SEB). An SEB can be achieved through several options including managing and/or formally protecting an area of native vegetation for conservation purposes (Heritage Agreement), undertaking a revegetation program on the site of the operation or within the same region of the state, or alternatively, making a payment into the Native Vegetation Fund. The primary aim of the SEB is to achieve a net environmental gain, which contributes to improving the biodiversity values of the region, rather than simply off-setting the vegetation clearance.

There is little room for the rehabilitation of areas within the project footprint as the solar farm is considered long-term and it is unlikely that any re-establishment of vegetation within this area can occur for the life of the project. EBS has been advised by the client that a suitable grass cover will be grown across the site following construction, in accordance with planning obligations. This is considered separate to SEB obligations for native vegetation clearance.

8 SUMMARY AND RECOMMENDATIONS

8.1 Legislative approvals

8.1.1 Seek Native Vegetation Council approval for any vegetation clearance required

Any vegetation clearance that may be required needs approval under the *Native Vegetation Act 1991*. Once the infrastructure design is finalised, the extent of vegetation removal required will need to be determined to calculate the required Significant Environmental Benefit (SEB) offset. The provision of an SEB can be undertaken in several forms including managing and conserving areas of native vegetation, undertaking native vegetation restoration activities or making a payment into the Native Vegetation Fund. Potential opportunities to achieve an SEB offset within or surrounding the project area should be identified.

8.1.2 EPBC referral

The project is not considered to have a significant impact on any EPBC Act listed flora, fauna or ecological communities, and hence a referral is not required based on the current assessment area.

8.2 General

8.2.1 Infrastructure placement

- Infrastructure placement should avoid the need for tree clearance, in particular; the western side of the western block, where numerous scattered *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland SA Blue Gum) are located. It is presumed this area will be unsuitable anyway due to steepness.
- Infrastructure and access routes should be aligned, where practical, with cropping/cleared land. Areas containing the woodland and shrubland associations and scattered trees should be avoided where possible as they offer valuable habitat for fauna species in an area largely devoid of shrubs and trees.
- Ideally, locate infrastructure away from areas of native vegetation/fauna habitat to reduce impacts associated with disturbance, weed invasion etc.
- If any Wedge-tailed Eagle nests are observed (none were recorded during the survey), a buffer between the nest and infrastructure/maintenance access is recommended to avoid disturbance.
- Further assessment is required if any impact is proposed outside of the assessed area.

8.2.2 Construction

- In general, avoid construction or disturbance to any areas of high ecological value i.e. remnant trees in western block and remnant roadside vegetation patches.
- A Construction Environmental Management Plan (CEMP) should be in place, prior to construction. This will provide specific, detailed methods to avoid environmental damage during the construction phase.
- Ensure vegetation clearance is restricted to the designated clearance envelope.

- A site induction session with clearance contractors should be arranged whereby the project area is defined and areas designated for clearance are delineated. The purpose of the site induction would be to prevent inappropriate clearance of vegetation not within the clearance envelope.
- Native fauna disturbed during vegetation clearance/construction should if possible be relocated to suitable habitat nearby.
- Ensure that construction machinery is clean and free from soil pathogens and any weed seed materials before entering/exiting the area. This includes performing appropriate hygiene when leaving the subject site to avoid potential spread.
- Any soil/material brought to site should be certified clean and free of weed propagules and soil pathogens. Suitable management measures in relation to Phytophthora should be included in the CEMP.
- Vegetative material removed from the site must be managed appropriately (i.e. any dumping should occur at a licensed waste facility to ensure there is no spread of material contaminated with weed propagules amongst native vegetation).
- Stockpile sites, vehicle / machinery parking areas and general laydown areas should be located away from any native vegetation.
- Weed management strategies (including weed hygiene procedures) should be implemented to ensure that weed species are not introduced or spread throughout the construction area.

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10 APPENDICES

Appendix 1. Plant species recorded within survey area.

Scientific name	Common name	Conservation status		Introduced	Vegetation Association					
		Aus.	SA		1	2	3	4	5	6
Acacia acenacea	Gold Dust Wattle							✓		
Acacia notabilis	Notable Wattle							✓		
Acacia paradoxa	Kangaroo Thorn				✓		✓	✓		
Acacia pycnantha	Golden Wattle					✓		✓		
Acacia spp.	Wattle							✓		
Allocasuarina verticillata	Drooping Sheoak					✓		✓		
Amyema spp.	Mistletoe							✓		
Austrostipa spp.	Spear-grass					✓		✓		
Bromus diandrus	Great Brome			*						
Bulbine bulbosa	Bulbine Lily					✓				
Bulbine semibarbata	Small Leek-lily									
Bursaria spinosa	Christmas Bush							✓		
Callitris spp.	Conifer							✓		
Cannabis sativa	Hemp			*			✓			
Casuarina cunninghamiana	River Oak							✓		
Chrysocephalum spp.	Everlasting					✓				
Dianella revoluta var.	Blueberry Lily					✓		✓		
Digitaria brownii	Cotton Panic-grass					✓				
Echium plantagineum	Salvation Jane			DP			✓			
Epacris spp.	Heath					✓				
Eucalyptus camaldulensis	River Red Gum							✓		
Eucalyptus leucoxylon ssp. *pruinosa*	Inland South Australian Blue Gum				✓			✓		
Eucalyptus spp.	Gum Tree							✓		
Foeniculum vulgare	Fennel			EW				✓		
Fraxinus spp.	Ash Tree							✓		
Hordeum vulgare	Barley			*		✓				
Lagurus ovatus	Hare's Tail Grass			*						
Lomandra multiflora ssp. *dura*	Hard Mat-rush									
Lomandra spp.	Mat-rush					✓				
Malva parviflora	Small-flower Marshmallow			*		✓				
Marrubium vulgare	Horehound			DP				✓		
Melaleuca spp.	Teatree							✓		
Microlaena stipoides var. *stipoides*	Weeping Rice-grass									
Olea europaea ssp.	Olive			DP				✓		
Oxalis pes-caprae	Soursob			*			✓	✓		
Phalaris aquatica	Phalaris			*						
Pinus spp.	Pine Tree			*				✓		

Scientific name	Common name	Conservation status		Introduced	Vegetation Association					
		Aus.	SA		1	2	3	4	5	6
Plantago lanceolata	Ribwort Plantain			EW				✓		
Romulea rosea	Onion Grass			EW				✓		
Rosa canina	Dog Rose			DP			✓	✓	✓	
Rumex spp.	Dock							✓		
Rytidosperma spp.	Wallaby Grass					✓		✓		
Salvia verbenaca var.	Wild Sage			EW				✓		
Scabiosa atropurpurea	Pincushion			*						
Scabiosa spp.	Honeysuckle			*			✓	✓		
Schinus molle	Peppercorn Tree			*				✓		
Sisymbrium spp.	Mustard			*				✓		
Themeda triandra	Kangaroo Grass					✓				
Unknown	Deciduous Tree							✓		
Unknown	Introduced grasses			*		✓	✓	✓	✓	✓
Vicia spp.	Vetch			*						
Vittadinia gracilis	Woolly New Holland Daisy									
Vittadinia spp.	New Holland Daisy									
Xanthorrhoea quadrangulata	Grass Tree					✓				
Acacia acenacea	Gold Dust Wattle							✓		

Conservation status

Aus.: Australia (Environment Protection and Biodiversity Conservation Act 1999). SA: South Australia (National Parks and Wildlife Act 1972). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. DP: Declared Plant. EW: Environmental Weed.

Appendix 2. Fauna species recorded within survey area.

Scientific name	Common name	Conservation status		Introduced
		Aus.	SA	
Bird				
Acanthiza chrysorrhoa	Yellow-rumped Thornbill			
Alauda arvensis	Eurasian Skylark			*
Anas gracilis	Grey Teal			
Anas superciliosa	Pacific Black Duck			
Anthochaera carunculata	Red Wattlebird			
Anthus australis	Australian Pipit			
Cacatua sanguinea	Little Corella			
Chenonetta jubata	Maned (Australian Wood Duck)			
Cincloramphus cruralis	Brown Songlark			
Circus assimilis	Spotted Harrier			
Columba livia	Feral Pigeon [Rock Dove]			*
Coracina novaehollandiae	Black-faced Cuckooshrike			
Corcorax melanorhamphos	White-winged Chough		R	
Corvus spp.	Raven or Crow			
Dacelo novaeguineae	Laughing Kookaburra			
Egretta novaehollandiae	White-faced Heron			

Scientific name	Common name	Conservation status		Introduced
		Aus.	SA	
Elanus axillaris	Black-shouldered Kite			
Eolophus roseicapilla	Galah			
Epthianura albifrons	White-fronted Chat			
Falco cenchroides	Nankeen Kestrel			
Gavicalis virescens	Singing Honeyeater			
Glossopsitta concinna	Musk Lorikeet			
Grallina cyanoleuca	Magpielark			
Gymnorhina tibicen	Australian Magpie			
Manorina melanocephala	Noisy Miner			
Pardalotus striatus	Striated Pardalote			
Passer domesticus	House Sparrow			*
Petrochelidon nigricans	Tree Martin			
Platycercus elegans	Crimson Rosella			
Psephotus haematonotus	Red-rumped Parrot			
Rhipidura albiscapa	Grey Fantail			
Rhipidura leucophrys	Willie Wagtail			
Sturnus vulgaris	Common Starling			*
Trichoglossus haematodus	Rainbow Lorikeet			
Mammal				
Macropus fuliginosus	Western Grey Kangaroo			

Conservation status

Aus.: Australia (Environment Protection and Biodiversity Conservation Act 1999). SA: South Australia (National Parks and Wildlife Act 1972). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level.

Appendix 3. Assessment criteria for the condition of vegetation communities.

Condition	SEB ratio	% indigenous cover	Overstorey condition description	Understorey condition description	Indicators	NVC Interim Policy (1.2.11)
Very Poor	**0:1**	<10%	No overstorey stratum remaining.	Complete destruction of indigenous understorey* (by grazing &/or introduced plants).	Vegetation structure no longer intact (e.g. removal of one or more vegetation strata). Scope for regeneration, but not to a state approaching good condition without intensive management. Dominated by very aggressive weeds. Partial or extensive clearing (> 50% of area). Evidence of heavy grazing (tracks, browse lines, species changes, complete depletion of soil surface crust).	Where proposed clearance is considered to be minor and of limited biodiversity impact, e.g. lopping of overhanging limbs only or minor clearance of shrubs in areas otherwise considered as highly disturbed.
	1:1	10-19%	Scattered trees in poor health and/or representing an immature stand.	Almost complete destruction of indigenous understorey* (by grazing &/or introduced plants) - reduced to scattered clumps and individual plants.		Where proposed clearance is in areas dominated by introduced species, the area of native vegetation is largely reduced to scattered trees, indigenous understorey reduced to scattered clumps and individual plants.
	2:1	20-29%	Scattered trees either immature in good health or mature in poor/moderate health. Alternatively, the dominant overstorey stratum is largely intact and is an immature stand (or regrowth), and is generally in poor health.			
Poor	**3:1**	30-39%	Dominant overstorey stratum is largely intact and is a moderately healthy mature stand.	Heavy loss of native plant species (by grazing &/or introduced plants). The understorey* consists predominately of alien species, although a small number of natives persist.	Vegetation structure substantially altered (e.g. one or more vegetation strata depleted). Retains basic vegetation structure or the ability to regenerate it. Very obvious signs of long-term or severe disturbance. Weed dominated with some very aggressive weeds. Partial clearing (10 – 50% of area). Evidence of moderate grazing (tracks, browse lines, soil surface crust extensively broken).	Where the proposed clearance is of mostly intact overstorey vegetation but there is still considerable weed infestation amongst the understorey flora.
	4:1	40-49%	Dominant overstorey stratum is largely intact and is a healthy mature stand with high wildlife habitat value (e.g. hollows).			
Moderate	**5:1**	50-59%	Dominant overstorey stratum is largely intact – any condition+	Moderate loss of native understorey diversity. Weed-free	Vegetation structure altered (e.g. one or more vegetation	Where the proposed clearance is of mostly intact

Condition	SEB ratio	% indigenous cover	Overstorey condition description	Understorey condition description	Indicators	NVC Interim Policy (1.2.11)
				areas small. Substantial invasion of aliens resulting in significant competition, but native understorey* persists; for example, may be a low proportion of native species and a high native cover, or a high proportion of native species and low native cover.	strata depleted). Most seed sources available to regenerate original structure. Obvious signs of disturbance (e.g. tracks, bare ground). Minor clearing (<10% of area). Considerable weed infestation with some aggressive weeds. Evidence of some grazing (tracks, soil surface crust patchy).	overstorey vegetation with moderate but not severe weed infestation amongst the understorey flora. Clearance is not seriously at variance with the Principles.
	6:1	60-69%	Dominant overstorey stratum is largely intact – any condition+	Moderate but not severe weed infestation amongst the understorey flora.		
Good	**7:1**	70-79%	Original overstorey stratum is still dominant and intact – any condition+	Understorey only slightly modified. High proportion of native species and native cover in the understorey*; reasonable representation of probable pre-European vegetation.	Vegetation structure intact (e.g. all strata intact). Disturbance minor, only affecting individual species. Only non-aggressive weeds present. Some litter build-up.	Where the proposed clearance is of mostly intact overstorey and understorey vegetation, weed infestation is moderate to low, but the original vegetation is still dominant. Clearance is assessed by the NVC to be at variance with the Principles.
	8:1	80-89%	Original overstorey stratum is still dominant and intact – any condition+	Understorey only slightly modified. High proportion of native species and native cover in the understorey*; reasonable representation of probable pre-European vegetation.		
Excellent	**9:1**	> 89%	Original vegetation is still dominant and intact. Overstorey individuals in good condition and represent a mature stand.	Diverse vegetation with very little weed infestation. Understorey largely undisturbed, minimal loss of plant species diversity. Very little or no sign of alien vegetation in the understorey*; resembles probable pre-European condition.	All strata intact and botanical composition close to original. Little or no signs of disturbance. Little or no weed infestation. Soil surface crust intact. Substantial litter cover.	Where the proposed clearance is of diverse vegetation with very little weed infestation. Clearance is assessed by the NVC to be seriously at variance with the Principles.
	10:1		Original vegetation is still dominant and intact. Overstorey individuals in good condition and represent a mature stand, with high habitat value (e.g. hollows).			

* Or all strata if the upper and lower strata are difficult to distinguish.
+ Ratio assessment will largely depend upon condition of understorey associated with an intact overstorey stratum.

Adapted from *Guide to Roadside Vegetation Survey Methodology for South Australia* (Stokes et al. 1998) and *Guidelines for a Native Vegetation Significant Environmental Benefit Policy* (DWLBC 2005).

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APPENDIX H

ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Integrated Heritage Services

Aboriginal Cultural Heritage Survey, Chaff Mill Solar Farm, Mintaro, South Australia

SURVEY REPORT 22 DECEMBER 2017

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View north adjacent Wookie Creek

By David Mott

CLIENT

WSP Australia Pty Limited
Level 1
1 King William Street
Adelaide, SA
5000 Australia

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Ownership

Under section 35 of the SA *Aboriginal Heritage Act 1988* it is an offence to divulge information relating to an Aboriginal site, object, remains or Aboriginal tradition without authorisation from the relevant Aboriginal group or groups.

Disclaimer

The professional advice contained in this report are those of the consultants, Integrated Heritage Services Pty Ltd. Integrated Heritage Services Pty Ltd have taken all the necessary steps to ensure that an accurate document has been prepared, the company accepts no liability for any damages or loss incurred because of reliance placed upon the report and its contents. The professional advice contained in this report does not constitute legal advice.

REPORT CITATION: Mott, D. 2017 *Aboriginal Cultural Heritage Survey, Chaff Mill Solar Farm, Mintaro, South Australia*. Confidential report to WSP Australia Pty Limited under contract with Integrated Heritage Services Pty Ltd.

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Abbreviations

Abbreviation	Meaning
AHA SA	*Aboriginal Heritage Act 1988* (SA)
DSD-AAR	Department of State Development - Aboriginal Affairs and Reconciliation
FRV	FRV Services Australia Pty Ltd
GIS	Geographic Information Systems
GPS	Global Positioning System
IHS	Integrated Heritage Services Pty Ltd
NNAC	Ngadjuri Nation Aboriginal Corporation
NTA	*Native Title Act 1993* (Commonwealth)
RARB	Recognised Aboriginal Representative Bodies
WSP	WSP Australia Pty Limited

Executive Summary

Integrated Heritage Services Pty Ltd (IHS) has been engaged by WSP Australia Pty Limited (WSP) to undertake an Aboriginal cultural heritage survey and assessment of lands to be potentially developed associated with the Chaff Mill Solar Farm Project, Mintaro, South Australia (the Project Area). The Project Area is divided into distinct geographic areas discussed in this report; Site Area 1 and Site Area 2 (Figure 1).

The Project Area is situated in the traditional lands of the Ngadjuri people, represented by the Ngadjuri Nation Cultural Aboriginal Corporation (NNAC), who have been engaged in survey and consultation works.

There are no anthropological sites within the Project Area, although Wookie Creek was identified as culturally sensitive in relation to Aboriginal anthropology. There were no archaeological sites recorded for the Project Area, however the constraints to the survey were considerable and there remains potential for archaeological sites to be present in currently obscured terrain.

As a result of the Aboriginal heritage survey of the proposed Chaff Mill Solar Farm Project Area, including consultation with Ngadjuri Traditional Owners, the following recommendations are made:

1. Consider survey of the currently cropped paddocks once ground surface visibility is rendered to a state where the identification of Aboriginal heritage sites and objects can be undertaken confidently;
2. The drafting and implementation of a cultural heritage management plan incorporating a fully consulted site discovery procedure and salvage methodology for specific site types if Aboriginal heritage sites, objects or remains are discovered during civil works;
3. The heritage induction of civil contractor and other employees undertaking the ground disturbance works. Heritage induction should contain at a minimum, typical Aboriginal sites descriptions, potential indicators, site discovery process, working with monitors and legislative obligations;

Further, Ngadjuri Traditional Owners wish to explore prospects to engage in employment opportunities associated with the project plus input into dual naming, interpretive signage, landscaping and more generally, thematic considerations to provide the wider community with accessible information around Ngadjuri identity and culture.

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1.0 Introduction

Integrated Heritage Services Pty Ltd (IHS) has been engaged by WSP Australia Pty Limited (WSP) to undertake an Aboriginal cultural heritage survey and assessment of lands to be potentially developed associated with the Chaff Mill Solar Farm Project, Mintaro, South Australia (the Project Area). The Project Area is divided into distinct geographic areas discussed in this report; Site Area 1 and Site Area 2 (Figure 1).

The Project Area is situated in the traditional lands of the Ngadjuri people, represented by the Ngadjuri Nation Aboriginal Corporation (NNAC), who have been engaged in survey and consultation works.

This Aboriginal cultural heritage survey assessment includes a review of previous documentation including reports, surveys and other technical reports to assist with the survey and development of a risk assessment for the Project Area.

1.1 The Chaff Mill Solar Farm Project

Australian solar development company FRV Services Australia Pty Ltd (FRV) is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia. The proposed 100MW solar farm would be developed on a 380HA site adjacent to the existing Mintaro substation and its 132kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

1.2 Project Area

The proposed Chaff Mill Solar Farm Project is located 3.5 kilometres north-east of Mintaro in the Clare Valley, 130 kilometres north of Adelaide. The proposed 100MW solar farm would be developed on a 380HA site that is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. The existing land use is agricultural, and the site falls within the District Council of Clare and Gilbert Valleys.

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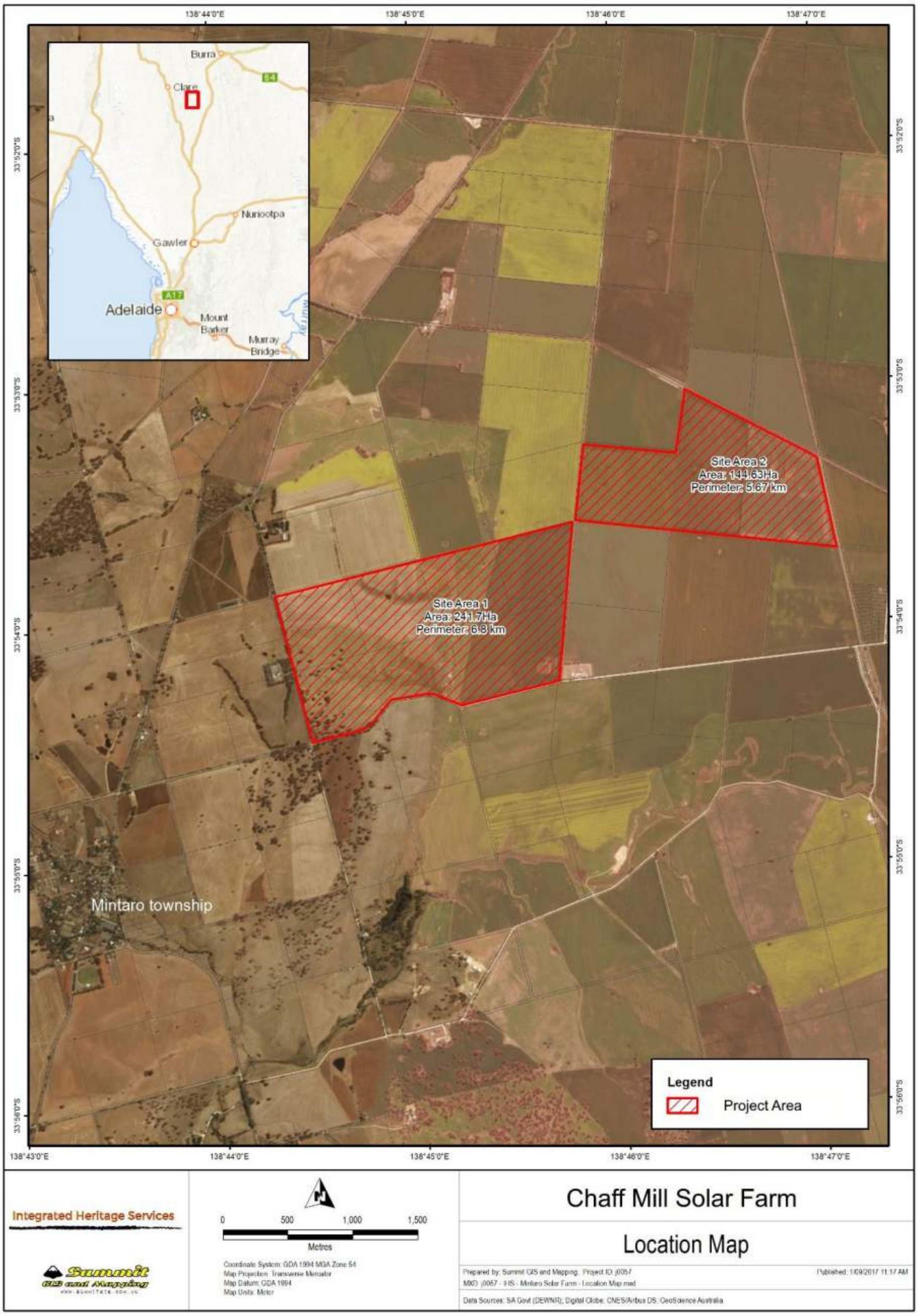

Figure 1 Location map showing the Project Areas referred to in this report

2.0 Aboriginal Heritage Protection Legislation

This section of the report provides an overview of relevant Aboriginal heritage protection legislation.

2.1 Aboriginal Heritage Act 1988

The SA *Aboriginal Heritage Act 1988* (AHA) is administered by the Department of State Development – Aboriginal Affairs and Reconciliation (DSD-AAR). Any Aboriginal site, object or remains, whether previously recorded or not, is covered under the blanket protection of the AHA. The AHA provides the following definition of an Aboriginal site in section 3.

> *"Aboriginal Site" means an area of land*
> *(a) That is of significance according to Aboriginal tradition; or*
> *(b) That is of significance according to Aboriginal archaeology, anthropology or history.*

It is an offence under section 23 of the AHA to damage, disturb or interfere with an Aboriginal site, object or remains unless written authorisation from the Minister for Aboriginal Affairs and Reconciliation has been obtained. Penalties for an offence under this section are up to $10,000 or six months' imprisonment in the case of an individual, or $50,000 in the case of a corporate body.

It should also be noted that it is an offence under section 35 of the AHA to divulge information relating to an Aboriginal site, object, remains or Aboriginal tradition without authorisation from the relevant Aboriginal group or groups. Penalties for an offence against this section are up to $10,000 or six months' imprisonment.

Relevant to discussion further in this report is Division 5 (Protection of Traditions), Section 37 where:

> *Nothing in this Act prevents Aboriginal people from doing anything in relation to Aboriginal sites, objects or remains in accordance with Aboriginal tradition.*

On 17 October 2017 the Minister for Aboriginal Affairs and Reconciliation introduced changes to the AHA in the form of the Aboriginal Heritage Regulations 2017. The main changes that may be relevant to this project going forward include:

2.1.1 Introduction of Recognised Aboriginal Representative Bodies (RARB)

The main role of a RARB is to consult with and represent the views of the Traditional Owners of heritage that is under threat of impact. RARBs can make formal agreements, called local heritage agreements, allowing proponents to impact the heritage the RARB represents. A proponent can take the actions agreed in an approved local heritage agreement without being prosecuted for them under the Heritage Act. Importantly, acts or omissions taken by proponents outside or beyond the terms of an approved local heritage agreement and which adversely impact heritage remain liable to prosecution.

2.1.2 Introduction of Local Heritage Agreements

RARBs can make agreements about heritage directly with land use proponents. When such agreements are made in accordance with the AHA, they are known as 'local heritage agreements'. Local heritage agreements act to ensure that heritage is managed in culturally appropriate ways agreed to by Traditional Owners. They allow proponents to negotiate the treatment of heritage directly with Traditional Owners, rather than asking the Minister to run a consultation process with the same people. Where accompanied by an authorisation from the Minister under section 23 of the

AHA, local heritage agreements protect proponents from prosecution under the AHA for impacting heritage to the extent authorised.

2.1.3 Introduction of Division A2 Agreements

A Division A2 agreement is an agreement with provisions about heritage impacts made by an Aboriginal group (usually the Registered Native Title Body Corporate) under an Act other than the AHA, which has been approved by the Minister. Agreements can allow for heritage to be excavated, damaged, destroyed or interfered with. Before, even with such an agreement, the Heritage Act required the Minister for Aboriginal Affairs and Reconciliation to run a formal consultation process to consider the idea with Traditional Owners and others. Now, the Heritage Act allows the Minister to approve some agreements made under Acts other than the Heritage Act, streamlining the process for authorising impacts to heritage where the relevant Traditional Owners have already agreed to it.

The AHA and accompanying Regulations is relevant here given potential to encounter Aboriginal sites, objects or burials in buried contexts during proposed civil works for the Chaff Mill Solar Farm project.

2.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cwth)

The *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides a mechanism for the Commonwealth Minister for Environment to make declarations regarding the protection of an Aboriginal area when the Minister is satisfied that, under State or Territory law, there is ineffective protection of the area from a threat of injury or desecration. Declarations made under this Act may involve restricting activities and/or access to an Aboriginal site.

Under section 22 of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, it is an offence to conduct behaviour or partake in an action that contravenes a declaration made by the Minister. Where an Aboriginal place is concerned, the penalties under this section are $10,000 or imprisonment for five years, or both, for an individual, or $50,000 for a corporate body. In the case of an Aboriginal object, the penalties are $5,000 or imprisonment for two years, or both, for an individual, or $25,000 for a corporate body.

If the requirements of the AHA are adhered to, the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* will likely have no relevance for any Aboriginal site that may be in the project area.

2.3 Native Title Act 1993 (Cwth)

The Commonwealth *Native Title Act 1993* (NTA) is part of the Commonwealth's response to the High Court's decision in Mabo v Queensland (No.2) and adopts the common law definition of native title, defined as the rights and interests that are possessed under the traditional laws and customs of Aboriginal people in land and waters, and that are recognised by the common law. These rights may exist over Crown Land but do not exist over land held as freehold title.

The NTA recognises the existence of an Indigenous land ownership tradition where connections to country have been maintained and where acts of government have not extinguished this connection.

The Ngadjuri Nation #2 Native Title Claim is currently registered over the Project Area (Tribunal No SC2011/002, Fed Court No SAD304/2011) and was lodged 21 Nov 2011. The Ngadjuri Nation #2 Native Title Claim covers an area of 26,239.50sq km (see Figure 2).

2.4 Native Title (South Australia) Act 1994

As stated above, the Commonwealth Native Title Act 1993 is part of the Commonwealth's response to the High Court's decision in Mabo v Queensland (No. 2) and adopts the common law definition of native title defined as the rights and interests that are possessed under the traditional laws and customs of Aboriginal people in land and waters, and that are recognised by the common law. Provisions within the Commonwealth NTA allow for the States to develop their own native title legislation, provided the State legislation does not conflict with the Commonwealth Act.

South Australia has enacted an alternative State 'right to negotiate' scheme as authorised by the Commonwealth under section 43 of the NTA. This scheme is operative and to date comprises the *Native Title (South Australia) Act 1994; Land Acquisition (Native Title) Amendment Act 1994; Mining (Native Title) Amendment Act 1994; Opal Mining Act 1995* and the *Environment, Resources and Development Court (Native Title) Amendment Act 1995*. Regulations are in force for all these Acts together with Rules of Court for the Environment, Resources and Development Court.

2.5 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) protects places of national cultural and environmental significance from damage and interference by establishing a National Heritage List (for places outside of Commonwealth land) and a Commonwealth Heritage List (for places within Commonwealth land). Under the EPBC Act 1999 any action that has, will have or is likely to have a significant impact on a place of national cultural and/or environmental significance must be referred to the Minister for the Department of Sustainability, Environment, Water, Population and Communities for approval. The EPBC Act 1999 sets out a procedure for obtaining approval, which may include the need to prepare an environmental impact statement for the proposed action (an action is defined in s.523 to include a project, development, an undertaking or an activity or series of activities).

The current project area does not intersect any entries on the National or Commonwealth Heritage Lists.

2.6 Summary

The central legislation to management of Aboriginal heritage in the project area is the AHA, as the project area may contain Aboriginal sites, objects or remains covered and protected by this Act. To identify Aboriginal cultural heritage sites (archaeological and anthropological) the Traditional Owners, represented by the Ngadjuri Nation Aboriginal Corporation (NNAC) have been engaged to undertake cultural heritage survey over the Project Area.

The project area is within the native title boundary schedule of the Ngadjuri Native Title Claim (SC00/1). Under the *Native Title Act 1993*, the proponent should notify the contact point for the Ngadjuri Native Title Claim if any land subject to Native Title is to be affected (Figure 2).

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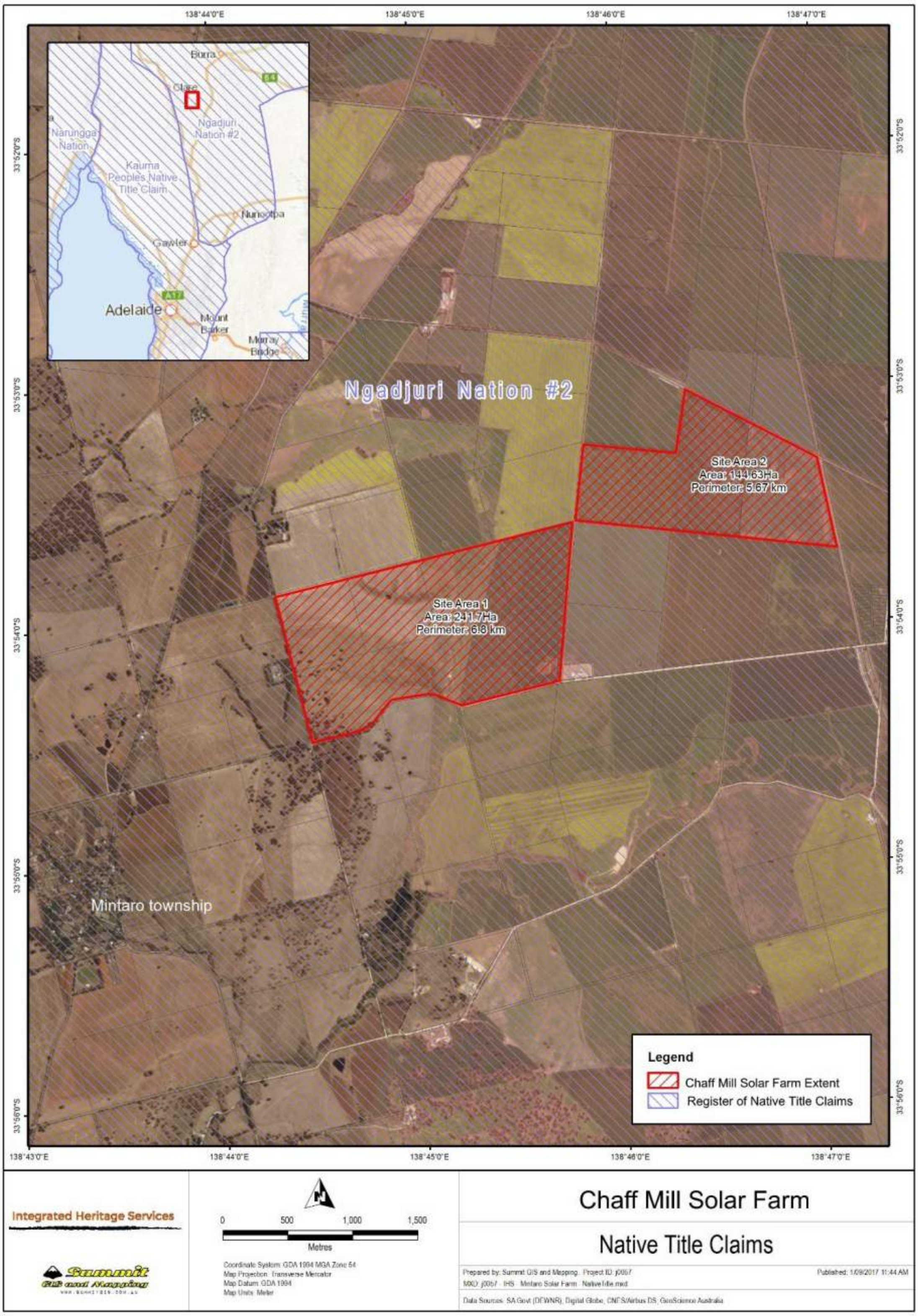

Figure 2 The Project Areas in relation to the Ngadjuri Native Title Claim

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3.0 Project Assessment Methodology

3.1 Introduction

The Aboriginal cultural heritage survey for Chaff Mill Solar Farm involves preparation in the form of desktop background research to provide an early appraisal of whether or not there are any cultural heritage sites and/or areas of cultural heritage sensitivity previously recorded within the project area which assists to refine the proposed field survey methodology.

Desktop background research to help identify the presence (or absence) of Aboriginal heritage sites and areas of potential cultural heritage sensitivity has been undertaken through searches of:

- the SA Museum Anthropology and Sites Database;
- Central Archive Register of Aboriginal Sites and Objects maintained by Aboriginal Affairs and Reconciliation Division (DSD-AAR);
- The South Australian Heritage Places Database;
- The Australian Heritage Places Database;
- internal corporate archives;
- relevant Aboriginal Cultural Heritage survey reports;
- the literature relating to the mythologies and oral histories relevant to the area;
- the aerial photographs and other documents relating to the development history of the area, and other reference material as relevant.

3.2 Field Survey Methodology

The Project Area required Aboriginal cultural heritage field survey to identify and record potential archaeological and anthropological sites, objects and remains as defined by the AHA. Further, by assessing the natural landforms in view of previous disturbances, a risk assessment can be inferred in relation to the potential during future proposed works of encountering archaeological and anthropological sites, objects and remains as defined by the AHA.

The anthropological survey was undertaken on the 1st November 2017 with the archaeological survey undertaken 2nd November 2017.

Prior to fieldwork, high resolution aerial photography was overlaid with survey data containing Project Area delineations onto Collector for ESRI ArcGIS (Version 17.0.4) to enable accurate survey planning. The aerial photography also enabled the team to target specific parts of the Project Area based on particular landscape features identified as possessing greater potential to contain Aboriginal heritage sites. These features included stands of remnant vegetation (i.e. lesser disturbed areas), sandy exposures, creek lines and rock outcrops.

The field methodology consisted of pedestrian foot survey for the archaeological component and some foot survey and broad, on site consultation with nominated Ngadjuri traditional owner representatives for the anthropological survey. Due to visibility and access issues as described in Section 3.2.1, the pedestrian survey was limited to targeted areas identified through aerial photography including sporadic sandy, exposed areas, the Wookie Creek line, existing access tracks and some internal fence-line extents, although in most cases long, thick grasses and crops abutted the boundary fences. The south-west corner of Site Area 1 featured significant stands of remnant River Red Gum (*Eucalyptus camaldulensis*) that were inspected for the presence of potential cultural modifications (i.e. scar trees).

IHS consultants comprise one senior archaeologist (male) and one senior anthropologist (female). Ngadjuri traditional owners are represented by the Ngadjuri Nation Aboriginal Corporation (NNAC). Table 1 specifies the participants in the survey.

Name	Role
Betty Branson	NNAC
Carlo Sansbury	NNAC
Vanessa Reynolds	NNAC
Ngadjuri Elder	NNAC
Beau Sparrow	NNAC
Dwayne Wilson	NNAC
David Mott	Archaeologist
Fiona Sutherland	Anthropologist

Table 1 Survey participants

The aim of the survey was to record any sites of significance according to Aboriginal tradition, or of significance to Aboriginal archaeology, anthropology or history. The field survey sought to identify and record all Aboriginal heritage sites and objects that exist within the Project Area to the extent that they could be identified given the constraints outlined below. The anthropological or archaeological significance of Aboriginal sites/objects would be determined with recommendations made, where appropriate, for the protection, conservation and management of these sites and objects. Based on these results a risk assessment can be inferred.

3.2.4 Constraints

Pedestrian access by the eight-person heritage team into fields under current cropping was not preferable to the landowner due to concern over the potential impact to the crops (pers. comm). Regardless, the high-density wheat crops offered zero ground surface visibility making it virtually impossible to survey for archaeological sites, objects and remains as defined by the AHA.

As discussed in the previous section pedestrian survey was limited to targeted areas identified through aerial photography including sporadic sandy, exposed areas, the Wookie Creek line, existing access tracks and some internal fence-line extents, although in most cases long, thick grasses and crops abutted the boundary fences.

4.0 Project Environment

4.1 Introduction

There are a range of other studies which have been commissioned for the project to comprehensively describe project area environs. This section provides a broad landscape description overview that is relevant to the field of Aboriginal cultural heritage management and particularly, how certain natural features may correspond with the potential for the presence of Aboriginal heritage sites as defined by the AHA.

4.2 Broad Landscape Description

The Project Area consists of ploughed paddocks with some minor watercourses and drainage channels present. The topography of the Project Area is flat to gently sloping cropland with pockets of natural grassland and some remnant eucalypt vegetation. The dominant vegetation in the area is introduced plant species consistent with agricultural crops and livestock grazing. No native grassland vegetation was noted within the Project Area.

The town of Mintaro, including the subject land, is located within the regionally extensive Adelaide Geosyncline fold belt defined by the series of north-south trending ranges and valleys of the area. The local Basement geological formation is the Mintaro Shale, a fluvioglacial siltstone with local glacial erratics (Burra Geological Map Sheet). Some lichen-encrusted outcrops were identified for Site Area 1, primarily along Wookie Creek and to the west. A small borrow pit was identified featuring siltstone with quartzitic inclusions including prominent quartz veins. Loose quartz ranging considerably in size was found throughout the Project Area.

Figure 3 Rocky outcrops adjacent Wookie Creek

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Figure 4 Quartz boulder, presumably from borrow pit in Site Area 1

4.2.5 Land Use

The Project Area is situated in a region that has been cleared from the 1870's for pastoral uses. Regionally, the land classifications are predominantly rural, residential, and agricultural, with activities focused generally on hobby farming, livestock, horticulture and viticulture. The Project Area lands have been subject to previous disturbance by intensive farming and are subject to considerable natural erosion. Persistent clearing of the area for agricultural related activities, and then crop cultivation and livestock grazing is evident in the general area.

The gently sloping terrain feeding into Wookie Creek has been subject to less pastoral impact than majority of the Project Area paddocks. At time of survey at least 60% of the total Project Area was under cropping and the remainder was fallow, although evidence of occasional sheep grazing was noted.

4.2.6 Ploughing and the distribution of archaeological materials

Given the majority of the Project Area is situated within ploughed paddocks it is relevant to discuss the effect pastoral practices may have on the archaeological record.

In general, archaeological features such as burials, fire-places and ovens, middens, preserved workshop areas etc. will be destroyed by ploughing if they occur on the surface or within the plough zone. As a plough turns the soil it displaces any archaeological deposits within that depth of soil. Material buried lower within the soil profile will remain undisturbed, unless exposed by repeated ploughing and soil erosion. Over time, the plough blades will move the soil within the plough zone and any artefacts contained within. If a field is ploughed in the same direction each time, the soil will move outwards and eventually form a ridge on the edge of the field causing an overall reduction in soil depth. Consequently, many farmers plough in alternate directions each time. Archaeological research concerning the effects of ploughing on sites has indicated that a great deal can be learned from plough-disturbed site surfaces. It has been found that artefact movement from their original positions is often limited and may be estimated in various ways (Ammerman 1985, Binford et al 1970, Frink 1984, Steinberg 1996).

After a field is ploughed grass coverage is minimal, fresh soil is exposed and artefacts drawn to the surface by the pull of the plough are revealed. Rain may wash soil from artefacts making them more visible. While the plough pulls up both large and small artefacts, the small artefacts are more likely to become covered again. Ploughed ground that has not been worked recently may have artefacts on the surface, but often they are gradually hidden by regrowth of vegetation.

Although no archaeological materials were recorded during the current survey, access to some of the ploughed paddocks was not possible (see Section 3.2.4). Some ploughed paddocks could be viewed from public spaces. Notwithstanding, there remains the potential, albeit low, for archaeological materials to be preserved within modern ploughed surfaces.

5.0 Previous and Current Research

5.1 Introduction

This section of the report provides an overview of previous Aboriginal cultural heritage research relating to the Project Area and relevant details from adjacent areas. There have been no specific heritage surveys carried out relating directly to the Project Area.

It should be noted that by searching the Central Archive and SA Museum database it is only possible to ascertain the presence of previously recorded sites. The absence of previously recorded sites within the Project Area is not necessarily an indication that it is void of sites, rather that there is a good likelihood that no surveys or discoveries have been made in the areas and therefore nothing has been formally registered.

5.2 DSD-AAR Central Archive

The Central Archive is maintained by DSD-AAR and includes the Register of Aboriginal Sites and Objects. The Central Archive is a record of known (some reported, some formally registered) Aboriginal sites in South Australia, which are divided into three types: reported, recorded and archived. The Register can be searched for known Aboriginal sites within an area prior to development activities taking place.

IHS instigated a search in September 2017 of the current Project Area and was advised that no previously recorded Aboriginal heritage sites are contained in the Central Archive (Langeberg 2017: 1):

> *I advise that the central archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the Department of State Development, Aboriginal Affairs and Reconciliation (DSD-AAR), has no entries for Aboriginal sites within the proposed development area.*
>
> *The applicant is advised that sites or objects may exist in the proposed development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the Aboriginal Heritage Act 1988 (the Act), whether they are listed in the central archive or not (Langeberg 2017: 1)*

5.3 South Australian Museum (SAM) Anthropology Database

The South Australian Museum (SAM) Anthropology collections include (a) archaeological artefacts and samples of material (e.g., shell from middens), (b) ethnological collections of more recent artefacts, tools, weapons, etc., and (c) the human biology collection, including skeletal material. These collections have not been added to since the 1970's.

To ascertain if any culturally sensitive material has been located in the vicinity of the Project Area, the SAM database was searched using nearby suburb localities as search terms. Several entries pertain to the general region and provide useful context around types of sites typical for the area. These results in combination with background research and the principles of different types of environmental associations and how they typically interact and intersect with Aboriginal site types for the Adelaide Plains proper combine to assist forming the results and recommendations further in this report.

Search terms included Mintaro, Clare, Farrell Flat, Manoora, Penwortham, Sevenhill, Apoinga, Koononna, Wookie and Polish Hill River. Unfortunately, details are scant in the SAM database but nonetheless provide additional background information and evidence of the presence of Aboriginal heritage sites and occupation for the general region (See Table 2).

SAM Ref	Description	Location	Collector
A11545	Part skull and femur	Clare	Police
A25409	Cranium	Clare	RS Rogers
A25546	Skull	Clare	Dr Rogers
A52724	-	NW of Clare	-

Table 2 Results of SA Museum database search

The SAM database search details scant finds that are undated and without specific provenance. Typically, artefacts and other associated archaeological materials are underrepresented in historical finds and almost always found by amateurs, as typically most interest was reserved for the more ‘obvious’ materials such as skeletal remains. Typically, Ngadjuri burial sites would be located in and around occupation sites and it would be unusual not to find other evidence of human occupation in the form of artefacts, however the detail provided in the SAM database is limited.

The details around types and amounts of skeletal remains are lacking in Table 2. Skulls/craniums are represented while other skeletal remains are barely mentioned. Either the recordings were lacking in detail or much of the skeletal remains were not excavated and taken to the SA Museum. This leaves a distinct possibility that human skeletal remains remain at the original locations or have been removed at other times and we have no records.

It is worth noting that significant burial sites lie approximately 25kms to the northeast at Red Banks, near Burra.

5.4 South Australian Heritage Places Database

The South Australian (SA) Heritage Places Database is maintained by the SA Government Department of Planning & Local Government. It is a searchable database to assist people in locating heritage places and associated information within specified areas in South Australia. The SA Heritage Places Database is a comprehensive listing of State Heritage Places from the SA Heritage Register, Local Heritage Places from SA Development Plans and Contributory Items from SA Development Plans.

A search of the of the SA Heritage Places Database found no heritage sites within the Project Area. Approximately 3.5km south east of the Project Area the historic township of Mintaro is listed as a State Heritage Area as an example of a well preserved early colonial town. Established in the 1850s as an important staging point on the road between Burra and Port Wakefield, Mintaro is associated with early transport, farming and slate quarrying. The extensive use of slate is a notable feature of the town, it being used for walls, roofs, sills, posts, troughs, tanks, kerbs and steps (State Heritage Place Number 13935).

5.5 Australian Heritage Places Database

The Australian Heritage Database is maintained by the Federal Government Department of the Environment. This searchable database provides details of heritage items listed on the World Heritage List, the National Heritage List, the Commonwealth Heritage List, the former Register of the National

Estate (RNE), the List of Overseas Places of Historic Significance to Australia and any place under consideration, or previously considered, for any of these lists. The RNE was closed in 2007 and is now an archive of information maintained on a non-statutory basis as a publicly available archive and educational resource. Information on the RNE may continue to be current and may be relevant to statutory decisions about protection while places may be protected under appropriate state, territory or local government heritage legislation. It is also possible for heritage places on the RNE to be transferred onto the National or Commonwealth Heritage Lists.

A search of the of the Australian Heritage Places Database found reference to the aforementioned State Heritage Places Database information (Section 5.5) about the township of Mintaro with no other relevant entries.

5.6 General Background Research

5.6.7 Introduction

This section of the report details general background research derived from a variety of sources including internal corporate archives, relevant Aboriginal cultural heritage survey reports, literature relating to the mythologies and oral histories relevant to the area, old newspaper articles and other documents relating to the development history of the area, and other reference material as relevant.

5.6.8 Naming

There are a range of theories around the naming of the township of Mintaro. The district was called 'Mintara' in the early advertisements and it was promoted as being ideal for carters because there was plenty of feed and water. The town site was laid out in 1854 by Joseph and Henry Gilbert. Sources indicate that the name ‘Mintaro’ is derived from the Ngadjuri word’ mintadloo’ or Minta - Ngadlu meaning netted water (McDougall & Vines 1989).

5.6.9 Ngadjuri Identity and Traditional Lands

The Project Area is lying within the country of the Ngadjuri peoples. The region that contemporary Ngadjuri Aboriginal people identify as their traditional tribal territory lies partly within what has been identified as the Olary region of South Australia (Smith 1980; Nobbs 2000). Specific ethno-historical data on the region is scarce. Although much of the following research does not directly involve the Project Area, it does provide background of the history of the Ngadjuri peoples for the general region.

Very little is known regarding the vocabularies of the Ngadjuri peoples – a paper by Berndt and Vogelsang (1941) compares Ngadjuri and Dieri vocabularies, sourced primarily from other anthropologists of the time.

Eyre (1845) passed by the region to the west in 1839 and Sturt (1849), by-passed the region to the east in 1844. Both men were on failed expeditions seeking the interior of the Continent. The areas through which they travelled contained large Aboriginal populations, yet from their own journals, it is obvious that these people avoided contact with Europeans. Eyre wrote:

> *In going up the watercourse I again found a native fire, where the natives had been encamped within a mile of us during the night, without our being aware of it… (Eyre 1845: 93)*

It is hardly surprising then, that within the more sparsely populated Olary region, contact with the Aboriginal population was few and far between. Hayward, a pastoralist who occupied a station near Pekina made an eastwards journey, in search for new range-land and water sources based on information supplied to him by Aborigines living at Pekina (Smith 1980: 56).

It was incursion into the region by early pastoralists that saw initial contact with Aboriginal people. In 1855, one of the first pastoralists to lease land in Ngadjuri country was Stephen King, whose property was located at Outalpa Well (Gibbons 1973: 5). Within ten years of this first wave of pastoralists, most of the Olary uplands had been occupied including westwards to the Clare Valley region.

Letters written by Isaac Palmer Hall, Manager of the Boolcoomata Station, between 1859 and 1866, and the reports of J.P. Buttfield, Sub – Protector of Aborigines in the far north during the 1860's, are the only documents that mention Aborigines occupying the region during this period (Smith 1980: 52). The scarcity of available European labour meant that Hall employed local Aborigines. One letter, written in 1865, indicates quite a significant local population of Aboriginal people. He wrote:

> *We have been without blacks for some time but now that they have all swarmed in they mustered over 150 the other day and miserable and thin they looked. They had been right away from the white fellows and living on seeds and vegetables. (Hall 20.4.1865)*

Given the history of violent clashes between settlers and Aborigines, Hall's letter clearly indicates the local Aborigines reluctance to spend any time near European settlements. However, Hall also witnessed the breakdown of traditional Aboriginal life. He wrote:

> *The Blacks are becoming more and more dependent upon white men every year and now come in at regular seasons to look for work for the sake of blankets, flour, tobacco etc. – they are gradually decreasing in number too – the deaths of this tribe are treble the births. (Hall 14.6.1863)*

Smith (1980), in specific relation to Ngadjuri territories writes:

> *The Olary region appears to have been occupied by two distinct Aboriginal groups, both with tribal areas centred on the better watered country to the east or west of the upland. Tindale's map of the tribal boundaries in Australia (1974) places Plumbago in the extreme north – east of the territory of the Ngadjuri. (Smith 1980: 62 – 63)*

J.K. Chilman (1990) wrote in the "Barossa Valley Aboriginal Heritage Survey" that:

> *Accordingly, the Barossa Valley Aborigines are accepted in this study as being northern Peramangk and southern Ngadjuri. [Tindale's] …map shows the North Para River approximating the boundary between the two tribes while their western boundary with the Kaurna roughly coincides with the western edge of the Barossa region adopted for this study, passing through Freeling and near Sandy Creek. Truro, on the northern edge of the Barossa region, is in Ngadjuri and is only a few kilometres from the boundary with the Ngaiawang (River Murray) tribal area. This boundary marks the eastern limit of circumcision rites. (Chilman 1990: 7)*

Norman Tindale, in "Aboriginal tribes of Australia", describes the Ngadjuri territories as:

> *Location: From Angaston and Freeling north to Clare, Crystal brook, Gladstone, Carrieton, and north of Waukaringa to Koonamore; east to Mannahill; in Orroroo, Peterborough, Burra, and Robertstown districts; inhabitants of the gum forest areas. In the period just before the arrival of white people, they were making movements towards the Murray River*

near Morgan in aggressive attempts to impose the rite of circumcision on the river people. Miranda was a leading male until his death in 1849. The Mimbara horde remained living in the northern bushlands until 1905, the last "wild" group in South Australia. In their last years these people lived near Quorn, at Riverton, and on Willochra Creek. The term Aluri also spelled variously as Hilleri, Yilrea, Eeleeree, etc., is a general term used for several tribes here and on the west coast of South Australia.

Coordinates: 139°0'E x 33°5'S.
Area: 11, 500 sq. m. (29, 900 sq. km.).

Alternatives: Ngadluri, Ngaluri, Aluria, Alury, Eeleeree, Hilleri, Hillary, Yilrea, Wiramaju ([wira] = gum tree [meju] = men, lit. gum forest men), Wirrameyu, Wirramayo, Wirramaya, Wiramaya, Wirra, Weera, Eura (general term for several tribes), Manuri (Nganguruku tribe term, means "big goanna people"), Manuri (Nukunu term claimed to mean inland people), Manu, Monnoo, Manuley, Youngye (name of language), Boanawari (term meaning "bat people", and linked with circumcision; applied by non circumcising eastern tribes who feared their proselytising urges), Doora, Burra Burra or Abercrombie Tribe (two names for one horde of this tribe), Mimbara (name of northernmost horde).
References: Angas, 1847; Noble in Taplin, 1879; LeBrun in Curr, 1886; Valentine in Curr, 1886; East, 1889; Mathews, 1900 (Gr. 5626, 6448), Hossfeld, 1926; Gray, 1930; Elkin, 1931; Tindale, 1937, 1940, 1952, and 1964 MSS; Berndt and Vogelsang, 1941; Tindale and Lindsay, 1963; Berndt, 1965; R.D.J. Weathersbee, 1971 MS. (Tindale, 1974: 214)

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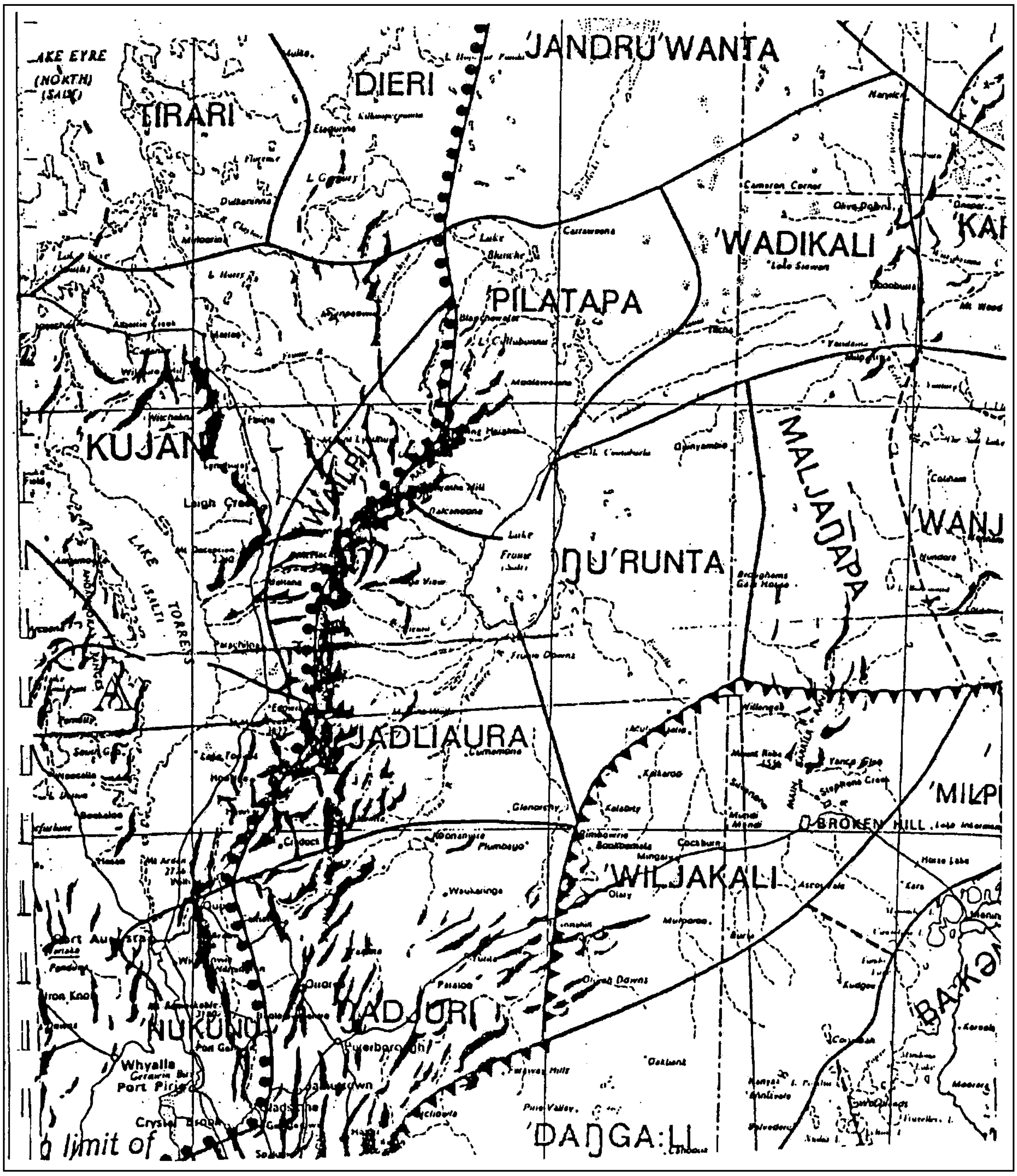

Figure 5 Map showing Ngadjuri tribal boundaries as recorded by Tindale in 1974

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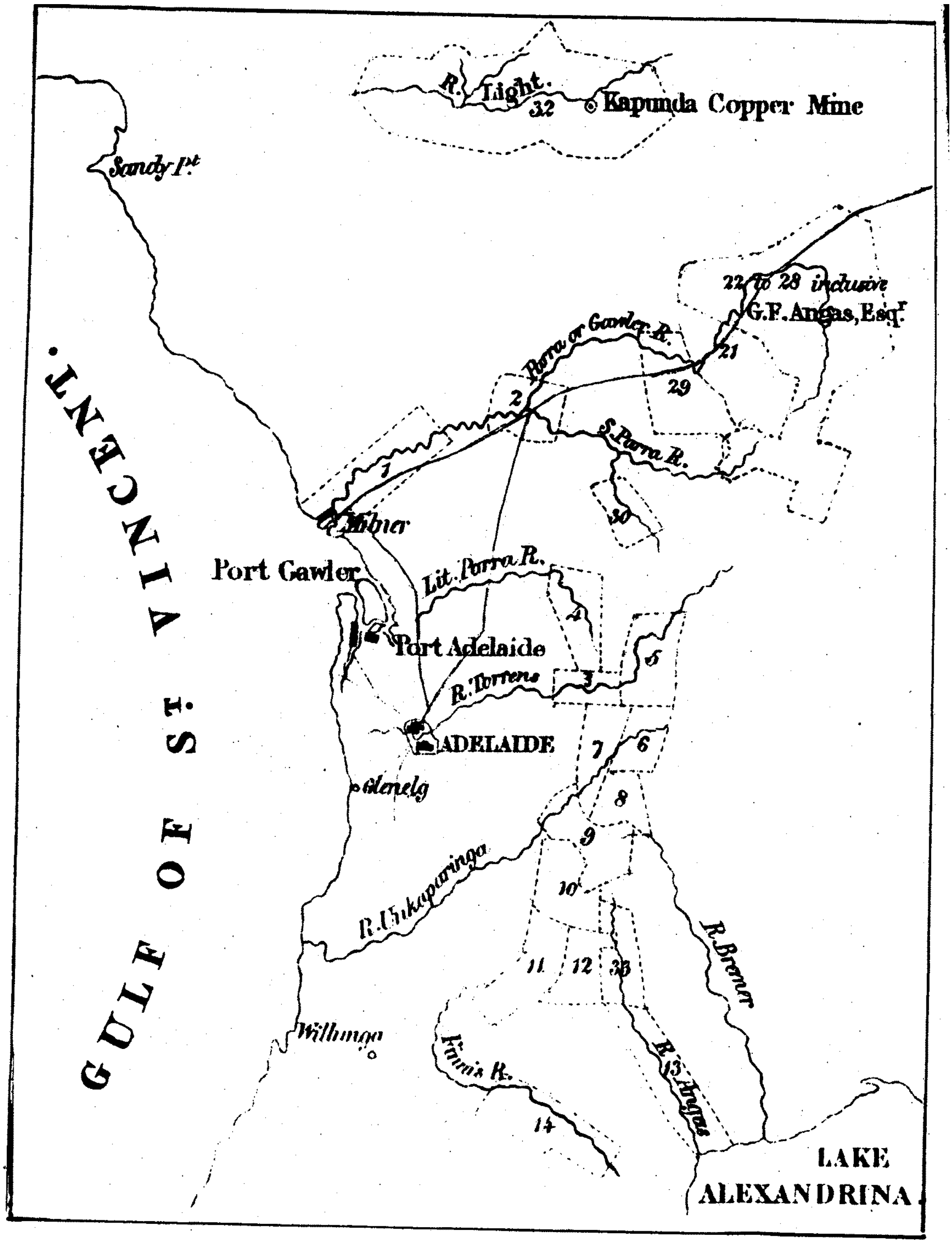

Figure 6 Map indicating some special land surveys taken in Peramangk and Ngadjuri tribal territories [from "Agricola" 1849] (Chilman 1990: 20)

In his journal entitled "Research data on Aboriginal Tribes in Australia (Chiefly from South, West and Central Australia), 1924 – 1936", Tindale includes several entries relating to the "Wira" tribe, which at some later stage he has renamed by crossing out this name and writing "Ngadjuri". One reference arises from a letter he received from a Mrs. A. Moyle who lived at Kapunda.

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Mrs. A. Moyle, who arrived in South Australia as a child in 1847 relates the following incident regarding the Wirra Natives. A woman was stolen from the Burraburra natives by a Kapunda man, one of a party who often made their camp at Allandale. The Burra natives therefore came down to Kapunda in force. A group of fully armed men from both camps stood and watched a set combat between the two principals. At first songs were sung and there was much shouting. The two men, both old then came out of the crowd each armed with a spear, spear thrower and shield. The Burra man first pierced the Kapunda man through the left arm; his opponent thereupon retaliated with a blow that pierced him through the heart. His body was placed on a bier and was carried back to the Burra, accompanied by a group of wailing mourners. In 1850 the natives in the district around Kapunda were still wild. They camped near the local dam (as it is now). (Tindale 1932)

Tindale also includes quite detailed renditions of two Ngadjuri Dreamtime stories. One concerns an old woman and her two dogs and the other concerning the Eagle and Crow (Tindale Jan. 1936).

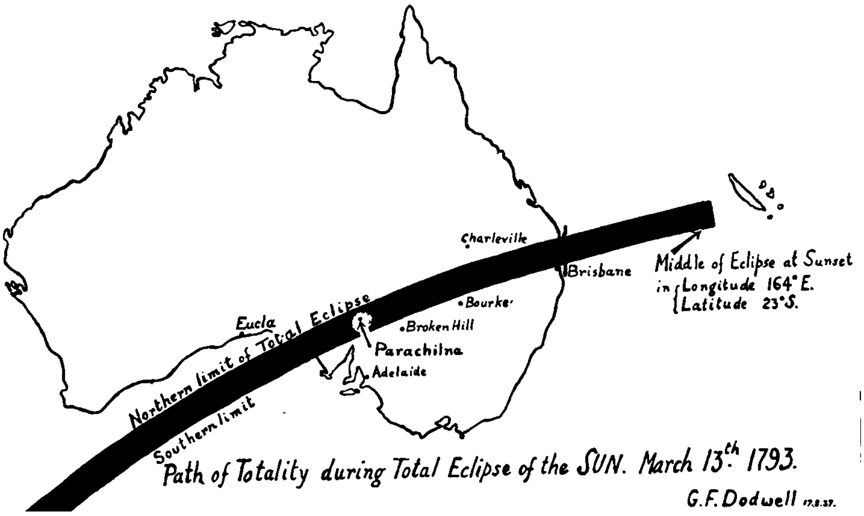

Figure 7 Map showing path of eclipse, March 13th, 1937 (Tindale 1937: 152)

In his introduction to the two legends, Tindale wrote:

It is probable that less has been written about this tribe than any other in South Australia…The territory of the Ngadjuri people extended from Angaston and Gawler in the south to Port Pirie and Orroroo in the north. Westward they ranged to Crystal Brook, but they scarcely touched the coast at Spencer Gulf except when on visits to the [Nar:aŋga] people of Yorke Peninsula. In the south their boundaries marches with those of the ['Kaurna] between Hamley Bridge and Gawler. Their eastern boundary was the eastern scarp of the Mount Lofty Ranges. Their northern neighbours were the ['Nukunu], who lived on the highlands and coast near Mount Remarkable. To the north east was ['Maraura] country. In accordance with the general practice that each neighbouring people has its own term for a tribe, we find that several names have been applied to the members of the Ngadjuri tribe by surrounding peoples. (Tindale 1937: 149)

The story of the old women is essentially an explanation of how both red ochre and black wad deposits were formed. However, as part of the story, the old woman's death instigates the first setting of the sun in the west. Tindale mentions that an unpublished Western Desert legend depicts an ancestral hero "bringing back the sun after it had been eclipsed", and surmises that the Ngadjuri legend may incorporate an actual event concerning the total eclipse of the sun, the last occurring at the writing of Tindale's article, in 1793 (refer Figure 5 above) (Tindale1937: 152).

Margaret Nobbs, (2000), wrote:

> *Berndt's informant, Barney Waria gave the following information: 'On the north too, the Ngadjuri interacted closely with people belonging to territories called by Tindale (1940) Jadliaura and Wailpi. As far as the Ngadjuri were concerned the territories and people of these two groups were Adnyamathanha…Barney said that, with the reduction of Ngadjuri numbers after European settlement of the region, those remaining either scattered across the country, living in the main townships or joined the Adnyamathanha. (Nobbs 2000: 24)*

It is quite evident, from both historical and contemporary sources, that the Ngadjuri tribe had significant interests in the country encompassing the Clare Valley, east across the Olary District in South Australia. From early sources such as Hall, Buttfield and Eyre and, more recently, Berndt and Tindale, it is also apparent that the region has great social, economic and ceremonial significance to not only the Ngadjuri, but to other surrounding tribes, as well as tribes from New South Wales and Victoria (these eastern tribes more so for east Ngadjuri country). Trade in quartz and ochre for ceremonial and subsistence purposes, linked groups throughout the region. Berndt (1941), indicated that the Ngadjuri name for pearl shell was makila:a, which indicates that, despite having their tribal territory far inland from the coast, the Ngadjuri were well aware of pearl shell through trade with coastal groups (Berndt & Vogelsang 1941: 9).

Ngadjuri shares close ties with neighbouring groups and it is likely that neighbouring people worked and socialised together in the Clare region at places such as Bungaree Station. Bungaree Station was established in 1847 as an Aboriginal ration station (Foster 1989: 64). Although information specific to this ration station is scarce, by drawing parallels with other ration stations in South Australia it is highly probable that the establishment of the ration station at Bungaree Station drew Aboriginal people for neighbouring areas to this location, and hence added to the blurring of Aboriginal tribal distinctions that tended to occur with the onset of European colonisation.

Kudnarto, the first Aboriginal woman in South Australia to legally marry a European colonist, is claimed as an apical ancestor by both the Kaurna and the Ngadjuri people.

> *Kudnarto was born into the region was known by the Kaurna people as Warrawarra. Running through the area was a creek known as Mekauwe, the pure waters of which were famed among the Kaurna and Ngadjuri peoples. The creek was a common meeting area for the peoples living within this region during the hot summer months when water became scarce. (O'Conner 1998: 133)*

In 1841 Kudnarto and her husband were granted Section 346 on Skillogalee Creek, in the Clare region (O'Connor 1998: 144), only to have this land taken back by the government once Kudnarto's husband died. Kudnarto died in 1855 at Bungaree Station, Clare (Kartinyeri 2002: 109).

In the book *Ngadjuri: Aboriginal People of the Mid North Region of South Australia* (Warrior *et al*. 2005) Ngadjuri country is described by Barney Waria, a Ngadjuri man who provided anthropologists with detailed information on Ngadjuri culture and history in the 1920s-1940s.

> *Barney Waria, a Ngadjuri descendant who talked to a number of anthropologists in the 1940s, told Berndt that the Ngadjuri land extended from Angaston and Gawler in the south to Panaramitee and Yunta in the north. (Warrior et al 2005: 11)*

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This book also identifies an old Ngadjuri campsite in the vicinity of Clare:

> *It is not known how many Ngadjuri people there were before the 1830s. However, as one example, there were 800 recorded by the Hawker family, as living near Bungaree and the Hutt River (just north of Clare). (Warrior et al 2005: 12)*

Further mention of Ngadjuri affiliation to the Clare region is provided with a strong Aboriginal view point in this book (Figure 6).

Clare script

Clare 1839–41, Edward John Eyre travels near Crystal Brook and the Broughton River. He looks like a ghost to us, riding a type of giant possum.

We hide out of his view as much as possible but he sees the remains of our campfires. He and his men eat some bandicoots which are plentiful.

Clare 1840 Newcomers, including John Horrocks and the Hawker brothers, move into our country with their strange animals. Horrocks settles at Penwortham and the Hawkers at Bungaree. That's our country, not theirs.

At first we are curious and so are they. We welcome visitors but these newcomers do not follow our law. They kill native animals but if any of the sheep or cows which arrived with them are killed by us for food, some of the newcomes become violent.

They are very ignorant and break our law all the time. They should know they have obligations.

Clare 1840 **February** Some of our men attack a shepherd with spears and waddies and take off with a shirt, shotgun and some sheep. In response, Thomas Flannery, a shepherd at Horrocks' station shoots one of our men.

Clare 1841 Our people set fire to surrounding country during the hot weather to try to force the newcomers to leave. This is our country and they've got no respect.

Clare later in 1841 The police try to maintain control but we hide in the scrub. A big mob of us meet together to attack but they have guns so we change our minds. Two of our men are captured and are tied by rope around their necks. They are tried in court in Adelaide but released.

Clare 1843 The white fellows at Bungaree try to take back some sheep from us and they kill one of our women. The killer is not punished by his government because he said it was self-defence. Nearby, on another station, a shepherd, Shelton, shoots and kills one of our men near their sheep enclosure.

Clare 1894 There is still a ration station near Clare. We're completely outnumbered by Europeans. We get work picking grapes.

Figure 8 Chronological information regarding Ngadjuri people at Clare (Warrior et al 2005: 129)

In reference specifically to Mintaro a brief article in the local paper of the time describes the unearthing of Aboriginal skeletal remains:

> *On Saturday afternoon last Mr. Heushcker was digging in front of his house at Waokoi Belt when he came across a quantity of bones. On Monday morning they were brought to Mintaro by Police-trooper Davis, and underwent an examination by Dr. Parker, who pronounced them to be bones of an aboriginal, many years buried. Mr. T. Priest, J.P., considered an inquest unnecessary, and the bones were reburied. (Northern Argus Clare 9/11/1877: 2)*

'Waokoi Belt' does not factor in any modern searches of this name. It is possible it is related, or possibly a corruption of "Wookie' that refers to creek traversing the Project Area and nearby road of the same name.

5.7 Discussion

The presence of Aboriginal heritage sites, objects or remains, as defined by the AHA is evident through the general region from various historical accounts and the analysis of the SA Museum collections. A wider search of the Central Archive shows a range of Aboriginal heritage sites for the general region, but they are not discussed here in order to keep this section of the report to a practical extent.

There are many cultural heritage survey reports adjacent to the survey area in neighbouring townships such as Clare, Burra and Waterloo but none specific to Mintaro and analysis of the ones available to the author has not found any more relevant information than provided above.

This section, although not specific to the project area, highlights the Ngadjuri people as enduring traditional owners with cultural ties to the general project region.

6.0 Aboriginal Site Types Typical for the Project Area

6.1 Introduction

This section discussed Aboriginal site types that are typically found in the region, based on the authors knowledge of Aboriginal heritage sites recorded in adjacent regions in conjunction with the background research in Section 5.0.

6.2 Aboriginal Site Types that may be typical for the Project Area

Based on the existing knowledge researched for the general region and understanding of the heritage landscape as inspected during the survey this section contains a range of Aboriginal heritage site types (archaeological and anthropological) that may be applicable. These site types are generally reflective of the types of Aboriginal sites that may be located regionally and may include, but are not limited to, the following Aboriginal site types.

Archaeological Occupation Sites

These sites contain the remains of old campsites and are areas of occupation potentially within the alluvial floodplains adjacent to river and creek systems. Artefact types and associated materials often consist of stone tools, ovens, food remains and possibly burials. Archaeological sites may occur in isolation or may be related to other site types such as stone arrangements and/or anthropological sites.

Aboriginal campsites are most often found adjacent creeks and streams feeding out of the ranges, and are usually situated on the sandy banks and overflow areas of the larger water courses. Site descriptions tell us that such campsites usually consist of large open areas containing scattered stone artefacts and the remains of hearths and ground ovens. Human burials are sometimes found within campsites, and culturally modified or scarred trees are also often found in proximity to occupation sites indicating that a range of activities was taking place at these locations.

Archaeological sites are likely to be the most common form of Aboriginal site for the general Project Area and potentially buried under current modern ground surfaces within undisturbed soils.

Burial Sites

Burial grounds are recorded in the region although none for the specific Project Area (see Section 5.3 & 5.6) and are more likely buried in sandy, alluvial deposits near creeks and rivers. As mentioned above, these are the areas also targeted for campsites, and the co-location of burials and campsites in sandy grounds adjacent water sources is not uncommon. Burial sites can potentially be marked with piles of wood or stone, and most burial sites cannot be identified until the human remains erode out of the ground or are disturbed inadvertently.

Quarry Sites

Quarry sites are areas where Aboriginal people have located a type of raw material, usually stone for stone tool making or ochre for ceremonial use and exploited that resource. Stone tool quarries are identified from signs of flaking/hammering on rock outcrops and from scatters of stone artefacts.

There are many quarry sites recorded generally throughout SA and these usually correspond with overt geological features – i.e. rock outcrops that feature materials conducive to stone tool production. The current Project Area features siltstone and quartz outcropping that are suitable raw materials for stone tool production.

Ancestral Creation Sites

Creation or Dreaming sites are still often called 'Myth' sites although that terminology is generally misleading given that one definition of 'myth' is "a widely held but false belief or idea". These sites are often associated with natural landscape features indicative of activity in the Dreamtime. These sites may include waterholes, rock outcrops, trees or other natural landscape features and there are often gender restrictions at play. Claypans, salt lakes, cane grass swamps, rivers and creek lines can all fall within this category. Frequently archaeological sites are located in relation to Creation sites, providing material evidence associated with traditional use of those sites.

Culturally Modified Trees (CMTs)

CMT's are particularly likely to be recorded on the banks of water courses although there are always exceptions to this rule, most are River Red Gums bearing scars from the removal of bark for use as a dish, shield, canoe or a variety of other wooden implements (e.g. Gara and Turner 1982). Large 'sheets' were also often removed for use in shelter construction further south in the northern Mt Lofty Ranges (Tindale 1974, cited in Coles and Draper 1988). Additionally, smaller scars may also be present, where toe-holds have been cut out and/or spikes driven into the wood by Aboriginal people climbing trees to catch possums for food and skins (e.g. Sanders 1909, cited in Draper 1985).

6.3 Summary

Given the Project Area is highly disturbed farmland including a moderately disturbed minor creek system with little remnant vegetation noted, the potential for intact Aboriginal heritage sites remains low although there remains potential for subsurface archaeological sites, objects or remains as defined by the AHA, based on general research discussed in this report combined with the consultation and survey results presented in the next section.

7.0 Results and Recommendations

7.1 Introduction

This section provides details of the Aboriginal cultural heritage field survey results and recommendations. Methodology and constraints have been discussed in Section 3.0.

7.2 Anthropological Survey

The anthropological survey was held on Wednesday 1 November 2017 in partial combination with the archaeological survey. The anthropological survey concentrated on Site Area 1 of the Project Area that given anthropological issues were discussed for the broader region that were subsequently focussed to specific landform characteristics of the Project Area.

The survey team inspected the survey area from several vantage points using vehicular and pedestrian methods. During the survey, Ngadjuri Traditional Owners discussed the Aboriginal heritage significance of the project area and the surrounding landscape.

There are three significant Creation Ancestor stories that travel through the general area from the north to the south. The activities of Creation Ancestors are remembered in story and song, and their activities are considered to have shaped the landscape as they travelled. Their travels also show how different Aboriginal groups are connected. Specific examples of their travels and activities in the project area and surrounding region were discussed by the Traditional Owners and recorded by the anthropologist. Details of the stories are not included here at the request of the Traditional Owners, as they are culturally confidential.

There are landscape features within the Project Area that are connected to these stories. These include rocks and outcrops that are coloured a deep purplish red (Figure 9) and which may also have a covering of lichen, and milky quartz. Within the Project Area, there are outcrops of the lichen covered rocks along the western slopes which decline towards Wookie Creek (Figure 3). Visibility was poor due to the amount of vegetation present within the Project Area, so there may be other places where surface outcrops occur, and it is highly likely these outcrops extend beneath the surfaces. Milky quartz was not visible; however, it may be present. Both features have cultural significance and should not be disturbed.

Ngadjuri representatives were pleased that the current draft layout of the proposed solar farm infrastructure does not impede on the Wookie Creek area, nor does it seek to disturb the remnant vegetation in the south west corner of Site Area 1 of the Project Area.

As a result of the consultations on site the Wookie Creek area featuring rock outcrops has been delineated as a culturally sensitive area on Figure 10.

There are no other anthropological sites within the Project Area.

Figure 9 Siltstone rocks feature in traditional stories and are a potential ochre source

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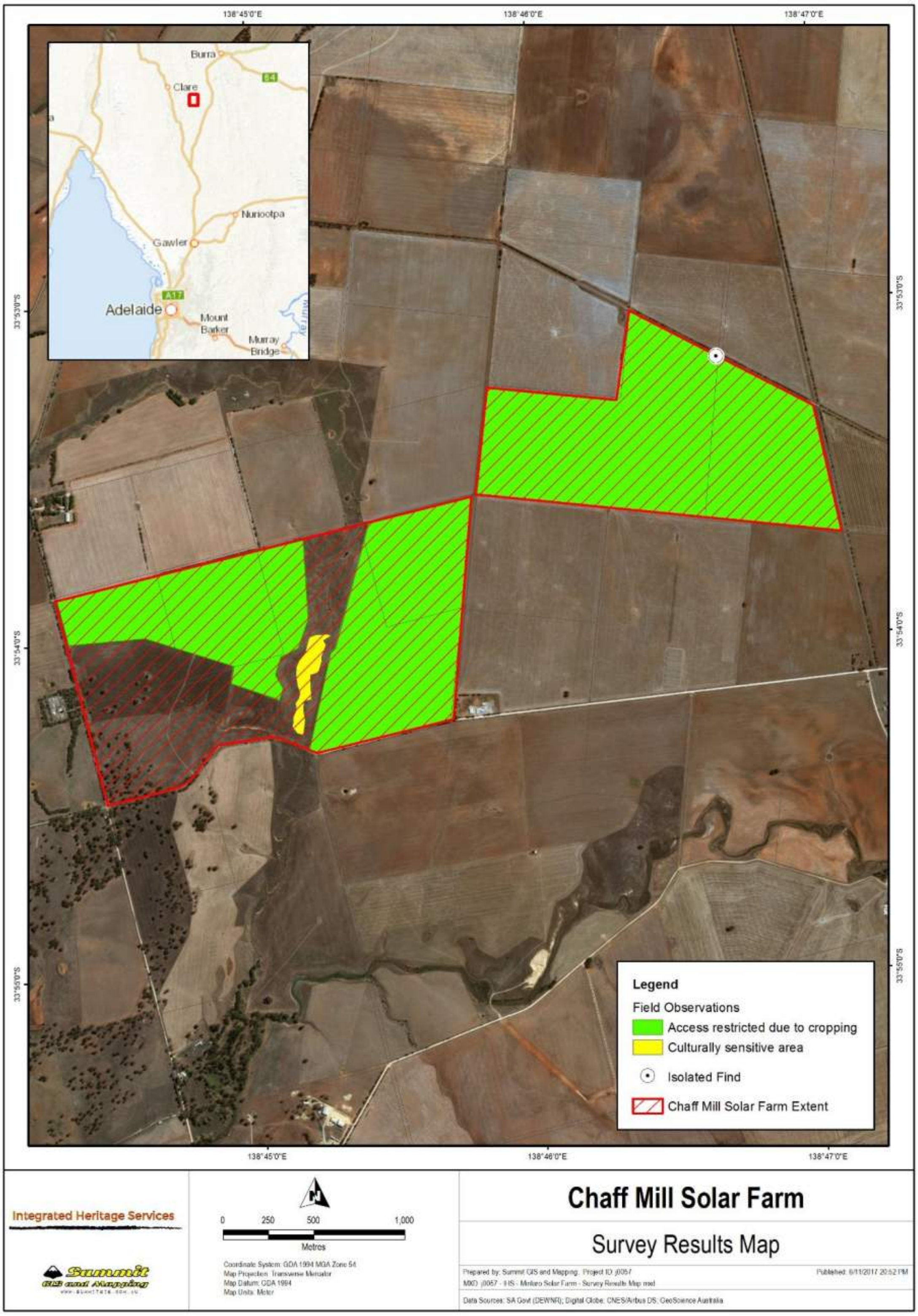

Figure 10 Field survey results

7.3 Archaeological Survey

The archaeological survey was held on Wednesday 1 November 2017 in partial combination with the anthropological survey and on Thursday 2 November 2017. The archaeological survey concentrated on Site Area 1 of the Project Area given the better ground surface visibility in much of that section of the Project Area. The constraints outlined in Section 3.2.1 discuss issues of access and visibility that affected the survey.

As discussed in the methodology section, Collector for ESRI ArcGIS was used to identify areas featuring more potential to contain Aboriginal heritage sites, while more geographically featureless areas were subject to more cursory survey.

The survey team inspected the Project Area from several vantage points using vehicular and pedestrian methods. Areas of best visibility were targeted first, including some fence lines, gates, sandy exposures, creek lines and the borrow pit quarry.

Figures 11-16 illustrate the typical and current landscape characteristics.

Figure 11 Visibility along fence lines was mostly poor

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Figure 12 Sandy exposures offered occasional windows of visibility

Figure 13 Nil ground surface visibility in fallow paddock

Figure 14 Borrow pit quarry in Site Area 1

Figure 15 Drainage channel feeding into Wookie Creek

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Figure 16 Current wheat crops offering no visibility and restricted access

The archaeological survey recorded raw material conducive to potential use for artefact production. Quartz, quartzite, siltstone and one example of a light brown silcrete was noted. On the northern fence line of Site Area 2 of the Project Area a broken glass base from a historic bottle was noted featuring potential pressure-flake scars caused by human interaction. The bottle base was found adjacent to heavily ploughed fields and the local road within a highly disturbed context and is detailed on Figure 10 as an "isolated find" and is not definitively identified as an artefact due to its highly fractured condition within a pastoral landscape frequently traversed by machinery. There is very little one can infer from the presence of this disturbed item, but it may indicate glass artefacts in the area. The incursion of Europeans and modern materials, such as glass and ceramics, into Aboriginal traditional society saw a period in which modern materials were being used in tradition-based artefact production. This was mostly due to the materials being sourced easily and their increased predictability to fracture reliably (see Allen et al 1980, Gojak 1981, Freeman 1993, Harris c1995, DiFazio 2000, Carver nd, Harrison nd).

Figure 17 Glass bottle base with potential pressure-flake scars

7.4 Results

The Aboriginal cultural heritage survey of the Mintaro Solar Farm Project Area recorded no archaeological or anthropological sites as defined by the AHA. The entirety of the Project Area, apart from the more moderately disturbed areas adjacent Wookie Creek and the stand of remnant eucalypts in the south west corner of Site Area 1, has been heavily disturbed through vegetation clearance and pastoral activities such as ploughing and cropping. The gently sloping geographic relief of much of the terrain and relatively high disturbance encountered suggests low probability for encountering Aboriginal heritage sites, objects and burials. However, given the likelihood of buried undisturbed soils within a region that has been demonstrably well-occupied by Ngadjuri people before and during European colonisation, the potential for encountering buried heritage sites, albeit low, does exist.

The Ngadjuri representatives were supportive of the solar farm development and the consensus was that Ngadjuri would like to develop the relationship further with the proponent in order to manage potential heritage discoveries in the ground disturbance phase and also work towards developing a Ngadjuri 'footprint' in terms of thematic possibilities celebrating the Aboriginal cultural aspects of the region. This could take a variety of forms including interpretive signage and other design aspects as well as potentially dual naming. The inability to adequately survey the Project Area due to the constraints covered in this report was a concern and the team would like the opportunity to undertake follow-up survey post-cropping, when the ground surfaces are more visible and accessible. Should the level of post-cropping ground surface visibility remain low then the next best option to manage identification and management of potential Aboriginal sites and objects would be through the early stages of the initial ground disturbance phase.

Further, it is the preference of Ngadjuri traditional owners to consult with the proponent, in the context of developing and implementing a Cultural Heritage Management Plan (CHMP), in order to deal with potential discoveries in accordance with Aboriginal tradition in relation to Aboriginal sites, objects or remains and in line with best-practice cultural heritage management. The preparation and implementation of a CHMP for the ground disturbance phase is good practice for defining roles, responsibilities and processes for dealing with inadvertent discoveries of previously unrecorded aboriginal cultural heritage sites, objects and remains as defined by the AHA. Procedures agreed upon in the plan are typically laid out in a short cultural heritage induction session on the first day or ground disturbance works with the wider civil team.

There were no archaeological sites recorded for the Project Area although the constraints to the survey were considerable and there remains potential, albeit low, for archaeological sites to be present in currently obscured terrain.

7.5 Recommendations

As a result of the Aboriginal heritage survey of the proposed Chaff Mill Solar Farm Project Area, including consultation with Ngadjuri Traditional Owners, the following recommendations are made:

1. Consider surveying of the currently cropped paddocks once ground surface visibility is rendered to a state where the identification of Aboriginal heritage sites and objects can be undertaken confidently;
2. The drafting and implementation of a cultural heritage management plan incorporating a fully consulted site discovery procedure and salvage methodology for specific site types if Aboriginal heritage sites, objects or remains are discovered during civil works;
3. The heritage induction of civil contractor and other employees undertaking the ground disturbance works. Heritage induction should contain at a minimum, typical Aboriginal sites descriptions, potential indicators, site discovery process, working with monitors and legislative obligations;

Further, Ngadjuri Traditional Owners wish to explore prospects to engage in employment opportunities associated with the project plus input into dual naming, interpretive signage, landscaping and more generally, thematic considerations to provide the wider community with accessible information around Ngadjuri identity and culture.

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Legislation

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cwth)
Aboriginal Heritage Act 1988 (SA)
Environment Protection and Biodiversity Conservation Act 1999 (amended 2003) (Cwth)
Heritage Places Act 1993 (SA)
Native Title Act 1993 (Cwth)
Native Title (South Australia) Act 1994 (SA)

APPENDIX I

NON-INDIGENOUS HERITAGE ASSESSMENT

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FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM

NON-INDIGENOUS HERITAGE REPORT

FEBRUARY 2018

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Chaff Mill Solar Farm
Non-Indigenous Heritage Report

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REV	DATE	DETAILS
00	29/01/2018	Draft
01	06/02/2018	Final
02	27/02/2018	Updated final to correct street name to Wookie Creek Road

	NAME	DATE	SIGNATURE
Prepared by:	Bronte Nixon, Erin Fitzner	06/02/2018	B. [signature] EFitzner
Reviewed by:	Bronte Nixon	06/02/2018	B. [signature]
Approved by:	Bronte Nixon	27/02/2018	B. [signature]

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ABBREVIATIONS

CEMP	Construction Environmental Management Plan
DEWNR	Department of Environment, Water and Natural Resources
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FRV	FRV Services Australia Pty Ltd
MNES	Matters of National Environmental Significance (MNES)
RNE	Register of the National Estate
SHA	State Heritage Area

1 INTRODUCTION

1.1 THE CHAFF MILL SOLAR FARM PROJECT

Australian solar development company FRV Services Australia Pty Ltd (FRV) is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia. The proposed 100MW solar farm would be developed on a 380HA site adjacent to the existing Mintaro substation and its 132kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

1.2 PROJECT AREA

The proposed Chaff Mill Solar Farm Project is located 3.5 kilometres north-east of Mintaro in the Clare Valley, 130 kilometres north of Adelaide. The proposed 100MW solar farm would be developed on a 380HA site that is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. The existing land use is agricultural and the site falls within the District Council of Clare and Gilbert Valleys.

1.3 LEGISLATIVE AND POLICY REQUIREMENTS

Three pieces of legislation apply to non-Indigenous heritage in South Australia:

1.3.1 THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (COMMONWEALTH)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It applies to all Australian territory and waters. Under the Act, actions that are likely to have a significant impact upon defined Matters of National Environmental Significance (MNES) are subject to an assessment and approval process. A company proposing to take an action that may have a significant impact on a MNES must refer that action to the Commonwealth Minister for the Environment. The EPBC Act prescribes nine matters of national environmental significance as triggers for Commonwealth assessment. These are:

- World Heritage sites
- National Heritage places
- Ramsar Wetlands of international importance
- nationally threatened species and ecological communities
- migratory species protected under international agreements
- the Commonwealth marine environment
- the Great Barrier Reef Marine Park
- nuclear actions, including uranium mining
- a water resource, in relation to coal seam gas development and large coal mining development.

1.3.2 HERITAGE PLACES ACT 1993

The *Heritage Places Act 1993* makes provision for the identification, recording and conservation of places and objects of non-Indigenous heritage significances in South Australia. The Act establishes the South Australian Heritage Council and allows for the identification and protection of places of heritage significance. The South Australian Heritage Register lists all places of heritage significance to South Australia. Heritage Places and objects must meet criteria outlined in Section 16 of the Act. Once registered, state heritage places are protected under both the *Heritage Places Act 1993* and the *Development Act 1993* (soon to be superseded by the recently passed *Planning, Development and Infrastructure Act 2016*). Any impacts to a State heritage place comprises development and as such requires development approval.

1.3.3 DEVELOPMENT ACT 1993 AND THE PLANNING, DEVELOPMENT AND INFRASTRUCTURE ACT 2016

Local councils' various heritage policies (for local and state heritage) are outlined in individual Development Plans for each local government area. Approval is currently required under the *Development Act 1993* if a proposed activity may impact a state or local heritage place.

The recent *Planning, Development and Infrastructure Act 2016* and Planning and Design Code provides for matters that are relevant to the use, development and management of land and buildings. The *Planning, Development and Infrastructure Act 2016* contains the following provisions that may be relevant to heritage values surrounding the Chaff Mill Solar Farm project area.

- The Planning and Design Code may designate a place as a place of local heritage value if it meets certain criteria set out in the Act. The Planning and Design Code may also be amended to include or remove State heritage places. In addition:
  - If a place that is the subject of an application for development authorisation under this Act becomes a State heritage place within the meaning of this Act, the place will be taken to have been a State heritage place for the purposes of this section at the time the application was made.
  - If a place that is the subject of an application for development authorisation under this Act becomes subject to an order under the *Heritage Places Act 1993* that requires a person to stop any work or activity, or prohibits any work or activity, the order will be taken to have been in force for the purposes of this section at the time the application was made.
- If urgent building work is required and affects a State heritage place or a local heritage place, the work must, so far as is reasonably practicable, be undertaken to conserve its heritage value.
- An emergency order can be issued if an authorised officer perceives a threat to any State heritage place or local heritage place. An emergency order may require the owner of any building or land to do any one or more of the following things: (a) evacuate the building or land; (b) not to conduct or not to allow the conduct of a specified activity or immediately terminate a specified activity; (c) carry out building work or other work.

1.4 ASSESSMENT METHODOLOGY

The methodology undertaken for assessing the non-Indigenous heritage values of the wider project area involved reviewing the following registers, databases and documents:

- The Australian Heritage Places Inventory – for all places on the State and Commonwealth heritage registers and lists.
- The Australian Heritage Database – for World Heritage Places, National Heritage Places and Commonwealth Heritage Places.
- The South Australian Heritage Places Database – for places of State and local heritage significance.
- The Clare and Gilbert Valleys Development Plan.
- The Register of the National Estate (non-statutory).
- The *Mintaro State Heritage Area: Guidelines for Development* (DEWNR, Government of South Australia 2015).
- The *Mintaro Conservation Study* (McDougall and Vines 1988).

1.5 TERMINOLOGY

Commonwealth heritage place	The Commonwealth Heritage List, established under the EPBC Act, comprises natural, Indigenous and historic heritage places which are either entirely within a Commonwealth area, or outside the Australian jurisdiction and owned or leased by the Commonwealth or a Commonwealth Authority; and which the Minister is satisfied have one or more Commonwealth Heritage values (DoEE ND). The List can include places connected to defence, communications, customs and other government activities (DoEE ND).
Contributory heritage place	Some development plans contain contributory items. They are listed in development plans as part of historic conservation areas, zones or policy areas, however they are not defined by the *Development Act*. As such, since 2012, no new contributory items have been added to development plans. Contributory items are legacies of earlier approaches to development plan policy. They were identified as examples of forms of development, representing a defined period and its built-form character (DoEE ND).
Local heritage place	Local heritage place means a place that is designated as a place of local heritage by the local Development Plan or the Planning and Design Code;
National heritage place	Australia's national heritage comprises exceptional natural and cultural places that contribute to Australia's national identity. National heritage defines the critical moments in Australia's development as a nation and reflects the achievements, joys and sorrows in the lives of Australians. It also encompasses those places that reveal the richness of Australia's extraordinarily diverse natural heritage. National heritage places are located within Australia (DoEE ND).
Register of the National Estate	The Register of the National Estate was closed in 2007 and is no longer a statutory list. All references to the Register of the National Estate were removed from the EPBC Act on 19 February 2012. The Commonwealth government is currently in the process of disbanding the Register of the National Estate. All items previously on this register are being assessed and may be placed on either the national or Commonwealth registers.
South Australian Heritage Places Database	The South Australian Heritage Places Database, developed by the South Australian Department of Environment, Water and Natural Resources - State Heritage Branch, covers both state and local heritage places.
State Heritage Area	A State Heritage Area is a clearly defined region with outstanding natural or cultural elements significant to South Australia's development and identity. South Australia has 17 State Heritage Areas, chosen because they represent our natural and cultural heritage and capture the State's identity and character (DEWNR ND).
State heritage place	State heritage place means— (a) a place entered, either on a provisional or permanent basis, in the State Heritage Register; or (b) a place within an area established as a State Heritage Area under the *Heritage Places Act 1993;*

2 EXISTING CONDITIONS

2.1 HISTORICAL OVERVIEW

The Clare Valley region was inhabited by the Ngadjuri people prior to European contact (South Australian Museum 2017). The name ‘Mintaro’ was possibly derived from the local Aboriginal word ‘mintinadlu’, meaning netted water as the Aboriginal people used nets to trap emus and other animals (State Library ND).

The country to the north of Gawler in SA was occupied during the early 1840s by colonists who recognised the pastoral opportunities presented by the fertile grassy plains. The Barossa Valley and Clare Valley were quickly settled and the discovery of copper at Kapunda in 1844 and Burra in 1845 continued to attract settlers and investment in the lower and mid-north regions of South Australia (McDougall and Vines 1988).

2.1.1 DEVELOPMENT OF MINTARO

The development of Mintaro has been shaped by early land transportation, extractive primary industry, distinctive social and community groups, and productive primary industry (McDougall and Vines 1988).

Following the discovery of copper at Burra in 1845, the Burra Burra Mine quickly became one of the richest copper mines in the world (DEWNR 1990). The village of Mintaro was originally intended as a stopping place for the bullock teams (and later muleteers) which carted the copper ore from the mine to Port Wakefield and returned with coal and supplies shipped from Wales (DEWNR ND). There were 300 men working in Burra in 1855 with the Mintaro area also supplying hay and fresh food for the mining town as it had a direct link to Burra (McDougal and Vines 1988).

A significant proportion of Mintaro’s buildings were built in the prosperous period between 1850-1860, including small cottages, shops, flour mill, blacksmiths, churches and hotels. During the 1860s and 1870s several public buildings were built in the town including a police station, a public school and the Council hall and Institute (Department of Environment, Water and Natural Resources 2015).

In 1877, the copper teams were rerouted through Riverton to the new railway terminus at Gawler, bypassing Mintaro and causing a decline. This was alleviated by the expansion of the slate quarries and the development of Mintaro as a service centre for the surrounding farming districts (McDougal and Vines 1988). The Mintaro Slate Quarry opened in 1854 and was a major source of employment. Approximately 40 men were employed at the quarry in 1860 (McDougal and Vines 1988). The Mintaro Slate Quarry continues to be one of the oldest continuously producing quarries in Australia (DEWNR 1990).

The Mintaro Railway Station (renamed Merildin in 1918) was built in 1870, approximately 7 km east of the township. Mintaro was well-placed to continue as an agricultural service centre despite the closure of the Burra Mines in 1877. The surrounding farming districts of the fertile Gilbert Valley prospered during South Australia’s rural boom of the early 1870s and early 1880s (DEWNR1990).

Two large pastoral properties were built during this prosperous period; Martindale Hall (built 1879-80 and Kadlunga Homestead (purchased 1881). These properties were serviced by local labour from Mintaro. Martindale Hall continuous to be an attraction in Mintaro.

After 1930, there was a general decline in rural populations. The continuing function of the slate quarry helped Mintaro survive, however there has been limited development. Consequently, Mintaro has retained much of its historic character (DEWNR ND).

2.1.2 DECLARATION OF STATE HERITAGE AREA

Mintaro was declared a State Heritage Area (SHA) in 1982. The designation of a State Heritage Area is intended to ensure that changes to, and development within, the area are managed in a way that the area’s cultural significance is maintained (DEWNR 2015).

As it is located away from main road, Mintaro has escaped the changes that generally occur on transportation routes. The townscape provides a highly intact representation of early colonial-Victorian character. Various elements contribute to Mintaro's historic character, including its buildings, geographic position, vegetation, open spaces, street pattern and street amenities. The spaces between buildings, mature landscaping and views into and out of Mintaro also make a strong contribution to the character of the town (DEWNR 2015).

Objectives within the Mintaro State Heritage Area include:

- Retention of the original land division pattern and orientation
- Reinforcement of the rural village character with minimal infrastructure
- Retention of significant views between buildings along Burra Street to agricultural land
- Retention and conservation of the historic buildings, structures and ruins
- Adaption of some historic buildings and structures to ensure their long-term conservation and viability
- Unity of built-form with new buildings of a sympathetic design and form to historic building
- Retention and enhancement of the town's landscape character (DEWNR 2015).

2.2 OUTCOMES OF DATABASE SEARCHES

The outcomes of the database searches are presented in Table 2.1. Each database was searched for Mintaro, South Australia and Merildin, South Australia. Heritage places are mapped in Figure 2.1.

- The Australian Heritage Places Inventory contained ten entries, two of which were state heritage places and eight listed under the Register of the National Estate (state heritage places were also recorded in the South Australian Heritage Database).
- The Australian Heritage Database contained 33 entries.
- The South Australian Heritage Places Database contained 27 entries.
- The Clare and Gilbert Valleys Development Plan did not contain any local heritage places for Mintaro (state heritage places were already covered by the South Australian Heritage Places Database).

Most of the heritage places are located within the Mintaro township and are between 1.8-2.3 km south-west of the project area. The closest heritage place to the project area is the Merildin Railway Station, approximately 1 km south of the site.

Table 2.1 Heritage places in Mintaro and surrounds recorded on the Australian Heritage Places Database

ADDRESS	DETAILS	CLASS	PROXIMITY TO SITE
Lot 44 Burra St	Blacksmiths Shop	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 53 Burra St	Briggs Cottage Ruins	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 38 Burra Rd	Carpenters Shop Complex	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Catholic Church Road, Mintaro	Catholic Church of Mary Immaculate	Register of the National Estate	Outskirts of Mintaro township, approximately 2km west of the project area
Lot 21 Church St	Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 65 Church St	Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 66 Young St	Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	PROXIMITY TO SITE
Lot 13 Burra St	Devonshire Hotel (former)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 5 Wakefield St	Flour Mill Ruins	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 41 Burra Rd	H Jolly House	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 80 Wakefield St	House and Outbuildings	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 35/36 Burra St	House, Outbuildings and Stone Wall	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 42 Burra St	Hunt Workshop/Barn and Stone Fence	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
	Kadlunga	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 4 Burra St	Magpie and Stump Hotel	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
	Martindale Hall	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro Rd	Merildin Railway Station Group	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 8/9 Stein St	Methodist Church Group	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro Rd	Mintaro Cemetery	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
	Mintaro Conservation Area	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 3 Burra St	Mintaro Institute and Civic Hall	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 61 Church St	Mintaro Primary School	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro Rd	Mintaro Slate Quarries	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 569 Burra Rd	Police Station (former)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 34 Burra St	Reillys Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 36 and 37 Burra St	Row of shops and dwellings	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	PROXIMITY TO SITE
Lot 35 Burra St	Shop and Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 37 Burra St	Shops and Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Ruin King St	Slate Farmhouse (R Alcock)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 23 Hill St	St Peters Anglican Church	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Government Rd	St Stanislaus Catholic Church (former)	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 33 Hill St	Thompson Priest House and Mines Office	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 77 Wakefield St	Wakefield Cottage	Register of the National Estate	Within township. approximately 1.8-2.3 km south-west of the project area
Mintaro road, Merildin	Merildin Railway Station	Register of the National Estate	Approximately 1km south of the project area

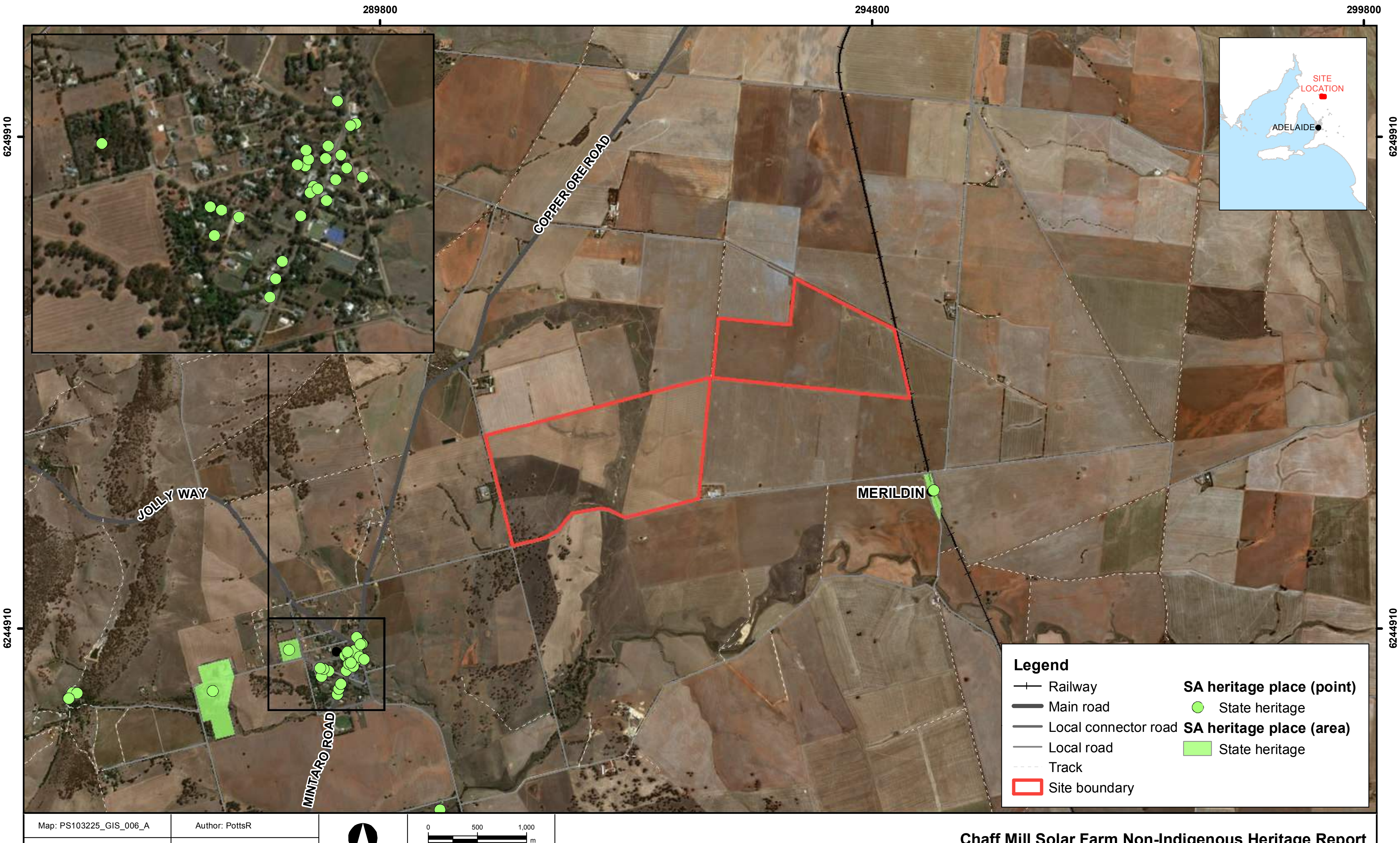
As outlined earlier, the Register of the National Estate is now a non-statutory database, however it still provides an indication of the heritage values in the area.

Table 2.2 Heritage places in Mintaro and surrounds recorded on the South Australian Heritage Places Database

ADDRESS	DETAILS	CLASS	STATE HERITAGE PLACE NO	PROXIMITY TO PROJECT AREA
Burra Road MINTARO	Mintaro Institute and Civic Hall	State	11650	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Dwelling (former Shop and Dwelling)	State	11647	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Dwelling - Jolly House	State	11721	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Former Carpenter's Workshop and Dwelling	State	11643	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Mintaro Mews (former Shop and Dwelling)	State	11646	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Former Blacksmith Shop	State	11718	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Road MINTARO	Former Carpenter's Workshop/Stables	State	11720	Within township. approximately 1.8-2.3 km south-west of the project area
Burra Street MINTARO	Mounting Steps, Mintaro	State	10069	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	STATE HERITAGE PLACE NO	PROXIMITY TO PROJECT AREA
Burra Street MINTARO	Dwelling (former Mintaro Police Station)	State	10205	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 22 Burra Street MINTARO	Shop and Cottage	State	11649	Within township. approximately 1.8-2.3 km south-west of the project area
Church Street MINTARO	Dwelling	State	11645	Within township. approximately 1.8-2.3 km south-west of the project area
Church Street MINTARO	Mintaro Primary School	State	11710	Within township. approximately 1.8-2.3 km south-west of the project area
Hill Street MINTARO	Former Mintaro Slate Mine Office and Dwelling	State	11707	Within township. approximately 1.8-2.3 km south-west of the project area
Hill Street MINTARO	Dwelling, Outbuilding and Fence	State	11709	Within township. approximately 1.8-2.3 km south-west of the project area
Kadlunga Road MINTARO	'Kadlunga' House and Stone Garden Wall	State	10200	Within township. approximately 1.8-2.3 km south-west of the project area
Leasingham Road MINTARO	Devonshire House (former Devonshire Hotel and Footway)	State	10066	Within township. approximately 1.8-2.3 km south-west of the project area
Leasingham Road MINTARO	Reillys Cellar Door and Restaurant, Heritage B&B Cottages (former Shop and Dwelling)	State	11648	Within township. approximately 1.8-2.3 km south-west of the project area
Lot 9 Leasingham Road MINTARO	Magpie and Stump Hotel	State	10201	Within township. approximately 1.8-2.3 km south-west of the project area
Manoora Road MINTARO	"Martindale Hall", Martindale Hall Conservation Park	State	10067	Approximately 2.6 km south-west of the project area
Mintaro Road MINTARO	Mintaro Cemetery	State	11715	Approximately 2.3 km south-west of the project area
Slate Quarry Road MINTARO	Mintaro Slate Quarries	State	11711	Approximately 3.1 km south-west of the project area
Wakefield Street MINTARO	Dwelling and Kitchen	State	11716	Within township. approximately 1.8-2.3 km south-west of the project area
Wakefield Street MINTARO	Dwelling ('Wakefield Cottage')	State	11714	Within township. approximately 1.8-2.3 km south-west of the project area
Wakefield Street MINTARO	Former Flour Mill	State	11644	Within township. approximately 1.8-2.3 km south-west of the project area
Young Street MINTARO	Dwelling (former Mintaro Anglican Church)	State	11695	Within township. approximately 1.8-2.3 km south-west of the project area

ADDRESS	DETAILS	CLASS	STATE HERITAGE PLACE NO	PROXIMITY TO PROJECT AREA
Young Street MINTARO	Dwelling	State	11699	Within township. approximately 1.8-2.3 km south-west of the project area
MINTARO	Mintaro State Heritage Area	State Her Area	13935	Covers whole of Mintaro township. The closest boundary is approximately 1.2km from the project area.



Map: PS103225_GIS_006_A	Author: PottsR
Date: 5/02/2018	Approved by: EFitzner

Source: Department of Planning, Transport and Infrastructure, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Chaff Mill Solar Farm Non-Indigenous Heritage Report
Figure 2.1
Heritage places in Mintaro and surrounds

3 POTENTIAL IMPACTS

3.1 CONSTRUCTION

Construction activities that result in the highest vibration levels are generated by compactors, vibration rollers and pile driving.

In most cases, the generated vibration would not cause structural damage to buildings greater than 25 m from construction areas. Given that the distance to the nearest heritage place would be approximately 1 km away, structural damage to heritage places during construction is unlikely.

Trucks accessing the site would not be driving through the Mintaro township and would not impact on any heritage places. The project will not involve the demolition of any buildings.

3.2 OPERATION

The operation of the Chaff Mill Solar Farm will not cause any vibration impacts and will not structurally impact heritage places in any way.

There is a slight risk that potential impacts to heritage values resulting from the proposed Chaff Mill Solar Farm could be to the State Heritage Area status and amenity value of the township and surrounds, however the solar farm would be located 3.5 km away from the actual township and any impacts will be negligible.

An objective within the Mintaro State Heritage Area that may be impacted by the project is ‘Reinforcement of the rural village character with minimal infrastructure’ (DEWNR 1990).

4 MANAGEMENT AND MITIGATION MEASURES

4.1 CONSTRUCTION

No direct impacts from construction are expected on the heritage values of the Mintaro township and surrounds.

A Traffic Management Plan and Construction Environmental Management Plan (CEMP) will be prepared for the project to ensure that workers are aware of the heritage values in the area and that there are no impacts to these places.

4.2 OPERATION

Potential impacts on the State Heritage Value objectives for Mintaro will largely be mitigated through the design layout of the solar farm.

The solar plant will be low in profile, comprising of panels which do not exceed three metres in height. The model of solar panel chosen for this project does not have metal frames in order to reduce glare impacts. Visual and Glare studies have been undertaken as part of the Development Application and mitigation and management measures, such as screening, have been investigated as part of these reports. Refer to the visual impact report for a full assessment of all visual amenity mitigation measures.

5 SUMMARY AND RECOMMENDATIONS

The Chaff Mill Solar Farm will not impact any heritage places within the Mintaro township and surrounds. The closest heritage place to the project area is approximately 1 km away. Vibration impacts of major construction projects are generally limited to 25 m. the construction of a solar farm will not be as intrusive.

The project may impact on the objectives of the Mintaro State Heritage Area which include limiting the development of infrastructure and retaining views to agricultural land. The visual impact of the project on the amenity of the township will be limited through the design of the solar farm (e.g. low profile models with no reflective frame). Visual and Glare studies have been undertaken as part of the Development Application and mitigation and management measures, such as screening, have been investigated as part of these reports.

Prior to construction, a Traffic Management Plan and Construction Environmental Management Plan will be prepared, in part to ensure that the heritage values of Mintaro are not impacted in any way.

Management and mitigation measures may include the delineation of a specified transport route for construction vehicles that does not pass through the Mintaro township.

All construction and site staff working on the project should be inducted as to their legal obligations regarding the protection on non-Indigenous heritage places on the project.

6 LIMITATIONS

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

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APPENDIX J

VISUAL AMENITY ASSESSMENT

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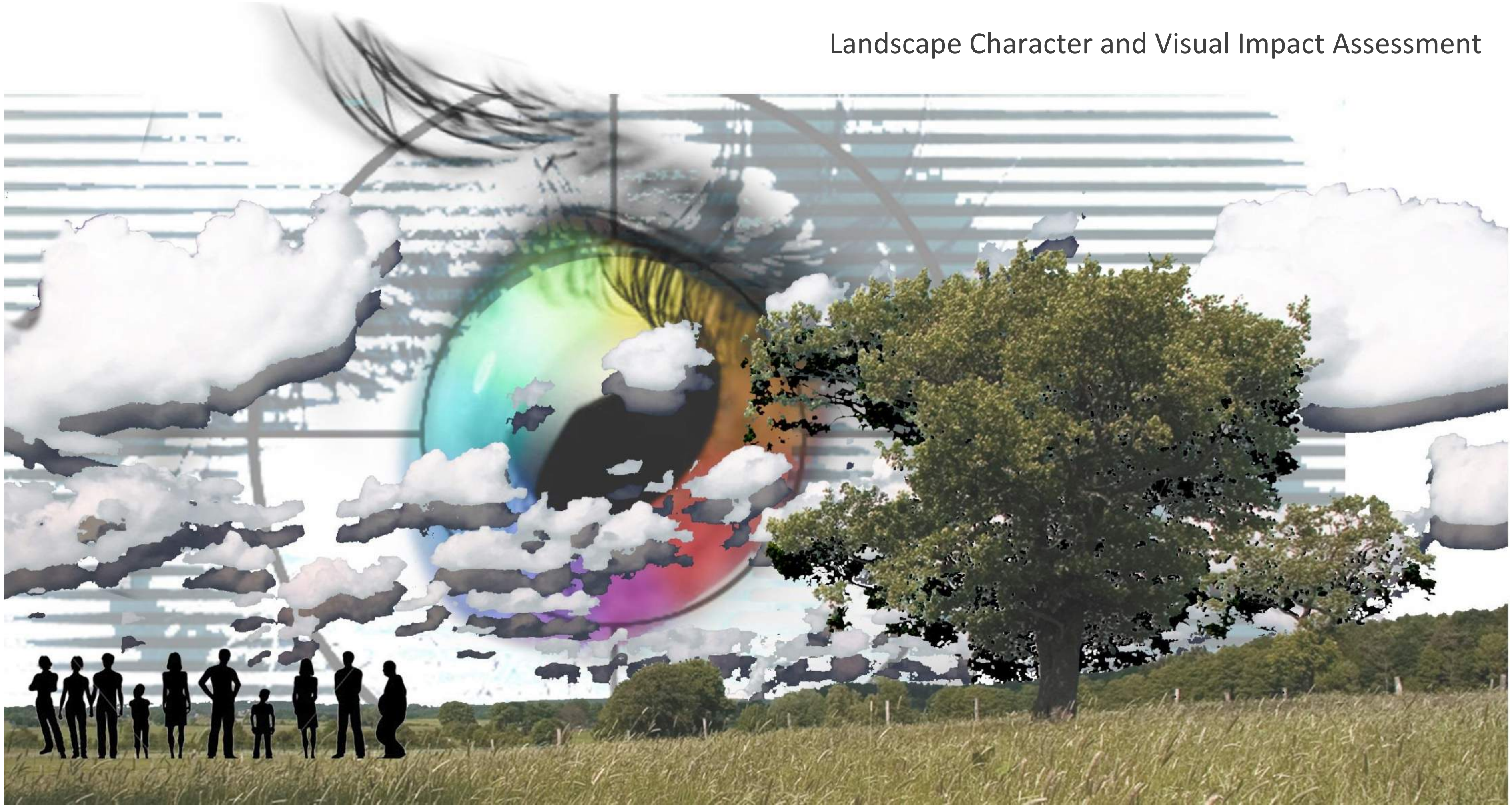
THE CHAFF MILL SOLAR FARM PROJECT

Landscape Character and Visual Impact Assessment



Hemisphere Design (Aust) Pty Ltd

Contents

1. Introduction

1.1 The Chaff Mill Solar Farm project

Australian solar development company FRV Services Australia Pty Ltd (FRV) is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia. The proposed 100MW solar farm would be developed on a 380 hectare site adjacent to the existing Mintaro substation and its 132kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology: Photovoltaic (PV) Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height above existing ground levels. The site is well-placed to capture renewable solar energy, then convert it to a usable form to be exported into the national electricity grid.

This assessment has been prepared to support a Development Application for the Chaff Mill Solar Farm and provides an overview of the existing landscape character and visual amenity of the proposed location, the sensitivity of the landscape to change, and the degree of visual impact as a result of the proposed development.

The delivery of the Chaff Mill Solar Farm has the potential to result in change to the existing landscape character and visual amenity of the landscape. Although the proposed location is highly disturbed by historical agricultural activity and an electricity substation, this development represents an additional visual alteration to the landscape. The degree of likely visual impact is discussed and, where relevant and appropriate, mitigation measures that would minimise the degree of visual impact are identified.

This assessment did not incorporate the preparation of photomontages. The degree of likely impact was determined based on an on-site analysis of viewpoints from both publicly accessible areas and locations adjacent residential dwellings.

It should be noted that assessment of visual impact is highly subjective and the individual consideration of visual impact from any given location or view point may differ from the findings presented in this assessment.

1.2 Project area

The proposed Chaff Mill Solar Farm Project is located 3.5 kilometres north-east of Mintaro in the Clare Valley, 130 kilometres north of Adelaide. The proposed 100MW solar farm would be developed on a 380 hectare site that is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. The existing land use is agricultural and the site falls within the District Council of Clare and Gilbert Valleys.

1.3 Legislative and policy requirements

Whilst no policy direction with regard to the development of solar farms is given in the relevant provisions of the District Council of Clare and Gilbert Valleys Development Plan, the Development Plan does outline a broad range of policy items of relevance to the design and appearance of the Chaff Mill Solar Farm project. In particular, the Development Plan provides that infrastructure development should:

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

Further, the State Heritage Area (Mintaro) Objectives, requires:

- *Objective 1.* Development that does not compromise the Statement of Heritage Value and contributes to the Desired Character for the Mintaro State Heritage Area.

1.4 Assumptions

A number of assumptions have been made which are:

- That the development of the solar farm will not require any new transmission power lines, transmission towers, poles or similar infrastructure beyond the existing 132KV transmission line to Waterloo.
- That security fencing will be erected on all perimeters. That the fencing is likely to be approximately 3 m high wire mesh with the top half being barbed wire and be of a post and panel construction which allows a high degree of visual permeability.
- All grades, levels and vegetative cover within the development site will remain as existing, notwithstanding some minor disturbance will be inevitable during the construction, installation of PV panels and construction of internal access paths. All disturbed areas will be remediated using an appropriate grass species.

Photo: Existing transmission line

2. Assessment Methodology

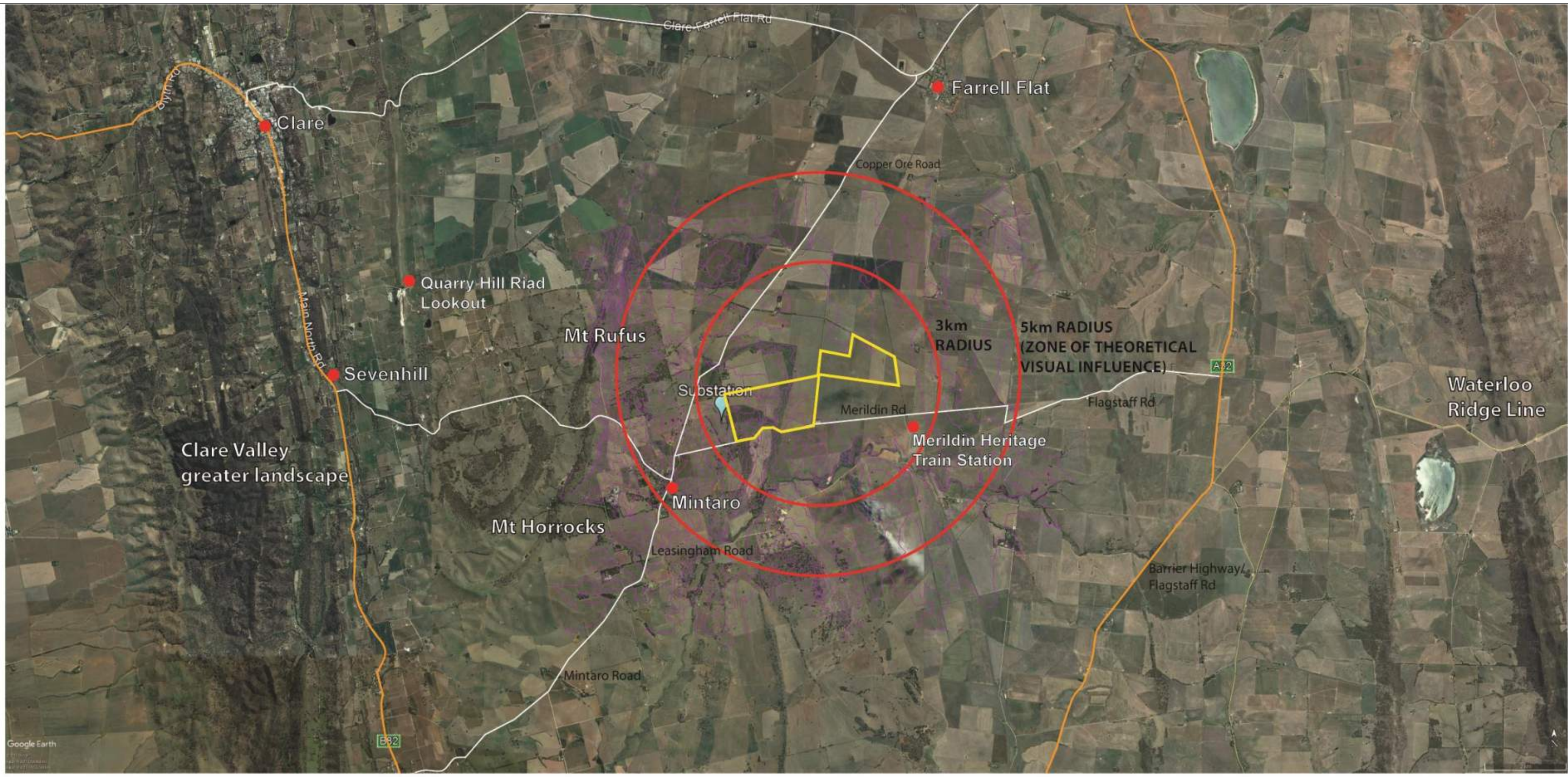
2.1 Desktop study

A desktop evaluation was undertaken to identify the nature of the regional topography and consequently likely viewpoints from which the development may be apparent. This evaluation identified a suitable study area for preliminary on -site assessment. This study area, the 'Zone of Theoretical Visual Influence' (ZTVI) was defined based on the assumption that modification to the contextual landscape as a result of the development could be discernible to the naked eye from within this defined area.

Given that the maximum height of the PV panels associated with the development is approximately three meters only, a distance of up to a 5 km radius from the development was adopted as the furthest extent of the ZTVI. It is my opinion that this distance could be considered to be conservative, as it is generally considered for developments of this nature that the maximum distance visible in a flat landscape (as is typical in the more immediate vicinity of the proposal) is approximately 3 km.

(Refer HD_T026_AD.01 _ Sheet 1)

The desktop study also considered other locations outside the ZTVI that may be more sensitive to visual change; in particular, elevated scenic lookouts and notable tourism routes of either or both local and regional importance. In particular, consideration was given to the potential for views of the development from the popular Quarry Hill Road lookout, a location some 10 kms from the proposed solar farm site.



LEGEND

Chaff Mill Solar Farm site

Contours within zone of theoretical visual influence

Major road

Secondary road

0 2.0km

TITLE	LANDSCAPE CONTEXT PLAN			
PROJECT	CHAFF MILL SOLAR FARM			
DWG NO HD_T026_AD01	SCALE -	SHEET NO 1	REVISION -	
DRAWN SW	CHECKED SRH	DATE 10/17		

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2.2 Site visit and photography

A series of site visits were undertaken on the 11th and 28th of August and 17th October 2017.

On each visit, photographs were taken at selected viewpoints to underpin the landscape character and visual impact assessment. Photographs have been taken using a Nikon 35mm Single Lens Reflex (SLR) camera with an approximate lens setting of 43mm.

Where appropriate, panoramas have been presented at certain viewpoints to simulate the wider horizontal field of view that a person typically experiences, as opposed to what is represented in a single photograph.

The ZTVI was assessed and 'truthed' on-site, where further consideration was given to the presence of other intervening elements, e.g. vegetation, local topography and built form that may obscure views to the solar farm, providing a conservative indication of the visibility of the solar farm.

In concluding the on-site assessment, the visibility or lack thereof of the solar farm from within the ZTVI has been represented through the identification of a 'visibility shadow' diagram. This diagram identifies areas within the ZTVI where it is predicted that the proposed development will not be visible because there are a combination of hills, ridges and specific blocks of vegetation between the viewer and the proposal that potentially blocks all views. Through the on-site assessment it was determined that generally, areas beyond the ZTVI and 'visibility shadow' are likely to be too far away from the proposed site to offer discernible views of the solar farm.

Photo: Agricultural landscape typical of expansive eastern plains

2.3 Evaluation of the existing landscape character

A qualitative landscape character assessment has been undertaken in a rigorous manner consistent with best practice, as prescribed by the *Guidelines for Landscape and Visual Impact Assessment* (Third Edition).

2.3.1 Landscape assessment

Landscape assessment, in contrast to visual assessment, deals with the fabric, character and quality of the countryside. The landscape fabric consists of the elements that make up the landscape, such as landform, land-use and cultural influences. The way these elements fit together in terms of proportion, pattern, scale, etc., gives rise to a particular landscape character. Changes to the fabric and character of a particular landscape may affect the perceived value of that landscape, giving rise to changes in its quality.

The landscape character assessment has encompassed both the wider contextual landscape and the locality, which is visually more difficult to define and within which the proposed development is located.

This characterisation process establishes a 'baseline' upon which judgments about the potential effects of the proposed development can be made. I apply the following guiding definitions to determine my assessments:

High scenic quality: Areas and localities which exhibit an exceptionally strong positive character with valued features which combine to give an experience of unity, richness and harmony. Within this definition 'exceptional' could apply where an area is also deemed to be worthy of a legislative designation, e.g. a National Park.

Moderate scenic quality: Areas which exhibit a strong positive character with valued features with evidence of a visually acceptable level of alteration/degradation/erosion resulting in a location of more mixed character.

Low scenic quality: Areas with a generally positive character with fewer valued features with evidence of a visually acceptable level of alteration/degradation/erosion resulting in a location of more mixed character.

No scenic quality: Areas with a little or no positive character with few or no valued features with evidence of a visually unacceptable level of alteration/degradation/erosion resulting in a highly modified location of little character.

Photo: Crest at Hare Road looking north east to site

2.3.2 Landscape Sensitivity

Further, the characterisation process defines the landscape ‘sensitivity to change’ of both the wider contextual landscape and the locality. This is categorised as either high, medium, low or negligible, where for example, a landscape that displays a high ‘sensitivity to change’ would not be able to absorb a development of this nature without irreparable consequences and impacts on the inherent character and visual amenity.

The factors used to determine the landscape sensitivity include:

- Pattern and scale of the landscape;
- Existing land use;
- Visual enclosure and openness of views;
- Scope for mitigation which would be in character with the existing landscape; and
- Value of the visual landscape and ‘sense of place’.

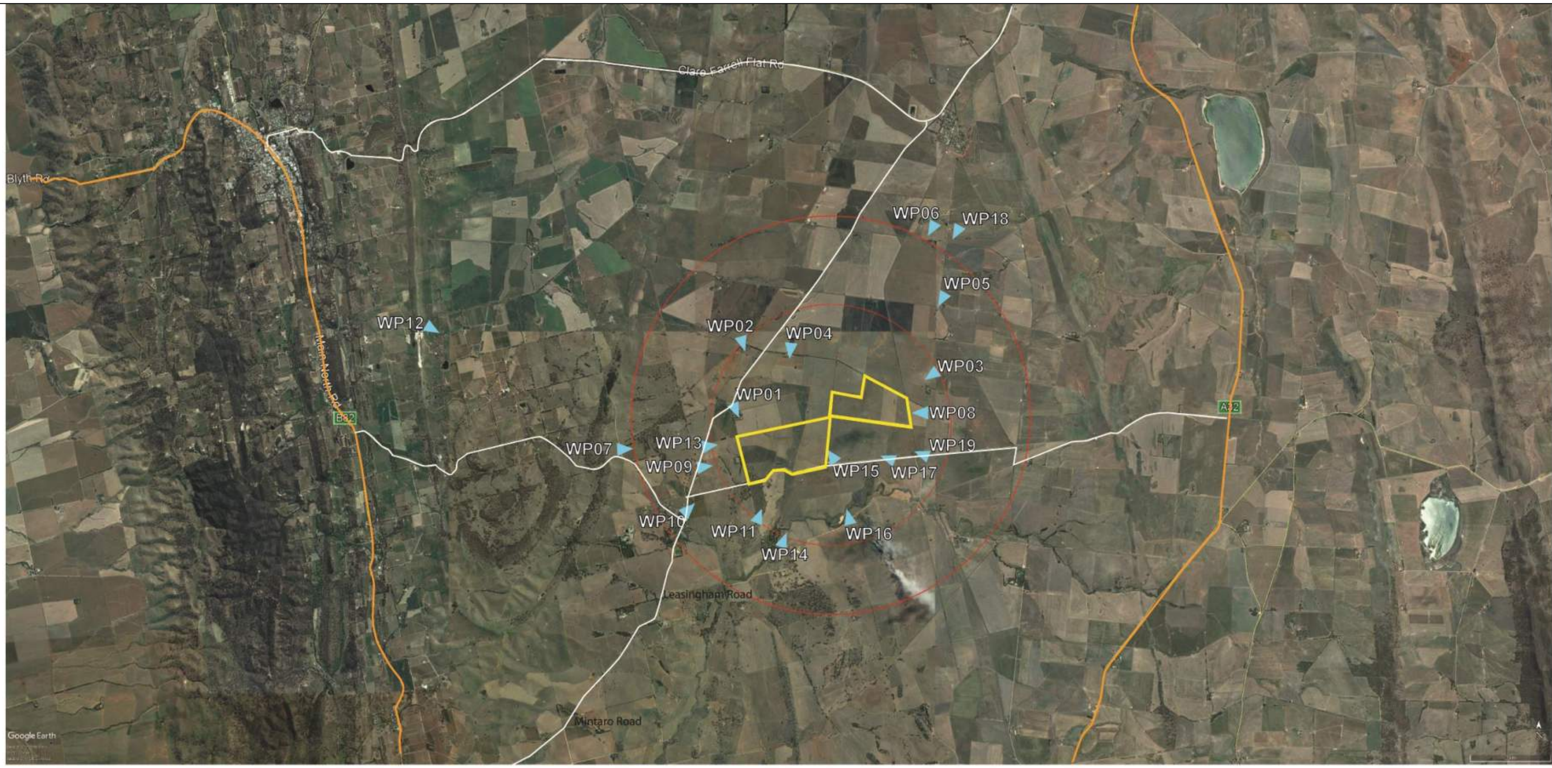
Photo: Copper Ore Road – view south and east across site.

In general landscape sensitivity:

- Decreases when the viewing time is infrequent and becomes shorter; however, repetitive viewing even if a of a short duration will increase sensitivity;
- Decreases as distance from the viewer to the development increases;
- Varies depending on the activity of the viewer, for example a resident within the confines of their dwelling at rest as compared to a rural hiker;
- Increases where a view is enjoyed and highly valued by the immediate community;
- Increases where a view is seen by many viewers;
- Increases if the view is seen from residences;
- Increases if the visual landscape plays a part in tourist or recreational activities.

In total, nineteen locations or waypoints have been visited to determine both the landscape character of:

- the wider contextual landscape of the Clare Valley within which the solar farm development will be located; and
- the more immediate study area, the locality, which is broadly contained within a five kilometre (i.e. the extent of the ZTVI) radius from the proposed solar farm development site.



LEGEND

Chaff Mill Solar Farm site

WP01-19 Waypoint

Major road

Secondary road

N

0 3.0km

TITLE	WAYPOINT LOCATIONS		
PROJECT	CHAFF MILL SOLAR FARM		
DWG NO HD_T026_AD01	SCALE -	SHEET NO 2	REVISION -
DRAWN SW	CHECKED SRH	DATE 10/17	

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2.3.3 Sense of Place

The term 'sense of place' is used in urban and rural studies in relation to place-making and most importantly the 'place attachment' of communities to their environment or homeland. The term sense of place is used in many different ways, however for the purpose of landscape evaluation I use the following definition sourced from the Geography Dictionary; that is sense of place is:

> *"Either the intrinsic character of a place, or the meaning people give to it, but, more often, a mixture of both."*[1]

> *"A sense of place is a unique collection of qualities and characteristics – visual, cultural, social, and environmental – that provide meaning to a location. Sense of place is what makes one city or town different from another, but sense of place is also what makes our physical surroundings worth caring about".*[2]

Therefore, in my opinion and in keeping with best practice guidelines for visual assessment, a landscape character assessment must go beyond merely describing land form and use but should also attempt to recognise and give consideration to the 'sense of place' and the values inherent in 'place attachment'.

Whilst 'place attachment' is not an amenity and character value that can be easily quantified or measured, I believe it is important to do so given the significance it plays – and especially so in this particular situation.

In my experience, 'place attachment' is the complex synergy of any number of relevant sensory and emotive qualities, which shape how individuals and communities perceive and connect to the landscape. Place attachment is generally expressed as a positive association with the locality. Through their frequent interaction (both passive and active) with a place, locals can be profoundly stimulated in a positive way by these cumulative influences. Their attachment to the 'place' is because of the way it makes them feel.

[1] Buntin, S.B., Terrain.org and the Online Nexus of Literature and environment. Virtual Sense of Place. 2009. http://www.terrain.org/ecomedia/q1/definitions.htm

[2] McMahon, E.T., UrbanLand The Magazine of the Urban Land Institute. The Distinctive City. 4 April 2012. http://www.urbanland.uli.org/development-business/the-distinctive-city

The place attachment value, in conjunction with the appreciation of the contextual landscape assists in defining sense of place and landscape character for a given locality.

Understanding and applying weighted consideration to a community's intimate relationship with their contextual surroundings is paramount and in my opinion, and the opinion of other professionals who undertake Landscape Character and Visual Assessments, the defining feature of landscape.

> *"Landscape is about the relationship between people and place. It provides the setting for our day-to-day lives. The term does not mean just special or designated landscapes and it does not only apply to the countryside. Landscape can mean a small patch of urban wasteland as much as a mountain range and an urban park as much as an expanse of lowland plain. It results from the way that different components of our environment - both natural (the influences of geology, soils, climate, flora and fauna) and cultural (the historical and current impact of land use, settlement, enclosure and other human interventions) - interact together and are perceived by us. People's perceptions turn land into the concept of landscape"*[3]

[3] Swanwick, C and Land Use Consultants (2002) in Landscape Institute and Institute of Environmental Management and Assessment. Guidelines for Landscape and Visual Impact Assessment, Third edition, 2013, p. 394

2.3.4 Landscape character of the wider Clare Valley

Located approximately 10 kilometres from the proposed solar farm site, the elevated position of the Quarry Hill Road lookout affords expansive panoramas over the rolling landscape of grazing activities and cropped fields, drawing the eye of the observer beyond the Mount Rufus and Mount Horrocks ridgelines towards the turbines of the Waterloo Windfarm, which silhouette the horizon.

This outlook aptly captures the attractive, pleasing and visually complex landscape which is typical of the wider Clare Valley. A landscape where the coloured patchwork array of fields is bounded by the occasional group of scattered eucalyptus and smaller hedgerows. It is the quintessential Clare Valley agricultural landscape where large, sprawling traditional land holdings of pastural and cropping fields are visually punctuated by the occasional visually prominent vineyard. The presence of visually imposing, steel constructed barns and warehouses reinforce the utilitarian nature of the landscape and the growing regional focus being placed on wine production.

The landscape of the Clare Valley comprises of some of the region's most productive rural land. Its visual qualities make the landscape a significant tourism asset to the region. The landscape of the Clare Valley is in stark contrast to the landscape of the Mt Rufus and Mount Horrocks ranges to the east which comprises of a visual expanse of open, sparsely vegetated grazing land, within which the proposed solar farm development site will be located.

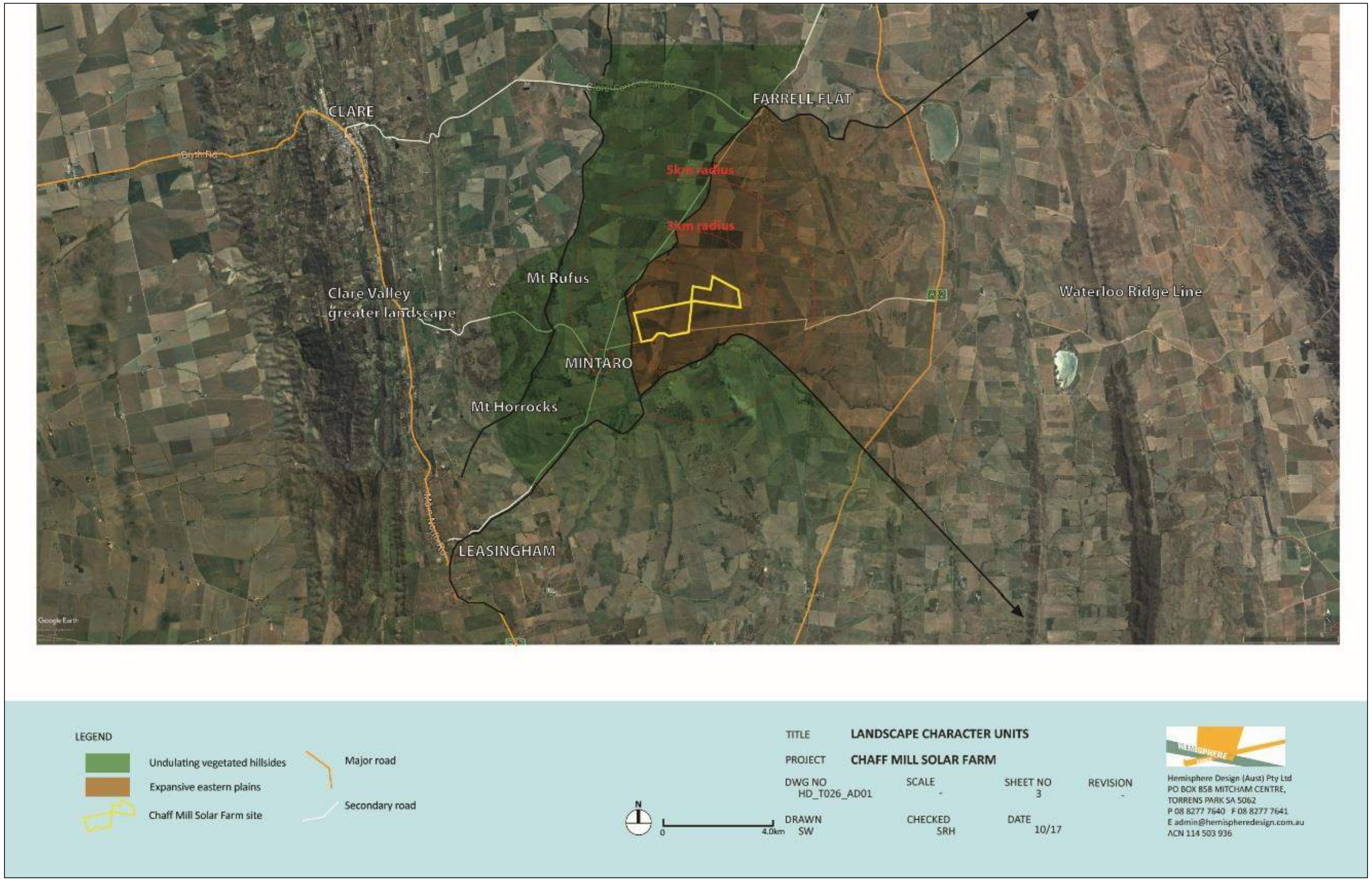
This panoramic experience enjoyed at Quarry Hill Road lookout is reintroduced from the higher slopes of the Mt Rufus range on the journey east along Sevenhill Road to Mintaro before descending into a more visually compact landscape where the folding and undulating topography and prominent mature roadside vegetation creates a more intimate, visually enclosed experience. The presence of this mature vegetation softens the built form of single storey traditional stone and brick farm buildings, residential properties and steel agriculture sheds and barns.

It is to be noted that the solar farm development site is not visible from the Quarry Hill Road locations evaluated.

Photo: Quarry Hill Lookout - looking north east to project site

2.3.5 Landscape character of the locality

The characterisation of the locality and area contained within the ZTVI has identified two distinct landscape character units.



2.3.5.1 The undulating vegetated hillsides to the west of Mintaro and the Mintaro township

This character unit broadly comprises of the landscape west to the Mt Horrocks and Mt Rufus ridgelines and east to Copper Ore Road. The character unit is bounded by Leasingham Road to the southwest, in the south by the higher ground to the south of Martindale Road and to the north by Farrell Flat Road. The undulating landform of this character unit envelops and visually encloses the historic township of Mintaro.

The character unit is a culturally modified agricultural landscape of pastural land, crop growing and the occasional vineyard. The rolling topography and presence of mature native road side vegetation creates a human scaled landscape where visual enclosure is more tightly defined and contained within the immediate locality.

Travelling along both Leasingham Road and Sevenhill – Mintaro Road towards Mintaro the landscape presents as a series of 'rooms', each one narrating the story of the locality through the composition of a landform of rolling fields and deep incisive creek lines, vegetation and generally harmonious rural built form.

Through occupation and adaptation, this is a landscape where a sense of place has evolved that displays characteristics which, anecdotal evidence suggests, many in the community accept as a typically '*natural*' agricultural landscape; a landscape where the open rural character of the hills surrounding Mintaro establish an important historic setting for the town.

The experience of travelling through this landscape of 'rooms' is celebrated on entering Mintaro where the scale, proportioning and vernacular of the built form heralds arrival at a town where a leisurely ambiance is underpinned by the rural, historic sense of place.

Views to the west, east and north from within the heart of Mintaro are contained within the rolling, undulating landform where sloped pastural fields and planted vines contain the eye of the observer, creating a human scale intimacy that permeates through the township.

As an experienced Landscape Architect, I can say that there is a diversity of attractive sensory qualities that can be experienced within this landscape character unit, and in particular within the Minarto township locality, where in my opinion the community are likely to have an intimate relationship with their surroundings. Therefore, it is my opinion that the 'place attachment' value in this landscape character unit would likely be one of significance.

Therefore, it is my opinion that the sense of place and landscape character of the undulating vegetated hillsides character unit which includes the Mintaro township is one of a **moderate to high scenic quality** and has a **moderate to high sensitivity to change**.

Photo: Merildin Heritage Train Station

2.3.5.2 The expansive eastern plains to the A32 Barrier Highway

A Primary Production Zone comprising of the landscape bounded by Copper Ore Road to the west and north, Martindale Road to the south, the A32 Barrier Highway to the east and the horizon of the elevated ridgeline above the township of Waterloo where the turbines of Waterloo Windfarm are visually prominent.

A visually simple landscape where the pleasing undulating vegetated hillsides to the west give way to a mostly flat, planar landform of expansive open pastural and cropping fields. A landscape of monotonous vistas where the general absence of significant boundary plantings and the occasional scattered groups of mature native trees clustered around the few residential dwellings in the location allows the eye to sweep across the landform in a fleeting moment. Although the occasional Southern Cross windmill, large agricultural barn or corridor of stobie poles momentarily captures the attention, the vastness of the landscape instils a sense of remoteness where sheep appear to be the primary occupants.

It is a landscape of straight and unsealed ochre earth roads which appear endless, bounded by post and wire fencing. It is a landscape less travelled and infrequently visited by the tourist, particularly during winter when many of the roads are unpassable save by four wheel drive vehicles.

It is of note that the existing electricity substation located off Wookie Creek Road remains visually anonymous, concealed and screened behind boundary plantings on each side. However, to the distant east the prominent turbines of the windfarm located on the higher ridges above Waterloo township dominate the horizon.

Whilst historic Mintaro Rail Station and its collection of palm trees evokes a moment of curiosity, its derelict, neglected state and inaccessibility does little to engage the enduring interest of the traveller.

The expansive eastern plains are a simple landscape that offers little visual appeal nor visual amenity except for views west to the wooded hills face and ridgelines of Mt Rufus and Mt Horrocks and the nearby ridgeline to the east and north east above Waterloo.

It is my opinion that the landscape of the locality is of a **low scenic quality** and has a **low sensitivity to change**.

Photo: Existing Electrical Substation at Wookie Creek Road

2.4 Likely visual impact of the proposed development

Of the 19 locations or waypoints visited the evaluation has identified:

(i) Eight locations which are considered to be 'Sensitive Receptors' which comprise of:

- six residential dwellings within a three kilometre radius of the solar farm (within the ZTVI);
- a series of elevated roadside vantage points on the descent into Mintaro along Sevenhill Road;
- one roadside location along Copper Ore Road, the primary road connection between Mintaro and Farrell Flat (within the ZTVI).

These are locations from where it is considered the proposed solar farm development is likely to be wholly or partially visible and in some instances prominent.

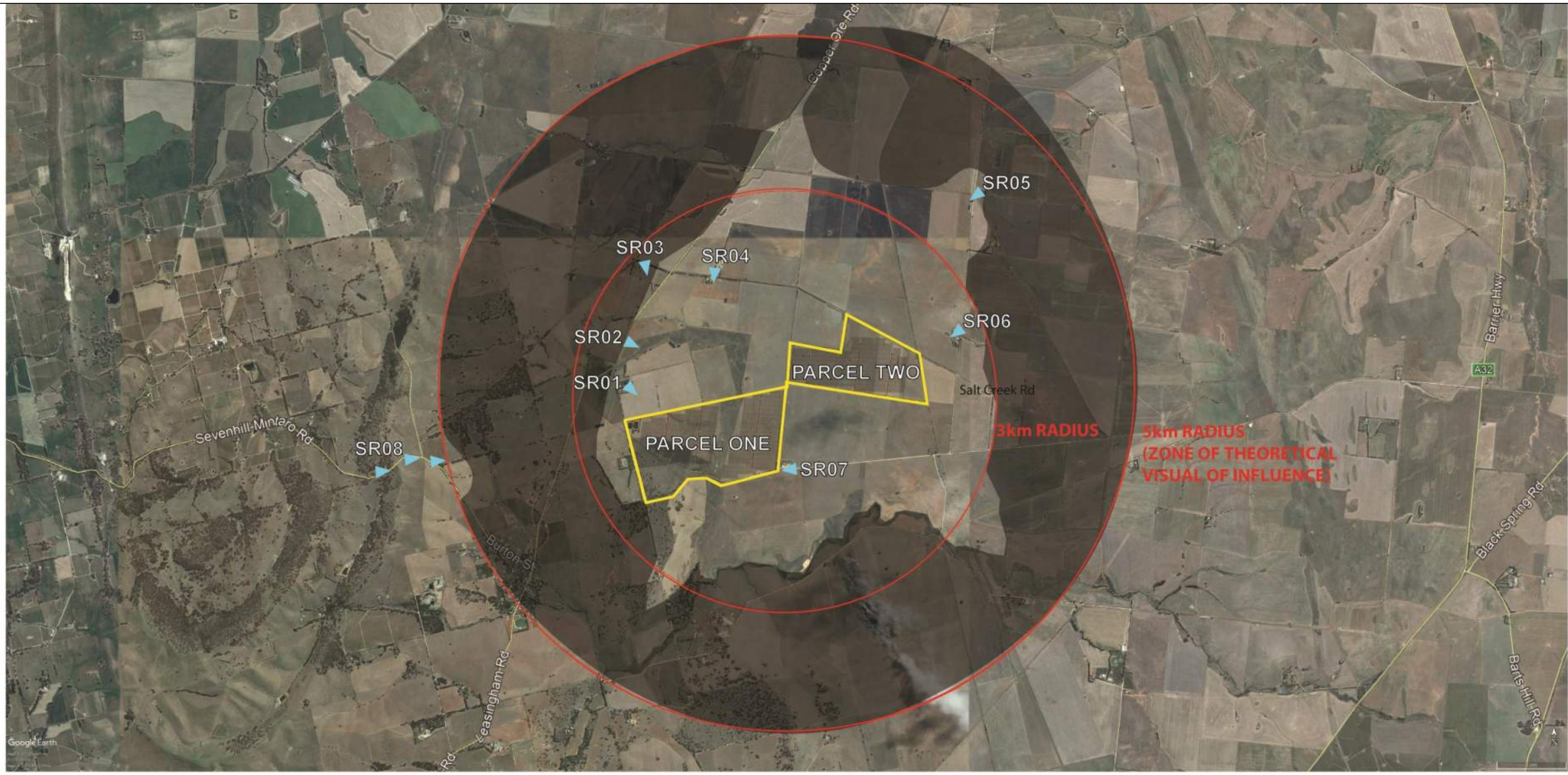
(ii) Six locations from which partial views of varying magnitude of the proposed solar farm are likely.

These locations are representative of many similar locations from within the ZTVI from which other similar views could be obtained. However, they are considered of low or no sensitivity due to their remoteness as a location, e.g. an unsealed road used infrequently and by local traffic only, where the number of affected viewers would be negligible.

(iii) Five locations from which views of the proposed solar farm will be concealed through a combination of both landform and vegetation screening.

My assessment of the likely visual impact of the proposed solar farm development has been confined to the eight 'Sensitive Receptors'.

Photo: Salt Creek Road looking south west to site



LEGEND

SR01-08 Sensitive Receptor

Chaff Mill Solar Farm site

Visual shadow zone

N

0 2.0km

TITLE	VISUAL SHADOW ZONE		
PROJECT	CHAFF MILL SOLAR FARM		
DWG NO HD_T026_AD01	SCALE -	SHEET NO 4	REVISION -
DRAWN SW	CHECKED SRH	DATE 10/17	

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With each assessment, reference is made to the description of the relevant prevailing landscape character unit.

For each 'Sensitive Receptor' the likely visual impact of the proposed development is described considering factors which may include:

- The visual qualities of the view and the duration and angle of the view in relation to the main activity of the viewer;
- The distance of the viewpoint from the proposed development;
- The extent of the area over which the changes would be visible and the scale of the change in the view (loss or addition of features, changes in composition, proportion of view affected);
- The degree of contrast in form, scale, mass, line, height, colour and texture introduced into the view by the proposed development;
- The duration and nature of the effect (temporary, permanent, intermittent);
- The numbers and types of viewers affected.

2.5 General solar farm development considerations

Photovoltaic panels are designed to absorb sunlight and convert it to electricity. Minimising the light reflected from the panels is a goal of panel design, manufacture and installation.

The dark, non-reflective nature of a solar array is generally considered to help minimise their visual contrast with the surrounding landscape, where at a distance they will appear similar to the belts of boundary plantings of native evergreen trees. Their horizontal scale is consistent with the large paddocks in the eastern plains character unit.

The solar farm will be low in profile, comprising of panels which do not exceed three metres in height. In theory the solar farm should be visible in the fore and mid-ground when viewed from locations to the immediate north and east of the site. However, it is apparent that subtle changes in undulation across the landform coupled with the presence of existing vegetation scattered throughout the area is likely to screen part or the entire solar farm from many locations within these immediate areas.

For viewers who are more than three kilometres away from the solar farm, the reduction in apparent size of the solar farm brought about by distance will mean that it is likely to be insignificant in height and therefore concealed within the view.

The likely potential visual impact of glare due to reflection from the solar farm PV panels and associated infrastructure are assessed and presented in a separate study.

2.6 Construction phase

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

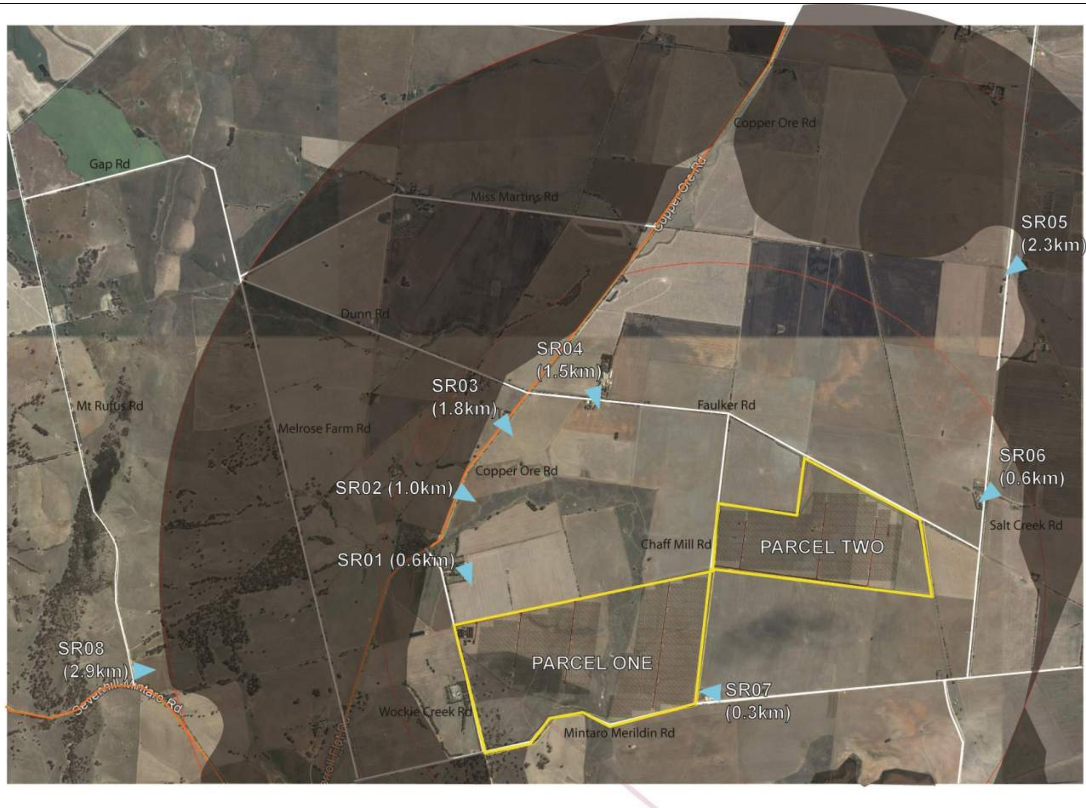
Photo: Adjacent Merildin Heritage Train Station looking north west to project site

2.7 Likely visual impact at the identified 'Sensitive Receptors'

The following criteria were applied to describe the likely visual impact of the proposed development at each 'Sensitive Receptor':

Substantial adverse impact	where the scheme would cause a significant deterioration in the existing view
Moderate adverse impact	where the scheme would cause a noticeable deterioration in the existing view
Slight adverse impact	where the scheme would cause a barely perceptible deterioration in the existing view
Slight beneficial impact	where the scheme would cause a barely perceptible improvement in the existing view
Moderate beneficial impact	where the scheme would cause a noticeable improvement in the existing view
Substantial beneficial impact	where the scheme would cause a significant improvement in the existing view
No change	No discernible deterioration or improvement in the existing view

To assist in the assessment of the likely visual impact, the site has been identified as two distinct parcels of land, the western portion as Parcel One and the eastern portion as Parcel Two.



LEGEND

SR01-08 — Sensitive Receptor (distance between SR to closest edge of Solar Farm site)

Road

Chaff Mill Solar Farm site

Visual shadow zone

N

0 1.0km

TITLE	VISUAL IMPACT ASSESSMENT		
PROJECT	CHAFF MILL SOLAR FARM		
DWG NO HD_T026_AD01	SCALE -	SHEET NO 5	REVISION -
DRAWN SW	CHECKED SRH	DATE 10/17	

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Landscape and Visual Impact Assessment - Sensitive Receptor SR #01	
	
Location	Adjacent 'Chelston', No. 168 Wookie Creek Road. A large allotment comprising of a residential dwelling and outlying agricultural buildings. The dwelling is centred within the property. The eastern property boundary is planted with mature evergreen trees creating a windbreak which is likely to preclude views out of the property to the east. Wookie Creek Road is an unmetalled road that carries occasional, local traffic only.
View Direction	South to south east.
Landscape and setting	*'Expansive eastern plains'* - Character Unit 2. Expansive views across cropping land broken by occasional, intermittent boundary plantings of native trees. The panorama across the Waterloo ridge captures views of the prominent wind turbines which dominate the horizon.
Distance from Project Site(s)	Parcel One: 0.6 km. Parcel Two: 2.4 km.
Visual exposure at receptor	Parcel One: **Slight to moderate** - the eastern portion only (approximately 30%) of Parcel One will be conspicuous from the southern property boundary. The north eastern edge of Parcel One will be partially concealed by a nearby windbreak of mature trees. The 'wedge' like appearance of the PV panels over undulating land will create a differential colour contrast to the surrounding cropped fields. However the PV panel appearance will be similar in colour to the darker vegetative backdrop along the lower slopes of the distant

	Waterloo ridge. Parcel Two: – **none to slight** only - A row of mature field trees to the immediate east will soften and ameliorate the darker colour of the PV panels. In perspective the 'line' of PV panels will appear as one of a number of narrow, linear strips that move in a north south direction along land which rises to the Waterloo ridge. The wind turbines will remain the most visually conspicuous features in the contextual landscape. An extensive collection of mature tree and shrub plantings within the property and around the dwelling are likely to conceal all views of the solar farm from the living areas and outdoor recreational spaces.
Predicted visual impact	Parcel One: Views south from within the property (but beyond the dwelling) - **Slightly Adverse Impact** to **No change.** Parcel Two: Views to the east - **No change.**
Mitigation Considerations	None required.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #02

Location	Copper Ore Road at a point equidistant between SR.1 and SR.3. Copper Ore Road is a sealed secondary road which carries traffic between Mintaro and Farrell Flat. It is part of a local network of roads which serves the regional tourism industry.
View Direction	East- south east.
Landscape and setting	Edge of the *'Undulating Hills'* Character Unit 1 with views across the *'Expansive eastern plains'* – Character unit 2. Glimpsed views to the Waterloo Ridge horizon across a foreground of planted vines and a panoramic expanse of open, flat cropping fields in the mid ground and distance. Darker bands and 'belts' of native trees run north – south across the panorama and along the horizon. The two large grey agricultural sheds located on Merildin Road are prominent, the kinetic motion of the Waterloo Ridge wind turbines catch and draw the eye.
Distance from Project Site(s)	Parcel One: 1.0 km. Parcel Two: 2.4 km.

Visual exposure at receptor	Parcel One: **Slight** – The undulating foreground largely precludes views of Parcel One to the south east, with only a portion (less than 25%) of the western boundary and the north western corner visible. As at other sensitive receptors these visible portions will appear similar to the darker 'belts' of native trees which run north – south across the panorama. Parcel Two: **Slight to Moderate** – where less than half of the northern portion of the parcel will be visible. The visible portion will appear 'wedge like' softened by some foreground and mid ground tree plantings.
Predicted visual impact	Both Parcel One and Parcel Two: Where viewers will be transiting through the location the visual impact will be no more than a fleeting glimpse, therefore the impact will be one of **Slightly Adverse to No Change.**
Mitigation considerations	None required.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #03	
	
Location	At the entrance to No. 395 Copper Ore Road. No. 395 Copper Ore Road sits to the west on a crest which elevates the dwelling some 10m approximately above road level. Copper Ore Road is a sealed secondary road which carries traffic between Mintaro and Farrell Flat. It is part of a local network of roads which serves the regional tourism industry.
View Direction	East to south east.
Landscape and setting	Edge of the *'undulating hills'* Character Unit 1 views across the *'Expansive eastern plains'* – Character unit 2. Glimpsed views to the Waterloo ridge horizon across the panoramic flat expanse of open cropping fields.
Distance from Project Site(s)	Approximately 1.8 Kms (to the east and south east).
Visual exposure at receptor	Both Parcel One and Parcel Two **Slight:** - The dwelling sits at the edge of the defined 'visual shadow' and it is reasonable to assume that the eastern boundary only of the property would likely to be visually exposed to the solar farm. The collective presence of a dense hedge planting on the eastern property boundary and mature tree and shrub plantings along the boundary of Cooper Ore Road will preclude all but the occasional glimpsed view of both Parcel One and Parcel Two, which will appear as one of a number of darker coloured narrow, linear strips that move in a north south direction across the contextual landscape.

Predicted visual impact	Both Parcel One and Parcel Two: **Slightly Adverse Impact to No Change.**
Mitigation Considerations	None required.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #04	
	
Location	No. 58 Faulkner Road. Typical of the locality, the large property comprises of a residential dwelling with a perimeter collection of agricultural buildings. Faulkner Road is an unmetaled road that carries occasional, local traffic only.
View Direction	East to south east.
Landscape and setting	*'Expansive eastern plains'* - Character Unit 2. Expansive views across cropping land broken by occasional, intermittent boundary plantings of native trees. The panorama across the Waterloo range capture views of the prominent wind turbines which dominate the horizon.
Distance from Project Site(s)	Parcel One and Parcel Two: approximately 1.5 Km.
Visual exposure at receptor	Parcel One and Parcel Two: **Slight-** Views south east are dominated by a stand of mature eucalypts in the foreground and the two large and incongruous grey agricultural storage sheds juxtaposed against the distance horizon of Waterloo ridge. A small portion only (approximately 20%) of the eastern edge Parcel One which lies on rising land will be conspicuous from the southern property boundary. As at other nearby receptors, in perspective the 'line' of PV panels on the mainly flat Parcel Two will appear as one of a number of darker coloured narrow, linear strips. The PV panels will be one of a number of grey appearing strips that move in a north south direction across land which rises to the Waterloo ridge. The wind turbines will remain the most visually conspicuous features in the contextual landscape. An extensive collection of mature tree and shrub plantings within the property and around the dwelling are likely to conceal all views of the solar farm from dwelling living areas and outdoor recreational spaces.

Predicted visual impact	From within the property (but beyond the dwelling) - **No Change** to **Slightly Adverse Impact** only.
Mitigation considerations	None required.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #05	
	
Location	No. 395 Salt Creek Road. What appears to be an unoccupied dwelling on an unsealed road that carries infrequent and occasional, local traffic.
View Direction	South - south west.
Landscape and setting	*'Expansive eastern plains'* - Character Unit 2. On the cusp of the defined 'Visibility Shadow'. Fore and mid ground views in all directions are typical of the character unit and are of a **low scenic quality**, very distant panoramic views to the Mt Horrocks and Mt Rufus Ranges on the western horizon capture the eye, and along with an immediate foreground of vine plantings offer some marginally enhancing visual amenity.
Distance from Project Site(s)	To Parcel Two: 3.7Km and further to Parcel One.
Visual exposure at receptor	Parcel One and Parcel Two: **Negligible** - Parcel Two is concealed by rising land which crests to the immediate south, partial distant views are afforded of a small proportion (less than 20%) of Parcel One to the south east which will appear as one of a number of dark linear threads in the contextual landscape. Over this distance it is unlikely that the eye of the observer will be able to discern that the additional dark thread is an arrangement of PV panels.
Predicted Visual Impact	Parcel One and Parcel Two: **No Change.**
Mitigation Considerations	None required.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #06

Extensive screen planting on the western and southern boundaries and around the dwelling will exclude all views of both the nearby Parcel Two and Parcel One which lies beyond.

Location	No. 159 Salt Creek Road. A large property comprising of a dwelling located on the eastern boundary and a collection of agricultural buildings to the north. The property boundary is densely planted with mature evergreen trees and shrubs with an inner ring of planting around the dwelling and outdoor amenity spaces. Only the upper roof on the dwelling is partially visible from Faulkner Road adjacent the northern boundary with Parcel Two. Salt Creek Road is an unsealed road that carries occasional, local traffic only.
View Direction	South west.
Landscape and setting	*'Expansive eastern plains'* - Character Unit 2. Fore and mid ground views in all directions, typical of the character unit and are of a **low scenic quality**, very distant panoramic views to the Mt Horrocks and Mt Rufus Ranges on the western horizon captures the eye, marginally enhancing visual amenity.
Distance from Project Site(s)	Approximately 0.6 Km from eastern boundary of Parcel Two.
Visual Exposure at receptor	Both Parcel One and Parcel Two - **Slight to Negligible.** The property sits at the edge of the defined 'visual shadow' and it is reasonable to assume that the extensive screen planting on the western and southern boundaries and around the dwelling will exclude all views of both the nearby Parcel Two and Parcel One which lies beyond.
Predicted Visual Impact	**No Change.**
Mitigation Considerations	None required.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #07	
	
Location	Chaff Mill Road intersection with Merildin Road. Comprising of agricultural storage buildings with residential property under construction. The property is located within and towards the western edge the *'Expansive eastern plains'* Character Unit 2. Both Chaff Mill Road and Merildin Road are unsealed roads that carry occasional, local traffic only.
View Direction	A panoramic view west, north west and north encompassing the views to be afforded to the residents of the soon to be constructed dwelling. The main bedrooms and outdoor entertaining areas face west and north west to take advantage of the visual amenity afforded by the panoramic view across the Mt Rufus and Mt Horrocks ranges.
Distance from Project Site	Various - at its closest Parcel One is approximately 200+ meters only from the yet to be constructed new dwelling.
Landscape and setting	*'Expansive eastern plains'* - Character Unit 2. Whilst fore and mid ground views in all directions are typical of the character unit and are of a **low scenic quality,** the distant panoramic views to the Mt Horrocks and Mt Rufus Ranges on the western horizon are pleasant and enhance the level of visual amenity which will be afforded to the residents of the soon to be constructed dwelling. An existing copse of mature trees on the western of the property boundary will be of limited assistance in screening the likely visual impact of the PV panels which will sit below the tree lower canopy line.
Visual exposure at receptor	Parcel One: **High** - where the foreground to mid ground views to the west and north west are dominated by the 'wedge like' appearance and expanse of PV panels on rising ground over Parcel One. However the visual contrast between the darker panel appearance and background landscape will be minimal due to the backdrop of mainly native evergreen tree species which appear a dark grey against the lighter ridgeline. The PV panels will sit well below the ridgeline which will remain unbroken. Parcel Two: **Slight** - where more distant views of PV panels arranged over Parcel Two appear more as a linear thread to the north. Parts of Parcel Two will be concealed by subtle changes in the adjacent landform coupled with the presence of existing mid - ground planting.
Predicted Visual Impact	The visual impact of the solar farm will be unique and a one - off at this chosen location. Parcel One: To the immediate east the likely visual impact on the dwelling location will be **Substantially** to **Moderately Adverse**.

	Parcel Two: To the south east and south the likely visual impact on the dwelling location will be **Slightly Adverse to No Change**.
Mitigation Considerations	On site opportunities should be found along and within the eastern boundary of Parcel One for the introduction of quick growing native screen planting – delivered when construction commences.

Landscape and Visual Impact Assessment - Sensitive Receptor SR #08	
 	
Location	Mt Rufus Road intersection with Sevenhill/Mintaro Road –typical of a number of views obtained in the descent off the Mt Rufus ridgeline heading east. The Sevenhill/Minarto Road is a sealed secondary road which carries traffic between the major road through the Clare Valley and Mintaro. It is part of a local network of roads which serves the regional tourism industry.
View direction	Panoramic views panning north east /east which capture the unfolding view on the journey along the Clare Valley Wine Trail to Mintaro.
Distance from project site	Between 3.3 km to 2.7 km.
Visual landscape and setting	Moving from the *'Undulating Hills'* (Character Unit 1) the viewer obtains a few brief glimpses of the panoramic view across the 'Expansive *Eastern Plains'* (Character Unit 2) a mostly flat, open and featureless landform of pastural and cropping fields. A landscape of **low scenic quality** and monotonous vista. A landscape where the general absence of any notable visual feature save two prominent co-located large grey agricultural storage sheds and the distant Waterloo windfarm fails to hold the eye of the observer for more than a fleeting moment.
Visual exposure at receptor	Parcel One **– moderate:** - where the depth and arrangement of PV panels across the mid ground perspective view will be pronounced. A thread of native tree canopies partially conceals and softens the northern western boundary of Parcel One. The two co-located large grey agricultural storage sheds to the south of Chaff Mill Road and the towering turbines of the Waterloo windfarm will remain the dominant visual features in the contextual landscape.

	Parcel Two – **slight: -** where the depth of PV panels appear as a narrow 'ribbon' like addition to the contextual landscape at the foot of the distant Waterloo range. The panels are barely perceptible; there will be no discernible deterioration or improvement in the existing view.
Predicted visual impact	The arrangement and PV colour of both Parcel One and Two appear as a natural extension of a planar landscape where colours and hues include a variety of grey and dark greens. Unlike the wind turbines along Waterloo Ridge Line the PV panels sit below the horizon and are complementary in form and appearance in contrast to the more visually abrupt collection of tall, massed, singular elements that draw the eye through their kinetic motion. Viewers will be transiting through the location, the visual impact will be a series of fleeting glimpses, therefore the likely visual impact of the solar farm from viewpoints along Sevenhill Road location will be Slightly **Adverse** for Parcel One and No **Change** impact for Parcel Two.
Mitigation considerations	Not required.

3. Post construction management and mitigation measures

Consideration should be given to the visual mitigation measures recommended at each 'Sensitive Receptor' on completion of construction works.

Unless recommended it is considered unnecessary to screen views from adjacent roads within the locality as these roads are for local traffic only and the volume and frequency of traffic movement is low.

It is recommended that where desirable, visual mitigation is undertaken on an individual site basis and should comprise of screen planting using indigenous and native vegetation.

Photo: Indigenous and native vegetation on verge along Copper Ore Road.

4. Summary and recommendations

The introduction of the solar farm does not change the mainly pastoral nature of the locality and wider contextual landscape, nor does it impact on any significant viewpoints within the contextual landscape. The nature and visual qualities of the Expansive Eastern Plains Character Unit will not be significantly altered.

The solar farm will meet the Provisions of the Development Plan which requires it to be *'sited and designed to blend with the natural features of the landscape'* and to '*cause minimal damage to the natural landform'.*

It has been demonstrated that, where necessary, the likely visual impact on the identified sensitive receptors can be managed through visual mitigation introduced through vegetative screening.

The sense of place and place attachment values of Mintaro township will not be detrimentally affected. As required by the Provisions of the Development Plan the development will:

- *'Protect areas of scenic or conservation significance from undue damage'*
- *'Not compromise the Statement of Heritage Value'*

It is my opinion that the solar farm will introduce a new infrastructure element of an acceptable design standard that will evoke curiosity, become an 'incidental' infrastructure feature of merit and a best practice example of progressive renewable energy delivery.

It is my opinion that with the application of the recommended mitigation measures the proposed Chaff Mill Solar Farm will have a **negligible to slightly adverse** only visual impact within a locality and character unit of **low scenic quality**.

About the author

Stuart Heseltine, Registered Landscape Architect, Principal Hemisphere Design.

Stuart is acknowledged as one of South Australia's leading practitioners in the area of landscape character and visual impact assessment. In considering each visual impact assessment exercise Stuart undertakes a qualitative landscape character assessment consistent with best practice as prescribed by the Guidelines for Landscape and Visual Impact Assessment (third edition), the Landscape Institute (UK) and Institute of Environmental Management and Assessment (NSW) 2013.

Stuart has successfully applied this methodology to major projects across South Australia and Victoria which includes main road, high street and highway projects, the Adelaide Desalination Plant EIA, the Roseworthy Development Feasibility Study, the Palmer, Allendale and Barn Hill Windfarm Developments, numerous infrastructure developments undertaken by Electranet SA and visual assessment exercises pertaining to Development Applications lodged in a numerous Adelaide metropolitan and regional council areas.

Stuart's particular expertise in undertaking visual assessments is highly sought after for the provision of expert evidence for the Environment, Resources and Development Court (SA).

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APPENDIX K

LETTER FROM PROPERTY OWNER

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To whom it may concern, 23/02/2018

Following meetings with FRV, we as a (or the most) sensitive receiver wish to expresses our interests in regards to the 50m vegetation buffer zone proposed by FRV. We understand the intention of the vegetation buffer zone is to create a visual barrier between our residential property and the proposed solar farm / panels.

For obvious reasons, we are not in favour of having the proposed solar farm right next to us. We also have genuine concerns of the feasibility of building a solar farm in an area and location that is currently prime agricultural land. We are not against renewable energy and believe a solar farm is a great way to provide clean, renewable energy. It's just we believe there are more suitable locations within SA to build a solar farm.

However, we wish to commend FRV and their efforts in regards to the way they are informing and engaging with us and the community about the proposed solar farm. They are going about it the right way so far and that is pleasing to see. It gives us confidence that they will continue to keep us well informed as the development stages continue.

Currently our block of land known as the 'Chaff Mill', located on the corner of Chaff Mill Road and Merildin Road, has beautiful views to the West, North and East. The proposed solar farm location will, in our opinion, significantly alter the views to the West and somewhat alter the views to the North and North East. Whilst we are concerned about the potential change of view to the North and North East, we do not want any visual barrier created on these sides as this would take away from us the remaining good views in the foreground and beyond the solar farm.

We support the concept of the proposed 50m vegetation zone and believe this is the best approach to creating a visual barrier between us and the solar farm located on the West side of us. We understand the length of the proposed vegetated buffer zone will run from the South East corner to the North (parallel with Chaff Mill Rd) for as far as practical to achieve a sufficient visual barrier. We understand and agree that the vegetation area will be entirely within FRV's property and entirely at the expense of FRV.

It is within our interests to work closely with FRV in regards to selecting what types (and heights) of vegetation are chosen. It is within our interests to have FRV commence the plantation of this vegetation either upon near completion of the solar farm or within 12 months of the solar farm being completed.

We do not want the plantation to commence before or early on in the build of the solar farm. The reason for this is because we wish to get an idea and a feel for what the solar farm will really look like. We feel it will be then that we can choose with confidence what vegetation is going to be most suitable. We don't want to remove the views we have of behind the solar farm (background).

We understand that by having the vegetation planting commencing later on in the building phase or soon after completion of the build, the vegetation will not be sufficient at creating a visual barrier right there and then. Obviously vegetation takes several years (potentially 10 years) to become established. We would rather get a feel for what the solar farm will look like, select the appropriate vegetation, and wait for it to become established, as opposed to guessing the vegetation requirements and then potentially not be happy with what we or FRV have chosen.

It is also within our interests to see the vegetation watered by FRV during it's establishment period when required (during any dry periods, especially during summer)

We endeavour to work closely with FRV on this matter. At this point of time, we have not considered what types and styles of vegetation would be appropriate. If the development of the solar farm commences, we will become more open to ideas and suggestions of appropriate vegetation.

APPENDIX L

GLARE ASSESSMENT

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CHAFF MILL SOLAR FARM

GLARE IMPACT ASSESSMENT REPORT

Prepared For

FRV Services Australia Pty Ltd

February 2018

ENVIRONMENTAL ETHOS

Prepared By Environmental Ethos for WSP on behalf of FRV Services Australia Pty Ltd

REF NO. 17004

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Cover Image: ToGa Wanderings

CONTENTS

1. INTRODUCTION

This report has been prepared by Environmental Ethos for WSP on behalf of the proponent FRV Services Australia Pty Ltd (FRV) to assess the potential glare impact of the proposed Chaff Mill Solar Farm (the Project).

1.1. The Chaff Mill Solar Farm Project

Australian solar development company FRV is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia. The proposed 100MW solar farm would be developed on a 380HA site adjacent to the existing Mintaro substation and its 132kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

1.2. Project Area

The proposed Chaff Mill Solar Farm Project is located 3.5 kilometres north-east of Mintaro in the Clare Valley, 130 kilometres north of Adelaide. The proposed 100MW solar farm would be developed on a 380HA site that is intersected by Chaff Mill Road and Wookie Creek, and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. The existing land use is agricultural and the site falls within the District Council of Clare and Gilbert Valleys.

Figure 1. Location Plan

2. ASSESSMENT METHODOLOGY

2.1. Scope of the Assessment

The scope of this Glare Assessment includes the following:

- Description of the methodology used to undertake the study;
- Assessment of the baseline conditions;
- Description of the elements of the Project with the potential to influence glare including size, height, and angle of PV modules, and type and operation of the tracking system;
- Identification of the viewshed and potential visibility of the Project;
- Desktop mapping of potential glare at the location of sensitive receptors within the viewshed, based on Solar Glare Hazard Analysis and viewshed analysis;
- Assessment of the potential risk of glare on sensitive receptors during operation of the Project; and
- Recommended management and mitigation strategies.

2.2. Glare Assessment Parameters

Glare assessment modelling for solar farms is based on the following factors:

- the tilt, orientation, and optical properties of the PV modules in the solar array;
- sun position over time, taking into account geographic location;
- the location of sensitive receptors (viewers); and
- Screening potential of surrounding topography and vegetation.

2.3. Glare Intensity Categories

Glare refers to the human experience of reflected light. The potential hazard from solar glare is a function of retinal irradiance (power of electromagnetic radiation per unit area produced by the sun) and the subtended angle (size and distance) of the glare source. [1]

Glare can be broadly classified into three categories: low potential for after-image, potential for after-image, and potential for permanent eye damage, *Figure 2* illustrates the glare intensity categories.

[1] HO, C.K., C.M. Ghanbari, and R.B. Diver, 2011, Methodology to Assess Potential Glint and Glare hazards from Concentrated Solar Power Plants

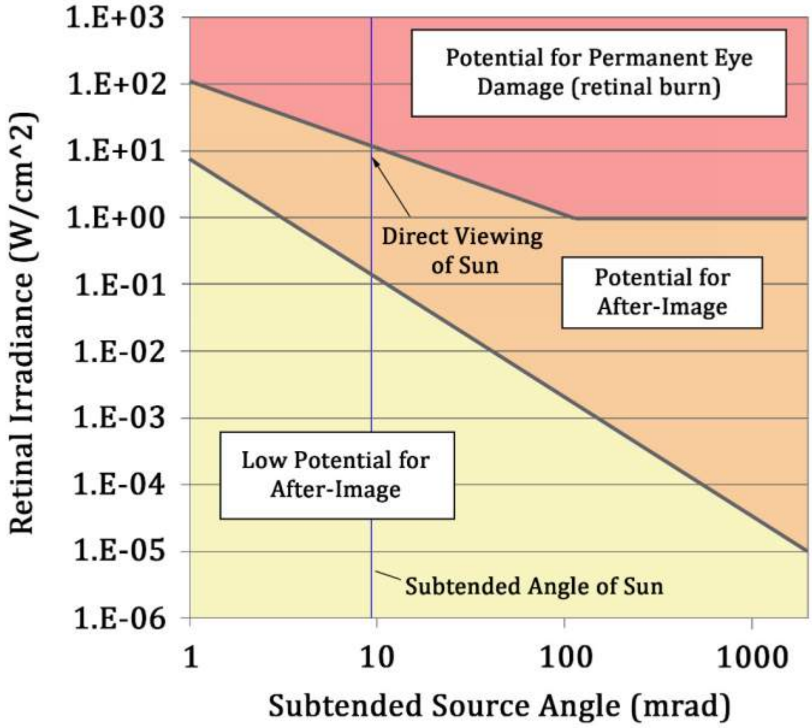

Figure 2. Ocular impacts and Hazard Ranges[2]

The amount of light reflected from a PV module depends on the amount of sunlight hitting the surface, as well as the surface reflectivity. The amount of sunlight interacting with the PV module will vary based on geographic location, time of year, cloud cover, and PV module orientation. 1000W/m^2 is generally used in most counties as an estimate of the solar energy interacting with a PV module when no other information is available. This study modelled scenarios using 2000 W/m^2 in order to cover potentially higher solar energy levels in Australia as compared to other parts of the world. Flash blindness for a period of 4-12 seconds (i.e. time to recovery of vision) occurs when 7-11 W/m^2 (or 650-1,100 lumens/m^2) reaches the eye[3].

2.4. Reflection and Angle of Incidence

PV modules are designed to maximise the absorption of solar energy and therefore minimise the extent of solar energy reflected. PV modules have low levels of reflectivity between 0.03 and 0.20 depending on the specific materials, anti-reflective coatings, and angle of incidence.[4]

The higher reflectivity values of 0.20, that is 20% of incident light being reflected, can occur when the angle of incidence is greater than 50°. *Figure 3 and 4* show the relationship between increased angles of incidence and increased levels of reflected light. Where the angle of incidence remains below 50° the amount of reflected light remains below 10%. The angle of incident is particularly

[2] Source: Solar Glare Hazard Analysis Tool (SGHAT) Presentation (2013) https://share.sandia.gov/phlux/static/references/glint-glare/SGHAT_Ho.pdf
[3] Sandia National Laboratory, SGHAT Technical Manual
[4] *Ho, C. 2013 Relieving a Glare Problem*

relevant to specular reflection (light reflection from a smooth surface). Diffuse reflection (light reflection from a rough surface) may also occur in PV modules, however this is typically a result of dust or similar materials building up on the PV module surface, which would potentially reduce the reflection.

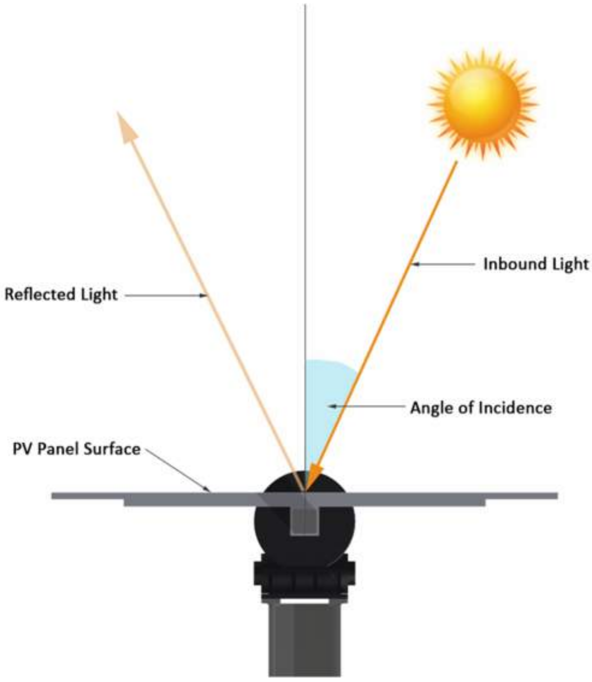

Figure 3. Angle of Incidence Relative to PV Panel Surface

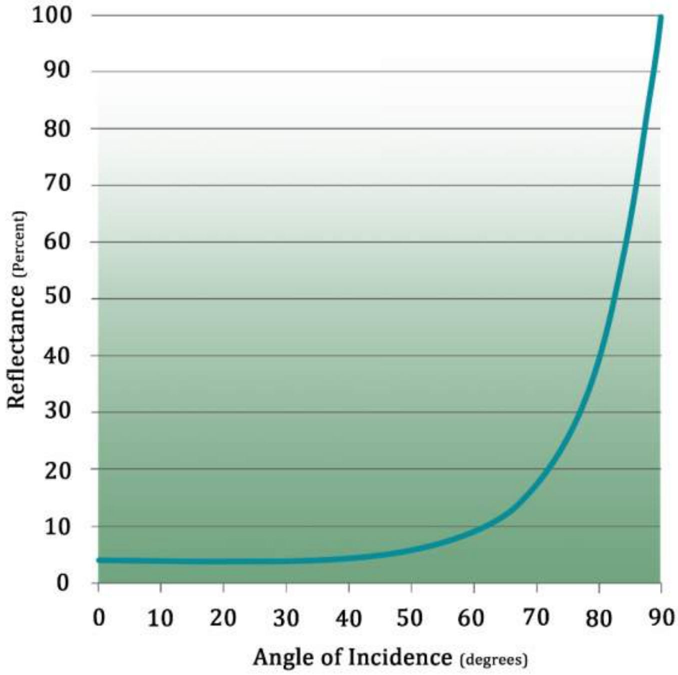

Figure 4. Angles of Incidence and Increased Levels of Reflected Light (Glass (n-1.5))

The sun changes its east-west orientation throughout the day, and the sun's north-south position in the sky changes throughout the year. The sun reaches its highest position at noon on the Summer Solstice (21 December in the Southern Hemisphere) and its lowest position at sunrise and sunset on the Winter Solstice (21 June in the Southern Hemisphere).

In a fixed PV solar array, the angle of incidence varies as the sun moves across the sky, that is the angle of incidence are at their lowest around noon where the sun is directly overhead, and increase in the early mornings and late evenings as the incidence angles increase. If the PV array is mounted on a tracking system, this variation is reduced because the panel is rotated to remain perpendicular to the sun. Therefore a PV modular array using a tracking system has less potential to cause glare whilst it tracks the sun. *Figure 5* illustrates a PV module mounted horizontal single axis tracking system following the east to west path of the sun.

A single axis tracking system has a fixed maximum angle of rotation, once the tracking mechanism reaches this maximum angle, the PV modules position relative to the sun becomes fixed and therefore the angle of incidence increases and the potential for glare increases. Some tracking systems utilise 'backtracking' to avoid PV modules over shadowing each other. During the backtracking procedure (early morning and late afternoon) the tracking system begins to rotate away from the sun to reduce shadow casting to adjoining PV panels. During the backtracking phase, higher angles of incidence will occur in comparison to the tracking phase, and this may increase the potential for glare.

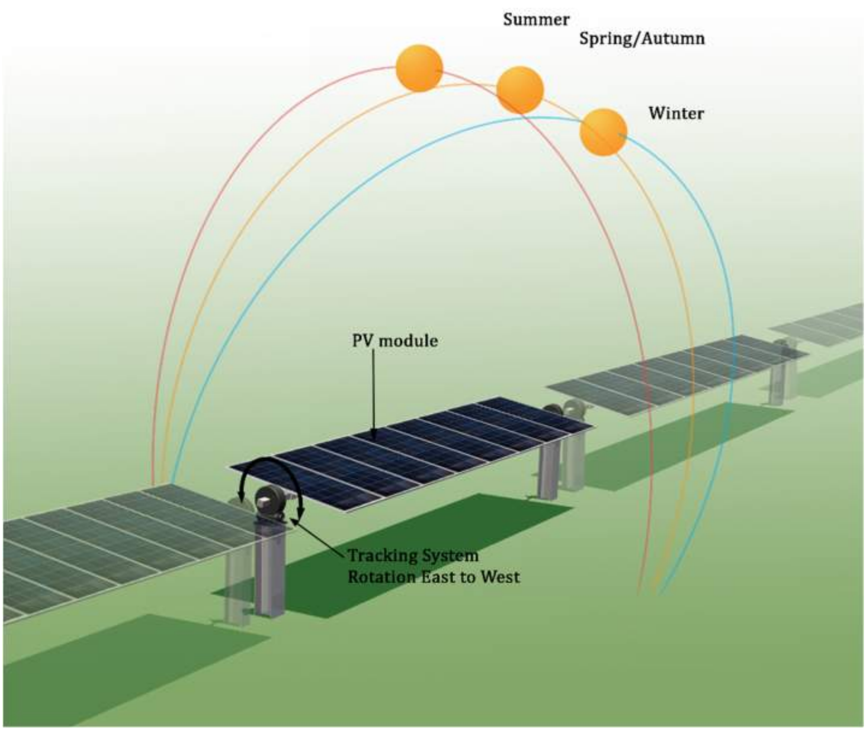

Figure 5. Diagrammatic illustration of sun position relative to PV module mounted on a horizontal single axis tracking system.

2.5. View shed Analysis

The Digital Terrain Model (DTM) used in this study is based on a contour interval of 10 metres. The location of sensitive receptors (dwellings, roads, etc.) are located relative to the location of the solar farm and view lines between the two assessed taken into consideration intervening topography. The viewshed analysis is used in conjunction with solar hazard assessment software to assess the potential for solar glare hazard.

2.6. Solar Glare Hazard Analysis

This assessment has utilised the Solar Glare Hazard Analysis Tool (SGHAT 2.0 and 3.0) developed by Sandi National Laboratory[5] to assess potential glare utilising latitude and longitudinal coordinates, elevation, sun position, and vector calculations. The PV module orientation, reflectance environment and ocular factors are also considered by the software. If potential glare is identified by the model, the tool calculates the retinal irradiance and subtended angle (size/distance) of the glare source to predict potential ocular hazards according to the glare intensity categories (refer *Section 3.2*).

The sun position algorithm used by SGHAT calculates the sun position in two forms: first as a unit vector extending from the Cartesian origin toward the sun, and second as azimuthal and altitudinal angles. The algorithm enables determination of the sun position at one (1) minute intervals throughout the year.

The SGHAT is a high level tool and does not take into consideration the following factors:

- Backtracking or the effect of shading in relation to the PV array tracking system
- Gaps between PV modules
- Atmospheric conditions
- Vegetation between the solar panels and the viewer (sensitive receptor)

SGHAT has been used extensively in the United States to assess the potential impact of solar arrays located in close proximity to airports. The US Federal Aviation Administration requires the use of SGHAT to demonstrated compliance with the safety requirements of all proposed solar energy systems located at federally obligated airports. Used in conjunction with a viewshed analysis, the two tools represent a conservative assessment.

2.7. Risk Assessment Approach

Once the potential for glare has been identified through the viewshed analysis and SGHAT, the potential magnitude of the glare hazard is considered relative to background conditions. A risk assessment approach is then used to identify the potential significance of the risk based on the magnitude of the glare hazard generated and the sensitivity of the receptors (viewers).

[5] https://share.sandia.gov/phlux/static/references/glint-glare/SGHAT_Technical_Reference-v5.pdf

3. EXISTING CONDITIONS

The baseline is a statement of the characteristics which currently exist in the Project area. The baseline glare condition assessment takes into consideration the following:

- Characteristics of the environment that may affect the potential for glare;
- Land use and human modifications to the landscape such as roads, buildings and existing infrastructure which may influence glare and sensitivity to glare.

3.1. Baseline Conditions

The baseline condition within the vicinity of the Project site is characterised by flat to undulating agricultural land. The landscape is predominately cleared with some native vegetation remaining along road verges, creeks and drainage lines.

Existing dwellings in the area include homesteads which are scattered across the landscape and are generally located in association with agricultural buildings. There are a small number of dams within the vicinity of the Project site.

The closest buildings to the Project site are agricultural storage buildings located at the intersection of Chaff Mill and Merildin Roads. A proposed residential dwelling is currently under construction on this property, for further on the proposed dwelling refer to the Landscape Character and Visual Impact Assessment report[6].

There are no significant existing features in the landscape with the potential to contribute to glare.

3.2. Atmospheric Conditions

Atmospheric conditions such as cloud cover, dust and haze will impact light reflection, however these factors have not been accounted for in this glare assessment. The Bureau of Meteorology statistics for Clare Post Office 14 km north-west of the Project site (the closest BOM records for cloud cover statistics) recorded 111.8 cloudy days per year (mean number over the period 1957 to 1994)[7]. Cloudy days predominately occur during the winter months, May to September. Since atmospheric conditions have not been factored into this assessment modelling, statistically the glare potential represents a conservative assessment.

4. PROJECT DESCRIPTION

The general layout of the solar farm is as show in *Figure 6.* The main elements of the Solar Farm with the potential to influence glare are the tilt, orientation, and optical properties of the PV modules in the solar array, and the rotational capabilities of the tracking system. Whilst specific products are yet to be determined for the Project, the general technical properties of the main elements influencing glare are described below.

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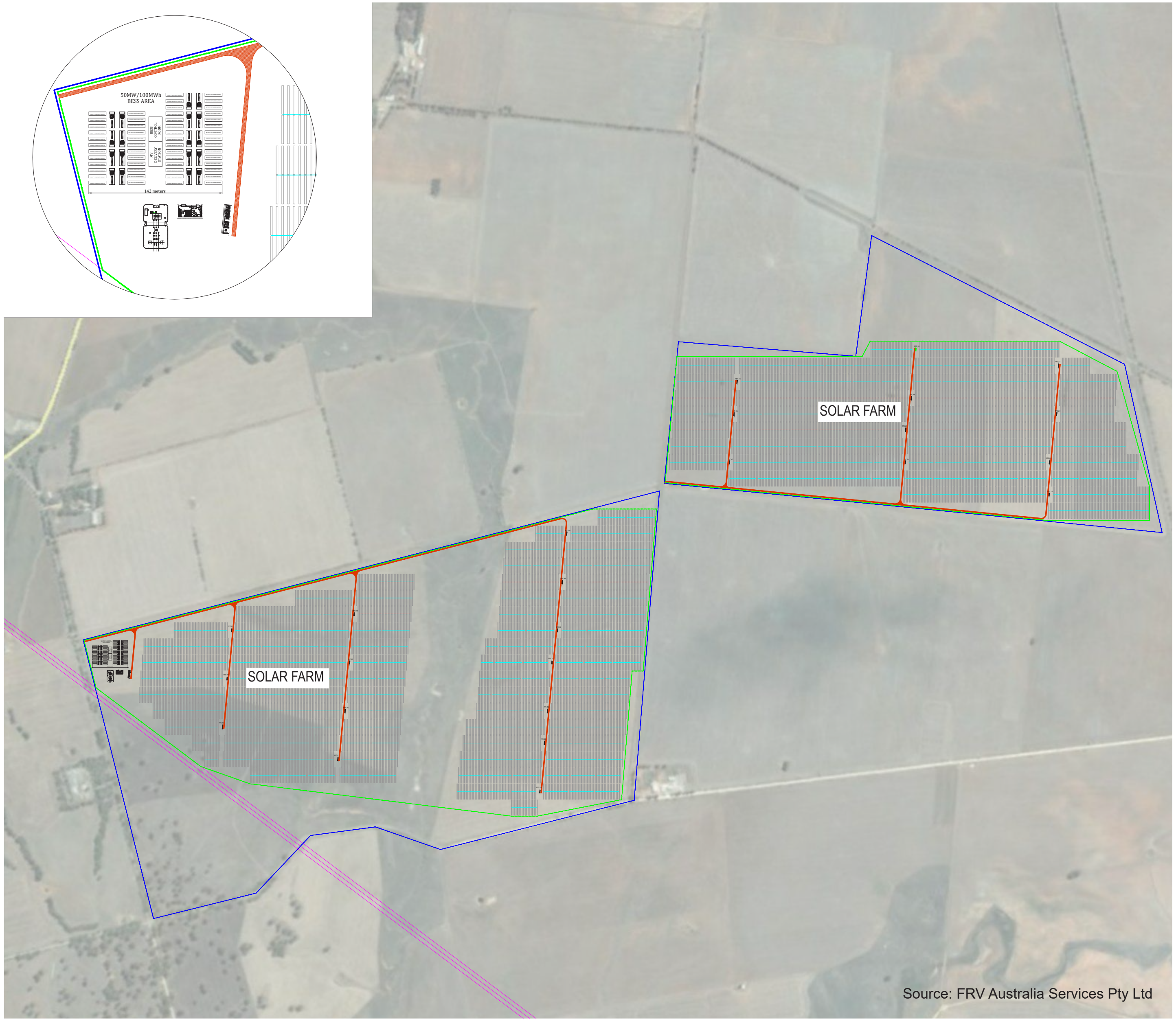
[6] Hemisphere Design (Aust) Pty Ltd, 2017, The Chaff Mill Solar Farm Project, Landscape Character and Visual Impact Assessment.

[7] http://www.bom.gov.au/climate/averages/tables/cw_021014.shtml



LEGEND

- Tracker (1P) x 60M
- 4 MWac Inverter/Transformer Station
- 2.66 MWac Inverter/Transformer Station
- Fence
- Overhead Line
- Boundary

ENVIRONMENTAL ETHOS
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PROJECT
CHAFF MILL SOLAR FARM

CLIENT
FRV SERVICES AUSTRALIA PTY LTD

ISSUE	DESCRIPTION	DATE
A	DRAFT	26/10/17
B	FINAL	02/02/18

APPROVED BY S CRAWFORD

DATE OF FIRST ISSUE 26/10/2017

NORTH

DRAWING NAME
SITE LAYOUT PLAN

DRAWING NUMBER **17004-FIGURE 6** ISSUE B

4.1. PV modules

Each PV panel comprises of approximately 72 polycrystalline silicon solar cells overlayed by a 3.2 to 4.0 mm tempered glass front, at this stage in the Project design process it is anticipated the panels will be dual-glass and frameless. The approximate dimensions for a typical solar array are 7 metres x 2 metres, being made up of approximately 7 individual solar panels of approximately 2 metres x 1 metre. Another alternative array arrangement is 9 solar panels approximately 2.7 metres x 0.9 metres in size with an array size of 8.1 metres x 2.7 metres.

Photo 1. *Example of a typical frameless solar array*[8]

The PV modules are mounted on a horizontal single axis tracking system with rows aligned north-south, refer *Figure 7.*

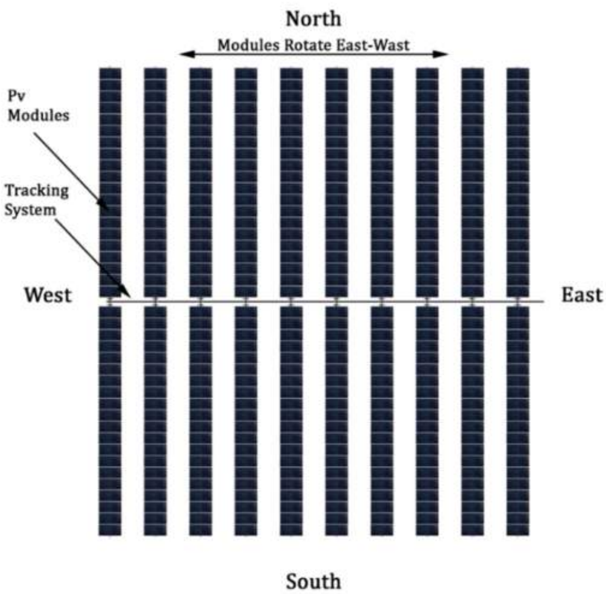


Figure 7. Illustration of PV Module Row Alignment

[8] Source: http://solarbuildermag.com/featured/frameless-modules-mount/

4.2. Horizontal single axis tracking system

The horizontal single axis tracking system rotates the PV panels across an east to west arc, following the sun's trajectory across the sky. The purpose of the tracking system is to optimize solar energy collection by holding the PV module perpendicular to the sun. The tracking system is capable of a maximum rotation range of 90° (+/- 45°) or 120° (+/- 60°) depending on the system used. For the purpose of this study a rotation range of 120° (+/- 60°) has been used, refer *Figure 8.*

This study has assumed the tracking system will utilise a 'backtracking' procedure to reduce the potential for over shadowing between panels.

The zenith tilt angle of the panels are assumed to be set at zero, that is, the panels are not tilted on a north – south alignment but remain horizontal along the plane of the tracker. This enables the height of the panel to remain consistent relative to each other and avoids potential over shadowing.

The maximum height of the PV modules above natural ground is approximately up to 3 metres, a height of 3 metres was used in the modelling.

The configuration of the tracking system rows may vary slightly dependent on the type of system used, in general the rows will be a 3 to 6 metres apart.

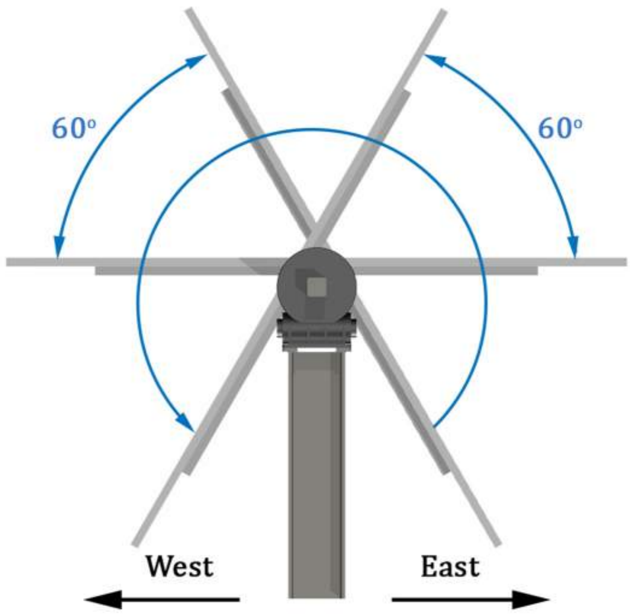


Figure 8. Illustration of PV Module Rotation Angles

4.3. Solar Inverters, Control Room, and Storage Buildings

The proposed solar farm also includes solar inverters, control/switch building, storage buildings, battery storage, and perimeter fencing. These elements are not considered likely to influence glare as they generally comprise of non-reflective surfaces typically found in the built environment.

5. DESKTOP GLARE ASSESSMENT

The aim of the desktop glare assessment is to identify if any sensitive receptors have the potential to be impacted by glare. The software modelling systems used in the desktop assessment include viewshed modelling to identify the location of sensitive receptors with line of sight to the solar farm, and the SGHAT to identify the potential and ocular significance of glare.

5.1. Viewshed Analysis

The results of the viewshed analysis are shown in *Figure 9.*

Contour information (contours at 10 m intervals covering an area of approximately 5 km from the Project) was assessed and shows the topography surrounding the Project is generally flat to undulating, with a ridgeline to the west of the Project site. The low hills to the south west of the Project site provide screening between Mintaro and the Project. Shallow valleys to the south and east are also screened from the Project site due to intervening topography. The ridgeline to the west provides some visibility of the Project from higher ground.

Solar Farms are characterised by their low horizontal profile. The major elements of a solar farm are the PV models and trackers, these are generally 3 to 4 metres above ground level. In this study a height of 3 metres above ground level was used in the modelling. At distances greater than 1 km a 3 metre high horizontal object in the landscape becomes visually insignificant (perceived as a narrow line in the distance) when viewed across a flat plain. Since the topography surrounding the Project site is relatively flat, the Project has the potential to be visible within 1 km of the Project site, visually insignificant at distances greater than 1 km, and barely visible at 2 km from the Project site.

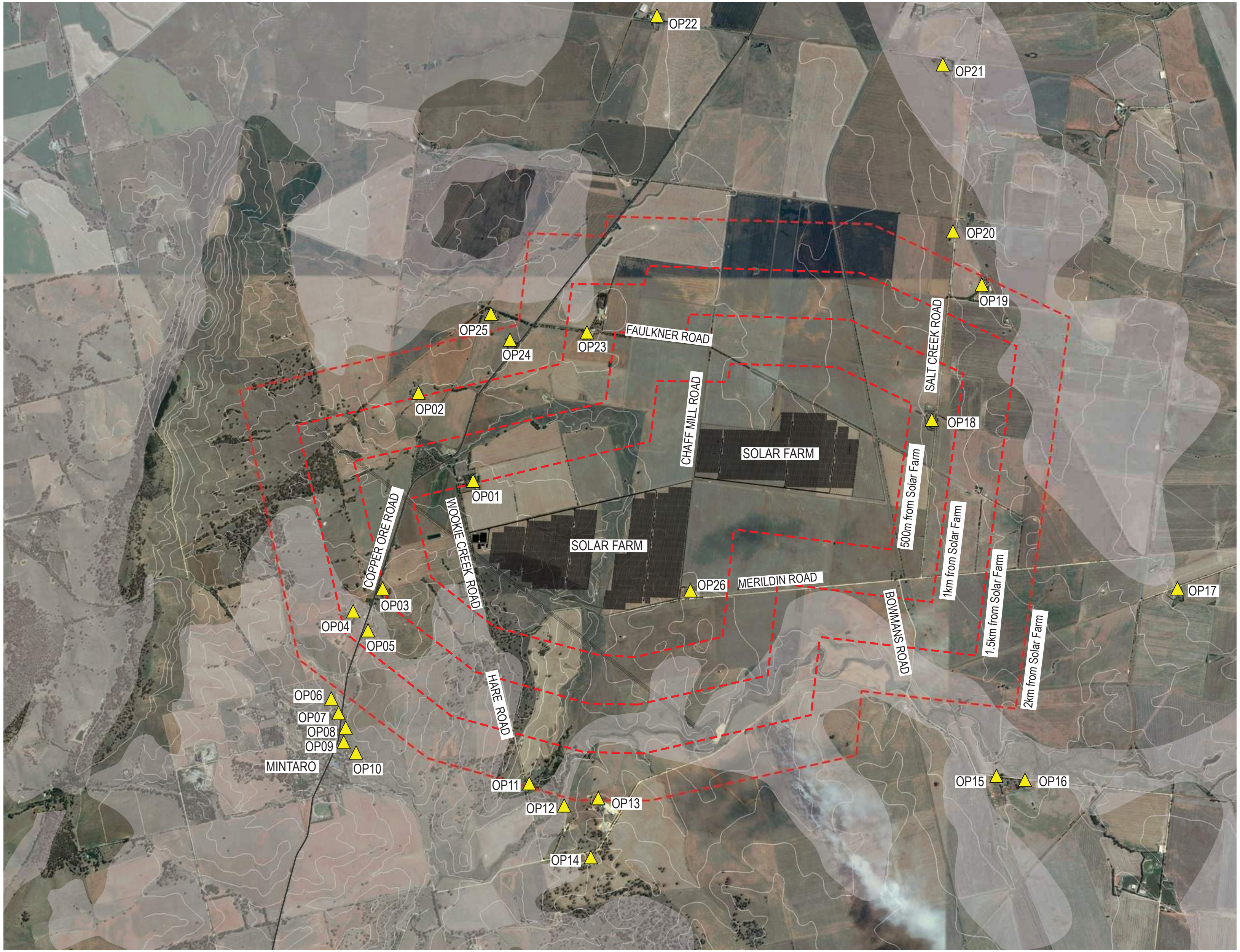
There are 11 existing rural dwellings within 2 kilometres of the Project, in addition there is a residential dwelling currently under construction 120 metres from the south east corner of the solar farm adjoining the intersection of Chaff Mill and Merildin Roads. A further 14 rural and residential dwellings are located at distances greater than 2 kilometres from the Project, these were also assessed in the study. Detailed assessment of the viewshed undertaken as part of the Landscape Character and Visual Impact Assessment[9] identified 6 of the 25 rural/residential dwelling may have views or partial views of the Project.

Copper Ore Road passes within 600 metres of the Project's north-western boundary. A number of minor roads are also located within the viewshed.

The results of the viewshed analysis are summarised below:

- 11 existing rural dwellings and 1 dwelling under construction, were identified within 2 kilometres of the Project site as follows:
    - The proposed rural dwelling under construction is the closest to the Project site, located at the intersections of Chaff Mill and Merildin Roads (OP26). A line of existing trees on the western boundary of the property provide limited screening, the Project will be visible from this location.

[9] Hemisphere Design (Aust) Pty Ltd, 2017, The Chaff Mill Solar Farm Project, Landscape Character and Visual Impact Assessment.



LEGEND

- Contours (10 m intervals)
- Solar Farm
- Observation Points
- Distance from solar farm
- Extent of viewshed: solar farm not visible from grey areas

ENVIRONMENTAL ETHOS

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PROJECT
CHAFF MILL SOLAR FARM

CLIENT
FRV SERVICES AUSTRALIA PTY LTD

ISSUE	DESCRIPTION	DATE
A	DRAFT	26/10/17
B	FINAL	02/02/18

APPROVED BY
S CRAWFORD

DATE OF FIRST ISSUE
26/10/2017

NORTH

DRAWING NAME
VIEWSHED ANALYSIS

DRAWING NUMBER **17004-FIGURE 9**
ISSUE B

  - One (1) rural dwelling is located approximately 500 metres from the Project (OP01), existing vegetation between the dwelling at OP01 and the Project site provides potential screening from this location.
  - One (1) rural dwelling is located between 500 metres to 1 kilometres from the Project (OP18), existing vegetation between the dwelling and the Project site provides potential screening from this location.
  - Four (4) rural dwellings are located between 1 to 1.5 kilometres from the Project (OP03, OP04, OP05, and OP23). Existing vegetation and topography are likely to screen the Project from these locations.
  - Five (5) rural dwellings are located between 1.5 to 2 kilometres from the Project (OP02, OP11, OP13, and OP24). Existing vegetation and topography are also likely to screen the Project from these locations.
- The 14 rural and residential dwellings located at distances greater than 2 kilometres from the Project are not considered likely to have views of the Project due to distance, intervening topography and vegetation.
- Copper Ore Road passes within 600 metres of the north-western boundary of the Project site. Existing vegetation along the road verge is likely to provide some screening.
- Wookie Creek Road adjoins the Project site's western boundary, existing vegetation along the roadside is likely to provide partial screening, views of the Project are considered likely.
- Merildin Road adjoins the Project site's southern boundary, there is some scattered vegetation along the roadside, the Project will be visible from this minor road.
- Chaff Mill Road passes through the centre of the Project site, the Project will be visible from this minor road.
- Salt Creek Road is located within 750 metres of the Project site's eastern boundary, the Project may be visible from this minor road.
- Faulkner Road adjoins the Project site's northern boundary, the Project will be visible from this minor road.

The potential glare hazard impact for identified rural and residential dwellings, and surrounding roads, has been assessed in *Section 5.2.*

5.2. Solar Glare Hazard Analysis

The parameters used in the SGHAT model are detailed in *Table 1.*

Table 1. Input data for SGHAT Analysis

SGHAT Model Parameters	Values
Time Zone	UTC +9
Axis Tracking	Single
Tilt of tracking axis	0
Orientation of tracking axis	0
Offset angle of module	0

Module Surface material	Smooth glass without anti-reflective coating (ARC)
Maximum tracking angle	60
Height of panels above ground	3 m at rotational base

The assessment outcomes for the SGHAT are outlined in *Table 2:*

Table 2. SGHAT Assessment Results.

Sensitive Receptor	Glare Potential
Observation Point 01- Rural Dwelling	No Glare
Observation Point 02 - Rural Dwelling	No Glare
Observation Point 03 - Rural Dwelling	No Glare
Observation Point 04 – Rural Dwelling	No Glare
Observation Point 05 - Rural Dwelling	No Glare
Observation Point 06 – Residential Dwelling	No Glare
Observation Point 07 - Residential Dwelling	No Glare
Observation Point 08 - Residential Dwelling	No Glare
Observation Point 09 - Residential Dwelling	No Glare
Observation Point 10 - Residential Dwelling	No Glare
Observation Point 11 - Rural Dwelling	No Glare
Observation Point 12 - Rural Dwelling	No Glare
Observation Point 13 - Rural Dwelling	No Glare
Observation Point 14 - Rural Dwelling	No Glare
Observation Point 15 - Rural Dwelling	No Glare
Observation Point 16 - Rural Dwelling	No Glare
Observation Point 17 - Rural Dwelling	No Glare
Observation Point 18 - Rural Dwelling	No Glare
Observation Point 19 - Rural Dwelling	No Glare
Observation Point 20 - Rural Dwelling	No Glare
Observation Point 21 - Rural Dwelling	No Glare
Observation Point 22 - Rural Dwelling	No Glare
Observation Point 23 - Rural Dwelling	No Glare
Observation Point 24 - Rural Dwelling	No Glare
Observation Point 25 - Rural Dwelling	No Glare
Observation Point 26 – Proposed Rural Dwelling under construction	Glare Potential
Travel Path – Copper Ore Road	No Glare
Travel Path – Wookie Creek Road	No Glare
Travel Path – Merildin Road	Glare Found
Travel Path – Chaff Mill Road	No Glare
Travel Path – Salt Creek Road	No Glare
Travel Path – Faulkner Road	No Glare

6. POTENTIAL IMPACTS

6.1. Solar Glare Hazard Analysis Tool (SGHAT) Results

The results of the SGHAT modelling identified no glare hazard potential is likely to affect existing rural and residential dwellings within the vicinity of the Project.

The SGHAT modelling found there is the potential for glare hazard to occur when traveling along Merildin Road adjoining the south east corner of the Project site, notably at the intersection with Chaff Mill Road.

Potential glare hazard may also affect the residential dwelling currently under construction adjoining the intersection of Chaff Mill and Merildin Roads.

No glare potential was identified for Copper Ore Road, and other minor roads.

The glare hazard potential along Merildin Road predominately effects the intersection of Merildin and Chaff Mill Roads. The glare hazard potential occurs in the morning, from about 5 am to 11 am throughout the year, *refer Figure 9*.

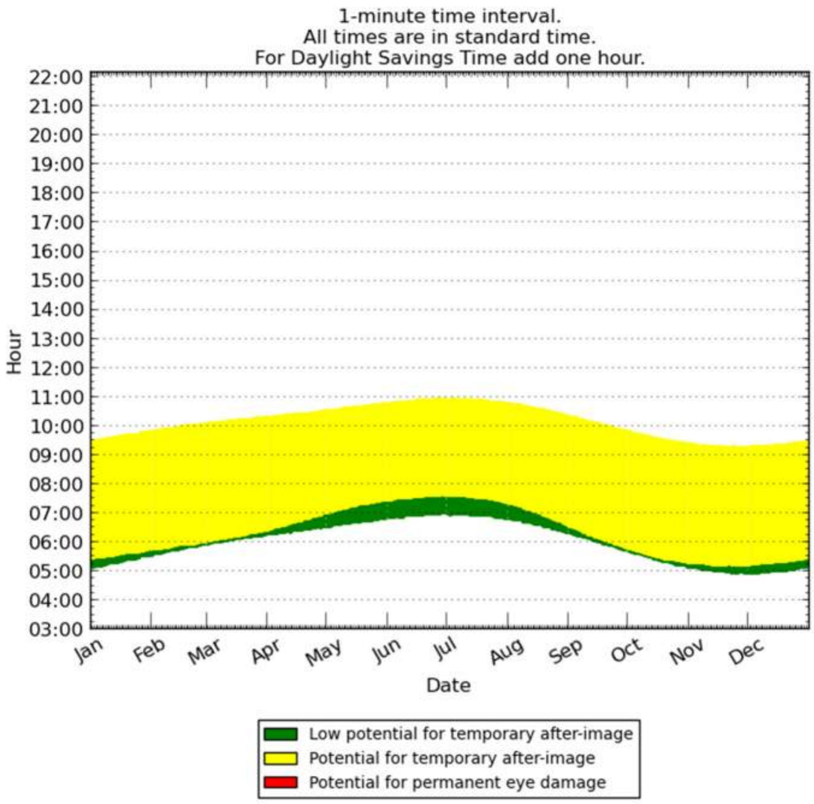

Figure 9. Glare Hazard Plot – Corner Merildin and Chaff Mill Roads

SGHAT modelling is based on topography and does not take into consideration existing vegetation. There is some existing vegetation within the Merildin Road corridor and to the west of the dwelling under construction (OP26), however this is not consider sufficient to mitigate the impact of the potential glare identified.

SGHAT modelling does not account for the ‘backtracking’ procedure, that is, variable angles of incidence of the sun relative to the PV module where the tracking system accounts for over shadowing potential. Therefore during the early morning and late afternoon when a backtracking procedure may be operating there may occur a variation to the angle of incidence of the sun relative to the PV modules compared to that predicted in this modelling. Operation of a ‘backtracking’ procedure is unlikely to alter the findings of this assessment in relation to rural and residential dwellings, however it may influence the results of glare impacting roads immediately adjoining the Project boundary.

7. MANAGEMENT AND MITIGATION MEASURES

The sections of Merildin and Chaff Mill Roads adjoining the Project’s south eastern corner are currently not fully screened by existing vegetation and glare hazard potential was identified along this section of Merildin Road, notably around the intersection with Chaff Mill Road. The identified glare hazard may also affect the rural dwelling currently under construction close to the intersection. Proposed mitigation of this glare potential would be a minimum 3.5 metre high screen planting along the south eastern boundary of the Project site where it adjoins Merildin Road. The planting should extend along Chaff Mill Road approximately 130 metres from the intersection with Merildin Road to provide screening to Chaff Mill Road and the rural dwelling under construction (OP26). The proposed vegetation planting should be of sufficient density to screen potential glare, a minimum width of 5 metres containing dense shrubs and tree planting, is likely to provide the screening required. Establishment of the vegetation screen prior to operation of the solar farm should be undertaken in order to effect this mitigation factor.

8. SUMMARY AND RECOMMENDATIONS

This assessment took into consideration the operation of the Solar Farm during daylight hours throughout the year (SGHAT modelling calculates the potential for glare at 1 minute intervals). SGHAT testing was undertaken for assumed sun energy intensity of 2000 W/m^2, which is 2x the US Federal Aviation Administration modelling requirement standards. In addition no allowance was made for atmospheric conditions.

In summary, based on the assumptions and parameters of this desktop assessment, the following results were identified:

- No glare potential was identified for surrounding existing rural and residential dwellings, therefore the likely impact on these sensitive receptors within the viewshed was identified as insignificant;
- No glare potential was identified for Copper Ore Road and other minor roads, with the exception of Merildin Road;
- Glare hazard potential was identified for travellers on Merildin Road where the road adjoins the Projects south eastern boundary, approximately 760 metres in length;
- Glare hazard potential was identified for the intersection of Chaff Mill and Merildin Roads;
- Glare hazard potential is considered likely to impact the proposed residential dwelling currently under construction at the intersection of Chaff Mill and Merildin Roads; and

- Mitigation of potential glare on travellers along the affected Merildin Road section and intersection with Chaff Mill Road, and the residential dwelling currently under construction at this intersection (OP26), can be undertaken with the establishment of vegetation screen planting. This planting should be established prior to operation of the solar farm and be maintained as a dense vegetation screen to a minimum height of 3.5 metres.

APPENDIX A:

SOLAR GLARE HAZARD ANALYSIS COMPILED REPORT

SOLAR GLARE HAZARD ANALYSIS REPORT

INPUTS

Parameters	Inputs
PV array axis tracking	single
Tilt of tracking axis (deg)	0.0
Orientation of tracking axis (deg)	0.0
Offset angle of module (deg)	0.0
Limit rotation angle?	True
Maximum tracking angle (deg)	60.0
Vary reflectivity	True
PV surface material	Smooth glass without ARC
Timezone offset	+10.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	2000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	6.55

PV ARRAY 1 VERTICES

ID	Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Height of panels above ground (m)	Total elevation (m)
1	-33.892745	138.763409	416	3	419
2	-33.887526	138.764062	413	3	416
3	-33.888381	138.771812	412	3	415
4	-33.884017	138.772711	412	3	415
5	-33.888060	138.781541	413	3	416
6	-33.894481	138.780846	417	3	420

PV ARRAY 2 VERTICES

ID	Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Height of panels above ground (m)	Total elevation (m)
1	-33.897752	138.738266	438	3	441
2	-33.892939	138.763065	416	3	419
3	-33.903941	138.761527	421	3	424
4	-33.905366	138.753643	398	3	401
5	-33.902445	138.743572	421	3	424
6	-33.900802	138.739114	434	3	437

OBSERVATION POINTS

ID	Latitude (deg)	Longitude (deg)	Ground Elevation (m)	Eye-level height above ground (m)	SGHAT Result
1	-33.89305	138.73838	432	1.5	No Glare Found
2	-33.88505	138.73261	436	1.5	No Glare Found
3	-33.90401	138.72878	442	1.5	No Glare Found
4	-33.90572	138.72491	431	1.5	No Glare Found

5	-33.90727	138.72689	427	1.5	No Glare Found
6	-33.91379	138.72304	408	1.5	No Glare Found
7	-33.91448	138.72362	408	1.5	No Glare Found
8	-33.91619	138.72422	404	1.5	No Glare Found
9	-33.91792	138.72465	400	1.5	No Glare Found
10	-33.91868	138.72578	398	1.5	No Glare Found
11	-33.92125	138.7451	398	1.5	No Glare Found
12	-33.9234	138.74896	388	1.5	No Glare Found
13	-33.92273	138.75246	404	1.5	No Glare Found
14	-33.92858	138.75147	404	1.5	No Glare Found
15	-33.92048	138.7974	419	1.5	No Glare Found
16	-33.92065	138.80003	420	1.5	No Glare Found
17	-33.90279	138.81717	455	1.5	No Glare Found
18	-33.88709	138.78962	427	1.5	No Glare Found
19	-33.87428	138.7955	434	1.5	No Glare Found
20	-33.86943	138.79205	431	1.5	No Glare Found
21	-33.85404	138.79161	421	1.5	No Glare Found
22	-33.84994	138.75907	418	1.5	No Glare Found
23	-33.8794	138.75109	427	1.5	No Glare Found
24	-33.88017	138.74271	440	1.5	No Glare Found
25	-33.87751	138.74102	437	1.5	No Glare Found
26	-33.903216	138.76277	421	1.5	Glare Potential

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APPENDIX M

TRAFFIC IMPACT STATEMENT

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FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM

TRAFFIC IMPACT ASSESSMENT

MARCH 2018

CONFIDENTIAL

Chaff Mill Solar Farm
Traffic Impact Assessment

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REV	DATE	DETAILS
00	18/01/2018	Draft
01	06/02/2018	Final
02	08/03/2018	Revised Final
03	19/03/2018	Final

	NAME	DATE	SIGNATURE
Prepared by:	Andrew Leedham	19/03/2018	Andrew Leedham
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Approved by:	Bronte Nixon	19/03/2018	B.

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1 INTRODUCTION

1.1 REPORT PURPOSE AND OBJECTIVES

This Traffic Impact Assessment (TIA) report assesses the traffic related aspects of the proposed Chaff Mill Solar Farm project and has been prepared in support of the development application for the project. The project is proposed by FRV Services Australia Pty Ltd (FRV) – an international leader in solar energy with operations in eight countries and significant presence in Australia.

The objective of the TIA is to identify any key traffic operational and safety issues that may arise out of the construction and operational phases of the project and to suggest measures that may mitigate these.

This assessment is based on a desktop assessment and site inspections (undertaken on 11 January and 15 March 2018) of roads and traffic operations at and surrounding the proposed site. The assessment was informed by information on construction and maintenance activities provided by FRV.

1.2 ASSESSMENT METHODOLOGY

The assessment approach included:

- determining the existing (baseline) road and traffic conditions near the project that may be impacted by the proposed project
- developing an understanding of the construction staging and traffic generating activities
- identifying and assessing options for access to the project site
- estimating the volume, type, frequency and patterns of traffic movements associated with the construction and ongoing operations activities of the project
- assessing the impacts of the traffic generated by the project on the existing (baseline) road and traffic operations
- identifying and suggesting mitigation measures that may be implemented to minimise or eliminate these impacts.

1.3 OVERVIEW OF THE DEVELOPMENT PROPOSAL

The proposal by FRV is to develop a 100 MW solar farm– the *Chaff Mill Solar Farm* – near the Mintaro township in the Clare Valley, South Australia approximately 130 km north of Adelaide (refer Figure 1.1). The solar farm would be developed on a 380 ha site (comprising two adjacent parcels of land) located adjacent to the existing Mintaro electrical substation on Wookie Creek Road and its 132 kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

The project proposal is described in more detail in Section 3.

1.4 TIA REPORT STRUCTURE

The following sections of this TIA report describe:

- existing (baseline) road and traffic conditions (Section 2)
- the development proposal (Section 3)
- access options and the impacts of the project (Section 4)
- possible mitigation measures (Section 5)
- summary and recommendations (Section 6).

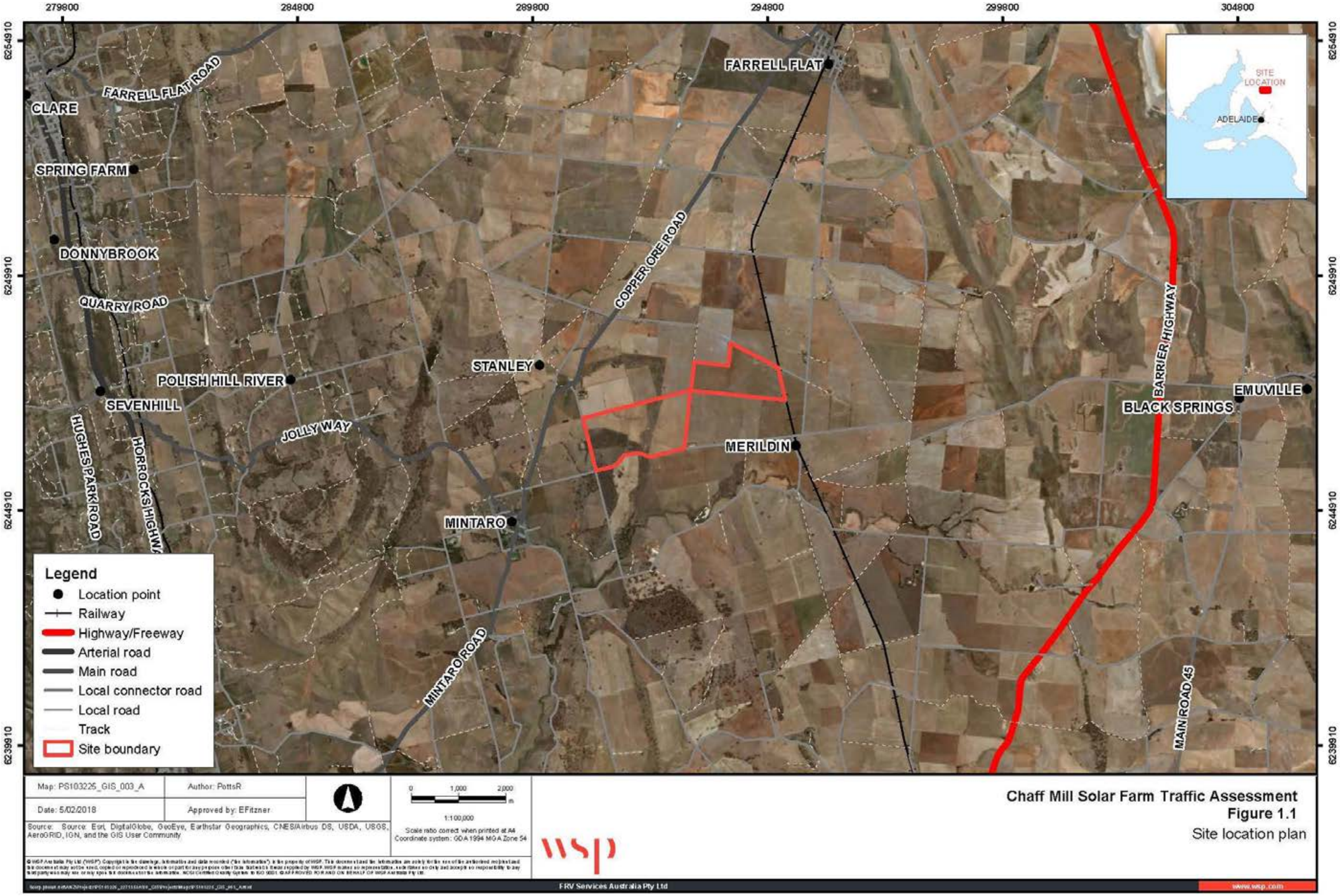


Figure 1.1 Chaff Mill Solar Farm site location plan

2 EXISTING CONDITIONS

2.1 LOCALITY

The proposed Chaff Mill Solar Farm site is located approximately 2.5 km to the north-east of the Mintaro township in the Clare Valley.

The subject site comprises two land parcels (refer Figure 1.1):

- The west section is situated immediately north of the Mintaro-Merildin Road and extends approximately 2 km eastwards between Wookie Creek Road and Chaff Mill Road and about 1 km northwards along both roads.
- The east section is situated immediately east of Chaff Mill Road and to the north east of the west section land parcel. The irregular-shaped land parcel extends about 2 km east and about 600 m north along Chaff Mill Road. Part of the northern boundary of the land parcel abuts Faulkner Road. The eastern boundary of the land parcel abuts a disused railway line.

2.2 TOPOGRAPHY AND LAND USE

The topography of the land in the immediate vicinity of the subject site may be described as generally flat to moderately undulating. A series of watercourses run through the property with the main one running approximately north-south through the site. There are several moderately graded depressions and hills further away from the site.

The area is sparsely populated and the existing land use is predominantly low intensity agricultural activities including cropping and grazing. Natural vegetation in the form of trees and shrubs are generally located along the road corridors.

2.3 ROADS

2.3.1 ROAD NETWORK LAYOUT AND SITE ACCESS

Mintaro is located between two major arterial roads; 13 km west of the Barrier Highway (A32 linking Gawler with Sydney via Broken Hill) and 8 km east of the Horrocks Highway (the B82 – Main North Road – which joins the A32 at Giles Corner about 35 km to the south and provides access to the mid-north via Clare). These roads are sealed two-lane undivided roads.

The roads providing access to Mintaro from the south are:

- Mintaro-Leasingham Road (approximately 10 km, orientated generally south-west to north-east and connecting with the Horrocks Highway south of Clare).
- Min-Man (Mintaro-Manoora) Road (approximately 13 km, orientated generally south-east to north west and connecting with the Barrier Highway via Manoora).

Both roads are sealed two-lane undivided roads.

The roads providing access to Mintaro from the north are:

- Jolly Way/Burton Street (approximately 10 km, orientated generally west-east and linking the Horrocks Highway with Burra Street).
- Mintaro-Farrell Flat Road (also referred to as Copper Ore Road, orientated generally south-west to north-east, approximately 9 km, to Farrell Flat and then another 11 km through to the Barrier Highway).

Both roads are sealed two-lane undivided roads.

Road access to the subject land parcels is provided by:

- Merildin Road which connects Copper Ore Road about 600 metres north of Mintaro. The south west corner of the west section land parcel at Wookie Creek Road is about 1.5 km east of the Copper Ore Road intersection. The south west corner of the east section land parcel is located a further 2.1 km east along Merildin Road then 1.2 km north along Chaff Mill Road.
- Wookie Creek Road (west land parcel only) which connects with Copper Ore Road at its norther end about 3 km north of Mintaro and 800 metres to the north-west corner of the west section land parcel.
- Flagstaff Road which connects the Barrier Highway to the east of the project site and about 13 km north of Manoora and then via Riley Road/Merildin Road. It is about 8.5 km from the Barrier Highway to the junction with Chaff Mill Road and a further 2.1 km to the junction with Wookie Creek Road.
- Chaff Mill Road runs between the two land parcels linking Merildin Road and Faulkner Road.

These roads are all unsealed. Chaff Mill Road and Faulkner Road are narrow unsealed roads suitable for dry weather access only.

2.3.2 DESCRIPTION OF ROADS

Inspections of the roads were conducted on Thursday 11 January and Thursday 15 March to assess their current condition, identify any existing safety hazards and determine their capacity to carry additional traffic if required. These inspections together with traffic usage provides a basis for the assessment of any impacts associated with the proposed solar farm.

BARRIER AND HORROCKS HIGHWAYS

The inspection of the Horrocks Highway and the Barrier Highway included a drive-through from approximately their junction just south of Giles Corner to the junctions with Jolly Way and Min-Man Road respectively; these being junctions where traffic generated by the proposed development might be expected to turn to gain access to the site (see section 4.1). These two rural arterial roads are sealed with formed shoulders and (centre and edge) line marking. Both roads are gazetted B-double routes which means they have been assessed and are of an appropriate standard to allow for use by restricted access vehicles (RAV) without the need for special permits.

The subject 27 km section of the Barrier Highway passes through the townships of Saddleworth, Riverton and Manoora. The vertical and horizontal alignments through this section are of a high standard with few small radii curves.

The subject 40 km section of the Horrocks Highway passes through 6 towns including Auburn. The vertical and horizontal alignments through this section are also of a reasonable standard and the section includes overtaking lanes in both directions. The apparent poor physical condition of the Horrocks Highway has been the subject of adverse public comment in recent years which has been supported by the RAA. This is clearly a very emotive issue that relates to the more highly trafficked sections north of Gawler and less so in the section north of Giles Corner.

MINTARO-LEASINGHAM ROAD

This road is a narrow sealed road with gravel shoulders. It is generally flat (i.e. no significant vertical grades) and exhibits long straight sections with intermittent horizontal curves. Some of these curves are quite tight and reduced speeds are required to negotiate these. There are numerous trees located close to the road posing safety hazards but not unlike many other rural roads of its type. Through the Mintaro township there are no shoulders. The road is not generally considered to be conducive to significant use by large heavy vehicles (such as semi-trailers) without some improvements along parts of its length to improve curves and sight distances, widen shoulders and provide protection from roadside hazards.

MINTARO-MANOORA (MIN-MAN) ROAD

This road is a sealed road about 7.5 metres wide and with minimal shoulders. The alignment consists of straight sections with intermittent curves. Many of these curves have small radii and are treated with advisory speed signs (50, 60 and 70 kph). There are numerous small crests having slight grades. The road has painted centrelines, edgelines and barrier lines (around curves and over crests). There is evidence in numerous locations of significant stormwater erosion which may appear to undermine the pavement structure. It is assumed that this would be exacerbated with further wet weather. Vehicles riding off the pavement edge at these locations may lose control.

MINTARO-FARRELL FLAT (COPPER ORE) ROAD

The inspection was limited to the section between Mintaro and the junction with Faulkner Road. The road exhibits similar characteristics to the Mintaro-Leasingham Road with some crests that restrict sight distance and warrant limits on overtaking. From here-on the road will be referred to as Copper Ore Road.

JOLLY WAY (MAIN NORTH ROAD TO COPPER ORE ROAD)

The alignment of this sealed road consists of a combination of straight sections and curves having varying radii through level to undulating topography. There are sections of road where visibility of oncoming traffic is restricted and hence overtaking without care may be problematic. The road is delineated with painted centrelines, edgelines and barrier lines over some crests and around some curves (preventing overtaking), Some of the curves are signposted with advisory speed signs and other warning signs and a guardrail is located on the outside of those curves where there is a drop off. There are two curves where the advisory speed signs are 50 kph and 45 kph (S-vend). Although the design standard of the vertical and horizontal alignment of this road is lower than the posted speed limit, appropriate safety measures appear to have been implemented to both reduce the risk of crashes occurring and the severity of crashes should these occur. Overall the road did not present any foreseen significant safety issues. At the western end of the road, it is crossed by the Riesling Trail – a shared use path along a disused rail corridor. Tourist cyclists reportedly use this path and then Jolly Way to access the wineries abutting Jolly Way further to the east.

CATHOLIC CHURCH ROAD (JOLLY WAY TO COPPER ORE ROAD)

This is a narrow, unsealed road about 750 m in length with no shoulders. It is generally straight and exhibits a slight uphill grade from east to west at its western end. It connects to Jolly Way via a T-junction and to Copper Ore Road with a four-way intersection opposite Merildin Road.

MINTARO-MERILDIN ROAD

This road is a narrow unsealed road with no effective shoulders. At the time of inspection there were significant sections of road with loose gravel on the road surface. It appears likely that the road would be slippery to traverse when wet. The riding surface was corrugated in parts indicating that re-grading and possible re-sheeting is required in selective areas. Long grass and trees of varying sizes occupy the road verges, some of which pose safety hazards due to insufficient clearance from the road edge. There are unprotected drop-offs of varying heights along the road which pose a safety hazard for errant vehicles. There are several horizontal curves around which sight distance is restricted and in one location there is a dangerous combination of vertical and horizontal curves. A short 300m section of road has been sealed around a combination S-curve.

The road does not appear to be well used by traffic. During the inspection, only one passing car was observed. The road provides access to a small number of farming residences (east of the project site) and adjacent land and there is likely very low exposure to the safety risks identified. In its current form, the road would not be conducive to use by any significant increase in light vehicle traffic or use by heavy or long vehicles.

Photo 2.1 Mintaro – Merildin Road (looking west from intersection with Wookie Creek Road)

FLAGSTAFF ROAD/RILEY ROAD

These roads exhibit similar characteristics to Merildin Road. Flagstaff Road is misaligned at and connected by a 450 metres long section of Riley Road. The horizontal curves at either end of these connections exhibit very small radii which are difficult to negotiate without encroaching onto the opposite side of the road. Sight distance is restricted in all directions.

WOOKIE CREEK ROAD

This road is a narrow, unsealed road with minimal pavement and no shoulders. It appears likely that the road would be slippery to traverse when wet. The road alignment is quite straight and is flanked by natural vegetation including some large trees close to the road which pose a safety hazard for errant vehicles. The road passes through several cuts in the natural topography and it appears there is little if no provisions to carry stormwater away from the road.

The road does not appear to be well-used by traffic. During the inspection, no other cars were observed. The road provides access to adjacent land (including the existing substation) and is a convenient link between Merildin Road and Copper Ore Road. In its current condition the road would not be conducive to use by any significant increase in traffic volumes.

CHAFF MILL ROAD

This is a narrow, earth-formed road having no shoulders. It is sign-posted as a dry weather road as it has not been raised above the natural ground level and is subject to impacts of wet weather. During the inspection, the road was quite firm but it operates as a single-lane track with worn wheel tracks evident either side of an earth mound. The road is clearly not conducive to general use in its present form.

Photo 2.2 Chaff Mill Road

MARTINDALE ROAD

Martindale Road runs west-east from Min-Man Road to Bowmans Road. It is a narrow unsealed road in a wide road reserve and is generally flat and straight apart from a low-speed S-bend between Hare Road and Mintaro-Manoora Road. The pavement condition is poor in places and there is no stormwater drainage along its length. There appears to be potential for flooding in wet weather. Martindale Hall, a key tourist attraction for the area, has driveway access off this road.

Photo 2.3 Martindale Road looking east from Min-Man Road

HARE ROAD

Hare Road runs north-south connecting Martindale Road (about 1 km from Min-Man Road) with Merildin Road, and is about 2.2 kms in length. There is one residence (no. 159) located immediately adjacent the road. The road is straight, narrow and unsealed and there are numerous large trees close to the road edge. It is low-lying with no stormwater drainage and is clearly subject to flooding. There is a moderate uphill grade (south to north) part way along its length and pavement condition overall is quite variable.

Photo 2.4 Hare Road looking north towards the uphill grade

FAULKNER ROAD

This is another earth-formed road with no shoulders. It runs generally west-east and connects Copper Ore Road with Chaff Mill Road. The eastern end of the road abuts the boundary of the east section of land.

2.3.3 INTERSECTIONS

The following intersections were inspected to determine any restrictions in sight distance that may pose safety hazards for vehicles turning into or out of the minor roads.

COPPER ORE ROAD-MERILDIN ROAD-CATHOLIC CHURCH ROAD

This four-way intersection of a sealed main road and two unsealed roads is in an 80 kph posted speed limit zone. Copper Ore Road exhibits a slight right-hand bend from south to north. Merildin Road is located on the inside of this curve. The visibility of oncoming traffic from both directions along Copper Ore Road is restricted by vegetation. The intersection is inconspicuous and would be difficult to identify at night time.

Photo 2.5 Intersection of Copper Ore Road and Mintaro – Merildin Road

COPPER ORE ROAD-WOOKIE CREEK ROAD

This junction of a sealed main road and an unsealed road is located in a 110 kph posted speed limit zone. Cooper Ore Road exhibits a slight crest on the southern approach to the junction and a left-hand curve on the northern approach. The visibility of oncoming traffic from both directions along Copper Ore Road is restricted by the road geometry. The intersection is inconspicuous and would be difficult to identify at night time.

BARRIER HIGHWAY-FLAGSTAFF ROAD-WINDERS ROAD

This four-way intersection of a sealed main road and two unsealed roads is located in a 110 kph posted speed limit zone. The alignment of the Barrier Highway on the approach to and through the intersection is straight and flat. There is no roadside vegetation to restrict visibility. Culverts located either side of Flagstaff Road and passing under the highway prevent vehicles from taking generous radii turns and must therefore slow down significantly to negotiate the tight right angle manoeuvre. This might lead to rear-end crashes on the main road (in particular). The intersection is inconspicuous and would be difficult to identify at night time.

BARRIER HIGHWAY – MIN-MAN ROAD

This acute angled T-junction is located on the northern side of the Manoora township in a 60 kph speed zone. Approaching the junction from the north, the Barrier Highway exhibits a right-hand bend, is on moderate downhill grade and passes over a disused railway crossing. The curve restricts visibility of the junction and traffic entering the Barrier Highway from it. Min-Man Road approaches the junction at an acute angle and this combined with the curve on the northern approach of the Barrier Highway makes it very difficult for drivers entering the Barrier Highway to see oncoming traffic (refer Photo 2.6). Large trucks making a right hand turn from Min-Man Road from a standing start would take some time to accelerate and may impede southbound traffic on the main highway.

Photo 2.6 Barrier Highway – Min-Man Road junction looking north

MERILDIN ROAD-WOOKIE CREEK ROAD-HARE ROAD

This four-way intersection comprises four unsealed road approaches at right angles. There is also a gated entrance to a property located on the north-eastern corner. The alignment of all four roads is straight and visibility from Wookie Creek Road of approaching traffic on Merildin Road is reasonable. However, as the roads are unsealed there is no delineation at the intersection and the intersection is inconspicuous. It is likely that in the event of wet weather, vehicles may experience difficulties in stopping at the intersection should the need arise.

MERILDIN ROAD-CHAFF MILL ROAD

This T-junction of unsealed roads is located on a slight grade on Merildin Road. Visibility of west-bound traffic on Merildin Road from Chaff Mill Road is restricted by the slight crest on the road. The junction is inconspicuous.

HORROCKS HIGHWAY-JOLLY WAY

This T-junction is located in a 100 kph zone. The northern approach of the Horrocks Highway exhibits a left hand bend which restricts sight distance to about 200 metres. There is a short (left turn) deceleration lane on the northern approach but there is no right turn lane for traffic entering the junction from the south. Right turning vehicles may impede following traffic. There is an approximate level difference of about 1 metre between road junction and the adjoining land on the south-east corner and accordingly the left turn movement from Jolly Way is via a right angle turn. Large vehicles are likely to encroach into the adjacent traffic lanes when turning left and at the time of the inspection there was evidence of tyre marks supporting this assumption. Also in the same corner, there are small diameter trees abutting the road and a length of guard rail fence.

MIN-MAN ROAD – MARTINDALE ROAD

The T-junction is located about 100 metres north of the driveway entrance to Martindale Hall. It is quite inconspicuous from the southern approach as there is no junction warning sign. The stem of the junction is quite narrow and there is a stand of trees on both corners. The apron of the junction is unsealed and there is loose material on the surface which could hinder stopping or turning vehicles. Trucks would have to cross onto the opposite side of the roads to negotiate left and right turns out of and into the junction.

MARTINDALE ROAD – HARE ROAD

This T-junction comprises unsealed roads and is quite inconspicuous from all approaches. There is a stand of trees on the south-west corner that restricts sight distance from the west approach of Martindale Road (refer Photo 2.7). Sight distance is otherwise good. The junction pavement surface was of variable condition and there is loose materials in the junction area and on the approaches which might be a hazard for stopping and turning vehicles. Large vehicles turning at the junction would encroach into the opposite side of the road.

Photo 2.7 Martindale Road – Hare Road junction

2.3.4 COMMENTS

Inspection of the existing unsealed roads and junctions identified concerns regarding:

- the geometric standard of the roads
- the condition of the road pavements
- safety hazards including trees close to the road and unprotected drop offs around curves
- restricted visibility and inconspicuous intersections.

It is understood that some of these concerns have been raised by members of the local community with the local council (Clare and Gilbert Valleys Council) responsible for the care and control of these roads. This is not a matter for this TIA but suffice to say, the standard of design, construction and maintenance that is to be provided is often influenced by the funds available and the exposure of road users to the risks. By observation during the limited time spent inspecting these roads, the level of exposure to the identified risks and areas of concern would appear to be very low, especially on the unsealed roads. Notwithstanding that, it is acknowledged that during grain-carting season, large trucks and farming machinery are prominent and the safety risks are further exposed.

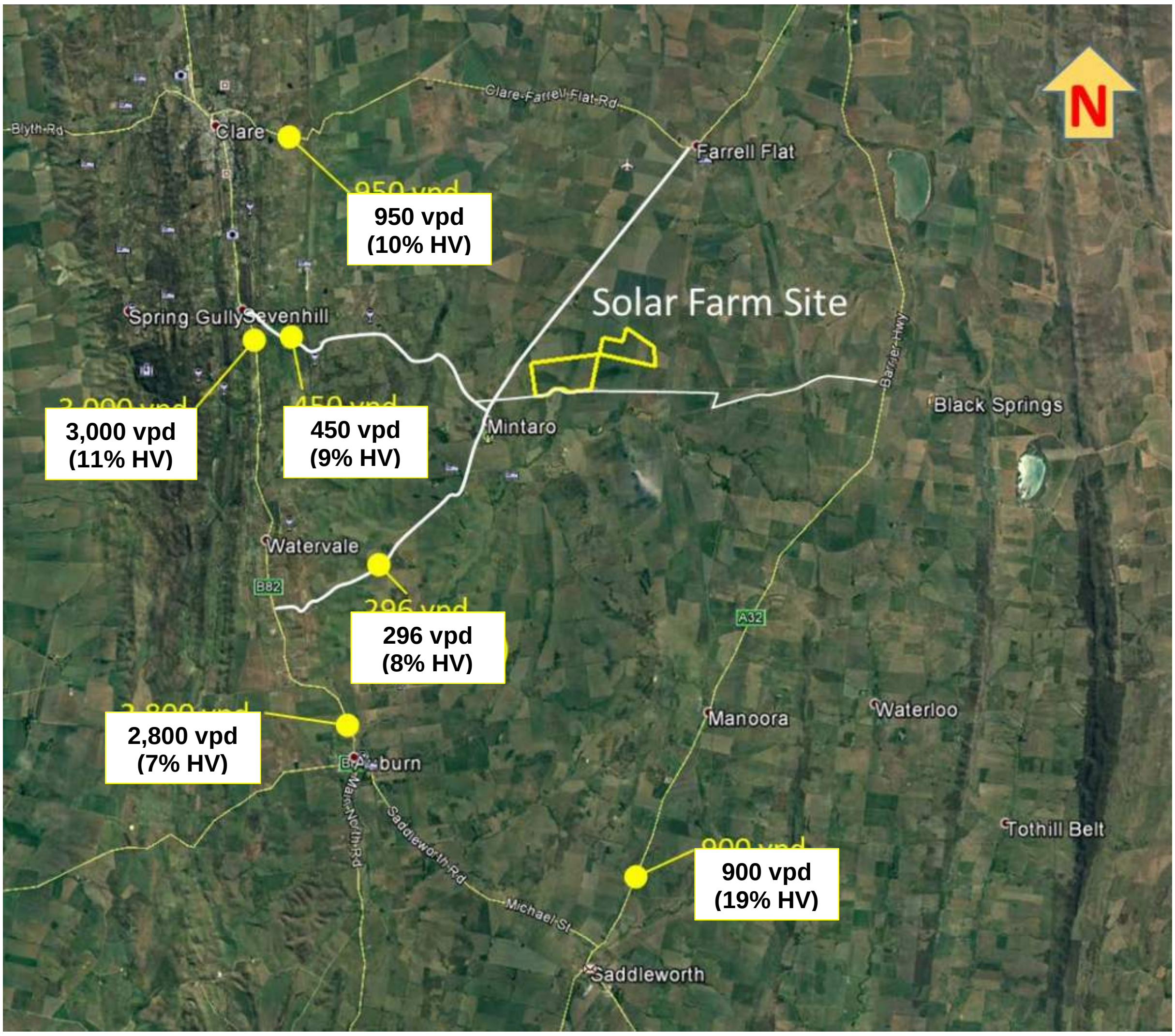
None of the roads described above (either sealed or unsealed) are lit and all of the safety risks mentioned above would be exacerbated at night time. None of the unsealed roads in their existing condition are considered suitable to accommodate any significant increase in use, particularly by large trucks.

2.4 TRAFFIC

Traffic counts for roads near the project site were sought from the Department of Planning Transport and Infrastructure (DPTI) and the Clare and Gilbert Valleys Council. Traffic counts provide a measure of the use of the roads of interest.

There is no information on traffic volumes available for the unsealed roads near the subject site. This in itself might indicate very low traffic usage of these roads. It is anticipated though that during grain-carting season, some sections of some of these roads may experience relatively high volumes of truck traffic for a short period of time.

Traffic counts sourced from DPTI are annual average daily traffic volumes (AADT) and are shown in Figure 2.1 below. These are some distance from Mintaro but provide an indication of the order of traffic volumes using roads in the vicinity. The counts also show the proportions of traffic that are heavy vehicles. The volume of traffic using the Mintaro-Leasingham Road is under 300 vehicles per day of which about 24 are heavy vehicles. Growth in traffic volumes is expected to be low as there is not a lot of development or population growth in the general area to generate any significant increase. Jolly Way carries 450 vehicles per day of which 9% are heavy vehicles. It is not evident from these daily traffic counts whether there is any particular peak period of traffic flow during any time of the day. If there is then it might be reasonable to expect that the peak hour traffic volume would be represented by no more than 10% of the daily traffic volume. The peak hour traffic on Jolly Way then might be just 45 vehicles (two-way). It is possible that because of the agricultural land use in the area, these traffic volumes may be subject to seasonal activity. The daily traffic volumes during these periods then may be higher than the AADT but lower at other times. Jolly Way also provides access to a number of tourist attractions and this too might generate a wide variation in traffic flows.



Source: DPTI, 2017

Figure 2.1 Traffic counts on arterial roads

The Clare and Gilbert Valleys Council provided traffic volume data for Mintaro-Leasingham Road but was unable to provide traffic volume data for other roads in the area.

Based on observations and assessment of the surrounding land uses and the road network configuration, the overall level of traffic using the roads of interest is likely to be low.

The unsealed roads in the immediate vicinity of the project site would be expected to carry no more than 50 vehicles per day (at the very most).

2.5 CRASHES

There are no records of road crashes on the unsealed roads.

Along Jolly Way, 2 crashes occurred in the five years between 2012 and 2016. One of the crashes occurred at night time and resulted in a double fatality. The other crash occurred during the day time and no injuries resulted. Both crashes involved single vehicles hitting a fixed object adjacent to the road.

One crash was reported along Copper Ore Road, in the five years between 2012 and 2016. This occurred approximately 500 m north of Merildin Road intersection with Copper Ore Road during the day time. There were no casualties.

3 THE DEVELOPMENT PROPOSAL

3.1 INFORMATION PROVIDED

FRV has provided some information on the proposed solar farm to assist in the traffic impact assessment. This has included:

- a general layout plan (refer Appendix A)
- general advice on construction staging and duration
- estimates of staffing levels
- estimates of traffic generation.

3.2 SITE LAYOUT

The general layout of the site is in its formative stages and is subject to review, but the general layout (Appendix A) indicates:

- two land parcels to be developed with solar panels
- road access to the north-west corner of the west section (via Wookie Creek Road)
- a 50 MW/100 MWh Battery Energy Storage System (BESS) area located at the north-west corner of the west section comprising:
  - numerous battery containers
  - BESS Control Room
  - MV Delivery Station
- a network of 4 m wide roads to access the solar panels.

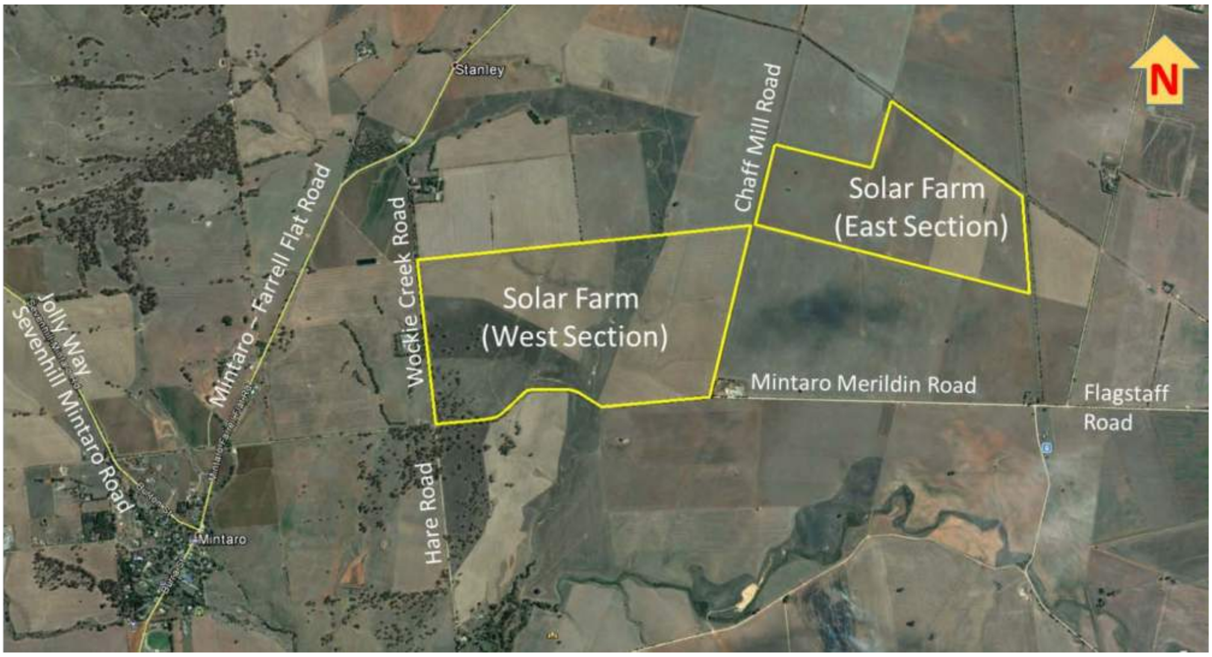


Figure 3.1 Project site and land parcels

3.3 PROJECT CONSTRUCTION

3.3.1 CONSTRUCTION ACTIVITIES

The solar farm will be constructed in two main consecutive stages over approximately 18 months. Each stage will take about 9 months. The stages will include preliminary accommodation works (fencing and site set out for example), earthworks to prepare the site, development of the internal road network, external roadworks, preparation of foundations for buildings and other structures, first and second fix trades and panel assembly. The construction activities may commence in the west section before moving into the east section. This might influence the preferred access to site.

Each of these construction activities will generate specific requirements for traffic movements including staff movements to and from the site each day, transportation of plant and equipment (including earthmoving and lifting plant, temporary buildings and project components such as solar panels) and delivery of materials (e.g. quarry rubble and concrete).

Details of the specific delivery schedules and staffing arrangements have yet to be determined.

3.3.2 WORKFORCE

Up to 200 workers will be present on-site during peak construction activity (Stage 2). At this stage, it is not intended to provide on-site accommodation for workers and temporary accommodation will be sought in nearby townships of Mintaro and/or Clare. It is possible that some of the workers residing in northern parts of Greater Adelaide (i.e. Gawler, Virginia, Port Wakefield etc.) will commute daily to/from construction site.

FRV has indicated that a bus service may be offered by the construction company to transport workers in temporary accommodation.

3.3.3 TRAFFIC GENERATION

High-level estimates of traffic generation for each of the two construction stages have been provided by FRV.

These are shown in Table 3.1 below.

Table 3.1 Estimates of traffic generation by construction stage

CONSTRUCTION STAGES	STAGE 1	STAGE 2
Duration	0 to 9 months	10 to 18 months
Full time workers	Up to 100	Up to 200
Heavy Vehicle Movements	4 deliveries daily (i.e. 8 two-way movements per day)	8 deliveries daily (i.e. 16 two-way movements per day)
Light Vehicle Movements[1]	Up to 100 movements per day	Up to 200 movements per day
Total Vehicle Movements (upper limit)	Up to 108 vehicle movements per day	Up to 216 vehicle movements per day

[1]LIGHT VEHICLE MOVEMENTS

The numbers of light vehicle movements trips shown in Table 3.1 represent conservative upper limit estimates assuming two workers on average will share a ride (one driver and one passenger) to and from the site. The project site is quite remote and it is unlikely that the majority of workers will live close by (see section 3.3.2). Accordingly, it can be expected that a high proportion of workers will reside in temporary accommodation in the general vicinity and would share rides to and from the project site. A higher proportion of ride sharing (4 per car) could see the number of light vehicle movements reduce to 50 and 100 vehicles per day for Stage 1 and Stage 2 respectively. It has also been mentioned that workers might be transported to the site by buses which would reduce these estimated numbers further.

It is not clear at this stage whether there will be one or more working shifts and hence it isn't clear how the arrival and departure of construction staff in light vehicles will be distributed in time. For the sake of this TIA, it is assumed that there will be one shift and all workers will arrive in the morning within a one hour period and depart at the end of the day in a similar one hour period. It is assumed that an appropriate hard stand area will be provided at the site to cater for car parking.

HEAVY VEHICLE MOVEMENTS

The estimates for heavy vehicle movements presented in Table 3.1 includes the transportation of plant and equipment as well as the solar system components. Plant items (including for example earthmoving and lifting equipment) will be transported to site and then remain on site for a specified period before being removed. Plant is not expected to be transported to and from the site on a daily basis.

Heavy vehicles will likely include semi-trailers and tray top trucks. B-doubles may be considered for some larger loads but it is noted whilst both Horrocks Highway and Barrier Highway are gazetted routes for use by Restricted Access Vehicles (RAV), the minor sealed roads and the unsealed roads are not. Permits would be required to operate RAV's on these minor roads. The alignment and width of these roads though may preclude their use (without possibly significant upgrading including widening, realignment and intersection improvements).

3.4 CONSTRUCTION MATERIAL AND EQUIPMENT

Components for the solar farm (e.g. pre-assembled solar panels) are expected to be transported by road from Adelaide. The required components may be manufactured and/or assembled either in Adelaide or shipped from interstate/overseas. If shipped from interstate or overseas, these components will likely be transported through Port Adelaide and then by road to the project site.

Transportation of components is expected to be predominantly by 19.5 m semi-trailers. A small number of larger sized equipment (e.g. transformer) may need special/longer vehicles requiring special permits. Any such permit requirements will be addressed at the time of detailed design.

Components delivered in bulk to the site are assumed to be unloaded at a single location within one or both land parcels. Individual components will then be moved to specific locations within the project site by smaller trucks or utilities.

3.5 SITE ACCESS

The indicative layout in Appendix A shows site access to the north west of the west section of the project site. Road access for the daily workforce, delivery of components and equipment as well as oversize plant and equipment has yet to be finalised and several alternatives may be considered. These are discussed in Section 4.1.

Considerations include:

- the accommodation regime for the daily workforce (on site camp or temporary accommodation in nearby townships – presumed off-site for this assessment)
- impacts of additional traffic on road condition and works required to mitigate these
- increased exposure to identified safety risks on roads and at intersections
- impacts on the amenity of residents and other environmental concerns.

Increasing traffic movements through Mintaro is understood to be an issue with the local community because of the impacts on the general amenity in the town as well as the increased exposure to the safety and operational risks identified. The proponent also understands that Mintaro township is a State heritage area and has a high visual amenity, heritage and tourism value.

3.6 POST CONSTRUCTION

The solar farm will employ up to five staff once operational. It is estimated that the vehicular traffic generated by the daily operating activities will be very low. and be predominantly light vehicles. These traffic movements will generally be by light vehicles and will represent volumes in the order of what is already being experienced on these roads. The additional traffic movements are likely to have a negligible impact on traffic operations for the surrounding road network.

4 TRAFFIC ACCESS AND IMPACTS

4.1 ACCESS LOCATIONS

It was noted in section 3 that at this early stage of planning for the project, there is some flexibility in locating the access to the project site (each of the two land parcels). With careful consideration of the key safety and operational issues identified within the road network, site access can be determined to minimise or even eliminate adverse impacts that might otherwise be associated with traffic generated by construction activities. A critical consideration is the route that vehicles will take to travel to and from the project site.

The west section of the project site abuts three roads (Wookie Creek Road, Merildin Road and Chaff Mill Road) and access could be provided from any one or more of these. The east section abuts Chaff Mill Road and Faulkner Road, both of which are dry weather only tracks.

The indicative layout of the project site provided in Appendix A shows access to the west section via the northern end of Wookie Creek Road. It shows no access to the east section.

From a traffic operations and impacts perspective, the aim would be to locate access points that would minimise travel along unsealed roads to reduce the extent of works required to improve these and would minimise traffic passing residential properties situated adjacent to the roads. The access locations may be different for light vehicles and heavy vehicles depending on the origins of each of the trips and their route to and from the project site.

Alternatives for each access point are discussed below.

4.1.1 LIGHT VEHICLE ACCESS

This assessment assumes that construction workers will reside in rental or hotel accommodation in townships in the region or travel directly from their permanent homes in areas near Mintaro. The most likely location for temporary accommodation is in Clare and other areas west of Mintaro.

It is likely then that the majority of workers will travel to the project site from Main North Road (and approaching Mintaro from the west). Those who might travel from areas south of Mintaro will likely travel via the Mintaro-Leasingham Road and through the Mintaro township. While this may not be ideal from a community perspective, travel through the Mintaro township may be the most direct route for some construction workers. Construction workers residing in Clare and other nearby areas would likely travel via Jolly Way and Catholic Church Road to Copper Ore Road.

From the intersection of Copper Ore Road with Catholic Church/Merildin Road) four route/access options are considered for the project site. These are shown in Figure 4.1 and described below:

- Option A: Site access on Wookie Creek Road at the north-west corner of the west section as indicated in the layout plan. Route comprises 2.5km along Copper Ore Road, then 750 m south along the unsealed Wookie Creek Road to the site entry.
- Option B: Site access on Wookie Creek Road near the existing substation. Route comprises 1.5 km along Merildin Road then 600 m north along the unsealed Wookie Creek Road the site entry.
- Option C: Site access on Merildin Road nominally east of the junction with Wookie Creek Road. Route comprises about 1.8 km east along the unsealed Merildin Road from the Copper Ore Road.
- Option D: Site access on Chaff Mill Road nominally 500 metres from Merildin Road. Route comprises 3.5 km east along the unsealed Merildin Road and about 500 metres along the unsealed Chaff Mill Road.

It is not clear whether light vehicles would need to access the east section (workers might park in the west section and then use project vehicles to travel internally between the land parcels) but if required the most practical access would be via Chaff Mill Road – a further 600 metres north from the Option D access to the west section. The east section could alternatively be accessed directly from the west section (by extending the internal road network) via a short connecting section of Chaff Mill Road. Access to the site via Faulkner Road might be possible but this is considered an inferior option to those identified. It is less direct and would require significant upgrading of the road.

To determine a preferred access location from the four options, the access requirements for heavy vehicles also need to be considered.

4.1.2 HEAVY VEHICLE ACCESS

Heavy vehicles will be required to transport plant, equipment and infrastructure components from Adelaide. Heavy vehicles (mainly semi-trailers) could travel to the project area via either the Barrier Highway or Horrocks Highway. To access the project site itself, trucks will then have to travel along the unsealed roads, none of which are currently conducive to use by large vehicles. Selected sections of these unsealed roads used by the heavy vehicles will need to be upgraded and periodically maintained for the duration of the construction phase of the project. There exists a number of alternative routes comprising a combination of sealed and unsealed roads that could be used to access the project site.

FRV anticipates that all plant and equipment will be transported to the project site by semi-trailers or smaller trucks (general access vehicles). It does not propose to use Restricted Access Vehicles such as B-doubles. Accordingly, these vehicles could legally use any of the public roads (sealed or unsealed) to access the project site. However, as the unsealed roads are not in a suitable condition for extended use by large vehicles and in the interests of developing good relations with any potentially impacted sections of the community, it is prudent to prepare an access strategy based on sound traffic and civil engineering principles.

The preferred route for heavy vehicle access might be a compromise of relevant factors including vehicle operating costs (travel distance and driver time) over the duration of the construction period, the costs of upgrading and maintaining sections of any unsealed roads and the impacts of truck movements on amenity for residents and the wider community along the routes.

Six alternative routes to the project site (taken from Giles Corner where the Horrocks Highway and Barrier Highway diverge) are shown in Figure 4.1 and are:

- Option HV1: Horrocks Highway to Mintaro via the Mintaro-Leasingham Road (about 42 km) then a further 2 km along Merildin Road to Wookie Creek Road (access Option B). This route travels through Mintaro township.
- Option HV2: Horrocks Highway to Mintaro via Jolly Way (about 51 km) and then a further 2km along Merildin Road and Wookie Creek Road (access Option B). This route avoids travel through Mintaro township.
- Option HV3: Horrocks Highway to Mintaro via Jolly Way (about 51 km) and then a further 3.2 km along Copper Ore Road and 700 m south along Wookie Creek Road (access Option A). This route avoids travel through Mintaro township and avoids travel on Merildin Road.
- Option HV4: Barrier Highway to Mintaro via Mintaro-Manoora Road (about 43 km) and then a further 2 km along Merildin Road and Wookie Creek Road (access option B). This route travels through Mintaro township.
- Option HV5: Barrier Highway to Mintaro via Mintaro-Manoora Road and then Martindale Road and Hare Road to Merildin Road (about 42 km, access Option C). This route avoids the Mintaro township incurring travel along 3.8 km of unsealed narrow roads.
- Option HV6: Barrier Highway and then via Flagstaff Road-Riley Road-Merildin Road (54 km, access Option C). This route avoids both Mintaro and Manoora townships.

The most direct route using the Horrocks Highway or the Barrier Highway is via Mintaro (HV1 or HV4). If trucks are to avoid the Mintaro township, then there would be an approximate 18 km round trip penalty for each truck trip using the alternative Horrocks Highway routes (HV2or HV3) and an approximate 22 km round trip penalty for each truck trip using the alternative Barrier Highway route (HV6). The most direct route to the project site that avoids travel through Mintaro is HV5.

To allay community concerns regarding heavy vehicles travelling through the Mintaro township, route options HV1 and HV4 are not considered further.

The Barrier Highway route option via Flagstaff Road/Merildin Road (HV6) would require the upgrading of over 13 km of unsealed road and realignment of some of the sub-standard curves. The much shorter route options HV5 would take traffic via a much shorter length of unsealed roads. HV5 is therefore the preferred Barrier Highway route option.

The Horrocks Highway option HV2 includes upgrading of 2.6 kms of unsealed road; Catholic Church Road (700 m), Merildin Road (1.4 kms) and the southern end of Wookie Creek Road (500 m). Option HV3 is overall about 3 kms longer than HV2 but includes only 1.4 kms of unsealed road; Catholic Church Road (700 m) and the northern end of Wookie Creek Road (700 m). HV3 though passes by a residence in Wookie Creek Road. Accordingly the preferred Horrocks Highway route option is HV2.

HV2 and HV5 are similar in overall route distance. HV2 avoids trucks passing dwellings immediately adjacent unsealed roads whereas trucks using HV5 would pass the residence at 159 Hare Road located within 30 metres of the road. HV2 requires less significant upgrading of a shorter length (1.2 km) of unsealed road. If trucks are to use HV5 then Catholic Church Road may still require a reduced level of upgrading to cater for the extra car trips generated by the construction workers. HV2 would appear to be a more favourable option.

However, during the period of public consultation conducted by FRV in February 2018, it became apparent that there was Council and community support for the HV5 route option and concerns for the increased use of Jolly Way by heavy vehicles.

Jolly Way does exhibit a vertical and horizontal alignment that requires care and attention to safely negotiate. It does attract tourist traffic and some cyclists, which might demand other regular road users to be more vigilant. On the other hand, the traffic management and controls implemented along the road would appear to adequately address any safety risks for the level of exposure. The curves have been treated with advisory speed signs, barrier lines to discourage overtaking and guard rail in places to prevent errant vehicles from leaving the road. There may be a perception that the road is not fit for use by trucks but there is already an average of 45 heavy vehicle movements per day using the road. There may also be additional trucks using the road during grain-carting season. The introduction of 8-16 extra truck movements per day is not expected to significantly increase the safety risks along the road.

The alternative route (HV5) will direct trucks onto Min-Man Road and the unsealed Martindale and Hare Roads. Min-Man Road is a lower standard road to Jolly Way and the significant stormwater drainage issues affecting the integrity of the pavement structure might be exacerbated by an increase in heavy vehicle traffic running close to the pavement edge. Tourist traffic also uses this road to access Martindale Hall. Martindale Road is narrow and subject to flooding and Hare Road would require significant upgrading in some sections. Directing trucks along these unsealed roads would pose a greater safety risk to other road users than directing them along Jolly Way where truck traffic is already evident.

On balance from a safety and amenity viewpoint, the preferred route option for access by heavy vehicles to the vicinity of the project site is via Horrocks Highway (HV2). The significant majority of the route is sealed, deploys appropriate traffic control measures to reduce the risk and severity of crashes and (as is reported in Table 3.1) will be subjected to only a small number of additional heavy vehicles movements per day during the construction period. The route is also the preferred and most likely route for access by light vehicles travelling predominantly to and from the west of Mintaro.

Other routes were suggested during the consultation period but all were considered inappropriate because of the extra distance compared to the preferred routes.

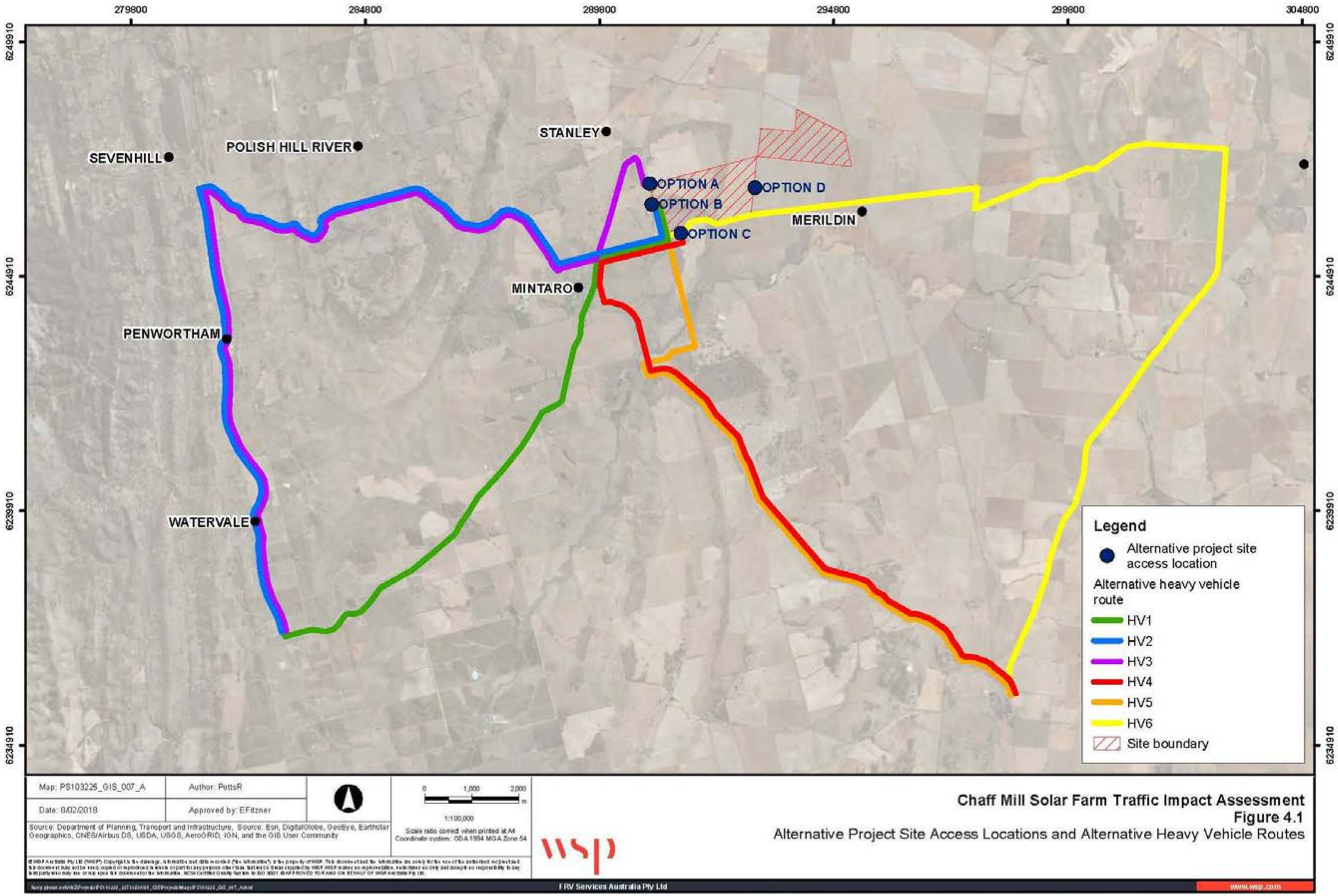


Figure 4.1 Heavy vehicle access routes

4.2 ASSESSMENT OF ACCESS OPTIONS

Alternative access locations are compared in Table 4.1. The assessment of alternative access locations is based on route HV2 to the project area via Horrocks Highway/Jolly Way.

The high level assessment presented in Table 4.1 indicates the advantages and disadvantages of each of the site access locations. Further investigations may be required to determine the extent of upgrade works required, particularly at junctions to develop safe sight and stopping distances.

There is considered significant opportunity to minimise both the extent of road upgrade works required and the amount of additional travel on the unsealed roads by making use of the internal road layout required for the project.

The suggested access located midway along Wookie Creek Road (Option B) is preferred. The road is straight and is conducive to the development of a safe access and egress for trucks and cars, it requires the upgrade and ongoing maintenance of a relatively short section of road and upgrade of two junctions. Traffic using the route to access the site would not be required to pass any adjacent residences.

Table 4.1 Alternative access locations

ACCESS LOCATION	ADVANTAGES	DISADVANTAGES	COMMENTS
Option A Wookie Creek Road (North) As per Indicative Layout Plan	**Light vehicles:** Trips to and from Clare via Catholic Church Road involve left and right turns to/from Copper Ore Road at intersections with Catholic Church Road and .Wookie Creek Road. **Heavy vehicles:** Predominantly sealed route for majority of trip via Horrocks Highway/Jolly Way. Comparative route length to Barrier Highway via Flagstaff/Merildin Road. Internal road network shown in the indicative layout could be extended to allow vehicles to access the east section via a short section of Chaff Mill Road if required. Requires upgrade of a relatively short section of unsealed road and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road). Provides direct access to the BESS and office area.	Perceived anti-directional route (for light vehicles) to access site compared with access options along Merildin Road (option C) and Wookie Creek Road (option B). All light and heavy vehicle movements will pass by a residence located on the eastern side of Wookie Creek Road for the duration of the construction period. Requires upgrade of unsealed road sections (Catholic Church Road) and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road).	Requires upgrading of the Copper Ore Road junction and approximately 1.4 km of unsealed road (including 700 metres along Catholic Church Road and 700 metres along Wookie Creek Road). Project staff and transport contractors would need to be discouraged from accessing Wookie Creek Road via Merildin Road

ACCESS LOCATION	ADVANTAGES	DISADVANTAGES	COMMENTS
Option B Wookie Creek Road adjacent to substation	**Light vehicles:** Trips to and from Clare via Catholic Church Road, then cross Copper Ore Road and most direct route via Merildin Road followed by left turn into Wookie Creek Road. **Heavy vehicles:** Predominantly sealed route for majority of trip via Horrocks Highway/Jolly Way. Comparative route length to Barrier Highway via Flagstaff/Merildin Road Internal road network could be adapted to allow vehicles to access the east section via a short section of Chaff Mill Road if required. Shorter route than Option A by 1.2 km as it uses the more direct route along Merildin Road rather than the indirect route along Copper Ore Road. Does not impact on adjacent residents along either Wookie Creek of Merildin Roads.	Cars and trucks would need to cross at right angles the Copper Ore Road junction between Catholic Church Road and Merildin Road. Requires longer section of road upgrade than access at Option A at the northern end of the road (2.8 km vs 1.4 km). Requires upgrade of unsealed road sections (Catholic Church Road) and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road).	Project staff and transport contractors would be encouraged to access Wookie Creek Road via Merildin Road. Requires upgrading of the junctions of Copper Ore Road with Merildin/Catholic Church Road and Merildin Road with Wookie Creek Road and upgrading selected sections of approximately 2.8 km of unsealed road (including Catholic Church Road).
Option C Merildin Road	**Heavy vehicles:** Predominantly sealed route for majority of trip via Horrocks Highway/Jolly Way. Comparative route length to Barrier Highway via Flagstaff/Merildin Road Internal road network could be adapted to allow vehicles to access the east section via a short section of Chaff Mill Road if required. Shortest route of the four access options depending on the exact location of the access. Preferred access location is about 200-300 metres east of the Wookie Creek Road junction. Does not impact on adjacent residents along either Wookie Creek of Merildin Roads.	Cars and trucks would need to cross Copper Ore Road junction between Catholic Church Road and Merildin Road. Requires upgrade of unsealed Catholic Church Road and two junctions along Copper Ore Road (Wookie Creek Road and Catholic Church Road)	Requires upgrading of the junction of Copper Ore Road with Merildin/Catholic Church Road, development of a suitable access layout on Merildin Road and 2.4 km of unsealed road. An alternative access could be located about 300 metres west of the Chaff Mill Road junction.

ACCESS LOCATION	ADVANTAGES	DISADVANTAGES	COMMENTS
Option D Chaff Mill Road	Provides a single road access to both the west and east sections.	Proposed new residence on the corner of Chaff Mill Road and Merildin Road would be subjected to significant impacts of turning car and truck traffic. Cars and trucks would need to cross Copper Ore Road junction between Catholic Church Road and Merildin Road. Requires longest section of road upgrade than the other access options.	Requires upgrading of the junctions of Copper Ore Road with Merildin/Catholic Church Road and Merildin Road with Chaff Mill Road and approximately 4 km of unsealed road.

4.3 TRAFFIC IMPACTS ON THE ROAD NETWORK

4.3.1 TRAFFIC VOLUMES AND DISTRIBUTION

Table 3.1 indicates estimates provided by FRV of daily heavy vehicle traffic generation and the number of construction workers for each of the two stages of construction. The number of light vehicle trips could vary from between 50 and 100 for Stage 1 and 100-200 for Stage 2 depending on the extent of ride sharing by workers. This estimate could be reduced if the construction company provides one or more buses to transport workers from temporary accommodation in nearby towns.

In section 4.2 it was determined that the most appropriate access to the western section of the site would be from Wookie Creek Road opposite the substation (access option B). The internal road layout could be developed to provide access to the eastern section via a short connecting length of Chaff Mill Road. In section 4.1 it was determined that the preferred route to the project site for both light vehicles (construction workers) and heavy vehicles would be from Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road. Some construction workers (perhaps 10%) may travel to the site in light vehicles via Leasingham and Mintaro.

The estimates of traffic volumes represent a significant increase in the volumes of traffic using the lower order roads near the project site. Jolly Way currently carries 450 vehicles per day and this could increase to 500-550 (11%-22%) during Stage 1 (about 9 months) and 550-650 (22%-44%) during Stage 2 (about 9 months). The increase in traffic though will likely occur over two short periods of time in the day when construction workers travel to and from the project site before the start and at the end of the working shift. Peak hour traffic could then increase from about 45 to 95-145 (2 to 3 times) and 145-245 (3 to 5 times) during Stage 1 and Stage 2 respectively. The road has the capacity to carry this extra traffic in a safe manner but regular users of Jolly Way will need to more vigilant during these short periods of the day.

The number of daily truck movements is estimated would to by 8-16 movements (one-way) per day which represents a 2%-4% increase over existing volumes. This is not a significant increase especially when compared with possible likely increase in truck movements during the grain carting season. These truck movements though could travel to the project site via the Barrier Highway (or the alternative route HV5) but these would need to travel on a longer length of unsealed road.

The proportional increase in traffic movements on the unsealed roads would be significantly higher but the extra traffic would only pass three residences, all on Catholic Church Road and each set well back from the road. Traffic volumes through Mintaro could increase by 5-10 (Stage 1) and 10-20 (Stage 2).

The extra traffic may be most noticeable at the junctions (Jolly Way with Horrocks Highway and Copper Ore Road/Catholic Road/Merildin Road. During Stage 2, there could be up 4-5 vehicles attempting to cross or turn at these intersections at a time. At the Copper Ore Road intersection the conflicting traffic volumes are not high and crossing/turning vehicles would not be expected to be delayed unduly.

4.3.2 SAFETY AND CRASHES

The safety record of the roads near the project site is good with only 2 crashes in 5 years occurring on Jolly Way. This is partly due to the low traffic volumes using the roads. There is through numerous safety hazards along the impacted roads and there will be increased exposure to these risks with the increase in traffic generated by the project.

The areas of greatest concern are:

- conflicts at intersections. Vehicles turning to and from side roads onto major roads will need to select appropriate gaps in traffic to cross or enter the road
- vehicles leaving the road on the approaches to and departures from tight radii curves
- vehicles overtaking over crests having poor sight distance
- vehicles travelling at inappropriate speeds along particularly unsealed road sections and losing control
- vehicles losing control on loose gravel particularly on narrow roads and around curves.

There are appropriate actions that can be taken to mitigate against these.

4.3.3 ROAD CONDITIONS

The increase in both light vehicles and heavy vehicles on the unsealed road network will undoubtedly accelerate the deterioration of the road surface conditions. The condition of these roads is already of concern to the community. The condition of the roads and the extent of additional traffic use suggest that increased maintenance alone will not be sufficient. Road conditions can be expected to deteriorate more rapidly during wet weather.

The issue of restricted visibility of oncoming traffic around tight radius curves and crests will be exacerbated by increased traffic use and there is likely to be additional wear and erosion around the inside of curves.

On roads that are narrow, vehicles tend to drive closer to the centre of the road. The edges of the unsealed roads are not defined and there is loose gravel and vegetation growing close to the road which can cause vehicles to skid or slide. With the increase in traffic use, vehicles may travel closer to the road edge when vehicles confronted by approaching vehicles thereby increasing the risk of vehicles losing control.

5 MITIGATION WORKS

As mentioned earlier, the existing unsealed roads exhibit geometric deficiencies (sub-standard curves and crests which restrict sight distance), have no shoulders and make no provisions for stormwater drainage. The roads are narrow and there is little if no effective wearing course. These roads would appear to be used by very few vehicles each day.

It is understood that concerns have been raised with the Clare and Gilbert Valleys Council regarding the condition of these roads.

The introduction of a maximum of 100-200 car trips daily (but more likely between 50-100 and 100-200) and 8-16 truck movements per day would represent a significant proportional increase in traffic using these roads and without improvements would result in an increased rate of deterioration in their condition. These roads would eventually become dysfunctional and unsafe to travel on.

The additional traffic will only be present for the estimated 18-month period of the construction of the solar farm project, after which the extent of road use will revert to what is it currently.

The impacted sections of road should be upgraded as an integral part of the project construction. Upgrade does not imply the impacted road be brought up to a higher standard along its entire length; rather, any upgrade should be commensurate with the duration of the project works. This might include appropriate localised geometric improvements to improve sight distances around curves and over crests, widening of intersections to cater for truck turning, strengthening of the road pavements particularly around curves and regular monitoring of, repairs to and grading of the road wearing course. It may not be appropriate to widen the full length of the road in areas not impacted by the project nor upgrading to a standard well beyond that which exists. There may be an opportunity though for the proponent and the Clare and Gilbert Valleys Council to negotiate over the joint funding of more substantial and longer lasting improvements for the impacted sections of road.

To determine the extent and location of upgrade works, it would be prudent to commission a road safety audit of the impacted roads when the potential impacts are better known. This audit will guide the development of any design works required commensurate with the expected duration of the use of the roads.

The suggested mitigation works for the preferred route (HV2) and project site access location should include:

- road pavement improvements (resheeting) along the full length of Catholic Church Road
- localised widening of the intersection of Copper Ore Road with Catholic Church/Merildin Roads and sealing of the immediate approaches
- road pavement improvements (resheeting), selective localised widening and trimming of vegetation along Merildin Road from Copper Ore Road to Wookie Creek Road
- temporary sealing on the immediate approaches to the intersection of Merildin Road, Hare Road and Wookie Creek Road
- localised widening of the approaches to the intersection of Wookie Creek Road with Merildin Road and clearly define junctions
- road pavement improvements (resheeting), selective localised widening and trimming of vegetation along Wookie Creek Road from Merildin Road to the site access location
- road pavement works (sheeting) and widening of Chaff Mill Road in the section between the east and west sections if this is required
- regular grading and/sweeping of the road surface to remove loose gravel
- regular re-sheeting of worn sections of road surface
- provide barriers at selected curves to prevent errant vehicles leaving the road.

5.1 COMPLEMENTARY ACTIONS

In addition to these physical works, it would be prudent to:

- limit travel to daylight hours
- educate drivers of both cars and trucks on how to drive safely along the unsealed roads (including driving at appropriate speeds and avoiding overtaking)
- actively discourage travel through Mintaro by heavy vehicles
- liaise regularly with the local community and Council regarding the construction activities, expectations regarding increased travel on the roads and any events that might change traffic patterns
- provide a bus service to ferry construction workers to and from the site to reduce the number of light vehicle trips. The operating cost of providing this service may be offset by savings in the costs of any reduced road maintenance works
- make the intersections more conspicuous by implementing advance warning signs and improved delineation
- consider staggering shift start and end times to distribute the arrival and departure times of traffic to and from the site and hence over the road network.

5.2 CONSTRUCTION TRAFFIC MANAGEMENT PLAN

As per best-practice, a Construction Traffic Management Plan (CTMP) should be prepared to the satisfaction of DPTI (and/or the *Clare and Gilbert Valleys Council*) prior to construction commencement.

The CTMP should include, but not be limited to, the following items:

- a detailed assessment of existing road condition
- a delivery schedule should be prepared to coordinate the delivery of major components of the solar farm during construction phase
- an outline of the specific travel routes which must be followed by construction traffic involved in the construction phase
- detailed turn path modelling for construction equipment/material delivery truck (19 m semi-trailers and other special vehicles if used etc.)
- a monitoring program to identify any traffic-related impacts on the local road network during construction, and an outline of mitigation measures that could be implemented should such a situation arise
- appropriate traffic control measures (including training) should be implemented to guide drivers delivering major project components from nearest major highway (e.g. Barrier Highway or Horrocks Highway) to the construction site.

6 SUMMARY AND RECOMMENDATIONS

6.1 THE PROPOSAL

FRV proposes to develop a solar farm project on two parcels of land located about 2.5 km north east of Mintaro. The land parcels are located adjacent to and accessible via a network of unsealed roads.

The detailed layout of the solar farm is yet to be finalised but it will require vehicle access to both land parcels and an internal road network to allow for both its construction and maintenance. The early staging of planning allows some flexibility to determine appropriate access points from the local road network which will minimise any impacts of traffic generation.

Once operational, only a small number of staff will be in attendance daily and the vehicle trips generated will be less than 10 per day.

During the construction phase though, traffic generation will be more significant. In the first stage of construction (duration 9 months) it is estimated that there will be 100 construction workers on site. This will increase to 200 in the following second stage (also 9 months). These construction workers will travel to and from the site daily using light vehicles. The construction company may consider providing buses to transport workers to reduce the number of car trips and to reduce the extent of parking area to be provided on site. Transportation of components and materials to the project site from Adelaide will also generate vehicle movements to and from the site. It is estimated that there will be 8 and 16 heavy vehicle movements daily in Stage 1 and Stage 2 respectively.

6.2 ROAD AND TRAFFIC CONDITIONS

The project site is located between the Horrocks Highway and Barrier Highway. Both are sealed rural arterial roads and are of are of a suitable standard to carry heavy vehicles. Both are gazetted B-double routes. The minor roads linking these highways to Mintaro (via Leasingham and Manoora) are also sealed but are narrow and exhibit some geometric deficiencies. An alternative access road is Jolly Way from Horrocks Highway. This route is more indirect and exhibits some geometric deficiencies, many of which have been treated with signs, line-marking and guardrails to reduce safety risks.

Direct access to the project site is via low standard unsealed roads (Merildin Road, Wookie Creek Road, Chaff Mill Road). These roads have sub-standard curves, are narrow and have poor surface condition. The condition of these roads is a concern to the local community. It is anticipated that sections of these roads are difficult to negotiate during wet weather.

Traffic volumes on roads near the project site are low. These vary from 495 vehicles per day on Jolly Way to under 50 vehicles per day on the unsealed roads.

There have been no recorded crashes on the unsealed roads but two single-vehicle crashes occurred on Jolly Way in the five year period to 2016.

6.3 ROAD ACCESS TO THE PROJECT SITE

Four alternative locations for access to the west and east sections of the project site were identified. These locations included access from Wookie Creek Road (north end and midway near the substation), Merildin Road and Chaff Mill Road. The advantages and disadvantages of these were assessed taking into consideration:

- the likely routes to be taken by construction workers (light vehicles) and heavy vehicles to the project site from their trip origins
- the extent of upgrading required to the unsealed roads and intersections
- the existing alignment of the unsealed roads and hence the safety risks
- the number of residential properties along the route that may be affected by the passing traffic.

In assessing the options, it was assumed that it would be possible to develop an internal road network that would reduce the extent of travel on the public road network whilst also providing for the ongoing maintenance of the solar panels.

On balance the preferred access location is on Wookie Creek Road adjacent to the existing substation. This would be supported by an internal road network that would allow access to Chaff Mill Road and then to the east section of the project site. Most light vehicle trips and all heavy vehicle trips would be expected to travel to the site via Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road.

The clear advantages of this option are:

- there are no residential properties along this section of Merildin Road or Wookie Creek Road
- there is a relatively short section of unsealed road to be upgraded as well as two intersections
- it avoids upgrading of some of the worst sections of Merildin Road.

Through consultation with Council and the community, FRV learned that there was support for trucks to travel to and from the site via Martindale Road/Hare Road. These roads are unsealed and would also need to be upgraded for use by heavy vehicles. This route would require trucks to pass though the Manoora township.

The use of the Mintaro-Leasingham Road by heavy vehicles (in particular) should be avoided as this takes traffic through the historic Mintaro township. The alternative route via Jolly Way represents a 20 km round trip penalty. Access to the project site via Barrier Highway are also not preferred. The route via Manoora also takes traffic through Mintaro and the route via the unsealed Flagstaff and Riley Roads would require significant road upgrade and realignment works.

6.4 TRAFFIC IMPACTS

The construction of the project will generate both light vehicle trips and heavy vehicle trips during the two construction phases of the project.

Assuming the construction workforce will reside off site and travel to the project site daily (with some sharing rides), it is estimated that 50-100 and 100-200 vehicle trips per day will be generated during Stage 1 and Stage 2 of the construction program. 8 and 16 heavy vehicle trips per day are estimated for each of the stages respectively.

Most of the light vehicle trips (45-90 and 90-180) are predicted will travel via Jolly Way with the remainder (5-10 and 10-20) travelling via Mintaro. All heavy vehicle trips are predicted will travel via Jolly Way.

These numbers of vehicle trips are not high in absolute terms but will represent a significant proportional increase in the traffic volumes currently using the sealed and particularly the unsealed road network. Daily traffic volumes on Jolly Way for example could increase by up to 44% during Stage 2 construction period. The increase in traffic volumes on the unsealed roads will be significantly higher than existing but only on relatively short sections of road and sections which do not pass by adjacent residences.

The increased level of traffic will increase the exposure to the identified safety risks and these will need to be mitigated. The increased traffic will also accelerate the deprecation of the road surfaces.

6.5 MITIGATION MEASURES

A range of mitigation measures have been proposed to address the increased exposure to risk and the impacts on the road conditions. These include:

- improvements to the horizontal and vertical alignment at selected locations
- improvements at intersections to improve sight distance, make the approaches more conspicuous and reduce wear and tear by turning vehicles
- re-sheeting of the road surface and regular repair and grading
- widening of the roads particularly around curves
- measures to protect errant vehicles from roadside hazards.

A range of complimentary mitigation measures are also proposed. These measures aim to reduce the amount of travel, reduce the intensity of travel demand (staggering shift times), encouraging appropriate driver behaviour and informing the community of construction activities that may change traffic patterns.

A road safety audit of roads near the project site is recommended. This should be undertaken when more details of the project are known (at detailed design stage).

It is strongly recommended that no construction related travel be undertaken on these roads outside of daylight hours.

APPENDIX A

INDICATIVE SITE LAYOUT

PV PLANT SUMMARY "MINTARO"

AC Power : 100 MWn
Peak Power: 125,007 kWp
25 Power Stations
24 3 x Ingeteam 1600 TL B615 (50°C) - 3.996 MWac
1 2 x Ingeteam 1600 TL B615 (50°C) - 2.664 MWac

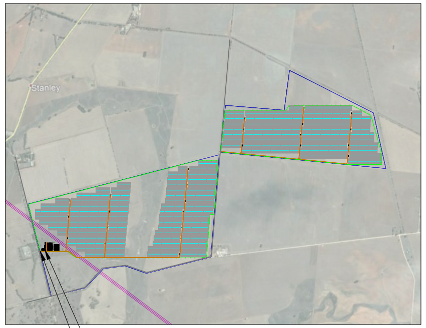
BESS Capacity: 50MW/100MWh

362,340 Modules 345 Wp

Area:	Fenced area	Fence length
	310.3 Ha	10,995 m

GEOGRAPHICAL COORDINATES

Country	Australia
Coordinates (UTM 54H)	291839.02 m E, 6246667.96 m S
Altitude	420 m



LEGEND

- Tracker (1P) x 60M
- 4 MWac Inverter/Transformer Station
- 2.66 MWac Inverter/Transformer Station
- Fence
- Overhead Line
- Boundary
- 4m wide path (internal road)
- Access to the PV Plant

COMMENTS / APPROVED — A1

REV.	DATE	DRAWN	DESIGNED	CHECKED	APPROVED	DESCRIPTION	VERIF.
00	180315	A.M.C	A.M.C	A.T.A	I.C		

PROJECT
MINTARO PV PLANT
100 MWac

TITLE
GENERAL LAYOUT

REF. N°:
SCALE 1:7500
N° — 0 Rev.
SHEET 01 FOLLOWS –

180315-EP-MINTARO-PLNS-OP01-REV00.DWG

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 36,000 talented people in more than 500 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

APPENDIX N

STORMWATER AND FLOODING ASSESSMENT

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FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM

CIVIL ASSESSMENT: STORMWATER AND FLOODING

FEBRUARY 2018

CONFIDENTIAL

Chaff Mill Solar Farm
Civil Assessment: Stormwater and Flooding

FRV Services Australia Pty Ltd

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REV	DATE	DETAILS
00	18/12/2017	Draft
01	06/02/2018	Final
02	26/02/2018	Updated final to correct street name to Wookie Creek Road

	NAME	DATE	SIGNATURE
Prepared by:	Brad Bown, Adam Malavazos	06/02/2018	
Reviewed by:	Brad Bown	06/02/2018	
Approved by:	Bronte Nixon	26/02/2018	

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EXECUTIVE SUMMARY

BACKGROUND INFORMATION

WSP was commissioned by FRV Services Australia Pty Ltd (FRV) to undertake a Civil Assessment (Stormwater and Flooding) for a site identified as Allotments 114-117 in Filed Plan 170301 and Allotments 3 and 4 in Deposited Plan 12560 in the area named Stanley, Hundred of Stanley (the site). This investigation forms part of the planning approval services to support FRV's development of the proposed Chaff Mill Solar Farm in the Clare Valley, South Australia.

The proposed site is located north-east of the Mintaro township in SA and consists of 2 parcels, which are located within the Primary Production Zone of the Clare and Gilbert Valleys Development Plan with agriculture as the current land use.

Parcel 1 is bounded by Merildin Road to the south, Wookie Creek Road to the west, Faulkner Road to the east, and Parcel 2 is bounded by Faulkner Road to the north and west agricultural land to the south and a rail line to the east.

1 INTRODUCTION

WSP was commissioned by FRV Services Australia Pty Ltd (FRV) to undertake a Civil Assessment (Stormwater and Flooding) for a site identified as Allotments 114-117 in Filed Plan 170301 and Allotments 3 and 4 in Deposited Plan 12560 in the area named Stanley, Hundred of Stanley (the site). This investigation forms part of the planning approval services to support FRV's development of the proposed Chaff Mill Solar Farm in the Clare Valley, South Australia.

The proposed site is located north-east of the Mintaro township in South Australia, and consists of 2 land parcels, which are located within the Primary Production Zone of the Clare and Gilbert Valleys Development Plan with agriculture as the current land use.

Land parcel 1 is bounded by Merildin Road to the south, Wookie Creek Road to the west, Faulkner Road to the east, and Parcel 2 is bounded by Faulkner Road to the north and west agricultural land to the south and a rail line to the east.

1.1 OBJECTIVES

The main objective of the Civil Assessment (Stormwater and Flooding) was to assess the topography and drainage characteristics of the site, and to then identify any flooding and drainage issues which may result from the proposed development, presenting potential public health, safety or environmental risks.

2 SITE ASSESSMENT

2.1 METHODOLOGY

This report has been prepared in accordance with the guidance provided in the following documents:

- Environmental Protection Agency Government of South Australia (EPA) 1999, '*Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999*.
- The *Environment Protection (Water Quality) Policy 2015* (under the *Environment Protection Act 1993*).
- Environmental Protection Authority Government of South Australia 1999, *EPA Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999*.
- Clare and Gilbert Valleys Council, *Development Plan 2016*.

The research components of the report are detailed in Table 2.1.

Table 2.1 Summary of civil and flooding assessment components

COMPONENT	SECTION OF REPORT
Civil Assessment Report	**Section 2.2**
Desktop Hydrological Analysis	Section 2.2.1
Assessment of modifications to the site	Section 2.2.2
Assessment of potential risks	Section 2.2.3
Identify mitigation measures	Section 2.2.4
Understanding of potential construction impacts	Section 2.2.5

2.2 CIVIL ASSESSMENT

2.2.1 SOLAR FARMS AND DRAINAGE – PRINCIPLES

Typical solar farm construction utilises the natural layout of the land to minimise earthwork construction costs, whilst also maintaining existing natural features, such as watercourses, across the site.

The installation of solar panels does not increase the overall runoff from the site, as runoff from each panel soaks into the ground under the adjacent downstream panel – resulting in little to no increase in the total catchment runoff.

The provision of access roads, hardstand zones and new buildings do result in an increase in the total runoff from the site, given the once permeable topsoil is replaced with a crushed rock/roofed structures.

Based on the above information, the detention of stormwater is recommended. This may be through the provision of swales or detention basins (if required) to ensure post-development flows offsite are restricted to match pre-development flows from the site. Swale/basins modelling and sizing is subject to a more detailed analysis during the final design stage.

The proposed draft layout ([1] 170915-91-EP-MINTARO-PLNS-OP00-REV00-01. LAYOUT GENERAL) utilises a majority of the land across the sites for solar panels, noting access roads and panels have been located to avoid the water course in the southern catchment.

Culverts will be provided at all locations along access tracks that cross any water course or natural depression. The sizes of these culverts will also be subject to a more detailed analysis during the final design stage.

2.2.2 DESKTOP HYDROLOGICAL ANALYSIS

Mapping from Location SA, outlined in Figure 2.1 below, confirms that there is a water course (Wookie Creek) which traverses north to south across the southern site, however there are no formalised water courses present in the northern site.

Flood mapping is not available for either site in the *Clare and Gilbert Valleys Council Development Plan*, and it is recommended that further analysis should be undertaken to assess the risk of flooding (despite the sites' occurring in the upper reaches of large catchment areas) during the later design stages.

Each site is in the upper reach of a separate stormwater catchment (Wakefield River and Broughton River catchments, respectively). As such it is highly unlikely that either site would experience any flooding issues during peak storm events. No flood plain zones are located within either site.

2.2.2.1 NORTHERN SITE

The northern site is relatively level, with any runoff gradually flowing northward, towards Faulkner Road.

It is anticipated that the access track layout will have negligible impact on the total site runoff given the relatively level site characteristics. However, the quantifiable impact from access track/hardstand provisions on the total runoff is subject to detailed drainage analysis of the site during the subsequent detailed design stage. This analysis forms part of the anticipated Site Drainage Management Plan requirement; which is in line with general civil work projects for South Australian Councils.

2.2.2.2 SOUTHERN SITE

The southern site is of more undulating terrain with a central watercourse draining to the south; whereby runoff at the site enters Wookie Creek and flows south, past Merildin Road.

As outlined in Figure 2.1, there are three smaller sub-catchments that drain into Wookie Creek. Any formalised water courses will need to be maintained for adequate site drainage.

Solar panels are located outside the principal watercourse, and to determine the actual drainage corridor width; detailed flood modelling of the greater site would need to be undertaken prior to detailed design as there is currently no available flood mapping data for this area. The closest available flood mapping is at the nearby Mintaro Township (Figure 2.2), however this area will not be impacted by any modifications to the project site.

The proposed access road layout will incorporate culvert crossings where appropriate to ensure sub-catchment drainage is not affected.

It is anticipated that swales or detention basins will be required and would be located either side of the central water course near the southern site boundary. These stormwater treatment measures will be sized to limit post-development flows to match pre-development flows. This is in line with South Australian Councils' typical requirements for site developments, including solar farms.

As with the Northern Site, the impact on the total site runoff from access track/hardstand provisions are subject to more detailed analysis during a subsequent design stage.

Figure 2.1 Site drainage overview, outlining land parcels (green), existing water courses (light blue), catchment boundary (dark blue)

Table 2.2 Site catchment characteristics

	SOUTHERN SITE	NORTHERN SITE
Site Area (km^2)	2.46	1.44
Catchment Area (km^2)	12.3	4.2
Existing Pervious Surface Area (%)	100%	100%
Local watercourses	Wookie Creek	nil
Highest elevation across site	430 m	415 m
Lowest elevation across site	390 m	410 m

As the combined area of the two sites is approximately 3.9 km^2, a Soil Erosion and Drainage Management Plan (SEDMP) must be prepared during the detailed design stage as the *'Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999'* states that this will be necessary where *"the total area to be disturbed, or left disturbed, at any one time exceeds 0.5ha"*.

2.2.3 ASSESSMENT OF MODIFICATIONS TO THE SITE

Construction of the solar farm will involve earthmoving activities to form the internal access tracks and minor groundworks prior to solar panel installation (including trenching for underground cables and other services). This will include the stripping of topsoil and localised regrading to ensure maintenance access tracks are trafficable. Any localised regrading across the site will need to be considered in terms of potential; impacts to local watercourses and catchments.

As discussed in Section 2.2.1, the installation of solar panels has negligible impact on the total site runoff as the ground beneath each panel is permeable. The construction of access tracks will increase runoff from the site given their impermeable nature.

To adequately consider the effects of access tracks and hardstand areas on the sub-catchments across the southern site, the installation of solar panels and construction of localised earthworks will need to be reviewed during the future detailed design phase. Utilising the existing topography where feasible, and allowing the existing drainage network to continue to drain freely aligns with best management practices regarding site stormwater management for solar farm operation.

It is noted that the solar farm will be re-seeded with native grasses following completion of construction works, providing benefits to stormwater runoff quality.

Appropriate sediment control practices during construction will need to be adhered to; ensuring downstream watercourses are protected from soil runoff during storm events. All contractors onsite will need to abide by the Soil Erosion and Drainage Management Plan (SEDMP) prepared by the Construction Contractor.

The *Environment Protection (Water Quality) Policy 2015* must be complied with, and it is explicitly stated that *"A person must not discharge a class 1 pollutant into any waters or onto land in a place from which it is reasonably likely to enter any waters (including by processes such as seepage or infiltration or carriage by wind, rain, sea spray or stormwater or by the rising of the water table)"* and nor must they *"discharge a class 2 pollutant into any waters or a cavity in land"*. Class 1 pollutants used during construction may include, but not be limited to:

- brick bitumen or concrete
- cleaning agents
- concrete waste
- construction and demolition waste
- hard waste (for example, vehicles, tyres, batteries, metal parts, piping, electronic equipment and municipal solid waste)
- human waste
- high pressure water blasting waste
- washdown water from cleaning vehicles, plant or equipment.

Similarly, the Class 2 pollutants used during construction may include, but not be limited to:

- soil, clay, gravel or sand.

Failure to abide by this policy may result in serious damage to the wider stormwater network and significant financial penalties.

2.2.4 ASSESSMENT OF POTENTIAL RISKS

As outlined in previous sections, whilst the construction of a solar farm will increase the quantity of impervious surfaces across the site (from construction of hardstand zones, buildings and access tracks), the solar panels themselves will not increase runoff.

Stormwater runoff from developed zones across the site will need to be addressed in accordance with planning conditions, limiting flows from the site to pre-development peak flow levels, and provision of suitable erosion control for new earthwork zones.

Due to the relatively gradual slope of the land in the northern site, it is anticipated that the impacts on total site runoff will be negligible following construction of the solar farm.

As discussed previously, there is no existing flood mapping for the two sites or the associated Wookie Creek or the watercourse in the northern site. The only flood mapping available near the site, is in the nearby Mintaro Township, as outlined in Figure 2.2, this town will not be in any way impacted by the proposed development.

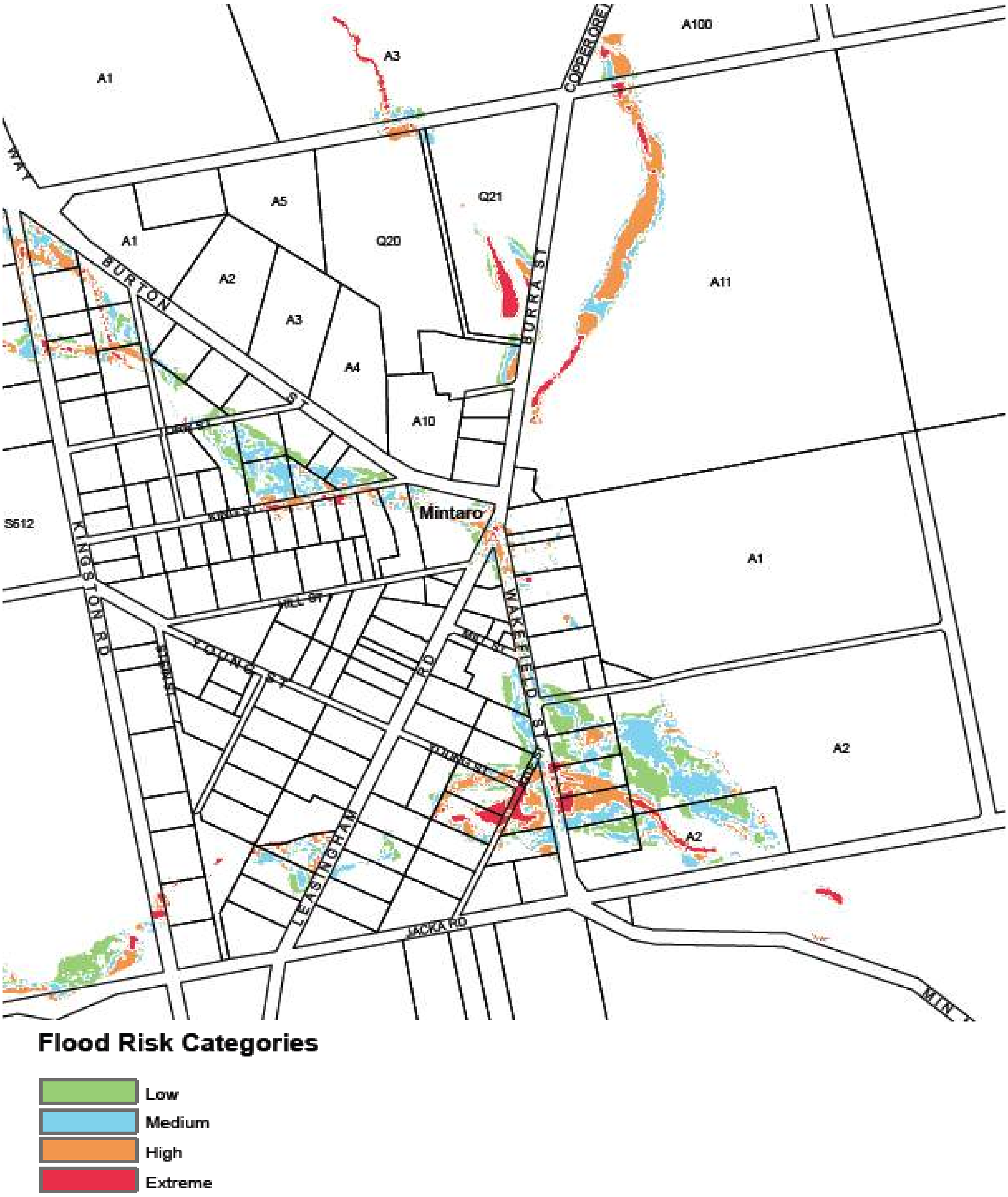

Figure 2.2 *'Overlay Map CGV/9 - Development Constrains'* (Flood Mapping) of Mintaro Township from *Clare and Gilbert Valleys Council* Development Plan

2.2.5 IDENTIFY MITIGATION MEASURES

Prior to the construction stage, the SEDMP outlined in Section 2.2.2 must be lodged for approval with the Clare and Gilbert Valleys Council, along with the engineering design drawings.

As per the *Clare and Gilbert Valleys Council Development Plan*, the location, siting, design and operation of renewable energy facilities must be completed such that the *"adverse impacts on the natural environment and other land uses"* are minimised. Any development must also be *"located and designed to minimise the risks to safety and property from flooding"* during *"a minimum of a 1-in-100 year"* ARI event.

The project must also not result in any of the following items outlined in the development plan:

- impede the flow of floodwaters through the land or other surrounding land
- increase the potential hazard risk to public safety of persons during a flood event
- aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
- cause any adverse effect on the floodway function
- increase the risk of flooding of other land
- obstruct a watercourse.

To avoid conflict with any tributaries or creeks, it is recommended that a "buffer zone" be created around these waterways to prevent works being undertaken in areas which may be subject to localised flooding. Subject to further detailed investigation, it may also be necessary to establish stormwater detention ponds to ensure post-development flows match pre-development flows from the site.

2.2.6 UNDERSTANDING OF POTENTIAL CONSTRUCTION IMPACTS

As outlined in Section 2.2.3, there is a potential for erosion and deterioration of water quality during the construction phase.

All contractors onsite will need to abide by the Soil Erosion and Drainage Management Plan (SEDMP) prepared by the Construction Contractor.

It is recommended that if a significant rainfall event has been forecast, all work may need to be temporarily halted until the storm has passed. It is also advisable to secure loose materials including construction waste and equipment, or to alternatively remove them from the site. Any washing of site vehicles and equipment should also be prohibited on-site to prevent stormwater contamination, unless an appropriate facility is provided.

If there is a risk that contaminants have entered the waterway, it is recommended that water quality tests should be undertaken immediately. If there is any trace of contamination, works should be suspended until an appropriate treatment is implemented.

Numerous erosion and sediment controls that could be implemented are outlined in the *'EPA Handbook for Pollution Avoidance on Commercial and Residential Building Sites, 2004'* and in the *'Stormwater Pollution Prevention Code for the Building and Construction Industry, 1999'*. These measures include, but are not limited to:

- preserving as much grassed area as possible
- construction vehicles should enter and leave the site by an access driveway to limit the tracking of mud and/or soil onto roads
- a large gravel or aggregate should be used to establish the entry/exit point, and should only require periodic maintenance by topping up the rock
- a guide to the design and operation of a wash area should be outlined in the documents
- where practical, upslope water should be diverted around the site onto stable areas and should not be diverted into neighbouring properties unless written permission is obtained from the landowner(s)
- a guide to waste management should be outlined in the documents

- all areas disturbed by construction should be promptly stabilised—for example, re-vegetated—so they can no longer act as a sediment source
- all construction vehicles on-site are to be fitted with a suitable oil/fuel spill kit.

This is not a definitive list of measures to be undertaken, and other items will need to be considered and implemented.

2.3 PREVIOUS SITE INVESTIGATION REPORTS

No known previous site investigations reports exist for this site.

3 SUMMARY

The existing site will be impacted by the construction of access roads, hardstand zones, buildings and solar panels. Specifically, Wookie Creek in the southern site will be directly impacted by the proposed panels which are expected to cover the Creek's feeding sub catchments.

Prior to the commencement of the construction phase, Council must approve a Soil Erosion and Drainage Management Plan (to be submitted with the engineering design drawings). It is necessary to ensure that the design satisfies the requirements outlined in, but not limited to, Section 2.2.2 of this assessment.

As outlined in Section 2.2.6, it is important to implement measures, including but not limited to those listed below, that will minimise the impacts on the surrounding water courses during the construction phase.

- provide stormwater detention basins (as discussed in Section 2.2) in the southern site which will be sized to limit post-development flows to match pre-development flows
- temporarily halt all work if a significant storm is forecast (securing any loose materials, including construction waste and equipment, or alternatively removing them from the site)
- unless an appropriate facility is provided, prohibit the washing of vehicles and equipment onsite, to prevent stormwater contamination
- implement erosion and sediment controls as outlined in Section 2.2 and in both the *'EPA Handbook for Pollution Avoidance on Commercial and Residential Building Sites, 2004'* and in the *'Stormwater Pollution Prevention Code for the Building and Construction Industry, 1999'*.

The site is to be reseeded with native grasses following construction works, to minimise the risk of localised erosion across the sites, during the solar farm's operation. It will also be necessary to ensure that the local access roads are designed with appropriate consideration of all drainage requirements, as discussed in Section 2.2.

These recommendations are not definitive, and other items may need to be considered as the layout of the site is further defined.

4 REFERENCES

Clare and Gilbert Valleys Council *Development Plan, as collated in 2016.*

Environment Protection Act 1993.

Environment Protection Authority *Handbook for Pollution Avoidance on Commercial and Residential Building Sites 2004.*

Environment Protection Agency *Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999.*

Location SA Mapping www.location.sa.gov.au.

SA EPA public register http://www.epa.sa.gov.au/what_we_do/public_register_directory/site_contamination_index.

SA *Environment Protection (Water Quality) Policy 2015*, under the Environment Protection Act 1993.

WaterConnect website (https://www.waterconnect.sa.gov.au/) accessed September 2017.

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ABOUT US

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APPENDIX O

SOCIO-ECONOMIC ASSESSMENT

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FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM

SOCIAL AND COMMUNITY ASSESSMENT

MAY 2018

CONFIDENTIAL

Chaff Mill Solar Farm
Social and Community Assessment

FRV Services Australia Pty Ltd

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REV	DATE	DETAILS
00	24/01/2018	Draft
01	13/02/2018	Final
02	27/02/2018	Updated final to correct street name to Wookie Creek Road
03	30/05/2018	Revised final

	NAME	DATE	SIGNATURE
Prepared by:	Marion McCormack, Jen McDonnell, Erin Fitzner	30/05/2018	
Reviewed by:	Bronte Nixon, Steph Luyks	30/05/2018	
Approved by:	Bronte Nixon, Steph Luyks	30/05/2018	

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1.1 THE CHAFF MILL SOLAR FARM PROJECT

Australian solar development company FRV Services Australia Pty Ltd ("FRV") is proposing to develop the Chaff Mill Solar Farm at a location north-east of Mintaro in the Clare Valley, South Australia. The proposed 100 MW solar farm would be developed on a 380 ha site adjacent to the existing Mintaro substation and its 132 kV transmission line to Waterloo. The project would deliver clean, zero-emissions electricity via the latest in solar energy generation technology; PV-Polycrystalline modules with a horizontal, single-axis tracking system. The panels, including the mounting structures, would not exceed three metres in height. The site is well-placed to capture and export renewable solar energy into the national electricity grid.

1.2 PROJECT AREA

The proposed Chaff Mill Solar Farm Project is located 3.5 kilometres north-east of Mintaro in the Clare Valley, 130 kilometres north of Adelaide. The proposed 100 MW solar farm would be developed on a 380 ha site that is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merildin Road, Salt Creek Road and Faulkner Road. The existing land use is agricultural and the site falls within the District Council of Clare and Gilbert Valleys.

1.3 LEGISLATIVE AND POLICY REQUIREMENTS

The Chaff Mill Solar Farm will be assessed under Section 49 of the *Development Act 1993*. Under this approval pathway, public comment is sought on major projects (i.e. those defined as above $4 million in development cost for all stages). Notice is given in the form of a public advertisement and comment can be made within 15 business days. In addition to this, at the same time as lodging a Development Application, the proponent must forward details of the proposal to the relevant Council. This notice must be given within three days of lodgement with the State Commission Assessment Planning (SCAP).

The project must comply with relevant legislation and policies including:

- *Development Act 1993*
- *Aboriginal Heritage Act 1988*
- *Environment Protection Act 1993* (including policies under this Act)
- *Environment Protection Biodiversity Conservation Act 1999*
- *Heritage Places Act 1993*.

1.4 ASSESSMENT METHODOLOGY

This assessment establishes a baseline summary of the current socio-economic conditions of Mintaro and the Clare Valley and Mid-North Regions prior to the construction of the proposed Chaff Mill Solar Farm. Qualitative and quantitative sources were used to assess the impacts that the project may cause to the social and economic environment during construction, operation and decommissioning. Potential impacts have been assessed to determine if they will result in positive or negative outcomes for the community and regional economy. Where potential impacts are considered to have negative consequences, management and mitigation measures are proposed.

The assessment was carried out using the following key sources of information:

- Statistical information from the Australian Bureau of Statistics (ABS) 2016 Census data.
- Social service providers' websites including the Clare and Gilbert Valleys District Council and Tourism SA.
- Review of relevant reports and recent literature concerning the social and economic impacts of solar farms.
- Review of FRV's current proposal for the proposed Chaff Mill Solar Farm.

Please note that the assessment relied on understanding and addressing the existing perceptions and values of stakeholders and the community. All consultation and engagement activities were comprehensively undertaken by RPS and WSP's review relied on documentation/records of these activities.

2 EXISTING CONDITIONS

2.1 REGIONAL CONTEXT – CLARE VALLEY AND THE MID-NORTH

2.1.1 POPULATION AND DEMOGRAPHICS

The Mid-North region covers about 23,000 square kilometres, bordered by the Clare and Gilbert Valleys to the south, Port Pirie and the Spencer Gulf to the west, Southern Flinders Ranges to the north, and pastoral lands to the north-east (Department of Planning and Local Government 2011). The Mid-North Region is governed by several regional and district councils including:

- Clare and Gilbert Valleys Council
- District Council of Mount Remarkable
- District Council of Orroroo Carrieton
- District Council of Peterborough
- Northern Areas Council
- Port Pirie Regional Council
- Regional Council of Goyder.

The proposed Chaff Mill Solar Farm is situated within the Clare and Gilbert Valleys Council area. The total permanent population of the Clare and Gilbert Valleys Council area was approximately 9,059 in 2016 (ABS 2016). A high portion of the Clare and Gilbert Valleys Council's permanent residents are children aged 0-14 years (20.6% in 2015). The second largest age bracket is 55-64 years (14.7% in 2015) (ABS 2016) (Figure 2.1). There is a higher median age in this area (44.4 years) compared to Greater Adelaide (38.6 years) and South Australia (40 years).

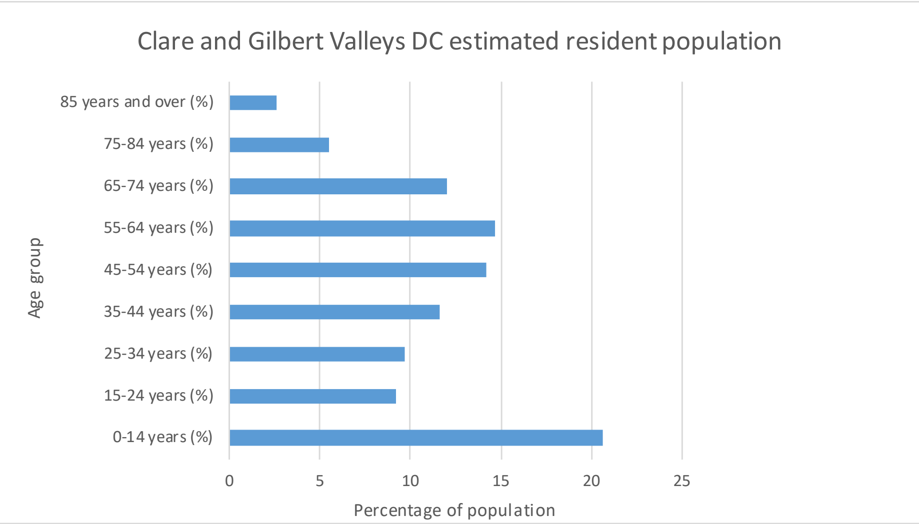


Figure 2.1 Clare and Gilbert Valleys District Council estimate resident population by age group

The Clare and Gilbert Valleys Council is covered by Native Title Claims from the Kaurna Peoples and Ngadjuri Nation #2 (Location SA 2017). Aboriginal and Torres Strait Islanders comprised one percent of the permanent population of the Clare and Gilbert Valleys Council in 2011 (ABS 2016). Approximately 13% of the population was born overseas in 2011 (ABS 2016). Supporting the diversity of people who live in the Mid-North region is identified as a priority in the Mid North Region Plan (Department of Planning and Local Government 2011), which comprises a volume of the South Australian Planning Strategy.

2.1.2 REGIONAL GROWTH

The population of the Clare and Gilbert Valleys Council area has generally increased over the last ten years, however there was zero percent population growth from 2015-2016 (decline of two people from 9,061 in 2015).

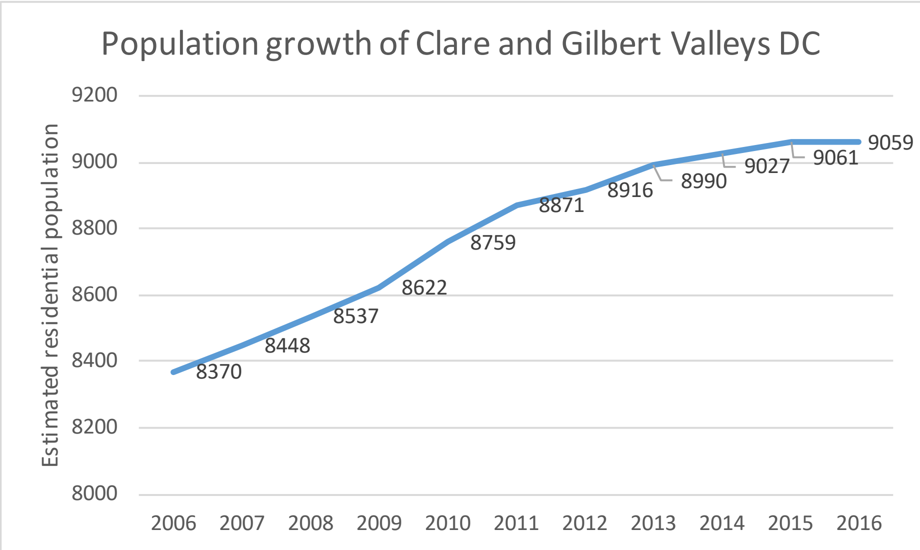


Figure 2.2 Population growth of Clare and Gilbert Valleys District Council

The slower rate of population growth in recent years may be attributed to the restructuring of farming enterprises, resulting in fewer agricultural properties; interstate and intrastate migration and changing industry demands (Department of Planning and Local Government 2011). The Clare and Gilbert Valleys Council Strategic Plan 2020 contains population projections outlined in Table 2.1, below, with the strongest growth predicted for the Clare township.

Table 2.1 Clare and Gilbert Valleys District Council population projections

YEAR	POPULATION	% INCREASE
2021	9,339	2.6%
2027	9,585	2.6%

South Australia's Strategic Plan (SASP) originally called for regional South Australia to maintain an 18 per cent share of the state's total population (Target 5.9) (Department of Premier and Cabinet 2011). This equated to a population growth in the Yorke and Mid-North region of 925 persons per year from 2008-2036) (Department of Planning and Local Government 2011). This target was modified in 2011 to increase regional populations by 20,000 to 320,000 or more by 2020. The Barossa, Yorke and Mid-North population was 109,991 in 2015 (ABS 2016). The regional South Australian population (outside of Greater Adelaide) was 388,775 at 30 June 2016 (ABS 2016).

2.1.3 KEY ECONOMIC DRIVERS

Key economic assets of the Yorke and Mid North region are identified as:

- Highly productive agriculture and horticultural land
- An agriculture sector which contributes 43.7% of South Australia's GSP for Grains
- Diverse landscape and scenery
- Tourism in selected districts
- Renewable energy opportunities – in 2016 the region had nearly half of all South Australia's installed wind farm capacity (Regional Development South Australia 2016).

The 2017 regional roadmap report prepared by Regional Development Australia: Yorke and Mid North, has not yet been released, however the 2014 roadmap is available. The 2014 roadmap report provides an overview of key industries including agriculture and food production, intensive livestock, viticulture and oenology and tourism (Regional Development Australia 2014). The 2011 census found that the primary employment industry in the Clare and Gilbert Valleys District Council was agriculture, forestry and fishing (17.9%) (ABS 2018).

Primary industries are a significant contributor to the Yorke and Mid North economy. The area used for agriculture, food production and intensive livestock within the Clare and Gilbert Valleys District Council is:

- Agriculture – 146,246.45 ha
- Food Industry – 170.5 ha
- Livestock – 11,767.7 ha.

Viticulture and Winemaking industries are major employers in the region, both directly through vineyard and winery operations and indirectly through support services and industries (Regional Development Australia 2014).

The Clare Valley has significant tourism value and contributed $96 million to the December 2016 South Australian expenditure of $5.8 billion (SA Tourism Commission 2016).

2.2 MINTARO

2.2.1 COMMUNITY CHARACTERISTICS

Mintaro is a small, rural community with seemingly strong social cohesion. A community workshop held by the Clare and Gilbert Valleys Council in 2012 asked attendees; 'What is special about Mintaro to you?'. Strong values were the people and community as well as the township's heritage status (Clare and Gilbert Valleys Council 2012). Additional key community values identified in the responses were:

- Environment and scenery
- Peace and quiet
- Space
- Balance of heritage and modern values
- Uniqueness of the town
- The Mintaro slate quarry
- Gardens
- Tourism
- Wineries.

Housing in Mintaro is comprised of separate houses, with 117 private dwellings recorded in the 2016 census. Only 67% (75 houses) of these were occupied. Mintaro has a high rate of home ownership, with 46.2% of houses owned outright, 23% owned with a mortgage and 19% rented (compared to 32.2% of houses owned outright for South Australia, 35.3% owned with a mortgage and 28.5% rented) (ABS 2018).

The average number of people per household recorded in the census was 2.3 people. Of the families in Mintaro, 32.1% were couple families with children and 67.9% were couple families without children (ABS 2018).

Most the dwellings (53.2%) owned two cars, with private car travel being the primary method of travel to work. Most people living in Mintaro are regular drivers. The 2012 community workshop asked participants 'What are the critical issues for Mintaro and District today and into the future?'. A common theme in the responses to this question was around the appropriateness of local roads and trucks driving through the township. Concerns regarding this issue included:

- Frequency of large trucks through the street and the importance of speed limits
- State of roads not particularly truck friendly – concerns relate to safety
- Speed limit signage

- Sealing of Min Man Road to detour trucks and attract visitors
- Maintaining roads in a safe condition, particularly within Mintaro
- Poor condition of Leasingham Road
- Load limits to be placed on vehicles travelling through Mintaro to aid safety and reduce damage to road surfaces
- Making the roads safer for cars and pedestrians
- Limiting trucks to reduce damage to road condition, bridges and trees.

Mintaro has strong involvement in community groups for a town of its size. Active groups in the community include the following (Mintaro South Australia ND):

- Mintaro Progress Association
- Mintaro CFS
- Country Women's Association
- Mintaro Men's Group
- Mintaro Ladies Luncheon.

2.2.2 COMMUNITY SERVICES AND FACILITIES

For critical community facilities, such as education and health care, the nearest services available are in Clare. Community facilities and attractions within Mintaro include:

- Martindale Hall
- Mintaro Maze
- Mintaro Garden Rooms
- Sporting clubs including the Mintaro Bowling Club, MinMan Sporting Club (Mintaro and Manoora Football and Netball teams), Mintaro Tennis Club and Auburn Mintaro Cricket Club.
- Anglican Church of Australia St Peters
- St Mary's Catholic Church
- Local wineries and eateries, including the recently reopened Magpie & Stump Hotel and Reilly's Eatery on the main street.
- Accommodation including Mintaro Mews, Mintaro Hideaway, Millers House, Devonshire House, The Olde Lolly Shop B&B, Reilly's Historic B&B Cottages, William hunt's Retreat, Ellenor Ivy Cottage and Irongate Studio B&B.

The heritage status of the township is strongly valued by the community. Martindale Hall is noted by the community as being of place of significance (Clare and Gilbert Valleys 2012).

2.2.3 POPULATION AND DEMOGRAPHICS

The 2016 Census recorded a residential population of 188 people in the Mintaro township. This represents a significant decline from the 2011 population of 370 people (ABS 2017).

This drop in population may be partly attributed to the age profile of the community which recorded a median age of 50 in the 2011 census (compared to 39 years for South Australia in the same year). People aged 65 years and over made up 15.6% of the population in 2011 (ABS 2017).

The median age of people in Mintaro has increased since the 2011 census to 54 years in the 2016 census. People aged 65 years and over made up 24.9% of the population of Mintaro (ABS 2017).

Another contributing factor to the decline in population could be the restructuring or sale of agricultural properties in the area. In 2011, the main industries of employment were related to wine and agricultural industries, compared to 2016 which recorded the main employing industry as secondary education (refer Table 2.2).

Table 2.2 Top industries of employment for people living in Mintaro in 2011 and 2016 (ABS 2017)

INDUSTRY OF EMPLOYMENT	2011 NO OF PEOPLE EMPLOYED	2011 %OF PEOPLE EMPLOYED	2016 NO OF PEOPLE EMPLOYED	2016 % OF PEOPLE EMPLOYED
Wine and Other Alcoholic Beverage Manufacturing	25	12.6%	4	6.5%
Sheep, Beef Cattle and Grain Farming	19	9.6%	5	8.1%
Fruit and Tree Nut Growing / Grape Growing	18	9.1%	4	6.5%
Education / Secondary Education	10	5.1%	7	11.3%
Cafes and Restaurants/Specialised Food Retailing	9	4.5%	6	9.7%

The 2016 Census recorded zero Aboriginal and Torres Strait Islander people living in Mintaro (ABS 2017). Most Mintaro residents were born in Australia (81.4%), with Australian or English ancestry. (27.7% and 38.7% respectively) (ABS 2017).

Mintaro sits within the Federal Electorate of Wakefield and the State Electorate of Frome. The Wakefield Electorate is held by Nick Champion MP (Australian Labor Party) and the Frome Electorate is held by the Hon Geoff Brock (Independent).

2.2.4 KEY ECONOMIC DRIVERS

Key economic drivers for Mintaro include the production of slate, agriculture and food production, intensive livestock, viticulture and oenology and tourism.

Local businesses in Mintaro include wineries and eateries, such as the recently reopened Magpie & Stump Hotel and Reilly’s Eatery on the main street and Mintaro wines, as well as various accommodation options.

Slate deposits were discovered in Mintaro in the 1850s and the Mintaro Slate Quarry opened in 1854. It is one of the oldest continuously operated quarries in Australia.

The township is surrounded by the fertile Gilbert Valley. Main land uses in the surrounding area comprise livestock, horticulture and agriculture.

The character and scenic landscape of Mintaro and surrounds has made it a popular destination for visitors to the Clare Valley. The township was declared a State Heritage Area in 1984 and contains significant heritage attributes and amenity. Attractions include Martindale Hall, various historical buildings, wineries, the Riesling Trail and gardens.

3 POTENTIAL IMPACTS

This section provides an assessment of potential impacts expected from the development, management measures to minimise these impacts and protect social and economic values.

3.1 IMPACTS DURING CONSTRUCTION

3.1.1 IMPACTS ON THE LOCAL COMMUNITY

3.1.1.1 IMPACTS

Potential socio-economic impacts on the local community from the construction of the proposed solar farm are detailed below.

SOCIAL COHESION AND PUBLIC OPINION

Development can cause divided opinions, conflict and disrupt social cohesion in small communities which may be reliant on connectedness. Mintaro is a small community whose views are generally represented by the Mintaro Progress Association. The Progress Association is active in the community and ensures concerns and issues are brought before the Clare and Gilbert Valleys Council.

The local region has extensive experience with wind farm development and approval processes. These experiences will have informed these communities and many people have developed opinions of renewable energy developments in their region. Only 20 kilometres from the proposed solar farm development envelope, a controversial wind farm development 'Waterloo Wind Farm' has had a significant impact on community cohesion in the local region. It has received extensive media attention in the past 10 years and a strong, well organised opposition group has developed in the region (the Waterloo and District Concerned Citizens Group).

It has been important to recognise and acknowledge the legacy of previous renewable energy developments (particularly wind farms) with both the Council and community regarding this development. In considering the characteristics of the area's local renewable energy development history, the broader South Australian energy supply issues (i.e. blackouts in January 2016 - the media and some politicians blamed these events on renewable energy) and Mintaro's close location to Waterloo Wind Farm, there is a likelihood that there will be elements of opposition within the community to further renewable energy development.

DEMAND ON PUBLIC FACILITIES AND SERVICES

An increase in the temporary population during the construction process will inevitably increase demand for public facilities and local services such as accommodation, eateries and possibly health services. The construction period will last between 12 to 18 months. There is potential for local services to be overstretched or unable to service the increased demand. The community currently experiences influxes in the population for tourism however the demographic of the workforce and nature of their stay will differ. The average length of stay for visitors to the Clare Valley is 2.8 days (South Australian Tourism Commission 2016). The workforce will likely be staying for five day periods to work at the site. If they are not local, the workforce may travel back to Adelaide for the weekend or choose to stay in the region. There could be a short-term decline in tourist visits to Mintaro if local services cannot accommodate increased demand. Once constructed, however, the Chaff Mill Solar Farm may become an attraction and increase tourist visits in the long-term.

CONSTRUCTION TRAFFIC

There will be increased traffic for the duration of the construction period. Increased traffic on arterial and local roads from construction vehicles and workforce private vehicles increases the risk of collisions, road damage/deterioration (particularly on unsealed roads) and congestion. Road condition is a key community concern in the area. Dust suppression and management will be required throughout construction. There is a slight risk that increased traffic generation and the impacts associated with this could deter tourism during construction. A traffic impact statement has been prepared to assess the potential impacts of the Chaff Mill Solar Farm.

NOISE

The project site is located approximately three kilometres away from the Mintaro township and therefore construction noise is not expected to impact the town. Six properties border the proposed project site, some of which contain sensitive receivers which may be impacted by construction noise. In saying this, construction works must comply with the *Environment Protection (Noise) Policy 2007* at all times.

BIOSECURITY

There is a small potential for compromised biosecurity for neighbouring properties from contaminants being transported on construction vehicles using private and public roads (RPS 2017). This impact can be mitigated through effective hygiene procedures implemented through the Construction Environmental Management Plan.

3.1.1.2 BENEFITS

Potential socio-economic benefits on the local community from the construction of the proposed solar farm are detailed below.

EMPLOYMENT AND INVESTMENT

The project will directly employ up to 200 workers during construction. This workforce will be drawn from the local area where possible, providing local jobs and opportunities to increase the working population of the region.

A temporary increase in Mintaro's population is expected to boost the local economy through the procurement of hospitality and retail services.

The project may also encourage local and regional investment into Mintaro and the Mid North Region.

BENEFITS TO FARMERS

Key issues for farmers are security of energy supply, price transparency and keeping energy costs low. Investment in renewable technologies may assist in alleviating these concerns (Guerin 2017).

3.2 IMPACTS DURING OPERATION

3.2.1 IMPACTS ON THE LOCAL COMMUNITY

3.2.1.1 IMPACTS

Potential socio-economic impacts on the local community from the operation of the proposed solar farm are detailed below.

NOISE

During consultation, the community have raised concerns about the potential noise of the solar farm when it is operational. While the solar panels themselves will not create any noise, the battery to be used is likely to be a 50-megawatt battery with a very low noise profile. The battery is likely to come into operation for 2–4 hours a night and will be charged from the energy produced by the solar farm. Inverter fans for the battery and inverter substations are activated in warmer temperatures however the noise can only be heard within the immediate vicinity. Noise is expected to be negligible and impacts to sensitive receivers must comply with the *Environment Protection (Noise) Policy 2007.*

VISUAL AND GLARE

While situated approximately 3.5 kilometres north-east of the Mintaro Township, the proposed solar farm will be visible from some viewpoints in the surrounding area and to some sensitive receptors (residential properties). The model of solar panel chosen for this project does not have metal frames in order to reduce glare impacts. Visual and Glare studies have been undertaken as part of the Development Application and mitigation and management measures, such as screening, have been investigated as part of these reports. The proponent will work closely with an adjacent landholder who will have a direct view of the solar farm.

FARMING OPERATIONS

There are community concerns that the solar farm will impede aerial operations currently practiced to manage surrounding properties. This concern is based on having above ground infrastructure. The community has requested that underground wiring is used for the project to mitigate this concern.

PROPERTY VALUES

Property values for neighbouring properties and within the local area may be influenced by the solar farm (potentially positively or negatively). Market values are difficult to predict however impacts to neighbouring properties will be mitigated where possible to minimise the extent to which this affects property values.

Statutory property valuations are determined by the Valuer-General South Australia every year. Qualified valuers analyse property sales and market trends that occur between revaluations to determine levels of value (Department of Treasury and Finance 2017). This is then applied to each individual property. Valuers consider physical attributes such as:

- Location including views, aspect and elevation
- Site details, such as land classification, zoning and land area, and heritage restrictions
- Site influences such as the shape, topography, nearby uses, frontage, easements and encumbrances
- The building, its size, age, condition, style, improvements and construction type
- The highest and best use of the site.

The valuations are provided to statutory authorities who use them to determine the rates and taxes to be charged. Statutory authorities include:

- Local councils for council rates
- SA Water for water and sewerage rates
- Revenue SA for the emergency services levy and land tax.

The degree to which the proposed Chaff Mill Solar Farm could impact property values (and therefore Council rates and land taxes) is largely dependent on the management of impacts e.g. visual.

FROST AND MICRO-CLIMATE CHANGES

An issue raised by the community was the perceived potential for the positioning of the solar farm to exacerbate the frost risk at adjacent properties. This issue was later clarified as being more related to the potential impacts (either positive or negative) of radiative heat loss from the surfaces of the solar panels on the temperatures of the surrounding environments. Frost damages plants when the temperature drops below zero and the surrounding air is very dry, which may be outside of the winter season.

There is very little research available on the potential for solar farms to exacerbate frost conditions at adjacent properties, however WSP prepared a frost study / overview which investigated the potential for the solar farm to exacerbate frost conditions in the area.

Scientific studies and research papers published in relation to the issue have generally found that whereas there may be temperature changes directly underneath a solar panel (i.e. slightly cooler) and directly above a solar panel (i.e. slightly warmer) these changes become negligible adjacent or outside of the solar farm, where environmental temperatures quickly return to ambient status. The addition of internal access tracks and external buffer plantings also help temperatures return to ambient.

Information from the available literature and subsequent discussions undertaken with a number of agricultural, climate, weather and scientific organisations suggest that the potential for the Chaff Mill Solar Farm to exacerbate frost in the area is extremely low.

TRAFFIC

Traffic to and from the Chaff Mill Solar Farm during operation will be minimal. Maintenance requirements will be relatively low during operation and decommissioning. Vehicles will only need to access the site occasionally for maintenance purposes, and in the instance of an emergency. Any additional traffic and accommodation impacts from the number of operational staff will be minimal. Decommissioning will require considerably less staff onsite in comparison to the construction phase and would extend similar economic benefits to the community regarding local staff and industries.

3.2.1.2 BENEFITS

Potential socio-economic benefits on the local community from the operation of the proposed solar farm are detailed below.

EMPLOYMENT

The project will employ up to five full-time workers during operation. This workforce will be drawn from the local area where possible, providing local jobs and increased security to the local economy, an opportunity to increase the working age population of the region and diversify employment in the area.

TOURISM

The Yorke and Mid North Region is becoming well known for renewable energy. The world’s largest lithium battery recently built in Jamestown to store power generated by renewables achieved recognition on a global scale. During operation, the solar farm has the potential to draw visitors to the area, including scientific and academic visitors, therefore providing opportunities to increase tourist accommodation and services in the food, retail and tourism sectors.

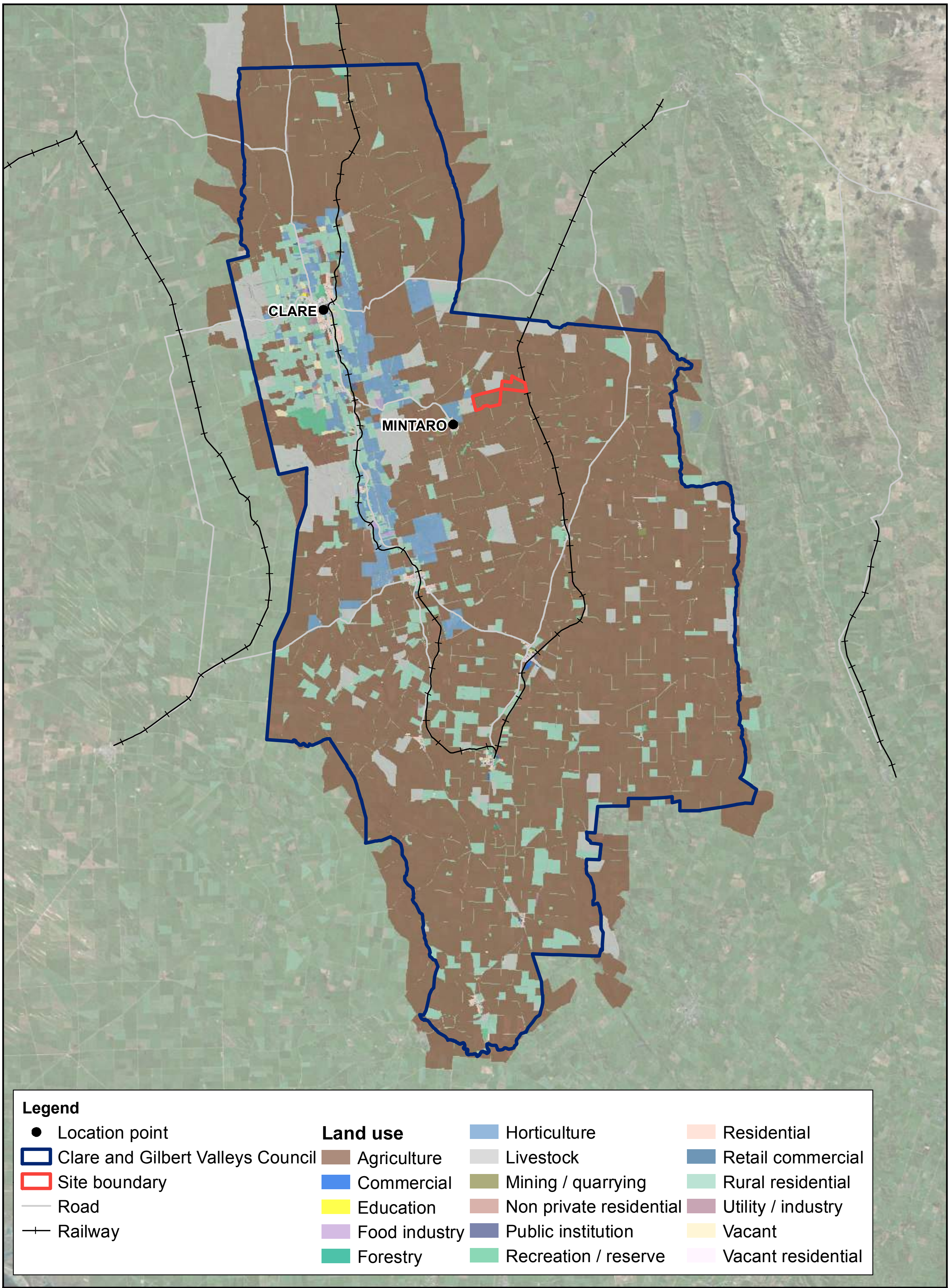
3.2.2 REGIONAL IMPACTS

Potential socio-economic impacts on the region from the operation of the proposed solar farm are detailed below.

3.2.2.1 IMPACTS

LOSS OF ARABLE LAND

Retaining productive primary production land is identified as a priority in the Mid North Region Plan (Department of Planning and Local Government 2011). The exact area used for agriculture, food production and intensive livestock within the Clare and Gilbert Valleys District is outlined below. On balance, the loss of a 380 ha site within the context of the Clare and Gilbert Valleys Council area comprises only a 0.24% loss of arable farming land.



Map: PS103225_GIS_005_A

Author: PottsR

Date: 5/02/2018

Approved by: EF

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

1:400,000

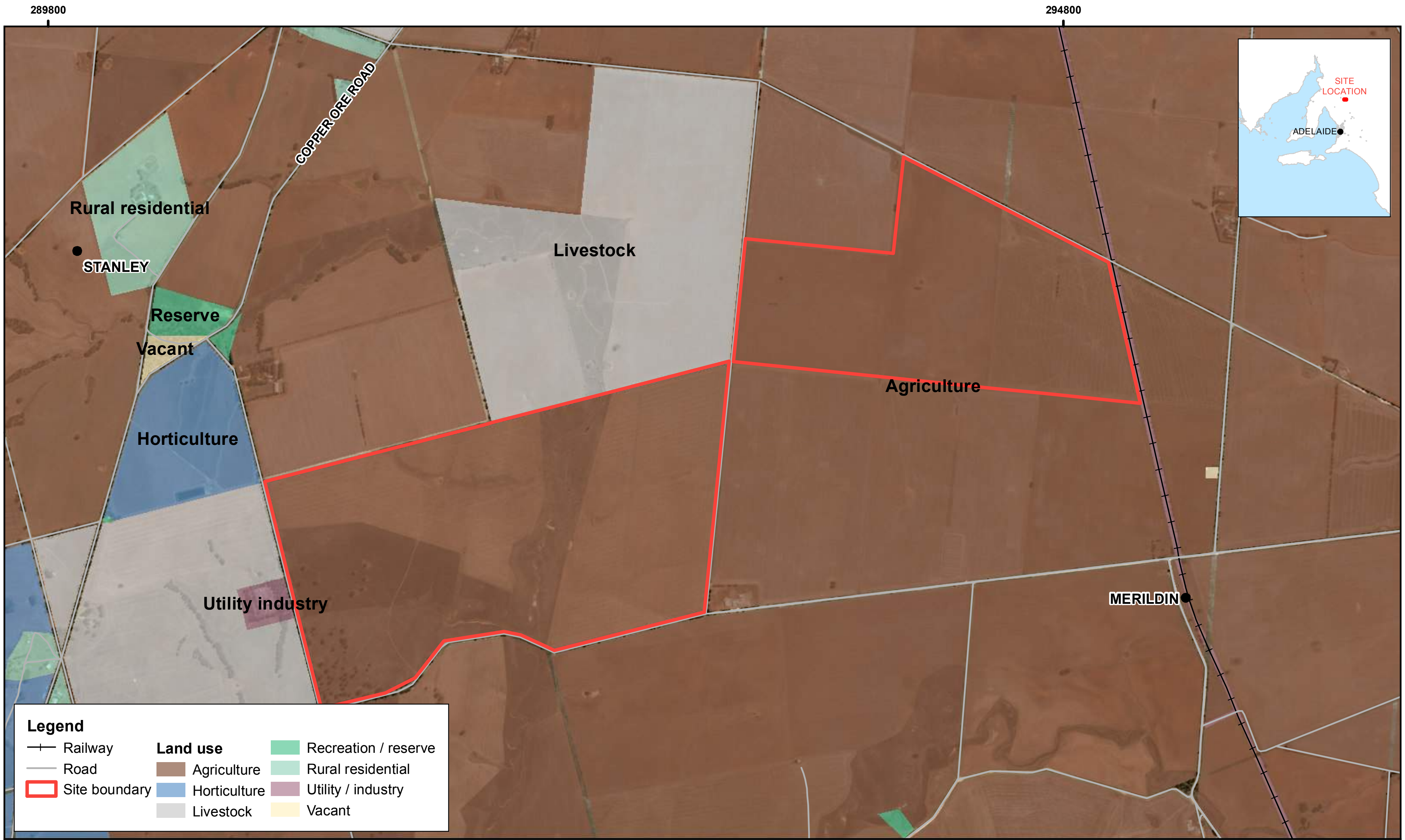
Coordinate system: GDA 1994 MGA Zone 54

Scale ratio correct when printed at A4

Chaff Mill Solar Farm: Social and Community Assessment

Figure 3.1

Land use within the Clare and Gilbert Valleys District Council



Map: PS103225_GIS_004_A	Author: PottsR
Date: 5/02/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 250 500 m

1:25,000

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Chaff Mill Solar Farm Social and Community Assessment
Figure 3.2
Land use within the project area

3.2.2.2 BENEFITS

Potential socio-economic benefits for the region from the operation of the proposed solar farm are detailed below.

RENEWABLE ENERGY OBJECTIVES

The project will contribute to achieving several renewable energy objectives within local and state level planning documents. These objectives have been identified by the Clare and Gilbert Valleys Council and the State Government to strengthen the economy, provide a more reliable and clean source of energy and limit greenhouse gas emissions. Relevant local and state level objectives are outlined in Table 3.1.

Renewable Energy is an emerging industry in the Yorke and Mid North Region. At the time of publication of the 2014 Yorke and Mid North Regional Roadmap, the region had the largest installed renewable energy source of wind farms in South Australia with over $1billion of development approvals for wind farms under consideration in the region (Regional Development Australia 2014).

Renewable energy will give South Australia a competitive advantage in a carbon-constrained economy (Department of Planning and Local Government 2011). Large-scale solar developments will assist in meeting national greenhouse gas emission reduction commitments.

Table 3.1 Renewable energy objectives

GOVERNMENT LEVEL	PLANNING DOCUMENT	OBJECTIVE
Local	Clare and Gilbert Valleys Council Development Plan	— Energy Efficiency objective 2: Development that provides for on-site power generation including photovoltaic cells and wind power. — Renewable Energy Facilities objective 1: Development of renewable energy facilities that benefit the environment, the community and the state. — Renewable Energy Facilities objective 2: The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity. — Renewable Energy Facilities objective 3 Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.
State	2014 Yorke and Mid North Regional Roadmap	Key Priority Area: — Encouragement of alternative renewable energy production whilst protecting important landscapes from inappropriate development. Key Goal (Infrastructure and Services Provision): — Expanding local electricity generation through renewable energy sources, such as wind farms and gas-fired peak demand plants, which will provide greater capacity for economic activity. This will require expansion of the transmission infrastructure to service this growth.
State	South Australia’s Strategic Plan	Renewable energy to comprise 33% of the State’s electricity production by 2020.
Commonwealth	Renewable Energy Target	Australia’s Renewable Energy Target (RET) aims to deliver more than 23% of Australia’s electricity from renewable sources by 2020

CLIMATE CHANGE MITIGATION

As agriculture is an important sector in the surrounding Clare Valley region, efforts to reduce global warming impacts and subsequent increases in temperatures will ensure sustainability for crops and the continuous use of arable land. Meeting reduction targets will alleviate increases in emissions and reduce the further costs regarding adaptation to consequences of climate change.

4 MANAGEMENT AND MITIGATION MEASURES

4.1 MANAGEMENT AND MITIGATION DURING CONSTRUCTION

The potential socio-economic impacts of the project during construction identified in Section 3.1 are addressed in Table 4.1 below.

Table 4.1 Safeguards and mitigation measures for potential socio-economic impacts of the project during construction

POTENTIAL IMPACT	SAFEGUARDS AND MITIGATION MEASURES
Social cohesion	A Stakeholder and Community Consultation Plan would manage impacts to community stakeholders, including but not limited to: — Protocols to keep community updated about progress of the project, any potential benefits and impacts and mitigation measures. — Protocols to respond to complaints/concerns received. — Preparation of a Local Benefits Plan detailing the ongoing benefits to the community once the project is constructed.
Demand on public facilities and services	— Liaison with local representatives regarding business opportunities such as accommodation options for staff-to minimise any adverse impacts on local services and maximise opportunities for businesses (i.e. re accommodation). — Liaison with local tourism industry to manage potential timing conflicts with local events and maximise opportunities for future tourism. — Liaison with local industry representatives and contractors to maximise the use of local contractors, manufacturing facilities, materials.
Construction traffic	— Protocols to inform relevant stakeholders of potential impacts (i.e. transport movements, haulage, noise etc.) — Set up appropriate protocols to respond to complaints/concerns received — A Traffic Management Plan will form part of the overall Construction Environmental Management Plan for the project. This should include measures to address road safety, road upgrade requirements and reducing dust impacts through reduced speed limits and watering down unsealed roads. — FRV has indicated that a coach service may be offered for workers in temporary accommodation which will reduce the overall traffic generated by the proposed construction activity at the site. — Amenity should be maintained during construction in terms of cleanliness and maintenance to any damaged areas. Upgrading and reinstatement of roadways should occur (to an equal or better higher condition) than the existing condition, in collaboration with either the Clare and Gilbert Valleys Council or the Department for Planning, Transport and Infrastructure (depending on the road caretaker).
Noise	— Comply with *Environment Protection (Noise) Policy* requirements. — Time construction activities to minimise disturbance.
Biosecurity	— Ensure appropriate hygiene practices are detailed in a Construction Environmental Management Plan and followed on site.

4.2 MANAGEMENT AND MITIGATION DURING OPERATION

The potential socio-economic impacts of the project during operation identified in Section 3.1 are addressed in Table 4.2 below.

Table 4.2 Safeguards and mitigation measures for potential socio-economic impacts of the project during operation

POTENTIAL IMPACT	SAFEGUARDS AND MITIGATION MEASURES
Noise	— Comply with *Environment Protection (Noise) Policy* requirements.
Visual and Glare	— FRV will use PV-Polycrystalline modules with a horizontal, single axis tracking system. The panels, including the mounting structure would be no more than three metres from ground level. With this technology, the panels no longer feature metal rims, lessening the risk of glare to neighbouring properties. — Visual and Glare studies are being undertaken as part of the Development Application and mitigation and management measures, such as screening, will be investigated as part of these reports. Solar panels are designed to absorb, rather than reflect, light.
Farming operations	— FRV have noted that the use of underground cabling, as opposed to overhead powerlines, is preferred by the community so that aerial farming operations (spraying) is not impeded. There will be a power line from one parcel of land to the other, but it won't go over neighbouring properties. It is yet to be determined if this will be an overhead or underground powerline. There will also be a powerline from the solar farm connecting to the overhead transmission line that runs across the site.
Property values	— The degree to which the Chaff Mill Solar Farm could impact property values is largely dependent on the effective management of physical impacts to neighbouring properties. Potential adverse impacts such as visual and glare will be mitigated where possible so reduce the likelihood of this affecting property values.
Frost and micro-climate changes	— Available information suggests that the potential for the Chaff Mill Solar Farm to impact neighbouring properties is very low however FRV is researching this issue to ensure that potential impacts are mitigated.
Traffic	— Maintenance requirements will be low during operation and decommissioning. This impact does not require mitigation however upgrading and reinstatement of roadways should occur (to an equal or better higher condition) than the existing condition, in collaboration with either the Clare and Gilbert Valleys Council or the Department for Planning, Transport and Infrastructure (depending on the road caretaker) as needed for the duration of the project.

5 SUMMARY AND RECOMMENDATIONS

This assessment has looked at the potential socio-economic impacts (negative and positive) associated with the construction and operation of the proposed Chaff Mill Solar Farm to the local and regional community.

The solar farm would generate considerable environmental, economic and social benefits to Mintaro and the local region, including but not limited to:

- Providing employment for up to 200 workers during construction, drawn from the local area where possible.
- Boost to the local economy through the procurement of local goods and services.
- Attracting investment to the area.
- Opportunities for landowners to be agents of change in contributing to new, non-fossil fuel infrastructure.
- Increased energy security.
- Contributing to the Mid North region's reputation for renewable energy and potentially drawing increased tourism to the area.
- Contributing to the achievement of local, state and national renewable energy targets.
- Mitigation of climate change.

Whilst the project will provide positive impacts on the existing social and economic environment of Mintaro, as well as providing broader regional and State-wide benefits, there is also the potential for the project to impact negatively on the community. Several mitigation measures are recommended to minimise potential socio-economic impacts associated with the proposed project, including:

- Protocols to keep community updated about progress of the project, any potential benefits and impacts and mitigation measures.
- Protocols to respond to complaints/concerns received.
- Liaison with local representatives regarding business opportunities such as accommodation options for staff-to minimise any adverse impacts on local services and maximise opportunities for businesses (i.e. re accommodation).
- Liaison with local tourism industry to manage potential timing conflicts with local events and maximise opportunities for future tourism.
- Liaison with local industry representatives and contractors to maximise the use of local contractors, manufacturing facilities, materials.
- Prepare and implement a Construction Environmental Management Plan to develop specific mitigation measures to manage potential impacts of the project:
  - Noise
  - Traffic (including Traffic Management Plan)
  - Dust and air quality
  - Visual and glare
  - Flora and fauna, including weed management and site hygiene
  - Erosion and stormwater (including Soil Erosion Drainage Management Plan)
  - Waste
  - Cultural heritage
  - Emergency and fire.

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ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 36,000 talented people in more than 500 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

APPENDIX P

SITE CONTAMINATION ASSESSMENT

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FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM

PRELIMINARY SITE ASSESSMENT

FEBRUARY 2018

CONFIDENTIAL

Chaff Mill Solar Farm
Preliminary Site Assessment

FRV Services Australia Pty Ltd

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REV	DATE	DETAILS
00	06/12/2017	Draft
01	06/02/2018	Final – minor edits
02	26/02/2018	Updated final to correct street name to Wookie Creek Road

	NAME	DATE	SIGNATURE
Prepared by:	Sandra Struck, Jennifer Catherine	21/12/2017	(p.p.)
Reviewed by:	Shya Jackson	06/02/2018	
Approved by:	Bronte Nixon	26/02/2018	

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EXECUTIVE SUMMARY

BACKGROUND INFORMATION

WSP was commissioned by FRV Services Australia Pty Ltd (FRV) to undertake a Preliminary Site Investigation (PSI) for a site identified as Allotments 114-117 in Filed Plan 170301 and Allotments 3 and 4 in Deposited Plan 12560 in the area named Stanley, Hundred of Stanley (the site). This investigation forms part of the planning approval services to support FRV's development of the proposed Chaff Mill Solar Farm in the Clare Valley, South Australia.

It is understood that the site is located north-east of the Mintaro township in SA and consists of 2 parcels, which are located within the Primary Production Zone of the Clare and Gilbert Valleys Development Plan with agriculture as the current land use.

Parcel 1 is bounded by Merildin Road to the south, Wookie Creek Road to the west, Faulkner Road to the east, and Parcel 2 is bounded by Faulkner Road to the north and west agricultural land to the south and a rail line to the east.

The main objective of the PSI was to identify site contamination issues which may have resulted from past and/or current site use(s) and which may significantly impact the proposed use of the site for a solar farm and/or represent potential public health or environmental risks.

HISTORICAL OVERVIEW

The findings of the PSI assessment indicated that as early as 1870 until today the site (including Parcel 1 and 2) was operated as farm land and had several private owners. From 1993 Parcel 1 was transferred to Martindale Holdings Pty Ltd, which has been owned by Arapunya Investments since 2011. Parcel 2 has been owned by the Martindale Farm since 2014. The main use for the site and the surrounding area was grazing and horticultural land with different types of crops.

POTENTIALLY CONTAMINATING ACTIVITIES

No potentially contaminating activities were confirmed to have occurred at the site.

It is considered possible that the following potentially contaminating activities may have occurred at the site:

- Use of imported, and potentially impacted fill materials, which were not identified as part of the site walkover. Farmers may use fill to level out the land. Imported fill can contain naturally occurring arsenic that is above the sensitive land use criteria. Also, farmers may have deposited old machinery or waste in pits on their property.
- Historical use of agricultural chemicals, weedicides and termiticides – including possible use of arsenic based weedicides/herbicides in the vicinity of the rail infrastructure at the eastern boundary of Parcel 2.
- Hydrocarbons associated with railway activities.
- Use of asbestos train brakes.

1 INTRODUCTION

WSP was commissioned by FRV Services Australia Pty Ltd (FRV) to undertake a Preliminary Site Investigation (PSI) for a site identified as Allotments 114-117 in Filed Plan 170301 and Allotments 3 and 4 in Deposited Plan 12560 in the area named Stanley, Hundred of Stanley (the site). This investigation forms part of the planning approval services to support FRV's development of the proposed Chaff Mill Solar Farm in the Clare Valley, South Australia.

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Parcel 1 is bounded by Merildin Road to the south, Wookie Creek Road to the west, Faulkner Road to the east, and Parcel 2 is bounded by Faulkner Road to the north and west agricultural land to the south and a rail line to the east.

1.1 OBJECTIVES

The main objective of the PSI was to identify site contamination issues which may have resulted from past and/or current site use(s) and which may significantly impact the proposed use of the site for a solar farm and/or represent potential public health or environmental risks.

2 SITE HISTORY INVESTIGATION

2.1 METHODOLOGY

This report has been prepared in accordance with the guidance provided in the following documents:

— National Environment Protection Council (NEPC) 2013, *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended in 2013 (ASC NEPM).
— Planning SA 2001, *Site Contamination*. Planning Advisory Notice 20.
— Standards Australia 2005, *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds*. AS4482.1-2005 Homebush NSW.

The research components of the report are detailed in Table 2.1.

Table 2.1 Summary of PSI research components

COMPONENT	SECTION OF REPORT
Site Characterisation	**Section 2.2**
Site identification	Section 2.2.1
Site inspection	Section 2.2.2
Adjacent land uses and sensitive receptors	Section 2.2.3
Regional geology	Section 2.2.4
Regional hydrogeology	Section 2.2.5
Zoning	Section 2.2.6
Previous site investigation reports	**Section 2.3**
Historical information	**Section 2.4**
History of Certificates of Title	Section 2.4.1
Aerial photographs	Section 2.4.2
EPA Section 7 search	Section 2.4.3
EPA Public Register	Section 2.4.4

2.2 SITE CHARACTERISATION

2.2.1 SITE DETAILS

Site information details are provided in Table 2.2 below.

Table 2.2 Site information

SITE ADDRESS	159 Hare Road, Mintaro, SA, 5415
TITLE REFERENCE	CT Volume 6081 Folio 22 CT Volume 6128 Folio 159 CT Volume 6128 Folio 160

PROPERTY DESCRIPTION	Allotments 114-117, Filed Plan F170301 Allotments 3 and 4, Deposited Plan D12560 In the Area named Stanley Hundred of Stanley
PROPERTY OWNER	Arapunya Investments Pty Ltd (6081/22) Martindale Farm Pty Ltd (6128/159 and 6128/160)
COUNCIL ZONING	Primary Production (PrPro)
CURRENT SITE USE	Agricultural
PROPOSED SITE USE	Commercial/Industrial
LAND AREA	Approximately 391 ha

2.2.2 SITE INSPECTION

WSP conducted a site inspection on 28 September 2017 as part of the broader environmental impact assessment, which is currently being undertaken to inform a Development Application Report. Photographs taken during the site inspection are also included in this report. A figure showing the site location and boundaries is provided in Appendix A.

2.2.3 ADJACENT LAND USES AND SENSITIVE RECEPTORS

At the time of the inspection, the land uses immediately surrounding the site were observed and are detailed in Table 2.3 below:

Table 2.3 Surrounding land uses

NORTH	Parcel 1: agricultural Parcel 2: Faulkner Road and agricultural beyond
SOUTH	Parcel 1: Merildin Road and agricultural beyond Parcel 2: agricultural
EAST	Parcel 1: Chaff Mill Road, agricultural beyond, storage yard including sheds on property south-east Parcel 2: rail line and agricultural beyond
WEST	Parcel 1: Wookie Creek Road, Epic Energy power station and agricultural beyond Parcel 2: Chaff Mill Road and agricultural beyond

The site is located in a rural/agricultural area of Mintaro. The closest surface water body is the Wakefield River, located approximately 2.3 km south of the site (Parcel 1). Sensitive human and environmental receptors located within the vicinity of the site are considered likely to include the following:

- Future users of and maintenance workers on the site
- Adjacent site users
- Workers who may undertake excavation, maintenance or construction work within the surrounding area (i.e. to the site developments, underground services).

2.2.4 REGIONAL GEOLOGY

The Burra 1:250,000 geological map sheet (South Australian Department of Mines and Energy, 1964) indicates that the region is underlain by the quaternary recent low angle slope deposits. Parcel 1 is also located with the Torrensian Burra Group formation, which is characterized by quartzite and dolomite and interbedded shale.

The 1:100,00 Geology Map provided in the Lotsearch report characterises the local geology in Parcel 2 as Holocene claypan and lagoonal sediments. Soil types identified were predominantly loam over clay or rock in Parcel 1 and red cracking clay in Parcel 2.

According to the Australian Soil Resource Information System (ASRIS) website (http://www.asris.csiro.au/mapping/viewer.htm), the area of Mintaro that includes the site has an extremely low probability of acid sulfate soils occurring.

2.2.5 REGIONAL HYDROGEOLOGY

A summary of the Department of Environment, Water and Natural Resources (DEWNR, 2017) bore database for the area (Appendix B) indicates the following:

There are seven registered bores within a 2 km radius of Parcel 1 and five registered bores within a 2 km radius of Parcel 2, of which all of them are groundwater bores. The status of two bores were listed as abandoned (Parcel 1) one bore was backfilled (Parcel 1) and one as unknown (Parcel 2). The current status of the remaining eight bores was not listed. In terms of their primary purpose, two bores were listed as being for each domestic and investigation purposes (Parcel 1) and one for monitoring purposes (Parcel 1), three bores for stock purposes (Parcel 2) and one for domestic purposes (Parcel 2). The purposes of the remaining three bores were not listed.

Based on the available data the wells around Parcel 1 were drilled to depth of between 35 and 122 m between 1986 and 2003 with recorded SWLs of 3.4 to 18.7 m. The wells in Parcel 2 were drilled to depths of between 19 and 38 m between 1958 and 1972 with recorded SWLs of 12 to 12.2 m.

Groundwater salinity, recorded for all but one bore, ranged from 1,525 mg/L to 6,236 mg/L total dissolved solids (TDS) . Yield rates were reported for five bores and were between 0.05 and 3.75 L/sec.

The closest registered groundwater bore to Parcel 1 was bore no. 6630-3148, located just west of the site across from Wookie Creek Road. The closest registered bore to Parcel 2 was bore no. 6630-525, located east of the parcel across Salt Creek Road. All registered bores were located offsite.

Details regarding the five closest registered bores to the site are presented in Table 2.4.

Table 2.4 Information regarding closest registered bores to site

BORE NO.	APPROXIMATE DISTANCE FROM SITE	DRILL DATE	DRILL/MAX DEPTH (m)	STATUS	PURPOSE	SWL (mBGL)	SALINITY (mg/L TDS)
Parcel 1							
6630-3148	20 m W	22/12/2000	80.0	-	Domestic	18.7	1,546
6630-3258	1,200 m W	22/12/2000	34.96	-	Monitoring	16.21	1,653
Parcel 2							
6630-525	350 m SE	15/03/1972	30.48	-	-	12.19	5,273
6630-521	400 m NE	06/06/1958	38.1	Unknown	Domestic	-	3,639
6630-522	500 m NE	15/03/1972	19.0	-	Stock	12	6,236

Wookie Creek intersects Parcel 1 in a north-southerly direction and runs into the Wakefield River, located approximately 2.3 km south of the site (Parcel 1). Based on that, groundwater within the uppermost aquifer would generally be expected to flow in a southerly direction.

2.2.6 ZONING

According to the Clare and Gilbert Valleys Development Plan, an extract of which is included in Appendix C, the site is currently zoned Primary Production, which is primarily accommodating economically productive, efficient and environmentally sustainable primary production, including cropping, grazing, viticulture and intensive animal keeping.

It is anticipated that the future site use will be for commercial/industrial purposes, consistent with its zoning.

2.3 PREVIOUS SITE INVESTIGATION REPORTS

No known previous site investigations reports exist.

2.4 HISTORICAL INFORMATION

2.4.1 HISTORY OF CERTIFICATES OF TITLE

The site is currently described by three Certificates of Title, including Volume 6081 Folio 22 for Parcel 1 and Volume 6128 Folios 159 and 160 for Parcel 2. A copy of the current Certificates of Title is included in Appendix D.

Table 2.5 and 2.6 summarise the history of Certificates of Title applicable to the site. Land owners are highlighted in bold.

Table 2.5 History of certificates of title – Parcel1 – Volume 2081 Folio 22

PROPERTY DESCRIPTION	CERTIFICATE OF TITLE	PARENT TITLE	DATE	DETAILS
Sections 123, 124 and 126, Hundred of Stanley	Volume 452 Folio 44		28/03/1879	New title issued to **Edmund Bowman** (gentleman)
			26/05/1886	Transfer to **Edmund Bowman** and **Charles William Bowman** (sheep farmer)
			07/04/1896	Transfer to **William Tennant Mortlock**
			09/11/1927	Transfer to **Elders Trustee and Executor Company Ltd and Richard MacDonnell Hawker**
	Volume 2181 Folio 153	Volume 452 Folio 44	13/12/1951	New title issued to **Elders Trustee and Executor Company Ltd**
			24/12/1951	Transfer to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
	Volume 2393 Folio 2	Volume 2181 Folio 153	09/06/1955	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
	Volume 3084 Folio 191	Volume 2393 Folio 2	10/07/1962	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**

PROPERTY DESCRIPTION	CERTIFICATE OF TITLE	PARENT TITLE	DATE	DETAILS
Section 125, Hundred of Stanley	Volume 304 Folio 126		28/03/1879	New title issued to **Edmund Bowman**
			26/05/1886	Transfer to **Edmund Bowman** and **Charles William Bowman** (sheep farmer)
			07/04/1896	Transfer to **William Tennant Mortlock**
			09/11/1927	Transfer to **Elders Trustee and Executor Company Ltd and Richard MacDonnell Hawker**
	Volume 2181 Folio 154	Volume 304 Folio 126	13/12/1951	New title issued to **Elders Trustee and Executor Company Ltd**
			24/09/1951	Transfer to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
	Volume 2393 Folio 3	Volume 2181 Folio 154	09/06/1955	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
Sections 115, 116 and 134, Hundred of Stanley	Volume 135 Folio 69		16/09/1869	Transfer from John Kidley to **John Bowman** (sheep farmer), **Henry Alfred Wood** (accountant) and **William George Cole** (farmer)
			23/03/1877	Transfer to **Edmund Bowman**
			26/05/1886	Transfer to **Edmund Bowman** and **Charles William Bowman** (sheep farmer)
			07/04/1896	Transfer to **William Tennant Mortlock**
			09/11/1927	Transfer to **Elders Trustee and Executor Company Ltd** and **Richard MacDonnell Hawker**
			24/09/1957	Transfer to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
Section 116, 125, 126, 134 and Portions of Sections 115, 123 and 124, Hundred of Stanley	Volume 3430 Folio 4	Volume 135 Folio 69 Volume 2393 Folio 3 Volume 3084 Folio 191	05/08/1966	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
	Volume 3659 Folio 188	Volume 3430 Folio 4	09/10/1969	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist), **Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**

PROPERTY DESCRIPTION	CERTIFICATE OF TITLE	PARENT TITLE	DATE	DETAILS
	Volume 3705 Folio 168	Volume 3659 Folio 188	17/06/1970	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist)**, Robert Newenham Irwin** (solicitor) and **Elder's Trustee and Executor Company Ltd**
	Volume 4097 Folio 896	Volume 3705 Folio 168	11/08/1977	New title issued to **Dorothy Elizabeth Mortlock** (widow), **Richard George Hawker** (pastoralist) and **Elder's Trustee and Executor Company Ltd**
			24/11/1980	Transfer to **Mortlock-Dale Nominees of Waite Agricultural Research Institute** (change of name to Martindale Holdings Pty Ltd on 28 July 1981)
	Volume 4400 Folio 50	Volume 4097 Folio 896	28/10/1993	New title issued to **Martindale Holdings Pty Ltd**
Allotments 114, 115, 116 and 117 Filed Plan 170301 in the area named Stanley Hundreds of Stanley and Upper Wakefield	Volume 5438 Folio 44	Volume 4400 Folio 50	25/07/ 1997	New title issued to **Martindale Holdings Pty Ltd**
	Volume 5887 Folio 46	Volume 5438 Folio 44	11/01/2003	New title issued to **Martindale Holdings Pty Ltd**
	Volume 5949 Folio 90	Volume 5887 Folio 46	17/09/2005	New title issued to **Martindale Holdings Pty Ltd**
	Volume 5957 Folio 794	Volume 5949 Folio 90	07/02/2006	New title issued to **Martindale Holdings Pty Ltd**
	Volume 5989 Folio 872	Volume 5957 Folio 794	10/07/2007	New title issued to **Martindale Holdings Pty Ltd**
	Volume 6061 Folio 485	Volume 5989 Folio 872	22/07/2010	New title issued to **Martindale Holdings Pty Ltd**
	Volume 6069 Folio 94	Volume 6061 Folio 485	09/12/2010	New title issued to **Martindale Holdings Pty Ltd**
	Volume 6081 Folio 22	Volume 6069 Folio 94	26/07/2011	New title issued to **Arapunya Investments Pty Ltd**

Table 2.6 History of certificates of title – Parcel 2 – Volume 6128 Folio 159 and Folio 160

PROPERTY DESCRIPTION	CERTIFICATE OF TITLE	PARENT TITLE	DATE	DETAILS
Section 297 and 299, Portion of Section 298, Hundred of Stanley, County of Stanley	Volume 207 Folio 131		02/06/1870	New title issued to **Michael Cunneen** (farmer)
			14/09/1875	Transfer to **Thomas Cunneen** (farmer)
			25/04/1884	Transfer to **Thomas Horgan (farmer)**
	Volume 660 Folio 140	Volume 207 Folio 131	19/05/1900	New title issued to **Thomas Horgan** (farmer)
			23/04/1900	Transfer to **John Horgan** and **James Thomas Horgan** (railway farmers)
			08/08/1933	Transfer to **Thomas Erwin Horgan**
Section 297, Hundred of Stanley, County of Stanley			10/03/1967	Transfer to **George Eugene Faulkner** and **Ellen Patricia Faulkner**
			10/03/1967	Transfer to **Daniel Smith and Adrian Christopher Smith** (farmers)
Section 299 and 300, Portion of Section 298 and 331 Hundred of Stanley, County of Stanley	Volume 3494 Folio 163	Transfer 280393, Volume 9 Folio 13, Volume 122 Folio 14 and Volume 660 Folio 140	08/06/1967	New title issued to **Daniel Smith and Adrian Christopher Smith** (farmers)
			26/03/1974	Transfer to **Martin Daniel Smith** (farmer)
			10/06/1983	Transfer to **Adrian Christopher Smith** (farmer)
Allotment 4 of Section 298 and other land, Hundred of Stanley, County of Stanley	Volume 4223 Folio 254	Volume 3494 Folio 163	15/05/1984	New title issued to **Adrian Christopher Smith** (farmer)
	Volume 5465 Folio 754	Volume 4223 Folio 254	31/10/1997	New title issued to **Adrian Christopher Smith** (farmer)
Allotment 4 Deposited Plan 12560 in the area named Stanley, Hundred of Stanley	Volume 6128 Folio 159	Volume 5465 Folio 754	09/01/2014	New title issued to **Martindale Farm Pty Ltd**
Allotment 3 of Section 298 and other land, Hundred of Stanley, County of Stanley	Volume 4223 Folio 251	Volume 3494 Folio 163	15/05/1984	New title issued to **Adrian Christopher Smith** (farmer)
	Volume 5465 Folio 700	Volume 4223 Folio 251	31/10/1997	New title issued to **Adrian Christopher Smith** (farmer)

PROPERTY DESCRIPTION	CERTIFICATE OF TITLE	PARENT TITLE	DATE	DETAILS
Allotment 3 Deposited Plan 12560 in the area named Stanley, Hundred of Stanley	Volume 6128 Folio 160	Volume 5465 Folio 700	09/01/2014	New title issued to **Martindale Farm Pty Ltd**

2.4.2 AERIAL PHOTOGRAPH REVIEW

Copies of relevant portions of aerial photographs of the area taken in 1954, 1979, 1983, 1987, 1993, 2003 and 2012 were provided by Lotsearch and have been included in Appendix E.

A summary of the features identified within each of the aerial photograph is provided in Table 2.7.

Table 2.7 Aerial photograph review

YEAR	DESCRIPTION
1954	**Site Layout:** Parcel 1 appears to be undeveloped grassland, with no buildings or structures visible. Scattered trees are evident in the south-western part of the parcel, and a water dam is located in the northern portion. Parcel 2 appears to be graze/farmland, containing three arranged areas. No buildings or structures are visible. **Surrounding Area:** The surrounding area included predominantly grass land with tracks connecting the parcels. A few properties to the north and west contained some buildings and structures, assumable farm houses, surrounded by trees. Wookie Creek Road, Faulkner Road, Chaff Mill Road, Merildin Road and the rail tracks were visible and unsealed.
1979	**Site Layout:** Parcel 1 appears to remain relatively unchanged. The colour aerial shows geological differences with the western part covered with grass and the eastern part containing brown (soil) areas. A creek, running north-south separates the two parts. Parcel 2 seems to have been divided in more areas containing different types of crop and/or surface cover. More tracks are visible surrounding these areas. **Surrounding Area:** The immediately surrounding area remains relatively unchanged; a few more buildings were erected on the residential property north-west of Parcel 1.
1983	**Site Layout and surrounding area:** The site and surroundings appear to remain relatively unchanged. The power station to the west of Parcel 1 has been developed.
1987	**Site Layout and surrounding area:** The site and surroundings appear to remain relatively unchanged.
1993	**Site Layout and surrounding area:** The site and surroundings appear to remain relatively unchanged. Two surface water bodies are visible on Parcel 2, and one larger water hole is evident on the northern corner of Parcel 2.
2003	**Site Layout and surrounding area:** The site and surroundings appear to remain relatively unchanged, with the surface water bodies no longer visible.
2012	**Site Layout and surrounding area:** The site and surroundings appear to remain relatively unchanged. It seems that the surrounding area is used more intensely for agricultural activities.

2.4.3 EPA SECTION 7 SEARCH

A Section 7 search was conducted by the South Australian EPA for the land described in Certificate of Title Volume 6081 Folio 22, Volume 6128 Folio 159 and Volume 6128 Folio 160.

A copy of the search results is included in Appendix F and indicated the following, as of 11 September 2017:

- There are no mortgages, charges or prescribed encumbrances affecting the site under the relevant sections of the *Environment Protection Act 1993.*
- No licenses and exemptions recorded by EPA in public register have been issued under the Part 6 of the *Environment Protection Act 1993.*
- No licenses to operate a waste depot and/or to produce listed waste have been issued or repealed for the site under the *South Australian Waste Management Commission Act 1979*, the *Waste Management Act 1987* or the *Environment Protection Act 1993.*
- The EPA does not hold any of the following information:
  - reports, environmental assessments or site contamination audits of the land or any part of the land
  - details of serious or material harm, or notifications of site contamination, under Section 83A of the *Environment Protection Act 1993*
  - details of an agreement for the exclusion or limitation of liability for site contamination
  - details of any agreements relating to approved voluntary site contamination assessment or remediation proposals
  - details of notification of the commencement or termination of a site contamination audit; or
  - any other relevant information, as listed in the Section 7 search results.

The Section 7 Search results note that historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete.

2.4.4 EPA PUBLIC REGISTER

A search of the SA EPA website was undertaken on 5 September 2017 to assess whether any Section 83A notifications had been recorded in the area. No records were found for the Mintaro area. The nearest notifications were reported for service stations and work depots in Clare, which are located approximately 20 km to the north-west of the site. Potential contamination from these sites is considered unlikely to impact upon the site due to the distance of separation.

The Lotsearch report (Appendix E) identified that an EPA licence was issued to Synergen Power Pty Ltd for fuel burning – not coal or wood at the power station, located 25 m west of Parcel 1.

3 PSI DISCUSSION

3.1 HISTORICAL OVERVIEW

The findings of the PSI assessment indicated that as early as 1870 until today the site (including Parcel 1 and 2) was operated as farm land and had several private owners. From 1993 Parcel 1 was transferred to Martindale Holdings Pty Ltd, which has been owned by Arapunya Investments since 2011. Parcel 2 has been owned by the Martindale Farm since 2014. The main use for the site and the surrounding area was grazing and horticultural land with different types of crops.

3.2 POTENTIALLY CONTAMINATING ACTIVITIES

No potentially contaminating activities were confirmed to have occurred at the site.

It is considered possible that the following potentially contaminating activities may have occurred at the site:

- Use of imported, and potentially impacted fill materials, which were not identified as part of the site walkover. Imported fill may have been used by farmers to level the land
- Historical use of agricultural chemicals, weedicides and termiticides – including possible use of arsenic based weedicides/herbicides in the vicinity of the rail infrastructure at the eastern boundary of Parcel 2
- Hydrocarbons associated with railway activities
- Use of asbestos train brakes.

A more detailed summary of the potentially contaminating activities, including potential contaminants, likely locations and possible significance, is provided in Table 3.1.

Table 3.1 Summary of potentially contaminating activities

POTENTIALLY CONTAMINATING ACTIVITY	POTENTIAL CONTAMINANTS	LIKELY LOCATIONS	POSSIBLE SIGNIFICANCE/RISK
Unconfirmed activities:			
Use of imported, and potentially impacted, fill materials	Metals, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, solvents, asbestos, OCPs/OPPs and/or PCBs.	Entire site	**Unknown but probably minor:** Uncontrolled filling or dumping may have occurred at the site. These materials are often brought in from other sites without checks. Such materials have the potential to contain concentrations of chemicals which may preclude the site for certain future land uses (i.e. depending on possible human exposure scenarios) or aesthetically and/or geotechnically unsuitable, without further assessment and/or remediation. As the land is cropped or grassed, only intrusive investigation will reveal material brought in from off-site sources to fill in undulations or build up the site.

POTENTIALLY CONTAMINATING ACTIVITY	POTENTIAL CONTAMINANTS	LIKELY LOCATIONS	POSSIBLE SIGNIFICANCE/RISK
Historical use of agricultural chemicals, herbicides and termiticides	Unknown but may have included metal or arsenic-based herbicides, triazines, phenoxyacid herbicides and, more recently, glyphosate-based chemicals, fertilizers (nitrogen, phosphorous), OCPs, OPPs	Entire site	**Unknown but probably minor:** As the allotment appears to have been used for historical agricultural/grazing purposes it is likely that various chemicals may have been used. Should any persistent chemicals have been used on the site, they are likely to have resulted in surface (if any) soil contamination and the degree of remnant contamination would be largely dependent on when they were used, the volumes used and the persistence of the individual chemical compounds. Given their low mobility, leaching of these chemicals into the groundwater is considered unlikely.
Potential use of arsenic based weedicides/herbicides in the vicinity of rail infrastructure	Arsenic, lead, organochlorines, organophosphates	Parcel 2 (eastern boundary)	**Unknown but probably minor:** As Parcel 2 is situated in the vicinity of the railway line it is likely that some weed spraying may have occurred. Such contamination is likely to be confined to shallow soils in the area.
Hydrocarbons associated with railway activities	Hydrocarbons, arsenic, phenolics, heavy metals, nitrates and ammonia	Parcel 2 (eastern boundary)	**Unknown but probably minor:** As Parcel 2 is situated near the railway line it is likely that some soil contamination may have resulted due to dripping and spilling of hydrocarbon products. Such contamination is likely to be confined to shallow soils in the area.
Use of asbestos train brakes	Asbestos	Parcel 2 (eastern boundary)	**Unknown:** As Parcel 2 is situated near the railway line it is possible that if asbestos brakes were used historically, some fragments may exist in the nearby soils.

3.3 CONCLUSIONS

It is unlikely that the above potentially contaminating activities would significantly impact the proposed future land use of the site as a solar farm.

However, once the final site is selected it would be prudent to undertake a baseline intrusive investigation to identify if the identified potentially contaminating activities are crystallised. This work could be undertaken in conjunction with a geotechnical intrusive investigation.

4 REFERENCES

Australian Soil Resource Information System website: http://www.asris.csiro.au/mapping/viewer.htm

Department of Environment, Water and Natural Resources (DEWNR, 2017) *Master Register of All Bores.* Primary Industries and Resources South Australia.

Environment Protection Act 1993.

National Environment Protection Council, (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended in 2013* (ASC NEPM).

Planning SA (2001) *Site Contamination.* Planning Advisory Notice 20.

SA EPA public register http://www.epa.sa.gov.au/what_we_do/public_register_directory/site_contamination_index

South Australian Department of Mines and Energy (1969) Burra 1:250,000 *Geological Map Sheet.*

South Australian Department of Mines and Energy (1992) *Groundwater in the Adelaide Metropolitan Area.* Information Sheet 21.

WaterConnect website (https://www.waterconnect.sa.gov.au/) accessed September 2017.

5 LIMITATIONS

SCOPE OF SERVICES

This environmental site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data and has not conducted any environmental field monitoring or testing in the preparation of the report. The conclusions are based upon the data and visual observations and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions.

Within the limitations imposed by the scope of services, the assessment of the site and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client and no other party. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party in relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

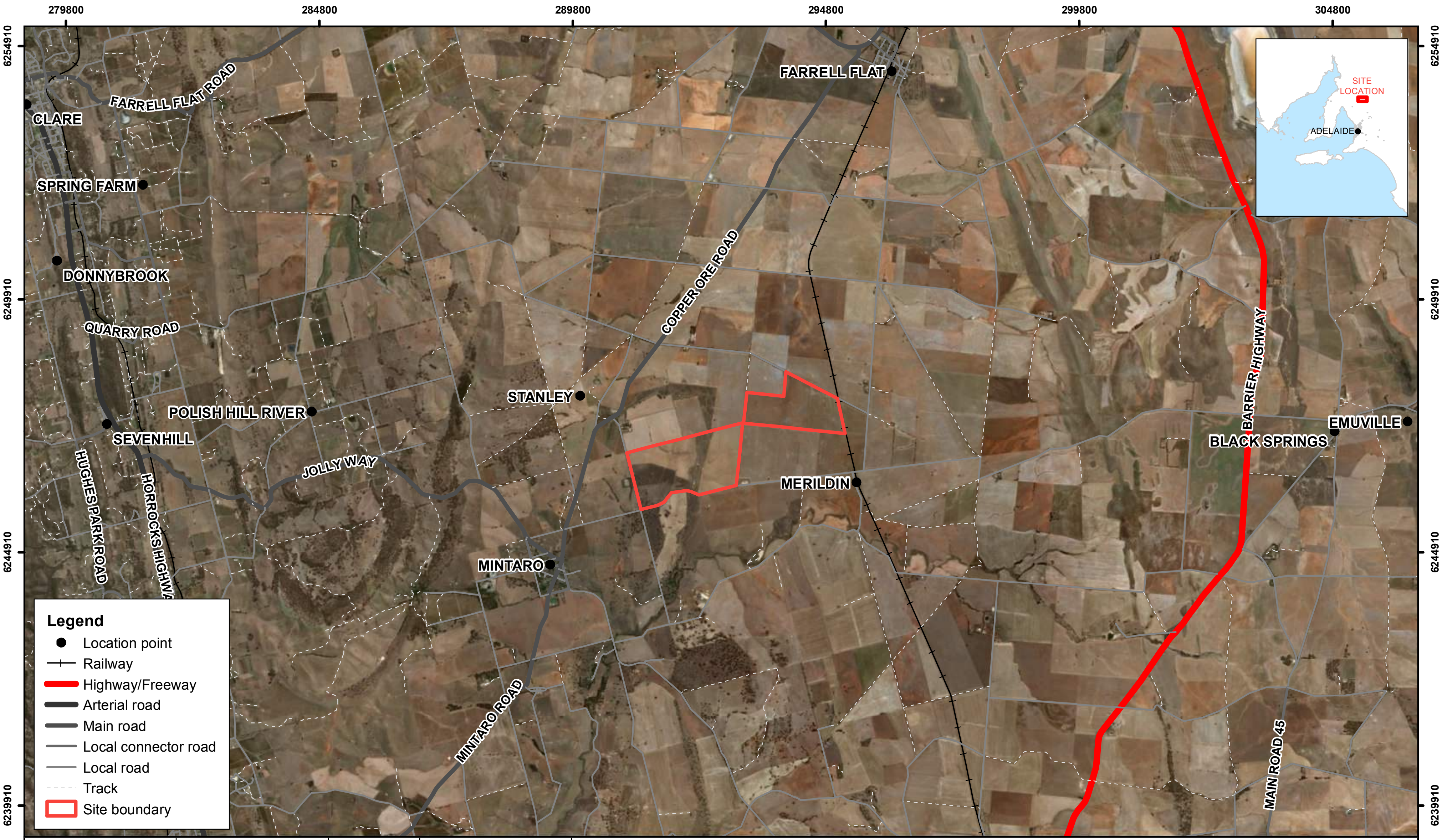
OTHER LIMITATIONS

WSP will not be liable to update or revise the report to take into account any events, emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to nor ownership of the properties, buildings and structures referred to in the report, nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

APPENDIX A

SITE LOCATION FIGURE



Map: PS103225_GIS_003_A	Author: PottsR
Date: 5/02/2018	Approved by: EFitzner

Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 1,000 2,000 m

1:100,000

Scale ratio correct when printed at A4
Coordinate system: GDA 1994 MGA Zone 54

Chaff Mill Solar Farm Preliminary Site Assessment

Site location plan

\\corp.pbwan.net\ANZ\Projects\PS103225_2271358A\10_GIS\Projects\Maps\PS103225_GIS_003_A.mxd

FRV Services Australia Pty Ltd

www.wsp.com

APPENDIX B

DEWNR BORE SEARCH RESULTS

WaterConnect

Groundwater Data Report

Government of South Australia
Department of Environment, Water and Natural Resources

Circle Centre -33.902615,138.743334, Radius 2.000km

Unit No	Date	Max Depth (m)	Latest Depth (m)	Status	Permit No	SWL (m)	SWL Date	Yield (L/sec)	Yield Date	TDS (mg/L)	TDS Date	Aquifer	Cased To (m)	Purpose	Obs No
6630-1725	15/01/1986	43	0	BKF	17864										
6630-1726	16/01/1986	73	0		17864	3.4	25/03/1986	0.05	16/01/1986	1525	16/01/1986	Nli			
6630-2848	21/11/1997	122	122		43211	9.8	21/11/1997	20	21/11/1997	1883	21/11/1997	Nli	10	DOM	
6630-2878	30/03/1998	75	0	ABD	43788			0.25	30/03/1998	5622	30/03/1998	Nli		INV	
6630-2879	30/03/1998	120	0	ABD	43788			1	30/03/1998	4776	30/03/1998	Nli		INV	
6630-3148	22/12/2000	80	80		52115	18.7	22/12/2000	3.75	22/12/2000	1546	22/12/2000		80	DOM	
6630-3258	22/12/2003	34.96	34.96		64018	16.21	21/07/2008			1653	19/03/2008	Nli	16	MON	STN002

7 records

Groundwater Data Report

Circle Centre -33.890646,138.775778, Radius 2.000km

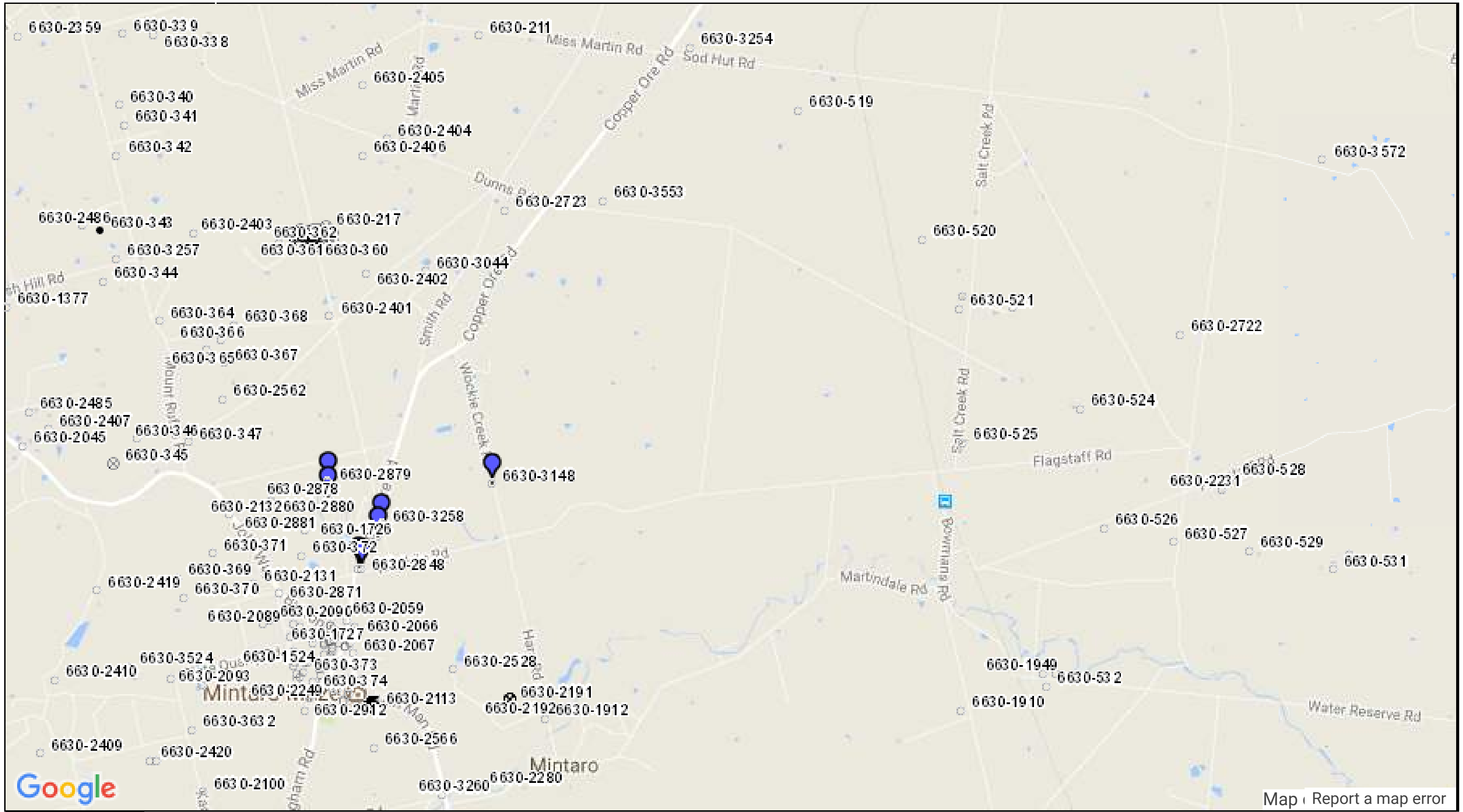
Unit No	Cased To (m)	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Purpose	Status	Aquifer
6630-520	33.53	33.53	33.53	12.19	15/03/1972	4047	15/03/1972	STK		
6630-521	38.1	38.1	38.1			3639	15/03/1972	DOM	UKN	
6630-522		19	19	12	15/03/1972	6236	15/03/1972	STK		Nms
6630-523		30.48	30.48			2675	15/03/1972	STK		Nd
6630-525	30.48	30.48		12.19	15/03/1972	5273	15/03/1972			Nms

5 records

Government of South Australia

WaterConnect

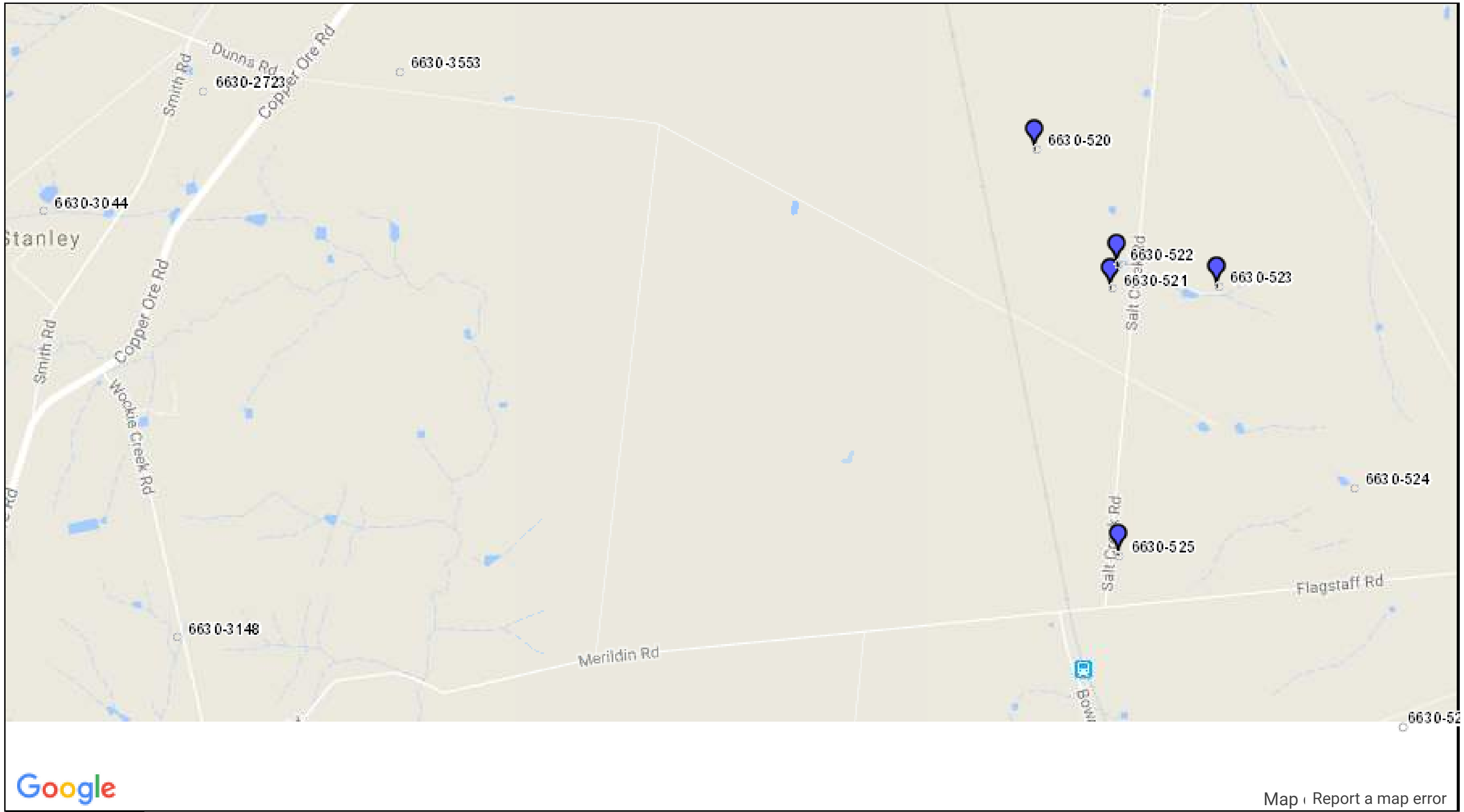
Circle Centre -33.901475,138.742819, Radius 2.000km



Government of South Australia

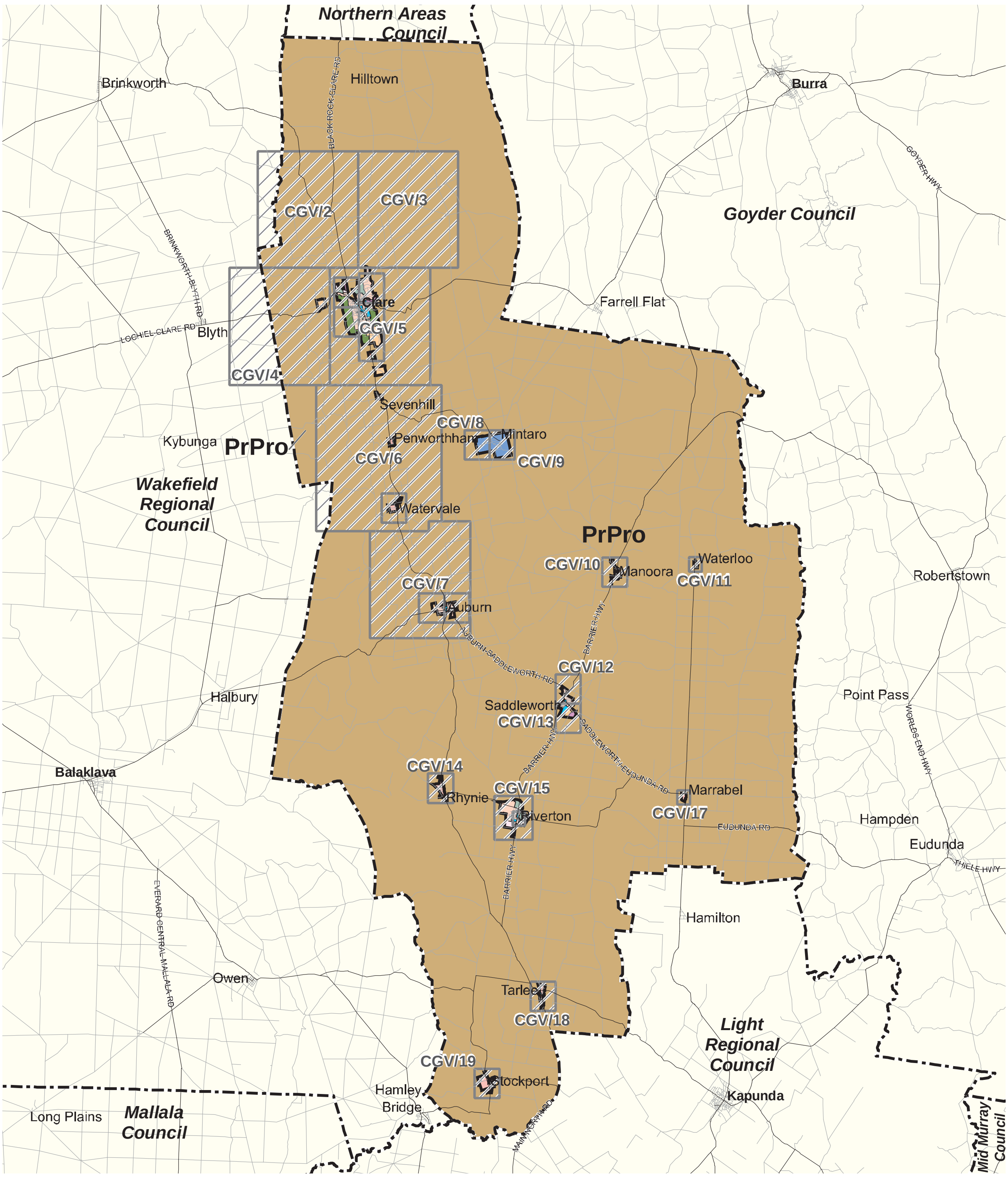
WaterConnect

Circle Centre -33.890646,138.775778, Radius 2.000km



APPENDIX C

EXTRACT FROM COUNCIL DEVELOPMENT PLAN



See enlargement map for accurate representation.

Zones

PrPro	Primary Production
	Zone Boundary
	Development Plan Boundary

Zone Map CGV/1

CLARE AND GILBERT VALLEYS COUNCIL

Consolidated - 10 January 2013

APPENDIX D

CERTIFICATES OF TITLE

Product	Register Search (CT 6081/22)
Date/Time	04/09/2017 03:19PM
Customer Reference	2271358A
Order ID	20170904009620
Cost	$28.25

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 6081 Folio 22

Parent Title(s) CT 6069/94

Creating Dealing(s) T 11597037

Title Issued 26/07/2011 **Edition** 3 **Edition Issued** 24/05/2017

Estate Type

FEE SIMPLE

Registered Proprietor

ARAPUNYA INVESTMENTS PTY. LTD. (ACN: 060 009 074)
OF CARE 1294 NORTH EAST ROAD TEA TREE GULLY SA 5091

Description of Land

ALLOTMENT COMPRISING PIECES 13 AND 14 DEPOSITED PLAN 64368
IN THE AREA NAMED MINTARO
HUNDRED OF STANLEY

ALLOTMENTS 109, 110 AND 111 FILED PLAN 170301
IN THE AREA NAMED MINTARO
HUNDREDS OF STANLEY AND UPPER WAKEFIELD

ALLOTMENTS 114, 115, 116 AND 117 FILED PLAN 170301
IN THE AREA NAMED STANLEY
HUNDREDS OF STANLEY AND UPPER WAKEFIELD

ALLOTMENTS 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 134, 135, 136, 145, 146, 147, 148, 149, 150, 151, 152 AND 153 FILED PLAN 170301
IN THE AREA NAMED MINTARO
HUNDREDS OF STANLEY AND UPPER WAKEFIELD

ALLOTMENT COMPRISING PIECES 166, 167, 168 AND 169 FILED PLAN 170301
IN THE AREA NAMED MINTARO
HUNDREDS OF STANLEY AND UPPER WAKEFIELD

ALLOTMENT COMPRISING PIECES 170, 171, 172 AND 173 FILED PLAN 170301
IN THE AREA NAMED MINTARO
HUNDREDS OF STANLEY AND UPPER WAKEFIELD

PIECES 166.167.168 AND 169 FORM ONE ALLOTMENT
PIECES 170.171.172 AND 173 FORM ONE ALLOTMENT

Easements

SUBJECT TO THE EASEMENT(S) AS PROVIDED FOR BY SECTION 9 OF THE NATURAL GAS AUTHORITY ACT 1967

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (T 1888615)

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 (T 1888615)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B TO THE NATURAL GAS AUTHORITY OF SOUTH

AUSTRALIA (T 3028083)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes NIL

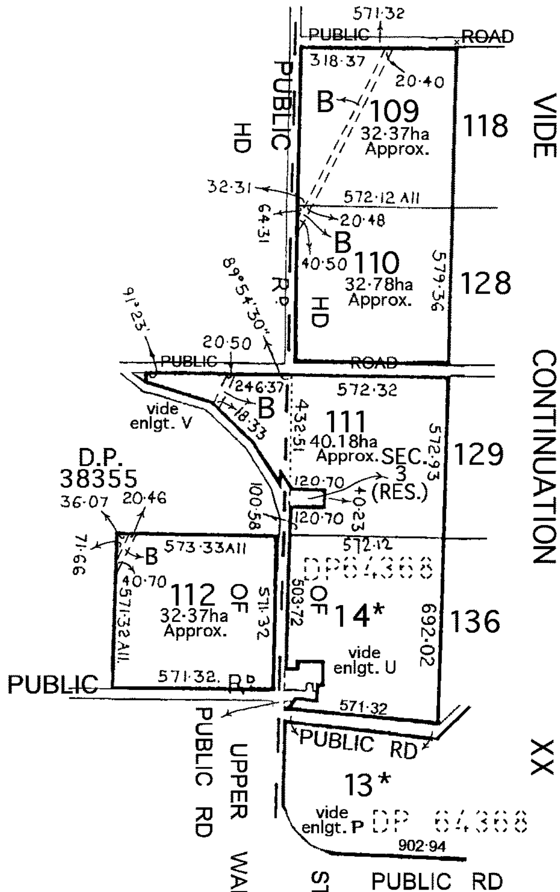
Administrative Interests

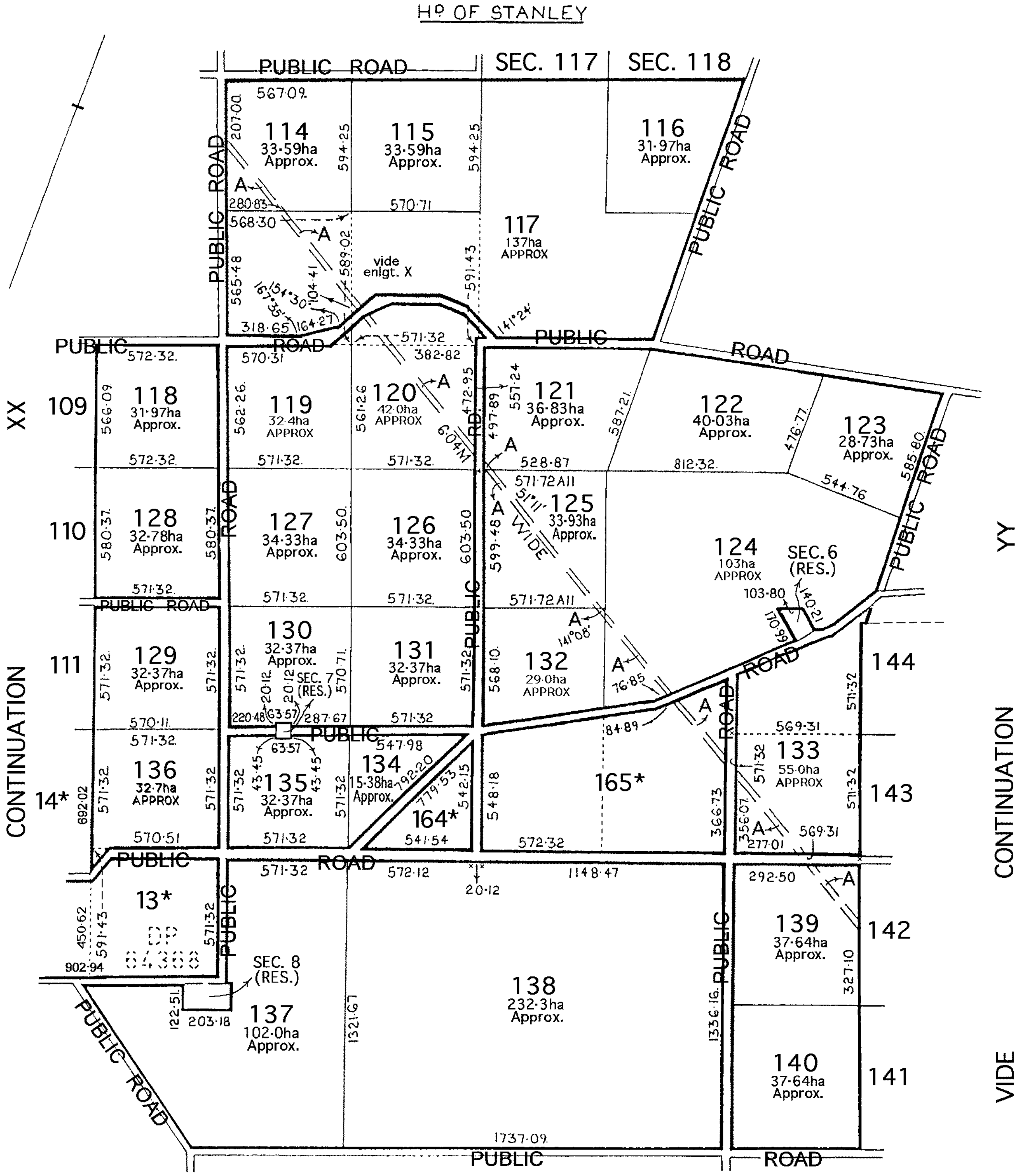
PROPERTY IN A STATE HERITAGE AREA 20/09/1984

PIECES SCHEDULE

ONE ALLOTMENT COMPRISES	TOTAL AREA
13* & 14*	94.1 ha Approx

*Asterisk denotes PIECE indentifier only.





PIECES SCHEDULE

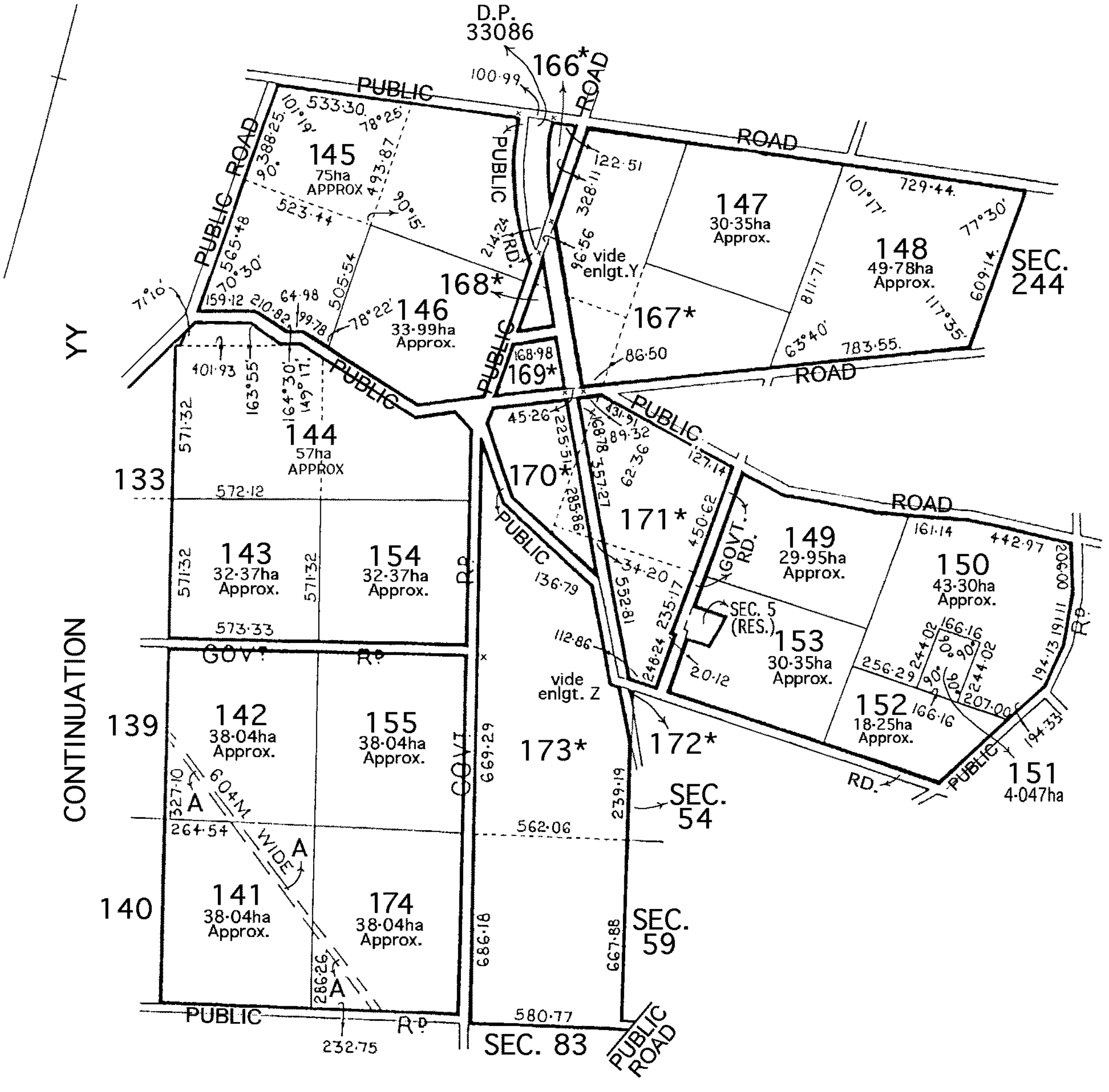
ONE ALLOTMENT COMPRISES	TOTAL AREA
164* & 165*	91·0ha APPROX

*Asterisk denotes PIECE indentifier only.

0 200 400 600 800 Metres

Product	Register Search (CT 6081/22)
Date/Time	04/09/2017 03:19PM
Customer Reference	2271358A
Order ID	20170904009620
Cost	$28.25

H^D OF STANLEY

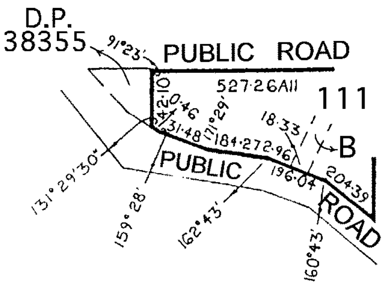


PIECES SCHEDULE

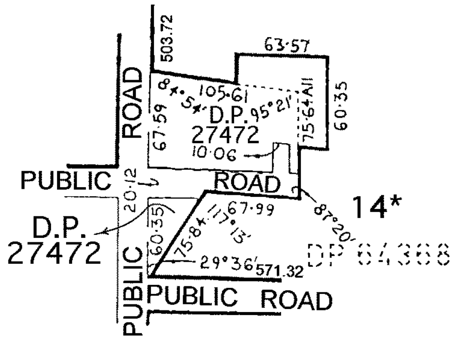
ONE ALLOTMENT COMPRISES	TOTAL AREA
166*, 167*, 168* & 169*	57·4ha Approx
170*, 171*, 172* & 173*	147·4ha Approx.

*Asterisk denotes PIECE indentifier only.

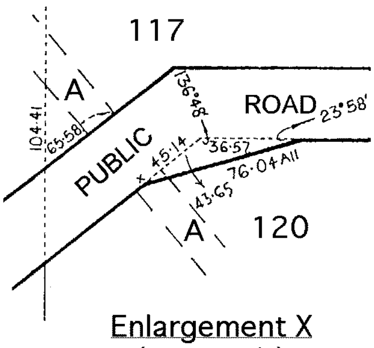
*** ASTERISK DENOTES PIECE IDENTIFIER ONLY.**



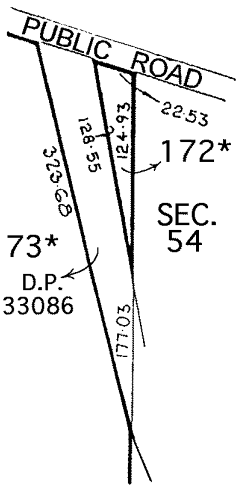
Enlargement V
(not to scale)



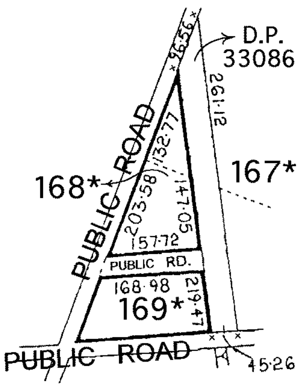
Enlargement U
(not to scale)



Enlargement X
(not to scale)

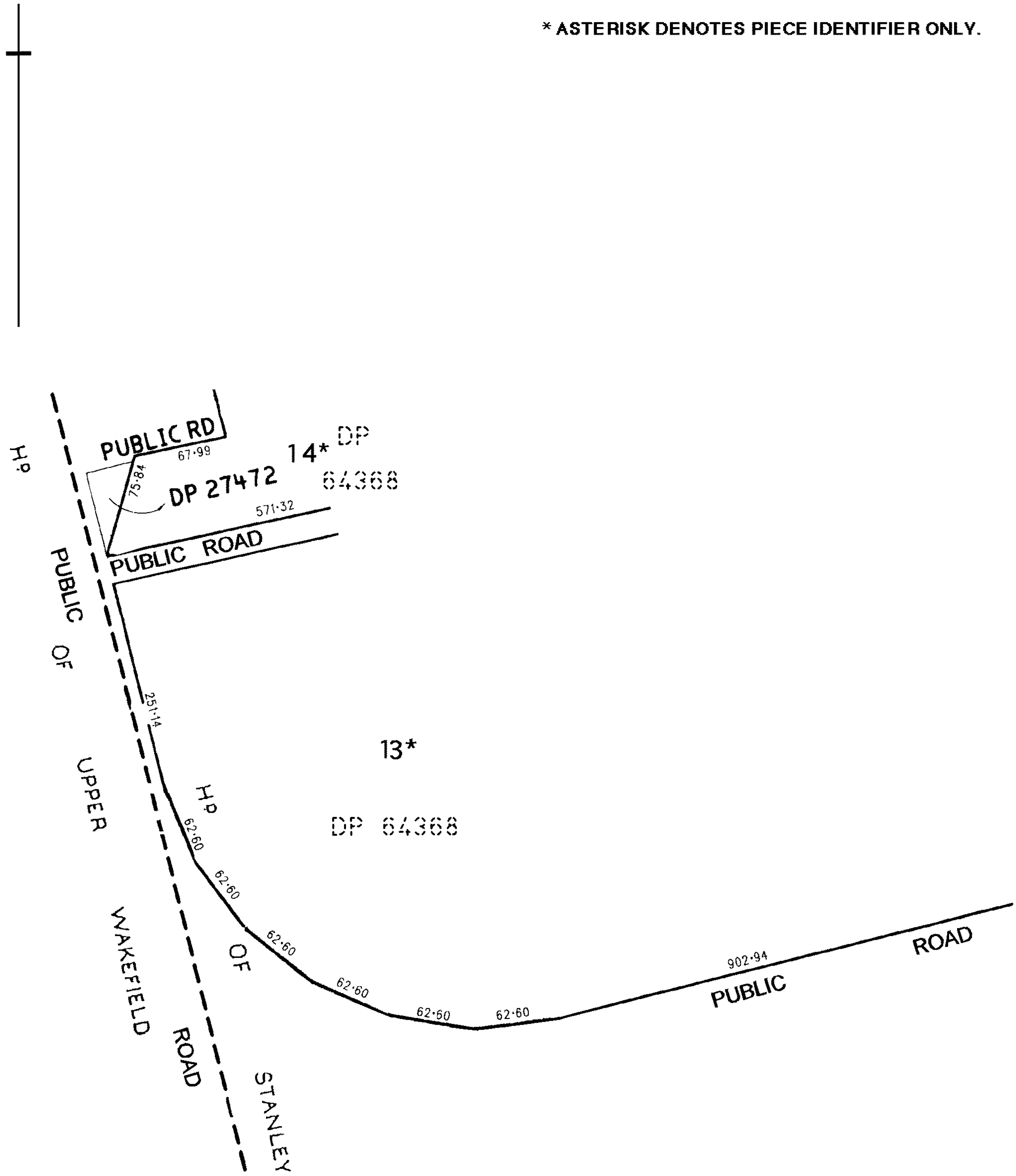


Enlargement Z
(not to scale)



Enlargement Y
(not to scale)

* ASTERISK DENOTES PIECE IDENTIFIER ONLY.



Enlargement P
(Not to Scale)

Product	Register Search (CT 6128/159)
Date/Time	04/09/2017 03:24PM
Customer Reference	2271358A
Order ID	20170904009734
Cost	$28.25

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 6128 Folio 159

Parent Title(s) CT 5465/754

Creating Dealing(s) DDA 12041393

Title Issued 09/01/2014 **Edition** 3 **Edition Issued** 12/10/2015

Estate Type

FEE SIMPLE

Registered Proprietor

MARTINDALE FARM PTY. LTD.
OF 700 MILNE ROAD BANKSIA PARK SA 5091

Description of Land

ALLOTMENT 4 DEPOSITED PLAN 12560
IN THE AREA NAMED STANLEY
HUNDRED OF STANLEY

Easements

NIL

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

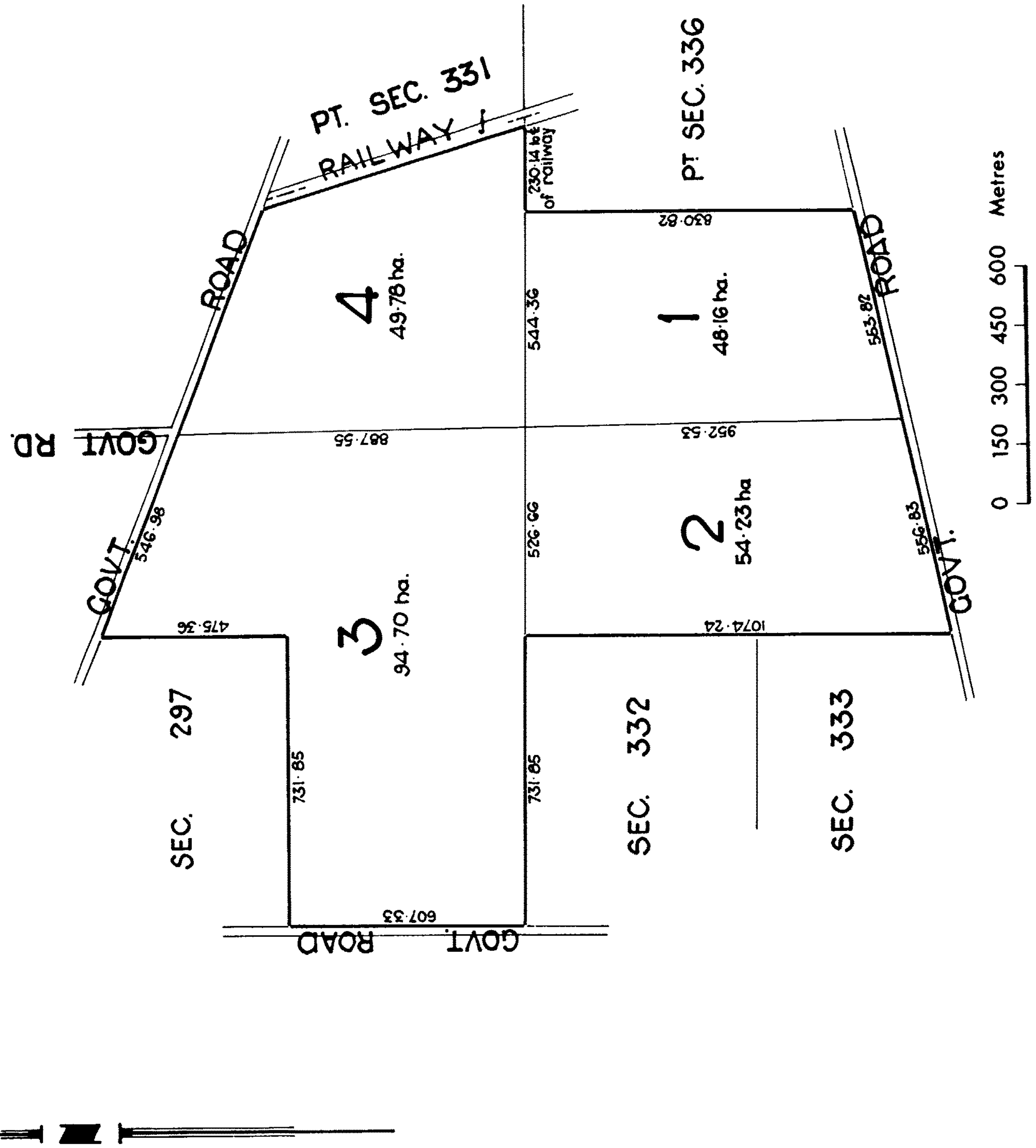
Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

NEW EDITION CREATED DUE TO EXPIRATION OF LEASE

Administrative Interests NIL


PT. SEC. 331
RAILWAY
PT. SEC. 336
230.14 bet of railway
830.82
ROAD
4
49.78 ha.
544.36
1
48.16 ha.
553.82
GOVT. RD.
887.55
952.53
546.98
GOVT.
526.66
2
54.23 ha
556.83
GOVT.
475.36
3
94.70 ha.
1074.24
SEC. 297
731.85
731.85
SEC. 332
SEC. 333
607.33
GOVT. ROAD
Metres
0
150
300
450
600
N

Product	Register Search (CT 6128/160)
Date/Time	04/09/2017 03:22PM
Customer Reference	2271358A
Order ID	20170904009714
Cost	$28.25

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 6128 Folio 160

Parent Title(s) CT 5465/700

Creating Dealing(s) DDA 12041393

Title Issued 09/01/2014 **Edition** 3 **Edition Issued** 12/10/2015

Estate Type

FEE SIMPLE

Registered Proprietor

MARTINDALE FARM PTY. LTD.
OF 700 MILNE ROAD BANKSIA PARK SA 5091

Description of Land

ALLOTMENT 3 DEPOSITED PLAN 12560
IN THE AREA NAMED STANLEY
HUNDRED OF STANLEY

Easements

NIL

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

Priority Notices NIL

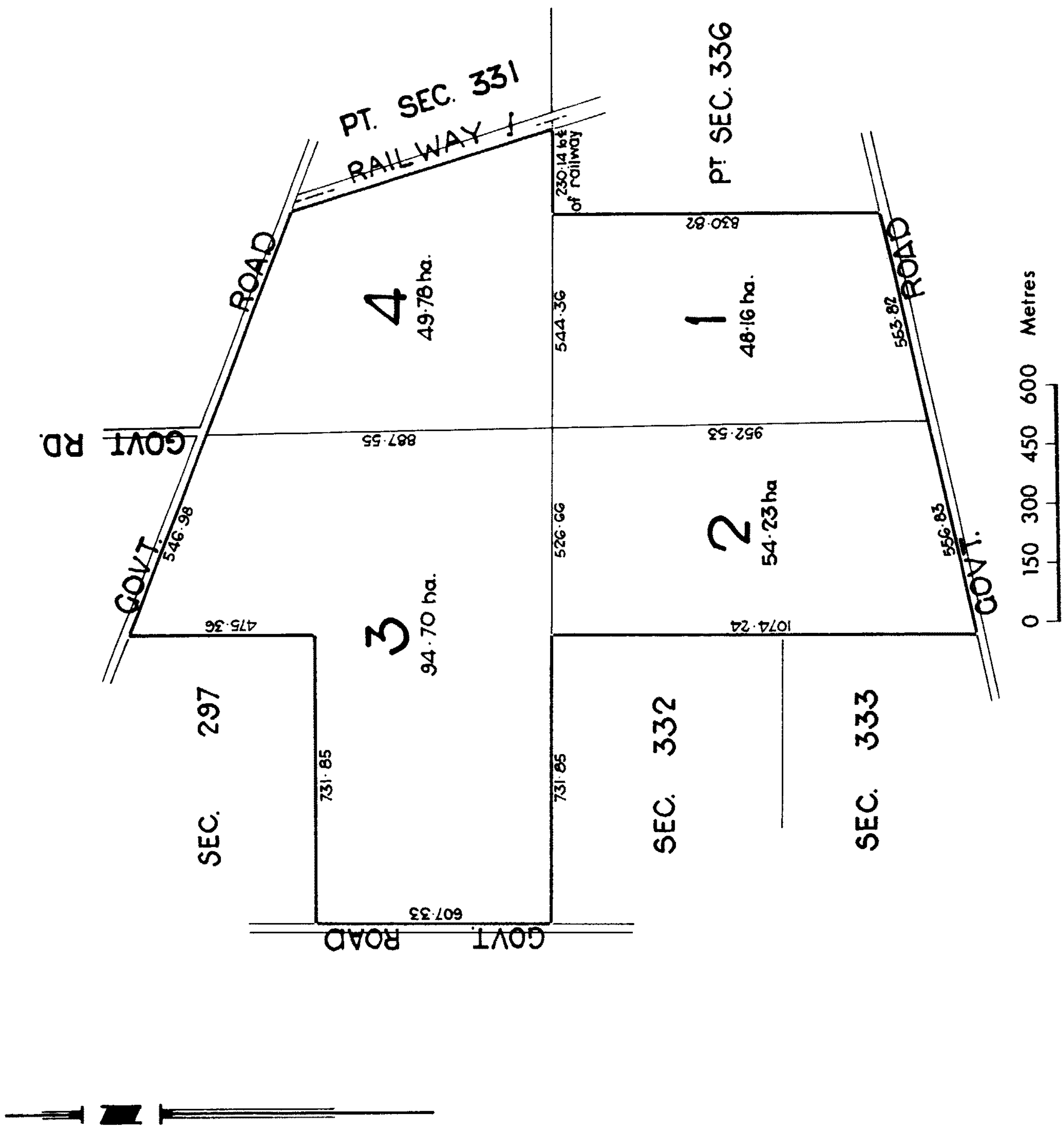
Notations on Plan NIL

Registrar-General's Notes

NEW EDITION CREATED DUE TO EXPIRATION OF LEASE

Administrative Interests NIL

Product	Register Search (CT 6128/160)
Date/Time	04/09/2017 03:22PM
Customer Reference	2271358A
Order ID	20170904009714
Cost	$28.25



APPENDIX E

LOTSEARCH REPORT

Environmental Risk and Planning Report

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Report Date: 11 Sep 2017 13:05:17

Table of Contents

Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a confidence is given under the field heading “LocConf” or “Location Confidence”.

Location Confidence	Description
Premise Match	Georeferenced to the site location / premise or part of site
Area Match	Georeferenced with the confidence of the general/approximate area
Road Match	Georeferenced to the road or rail
Road Intersection	Georeferenced to the road intersection
Buffered Point	Feature is a buffered point
Network of Features	Georeferenced to a network of features

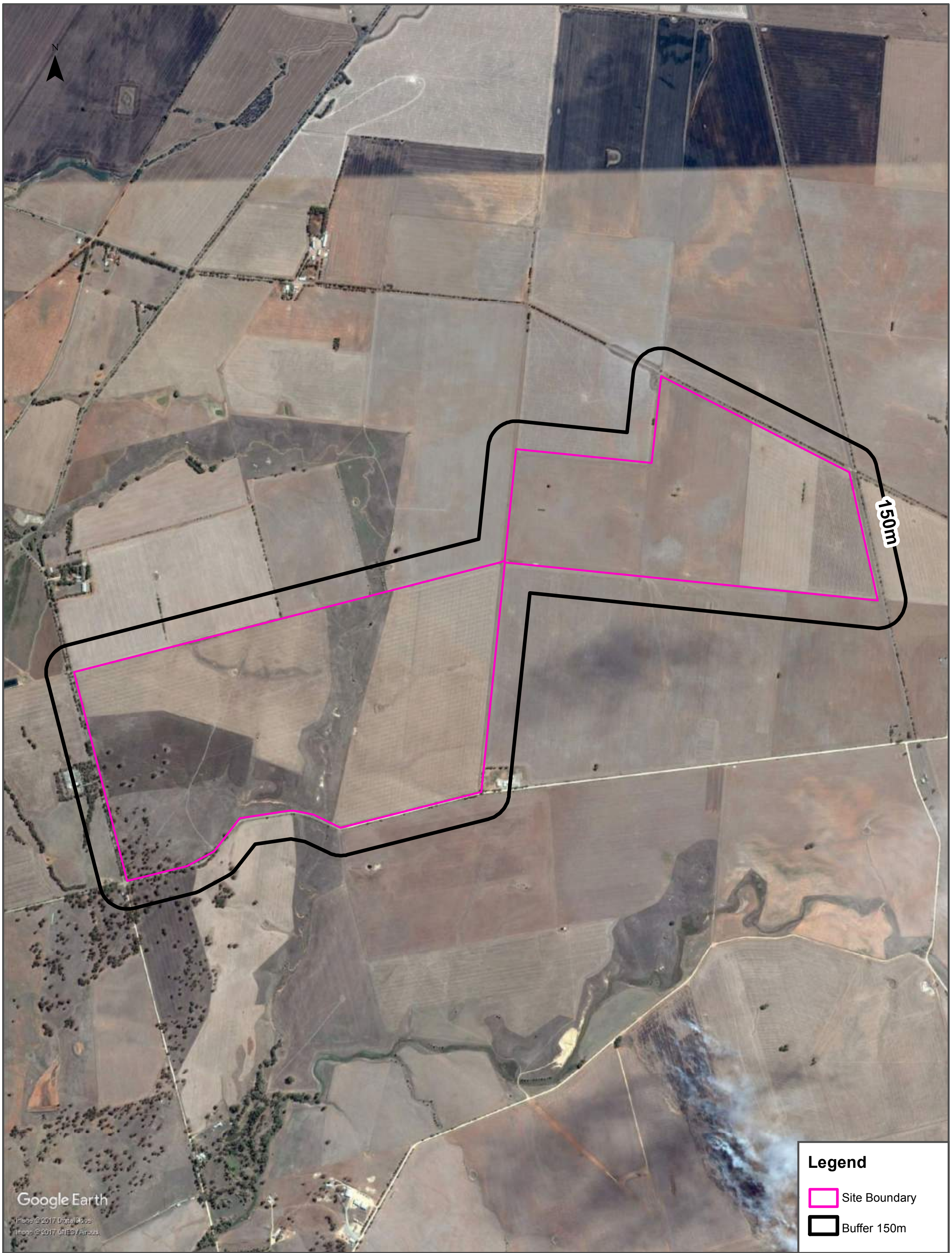
Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
EPA Site Contamination Index	EPA South Australia	11/09/2017	11/09/2017	Monthly	1000	0	0	0
EPA Environmental Protection Orders	EPA South Australia	11/09/2017	11/09/2017	Monthly	1000	0	0	0
EPA Environmental Authorisations	EPA South Australia	11/09/2017	11/09/2017	Monthly	1000	0	1	1
EPA Assessment Areas	EPA South Australia	02/08/2017	21/07/2017	Quarterly	1000	0	0	0
National Waste Management Site Database	Geoscience Australia	27/06/2017	07/03/2017	Quarterly	1000	0	0	0
EPA Collection Depots	EPA South Australia	07/06/2017		Quarterly	1000	0	0	0
Mines and Mineral Deposits	Department of State Development, Resources and Energy	21/07/2017	21/07/2017	Monthly	1000	0	1	1
Groundwater Aquifers	Department of Environment, Water and Natural Resources	19/07/2017	01/01/2008	As required	1000	1	1	1
Drillholes	Dept of Environment, Water and Natural Resources - South Australia	07/08/2017	02/08/2017	Quarterly	2000	0	1	44
Surface Geology 1:100,000	Department of State Development, Resources and Energy, South Australia	20/06/2017	28/05/2012	As required	1000	18	18	27
Geological Linear Structures 1:100,000	Department of State Development, Resources and Energy, South Australia	20/06/2017	28/05/2012	As required	1000	12	17	29
Soil Types	Dept of Environment, Water and Natural Resources - South Australia	30/01/2017	01/07/2009	As required	1000	5	5	7
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	1	1	1
Acid Sulfate Soil Potential	Dept of Environment, Water and Natural Resources - South Australia	08/07/2017	01/09/2009	As required	1000	1	1	1
Soil Salinity - Watertable Induced	Dept of Environment, Water and Natural Resources - South Australia	30/01/2017	01/07/2009	As required	1000	2	3	3
Soil Salinity - Non-watertable	Dept of Environment, Water and Natural Resources - South Australia	30/01/2017	01/07/2009	As required	1000	2	2	2
Soil Salinity - Non-watertable (magnesia patches)	Dept of Environment, Water and Natural Resources - South Australia	30/01/2017	01/07/2009	As required	1000	1	1	1
Land Development Zones	Department of Planning, Transport and Infrastructure	19/07/2017	14/07/2017	Monthly	1000	1	1	1
State Heritage Areas	Dept of Environment, Water and Natural Resources - South Australia	24/05/2017	10/11/2004	As required	1000	0	0	0
SA Heritage Places	Dept of Environment, Water and Natural Resources - South Australia	14/07/2016	25/02/2016	Quarterly	1000	0	0	1
Aboriginal Land	Department of State Development, Resources and Energy	24/08/2017	20/08/2017	As required	1000	0	0	0
Bushfire Protection Areas	Department of Planning, Transport and Infrastructure	30/01/2017	04/03/2015	As required	1000	1	1	1
Bushfires and Prescribed Burns History	Department of Environment, Water and Natural Resources	17/07/2017	19/12/2016	As required	1000	0	0	0
Groundwater Dependent Ecosystems Atlas	The Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000	2	3	6
Ramsar Wetland Areas	Department of Environment, Water and Natural Resources	30/01/2017	30/01/2013	As required	1000	0	0	0

Aerial Imagery 2016

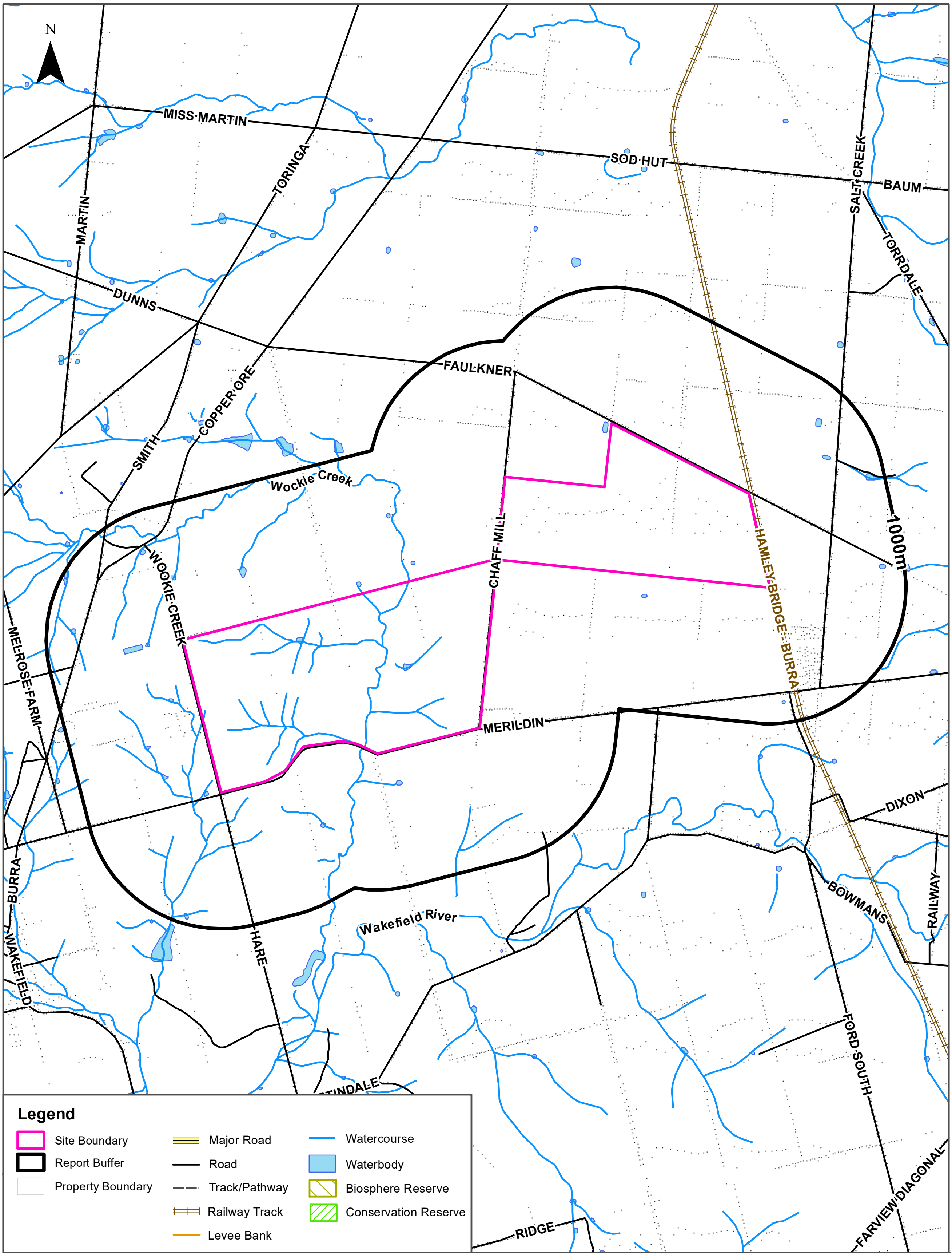
159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 300 600 1,200 Meters	Data Sources: Aerial Imagery © 2016 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 21April 2017

Topographic Features

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources)	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

EPA Contaminated Land

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

EPA Site Contamination Index

Sites on the EPA Contamination Index within the dataset buffer:

Notification No	Type	Address	Activity	Status	Location Confidence	Distance	Direction
N/A	No records in buffer						

Site Contamination Index Data Source: EPA South Australia

EPA Public Register

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

EPA Environment Protection and Clean Up Orders

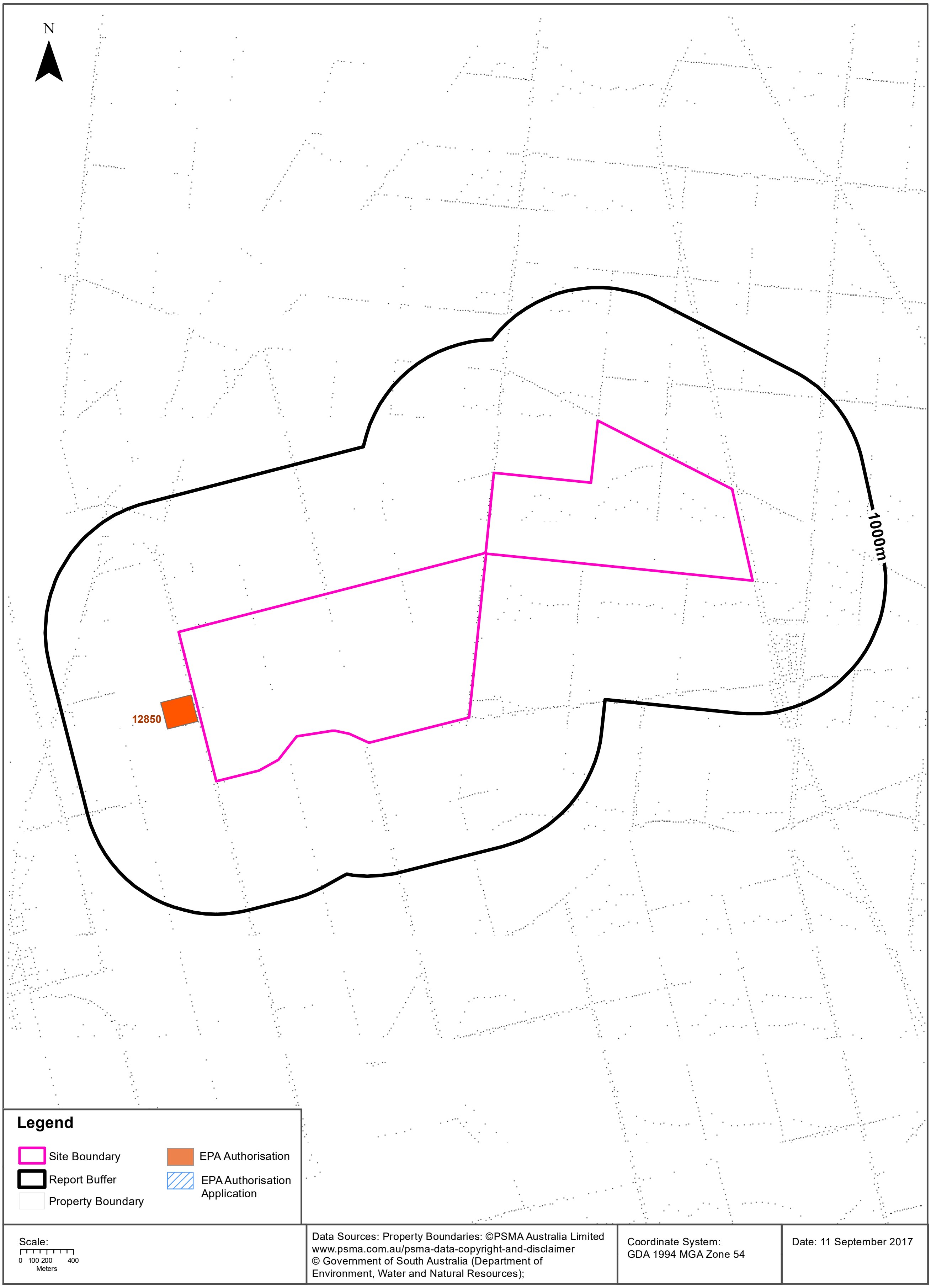
EPA Environment Protection and Clean Up Orders, within the dataset buffer:

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	Location Confidence	Distance	Direction
N/A	No records in buffer								

Authorisations Data Source: EPA South Australia

EPA Authorisations and Applications

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



EPA Public Register

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

EPA Authorisations and Applications

EPA Authorisations and Authorisation Applications within the dataset buffer:

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	Location Confidence	Distance	Direction
12850	LICENCE	Issued	SYNERGEN POWER PTY LIMITED	Wookie Creek Road, MINTARO SA 5415	Fuel burning not coal or wood	Current EPA Register	Premise Match	25m	West

Authorisations Data Source: EPA South Australia

EPA Assessment Areas

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

EPA Assessment Areas

EPA Assessment Areas within the dataset buffer:

Map Id	Supplied Ref	Area Name	Map Link	Status	Location Confidence	Distance	Direction
N/A	No records in buffer						

Assessment Areas Data Source: EPA South Australia

Waste Management Facilities

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Revised Date	Location Confidence	Distance	Direction
N/A	No records in buffer								

Wate Management Facilities Data Source: Australian Governement Geoscience Australia

EPA Approved Container Collection Depots

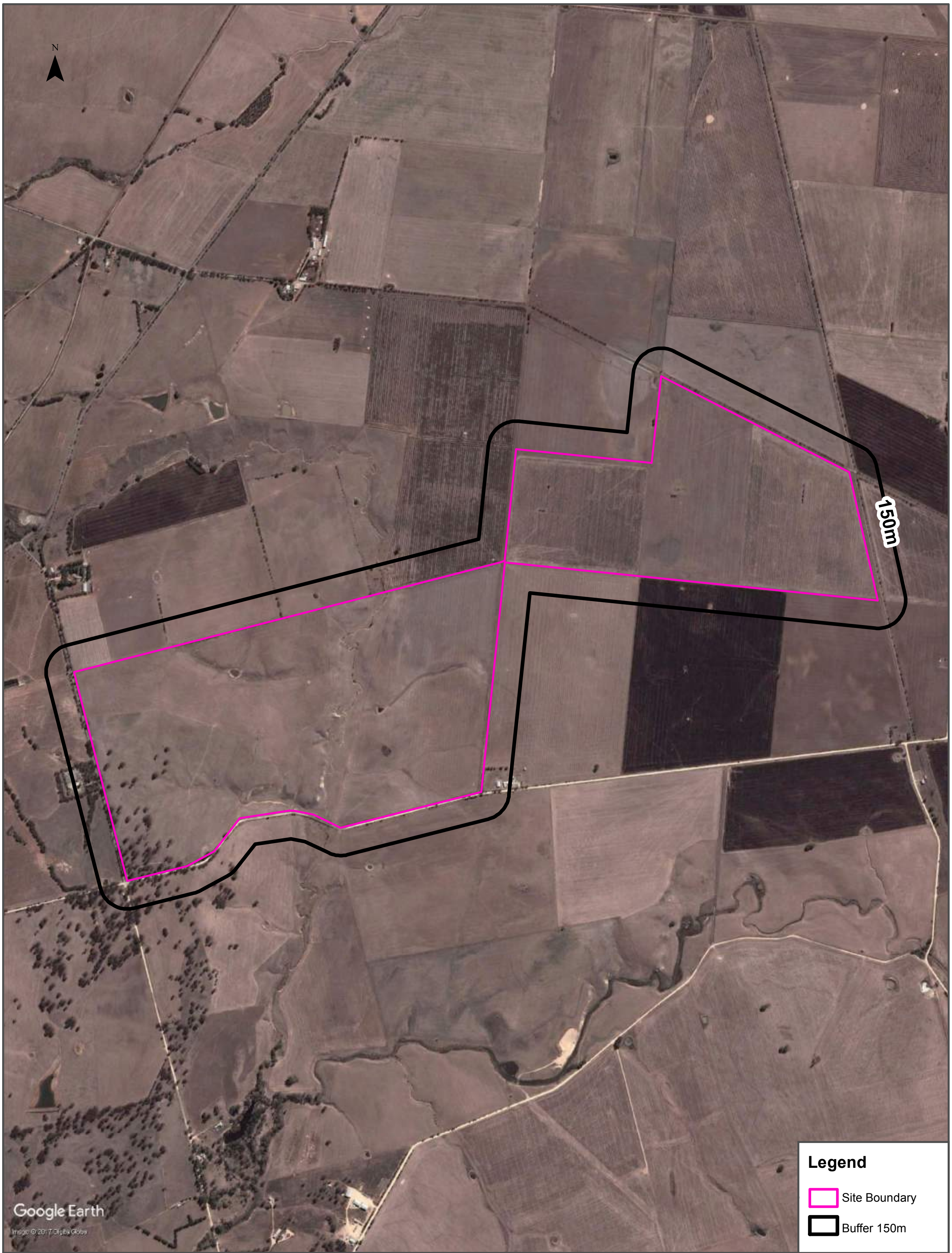
EPA approved container collection depots within the dataset buffer:

MapId	Name	Address	Suburb	Loc Conf	Distance	Direction
N/A	No records in buffer					

Collection Depot Data Source: EPA South Australia

Aerial Imagery 2012

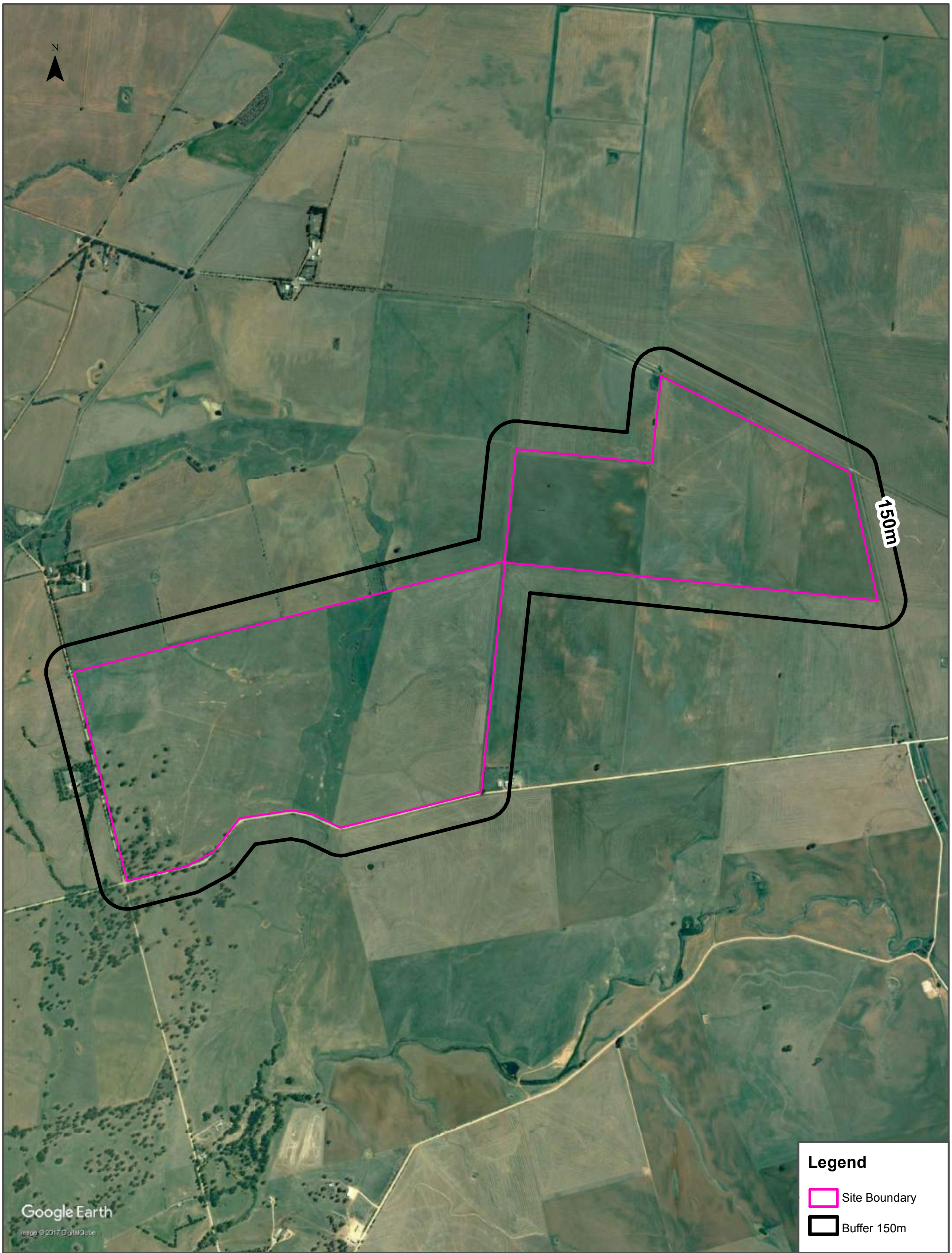
159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 300 600 1,200 Meters	Data Sources: Aerial Imagery © 2016 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 21April 2017

Aerial Imagery 2003

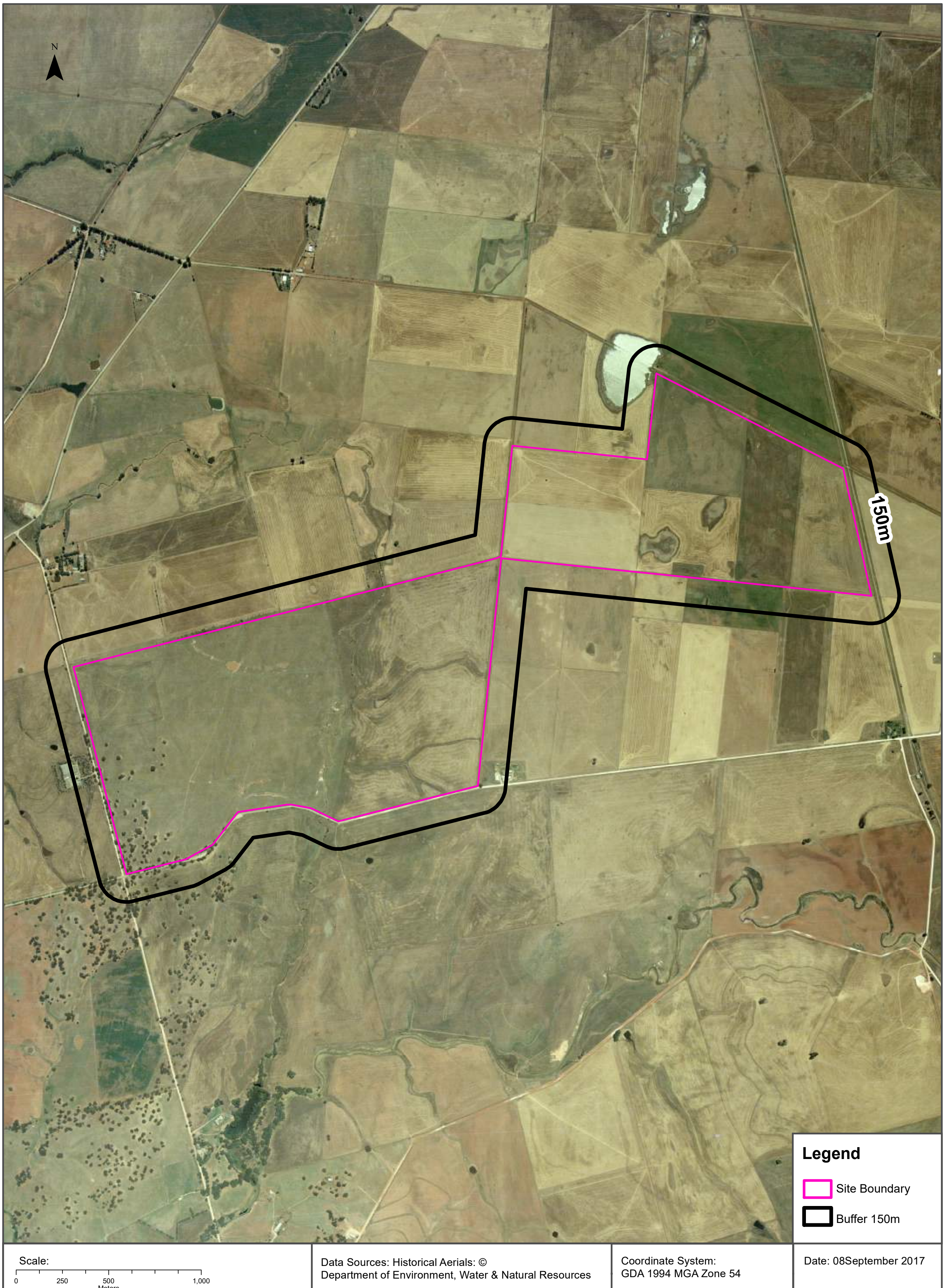
159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 300 600 1,200 Meters	Data Sources: Aerial Imagery © 2016 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 21April 2017

Aerial Imagery 1993

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



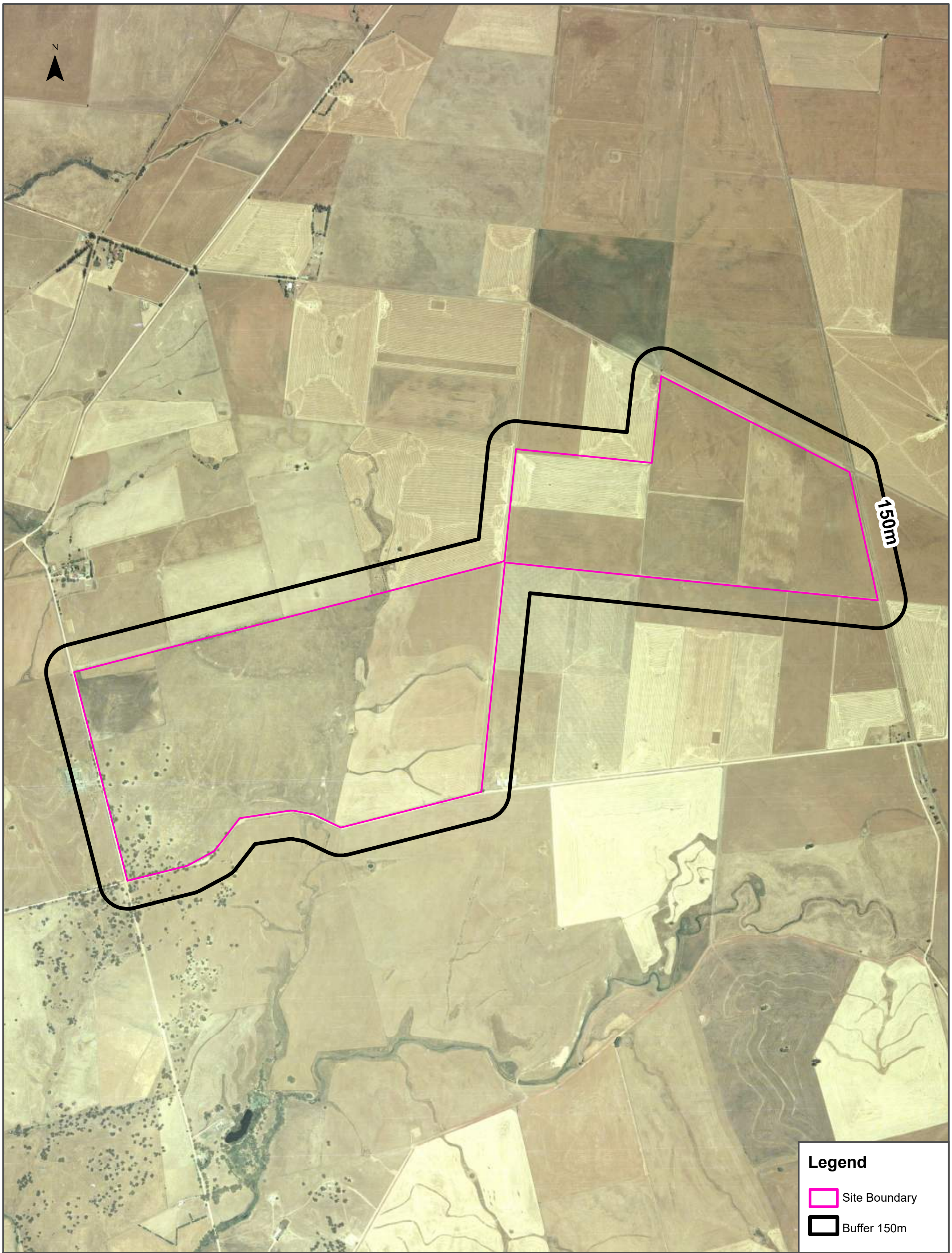
Data Sources: Historical Aerials: © Department of Environment, Water & Natural Resources

Coordinate System: GDA 1994 MGA Zone 54

Date: 08September 2017

Aerial Imagery 1987

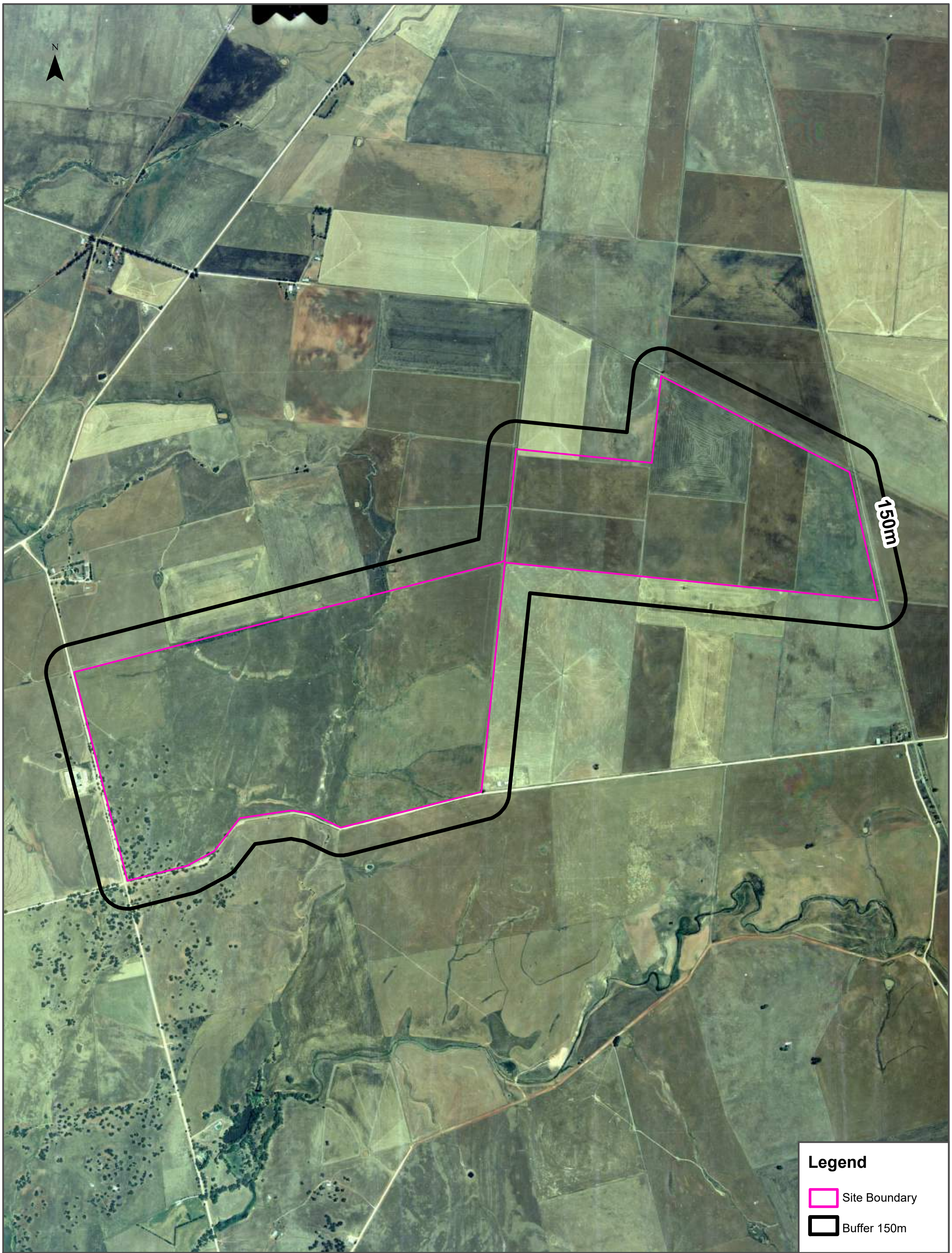
159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 250 500 1,000 Meters	Data Sources: Historical Aerials: © Department of Environment, Water & Natural Resources	Coordinate System: GDA 1994 MGA Zone 54	Date: 08September 2017

Aerial Imagery 1983

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 250 500 1,000 Meters	Data Sources: Historical Aerials: © Department of Environment, Water & Natural Resources	Coordinate System: GDA 1994 MGA Zone 54	Date: 08September 2017

Aerial Imagery 1979

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Scale: 0 250 500 1,000 Meters	Data Sources: Historical Aerials: © Department of Environment, Water & Natural Resources	Coordinate System: GDA 1994 MGA Zone 54	Date: 08September 2017

Aerial Imagery 1954

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

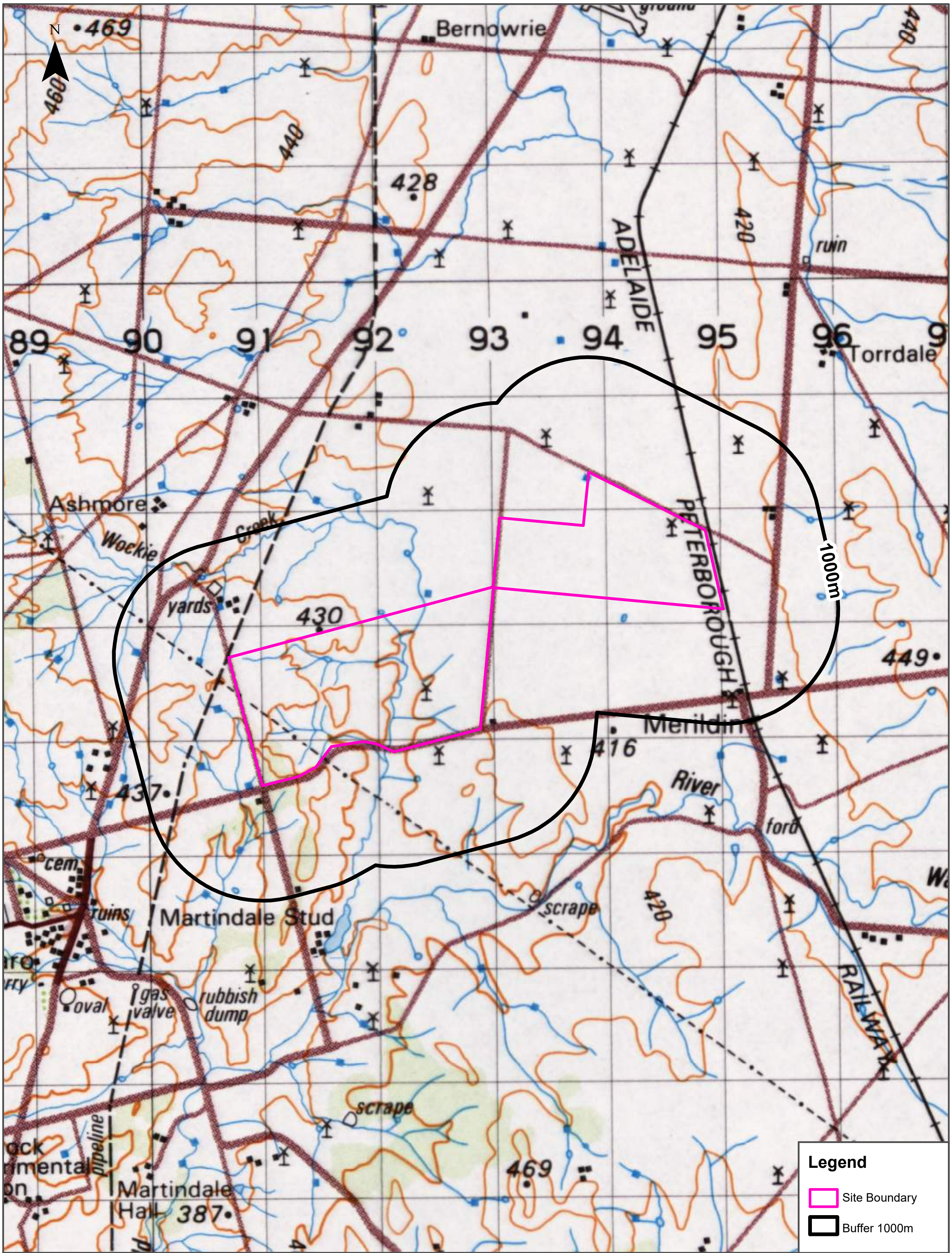
Legend

- Site Boundary
- Buffer 150m

Scale: 0 250 500 1,000 Meters	Data Sources: Historical Aerials: © Department of Environment, Water & Natural Resources	Coordinate System: GDA 1994 MGA Zone 54	Date: 08September 2017

Historical Map 1980

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

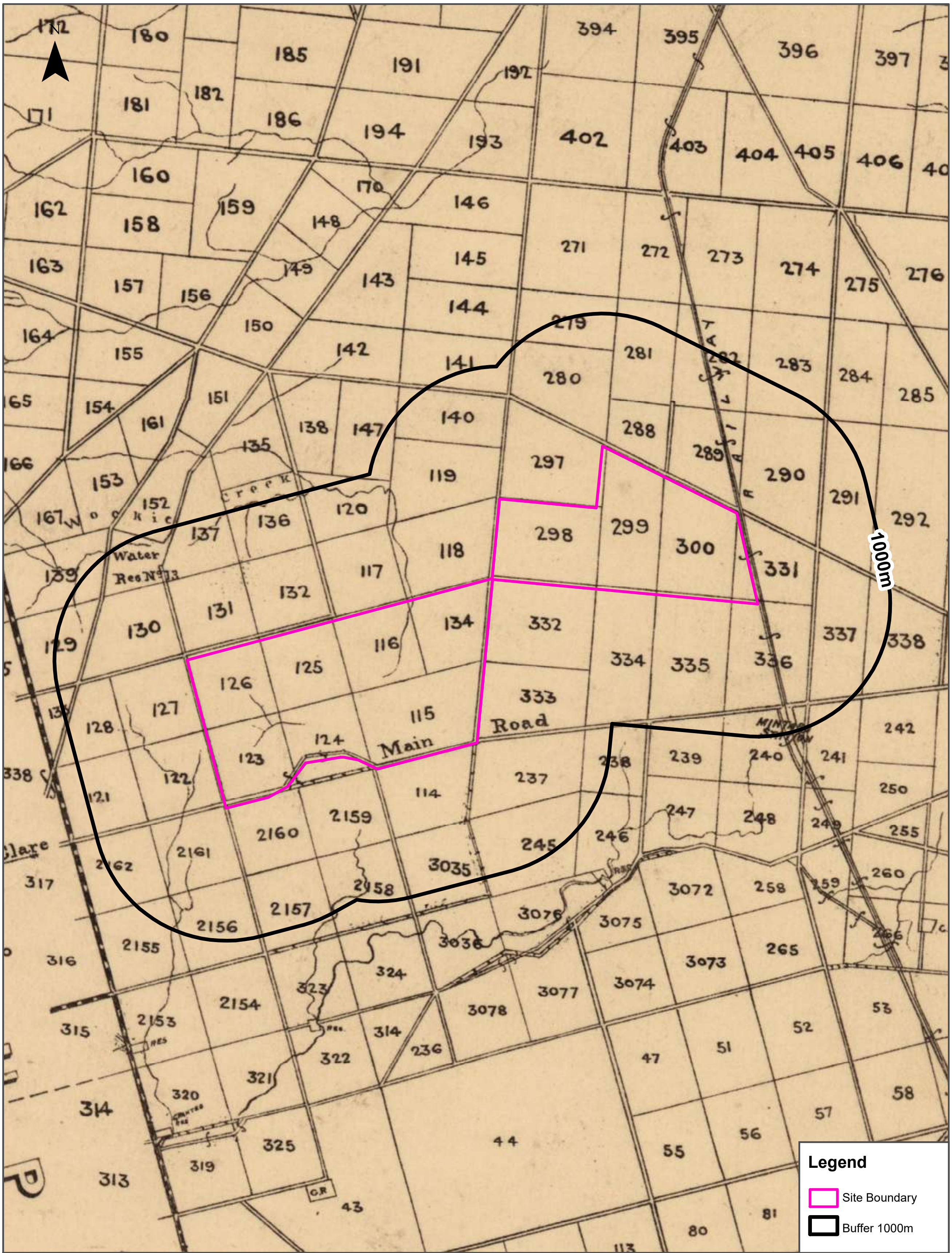


Legend
- Site Boundary
- Buffer 1000m

Scale: 0 250 500 1,000 Meters	Data Sources: Sheet 6630 Edition 1 Clare, SA National Topographic Map Series Commonwealth of Australia	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Historical Map ca.1895

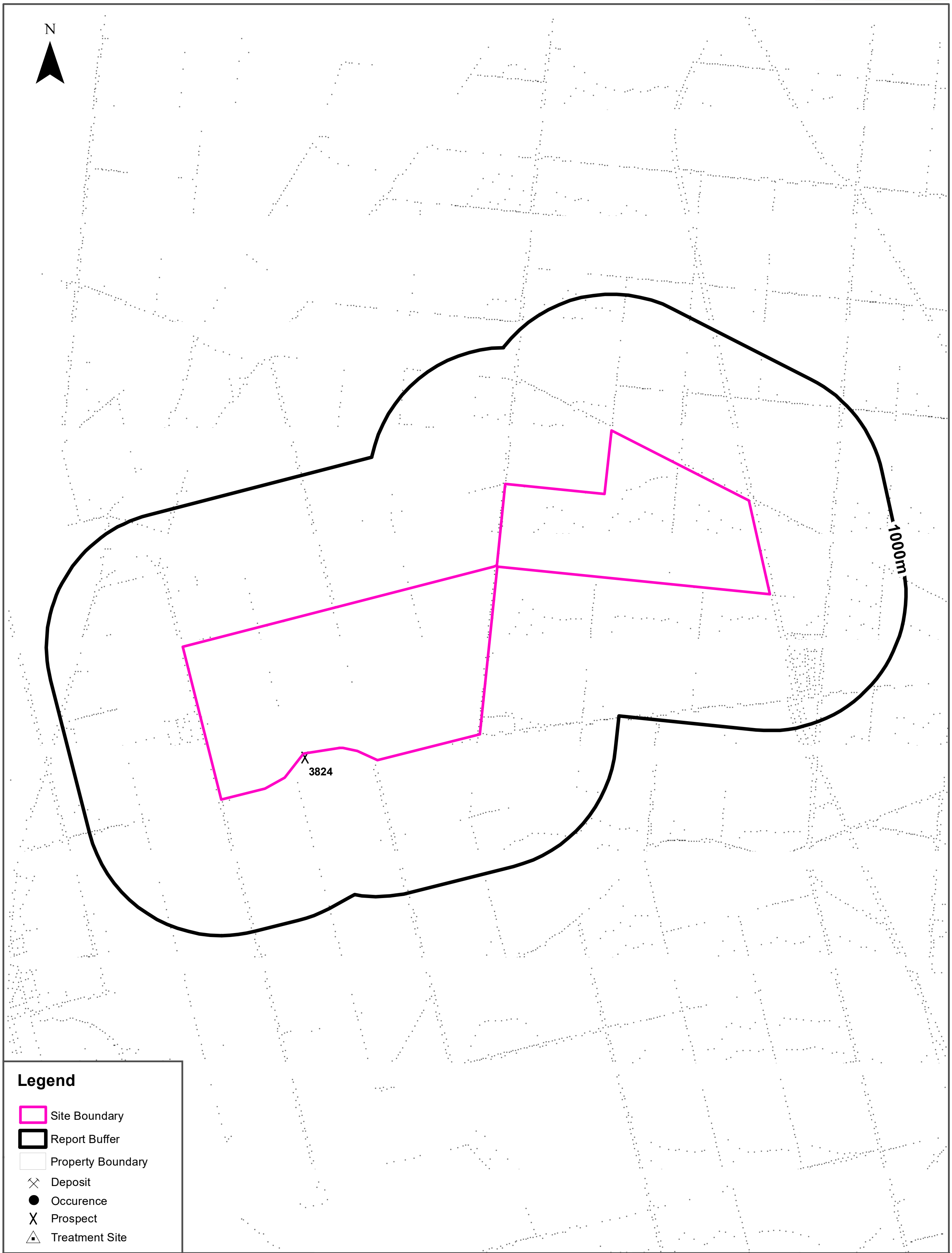
159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 250 500 1,000 Meters	Data Sources: Hundred Map - Stanley Compiled in the Office of the Surveyor General Department of Lands South Australia	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Mines and Mineral Deposits

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 200 400 800 Meters	Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Mining

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Mines and Mineral Deposits

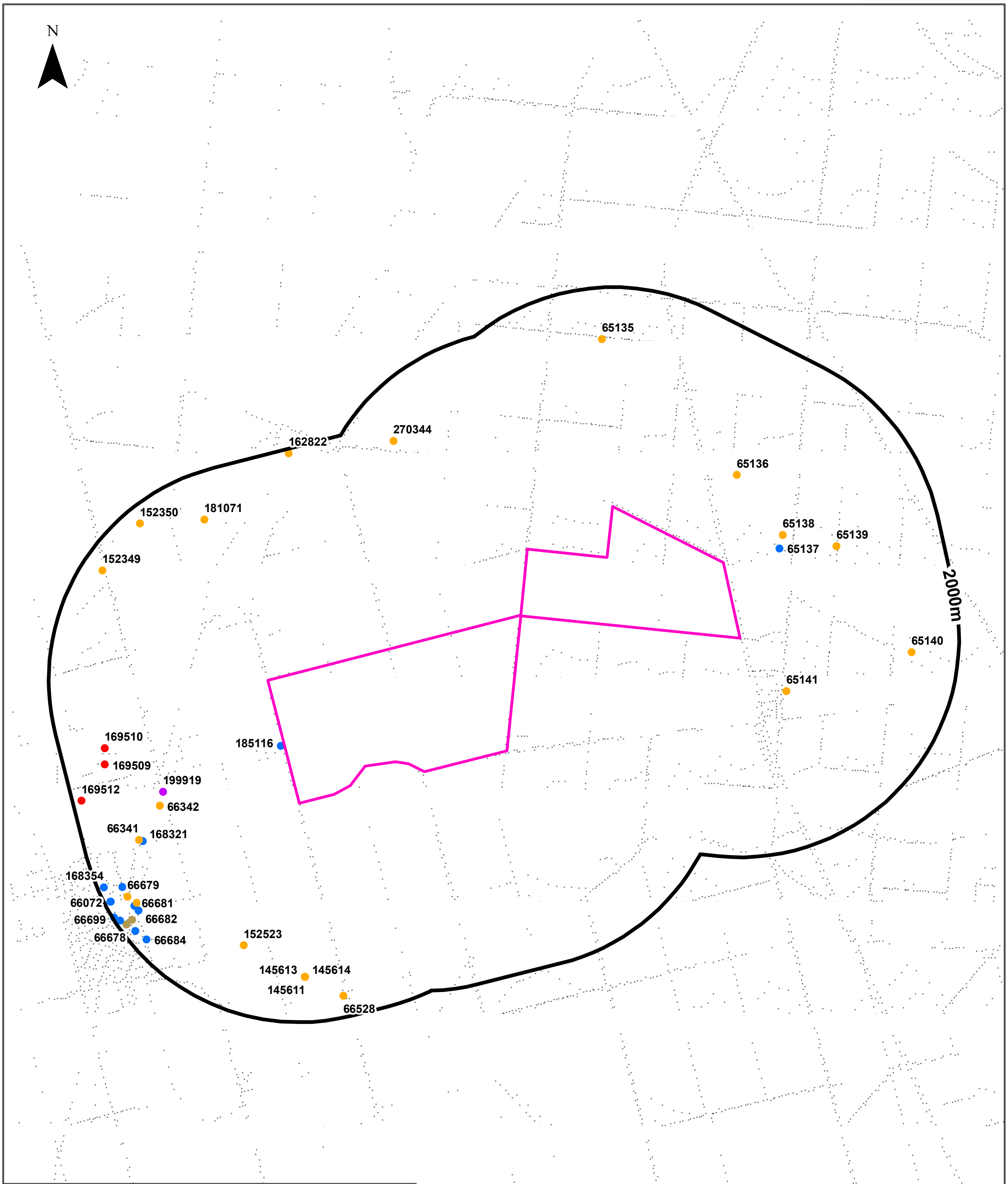
Mines and mineral deposits within the dataset buffer:

Deposit No.	Name	Class	Status	Commodity	Year	Description	Dist	Dir'n
3824	MINTARO MERILDIN	PROSPECT	Abandoned	Sandstone	1960	council rubble pit in weathered sandstone and shale of the Watervale Formation.	25m	South West

All Mines and Mineral Deposits Data Source: Dept. of State Development, Resources and Energy - South Australia

Drillholes

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Site Boundary	Domestic	Irrigation
Report Buffer	Drainage	Monitoring
Property Boundary	Investigation	Observation
		Other

Scale: 0 200 400 800 Meters	Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Groundwater and Drillholes

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Groundwater Aquifers

Groundwater aquifers within the dataset buffer:

Aquifer Code	Description	Distance	Direction
30	Fractured Rocks - Cambrian and Precambrian rocks - quartzite, sandstone, limestone, dolomite, slate, marble, siltstone, phyllite, schist and gneiss	0m	Onsite

Groundwater Aquifers Data Source: Dept. of Environment, Water and Natural Resources - South Australia

Drillholes

Drillholes within the dataset buffer:

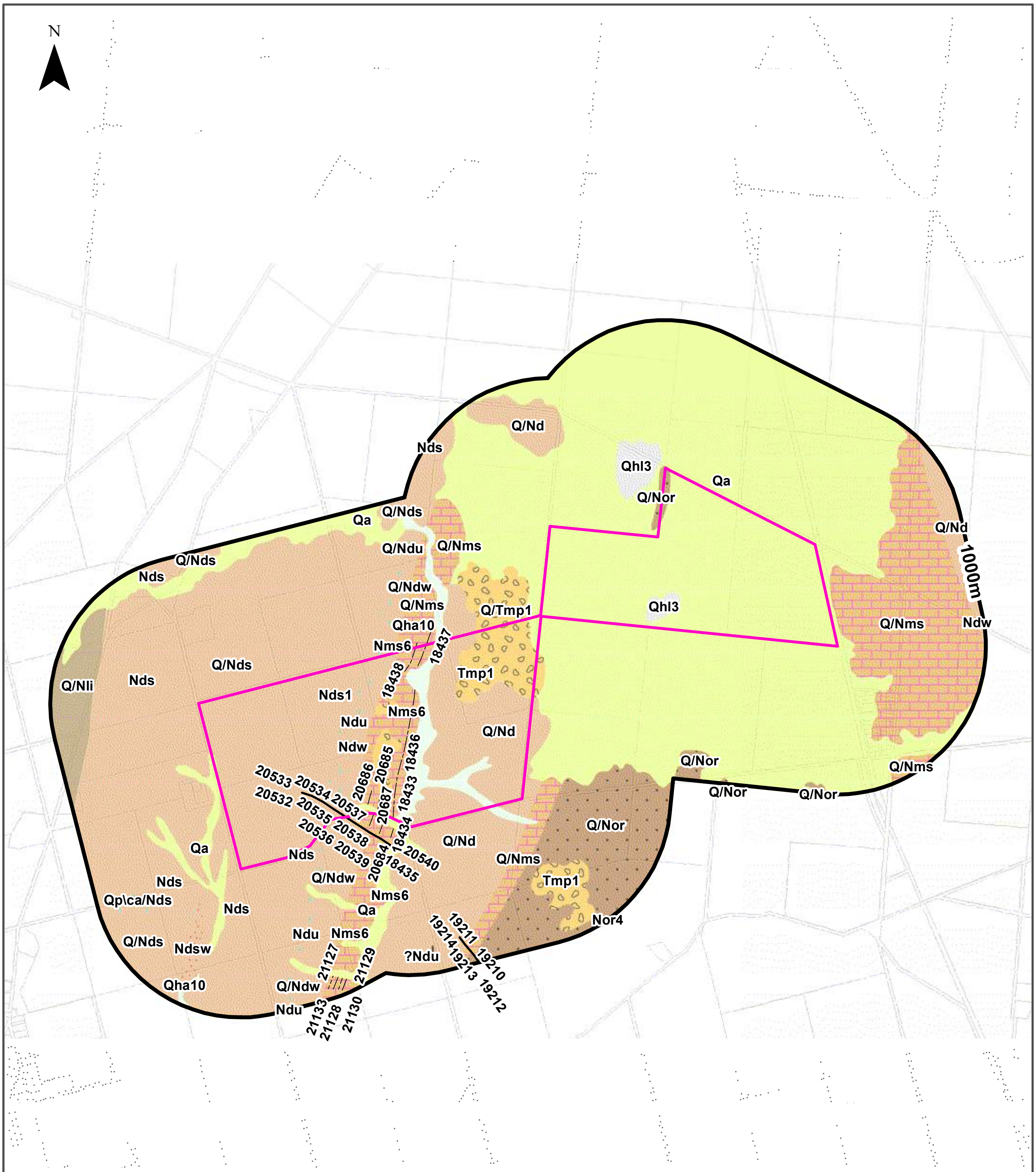
Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
185116			Domestic	2000-12-22	80.00		419.99		1546	3.7500	18.70	18.70	401.29	2790	33m	West
65137		Unknown	Domestic		38.10		421.21	6.50	3639					6473	529m	East
65138			Stock		19.00		421.42	6.50	6236		12.00	12.00	409.42	10903	595m	North East
65141					30.48		419.58	6.50	5273		12.19	12.19	407.39	9279	643m	East
65136			Stock		33.53		415.83	6.50	4047		12.19	12.19	403.64	7179	768m	North East
65139			Stock		30.48		431.28	7.00	2675					4790	1041 m	East
199919	SAW 15		Monitoring	2003-12-22	34.96	420.07	419.47	7.69	1653		16.81	16.21	403.26	2980	1179 m	West
66342				1986-01-16	73.00		419.80	7.50	1525	0.0500	3.40	3.40	416.40	2752	1240 m	South West
152523		Operational	Stock				387.08				9.47	9.47	377.61		1397 m	South West
168321			Domestic	1997-11-21	122.00		416.65		1883	20.0000	9.80	9.80	406.85	3390	1471 m	South West
66341		Backfilled		1986-01-15	43.00		409.50								1502 m	South West
65135			Stock		12.00		407.36	6.50	4396		5.90	5.90	401.46	7780	1526 m	North
270344				2012-05-08	53.00				1984	0.2000	24.50	24.50		3570	1572 m	North West
65140			Stock	1959-10-13	35.00		439.58	6.50	3528		13.60	13.60	425.98	6280	1572 m	East
181071			Stock	1992-02-12	90.00		434.76		5823	0.6250	18.70	18.70	416.06	10200	1575 m	North West
145614	PDH 6	Unknown		1990-01-01	1.83		409.13								1588 m	South West
145613	PDH 5	Unknown		1990-01-01	1.83		409.13								1588 m	South West
145612	PDH 4	Unknown		1990-01-01	6.10		409.13								1588 m	South West
145609	PDH 1	Unknown		1990-01-01	48.00		409.13								1588 m	South West
145615	PDH 7	Unknown		1990-01-01	1.83		409.13								1588 m	South West
145611	PDH 3	Unknown		1990-01-01	15.24		409.13								1588 m	South West
145610	PDH 2	Unknown		1990-01-01	36.00		409.13								1588 m	South West

Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	Yield	DTW	SWL	RSWL	EC	Dist	Dir'n
169510		Abandoned	Investigation	1998-03-30	120.00		439.94		4776	1.0000				8430	1597 m	West
169509		Abandoned	Investigation	1998-03-30	75.00		435.49		5622	0.2500				9870	1634 m	West
66680	B308	Operational	Stock		21.34		399.90	7.40	2750	0.1500	4.00	4.00	395.90	4920	1743 m	South West
66682	B310	Operational	Domestic; Observation	1940-01-01	21.34	397.00	396.85	7.32	2364	0.5000	5.37	5.22	391.63	4240	1767 m	South West
66681	B309	Operational	Domestic		7.20		397.77		2881		2.29	2.29	395.48	5150	1776 m	South West
66679	B307				7.78		401.31	8.60	2510	0.1200	4.84	4.84	396.47	4500	1787 m	South West
66675	B302	Operational	Domestic				404.31		3501	0.1900	5.48	5.48	398.83	6232	1788 m	South West
66528		Operational	Stock	1989-04-27	24.30		379.41	7.60	2334	1.0000	1.34	1.34	378.07	4190	1808 m	South West
152349		Abandoned					441.45				5.66	5.66	435.79		1810 m	West
152350		Operational	Stock	1960-01-01	36.58		443.79			0.6061					1846 m	West
66343		Operational	Irrigation	1986-01-17	42.00		395.85	7.30	1964	0.8800	1.97	1.97	393.88	3400	1862 m	South West
66684	B312	Operational	Domestic		6.10		393.13		2691		2.36	2.36	390.77	4816	1871 m	South West
66683	B311	Operational	Domestic		13.72		395.59		1800		2.57	2.57	393.02	3243	1900 m	South West
169512			Investigation	1998-03-31	100.00		427.25		7896	37.0000	10.00	10.00	417.25	13650	1919 m	West
66678	B306	Operational	Domestic		13.72		397.98		3035		2.34	2.34	395.64	5420	1929 m	South West
66677	B305	Operational	Irrigation		37.00		397.98	7.40	3041	0.8800	6.08	6.08	391.90	5430	1929 m	South West
66676	B303	Collapsed	Domestic; Observation; Stock		9.14	403.00	403.00	7.32	1928	0.3100				3470	1944 m	South West
168354			Domestic; Stock	1997-12-16	129.00		407.47		3339	0.8750	7.60	7.60	399.87	5950	1945 m	South West
66072	B304	Operational	Domestic; Observation; Stock	1983-03-06	42.00	402.00	401.88		1210	0.1900	4.64	4.52	397.36	2190	1947 m	South West
162822		Abandoned	Stock	1996-11-23	61.00		437.71								1955 m	North West
66698	B326	Operational	Domestic				400.16		3006	0.4400	2.77	2.77	397.39	5370	1957 m	South West
66699	B327	Operational	Domestic; Observation			401.00	400.60	6.99	2165	0.2500	7.42	7.02	393.58	3890	1989 m	South West

Drillholes Data Source: Dept of Environment, Water and Natural Resources - South Australia

Geology 1:100,000

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

- Site Boundary
- Report Buffer
- Property Boundary

Linear Feature

- Alluvial fan
- Dyke
- Fault
- Fold
- Gilgai
- Joint
- Lineament
- Open cut quarry
- Shear zone
- Other Linear Feature

Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Geology

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Surface Geology 1:100,000

Surface Geology Units within the dataset buffer:

Map Unit Code	Name	Description	Parent Name	Province	Age	Min Age	Max Age	Distance
Q/Nd	Bungarider Subgroup	Shale; quartzite; siltstone; dolomite; sandstone; slate.	Burra Group	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Nds	Saddleworth Formation	Mudstone; siltstone; shale, partly carbonaceous.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Q/Nds	Saddleworth Formation	Mudstone; siltstone; shale, partly carbonaceous.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Nds1		Sandstone, fine to medium-grained . BURRA 2nd edition - preliminary unit for compilation.	Saddleworth Formation	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Ndu	Undalya Quartzite	Quartzite, white to cream, medium-grained, well bedded, feldspathic; interbeds of sandy, carbonaceous and pyritic shale.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Ndw	Woolshed Flat Shale	Shale, black; dolomitic siltstone; dolomite; grey laminated siltstone.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Q/Ndw	Woolshed Flat Shale	Shale, black; dolomitic siltstone; dolomite; grey laminated siltstone.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Ndw1		Sandstone, fine-medium grained, interbeds. BURRA 2nd ed. - interim unit for compilation.	Woolshed Flat Shale	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Nms6		Lower member, typified by pale dolomite. BURRA: interim unit for compilation.	Skillogalee Dolomite	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
?Nms7		Upper member, typified by dark dolomite. BURRA: interim unit for compilation.	Skillogalee Dolomite	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Q/Nor	Rhynie Sandstone	Sandstone, coarse-grained, feldspathic, conglomeratic.	Emeroo Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
br/Nms	Skillogalee Dolomite	Dolomite; marble, with magnesite mud-pellet conglomerates.	Mundallio Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Q/Nms	Skillogalee Dolomite	Dolomite; marble, with magnesite mud-pellet conglomerates.	Mundallio Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	0m
Qa		Undifferentiated Quaternary alluvial/fluvial sediments.			PLEISTOCENE-HOLOCENE	Quaternary	Quaternary	0m
Qha10		Holocene high to low angle slope deposits. Based on Qrt (plain) on ORROROO; colluvium and alluvium, gravelly near source.			HOLOCENE	Holocene	Holocene	0m
Qhl3		Holocene claypan and lagoonal sediments. Based on Qhl on CHOWILLA.			HOLOCENE	Holocene	Holocene	0m
Q/Tmp1		Miocene to Pliocene ferruginous pebbly grit, conglomerate, fine sandstone. Based on Ts on YARDEA.			MIOCENE-PLIOCENE	Pliocene	Miocene	0m
Tmp1		Miocene to Pliocene ferruginous pebbly grit, conglomerate, fine sandstone. Based on Ts on YARDEA.			MIOCENE-PLIOCENE	Pliocene	Miocene	0m
Q/Ndu	Undalya Quartzite	Quartzite, white to cream, medium-grained, well bedded, feldspathic; interbeds of sandy, carbonaceous and pyritic shale.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	153m
?Ndu	Undalya Quartzite	Quartzite, white to cream, medium-grained, well bedded, feldspathic; interbeds of sandy, carbonaceous and pyritic shale.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	176m
Ndsw	Watervale Sandstone Member	Sandstone and quartzite, mostly medium-grained, feldspathic; sandy shale and siltstone; dolomitic sandstone and dolomite near top and base.	Saddleworth Formation	ADELAIDE GEOSYNCLINE	NEOPROTEROZOIC	Torrensian	Torrensian	355m

Qp \ca/Nds	Saddleworth Formation	Mudstone; siltstone; shale, partly carbonaceous.	Bungarider Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTERO ZOIC	Torrensian	Torrensian	603m
Q/Nli	Mintaro Shale	Siltstone, with very rare pebbles of sandstone, quartzite and limestone.	Belair Subgroup	ADELAIDE GEOSYNCLINE	NEOPROTERO ZOIC	Sturtian	Sturtian	708m
qz		Quartz veins/bodies, undifferentiated.			MISCELLANEO US			815m
?Nms6		Lower member, typified by pale dolomite. BURRA: interim unit for compilation.	Skillogalee Dolomite	ADELAIDE GEOSYNCLINE	NEOPROTERO ZOIC	Torrensian	Torrensian	844m
?Nora	Anama Siltstone Member	Siltstone and shale, carbonaceous, black; sandstone and grit, fine to very coarse-grained, interbedded; dolomite, buff, partly stromatolitic, thin beds.	Rhynie Sandstone	ADELAIDE GEOSYNCLINE	NEOPROTERO ZOIC	Torrensian	Torrensian	968m
Nor4		Siltstone, dark grey, laminated; sandstone, fine-grained interbeds; greywacke, rare. BURRA 2nd ed. interim unit for compilation.	Rhynie Sandstone	ADELAIDE GEOSYNCLINE	NEOPROTERO ZOIC	Torrensian	Torrensian	991m

Linear Structures 1:100,000

Linear geological structures within the dataset buffer:

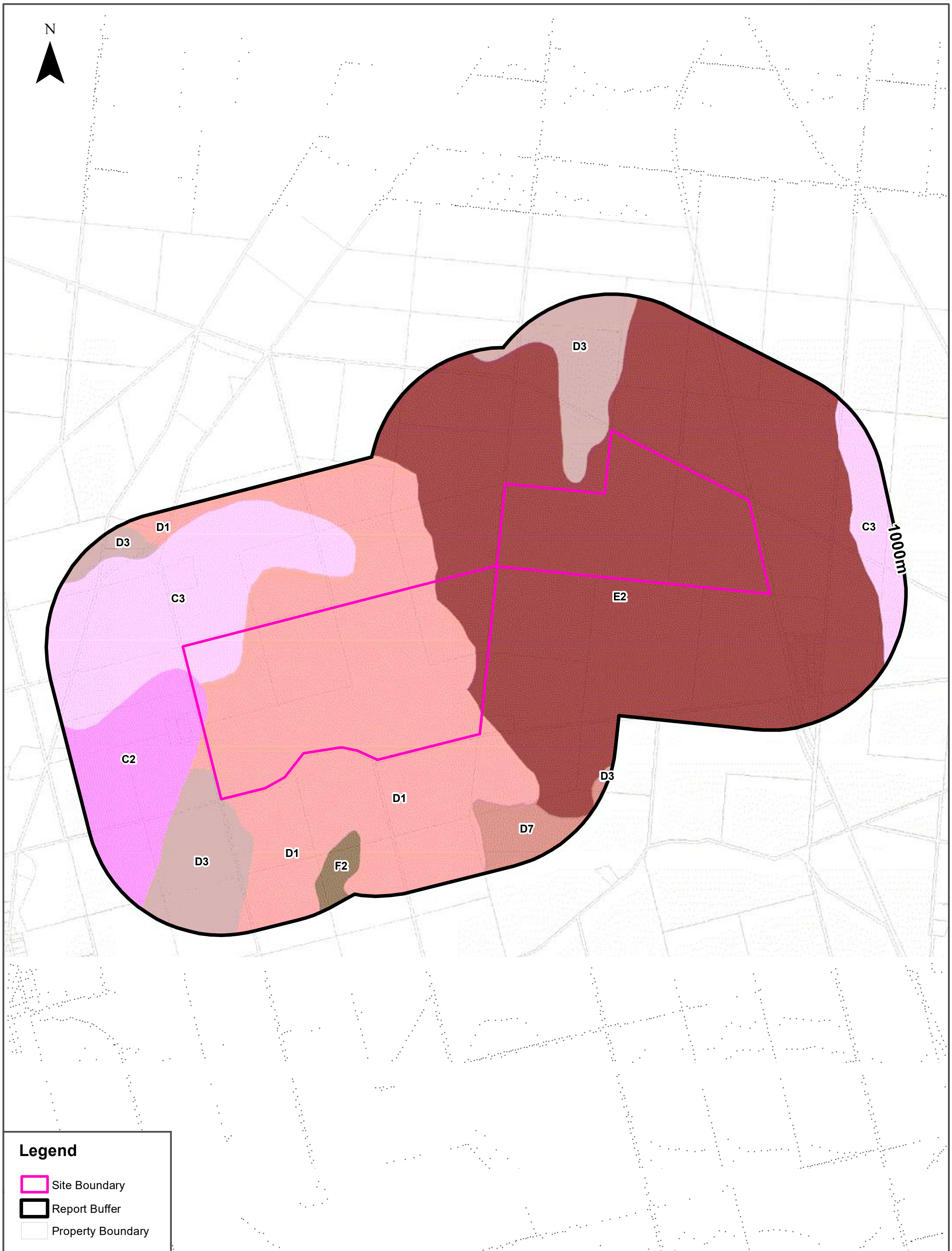
Map Code	Description	Distance
276	Trend-line	0m
25	Fault position accurate	0m
276	Trend-line	0m
276	Trend-line	0m
25	Fault position accurate	0m
276	Trend-line	0m
25	Fault position accurate	0m
276	Trend-line	0m
25	Fault position accurate	0m
25	Fault position accurate	0m
25	Fault position accurate	0m
276	Trend-line	0m
25	Fault position accurate	54m
276	Trend-line	58m
276	Trend-line	62m
25	Fault position accurate	84m
276	Trend-line	92m
25	Fault position accurate	129m
25	Fault position accurate	160m
25	Fault position accurate	803m
276	Trend-line	855m
25	Fault position accurate	856m
276	Trend-line	875m

25	Fault position accurate	877m
276	Trend-line	892m
276	Trend-line	909m
25	Fault position accurate	917m
25	Fault position accurate	950m
276	Trend-line	990m

Geology Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Types

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



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Soils

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Soil Types

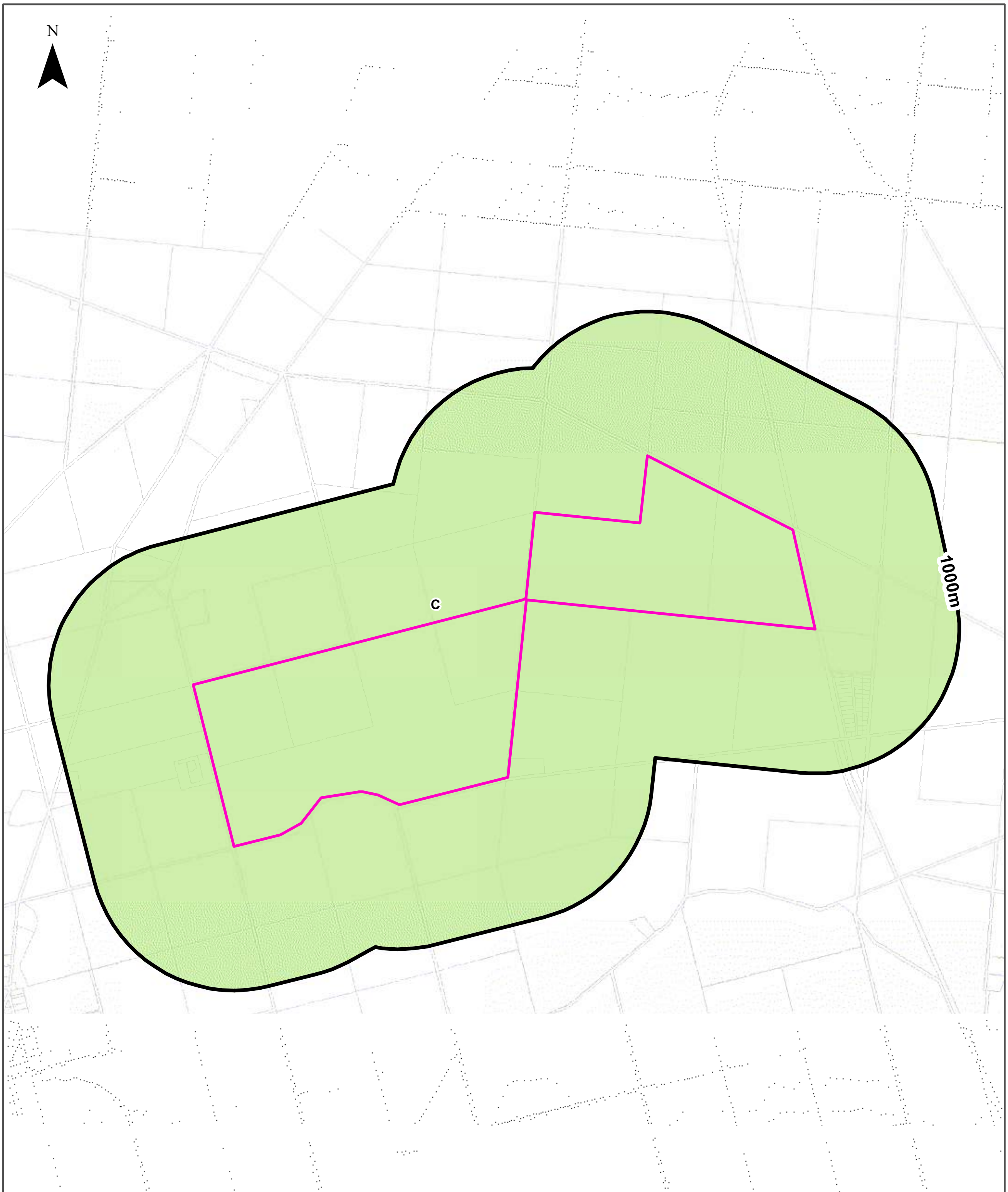
Soil types within the dataset buffer:

Map category code	Soil type description	Distance
C3	Friable gradational clay loam	0m
C2	Gradational loam on rock	0m
D1	Loam over clay on rock	0m
D3	Loam over poorly structured red clay	0m
E2	Red cracking clay	0m
D7	Loam over poorly structured clay on rock	457m
F2	Sandy loam over poorly structured brown or dark clay	542m

Soil Types Data Source: Dept of Environment, Water and Natural Resources - South Australia

Atlas of Australian Acid Sulfate Soils

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Site Boundary
Report Buffer
Property Boundary

Probability of occurrence of Acid Sulfate Soils

A. High (>70%)
B. Low (6-70%)
C. Extremely Low (1-5%)
D. No Chance (0%)

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Acid Sulfate Soils

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Atlas of Australian Acid Sulfate Soils

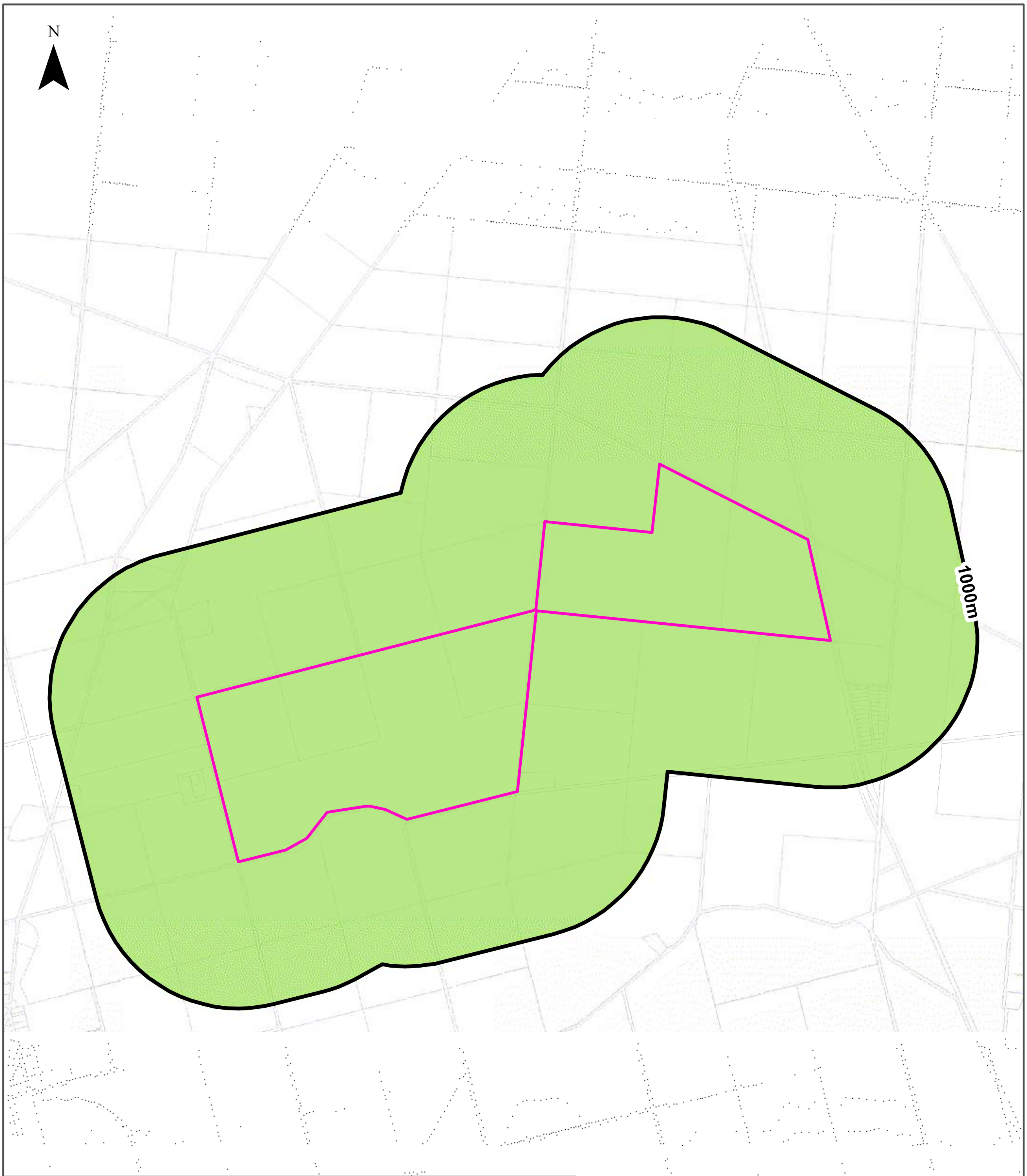
Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

Acid Sulfate Soils Potential

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Site Boundary
Report Buffer
Property Boundary

Proportion of land susceptible to the development of Acid Sulfate Soils

Negligible
1-10%
10-30%
30-60%
More than 60%
Incomplete data (usually wet inland areas)
Not applicable - No assessment/ analysis

Scale:
0 100 200 400
Meters

Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);

Coordinate System: GDA 1994 MGA Zone 54

Date: 11 September 2017

Acid Sulfate Soils

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Acid Sulfate Soil Potential

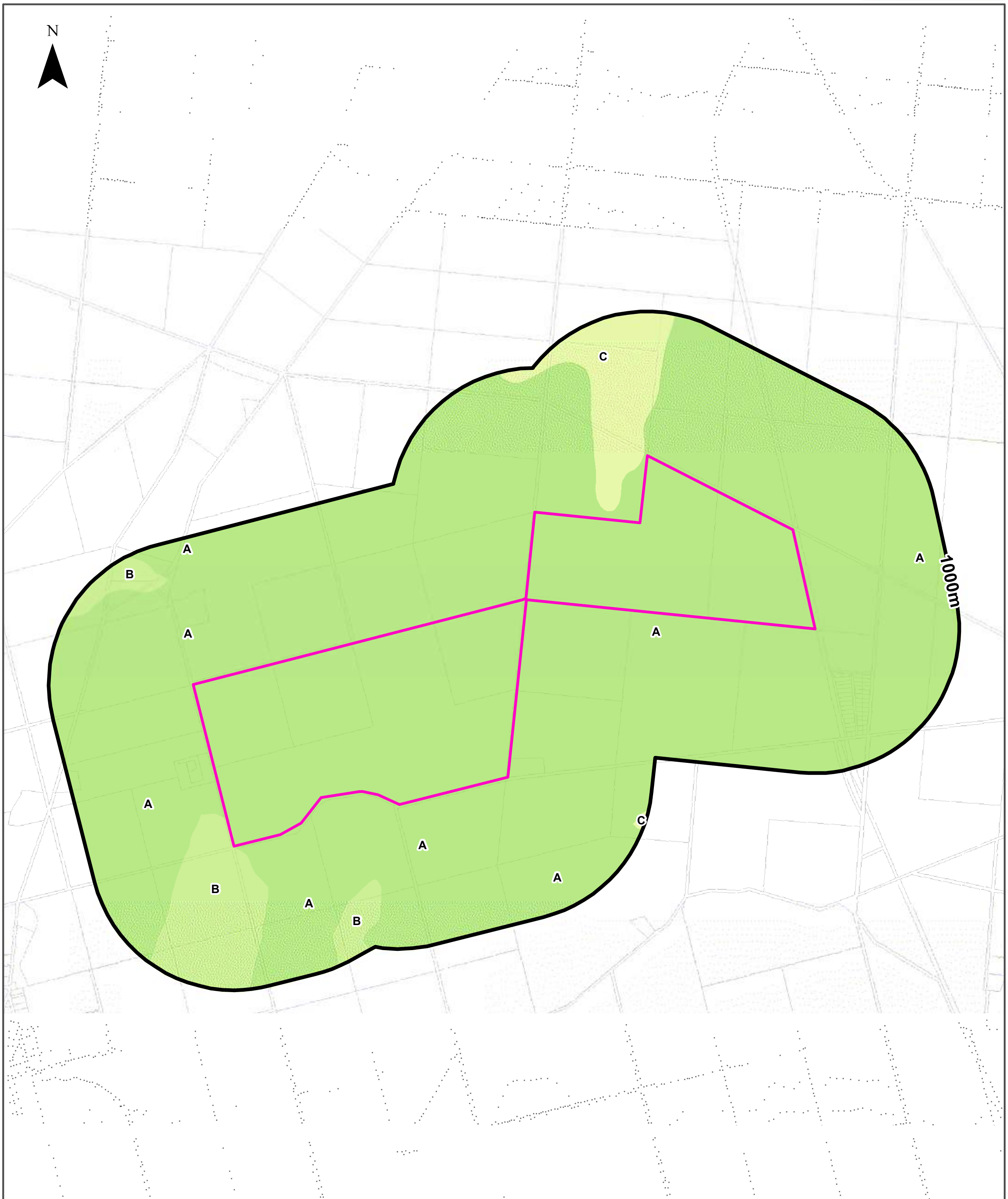
Acid sulfate soil potential within the dataset buffer:

Map category code	Proportion of land susceptible to the development of acid sulfate soils	Distance
A	Negligible	0m

Acid Sulfate Soils Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Salinity - Watertable Induced

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Severity of watertable induced soil salinity

Site Boundary	A. Negligible	D. Moderately high	G. Very high to extreme
Report Buffer	B. Moderately low	E. Moderately high to high	X. Not applicable
Property Boundary	C. Moderate	F. High	

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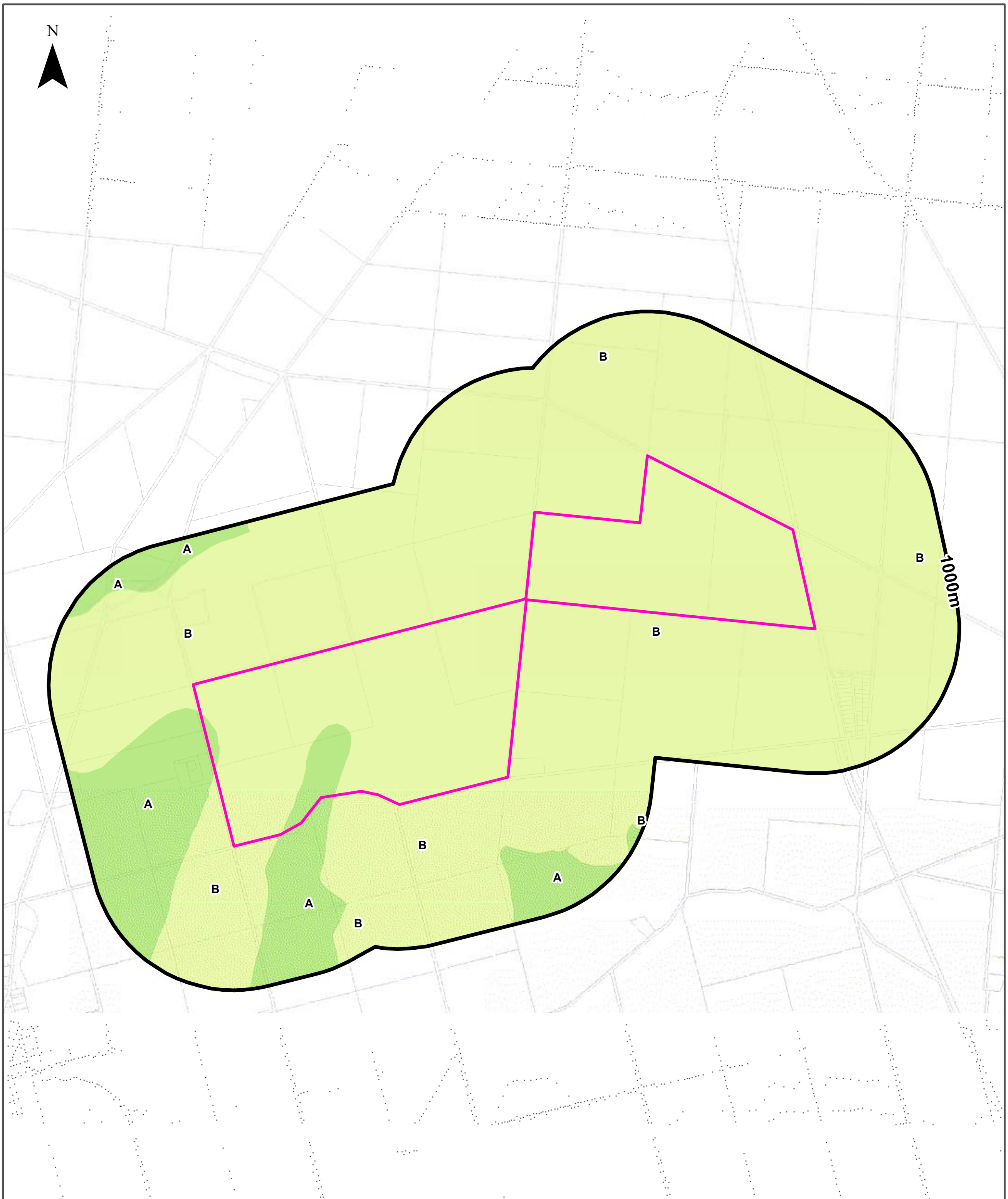
Soil Salinity - Non-watertable

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Severity of non-watertable induced soil salinity

- Site Boundary
- Report Buffer
- Property Boundary
- A. Low
- B. Moderately low
- C. Moderate
- D. Moderately high to high
- X. Not applicable

Scale: 0 200 400 800 Meters

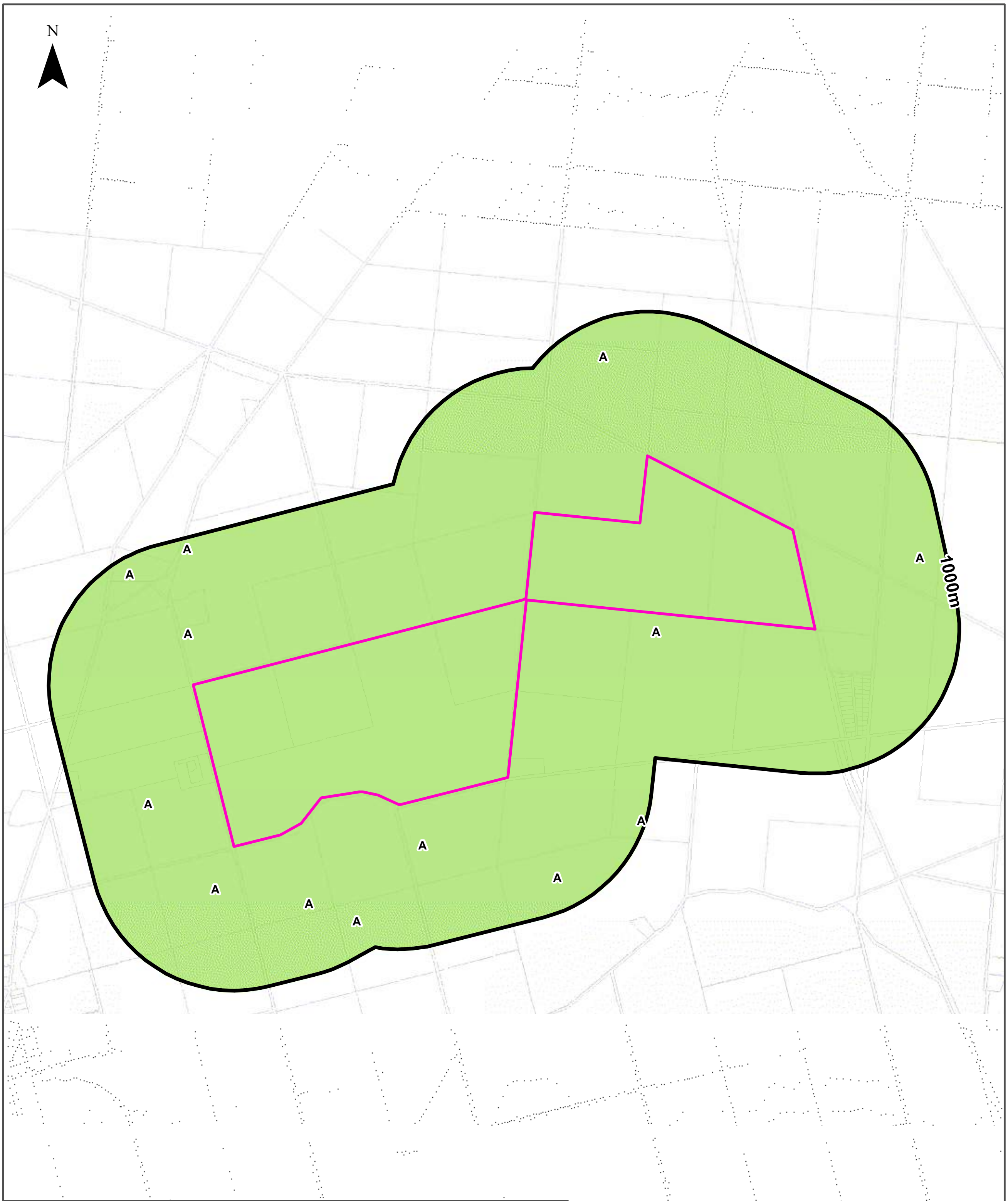
Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);

Coordinate System: GDA 1994 MGA Zone 54

Date: 11 September 2017

Soil Salinity - Non-watertable (Magnesia Patches)

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Site Boundary	
Report Buffer	
Property Boundary	

Proportion of land affected by magnesia patches

A. Negligible	C. 2-10%	E. More than 50%
B. Up to 2%	D. 10-50%	X. Not applicable

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Soil Salinity

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Soil Salinity - Watertable Induced

Watertable induced soil salinity within the dataset buffer:

Map category code	Severity description	Distance
B	Moderately low salinity, or less than 2% of land affected by highly saline seepage	0m
A	Negligible	0m
C	Moderate salinity, or 2-10% of land affected by highly saline seepage	26m

Salinity Watertable Induced Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Salinity - Non-Watertable

Non-watertable soil salinity within the dataset buffer:

Map category code	Severity description	Surface ECe (dS/m)	Subsoil ECe (dS/m)	Distance
A	Low	<2	<4	0m
B	Moderately low	2-4	4-8	0m

Salinity Non-Watertable Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Salinity - Non-Watertable (Magnesia Patches)

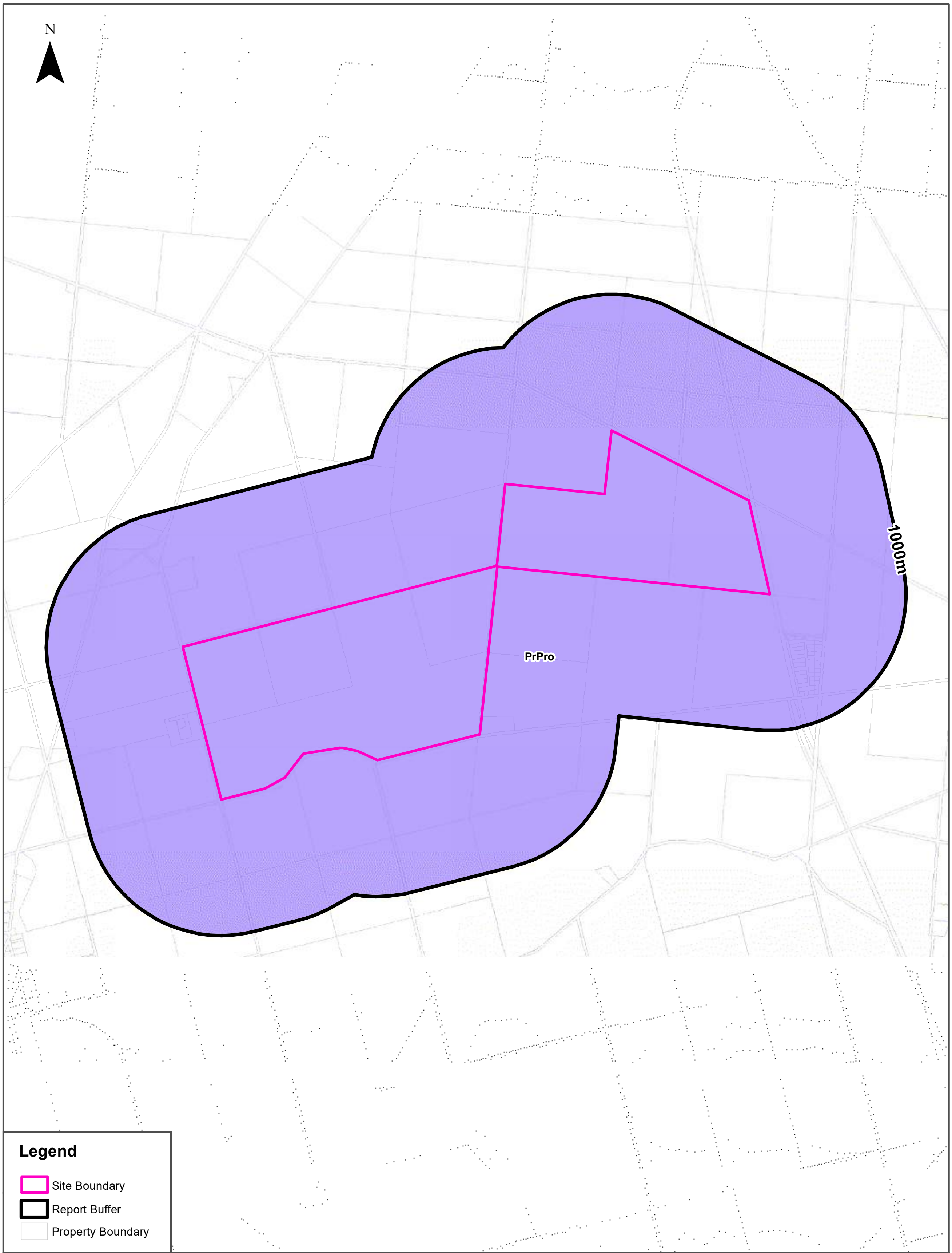
Magnesia patches within the dataset buffer:

Map category code	Proportion of land affected by magnesia patches	Distance
A	Negligible	0m

Salinity Non-Watertable (Magnesia Patches) Data Source: Dept of Environment, Water and Natural Resources - South Australia

Land Development Zones

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



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Planning

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Land Development Zones

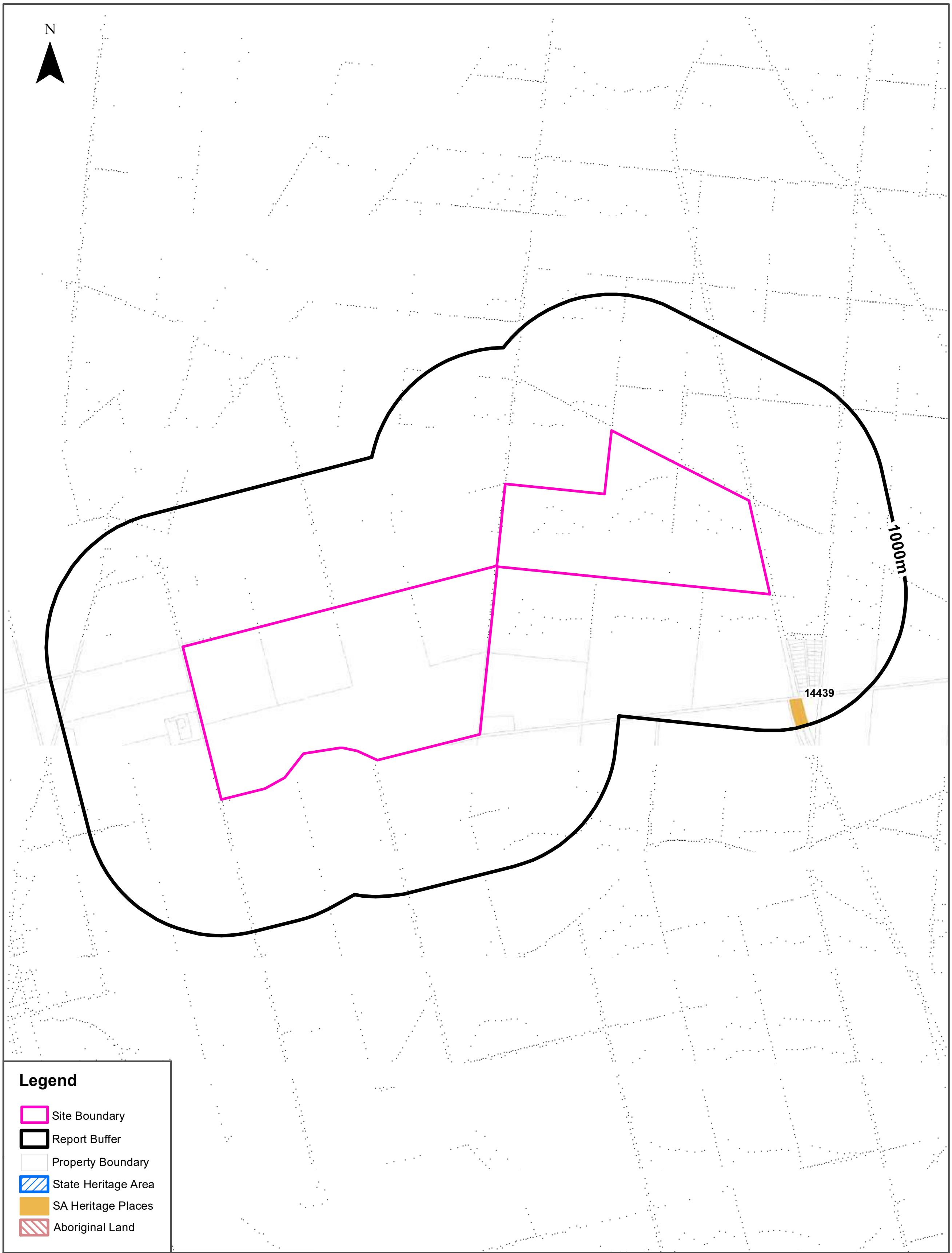
Land development zoning within the dataset buffer:

Zone Code	Development Plan Code	Zone Description	Devlopment Category	Distance	Direction
PrPro	CGV	Primary Production	PRIMARY PRODUCTION - MINING	0m	Onsite

Land Development Zones Data Source: Dept of Planning, Transport and Infrastructure - South Australia

Heritage

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Scale: 0 200 400 800 Meters	Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Heritage

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

State Heritage Areas

State Heritage Areas within the dataset buffer:

Heritage Id	Name	Distance	Direction
N/A	No records in buffer		

Heritage Areas Data Source: Dept of Environment, Water and Natural Resources - South Australia

SA Heritage Places

SA Heritage Places within the dataset buffer:

Heritage No	Location	Heritage Class	Australian Class	Details	Auth Date	Distance	Direction
14439	Bowman Road MERILDIN VIA MINTARO	State	Features related to Railways	Merildin Railway Station & Yards		790m	East

Heritage Places Data Source: Dept of Environment, Water and Natural Resources - South Australia

Aboriginal Land

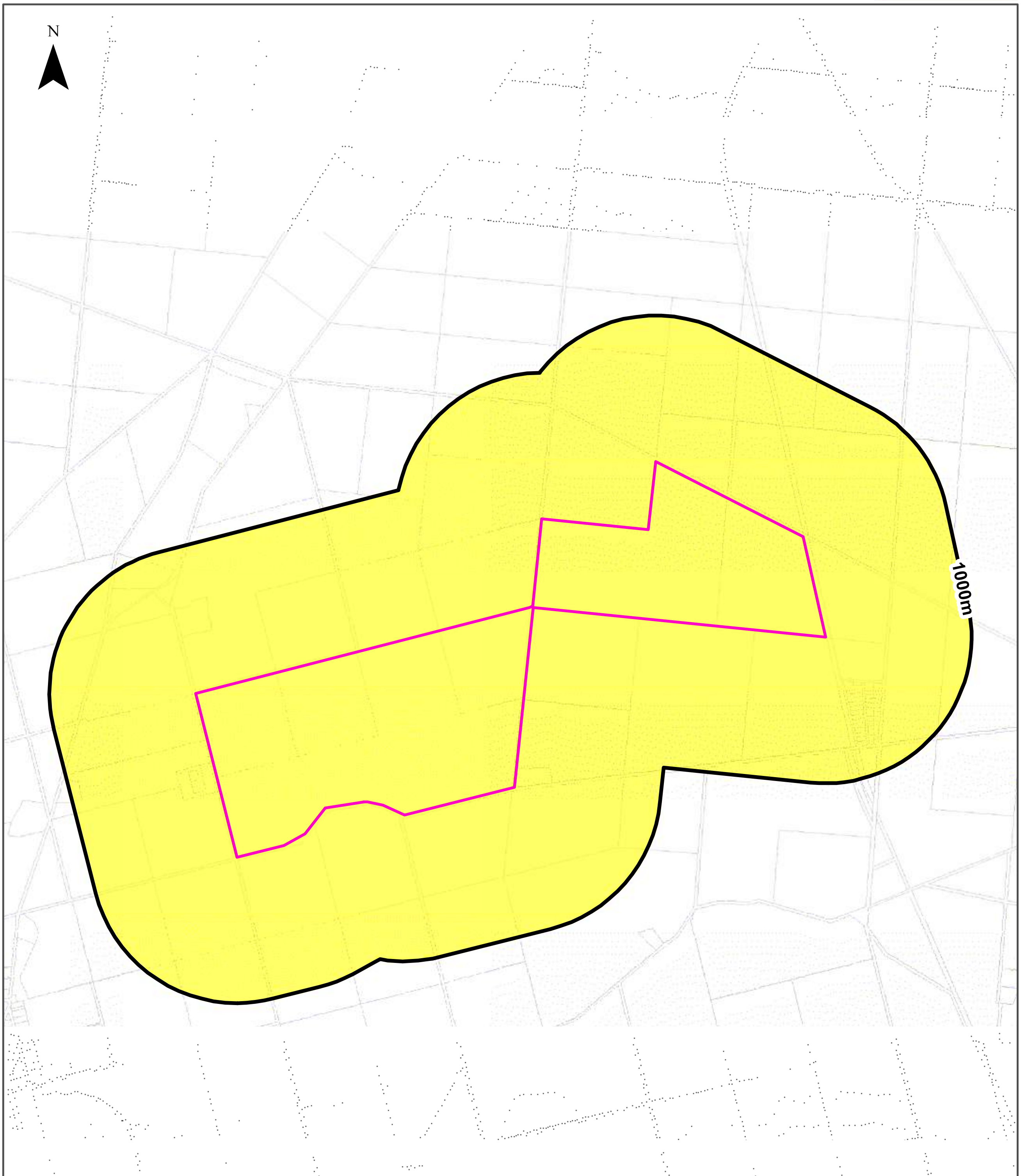
Aboriginal Land within the dataset buffer:

Map Id	Grant Date	Address	Locality	Description	Title	Distance	Direction
N/A	No records in buffer						

Aboriginal Land Data Source: Department of State Development, Resources and Energy - South Australia

Bushfire

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Bushfire History

Bushfire Protection Area - Risk Level

- High
- Medium
- General
- Excluded

Scale: 0 200 400 800 Meters	Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);	Coordinate System: GDA 1994 MGA Zone 54	Date: 11 September 2017

Natural Hazards

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Bushfire Protection Areas

Bushfire Protection Areas within the dataset buffer:

Map Id	Bushfire Risk Code	Development Plan Code	Additional Development Criteria	Distance	Direction
115	General	CGV		0m	Onsite

Bushfire Protection Areas Data Source: Dept of Planning, Transport and Infrastructure - South Australia

Bushfires and Prescribed Burns History

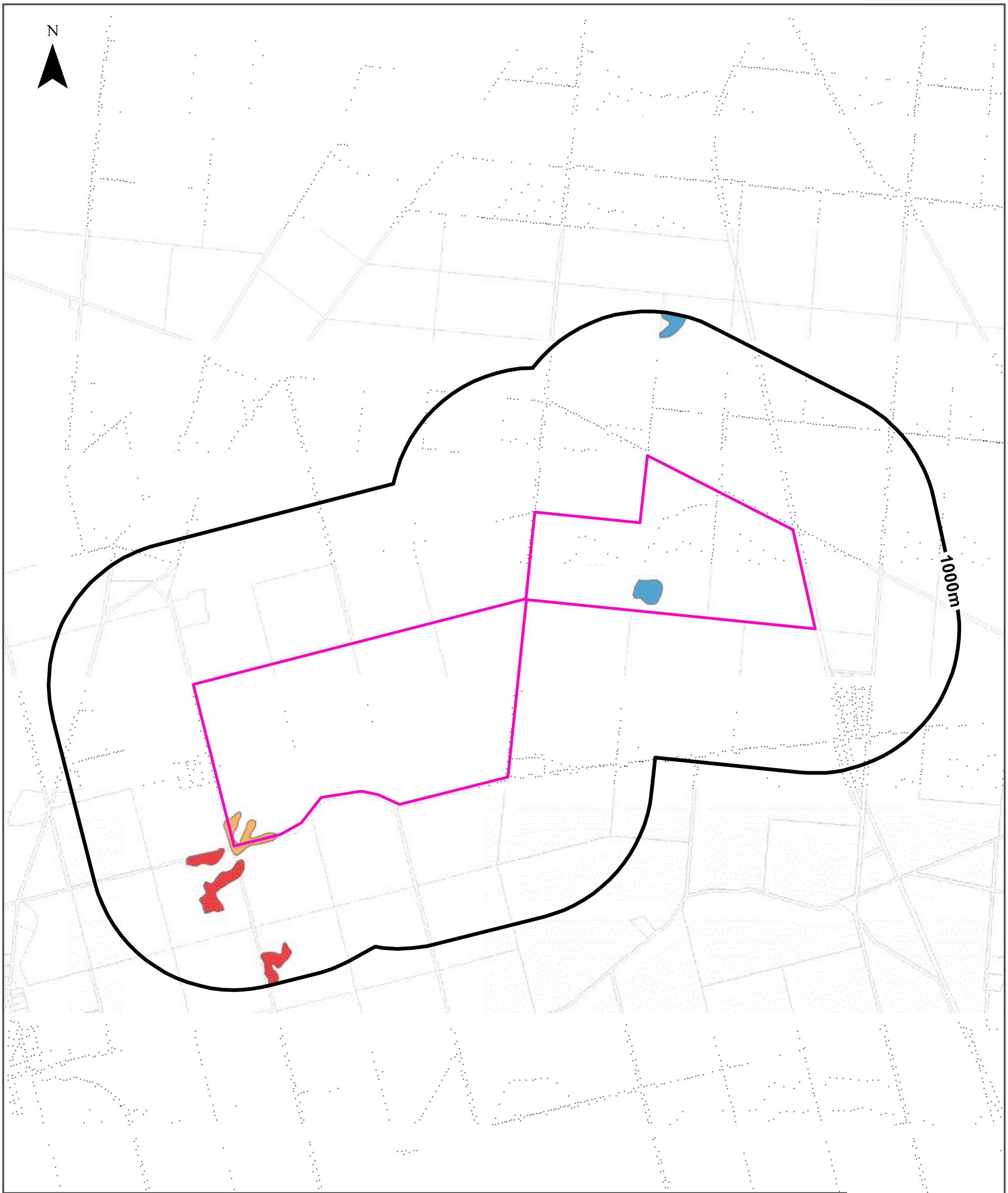
Bushfires and prescribed burns within the dataset buffer:

Map Id	Incident No.	Incident Name	Incident Type	Date of Fire	Area of Fire	Distance	Direction
N/A	No records in buffer						

Bushfires and Prescribed Burns History Data Source: Dept of Environment, Water and Natural Resources - South Australia

Groundwater Dependent Ecosystems Atlas

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415



Legend

Site Boundary
Report Buffer
Property Boundaries
High potential GDE - from national assessment
High potential GDE - from regional studies
Moderate potential GDE - from national assessment
Moderate potential GDE - from regional studies
Low potential GDE - from national assessment
Low potential GDE - from regional studies
Known GDE - from regional studies
Unclassified potential GDE - from national assessment
Unclassified potential GDE - from regional studies

Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries: ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer © Government of South Australia (Department of Environment, Water and Natural Resources);

Coordinate System: GDA 1994 MGA Zone 54

Date: 11 September 2017

Ecological Constraints

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

Groundwater Dependent Ecosystems Atlas

GDEs within the dataset buffer:

Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial		Moderate potential GDE - from national assessment	6	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		0m	Onsite
Aquatic		Low potential GDE - from national assessment	4	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Wetland		0m	Onsite
Terrestrial		High potential GDE - from national assessment	10	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		74m	South West
Terrestrial		High potential GDE - from national assessment	10	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		102m	South West
Terrestrial		High potential GDE - from national assessment	5	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Vegetation		735m	South West
Aquatic		Low potential GDE - from national assessment	4	Complex fold belt of prominent ranges in north, chiefly quartzite with vales on weaker rocks; stepped fault blocks and islands in south, mainly of weathered metamorphic rocks with ferruginous cappings.	Wetland		823m	North East

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology

Ecological Constraints

159 Hare Road, Mintaro & Government Road, Stanley, SA 5415

RAMSAR Wetlands

RAMSAR Wetlands within the dataset buffer:

Wetland	Distance	Direction
No records in buffer		

RAMSAR Wetlands Data Source: Dept of Environment, Water and Natural Resources - South Australia

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   - (f) the Report does not include any information relating to the actual state or condition of the Property;
   - (g) the Report should not be used or taken to indicate or exclude actual fitness or unfitness of a Property for any particular purpose;
   - (h) the Report should not be relied upon for determining saleability or value or making any other decisions in relation to the Property and in particular should not be taken to be a rating or assessment of the desirability or market value of the property or its features; and
   - (i) the End User should undertake its own inspection s of the Property to satisfy itself that there are no defects or failures.
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9. Subject to paragraph 7, neither Lotsearch nor the End User is liable to the other for any indirect, incidental,consequential, special or exemplary damages arising out of or in relation to these terms.
10. These terms are subject to New South Wales law.

APPENDIX F

EPA SECTION 7 SEARCH RESULTS

Environment Protection Authority
www.epa.sa.gov.au

EPA South Australia
GPO Box 2607 Adelaide SA 5001
250 Victoria Square Adelaide SA
T (08) 8204 2000 F (08) 8204 2020
Country areas 1800 623 445

WSP Australia Pty Limited
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Contact: Section 7
Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

Contact: Public Register
Telephone: (08) 8204 9128
Email: epa.publicregister@sa.gov.au

11 September, 2017

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6081 Folio 22
Address	Pieces 13-14, Allotments 109-111, 114-132, 134-136, 145-153, Pieces 166-173, 159 Hare Road, MINTARO SA 5415

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h) details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land? NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a) details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)? NO

b) details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*? NO

c) a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register? NO

d) a copy of a site contamination audit report? NO

e) details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies? NO

f) details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?* NO

g) details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?* NO

h) details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit? NO

i) details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit? NO

j) details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995? NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a) a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)? NO

b) details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?* NO

c) details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*? NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

Environment Protection Authority
www.epa.sa.gov.au

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Country areas 1800 623 445

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Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

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I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6128 Folio 159
Address	Allotment 4, Government Road, STANLEY SA 5415

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

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Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
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7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
7.10	Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land.	NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a)	details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

h)	details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land?	NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a)	details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)?	NO
b)	details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*?	NO
c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	NO
d)	a copy of a site contamination audit report?	NO
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	NO
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

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b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

WSP Australia Pty Limited
Level 1
1 King William Street
ADELAIDE SA 5000

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7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8	Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination).	NO
7.9	Section 103P - Notation of site contamination audit report in relation to the land.	NO
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i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
b)	details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-	
i)	a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or	NO
ii)	activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or	NO
iii)	any other prescribed activity of environmental significance under Schedule 1 of that Act?	NO
c)	details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
d)	details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land?	NO
e)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land?	NO
f)	details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land?	NO
g)	details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land?	NO

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c)	a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register?	NO
d)	a copy of a site contamination audit report?	NO
e)	details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies?	NO
f)	details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
g)	details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?*	NO
h)	details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit?	NO
i)	details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit?	NO
j)	details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995?	NO

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c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO

d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

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ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 36,000 talented people in more than 500 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

APPENDIX Q

ENVIRONMENTAL MANAGEMENT FRAMEWORK

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FRV SERVICES AUSTRALIA PTY LIMITED

CHAFF MILL SOLAR FARM

ENVIRONMENTAL MANAGEMENT FRAMEWORK

MARCH 2018

CONFIDENTIAL

Question today
Imagine tomorrow
Create for the future

Chaff Mill Solar Farm
Environmental Management Framework

FRV Services Australia Pty Limited

WSP
Level 1, 1 King William Street
Adelaide SA 5000
GPO Box 398
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Tel: +61 8 8405 4300
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REV	DATE	DETAILS
1	19/03/18	Draft

	NAME	DATE	SIGNATURE
Prepared by:	Erin Fitzner	19/03/18	
Reviewed by:	Bronte Nixon	19/03/18	
Approved by:	Erin Fitzner	19/03/18	

TABLE OF CONTENTS

ABBREVIATIONS

CEMP	Construction Environmental Management Plan
EMF	Environmental Management Framework
EPA	Environment Protection Authority
EPBC Act	*Environment Protection Biodiversity Conservation Act 1999*
FRV	FRV Services Australia Pty Limited
ILUA	Indigenous Land Use Agreement
MNES	Matters of National Environmental Significance
SEB	Significant Environmental Benefit
TEC	Threatened Ecological Community
WSP	WSP Australia Pty Ltd

1 INTRODUCTION

1.1 PURPOSE

WSP Australia Pty Ltd (WSP) has been engaged by FRV Services Australia Pty Limited (FRV) to prepare an Environmental Management Framework (EMF) for the proposed Chaff Mill Solar Farm, at a location north-east of Mintaro in the Clare Valley, South Australia.

This EMF has been developed to identify the environmental management and monitoring measures that would need to be implemented during the construction phase of the project. This EMF will:

- Provide a framework for the management of potential environmental impacts.
- Provide guidance to the contractor(s) and help them meet their obligations; particularly under the *Environment Protection Act 1993*.
- Address statutory requirements.
- Provide assurance to government agencies on how potential environmental impacts will be avoided or mitigated during construction.
- Detail individual environmental commitments to the project.
- Provide an overview of all environmental values of the project area in association with the implications of the construction methodology.
- Outline and discuss the implications of all relevant legislation and state and commonwealth guidelines that will need to be incorporated into management measures.
- Guide the preparation of the Construction Environmental Management Plan (CEMP) by the contractor(s).

1.2 PROJECT DESCRIPTION

FRV Services Australia Pty Limited (FRV) is seeking Development Approval for the construction and operation of a solar farm, at a location north-east of Mintaro in the Clare Valley, South Australia. The project is seeking approval under Section 49 (Crown Development) of the *Development Act 1993* as it is considered significant infrastructure for the State's development. The project sponsor for this application is the Department of State Development (DSD) and the State Commission Assessment Panel (SCAP) is the relevant authority.

The project would generate approximately 250,000 Megawatt hours (MWh) of clean, zero emission electricity each year and would make a significant contribution to South Australia's energy production and stability of supply. The project would save approximately 132,500 tonnes of greenhouse gas emissions annually. The project would contribute to achieving renewable energy objectives within local, State and Commonwealth level planning and energy policy documents. The project will also create economic benefits to the local region, including employment, investment and tourism opportunities.

2 SITE ACTIVITIES AND EXISTING ENVIRONMENT

2.1 SITE LOCATION

The proposed Chaff Mill Solar Farm is approximately 130 km north of Adelaide, located west of the Barrier Highway and east of Main North Road. The site is located approximately 3.5 km north-east of the Mintaro township in the Mid North Region of South Australia (Figure 2.1). The site consists of two land parcels located to the east and west of Chaff Mill Road on approximately 380 HA of privately owned land. FRV has negotiated the purchase of this land with the existing landowner, subject to Development Approval. The western parcel is bounded by Merildin Road to the south, Wookie Creek Road to the west, Chaff Mill Road to the east and agricultural land to the north. The eastern parcel is bounded by Faulkner Road to the north, Chaff Mill Road to the west, agricultural land to the south and a rail line to the east.

Figure 2.1 Location plan

2.2 SITE VALUES

2.2.1 FLORA AND FAUNA

The project area is mostly cleared of native vegetation and is under crop. There is a large patch of remnant *Eucalyptus leucoxylon* ssp. *pruinosa* (Inland Blue Gum) in the western corner of the western parcel, where the land is too steep to cultivate. The understory is grazed and comprised of exotic grassland species. The creek line running through the western parcel is highly degraded with very limited native understory species present. The western parcel is bordered on the western side by a relatively steep rocky escarpment.

Amenity plantings, mostly comprised of native species, occur as small patches within the project area and as narrow strips along the roadsides. Small strips of remnant native woodland and shrubland also occur along some roadside.

2.2.2 ABORIGINAL CULTURAL HERITAGE

Lichen-encrusted outcrops are present within the project area, primarily along Wookie Creek and to the west. A small borrow pit was identified featuring siltstone with quartzitic inclusions including prominent quartz veins. Loose quartz ranging considerably in size was found throughout the project area.

The project area has been subject to previous disturbance by intensive farming and is subject to considerable natural erosion. Persistent clearing of the area for agricultural related activities, and then crop cultivation and livestock grazing is evident in the general area. In general, archaeological features such as burials, fire-places and ovens, middens, preserved workshop areas etc. will be destroyed by ploughing if they occur on the surface or within the plough zone. As a plough turns the soil it displaces any archaeological deposits within that depth of soil. Material buried lower within the soil profile will remain undisturbed, unless exposed by repeated ploughing and soil erosion.

2.2.3 NON-INDIGENOUS HERITAGE

Mintaro was declared a State Heritage Area (SHA) in 1982. The designation of a State Heritage Area is intended to ensure that changes to, and development within, the area are managed in a way that the area's cultural significance is maintained (DEWNR 2015). Objectives within the Mintaro State Heritage Area include:

- Retention of the original land division pattern and orientation
- Reinforcement of the rural village character with minimal infrastructure
- Retention of significant views between buildings along Burra Street to agricultural land
- Retention and conservation of the historic buildings, structures and ruins
- Adaption of some historic buildings and structures to ensure their long-term conservation and viability
- Unity of built-form with new buildings of a sympathetic design and form to historic building
- Retention and enhancement of the town's landscape character (DEWNR 2015)

The desktop search revealed a number of places of heritage interest in the subject area. In total, the search revealed 34 places on the Register of National Estate (now non-statutory), 26 State heritage places, one State Heritage Area, and no local heritage places. Most of the registered places are located within the township, approximately 1.8-2.3 km south-west of the project site; the nearest being the Merildin Railway Station, approximately 1km south of the project site.

2.2.4 VISUAL AMENITY AND GLARE

The agricultural land use defines the area with pastural land, crop grazing, and vineyards. The landscape is predominately cleared with some native vegetation remaining along road verges, creeks and drainage lines. Existing dwellings in the area include homesteads which are scattered across the landscape and are generally located in association with agricultural buildings. There are a small number of dams within the vicinity of the project area. The closest buildings to the project area are agricultural storage buildings located at the intersection of Chaff Mill and Merildin Roads. A proposed residential dwelling is currently under construction on this property.

Through the assessment, this locality was determined to be of a low scenic quality and of low sensitivity to change. There are no significant existing features in the landscape with the potential to contribute to glare.

2.2.5 GEOLOGY

The underlying geology of the location north-east of the Mintaro area comprises recent Quaternary slope alluvium including outwash and soils, with some coarse gravels derived from older alluvium. More broadly, the Mintaro area soil comprises unbleached A_2 horizon and pedal subsoils, with soils that comprise sandy and clayey red-brown earths with dark brown cracking clay and terra rossa soils. Tertiary deposits are recorded as being present in areas of Site 1, comprising sandstone, sandy gravel, ferruginous (containing iron oxide or rust) gravel, and siliceous duricrust. Watervale Sandstone Member of the Burra Group is also present underlying areas of Site 1 and is characterised by fine to coarse grained feldspathic quartzite and orthoquartzite.

The groundwater table is generally located greater than 12 metres below ground level, although the presence of Wookie Creek indicates that groundwater may be intersected at shallower depths in some locations. Very hard rock (shale and slate) could be encountered at shallow depths in the area and soft soil materials (i.e. sand and gravel) may necessitate deeper footings. It is also known that local soils can become wet and boggy during periods of rainfall. Detailed geotechnical testing will be undertaken as part of the detailed design process.

2.2.6 TRAFFIC AND ACCESS

Mintaro is located between two major arterial roads; 13 km west of the Barrier Highway (A32 linking Gawler with Sydney via Broken Hill) and 8km east of the Horrocks Highway (the B82 -Main North Road - which joins the A32 at Giles Corner about 35km to the south and provides access to the mid-north via Clare). These roads are sealed two-lane undivided roads.

Road access to the project area is provided by:

- Merildin Road which connects Copper Ore Road approximately 600 m north of Mintaro. The south west corner of the west section land parcel at Wookie Creek Road is approximately 1.5 km east of the Copper Ore Road intersection. The south west corner of the east section land parcel is located a further 2.1 km east along Merildin Road then 1.2 km north along Chaff Mill Road.
- Wookie Creek Road (west land parcel only) which connects with Copper Ore Road at its norther end about 3 km north of Mintaro and 800 m to the north-west corner of the west section land parcel.
- Flagstaff Road which connects the Barrier Highway to the east of the project site and about 13 km north of Manoora and then via Riley Road/Merildin Road. It is about 8.5 km from the Barrier Highway to the junction with Chaff Mill Road and a further 2.1 km to the junction with Wookie Creek Road.
- Chaff Mill Road runs between the two land parcels linking Merildin Road and Faulkner Road.

These roads are all unsealed. Chaff Mill Road and Faulkner Road are narrow unsealed roads suitable for dry weather access only.

2.2.7 STORMWATER AND FLOODING

Each site is in the upper reach of a separate stormwater catchment (Wakefield River and Broughton River catchments, respectively). As such it is highly unlikely that either site would experience any flooding issues during peak storm events. No flood plain zones are located within either site.

The northern site is relatively level, with any runoff gradually flowing northward, towards Faulkner Road. The southern site is of more undulating terrain with a central watercourse draining to the south; whereby runoff at the site enters Wookie Creek and flows south, past Merildin Road.

2.2.8 SOCIO-ECONOMIC

The Clare and Gilbert Valleys Council area has a permanent residential population of approximately 9,059 (ABS 2016). The median age of the council area, at 44.4 years, is moderately greater than that of both Greater Adelaide, at 38.6 years, and the whole of South Australia, at 40 years. The area has had slow but stable population growth overall since 2006, with the exception being a small population decline of two people between 2015-2016. This slow rate of population growth may be attributed to the restructuring of farming enterprises, interstate and intrastate migration, and changing industry demands.

Key economic assets of the Yorke and Mid North region were identified as:

- Highly productive agriculture and horticultural land
- An agriculture sector which contributes 43.7% of South Australia's GSP for Grains
- Diverse landscape and scenery
- Tourism in selected districts
- Renewable energy opportunities – in 2016 the region had nearly half of all South Australia's installed wind farm capacity (Regional Development South Australia 2016).

Within the council area, primary production industries occupy a significant portion of the land. Land occupations include:

- Agriculture – 146,246.45 ha
- Food Industry – 170.5 ha
- Livestock – 11,767.7 ha

2.2.9 SITE CONTAMINATION

A preliminary site investigation was undertaken for the project to determine any potential site contamination issues within the project area. The site has operated as farm land, with several private owners, from as early as 1870 through to the present day. It is possible that potentially contaminating activities associated with farming operations occurred on site.

3 REGULATORY FRAMEWORK

3.1 LEGISLATION AND POLICY

The *Development Act 1993* and *Development Regulations 2008* are the main pieces of legislation facilitating planning and development in South Australia. The *Development Act 1993* requires that Development Approval must be sought and obtained prior to undertaking any form of development, generally defined as a change in the use of land, building work or the division of an allotment (Attorney-General's Department 2014).

The project has secured Section 49 (Crown Development) status under the Development Act, with the Department of State Development (DSD) providing sponsorship/endorsement.

The project is located within the jurisdiction of the Clare and Gilbert Valleys Council. Therefore, assessment of the project against the relevant provisions of the Clare and Gilbert Valleys Council Development Plan (consolidated 10 November 2016); and subsequent Development Approval, is required.

It is expected that referral to the following Prescribed Bodies / Referral Authorities will be required at a minimum:

- The Environment Protection Authority (EPA).
- Department Planning, Transport and Infrastructure (DPTI) (i.e. the Minister responsible for administering the *Highways Act 1926*).
- The Aboriginal Affairs and Reconciliation Division – Department State Development (AARD-DSD) (i.e. the Minister responsible for administering the *Aboriginal Heritage Act 1988*).
- The Native Vegetation Council (NVC) within the Department of Environment, Water and Natural Resources (DEWNR) (i.e. the Minister responsible for administering the *Native Vegetation Act 1991*).
- Potentially; Heritage SA (i.e. the Minister responsible for administering the *Heritage Places Act 1993*).

The development of solar farms and their ancillary infrastructure is not listed as complying or non-complying development within the relevant Development Plan zone. Therefore, the project must be assessed on its merits against the relevant objectives and principles of development control.

3.2 OTHER APPROVALS

Other environmental approvals, authorisations and permits may be required in both the pre-construction and construction phases of the project under the following acts of legislation:

- *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act)
- *Development Act 1993*
- *Environment Protection Act 1993*
- *Natural Resources Management Act 2004* (NRM Act)
- *Native Vegetation Act 1991*
- *National Parks and Wildlife Act 1972* (NPW Act)
- *Aboriginal Heritage Act 1988*
- *Native Title Act 1993.*

3.2.1 EPBC RISK ASSESSMENT

Under the EPBC Act, proponents proposing an action that may have a significant impact on a Matter of National Environmental Significant (MNES), or occurring on Commonwealth Land, must prepare a referral that will help the Commonwealth decide whether the proposal is a controlled action and requires assessment and approval.

An EPBC risk assessment was completed for the Chaff Mill Solar Farm proposal to determine the likelihood of the proposal impacting on a MNES. This risk assessment found that of the nine MNES prescribed under the EPBC Act, there are three which could potentially trigger a Commonwealth assessment for the Chaff Mill Solar Farm project:

- Nationally threatened species and ecological communities
- Migratory species protected under international agreements
- National Heritage Places

The EPBC risk assessment process was informed by a desktop assessment, including generation of an EPBC Act Protected Matters Report, Biological Database of South Australia (BDBSA) data and results from the flora and fauna survey undertaken for the project by EBS Ecology. A non-Indigenous Heritage report was also written for the project and identifies National Heritage Places within Mintaro and surrounds.

No EPBC Act listed flora species or ecological communities were observed during the flora and fauna survey however three nationally threatened species were identified as potentially occurring within the project area:

- *Dodonaea procumbens* (Trailing Hop-bush)
- Pygmy Blue-tongue Lizard (PBLT) (*Tiliqua adelaidensis*)
- Flinders Ranges Worm-lizard (FRWL) (*Aprasia pseudopulchella*)

The flora and fauna report and EPBC risk assessment found that, based on the EPBC Act Significant Impact Guidelines, the project is not considered to have a significant impact on any EPBC Act listed flora, fauna or ecological communities, for the following reasons:

- No Threatened Ecological Communities (TEC) were identified within the project area
- No EPBC listed flora species were detected or considered likely to occur within the project footprint, based on available habitat.
- No EPBC listed fauna species were detected during the survey or considered likely to occur.

The EPBC risk assessment also involved a review of solar farm projects that have been referred to the Commonwealth Environment Minister under the EPBC Act from 2016-2017. In this period, 17 (seventeen) solar farms have been referred. Of these projects, 12 (twelve) were assessed as 'not a controlled action', meaning that approval is not required if the action is taken in accordance with the referral. Four were assessed as 'not a controlled action if undertaken in a particular manner', meaning that approval is not required if the action is taken in accordance with the manner specified. One project is currently open for Public Comment, with the referral decision pending. These previous referrals illustrate that projects of a similar nature and scale to the Chaff Mill Solar Farm have been considered not to have a significant impact on MNES.

The risk assessment considered submission of a referral under the EPBC Act for the Chaff Mill Solar Farm project to be unnecessary due to:

- The existing land use of the site – the project area has been cleared and farmed for more than 100 years.
- A lack of threatened species recorded during the flora and fauna survey
- A lack of threatened species recorded in the BDBSA
- A lack of key habitat for threatened species within the project area

- The nature of the proposed development
- The distance to National Heritage Places
- The ability to manage and mitigate potential impacts through a detailed Construction Environmental Management Plan (CEMP)

3.2.2 ANCILLARY APPROVALS

The construction of the project will be subject to secondary and ancillary environmental and project approvals under predominantly State-based legislation, including:

- A range on Environmental Authorisations (e.g. licence for earthworks drainage) for prescribed activities under the *Environment Protection Act 1993*.
- Potential approvals under the *Aboriginal Heritage Act 1988*
- Applications to remove native vegetation under Regulation 12(34) – Infrastructure or Regulation 12(27) – Major Projects exemptions of the *Native Vegetation Act 1991*
- Permits under Sections 79 and 80 and Regulations 33-46 of the *Fire and Emergency Services Act 2005*.
- Wells, groundwater and water-related permits under the *Natural Resources Management Act 2004.*
- Road transport permits under the *Road Traffic Act 1961*.
- Dangerous Goods Licences under the *Dangerous Substances Act 1979.*

Table 3.1 Relevant Commonwealth legislation

LEGISLATION	RELEVANCE TO THE PROJECT	APPROVAL REQUIREMENTS / CONDITIONS
Environment Protection Biodiversity Conservation Act 1999	An EPBC risk assessment was undertaken to determine whether there was a requirement to submit the proposal to the Commonwealth Environment Minister. The risk assessment considered submission of a referral under the EPBC Act for the Chaff Mill Solar Farm project to be unnecessary.	No further action is required
Native Title Act 1993	Recognition by Australian law that Indigenous people have rights and interests to their land established through their traditional laws and customs. The Chaff Mill Solar Farm project area is covered by the Ngadjuri Nation #2 Native Title claim.	The implications of the *Native Title Act 1993* will need to be reviewed by an FRV legal representative; (depending upon land tenure details) particularly if the activities could comprise a 'Future Act' under the Act. In general, Native Title is considered extinguished with Freehold land tenure.

Table 3.2 Relevant State (SA) legislation

LEGISLATION	RELEVANCE TO THE PROJECT	APPROVAL REQUIREMENTS / CONDITIONS
Aboriginal Heritage Act 1988	If Aboriginal sites, objects and / or remains are found or need to be disturbed during the works, the contractor will undertake relevant actions according to the requirements made under the *Aboriginal Heritage Act 1988.*	Authorisation under Section 23 of the Act to damage, disturb or interfere with Aboriginal sites, objects or remains.
Environment Protection Act 1993	Under the Environment Protection Act 1993 there is a General Environmental Duty (as detailed in Part 4 (Section 25)) that specifies that a person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm. Generally, meeting the requirements of any Environment Protection Policy (under the Act) satisfies the General Environmental Duty.	Work processes will need to be mindful of the implications Section 25 of the *Environment Protection Act 1993.*
Environment Protection (Water Quality) Policy 2003	The main objective of the Water Quality Policy is to achieve the sustainable management of waters by protecting or enhancing water quality, whilst allowing economic and social development. The policy aims to achieve this objective by: — Setting environmental values and water quality objectives for streams, rivers, oceans and groundwater	Specific management and mitigation measures will need to be incorporated into the CEMP to ensure that the objectives of the Act are complied with.

LEGISLATION	RELEVANCE TO THE PROJECT	APPROVAL REQUIREMENTS / CONDITIONS

	— Establishing obligations for industry and the community to manage and control different forms of pollution
	— Encouraging better use of wastewater by
	  — avoiding its production
	  — eliminating, or reducing it
	  — recycling and re-using it
	  — treating it to reduce potential harm to the environment
	— Promoting best practice environmental management
	— Promoting within the community environmental responsibility and involvement in environmental issues
	— Setting discharge limits for particular activities.
	Any person, business or industry that fails to comply with the laws may receive an on-the-spot fine, an environment protection order, and/or face prosecution in court.	

Environment Protection (Noise) Policy 2007	The General Environmental Duty provisions in Section 25 of the Act must be complied with by taking all reasonable and practicable measures to minimise environmental harm.	Noise issues associated with investigative works should be mindful of the requirements and implications of the Noise Policy. In particular, provisions of Part 4 – General noise control provisions should be considered.
Environment Protection (Waste to Resources) Policy 2010	Construction activities must aim to achieve sustainable waste management through the application of the waste management hierarchy.	The CEMP should include a waste management plan.
Native Vegetation Act 1991	Any vegetation clearance that may be required needs approval under the *Native Vegetation Act 1991*. Once the project footprint is finalised, the extent of vegetation removal required will need to be determined to calculate the required Significant Environmental Benefit (SEB) offset. The provision of an SEB can be undertaken in several forms including managing and conserving areas of native vegetation, undertaking native vegetation restoration activities or making a payment into	Native Vegetation Clearance approval and SEB calculations and recommendations.

LEGISLATION	RELEVANCE TO THE PROJECT	APPROVAL REQUIREMENTS / CONDITIONS
	the Native Vegetation Fund. Potential opportunities to achieve an SEB offset within or surrounding the project area should be identified.	
Natural Resources Management Act 2004	The *Natural Resources Management Act 2004* seeks to promote sustainable and integrated management of the State's natural resources. The *Natural Resources Management Act 2004* provides laws on water, land, animal and plant control.	A Water Affecting Activities Permit may be required if the project includes any activities that may potentially have an adverse effect on the health or condition of water resources. Permits are also required under the *Natural Resources Management Act 2004* for activities relating to wells. The site contains weeds declared under the *Natural Resources Management Act 2004*. These species have Declared Plant Policies which should be reviewed to relevance to the CEMP.

4 KEY ENVIRONMENTAL ISSUES AND RISKS

4.1 RISK ASSESSMENT METHODOLOGY

Risk assessments are a key component of any EMF and CEMP. They identify those activities with the potential to cause environmental impact. The construction contractor will be required to identify all potential environmental risks with a risk assessment format as outlined below.

In general, risk assessments are presented as a comprehensive list of aspects (those parts of the project that interact with environment), activities and corresponding impacts (termed environmental impacts). Impacts are subject to a risk assessment process by which the likelihood and consequence of each impact are judged to determine the overall risk profile. A preliminary review of environmental risks associated with the Chaff Mill Solar Farm has been undertaken and is included in below. The preliminary assessment identifies the key risks which will need to be further developed by the construction contractor in the Chaff Mill Solar Farm CEMP.

The methodology used to undertake the preliminary environmental risk assessment (qualitative) involved the following key steps:

1. Determination of the environmental aspects for the works through assessment of the type of construction activities that will interact with the environment.
2. Identification of risks by analysing how the activities may impact the environmental values.
3. Assessment of the risk associated with the potential impacts and activities in terms of their likelihood and the consequence of the risk occurring. The risk level has been calculated based on application of the risk analysis criteria in Table 4.5.
4. Determining appropriate mitigation measures to reduce the consequence and likelihood of the risk occurring to prevent environmental harm.
5. Assuming the implementation of these control measures, re-calculation of the likelihood and consequence of the risk to identify the resulting residual risk.

4.1.1 LIKELIHOOD/CERTAINTY OF RISK

Likelihood is defined as ‘the chance of something happening’ (AS/NSZ/ISO 31000:2009). Likelihood is determined by available evidence, previous experience and professional judgement. Table 4.1 outlines the definitions used for likelihood of a consequence or impact occurring.

Table 4.1 Risk assessment criteria - qualitative measures of likelihood

DESCRIPTOR	DEFINITION
Almost certain (AC)	Expected to occur in the course of most normal circumstances
Likely (L)	Could occur in the course of most normal circumstances
Possible (P)	May occur in the course of normal circumstances
Unlikely (U)	Is possible, but not likely to occur in the course of normal circumstances
Remote (R)	May occur in exceptional circumstances

4.1.2 CONSEQUENCE / SIGNIFICANCE OF IMPACTS

By definition, consequence is 'the outcome of an event affecting objectives' (AS/NZS/ISO 31000:2009). Consequence is informed by a number of factors, including:

- spatial extent – local (works site and nearby surrounding areas)
- duration – short-term, medium-term, or long-term
- nature – whether an impact is:
  - reversible or irreversible
  - direct, indirect or cumulative; or
  - positive, negative or neutral.

Assessment of the consequence of an impact may be informed by some of the above factors, with assessments based on available evidence, previous experience and professional judgement. The criteria used to assess the consequence or impact of an activity is provided in Table 4.2

Table 4.2 Risk assessment criteria – significance of (unmitigated) risk

DESCRIPTOR	DEFINITION
Negligible (N)	Impact likely to be very short-term and readily reversible (insignificant) Resilient or highly disturbed receiving environment/population
Low (L)	Impact likely to be short-term and reversible Resilient or disturbed receiving environment/population
Moderate (M)	Impact likely to be medium-term and reversible
High (H)	Impact likely to be medium to long-term and potentially irreversible Sensitive receiving environment/population
Sever (S)	Impact likely to be long-term and irreversible Highly sensitive receiving environment/population

The significance of a risk, in an unmitigated scenario, has been determined by combining the likelihood determinations of an impact in accordance with the risk matrix illustrated in Table 4.3 below.

Table 4.3 Qualitative risk analysis matrix – level of risk

LIKELIHOOD	CONSEQUENCES				
	Negligible	Low	Moderate	High	Sever
Almost certain (AC)	**L**	**M**	**M**	**S**	**S**
Likely (L)	**L**	**M**	**M**	**H**	**S**
Possible (P)	**L**	**L**	**M**	**H**	**H**
Unlikely (U)	**N**	**N**	**L**	**M**	**H**
Remote (R)	**N**	**N**	**L**	**M**	**H**

4.1.3 RESIDUAL (MITIGATED RISK)

Residual risk was determined by considering the significance of an impact and the manageability of that impact (the ability of the impact to be managed or mitigated using proposed measures). Similar to consequence of ratings, a number of factors were considered in determining the rating. Table 4.4 defines the ratings used to determine the residual risk of impacts associated with the Project.

Table 4.4 Risk assessment criteria – significance of mitigated risk

DESCRIPTOR	DEFINITION*
Negligible (N)	— Impact likely to be very short-term and readily reversible (insignificant) — Resilient or highly disturbed receiving environment/population — Impact understood/common — No or very few mitigation measures required
Low (L)	— Impact likely to be short-term and reversible — Resilient or disturbance receiving environment/population — Impact well understood/common — Standard, few mitigation measures required (mitigation measures that are required are measures are highly effective in eliminating or avoiding the impact)
Moderate (M)	— Impact likely to be medium-term and reversible — Resilient or disturbed receiving environment/population — Impact understood — Standard set of mitigation measures required — Medium likelihood that potential risk/impact can be mitigated based on proven experience or similar projects and/or specialist knowledge
High (H)	— Impact likely to be medium to long-term and potentially irreversible — Sensitive receiving environment/population — Impact not well understood — Low likelihood that potential risk/impact can be mitigated based on proven experience or similar projects and/or specialist knowledge
Severe (S)	— Impact likely to be long-term and irreversible — Highly sensitive receiving environment/population — Impact not understood (high level of uncertainty) — Very low likelihood that potential risk/impact can be mitigated based on proven experience or similar projects and/or specialist knowledge

*Impacts do not have to meet all criteria to fall within one category (i.e. an activity can be classified 'high impact' because it is located in a sensitive receiving environment, even though the impact is well understood).

4.2 RISK ASSESSMENT FOR CHAFF MILL SOLAR FARM PROPSOAL

Table 4.5 provides the details of the preliminary environmental risk assessment undertaken for the Chaff Mill Solar Farm. The risk assessment is intended to provide a starting point which would be further developed in the CEMP.

Table 4.5 Preliminary environmental risk assessment

ENVIRONMENTAL ASPECT	ACTIVITY	POTENTIAL IMPACT	UNMITIGATED RISK			RESIDUAL RISK			ENVIRONMENTAL MANAGEMENT OBJECTIVES AND INDICATORS
			Likelihood	*Consequence*	*Rating*	*Likelihood*	*Consequence*	*Rating*	
Water quality protection, erosion and sediment control	Operation of plant/machinery. Construction of footings.	Erosion Water pollution	**L**	**M**	**M**	**P**	**M**	**M**	— A Soil Erosion and Drainage Management Plan should be prepared for this project which includes, as a minimum, site plans indicating the proposed types of sediment and erosion control measures that will be used and their locations.
Aboriginal cultural heritage	Operation of plant/machinery. Construction of footings.	Disturbance to cultural heritage sites or areas of archaeological sensitivity.	**P**	**H**	**H**	**R**	**M**	**L**	— Ensure that on-site personnel are made aware of the potential sensitivity of the area regarding Aboriginal heritage any potential sites of Aboriginal heritage significance. — In the event that potential human skeletal material is uncovered, work will cease within 25 metres of the material and the find reported to police and the project manager. — In the event that artefacts or material of suspected Aboriginal origin is discovered work will cease within 25 metres of the material and the find reported to the project manager, which will in turn contact an Archaeologist.
Noise and vibration	Operation of plant/machinery.	Noise disturbance to sensitive receptors.	**L**	**L**	**M**	**P**	**L**	**L**	— All construction activities will be in accordance with the SA EPA Noise Policy 2007 and EPA Construction Noise Information Sheet (EPA 425/10). — Construction noise resulting in noise with an adverse impact on amenity must not occur on a Sunday or other public holiday, and must not occur on any other day except between 7am and 7pm.

									— Where possible, stationary constant noise sources will be located as far as possible from nearby receivers. — Where possible, low vibration alternatives for plant will be implemented.
Storage of hazardous substances	Storage of fuels and chemicals (not specifically proposed as part of the works, but may occur).	Contamination of surrounding environment.	**U**	**H**	**M**	**R**	**H**	**M**	— Ensure that waste and hazardous materials are stored and disposed of appropriately, with minimum impacts on the environment. Ensure that the risk associated with the storage and use of dangerous substances is minimised — Contact project manager and appropriate agency (SES, EPA) in the event of an emergency. — Store chemicals and materials on a flat, safe site, away from the canopy zone of trees. — Only refuel in this delineated flat zone. — Hazardous substances must not come into contact with the soil surface. — Store chemicals and dangerous substances in sealed containers (e.g. portable bunding). — Minimise the amount of dangerous substances and chemicals stored on site. — Use trays to catch any chemical drips during repair works. — Wastewater from repair works should be collected and disposed of appropriately. — Store chemicals and dangerous substances in accordance with relevant legislation and standards. — Inspect for leakages regularly and replace/fix. — Use licenced contractors. — Dispose of chemicals and substances off site. — Store chemicals and dangerous substances in sealed containers.

									— Maintain records of all dangerous substances and chemicals on site. — Identify each container of chemicals or dangerous substances by use of labels and correct identification.
Weeds, pests and disease control	Waste generated from activities on site. General waste (e.g. litter). Use of vehicles and machinery.	Waste entering receiving environment impacting on flora and fauna (e.g. litter). Spread of existing weeds and introduction of new weed species.	**P**	**M**	**M**	**U**	**M**	**L**	— The Contractor shall implement practices to ensure that pests and weeds are not introduced to the construction area by construction activities. — Any weeds in the area that may have been exacerbated as a result of works will need to be controlled once works are complete. — Rubbish should be stored and disposed of appropriately in covered bins.
Flora and fauna	Operation of plant/machinery. Construction of footings.	Degradation of vegetation quality. Disturbance to native fauna species. Unnecessary vegetation clearance.	**P**	**M**	**M**	**U**	**M**	**L**	— There will be no unnecessary removal of vegetation. — Any vegetation removal, including weeds, must be approved prior to works. — Impacts to native vegetation should be avoided at all costs. Removal of potential native vegetation would require an application to the Native Vegetation Council of South Australia and subsequent approval prior to works. — Prior to any vegetation removal (even weedy vegetation) a fauna inspection will take place. These inspections will be undertaken by appropriately qualified and experienced persons. — In addition to pre-vegetation removal checks for fauna species, daily checks shall be undertaken during construction for any fauna that may be trapped within the site. Any fauna shall be removed or relocated away from the construction area. This work shall be undertaken by appropriately qualified and experienced persons.

									— If any fauna species are injured on site, the RSPCA will be contacted. — Avoid stockpiles of waste or other materials for long periods of time. — Store all waste in enclosed bins and dispose of regularly. — Do not bury potential habitats with waste, sediment or other material. — Restrict access to any known sensitive areas by using fencing.
Air quality and dust suppression	Use of vehicles and machinery. Excavation	Generation of dust other air-borne pollutants.	**L**	**M**	**M**	**P**	**M**	**M**	— Minimise the clearance of areas. — Maintain levels of dust and air-born particles to a level lower than those specified by relevant standards and legislation. — Water access tracks if needed. — Undertake activities with a potential to cause excessive amounts of dust or air-born particles only during appropriate weather conditions. — Cover or enclose materials with the potential to become airborne. — Store materials and chemicals in sealed containers. — Select materials, paints and chemicals which have minimal potential to contaminate air. — Equip machinery and equipment with adequate emission controls. — Maintain machinery and equipment regularly. — Seal all paint and chemical containers when not in use. — Maintain levels of emissions in accordance with EPA standards and relevant legislation. — Undertake activities with a potential to cause excessive amounts of odour only during appropriate weather conditions. — Select materials, paints and chemicals which have minimal potential to cause a nuisance by way of odour. — Store all waste in bins.

Materials, fuels and waste management	Storage of materials on site. Temporary storage of waste on site and disposal.	Waste entering receiving environment. Large volumes of material sent to landfill. Inappropriate storage impacting on the environment.	**L**	**M**	**M**	**U**	**M**	**L**	— Plan works to minimise materials waste. — Reuse old materials suitable for other uses where possible. — Recycle waste where possible. — Store waste from ablution facilities appropriately (e.g. in tanks). — Store waste in enclosed bins with no exposure to the elements. — Store waste in accordance with Australian Standards, Codes of Practice and relevant legislation. — Store materials and waste on a flat, safe site, at least five metres from the watercourse and away from the canopy zone of trees. — Only refuel in this delineated flat zone. — Fuels must not come into contact with the soil surface. — Avoid large stockpiles of materials on site. — Avoid overloading bins. — Avoid storing waste on site for long periods of time. — Provide sufficient recycling and waste bins on site. — Use licenced contractors for the disposal of waste. — Dispose of waste on a regular basis or as needed. — Maintain records of disposal times and contractors.

5 ENVIRONMENTAL MANAGEMENT

5.1 MANAGEMENT AND CONTROL OF IMPACTS

Table 4.5 in Section 4.2 identifies the measures that need to be incorporated into the contractor's CEMP to ensure compliance with the relevant legislation and approvals in terms of the management of environmental risks.

The operation and maintenance of the Chaff Mill Solar Farm would have minimal environmental impact.

5.2 TRAINING, INCIDENTS, INSPECTION AND REPORTING

5.2.1 TRAINING

Prior to the commencement of works the contractor shall ensure that all onsite personnel are informed of the environmental issues and specific risks associated with the works and the mitigation measures to address these risks. This should be undertaken during site inductions and should include:

- familiarisation with the requirements of the CEMP;
- environmental emergency response training;
- familiarisation with the site environmental controls specified in the CEMP; and
- familiarisation with the use of plant and materials for efficiency and minimise of potential environmental impacts.

Records of all training shall be maintained and kept on site. The records should include details on: who was trained; when training was undertaken; name of trainer; and description of training content.

In addition, prior to commencement of works onsite the contractor shall ensure that all personnel directly involved in the implementation of the CEMP and the installation of the maintenance and control measures for this contract:

- have demonstrated competence and suitable experience in environmental management in a site investigation environment; and
- have successfully completed an accredited training course which addressed management practices for containment of spills/hazardous.

5.2.2 INCIDENT MANAGEMENT

In the event that environmental incident occurs in relation to the works, the contractor(s) shall:

- Take immediate action to avoid continuance of the incident (which may include cessation of the work), and to minimise the effect of the incident on the environment.
- Immediately notify FRV, the Environment Protection Authority (EPA) and Council of the incident (or by 9 am the next working day if the incident occur outside of working hours).
- Submit to FRV for review of incident report within 7 days of the incident. The incident report shall include photographs where available and cover details of the incident, and the proposed corrective action to avoid a re-occurrence.

5.2.2.1 SPILLS/EMERGENCIES

Prompt and effective emergency response reduces losses and the consequences of spills. Should an incident/spill occur, a full environmental investigation shall be carried out by the contractor. In the event that spills occur the contractor, in consultation with FRV, shall follow the following procedures:

1 minimise the spill: turn off valves, taps;

2 contain the spill: use of bunds, catching trays; and

3 isolate the area.

If there is a spill of a flammable material, the contractor must call the fire service and notify FRV. There should be no attempt to contain spills containing acids. The fire service shall be called immediately.

5.2.3 NON-CONFORMANCE AND CORRECTIVE ACTION

The contractor shall establish, implement and maintain an incident system to deal with actual and potential non-conformities and for taking corrective and preventive actions that arise from site works. The system will define requirements to:

- identify and correct non-conformities and take action to mitigate their environmental impacts;
- investigate non-conformities, determine their cause and take action to prevent their recurrence;
- evaluate the need for action to prevent non-conformities and implement appropriate actions designed to avoid their occurrence
- record the results of corrective action and preventive action taken; and
- review the effectiveness of corrective action and preventive action.

Incident investigations should be closed out within a reasonable timeframe as agreed with FRV. Suggested environmental incident categories and incident notification processes according to the incident category are detailed in Table 5.1.

Table 5.1 Recommended environmental incident categories

INCIDENT CATEGORY	DEFINITION	RECOMMENDED NOTIFICATION PROCESS
Minor	Where the environmental impact is limited and is confined within the work site. Environmental impacts are readily addressed through clean-up or changes to work practices. NB: minor incidents that have a high frequency of recurrence are indicative of underlying issues associated with work practices. This in turn increases the potential for these minor incidents developing into significant incidents.	Observer(s) notifies the Project Manager by end of the working day.
Significant	Incident involving off-site environmental impacts that requires significant resources to address. Non-compliance with statutory requirements or environmental criteria requiring reporting to authorities.	Observer(s) notifies the Project Manager upon completion of remediation actions. FRV Project Manager notified upon completion of initial incident assessment.
Major	Any on-site or off-site environmental incident resulting in significant long-term environmental impacts (e.g. actual pollution of environment or offsite fuel spills). An incident resulting in prosecution under environmental laws.	Observer(s) notifies the Project Manager immediately. Project Manager notifies the FRV Project Manager immediately and a decision is made as to how FRV will internally deal with situation.

5.2.4 MONITORING AND INSPECTION

The contractor should appoint a suitably qualified environmental officer with regular onsite attendance to ensure and supervise the implementation of the CEMP and to determine the effectiveness of the mitigation measures detailed in the CEMP. The monitoring and inspection should be undertaken at three defined intervals:

- at the commencement of works to ensure that appropriate measures at put in place and all site personnel are familiar with CEMP requirements;
- at a time when the works are being undertaken; and
- at the end of the works to ensure that the site is returned to its original state.

An inspection record will be provided to the FRV Project Manager. Any issues observed during the inspection will be raised with the FRV Project Manager at the time of the inspection and measures to resolve issues will be identified.

5.2.5 REPORTING

The contractor shall notify FRV within 24 hours of all environmental inspection, correspondence and/or discussions with the EPA or other authorities. The inspection records should be incorporated into the Preliminary Survey Report and the Final Survey Report with details of conformance.

5.3 ENVIRONMENTAL RESPONSIBILITIES

This section outlines the key responsibilities of the appointed construction contractor(s) for Chaff Mill Solar Farm construction activities.

The successful contractor will be required to develop a detailed CEMP to address all aspects identified in this EMF and meet all relevant legislation and best practice standards. Table 5.2 identifies the minimum environmental responsivities for various personnel, however it is expected that these roles and responsivities will be further defined in the CEMP.

Table 5.2 Minimum environmental accountability responsibilities

ROLE	RESPONSIBILITY
Project Manager	— Ensure that a detailed CEMP is prepared and approved by FRV prior to commencing works. Prepared in accordance with this EMF. — Responsible for the environmental performance of the activities on site and for complying with general environmental performance of the cable survey works. — Responsible for coordinating the implementation of this EMF and the detailed CEMP including training of onsite personnel, implementation of mitigation measures and update of the CEMP should works scope change. — Ensure all site personnel are inducted and are aware of their responsibility under the CEMP. — Manage internal communication and management systems in implementing the CEMP. — Appoint a suitably qualified environmental officer with regular onsite attendance to ensure and supervise the implementation of the CEMP and relevant environmental management measures. — Monitor compliance with the CEMP throughout the duration of the works and review and/or implement management procedures if a problem persists.
All personnel	— Responsible for own understating of CEMP requirements prior to undertaking works. — Duty of environmental care and compliance with the CEMP requirements.

ROLE	RESPONSIBILITY
	— All persons associated will be held accountable for compliance with their particular environmental responsibilities under this CEMP. — Identify and report on any non-conformance.
FRV Project Manager	— Review and sign off CEMP prior to works commencing. — Review any incident reports and respond providing approval/agreement for any correction action required.

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 36,000 talented people in more than 500 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

AARV2018/000746
File No. AAR2018/000010
HIT0200

Government of South Australia
Department of the Premier and Cabinet

Aboriginal Affairs & Reconciliation
GPO Box 320
Adelaide SA 5001
DX 452
Tel 08 8226 8900
Fax 08 8226 8999

16 July 2018

Sharon Wyatt
Planning Officer
State Commission Assessment Panel
Level 5, 50 Flinders Street
ADELAIDE SA 5000

Dear Sharon

Thank you for your correspondence (email) dated 28 June 2018, regarding the development application 433/V003/18 for the construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure at Chaff Mill Road, Stanley by the applicant FRV Services Australia Pty Ltd. The search was based on the provided map and parcel details CT 6128/159 D12560 A4, CT 6128/160 D12560 A3, CT6081/22 F170301 A114, A115, A116 and A117.

I advise that the central archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the Department of the Premier and Cabinet, Aboriginal Affairs and Reconciliation (DPC-AAR), has no entries for Aboriginal sites within the project area.

The applicant is advised that sites or objects may exist in the proposed development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the *Aboriginal Heritage Act 1988* (the Act), whether they are listed in the central archive or not. Land within 200 metres of a watercourse (for example the River Murray and its overflow areas) in particular, may contain Aboriginal sites and objects.

Pursuant to the Act, it is an offence to damage, disturb or interfere with any Aboriginal site, object or remains (registered or not) without the authority of the Minister for Aboriginal Affairs and Reconciliation (the Minister). If the planned activity is likely to damage, disturb or interfere with a site, object or remains, authorisation of the activity must be first obtained from the Minister under Section 23 of the Act. Section 20 of the Act requires that any Aboriginal sites, objects or remains, discovered on the land, need to be reported to the Minister. Penalties apply for failure to comply with the Act.

It should be noted that this Aboriginal heritage advice has not addressed any relevant obligations pursuant to the Native Title Act 1993.

Please be aware in this area there are various Aboriginal groups/organisations/traditional owners that may have an interest, these may include:

NGADJURI NATION ABORIGINAL CORPORATION

Chairperson:	Quenten Agius
Address:	46 Maitland Road POINT PEARCE SA 5573
Mobile:	0429 367 121
Email:	Traditionalowners@adjahdura.com.au

If you require further information, please contact the Aboriginal Heritage Team on telephone (08) 8226 8900 or send to our generic email address dpc-aar.heritagesites1@sa.gov.au

Yours sincerely

Perry Langeberg
SENIOR INFORMATION OFFICER (HERITAGE)
ABORIGINAL AFFAIRS & RECONCILIATION

South Australian
COUNTRY FIRE SERVICE

18 July 2018

State Headquarters
GPO BOX 2468
ADELAIDE SA 5001
TELEPHONE: 08 8463 4200
ABN: 97 677 077 835

Your ref:
Our ref:
Enquiries: Joel Taggart
Telephone: 08 8115 3361
Email: joel.taggart@sa.gov.au

Ms Sharon Wyatt
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5001

SA Country Fire Service Comment

FRV SERVICES AUSTRALIA PTY LTD, CHAFF MILL ROAD, STANLEY, SOUTH AUSTRALIA (APPLICATION NUMBER 433/V003/18 - V1)

The South Australian Country Fire Service (SACFS) welcomes and supports development in regional and rural areas of South Australia. Whilst the SACFS has no direct concerns with the proposal, the proposed development does pose a number of fire safety and fire service response issues for the Fire Service.

Plans and details considered by the SACFS

- Development Application report – WSP – dated June 2018 (and associated attachments A - Q)

Proposed development summary (433/V003/18 - V1)

- Site area approximately 380 hectares
- Located 3.5 km north-east of Mintaro
- 360,000 solar panels (max. 3m height)
- Inverter stations
- Battery energy storage systems
- A substation
- Overhead power lines
- Refuse storage areas
- Site access, fencing and ancillary buildings (including an office)

Current infrastructure concerns in the area

- There is a lack of reticulated water in the area. Static fire water tanks for both bush fire and building fires will be required to assist in effective Fire Service intervention and suppression.
- There is a possible lack of reliable communication networks to meet the basic requirements of mobile communication.

Fire response capability

- The site will be serviced as first response by the Mintaro (SACFS) fire brigade
- Due to the regional nature of the sites location, secondary and subsequent fire service crews may have some distance to travel, therefore, additional on-site firefighting infrastructure may need to be considered to reduce the severity of any incident.

SA COUNTRY FIRE SERVICE REQUIREMENTS/COMMENTS

All access/egress roads on the project site:

- Shall include one access road to be constructed around the entire boundary of the site and be formed, compacted, self-draining, all-weather surface,

- Shall be a minimum width of 6 metres, if constructed less than 6m wide, shall incorporate passing bays with a minimum formed width of 6 metres (including the road or driveway width), and a minimum formed length of 17 metres. The passing bays should be constructed at 200 metre intervals along the driveway. Where it is necessary to provide adequate visibility, such as the nearest point to another passing bay, passing bays may be required at intervals of less than 200m.
- Shall be constructed with a minimum external radius of 12.5m for all road curves,
- Shall not exceed a gradient of 16 degrees (29%),
- Shall incorporate solid all-weather crossings over any water-course capable of supporting fire-fighting vehicles with a gross vehicle mass (GVM) of 21 tonnes,
- Vegetation overhanging the access road shall be pruned to achieve a minimum vehicular clearance of not less than 4 metres width and a vertical height clearance of 4 metres,
- Shall allow fire-fighting vehicles to safely enter and exit the site in a forward direction by incorporating the abovementioned access loop road around the entire boundary of the site.

Fire-fighting equipment – (During Construction Phase):

- Shall be readily available and in good operable condition at all times, mounted on a suitably designed vehicle or trailer dedicated to serve as the 'site fire trailer' for each construction site
- Shall consist of no less than –
  - 2000 litres fire-fighting water
  - 1 x 5HP (3.7Kw) fire-fighting pump
  - 2 x 30 metre x 19 mm ID fire hose reels with spray/jet nozzles
  - 2 x 9 litre stored water pressurised extinguishers
  - 2 x 9 kg dry powder extinguishers
  - Communication line or procedure to be able to call 000

Vegetation Management (Substation, Inverter Stations & and all other Buildings):

- A vegetation management zone (VMZ) shall be established and maintained within 30 metres of each Substation, Inverter Stations and all others Buildings on the site as follows:
  - The understorey plants within the VMZ shall be maintained such that when considered overall, a maximum coverage of 30% in that area is attained, and so that the leaf area of any shrubs is not continuous.
  - No understorey vegetation shall be established within 10 metres of the Substation, Inverter Stations and all others Buildings on the site (understorey is defined as plants and bushes up to 2m in height)
  - Grasses within the VMZ shall be reduced to a maximum height of 10cm during the fire danger season (e.g. by grazing, slashing or chemical treatment)
  - The VMZ shall be maintained to prevent the accumulation of dead vegetation during the fire danger season.

Bushfire safety

All buildings will need to comply with the National Construction Code and consider bushfire provisions found in AS3959 (Construction of Buildings in Bushfire Prone Areas), Minister's Code (Undertaking Development in Bushfire Protection Areas) and Minister's Specification SA 78 due to the sites remoteness.

A vehicle gate is to be located at least every 2000m around the perimeter fence of the site. At each, gate a 20000L static firewater tank with the relevant fire authority fittings shall be fitted.

Vegetation

The SACFS recommends a 30m buffer from the natural vegetation to any infrastructure. This buffer should be a defined and also maintained as a mineral earth fire break, and shall include a vehicle access track of a minimum of 6m in width.

An onsite vegetation management plan needs to be developed to ensure that the the on-site vegetation is kept to less than 100mm in height.

The aim of this requirement is for the operator to meet their requirement under Part 4A, Division 3 (*Duties to prevent fires*) of the *Fire and Emergency Services Act, 2005*.

Building fire safety

All class 2 – 9 buildings will need to comply with National Construction Code (NCC) and must include all the minimum *Deemed to satisfy* fire and life safety provisions.

Access and working clearances for large emergency service vehicles to the following areas needs to be incorporated into the development (this includes a clear and safe working environment) –

- Substation and Control Area
- Refuse Storage Area
- Battery Energy Storage System (BESS) Area

FRV Services Australia Pty. Ltd. and/or its operators will be required to engage on a regular base with the CFS in relation to on-site training and site inductions for emergency service personnel.

Additional consideration is required in relation to compliance with AS3745 (Planning for Emergencies in Facilities) - a comprehensive Bushfire Survival Plan and Emergency Response Plan is required to be developed and reviewed annually in consultation with the South Australian Country Fire Service's Region 2 office – contact details are provided at this link here - https://cfs.sa.gov.au/site/about_cfs/contact_the_cfs.jsp#region_2.

Conclusion

The South Australian Country Fire Service (SACFS) welcomes and supports development in regional and rural areas of South Australia. Whilst the proposal does highlight some fire service operational considerations, the South Australian Country Fire Service is willing to work with the developers to formulate appropriate fire service response plan and systems.

Yours sincerely,

JOEL TAGGART
B. Urb. & Reg. Plan, MPIA
MANAGER – DEVELOPMENT ASSESSMENT SERVICE
South Australian Country Fire Service

CC.

(*Applicant*)
Bronte Nixon
WSP
GPO Box 398
ADELAIDE SA 5001

(*CFS - internal*)
Region 2 Commander, Roseworthy
Director Operational Capability & Planning, SHQ
Director Operational Infrastructure & Logistics, SHQ

3309 - Assessing - 433/V003/18 - On Hold - Sharon Wyatt

DETERMINE ADDITIONAL REFERR... | EXTEND A REFERRAL | RECALL A REFERRAL

Summary | Attachments | Contacts | Invoices | Categorisation Details | Referral History | Public Notification Response | Decisions | Application Time Usage | Event History | Related Actions

REFERRAL STATUS

GENERATE EMAIL TO APPLICANT

☐	Referral Body	Response Type	Distribution Date	Due Date	Response Date	Status	Fee Waived Comment
☐	Clare and Gilbert Valleys Council	Regard (2 months)	27/06/2018	27/08/2018	22/08/2018	Response Received	
☐	Native Vegetation Council	Crown Regard (6 weeks)	27/06/2018	08/08/2018	09/08/2018	Late Response	
☐	Country Fire Service	Non-Mandatory (4 weeks)	27/06/2018	25/07/2018		Expired	
☐	Commissioner of Highways	Non-Mandatory (4 weeks)	27/06/2018	25/07/2018		Expired	
☐	Essential Services Commission	Non-Mandatory (4 weeks)	25/07/2018	22/08/2018		Expired	

5 items

RESPONSE DETAILS - NATIVE VEGETATION COUNCIL

Chosen Standard Planning Conditions

None Selected

Other Authored Planning Conditions

Chosen Standard Advisory Notes

None Selected

Other Authored Advisory Notes

Additional Comments

Infrastructure placement should aim avoid native vegetation clearance where possible. Any native vegetation clearance will require approval under the Native Vegetation Act 1991& relevant Regulation 12(34) Infrastructure

Government of South Australia
Department of Planning, Transport and Infrastructure

In reply please quote Process ID: 526485
Enquiries to Matthew Henderson
Telephone 0419 747 010
E-mail dpti.luc@sa.gov.au

DEVELOPMENT DIVISION
Transport Assessment and Policy Reform

GPO Box 1533
Adelaide SA 5001

ABN 92 366 288 135

25 July 2018

State Commission Assessment Panel
C/- Mrs Sharon Wyatt
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5001

Dear Mrs Wyatt

SECTION 49 DEVELOPMENT ACT (CROWN DEVELOPMENT BY STATE AGENCIES) - REFERRAL RESPONSE

Development No.	433/V003/18
Applicant	FRV Services Australia Pty Ltd
Location	Chaff Mill Road, Stanley
Proposal	100MW solar farm and associated infrastructure

The above development proposal was referred to the Commissioner of Highways (CoH) by the State Commission Assessment Panel (SCAP) for advice to assist SCAP in its report to the Minister for Planning in accordance with the requirements of Section 49(7a) of the *Development Act 1993*.

The following response is provided in accordance with Section 49(7a) of the *Development Act 1993*, and Schedule 8 of the *Development Regulations 2008*.

CONSIDERATION

The application proposes a solar farm, which would generate power for the broader electricity network, together with ancillary site improvements. The site is located approximately 3.5 km north east of Mintaro in the Clare Valley. Whilst the roads immediately abutting the site are council roads, the construction phase of the proposed development will result in a significant increase in traffic to/from the site, particularly heavy vehicles. This traffic will use junctions with the arterial road network to access the site.

The applicant has provided a Traffic Impact Assessment (TIA) for assessment. The TIA identifies a preferred haul route for heavy vehicle movements to/from the site that would utilise Horrocks Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road. There are two arterial road junctions on this route - Horrocks Highway / Jolly Way and Jolly Way / Catholic Church Road. Both of these junctions should be subject to Road Safety Audits as part of producing a Traffic Management Plan (TMP) for the construction phase of the development, with any upgrades identified being completed to the satisfaction of the CoH and/or Council at the developer's expense prior to the commencement of construction for the development.

Some roads identified in the TIA for use during the construction phase of the development are not gazetted for use by vehicles larger than a General Access Vehicle. Please note that the applicant will need to apply to the National Heavy Vehicle Regulator via www.nhvr.gov.au for permits to utilise the desired route/s for access by Restricted Access Vehicles if required.

ADVICE

In light of the above, it is recommended that the SCAP require a Traffic Management Plan to be formulated in consultation with the CoH and the Clare and Gilbert Valleys Council that includes a Road Safety Audit of the proposed route (particularly the arterial road junctions) and identifies any required upgrades to the roads, junctions or intersections to be utilised for the development. Agreements should be put in place between the developer, the CoH and/or the Clare and Gilbert Valleys Council (as required) to ensure that any required upgrades or ongoing road condition monitoring and maintenance are funded by the developer.

The State Commission Assessment Panel (SCAP) is therefore advised to attach the following condition to any approval:

- A final Traffic Management Plan (TMP), prepared in consultation with Commissioner of Highways (CoH) and the Clare and Gilbert Valleys Council, shall be submitted for approval by the Minister for Planning. As part of the TMP, the applicant shall engage an accredited Road Safety Auditor to undertake a safety audit of the route to be used by vehicles servicing the development. The TMP shall address matters including, but not limited to, the following:

    1. Definition of roads and routes to be used for vehicles during construction and for on-going maintenance purposes;

    2. Load specifications of vehicles servicing the development;

    3. Identification of upgrade of roads required to accommodate all vehicles servicing the development;

    4. Identification of any intersection treatment that is required to facilitate heavy traffic turning movements;

    5. Specification of engineering standards for pavement and drainage design and construction;

    6. A management schedule for the construction stage of the development to minimise impact on road users;

    7. A maintenance program for roads utilised by the vehicles servicing the development; and

    8. An agreement with the Clare and Gilbert Valleys Council (and/or the CoH where relevant) that all necessary road upgrading (including drainage and water runoff measures), intersection treatments and on-going maintenance costs are to be borne by the developer.

The following note provides important information for the benefit of the applicant and is required to be included in any approval:

- Some roads identified in the Traffic Impact Assessment for use during the construction phase of the development are not gazetted for use by vehicles larger than a General Access Vehicle. The applicant will need to apply to the National Heavy Vehicle Regulator via www.nhvr.gov.au for permits to utilise the desired route/s for access by Restricted Access Vehicles if required.

Yours sincerely

MANAGER, TRANSPORT ASSESSMENT AND POLICY REFORM
for **COMMISSIONER OF HIGHWAYS**

CLARE & GILBERT VALLEYS COUNCIL

21 August 2018

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

To the Secretary,

DEVELOPMENT NO.:	433/V003/18
APPLICANT:	FRV Services Australia Pty Ltd.
PROPOSAL:	The Chaff Mill Solar Farm will see the construction and operation of a 100MW solar farm, comprising photovoltaic solar panels, tracking system, inverter/transformer stations; 50MW/100MW battery energy storage system including battery containers; substation and connection to existing 132KV transmission lines within the project site; modular site office; internal access roads and parking; and 2.1m security fencing around the perimeter of the project site.
SUBJECT LAND:	Located 3.5 km to the northeast of the town of Mintaro. The project site is intersected by Chaff Mill Road and Wookie Creek and is bordered by Wookie Creek Road, Merilden Road, Salt Creek Road and Faulkner Road. The site occupies Lots 13 and 14 Chaff Mill Road, Stanley • Section A114-117 F170301, Hundred Stanley A71259, Vol. 6081 Folio 22 (Part) • Section A4 D12560 Lot 3,4. Hundred Stanley A85147, Vol. 6128 Folio 159 (whole) • SectionA3 D12560, Hundred Stanley, Vol. 6128 Folio 160 (whole)

The Clare and Gilbert Valleys Council would like to take this opportunity to express their appreciation for being able to provide comments on Development Application 433/V003/18.

After conducting a review of the application of the proposed development at the above mentioned site, pursuant to Section 49(5) of the *Development Act 1993*, the Council makes the following comments.

Impacts on amenity

The Clare and Gilbert Valleys Development Plan seeks the preservation of the natural character of the Clare and Gilbert Valleys understanding that it has a high amenity value, forms the foundation of the important tourism industry and is one of the key reasons for people to reside within the region.

With this in mind, reference has been made to the Primary Production Zone (PP Zone), more specifically the Desired Character statement, which states:

"The role of the zone is to accommodate cropping and grazing activities on large land holdings and viticulture on small to medium sized allotments. The rural area is predominantly characterized by rolling pastures with stands of remnant vegetation with a variety of agricultural activities. The zone is of a significant asset to the district and comprises of some of the region's most productive rural land which is capable of supporting a wide range of agricultural activities."

In addition, Objective 4 – "*Preservation of the natural landscape as characterized by steep north south ridgelines, broad valley floors and undulating hills.*"

The proposed development will undoubtedly have a visual impact on the existing landscape which has been extensively reviewed within the development application's visual amenity assessment report. Given the scale of the proposed development there will understandably be a visual impact to nearby residents in particular whom will have a direct view of the proposed solar farm. Therefore, there is somewhat of a fundamental contradiction in terms of a solar farm, which will essentially quarantine the land from primary production and remove its natural, vegetated (mainly crops) nature to that of the solar farm's large, industrial-type form, to the intent of the Zone and its high scenic value.

However, considering the above, and that solar farms, in the absence of any specific zones for these type of developments, are largely located within Primary Production Zones, it is important that projects that are proposed within these zones are undertaken in locations which have minimal impact on the Zone's broader objectives of agricultural land use and high scenic quality. As such, the proposed development is sighted within an area which has limited surrounding visual impact with few residential properties and largely within a lower part of a broad valley. The most impacted dwelling, yet to be constructed, has been in discussion with the applicant to incorporate landscaping at a future time once the project is constructed, depending on how the future residents will feel about the project's impacts on their visual amenity. This approach is supported by Council. In addition, the solar farm will utilize frameless solar panels and landscaping in strategic locations to prevent glaring issues which is one of the key issues with solar panels. This is supported by Council and if any glaring issues become present once construction is complete, that the applicant works with Council and any potential complainant to alleviate these issues as a priority.

Understanding that you cannot hide such large-scale developments within the landscape, siting is therefore critical and this has been addressed to a large extent by the applicant. Therefore, Council would seek the following incorporated into the proposed development:

- Perimeter landscaping around the development should be incorporated so that it softens its external appearance as much as practicable. The proposed development will incorporate a 2.1m security fence around the entire development and we believe that over the project's lifetime the vegetation will have a chance to grow substantially so that it has a beneficial impact on the natural character of the landscape. Adjacent properties currently have planted rows of trees along the road networks which adds to the amenity of the area. Although whether people believe solar farms are attractive or not is a subjective matter, a 2.1m high security fence could not be considered attractive and as this is essentially the frontage of the proposed development, every effort should be undertaken to screen it as much as possible particularly from existing residents and passing traffic. A preferable option would be to remove the fence altogether and also integrate landscaping around the proposed development.

Preservation of agricultural land

As identified above, the Zone seeks to preserve and enhance the land with a focus on agricultural activities and related land uses. There is some scope for complementary development such as small-scale tourism development however the scope is limited. A solar farm is not an envisaged use within the Zone and is largely contrary to the Zone's objectives with PDC 11 specifically stating:

"*Development which would remove productive land from agriculture, or diminish its overall productivity for primary production should not be undertaken, unless the land is required for essential public purposes or the processing of organic waste.*"

Whether a solar farm is considered an "essential public purpose" could be the subject of some debate with the provision of electricity undoubtedly essential, however the context of this provision Council would argue is in association with infrastructure such as substations, water plants, etc., not the generation of power to be exported on a national basis. However, given the existing gas power plant adjacent to the project site, facilities of this nature tend to be located within such zones and do not prevent surrounding agricultural land from continuing to operate.

Although the argument made within the development application is that there will be a minor loss (380 hectares) of agricultural land and production seen in the wider context of agricultural land in the region, the planning policy sees all agricultural land as one of the same and does not reflect what constitutes some of the highest rainfall (approx. 600mm per annum) and productive cropping land in the State. Even in low rainfall years, the region still provides significant amount of crops in comparison to low rainfall primary production land such as the Mallee or more northern parts of the State. The majority of South Australia is arid with limited agricultural productivity, therefore sites of this nature being taken out of the agricultural system has a far greater negative impacts on agricultural production than elsewhere in the State.

In addition, the SCAP should also keep in mind when making its decision the impacts of climate change and the drying of the Australian landscape which will make high rainfall sites such as this increasingly rare and more valuable. Pastoral land will likely become more prevalent and therefore it may be more appropriate to locate such developments within pastoral locations.

Understanding that you cannot prevent this land being taken out of the agricultural production system in order to accommodate the development, Council would seek that the State Planning Commission seriously rethink its approval processes when developments of this nature occupy such large quantities of productive land and that the State Planning Commission develop a policy based on rainfall deciles or similar in the future which quarantine high rainfall land such as these from such large-scale developments. With the vast majority of the State being arid, there is ample space for these developments to be located which do not impact highly productive agricultural land and can still provide opportunities for the growth of the renewable energy sector.

Council would not like to see the growth of this proposed development to occur in the future nor see other developments of this nature occupy its valuable, high rainfall agricultural land.

Transport

Of the six options presented for transportation to and from the site, the preferred route via Horrocks Highway, Jolly Way, Catholic Church Road, Merilden Road and Wookie Creek Road is the preferred route of Council as it largely avoids the Mintaro township and is mainly on sealed roads which avoids the generation of dust.

Given that Catholic Church Road, Merilden Road and Wookie Creek Road are all unsealed, Council would seek that at a minimum:

- Catholic Church Road is upgraded and sealed to ensure that the road has the capacity to cater for the up to 200 light vehicles per day and up to 16 heavy vehicles per day that will be utilizing it during the construction period. Catholic Church Road is along the northern boundary of the State Heritage Area and therefore is a highly sensitive site. Dust associated with the proposed number of trucks will most certainly impact the adjacent Catholic Church, a sealing of the road from Jolly Way past the Church and adjacent existing residential property connecting to Copper Ore Road should be implemented to reduce dust generated by the proposed development's traffic movement and prevent any damage to the road and intersection with Copper Ore Road.

- That access to the proposed site is only via the Wookie Creek Road entrance point and not via any other entrance points. We understand that there will be an internal road network and we would want this to be the only way for the proponents to develop the site and not utilize other sections of Merilden Road or Chaff Mill Road for potential access.

Council would like to reiterate its key concern regarding the condition of the Horrocks Highway and that projects such as these which utilize many heavy vehicles over a number of years, will negatively impact its current poor state. As Minister Stephan Knoll MP is the Minister that will approve or refuse this development application, Council would like the Minister to be aware of this issue and the significant need for improvements to this highway particularly if other projects of this nature are proposed in the region. We are aware that adjacent Council areas are subject to large solar proposals as well and with the proposed SA to NSW transmission line it will likely make the Mid North even more attractive to these type of large-scale developments into the future that will undoubtedly negatively impact the condition of Mid North roads.

Stormwater

Council acknowledges the intention to develop a Soil Erosion and Drainage Management Plan (SEDMP) as part of the detailed design stage of the project in conjunction with Council and supports this move. Care needs to be undertaken that the creation of such a large-scale impervious structure on the landscape does not increase the velocity of water into the existing landscape, although the creeks that traverse the property do not flow through Mintaro they do contribute to the Wakefield River, which flows through Auburn further to the south. Council would seek that there be no increase in velocity of stormwater from the site which may impact towns further to the south and outside of our Council area.

Existing vegetation

Inspection of the site identified a number of existing, well-established trees in the hillier western portion of the site. Viewing the project's site plan (Figure 5.1) it would appear a number of these will need to be removed to accommodate the panels. Understanding that the project has a life span of 30 years and that the project does not incorporate any buffer plantings apart from those proposed to the residential property to the south and potential glare points, all the established trees currently within the landscape should be retained. Trees have an ecological and amenity value but also an agricultural value in terms of providing shade for livestock therefore any vegetation removal must be avoided.

Site rehabilitation

The applicant specifies the proposed land use life is expected to be approximately 30 years, with the site to be rehabilitated at the end of the project's useful life. To ensure the retention, protection and restoration of natural resources and environment (Natural Resources Objective 1), it is requested that the Environmental Management Plan incorporate measures to address post closure works and rehabilitation of the land to a level compatible with the surrounding landscape and to return the land to primary production purposes. These measures must be provided prior to construction.

Impacts on the tourism sector

The solar farm presents a tourism opportunity for visitors to the region to see a site of potential interest once fully constructed. This may have benefits in providing more things to see and do within the region and therefore making it more attractive for visitors particularly to Mintaro. Creating a look-out spot for tourists would be a potential opportunity for the region and Council encourages the applicant to consider one.

Although the construction workers coming to our community can be seen as a good thing as they will need accommodation, food, fuel, etc. which will provide short term benefits to local businesses, the Clare Valley is a growing tourism region and Council would want to see that accommodating the construction workers does not have a negative impact on the tourism sector by occupying all the accommodation that the region has to offer.

We hope that the applicant considers spreading the benefits of increased accommodation occupancy throughout the Council area and wider region and considers avoiding weekend peak periods that are the most popular for tourists. Occupying the majority of the available accommodation for workers who are unlikely to be visiting the region's restaurants, wineries and other attractions in the manner tourists are could have a negative consequence so spreading out the accommodation more broadly would have the most benefits.

Community engagement

Council would like to thank FRV Services in terms of their commitment to community engagement including engaging early with Council and local stakeholders. I understand from other renewable energy projects within the State that this level of engagement is not the norm and is not a requirement of the Section 49 process, therefore we would like to thank them for this commitment and seek that it continues if the solar farm is approved and built.

Finally, Council requests SCAP take into consideration the issues raised by Council. In its current form, there remain outstanding matters to be addressed and at this stage the Council reserve any decision to support the project. If you have any questions or wish to seek clarification in relation to any of the matters raised in this letter, please contact myself at achristiansen@cgvc.sa.gov.au or 8842 6400.

Yours faithfully

Andrew Christiansen

Manager Development and Community

Representation 1 - Hein

dealt

(1)

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

(Deplicated ~ Reed)
#12960796

12945302

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Roger Hein

My phone number: 0400714847

PRIMARY METHOD(s) OF CONTACT: Email address: heinicken@ymail.com

Postal address: PO Box 5, Mintaro

Postcode 5415

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

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

The address of the property affected is 377 Merildin Road Postcode 5415

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

- The location of the proposed solar farm.
- The affects it may have on our farming community
- Traffic plan advice
- The affects this solar farm would have on our personal property and lifestyle.

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: 23/07/~~2108~~ 2018 Signature: Roger Hein

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

RECEIVED
30 JUL 2018
State Commission Assessment Panel

23 July 2018

The Secretary
State Commission Assessment Panel

RECEIVED
30 JUL 2018
State Commission
Assessment Panel

Dear Panel Members,

We are writing to express our concerns of the proposed Chaff Mill solar farm.

We are the owners of the property known as the Chaff Mill, located on the corner of Merildin and Chaff Mill Roads. We are direct neighbours to the proposed solar farm and we are described as Sensitive Receiver Number Seven in the application documents.

We are also farmers and have concerns of what effects the solar farm will have on our farm and business, as well as our neighbour's farms and the farmers adjoining the solar farm.

We have looked over the development application and feel that a lot of the investigation results are written in a way that makes it look permissible or favourable to build a solar farm here whilst having a minimum impact to the area. However, we believe the solar farm will have a big and somewhat negative impact on the area.

We also found quite a few mistakes and typos including mis-spelling of Wockie Creek in places, the orientation of some photos not matching up with the description of the photo, and the mentioning of Martindale Hall being on Martindale Road which it is not. Martindale Hall is located on Min Man Road and Mortlock Rd.

We are not against the concept of Solar farms. We believe renewable energy is a vital tool to the future. But infrastructure needs do be built in smart locations.

We have divided the remainder of our letter into three sections.

1/ Concerns for our farming area.
2/ Traffic plan advice.
3/ Our own personal concerns.

1/ Concerns for our farming area:

Why a solar farm here? This is not an ideal location to build a solar farm. There are many other far more suitable locations in South Australia to build a solar farm. There is a lot of marginal and pastoral land in SA that has lots more sun, is far easier to build on, and would be just as easy to connect to the grid. This is prime agricultural land, the best in the state, and FRV, a foreign owned company, want to destroy the current use of this prime land.

If you were to list the criteria that stipulates what makes a great location to build a solar farm, what would you have on it? With the Chaff Mill solar farm, the only criteria this location is successful at is that it is close to Adelaide, and it is close to the Grid. That is all that is in favour of this location.

If you proposed to build a solar farm like this on prime agricultural land in almost any European country, there is no way it would be approved. Most European countries see the value in their prime agricultural land. There are few countries that have enough prime agricultural land as it is. Why are we even considering taking away some of our prime agricultural land when alternative locations are such a realistic option?

We are genuinely concerned that the Chaff Mill solar farm would increase the amount of frosts in the area. It only takes a small change in the area to have a small affect on the microclimate. And a small affect on the microclimate can lead to a big affect on Frost. And a single bad frost occurrence at the wrong time can lead to a massive loss of production, let alone multiple frost occurrences.

Another concern is water drainage. Whilst the West section of the solar farm drains into the Wockie Creek (we have no concerns for the West Side), the East section does not drain well at all. It is very flat with no major water courses in the area to divert water away. In wetter years there is often flooding in isolated, lower lying sections and this area relies heavily on crops to absorb the excess moisture. If some of this cropping area is replaced with solar panels, this area will flood into neighbouring farm land, most likely to the North, further adding to crop and production loss.

Should local farmers be affected by worsened frost events and flooding, who is paying for the loss of production?? FRV? Or our Government? Why should our government have to pay for something that is avoidable in the first place?

2/ Traffic plan advice:

Should the solar farm go ahead, we believe more needs to be proposed in regards to roads being upgraded. There is mention of re-sheeting roads and sealing of some intersections. Whilst this would be okay, maintaining the re-sheeted roads will be a demanding job and our local council is already struggling to keep up with the road maintenance. During the construction phase, there will be enough traffic to easily justify sealing the key access roads.

The selected 'preferred' path of Horrocks Hwy, Jolly Way, Merildin Rd in my opinion is not the safest path to send the majority of traffic. The Barrier Hwy is generally safer to travel along then Horrocks Hwy. And the Min Man Rd is a lot safer then Jolly Way Rd, as Min Man Road is a lot wider, flatter and straighter then Jolly Way. Travel via Barrier Hwy, Min Man Rd, Martindale Rd, Hare Road is the safest, most direct path taking commuters through only 3 towns after Tarlee. The Barrier Hwy has approx 7 towns after Tarlee.

However Jolly Way would still be the primary travel for those coming from the Clare town / area. In my opinion, it would benefit the community and the whole development of the Solar farm if the following roads are upgraded and completely / permanently sealed:
Catholic Church Rd
Merildin Rd (part of)
Wockie Creek Rd
Hare Rd
Martindale Rd (part of)

See below map showing in red the roads that should be sealed in order to handle the traffic.

Other Roads that should be considered upgrading should include the re-sheeting of Faulkner Rd, the re-sheeting of Chaff Mill Rd, and the sealing of Merildin Road further to the East until the Chaff Mill Rd intersection.

3/ Our own personal concerns:

Should the solar farm go ahead, we personally will be the most directly affected people in relation to visual impacts and lifestyle impacts. We purchased the Chaff Mill property in early 2013, having recently moved to the area.

We purchased the Chaff Mill for 2 key reasons:

1/ for the property to serve our nearby family farming business with it's infrastructure and facilities.
2/ to build our home and our lives here because of it's beautiful views, in a quiet and semi-secluded area.

With plans of building a house at the point of construction, it is too late for us to change our plans. We have orientated our house to take in the beautiful views to the West, as well as to the North and North East. The Western view is our key view and reason for building a house the way we are.

We are farmers and we very much enjoy watching a good crop grow and mature. To have the views of our proposed house overlooking the cropping landscape that is across the road from us turned into a see of solar panels so soon after our house is completed would be heart breaking. We are passionate about farming and to have our dream home with views of farming turn into views of solar panels is not good.

FRV are proposing to vegetate an area within the solar farm property to help disguise the views of the solar panels. Whilst we are in favour of this and would work closely with FRV to ensure the desired outcome is achieved, a vegetation plantation is not what we want to be looking at either. We want a home that overlooks farming land as that is where our passion is.

In the application, appendix J, it is mentioned that our current views of the paddocks are of low scenic value. Heck! How can you put a value on a view? How can a paddock that changes colour with the seasons and different crops each year be of low scenic value? If someone is passionate about salt bush, then a view of it would be of high scenic value to them. As I said, we are passionate about farming and that's what we enjoy having a view of.

Additionally,
We are concerned for the safety of our family with the increase in traffic movements.
We are concerned for the security of our property.
We are concerned our privacy will be somewhat jeopardised.

Conclusion:
Thank you for giving us the opportunity to express our views and concerns for the proposed Chaff Mill solar farm and we hope you consider them with seriousness and fairness.

Kind Regards,
Roger & Kylie Hein

377 Merildin Rd,
PO Box 5, Mintaro, 5415
heinicken@ymail.com

Representation 2-
Parnell

support

1296007I

②

Wyatt, Sharon (DPTI)

From:	Parnell <Parnell@parliament.sa.gov.au>
Sent:	Friday, 27 July 2018 4:11 PM
To:	DPTI:scapreps
Cc:	Bronte.Nixon@wsp.com; Parnell
Subject:	Representation: 433/V003/18 - FRV Services Australia Pty Ltd - Chaff Mill Solar Farm

Dear Simone,

I write in support of this development application for a 100MW solar farm and associated infrastructure.

I note that the land is located within the Primary Production Zone of the Clare & Gilbert Valleys Development Plan. Whilst the Development Plan is silent on developments of this nature, I note that "on site power generation including photovoltaic cells" is one of the Energy Efficiency objectives within the General Section of the Development Plan. Whilst that objective might be regarded as referring to small scale generation of electricity to be used on-site rather than exported, the objective isn't so limited and in my submission, should be generously interpreted in support of solar farms.

I also note that windfarms are envisaged in the Primary Production Zone. Given that the output of both windfarms and solar farms are the same (renewable electricity) and the visual and noise impacts are far lower, it is also reasonable to infer support in the Development Plan for developments such as this, even if they aren't specifically mentioned.

In the past, I have lodged objections to fossil fuel generation projects and have made the submission that SCAP can and should look wider than the local Development Plan. I have pointed out that the Minister, as final decision-maker, is NOT bound by the Development Plan and can consider other policy objectives. In my early submissions to SCAP, I have pointed out that as the primary advisory body to the Minister, SCAP should do likewise. I have previously drawn your attention to a number of government policies and strategies around climate change and carbon reduction that seek to promote renewable energy in order to reduce the State's carbon footprint. I don't propose to set out all this material again here, but my view is that SCAP should look wider than the Development Plan and when you do, you will find much to recommend this exciting renewable energy project.

Please note that I would like to be advised when the hearing is to be held, so I can choose whether or not to attend.

Yours faithfully,

Mark Parnell MLC LLB BCOMM MRUP

Mark Parnell MLC

Parliament House, North Tce, Adelaide SA 5000
Ph. 08 8237 9111 | parnell@parliament.sa.gov.au
www.sagreens.markparnell.org.au | Follow Mark on Facebook, Twitter & Instagram

Representation 3 - Cunningham

#1297430B (duplicate # 1297425)

(3) (Duplicated = Kinds)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: ROD CUNNINGHAM

My phone number: 041 784 2293

PRIMARY METHOD(s) OF CONTACT: Email address: rodmintaro@gmail.com

Postal address: PO Box 18

Mintaro SA Postcode 5415

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

My interests are:
- [ ] owner of local property
- [ ] occupier of local property
- [X] 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: ....

As per attached submission

I
- [X] wish to be heard in support of my submission
- [ ] do not wish to be heard in support of my submission

(Please tick one)

by
- [X] appearing personally
- [ ] being represented by the following person : ....

(Cross out whichever does not apply)

Date: 1-8-18 Signature: Rod Cunningham

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

PO Box 18
Mintaro SA 5415
1 August 2018

The Secretary,
State Commission Assessment Panel
GPO Box 1815, Adelaide SA 5001

Comments on Chaff Mill Solar Farm- Development Application Report (433/V003/18)

Dear Sir,

Please find attached my comments regarding the proposed Chaff Mill Solar Development near Mintaro in the mid-north of South Australia.

While I support the generation of renewable energy I question the use of good farming land for this purpose. I feel there are better locations, possibly without the proximity of a large power feeder that is necessary to connect the proposed farm to the electricity grid.

FRV's approach appears to be the development of a solar farm with minimal infrastructure costs and this is evident in their selection of a Heavy Vehicle Route (HV2) which is less than ideal and has significant impact on the Mintaro community and its heritage. Better options need to be considered and analysed.

For a project of this size and nature some of the background analysis is sketchy. Local aviation impacts have not been considered. The impact of the solar farm on local communications, TV and radio reception is token, as was the community engagement by FRV. Farmers are still concerned at the impact the solar array will have on farming activities.

As a local firefighter I am unclear on the efforts to be undertaken by FRV to minimise fire risk and to prevent possible impacts from bushfire on the Mintaro community. This is critical during the construction phase when there are significant staff and activities occurring at the Chaff Mill site. I suspect FRV are unwilling to face up to the hard questions.

There are unanswered questions and hopefully you will elicit detailed answers from FRV before any approvals are contemplated.

Yours Sincerely,

Rod Cunningham

Rod Cunningham

CHAFF MILL SOLAR FARM

COMMENTS ON DEVELOPMENT APPLICATION REPORT
433/V003/18

Prepared by- Rod Cunningham
Po Box 18, Mintaro SA 5415
rodmintaro@gmail.com
Mob 0417 842 293

Comments on Section 6- Key Stakeholder Consultation

FRV on their web-site and in documentation emphasise the importance of Community engagement- "Community engagement is an important part of our planning approach as it allows us to understand stakeholders' views and expectations."

Meetings were held with local landowners, the Mintaro Progress Association, Council and Members of Parliament. Local landholders were concerned that they were unable to attend the meeting between FRV and the Clare and Gilbert valleys Council. Several indicated the meeting should have been held in a "workshop format" to allow the public to attend as observers.

In regard to the Phase Three Engagement FRV state- "the intention was to address any outstanding concerns that the community may have". For many in the community, the meeting held at the Mintaro Institute on 23 February was their first opportunity to obtain information. The meeting was advertised with a note that "community members are welcome to sit in on this meeting".

Comments from those attending the Mintaro meeting include-

1. It was "closely structured and controlled with a fixed time limit". It appeared to be a "token effort" rather than genuine consultation and was carried out to "tick the community engagement box" on the development proposal.
2. FRV commenced the meeting with a presentation which had to be repeated in part due to the late arrival of a community member.
3. The meeting dwelt laboriously on the "dust" concerns of one attendee to the exclusion of other questions.
4. Several community questions were addressed.
5. The bulk of the written questions submitted by R Cunningham were not addressed at the meeting (due to FRV's desire to close the meeting) with the questions tabled and partial replies subsequently provided by FRV at a later date.
6. The discussion and suggestions made by attendees on suitable transport routes "appear to have been ignored" by FRV. "It was a waste of time."

It appears that FRV's community engagement process is to ignore questions that are too hard! Questions I submitted to FRV in writing at the Mintaro Progress meeting and still unanswered are-

- Should Catholic Church Road be sealed to enable vehicles coming from Clare to the site to bypass the Mintaro township?
- Will the equipment (solar panels, inverters, and control systems) installed by FRV cause interference to local electrical supplies, radio, television, mobile phone and NBN transmissions?
- Will FRV have their own fire appliance and fire-fighting water supply on site?

- It is important that the Chaff Mill Solar Farm Project proceed with minimal impact on the community and any issues are promptly addressed and resolved. Will FRV be establishing a Community Liaison Officer and hold regular meetings with representatives from the Mintaro Community and Clare and Gilbert Valleys Council?

It is noted that the Development Application Report omits these questions from both-

(a) Section 6.1.1.3 Feedback received- Key issues Arising from Phase Three Engagement, and

(b) "Stakeholder and Community Concerns" listed in Section 4 of Appendix C- Chaff Mill Solar farm Engagement report.

I view with concern a "community engagement" process where questions and issues are selectively edited from the record. This isn't engagement, its wallpapering!

If FRV are unwilling to be upfront and honest with residents in the Mintaro Community then there will be increasing distrust and opposition to the Chaff Mill Solar Farm project.

My email detailing questions and comments supplied to the Mintaro Progress Association meeting Chair (and subsequently FRV) is at Attachment A.

Comments on Section 7.4- Non Indigenous Heritage

Section 7.4.4.1 indicates trucks accessing the site are a potential source of impact on heritage structures. " Whilst vibration levels can cause structural damage , this is generally limited to 25m. All heritage places of heritage interest are located "at least 1km away".

This is quite incorrect!

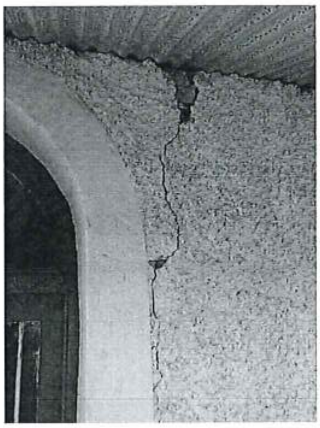
The proposed access route for heavy vehicles, Option HV2 is along Catholic Church Rd and is described as a "narrow unsealed road". The roadway is rough and can be corrugated depending on the frequency of grading. When dry, there are substantial quantities of dust raised by vehicles.

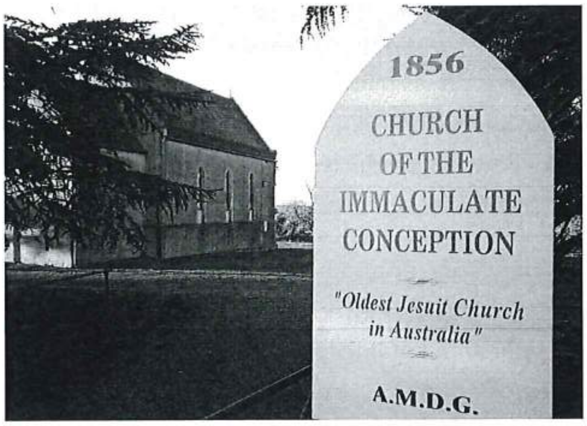
The church is a listed Heritage Place and is constructed 16m from the road boundary. The building is in regular use and shows signs of cracking and movement. Given the state of the Catholic Church Road, the number and size of heavy vehicles proposed, there is a significant likelihood the building will suffer further damage from heavy vehicles using Catholic Church Road to access the Chaff Mill site.

Not only is there potential for the building to be damaged but the impact of dust from passing trucks and vehicles will add to the problem and maintenance/cleaning costs.

The assertion by FRV that all places of heritage interest are at least 1km away is incorrect. The selection of Option HV2 as the preferred route needs to be reviewed in the light of this and other issues of road width, narrow radius curves, steep inclines and the accident incidence along Jolly Way.

The heavy vehicle route HV5 is the best option but will require some work on the intersection of the Barrier Highway and Min-Man Road. It appears FRV are intent on using existing infrastructure at minimal cost to FRV (but at some long term cost to the community). For a project of this nature and size, FRV can be reasonably expected to invest where required to ensure the project proceeds.





Catholic Church of Mary Immaculate

Catholic Church Road - Mintaro

Top- view from east showing proximity to un-sealed roadway.

Centre- there are significant cracks in the building in the area closest to Catholic Church Road and along the eastern wall. Of the building.

The front wall of the church building is 16m from the road boundary.

Comments on Section 7.8- Traffic and Access

Despite advice to the contrary from residents and local landowners about the suitability of heavy vehicle route, Option HV2, it appears FRV are intent on using this route.

FRV's description of roads, intersection analysis, the absence of any analysis of one of the most critical intersections (Jolly Way and Catholic Church Road) and the incorrect accident statistics for Jolly Way all appear aimed at substantiating the selection of Option HV2 for heavy vehicles!

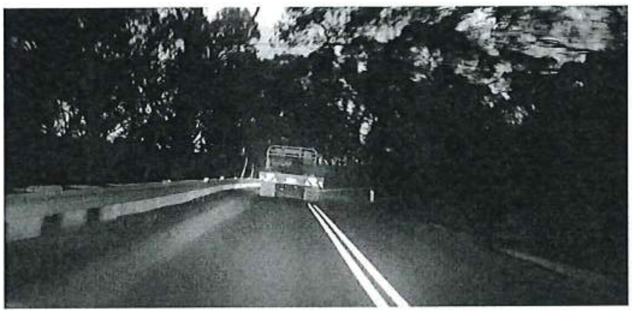
Two local semi-trailer drivers who regularly cart hay and grain in the Mintaro area suggest Jolly Way has the sharpest curves, steepest inclines and narrow roadway, particularly near Paulette's Winery. They advise it is impossible to negotiate the bends without crossing the double lines. Local residents advise they frequently have to move to the left of the roadway to avoid 4WD and larger vehicles on these curves. Jolly Way has double lines for 7.5km of its 10km distance. The limited visibility and curves make it difficult to pass cyclists and slow moving vehicles.

Recently Neil Paulette noted a large low-loader carrying a crane lost traction on the hill approaching their winery and slid off the road. The loader blocked the road for several hours while the crane was unloaded and the truck extricated and returned to the roadway. He attributed the problem to the steep incline, sharp curve and road surface.

The write up of Jolly Way in Section 7.8.3.2 fails to mention small radii curves, steep inclines and stormwater erosion along sections of this roadway. These have all been highlighted in the analysis (and non-selection) of the Mintaro-Leasingham Road and Min-Man Road. The report fails to compare these roads on a proper analytic basis.

The intersection of Horrocks Highway and Jolly Way presents problems to semi-trailers approaching from North or South, on the Horrocks Highway. The narrow roadway and small radii corner prevents large vehicles on the Horrocks Highway from turning into Jolly Way, particularly if there are vehicles from Mintaro waiting to turn right toward Clare. It is extremely dangerous as there is no visibility of vehicles approaching along Horrocks Highway from the north. Motorists from Mintaro have had to reverse 20-30 metres back from the intersection to allow large vehicles to complete a turn into Jolly Way. In the last 12 years there have been at least 4 accidents at this intersection.

The "heavy vehicles" currently using Jolly Way tend to be of medium length, Class 3 or 4 vehicles. They are mainly school and other buses, delivery and courier trucks for wine and agricultural products, concrete, sand and building materials. Generally they have 2 or 3 axles. There are no cropping, livestock or hay producers operating along Jolly Way and consequently there are very few large articulated vehicles. FRV's statement of 8-16 heavy vehicles per day provides no indication of size or loads. They are likely to be large articulated vehicles transporting equipment, PV panels and steelwork. Articulated vehicles on Jolly Way are unsafe as they are incompatible with the narrow road surface, steeper inclines and small radius curves.

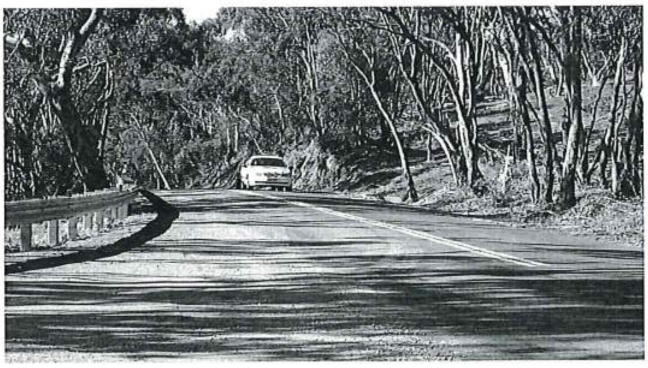


Jolly Way-near Paulettes Winery

This tray top truck negotiated most bends with 300-400mm over the double lines. Semi -trailers are often worse.

Jolly Way- Paulettes Winery exit

Leaving Paulettes winery the view to the west is limited. This truck had just rounded the curve and was about 400mm over the dual lines.



Jolly Way- Paulettes Winery exit

Leaving Paulettes winery the view to the east is limited. There has been one accident caused by a vehicle leaving the car-park and another 4 accidents within 200 metres of this intersection.

Horrocks Highway - Jolly Way Intersection

Vehicles approaching from Adelaide or Clare to the Chaff Mill site need to turn into Jolly Way. While vehicles from Mintaro are waiting to enter Horrocks Highway it is impossible for a large vehicle to enter Jolly Way.

Comment on Section 7.8.3.3 Intersections

Catholic Church Road and Jolly Way. The report by FRV omits analysis of the intersection of Jolly Way and Catholic Church Road. The intersection is on the apex of a sweeping bend with 80 kph speed limit. When approaching Mintaro the road is on a downhill slope and with heavily loaded vehicles this will increase braking distances. Kingston Rd also intersects on the opposite side to Catholic Church Road approx. 20 metres away. For this intersection to be used by heavy vehicles a turning lane must be provided and the road widened. Trees will need to be removed for this work.

Intersection of Jolly Way and Catholic Church Road. Above left is the approach from Mintaro and right is the approach from Sevenhill. From either direction there is not good visibility of vehicles entering and leaving the intersection . Long and slow moving vehicles entering and leaving Jolly Way will present particular safety problems. Below- the approach to Jolly Way driving south on Catholic Church Road.

Meridlin Road- Chaff Mill Road Intersection. I note the comments in Appendix K from the owner of the property (and house under construction) at the intersection of Merildin Road and Chaff Mill Road (Sensitive Receptor #07). I would anticipate there will be significant vehicle traffic past their property and using the intersection. Put bluntly, FRV and the Chaff Mill Solar project have stuffed up and caused significant changes to their plans and dreams for a new home. Several years ago they cleared trees to enjoy a view which will now be occupied by rows of solar panels and the associated glare. I am amazed at their acceptance of the situation as it will affect the amenity of their property and its resale value.

While there is an offer from FRV to plant screening trees to minimise glare it would seem quite reasonable for FRV to undertake sealing of the Merildin and Chaff Mill roads (at FRV's cost) for a distance of 100m in each direction to minimise dust and vehicle noise.

Hopefully there is zero interference to their radio, TV, mobile and NBN services and FRV's claims of a "zero emission" solar farm are realised.

Extract from Mintaro Community Newsletter- July 2018

Doubts still on heavy vehicle access to proposed 'Chaff Mill' solar farm

The 'Chaff Mill' solar farm company FRV has advised Progress that its preferred route for heavy vehicles during the construction phase would be from Horrocks Highway, Jolly Way, Merildin and Wookie Creek Roads to the site.

This was in answer to a question by Rod Cunningham.

However, Lorraine Edmunds feels that consensus reached in previous discussions between the community and FRV about the most desirable route have been ignored by FRV.

The route from the Barrier Highway from Manoora, along Min Man Road, then Martindale and Hare Roads to the site was seen as the safest route with the least impact on Mintaro township.

This was agreed by both community and FRV spokespersons at a meeting in Mintaro on 23 February.

At the February meeting there was lengthy discussion about access routes for heavy vehicles during the construction phase. It was agreed that the Horrocks Highway and Jolly Way route should not be considered because of tight bends and road width, the amount of local and tourist traffic that it carries and relatively low overhanging vegetation.

That meeting was told that Clare & Gilbert Valleys Council also had concerns about that route.

Andrew and David Mitchell suggested the Barrier Highway, Flagstaff Hill, Merildin route would be the best option. This was rejected by FRV because of expense associated with getting the unsealed road from the highway up to the standard the company would need.

In a question in Business Arising at the 13 June meeting of Progress, Lorraine asked, "What has happened to the Manoora, Min Man, Martindale and Hare Roads option".

Cr Liz Calvert said at the meeting that council would have its own perspective on the preferred route, and agreed to follow up to ensure the Progress and Mintaro community's concerns were known.

The next meeting of Progress is the AGM on 8 August.

Comment on Section 7.8.3.6- Crashes.

The number of vehicle accidents on Jolly Way (2 in 5 years) is incorrect. The records of the two Country Fire Service brigades, Mintaro and Sevenhill, who respond to accidents on Jolly Way have been checked and on average there are 1-2 vehicle accidents annually.

Over a period of 12 years Mintaro CFS have attended 8 vehicle accidents. In the last 5 years Sevenhill has attended 3 vehicle accidents. In the 12 year period there have been two fatal accidents on Jolly Way and one stillborn baby as the result of an accident at the intersection of Horrocks Highway and Jolly Way.

All vehicle accidents are not attended by emergency services, CFS, Police or SAAS. In some cases those involved are unwilling to call for assistance (possibly due to alcohol or an unroadworthy vehicle) and some call a friend or arrange a tow or trailer to get the damaged vehicle removed. CFS members are aware of at least 7 reasonably serious unreported accidents in this category on Jolly Way. Details and locations are shown on the map.

In addition to road accidents there are usually 2-3 times each year when Jolly Way is closed because of storm damage and fallen trees.

The road name "Jolly Way" has only been in use for about 3 years. Previous accident records may be under the original road name.

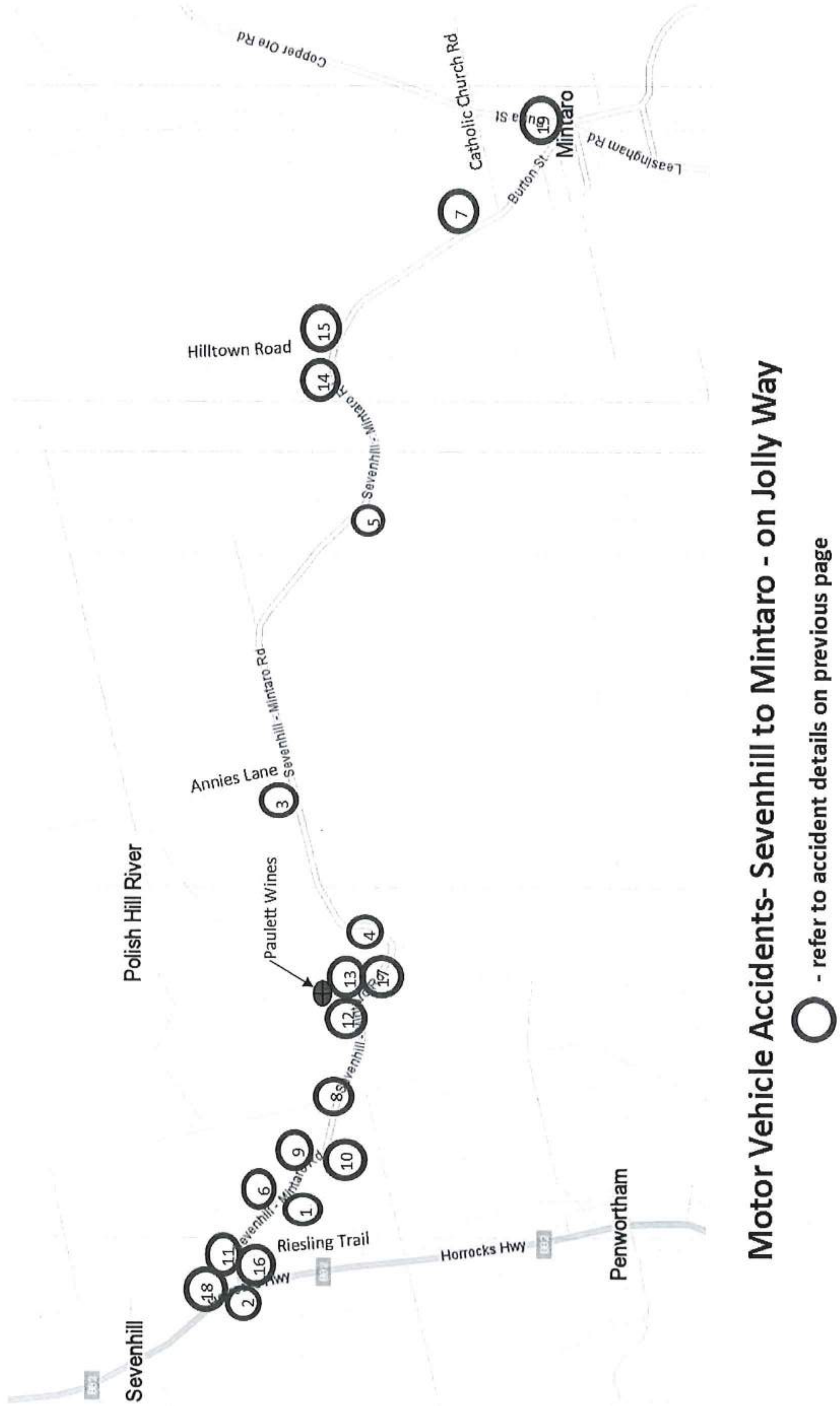
Two vehicle Accident- Corner Jolly Way and Annies Lane

Vehicle Accidents attended by CFS Brigades

1. April 2006 Car vs Tree near Riesling Trail crossing- Daylight – Fatality
2. June 2006 2 cars –Intersection Jolly Way and Horrocks Highway- injuries-day
3. Dec 2006 2 utilities- Intersection Annies Lane and Jolly Way- injuries-day
4. March 2008 Single vehicle vs tree near Paulettes- injuries and car incinerated-night
5. April 2008 Single vehicle vs tree near Jefferies- injuries- night
6. Feb 2010 Single vehicle vs tree near Riesling Trail- Night- One fatality
7. March 2010 Single vehicle vs tree near Mintaro- injury- day
8. Nov 2010 Two vehicles-Spring Farm Rd and Jolly Way- injuries- daylight
9. Dec 2016 Two vehicles vs Fallen tree- injury- day
10. July 2016 Single vehicle vs tree near Sevenhill-injury- day
11. Feb 2018 Motorcycle vs guardrail and concrete bollard (by Riesling Trail)-injury-day

Other accidents on Jolly Way- not reported or attended by CFS

12. NC- Mother and children skidded into safety barrier near Paulettes-Day-2014 approx
13. PH- Male Driver- Vehicle rolled and landed in Paulette's vineyard-Day- 2010 approx.
14. VD- Male Driver- Vehicle rolled near Hilltown Rd intersection-no injuries-Day- 2010
15. Male Driver- Windfarm Contractor- Vehicle rollover Hilltown-Jolly Way intersection- injuries- taken to hospital by other contractors- Day- 2014 approx
16. BS- Male Driver- Vehicle off road at Horrocks Highway-Jolly Way intersection- Day- 2017
17. Unknown Male Drivers-2 vehicle accident Jolly Way-Paulettes Car Park-no injuries- 2013 approx- Day
18. Unknown Female Driver- 2 females-single vehicle rollover at intersection-Horrocks Hwy and Jolly Way- 2014 approx- no injuries-Day
19. Unknown Male Driver-Truck rollover and collision with building in Burra St Mintaro following-brake failure on Jolly Way-2012- Photo below


Motor Vehicle Accidents- Sevenhill to Mintaro - on Jolly Way
- refer to accident details on previous page
Sevenhill
Penwortham
Horrocks Hwy
Riesling Trail
Sevenhill - Mintaro Rd
Polish Hill River
Paulett Wines
Annies Lane
Hilltown Road
Burton St
Mintaro
Leasingham Rd
Catholic Church Rd
Copper Ore Rd
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Comment on 7.13- Electromagnetic Field Limits

The FRV website describes Fotowatio Renewable Ventures (FRV) as a leading global developer of large-scale solar power plants!

On this basis it is surprising that FRV's proposal for "EMI Mitigation and Management Measures" is a copy and paste of a "wind farm" proposal from the Wind Farm Development Guidelines. It hardly instils confidence and suggests FRV do not understand the issues.

Despite FRV operating solar farms at Moree(NSW) and Royalla (ACT) they appear unable to rely on their experience as a "leading global developer" to present a considered EMI proposal for the Chaff Mill Site. Their proposal in the Development Application is irrelevant and a load of rubbish.

What FRV are suggesting in the event of EMI problems is

- that they will remove or relocate solar panels, or
- relocate existing radio communication services to another tower or a new telecommunications tower! So, if the Chaff Mill Solar Farm generates interference to our mobiles or data communications FRV will ask Telstra or the NBN to shift their equipment or build a new tower!

This is not a practical plan and one imagines the likely reaction from Telstra or Optus.

The question asked during community engagement was- "Will the equipment (solar panels, inverters, and control systems) installed by FRV cause interference to local electrical supplies, radio, television, mobile phone and NBN transmissions?"

The question remains unanswered and FRV's proposal suggests they have only a limited concept of the communication problems and interference that can be generated by the inverters, power control systems and communications equipment they propose to install at the Chaff Mill Site.

People living in Mintaro community are in the fringe area for TV reception, we don't get good TV! Mobile signals from both Telstra and Optus are weak in many locations. FM and radio reception is poor. Any interference will create problems with reception and the operation of electronic devices.

Put bluntly the community, farmer's next door to the Chaff Mill Solar site trying to use their mobile phones and GPS auto steer dont want interference from a pile of solar arrays and power inverters rendering their communications and farming equipment useless.

Its clear FRV need to look at the selection of inverters, the design and installation of cables underground to minimise EMF's, placement of inverter shelters in the array rather than on the edges, use of filtering etc to minimise the generation of EMI and EMF's.

If the South Australian Government approves this proposal then I suggest-

1. FRV be required to install and operate a site monitoring system to monitor EMI emissions from their equipment with the data available on-line, and
2. The following wording be included in any approval for the Chaff Mill Solar Farm- "The electromagnetic disturbance generated by the Chaff Mill Solar farm does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended."

The Development Application Report FRV repeatedly emphasises the Chaff Mill Solar Farm has "zero emissions". It is important to ensure the final product in fact does have zero emissions.

Comments on Section 7.14- Aviation Safety

The report considers aviation operations within 50km of the Chaff Mill site but only in the context of operations from airports. Other important, local aviation activities have been omitted from the report and include-

1. Martindale Farm- a private airstrip is located 2km from the Chaff Mill Solar Farm and aircraft will take off and land over the solar array. The airstrip is used by Aerotech approximately 10 days each year for crop spraying and fertilising. There could be 100-300 flights from this airstrip annually. The entrance to the airstrip is from Martindale Road.
2. Pipeline Inspections. The Moomba-Adelaide gas pipeline operated by Epic Energy is inspected every 3 months using a low flying rotary wing aircraft. The aircraft will fly within metres of the Chaff Mill array.
3. Country Fire Service- during the bushfire season Aerotech operate water bombers from a privately owned airstrip at Hoyleton. This can amount to over 1000 flights each year and some of these flights are likely to be in response to bushfires in the Mintaro area. Aerotech also conducts aerial spraying from Hoyleton . Hoyleton is 22km from the Chaff Mill Solar Farm.
4. Other aircraft activities include medical retrievals and RAAF aircraft (based at Edinburgh) undergoing training near Mintaro.

While the Key Recommendations advise aerial spraying, seeding and fertilising operations in the vicinity of the solar farm are not recommended it would seem FRV are unaware these activities have been carried on within 2km of the proposed farm for the last 10-15 years!

Spraying, fertilising and firefighting activities are more critical to the local community than operations from airports. FRV appear to have ignored or are unaware of these aviation operations. Glare analysis and further consideration should be given by FRV to the activities from the Martindale Airstrip (-33.921116, 138.766769). The airport listed at Farrell Flat has been closed for approximately 2 years.

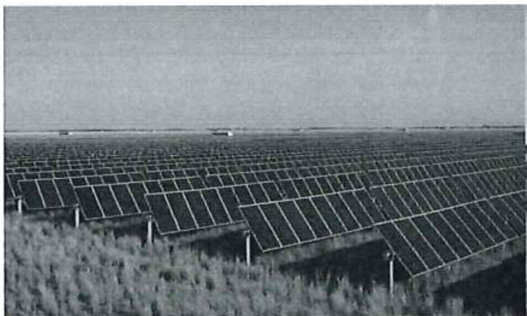
Comments on Section 8.2.3- Fire / Bushfire Management

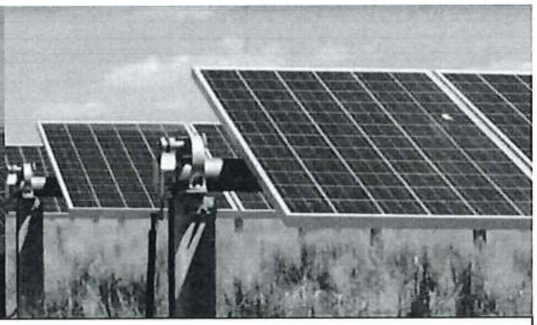
FRV have indicated they will prepare a Bush Fire Management Plan in conjunction with the Country Fire Service. A written question submitted to FRV during community meetings regarding the provision of a firefighting unit and firefighting water during the construction phase remains unanswered.

By far the greatest fire risks will occur during the construction phase with up to 200 workers engaged on construction activities, operating machinery and plant and vehicles on site. It would seem essential for FRV to have at least one fire appliance operated by trained workers at the site. Both Mintaro and Farrell Flat have CFS appliances and typical response times would be 15 minutes. All the farms surrounding the Chaff Mill site have their own farm fire units to provide protection during farming activities in summertime. Why not FRV?

The Chaff Mill Solar Farm is 3km northwest of Mintaro and 4km NNE of Martindale Hall and on days of catastrophic fire danger with northerly winds there will be limited time to warn local communities and tourists should a fast moving fire occur.

The provision of at least one suitable fire appliance and substantial quantities of water at the Chaff Mill Site should be mandated.





Above- Photos taken at FRV's Moree Solar Farm. Substantial grassy vegetation is growing under the PV arrays. As flame height is normally 2-3 times the vegetation height there is likely to be substantial damage to PV panels should a fire occur in this situation. The spacing of the arrays limits the ability of normal sized fire appliances to access the fire. It is important that FRV have suitable equipment and procedures to access fires and appropriate management of vegetation.

Summary of Reccomendations

1. Seek responses from FRV to unanswered questions raised at the Mintaro community consultation-
    - Should Catholic Church Road be sealed to enable vehicles coming from Clare to the site to bypass the Mintaro township?
    - Will the equipment (solar panels, inverters, and control systems) installed by FRV cause interference to local electrical supplies, radio, television, mobile phone and NBN transmissions?
    - Will FRV have their own fire appliance and fire-fighting water supply on site?
    - It is important that the Chaff Mill Solar Farm Project proceed with minimal impact on the community and any issues are promptly addressed and resolved. Will FRV be establishing a Community Liaison Officer and hold regular meetings with representatives from the Mintaro Community and Clare and Gilbert Valleys Council?
2. Review and amend the proposed choice of Heavy Vehicle Route to either HV5 or HV6. The preferred Heavy Vehicle route HV2 is unacceptable in view of-
    - Lack of a detailed analytical comparison of alternatives routes (small radii curves, inclines, narrow road width, etc)
    - The lack of detail on the proposed size and category of Heavy Vehicles being utilised by FRV
    - Proximity of route HV2 (less than 25m) to the Mintaro Catholic Church- a listed State Heritage Asset.
    - Significantly higher vehicle accident rates on Jolly Way than indicated by FRV
    - The absence of any analysis (and the unsuitability) of the Jolly Way, Catholic Church Road intersection for Heavy Vehicles.
    - The unsuitability of the Horrocks Highway and Jolly Way intersection for heavy, articulated vehicles.
3. Review the treatment of the Merildin Road-Chaff Mill Road intersection to minimise the impact of residents living by the intersection.
4. FRV to provide a relevant and realistic proposal to minimise the generation of EMI emissions from the solar farm.
5. FRV to undertake the provision of an EMI site monitoring system during the construction and operating phases to ensure the achieve their stated goal of "zero emissions" from the Chaff Mill Site.
6. FRV to review the Aviation Safety Analysis (and Glare analysis) to include the private Martindale Airstrip and local aviation activities omitted from the original proposal.
7. FRV to confirm a suitable fire appliance and fire fighting water will be provided at the Chaff Mill Solar Farm during the Construction Phase.

About the Author- Rod Cunningham

- I am a retired, qualified Electronics Engineer with over 30 years experience with Telstra on the design, and operation of communications systems and switching networks.
- I have been State Broadcasting Manager of Telstra responsible for the operation of ABC, SBS and Radio Australia sites throughout South Australia and the Northern Territory.
- Extensive design and construction experience on Defence Communication and the Jindalee Over the Horizon Radar projects. This included specific treatment of EMI, EMF and RF Radiation Hazards.
- Management of pay television and broadcasting projects in Australia and Overseas for RFS Australia.
- For the SA Country Fire Service
    - Community Engagement Officer - 4 years
    - Member of State Incident Management Team-Public Information
    - Participation in preparation of Bushfire Management Plans
- In the Mintaro Community
    - Active member the Mintaro CFS (Captain-Lieutenant etc)
    - President and Treasurer of the Mintaro Progress Association-3 years
    - Resident for 22 years.

Attachment A- Questions to be answered by FRV at meeting of 23 Feb- 2018

Mintaro Institute

Rod Cunningham

From:	Rod Cunningham <rodmintaro@gmail.com>
Sent:	Tuesday, February 20, 2018 11:07 PM
To:	'Mintaro Progress'
Subject:	RE: FVR Solar Farm visit

Chairperson- Mintaro Progress Association

Richard, thanks for the advice regarding the meeting between the Progress Association Committee and FRV on Friday 23rd February and also FRV's presence at the Sevenhill Markets.

I would have to suggest FRV's "Community Engagement" process is a little ridiculous and more oriented to ticking boxes than " informing the planning process and encouraging the community to provide feedback."

The detailed exchange of information and feedback is unlikely to occur at the Sevenhill Market and it appears the only people who can ask questions at the Friday meeting are the MPA Committee. How has the MPA committee canvassed issues and feedback from the Mintaro community to present to FRV?

Due to a long standing commitment I am unable to attend the Friday meeting. Could you please ask the following questions of FRV and record their responses in the meeting minutes. I understand that issues raised by the community have to be specifically addressed in the Environmental Impact Statement for the project. (I am happy for a copy of this email to be given to FRV)

My questions or comments are-

1. What benefits are expected to come from this project to the Mintaro Community during the construction and operational phase of the Chaff Mill Solar Farm?
2. Substantial amounts of machinery, equipment and materials will need to be transported by FRV and their contractors to site.
    - What is being done to widen Burra street from the Mintaro township to the Merilden corner as this section of roadway is narrow and dangerous. It is basically a "one way" roadway when used by larger vehicles.
    - Is FRV proposing to bituminise the Merilden Road to the Chaff Mill site to minimise dust and damage to the road and inconvenience to adjoining landholders.
    - Should Catholic Church Road be sealed to enable vehicles coming from Clare to the site to bypass the Mintaro township?
    - How will FRV minimise transport and haulage impacts on the Mintaro Community, farming operations and local infrastructure?
3. Will the equipment (solar panels, inverters and control systems) installed by FRV cause interference to local electrical supplies, radio, television, mobile phone and NBN transmissions?
4. During the construction phase what are FRV and their contractors doing to ensure no fires are caused by activities at the site. Will FRV have their own fire appliance and fire fighting water supply on site?
5. Following commissioning of the Chaff Mill Solar Farm what actions are proposed by FRV or the operator to ensure any fault or failure of the equipment does not cause environmental impact or fire?
6. What will be the hours of operation at the Chaff Mill site during the construction phase? Will there be any noise, dust or any other impacts on the Mintaro township or properties adjoining the solar farm site?
7. Several recent studies indicate large scale solar farms alter the local climate and induce a "heat island" effect with changes to soil moisture, temperatures and vegetation. What beneficial and adverse impacts will be caused to the environment and areas of land adjoining the solar farm?
8. It is important that the Chaff Mill Solar Farm project proceed with minimal impact on the community and any issues are promptly addressed and resolved. Will FRV be establishing a Community Liaison Officer and hold regular meetings with representatives from the Mintaro Community and Clare and Gilbert Valleys Council?

Attachment A (cont'd)- Questions to be answered by FRV at meeting of 23 Feb 2018- Mintaro Institute

Yours, Rod Cunningham (Mob 0417 842 293)

From: Mintaro Progress [mailto:mintaroprogress@gmail.com]
Sent: Tuesday, February 20, 2018 5:41 PM
To: Mintaro Progress Assoc
Subject: FVR Solar Farm visit

Greetings all.

The FVR solar farm team are going to be at the Sevenhill Markets on Saturday morning 24 Feb to answer any questions from the Community.

The FVR team are also meeting with landowners bilaterally and the Council and local MPs.

The MPA Committee are meeting with them on Friday Afternoon at 2pm in the Meeting Room at the Institute so that we are also kept in the loop. Any Community member is welcome to sit in on this meeting.

best regards

Richard Lathlean
Chair

--
Mintaro Progress Association Inc.
c/o Post Office, MINTARO SA 5415
ABN 59 838 572 252

www.mintaro.sa.au – **A step back in time..**

#12978299 (4)

Representation 4 -
K & D Baum

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: KYM AND DEBORAH BAUM

My phone number: 0481 322 821 08 88438087

PRIMARY METHOD(s) OF CONTACT: Email address: debkym@activ8.net.au

Postal address: PO BOX 504

FARRELL FLAT SA Postcode 5416

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

My interests are:
- [X] 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 76 TORRDALE RD STANLEY Postcode 5415

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

(1) unknown impacts on micro-climate change in particular frost and water logging

(2) location in highly productive cropping region.

(3) financial loss in value to surrounding land holdings

I
- [X] 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
- [X] being represented by the following person : DEBORAH BAUM

(Cross out whichever does not apply)

Date: 2.8.18 Signature: [signature]

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Deb Baum
76 Torrdale Road, Stanley SA 5415
PO Box 504, Farrell Flat SA 5416
0481322821
debkym@activ8.net.au

2 August 2018

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

Dear Panel Members

This submission is an objection to the application of the Chaff Mill Solar Farm, proposed by FRV Services Australia Pty Ltd.

We do not object the value that solar farms offer as a renewable energy source, rather it is an objection to the proposed location on long established, highly productive agricultural land, with a potential for production/land risks evolving for neighbouring landholders.

Our main concerns are, but not limited to the following points:

1. Unknown impacts on micro–climate change, ie. enhanced frost and waterlogging conditions.
2. Location in highly productive cropping region.
3. Financial loss in value to surrounding land holdings.

1. Micro–climate change

Risk: Increase of frost occurrences and spread of frost due to the noted 5 degree temperature variance under panels.

As a long term, generational landowner our concerns are for the impact to the micro-climate of land surrounding the 360,000 PVC 3 metre panels. This valley and in particular the site selected for the solar farm is not flat, it is intensively cropped, it is an undulating valley with rocky outcrops, trees and creeks and is subjected to increased occurrences of high intensity frosts particularly in the last 5 years.

Research* suggests that lack of drainage on sub-zero, still nights is the cause of increased frost risk on surrounding land that "the crop temperature can vary widely due to differences in topography and micro-environment with small differences in topography causing significant temperature variation by impeding or facilitating the drainage of cold air." This is in contrast to studies conducted by FRV who have stated "The studies did not note any significant changes to temperatures at progressive locations next to the solar farms." However, FRV noted that 'no significant changes were noted' due to the research not involving analysis of the surrounding areas. Furthermore, in meeting with FRV they agreed that there has been no research completed regarding the impact on adjacent areas, or any research done on the impact of solar farms in continual cropping, frost prone valleys.

- (Frederiks, Christopher, Sutherland, & Borrell, 2015)

Unfortunately, to date there has been no relevant research or evidence in similar circumstances looking at productivity impacts of cropping production surrounding large solar farm developments. This lack of documented evidence does not give us the surety that our valley will not be at risk of increased frost conditions and we would rather not be the test case that proves otherwise just in case our fears are realised post construction of the facility.

Risk: Disrupted water drainage increasing risk of waterlogging, erosion and increased run off.

The proposed site is in a winter dominant high rainfall (598mm annual rainfall) predominantly continually cropped area. Due to the heavy nature of the soil, waterlogging can occur regularly during the growing season, with paddocks and roads being inaccessible for weeks at a time.
Following rainfall events the deep nature of the un-compacted soil will absorb a significant amount of water and will be used by the growing crop during the season. With no crop growing on the solar farm site, and the soil being compacted due to construction, our concerns are for the disruption to the water drainage patterns. A foreseeable risk is of the affect to infrastructure, roads and neighbouring land holdings from the increased waterlogging, erosion, and run off due to the development with waterlogging to be expected to be particularly worse during the construction phases, due to heavy machinery compacting the land.

Such impacts to microclimate change are greatly unknown, however after generations of farming the land in this area landowners have identified both frost and waterlogging to be significant risks associated with the proposed solar farm. FRV have had approved other installations of solar farms at Moree in NSW and Clare in far north Queensland, these locations were chosen because the land in both situations is flat and in Qld, Clare's case is flat and has excellent drainage. Such infrastructure has not been developed in similar landscapes and surrounding growers shouldn't need to bear the impact of the unknown detrimental impacts to their farming business and livelihood.

2. Location in highly productive cropping region

Risk: Impact to production and ability to farm for future generations
The location of proposed solar farm is within an area that is unique to the Clare Valley in particular the heavy black cracking soils. It is also considered to be from recent sales an area that supports high value agricultural production through intensive continual cropping, its high rainfall environment (598mm average annual rainfall).

Firstly, it is crucial, that you the panel, understand that the land proposed for development is arable land, all of which has the capacity to be used for intensive, high value continual cropping. FRV have incorrectly labelled this land as largely cleared and used predominantly for livestock grazing. This high value agricultural area, is classified in the high rainfall zone, receiving an average annual rainfall of 598.2mm[1]. The land has always been cleared, with much of the valley being treeless prior to farming settlement. The heavy black soil in the area is highly sought after, because it's unique highly fertile, deep profile, allowing for high yield and reliable cropping production[i]. This land is included in the 5% of arable land within South Australia's land mass[2], which in the last 20 years in South Australia, has seen a 10% reduction in the amount of land used for food production due to non-agricultural related development[3] (mining, housing, gas exploration, energy production). Productive agricultural land in South Australia is a finite resource that

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[1] BOM,
[2] GPSA
[3] Tim Burrows Agribusiness Australia.

cannot be created or replaced. Once converted to another use, is extremely difficult if not impossible to rehabilitate agricultural land back to its productive state[4]. We consider the placement of this solar farm to be illogical in terms of appropriate land use, considering the close proximity to Goyder's line[ii], where past this line, in the low rainfall area near Robertstown, a larger solar farm development has been approved, in unproductive, low rainfall land where solar farms should be placed. The site selected for the Chaff Mill solar farm is seen by FRV to be ideal due to its direct proximity to the grid via the Mintaro sub-station however, in the bigger picture, it is highly illogical to place a solar farm on land capable for food production. Whilst a solar farm is able to be constructed on much of South Australia's land mass, (of course with reasonable distance from the electricity grid), cropping production is limited to the 5% of the SA land mass, with this area ever reducing in the near future if such installations are approved.

From the Clare & Gilbert Valley Council (CGVC) Strategic Plan:
"Our local area comprises some of the most productive lands and scenic landscapes in Australia, with the capacity to deliver premium products and experiences to visitors and residents alike.
The productive and fertile lands of the Clare & Gilbert Valleys, combined with favourable climatic conditions, result in excellent broad acre cropping opportunities and livestock production. "[5]
The CGVC strategic plan quotes "Protect agricultural land suitable for local food production"[iii]. If approved the 380ha of agricultural land will no longer be available for primary production, as the intended use of the land will change to industrial/commercial for energy production and undermines the strategy adopted by the CGVC.

3. Financial loss in value to surrounding land holdings.

Risk: Land devaluation due to microclimate change
We together with a number of concerned land owners see the risk of decreased land valuation as a result of the proposed solar farm. This includes reduced production potential due to risks from micro-climate change such as enhanced frost risk, and water logging /water drainage issues.

Risk: Loss of value due to lack of opportunity to expand
The use of the 380ha for a non-agricultural enterprise prevents current landholders from expanding their property in that direction/area, this then reduces the potential of the land, hence reducing the value from potential buyers. Reduced land value not only impacts landholders if they wish to sell, but also impacts on local businesses from the reduced purchases of goods, services and machinery.

Risk: Loss of value due to visual impact
The construction of 380 ha of black panels surrounded by a 3m high fence with barbed wire will contribute to the loss of scenic values to neighbouring land owners across the landscape of the whole valley. There are a number houses in close proximity (three less than 500m to the proposed site), these homes would have reduced appeal to potential buyers due to visual and privacy concerns.

Risk: Loss of value due to loss of privacy
Violation to privacy and security to surrounding landowners through increased traffic and implied tourism from the solar farm. Up to 200 workers on site during construction will cause a significant amount of traffic in the usually quiet, safe area. Property trespass and increased theft is a concern to local residents and landholders, as it will become a thoroughfare to the solar farm. We are already experiencing incidences whereby locals are expected to rescue vehicles that become bogged on wet roads or attend to CFS callouts due to tourists and people unfamiliar with fire risks from cars that pull over onto road side vegetation for photographic opportunities of our landscape.

[4] GPSA
[5] CGVC Strategic Plan

The application proposed by FRV will affect many in the area, with the unknown risks, and lack of reassurances by FRV, causing a great deal of grief in the community. My views and objections are supported and mirror the views of the following neighbouring community members and landholders:

- The Dixon Family
- The Mitchell Family
- The Bradley Family
- The Faulkner Family

Subsequent letters of support can be produced on request.

I am willing to make a visual representation to the State Commission Assessment Panel to support my objection and to provide further representation of the issues detailed.

Kind Regards,

Kym Baum

Deb Baum

Letter for Representations 5-12

(5)-(12)

Jana Dixon
R: 159 Salt Creek Road, Stanley SA 5415
P: PO Box 214, Farrell Flat SA 5416
0438025825
jana.dixon98@gmail.com

3 August 2018

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

Dear Panel Members

This submission is an objection to the application of the Chaff Mill Solar Farm, proposed by FRV Services Australia Pty Ltd.

This submission is not objecting the value that solar farms offer as a renewable energy source, rather it is a representation objecting the proposed location on long established, highly productive agricultural land, with a significant potential for production, environmental and business risks evolving for neighbouring landholders.

This objection is on the basis, but is not limited to the following points:

1. Unknown impacts on micro – climate change (enhanced frost and waterlogging conditions, disrupted water drainage) and biosecurity/environmental concerns.
2. Location on highly valuable 'primary production' agricultural land.
3. Financial loss in value to surrounding land holdings.
4. Adverse influence on 'business as usual' for growers and land users.
5. Visual impacts to neighbouring residents and scenic landscape.
6. Impacts to privacy and security through increased traffic & implied tourism.

These points are our primary areas of concern and from the application provided by FRV, have not been addressed adequately, logically or factually enough to ensure that surrounding land owners, residents, the community and the environment will not adversely be impacted by the development in the short or long term.

1. Micro–climate change

A number of concerns have arisen from generational landowners regarding disrupted micro-climate patterns as a result of the proposed 360,000, 3m high PVC solar panels on 380ha of agricultural land. The area is unique in nature; ie. intensive continual cropping, high rainfall environment (598mm average annual rainfall[1]), comprised of heavy black cracking soils, in an already frost prone valley. The land is currently being used for high value agricultural production, and as a result, a number of significant issues have been raised when considering such a disruptive development to the landscape such as a solar farm. Unfortunately, to date there has been no relevant research or evidence in similar circumstances looking at the productivity impacts of the disturbed micro-climate on cropping production surrounding large solar farm developments. Whilst FRV have outlined a number of assumptions regarding micro-climate impacts, it is difficult to comment reliably and accurately on such a unique landscape, in contrast to the generations of experienced landowners living and working in this environment.

[1]Bureau of Meteorology, Climate Statistics 2018

Furthermore, enhanced frost conditions is a major concern regarding this proposed enterprise. In the low-lying valley to the North East of Mintaro, frost already can be a significant production risk in most seasons, costing growers significantly, and seeing new management strategies being adopted to mitigate risk. Damage due to frost is hugely detrimental to the Australian agriculture sector, costing growers $360million in direct and indirect losses each year[2]. FRV have reiterated the lack of suitable literature regarding the micro-climate impacts to surrounding land, and in failing to discuss the concern of impeded cold air drainage; the main production risk to surrounding crops causing frost damage. Furthermore, literature referred to in the application by FRV is not adequate in addressing the significant production risks impacting growers in the area.

The lack of air drainage on sub-zero, still nights in the valley is the cause of increased frost risk to the surrounding land. It is known from published literature that: *The crop temperature can vary widely due to differences in topography (Kelleher et al., 2001) and micro-environment (Marcellos and Single, 1975) with small differences in topography causing significant temperature variation by impeding or facilitating the drainage of cold air*[3]. Furthermore, there has been no evidence to prove that the large, obstructive proposed solar panels won't cause an increased risk of frost damage to the crops of surrounding landowners, by impeding the drainage of cold air, due to differences in topography, during the frost risk periods of the growing season (ie. June to October).

We ask how FRV plan on addressing the fact that there is a significant chance that the cropping production of nearby growers may be impacted by the construction of the solar farm. What modelling has, or will be done specifically in this area to ensure no financial impact will be inflicted on farming businesses? How will the absence/presence of increased frost damage as a result of the solar farm be measured? How will growers be compensated for damaged caused by enhanced frost conditions?

Secondly, as the proposed site is in a winter dominant, high rainfall, continually cropped area, it is known that waterlogging, compaction and bogginess of the soil are already production issues. Due to the heavy nature of the soil, waterlogging can occur regularly during the growing season, with paddocks being inaccessible at times. A significant amount of water is removed/used by the growing crops during the season. With no crop growing on the solar farm site, and the soil being compacted due to heavy vehicle traffic during the 18 months of construction, neighbouring growers are concerned about disrupted water drainage patterns. From generational knowledge of the water drainage patterns in the area, nearby land owners expect to see enhanced water drainage onto their land, causing waterlogging and erosion due to increased run off from the industrialised land of the solar farm. Such impacts are detrimental to the surrounding land with waterlogging resulting in large areas of inhibited crop growth, inaccessibility, and erosion causing loss of topsoil and unwanted waterways throughout paddocks.

We ask how FRV will work with the growers to mitigate such a significant risk to both short and long-term production, soil structure and soil health that growers may very likely experience. How will FRV ensure that water drained from the heavily compacted black soil on the proposed site won't cause issues on nearby land? How will such damage be measured and prevented? What compensation will be provided to the land holders and farmers impacted?

Furthermore, we appreciate that such impacts to microclimate change are greatly unknown, however after generations of farming the land, landowners have identified significant risks associated with the proposed

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[2] March, T., Laws, M., Eckermann, P., & McGowan, P. (2016). *Ranking cereal varieties for frost susceptibility using frost values northern.* GRDC.

[3] Frederiks, T., Christopher, J., Sutherland, M., & Borrell, A. (2015, June 1). Post-head-emergence frost in wheat and barley: defining the problem, assessing the damage, and identifying resistance. *Journal of Experimental Botany, 66*(12), 3487–3498.

solar farm. Such infrastructure has not been developed in such a similar unique situation, and surrounding growers shouldn't need to bear the impact of the unknown detrimental impacts to their farming business and livelihood, without any hard-factual support, or reassurance of compensation.

Additionally, a number of biosecurity issues have been raised which have the potential to significantly, and irreversibly disrupt neighbouring land use. Such biosecurity issues include the introduction of foreign pests (including weeds, insects (including snails), soil and plant pathogens) through substantially increased traffic of heavy machinery and up to 200 workers during the construction phase. It is known that workers can bring foreign pests from both vehicle tyres and footwear. An introduction of a problem pest has the potential to cause significant production, and environmental damage to the region. To mitigate this risk, tight biosecurity protocols must be put in place, such as thorough cleaning of all thoroughfare to reduce the likelihood of an incursion. Furthermore, we ask how such breaches to biosecurity resulting in impacts to surrounding land users will be managed, monitored and compensated?

2. **Location**

Firstly, it is crucial that it be made clear that the land proposed for developed is arable land, all of which has the capacity to be used for intensive, high value continual cropping. FRV have incorrectly labelled the land as largely cleared and used predominantly for livestock grazing. This high value agricultural area, is classified in the high rainfall zone, receiving an average annual rainfall of 598.2mm[4]. The heavy black soil in the area is highly sought after, because of its unique, highly fertile, deep profile, allowing for high yielding, reliable cropping production[i]. This land is included in the 5% of arable land within South Australia's land mass[5], which in the last 20 years in South Australia, has seen a 10% reduction in the amount of land used for food production due to non-agricultural related development[6] (mining, housing, gas exploration, energy production). *Productive agricultural in South Australia is a finite resource that cannot be created or replaced. Once converted to another use, is extremely difficult if not impossible, to rehabilitate agricultural land back to its productive state*[7]. Furthermore, the placement of this solar farm is highly illogical, in terms of appropriate land use, especially considering the close proximity to Goyder's line[ii], whereby near Robertstown (located above Goyder's line) a large solar farm development has been approved, on significantly less productive, low rainfall land. Furthermore, the Chaff Mill solar farm site is seen as "Cherry Picking" next to the Mintaro substation, and in the bigger picture, is highly irrational to place a solar farm on land capable for high value food production, due to that fact that a solar farm is able to be constructed on the much of South Australia's land mass, (of course within reasonable distance from the electricity grid), whereas cropping production is limited to the 5% of arable land available, a statistic that is shrinking. We do not wish to argue that the Agricultural industry is of great importance than renewable energy production. We believe that the overall bigger picture of sustainability must be realised, for both industries to run harmoniously, hence with renewable energy production not taking the place on the finite source of farming land SA has, and creating further production risks to land nearby.

This argument of inappropriately proposed land use is supported by the Clare & Gilbert Valley Council (CGVC) Strategic Plan[8]:
"Our local area comprises some of the most productive lands and scenic landscapes in Australia, with the capacity to deliver premium products and experiences to visitors and residents alike. The productive and fertile lands of the Clare & Gilbert Valleys, combined with favourable climatic conditions, result in excellent broad acre cropping opportunities and livestock production."

One strategy from the CGVC strategic plan quotes to "Protect agricultural land suitable for local food production". If the 380ha of agricultural land is no longer available for primary production (the intended

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[4] Bureau of Meteorology, Climate Statistics
[5] Grains Producers SA
[6] Tim Burrows Agribusiness Australia.
[7] Grains Producers SA
[8] CGVC Strategic Plan

use of the land) and re-classed as land for industrial energy production it undermines the value of the CGVC Strategic Plan.

3. **Financial loss in value to surrounding land holdings.**

A number of concerned landowners see the risk of decreased land valuation of their properties as a result of the proposed solar farm. This includes reduced production potential due to risks from micro-climate change as previously outlined; devaluing surrounding properties due to reduced yield potential. Such an example is evident with neighbouring vineyards, again with reduced land value and reduced buyer potential already seen as a result of the proposed solar farm development. The unknown production risks resulting from the proposed solar farm and inadequate reassurance from FRV are expected to continue impact land values and buying potential in the area. The use of the 380ha for a non-agricultural enterprise prevents current landholders expanding their property in that direction/area, this then limits the potential of their own land to grow, hence reducing the market value buyers look for. Reduced land value not only impacts landholders if they wish to sell, but also impacts on business purchases of land and machinery, due to asset devaluation. Additionally, there are a number residential houses in close proximity (three houses less than 500m to the proposed site), it is expected for these properties to have reduced appeal to potential buyer's due to significant visual and privacy concerns as a result of the solar farm development. There has also been concern regarding the ownership of the land, and the state the land will be left in after the 30years of operation. As the land is extremely valuable to the surrounding land owners for their own business expansion, will the land be offered up to purchase? Or will the land remain under foreign ownership by FRV?

4. **Adverse influence on 'business as usual' for growers and land users.**

A large-scale development in a low populated, quiet area has the potential to cause significant disruptions to those spending all their time living and working in the area. There is expected to be implied tourism as a result of the development. The summer roads surrounding/nearby to the site can be inaccessible over winter, with landholders the ones to give assistance to the number of cars a year getting bogged. This is expected to increase as a result of the development. In contrast, over summer there is a fire danger risk if non-diesel cars are pulling over into long grass on the sides of roads. Additionally, landholders identified a fire hazard risk with firstly the electrical equipment within the solar farm, and the proposed native grass that will be seeded on the site, as stated by a FRV fact sheet. It is a concern of how the native grasses will be managed in term of fire hazards over summer. There is also concern regarding impacted management strategies of such grasses in the area which FRV needs to address. Additionally, it is a concern that the 3m high barbed wire fence will prevent nearby landholders from accessing inside the site to assist fire efforts, starting either on or off of the site.

5. **Visual impacts to neighbouring residents and scenic landscape.**

This solar farm will be able to be viewed within a significant number of kilometres, with glare issues being significant for a number of roads. Additionally, there is a significant loss of scenic values to existing land and home owners, with the 3m high fence barbed wire fence, and large black panels shaping the picturesque landscape. The proposed shrubs and trees to be planted will take a number of years to grow to a suitable size to obstruct the view. Nearby home owners (less than 500m) will have a significant disruption to their livelihood where their family have worked and lived for generations, especially during the construction phase.

6. **Impacts to privacy and security through increased traffic & implied tourism.**

There is potential for significant violation to privacy and security to surrounding landowners through increased traffic and implied tourism from the solar farm. There will be up to 200 workers on site during construction, causing a significant amount of traffic and disruption. Furthermore, property trespass and increased theft is a concern to local residents and landholders, as is expected with increased thoroughfare through the area. How can this be reduced, without the expense/detrimental to land and home owners?

The application proposed by FRV will affect the livelihood and businesses of many in the area. The predicted risks, the unknown risks, and the lack of factual and logical reassurances by FRV, has already, and will continual to cause a great deal of grief in the community.

Furthermore, my views and objections support and mirror the views of the following stakeholders impacted by this proposal, as shown by name, interest and signature. I am willing to make a visual representation to the State Commission Assessment Panel on behalf of those sharing the same views and concerns as myself.

Trelawney Trading supports the above submission being an adjoining landowner & concerned stakeholder.

MR TRACY SANDOW + FAMILY.

PHILLIP DIXON
Christina Dixon
Renée Dixon

WN + SL Baum Cavandale

Warren Baum

Riley's Gap Family Trust
Warwick Abbott

MANORDALE AG LTD
(NEARBY LANDHOLDER)

Roger Hein
Kylie Hein

AARON BRADLEY.

RICHARD SANDOW
RICES PARK TRADING.

WILSFORD FARMING TRUST
Luke Burge

Kind Regards,

Jana Dixon
Daughter of landowner, Merilden SA
Bachelor of Agricultural Science, University of Adelaide, 3rd Year Student.

The application proposed by FRV will affect the livelihood and businesses of many in the area. The predicted risks, the unknown risks, and the lack of factual and logical reassurances by FRV, has already, and will continual to cause a great deal of grief in the community.

Furthermore, my views and objections support and mirror the views of the following stakeholders impacted by this proposal, as shown by name, interest and signature. I am willing to make a visual representation to the State Commission Assessment Panel on behalf of those sharing the same views and concerns as myself.

GRAHAM & LOIS MITCHELL
OWNERS AND OPERATORS OF A 35 HA VINEYARD ON SECTION 130 ACROSS THE ROAD FROM PROPOSED FRV SOLAR FARM AT MINTARO.

G L Mitchell
L.C. Mitchell

Kind Regards,

J A Dixon

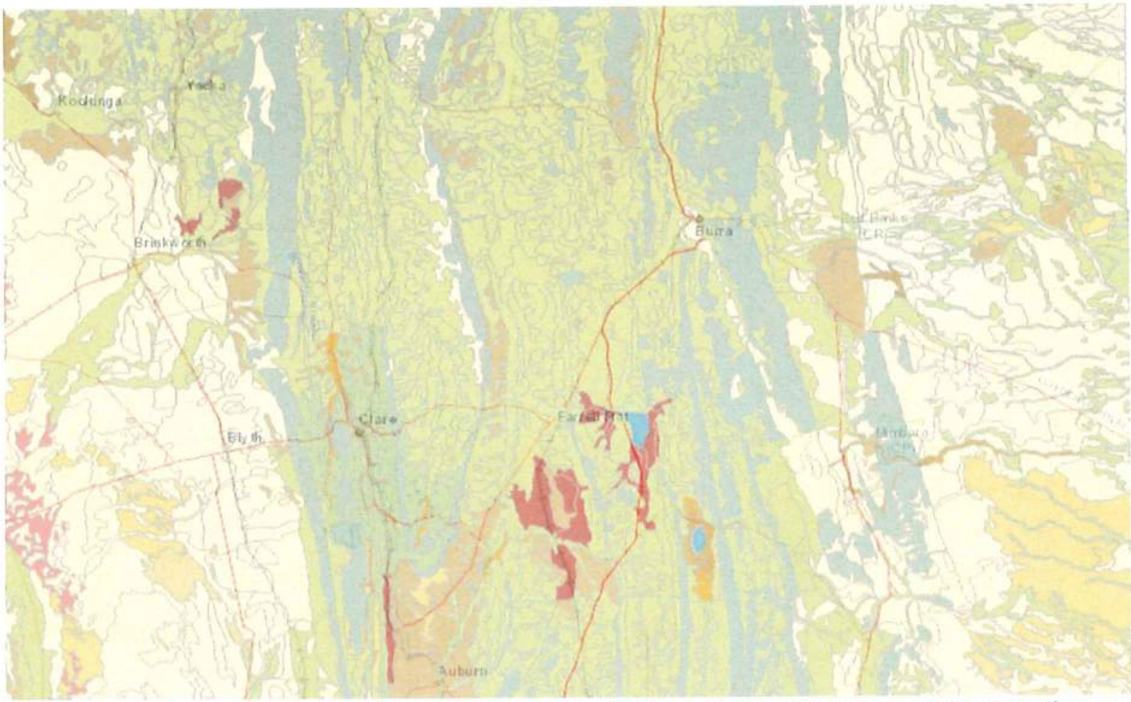
Jana Dixon
Daughter of landowner, Merilden SA
Bachelor of Agricultural Science, University of Adelaide, 3rd Year Student.

i

Soil type subgroups illustrating the unique nature of the heavy black fertile soils (dark red) around Mintaro / Farrell Flat, compared to lighter infertile soils east post Goyder's line (yellow coloured)

i

i



Soil type subgroups illustrating the unique nature of the heavy black fertile soils (dark red) around Mintaro / Farrell Flat, compared to lighter infertile soils east post Goyder's line (yellow coloured)

ii

Proximity of the proposed solar farm to Goyder's line.

Representation 5 - Dixon

doped

#129 84551
(duplicate 1298550)

(5)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Jana Dixon

My phone number: 0438025825

PRIMARY METHOD(s) OF CONTACT: Email address: jana.dixon98@gmail.com

Postal address: PO Box 214, Farrell Flat

Postcode 5416

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

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

The address of the property affected is 159 Salt Creek Rd, Stanley Postcode 5415

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

See attached letter

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: 1/8/18 Signature: J Dixon

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 6 -
R Sandow

objected

#12985517 ⑧

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: RICHARD SANDOW

My phone number: 0409 282671

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: PO Box 225
AUBURN Postcode 5451

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

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

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

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

AS PER ATTACHED

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 : JANA DIXON
(Cross out whichever does not apply)

Date: 29/7/18 Signature: [signature]

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 7 - Burge

12985506

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: LUKE BURGE

My phone number: 0407161686

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: PO BOX 206 FARRELL FLAT 5416

Postcode

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

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

The address of the property affected is 1619 FARRELL FLAT RD Postcode 5416

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

As Per Attached

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 : JANA DIXON
(Cross out whichever does not apply)

Date: 29/7/18 Signature: L Burge

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 8 - Abbott

#129 85537

(8)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Mr Warwick Abbott

My phone number: 0419 802 869

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: Po Box 201 Farrell Flat SA

Postcode 5416

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

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

The address of the property affected is 90 Riley Rd. Farrell Flat Postcode 5416

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

As Per Attatched.

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 : Jana Dixon

(Cross out whichever does not apply)

Date: 28/7/2018 Signature:

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 9
- A Bradley

12985492

1

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: AARON BRADLEY

My phone number: 0419863256

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: PO Box 509
FARRELL FLAT SA Postcode 5416.

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

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

The address of the property affected is 606 SALT CREEK RD FARRELL FLAT Postcode 5416.

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

AS PER ATTACHED

I
- [ ] wish to be heard in support of my submission
- [X] do not wish to be heard in support of my submission

(Please tick one)

by
- [ ] appearing personally
- [X] being represented by the following person: JANA DIXON

(Cross out whichever does not apply)

Date: 29/7/18 Signature:

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 10 - W Baum

#11985533 (10)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Warren Baum

My phone number: 0427 438071

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: 1098 Clare SA Postcode 5453

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

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

The address of the property affected is 353 Baum RD HD Stanley Postcode 5416

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

As per Attached

I
- [✓] wish to be heard in support of my submission
- [X] ~~do not wish to be heard in support of my submission~~

(Please tick one)

by
- [X] ~~appearing personally~~
- [✓] being represented by the following person : Jana Dixon

(Cross out whichever does not apply)

Date: 28/7/2018 Signature: ...

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 11 - T Sandow

#12985524 (11)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: MR TRACY D SANDOW

My phone number: 0428 951925

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: 592 MINTARO RD WATERVALE SA Postcode 5452

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

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

The address of the property affected is CHAFF MILL RD MINTARO Postcode 5415.

The specific aspects of the application to which I make comment on are: AS SUBMITED BY SANA DIXONS SUBMISSION WE SUPPORT THIS SUBMISSION TOTALLY

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 : SANA DIXON
(Cross out whichever does not apply)

Date: 27/7/2018 Signature:

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 12 - Dixon

objd

#1\|9 85514 (12)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: PHILLIP W DIXON

My phone number: 0417851206

PRIMARY METHOD(s) OF CONTACT: Email address:

Postal address: BOX 214 STANLEY FARRELL FLAT Postcode 5416

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

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

The address of the property affected is 159 SALT CREEK RD Postcode 5416

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

AS PER JANA DIXON ATTACHED

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 : JANA DIXON

(Cross out whichever does not apply)

Date: 30/7/18 Signature: P W Dixon

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 13 - Chelwood Farming

(12)

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

12989765 (duplicate 12491259)

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Chelwood Farming Pty Ltd.
My phone number: 08 88439092 or 0417 805 889
PRIMARY METHOD(s) OF CONTACT: Email address: chelwood@rbe.net.au
Postal address: PO Box 12 Mintaro SA
Postcode 5415.

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

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

The address of the property affected is Wookie Creek Road Mintaro Postcode 5415

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

- affect on the microclimate
- financial loss in value to surrounding land holdings
- adverse influence on "business as usual" for growers and land users
- visual impacts to neighbouring residents and scenic landscape
- impact to privacy and security through increased traffic and tourism.

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 persons Andrew Mitchell + David Mitchel
(Cross out whichever does not apply)

Date: 3/8/18 Signature: Pamela Mitchell

for Chelwood Farming P/L

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

RECEIVED
07 AUG 2018
State Commission Assessment Panel

publ # 12495836 support (transport overall) (14)

Representation 14 - Redden

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Mrs Chrissie Redden

My phone number: 0488439024

PRIMARY METHOD(s) OF CONTACT: Email address: christimes2@bigpond.com

Postal address: P.O. Box 31 Mintaro SA. Postcode 5415

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

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

The address of the property affected is Catholic Church Road Mintaro Postcode 5415

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

Please Refer to email dated 8/8/18 CR

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: 8-8-2018 Signature: C.Redden

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Support - transport issue (qualified)

(14)

Wyatt, Sharon (DPTI)

From:	Chrissy Redden <christimes2@bigpond.com>
Sent:	Wednesday, 8 August 2018 1:39 PM
To:	Wyatt, Sharon (DPTI)
Subject:	RE: Representation form - Chaff Mill Solar Farm proposal
Attachments:	Representation Form.JPG

Thank you Sharon, please find completed 'Representation Form 'attached.

Mintaro Catholic Church on Catholic Church Road Mintaro.

Re: the proposed road for heavy vehicle transport to the future Solar Farm.
We believe this project will have a positive impact on the Mintaro community, and long term benefits for our state! Please note that we have no objection to the project itself, but are primarily concerned about the impact heavy vehicles may have to our Catholic Church and Road.

As the representative for Mintaro on the Property and Maintenance Committee for the Parish of Sevenhill, which includes Clare, Auburn and Mintaro, I wish to address the following concerns;

- The Catholic Church is heritage listed, built in 1852, the church stands at 16 metres from the road, heavy transport creates clouds of dust and stones, and the vibration can be felt under foot as heavy vehicles pass. This church has an active community of participants it is a site for weddings, funerals, visitors on ancestry tours, and pilgrimage. Ancestors of the original 1852 community still live in Mintaro today. The age and the cost of major renovations makes this sacred space vulnerable to external influences.

- The road beside the church is a single lane dirt/rubble track, the sides of the road are higher than the road reducing the ability of on coming traffic to move off the road. The junction at the western end is obscured and angled, the give way sign is often knocked over by trucks. The eastern intersection is at an angle, hence the need to pull out to observe for oncoming traffic, and vice versa.

In conclusion our committee and community would suggest widening, sealing, and excavating said road to increase visibility and safety for concerned.

We would appreciate your consideration and understanding.

Yours Sincerely

Chrissy Redden

From: Wyatt, Sharon (DPTI)
Sent: Wednesday, 8 August 2018 11:32 AM
To: christimes2@bigpond.com
Subject: Representation form - Chaff Mill Solar Farm proposal

Hi Chris,

As discussed, please find attached the representation form for the proposed solar farm at Chaff Mill (DA 433/V003/18).

Kind Regards
Sharon

Representation 15 - Mitchell

(15)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: GRAHAM AND LOIS MITCHELL

My phone number: 0429 439 009

PRIMARY METHOD(s) OF CONTACT: Email address: chelston@capri.net.au

Postal address: UNIT 1, 33 ESPLANADE, HENLEY BEACH SOUTH SA Postcode 50 22

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

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

The address of the property affected is SEC^N 130 Hd STANLEY Postcode 5415

The specific aspects of the application to which I make comment on are: POTENTIAL FOR ELEVATED FROST RISK IN IMMEDIATE AREA. OUR ADJACENT VINEYARD REQUIRES CAREFUL MANAGEMENT FOR FROST. WE BELIEVE THIS PROPOSAL HAS ALREADY SUBSTANTIALLY AFFECTED THE CAPITAL VALUE OF THE PROPERTY. FRV APPEAR UNWILLING TO DISCUSS THIS OR FUTURE POTENTIAL PRODUCTION LOSSES. THIS PROJECT MUST NOT PROCEED ~~[illegible]~~ IN THESE CIRCUMSTANCES. IT IS ALSO IN THE WRONG AREA AND THE PROJECT FAILS LOCAL DEVELOPMENT POLICY REQUIREMENTS

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: 6/8/18 Signature: G E Mitchell L.C. Mitchell

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

object (15)

Wyatt, Sharon (DPTI)

From: DPTI:scapreps
Sent: Wednesday, 8 August 2018 1:47 PM
To: Wyatt, Sharon (DPTI)
Subject: FW: State Development Assessment Panel Submission for FRV Solar Farm Application : Develoment Number : 433/V003/18
Attachments: STATE ASSESSMENT PANEL SUBMISSION P1.jpg; STATE ASSESSMENT PANEL SUBMISSION P2.jpg; STATE ASSESSMENT PANEL SUBMISSION P3.jpg; FRV BOARD LETTER.docx; VINEYARD VALUATION 2018.pdf; CLARE AND GILBERT VALLEY COUNCIL DEVELOPMENT ASSESMENT PANEL HORTICULTRURAL POLICY.jpg; STATE ASSESSMENT PANEL REPRESENTATION ON APPLICATION.jpg

I have put into Knet.

D

State Commission Assessment Panel - Representations
Development Division
Department of Planning, Transport and Infrastructure
• scapreps@sa.gov.au
Level 5, 50 Flinders Street, Adelaide SA 5000 • PO Box 1815, Adelaide SA 5001 • DX 171 • www.dpti.sa.gov.au
View the SA Planning Portal • Subscribe to our Newsletters

From: Graham Mitchell [mailto:chelston@capri.net.au]
Sent: Monday, 6 August 2018 9:03 PM
To: DPTI:scapreps
Cc: Graham and Lois Mitchell
Subject: State Development Assessment Panel Submission for FRV Solar Farm Application : Develoment Number : 433/V003/18

To The State Development Assessment Panel.

We write to further detail our concerns about the application to establish a solar farm at Mintaro by FRV.

Please see attachments above as an integral part of this submission.

Many of these concerns were expressed directly to FRV – see attached FRV Board letter – which sadly has not experienced the courtesy of a reply to this day.

Our 35Ha vineyard is on Section 130, Hundred of Stanley – Block 1 being directly across the road from the western boundary of the application area.

Our concerns are :

(A)FROST

The distinct possibility of an elevated frost risk exists from the export of energy from an area quite sensitive to the impact of frost on vineyard and general cropping production.

Our vineyard must be carefully managed to minimise frost damage. Failure to manage interrow cover crops and straw on the vine row properly can result in significant damage.

From our perspective we believe there are two areas of major concern to our business interests:

(1) The effect this proposal has already had in the reduction of its capital value. Local vineyard operators have similar concerns about the impact of an elevated frost risk.

We are of retirement age and our preference would be to be able to sell the vineyard for its assessed value – see attached valuation (Knight Frank – 10/1/18)

(2) The future possibility that if we continue to operate the vineyard, because of the difficulty of achieving a satisfactory sale, our own future production may suffer a detrimental effect from an elevated frost risk.

(B) FRV RESPONSE

Discussions with FRV representatives have indicated there have been no recorded examples of elevated frost risk from solar instillations.

The obvious questions are

- Have any of these instillations been in frost sensitive areas?
- What guarantees can FRV provide that there will be no frost damage?
- What is the response from FRV if they are wrong?
- What is the FRV response to the very real reduction now to the value of our vineyard? *****
  They have failed to respond to our expressed concerns and losses now
  – what hope, what process is there for seeking a fair and reasonable timely response to future possible losses from a distant multinational corporate? *****

(C) SITE SUITABILITY

The site is obviously attractive because of the proximity of the sub station at the Mintaro gas turbine power generating plant. However the Clare and Gilbert Valley`s Council`s Development Plan Policy (Horticultural Policy Area 2, page 127) states that :

`Development which would remove productive land from agriculture, or diminish its overall productivity for primary production should not be undertaken.`

Plainly this proposal fails on both measures.

- The site chosen is in fact prime, reliable South Australian farming land. This is surely irresponsible land stewardship when clearly other projects have rightly chosen far more suitable lower value sites such as Port Augusta and Robertstown.
- The Council document continues to say `unless the land is required for essential public purposes.`

Firstly it is currently a matter of debate in the wider community that our country presently requires more renewable energy sources before it needs more reliable base load power generation.

What is not a matter of debate is that this particular site is essential to provide this form of public need when other lower value, less visually attractive sites are obviously available elsewhere.

We look forward to the opportunity to meet with the State Development Assessment panel.
Our Representation on Application form is included as an attachment.

Your Sincerely,
Graham Mitchell ....

Lois Mitchell .... (Signed on Attachments)

Dear FRV Board Members,

As an adjoining neighbour of the proposed Mintaro Solar Project we wish to register our very real concerns about the impact this project has :
(1) already had on our business.
(2) the future impact on our vineyard production
- due also to the potential, or perceived potential, from elevated frost risk.

The basis for this concern is that our vineyard already requires careful management strategies - timely removal of cover crop and straw management etc - to avoid frost impact.

My wife and I are well advanced in our plans to retire and move to Adelaide, closer to our family (April 25th). We have sold our farm land to my brother John after thoroughly enjoying a 48 year farming career.

We continue to operate a 35 Ha wine grape producing vineyard near Mintaro - Section 130. In recent years, at considerable expense and business risk, 19 Ha of this area has been grafted to an alternative variety (Cabernet Sauvignon) and is only now coming back toward full production.

A very real influence in embarking on this grafting process was to meet market requirements with a greater varietal range and in fact to make the vineyard more attractive for future sale as we approached retirement.

It is a definite fact that our most likely potential purchasers - the local vineyard owners - like ourselves, share concerns about the possibility of elevated frost risk due to the 'export' of energy from the immediate environment. Regardless, if this does or does not eventuate, that is the strong local expectation – particularly considering the increasing impact of frost damage to commercial horticultural and broadacre crop production in this immediate area in the last 5 years.

The most unfortunate result for my wife and I, is that the local vineyard operators therefore would have absolutely no interest in purchasing our vineyard at full value. It is just a risk - real or not - that they do not need to take. This we believe has substantially reduced our vineyard's value as a result of your proposed solar project.

As a company you may refuse to acknowledge our claim but , I assure you, we believe it is factual and for us very real. We are now open to sell our vineyard investment and this plan has been severely compromised.

If you, as a responsible corporate entity, will accept the validity of our expressed opinion we would be most happy to meet with you to discuss a satisfactory resolution.

If, in fact, you do not accept our view, but as a responsible corporate entity, seek to test our claims we would suggest a process that would actually provide a clear determination of the matter. Whilst we believe our best prospects for a satisfactory sale would be a local vineyard operator, no doubt other potential purchasers are out in the wider market.
Our suggestion is that the property be widely advertised for sale after vintage - in the May to July period this year.

This together with a binding commitment from FRV to cover any sale shortfall from a recent valuation already provided (Jason Oster - Knight Frank, Adelaide) would resolve the situation.
If the sale did meet the valuation , FRV would have no obligation and your position would be vindicated. Likewise if the sale price failed to make valuation, obviously our claim would be confirmed and that would clearly quantify our loss and identify the of level of compensation to resolve the matter.

We seek this resolution in good faith and look forward to your considered response. We acknowledge your reply, via Daniel Hegarty, previously to decline the opportunity to purchase the vineyard.

We still believe its location does have a long term strategic value to your company - being much closer to the substation and a northerly aspect.

Once again, we are happy to further discuss the matter.

Yours Sincerely,
Graham and Lois Mitchell,
for Chelston Farm Pty Ltd
PO Box 1177,
Clare, SA. 5453.

Ph: 0429 439 $009

Horticulture Policy Area 2

Refer to the *Map Reference Tables* for a list of the maps that relate to this policy area.

OBJECTIVES

1 A policy area primarily for horticulture and in particular, the retention and expansion of viticulture and other agricultural production in an environmentally sustainable manner.

2 The establishment of appropriately scaled industries for washing, processing and packaging primary produce, and servicing and supporting horticulture.

3 Encouragement of the establishment of appropriately scaled 'value added' industries to utilize local rural production, including the establishment of niche market products, within suitable areas of minimal landscape intrusion and environmental impact.

4 Achieve a clear edge separation from township development through buffer areas of compatible rural activities.

5 Preservation and enhancement of the attractive appearance of the zone as viewed from scenic routes.

6 Retention and protection of the historic homestead of Inchiquin at Clare, and its surrounding grounds and outbuildings.

7 Development that contributes to the desired character of the policy area.

DESIRED CHARACTER

The policy area benefits from a beautiful landscape of viticultural and agricultural uses which provides the backdrop for tourism, wineries and rural production. It is characterised by a unique combination of soils, climate and landscape, with attraction of visitors and tourists to the many wineries and associated vineyards, other local products and the picturesque scenery. The combination of rich soils, high rainfall and ideal ripening conditions makes the Clare Valley a premium wine production area. The policy area extends from Stanley Flat in the north to Auburn in the south and includes the valley floor (excluding the townships of Clare, Penwortham, Sevenhill and Watervale) and outer lying areas to the east and west between the north/south ranges, including the heavily vegetated ridges and hilltops, the Skilly Hills and Spring Gully Conservation Park.

Sound land management practices and reinforcement of viable productive land uses, in preference to further fragmentation of land holdings is encouraged. Development which would remove productive land from agriculture, or diminish its overall productivity for primary production should not be undertaken, unless the land is required for essential public purposes or the processing of organic waste. The policy area should be encouraged to develop further as a vineyard and agricultural area. The provisions encourage the retention of the current rural character, native vegetation and sustainable development with land capable of managing agricultural production. Tourist accommodation in the form of Bed & Breakfast and Farm Stay accommodation is encouraged within appropriate locations.

Precinct 5 Leasingham

Within **Horticultural Policy Area 2** lies the historic hamlet of Leasingham.

The soils at Leasingham are rich alluvial deposits over limestone which sustains some of the region's richest viticultural lands.

The Development Plan does not recognise Leasingham as a township.

Representation 16 - Mallett   Support - qualified (Chaff Mill)   #13003581   16

Wyatt, Sharon (DPTI)

From:	DPTI:State Commission Assessment Panel
Sent:	Friday, 10 August 2018 11:48 AM
To:	Wyatt, Sharon (DPTI)
Subject:	FW: FRV Services Australia Pty. Ltd. - Development No. 433/V003/18
Importance:	High

I have put into Knet.

State Commission Assessment Panel - Administration
Development Division
Department of Planning, Transport and Infrastructure
T 7109 7101 (internal 97101) • **E** SCAPadmin@sa.gov.au
Level 5, 50 Flinders Street, Adelaide SA 5000 • PO Box 1815, Adelaide SA 5001 • DX 171 • www.dpti.sa.gov.au
View the SA Planning Portal • Subscribe to our Newsletters

SOUTH AUSTRALIA

collaboration . honesty . excellence . enjoyment . respect

From: Jennifer Deckert [mailto:iandjdeckert@gmail.com]
Sent: Thursday, 9 August 2018 7:50 PM
To: DPTI:State Commission Assessment Panel
Cc: Ross Mallett
Subject: re: FRV Services Australia Pty. Ltd. - Development No. 433/V003/18
Importance: High

Dear Sir,

We refer to the above application.

We write to advise that the Mintaro Progress Association lends its support to the above application with the proviso that the preferred vehicle route, as set out in the Chaff Mill Solar Farm Development Application Report; in particular Jolly Way and Catholic Church Road be abandoned as it is an unsuitable route.

Further, the Mintaro Progress Association supports the adjoining landowners in that their submissions should also be taken into consideration.

Yours faithfully

ROSS MALLETT
CHAIR
MINTARO PROGRESS ASSOCIATION
Burra Street,
MINTARO SA 5415

Representation 17 - Murdoch

13003626 (17)

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: PETER MURDOCH

My phone number: 0432 374 589

PRIMARY METHOD(s) OF CONTACT:

Email address: pgmurdoch@gmail.com

Postal address: 84 Kingston Road

MINTARO SA Postcode 5415

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

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

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

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

7.4 Non Indigenous Heritage

7.8 Traffic and Access

7.8.3.3 Intersections

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: .... 9 AUGUST 2018 .... Signature: ....

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Peter G Murdoch
PO Box 33
Mintaro SA 5415

m 0432 374 589
pgmurdoch@gmail.com
http://pgmurdoch.com.au

9 August 2018

State Commission Assessment Panel (SCAP)
GPO Box 1815
ADELAIDE SA 5001

RE: Representation on Crown Development Application 433/V003/18

Dear SCAP Members,
With regard to this application I would like to make comment on the following Environmental Assessment matters:

7.4 Non Indigenous Heritage
7.4.3.2. identifies the Catholic Church of Mary Immaculate, Catholic Church Road, Mintaro, as a heritage place listed on the Register of the National Estate and also identifies it as being on the 'Outskirts of Mintaro township, approximately 2km west of the project area'.

Figure 7.6 Heritage Places in Mintaro and Surrounds - does not show the location for this church as it only shows State Heritage listed places.

7.4.4.1 describes Potential Impacts during Construction. The development application report states that "Any potential impacts on non-Indigenous heritage interests in the area during construction are unlikely" and citing that "All places of heritage interest are located at least 1 km away. Measures will be put in place to ensure construction traffic does not access the site via the Mintaro township."

Through the selection of appropriate wording and omission of visual data the report downplays the significance of the potential impact on the Catholic Church of Mary Immaculate, particularly when it is recognised that FRV Services Australia's (FRV) preferred heavy-vehicle transport route will see 8-16 trucks per day drive within metres of the church over the two year construction period.

The church is located inside the northern boundary of the gazetted State Heritage Area and part of the northern rural living zone of the Mintaro township. A place of significant heritage, being the oldest Jesuit church in Australia, it was built in 1856 on land donated by Irish pioneers Peter and Brigid Brady, whose graves are in the adjoining cemetery.

I ask the panel to give due consideration to the very real potential for impact on the national heritage listed Catholic Church of Mary Immaculate and its adjoining cemetery and seek that an alternate route for heavy-vehicle traffic be prescribed.

7.8 Traffic and Access
7.8.5.1 includes the statement 'Most light vehicle trips and all heavy vehicle trips would be expected to travel to the site via Horrocks
Highway, Jolly Way, Catholic Church Road, Merildin Road and Wookie Creek Road.'

7.8.5.2 indicates that 'The preferred heavy vehicle route is HV2, via Horrocks Highway.'

I note that community concern has been acknowledged, particularly in regard to Jolly Way and by avoiding traffic through the township, but I am personally surprised that this route has been chosen as the preferred one.

It possibly makes economic sense for FRV as minimal infrastructure spending would be required in contrast to some of the other options. However, the burden of expenditure for repair and maintenance for the roadways will likely fall back to DPTI and the Clare and Gilbert Valleys Council over time. Many of the roads are already in poor condition in a number of places. While the development application report directs your attention to the need for work on the Gawler to Giles Corner section of Horrocks Highway, it fails to address the serious need for work on sections between Giles Corner and Sevenhill, nor does it address adequately some of the issues of using Jolly Way from a local's point of view.

As the driver of a light vehicle that uses the Horrocks Highway I find the road surface between Giles Corner and Rhynie very patchy with steering being difficult as the wheels are buffeted from one pothole to another. This is notable in places such as the stretch just before the passing lanes at Macaw Creek, through the bends leading into Rhynie and on the section of road past Rubbish Tip Road, north of Rhynie. The road surface for the descent when travelling north at Undalya—where a crash fatality occurred just this July—is also of particular concern, as is the narrow bridge passing just beyond it.

Jolly Way can at times be anything but for local users and for tourists wanting to access some of the best the Clare Valley has to offer. While the straight stretches are generally good to traverse, I am often confronted with vehicles 'riding the white line' on most of the bends from Sevenhill to the other side of Mintaro Gap. The road is narrow, steep in places, and drivers are reticent to go too close to the guard rail which is along most of Jolly Way. The road surface is less than adequate in the stretch after the curve past Annies Lane (travelling east) and further along still (on another curve) there is a wash-away at the road edge that appeared two years ago. Jolly Way from the Sevenhill turnoff to Spring Farm Road is very winding, narrow and with poor shoulder maintenance and it finishes with a flourish of loose gravel spreading into the intersection at Spring Farm Road. During particularly windy conditions traffic access can be restricted for periods of time on Jolly Way in order to remove fallen trees.

Jolly Way is the key traffic route to the Polish Hill River wineries and the heritage township of Mintaro for tourists visiting the Clare Valley region. Locals generally know what to expect on their local roads and accommodate for this, but this is not as true for tourists visiting the area who are in unfamiliar surroundings and can be caught unawares. It would be unfortunate to make their experience in 'the valley' less than desirable, as this may have a negative impact on future visitation.

Catholic Church Road is used by many locals and tourists who walk or cycle along the length of it for exercise and/or to access the historic Catholic Church of Mary Immaculate precinct. There are no footpaths and the verges are overgrown. Use of the roadway by walkers and cyclists has not been an issue due to the low level of traffic but a proposed increase in traffic on Catholic Church Road would require that improved facilities for foot traffic are considered.

I ask the panel to give due consideration to the potential for impact on future state and local government infrastructure expenditure, driver safety and the tourism credentials of the region and seek that an alternate route for heavy-vehicle traffic be prescribed.

7.8.3.3 Intersections
While in 7.8.3.2 it is indicated that Catholic Church Road connects to the Jolly Way with a T-junction, there is no information provided about this intersection in 7.8.3.3.

The Jolly Way–Catholic Church Road intersection is a junction of a sealed main road and an unsealed road located in an 80 kph posted speed limit zone at the main northern entry to Mintaro. The approach from Sevenhill on Jolly Way is on a sloping descent and obscured from view by vegetation. Heavy vehicles which overshoot this junction will have no choice but to proceed into Mintaro, having to then make a right-hand turn into Burra Street from Jolly Way (Burton Street). This would be an undesirable outcome for the town and residents.

On the access to Catholic Church Road the road surface of Jolly Way slopes, to the south, away from the left-hand turn at the junction. This may present a stabilisation problem for fully laden heavy vehicles using the HV2 route. Trucks will then have to negotiate a slight right-hand bend as Catholic Church Road rises to its highest point (next to the Catholic Church of Mary Immaculate).

The approach from Catholic Church Road requires a right-hand turn into Jolly Way, with the same vehicle stabilisation problem possible as trucks negotiate the turn. Also, to use FRV's terminology, the visibility of oncoming traffic from both directions along Jolly Way is restricted by the road geometry and adjacent vegetation. Conversely, the visibility of slow moving heavy vehicles entering Jolly Way is compromised by these same factors.

I ask the panel to give due consideration to the potential for impact on road traffic movement and driver safety at the northern entrance to Mintaro and seek that an alternate route for heavy-vehicle traffic be prescribed.

Summary
In conclusion I would like to acknowledge that I am in support of renewable energy initiatives that will support the long-term sustainability of the State's energy requirements. I, like many, have concerns about the ongoing use of productive agricultural land for alternate purposes but recognise that FRV's decision for the location of the Chaff Mill Solar Farm is based on the advantage that can be gained in utilising the existing infrastructure adjacent to the site.

While also recognising the employment potential of the proposed project in the short term, I do, however, have serious concerns that the financial benefit provided to FRV by the adoption of their preferred heavy vehicle route HV2 would not be in the best interests of the Mintaro community, nor the wider Clare Valley tourism region.

I respectfully ask that SCAP require FRV to find an alternate route for heavy vehicle traffic that does not impact on Horrocks Highway (Giles Corner to Sevenhill), Jolly Way, Catholic Church Road, or the roadways of the Mintaro township itself.

Yours faithfully,

Peter G. Murdoch
(Mintaro resident)

I offer the following references for further information:

Australian Heritage Database. Catholic Church of Mary Immaculate, Mintaro, SA, Australia.
http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=17426, accessed 1/8/18.

A history of the Jesuits in Australia.
https://ignatius.sa.edu.au/uploads/docs/The_History_of_the_Jesuits_in_Australia.pdf, accessed 9/8/18.

Want to reduce the Clare Valley road toll? "Fix the Horrocks" says RAA
https://www.raa.com.au/community-and-advocacy/media-releases/1238, accessed 9/8/18.

Fix SA's risky roads
https://samotor.raa.com.au/fix-sas-risky-roads/, accessed 9/8/18.

Man killed in serious head on crash in South Australia's Mid North
https://www.news.com.au/national/south-australia/serious-crash-in-south-australias-mid-north/news-story/ad72291fe05b24d915c1719693ca5933, accessed 9/8/18.

Horrocks Highway closed due to serious crash
https://www.northernargus.com.au/story/4546383/horrocks-highway-closed-due-to-serious-crash/, accessed 9/8/18.

DPTI Road Crash Facts
https://dpti.sa.gov.au/towardszerotogether/road_crash_facts, accessed 9/8/18.

DPTI Heavy Vehicle Drivers Fact Sheet (October 2017)
https://dpti.sa.gov.au/__data/assets/pdf_file/0017/247310/Heavy_Vehicle_Fact_Sheet.pdf, accessed 9/8/2018.

13003608 (18)

Representation 18 -
M Faulkner

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: Michael Faulkner

My phone number: 0428 857378

PRIMARY METHOD(s) OF CONTACT: Email address: mick.faulkner@bigpond.com

Postal address: PO Box 118 Watervale SA

Postcode 5452

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

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

The address of the property affected is adjoining to development Postcode 5415

The specific aspects of the application to which I make comment on are: The development of the FRV proposal will result in severe financial damage due to upslope pooling of cold air resulting in crop loss due to frost

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: 9/8/2018 Signature: M Faulkner

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Mr Michael Faulkner
PO Box 118, Watervale SA 545452
0428857378
mick.faulkner@bigpond.com

6 August 2018

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

Dear Panel Members

This submission is an objection to the application of the Chaff Mill Solar Farm, proposed by FRV Services Australia Pty Ltd.

This submission is not objecting the value that solar farms offer as a renewable energy source, it is a representation based on the severe financial loss to JP,CE & MG Faulkner as an adjoining landholder.

This objection is based on:

1. Increased frost damage resulting in severe financial loss due to blocking of cold air drainage.
2. Loss of capital value of adjoining land because of the increase in frost incidence and severity.

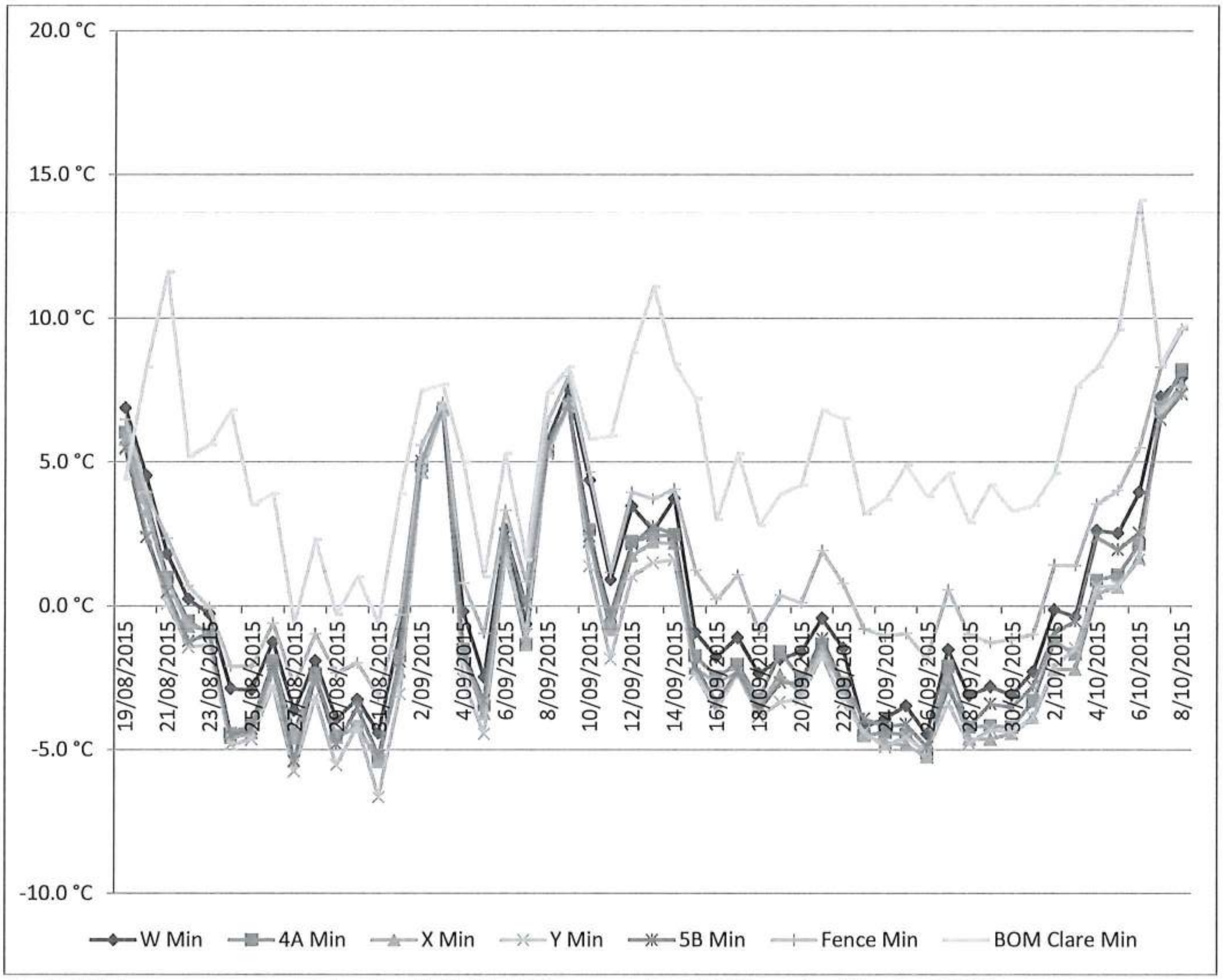
1. An increase in frost damage due to the restriction of natural cold air drainage caused by the installation of a solar farm and boundary fence in and around the lowest point in the landscape

The Merilden area is known to have a high risk of frost. Spring radiation frosts can cause damage to crops with yield losses experienced. The farm land owned by JP,CE & MG Faulkner (Faulkner property) has experienced damage from frost but is able to currently accept and mitigate some of the loss. In 2017 yield loss in chickpeas was estimated at 200 kg/ha (9.1%) and in 2016 wheat grain yield loss was 95% and the crop was cut for hay. There was no frost damage in 2015 and estimated 10% in 2014.

I am a frost researcher and am currently involved in frost research projects with Grains Research and Development Corporation, CSIRO, University of Adelaide, University of Western Australia and the Victorian Department of Economic Development, Jobs, Transport and Resources. I have presented frost information and mitigation workshops in SA, Vic, NSW and WA in recent years.

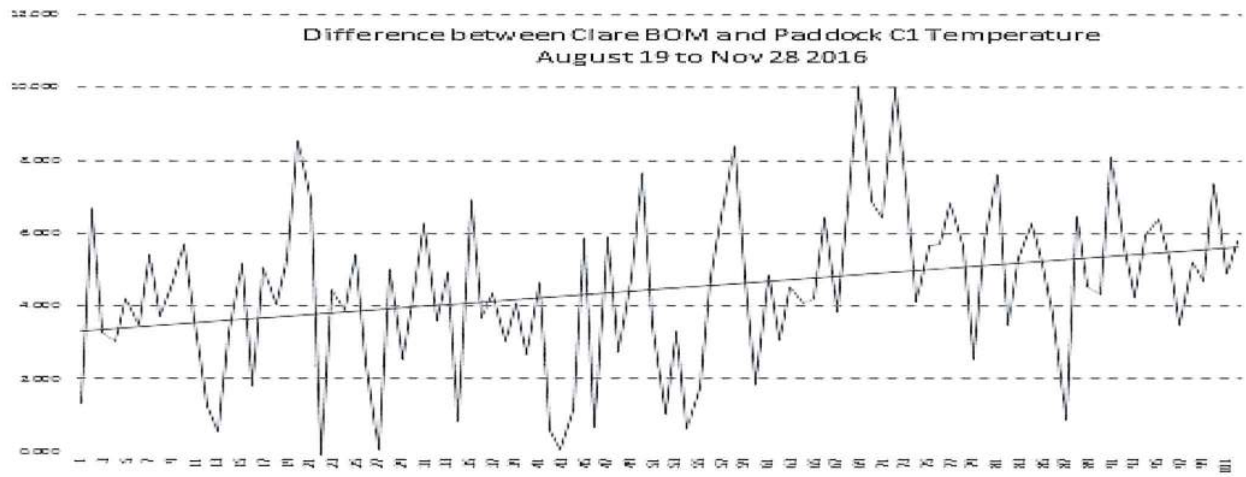
There are statements in the FRV proposal that are incorrect, not based on fact or reasonable science. Firstly there is a statement that there has been consultation with research scientists. Neither I, or any of my research colleagues, have been contacted by anyone associated with the project proponents for comment or to provide data on the impact of the proposal on frost damage.
The comments refer only to the effect of the solar panels and array on radiation and soil and air temperature inside the project site. There is no reference, nor has there been any attempt made to gain information, on the fact that the solar farm to the east of Chaffmill Road is being sited at the lowest point in the landscape and will be surrounded by a 3m high mesh fence.

Frost incidence and severity at or near the proposed FRV solar farm cannot be calculated from temperature data from the Bureau of Meteorology.
The following graph (Graph 1) indicates minimum temperature at the Clare BOM weather station compared to a research location (Paddock C1) 4 km from the FRV proposed site and the Faulkner property.



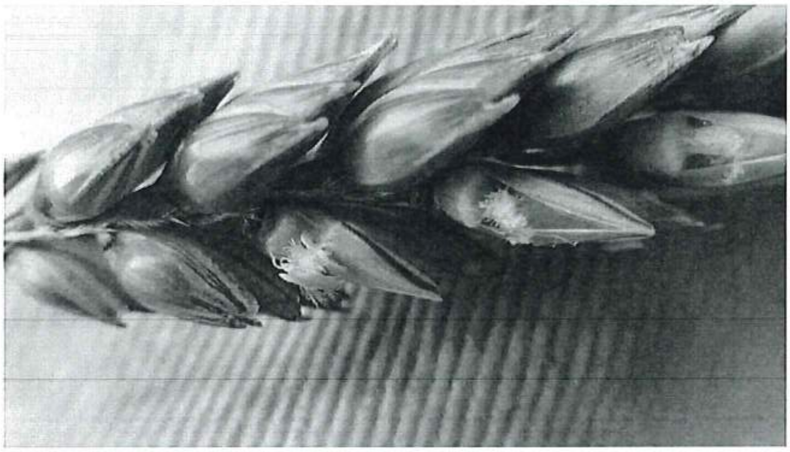
Graph 1 Minimum temperature at locations in Paddock C1 compared to BOM Clare, Aug 19 to Oct 8 2015

The difference in Clare BOM temperature and the canopy temperature at paddock C1 was also compared in 2016. It is apparent that the relationship is inconsistent, varies with time and that Clare BOM data cannot be used for frost risk analysis in the FRV proposed area.

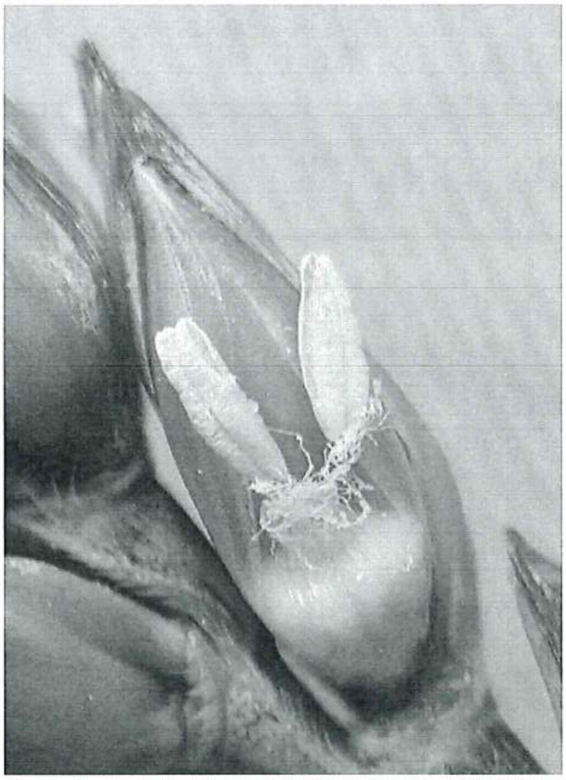


Graph 2 Minimum temperature anomalies for Paddock C1 and Clare BOM, Aug 19 to Oct 28 2016

Radiation frosts occur because heat absorbed by plants (and soil and other surfaces) during the day radiates from the surfaces of these plants at night to the atmosphere. This radiated heat is warmer than the surrounding cold air and therefore rises. Colder air is more dense than warm air and descends, or sinks, to the lowest parts of the landscape. Air at -5°C is approximately 4% more dense than the same air at 5°C. For this reason frosts generally occur in the lower landscape such as the bottom of valleys. Cold air also moves by mass flow from more elevated areas, such as valley walls or from small elevations in the landscape, to the lower parts.



Picture 1 Frost damage to flowering wheat



Picture 2 Frosted anthers and stigma in wheat Merilden 2016

One of the key frost reduction and mitigation techniques is to allow the cold air to freely move to the lowest points in the landscape, thereby pooling extremely cold air in these areas but protecting slightly more elevated areas.

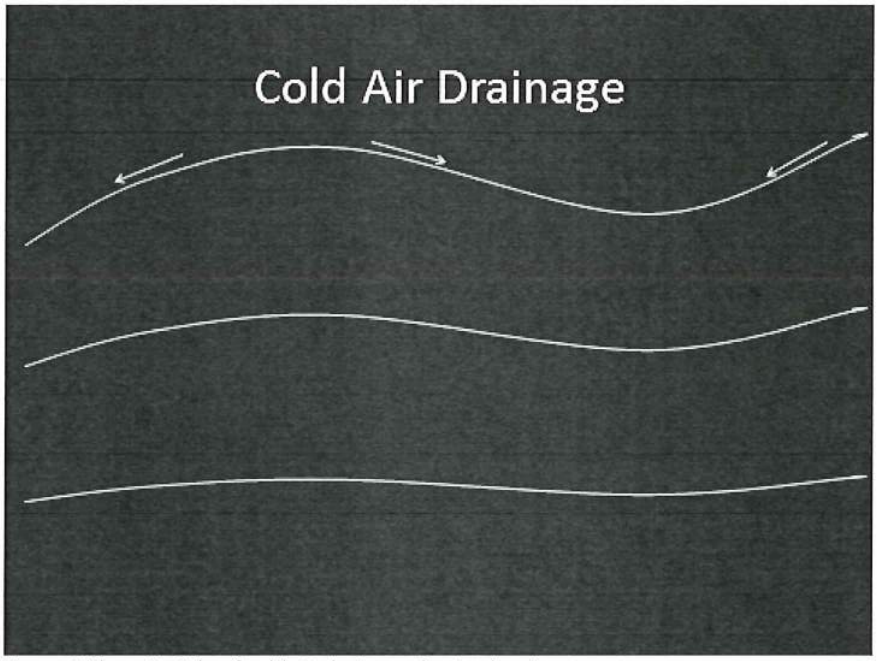


Figure 1 The principle of cold air drainage due to density

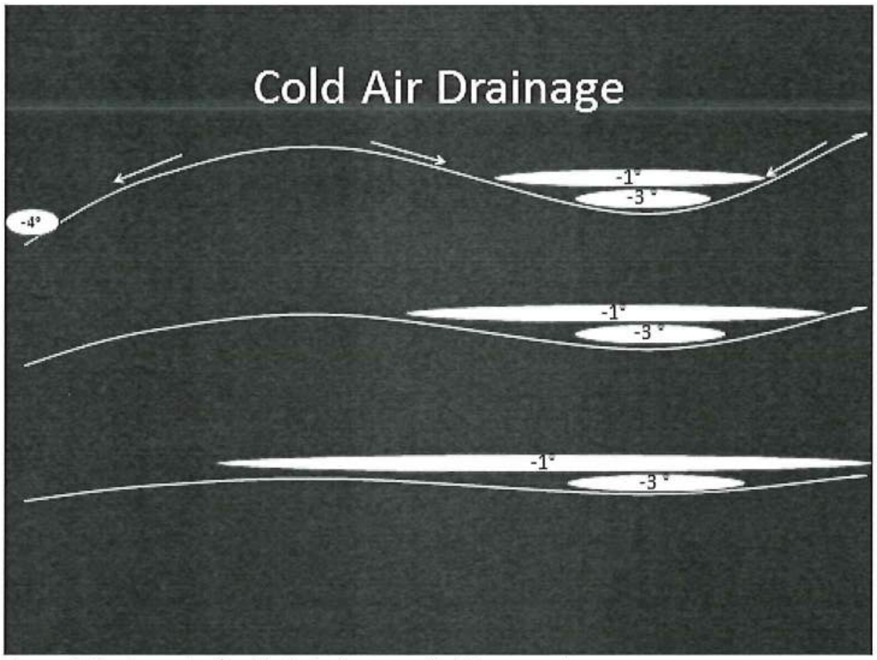
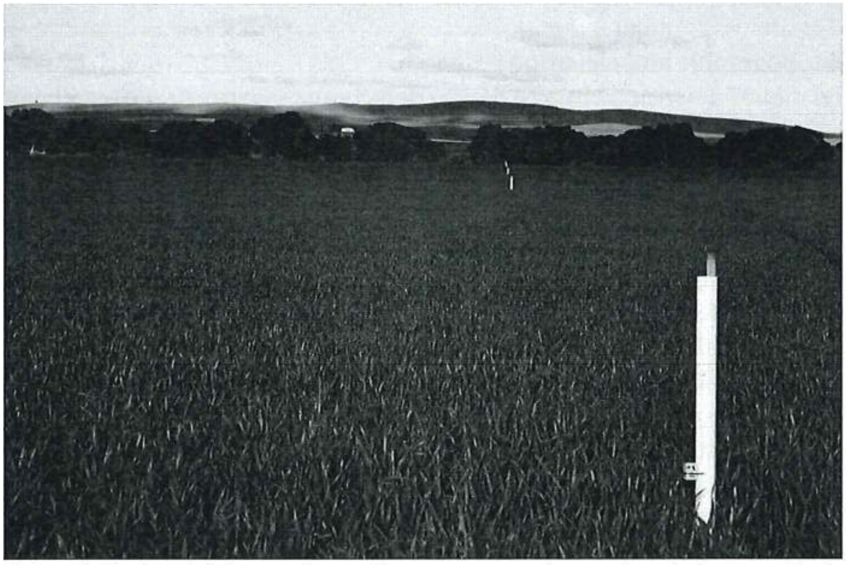


Figure 2 The impact of cold air drainage on field temperature

Conversely erection of a barrier (eg trees, mesh panel fencing etc) has been used to keep cold air upslope resulting in upslope damage and actually reducing damage downslope. This has resulted in shifting damage from traditional cold pooling (low) areas to upslope by the simple installation of a partial barrier. Low density air may be able to diffuse across a mesh fence at high temperature but high density air cannot at low temperature. The FRV proposal will raise the surface of the lowest areas of the landscape to where cold air has always drained and will also erect a 3m mesh fence which will prevent drainage of cold air from upslope adjoining properties.

Extensive temperature modelling by CSIRO and me over a number of years has clearly shown that cold air drainage and pooling is a significant factor in the local area. CSIRO measured and modelled canopy air temperature in an area immediately adjoining the proposed solar farm area with 96 ibutton loggers in 2016 (locations indicated in Picture 4). The proximity of these loggers to the proposed solar farm and Faulkner property is shown in Picture 4. In addition, as part of the GRDC National Paddock Survey, 30 TinyTag loggers were installed in nearby paddocks in 2015 and 2016 to determine spatial temperature differences due to topography. The results clearly indicate that cold air accumulates in the lower points of the landscape when there is no impediment to the mass flow of cold dense air. Temperature data is available on request. Also shown in Picture 4 are pins (C,D,F,G,H,I,J,K,L) used to mark elevation of the Faulkner property and A,B,and E which are located on the proposed solar farm site.



Picture 3: Tinytag data loggers to monitor crop canopy temperature in topographic frost project at Mintaro 2015

Picture 4: location of CSIRO/GRDC temperature monitoring project in relation to the property owned by JP,CE & MG Faulkner and the proposed FRV solar farm with the yellow pins marking transect points used for Graphs 4 to 7

Local temperature, topographic and elevation research.
Cold air is a fluid and moves downslope due to higher density than warm air. Research conducted by CSIRO in 2016 using a large number of temperature loggers clearly showed the impact of topography and elevation on temperature. Generally lower elevation resulted in lower temperature and in addition locations at the base of a slope were the coldest of all points along the slope.

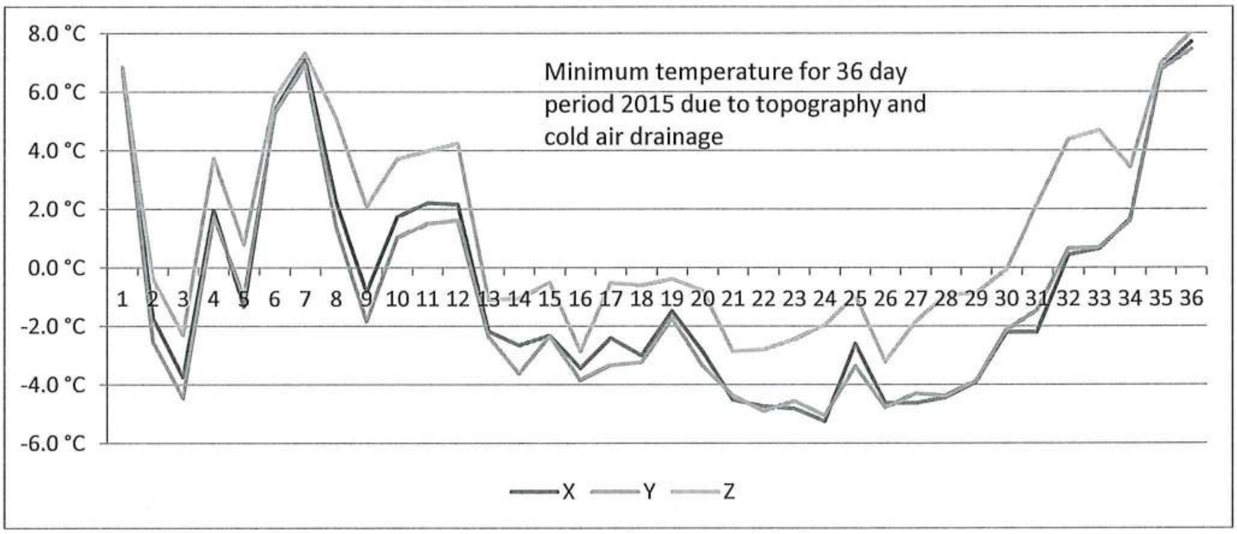
Agrilink Agricultural Consultants research in 2015 and 2016, on a paddock located 4km to the north west of the Faulkner property and the proposed FRV solar farm, shows the strong relationship between elevation and temperature with the cold air drainage downslope.
The elevation of the logger data points is shown in table 1. The results in Graph 3 show the minimum daily canopy temperatures for a 36 day period during spring 2015. Higher temperatures at slightly higher elevations and lower temperatures at lower elevations are apparent. What isn't shown in the data but is available from the research is that the duration of freezing temperature on most nights, when they occurred, was for a longer period of time. Frost damage to broadacre grain crops is known to be a function of absolute temperature and the duration at which low temperatures occur.

There is no barrier to the movement of cold air at this research location. The crop at point JFC X was completely destroyed by frost (and resultantly cut for hay) while there was no apparent damage at point JFC Z. Of great relevance to the FRV proposal is that the temperature differences are occurring at very low increments of altitude (or elevation) which is similar to the Faulkner property and FRV site parameters.

Data logger locations and details 2015

Location details	Reference	Logger ID	Lat	Long	Altitude
Spatial X Temporal	E-W slope transect point	JFC X	-33.85555	138.763466	407
Spatial X Temporal	E-W slope transect point	JFC Y	-33.855416	138.762383	409
Spatial X Temporal	E-W slope transect point	JFC Z	-33.855	138.75915	416

Table 1 Temperature data logger locations for paddock C1 2015



Graph 3 Minimum canopy temperature for 36 day period at 3 elevations, paddock C1 2015

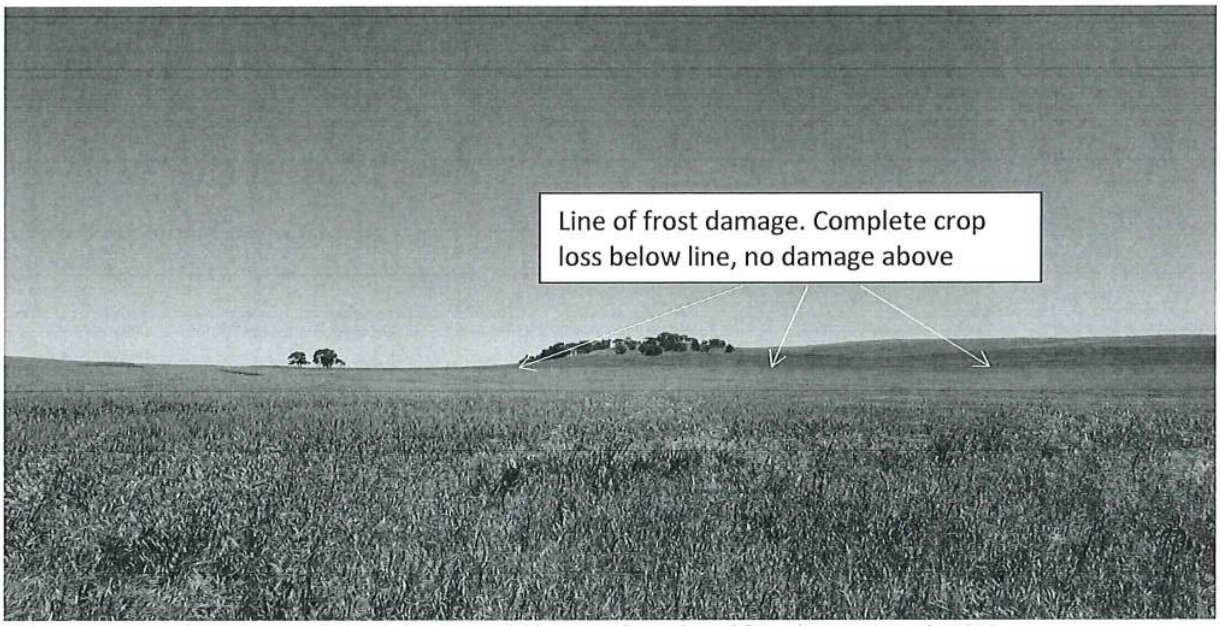
Picture 5 Grain yield map for adjacent paddock to the proposed solar farm Eastern parcel

Picture 5 is a grain yield map of an adjacent paddock to the proposed solar farm. Elevation varies from 415m to 411m. Green shaded areas represent yield in excess of 4 t/ha while red areas indicate yield of 0. The fact that yield has reduced from 4 t/ha to 0 over just 4m elevation indicates how much influence elevation has on cold air drainage to produce temperature outcomes.

Any object that elevates the radiative surface in the lowest points in the landscape or provides a physical barrier to cold air drainage will result in cold air accumulating up slope from that barrier. Frost damage will invariably occur up slope of the barrier.

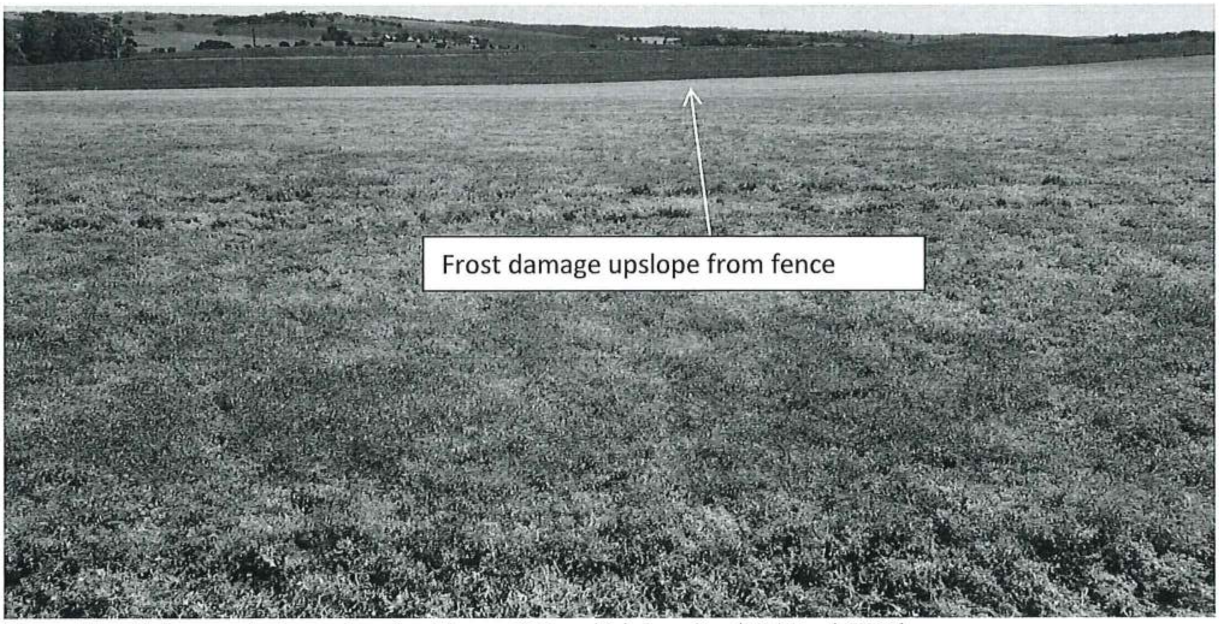
In real terms a barrier is any impediment to mass flow of cold air. Grass weeds, fencelines, trees, buildings are all impenetrable barriers to mass movement. The barrier does not have to be solid as the mass flow moves very slowly and does not have the momentum to 'force' or 'burst' its way through any sort of barrier. The colder the air mass the more dense it is, and the more easy it is to block. It is estimated that blocking mass air movement can be achieved if the barrier has as little as 5% structural material.

The photograph in Picture 6 is of massive frost damage to wheat in the Ngapala area in 2016 resulting upslope from some grass weeds on a fence line. The upslope damage could have been completely avoided by the removal of the grass and fence barrier. It should be noted that the vertical impact of the damage is much greater than the height of the fence and weeds, and that a 1m partial barrier has resulted in upslope damage of approximately 10m vertical height and penetration of 220 m into the paddock.



Picture 6 Upslope frost damaged wheat due to partial barrier of weeds and fenceline at Ngapala 2016

Picture 7 depicts an area of lentils upslope of a fence line (with faba beans growing to 0.7m height on the adjacent downslope paddock) being severely damaged by frost. Yield loss was estimated at 90% in this area. A faba bean crop could be expected to be 30-40% barrier. The amount and height of barrier in this case was sufficient to completely prevent cold air drainage resulting in upslope damage for a considerable distance. The economic loss from restriction to cold air drainage in this case was in the order of $2000/ha.



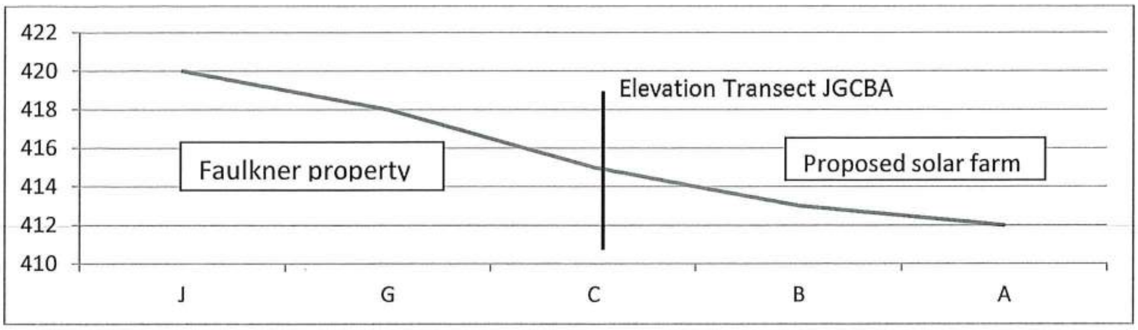
Picture 7 Lentil damage due to upslope frost from a 900mm high fenceline (Mid North 2016)

Picture 8 Vegetative damage to lentils (2017)

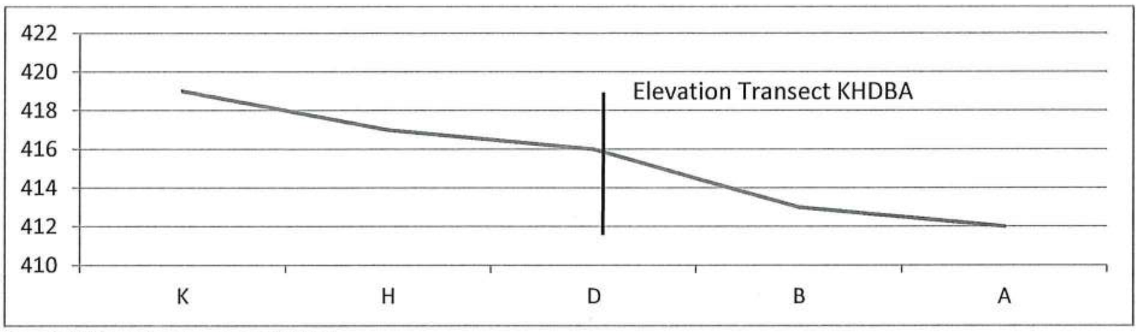
Cold air drainage on the Faulkner property and the impact of a solar farm and boundary fence

Unimpeded slope has historically been one of the key factors in reducing cold air deposition on the Faulkner property as the cold air has been able to drain to the north into the lowest point of the landscape, located as a large area on the site proposed by FRV. The owners have actively used this knowledge and process to reduce the impact of frost on the yield and profitability of the Faulkner property. In addition significant amounts of cold air are draining from the Sandow property (to the west of the Faulkner property) directly north but also across the Faulkner property to the lowest point on the site proposed by FRV. By allowing unrestricted air flow to the lower points the cold air from the Sandow property has not accumulated on the Faulkner property.

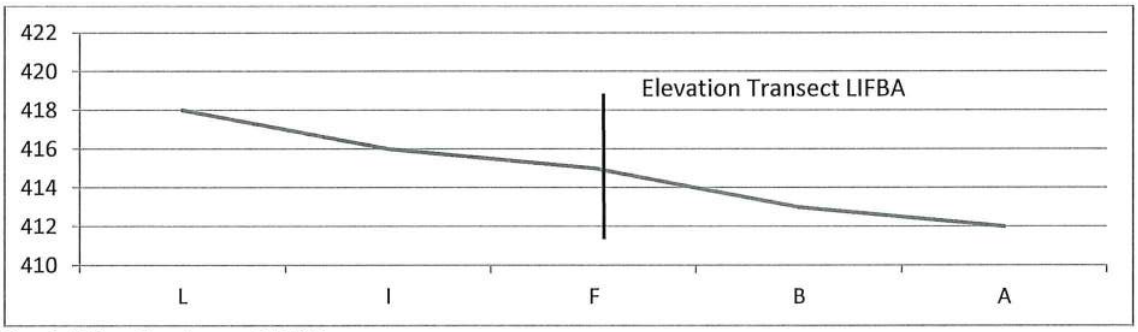
The Faulkner property slopes gently from South to North with elevation at 420 m in the SW corner. Elevation transects have been constructed for graphs 4-6 using GPS and Google Earth derived data. The slope across the property continues into the proposed development site which at its lowest point is 412m, at least 3m lower than anywhere on the Faulkner property. This is the natural basin for cold air drainage and pooling in the local area. Cold air has always drained across the Faulkner property into this basin and the owners have ensured all weed growth is removed along the northern fence line to ensure there is no barrier to this flow.



Graph 4 Elevation transect JGCBA



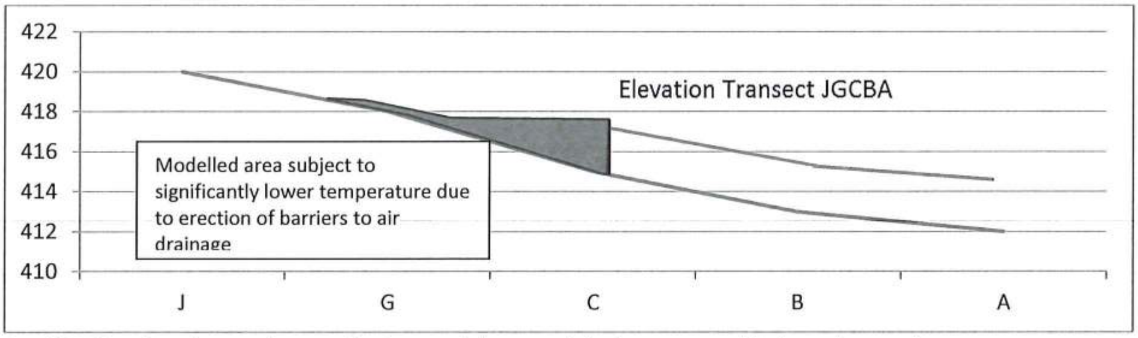
Graph 5 Elevation transect KHDBA



Graph 6 Elevation transect LIFBA

Graph 7 shows the elevation transects for JGCBA when solar panels and boundary fence are included. It also depicts the minimum upslope distance from the fence where cold air will accumulate. The accumulation of cold air can result in temperature of up to 3°C lower than if the barrier did not exist. This would indicate that at a mild frost of -0.5°C in the surrounding landscape, the upslope temperature could be reduced to as much as -3.5°C. During a moderate frost of -2°C the upslope temperature could be as low as -5.5°C.

The frost damage function due to temperature is slightly inexact as plants have 'supercooling' abilities due to solutes in and between cells that can prevent ice formation sometimes to minus 2°C. However damage has also occurred at temperatures nearer 0°C. Complete death of reproductive plant parts is expected at temperatures lower than -2.2°C and damage to grain or stems is expected when temperature reaches -4°C.



Graph 7 Elevation change due to solar farm and fence and the impact on cold air pooling upslope

Graph 7 clearly shows the proposed development will drastically change the dynamics of cold air movement and a very significant area of the Faulkner property will experience much lower temperatures with higher frequency. It will become almost impossible to avoid frost damage.

Erecting solar panels at a height up to 3m and surrounding them with a 3m high fence will prevent cold air from draining from the Faulkner property to where it has historically drained. Cold air will pool at the fence and back up on the Faulkner property until it reaches at least 3m when it may spill over the fence. At 3m on the boundary the cold air will back up to a minimum of 418m altitude (probably more – refer Picture 4) which is approximately 550 to 700m into the Faulkner property from the fence. This is a minimum of 52 ha of the total 78 ha.

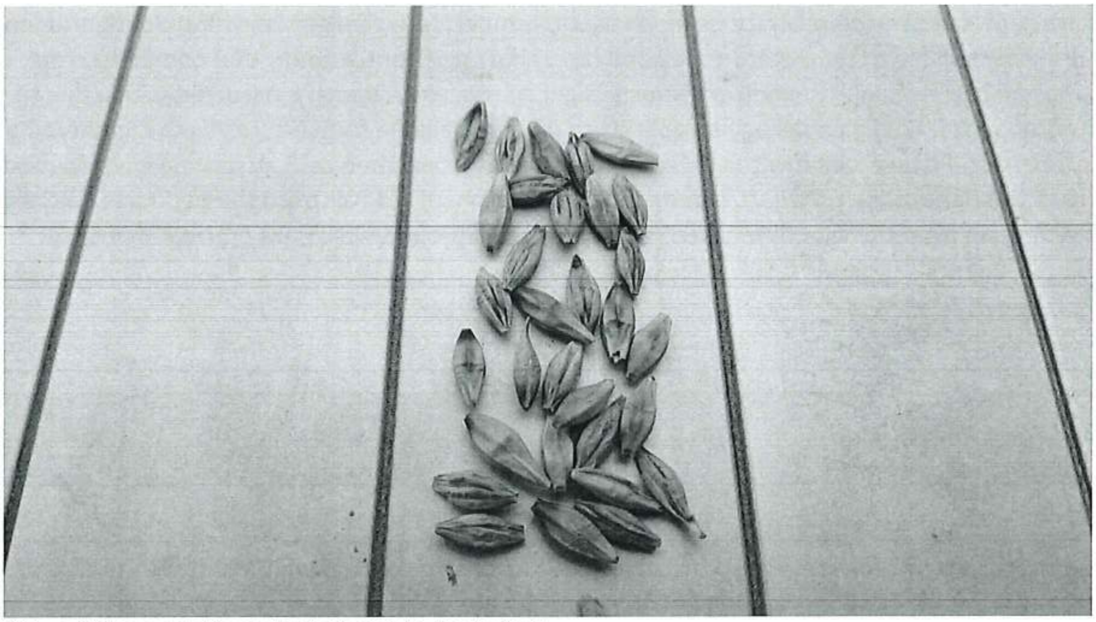
In addition cold air draining from the Sandow property adjoining to the west will be prevented from draining further and could be expected to decrease temperature by a further 1°C for a considerable distance on the Faulkner property.

Any planting of shrubs or trees across natural cold air drainage lines will exacerbate the problem.

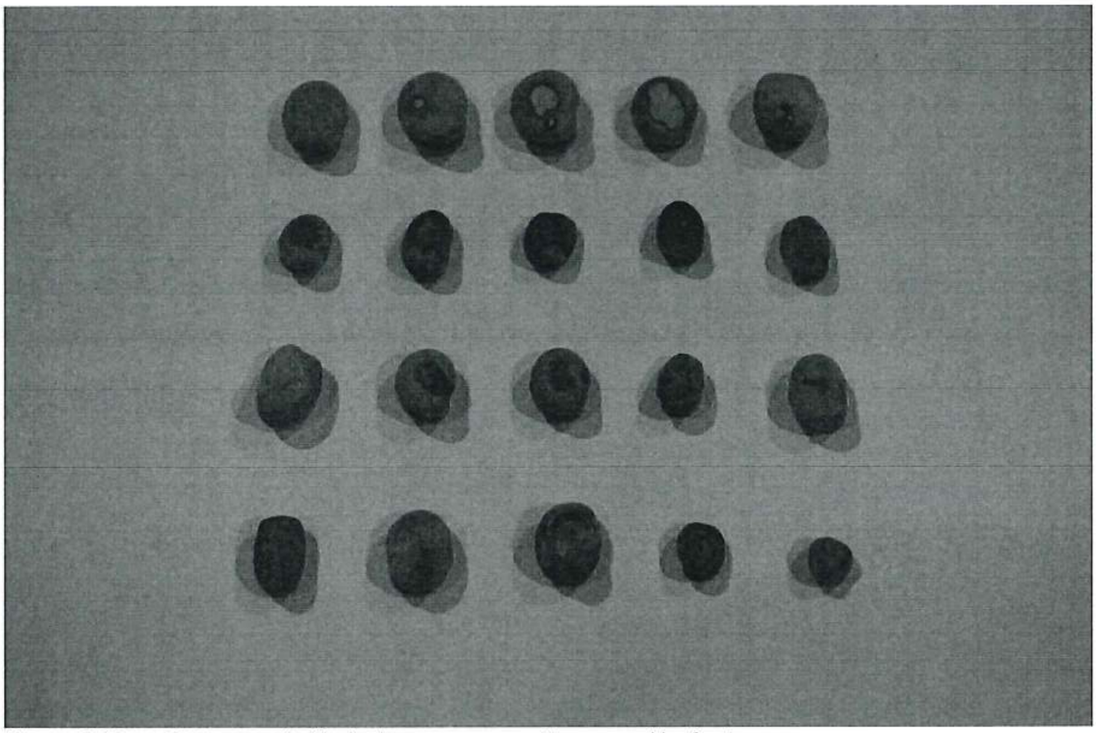
This type of temperature change would make the production for grain of wheat, barley and canola almost impossible. Small temperature changes of around 0.5°C can result in losses increasing from zero to 50% or from 20% (manageable) to 100% (disaster).

In addition to significant yield loss for most crops there would also be a much greater incidence of poor or unacceptable grain quality. Human consumption markets for broad beans, faba beans and chickpeas demand products free of visual and structural damage. These markets would probably be lost if the solar farm proceeds due to increased frost damage.

If barley, wheat and some pulses are removed from the farming system because they become too temperature prone to produce, the only relatively safe production alternatives are cereal or legume hay and faba or broad beans (with quality discounts).
Modern cropping relies on a diverse range of crop choices for disease, weed, seasonal risk and market access risk. Losing a number of options because of increased frost would impact severely on income and risk.



Picture 9 Unacceptable quality barley grain due to frost



Picture 10 Broad beans unsuitable for human consumption caused by frost

Cold air drainage can provide relief for as much as 3°C temperature change indicating clearly that impeding cold air drainage will lower temperature upslope by such a significant amount that complete crop destruction will occur regularly, when previously slight or moderate damage occurred with a low to moderate frequency. Cold air drainage temperature data is available from the research conducted on nearby properties. Picture 11 show the extent of damage by frost when cold air drainage is impeded. A fence line to the right of the picture has impeded the drainage of cold air from the paddock. Cold air has been able to drain from the slightly elevated area in the background which has no frost damage.

Picture 11 Severe upslope frost damage resulting from blockage of natural cold air drainage at Riverton 2016

Estimated impact of erection of solar farm and boundary fence on frost damage to the Faulkner property

Table 2 Estimated incidence and severity of frost due to impedence of cold air drainage on Faulkner property

Crop Type	Incidence		Severity	
	Before cold air drainage impeded	After cold air drainage impeded	Before cold air drainage impeded	After cold air drainage impeded
Wheat	50% of years	100% of years	10-100% damage	50-100% damage
Oats hay	Nil	30% of years	0 damage	30% damage
Chickpeas	20% of years	60% of years	10% damage	20-40% damage
Faba/Broad beans	30% of years	60% of years	0-15% damage	10-30% damage
Barley	30% of years	80% of years	10-80% damage	30-100% damage
Field Peas	60% of years	100% of years	60-100% damage	100% damage
Canola	30% of years	80% of years	0-50% damage	30-90% damage

Table 3 Estimated impact of erection of solar farm and fence on frost damage due to impedence of cold air drainage on Faulkner property

Crop Type	Comments on product yield due to frost increase	Comments on product quality change due to frost increase
Wheat	Uneconomical to grow with frost changes	Could not produce acceptable product for market
Oats hay	Change from no risk to reasonable risk	Impact on quality unknown
Chickpeas	Change from low risk to moderate risk	Product quality restraints due to frosted grain for human consumption
Faba/Broad beans	Change from low risk to moderate risk	Could not produce acceptable product for market
Barley	Uneconomical to grow with frost changes	Could not produce acceptable product for market
Field Peas	Total crop failure	Could not produce acceptable product for market
Canola	Change from moderate risk to very high risk	Product quality restraints due to frosted grain for oil extraction

Frost damage has been kept to a level that cropping is an acceptable risk on the Faulkner property. Table 2 summarises the incidence and severity of crop damage in recent years and the impact on the financial performance. It can be directly compared to Table 3 which models the crop performance during the same time frame assuming the frost damage that would be expected due to lower temperature caused by blocking cold air drainage from the property as influenced by the construction of the Eastern parcel of the FRV proposed solar farm.

Table 2 Frost impact on production and financial performance JP,CE & MG Faulkner prior to FRV project

Year	Crop type	Yield loss		Gross Income	Financial loss compared to unfrosted $/ha	Financial loss compared to unfrosted Total for property $
		kg/ha	%			
2013	Faba Beans/Broad Beans	450	15	1500	225	17550
2014	Wheat (cut for hay)	1000	28	910	80	6240
2015	Oats hay	0	0	1260	0	0
2016	Wheat	4500	95	900	120	9360
2017	Chickpeas/Broad Beans	200	9.1	1320	120	9360

Average for 5 year period $109/ha $8502

Table 3 Modelled impact of blockage of cold air drainage by FRV project on production and financial performance of JP,CE & MG Faulkner (using 2013 to 2017 crop data)

Year	Crop type	Yield loss		Gross Income	Financial loss compared to unfrosted $/ha	Financial loss compared to unfrosted Total for property $
		kg/ha	%			
2013	Faba Beans/Broad Beans	1000	30	1500	500	39000
2014	Wheat (cut for hay)	3000	50	910	455	35490
2015	Oats hay	1500	20	900	225	17550
2016	Wheat	4500	100	0	990	77220
2017	Chickpeas/Broad Beans	660	30	770	330	25740

Average for 5 year period $500/ha $39000

The economic analysis of Table 3 does not include a loss of quality of chickpeas, broad beans and canola. It also makes the assumption that crop choice would have remained the same. Given the analysis in Table 3 indicating that wheat production would no longer be viable then the economic impact is more severe.
It is envisaged that cropping will become extremely high risk upslope of the development and that an estimated average annual loss of $35-60,000 per year will occur. This figure has been calculated using an 80% incidence and 80% severity compared to the current incidence of 35% incidence and 30% severity and some loss of grain quality.

There is no other possible or profitable land use as grazing during winter and spring is impossible due to the presence of vertisol soil types, pugging and cold weather without shelter. In summer water is not available for stock. With a recent prediction of stronger temperature inversions in the future due to climate change it is envisaged that frost damage will become more severe in the short term.
What and to what extent have the proponents planned to compensate the owners of the Faulkner property for the severe financial impact the development will have on them?

2. Loss of capital value of adjoining land because of the increase in frost incidence and severity.

Frost prone land has always been difficult to sell and, when sold, is at a discount price to non-frost prone farming land in the same location.
The current value of the Faulkner property is in the vicinity of $6000 to $7500/ha. The additional damage because of the loss of cold air drainage due to frost from the FRV project will have negative impact on the value of the property because frost damage will increase. It may also result in the property being almost impossible to sell as neighbouring landowners would be well aware of the increased frost damage, and the effect on financial performance. They would be reluctant to purchase.

While it is not possible to predict future farming land prices it is accepted that the initial response would be that the Faulkner property would be reduced in value by $1500 to $3000/ha immediately and would be further devalued as the increased frost damage due to the completion of the project became apparent. Farming land values have increased by an average of 3-7% pa since the Faulkner's purchased this property. Will the land value increase in line with non-adjoining properties and similar production areas which have not had frost damage and risk increased by the solar farm development?

A loss of capital or a reduction in the growth of the asset base puts the owners of the Faulkner property at significant disadvantage for property expansion.

What have the proponents planned to protect the current value and provide for comparative capital growth to other farms not impacted by the solar farm development? Given that the development will result in economic loss because of increased frost damage what have the proponents in place to compensate the Faulkner's for these losses and the value of the Faulkner property.

Response to specific statements in the application by FRV

1. Statement: There is no reference to micro-climate or air temperature implications or requirements in any regulatory or policy guidelines in South Australia or interstate.
   Response: The fact that changing temperature by impeding the natural flow of cold air results in significant economic damage to an adjoining landholder should be sufficient. The deliberate act of one entity that results in financial harm to another is important.

2. Statement: A number of websites, reports and academic papers were reviewed to try and obtain an understanding of the potential radiative heat loss and frost exacerbation issues and impacts associated with solar farm development. Very little information on the topic exists but several sources stated that the potential development of thermal models for large-scale solar farms is highly problematic due to significant uncertainties associated with the multiple parameters involved including variations in albedo, climate data, cloud cover, landscape, seasonality, panel efficiency, panel design, wind speeds, vegetation cover, soil data and a number of other factors.
   Response: There may be little known about radiation heat loss but there is considerable information about cold air drainage per se and impeding cold air drainage. This objection is to the development causing restriction of cold air drainage causing severe frost impacts to upslope land holders.

3. Statement: There is a lack of specific studies and literature that relates to the general environmental impacts of solar farms.
   Response: There is substantial information about the creation of barriers to the mass flow of cold air and the potential and actual impact on temperature of upslope land. GRDC research and current

advice includes removing barriers to cold air drainage and to refrain from placing such barriers where upslope damage could occur.

4. Several studies were reviewed which had a range of findings and outcomes. Summarised relevant findings appear to be that:
   Temperatures in the centre of a solar farm may be slightly higher than ambient – particularly in warmer months
   Temperatures return to ambient several metres above a solar farm
   Temperatures may be slightly warmer directly adjacent a solar farm, gradually returning to ambient with distance away from the solar farm
   Soil temperatures at depth underneath panels may be slightly warmer during cooler months and slightly cooler in warmer months
   Air temperatures at ground level underneath panels may be slightly cooler during summer months
   Air temperatures at a two-metre height in the solar farm in the colder months would probably be similar to the surrounding areas
   Air temperatures at a two-metre height in the solar farm in the warmer months may be slightly warmer than the surrounding areas
   Air temperatures directly above solar arrays may be slightly warmer at night
   Temperatures at control sites adjacent solar farms generally had temperatures equal to ambient conditions

   <u>Response</u>: There is no mention that the height of the panels and fence change the landscape from being the least elevated to more elevated than the surrounding landscape. Upslope neighbouring properties will have a barrier to cold air mass flow from their property to the lower area of the Eastern parcel of the solar farm development. The area will no longer be the lowest in the landscape as the solar panel arrays will artificially raise the sink for cold air as well as the panels and perimeter fence reducing mass cold air movement. It is likely the coldest point in the proposed development will become the panel surfaces whereas previously it was the soil surface or crop canopy.

5. In discussion with research scientists, climatologists and meteorologists; the climate impacts of a 380-ha solar farm would not be significant and the addition of access roads within and around a solar farm would further mitigate any local climate impacts due to enhanced air flow.
   <u>Response</u>: Was the question actually asked the question about restricting cold air drainage from upslope properties by the proposed development. This question should be asked to hydrologists and scientists – I doubt if climatologists and meteorologists work at a scale that would give them knowledge in the area. There does, however, appear to be an admission that micro scale impacts can be important. The statement that access roads would further mitigate impacts due to enhanced air flow suggests there is some knowledge. To suggest access roads are positive without reference to the negative impacts of the solar panels and perimeter fence is scandalous. The impact of a 3m high fence will prevent cold air drainage from a large area while an access road will have an impact for a few metres either side of the road itself. The access roads are horizontal surfaces, obviously at ground level, whereas the panels and fence create vertical impediments.

6. The visual impact assessment undertaken for this project has demonstrated that the likely visual impact on nearby sensitive receptors can be mostly managed though vegetative screening.
   <u>Response</u>: Vegetative screening will create a barrier to the mass flow of cold air. There is no location on the proposed FRV Eastern parcel that would not reduce the mass flow of cold air to the lowest point of the landscape. Any vegetative screen will have detrimental impacts on low temperature accumulation for neighbouring landholders. Even vegetative screening on the western and north western boundary of the Western parcel will reduce the mass flow of cold air from farming properties adjoining to the west and north. The reason why there is very little tree and shrub vegetation in the area is that they were removed and never replanted so that cold air

drainage could be unrestricted and that pooling of cold air should naturally occur at the lowest point of the landscape.

7. Solar farms are not mentioned in the Clare and Gilbert Valleys Council Development Plan however the development of wind farms and ancillary development are envisaged within the Primary Production Zone. The Development Plan recognises that wind farms may need to be built in visually prominent locations to maximise effectiveness and states that visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy. Solar farms provide comparable benefits and may also be accepted within this zone.
   <u>Response</u>: Wind farms are strategically located on hills to capture the most reliable part of the landscape. They are generally not thought to contribute to the micro climate in a significant manner. The FRV development will directly influence the mass movement of cold air as it is being sited at the lowest point in the landscape and across natural cold air drainage lines caused by elevation and topography. The location of the development will directly impact the pooling of cold air on the upslope property of the Faulkner's (and possibly others) resulting in lower temperature when temperature inversion conditions exist that are precursors to frost. During winter and spring the lower temperature upslope will cause significant additional frost impacts than are currently experienced.

8. FRV adopted a three-phased engagement process:
   Stage 1: Meet with stakeholders and the community (including all neighbouring properties) to introduce them to the project, outline its benefits, explain the Development Application process and to seek feedback.
   Stage 2: Continued engagement with stakeholders and the community, in particular with the Council, local MPs and key stakeholder groups providing an update on the Development Application process, initial findings from technical assessments and how community concerns are being addressed.
   Stage 3: Meet with all directly neighbouring properties (and some additional neighbours), the Clare and Gilbert Valleys Council, local MPs and community groups to share the findings from the specialist technical assessments and outline how concerns will be addressed in the Development Application. This phase also included a pop-up community information session at the Sevenhill Markets. A meeting with the new Minister of Trade Tourism and Investment and the advisor for the local MP following the change of South Australian government in March 2018 was also held.
   <u>Response</u>: The first meeting (presumably Stage 1) as an adjoining landholder was for 15 minutes on September 28 2017, on the side of the road adjacent to the Faulkner property. The two FRV representatives at the meeting are no longer working for the company and the third attendee was from RPS. The issue of frost due to cold air drainage was one of many issues discussed although there was little substance to any of the points raised. There was no genuine attempt to satisfy the issues raised.
   If there were continuing discussions then I was not privy to them and there was no direct discussion on the points raised. Some minor issues were addressed by return email. There have been 9 emails in total, of which 4 have been to make appointments for Stage 1 and Stage 3 meetings.
   The stage 3 meeting was held in Clare and once again a number of points were raised. Some minor points have been responded by email but the ones of cold air drainage impedance and future land values have not been addressed. I suggested to the proponents at the time that significant frost and topography research had been conducted in the area in recent years. The response was underwhelming. The meeting was restricted to 50 minutes because of scheduling of the next appointment.

9. This enabled the landowners to have their concerns addressed first-hand by the project team and to ask any additional questions.
   <u>Response</u>: No concerns were addressed, they were simply written down and largely there has not been a satisfactory result to this point in time. The major issues on which this objection has been composed have never been addressed in any way and certainly not to my satisfaction as an adjoining landholder.

10. Specific issues relating to 7.12 Micro-climate impacts (Frost) in the application. An issue raised by the community regarding the proposed Chaff Mill Solar Farm was the perceived potential of the solar farm to exacerbate the frost risk at adjacent properties. This issue was later clarified as being more related to the potential impacts (either positive or negative) of radiative heat loss from the surfaces of the solar panels on the temperatures of the surrounding environments or climate. This section first provides some context on frost and the existing climate in proximity to the proposed project site, then moves on to discuss the investigations undertaken to form a view on the potential significance of radiative heat loss from solar farm sites, and closes by summarising key findings.
    Response: I don't agree with the point of clarification. My question was and always has been about the development reducing the natural mass flow of cold air that upslope properties have used for frost mitigation for generations.

11. Specific issues relating to Section 7.12 of the application.
    Response: None of the 10 points in 7.12.4.1 make any reference to mass cold air movement being interrupted by the erection of a solar panel array (variously quoted as being 2 or 3 m height) and a 3m mesh fence. A structure this size will definitely reduce drainage and result in the accumulation and spread of cold air upslope from the development. Cold air accumulation on upslope could be as much as 3°C above uninterrupted ambient temperature.
    The discussion with scientists referenced in 7.12.4.2 does not include cold air drainage and the development around the lowest point in the landscape impacting upslope landholders. Mass cold air drainage is an important factor and interrupting the natural flow can reduce upslope temperature considerably over a very significant area. Just a few wild oat plants on a fence line have caused sever upslope frost damage to 10 times the height of the weeds and incursion many hundreds of metres to the upslope of the barrier. The proposal for the solar panel arrays and perimeter fence are a highly significant barrier and could be expected to result in very extensive and intensive pooling of very cold air upslope of the development.
    The discussion in 7.12.5.1 simply ignores the science and evidence that mass movement of cold air can be blocked by non-uniform, non-contiguous and non-solid barriers. There is little difference in mass cold air being stopped by a mesh fence or a brick wall of the same height. The air does not moving with sufficient velocity to overcome the restriction.

I am willing to make a visual representation to the State Commission Assessment Panel in support of the objection.

Kind Regards,

Mick Faulkner
Landholder and Principal Consultant
Agrilink Agricultural Consultants

Followup
#13747726 (18)

Wyatt, Sharon (DPTI)

From:	DPTI:State Commission Assessment Panel
Sent:	Friday, 8 March 2019 12:03 PM
To:	Wyatt, Sharon (DPTI)
Subject:	FW: Representation re Development Number 433/V003/18
Attachments:	Location of temperature data loggers 2018 FRV proposed site.pdf

A follow up submission.

I have put into Knet.

State Commission Assessment Panel - Administration
Planning and Land Use Services
Department of Planning, Transport and Infrastructure
T 7109 7060 (internal 97060) • **E** SCAPadmin@sa.gov.au
Level 5, 50 Flinders Street, Adelaide SA 5000 • PO Box 1815, Adelaide SA 5001 • DX 171 • www.dpti.sa.gov.au
View the SA Planning Portal • Subscribe to our Newsletters

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From: Mick Faulkner [mailto:mick.faulkner@bigpond.com]
Sent: Thursday, 7 March 2019 1:45 PM
To: DPTI:State Commission Assessment Panel <scapadmin@sa.gov.au>
Subject: Representation re Development Number 433/V003/18

To the secretary, State Commission Assessment Panel
I am providing further information regarding the application from FRV Services Australia Pty Ltd, development number 433/V003/18.
Subsequent to my submission on August 9 2018, 26 Tinytag loggers were installed to measure temperature at crop height in and surrounding the proposed development site.
The loggers were installed to ensure temperature at different points in the landscape was measured. This data is critical in assessing the cold air drainage in the area. The positions of the loggers are identified in the attached image.
The loggers measured temperature every 5 minutes for a period from August 28 to September 24 2018. All loggers were removed when some paddocks were about to be cut for hay.
The temperature data from these loggers is available to the panel.
Kind regards
Mick Faulkner

Mick Faulkner
Agrilink Agricultural Consultants
PO Box 118, Watervale SA 5452
Ph: 08 88434282
Mob: 0428 857378
Email: mick.faulkner@bigpond.com

From: Mick Faulkner <mick.faulkner@bigpond.com>
Sent: Thursday, 9 August 2018 9:31 PM
To: 'scapadmin@sa.gov.au' <scapadmin@sa.gov.au>
Subject: Representation re Development Number 433/V003/18

To the secretary, State Commission Assessment Panel
Please find attached a representation application and objection submission for the application from FRV Services Australia Pty Ltd, development number 433/V003/18.
The proposed development will result in severe financial loss to our primary production business as outlined in the objection.
Could you please acknowledge receipt of this notification.
With regards
Mick Faulkner

PO Box 118, Watervale SA 5452
Ph: 08 88434282
Mob: 0428 857378
Email: mick.faulkner@bigpond.com

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Image © 2019 CNES / Airbus
© 2018 Google
Google Earth

Representation 19 - Deckert

Support (qualified)

#13006832

19

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: __JENNIFER DECKERT SECRETARY, MINTARO PROGRESS ASSOCIATION ______

My phone number: ______ 0420973309 ______

PRIMARY METHOD(s) OF CONTACT:

Email address: ______ iandjdeckert@gmail.com ______

Postal address: ______ PO Box 21 ______

______ MINTARO SA ______Postcode___ 5415 ___

<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
- [X] 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: .....7.8 TRAFFIC AND ACCESS ....

The Mintaro Progress Association lends its support to the application with the proviso that the preferred vehicle route, in particular Jolly Way and Catholic Church Road is not a suitable route. Further, the Mintaro Progress Association supports the adjoining landowners in that their submissions should also be taken into consideration.

....

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: .... 9 AUGUST 2018 .... Signature: ....

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

Representation 20 - Edmunds & Gosse

abbed #13 006929

20

Wyatt, Sharon (DPTI)

From:	DPTI:State Commission Assessment Panel
Sent:	Monday, 13 August 2018 9:37 AM
To:	Wyatt, Sharon (DPTI)
Subject:	FW: Attn Sharon Wyatt re Development Number 433/V003/18
Attachments:	Chaff Mill Solar Farm Submission_Edmunds & Gosse.pdf
Importance:	High

I have put into Knet.

D

State Commission Assessment Panel - Administration
Development Division
Department of Planning, Transport and Infrastructure
T 7109 7101 (internal 97101) • **E** SCAPadmin@sa.gov.au
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From: lorraineedmunds [mailto:lorraineedmunds@internode.on.net]
Sent: Friday, 10 August 2018 4:50 PM
To: DPTI:State Commission Assessment Panel
Subject: Attn Sharon Wyatt re Development Number 433/V003/18
Importance: High

Dear Sharon

Please find attached our joint submission re FRV Services Australia P/L Development Application Number 433/V003/18 – Chaff Mill Solar Farm Mintaro.

We are local residents and have serious concerns about the safety and appropriateness of the preferred access route HV2. This is the focus of our submission.

Our submission is sent in good faith that it will be considered.

Regards

Lorraine Edmunds and Hamish Gosse
PO Box 2 Mintaro 5415

CHAFF MILL SOLAR FARM MINTARO

An image-based Submission
Re Development Application Number 433/V003/18 FRV Services Australia Pty Ltd

Addressing TRAFFIC & ACCESS and ROAD NETWORK LAYOUT & SITE ACCESS

Prepared by Lorraine Edmunds and Hamish Gosse
PO Box 2
MINTARO SA 5415
Email: lorraineedmunds@internode.on.net

INTRODUCTION

Despite being supporters of renewable energy and solar in particular, we are deeply concerned about the route chosen by FRV to access the proposed Chaff Mill Solar Farm. Indeed, of all the options available, HV2, **in particular the Jolly Way section carries the greatest risk to public safety** and will have the greatest impact on tourist and local traffic, as it is the main route used in and out of Mintaro.

Jolly Way is characterized by sweeping bends, crests, several blind entrances, several long sections of unbroken double lines (in excess of two kilometres in places), and many stretches of Armco guardrail, in places on both sides of the road, with very narrow shoulders between the edge of the sealed road section and the rail. Additionally, entrance by heavy vehicles from Horrocks Highway onto Jolly Way cannot be completed without crossing double lines, because Jolly Way is not wide enough. This means that vehicles on Jolly Way have to back up to make room for large vehicles to complete their turn. And under FRV's proposal, the same situation will exist for heavy vehicles turning onto Catholic Church Road from Jolly Way, as the angle is less than ninety degrees. Again, heavy vehicles will have to cross double lines in the face of oncoming traffic to complete their turn.

Since the installation of Armco guardrail along Jolly Way, local residents have noticed that drivers tend to sit closer to the centre lines. It is our experience that on almost every occasion that we use this road (which is several times a week) we observe vehicles (cars, vans, trucks, and even buses) on or over the centre lines. The worst section is south west of Pauletts winery (travelling toward Horrocks Highway), where the road is narrow with crumbling shoulders or none at all, and sweeping bends.

Whilst Jolly Way does carry school buses, small trucks and is occasionally used by heavy vehicles carting soil or livestock, most heavy vehicles (livestock, hay and grain transports) use Copper Ore Road and Leasingham Road, which are much safer options.

It is totally unnecessary for heavy vehicles to approach the proposed site from the west of Mintaro. A much safer option would be access from the east off the Barrier Highway, via Flagstaff Hill Road (a distance of 11 kilometres from the highway to the solar farm site). This compares with a distance of 13.8 kilometres from Horrocks Highway, via Jolly Way, Catholic Church Road, and Merilden Road to the site, (of which four kilometres are unsealed). The Barrier Highway offers much straighter roads, with fewer towns, and a reasonable all-weather road, which is regularly used by heavy vehicles for the stock, hay and grain movements. Vehicle movements would have no impact at all on Mintaro infrastructure if this route were chosen. This route was recommended by community members at the February 23 Community Consultation Meeting in Mintaro.

Mintaro, South Australia's first heritage listed town is like no other town in South Australia. Its charm, setting, surviving built heritage, beautiful tree-lined streets and entrance roads, support a strong local tourism industry of B&Bs, art galleries, cellar doors, gift shops, restaurant, Maze, and pub. Visitors to Mintaro come by bicycle, some walk (Lavender Trail), others use recreational motorcycles and vehicles. Whilst visitors arrive from every direction, the major route used is Jolly Way, which connects Mintaro most directly to the Clare Valley, and along which are located several iconic cellar doors. The drive between Horrocks Highway and Mintaro, via Jolly Way, is considered one of the most scenic in the Clare valley and is an important part of the visitor experience. This will be seriously impacted with an increase in heavy traffic.

We cannot state strongly enough how inappropriate HV2 is as the preferred access route, and we believe that the developers have failed to honestly and robustly consider the very real hazards and shortcomings of this route, when looking at options. We will not shy away from the fact that as a community, we have identified the risks associated with this option should accidents involving heavy vehicles associated with the Chaff Mill Solar Farm development, happen in the future. This really is a no-brainer!

We will use images to try to convey what is at risk if HV2 is retained as the preferred access route.

Identified hazards on the Jolly Way section of preferred access route HV2

Above L: Long sections of double lines bounded by Armco guardrail. Very narrow area from edge of bitumen to rail – little place to go if vehicles cross double lines. Not suitable for use by large fully laden heavy vehicles when cyclists, tourists and local traffic are major users of this road. Cannot accommodate 'Wide Loads' as there is insufficient space for other vehicles to safely pull off.
Above R: Numerous sweeping bends with Armco guardrail on one or both sides.

Above: Long sections bounded by Armco guardrail with little shoulder available. Cyclists regularly use this road (daily bicycle traffic) and could easily be trapped if passed by vehicles occupying both lanes particularly where one is a wide heavy vehicle. Also, overhead canopies form a 'navelike' ceiling with relatively low branches in sections. The community would not want to see this roadside vegetation chopped back to make way for tall heavy vehicles as it is a highly valued element of the ambience and beauty of Mintaro's most heavily used 'approach/arrival' road.

The crests of some steep sections of road feed dramatically into sweeping bends, some of which have side roads entering.

Above: One school bus service operates between Mintaro and Clare daily. This bus was recently observed straddling double lines as it approached an S bend. This behavior is commonly observed on Jolly Way where the sealed section is relatively narrow, and especially where the road is bounded by Armco guardrail.

Although the main Riesling Trail crosses Jolly Way near the intersection with Horrocks Highway, there are other cycling loops like the *Father Regalski Loop* above left, which enters below Paulettes, and is used by many cyclists. There is no dedicated cycling lane on Jolly Way, which is currently quite safe for cyclists because of the low frequency of heavy traffic on the road.

The Jolly Way – Horrocks Highway Junction

Above: Jolly Way approach to Horrocks Highway junction. Vehicles turning onto Jolly Way from Horrocks Highway have right of way. However, because of the narrowness of the road and the steep drop off on top right side of Jolly Way, stationary vehicles (indicated by star) on Jolly Way have to back up to make room for large turning vehicles which require both sides of the road to complete the turn. This will be exacerbated with the increased volume of heavy vehicles.

Jolly Way – Catholic Church Road Junction

Junction of Jolly Way and Catholic Church Road - Heavy vehicles will be required to make a very tight turn (smaller than 90 degrees) onto Catholic Church Road as illustrated in the road sign top right. In order to successfully make this turn, heavy vehicles will have to swing out wide across the path of approaching vehicles, coming out of Mintaro, round a sweeping bend, with double lines, and accelerating as they pass a derestriction sign. This is an inherently dangerous situation, further exacerbated by the poor surface of the road, which is its normal condition. **It is unthinkable that the project developer could consider this acceptable.**

Jolly Way approach to Catholic Church Road, which is just around the sweeping bend beyond Kingston Road on the right.

Pauletts Winery and Bush Devine Café Entrance

The most dangerous section of Jolly Way and the area in which vehicles are most frequently observed and encountered straddling or crossing double lines is the approach, from both directions, to Paulett's Winery and Bush Devine Café. This is an existing hazard which will be further exacerbated should Jolly Way carry increased heavy traffic.

The entrance/exit is all but blind to vehicles rounding a sweeping bend travelling towards Mintaro. It should be noted that visitors to the winery turn onto Jolly Way from a stationary position and need space and time to accelerate. This is an inherently dangerous entrance driveway.

Below Pauletts Winery, travelling towards Horrock's Highway, the edge of the bitumen is fretting away on the left side (see image below). On this very tight bend, where the sealed surface is narrowing, vehicles from small sedans to trucks, are regularly observed travelling on or over the double lines. There is little room for 'forgiveness'.

Representation 21 - Hawke

#300 6882

21

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

Applicant:	FRV Services Australia Pty Ltd
Development Number:	433/V003/18
Nature of Development:	Construction of a 100MW solar farm, consisting of approximately 360,000 solar panels and associated infrastructure
Zone / Policy Area:	Primary Production
Subject Land:	Allotment 3, DP12560 (CT Volume 6128 Folio 160); Allotment 4, DP12560 (CT Volume 6128 Folio 159); and Allotments 114-117 in FP170301 (CT Volume 6081 Folio 22)
Contact Officer:	Sharon Wyatt
Phone Number:	08 7109 7132
Close Date:	10 August 2018

My name: JOHN HAWKE

My phone number: 0453 394 444

PRIMARY METHOD(s) OF CONTACT: Email address: johnkhawke@bigpond.com

Postal address: PO BOX 11

MINTARO SA Postcode 5415

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

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

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

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

See attached submission

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: 9/8/2018 Signature: [signature]

Return Address: The Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 or scapadmin@sa.gov.au

#11862591

PO Box 11

Mintaro SA 5415

8th August 2018

The Secretary

State Commission Assessment Panel

GPO Bow 1815 Adelaide SA 5001

Scapadmin@sa.gov.au

Re: Chaff Mill Solar Farm, DA Report 433/V003/18

Dear Sir

I write to endorse the comprehensive submission prepared by Rod Cunningham of Mintaro. I have had several discussions with Rod during the planning of this project and believe that he has carefully and succinctly represented the views and concerns of many in the community.

My major concern is the route suggested as the best option to access the Solar Farm site during the construction phase and beyond. If I had been asked to pick the worst route possible, it would be exactly that chosen i.e. Jolly Way, Catholic Church Road and Merilden Road.

I have been a resident of Mintaro for almost 30 years and, with the exception of a 4 year period when I commuted daily to Gawler for work, employment in Clare has seen me using Jolly Way on most days. In the last 7 years I have worked as a Driving Instructor and so am acutely aware of the habits of many drivers on country roads.

JOLLY WAY

Jolly Way is NOT a suitable access road for heavy vehicles. It has many tight bends and very narrow shoulders in many places. It offers very little opportunity for any vehicles to overtake. Mention was made in Mr Cunningham's submission of a truck carrying a crane losing traction on the Trillian's Hill bends. I have twice come across semi-trailers loaded with building materials that have also lost traction in icy conditions and have had to be towed up the hill by large horsepower tractors.

TOURISTS

Many tourists use Jolly Way to travel to and from Mintaro and I can say professionally that the average Grey Nomads, whether towing a caravan or not, are not good drivers on this narrow thoroughfare! In fact many are appalling! Some drive at 50 to 60 kms/hr, frequently traverse the double white lines, pull up abruptly to take in a view or a photo opportunity, often with no indicating.

BICYCLES

And then there are cyclists! You will be aware of the increasing popularity of bicycle tourism; three bicycle hire companies operate in the Clare Valley to augment the many visitors who bring their own bicycles. Needless to say, heavy vehicles and bicycles, many ridden by "first-timers" just does not work! Yet many tourist brochures and websites suggest that Jolly Way provides a great ride with magnificent views; it is a deviation from the very popular Riesling Trail, which traverses Jolly Way. Bikes and trucks just do not mix on this narrow "tunnel" through the steel guardrails.

INTERSECTION

Enough has been said in other submissions regarding the intersection of Jolly Way and Catholic Church Road. Let me add that it is possibly the worst intersection around Mintaro! I cannot believe that it is even considered, let alone recommended. It is so important that members of the Panel come to Mintaro and see the dangers of this intersection.

ALTERNATIVE ROUTES

Any entry to the proposed Solar Farm is much better from the Barrier Highway. This road to Burra and Broken Hill is in much better condition than Main North Road, is much straighter, wider shoulders and much less tourist traffic than Main North Road.

I would suggest that Solar Farm supply trucks turn left at Manoora onto Min Man Road, travel approximately 1.5 Kms and then turn right onto Bowman's Road which will take one straight to Merilden, a distance of approximately 12.5 kms. This road is an excellent unsealed road with many long straights, wide shoulders and only two 90 degree bends that require slowing down. Approximately 1 kilometre before Merilden there is a requirement to slow down with an unused railway crossing and a road junction to traverse.

CONCLUSION

The favoured route of Jolly Way, Catholic Church Road and Merilden Road is just plain unacceptable. If a sealed road must be used and therefore Bowman's Road is not appropriate, then Man Man Road must be used.

Yours sincerely

John Hawke BSc JP

Ph: 0458 894 444

Representation 22 - J Faulkner

object #13007429

22

Wyatt, Sharon (DPTI)

From:	DPTI:scapreps
Sent:	Monday, 13 August 2018 10:29 AM
To:	Wyatt, Sharon (DPTI)
Subject:	FW: Solar Farm Submission
Attachments:	John Faulkner Solar farm.docx

I have put into Knet.

State Commission Assessment Panel - Representations
Development Division
Department of Planning, Transport and Infrastructure
• scapreps@sa.gov.au
Level 5, 50 Flinders Street, Adelaide SA 5000 • PO Box 1815, Adelaide SA 5001 • DX 171 • www.dpti.sa.gov.au
View the SA Planning Portal • Subscribe to our Newsletters

SOUTH AUSTRALIA

From: JCFaulkner [mailto:jcfaulkn@aussiebb.com.au]
Sent: Thursday, 9 August 2018 8:49 PM
To: DPTI:scapreps
Cc: robyn.faulkner11@gmail.com
Subject: Solar Farm Submission

JP & CE Faulkner
PO Box 10
Mintaro, SA, 5415
P: 08 8843 9052
M: 0428 439 051

Please find attached our submission for Solar Farm application from FRV

John & Chris Faulkner

John Faulkner
54 Faulkner Road, Stanley SA 5415
PO Box 10, Mintaro, SA 5415
Phone 0428439051
johnchrisfaulkner@gmail.com

6 August, 2018

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

To whom it may concern,

The following submission is in response to the notice by FRV Services Australia Pty Ltd in regard to their proposed development of the Chaff Mill Solar Farm.

I am preparing this submission as an adjoining landholder and land manager. I also would like to appear before SCAP to explain and clarify any queries raised from the following submission.

The report prepared is very comprehensive, but in my opinion is slewed very much in favour of the project without a balanced view of the concerns of the adjoining landholder, hence I have prepared the following queries in dot points which I am happy to explain to the panel.

1 Maps (a) Why aren't dwellings highlighted to show their proximity to the project?

(b) Why is the area in Block 1 where panels are to be placed marked as grazing land and not as cropping land as it is?

(c) Access to site by heavy vehicles and workers is unclear

(d) Drill holes - why are none shown on Block 2

(e) Bore search - why are none shown on Block 2

(f) Why has the change of battery storage and service area changed and not been communicated to the community?

(g) Why are there no drainage lines and water collection areas marked on Block 2?

2 Visual

(a) The photos presented in the report don't appear to be relevant to actual visual impacts

(b)There is no mention of the visual effects of the security fencing on adjoining landholders

(c) It is unclear where the security fencing will be placed and hence risk of damage by farm machinery and hence liability.

3 Environmental

(a) How is the definition of Wookie creek as being degraded arrived at?

(b) How is the creek crossing going to be designed to handle the large volume of water that can come down the creek?

(c) I don't believe the environmental examination of fauna and flora has been extensive or concise. The following species I believe live in or have access to the proposed site

Fauna

Frogs
Yabbies
Turtles
Lizards -skinks
-blue tongue
-shingleback
Echidnas
Birds -plovers
-kites
-owls
-frogmouths
-mopokes
-wedge tail eagles
-quails
-ducks -teals
-mountain ducks
-chocks
-topknots
-wood pigeons
-parrots -rosella
-green grass parrot
-budgies

Flora

Creek species -reeds
-grasses
-sedges
Native grasses
Trees

4 Water

(a)

-What is the future of the windmill and its associated water structure on Block 2?

- Historically the water has been used, by agreement, by surrounding landholders

- There is a real need to preserve water supply
- An offer has been made to relocate storage tank

- An offer has been made to work to maintain supply to existing users

- Question if solar farm is to allow grazing on Block 2 where will water come from?

(b) Drainage of water from solar farm

-what is the effect of concentrated water runoff from panels?
-what is the effect of wheel tracks ?
! on compaction of soil and hence runoff
!! on infiltration of water and hence runoff
-What is the effect of change of vegetation on area on water use and hence Runoff?

-What is effect of access tracks on runoff?
-Why on maps Block 2 has no drainage lines marked?

5 Frost

-The topic has been glossed over
-Research needs to be done to examine whether risks are increased
-Landowners and operators need security to ensure their business will not be adversely affected and if risk exists then compensation needs to be considered

6 Change of land use

(a) From agriculture to industrial
(b) Question of effect on neighbouring enterprises

! Rotations of cropping

!! Spraying regimes

- Buffer zones

- Withholding periods

!!! Biosecurity

Weeds -invasive

-planted species

- species adapted to changed conditions

Pest animal -foxes

-rabbits

-mice

-rats

Intrusion of -Vehicles

- Weeds

- Pests

- Diseases

Grazing protocols - If grazing available we need first option to reduce risk of introducing

-Johnes disease

-footrot

-Lice

7 Final questions

(a) What is value to State?

(b) What is value to community?

(c) What is value to adjoining landholders -they need much more consideration than they are given at the moment?

(d) Because of length of project (30yrs) how are landholders protected now and in the future?

(e)What effect does the energy balance, because of energy leaving the environment, have on the health of the area.

\# 1305 ??? (dup 13058198) objected (Chaffey) (23)

Representation 23
- J & L Brady

02 August 2018

26 King Street
Mintaro SA 5415

The Secretary
State Submission Assessment Panel
GPO Box 1815
Adelaide 5001

Dear Sir/Madam

Re: FRV application for Chaff Mill solar project, Mintaro SA

Whilst we are in favour of projects to provide alternative sources of power, particularly solar and wind sources, and we endorse the establishment of the 'Chaff Mill' project by FRV near Mintaro, we have some concerns.

The main one is the preferred access route for heavy transport vehicles during the construction phase. Horrocks Highway, as you may know, has been earmarked for reconstruction in several dangerous places because of its poor surface in many places, relatively narrow bridges,

However, the worst aspect of this route is the confines, steep gradients and some tight bends on the Jolly Way (Sevenhill to Mintaro Road). We see this road as definitely unsuitable for heavy vehicles, particularly if large semi-trailers and B-double units are to be used to deliver materials and goods to the solar farm site.

Negotiating the 90-degree turn from the Horrocks Highway into Jolly Way just south of Sevenhill can be difficult for semi-trailers etc. and can be dangerous for unsuspecting motorists approaching the T-junction intersection from Mintaro.

Once on the Jolly Way there are a couple of steep inclines and bends, especially that near the entrance to Pauletts Winery. Large transport vehicles have been seen in difficulties in the past.

The relative unsuitability of this route has been pointed out to FRV before, and they strangely enough have agreed but appear to persist in selecting this route as best for them.

However, to continue, once near Mintaro there is a 90-degree turn into the unsealed\Catholic Church Road, where the 162-year-old church sits close to the road. We feel dust and possible vibration would be a problem for that old property. It is the oldest Jesuit church in Australia.

Once the route crosses Copper Ore Road (Mintaro-Farrell Flat Road) into Merildin Road, there should be no major problems, although the road is narrow in parts and unsealed. There are no properties that would be affected by dust.

Our suggestion for the preferred route is the one via the Barrier Highway as was agreed at a meeting of FRV and Mintaro community represenatives in Mintaro on 23 February this year.

Once the Barrier Highway is accessed six kilometres northn of Tarlee, the route is mostly straight and flat and much less dangerous than Horrocks Highway.

This is considered to be the best route. Once off the Barrier Highway, the site can be accessed via Flagstaff Road and Merildin Road. No tight bends, no steep inclines or declines and much less traffic than the Jolly Way used by many tourists and visitors to Mintaro for its wineries, restaurants, Martindale Hall, maze etc. Relatively little tourist traffic uses the routes from the Barrier Highway – Flagstaff Road and Min Man Road.

Whilst Min Man Road is sealed, there are bends and inclines. However, it could be considered, but just past the Martindale Hall entrance there is a right-hand turn into Martindale Road and then further along a left turn into Hare Road and another right turn into Merildin Road to Chaff Mill Road.

All this has likely been said in other submissions to you, but we feel strongly about the unsuitability of the Horrocks/Highway/Jolly Way route.

Disappointment over the use of prime agricultural land for this project has also been expressed, but that is another matter.

Yours Sincerely

per J Brady

Justin and Libby Brady

FRV SERVICES AUSTRALIA PTY LTD

CHAFF MILL SOLAR FARM DEVELOPMENT APPLICATION

SUBMISSION RESPONSE DOCUMENT

JUNE 2019

Question today
Imagine tomorrow
Create for the future

Chaff Mill Solar Farm Development Application
Submission response document

FRV Services Australia Pty Ltd

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REV	DATE	DETAILS
00	17/09/2018	Draft
01	30/04/2019	Updated draft
02	09/05/2019	Updated draft
03	05/06/2019	Final

	NAME	DATE	SIGNATURE
Prepared by:	T. Anderson, E. Fitzner, B. Nixon	05/06/2019	
Reviewed by:	B. Nixon	05/06/2019	
Approved by:	B. Nixon	05/06/2019	

TABLE OF CONTENTS

LIST OF APPENDICES

GLOSSARY

Katabatic	Local downward motion of cool air (Google Dictionary, 2019)
Pasquill Gifford Stability class	A classification of the atmospheric stability i.e. the tendency of the atmosphere to resist or enhance vertical motion (ESS, 2007).
Shuttle Radar Topography Mission	Radar mapping data of the Earth's topography, captured by the Space Shuttle Endeavour (GISGeography, 2018)
The Air Pollution Model	Developed by the CSIRO, The Air Pollution Model predicts three-dimensional meteorology and air pollution concentrations (CSIRO, 2008).
Watershed analysis	The process of using DEM and raster data to delineate watersheds (regions of land within which water flows down into a specified body) (GIS Resources, 2015).

ABBREVIATIONS

BoM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CFS	Country Fire Service
CGVC	Clare and Gilbert Valleys Council
CoH	Commissioner of Highways
DEM	Digital Elevation Model
DoEE	Department of the Environment and Energy
DPC	Department of Premier and Cabinet
FRV	FRV Services Australia Pty Ltd
HA	Hectare
km	Kilometre
kV	Kilovolt
MCA	Multi Criteria Analysis
MW	Megawatt
MWh	Megawatt hours
NVC	Native Vegetation Council
TAPM	The Air Pollution Model
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
RAV	Restricted Access Vehicle
RNE	Register of the National Estate
SCAP	State Commission Assessment Panel
SEDMP	Sediment Erosion and Drainage Management Plan
SRTM	Shuttle Radar Topography Mission
VMZ	Vegetation Management Zone
vpd	vehicles per day
WSP	WSP Australia Pty Limited

1 INTRODUCTION

FRV Services Australia Pty Limited (FRV) is seeking development approval for the construction and operation of a solar farm, known as the Chaff Mill Solar Farm (the Project), in the mid-north region of South Australia.

The Chaff Mill Solar Farm is being assessed pursuant to Section 49 (Crown Development) of the *Development Act 1993* as key public infrastructure. The project received endorsement/sponsorship from the Department of the Premier and Cabinet (DPC) in 2018.

The Chaff Mill Solar Farm Development Application was lodged with the State Commission Assessment Panel (SCAP) on 14 June 2018. This response document has been prepared by WSP Australia Pty Limited (on behalf of FRV, the Proponent) to formally respond to matters raised by the public and referral agency submissions on the Chaff Mill Solar Farm Development Application (the Development Application).

1.1 PROJECT BACKGROUND

The proposed Chaff Mill Solar Farm would be located approximately 3.5 kilometres (km) north-east of the Mintaro township in the mid-north region of South Australia.

The Development Application proposes the construction of a 100 Megawatt (MW) solar farm, across a 380 hectare (HA) site adjacent to the existing Mintaro substation and its 132 kilovolt (kV) transmission line to Waterloo.

The Project is considered significant infrastructure for the State's development as it would generate approximately 250,000 Megawatt hours (MWh) of clean, zero emission electricity each year and would make a significant contribution to South Australia's energy production and stability of supply.

1.2 PUBLIC EXHIBITION

As part of the Section 49 assessment process, the Development Application was released for public comment from 11 July to 10 August 2018 (the exhibition period).

A 'Notice of Application for Consent to Development' was published in the Adelaide Advertiser, Plains Producer and Northern Argus on 11 July 2018, advertising the display of the Development Application and inviting public submissions.

During the exhibition period, a total of twenty-three (23) public submissions were received by the SCAP. In addition, referral agency submissions were made by the Clare and Gilbert Valleys Council (CGVC), Native Vegetation Council (NVC), Country Fire Service (CFS) and the Commissioner of Highways (CoH).

1.3 PROJECT UPDATE

1.3.1 FROST FORMATION AND IMPACT POTENTIAL STUDY REPORT

Following the submission of the Development Application, and in response to concerns raised by the community, FRV commissioned further studies to assess the current frost-generating conditions at the Project site and to ascertain whether the development of the solar farm could potentially change the local environmental conditions in a way that could increase the frequency and severity of frosts in the local area.

Responses to public submissions regarding micro-climate are provided in section 3.8. The technical report and elevation and meteorological models are provided in Appendix A.

2 SUBMISSIONS RECEIVED

2.1 PUBLIC SUBMISSIONS

A visual representation of the issues raised in the public submissions, as they relate to the sections of the Development Application Report, is provided in Figure 2.1.

Several submissions endorsed other submissions. Submission #005 was signed by 11 stakeholders:

- seven of which also made submissions which were duplicates of #005 (submissions #006 – 012). Three of the signatures on #005 were from relatives of these respondents (based on having the same last name and known from stakeholder consultation activities undertaken by FRV).
- one of which also made a separately prepared submission (#001).

Submission #003 was endorsed by submission #021, which also raised unique issues.

The issues raised in the original submissions and endorsements are shown below. The key issues raised by original submissions related to the traffic and access, planning and land use and micro-climate aspects of the Development Application Report.

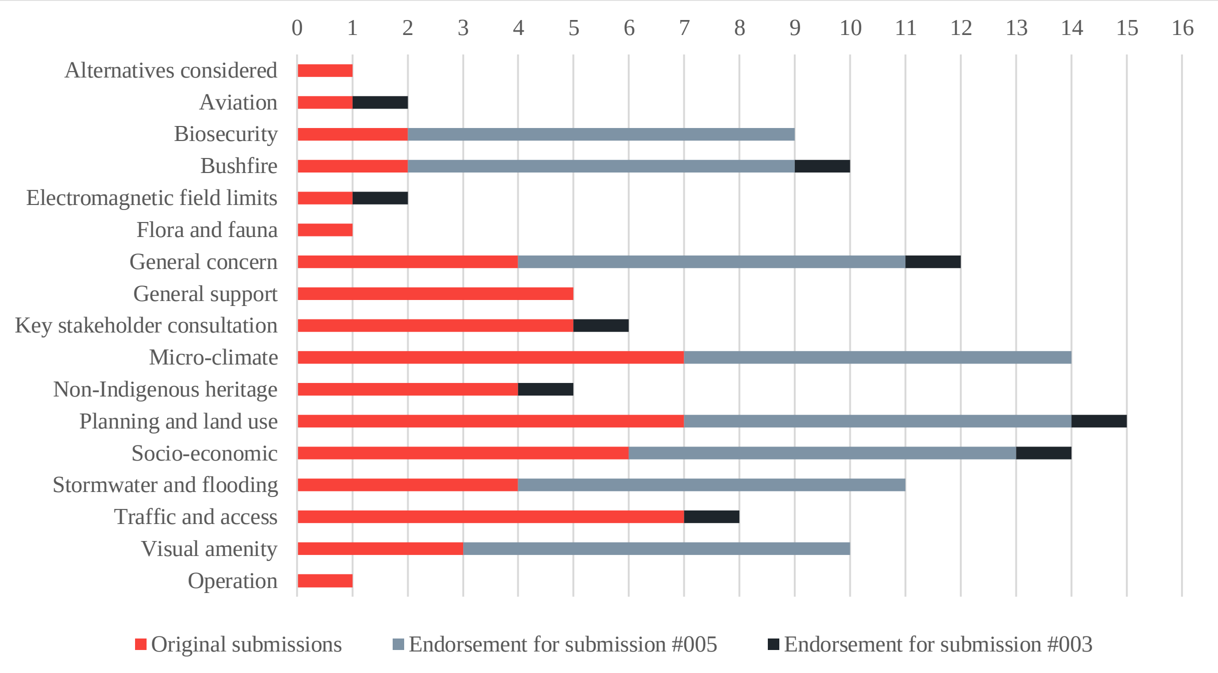

Figure 2.1 Issues raised in public submissions

2.2 REFERRAL AGENCY SUBMISSIONS

Referral agency submissions were made by the South Australian Country Fire Service (CFS), Clare and Gilbert Valleys Council (CGVC), Commissioner of Highways (CoH) and the Native Vegetation Council (NVC).

The referral agency submissions were generally supportive/neutral towards the Project. The CFS, CoH and NVC submissions specifically outlined requirements to be included as conditions if development approval is granted. FRV appreciates the opportunity to work with referral agencies to incorporate these requirements into the Project. These referral agency requirements are not discussed further in the context of this report.

The referral agency submissions also raised issues for further consideration. A summary of the issues raised and FRV's response is provided in below.

2.2.1 SOUTH AUSTRALIAN COUNTRY FIRE SERVICE

The CFS submission noted its support for development in regional and rural areas of South Australia. While the CFS had no direct concerns with the Project, fire safety and fire service response issues raised in the submission are summarised in Table 2.1.

Table 2.1 Summary of issues raised by the CFS

ISSUE	SUMMARY	RESPONSE
Bushfire – current infrastructure concerns in the area	There is a lack of reticulated water in the area. Static fire water tanks for both bush fire and building fires will be required to assist in effective Fire Service intervention and suppression.	Noted. The Proponent would provide static fire water tanks at the site, to be agreed with the CFS.
	There is a possible lack of reliable communication networks to meet the basic requirements of mobile communication.	Noted. The Proponent accepts the CFS requirement to ensure a communication line or procedure to be able to call 000 is provided during the construction phase.
Bushfire – fire response capability	The site will be serviced as first response by the Mintaro (SACFS) fire brigade Due to the regional nature of the site's location, secondary and subsequent fire service crews may have some distance to travel, therefore, additional on-site firefighting infrastructure may need to be considered to reduce the severity of any incident.	Noted. The Proponent accepts the CFS requirement for the provision/maintenance of fire-fighting equipment on-site during the construction phase.

2.2.2 COMMISSIONER OF HIGHWAYS

The CoH submission was neutral towards the Project and outlined key advice/requirements relating to traffic and access. A summary of the issues raised by the CoH is provided in Table 2.2.

Table 2.2 Summary of issues raised by the CoH

ISSUE	SUMMARY	RESPONSE
Traffic and access – arterial road junctions	The intersections of Horrocks Highway/Jolly Way and Jolly Way/Catholic Church Road should be subject to Road Safety Audits as part of producing a Traffic Management Plan (TMP) for the construction phase of the development, with any upgrades identified being completed to the CoH and/or Council at the proponent's expense prior to the commencement of construction.	Noted. Road Safety Audits are included as a key recommendation of the Traffic Impact Assessment (TIA) in section 7.8.6 of the Development Application Report. The Road Safety Audits would be undertaken during the detailed design stage of the Project and would identify potential risks. Any required upgrades would be further developed in consultation with the CGVC and/or CoH. The Proponent accepts responsibility for funding any upgrade works required to safely accommodate construction traffic. .

ISSUE	SUMMARY	RESPONSE
Traffic and access – Restricted Access Vehicle (RAV) routes	Some roads identified in the Traffic Impact Assessment (TIA) are not gazetted for use by vehicles larger than a General Access Vehicle. The proponent would therefore need to apply to the National Heavy Vehicle Regulator for permits to utilise the preferred access route for RAV.	Noted. The TIA (refer Appendix M of the Development Application Report) identifies the permit requirements to operated Restricted Access Vehicles (RAV) on minor roads not gazetted for use by heavy vehicles.

2.2.3 CLARE AND GILBERT VALLEYS COUNCIL

The CGVC submission noted that there were outstanding issues to be addressed and withheld support for the Project until these aspects had been confirmed. Key issues raised in the CGVC submission are summarised in Table 2.3.

Table 2.3 Summary of issues raised by the CGVC

ISSUE	SUMMARY	RESPONSE
Visual amenity	The submission raised that the Project contradicts the desired character of the Primary Production Zone and Objective 4 of the CGVC Development Plan (to preserve the natural landscape). However, it is noted that renewable energy developments are largely located within Primary Production Zones and that the Project is sited where it has limited visual impact and has proposed acceptable mitigation measures including vegetative screening and frameless solar panels. Council makes the following requests regarding visual amenity/glare: — that any glare issues that become apparent post-construction are addressed as a priority — landscaping should screen the perimeter fencing and mitigate visual amenity impacts. A preferred option is to remove the perimeter fencing altogether.	While vegetation screening on an individual basis has been proposed to address visual impacts to specified sensitive receptors, perimeter screening was not proposed in the Development Application Report due to concerns regarding the potential impacts on cold air flow and micro-climate. This risk will be re-assessed based on the findings of the Frost Generation Study. In addition, while alarms and surveillance will be utilised to ensure the security of the site, the removal of the perimeter fence is not considered practicable due to the value and sensitive nature of the infrastructure.
Planning and land use – Preservation of agricultural land	The submission raises that a solar farm is contrary to the objectives of the Primary Production Zone which only allows the removal of productive land for essential purposes or the processing of organic waste. A solar farm might not be considered an essential purpose. Highly productive cropping land should be protected from large-scale developments and Council would not like to see the growth of the Project or other similar developments in high rainfall agricultural land.	It is considered that the development of renewable energy facilities is critical to providing energy security to the state and therefore an acceptable use within the Primary Production Zone.
Traffic and access	Council's preferred access route is via Horrocks Highway, Jolly Way, Catholic Church Road,	Council's preferred access route aligns with that outlined in the Development Application Report.

ISSUE	SUMMARY	RESPONSE
	Merildin Road and Wookie Creek Road (the preferred option identified in the Development Application Report). Council raises concern regarding the condition of Horrocks Highway and the need for improvements to facilitate major projects in the region. Council makes the following requests regarding traffic and access: — That Catholic Church Road is upgraded and sealed — That the site is only accessed via the Wookie Creek Road access point.	Internal roads would be utilised to provide access to the site from a single access point on Wookie Creek Road. Council's concern regarding the condition of Horrocks Highway is noted. Upgrades to Catholic Church Road (re-sheeting) are recommended as mitigation works in the TIA. The Road Safety Audit would identify potential risks and any required upgrade works would be designed to address these. The preferred access point (option B) would provide access to the site (with the exception of emergency services). Connecting access to the eastern parcel would be required off of Chaff Mill Road.
Stormwater and flooding	Council seeks that there be no increase in velocity of stormwater from the site which may impact towns further to the south and outside of the council area.	Noted. The stormwater and flooding assessment found that the installation of solar panels would have a negligible impact on total site runoff, with the ground underneath being permeable (refer section 7.9 and Appendix N of the Development Application Report). Detailed civil investigations (including further analysis into the risk of flooding) would be undertaken as part of the detailed design process and a Sediment Erosion and Drainage Management Plan (SEDMP) prepared, in line with best practice.
Flora and fauna	The Project should avoid vegetation removal, particularly the established trees in the western portion of the site.	Noted. The chosen portion of the site is largely cleared of native vegetation. There is a large patch of remnant Eucalypts in the western parcel however impacts to remnant vegetation will be minimised through appropriate infrastructure placement.
Decommissioning	Measures to address decommissioning and rehabilitation of the land must be provided prior to construction. Rehabilitation should be to a level compatible with the surrounding landscape and suitable to return the land to primary production purposes.	Noted. Decommissioning is discussed in section 8.3 of the Development Application Report. The site would be rehabilitated to its productive state following decommissioning. Rehabilitation measures to be implemented would be developed prior to construction and provided to CGVC.
Socio-economic – impacts on the tourism sector	Council encourages the incorporation of a look-out spot or a viewing point into the project for tourists.	Noted. Mitigation measures to address these impacts are outlined in section 7.10.5.1 of the Development Application Report.

ISSUE	SUMMARY	RESPONSE
	Construction should be managed to ensure economic benefits (e.g. workers accommodation, fuel, food etc.) are spread throughout the region and are not focussed on one location. Construction should be arranged to avoid peak tourist times so that there is accommodation available.	
Key stakeholder consultation	Council notes the early community engagement process undertaken for the Project and seeks that this process continue should the Project be approved.	Noted. Consultation activities would continue with the community and key stakeholders if the Project is approved.

2.2.4 NATIVE VEGETATION COUNCIL

Table 2.4 Summary of issues raised by the NVC

ISSUE	SUMMARY	RESPONSE
Flora and fauna	Infrastructure placement should avoid native vegetation clearance where possible. Any native vegetation clearance will require approval under the *Native Vegetation Act 1991* and the relevant Regulation 12(34) Infrastructure.	Noted. The site is largely cleared of native vegetation. There is a large patch or remnant Eucalypts in the western parcel however impacts to remnant vegetation will be minimised through appropriate infrastructure placement.

3 RESPONSE TO PUBLIC SUBMISSIONS

3.1 ALTERNATIVES CONSIDERED

One submission raised that there is a lack of explanation about the site selection criteria and justification for the proposed site location, including alternative sites considered.

3.1.1 RESPONSE

The site selection criteria are discussed in section 3 and Appendix F of the Development Application Report. The Project site was selected based upon the following key considerations:

- solar profile and terrain of land
- proximity and connection to existing electricity transmission network
- infrastructure footprint
- land availability and accessibility
- proximity to sensitive receptors
- minimising visual impact
- minimising environmental impacts
- protecting cultural heritage

The above considerations were assessed through a Multi Criteria Analysis (MCA) process, the outcome of which supported the proposed siting and location of all project infrastructure.

3.2 AVIATION

One submission requested that the aviation and glare assessments be reviewed to include the following:

- private airstrips, including Martindale Farm (used for aerial agricultural operations) and Hoyleton (used by CFS during bushfire season)
- details of potential impacts to Epic Energy and RAAF activities which operate in the area
- note that the Farrell Flat airport is now closed

The submission also raised that some of the recommendations in the aviation assessment are incompatible with the current land use (i.e. recommendations for aerial spraying, seeding and fertilising operations not to be undertaken near the solar farm).

3.2.1 RESPONSE

Information regarding the Martindale Farm and Hoyleton private airstrips was not publicly available. Section 7.14.3 of the Development Application Report notes that, in addition to the aviation operations identified within 50 km of the project area, agricultural spraying and fertilising may occur in the region surrounding the proposed Chaff Mill Solar Farm and allows for this in the assessment.

The Development Application was referred to the South Australian CFS who did not raise issues with the Project relating to the use of the Hoyleton airstrip. Consultation will be undertaken with the operators of the private airstrips to ensure potential impacts are managed, including how aerial spraying, seeding or fertilising operations may be undertaken safely for agricultural land surrounding the solar farm (if required).

FRV will liaise with local operators, such as Epic Energy and RAAF, to ensure that no safety risks are imposed on aerial operations surrounding the site.

The closure of Farrell Flat airport is noted.

3.3 BIOSECURITY

Two submissions raised concern regarding potential biosecurity risks to neighbouring properties and consequent loss of production or environmental issues. The submissions enquired how biosecurity risks will be managed and how breaches will be managed, monitored and compensated (to surrounding landowners).

3.3.1 RESPONSE

Biosecurity risks and proposed management measures are discussed in section 8.2.6 of the Development Application Report. Broadly, risk would be managed through the implementation of site hygiene controls outlined within a Construction Environmental Management Plan (CEMP). The controls would be developed in accordance with guidelines developed by the Commonwealth Department of the Environment and Energy (DoEE) to help prevent the spread of invasive plant diseases and weeds.

The controls would be monitored through the appointment of a suitably qualified environmental officer through the construction contractor. The environmental officer would be responsible for the supervision and implementation of the CEMP. The CEMP would also contain measures for non-compliance and corrective action. It is not an FRV policy to provide financial compensation to neighbouring properties.

3.4 BUSHFIRE

Two submissions raised the importance of managing bushfire risk (particularly risk associated with electrical infrastructure), vegetation proposed to be seeded/planted at the site and non-diesel cars parking over long grass. The submissions enquired what mitigation measures would be implemented during construction and operation and if nearby landowners would be able to access the site to assist with fire-fighting efforts. Confirmation was sought that on-site fire-fighting equipment and water would be provided.

3.4.1 RESPONSE

A Bushfire Management Plan will be prepared for the Project in consultation with the CFS (refer section 8.2.4 of the Development Application Report). The CFS have outlined requirements to be included as conditions to development approval (if granted), including:

- The establishment and maintenance of vegetation management zone (VMZ) within 30 metres of each Substation, Inverter Stations and all other Buildings on the site.
- The preparation of an on-site vegetation management plan to ensure that the on-site vegetation is kept to less than 100mm in height.
- The installation of vehicle gates at least every 2000 m around the perimeter fence of the site, with a 20000L static firewater tank with the relevant fire authority fittings located at each gate.

The Bushfire Management Plan would also include measures surrounding the use of non-diesel cars.

In accordance with CFS requirements, fire-fighting equipment shall be readily available and in good operable condition at all times during construction. Fire-fighting equipment shall be mounted on a suitably designed vehicle or trailer dedicated to serve as the 'site fire trailer' for the construction site and are to include no less than –

- 2000 litres fire-fighting water
- 1 x 5HP (3.7Kw) fire-fighting pump
- 2 x 30 metre x 19 mm ID fire hose reels with spray/jet nozzles
- 2 x 9 litre stored water pressurised extinguishers
- 2 x 9 kg dry powder extinguishers
- Communication line or procedure to be able to call 000

3.5 ELECTROMAGNETIC FIELD LIMITS

One submission stated that the Electromagnetic Interference (EMI) assessment and mitigation measures outlined within the Development Application Report are not adequate or practical. The submission recommended that the following conditions be attached to development approval (if granted):

- Requirement to install and operate a system to monitor EMI and for that data to be made available online.
- Requirement for EMI generated by the Project to not exceed levels above which radio and telecommunications equipment or other equipment cannot operate as intended.
- Requirement that the claim of a "zero emission" solar farm is to be realised.

3.5.1 RESPONSE

The EMI assessment undertaken was considered commensurate to the risk presented by electromagnetic field limits for the Project.

Best practice guidance for solar energy facilities outlines that electromagnetic radiation produced from transformers and inverters is reduced through performance standards that apply to standard components (DEWLP, 2018). All infrastructure installed as part of the project would comply with the relevant emissions standards to ensure it does not cause local electrical interference. The guidance also states that the strength of electromagnetic fields will decrease with distance from the source and become indistinguishable from background radiation within 50 metres for high-voltage power lines and within 5 to 10 metres of substations (DEWLP, 2018). The design and layout of the Project would consider these factors.

Consultation would be undertaken with telecommunications and other radiocommunications license holders in the area to ensure potential EMI impacts are addressed.

Claims to zero emission electricity made in the Development Application Report are in reference to greenhouse gas emissions, not electro-magnetic fields.

3.6 FLORA AND FAUNA

One submission enquired why Wookie Creek was described as degraded in the flora and fauna assessment.

3.6.1 RESPONSE

The flora and fauna assessment found that the creek line has largely been cleared of native vegetation and has very limited native understorey present. It is within the vegetation association described as 'Exotic Grassland'. Native grass and sedge present in this association were in poor condition as they were surrounded by weeds. The creek line would provide habitat for birds and water-dependent fauna when water is present.

3.7 KEY STAKEHOLDER CONSULTATION

Three submissions expressed views that the community consultation undertaken for the project had not addressed community concerns/questions and that the format of consultation was not appropriate, specifically the public meeting held with the Mintaro community, and that landowners were unable to attend meetings held with the Clare and Gilbert Valleys Council.

Questions included whether a Community Liaison Officer would be appointed for the project and the process for future consultation to ensure responsiveness to potential issues.

A further two submissions requested that the submissions of adjacent landowners be taken into consideration in assessing the Development Application.

3.7.1 RESPONSE

Commencing in September 2017, a number of stakeholder consultation activities were undertaken which were considered to be in excess of current requirements under the *Development Act 1993*. Stakeholder engagement is discussed in detail in section 6 and Appendix C of the Development Application Report, and included a number of individual meetings with neighbours and interested parties, progress association meetings, a phone-line and email address for information, project information sheets and community displays.

Responses to feedback or requests for information were generally provided within 24 hours. Where information was unavailable, this was communicated.

The appointment of a Community Liaison Officer is not currently planned however consultation activities would continue with the community and key stakeholders if the Project is approved. This would include the development of protocols to respond to potential issues raised.

3.8 MICRO-CLIMATE

Seven submissions raised that the potential impacts of the Project on the local micro-climate are unknown. In general, issues raised were the potential for:

- increased frequency and severity of frost in the local area surrounding the solar farm due to blocking of cold air drainage
- increased frost damage, resulting in severe financial loss
- loss of capital value of adjoining land because of the increase in frost incidence and severity

3.8.1 RESPONSE

The basis for the issues raised in the submissions is that the solar array and its boundary fence would act as barriers to katabatic flows occurring under frost forming conditions. These barriers could allow cold air to accumulate on the adjacent uphill agricultural properties, possibly exacerbating existing frost events and causing damage to crops (Air Environment, 2019).

One submission estimated that cold air movement would be blocked by any barrier that “has as little as 5% structural material” however there was no reference to data, research or calculations to support this estimate and a literature review conducted was not able to identify any standard or guideline, in Australia or internationally, for assessing cold air drainage blocking potential in the environment.

In response to community concerns, FRV investigated methods to study the impact of the solar farm structure on cold air flow across the site.

No existing studies of frost issues related to solar farms locally and overseas could be found. Conversely, only increases in temperature in and around solar farms (via the heat island effect) have been studied.

Similarly, finding specialists to understand and analyse this phenomenon was challenging, as there is no data that can definitively prove or disprove the impact of a solar farm on frost formation without real world measurements taken from the constructed solar farm. Additionally, there are many local and external biophysical and meteorological factors that are difficult to quantify, which would need to be taken into consideration when attempting to directly attribute potential impacts.

Following extensive investigations, FRV were able to commission a detailed desk top and modelling analysis by an independent third-party company; Air Environment, to undertake an 'Assessment of Frost Formation and Impact Potential'. The primary objective of the study was to investigate the issue of potential flow-blocking as a result of the development of the proposed solar farm (refer Appendix A for full report). Air Environment is an Australian technical research company specialising in air science, meteorology and climatology. The study was undertaken by Andrew Balch and Dr Michael Power; air quality, air science, meteorological and topographical modelling specialists who are CASANZ-certified and have strong links to Australian government regulators. A summary of the findings of this assessment, addressing the issues raised in the submissions, is provided below.

SUMMARY OF THE ASSESSMENT OF FROST FORMATION AND IMPACT POTENTIAL

The specialist assessment developed a 30 m Digital Elevation Model (DEM), revealing the ranges of hills to the west and east of the site (which are important controls on wind direction), numerous small rises and declivities across the site and the north/south-aligned drainage gully running through the centre of the western parcel. A watershed analysis of flows arising from differential terrain heights provided an initial assessment of katabatic flow directions. This was considered to provide a good indication of localised flows and it confirmed the importance of the gully in the western parcel of the project site. The analysis did not however account for the valley-wide drainage flows becoming established off the walls of the surrounding ridges and draining south along the valley axis.

The year 2006 was selected to model in detail, based on analysis of Bureau of Meteorology (BoM) observations collected at the Clare High School Automatic Weather Station (AWS) over a 24-year period. This year was selected due to the large anomaly in the frequency of screen height (1.2 m) temperatures in the -4°C to 3°C temperature range, suggesting that this year had the greatest potential for frost forming conditions. FRV have established a small onsite meteorology station, however the data from the BoM provided a larger of data from an independent , 3rd party source (the BoM being a Federal Government Agency).

Meteorology for the site was modelled using a hybrid approach of The Air Pollution Model (TAPM), developed by the CSIRO and the diagnostic meteorological model, CALMET.

Potential frost events were selected for hours when all of the following conditions were met:

- modelled wind speed at 10 m above the ground was at or below 2 m/s
- modelled air temperature at 10 m above the ground was at or below 5°C
- modelled Pasquill Gifford Stability class was F (very stable)
- there was no rain predicted

Sixteen potential frost events were identified. Each of these occurred overnight or during the early morning and ended at dawn, was associated with the passage of an anticyclone over the region bringing clear skies and occurred during the winter to spring period. Predicted surface wind fields (i.e. at a height of 10 m above the ground) were assessed for the final hour of each event, when frost would be at its most intense and katabatic flows most developed. Three characteristic patterns for katabatic flows were identified:

- Uniform north-easterly drainage flows off the ranges to the east, becoming less coherent to the west as the flow interacts with terrain features and reaching the eastern and western solar farm sites from the north. The creek line within the western parcel is an important drainage discharge pathway towards the south.
- Uniform easterly drainage flows off the ranges to the east draining into the creek line gully within the western parcel. Occasionally katabatic flows will also drain off the western ranges and will merge with those from the east, with both flows discharging into the gully.
- If the katabatic flow off the eastern ranges has a south-easterly component, then the flow may travel up the creek line gully from south to north.

In each case the creek line within the western parcel of the project area played a critical role in providing a path for the wind to flow across the landscape. It should be noted that the proposed solar farm does not alter this creek line, there is no development proposed inside the creek gully itself, and there is a significant setback allowed for between the creek banks and solar panels.

The potential for the solar panel arrays and boundary security fences on each of the solar farm sites to block the flow of cold dense drainage air and accumulate upwind of an obstruction to cause frost was assessed by determining the cross-sectional area of their silhouette.

The boundary fence is not a solid structure and was determined to occupy less than 7.4% of the area between the ground and the top of the fence. The boundary fence is chain wire with a diamond pitch (or openings) of 50 mm, as required by Australian Standards (AS 1725.1-2010 "Chain link fabric fencing-Security fences and gates - General requirements). A pitch of 100 mm was investigated however the Proponent was informed that this would not be compliant with AS 1725.1-2010. Additionally, the difference between the 100mm diamonds required to achieve the 5% density estimated in the submission and the 50mm diamond required to meet AS 1725.1-2010 is only of increase of 2.4%. The Vegetation Management Plan prepared for the Project will include a commitment to keep the base of the fence clear of vegetation to minimise blocking potential as much as possible. The boundary fence is therefore considered to be a minimal flow blockage. No other landowner in the region is restricted in terms of the fences they can establish around their property. The fence surrounding the site is a legal requirement, however it also has important security and public safety functions. It is therefore a necessary feature of the proposed development.

The solar array is not a solid or continuous structure and the design of the solar array encourages air flow through the site. At night the panels are stowed in a near horizontal position, approximately 2 meters above the ground. Mounting posts have a small cross-sectional area (approx. 100m wide) and are spaced at intervals of 6.5m to 7 m. Rows of panels are on average 9m apart. This allows significant space for air flow below the stowed solar panels at night and between the mounting posts. The solar array is also likely to act as a heat sink and the horizontally stowed panels would also prevent longwave radiation emitted from the ground surface to escape to space under clear skies at night, effectively 'closing the atmospheric window' and absorbing and re-radiating the long wave radiation towards the ground. Both effects would contribute to a slight increase in air temperature under the arrays. This slightly warmer air is likely to alleviate the cold near-surface air temperature, reducing the frost risk rather than increasing it on adjacent agricultural properties.

The study specifically found two sites Site 6 (J. Faulkner - FRV property boundary) and Site 8 (Mitchell - FRV property boundary) were not predicted to experience any katabatic flows towards the solar farm site and hence are considered not to have an increased risk of frost from air flow blocking due to the construction and operation of the solar farm.

Similarly, the eastern solar farm will likely provide a measure of frost mitigation to agricultural land abutting Site 14.

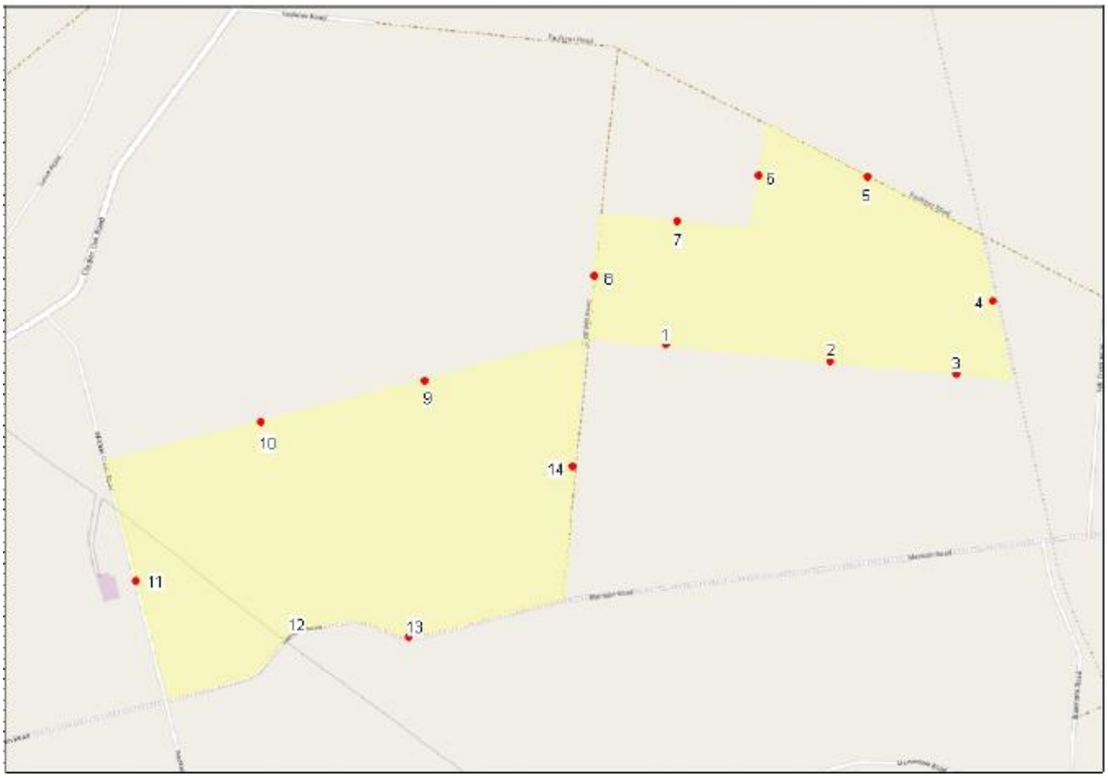

Figure 3.1 :Locations around the solar farm site boundary selected for analysis of wind flows during predicted frost events

The assessment considered that other common agricultural practices and features in the local area, which are not subject to any planning controls relating to frost formation and blockage, provide a greater potential for air flow blocking than the proposed solar farm. Vineyards, wheat and other crops, road and rail line embankments, tree lines, shed and building structures and areas of natural vegetation with multi-storey canopies all feature in this environment and are considered to have a greater wind blocking potential than the Project.

The complete study is provided in Appendix A.

3.9 NON-INDIGENOUS HERITAGE

Four submissions raised that the potential impacts on the Mary Immaculate Church located on Catholic Church Road were not addressed by the Development Application Report. The submissions were concerned with the potential dust and vibration impacts on the church associated with the use of Catholic Church Road by heavy vehicles during construction.

3.9.1 RESPONSE

The Mary Immaculate Church on Catholic Church Road was listed on the Register of the National Estate (RNE). The RNE was closed in 2007 and is no longer a statutory list. However, the church is located within the Mintaro State Heritage Area and is of significant community value.

The church is set back approximately 20 m from the property boundary. Based on indicative vibration levels from the operation of construction plant, this distance exceeds the order of distance required to avoid structural damage (refer Table 3.1).

Table 3.1 Typical Vibration Levels from Construction Activities (DPTI, 2017)

ACTIVITY	TYPICAL LEVELS OF GROUND VIBRATION	ORDER OF DISTANCE TO ACHIEVE DAMAGE TARGETS
Truck traffic (over maintained road surfaces)	0.2mm/s at 10m	5m
Truck traffic (over irregular surfaces)	2mm/s at 10m	10m

Mitigation measures to manage potential impacts to the Mary Immaculate Church may include:

- dust control (e.g. through undertaking road sealing or dust suppression)
- dilapidation surveys to monitor potential impacts and ensure they are remediated

Road pavement improvements (re-sheeting) along the full length of Catholic Church Road, are recommended as mitigation works in the TIA. The Road Safety Audit would include Catholic Church Road to identify additional road upgrade works required.

3.10 PLANNING AND LAND USE

Seven submissions raised concern with the use of agricultural land for the purposes of a solar farm. Issues raised were:

- the use and control of agricultural land by a foreign-owned company
- the difficulty of rehabilitating the site to agricultural use upon decommissioning of the solar farm and the potential impact on future productivity of the land
- potential impacts on productivity of adjacent land, including cropping activities and spraying regimes.
- inconsistency with the Clare and Gilbert Valleys Council Strategic Plan strategy to protect agricultural land suitable for food production
- inconsistency with the accepted land uses for Horticultural Policy Area 2 in the Clare and Gilbert Valleys Council Development Plan

3.10.1 RESPONSE

Options to maintain productive use of the land through grazing livestock in conjunction with the solar farm would be considered as part of the Project.

A review of studies relevant to the environmental impacts of solar farms was undertaken to support the Development Application (refer section 7.12.4.1). Key findings included that:

- solar farms can be easily rehabilitated at the end of the project life
- as the solar modules are tilted and raised on posts to minimise shading; the land is open to grassing and soil rehabilitation.

The site would be rehabilitated to its productive state following decommissioning. Rehabilitation measures to be implemented would be developed prior to construction.

Potential impacts to the productivity of adjacent productive land are addressed separately (e.g. aviation, biosecurity, micro-climate, stormwater and flooding).

A separate strategy within the CGVC's Strategic Plan supports the development of a solar farm in the area through encouraging alternative renewable energy production whilst protecting important landscapes from inappropriate development. The Project would occupy approximately 380 ha and would not remove a significant area of agricultural land from the regional area, while the site layout presents the opportunity for livestock grazing between solar panel rows.

The site is located within the Primary Production Zone, not within Horticultural Policy Area 2. The desired character of the Primary Production Zone within the CGVC Development Plan in which the project site is located recognises renewable energy facilities as forming an integral component of the area.

3.11 SOCIO-ECONOMIC

Six submissions raised that the Project would cause a reduction in land value surrounding the Project site and negative socio-economic impacts due to:

- a lack of opportunity for adjacent agricultural businesses to expand and the flow-on effects of this to the local economy.
- visual amenity impacts
- loss of privacy and reduced security
- potential impacts on productivity of adjacent land
- increased traffic
- Electromagnetic Interference (EMI)

The submissions also placed high value on the lifestyle provided by the locality and the potential influence of the Project on business as usual practices.

Questions raised in the submissions were:

- whether the land will be available for purchase upon decommissioning and rehabilitation.
- what the value of the Project is to the state, community and adjacent landowners
- how landowner’s interests will be protected for the life of the Project

3.11.1 RESPONSE

The degree to which the Project could impact property values is dependent on the effective management of physical impacts to neighbouring properties. Potential adverse impacts would be mitigated through the measures outlined in the Development Application Report to reduce the likelihood of the Project affecting property values.

The opportunity to expand agricultural holdings is dependent on the landowners' willingness to sell. The use of the land for the purposes of a solar farm does not impact this. The lifespan of the project is expected to be approximately 30 years. After this time, the site will be remediated to its original condition, with the intention of it being made available for lease or sale, offering future opportunities for expansion.

Privacy and security impacts to surrounding landowners during construction would be managed through the use of an access route that minimises impacts to sensitive receivers. A specific Traffic Management Plan to manage construction traffic would be prepared for the project (refer section 8.1.4 of the Development Application Report). Security is discussed in section 8 of the Development Application Report.

The Clare and Gilbert Valleys Council have recommended a look-out or viewing area be developed for the solar farm. If incorporated, this would provide a safe location for visitors to stop and view the solar farm and also reduce potential thoroughfare traffic associated with the solar farm, through directing tourists to the look-out/viewing area via a route that minimises impacts to sensitive receivers.

Consultation activities would continue with the surrounding landowners if the Project is approved. This would include the development of protocols to respond to potential issues raised and ensure landowners interests are protected throughout the life of the project.

The Project rationale and benefits are discussed in section 2.1 of the Development Application Report.

The question relating to the how the Project affects the energy balance/health of the area was interpreted as relating to the effect of sunlight being absorbed into the panels (rather than the ground). Solar power is generated through photovoltaic modules that convert sunlight into electricity. As sunlight is a renewable resource, the energy/health of the area will not be impacted by the project.

3.12 STORMWATER AND FLOODING

Four submissions included questions/concerns regarding the impact of the Project on stormwater and flooding. The key issue raised was the potential for water drainage issues on adjacent land and consequential loss in production or risk to assets. The submissions enquired how this risk would be managed and if compensation would be provided for potential losses caused by changes to water drainage patterns.

Other questions raised were:

- how soil structure and soil health would be managed
- how the design (creek crossing) would address flows

3.12.1 RESPONSE

The installation of solar panels would have a negligible impact on total site runoff, with the ground underneath being permeable (refer section 7.9 and Appendix N of the Development Application Report).

Detailed civil investigations (including further analysis into the risk of flooding) would be undertaken as part of the detailed design process and a Sediment Erosion and Drainage Management Plan (SEDMP) prepared, in line with best practice.

It is not an FRV policy to provide financial compensation to neighbouring properties.

The internal access road layout will likely incorporate culvert crossings (subject to detailed design) to maintain natural hydrological systems. Detailed civil investigations will be undertaken during further design stages to identify additional measures that may be required.

3.13 TRAFFIC AND ACCESS

Traffic and access issues were raised by 7 submissions and are summarised in Table 3.2. Some of the submissions specifically raised concerns regarding the potential impact of the proposed heavy vehicle access route on the Catholic Church of Mary Immaculate, located on Catholic Church Road. As this site was recorded on the Register of the National Estate and is within the Mintaro State Heritage Area, issues raised by these submissions are addressed in section 3.9 Non-Indigenous Heritage.

Table 3.2 Summary of traffic and access issues raised in public submissions

ISSUE	SUBMISSION #	SUMMARY OF ISSUE RAISED
Responsibility for maintenance	001, 017	The heavy vehicle route proposed requires minimal cost for FRV compared to other options and the cost of maintenance would fall back to Council or DPTI. The roads are currently not well maintained.

ISSUE	SUBMISSION #	SUMMARY OF ISSUE RAISED
Extent of proposed road sealing	001, 014 (Catholic Church Road)	During construction phase there will be sufficient traffic to justify sealing the key access roads. Permanent sealing/upgrade is requested for: — Catholic Church Road — Merildin Road (part of) — Wookie Creek Road — Hare Road — Martindale Road (part of) Other roads that should be considered for upgrade are: — Faulkner Road — Chaff Mill Road — Merildin Road (east to the Chaff Mill Road intersection)
Horrocks Highway	001	Barrier Highway is safer than Horrocks Highway.
	017, 023	The section of Horrocks Highway between Giles Corner and Sevenhill is in poor condition and requires significant upgrade works. This is noted in the following locations: – passing lanes at Macaw Creek – south of Rhynie – north of Rhynie (past Rubbish Tip Road) – north of Undalya, including the bridge over Wakefield River.
Catholic Church Road	014	Catholic Church Road is a single lane, unsealed road. The road verges are raised reducing ability for vehicles to move off the road.
	017	Catholic Church Road is used by pedestrians and cyclists. There are no footpaths and the road verges are overgrown so pedestrians walk on the road. An increase in traffic on this road requires consideration of the provision of improved pedestrian facilities.
Intersection of Catholic Church Road and Mintaro-Farrell Flat Road	014	The intersection of Catholic Church Road and Mintaro-Farrell Flat Road is on an angle and vehicles need to pull out into the intersection to check for traffic.
Intersection of Jolly Way and Catholic Church Road	014	The intersection of Catholic Church Road and Jolly Way is on an angle and is obscured. The give way sign is often knocked over by trucks.
	017	The intersection is obscured for vehicles travelling from Jolly Way and is easily missed, causing vehicles to detour through the Mintaro township. The right-turn from Catholic Church Road to Jolly Way presents stabilisation issues for heavy vehicles. Visibility for vehicles turning onto Jolly Way is low due to the angle of the road and vegetation.
	020	Heavy vehicles turning onto Catholic Church from Jolly Way encroach on the other side of the road.

ISSUE	SUBMISSION #	SUMMARY OF ISSUE RAISED
	020, 003 (endorsed by 021)	Slow-moving heavy vehicles turning onto Jolly Way from Catholic Church Road present a hazard to faster vehicles travelling along Jolly Way from Mintaro due to low visibility.
	017, 003 (endorsed by 021)	No information is provided about this intersection in the Development Application Report.
	023	There is a 90 degree turn onto Catholic Church Road from Jolly Way
	003 (endorsed by 021)	The intersection is on a bend with an 80 km/h speed limit. Approaching Mintaro, the road slopes downhill, increasing braking distances for heavily loaded vehicles. A turning lane should be provided and the road widened. Vegetation clearance would be required to facilitate this.
Jolly Way	001	Min Man Road is safer than Jolly Road as it is wider, flatter and straighter. It is noted that Jolly Way would still be the primary route for vehicles coming from Clare.
	003 (endorsed by 021)	Incorrect crash statistics for Jolly Way are provided in the Development Application Report. The Development Application Report does not include crashes not attended by the CFS, unreported crashes and possibly records under previous road names. Mintaro CFS have attended 8 vehicle accidents over 12 years while Sevenhill CFS have attended three in the last five years. The CFS are also aware of seven unreported accidents on Jolly Way.
	003 (endorsed by 021), 020	There is limited visibility for vehicles exiting Paulette Wines (concealed driveway) onto Jolly Way. Vehicles pull out onto Jolly Way from a stop and require time to speed up.
	003 (endorsed by 021), 017, 020, 023	Jolly Way has sharp curves, steep inclines and crests. It is winding and narrow and with erosion in places.
	003 (endorsed by 021),017, 020	Vehicles drive towards the centre of the road to avoid the guard rail along most of the road. Larger vehicles regularly cross double white lines causing vehicles on the other side of the road to avoid them.
	017	Jolly Way has poor shoulder maintenance between Horrocks Highway and Spring Farm Road. Vehicles cause loose gravel to spread into the intersection of Spring Farm Road and Jolly Way.
	020	The guard rail and narrow shoulders mean there is no way for vehicles or cyclists avoid oncoming traffic that has encroached onto the other side of the road. There is no room to accommodate wide-load vehicles. There is no dedicated cycling lane on Jolly Way. Trees canopies overhanging Jolly Way are valued by the community and pruning would be required to accommodate tall heavy vehicles.
	003 (endorsed by 021), 020, 023	The heavy vehicles currently using Jolly Way tend to be of medium length, Class 3 or 4 vehicles (school buses and small trucks and agricultural vehicles). The road is not suitable for articulated vehicles.

ISSUE	SUBMISSION #	SUMMARY OF ISSUE RAISED
	017, 020	Jolly Way is a key access road for tourism. The use of this road may have a negative impact on tourism.
	003 (endorsed by 021), 017	Access to Jolly Way can be restricted at times due to storm damage.
	003 (endorsed by 021)	Limited visibility and curves make it difficult to pass cyclists and slow-moving vehicles.
	021	Jolly Way is often used by poor drivers
Preferred community route	020, 023	The route via Barrier Highway and Flagstaff Hill Road was recommended as the preferred route by the community during consultation.
Intersection of Horrocks Highway and Jolly Way	003 (endorsed by 021), 023	Large vehicles cannot turn onto Jolly Way from Horrocks Highway due to the narrow roadway and small radii corner. Large vehicles turning on to Jolly Way present a hazard to vehicles on the other side of the road. Vehicles need to reverse 20-30 meters back from the intersection to allow large vehicles to complete the turn onto Jolly Way. waiting to turn right onto Horrocks Highway. There is no visibility of vehicles approaching along Horrocks Highway from the north. In the last 12 years there have been at least 4 accidents at this intersection.
Intersection of Merildin Road and Chaff Mill Road	003 (endorsed by 021)	Recommendation to for FRV to undertake sealing of the Merildin and Chaff Mill Roads for a distance of 100 m in each direction from the intersection to minimise dust and vehicle noise to sensitive receptor #07
Alternative routes	021	Recommended alternative route via Barrier Highway, Min Man Road, Bowmans Road. If Bowmans Road is not appropriate (due to being unsealed) then Min Man Road should be used.
	001	A route via Barrier Highway, Min Man Road, Martindale Road and Hare Road is safest and most direct, passing through 3 towns after Tarlee.

3.13.1 RESPONSE

RESPONSIBILITY FOR MAINTENANCE

The Clare and Gilbert Valley Council is responsible for maintaining local roads including routine and ad hoc grading, filling pot-holes, resurfacing and general repairs. The current extent and standard of maintenance of roads in proximity to the subject development site may reflect the low volume of traffic movements on these roads.

The preferred HV route makes sensible use of existing sealed arterial roads and minimises the extent of unsealed roads that would be impacted by the extra traffic. The selected sections of unsealed roads forming the preferred route minimise the number of residents that may be affected and reduces the extent of generation of dust.

During the approximate 18-month construction period of the proposed development, additional car and truck movements will travel along some of the unsealed local roads which will accelerate the deterioration of the condition of the road structure and riding surface. Accordingly, the Proponent would assume responsibility for maintaining these roads to a condition commensurate with their increased use for the duration of the construction period, after which the responsibility will revert to the local council. The Proponent would fund the maintenance costs but it has yet to be determined whether council would undertake the activities on behalf of the Proponent or, more likely, the Proponent would engage a contractor to undertake the works.

The Proponent would not only maintain these roads but also improve selected sections including, for example, easing curves, localised widening and improving sight distances, and making intersections more conspicuous.

The overall cost of the maintenance program for the preferred route may be less than that required for other routes investigated, but would still be significant. It should also be noted that the preferred route is not the shortest and the Proponent would incur additional transport (vehicle running) costs. At the conclusion of the construction period, the legacy of the project would be the unsealed road sections of the preferred route being in a better condition than at present and permanent improvements to some intersections.

EXTENT OF PROPOSED ROAD SEALING

Generally, it may be more economic in the long term to seal a road carrying nominally more than 150 vpd than to maintain an unsealed road surface. This of course would depend on many factors such as the vertical and horizontal alignment, weather conditions, management of stormwater runoff and the types of vehicles using the road. Council was unable to provide any traffic surveys of the local roads in proximity to the proposed development site but considering the sparsely populated area it is unlikely that daily traffic volumes on these roads would exceed this nominal threshold. During phase two of the construction period, traffic volumes may exceed 200 vpd (mainly cars).

At this stage the Proponent is committed to maintaining the unsealed roads in a trafficable state for the duration of the approximate 18-month construction period (including routine maintenance and ad-hoc repairs). It has been recommended that short sections of road on the approaches to any intersections be sealed to improve traction for accelerating and decelerating vehicles. The Proponent would undertake its own analysis to compare the life-cycle costs of this maintenance strategy with that of sealing the roads to determine the most appropriate and cost-effective course of action.

HORROCKS HIGHWAY

The submitted comment on the relative safety performance of the Barrier and Horrocks Highways is noted. The estimated levels of additional traffic generated by the development are unlikely to significantly impact on the safety performance of either road.

The section of Horrocks Highway between Giles Corner and the junction with Jolly Way exhibits passing lanes in both directions of travel and there are several sections of road where sight distance enables safe overtaking opportunities. Additional overtaking lanes would create a safer environment for road users but these are costly to construct and private land may have to be acquired. The state government (through the Commissioner of Highways) would be responsible for funding any such improvements. Any justification for additional overtaking lanes would consider the use of the road by all road users and not attributed just to the additional 8-16 truck movements generated by the proposed development.

CATHOLIC CHURCH ROAD

The TIA has acknowledged the deficiencies of this road to carry additional traffic and recommends improvements along its full length.

As is the case with all the unsealed roads in proximity to the proposed development site, the formed road is low-lying and the surface is at or below the level of the adjacent verges. The upgrading of this road would include raising the level and thickening and widening of the traveling surface. This would allow for the safe passage of two-way traffic.

Within the road reserve and either side of the unsealed road, the verges are grassed and uneven. The verges are populated by stands of native trees – for the full length on the northern side and short sections and stands of trees on the southern side. It appears possible for pedestrians to walk along some sections of the verges but the formed road provides a more even and consistent surface, albeit large stones and gravel are evident along both sides of the road edges. To avoid these pedestrians and cyclists (in particular) would need to walk/cycle closer to the centre of the road or in the verge where possible.

Footpaths or pathways for pedestrians along rural arterial roads are rarely provided as there is usually little or no demand to use them. There are no pathways along either of the roads adjoining Catholic Church Road (Jolly Way-Burton Street or Copper Ore Road-Burra Street) along which traffic volumes are higher and the verges impassable in places.

By observation there does not appear to be any obvious pedestrian movement desire line (well-worn, informal path). The church and graveyard would appear to be the only points of interest along the road that might attract pedestrians. No pedestrians or cyclists were observed during the site inspections but then no vehicular traffic was observed either. The potential for conflicts between pedestrians/cyclists and vehicle traffic one this road exists but the risk is considered extremely low.

The anticipated upgrading of Catholic Church Road will provide a wider pavement for vehicles to travel. In the absence of any footpath or shared use path and the possibly then that pedestrians or and cyclists may share the road space with cars and occasional trucks, the wider road surface will provide additional space for vehicles to pass with greater separation.

INTERSECTION OF CATHOLIC CHURCH ROAD AND MINTARO-FARRELL FLAT ROAD

This intersection is discussed in section 2.3.3 of Appendix M of the Development Application Report. The TIA noted that sight and stopping distances are insufficient and recommended improvements before allowing increased use by both cars and trucks. The form of the improvements would be determined in the next phase of the project and the design of the improved layout will be subject to a Road Safety Audit before it is implemented.

INTERSECTION OF JOLLY WAY AND CATHOLIC CHURCH ROAD

The intersection of Jolly Way and Catholic Church Road was included in the analysis of Catholic Church Road in section 7.8.3.2 of the Development Application Report.

Sight and stopping distances at the junction would need to be improved and the junction made more conspicuous to approaching traffic before allowing increased use by cars and trucks. These improvements may include flaring of the junction, trimming or removal of roadside vegetation, improved signage and review of speed limits. A Road Safety Audit of the improved junction design will be undertaken.

Trucks making deliveries to the proposed development site are likely to be operated by regular drivers who would in time be familiar with the characteristics of the route to and from the site. It is anticipated that truck drivers and construction workers would attend regular work pre-start (“tool box”) meetings at which any risks to safety either at the site or on the route to the site are identified and appropriate behaviours discussed. These meetings and actions would contribute to an improved safety regime for all activities associated with the construction of the site.

JOLLY WAY

Jolly Way is assessed in section 7.8.3.2 of the Development Application Report. The design standard varies along the length of the road with sections of curves, crests and long straights through undulating topography. Higher-risk sections have been treated with appropriately safety measures including W-bean guard rail, line marking and signage.

Key issues raised by the community with the use of Jolly Way relate to the road characteristics and condition, crash statistics, heavy vehicles currently using the road and driver behaviour.

ROAD CHARACTERISTICS AND CONDITION

- The TIA notes the deficiencies of Jolly Way which are typical of rural roads designed to lower standards and constructed over 50 years ago. These include tight curves and crests that restrict visibility of oncoming vehicles and are to be negotiated at speeds below the posted speed limit. The deficiencies also include narrow road pavements and shoulders which may contribute to loose materials encroaching onto the pavement.
- On Jolly Way, the approaches to most of the curves and crests are marked by continuous painted centre lines (barrier lines) which provide physical and visible cues to motorists that it is unsafe to overtake. Advisory speed signs are in place on the approaches to the tighter radii curves. These sections of road can be safely negotiated by attentive road users who give due regard to the road conditions. Road shoulders are sealed along some sections and the road pavement is wide enough to allow for edge lines.
- Erosion of road shoulders due to stormwater along some sections of the road was noted during site inspections. This is common on rural arterial roads (particularly around curves) and repairs and mitigation are part of any maintenance

strategy. The extent of erosion along the length of the road was not considered significant and the sealed shoulders in some sections prevent any risk of stormwater damage to the road pavement edges. The extent of erosion along this road was considered significantly less than that along roads on alternative routes especially the unsealed roads.

- The community value of the tree canopies overhanging Jolly Way is noted. Tree canopies over the road are evident along some sections of the road (but not the majority) of it. These appear to be high above the road although there may be a few locations where these may interfere with the passage of high loads. The legal height limit for any vehicle is 4.3m above which permits are required to operate the vehicles along the road. Jolly Way is already used by legal height vehicles. Should trimming of vegetation be required it would be done in accordance with the requirements of the *Native Vegetation Act 1991.* The TMP would address the potential for restricted access to Jolly Way in the event of storm damage. Full or partial closure of rural roads in the event of storm damage (fallen trees, erosion) is possible at times. In such events, local councils and emergency services collaborate to divert and manage traffic as appropriate until the road can be re-opened. The introduction of additional traffic to Jolly Way does not alter this requirement in any way.

CRASH STATISTICS

The crash statistics provided in section 2.5 of Appendix M were based on official records of crashes that occurred in the five-year period between 2012-2016, inclusive. The reported crashes occurred mostly at the western end of Jolly Way, with many involving single vehicles leaving the road. The unrecorded crashes raised in the submission also involved single vehicles and were likely attributed to driver error. It is noted in the submission that some of the crashes were allegedly not attended by emergency services, possibly due to driving under the influence of alcohol or an unroadworthy vehicle. It is assumed that if the crashes were not reported then no casualties were involved.

In 2012, the Department of Planning, Transport and Infrastructure (DPTI) installed W-beam guard rail along several sections of road to prevent errant vehicles leaving the road. Along these sections of the guard rail the road appears to have been widened slightly (providing separation between the guard rail and the road edge and passing vehicles), road shoulders sealed and painted edge-lines.

It is noted that the frequency of recorded crashes has reduced notably since the treatments were implemented

The comments relating to poor driver behaviour (discussed below) are noted. Unfortunately, poor and inappropriate driver behaviour is not restricted to Jolly Way and is a contributing factor to a high proportion of all crashes.

It is considered that the increased traffic exposure due to construction traffic would not significantly increase the frequency of the types of crashes that have occurred in the past. Any increased risk of crashes on Jolly Way is still considered lower than would be the case for travel along the alternative unsealed roads being exposed to the same level of traffic.

HEAVY VEHICLES USING THE ROAD

Concerns have been raised about the increased use of Jolly Way by heavy vehicles.

The road is currently used on average by 45 trucks per day (based on DPTI traffic statistics) and is understood to include articulated truck movements accessing Paulette Winery. Jolly Way is a designated B-double Commodity Route. This designation allows primary producers to use B-doubles to transport produce and other related goods and materials to and from properties used for primary production, including wineries.

The existing truck volumes are forecast to increase by 2-4% (8-16 movements per day) during the construction phases 1 and 2 respectively (combined period of 18 months). These additional movements would be general access vehicles (tray top trucks and semi-trailers) which are entitled to use any public road. The use of larger vehicles (Restricted Access Vehicles including for example B-doubles) is not anticipated but would in any case be subject to further investigations and the approval of appropriate permits. Over-dimension loads (height or width) are not anticipated.

During site inspections (on four occasions), no trucks were observed using the road.

The apparent difficulties of vehicles egressing Paulette Winery are noted. Truck movements generated by the proposed development will only travel along Jolly Way and not turn onto or from it except at the junctions identified in the TIA which are recommended for upgrading.

It has been mentioned that trucks using the road may have an adverse impact on tourism albeit trucks are already using the road (and in increased numbers during the grain carting season). The introduction of truck movements to one of the alternative routes passing Martindale Hall was one consideration in rejecting that route.

DRIVER BEHAVIOUR

- Section 7.8.3.2 of the Development Application Report notes the features of Jolly Way that require motorists to exercise care and attention to safely negotiate.
- Guard rails located close to the road edge may encourage a minority of drivers of some vehicles to drive closer to the centre of the road. The installation of W-beam by DPTI in 2012 included localised widening of the road pavement and sealing of the shoulders providing some separation between the road edge and the guard rail.
- As with most rural arterial roads, dedicated cycle lanes are not provided along Jolly Way. Drivers of motorised vehicles are required by law to pass cyclists with at least a one-metre separation. This may mean that vehicles encroach the oncoming traffic lane. In the event of oncoming traffic, motorists must mot overtake the cyclist until safe to do so.

MIN MAN ROAD AS A SAFER ALTERNATIVE TO JOLLY WAY

- The TIA identified and assessed several possible routes for HV to access the proposed development site. The route alternatives were compared in their entirety and by individual sections. Compared to Jolly Way, Min Man Road has some benefits and disadvantages but factors against this route included the additional length of unsealed road (Martindale Road and Hare Road) and the extra traffic passing Martindale Hall and residential dwellings.

PREFERRED COMMUNITY ROUTE

During community consultation, it became apparent that there was community support for the HV5 route option and safety concerns for HV2, particularly regarding the increased use of Jolly Way by heavy vehicles.

The community’s preference was taken into consideration in the assessment of the heavy vehicle route options and balanced with safety and amenity factors. HV2 was progressed as the preferred option for reasons including:

- avoiding dwellings immediately adjacent unsealed roads, whereas HV5 would pass a residence on Hare Road (unsealed), located within 30 metres of the road
- requiring less significant upgrades on a shorter length of unsealed road
- Catholic Church Road still likely requiring upgrade works to cater for construction light vehicle traffic
- Jolly Way safety risks having been treated with controls, including advisory speed signs, barrier lines and guard rails. The 2-4% increase to current heavy vehicle movements on Jolly Way are not expected to significantly increase risk.
- avoiding heavy vehicle movements on Martindale and Hare Roads (both unsealed). Martindale Road is narrow and subject to flooding and Hare Road would require significant upgrading in some sections. Directing trucks along these unsealed roads would likely pose a greater safety risk to other road users than directing them along Jolly Way where truck traffic is already evident.

INTERSECTION OF HORROCKS HIGHWAY AND JOLLY WAY

The junction of Horrocks Highway and Jolly Way is discussed in section 7.8.3.3 of the Development Application Report. Upgrading of this road junction will be required to improve sight distances and turning conflicts and make junction more conspicuous. The design of the improved layout will be subject to a Road Safety Audit before improvements are implemented.

INTERSECTION OF MERILDIN ROAD AND CHAFF MILL ROAD

There are no planned construction traffic movements at the intersection of Merildin Road and Chaff Mill Road.

ALTERNATIVE ROUTES

Several aspects of the HV route options were considered and comparative assessments made to determine the preferred route. These are presented in the TIA and included:

- use of existing sealed road network
- relative safety performance and risk of increased traffic
- length and extent of upgrades of unsealed roads
- amenity of residents living adjacent to roads
- impacts on Mintaro township

ROUTES VIA THE BARRIER HIGHWAY

The TIA considered three routes via the Barrier Highway:

- Option HV4: Barrier Highway to Mintaro via Mintaro-Manoora Road and then along Merildin Road and Wookie Creek Road
- Option HV5: Barrier Highway to Mintaro via Mintaro-Manoora Road and then Martindale Road and Hare Road to Merildin Road
- Option HV6: Barrier Highway and then via Flagstaff Road-Riley Road and Merildin Road

Option HV4 was not favoured as it required travel through the Mintaro Township. Option HV6 was not favoured as it required the upgrade of over 13 km of unsealed road and significant re-alignment of some curves.

HV2 was preferred over HV5 for the reasons discussed above (see preferred community route) and in section 7.5.8.2 of the Development Application Report.

Other routes were suggested during the consultation period but all were considered inappropriate because of the significant extra distance required. One suggested route was via the Barrier Highway, Mintaro-Manoora Road and Bowman's Road. This route was not considered as it passes dwellings on unsealed roads and would require significant sealing works to minimise impacts to sensitive receivers.

3.14 VISUAL AMENITY

Three submissions expressed dissatisfaction with the visual impact assessment and the assignment of low scenic value to certain viewpoints. The proposed mitigation measure to establish a screen of native plantings was considered not appropriate as the agricultural landscape is preferred. Also, there would be potential visual and glare impacts to neighbouring properties and the wider scenic landscape while the plantings became established.

3.14.1 RESPONSE

The Landscape Character and Visual Impact Assessment notes that the assessment of visual impact is highly subjective and individual consideration of visual impact from any given location of view point may differ from the findings of the report. The Landscape Character Assessment was undertaken in a manner consistent with best practice, as prescribed by the 'Guidelines for Landscape and Visual Impact Assessment' (Third Edition). Low scenic quality was assigned to areas where a generally more positive character with fewer valued features with evidence of a visually acceptable level of alteration/degradation/erosion resulting in a location of more mixed character.

The Landscape Character and Visual Impact Assessment found that the introduction of the solar farm would not change the mainly pastoral nature of the locality and wider contextual landscape. The solar farm would meet the provisions of the CGVC Development Plan which requires it to be sited and designed to blend with the natural features of the landscape and to cause minimal damage to the natural landform.

The Visual Impact Assessment identified that substantial-moderately adverse visual impacts are likely be experienced at one sensitive receptor (#007) with the remaining surrounding properties experiencing either no change or slight adverse-no change (refer section 7.5.4 and Appendix J of the Development Application Report).

3.15 OPERATION

One submission enquired about the ongoing water supply from the windmill located on the site.

3.15.1 RESPONSE

Consultation would be undertaken with neighbouring properties currently accessing this water supply regarding ongoing access arrangements.

3.16 GENERAL CONCERN

Two submissions raised general concerns relating to Development Application Report bias and accuracy.

3.16.1 RESPONSE

Th Development Application Report was prepared to support the Development Application for the Chaff Mill Solar Farm by appropriately qualified specialists and in-line with legislative requirements and best practice (where applicable).

The minor errors raised by the submissions were immaterial to the overall Development Application Report.

3.17 GENERAL SUPPORT

Five submissions expressed general support for the Project. For three of these submissions, this support was contingent on the preferred heavy vehicle access route being abandoned.

4 LIMITATIONS

- Limitations of the response document are as outlined in section 10 of the Development Application Report.
- In summarising the submissions in a concise manner, WSP has made every attempt to accurately represent/convey the issues raised in an impartial manner. However, it is recognised that true meaning may be misconstrued through this process.

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APPENDIX A

ASSESSEMENT OF FROST FORMATION AND IMPACT POTENTIAL STUDY REPORT airenvironment

Assessment of Frost Formation and Impact Potential

Prepared for WSP Australia for the

FRV Services Australia P/L Chaff Mill Solar Farm Project

28 May 2019

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Document Reference

Client:	WSP Australia Pty Limited (on behalf of FRV Services Australia Pty Limited)
Postal address:	Level 1, 1 King William Street, Adelaide, SA, 5000 Australia
Project:	Chaff Mill Solar Farm Project Development Application
Project number:	0060.1903
Document title:	Assessment of Frost Formation and Impact Potential
Reference:	Air Environment, 2019*. Report prepared by Air Environment for WSP Australia – Assessment of Frost Formation and Impact Potential of the FRV Services Australia Chaff Mill Solar Farm Project*, 28 May 2019, Brisbane, Australia.
Authors:	Dr Mike Power and Andrew Balch
Reviewed by:	Andrew Balch
Project director:	Andrew Balch

Report approved for issue by: Date:

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Abbreviations and Symbols

Term	Definition
Units of measurement	
s	second
min	minute
h	hour
d	day
yr	year
m	metre
km	kilometre
m^2	square metres
m^3	cubic metres
m/s	metres per second
km/h	kilometres per hour
Atm	atmosphere (unit of air pressure)
°C	degrees Celsius
K	Kelvin (unit of temperature)
MW	megawatts
MWh	megawatt hours
Scientific abbreviations	
3D	three-dimensional
PG	Pasquill-Gifford Scheme
TAPM	The Air Pollution Model. Prognostic meteorological and air dispersion model developed by the Australian Government's Commonwealth Scientific and Industrial Research Organisation (CSIRO).
CALMET	Diagnostic meteorological model
Q^*	Net all-wave radiation flux density
$K\downarrow$	Short wave radiation down (direct and scattered)
$K\uparrow$	Short wave radiation up (reflected)
K^*	Net short wave radiation
$L\downarrow$	Long wave radiation down
$L\uparrow$	Long wave radiation up
L^*	Net long wave radiation
Q_H	Sensible heat flux
Q_E	Latent heat flux
Q_G	Heat storage and loss via conduction to and from the underlying soil
d	Zero Plane Displacement
$\bar{u}$	Mean horizontal wind speed
Zg	Top of the boundary layer
Other abbreviations	
BoM	Bureau of Meteorology
DAR	Development Application Report
DEM	Digital Elevation Model
FRV	FRV Services Australia Pty Limited
SRTM	Shuttle Radar Topography Mission
WSP	WSP Australia Pty Limited

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Executive Summary

FRV Services Australia Pty Limited (FRV) is seeking Development Approval for the construction and operation of a solar farm, at a location northeast of Mintaro in the Clare Valley region of South Australia. Their proposed 100 MW Chaff Mill Solar Farm Project would generate approximately 250,000 MWh of electricity annually and provide a significant contribution to South Australia's energy production capacity. The solar farm array would be constructed on a 380 ha site over two parcels of land (referred to as the western and eastern parcels) comprising approximately 360,000 solar panels with an approximate height of three metres above ground, mounted on single-axis tracker framing. The agricultural land adjacent to the solar farm mainly comprises grazing and cropping areas that are largely cleared of native vegetation.

Submissions from some of the surrounding landowners oppose the development as they state that the solar array and its boundary fence will act as barriers to katabatic flows occurring under frost forming conditions. These barriers would allow cold air to accumulate on the adjacent uphill agricultural properties, exacerbating existing frost events and causing damage to crops. Air Environment was commissioned by FRV to investigate the issue of potential flow blocking by:

- Conducting a detailed study of the terrain within and surrounding the proposed FRV solar farm site as a first pass assessment of likely drainage flow conditions during frost events
- Developing a detailed meteorological model of the site and using it to investigate drainage flows under frost forming events
- Conducting an analysis of flow blocking potential from the solar farm array and its boundary security fence.

A 30 m Digital Elevation Model (DEM) was developed from Shuttle Radar Topography Mission (SRTM) measured data, revealing the ranges of hills to the west and east of the site, which are important controls on wind direction, numerous small rises and declivities across the solar farm site, in addition to the north/south-aligned drainage gully running through the centre of the site's western parcel. A watershed analysis of flows arising from differential terrain heights provided a first-pass assessment of katabatic flow directions. This was considered to provide a good indication of localised flows as katabatics commence, and it confirmed the importance of the gully in the western land parcel. The analysis did not however account for the valley-wide drainage flows becoming established off the slopes of the surrounding ridges and draining towards the south along the valley axis.

An analysis of BoM observations collected at the Clare High School AWS over a 24 year period, selected the year 2006 to model in detail. This year was selected due to the large anomaly in the frequency of screen height (1.2 m) temperatures in the -4°C to 3°C temperature range, suggesting that this year had the greatest potential for frost forming conditions.

Meteorology for the FRV solar farm site was modelled using a hybrid TAPM/CALMET approach, with the CALMET model being configured at a horizontal spatial resolution of 50 m. An assessment of TAPM predictions for the BoM Clare High School observation site showed that the TAPM predictions possessed skill at predicting wind speed, wind U and V vector components, air temperature, and relative humidity and were consequently suitable to characterise meteorological flows throughout the region.

Potential frost events were selected for hours when all of the following conditions were met:

- Modelled wind speed at 10 m above the ground was at or below 2 m/s
- Modelled air temperature at 10 m above the ground was at or below 5°C
- Modelled Pasquill Gifford Stability class was F (very stable) and
- There was no rain predicted.

Sixteen potential frost events were identified. Each of these occurred overnight or during the early morning and ended at dawn, was associated with the passage of an anticyclone over the region bringing clear skies and occurred during the winter to spring period. Predicted surface wind fields (i.e. at a height of 10 m above the ground) were assessed for the final hour of each event, when frost would be at its most intense and katabatic flows most developed. The wind fields each show katabatic flows which were decoupled from the prevailing synoptic flows. Three characteristic patterns were found:

- Uniform northeasterly drainage flows off the ranges to the east, becoming less coherent to the west as the flow interacts with terrain features, and reaching the eastern and western parcels as northerlies. The creek line on the western parcel is an important drainage discharge pathway towards the south.
- Uniform easterly drainage flows off the ranges to the east draining into the creek line gully on the western parcel. Occasionally katabatic flows will also drain off the western ranges and will merge with those from the east, with both flows discharging into the gully on the western parcel.
- If the katabatic flow off the eastern ranges has a southeasterly component, then the flow may travel up the creek line gully on the western parcel from south to north.

In each case the creek line on the western parcel played a critical role in providing a path for the wind to flow across the landscape. It should be noted that this gully area will be free from any built obstruction with the solar array being situated well back from the gully.

The potential for the solar panel arrays and boundary security fences on each of the solar farm sites to block the flow of cold dense drainage air and accumulate upwind of an obstruction to cause frost was assessed by determining the cross-sectional area of their silhouette. Both the solar array was determined to occupy less than 5% of the area between the ground and the top of each structure. The security fence with a 50 mm pitch was determined to occupy 7.4% of the area between the ground and the top of chainwire structure. In addition to this, neither structure is solid and continuous. The array has significant space for air flow below the stowed solar panels at night and between the mounting posts. The chainwire fence will have the maximum allowable 50 mm pitch between the links, providing for air to flow through the structure.

The solar array is also likely to act as a heat sink, and the horizontally stowed panels will also prevent longwave radiation emitted from the ground surface to escape to space under clear skies at night, effectively 'closing the atmospheric window' and absorbing and re-radiating the long wave radiation towards the ground. Both effects will contribute to an increase in air temperature under the arrays. The slightly warmer air will drain downhill and, in the near field, is likely to slightly alleviate the cold near surface air temperature, reducing the frost risk rather than increasing it on adjacent agricultural properties.

By comparison with the solar farm, other common agricultural practices and features in the local area are expected to provide a greater potential for air flow blocking. Vineyards, wheat and other crops, road and rail line embankments, tree lines, shed and building structures and areas of natural vegetation with multi-storey canopies may all feature in this environment and are considered to have a greater wind blocking potential than the FRV site.

1 Introduction

1.1 The project

FRV is seeking Development Approval for the construction and operation of a solar farm, at a location northeast of Mintaro in the Clare Valley region of South Australia. The project is considered to be significant infrastructure for the State's development under Section 49 (Crown Development) of the *Development Act 1993*. (WSP, 2018)

FRV's proposed 100 MW Chaff Mill Solar Farm Project would generate approximately 250,000 MWh of clean, zero greenhouse gas (GHG) emissions electricity annually and provide a significant contribution to South Australia's energy production capacity. The solar farm array would be constructed on a 380 ha site comprising approximately 360,000 solar panels with an approximate height of three metres above ground, mounted on single-axis tracker framing. The agricultural land adjacent to the solar farm mainly comprises grazing and cropping areas that are largely cleared of native vegetation.

1.2 Project background and study approach

WSP Australia Pty Limited (WSP) were commissioned by FRV to prepare a Development Application Report (DAR) for the Chaff Mill Solar Farm Project. Upon public presentation of the DAR, objections to the development were received from some of the local community members concerned that the installation and operation of the solar farm would potentially increase the frequency and severity of frost on agricultural land adjacent to the development by disrupting and blocking the natural flow of air across the region during cool temperature periods. In general, opponents to the solar farm development cited the following objections:

1. Increased frequency and severity of frost in the local area surrounding the solar farm due to blocking of cold air drainage.
2. Increased frost damage resulting in severe financial loss.
3. Loss of capital value of adjoining land because of the increase in frost incidence and severity.

WSP commissioned Air Environment to conduct a study of the Chaff Mill Solar Farm site to investigate the potential for frost generation in the area and the flow of air across the site. Specifically, the scope of the study comprised:

- Terrain and slope modelling
  - Objective: Terrain modelling was used to provide a first-pass assessment of the local slope flows and drainage patterns across the landscape under predominately calm, cold, dense air conditions. This analysis was used to determine flow direction, into and out of, the solar farm site and to understand the air blocking potential of the solar panel array and other project infrastructure.
  - Approach: An analysis of the topography of the broader region and project site was conducted to investigate its influence on the flow of wind, particularly under calm and light air drainage conditions. A digital elevation model (DEM) was developed and analysed based on 30 metre resolution topographic data that is commonly used in air dispersion modelling. The DEM was used to assess the degree of slope across the region and its aspect. A notional model of katabatic or cold, dense air drainage flows was developed to assess existing nocturnal air flow direction under calm to light air conditions.
- Analysis of regional meteorology
  - Objective: Regional climate information was used to investigate the critical parameters that cause frost conditions and the evidence for historic frost formation in the area.

- Approach: A review of information from previous climate assessment reports prepared on frost conditions in the Clare Valley area were reviewed and supplemented by an analysis of on-site meteorological observations.

- Meteorological modelling
  - Objective: To investigate the spatial and temporal flow of air and temperature profiles across the local area on and surrounding the solar farm.
  - Approach: As meteorological monitoring stations only provide data for a single location meteorological modelling was conducted to investigate the spatial variation in flow of air across the area on an hourly basis.
- Qualitative analysis of the air flow blocking potential of solar arrays and other infrastructure
  - Objective: To investigate the potential for the solar arrays and other project infrastructure to block wind flows due to their architecture, cross-sectional area and alignment.
  - Approach: The cross-sectional profiles of the solar array architecture and other infrastructure was considered based on engineering drawings and site plans for the development. Based on the interactions between project infrastructure and local wind directions and calm air drainage flows, the blocking potential of the site infrastructure was determined.

This report details the methods, analyses and findings of the study of topography, slope, air drainage, meteorology and frost exacerbation potential of the Chaff Mill Solar Farm Project.

1.3 The project site

The Chaff Mill Solar Farm Project is situated northeast of Mintaro in the Clare Valley region of South Australia. The project site is separated into two lots with each being surrounded by agricultural properties. A map of the area, property boundaries and topography is presented in Figure 1-1.

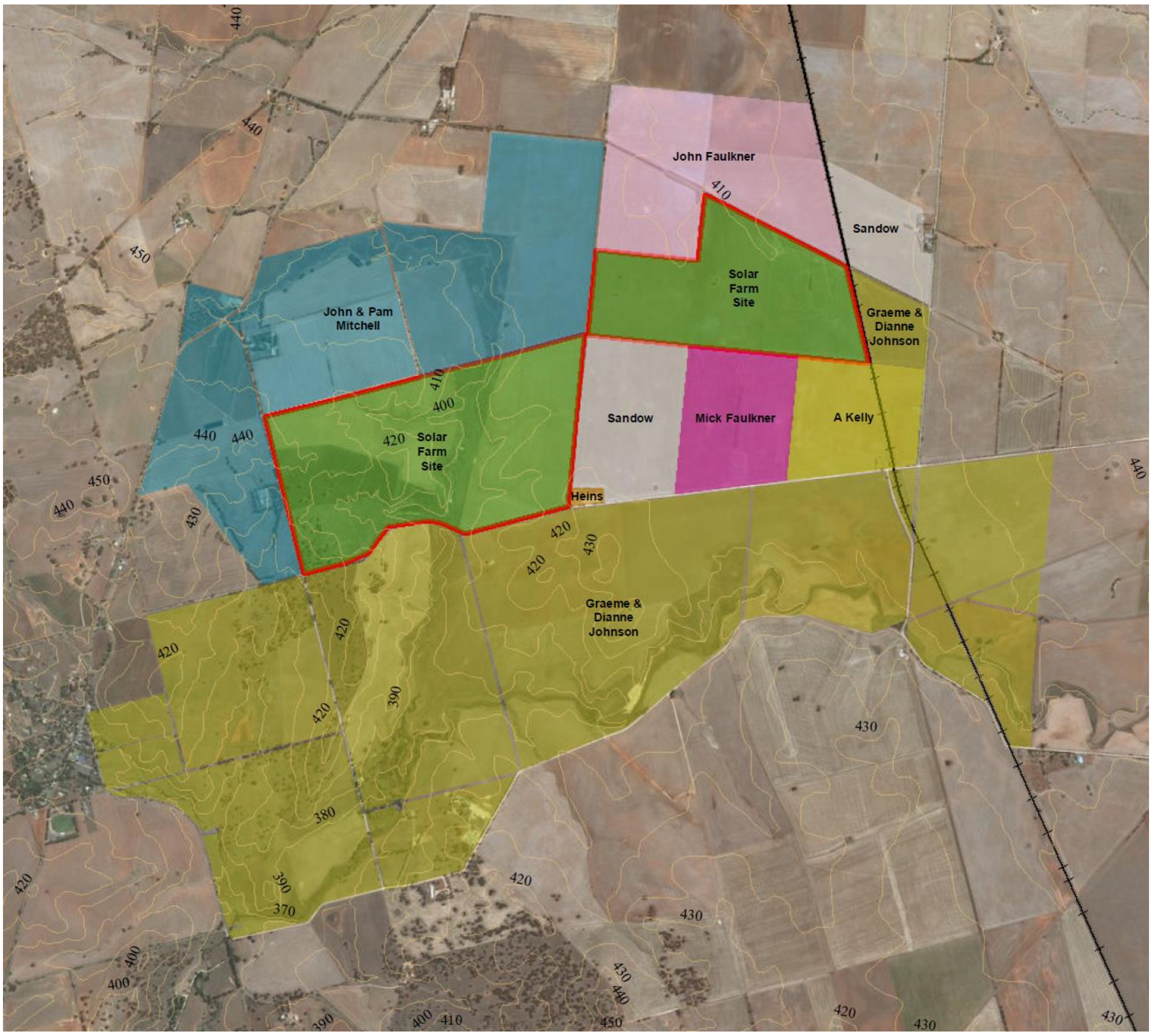


Figure 1-1 Chaff Mill Solar Farm site and neighbouring properties

Source: WSP, 2019

2 Review of Relevant Information Provided in the Development Application Report

During the preparation of the DAR and following its public exhibition during the Development Application process, some of the members of the local community around the solar farm site raised concerns on the potential for the development to exacerbate the generation of frost conditions on the adjacent agricultural farms. In response, WSP conducted a review of literature on frost formation around solar farms and micrometeorological conditions leading to frost in agricultural regions including the impacts of radiative heat loss from solar panels on the surrounding climate. The following approach was undertaken by WSP for this assessment (WSP 2018):

1. Review of Solar Farm Assessment Guidelines.
2. Review of all other solar farm assessments, approvals and conditions of consent documents in Australia.
3. Web-based desktop assessment of solar farms and frost / radiative heat loss impacts.
4. Academic literature review of solar farms and frost / radiative heat loss impacts.
5. Discussions with agricultural, climatology and meteorological scientists in South Australia, Australia and overseas.

WSP's review determined *that there is no reference to micro-climate or air temperature implications or requirements in any regulatory or policy guidelines in South Australia or interstate. In a review of other solar farm Development Applications and Environmental Impact Statements; none of them look at the issue in any detail.* (WSP 2018, p.xvi)

WSP found that there is little information on photo-voltaic (PV) cell based solar farms causing frost due to the fact that this phenomenon has never been noticed or raised in any other part of the world. The review identified the following relevant findings (WSP 2018, p.xvi-xvii):

- *Temperatures in the centre of a solar farm may be slightly higher than ambient, particularly in warmer months.*
- *Temperatures return to ambient several metres above a solar farm.*
- *Temperatures may be slightly warmer directly adjacent to a solar farm, gradually returning to ambient with distance away from the solar farm.*
- *Soil temperatures at depth underneath panels may be slightly warmer during cooler months and slightly cooler in warmer months.*
- *Air temperatures at ground level underneath panels may be slightly cooler during summer months.*
- *Air temperatures at a two-metre height in the solar farm in the colder months would probably be similar to the surrounding areas.*
- *Air temperatures at a two-metre height in the solar farm in the warmer months may be slightly warmer than the surrounding areas.*
- *Air temperatures directly above solar arrays may be slightly warmer at night.*
- *Temperatures at control sites adjacent to solar farms generally had temperatures equal to ambient conditions.*

Discussions with research scientists, climatologists and meteorologists suggested that the climate impacts of a 380 ha solar farm would not be significant and the addition of access roads within and around a solar farm would further mitigate any local climate impacts due to enhanced air flow.

3 Causes and Conditions of Frost Development

3.1 What is frost?

The Australian Government's Bureau of Meteorology (BOM) define frost *as a deposit of soft white ice crystals or frozen dew drops on objects near the ground; formed when the surface temperature falls below freezing point* (BOM, 2019).

In Australia, radiation frost is the most common form of frost formation and occurs when the ground cools by the loss of heat to the atmosphere, in a process known as radiative cooling. The cooling ground surface cools the ambient air close to the ground generating a cool layer of air above the ground. This most commonly occurs under clear, anticyclonic conditions with little or no wind. Radiation frost forms at the ground surface and as the layer of cold air above it grows thicker, the frost gradually rises to higher objects.

A less common form of frost formation in Australia is advection frost. This type of frost can occur at day or night and is caused by the horizontal movement (advection) of a very cold mass of air over an area, replacing a warmer air mass. Advection frost is not affected by cloud cover.

The types of frost are summarized in Table 3-1.

Table 3-1 Types of frost

Frost type	Description	Occurrence in Australia
White frost (also known as hoar frost)	A deposit of ice crystals formed by direct deposition on objects exposed to the air. Water vapour in the air freezes upon contact with an object that has a surface temperature below 0°C.	Common
Black frost (also known as black freeze)	Black frost occurs when the temperature drops to freezing point, but the adjacent air does not contain enough moisture to form white frost on exposed surfaces. This causes an internal freezing of the vegetation, leaving it with a blackened appearance and killing it.	Fairly uncommon
Killing frost	A frost period that is sufficiently severe that it ends the growing season or delays the beginning of the season.	Uncommon
Rime	A deposit of ice formed by the rapid freezing of super-cooled water droplets. This type of frost regularly affects aircraft flying at higher levels in the atmosphere where the temperature is much cooler.	Rare

Source: BOM, 2019

3.2 Physical aspects of frost development

The physical mechanisms occurring in the soil and boundary layer at the Earth's surface are important to understanding the causes of frost development.

3.2.1 The energy budget

Energy from the sun passes through Earth's atmosphere and is received at the surface (depicted as $K\downarrow$) as either direct (S) or diffuse (D – i.e. scattered or reflected) shortwave radiation. This shortwave radiation is either reflected back into the atmosphere, and potentially to space ($K\uparrow$), or absorbed by the surface and transferred into thermal energy (longwave radiation). The determinant of whether the shortwave radiation is reflected or absorbed at the surface is a function of the albedo (reflectivity) of the surface material. Light coloured objects (e.g. ice and snow) have relatively high albedo (high reflectivity) by comparison to darker coloured objects (e.g. water bodies) that can have a lower albedo and therefore absorb more energy. Direct (from the sun) and indirect (reflected or scattered) shortwave radiation can also be absorbed by dust particles, water vapour and other gases as it passes through the atmosphere. Once the shortwave radiation is absorbed at the surface it can be re-radiated back into the atmosphere as longwave radiation ($L\uparrow$). Shortwave radiation absorbed by particles in the atmosphere can also be re-radiated down to the ground ($L\downarrow$).

The surface radiation budget is defined in the following equations for day and night as illustrated schematically in Figure 3-1.

Net all-wave radiation flux density (Q^*):

$$Q^* = K\downarrow - K\uparrow + L\downarrow - L\uparrow \quad \text{Day}$$
$$= K^* + L^*$$

$$Q^* = L\downarrow - L\uparrow \quad \text{Night}$$
$$= L^*$$

Note: solar radiation is absent at night.

Thus, to characterise the typical diurnal course of net all-wave radiation flux density (Q^*), a surplus of daytime surface radiance occurs when the net shortwave gain exceeds the net longwave loss; while at night, a deficit occurs in the surface radiation flux when net longwave loss is unopposed by solar input.

3.2.2 Surface energy balance

The energy balance of a surface such as soil is further complicated by other energy exchange processes. At any given time, any surface radiative imbalance is accounted for by a combination of convective exchange to and from the atmosphere, either as sensible (Q_H) or latent heat (Q_E), and conduction to and from the underlying soil (Q_G) where heat can be stored (Oke, 1987). The surface energy balance of bare ground is defined simply by the following equation:

$$Q^* = Q_H + Q_E + Q_G$$

Note: Non-radiative fluxes directed away from the surface (or system) are positive. Thus, the terms on the right-hand side of the equation are positive when they represent losses of heat from the surface, and negative when they are gains. On the left-hand side, Q^* is positive as a gain and negative as a loss.

The energy budget and surface energy balance are depicted schematically in Figure 3-1 (Oke, 1987, p. 26).

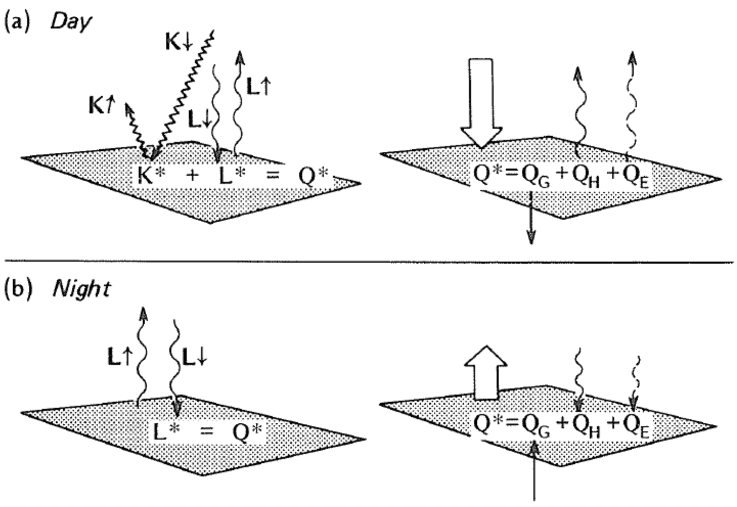


Figure 3-1 Summary of the fluxes involved in the radiation budget and energy balance of an 'ideal' site, (a) by day and (b) at night

3.2.3 The effect of cloud on the energy budget

Clouds have a significant effect on the exchange of short and longwave radiation and consequently, on the energy budget. In summary, clouds (Oke, 1987, p. 25-26):

- Reduce $K\downarrow$ by
  - reflecting S back into space
  - absorbing S, thereby reducing the amount of S that reaches the surface
  - reflecting and scattering S, thereby reducing the amount of S that reaches the surface and increasing the amount of D
- Reduce L^* by
  - Efficiently absorbing $L\uparrow$, then
  - Re-emitting $L\downarrow$, (which reduces L^*)
- Reduce (dampen) the diurnal surface radiation budget and reduce the diurnal temperature range.

As a consequence, cloudy weather tends to result in comparatively uniform temperatures through a reduction in both day time solar heating and night time longwave radiative cooling.

3.2.4 Diurnal effects on the energy balance

Day

During the day the aggregate of the solar and atmospheric thermal radiative fluxes is greater than the sum of the reflected solar and terrestrial thermal radiative fluxes and therefore the surface radiation balance is positive ($+Q^*$). This $+Q^*$ during the day causes the surface to heat up with a portion of this heat being conducted deeper into the soil layer ($+Q_G$). The air in the surface boundary layer is also heated by conduction ($+Q_H$) and begins to rise due to its lower density. The rising air parcel mixes (through convection) with cooler upper air layers generating turbulence (i.e. an unstable atmosphere), but rapidly falling in temperature in the first few metres before the rate of cooling with altitude decreases with height. (Loss, 1987) This temperature profile is known as the day time environmental lapse rate.

Night

During the night the surface radiation balance becomes negative ($-Q^*$) as the ground receives no solar radiation. Convective and evaporative heat loss from the surface and reflected solar radiation are negligible or zero. As the remaining thermal radiation (heat) in the soil is emitted to the atmosphere ($+Q_H$), the ground cools rapidly. This is known as radiative cooling. As the surface cools, so too does the air in the surface boundary layer as it contacts the ground. This cooler air is denser than the warmer layers above that were heated and rose during the day, and consequently this cool, dense air remains near the ground. This profile, whereby the air temperature increases with height, is the opposite (inverted profile) to that which occurs during the day, and hence is called an inversion layer. The inversion layer continues to grow throughout the night as long as the wind remains relatively calm or light. Above the inversion layer, the temperature profile (or lapse rates) returns to the typical profile observed during the day with the temperature diminishing with height. (Loss, 1987)

3.2.5 Wind effects

Wind has a significant effect on the transfer of heat and the structure of the atmosphere. Wind has a dampening effect on the diurnal fluctuation of temperatures near the surface and acts to mix stratified layers of varying temperatures with height above the ground. This has a dampening effect on atmospheric turbulence (i.e. the vertical motion of air) by reducing vertical mixing during highly unstable day time conditions and increasing vertical mixing during highly stable nocturnal conditions.

At night, wind acts to mix the warm air of the inversion layer with the cooler air near the surface. This weakens the temperature profile of the inversion layer and warms the air near the ground. Wind also increases the heat exchange between the ground and the air in the surface boundary layer, increasing convective heat losses from the ground during the day and increasing convective heat gains at night. This results in temperature extremes near the ground, such as the cool sub-zero surface temperatures conducive to frost formation, typically occurring during calm and stable conditions when horizontal air flow and vertical mixing are negligible.

Temperature height profiles (environmental lapse rates) are illustrated for day and night, and with and without wind, in Figure 3-2 (Loss, 1987).

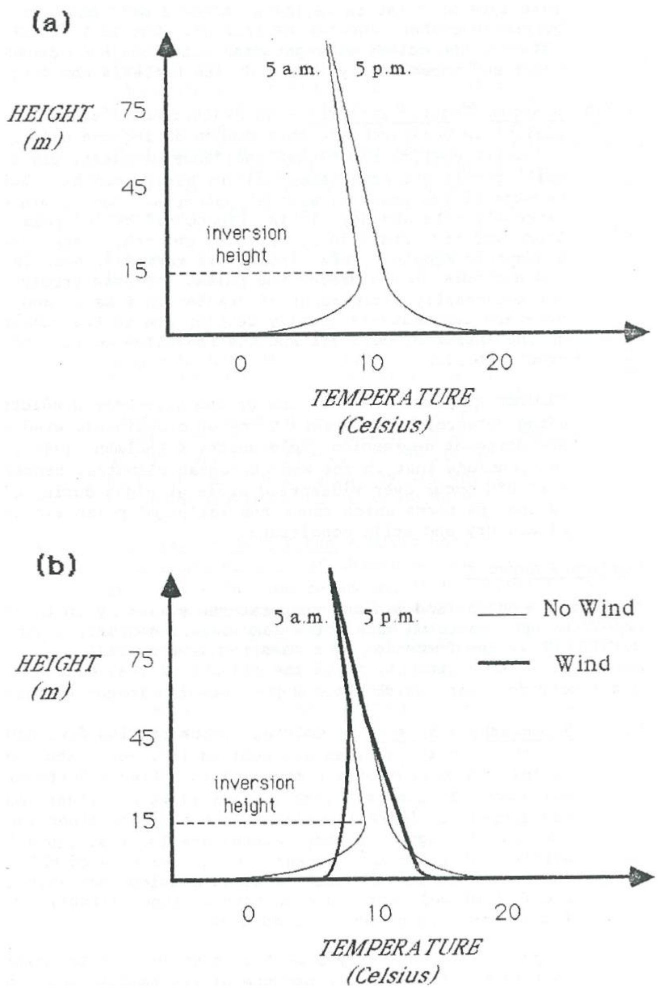


Figure 3-2 Environmental lapse rates for (a) day (5pm) and night (5am) and (b) with and without wind

3.2.6 Moisture effects

Terrestrial thermal radiation lost by the ground is absorbed by dust particles and water vapour in the atmosphere and then radiated back to the ground in the form of atmospheric thermal radiation. The amount of terrestrial thermal radiation absorbed and re-radiated by the atmosphere is greater during cloudy, humid or smoky conditions (than during clear and dry conditions) resulting in warmer ground temperatures at night.

Sub-zero temperatures near the surface are also affected by atmospheric moisture content (i.e. humidity). As the air temperature falls to near 0°C at night, the moisture content of the air increases. As the cool, humid air comes in contact with the ground, the water vapour may condense to form dew, or freeze to form frost if the temperature falls below 0°C. Ice visible on the ground is called white or hoar frost. These condensation and freezing processes are exothermic, causing the decrease in air temperature to cease while they occur. When the air moisture content is low, very little dew or ice is formed, resulting in the air temperature falling relatively uninterrupted and potentially leading to a black frost.

3.2.7 Effect of landscape

Though the formation of frost is primarily dependent upon meteorological factors, the landscape ultimately effects which sites experience the lowest temperatures.

Topography and aspect

Under calm, stable, anticyclonic night time conditions, cold, dense air tends to flow down slopes and drainage lines as katabatic flow, pooling in low flat parts of the landscape and basins. Katabatic flow velocity tends to be light but is a function of the slope and surface roughness. At night, temperatures are lower at low altitudes in the landscape due to the cold air drainage. This often results in frost occurring in hollows, or low points in the landscape. Notwithstanding this, cold, dense air may also collect above mid-slope barriers such as tree or solid fence lines. (Loss 1987)

Slopes with a south facing aspect receive less solar radiation than north facing slopes, due to the smaller angle of incidence of the sun, and hence are heated less during the day and lose that heat faster at night. East and west facing slopes receive the same amounts of solar radiation during the day and hence have similar energy balances. (Loss 1987)

Ground properties

The ability of the ground to absorb, store, conduct and radiate thermal energy and store heat will affect the potential for frost formation.

Soils with low heat capacity and conductivity characteristics will be susceptible to lower minimum ground level temperatures (Loss 1987, as cited in Geiger 1965). Loss (1987, p.8) suggests that *during the day, dark soils with high clay and moisture contents and a high bulk density will absorb more solar radiation to a greater depth than light soils with low clay and moisture contents and bulk density. Soils which absorb a large amount of heat during the day will also effectively conduct heat towards the cooling soil surface at night. The soil surface and air at ground level will not become as cold during the night in comparison to a soil with low conductivity characteristics. Hence, excluding all other factors, frosts will be more frequent and severe on sandier, light-coloured soils than on the darker coloured, loam and clay soils.*

The diurnal fluctuation of soil temperature is also reduced by ground covers such as vegetation (e.g. crops and weeds) as the soil's surface is shaded, reducing the absorption of solar radiation during the day. Conversely at night, ground cover insulates warm soil from the cold air above the vegetation layer, such that the transfer of heat from the soil to the air is reduced. Furthermore, at night the air above the shaded ground will be cooler, which is partly the reason for the increased frequency of white frosts on grassed areas by comparison to over bare soil. (Loss 1987)

Proximity to heat sinks

Heat sinks are objects and structures that are capable of absorbing thermal and solar radiation during the day and releasing it to the environment at night in the same manner in which the soil absorbs and releases energy. Building, roads, trees and water bodies are examples of heat sinks. Close proximity to heat sinks can reduce the occurrence of frost. (Loss 1987)

Air temperatures in rural towns can be significantly higher than those in country fields due to the density of structures in towns that can act as a heat sink. Frost is also rarer in coastal areas due to the warm regulating effect of the ocean at night. (Loss 1987)

3.3 Frost protection

The principles of frost protection are governed by the mechanism of the nocturnal energy balance, specifically, maintenance of the temperature (i.e. energy status) of a soil-plant-air volume above the critical temperature below which damage to plants may occur. This can be achieved in three ways (Oke, 1987, p. 236):

1. Energy loss from the system can be retarded
2. Existing energy can be redistributed within the system
3. New sources of energy can be added to the system by artificial means.

As previously discussed, frost tends to occur when the surface temperature (of the ground or plant) falls below 0°C. Protection measures can be helpful during those few hours a year when this occurs before recovering to a warmer temperature later in the day.

Initial frost protection measures to be considered should occur at the time of site selection. This may be associated with the identification of suitable crops or land for cropping. Following that, specific areas within a landholding under cropping may be more susceptible to frost hazard than others. As conditions for frost are also ideal for katabatic flow, areas where cold air can stagnate and accumulate should be avoided for planting. Such areas may include low-lying areas such as valleys, basins and other terrain depressions or hollows, and behind obstructions to downhill flow such as walls, hedges, large buildings, and road and railway embankments. Obstructions to flow by linear barriers such as walls, hedges and tree lines, fence lines and embankments can be lessened or mitigated by providing gaps or diversionary channels for the cold air to break through and drain away, reducing its accumulation. (Oke, 1987, p. 237)

A variety of approaches to the prevention of adverse frost effects are presented below.

3.3.1 Radiation control

The driving force of nocturnal cooling is surface net long wave radiation loss (L^*). The greatest losses (L^*) occur on cloudless nights when the atmospheric 'window' is open to the greatest transmission of $L\uparrow$. This is the ideal condition for frost formation when the surface temperature reaches below 0°C. Consequently, a method of protection from the formation of such conditions is to 'close the window' by placing a radiative screen above the surface. As with cloud cover, a barrier will absorb much of the $L\uparrow$ emitted by the surface and re-radiate some portion back so that $L\downarrow$ at the surface is greater than under clear skies and L^* heat losses are reduced. This effect is likely to take place within the canopy of the solar farm, reducing the frost potential on the site. The most practicable methods for providing such radiation control in the past has been through the generation of artificial clouds of mist or fog (from water sprays) and smoke (from smudge pots).

3.3.2 Soil heat control

The use of soil heat control is a direct approach to mitigating the loss of heat energy in the soil at the surface. There are three ways this may be achieved (Oke, 1987, p. 237-8):

1. Addition of a mulch layer over the soil around the plants prior to frost events, ideally on the evening before a forecasted frost event when the soil has stored heat from solar heating during the day
2. Increase the thermal conductivity of the upper soil layer to maximise the upward transmission of soil heat by either adding moisture through irrigation or by rolling the soil to exclude air from pore spaces.
3. Completely flood the soil and/or crop to provide a more stable thermal environment.

It is clear these methods of soil heat control would be unsuitable in this situation and should not be considered further.

3.3.3 Latent heat control

Latent heat control is based on managing heat loss by applying water to the plants. As plants are typically harmed by frost below 0°C, there is a small range of sub-zero temperatures within which no lasting frost damage occurs. Within this margin of safety in sub-zero temperatures, water is continuously applied to the crop with a fine spray, and as the water freezes, it releases latent heat which helps to retard the cooling. The addition of the water also raises the heat capacity of the plants, which also slows the rate of cooling. As long as the water spraying and freezing process are continuous, the temperature can be managed close to 0°C to prevent harm to the plants. (Oke, 1987, p. 238)

The method requires careful control as the addition of insufficient water could cause the temperature to drop due to evaporation/sublimation and too much water could result in the amount of latent heat emitted being insufficient to warm the enlarged ice and plant mass to offset the radiative and convective cooling from its exterior. If the water spray is terminated too soon, heat will be drawn from the plant and damage may result. (Oke, 1987, p. 238)

As with soil heat control, the latent heat control approach to frost protection may be unsuitable or difficult to implement for a non-irrigated crop such as those in the area surrounding the solar farm. A water source and distribution and application infrastructure would be required, and its use would only be for a small number of hours each year when frost is forecasted.

3.3.4 Sensible heat control

During radiation frost events at night, the lower atmosphere is characterised by a temperature inversion. The base height of the inversion is at the ground over bare soil and near the top of the canopy over vegetation. During an inversion, warmer air sits aloft the cooler air near the ground. This means that vertical mixing will re-distribute sensible heat (Q_H) aloft to the surface, raising the average temperature of the lower layers. The amount by which the temperature in the lower layers is raised depends upon the depth and intensity of the inversion. This mixing can be provided by large powered ‘frost’ fans. (Oke, 1987, p. 238-9)

3.3.5 Direct heating

The natural energy balance can also be modified by heat released through combustion. This can be achieved in the soil by installing electrical heating cables, similar to the practice of heating roads and airport runways to prevent icing. (Oke, 1987, p. 239)

Less environmentally desirable methods used in crop and orchard frost management include fuel burning heaters. The radiative and convective heat released by heaters can offset the cooling of the plants and trees, through the absorption by the plant of $L\uparrow$ and the warm plume of gases rising from the heater. This method is restricted to plants within the line of site of the heater and its plume. Further benefit can be received through the absorption of $L\uparrow$ by the protective layer of gases and particles in the heater’s plume, thereby warming the surrounding air as it mixes. Though this approach creates new undesirable air pollution impacts. (Oke, 1987, p. 239)

Warm air convectively rising from the heaters into the stable atmosphere above the vegetation will likely remain in the lowest layers and through mixing, raise the average air temperature. This has the effect of strengthening the temperature gradient between the air and vegetation, further stimulating the downward Q_H to the radiatively cooling vegetation. The heaters can promote deep convective mixing above the vegetation which is also beneficial to the redistribution of heat in the lower layers. (Oke, 1987, p. 240)

3.4 Mean horizontal wind velocity profile with height

Wind in the near surface boundary layer is mainly controlled by the frictional drag imposed on the flow by rigid structures at the surface (e.g., buildings and vegetation). As depicted in Figure 3-3, Z_g indicates the top of the boundary layer, the height above which the mean horizontal wind speed ($\bar{u}$) is approximately constant with height. The drag imposed by surface structures retards motion close to the ground, giving rise to a sharp decrease in mean horizontal wind speed. In the absence of strong thermal effects, particularly at night, the depth of this frictional influence depends on the roughness of the surface. (Oke, 1987, p.54)

The logarithmic wind profiles illustrated in Figure 3-3 are based on strong winds. The depth of the profile between the surface and Z_g increases with increasing surface roughness, while above Z_g surface drag is negligible. Consequently, the vertical gradient of mean wind speed is greatest over smooth terrain. Furthermore, Z_g is greater with strong surface heating and less with surface cooling at night. (Oke, 1987, p.54)

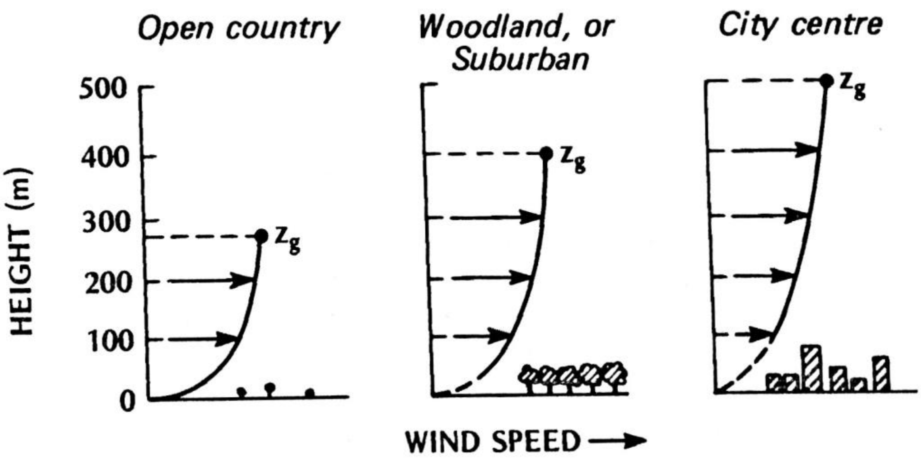


Figure 3-3 Wind speed profile near the ground

Source: Oke, 1987, p. 55

On bare ground, the mean horizontal wind speed approaches zero at the surface (known as the Principal Active Surface), however this can be very different within vegetative canopies. Crops like wheat and other grains have tall narrow stem and leaf architecture and are typically densely packed together. Other crops such as grape vineyards or fruit orchards have very different stand architecture and are typically planted in rows spaced evenly apart with trunks and an elevated canopy resulting in a very different flow pattern near the surface.

Near surface wind motion in a field of wheat will therefore be retarded by frictional drag, with the Principal Active Surface being at a height nearer the top of the canopy; the wind unable to penetrate within the canopy layer. When the logarithmic wind profile curve measured over a vegetated surface is extrapolated downward, it indicates that the Principal Active Surface is located at some height near the top of the vegetation stand, not at the ground (see Figure 3-4). This height is called the height of Zero Plane Displacement (d). The value of d for a wide range of crops and trees is approximately given by the following equation:

$$d = \frac{2}{3} * h$$

where h is the height of the stand.

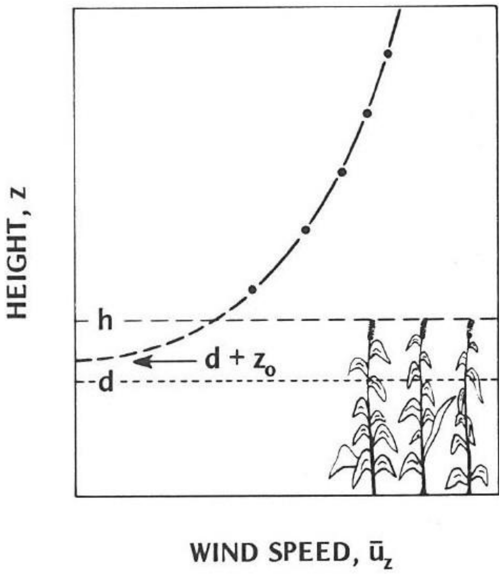


Figure 3-4 Typical wind profile measured above a vegetation stand and illustrating the height of the stand (*h*) and the concept of the zero plane of displacement (*d*)

In Figure 3-4, the wind speed profile above the crop shows the typical logarithmic curve observed above bare ground, but instead reaching the principal active surface near height *d*. During the day when wind speeds are highest, the wind speed gradient (slope of the profile) increases and the turbulent transfer of momentum is *correspondingly greater leading to deeper penetration into the canopy* (Oke, 1987, p.139). Wind penetration into the canopy depends on the internal stand architecture. In orchards or vegetative stands where the plant stem or trunk is sparsely covered in branches and/or leaves or not at all, *it is common to find a wind speed minimum in the mid to upper canopy where foliage density is greatest; then a zone of slightly higher speeds in the more open stem layer; finally deceasing again to zero at the ground* (Oke, 1987, p.139).

This effect should be carefully considered with respect to the solar panel array and the vegetation stands in the surrounding agricultural fields. Given that the flow of air during cold nights is important to frost generation, the roughness of local surface features will directly affect the wind speed and the drainage velocity of cold dense air near the ground. The blocking potential of the solar panel array and boundary fence are described in detail in Section 7. This should be compared to the surface roughness of the surrounding agricultural fields planted with densely packed crops such as wheat, that can grow to 1 to 1.2 m tall. At night, when the solar panels are stowed in a horizontal position, the panels are 1.9 m above the ground with occasional mounting posts (at a minimum separation distance of 6.5 m) blocking air flow in the area between the surface and the panel height. When considering the panel as the canopy, the depth of this layer is a mere 100 mm, by comparison to the depth of the vegetative canopy of any crop or orchard. It is possible that these fields, including the site of the proposed solar farm, could be planted with grape vines (a common crop in the Clare Valley region), a fruit orchard or a multi-storey native forest. Such vegetative uses of the land would likely have similar, if not greater, surface roughness and air flow blocking potential.

4 Analysis of Regional Topography, Slope and Air Drainage Flows

4.1 Method

Data from the SRTM at a grid resolution of 30 m, commonly used to map terrain in meteorological and air dispersion models, was input to the surface mapping software Surfer v13 to develop a DEM of the region. Surfer was then used to analyse the topographic data using a range of techniques to construct a digital:

- Topographic contour map
- 3D surface (or wireframe) map
- Downslope vector map
- Watershed drainage flow map.

The topographic and surface maps were used to investigate the spatial variability in terrain elevations in the regional, on-site and near-site landscape. The slope vector and watershed maps provided for the interpretation of the topographic data to determine how surface water and air (under anticyclonic, stable, calm to light air wind conditions) was likely to flow and drain from the landscape. The watershed map provides a means to connect the elevation data to follow the flow path through the landscape.

This data was then used as the basis for the terrain file in the 3D meteorological modelling (Section 6).

4.2 Topography

At a broad, regional-scale, the topography at the solar farm site and neighbouring agricultural properties appears to be relatively simple and flat with gentle undulations. Aerial images of the site and surrounding landscape taken from a drone are presented in Figure 4-1 to Figure 4-6. The images depict generally smooth flat fields with a meandering gully cutting a north to south path through the western parcel.

Figure 4-1 Aerial view of the site looking eastward from above the western site boundary of the western parcel with the electricity sub-station in the foreground

Figure 4-2 Aerial view of the site looking south-southwest from above the eastern end of the northern boundary of the western parcel

Figure 4-3 Aerial view of the site looking westward from above the southeastern corner of the western parcel

Figure 4-4 Aerial view of the site looking north-eastward from above the southwestern corner of the eastern parcel

Figure 4-5 Aerial view of the site looking north-westward from above the southeastern corner of the eastern parcel

Figure 4-6 Aerial view of the site looking south-south-westward from above the northeastern corner of the eastern parcel

Close examination of the horizons of the aerial images however reveals elevated terrain to the east and west of the solar farm site. At the regional level, the site sits between two relatively significant north-south aligned ridges, each approximately four kilometres to the east and west, with drainage lines flowing through the wide valley in a northward direction from the eastern parcel and a southward direction from the western parcel.

The regional topography has been defined at five metre contour intervals and presented in a topographic map based on the DEM in Figure 4-7. Terrain elevations range by more than 200 m between 359 and 574 m across approximately 11 km by 11 km of mapped area. This analysis illustrates that at a micrometeorological scale the terrain is relatively complex, and under stable, calm conditions can lead to the formation of frost accumulation in hollows.

Further examination of the local topography around the site at a one metre elevation contour interval scale, as illustrated in Figure 4-8, shows the complexity of the landscape that is likely to influence gravity driven slope flows of cold dense air during calm and stable conditions. The complexity of the surface undulations and hollows across the eastern parcel and properties to its north and south is shown in greater details at one metre resolution in Figure 4-9. This topographic map shows surface elevation anomalies of greater than 10 m within a 1,000 m^2 area in multiple locations across several properties.

The topography is further examined using the 3D surface maps in Figure 4-10 and Figure 4-11. While a vertical exaggeration has been applied to the surface map images in order to view the elevations across the large spatial scale of the image, it highlights the actual complexity of the area when trying to interpret the flow of water and air over the surface at the micro-scale.

This topographic analysis indicates a myriad of small undulations and drainage lines in multiple directions weaving through the landscape. The topography indicates that different sections of the solar farm site and each neighbouring agricultural property drain in different directions and that no single property in its entirety is likely to drain, under stable, calm to light air conditions, towards a single point along a boundary. Properties tend to have multiple drainage lines running into and out of them, as well as multiple accumulation points or basins, particularly in the east of the solar farm area and its surrounds. In the western solar farm areas, the drainage appears to be more consistent toward the creek line. This air drainage pattern is further explored in Section 4.3.

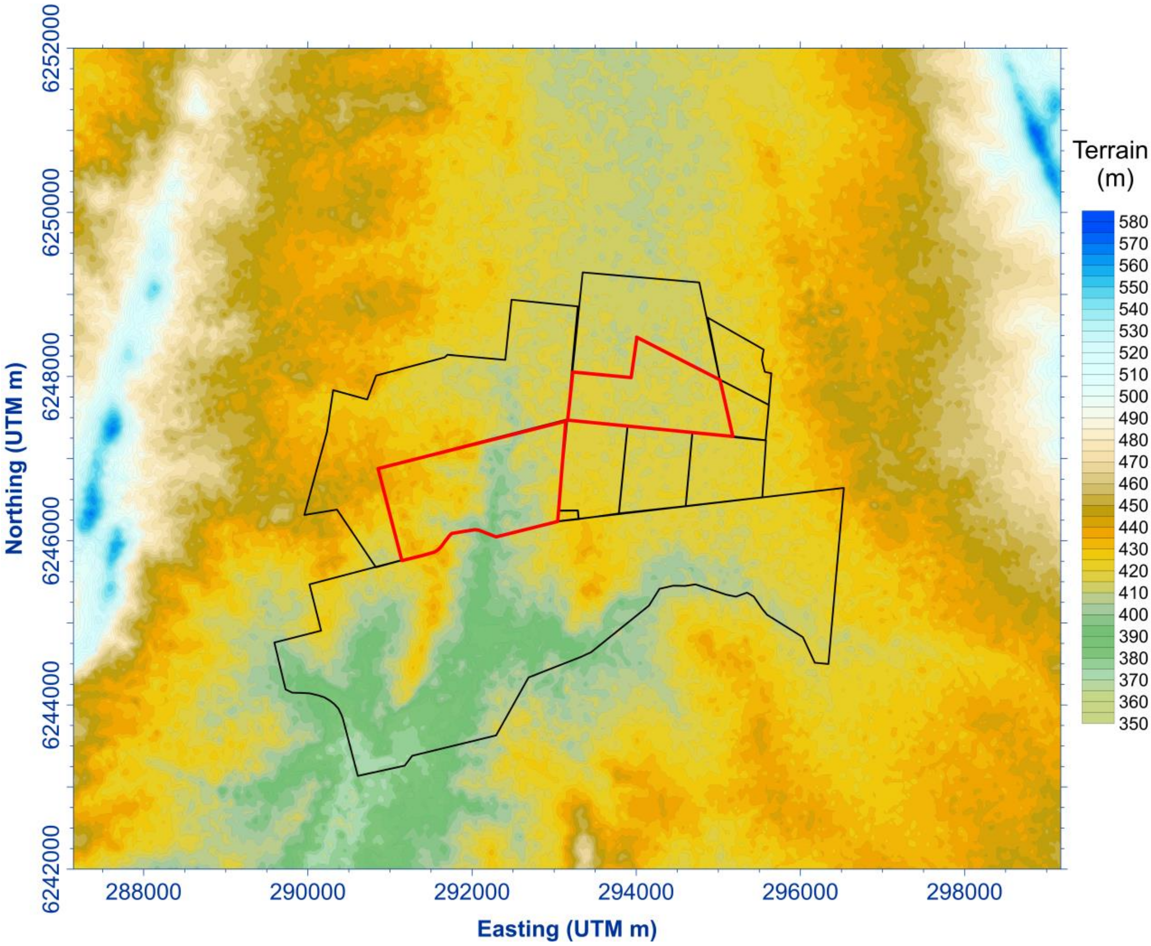


Figure 4-7 Regional topographic map based on the DEM at five metre contour intervals

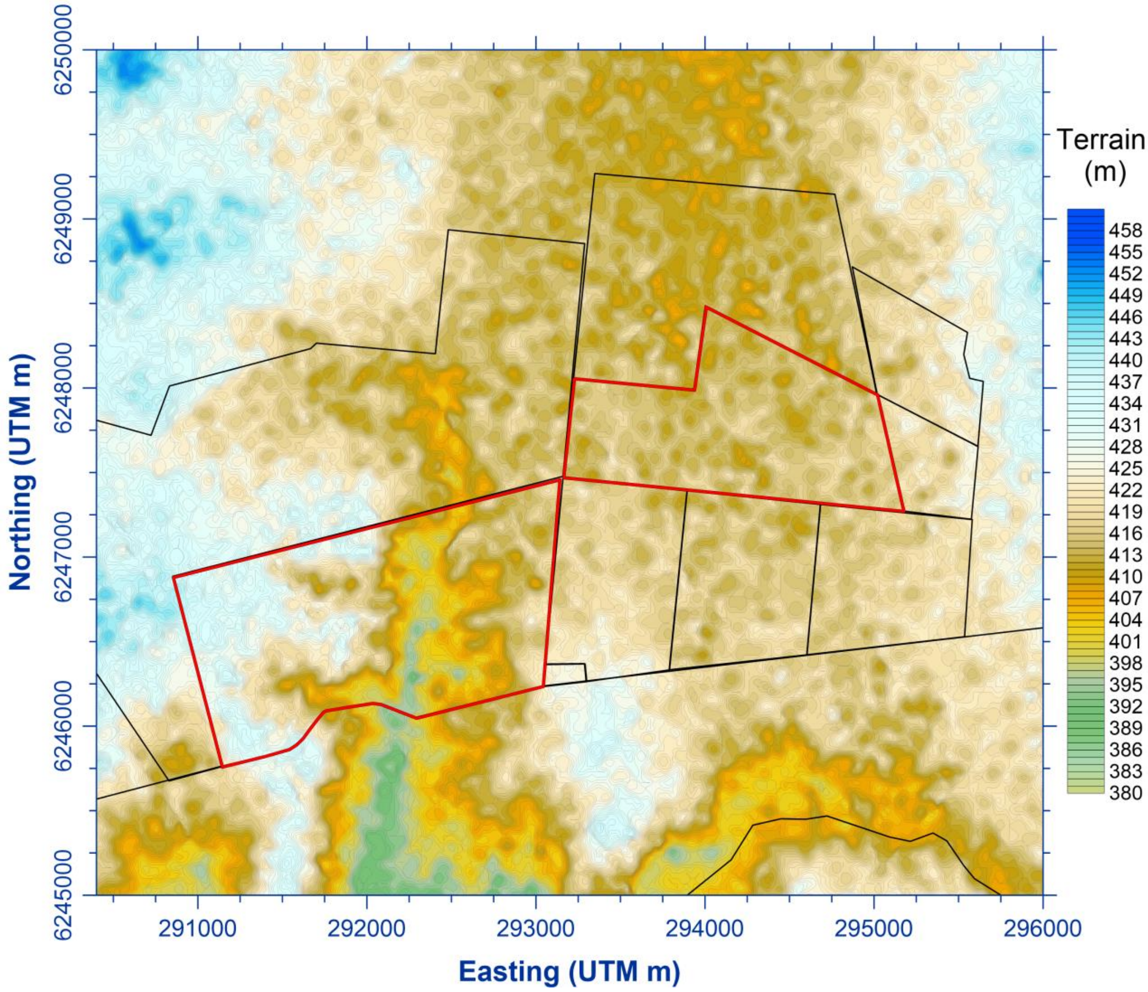


Figure 4-8 Topographic map of the site based on the DEM at one metre contour intervals

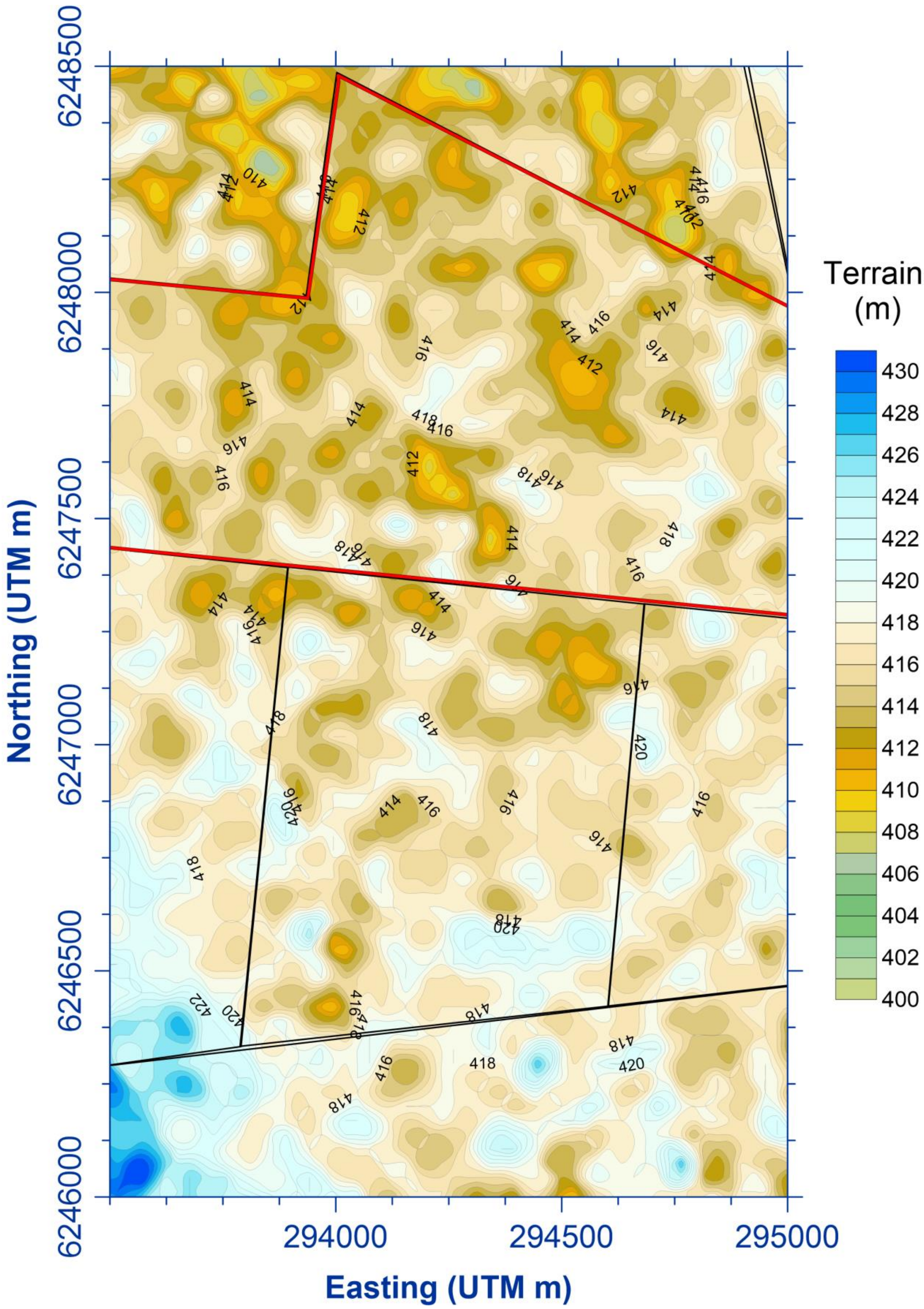


Figure 4-9 Topographic map of Mr Michael Faulkner's property and the eastern parcel based on the DEM at one metre contour intervals

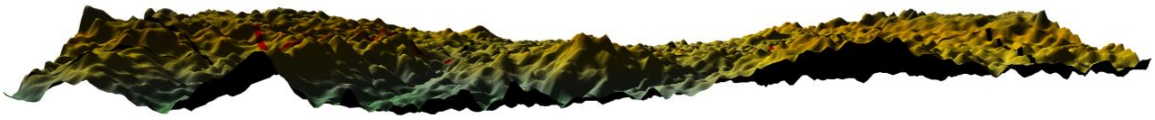


Figure 4-10 3D surface map of the solar farm site and surrounding properties using a tilt angle of 0°

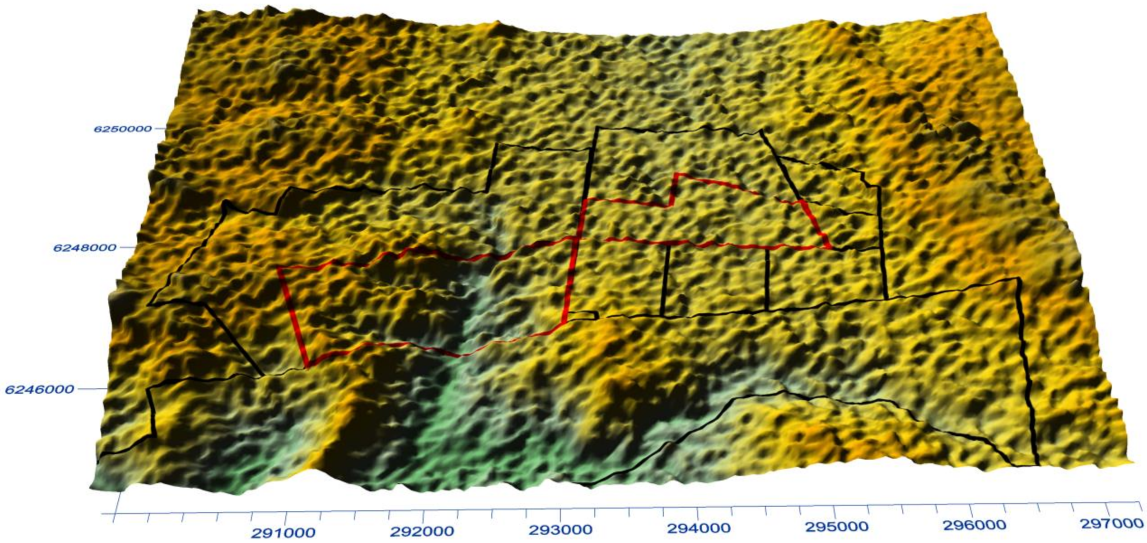


Figure 4-11 3D surface map of the solar farm site and surrounding properties using a tilt angle of 50°

4.3 Slope flows and drainage lines

The DEM was then used to develop slope vector and watershed maps to analyse slope direction, magnitude and potential surface drainage patterns. The slope vector map, presented in Figure 4-12, shows the downslope direction and magnitude (fall ratio) of the slope across the region. The directionality of the slope is not uniform and is quite complex, with slopes heading in many different directions across the landscape. Slope magnitude across the area shown in Figure 4-12 tends to be between 0.07 (i.e. 7 m fall in 100 m distance) and 0.13 (13 m in 100 m).

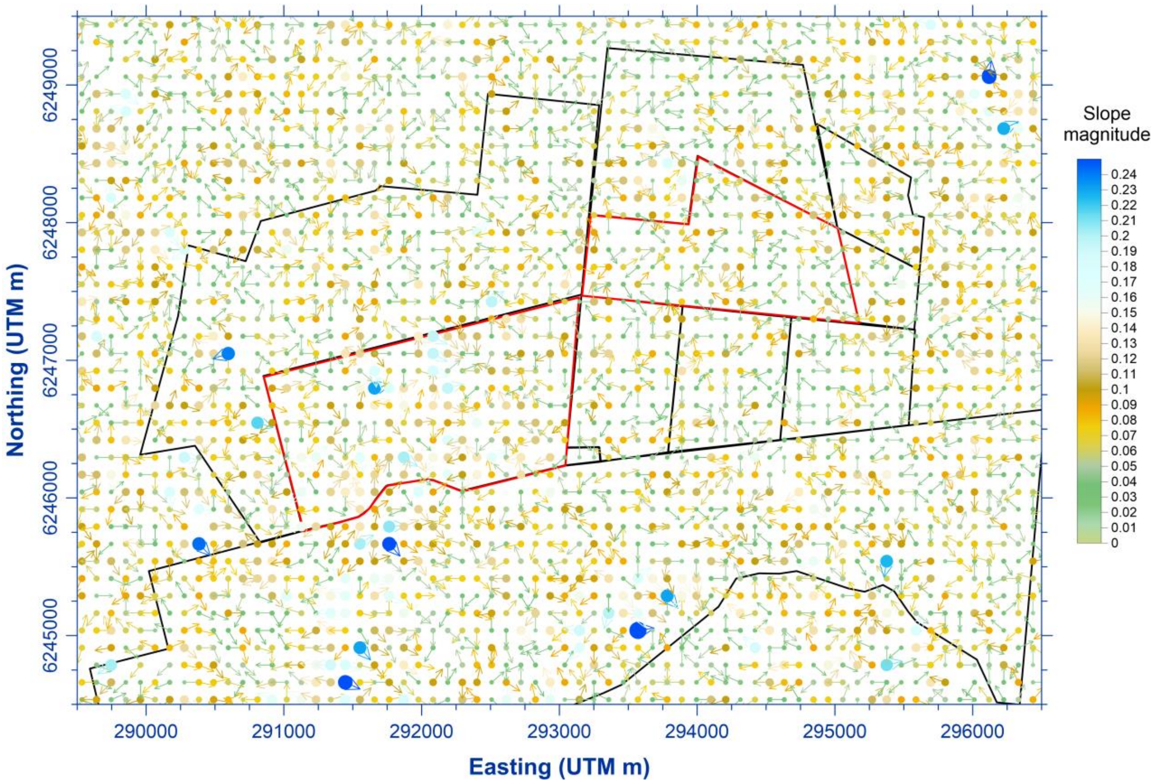


Figure note: The slope magnitude refers to the magnitude of slope in that a fall of 0.1 is equivalent to a fall of 10 m over a distance of 100 m.

Figure 4-12 Vector map showing slope direction and aspect

The watershed map analysis presented in Figure 4-13 'connects the dots' developed in the slope vector map analysis by modelling the drainage lines in which the flow of water and cold dense air near the ground may take as it flows through the landscape. The watershed analysis can be conducted at varying scales and determines the flow lines, watersheds (or catchments) and interfluves between each watershed. This provides for the theoretical analysis of flow direction under calm and stable conditions and indicates the merge points and separation of parcels of cold air as it drains through the landscape. This flow analysis is based on localised variations of terrain and therefore may be appropriate to characterise the initial stages of frost formation. This, however, does not account for synoptic or locally generated winds such as regional katabatic flows from the ridges to the east and west of the site and flows draining down the main valley axis. Such winds have been investigated using meteorological modelling and described in Section 6.

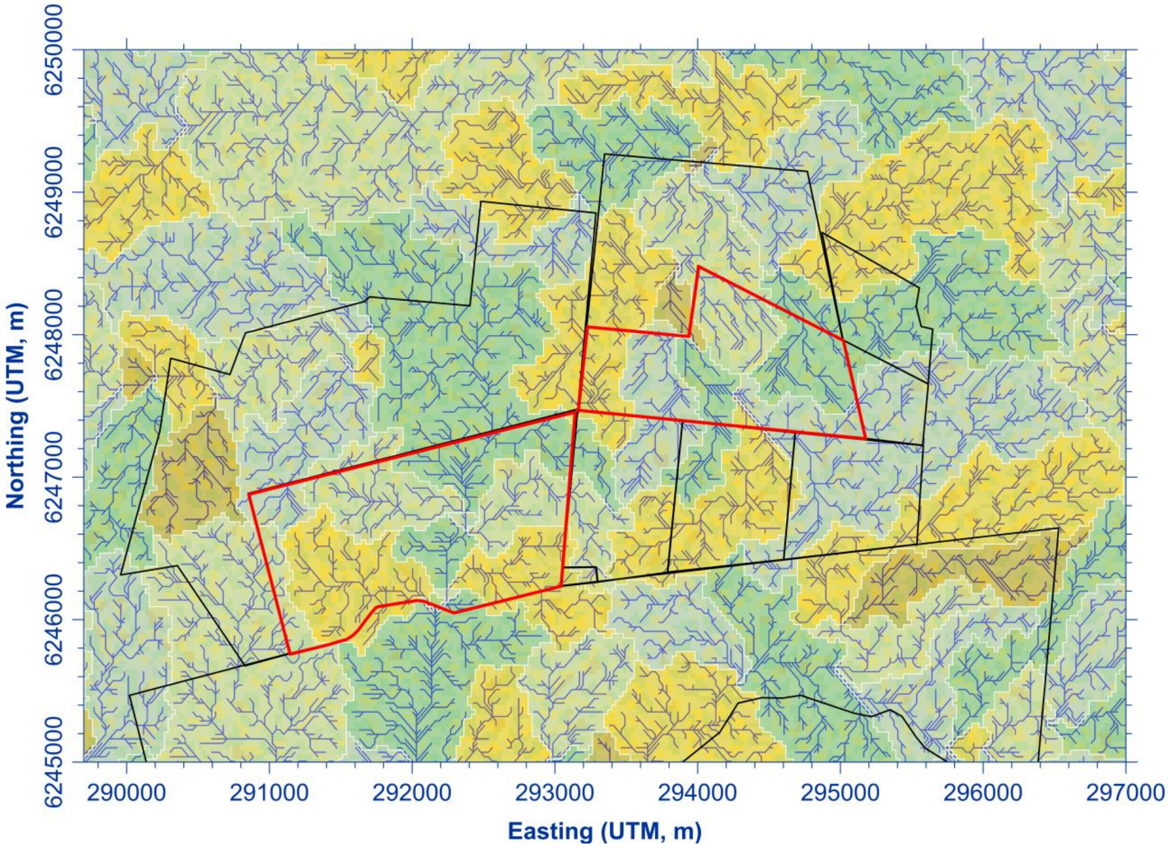


Figure 4-13 Watershed map indicating localised drainage lines based on slope flow across the solar farm site and surrounding properties

Figure note: Solar Farm site is depicted with a red boundary.
Neighbouring properties are depicted with a black boundary for reference.
Coloured areas depict different watersheds.
Blue lines depict gravity-fed flow drainage lines.

The watershed analysis has also been refined to more closely investigate the drainage lines into and out of the eastern (Figure 4-14) and western (Figure 4-15) parcels and adjoining properties, as summarised in Table 4-1.

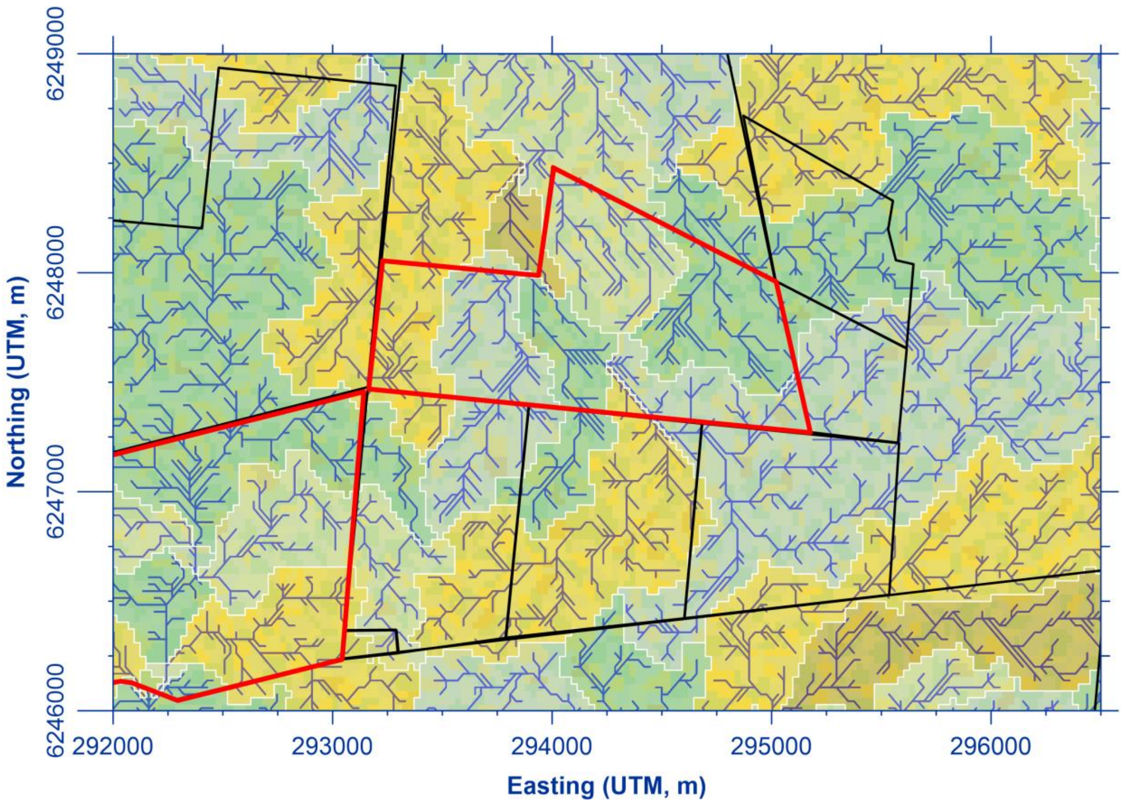


Figure 4-14 Watershed map indicating drainage lines based on slope flow across the eastern parcel and surrounding properties

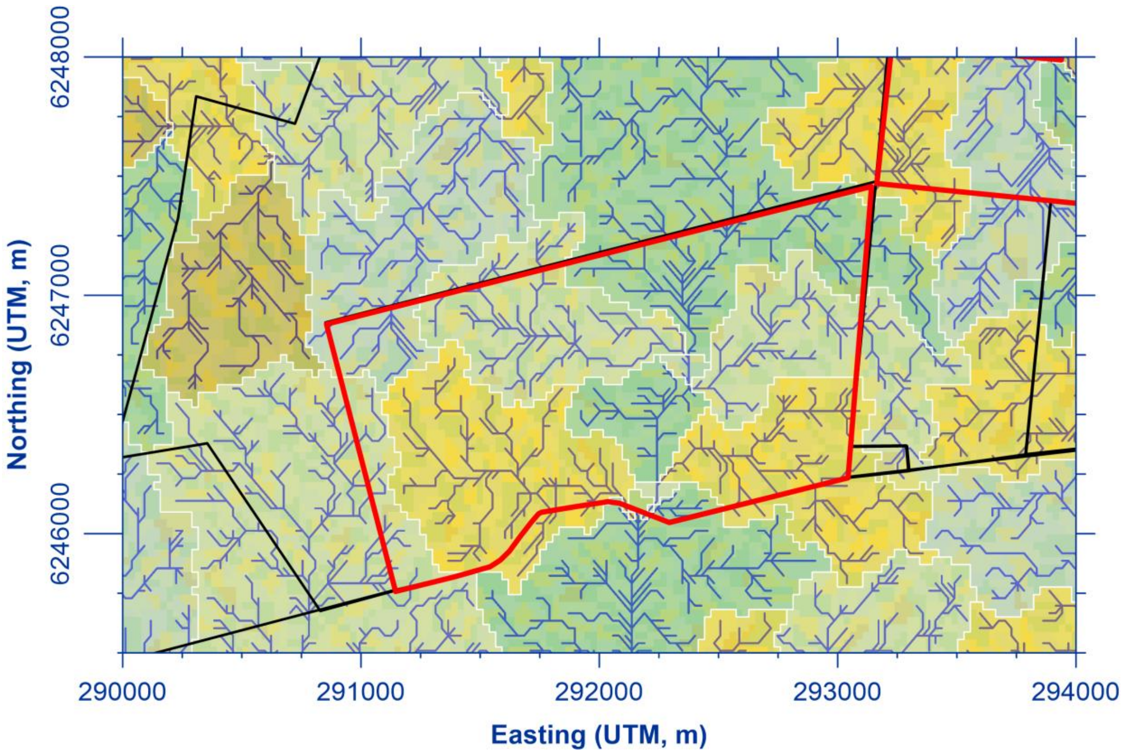


Figure 4-15 Watershed map indicating drainage lines based on slope flow across the western parcel and surrounding properties

Table 4-1 Drainage lines into and out of the solar farm sites to surrounding properties

Property	Number of drainage lines out of solar farm into property	Number of drainage lines from property into solar farm	Property boundary which borders solar farm	Critical wind direction causing flow toward solar farm boundary
G & D Johnson (southern property)	2	4	Northern	Southerly
G & D Johnson (eastern property)	0	2	Western	Easterly
J & D Mitchell (boundary with eastern parcel)	3	0	Eastern	Easterly
J & D Mitchell (boundary with western parcel)	1	6	Southern	Northerly
J Faulkner	0	5	Southern / eastern leg on southern boundary	Northerly / easterly
Sandow (northern property)	0	0	Southwest corner	None
Sandow (southern property)	1	5	Northern / western	Southerly / easterly
A Kelly	2	0	Northern (partly)	Southerly
M Faulkner	1	3	Northern	Southerly

5 Regional Meteorology

The closest Bureau of Meteorology (BoM) automatic weather station (AWS) observations to the Chaff Mill Solar Farm site are recorded at the Clare High School (site number 021131), located approximately 17.5 km to the west-northwest of the centre of the two farm sites.

Air Environment obtained data from the BoM Clare High School site comprising 211,940 hours (approximately 24 years) of meteorological observations, spanning between 1 October 1993, 15:00 and 5 December 2017, 10:00. It is acknowledged that meteorological conditions measured at the BoM site, particularly temperature, may be significantly different from those experienced at the FRV site. Despite this, it is useful to characterise the regional air temperature and wind distributions via an analysis of this long-term data set, particularly given that the patterns evident in the temperature and wind distributions should be relatively similar across the two sites.

5.1 Air temperature

The distribution of air temperature measured in a Stevenson Screen (screen height) at a height of 1.2 m above the ground is provided in Figure 5-1. Over the 24-year observation period, temperatures varied between -4.8°C and 42.7°C, with an average temperature of 14.7°C and a median temperature of 13.2°C.

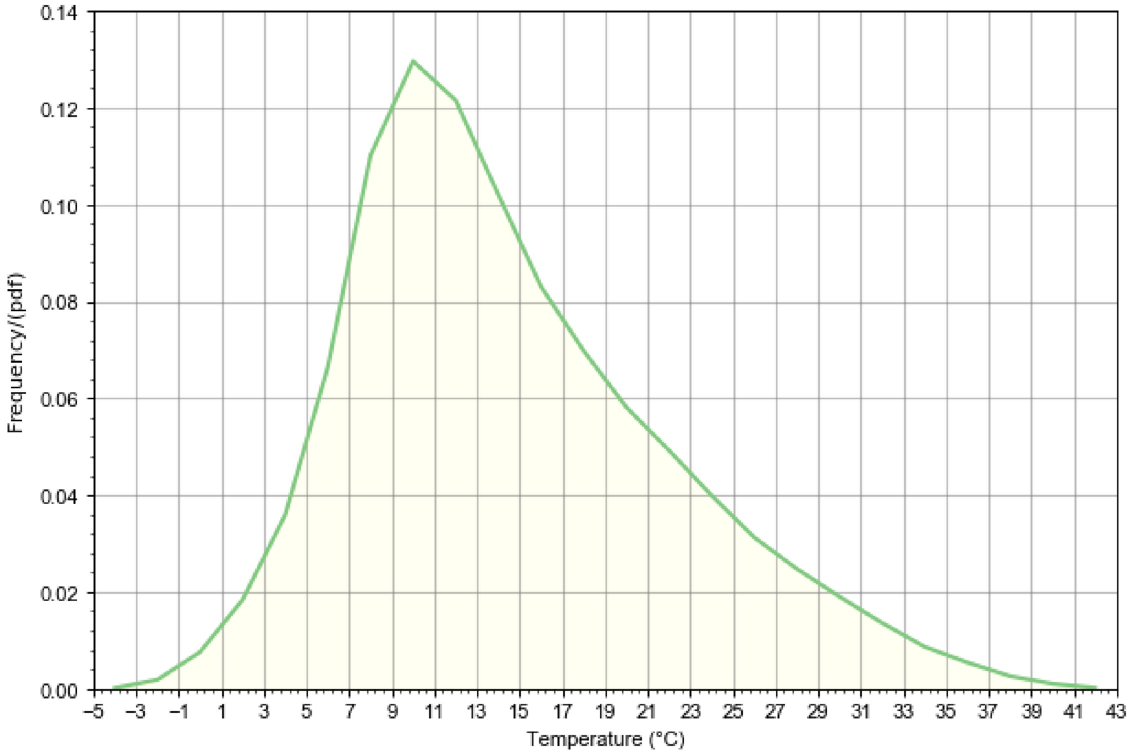


Figure 5-1 Distribution of air temperature recorded by the BoM at Clare High School, October 1993 to December 2017

The monthly variation in screen-level temperature is shown in Figure 5-2. The minimum, average, median and maximum temperatures are plotted by month, each following a similar pattern. The coldest months are June, July and August, with average temperatures of 8.8, 8.1 and 8.9°C respectively. The lowest recorded temperature occurred in June.

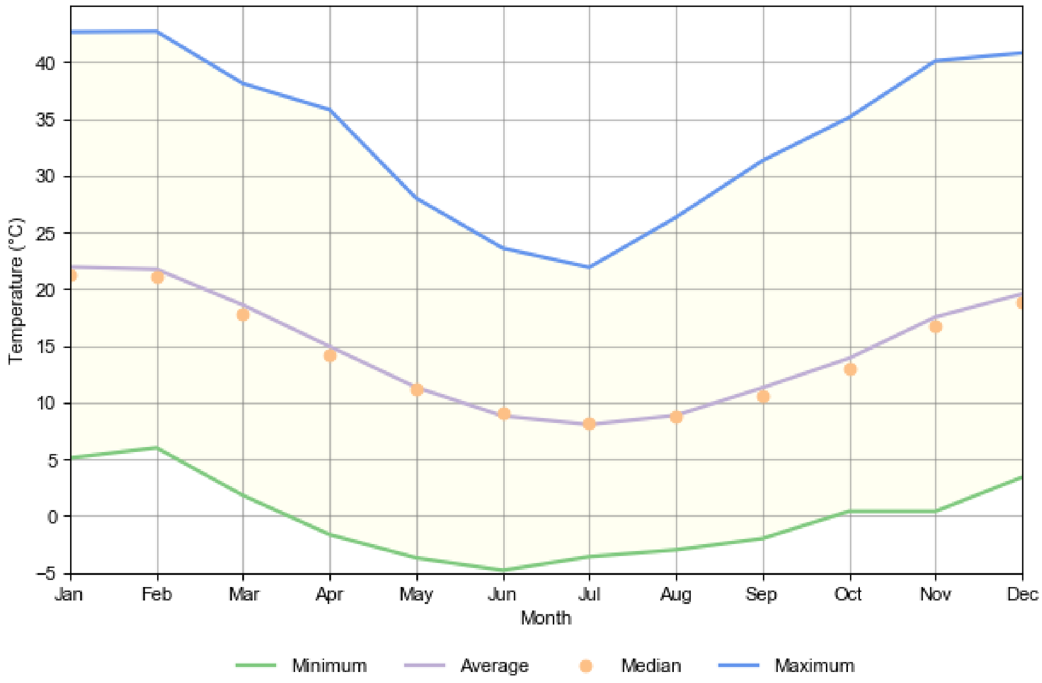


Figure 5-2 Monthly variation in air temperature recorded by the BoM at Clare High School, October 1993 to December 2017

The diurnal variation in screen temperature is similarly plotted in Figure 5-3 showing that on average the lowest temperature during the day occurs at 5am. This is not constant however as the lowest recorded temperature occurred at 7am. Sub-zero temperatures may occur between 10 pm and 8 am.

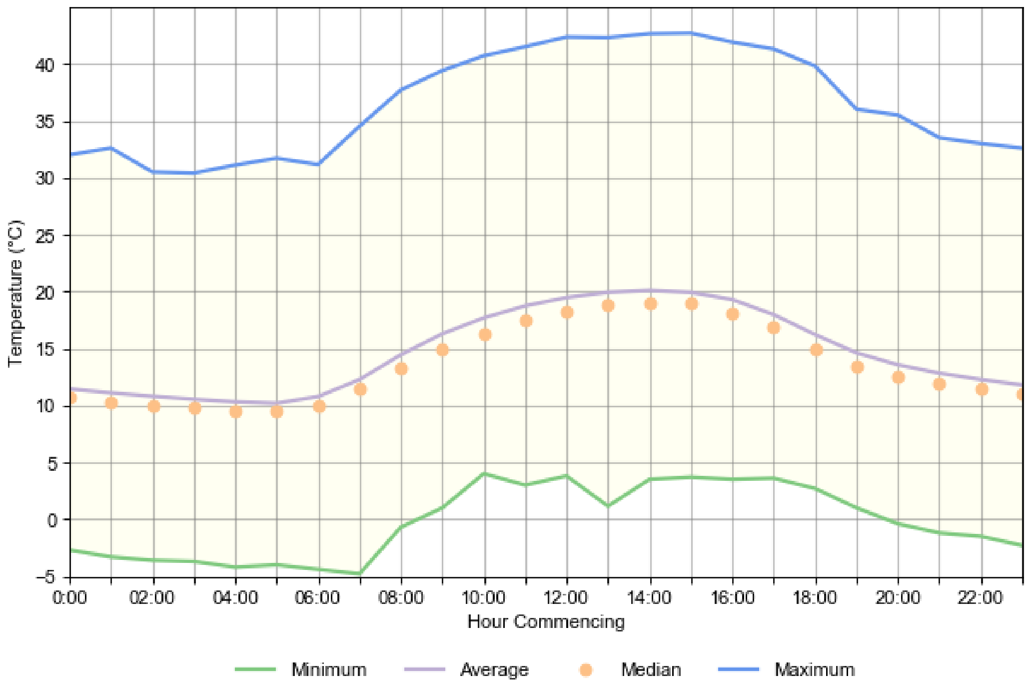


Figure 5-3 Diurnal variation in air temperature recorded by the BoM at Clare High School, October 1993 to December 2017

5.2 Wind speed and direction

The wind speed distribution is provided in Figure 5-4. Wind speed varied between 0.0 and 36.1 m/s, with an average speed of 3.0 m/s and a median speed of 3.1 m/s. The frequency of calms, winds less than 0.5 m/s in speed, is high at 17%, with the calmest season being winter (with 23.5% of calm winds) and the period of the day with the greatest number of calm conditions is the night (i.e. midnight to 6am, with calms for 30.6% of the time). The lowest wind speeds, i.e. winds between 0.5 and 2 m/s, occur 11.2%, 14.2%, 12.3% and 11.9% respectively during summer, autumn, winter and spring months.

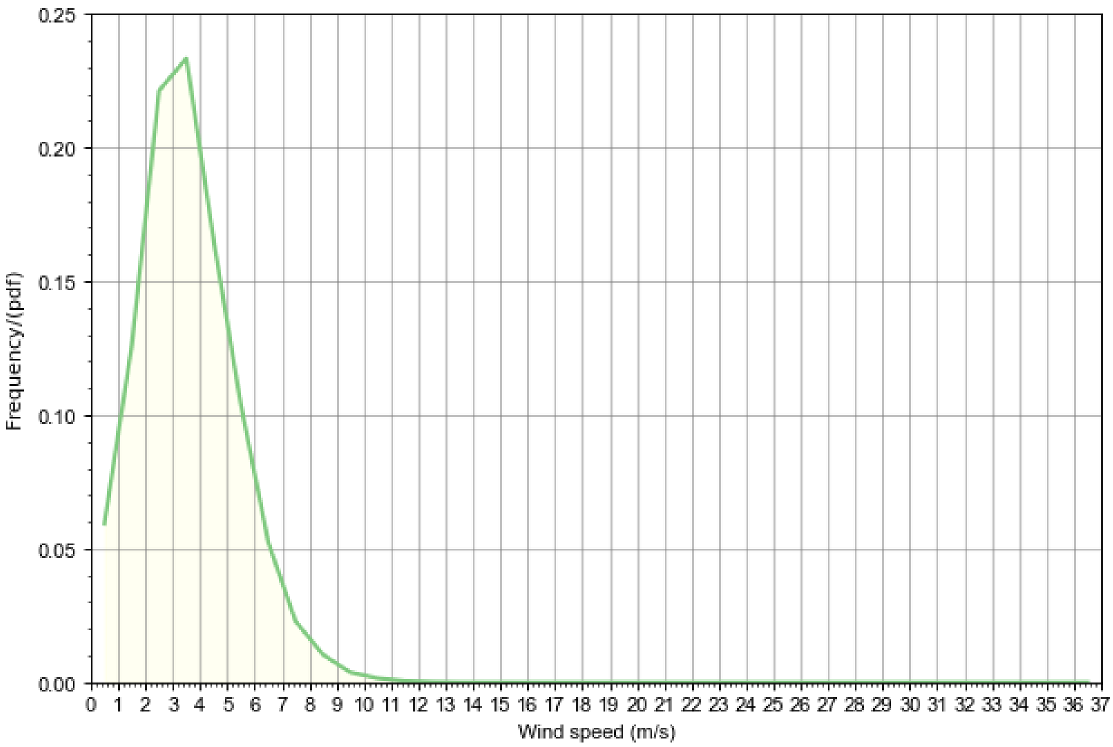


Figure 5-4 Distribution of wind speed recorded by the BoM at Clare High School (site number 021131), October 1993 to December 2017

A wind rose showing the distribution of winds occurring throughout the entire 24-year observation period is presented in Figure 5-5. It indicates that winds can arrive from any direction, however they arrive most frequently from the cardinal directions (N, E, S and W). Prevailing winds arrive from the east (10.6%); south (8.0%), west (7.9%), and east-southeast (6.9%). Northerly winds are also frequent (5.2%). This unusual distribution of winds reflects the site's inland position and the succession of north/south-aligned ridges surrounding the site.

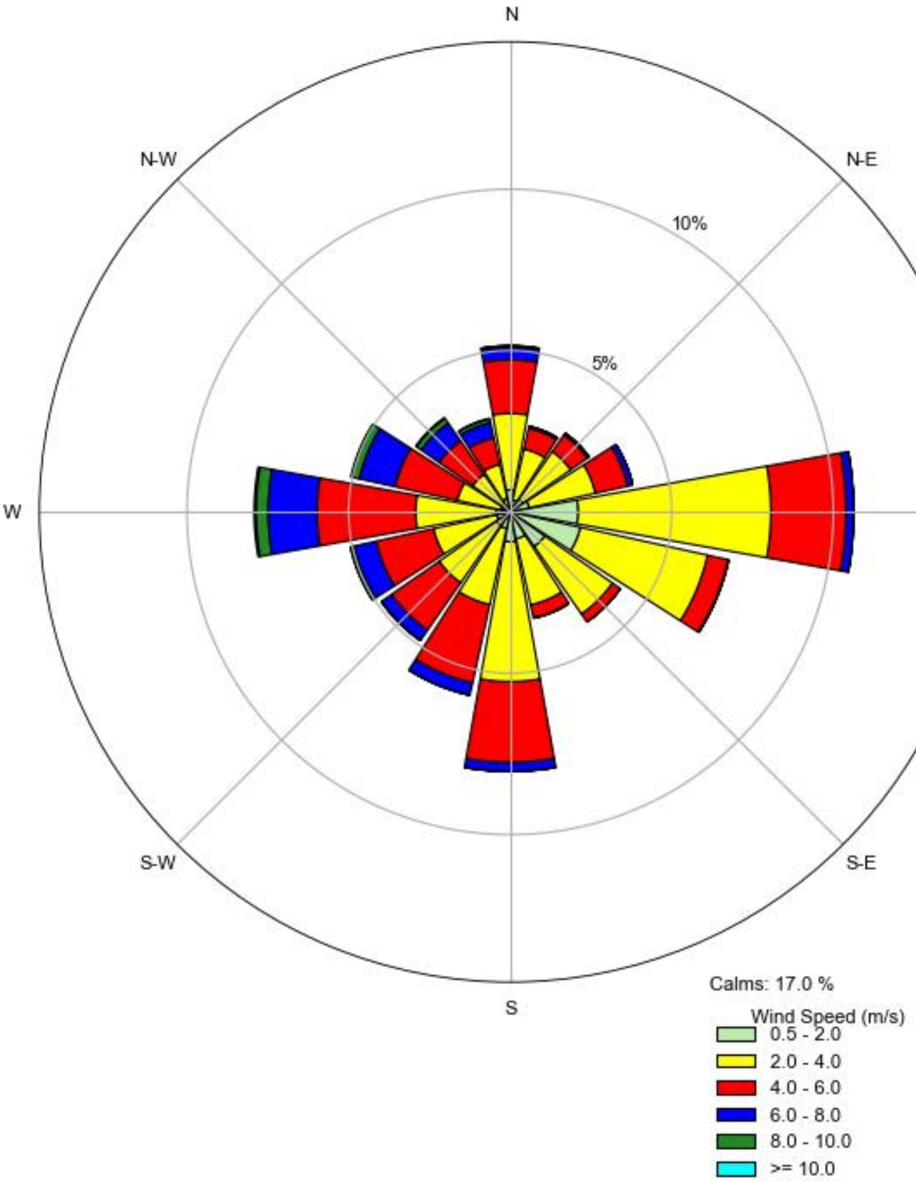


Figure 5-5 Distribution of winds recorded by the BoM at Clare High School (site number 021131), October 1993 to December 2017

The seasonal variation in the distribution of winds is provided in Figure 5-6. The Spring and Autumn roses closely match the annual rose presented in Figure 5-5. The distribution is similar for Summer, however winds from the south are more frequent (12.3%) and westerly winds are no longer prevalent (4.8%). During winter winds within the northwest quadrant (W, WNW, NW, NNW and N) are frequent, accounting for 39.4% of observations, however easterly (5.7%) and southerly (4.0%) winds remain relatively frequent.

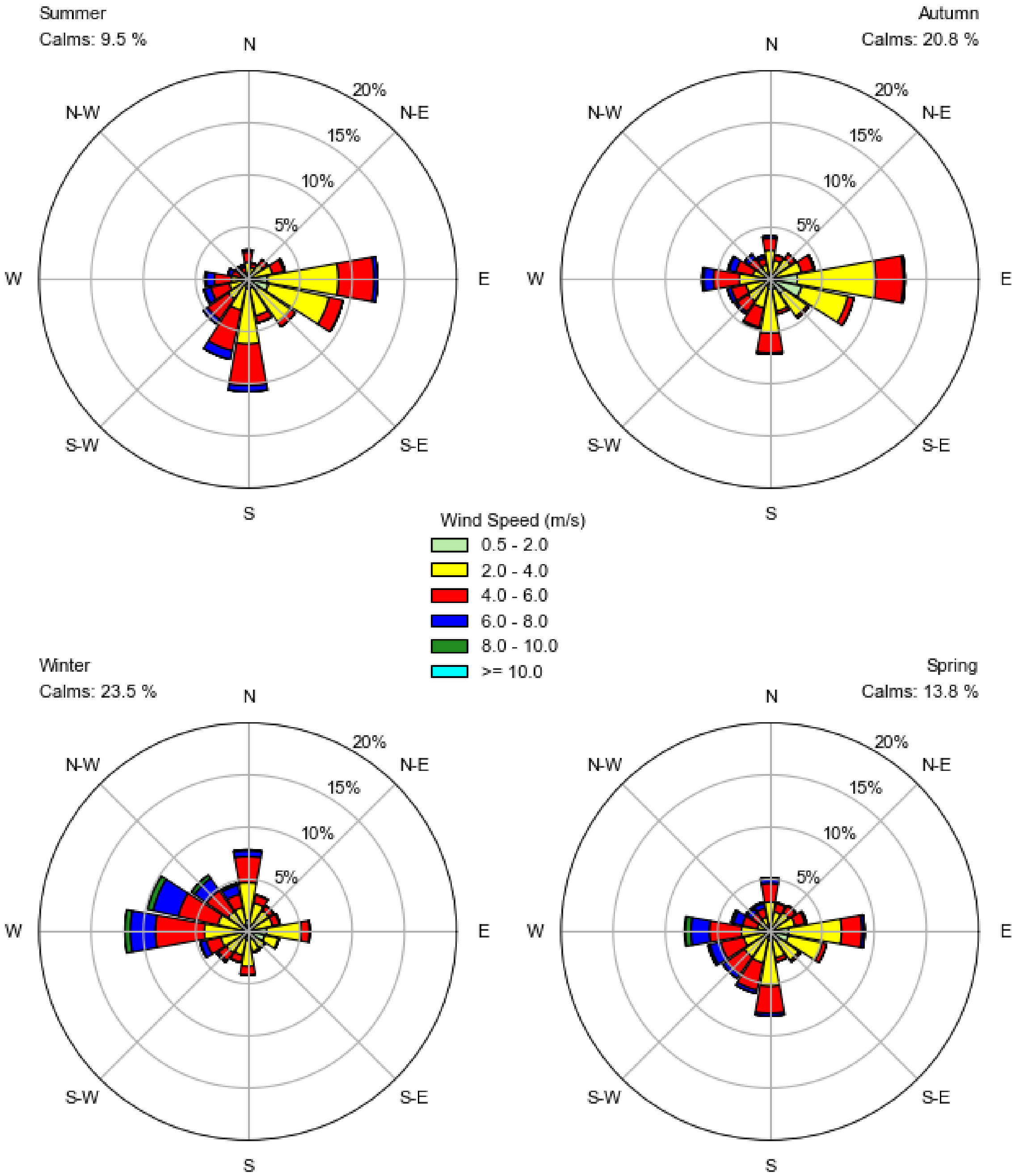


Figure 5-6 Seasonal distribution of winds recorded by the BoM at Clare High School, October 1993 to December 2017

The diurnal variation in winds is shown in Figure 5-7. During the night time, winds are light and frequently drain off the terrain located to the east, arriving as easterly and southeasterly winds. Calm conditions are frequent occurring during 30.6% of hours. The easterly winds persist during the morning and gain in strength, with northerly winds becoming more frequent. Calm winds are infrequent during the afternoon hours (1.9%) with winds strengthening and arriving most frequently from the western hemisphere (south, through west, to north), accounting for 74.4% of hours in total. Wind speeds tend to decline during the evening with winds from the southeast quadrant prevailing (44.3%).

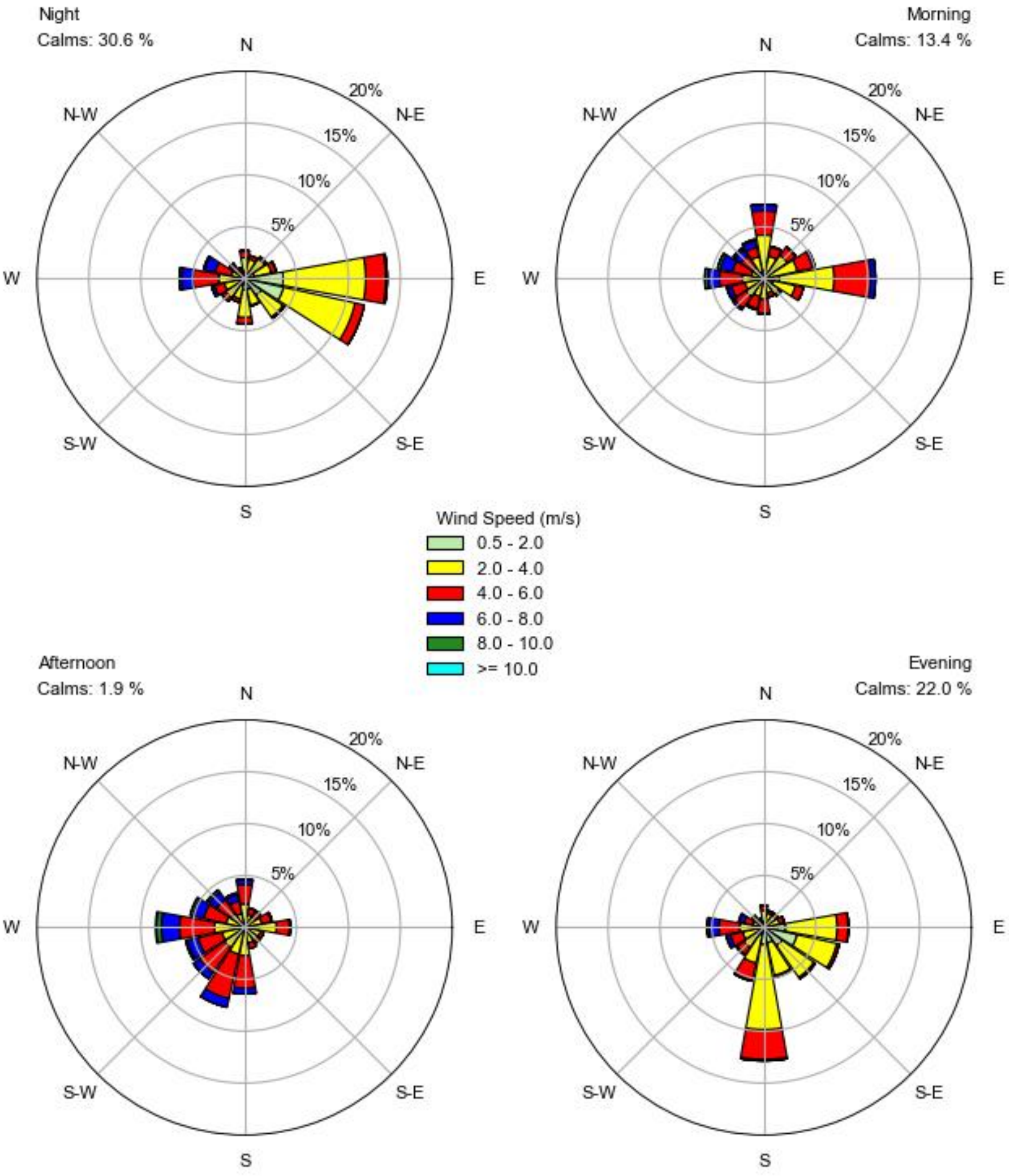


Figure 5-7 Diurnal distribution of winds recorded by the BoM at Clare High School, October 1993 to December 2017

The annual, seasonal, and diurnal variation in air temperature and wind speed is summarised in Table 5-1. The mean monthly minimum daily temperature at Clare High School is presented in Table 5-2.

Table 5-1 Annual, seasonal and diurnal variation in air temperature and wind speed recorded by the BoM at Clare High School (site number 021131), October 1993 to December 2017

Period	Minimum Air Temperature (°C)	Average Air Temperature (°C)	Maximum Air Temperature (°C)	Average Wind Speed (m/s)	Calms (%)
Annual	-4.8	14.7	42.7	2.9	17.0
Summer	3.4	21.1	42.7	3.2	9.5
Autumn	-3.7	14.9	38.1	2.6	20.8
Winter	-4.8	8.6	26.3	2.8	23.5
Spring	-2.0	14.3	40.1	3.1	13.8
Night: Midnight to 6am	-4.2	10.7	32.6	2.0	30.6
Morning: 6am to midday	-4.8	15.0	41.5	3.2	13.4
Afternoon: Midday to 6pm	1.2	19.4	42.7	4.2	1.9
Evening: 6pm to midnight	-2.3	13.5	39.8	2.3	22.0

Table 5-2 Mean monthly minimum daily temperatures at Clare High School (site number 021131) between 1994 and 2019

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
15.0	14.9	12.2	9.1	6.6	4.8	4.1	4.4	6.0	7.9	10.8	12.7

Source: http://www.bom.gov.au/climate/averages/tables/cw_021131.shtml

5.3 Annual frost days potential

The frequency of annual frost days across Australia based on a minimum screen temperature, at a height of 1.2 m above the ground, of 2°C has been assessed by the BoM and is presented by map in Figure 5-8 (BoM, 2019). The map indicates that the number of occasions when the temperature is less than 2°C in the Clare region could be around 10 – 20 days.

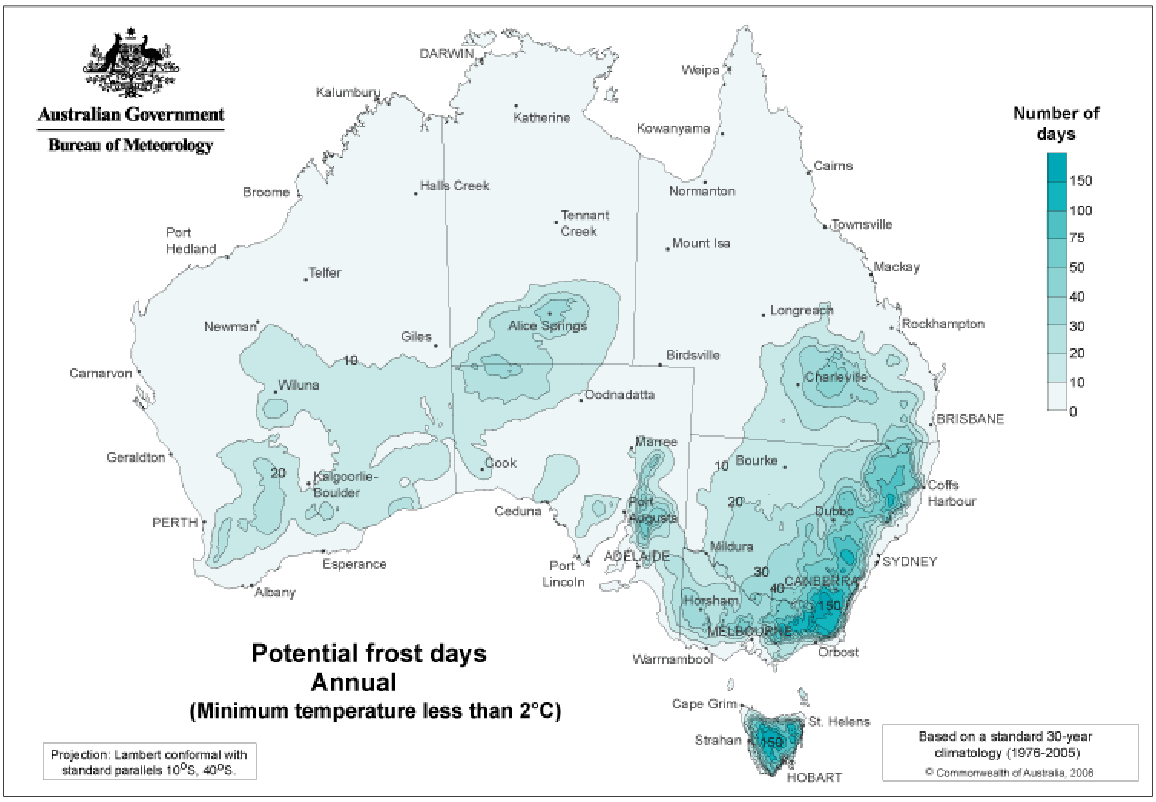


Figure 5-8 Potential annual frost days in Australia based on a minimum screen temperature of 2°C

Source: http://www.bom.gov.au/jsp/ncc/climate_averages/frost/index.jsp

6 Meteorological Modelling

6.1 Model year selection

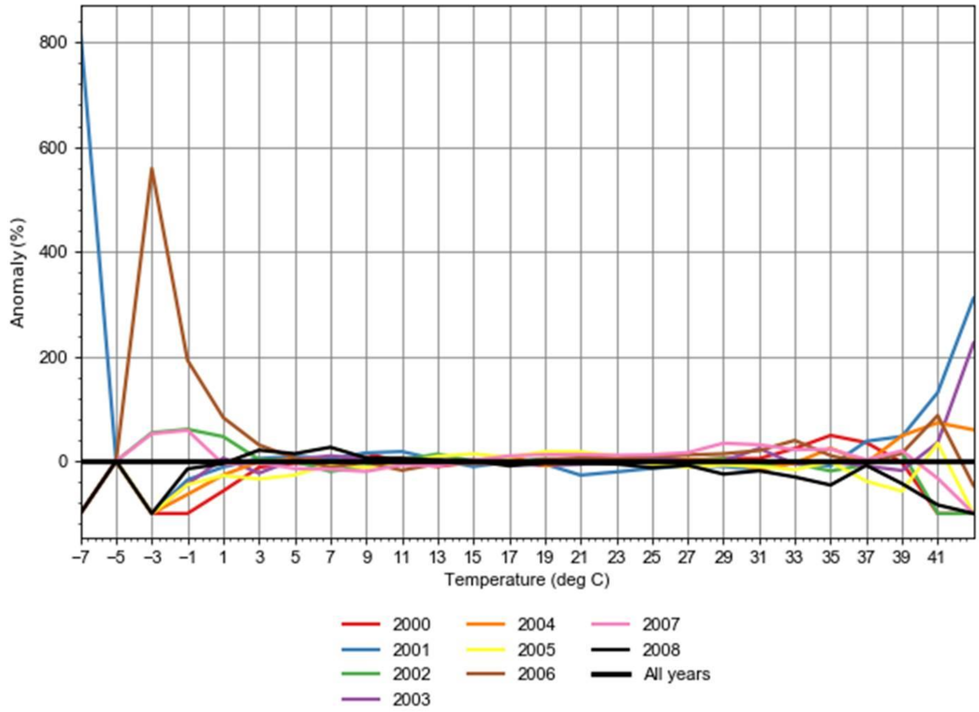
The BoM Clare High School observations were reviewed to determine a suitable meteorological year to model in detail. The BoM measures air temperature in a Stevenson Screen at a standard height of 1.2 m above the surface. During frost events, the temperature at this height will be significantly warmer than that at the ground surface. Despite this, the BoM temperature observations may still be used to identify cold years experienced throughout the region, where the potential for frost at the site would be greater than normal.

The temperature anomaly for the years 2000 to 2017 are plotted in Figure 6-1.

For any given year, the plot shows the deviation of the temperature distribution from the long term mean, with positive anomalies showing a higher frequency of temperature events when compared against the long term. Likewise, negative values show a lower frequency of events compared with the long term. The year 2017 for example was found to have a lower frequency than average of temperatures exceeding 29°C but a higher frequency of temperatures lower than 5°C. The year 2006 was identified as having the greatest anomaly (Figure 6-1a) in the -4°C to 3°C temperature range, suggesting that this year had the greatest potential for frost forming conditions and was consequently the most suitable year to model.

The frequency of zero or sub-zero screen temperature events by month and year is tabulated in Table 6-1. The year 2006 stood out as having 110 events, occurring between May and August. The next coldest years were 1994 and 1997 both experiencing 76 events, with 2017 experiencing 73. Given that synoptic analysis datasets were available for the CSIRO's TAPM (The Air Pollution Model) model for 2006, this year was selected for the simulation.

a)



b)

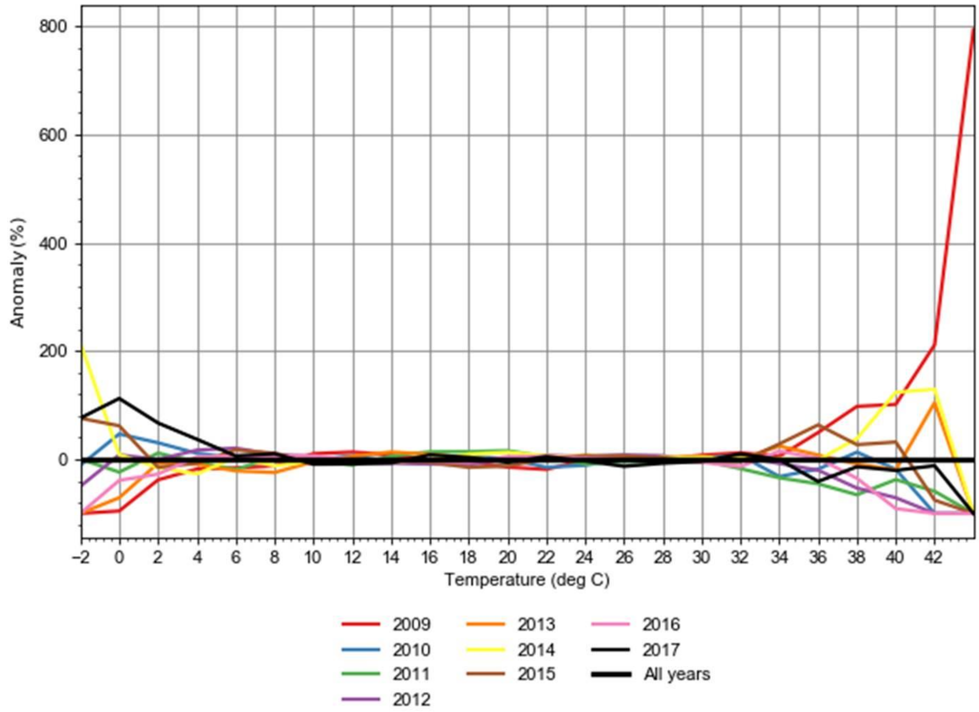


Figure 6-1 Temperature anomaly recorded at the BoM Clare High School site

Figure Note: a) 2000 to 2006;
b) 2007 to 2017

Table 6-1 Frequency of hours where screen temperature recorded at the BoM Clare High School site was less than or equal to 0°C, 1994 to 2017

Year	Month												
	1	2	3	4	5	6	7	8	9	10	11	12	Year
1994	0	0	0	0	0	0	24	44	8	0	0	0	76
1995	0	0	0	0	0	0	11	11	2	0	0	0	24
1996	0	0	0	0	0	5	3	3	3	0	0	0	14
1997	0	0	0	0	4	4	54	14	0	0	0	0	76
1998	0	0	0	0	1	6	18	1	0	0	0	0	26
1999	0	0	0	4	0	6	2	2	0	0	0	0	14
2000	0	0	0	0	1	4	2	0	0	0	0	0	7
2001	0	0	0	1	0	18	11	3	0	0	0	0	33
2002	0	0	0	0	0	11	21	23	4	0	0	0	59
2003	0	0	0	0	0	3	13	9	2	0	0	0	27
2004	0	0	0	0	0	1	3	10	3	0	0	0	17
2005	0	0	0	0	0	0	17	11	0	0	0	0	28
2006	0	0	0	0	19	70	15	6	0	0	0	0	110
2007	0	0	0	0	0	24	28	1	2	0	0	0	55
2008	0	0	0	0	0	6	14	10	0	0	0	0	30
2009	0	0	0	0	0	0	1	0	0	0	0	0	1
2010	0	0	0	0	5	20	21	3	0	0	0	0	49
2011	0	0	0	0	4	8	10	5	2	0	0	0	29
2012	0	0	0	0	3	12	19	2	0	0	0	0	36
2013	0	0	0	0	0	2	1	5	0	0	0	0	8
2014	0	0	0	0	0	0	0	47	0	0	0	0	47
2015	0	0	0	0	0	14	37	6	0	0	0	0	57
2016	0	0	0	0	0	1	11	6	0	0	0	0	18
2017	0	0	0	0	0	36	13	24	0	0	0	0	73

6.2 Meteorological model configuration

An investigation of the flow of wind across the solar farm site, neighbouring properties and wider region was conducted using meteorological modelling. The TAPM and CALMET model suite was used to simulate the regional meteorology with CALMET configured at a horizontal spatial resolution of 50 m and at 10 levels between 10 m above the ground and 4,000 m. The 30 m resolution topographic data used in the DEM was incorporated into the CALMET meteorological model to represent the regional terrain. As detailed in Section 6.1, the modelling was conducted for the year 2006.

Details of the TAPM and CALMET model simulations are presented in Appendix A. An evaluation of the performance of the meteorological models to represent the regional meteorology was conducted by assessing model predictions against the observations recorded at the BOM site. The BOM site location is not contained within either the CALMET modelling domain or the TAPM inner (300 m) modelling domain. Model performance evaluation was therefore conducted on predictions extracted from the TAPM Grid 4 domain (1000 m) at the closest grid point to the BOM site.

The model evaluation shows that the meteorological dataset generated by the TAPM/CALMET modelling system is representative of observations made by the BOM and is suitable for use in predicting flows during light wind conditions. This is evidenced by an Index of Agreement exceeding 0.6 for each meteorological parameter indicating good model performance. The $Skill_e$ and $Skill_r$ measures are each less than one for all parameters and $Skill_v$ is close to one for each parameter, thus indicating TAPM's skill at predicting wind, temperature and relative humidity.

TAPM was found to predict the frequency of light winds under 2 m/s well, however it underestimated the frequency of screen-height temperature between 0°C and 3°C and failed to predict the presence of sub-zero temperatures. Furthermore, TAPM performed well in predicting the frequency distribution of wind direction and incorporates the primary wind flows from the eastern and east-southeasterly sectors. A detailed analysis of the model performance is presented in Appendix B.

6.3 Analysis of regional wind flows during potential frost events

Frost events are a wide-spread phenomenon, occurring across a large region. It is therefore reasonable to identify the presence of potential regional frost events using modelled data extracted for a single location in the vicinity of the FRV solar farm. A location was selected (Figure 6-2) close to the centroid of the farm, at the southern boundary of the eastern of the two solar farm land parcels, at a site abutting the Sandow property in Merildin Road. This location is along one of the longest solar farm boundaries that borders several properties and is on the slope upstream of the creek line. It was selected to avoid flows within the creek line. Model predictions for this location were extracted for the entire modelled year for use in identifying potential frost events.

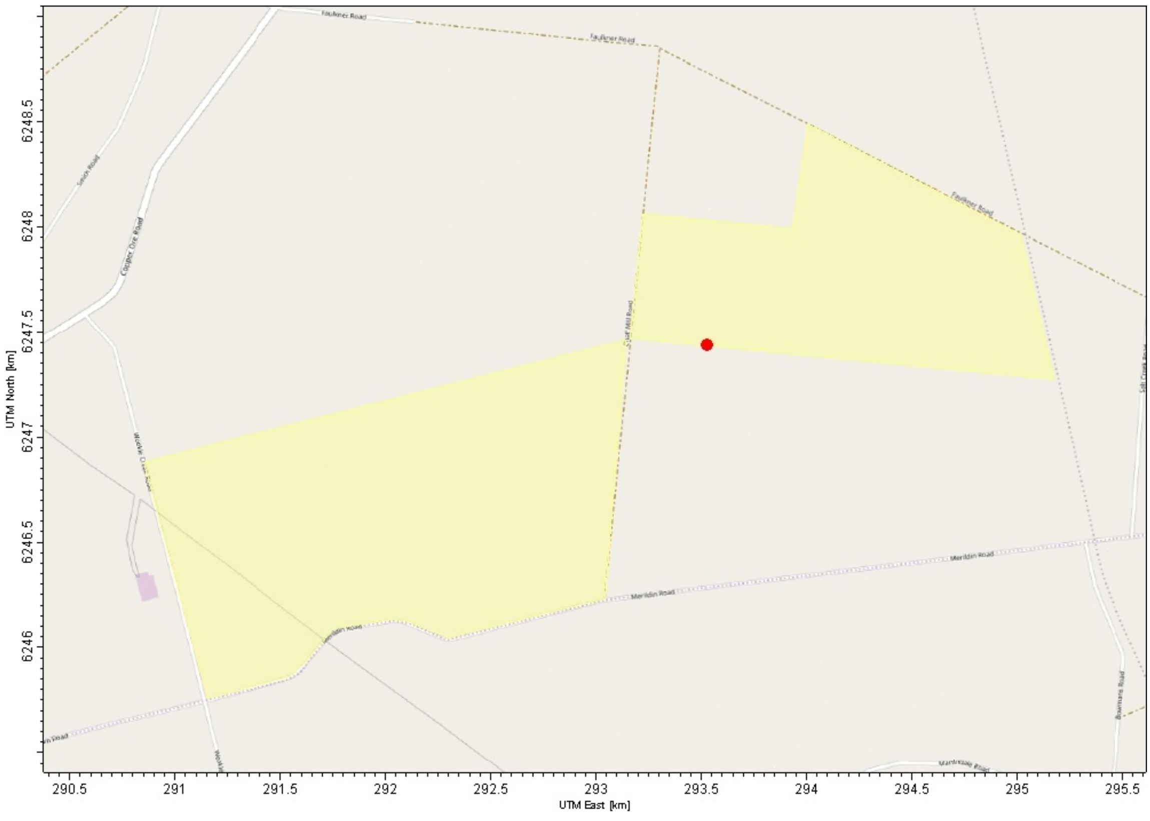


Figure 6-2 Location used to identify potential frost events (red dot)

A method was developed to identify which of the 8,760 modelled hours (i.e. the number of hours in a year) for 2006 were conducive to frost formation. Four separate conditions were defined, as detailed in Table 6-2, selecting the most extreme conditions for wind speed, air temperature, atmospheric stability, and precipitation. Frost is unlikely to occur if each of these conditions are not satisfied.

Table 6-2 Filter to identify potential frost events using CALMET meteorological parameters

Condition Number	Condition	Rationale
1	Wind speed at 10 m above the ground ≤ 2 m/s	Frosts occur under low wind conditions. The lowest available model height where wind data can be extracted is the standard height of 10 m. A predicted wind of 2 m/s will translate into lower wind speeds at the ground surface. For example, under stable F-class conditions, established power law relationships suggest that if the wind speed at a reference height of 10 m is 2 m/s then at a height of 0.1 m (10 cm) the wind speed will be 0.2 m/s.
2	Temperature at 10 m above the ground ≤ 5°C	Frosts occur when the air temperature at the surface is at or below zero degrees Celsius. The lowest available model height where temperature data can be extracted is the standard height of 10 m. A predicted temperature of 5°C will translate into lower temperatures at the ground surface, with the precise temperature depending on the temperature inversion strength.
3	Atmospheric stability (Pasquill Gifford Classification Scheme) = F	Frost occurs under stable atmospheric conditions. F class (Pasquill-Gifford scheme) stability represents very stable conditions and is the most stable classification predicted by the CALMET model.
4	Hourly precipitation rate = 0.0 mm/h	Frost occurs under clear sky conditions. If it is raining, then by definition there is some degree of cloud cover.

Table note: A potential frost event is defined when each of the four conditions is satisfied.

Based on this analysis, 17 separate events were identified and investigated, ranging between one and ten hours in duration. These are identified in Table 6-3. In total, 90 hours were identified as being conducive to frost formation. Each of these events occurs during the night time/early morning hours suggesting that they are accurately selecting potential frost events.

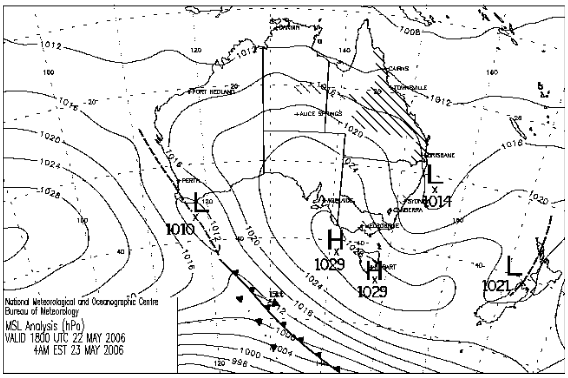
Table 6-3 Identified potential frost events at the FRV Chaff Mill Solar Farm Project site

Event number	Start date / time	End date / time	Event duration
1	23/05/2006 01:00	23/05/2006 06:00	6 hours
2	24/05/2006 0:00	24/05/2006 6:00	7 hours
3	05/06/2006 5:00	05/06/2006 5:00	1 hour
4	06/06/2006 3:00	6/06/2006 5:00	3 hours
5	07/06/2006 5:00	07/06/2006 6:00	2 hours
6	11/06/2006 21:00	12/06/2006 6:00	10 hours
7	12/06/2006 21:00	13/06/2006 6:00	10 hours
8	13/06/2006 23:00	14/06/2006 6:00	8 hours
9	15/06/2006 1:00	15/06/2006 6:00	6 hours
10	17/06/2006 23:00	18/06/2006 6:00	8 hours
11	19/06/2006 1:00	19/06/2006 6:00	6 hours
12	02/07/2006 6:00	02/07/2006 6:00	1 hour
13	04/07/2006 2:00	04/07/2006 6:00	5 hours
14	26/08/2006 2:00	26/08/2006 5:00	4 hours
15	15/10/2006 4:00	15/10/2006 4:00	1 hour
16	29/10/2006 0:00	29/10/2006 4:00	5 hours
17	15/11/2006 22:00	16/11/2006 4:00	7 hours

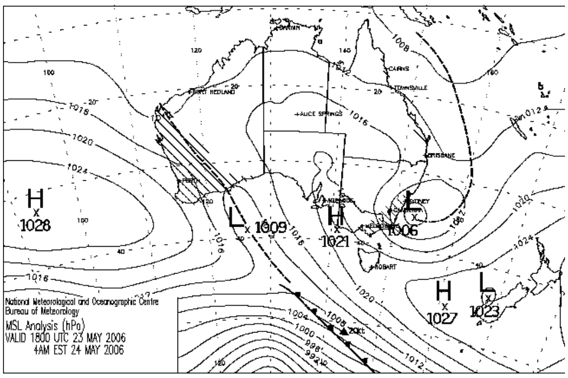
Table note: Events defined from meteorological predictions made at the southern boundary of the eastern of the two solar farm site parcels, abutting the Sandow property (Mintaro-Merildin Rd)

Synoptic-scale weather patterns and mean sea-level pressure were also analysed for each of the 17 potential frost events to determine whether anticyclonic conditions were present (Figure 6-3 to Figure 6-5). Synoptic charts are available in six-hour increments, with the most suitable chart for each event being the 4 am (EST) analysis. In each case the selected event was found to be associated with the presence of anticyclonic (i.e. a high-pressure system) conditions over the FRV solar farm site. This provides further strong evidence that the frost event identification approach used was effective at selecting potential frost events.

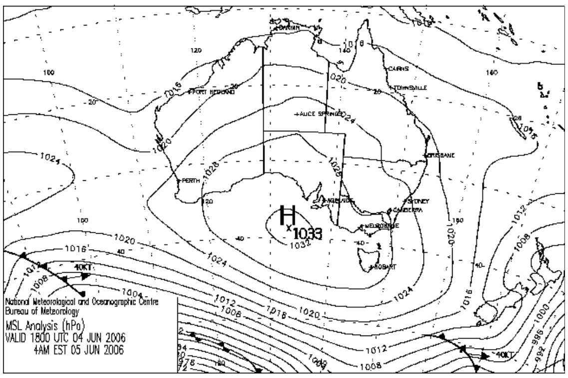
Event 1:



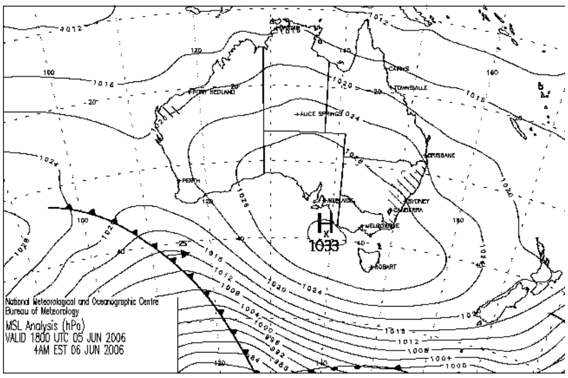
Event 2:



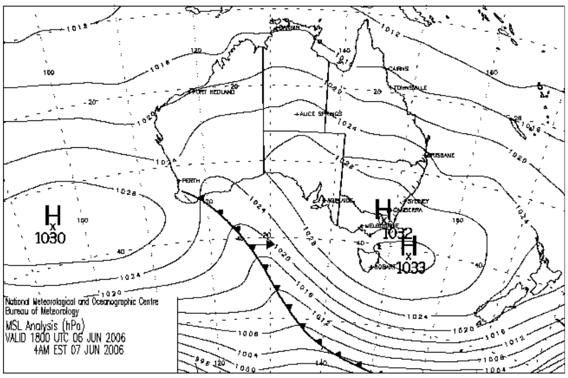
Event 3:



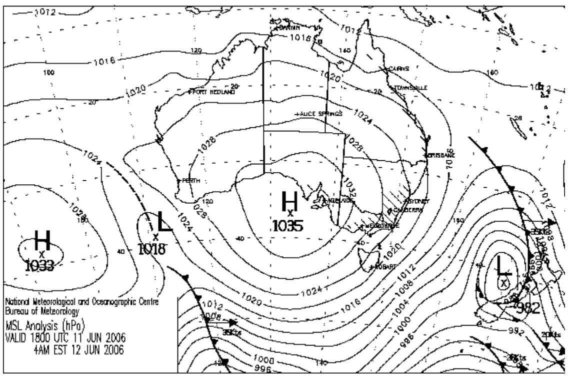
Event 4:



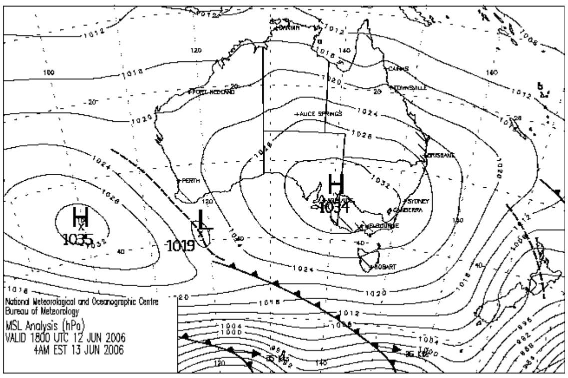
Event 5:



Event 6:



Event 7:



Event 8:

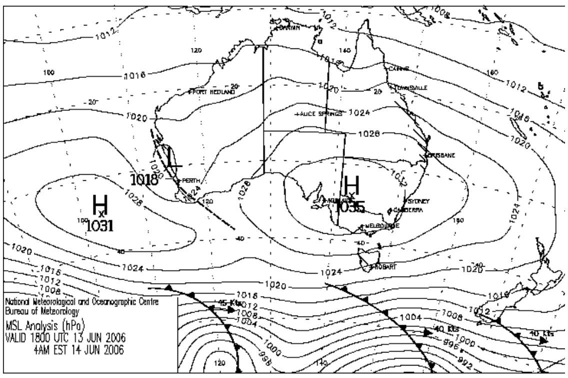
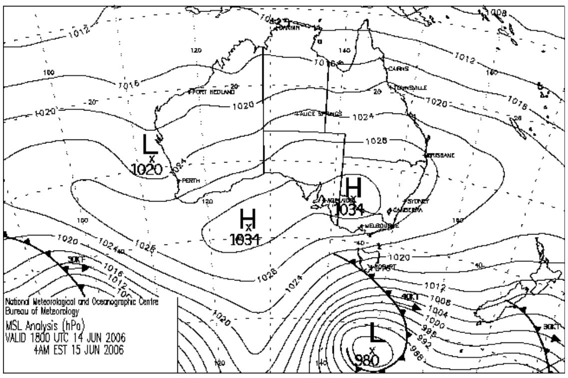


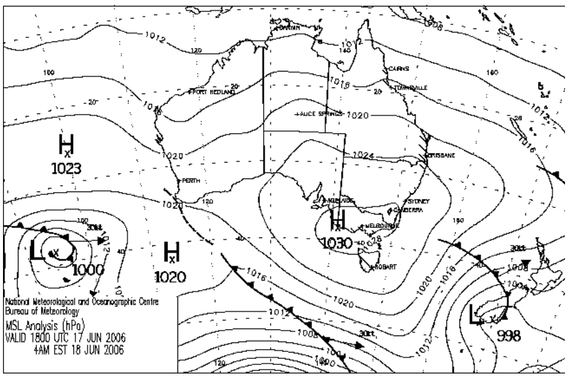
Figure 6-3 BoM mean sea-level synoptic analysis chart for Events 1 to 8

Figure note: Extracted from BoM analysis chart archive, http://www.bom.gov.au/australia/charts/archive/index.shtml

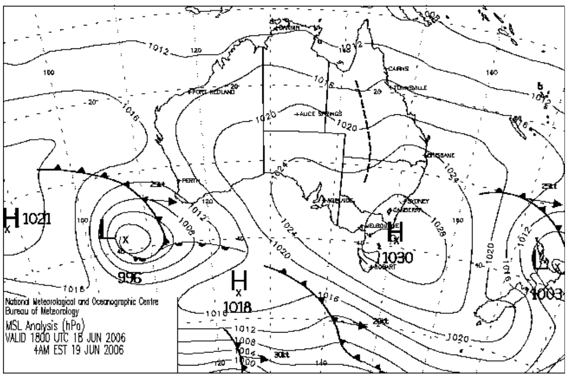
Event 9:



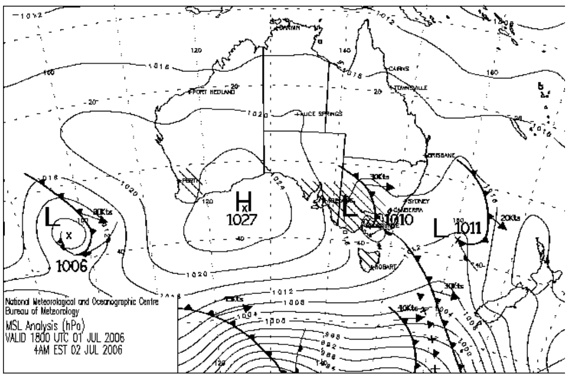
Event 10:



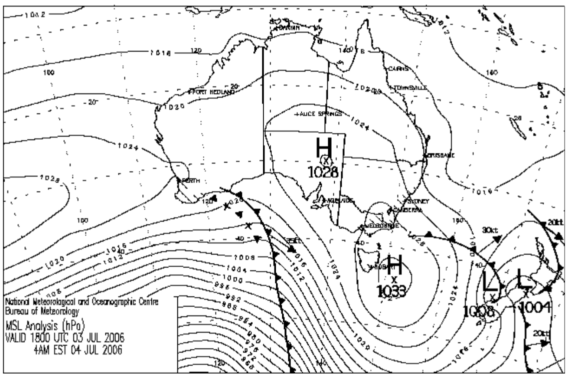
Event 11:



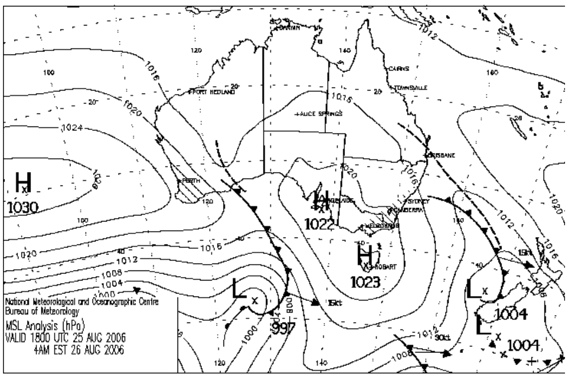
Event 12:



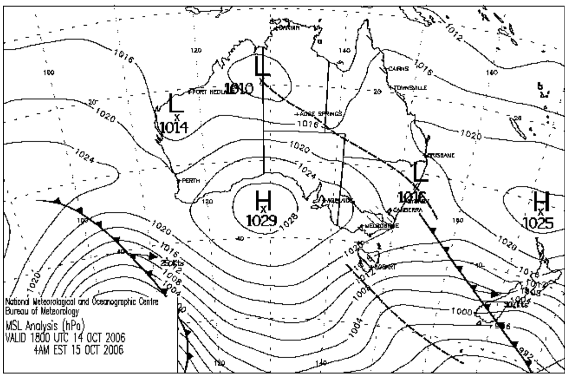
Event 13:



Event 14



Event 15:



Event 16:

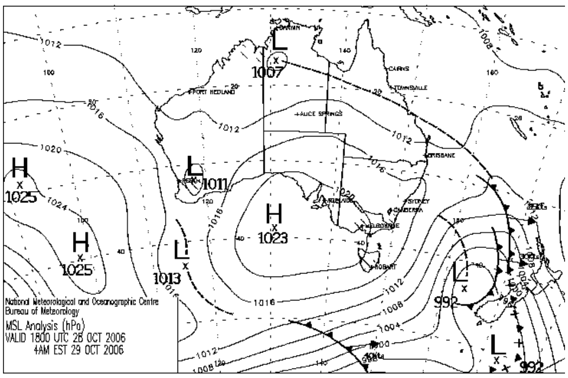


Figure 6-4 BoM mean sea-level synoptic analysis chart for Events 9 to 16

Figure note: Extracted from BoM analysis chart archive, http://www.bom.gov.au/australia/charts/archive/index.shtml

Event 17:

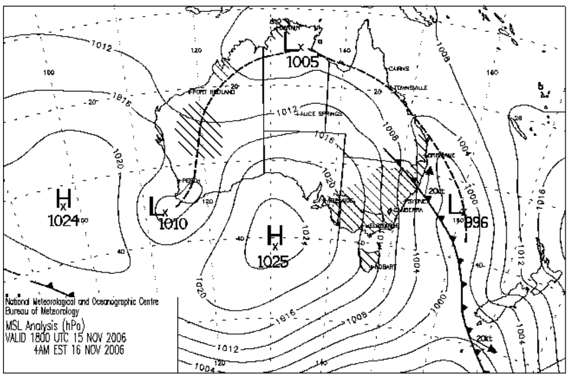


Figure 6-5 BoM mean sea-level synoptic analysis chart for Event 17

Figure note: Extracted from BoM analysis chart archive, http://www.bom.gov.au/australia/charts/archive/index.shtml

6.3.1 Event 1: 23 May 2006

Event 1 (or set of characteristic meteorological conditions) occurred over a six-hour period on 23 May, between the hours commencing at 1 am and 6 am. A surface (i.e. 10 m) wind field was extracted from the CALMET model predictions for the final hour of this event (6 am to 7 am). The final hour was selected as frost events develop over the course of a night and are hence most established in the hours close to sunrise, which occur at the end of each identified event. Selection of the final hour also provides time for thermographic flows to develop, draining off the valley walls (katabatic flows) and down along the main valley axis (“the mountain wind”).

The wind field selected to characterise Event 1 is provided in Figure 6-6. The figure shows gridded wind vectors over an area focused on the solar farm. The tail of each vector is located on a model grid point, with the direction of flow being shown by the arrow direction, and the arrow length being proportional to wind speed. Short vectors therefore denote light winds, with longer vectors showing stronger winds.

Completely calm wind conditions (0 m/s) can be identified as a dot. These are rare in modelling data as models can predict very low wind speeds. Another useful indication is that due to the filter applied, winds at the reference site (denoted with a ‘1’ in the figure) cannot be greater than 2 m/s in speed. The wind vector at this site can therefore act as an indicative reference vector.

Vectors are plotted at 100 m intervals (or for every second column and row of the modelling domain grid) in order to increase clarity, and to emphasise the spatial variation in wind velocity and flow direction. This has allowed each wind vector to be exaggerated in size to improve clarity to show the flows. Relatively long wind vectors therefore do not necessarily denote strong winds. The same scale has been adopted across all subsequent wind field images meaning that the relative differences in wind speed can also be compared across different events.

Event 1 is characterised by an easterly flow (heading towards the west), draining off the ridges to the east of the site. At first the flow is uniform as it crosses the eastern boundary of the eastern parcel. Shortly after crossing the eastern boundary, the flow direction and velocity become more varied as it travels towards the west. As the wind flows over the eastern side of the western parcel, the flow returns to a more uniform pattern before it drains down into the gully towards the south. Event 1 is therefore characterised by broad-scale drainage flows draining from the elevated terrain to the east and into localised drainage features, much as if water were draining off the terrain. Detailed model predictions are presented in Section 6.4 showing flows crossing the solar farm site boundaries at each of the locations indicated by a red dot in Figure 6-6.

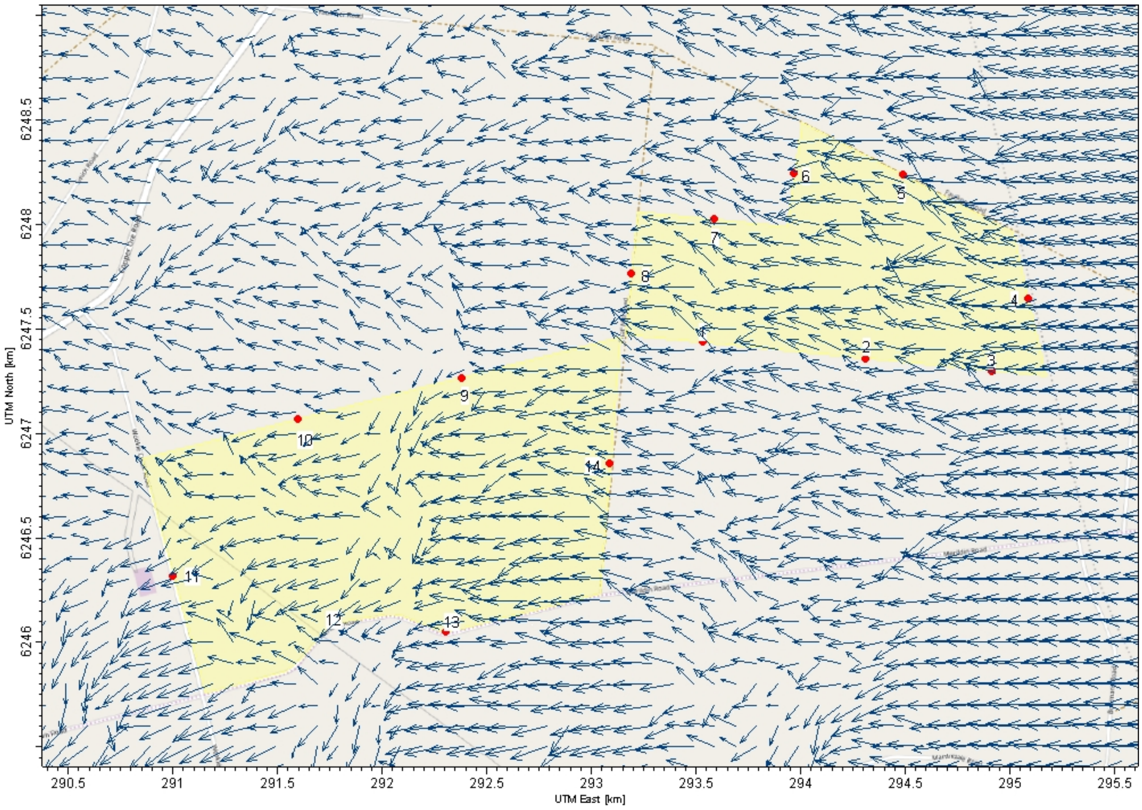


Figure 6-6 Predicted regional wind flows at 6am on 23 May at the end of Event 1

6.3.2 Event 2: 24 May 2006

Event 2 occurred on the day following Event 1 and was caused by the slow-moving passage of the same anticyclonic ridge that characterised Event 1. This event lasted for seven hours, extending between midnight and 7am on 24 May. The predicted wind field is shown in Figure 6-7, and was created using the same approach as that used for Event 1. During this event a drainage flow was once again established, this time as a northeasterly in the eastern portion of the wind field and at the eastern parcel, becoming a northerly flow (to the south) over the western parcel.

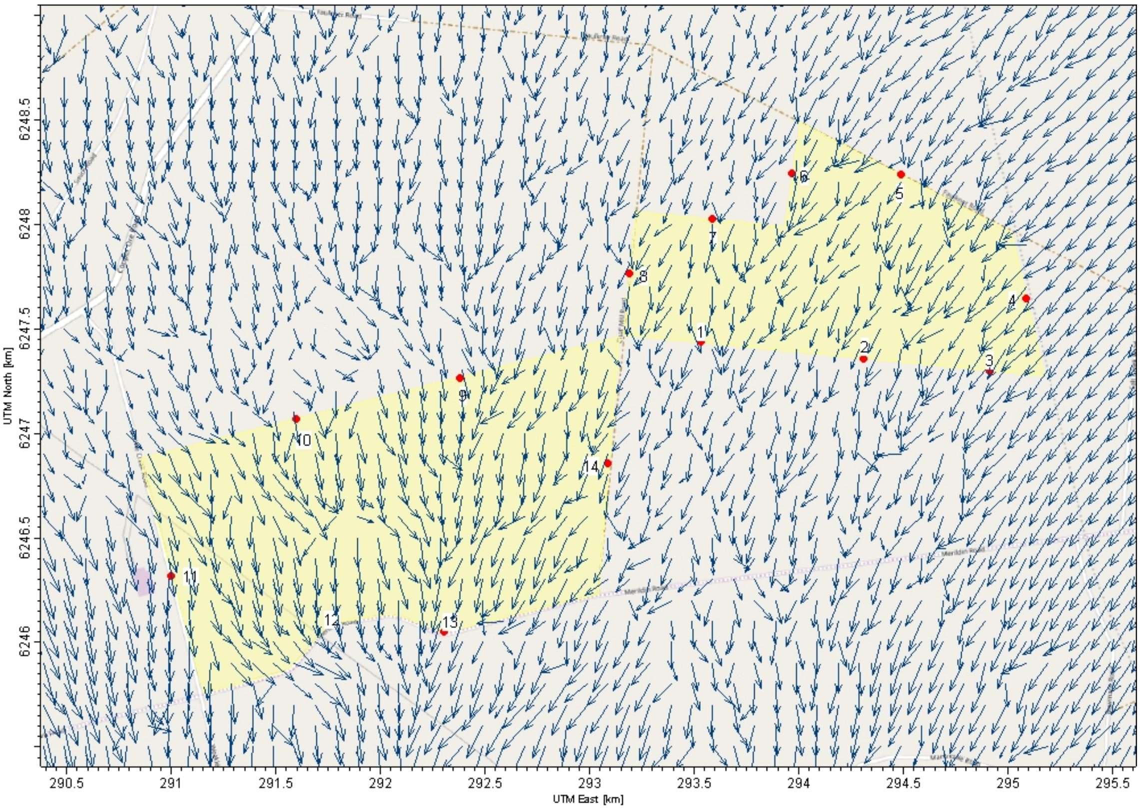


Figure 6-7 Predicted regional wind flows at 6am on 24 May at the end of Event 2

6.3.3 Event 3: 5 June 2006

Events 3, 4 and 5 occured during the early morning of three successive days on 5, 6 and 7 June. These events are characterised by the passage of an anticyclone, progressively forming into a northwest/southeast-aligned ridge, following a path to the south of the site, travelling from west to east. The centre of the anticyclone approaches during Event 3, is located to the south of the site during Event 4 and passes to the east during Event 5.

Event 3, shown in Figure 6-8, lasted for a single hour (5am to 6am) and is therefore probably less important than the previous two events in terms of its frost potential. The hour was characterised by a drainage flow from the east that reduced in speed towards the west of the modelling domain. This flow once again drains into the gully on the western parcel, travelling towards the south.

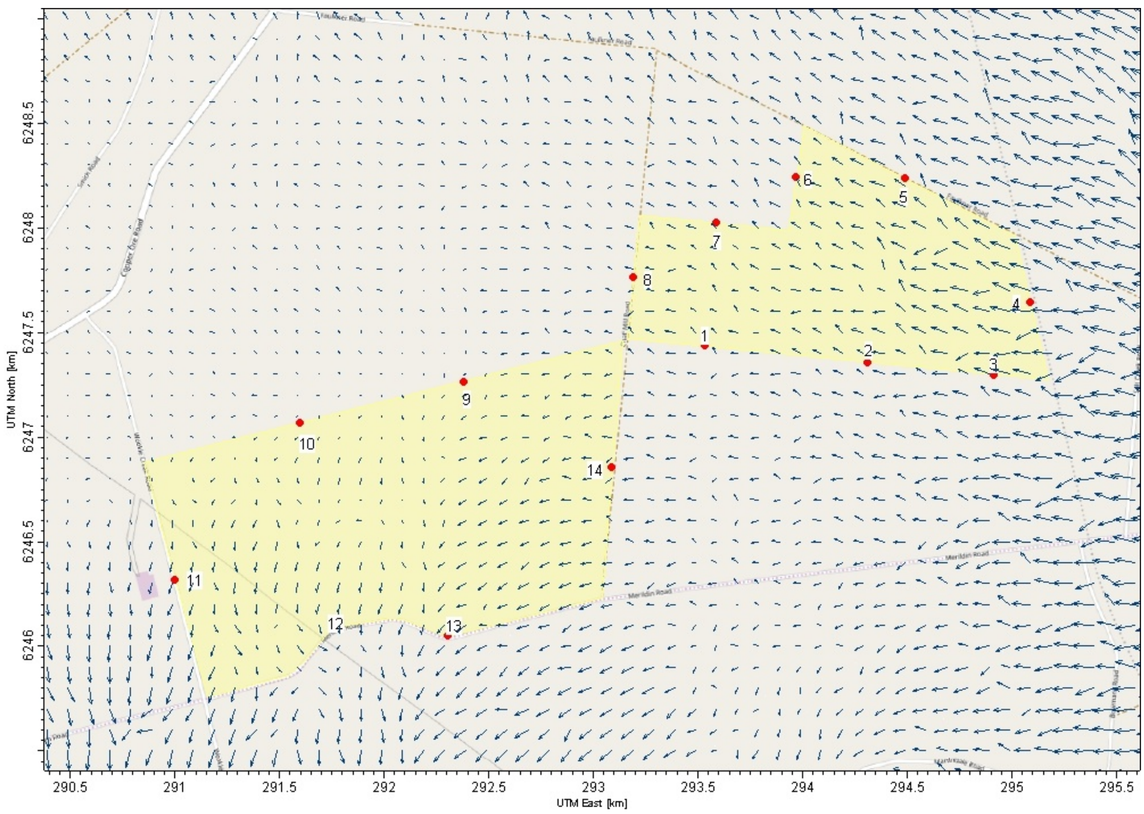


Figure 6-8 Predicted regional wind flows at 5am on 5 June during Event 3

6.3.4 Event 4: 6 June 2006

Winds during Event 4 (Figure 6-9), which lasted for three hours, were characterised by stronger easterly winds. These winds appear to be decoupled from the expected southeasterly winds associated with the anticyclone over the site. This suggests the principal driver of the wind flows is more local terrain and influences than synoptic flows. This flow once again drains into the creek line on the western parcel.

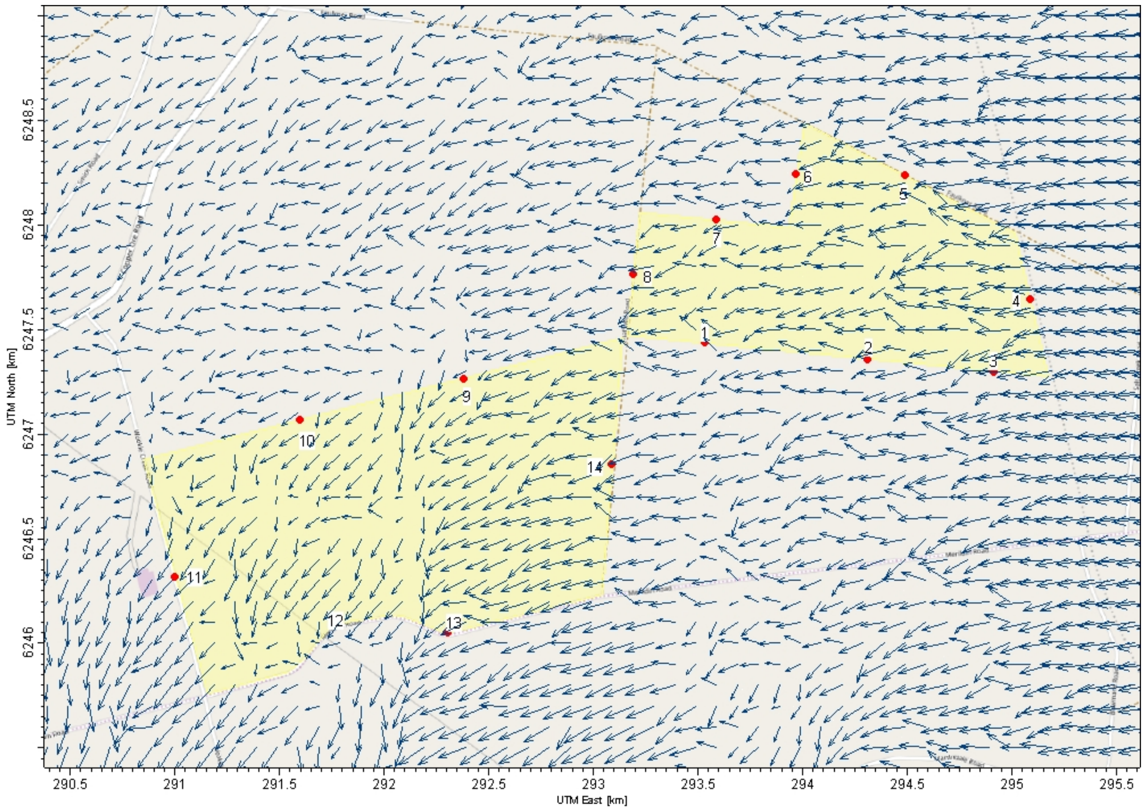


Figure 6-9 Predicted regional wind flows at 5am on 6 June at the end of Event 4

6.3.5 Event 5: 7 June 2006

Event 5 (Figure 6-10), which lasted for two hours between 5am and 7am, is characterised by a northerly flow draining along the valley axis throughout the entire modelling domain to the south.

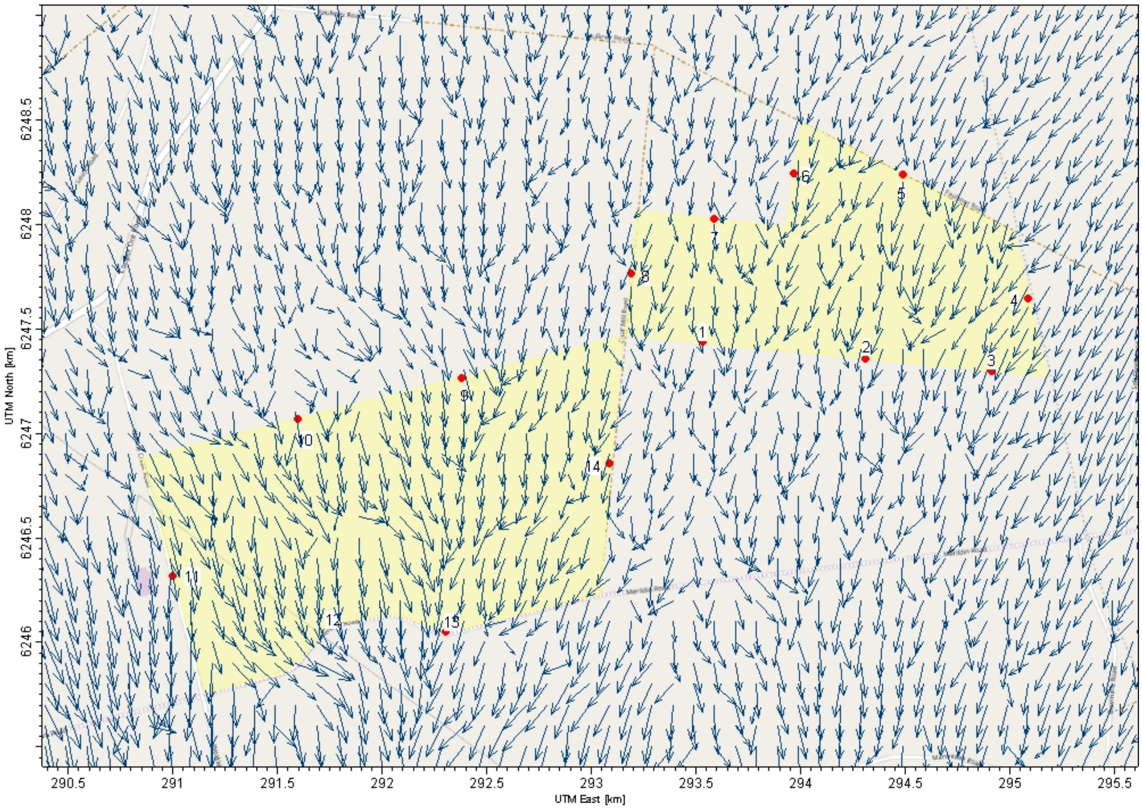


Figure 6-10 Predicted regional wind flows at 6am on 7 June at the end of Event 5

6.3.6 Event 6: 11-12 June 2006

Events 6 to 9 are each associated with the west to east passage of an anticyclone across southern Australia between 11 and 15 June. Event 6 lasted for ten hours, commencing at 9pm on 11 June and finishing the following day at around 7am. The wind field for the final hour of this period (6am to 7am) is shown in Figure 6-11.

A uniform easterly wind drains off the ridges to the east of the site, becoming more varied as it travels towards the west. Once again, a localised drainage flow is established along the creek line in the western parcel and travelling towards the south. Easterly winds are predicted travelling towards the west at other locations.

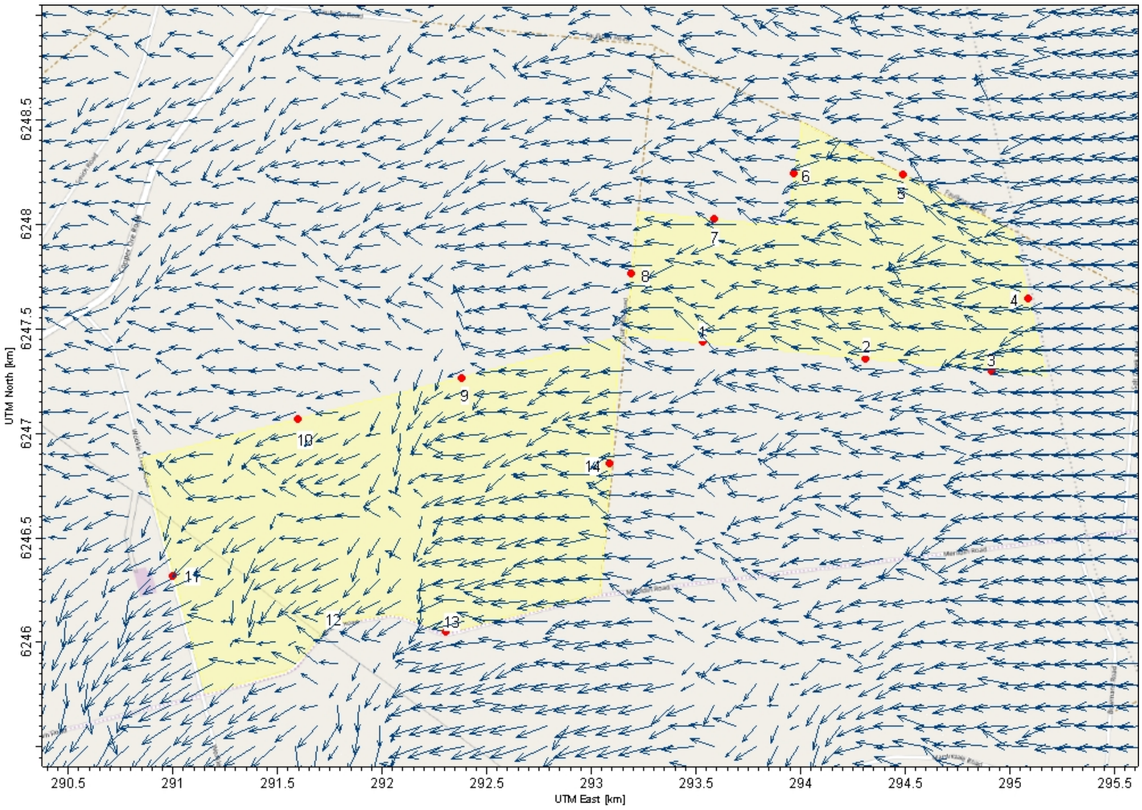


Figure 6-11 Predicted regional wind flows at 6am on 12 June at the end of Event 6

6.3.7 Event 7: 12-13 June 2006

Event 7 also lasted for ten hours, commencing at 9pm on 12 June and finishing the following day around 7am. Northeasterly winds, draining off the elevated terrain features, travel over the eastern parcel, turning into northerly drainage flows over the western parcel (Figure 6-12).

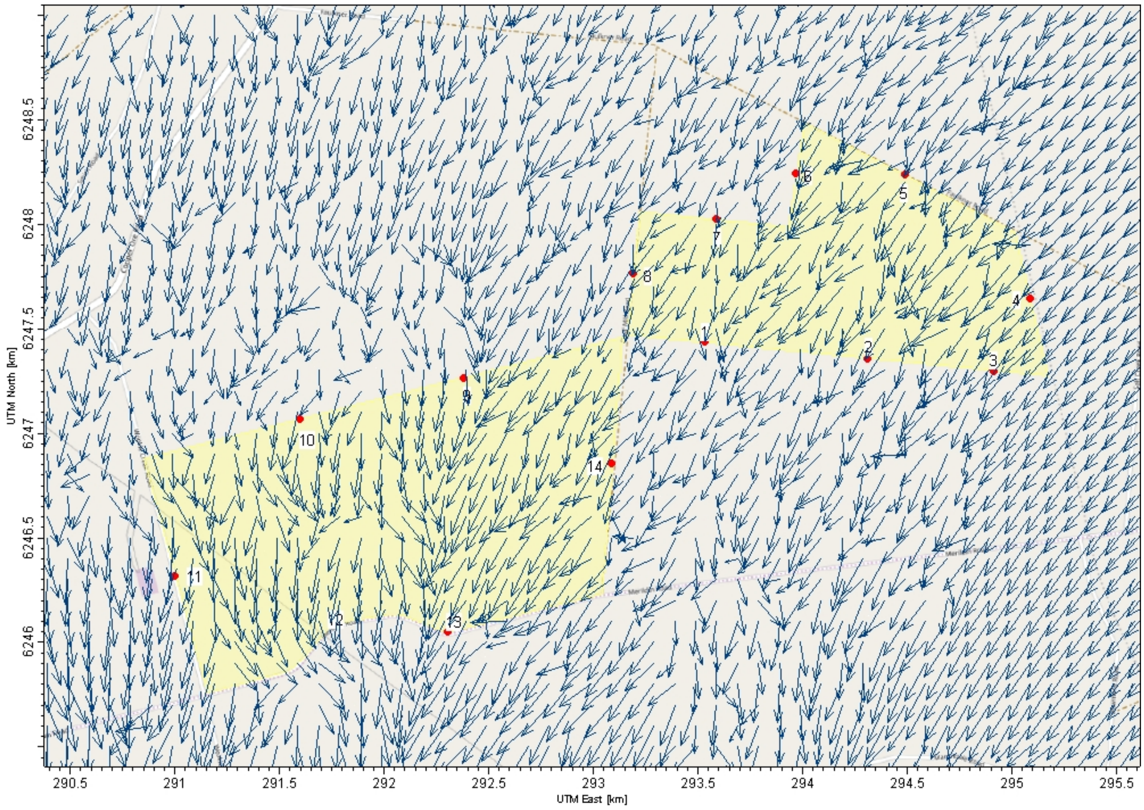


Figure 6-12 Predicted regional wind flows at 6am on 13 June at the end of Event 7

6.3.8 Event 8: 13-14 June 2006

The flows occurring during Event 8 (Figure 6-13), which lasted for eight hours commencing at 11pm on 13 June, are similar to those occurring in Event 7. A uniform northeasterly drainage flow, becomes modified over the eastern parcel, transitioning into northerly flows as it travels down the creek line over the western parcel.

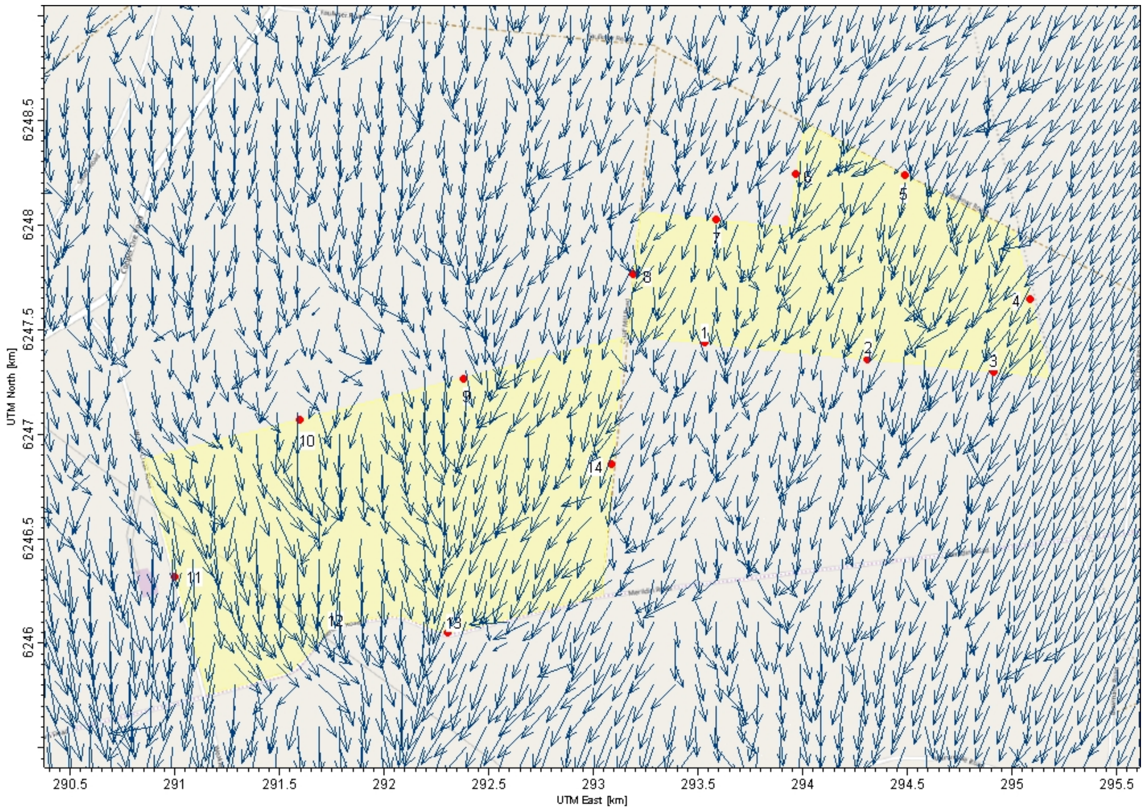


Figure 6-13 Predicted regional wind flows at 6 am on 14 June at the end of Event 8

6.3.9 Event 9: 15 June 2006

Event 9, which is shown in Figure 6-14, is associated with northwesterly winds to the west and northeasterly winds to the east, both draining off the ridges either side of the site. The eastern parcel is characterised by northerly flows originating from the elevated terrain to the east, while the winds over the western parcel arrive from the northwest and drain into the creek line travelling towards the south. The event that occurred on 15 June lasted for six hours and ended at by 7am.

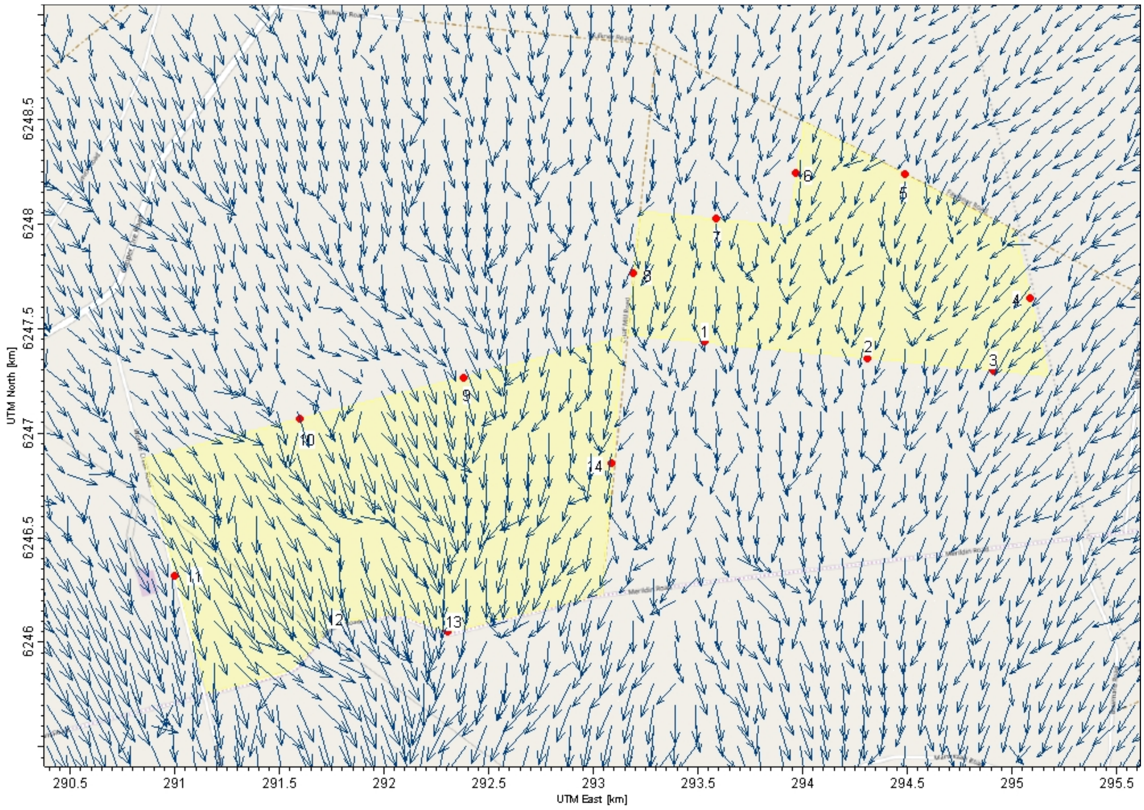


Figure 6-14 Predicted regional wind flows at 6 am on 15 June at the end of Event 9

6.3.10 Event 10: 17-18 June 2006

Events 10 and 11 are associated with the passage of an anticyclone to the southeast of the site. Event 10, which commenced at 11pm on 17 June, lasting for 8 hours, is similar to Events 2, 5, 7 and 8. Uniform wind flows from the northeast become less organised over the eastern parcel and transition to northerly flows draining out of the western parcel along the creek line (Figure 6-15).

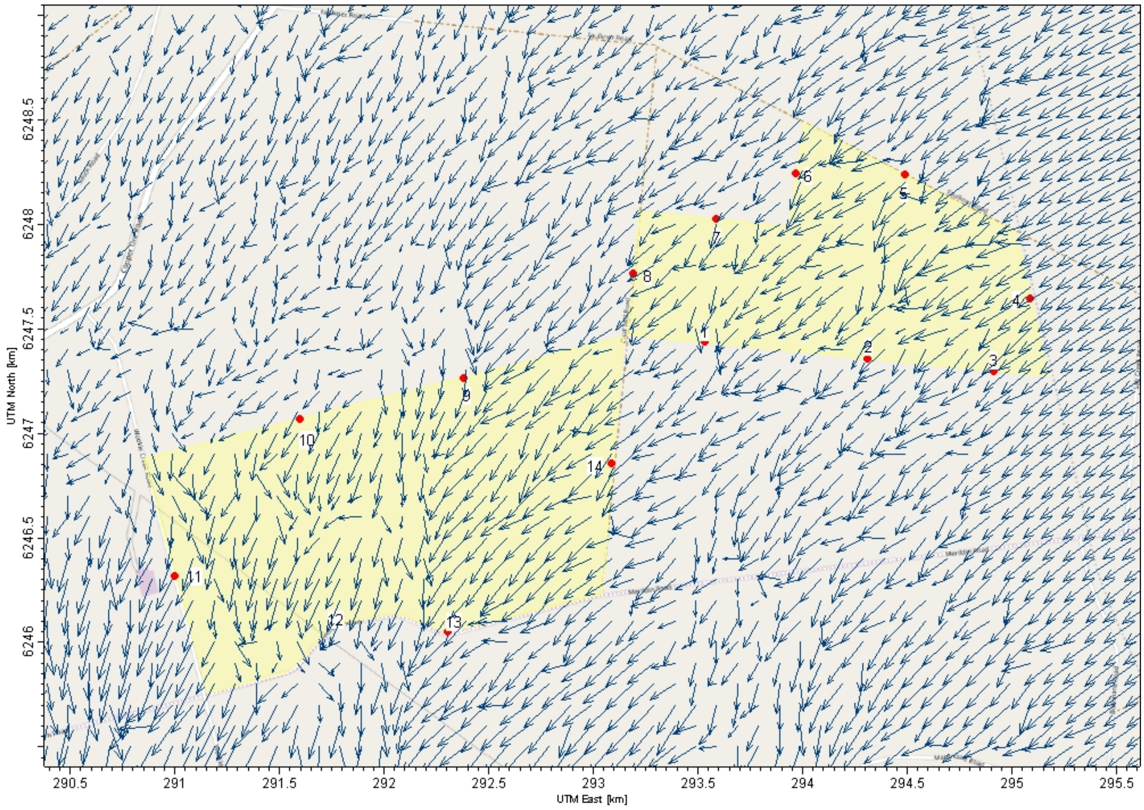


Figure 6-15 Predicted regional wind flows at 6 am on 18 June at the end of Event 10

6.3.11 Event 11: 19 June 2006

The Event 10 drainage flow is repeated the following night during Event 11 (Figure 6-16), over a period of six hours, commencing at 1am on 19 June.

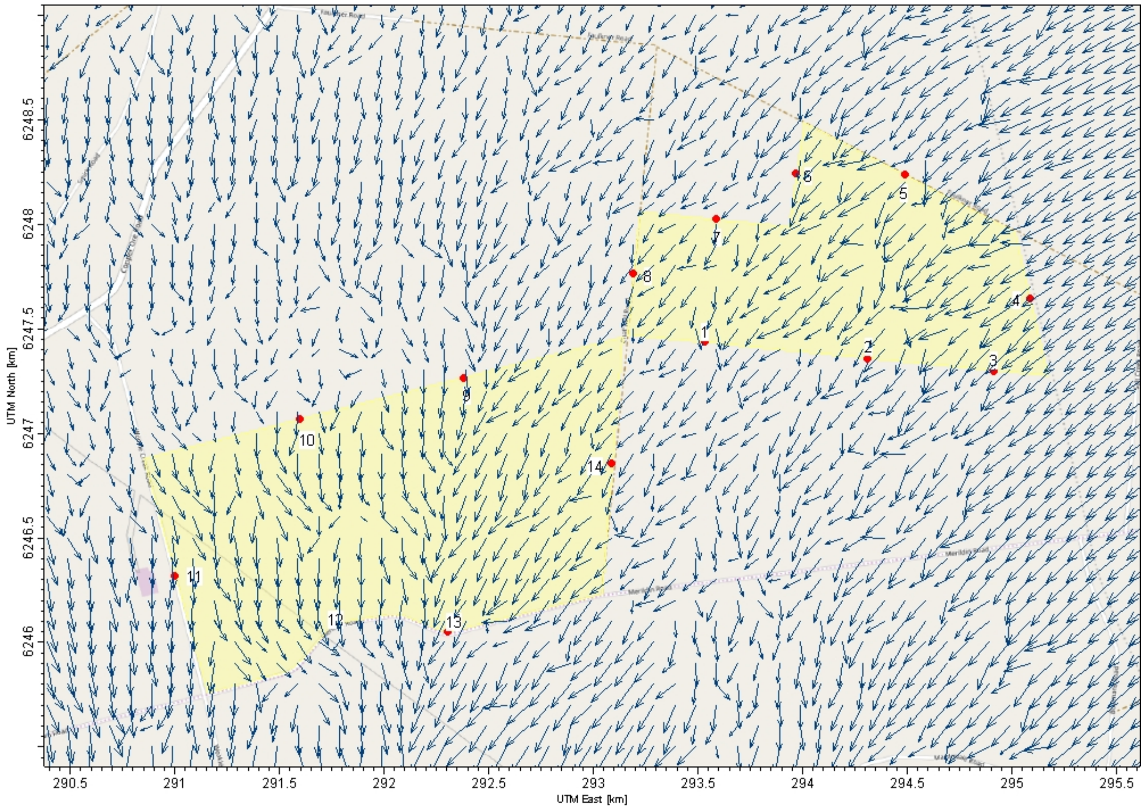


Figure 6-16 Predicted regional wind flows at 6 am on 19 June at the end of Event 11

6.3.12 Event 12: 2 July 2006

Event 12, shown in Figure 6-16, is associated with southerly winds (travelling towards the north) and an anticyclone in the Great Australian Bight. The event lasted for a single hour (commencing at 6am on 2 July). It is not stereotypical of frost conditions, due to its short duration, the lack of drainage flows, and the analysis chart (Figure 6-4) showing rainfall in the region. It is therefore suggested that this does not represent a frost event.

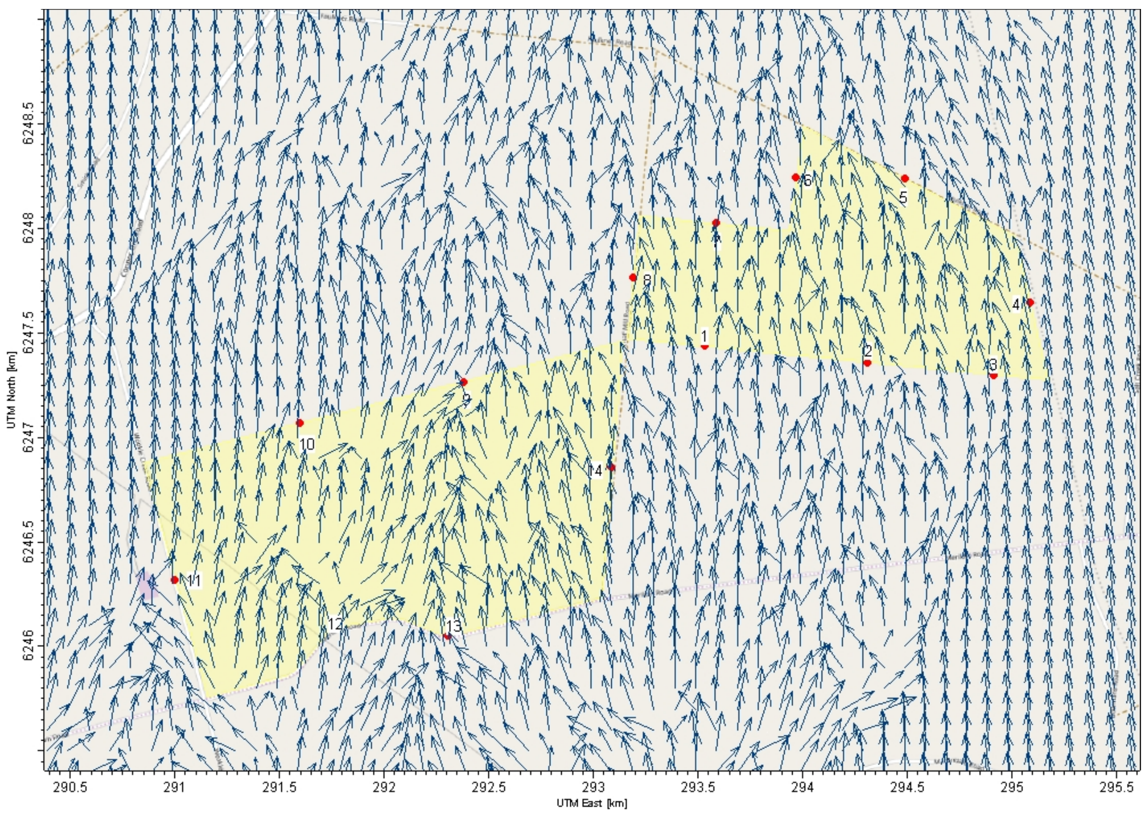


Figure 6-17 Predicted regional wind flows at 6 am on 2 July during Event 12

6.3.13 Event 13: 4 July 2006

Event 13 occurred two days after Event 12, with the anticyclone that had been approaching the region now ridging over Tasmania and the southeast portion of the continent. The event lasted for a period of five hours, commencing at 2am on 4 July. Uniform N to NNE drainage flows are established along the eastern region of the plot (Figure 6-18), with a slightly variable but predominantly northerly flow pattern throughout the remainder of the region. Flows are seen diverging into the gully in the western parcel.

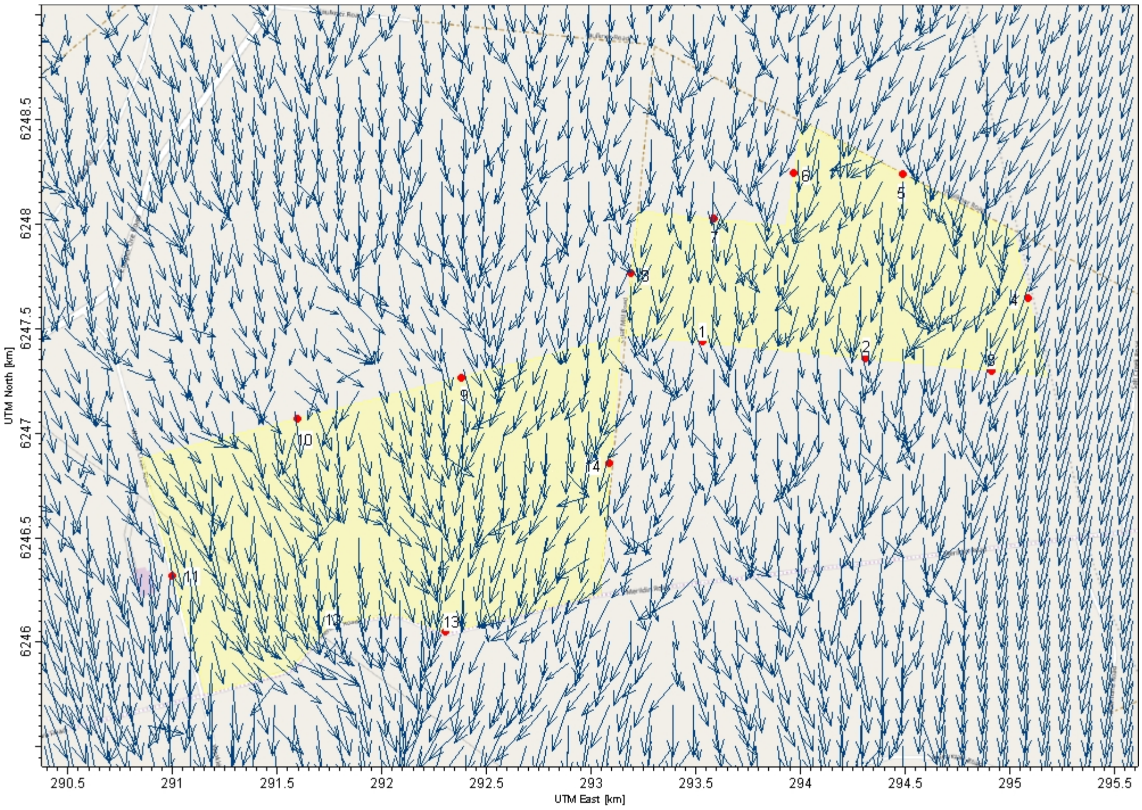


Figure 6-18 Predicted regional wind flows at 6 am on 4 July at the end of Event 13

6.3.14 Event 14: 28 August 2006

As the year progresses, the frost events become limited to isolated days rather than occurring over successive days. Event 14 commenced at 2am on 26 August and lasted for four hours. The regular pattern (Figure 6-19) of a uniform drainage flow from the east-northeast draining towards the south along the creek line in the western parcel is established.

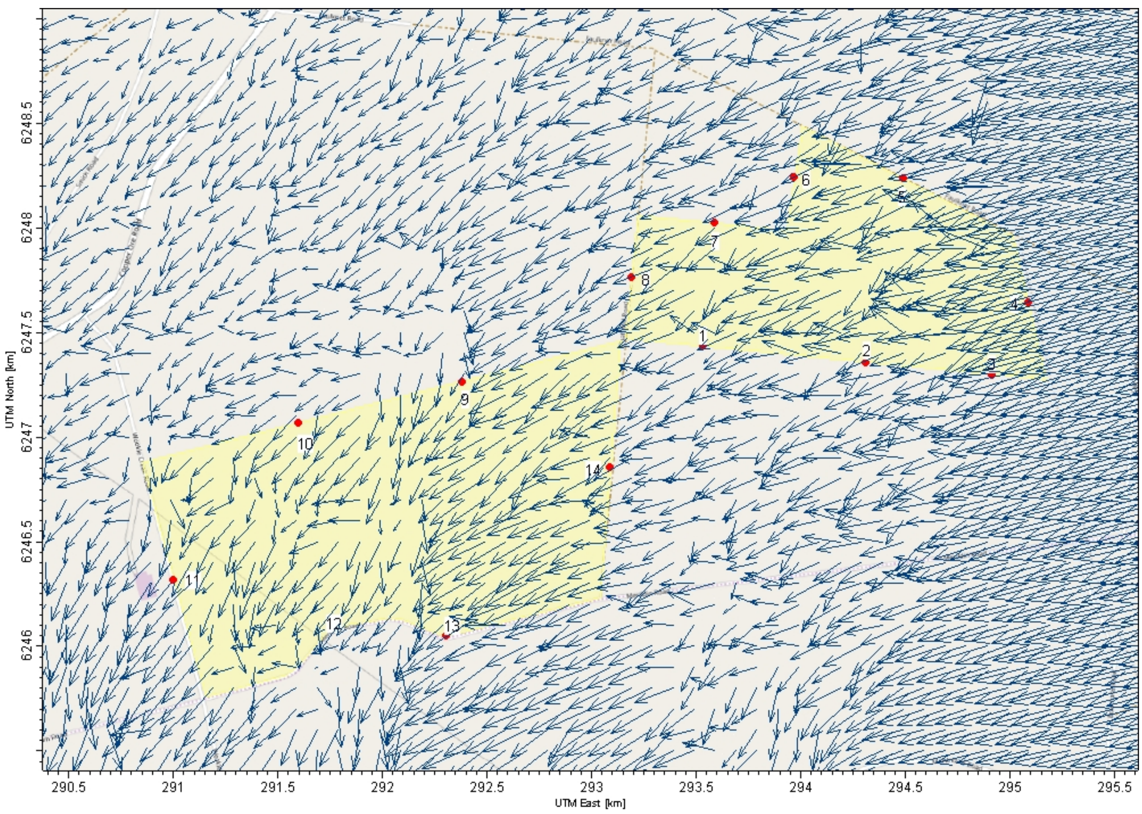


Figure 6-19 Predicted regional wind flows at 6 am on 26 August at the end of Event 14

6.3.15 Event 15: 15 October 2006

The predicted flows during Event 15, which lasted for a single hour commencing at 4am on 15 October, are presented in Figure 6-20. Once again, a uniform flow pattern is present at the eastern boundary of the plot, however rather than this arriving from the east or east-northeast, it arrives from the east-southeast. This subtle direction change caused flows towards the northwest over the eastern parcel and parts of the western parcel, with the flow being directed up the creek line towards the north, rather than down the creek to the south.

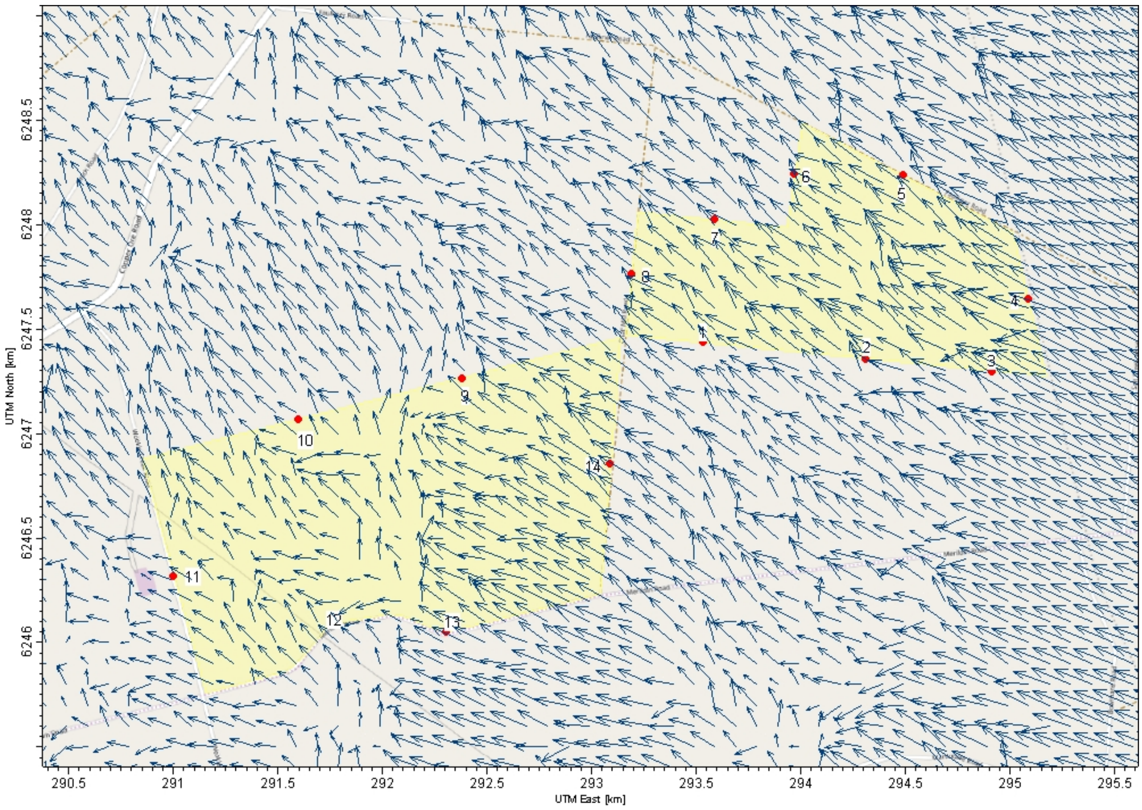


Figure 6-20 Predicted regional wind flows at 4 am on 15 October at the end of Event 15

6.3.16 Event 16: 29 October 2006

Event 16 commenced at midnight on 29 October and lasted for five hours. The westerly flow, shown in Figure 6-21, is once again channeled into the creek line running north-south through the western parcel.

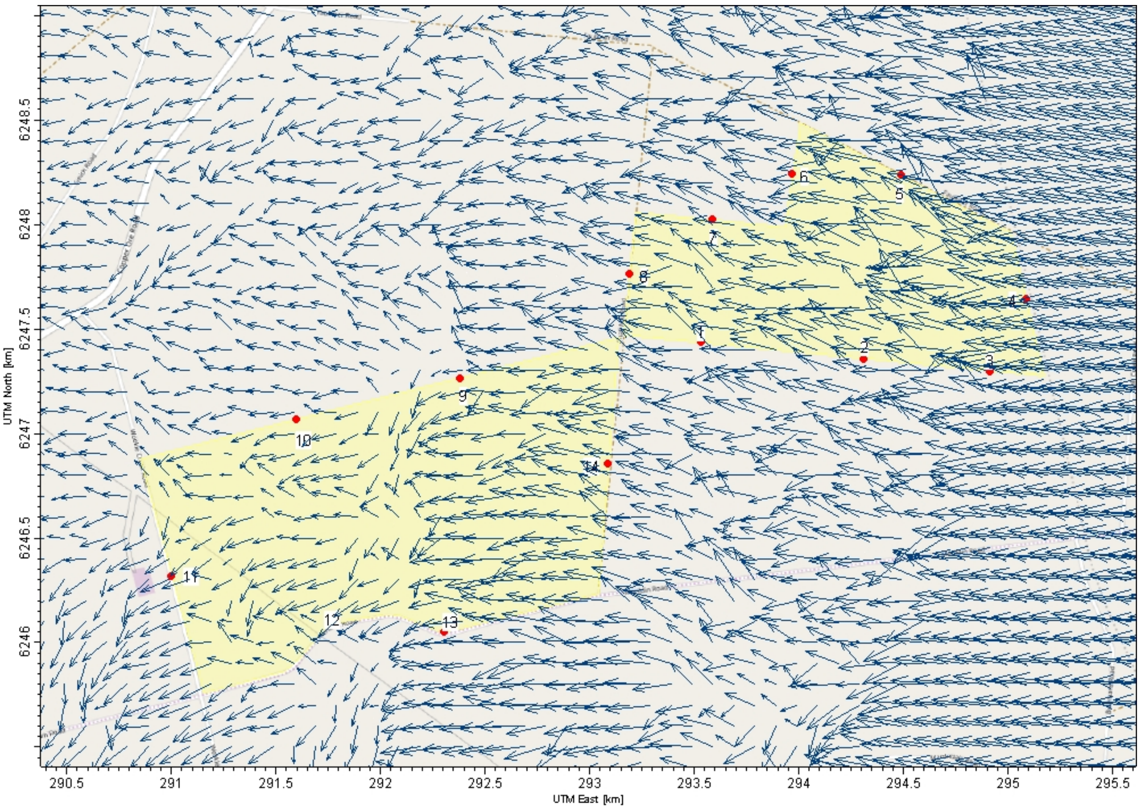


Figure 6-21 Predicted regional wind flows at 4 am on 29 October at the end of Event 16

6.3.17 Event 17: 15 November 2006

The plot for Event 17 (Figure 6-22) is similar to that of Event 15, where winds from the east-southeast are channeled up the drainage gully in the western parcel towards the north rather than down the creek line to the south. Unlike Event 15, Event 17 lasts for seven hours, commencing at 10pm on 15 November.

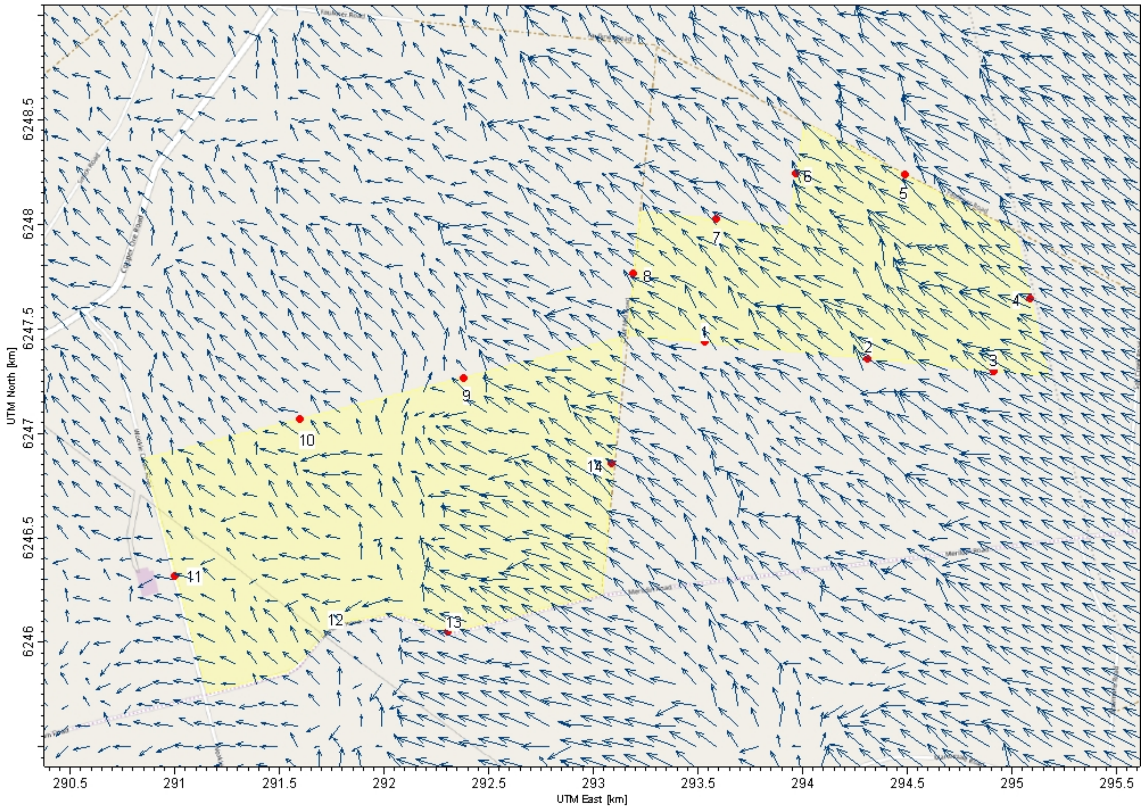


Figure 6-22 Predicted regional wind flows at 4 am on 16 November at the end of Event 17

6.4 Analysis of wind flows crossing the solar farm's boundaries during potential frost events

Analysis of the predicted local wind flows crossing the solar farm's boundaries was conducted by extracting hourly data files for key meteorological parameters at 14 regularly-spaced locations along the boundaries abutting the neighbouring properties (see Figure 6-23). The frost event identification method described in Table 6-2 was applied to the separate data file for each location. Each location is therefore assessed using a slightly different list of event hours. However, the majority of event hours are expected to be present across all locations. The minor differences between selected analysis hours at each location is caused by the spatial variation across the area of meteorological parameters that affect the relative frost-generating microclimates.

Rather than showing the final hour of each identified meteorological event, wind roses have been prepared for all identified 'frost' hours for the model simulation (i.e. year 2006 – 8,760 hours). Wind speed and direction distributions (i.e. wind roses) for identified frost events are presented for each location in Figure 6-24 to Figure 6-27.

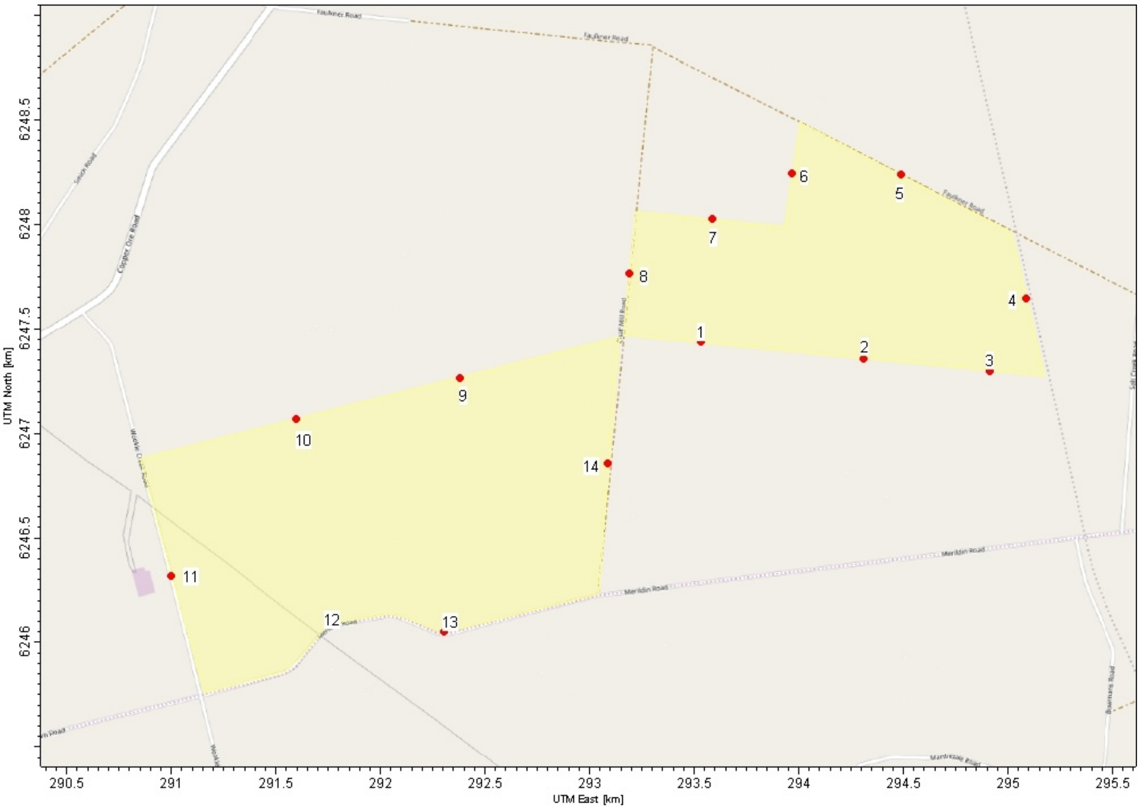


Figure 6-23 Locations around the solar farm site boundary selected for analysis of wind flows during predicted frost events

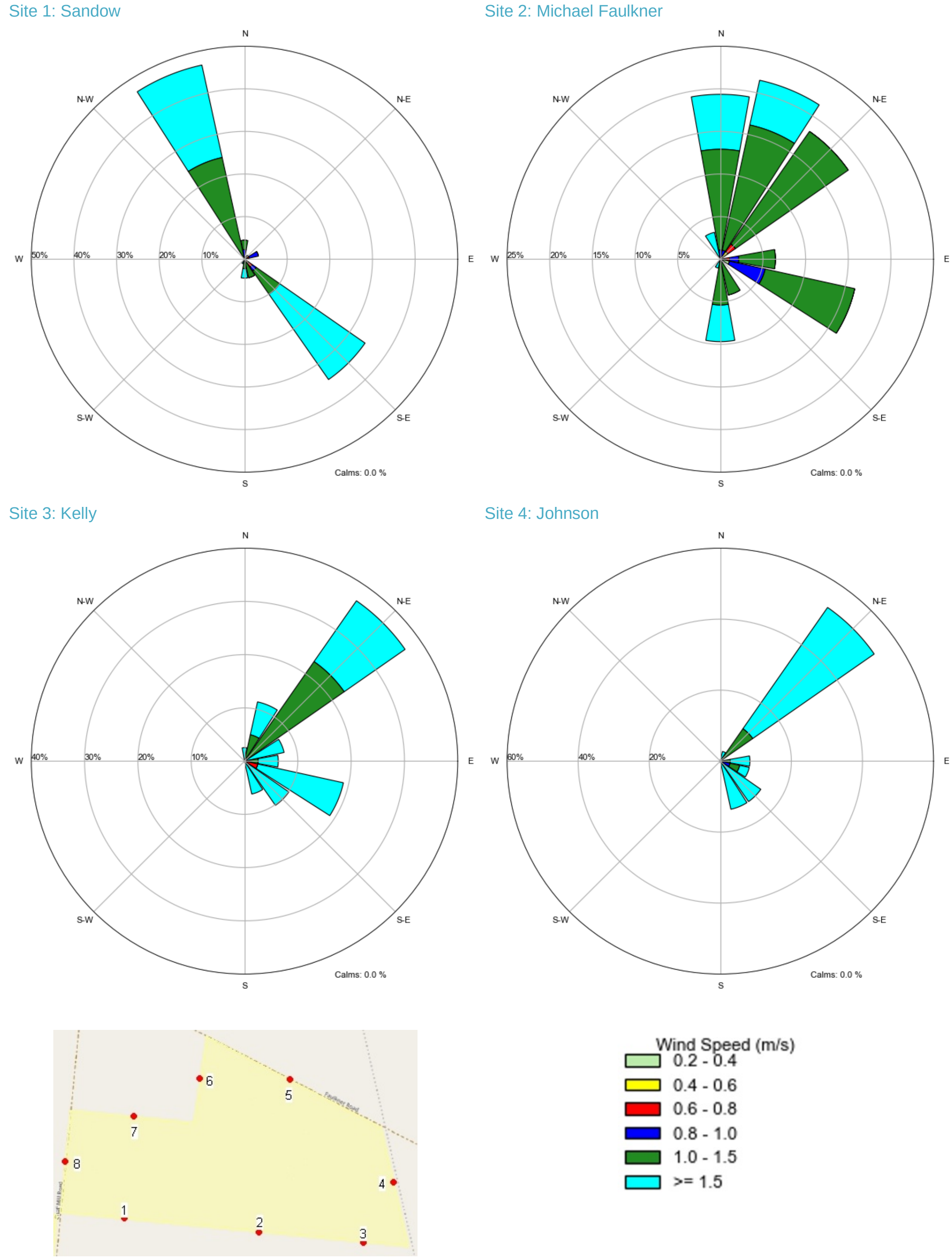
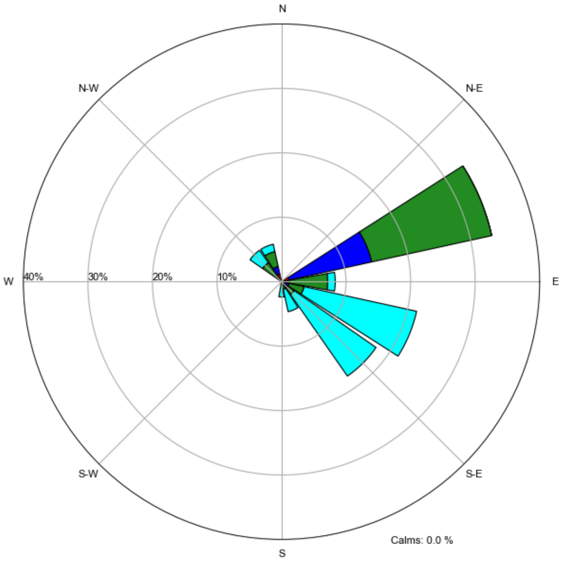


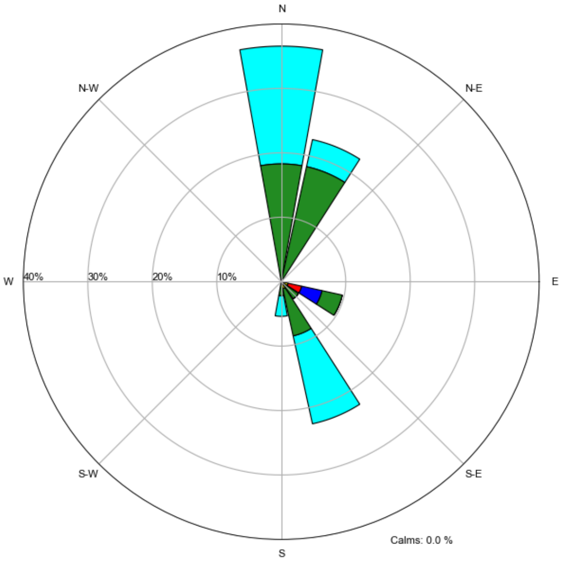
Figure 6-24 Analysis of flows crossing solar farm boundaries during potential frost events, Sites 1 to 4

Figure note: Potential frost forming conditions are assumed to occur when *CALMET* modelled meteorology extracted for the specified location matches the following conditions: Wind speed at 10 m ≤ 2 m/s; Temperature at 10 m ≤ 5°C; Pasquill Gifford stability class = F (very stable); and no rainfall during the hour. The 'calm' frequency refers to winds below 0.2 m/s.

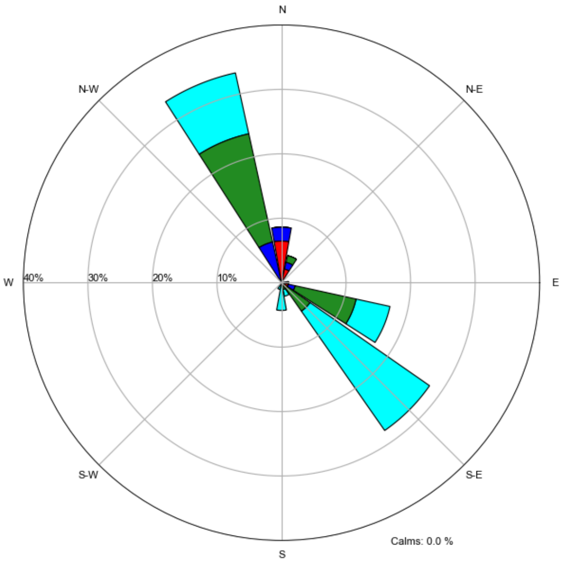
Site 5: John Faulkner



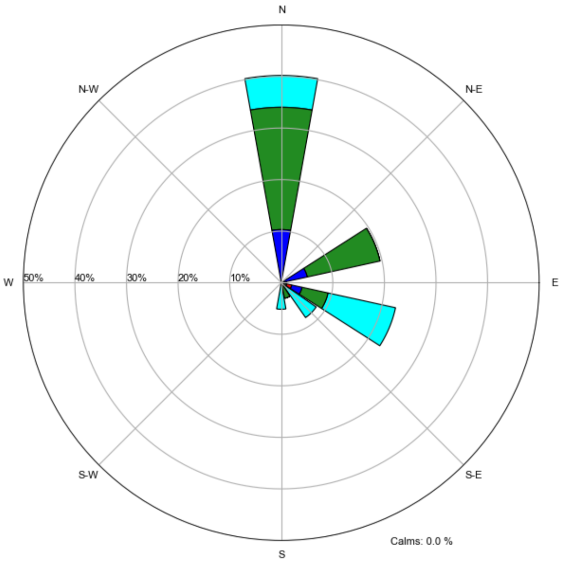
Site 6: John Faulkner

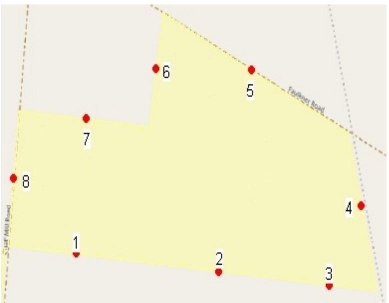


Site 7: John Faulkner



Site 8: Mitchell





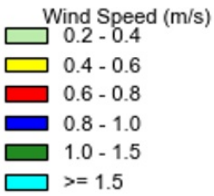


Figure 6-25 Analysis of flows crossing solar farm boundaries during potential frost events, Sites 5 to 8

Figure note: Potential frost forming conditions are assumed to occur when *CALMET* modelled meteorology extracted for the specified location matches the following conditions: Wind speed at 10 m ≤ 2 m/s; Temperature at 10 m ≤ 5°C; Pasquill Gifford stability class = F (very stable); and no rainfall during the hour. The ‘calm’ frequency refers to winds below 0.2 m/s.

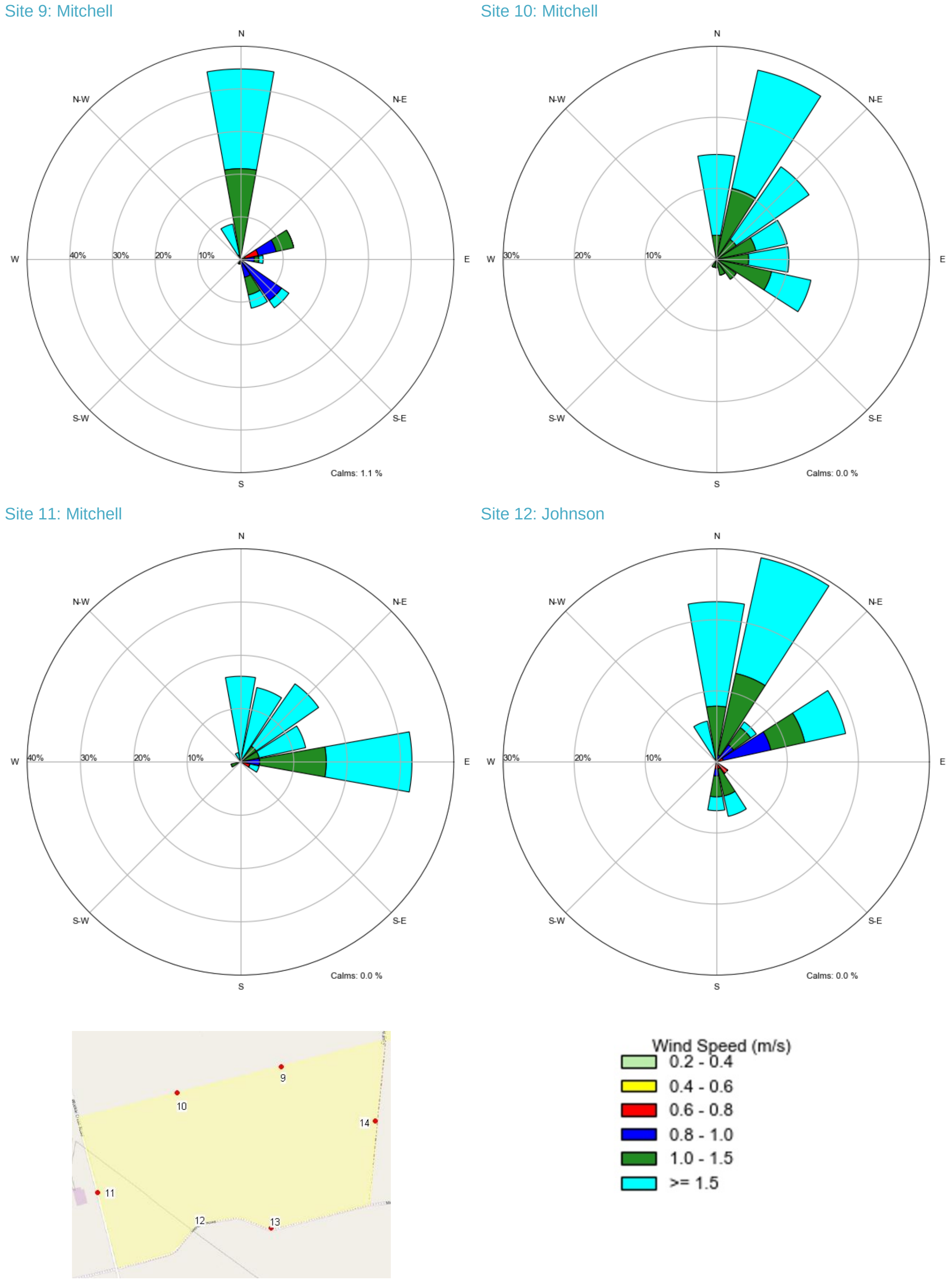


Figure 6-26 Analysis of flows crossing solar farm boundaries during potential frost events, Sites 9 to 12

Figure note: Potential frost forming conditions are assumed to occur when *CALMET* modelled meteorology extracted for the specified location matches the following conditions: Wind speed at 10 m ≤ 2 m/s; Temperature at 10 m ≤ 5°C; Pasquill Gifford stability class = F (very stable); and no rainfall during the hour. The 'calm' frequency refers to winds below 0.2 m/s.

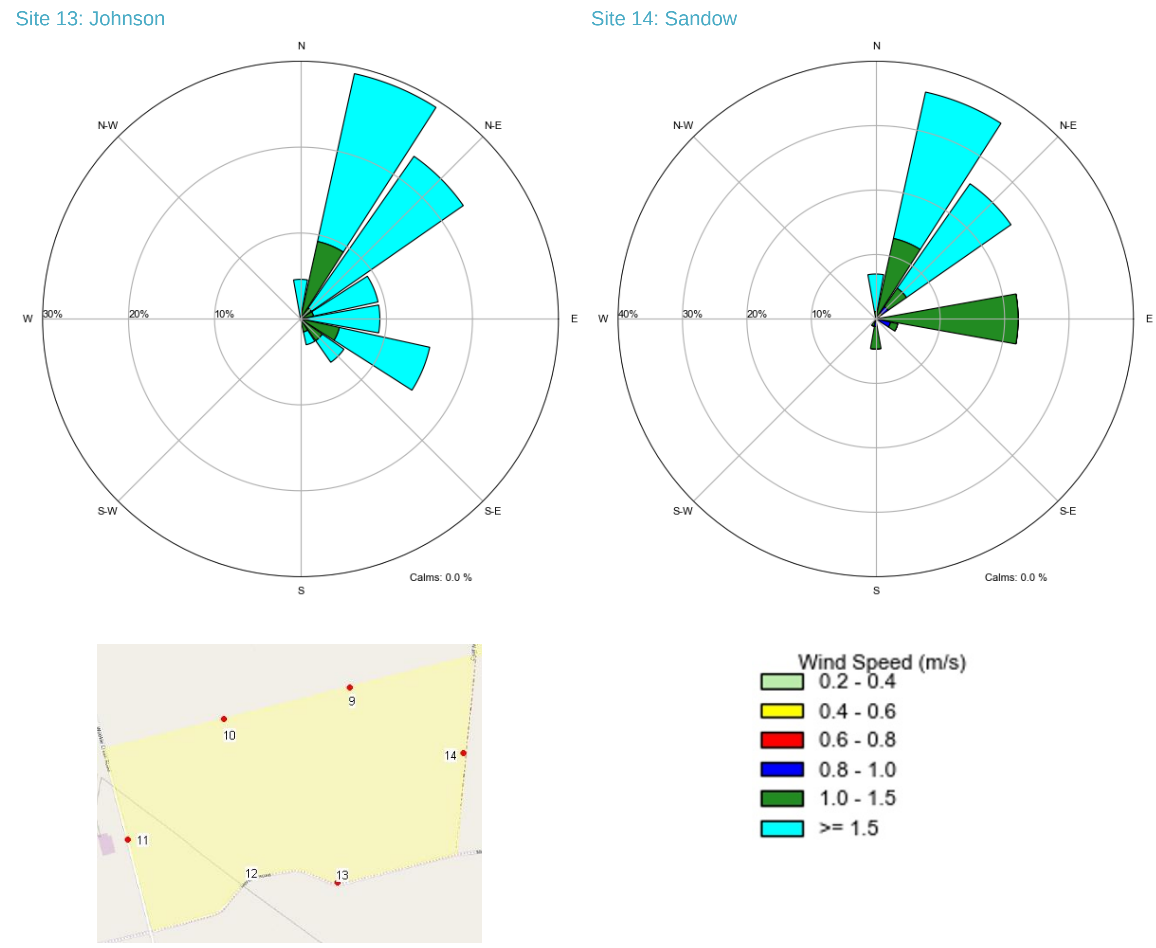


Figure 6-27 Analysis of flows crossing solar farm boundaries during potential frost events, Sites 13 and 14

Figure Note: Potential frost forming conditions are assumed to occur when *CALMET* modelled meteorology extracted for the specified location matches the following conditions: Wind speed at 10 m ≤ 2 m/s; Temperature at 10 m ≤ 5°C; Pasquill Gifford stability class = F (very stable); and no rainfall during the hour. The 'calm' frequency refers to winds below 0.2 m/s.

Results of this analysis are summarised in Table 6-4, which provides the range of wind speeds and temperatures, and the prevailing and next prevailing wind directions, occurring during potential frost events at each location. The number of potential frost hours varies across the 14 sites, ranging from a minimum of 36 hours at Site 4 (Johnson northeastern property – solar farm boundary), up to 102 hours at Site 12 (Johnson southern property – solar farm boundary). The wind roses for each site are highly skewed reflecting the limited number of predicted flow directions occurring under potential frost forming conditions.

Table 6-4 Analysis of frost hours at 14 locations along the boundary of the solar farm

Site	Owner	Easting	Northing	n	Min. 10m wind speed (m/s)	Ave. 10m wind speed (m/s)	Max. 10m wind speed (m/s)	Prev. 10m wind dirn	2nd Prev. 10m wind dirn	Min. 10m temp (°C)	Ave. 10m temp (°C)	Max. 10m temp (°C)
1	Sandow	293534	6247435	90	0.4	1.4	2.0	NNW	SE	3.3	4.4	5.0
2	M.Faulkner	294307	6247358	93	0.3	1.2	1.9	NNE	N	3.3	4.4	5.0
3	Kelly	294912	6247295	79	0.7	1.5	2.0	NE	ESE	3.2	4.4	5.0
4	Johnson	295085	6247646	36	0.9	1.6	2.0	NE	SE/ SSE	3.2	4.6	5.0
5	J.Faulkner	294486	6248234	84	0.7	1.4	2.0	ENE	ESE	3.2	4.4	5.0
6	J.Faulkner	293966	6248245	93	0.5	1.3	1.8	N	NNE/ SSE	3.3	4.4	5.0
7	J.Faulkner	293589	6248024	93	0.4	1.3	2.0	NNW	SE	3.3	4.4	5.0
8	Mitchell	293191	6247762	97	0.3	1.2	1.9	N	ESE	3.3	4.4	5.0
9	Mitchell	292382	6247265	94	0.1	1.3	1.9	N	SE	3.4	4.3	5.0
10	Mitchell	291600	6247068	88	1.0	1.5	2.0	NNE	NE	3.4	4.3	5.0
11	Mitchell	290998	6246320	56	0.6	1.5	2.0	E	NE	3.5	4.4	5.0
12	Johnson	291753	6246086	102	0.6	1.4	2.0	NNE	N	3.3	4.3	5.0
13	Johnson	292304	6246052	65	1.2	1.6	2.0	NNE	NE	3.3	4.3	5.0
14	Sandow	293086	6246854	86	0.4	1.5	2.0	NNE	NE	3.3	4.3	5.0

An analysis was conducted to determine the wind direction sector (out of sixteen sectors) at each location that would direct flows into the FRV Solar Farm from adjacent properties, at an angle normal to the site boundary. This 'centre wind sector' was enlarged to encompass the two adjacent 22.5° sectors on either side, providing a range of five wind direction sectors (total angle 112.5°). If flows were to travel across the site boundary during a potential frost event from these directions, and if they were subject to being blocked, then cold air may pool at locations upwind of the blockage.

Use of these sectors does not represent a comprehensive attempt at identifying blockage events or directions, however it does provide a basis for comparing the relative frost blockage risk across the 14 locations. It is important to note that this represents the existing flows across the region that currently occur during frost risk events that may already be present in the environment. It does not necessarily reflect blockage that would occur as a result of the FRV Solar Farm.

The results are summarised in Table 6-5, and show that Site 9—Mitchell currently experiences the greatest number of frost hours with predicted cross-boundary flow onto the solar farm (51 hours per year) when katabatic flows drain down the valley axis towards the south. This site would be most susceptible to blockage events if an obstacle were placed in the path of the flow.

The second most susceptible site is Site 14—Sandow (45 hours per year) which is subject to drainage flows from the northeast and east. It is important to note that northeasterly drainage flows at this site would have to travel through the eastern parcel prior to reaching Site 14. FRV have agreed to 'park' their solar array in a horizontal position at night in order to ensure that vertically aligned panels could not impede drainage flows. This will create rows of covered structures, which will stop longwave radiation from escaping to space and will re-radiate it back towards the ground. It is therefore expected that temperatures underneath the parked solar panels will be measurably warmer than those in the open under frost-forming conditions. The eastern solar farm parcel will likely provide a measure of frost mitigation to agricultural land abutting Site 14.

In contrast there were no identified frost risk hours at Sites 6—J. Faulkner and 8—Mitchell, as drainage flows at these sites under potential frost conditions do not cross from agricultural land into the Solar Farm site.

Table 6-5 Analysis of flows crossing the boundary into the FRV Solar Farm site during potential frost events

Site	Owner	Potential frost hours	On-site wind direction normal to boundary	Min. wind sector (/16)	Centre wind sector (/16)	Max. wind sector (/16)	Percent of filtered hours (%)	Frost hours with cross-boundary flow	Percent of total hours in year
1	Sandow	90	185	SE	S	SW	44.4	40	0.46
2	M.Faulkner	93	185	SE	S	SW	15.1	15	0.17
3	Kelly	79	185	SE	S	SW	16.5	14	0.16
4	Johnson	36	77	NNE	ENE	ESE	72.2	26	0.30
5	J.Faulkner	84	27	NNW	NNE	ENE	39.3	34	0.39
6	J.Faulkner	93	278	SW	W	NW	0.0	0	0.00
7	J.Faulkner	93	5	NW	N	NE	46.2	43	0.49
8	Mitchell	97	275	SW	W	NW	0.0	0	0.00
9	Mitchell	94	165	WNW	NNW	NNE	53.2	51	0.58
10	Mitchell	88	165	WNW	NNW	NNE	42	37	0.42
11	Mitchell	56	255	SSW	WSW	WNW	1.8	2	0.02
12	Johnson	102	166	ESE	SSE	SSW	16.7	18	0.21
13	Johnson	65	166	ESE	SSE	SSW	24.6	16	0.18
14	Sandow	86	95	NE	E	SE	51.2	45	0.51

7 Infrastructure Flow Blocking Potential

A detailed quantitative assessment of the wind drag and flow blocking potential of the solar farm and boundary fence was not conducted for this study. Such a study, comprising complex Computational Fluid Dynamics (CFD) modelling, was beyond the scope of this assessment. To address the potential for solar farm infrastructure to block air flows, a more qualitative approach was adopted. A discussion of this approach to assess solar farm air flow blocking potential is provided below.

It is noted that data and references to solar farm air flow blocking potential and frost exacerbation does not exist as this issue has never been raised previously in Australia or internationally.

7.1 Solar panels and array architecture

FRV has proposed several options for the geometric alignment of the solar panel tracker. The following set outs the architecture of the solar farm, panels and panel array considered in this assessment. Detailed schematic drawings of the panel array architecture are presented in Appendix C.

- The PV panel array will be aligned in a north-south axis alignment, in order for the tracker to tilt the panels to the east and west to follow the sun's daily path across the sky.
- Panels will be mounted side by side in portrait orientation and in two parallel rows either side of the tracker axis mounting bar. Panel groups will be arranged approximately 550 mm apart on the mounting frame.
- In sunlight hours, the tracker provides for a range of maximum tilt between 45° and 55°, resulting in a minimum panel ground clearance of between 400 and 500 mm and a maximum height of between 3,290 and 3,847 mm.
- At night, the panels will be parked in a horizontal (flat) alignment at between 1,902 and 2,364 mm above the ground.
- Panel frame mounting posts will be placed at 6,550 to 7,000 mm intervals.
- Rows of panels will be on average 9 m apart.
- The length, width and depth (thickness) of each individual solar panel is 1,971 (L) by 990 (W) by 100 (D) mm.
- Panels are arranged in groups of thirty, with fifteen panels fixed side by side, in two rows aligned end to end, with a 140 mm gap between the two rows.
- Panels are fixed to a mounting bar located between the end to end panels. The mounting bar is sitting atop primary and secondary mounting posts. Primary mounting posts support the motor and mounting bar to tilt the panel array and are positioned approximately 15.636 m apart. Secondary posts are situated 6.5 to 7 m apart.
- The height of each mounting post is 1,564 mm with a width of approximately 100 mm.

7.2 Flows through the solar farm

An assessment of the blocking potential of the solar panel array has been conducted by determining the surface area of the solar array cross section exposed to the horizontal wind as it passes through the solar farm. Based on the assumed dimensions of the array at the time of this study (as outlined Section 7.1), the view of the nocturnal cross-sectional area (XSA) of panels and posts (i.e., the side view of the panels at night when parked horizontally) has been determined from the east-west and north-south perspective.

7.2.1 East-West blocking potential

- Panel array XSA (between top surface of panels to ground and between primary mounting posts):
  - 1,902 mm (height of panel above ground)
  - 100 mm (panel thickness)
  - 30,176 mm (panel array length)

Therefore;

$$\frac{(1{,}902 + 100) * 30{,}176}{1{,}000{,}000} = 60.412 \text{ m}^2$$

- Panel edge XSA
  - 990 mm (panel width)
  - 100 mm (panel thickness)
  - 30 (number of panels per group)

Therefore;

$$\frac{990*100}{1{,}000{,}000} * 30 = 2.97 \text{ m}^2$$

- Posts XSA (one primary post and four secondary posts)
  - 2,002 mm (height of posts)
  - 100 mm (width of primary posts), account for one post per array group
  - 100 mm (width of secondary posts), account for four posts per array group

Therefore;

$$(((2{,}002 * 100) / 1{,}000{,}000) * 1) + (((2{,}002 * 100) / 1{,}000{,}000) * 4) = 1.001 \text{ m}^2$$

- Total blocking potential;

2.97 m^2 (Panel edge XSA) + 1.001 m^2 (Posts XSA) = 3.971 m^2

- As a proportion of total array XSA = 6.6%

It is important to understand that when panels are stored in their horizontal stow position at night, only the vertical posts will block air moving at the surface, as the panel array will be located 1,902 mm above the ground. Cold air will be free to move at the surface and will only be impeded by the posts and not by the panel array.

The flow will be stable, and if it extends above the panel array height then the panel interference will occur at a height range between 1,902 mm and 1,902+100=2,002 mm above the ground. Some of the flow in this height range will be directed below the panel array, with the remainder being lifted to above the panel array. If there is any blockage by the panels, then the upstream parcel of blocked cold air will remain at its original height (1,902 mm to 2,002 mm) due to buoyancy forces associated with stable flow. Once the flow has passed through the solar array then buoyancy forces will restore the displaced flow back to its original height.

It is therefore very unlikely that the solar panel array will act as a blocking mechanism indicating that the blockage calculations presented above are overly conservative. As such it is worth repeating them only taking into account the vertical poles and neglecting the area of the horizontal panel array. When this is performed the total east-west blocking potential by the solar farm is reduced to 1.6 %, which is more realistic of any actual blocking effect.

7.2.2 North-South blocking potential

The solar array has a slightly different blocking silhouette in the north-south direction to that presented in the east-west direction. This changes the blocking potential to 4.08 % for north-south orientated flows if the solar array is accounted for, and 2.00 % if it is neglected and blockage is only associated with vertical posts.

7.3 Flows through fence lines

As the solar farm is an electrical installation, it is a legal requirement to establish a security fence surrounding the site. FRV are required to construct a 2 m high chainwire fence, with an additional 0.3 m high barbed wire section atop the chainwire portion, around the site.

A chainwire fence is comprised of a mesh of 'diamonds' as shown in Figure 7-1. Each diamond is essentially a square shape, which is rotated so that its points are aligned vertically and horizontally. The distance between parallel wires, as shown in Figure 7-1, is known as the pitch, with chainwire being available in the following pitch sizes:

- 25 mm
- 32 mm
- 40 mm
- 45 mm
- 50 mm
- 60 mm
- 100 mm.

The Australian standard AS1725 (2010) requirement for a security fence is a 50 mm pitch with posts at 3.3 m intervals.

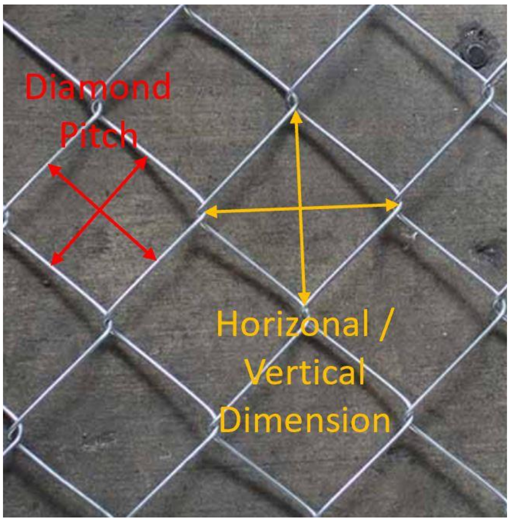


Figure 7-1 Characteristic dimensions of chainwire mesh

The blocking percentage for a security fence with a 50 mm chainwire pitch is calculated using the following procedure:

- Calculate the cross-sectional area of a single fence 'panel' (from the centre of one pole to the centre of the adjacent pole)
  - Fence height = 2,100 mm, based on the closest available chainwire size to 2 m.
  - Distance between fence poles = 3,300 mm (pole centre to pole centre), which is a standard distance for intermediate poles along a security fence.
  - Cross-sectional area of a single fence "panel":

$$= (2,100 * 3,300)/1000,000 = 6.930\ m^2$$

- Calculate the blocking area of wire used in a single diamond:
  - Each diamond is formed from lengths of wire delimiting the four edges, with each length also being used to form the side of an adjacent diamond. The length of wire per diamond is therefore:

$$pitch/2 + pitch/2 + pitch/2 + pitch/2 = 2*pitch$$

  - Assuming pitch = 50 mm:

$$\text{Wire length per diamond} = 2 * 50 = 100\ mm$$

  - Assuming a light duty wire gauge of 2.5 mm:

$$\text{Wire area per diamond} = 100 * 2.5 = 250\ mm^2$$

- Calculate the number of diamonds in a single fence panel:
  - The vertical/horizontal dimension (distance between opposite points of a diamond, see Figure 7-1) is calculated using Pythagoras' theorem:
  - Vertical/horizontal distance = sqrt(pitch2 + pitch2) = sqrt(502+ 502) = 70.7 mm
  - Number of diamonds high = fence height / vertical distance = 2,100 / 70.7 = 29.7
  - Number of diamonds wide = panel width / horizontal distance = 3,300 / 70.7 = 46.7
  - Number of diamonds per panel = 29.7 * 46.7 = 1,386.0
- Calculate blocking area of wire in a panel:
  - Blocking area of wire mesh in a panel:

$$= (\text{number of diamonds} * \text{wire area per diamond})/1000,000$$

$$= (1,386 * 250)/1000,000 = 0.347\ m^2$$

- Calculate blocking area of poles (assuming panel width = distance from pole centre to pole centre):
  - Blocking area of single pole = (pole diameter/2) * pole height.
  - Assume pole diameter = 80 mm (estimate).
  - Blocking area of single pole = (80/2) * 2,100 / 1000,000 = 0.084 m2
  - Blocking area of both poles = 0.084 m2 + 0.084 m2 = 0.168 m2
- Calculate blocking area of fence panel:

  Blocking area of fence panel = Blocking area of wire mesh in a panel + Blocking area of poles

$$= 0.347\ m^2 + 0.168\ m^2 = 0.515\ m^2$$

- Blocking percentage for the security fence:

= 100 * Blocking area of fence panel/ Cross-sectional area of fence panel

= 100 * 0.515 / *6.930 = 7.4 %*

The blocking percentage is calculated using this approach in Table 7-1 for all available chainwire pitch sizes, showing that blocking percentage varies between 12.4% for a 25 mm pitch down to 4.9% for a 100 mm pitch. The Australian standard for fence pitch of 50 mm was determined to have a blocking factor of 7.4%.

Table 7-1 Blockage calculations for a chainwire fence panel for different pitch dimensions

	Diamond pitch (mm)[1]						
Parameter	**25**	**32**	**40**	**45**	**50**	**60**	**100**
Vertical/horizontal dimension of diamond (mm)	35.4	45.3	56.6	63.6	70.7	84.9	141.4
Number of diamonds high	59.4	46.4	37.1	33.0	29.7	24.7	14.8
Number of diamonds wide	93.3	72.9	58.3	51.9	46.7	38.9	23.3
Total number of diamonds per panel	5544.0	3383.8	2165.6	1711.1	1386.0	962.5	346.5
Wire length per diamond (mm)	50	64	80	90	100	120	200
Wire area per diamond (mm^2)	125	160	200	225	250	300	500
Cross sectional area of poles (m^2)	0.168	0.168	0.168	0.168	0.168	0.168	0.168
Cross sectional area chainwire mesh (m^2)	0.693	0.541	0.433	0.385	0.347	0.289	0.173
Cross sectional area poles plus mesh (m^2)	0.861	0.709	0.601	0.553	0.515	0.457	0.341
Cross section area panel (m^2)	6.930	6.930	6.930	6.930	6.930	6.930	6.930
Blocking percentage	**12.4%**	**10.2%**	**8.7%**	**8.0%**	**7.4%**	**6.6%**	**4.9%**

Table Note: [1]Assumes fence height = 2,100 mm; Distance between pole centres = 3,300 mm; Wire gauge = 2.5 mm; Pole diameter = 80 mm

7.4 Air temperature and radiative heat loss

As previously stated, the solar array will be stowed in a horizontal configuration during night time hours. Under clear skies at night, when radiative divergence from the surface is at its greatest, there will be a noticeable difference in air temperature underneath the solar array compared with that in the open areas between the panel rows. The solar array will act as a radiative screen (see Section 3.3.1) to trap longwave radiation that would otherwise be emitted to space and will re-radiate this energy back to the ground. The layer of cold air at the surface will consequently be warmed. This is a well-known phenomenon occurring in forests where forest clearings are colder in temperature under frosty conditions than adjacent areas under the canopy of trees. The solar array will therefore act as a reservoir of slightly warmer air within the array structure, which may raise ambient temperatures beyond the edge of the solar panel array before returning to ambient temperature.

8 Interpretation of Study Findings

8.1 Topography

The analysis of regional topography has shown that whilst at first glance the terrain appears to be simple and flat, with gentle undulations, it is actually complex in form and is bounded to the west and east by well-defined ridges. This complexity increases at the local scale, with the 30 m DEM revealing numerous rises and declivities, which are highlighted in the 3D surface maps of the solar farm site. Regardless of the scale, the major terrain feature at the site is the north/south-aligned drainage gully running through the centre of the western parcel. Air Environment understands that the current landowner of this site has stated that this creek is a dominant path for cold air drainage flows.

The terrain analysis showing slope and aspect vectors highlights the complexity as the slope direction is rarely uniform in any portion of the region. The watershed maps present a first-pass view of potential drainage flow directions throughout the region. Both the terrain and watershed analyses are based on the 30 m DEM, which could be envisaged as a grid of 30 m cells, each at the average terrain height of the enclosed region. The watershed analysis provides a detailed view of the paths that water would take as it drains through the landscape from grid cell to grid cell. If a grid cell is elevated in comparison to adjacent cells, water is assumed to overflow into the lowest adjacent cell. If a cell or cells form a hollow, then this is assumed to fill with water and eventually overflow in the direction of lowest elevation. The streamlines trace this path as water flows from cell to cell.

The principles underlying the watershed map are therefore analogous to katabatic drainage flows. The weakness of the analogy however is that the analysis is derived purely on flows from adjacent cells and there is no knowledge of the combined effect of upstream cells and of the physical processes causing the development of regional drainage flows through the environment. The watershed analysis therefore represents potential flows as the katabatics commence, however these localised flows will be overwhelmed as the flows become more developed and the dominant regional flows become established off the valley walls and along the valley axis. Whilst being informative, the terrain analysis therefore has less explanatory ability than the meteorological modelling, which is informed by the 30 m DEM, and explicitly models drainage flows from first principles.

8.2 Regional meteorological observations

The analysis of meteorology collected by the BoM at the Clare High School AWS over a 24 year period identifies the times of day and year when air temperatures are coldest (10pm to 8 am, June to August) and winds are lightest, which are therefore most conducive to frost formation. The BoM predicts that the Clare region experiences between 10 and 20 days a year when frost may form, based on the frequency of observed screen level temperatures below 2°C.

The BoM meteorology was utilised to identify a year with a large potential for frost events to occur. The year 2006 was selected based on a large temperature anomaly in the -4°C to 3°C temperature range and 110 hours where the screen-level temperature was below zero.

8.3 Discussion of meteorological modelling results

The TAPM meteorological model was successfully evaluated and was shown to possess skill in predicting wind speed, the U and V components of wind, temperature, and relative humidity. It was found to predict the frequency of light winds under 2 m/s and the frequency distribution of wind direction well, however it underestimated the frequency of screen-height temperature between 0°C and 3°C and failed to predict the presence of sub-zero temperatures.

Seventeen potential frost events were identified, comprising a total of 90 hours, at a location close to the centroid of the two solar farm sites. Events were selected using four simple criteria relating to low wind speed and air temperature, a stable Pasquill Gifford stability class and the lack of rainfall. The additive effect of the four criteria proved to be remarkably successful in predicting potential frost events given that the selected events each lasted for multiple consecutive hours overnight and into the early morning hours and ended at dawn. Potential frost events were predicted for the winter and spring months, and were each associated with the passage of an anticyclone over the site bringing clear skies and consequent radiative divergence (heat loss).

Only one of the selected events (Event 12) had to be discarded as its single hour duration, lack of drainage flows and the presence of rainfall in the area suggested that this was not a frost event. Sixteen potential frost events were therefore identified, which compares well with the BOM prediction of between 10 and 20 days of frost per year and suggests that in this extreme modelling year the meteorological model successfully identified the most severe of these events, enabling this detailed investigation.

The modelled wind fields for the final hour of each predicted frost event indicate that:

- Winds were light during each event (i.e. < 2 m/s at 10 m above the ground) and were decoupled from the synoptic-scale flows, instead flowing off and along terrain features.
- Broad scale easterly katabatic flows are predicted to occur as cold air drains off the ridges to the east of the site. This is in accordance with the observations recorded by the BOM at Clare High School.
- The well-defined gully along the creek line in the western parcel was found to provide a natural drainage course for katabatic flows occurring under potential frost conditions. This prediction aligns with anecdotal evidence from the site landowner.
- Predicted wind fields fall into one of three patterns:
  - Uniform northeasterly drainage flows off the ranges to the east, becoming less coherent to the west as the flow interacts with terrain features, and reaching the eastern and western parcels as northerlies. The creek line at the western parcel is an important drainage discharge pathway.
  - Uniform easterly drainage flows off the ranges to the east draining into the creek line gully on the western parcel. Occasionally katabatic flows will also drain off the western ranges (e.g. Event 9) and will merge with those from the east, with both flows discharging into the western farm gully.
  - If the katabatic flow off the eastern ranges has a southeasterly component, then the flow may travel up the creek line gully on the western parcel from south to north.
- The meteorological model was therefore able to successfully predict the presence and path of katabatic flows as they regularly drain off the landscape under potential frost forming conditions, even though sub-zero temperatures were not predicted at screen height for Clare High school. The model predicted minimum temperatures at a height of 10 m above the ground of between 3.2 and 3.5°C at the 14 cross-boundary locations investigated. Under intense inversion conditions sub-zero conditions could readily be achievable at the surface. It is also important to note that once katabatic flows become well established, their strength (speed) will increase with lower temperatures however their direction will be unchanged. The meteorological model’s underestimation of air temperature will therefore not affect the direction of its predicted drainage flows.
- These flows are regular in occurrence and characterise the “natural flows over the region”. They are not uniform however, exhibiting a large amount of perturbation as the regional katabatic flows interact with local terrain features. It is therefore difficult in the absence of a detailed atmospheric dispersion modelling study or a well-placed network of meteorological monitoring stations to predict the precise directions that drainage flow will arrive from during frost events.

8.4 Cross boundary flows into the solar farm site

Meteorological model results were extracted for fourteen evenly spaced locations around the boundary of the solar farm. An analysis of cross-boundary flows into the solar farm site showed a wide variation in the frequency of cross-boundary flows under frost-forming conditions. These inter-site differences reflect the complexity of the terrain and flow characteristics and would be difficult to predict without the aid of a detailed meteorological model.

Site 9 (Mitchell - FRV property boundary) was predicted to be subjected to 51 hours per year (0.58% of the hours in the year), during the worst-case year of 2006, when katabatic flows would cross into the solar farm site under frost-forming conditions. Other sites, such as Site 6 (J. Faulkner - FRV property boundary) and Site 8 (Mitchell - FRV property boundary) were not predicted to experience any katabatic flows towards the solar farm site and hence are considered not to have an increased risk of frost from air flow blocking due to the construction and operation of the solar farm.

The pattern of potential blocking events (i.e., wind flows from a neighbouring agricultural property over the boundary and into the solar farm site), if this were to occur, would therefore be complex and difficult to predict, with location-specific mitigation measures being difficult to implement with any degree of precision.

8.5 Blocking potential of solar panel infrastructure

The representation by Mr Michael Faulkner to the State Commission Assessment Panel (Faulkner, 2018, p.10) states that:

> *Any object that elevates the radiative surface in the lowest points in the landscape or provides a physical barrier to cold air drainage will result in cold air accumulating up slope from that barrier. Frost damage will invariably occur up slope of the barrier.*
>
> *In real terms a barrier is any impediment to mass flow of cold air. Grass weeds, fencelines, trees, buildings are all impenetrable barriers to mass movement. The barrier does not have to be solid as the mass flow moves very slowly and does not have the momentum to 'force' or 'burst' its way through any sort of barrier. The colder the air mass the more dense it is, and the more easy it is to block. It is estimated that blocking mass air movement can be achieved if the barrier has as little as 5% structural material.*

The blocking potential of the solar panel infrastructure was therefore determined based on the vertical silhouette of the solar farm array from the east-west and north-south directions. These directions were chosen to align with the dominant katabatic flows from the east, which are subsequently directed towards the south by terrain elements. Drainage flows travelling from the east have a blocking potential of 6.6% from the solar farm. A significant proportion of this blocking potential occurs from the 100 mm thick trackers containing the solar array, at a height of around 1.9 m above the ground. Drainage flows are therefore largely unimpeded at ground level as grass and weed height will be maintained at a low level, and any blockage at a height of 1.9 m will not be propagated down towards the surface due to the stable nature of the flow. As discussed in Section 3.4, wind flow observations around stands of trees and crops with stems and trunks indicate a decrease in wind velocity within their canopy with an increase in wind speed between the base of the canopy and the ground where the wind is less impeded. This will occur within the solar panel array. Consequently, when the trackers are removed from the blockage calculations the blocking potential only arises from the vertical posts and therefore reduces to 1.6%. For drainage flows towards the south, the blocking potential is 4.1%, however this reduces to 2.0% if the elevated blockage from the trackers is neglected.

It is therefore clear that blockage from the solar array is below the 5% blockage rate quoted in Mr Faulkner's submission. Furthermore, as previously noted, obstructions to flow by linear barriers such as walls, hedges and tree lines, fence lines and embankments can be lessened or mitigated by providing gaps or diversionary channels for the cold air to break through and drain away, reducing its accumulation. (Oke, 1987, p. 237)

The site layout plan shows that rows of panels will be sited approximately 9 m apart, providing large diversionary channels in the unlikely event that they are required. FRV have also rearranged their site layout plan to ensure that there will be no panels within the drainage gully on the western parcel. This important drainage path will therefore not be blocked in any manner, and its radiative surface, which is at the lowest point in the landscape, will not be elevated.

8.6 Blocking potential of the boundary security fences

FRV are legally required to establish a chainwire security fence around the perimeter of the solar farm as it is an electricity generation installation. They originally planned to create the 2 m high fence using a standard chainwire pitch of 50 mm with an additional 0.3 m barbed wire portion atop the chainwire. Such a fence would have a blocking potential of 7.4%. FRV subsequently investigated the possibility of increasing the pitch to 100 mm thereby reducing the blocking potential to 4.9 %. However, it was determined that a chainwire fence pitch of 50 m was required for compliance with the Australian standard.

FRV has also agreed to maintain weeds along the inside of their fence line to ensure that they cannot become blockage sources. The boundary fence is therefore not considered to be a potential flow blockage source.

8.7 The warming effect of the solar array

The discussion so far has focussed on the potential for the solar farm to block cold air drainage flows allowing cold air to accumulate uphill from the boundary thereby exacerbating frost events. The solar farm may be a beneficial component to the environment as it may act as a heat sink, and the horizontally parked solar arrays act to block longwave radiation emitted from the ground surface and re-radiate it towards the ground. These two effects will both act to increase air temperature under the arrays. This slightly warmer air will drain downhill and in the near field may have a limited frost mitigating effect on adjacent agricultural properties.

8.8 Other considerations

As Air Environment has conducted this assessment, many other relevant considerations have become apparent:

- In his submission, Mr Michael Faulkner stated, "*It is estimated that blocking mass air movement can be achieved if the barrier has as little as 5% structural material*". Air Environment acknowledge the plausibility that barriers with a high porosity may still affect mass air movement, however the precise degree at which adverse effects to air flow occur is uncertain. A literature review conducted by Air Environment failed to identify a precise threshold for causing cold air flow blockage in the environment. Furthermore, we know of no standard or guideline for assessing cold air drainage blocking potential in the environment. Our use of a 5% blocking factor threshold is solely to facilitate a comparison with Mr Faulkner's claim.
- The Clare Valley is a prominent wine region. The blockage potential of a vineyard is considered to be significantly greater than that of the planned solar array, however vineyards are not subject to any planning controls relating to frost formation and blockage.
- Similarly, the crops surrounding the solar farm site would all be potential blockage sources in their own right. Any crops or agricultural structures located downhill from a neighbouring property could be a potential blockage source, however once again these are not subject to planning controls.
- No other landowner in the region is restricted in terms of the fences they are allowed to establish around their property. The fence surrounding the solar farm site is a legal requirement, however it

also has important security and public safety functions. It is therefore a necessary feature of the proposed development.

- A close examination of satellite imagery for the region surrounding the solar farm site shows that well-defined barriers are already present in the environment:
  - The railway line which passes the eastern boundary of the eastern parcel is lined by a long row of shrubs/trees with a significant blocking potential to drainage flows from the east.
  - The northern boundary of the eastern parcel, along Faulkner Rd, is similarly lined with a dense row of shrubs/trees with a significant blocking potential to drainage flows from the north.
  - Most of the residential properties in the region are surrounded by trees, presumably for both privacy and wind break purposes. Many of these have the potential to block northerly and/or easterly drainage flows.
  - The southeastern portion of western parcel, and the adjacent agricultural land in other ownership, is heavily treed forming a significant potential barrier along the western boundary of the western parcel. There are also dense vegetative barriers on the western side of Wocke Creek Road, particularly in the vicinity of the electrical substation.
  - There are agricultural buildings, such as the two large sheds on the Johnson property opposite Mr Michael Faulkner's property on Mintaro-Merildin Rd. These are oriented towards the east and have a large blocking potential for easterly drainage flows.

9 Conclusions

FRV is seeking Development Approval for the construction and operation of a solar farm, at a location northeast of Mintaro in the Clare Valley region of South Australia. The solar farm array would be constructed on a 380 ha site comprising approximately 360,000 solar panels with an approximate height of three metres above ground, mounted on single-axis tracker framing. The agricultural land adjacent to the solar farm comprises grazing and cropping areas that are largely cleared of natural vegetation.

A 30 m DEM was developed from SRTM observations, revealing the ranges of hills to the west and east of the site, which are important controls on wind direction, numerous small rises and declivities across the solar farm site, in addition to the north/south-aligned drainage gully running through the centre of the western parcel. A watershed analysis of flows arising from differential terrain heights provided a first-pass assessment of katabatic flow directions. This was considered to provide a good indication of localised flows as katabatics commence, and it confirmed the importance of the gully in the western parcel. The analysis did not however account for the valley wide drainage flows becoming established off the walls of the surrounding ridges and draining towards the south along the valley axis.

An analysis of BoM observations collected at the Clare High School AWS over a 24 year period, selected the year 2006 to model in detail. This year was selected due to the large anomaly in the frequency of screen height (1.2 m) temperatures in the -4°C to 3°C temperature range, suggesting that this year had the greatest potential for frost forming conditions.

Meteorology for the FRV solar farm site was modelled using a hybrid TAPM/CALMET approach, with the CALMET model being configured at a horizontal spatial resolution of 50 m. An assessment of TAPM predictions for the BoM Clare High School observation site showed that the TAPM predictions possessed skill at predicting wind speed, wind U and V vector components, air temperature, and relative humidity and were consequently suitable to characterise meteorological flows throughout the region.

Potential frost events were selected for hours when all of the following conditions were met:

- Modelled wind speed at 10 m above the ground was at or below 2 m/s
- Modelled air temperature at 10 m above the ground was at or below 5°C
- Modelled Pasquill Gifford Stability class was F (very stable) and
- There was no rain predicted.

Sixteen potential frost events were identified. Each of these occurred overnight or during the early morning and ended at dawn, was associated with the passage of an anticyclone over the region bringing clear skies and occurred during the winter to spring period. Predicted surface wind fields (i.e. at a height of 10 m above the ground) were assessed for the final hour of each event, when frost would be at its most intense and katabatic flows most developed. The wind fields each show katabatic flows which were decoupled from the prevailing synoptic flows. Three characteristic patterns were found:

- Uniform northeasterly drainage flows off the ranges to the east, becoming less coherent to the west as the flow interacts with terrain features, and reaching the eastern and western parcels as northerlies. The creek line at the western parcel is an important drainage discharge pathway towards the south.
- Uniform easterly drainage flows off the ranges to the east draining into the creek line gully on the western parcel. Occasionally katabatic flows will also drain off the western ranges and will merge with those from the east, with both flows discharging into the gully on the western parcel.
- If the katabatic flow off the eastern ranges has a southeasterly component, then the flow may travel up the creek line gully on the western parcel from south to north.

In each case the creek line on the western parcel played a critical role in providing a path for the wind to flow across the landscape. This gully area will be free from any built obstruction with the solar array being situated well back from the gully.

The potential for the solar panel arrays and boundary security fences on each of the solar farm sites to block the flow of cold dense drainage air and accumulate upwind of an obstruction to cause frost was assessed by determining the cross-sectional area of their silhouette. Both the solar array was determined to occupy less than 5% of the area between the ground and the top of each structure. The security fence with a 50 mm pitch was determined to occupy 7.4% of the area between the ground and the top of chainwire structure. In addition to this, neither structure is solid and continuous. The array has significant space for air flow below the stowed solar panels at night and between the mounting posts. The chainwire fence will have the maximum allowable 50 mm pitch between the links, providing for air to flow through the structure.

The solar array is also likely to act as a heat sink, and the horizontally stowed panels will also prevent longwave radiation emitted from the ground surface to escape to space under clear skies at night, effectively 'closing the atmospheric window' and absorbing and re-radiating the long wave radiation towards the ground. Both effects will contribute to an increase in air temperature under the arrays. The slightly warmer air will drain downhill and, in the near field, is likely to slightly alleviate the cold near surface air temperature, reducing the frost risk rather than increasing it on adjacent agricultural properties.

By comparison with the solar farm, other common agricultural practices and features in the local area are expected to provide a greater potential for air flow blocking. Vineyards, wheat and other crops, road and rail line embankments, tree lines, shed and building structures and areas of natural vegetation with multi-storey canopies may all feature in this environment and are considered to have a greater wind blocking potential than the FRV site.

10 References

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Chaff Mill Solar - Development Plan Provisions

PRIMARY PRODUCTION ZONE

OB 1 - Economically productive, efficient and environmentally sustainable primary production, including cropping, grazing, viticulture and intensive animal keeping.

OB 3 – Protection of primary production from encroachment by incompatible land uses and protection of scenic qualities of rural landscapes.

OB 6 – Accommodation of wind farms and ancillary development

OB 7 – Development that contributes to the desired character of the zone

PDC 1 – The following forms of development are envisaged in the zone:

- bulk handling and storage facility
- commercial forestry
- dairy farming
- farming
- horticulture
- intensive animal keeping
- tourist accommodation (including through the diversification of existing farming activities and conversion of farm buildings)
- wind farm and ancillary development
- wind monitoring mast and ancillary development.

PDC 3 – Wind farms and ancillary development should be located in areas which provide opportunity for harvesting of wind and efficient generation of electricity and may therefore be sited:

(a) in visually prominent locations
(b) closer to roads than envisaged by generic setback policy

PDC 6 – Buildings should primarily be limited to farm buildings, a detached dwelling associated with primary production or a tourist-related use on the allotment and residential outbuildings that are:

(a) grouped together on the allotment and set back from allotment boundaries to minimise the visual impact of buildings on the landscape as viewed from public roads
(b) screened from public roads and adjacent land by existing vegetation or landscaped buffers

PDC 9 – Development should not be undertaken unless it is consistent with the desired character for the zone.

PDC 11 – Development which would remove productive land from agriculture, or diminish its overall productivity for primary production should not be undertaken, unless the land is required for essential public purposes or the processing of organic waste

<u>Desired Character</u>

The role of the zone is to accommodate cropping and grazing activities on large rural land holdings and viticulture on small to medium sized allotments. The rural area is predominantly characterized by rolling pastures with stands of remnant vegetation with a variety of agricultural activities. The zone is of significant asset to the district and comprises of some of the regions most productive rural land which is capable of supporting a wide range of agriculture. Accordingly, it is desirable that no further fragmentation of rural properties be limited and that smaller properties be consolidated into larger holdings. Efforts should be made to revegetate the landscape in many parts of the zone with trees using locally indigenous species.

Wind farms and ancillary development such as substations, maintenance sheds, access roads and connecting power-lines (including to the National Electricity Grid) are envisaged within that part of the zone outside of Horticulture Policy Area 2 and constitute a component of this part of the zone's desired character. These facilities will need to be located in areas where they can take advantage of the natural resource upon which they rely and, as a consequence, components (particularly turbines) may need to be:

- located in visually prominent locations such as ridgelines
- visible from scenic routes and valuable scenic and environmental areas
- located closer to roads than envisaged by generic setback policy.

This, coupled with the large scale of these facilities (in terms of both height and spread of components), renders it difficult to mitigate the visual impacts of wind farms to the degree expected of other types of development. Subject to implementation of management techniques set out by general / council wide policy regarding renewable energy facilities, these visual impacts are to be accepted in pursuit of benefits derived from increased generation of renewable energy.

COUNCIL -WIDE

Renewable Energy Facilities:

OB 1 – Development of renewable energy facilities that benefit the environment, the community and the state.

OB 2 – The development of renewable energy facilities, such as wind farms and ancillary development, in areas that provide opportunity to harvest natural resources for the efficient generation of electricity.

OB 3 – Location, siting, design and operation of renewable energy facilities to avoid or minimise adverse impacts on the natural environment and other land uses.

PDC 1- Renewable energy facilities, including wind farms and ancillary development, should be:

(a) located in areas that maximize efficient generation and supply of electricity; and

(b) designed and sited so as not to impact on the safety of water or air transport and the operation of ports, airfields and designated landing strips.

PDC 2(b) - The visual impacts of wind farms and ancillary development (such as substations, maintenance sheds, access roads and wind monitoring masts) should be managed through… provision of vegetated buffers around substations, maintenance sheds and other ancillary structures.

Infrastructure:

OB 2 - The visual impact of infrastructure facilities minimised

OB 3 – The efficient and cost-effective use of existing infrastructure

PDC 1(a) – Development should only occur where it has access to adequate utilities and services, including… electricity supply

PDC 10 - Electricity infrastructure should be designed and located to minimise visual and environmental impacts

PDC 11 – Utilities and services, including access roads and tracks, should be sited on areas already cleared of native vegetation. If this is not possible, their siting should cause minimal interference or disturbance to existing native vegetation and biodiversity.

PDC 12 - Utility buildings and structures should be grouped with non-residential development, where possible

Interface Between Land Uses:

OB 1 - Development located and designed to minimise adverse impact and conflict between land uses.

Siting and Visibility:

OB 1- Protection of scenically attractive areas, particularly natural and rural landscapes

PDC 1(a) – Development should be sited and designed to minimise its visual impact on… the natural, rural or heritage character of the area

PDC 1(b) – Development should be sited and designed to minimise its visual impact on… areas of high visual or scenic value, particularly rural areas

PDC 2 – Buildings should be sited in unobtrusive locations and, in particular, should:

(a) be grouped together

(b) where possible be located in such a way as to be screened by existing vegetation when viewed from public roads

PDC 4 – Buildings and structures should be designed to minimise their visual impact in the landscape, in particular:

(a) the profile of buildings should be low and the roof lines should complement the natural form of the land

(b) the mass of buildings should be minimised by variations in wall and roof lines and by floor plans which complement the contours of the land

(c) large eaves, verandas and pergolas should be incorporated into designs so as to create shadowed areas that reduce the bulky appearance of buildings

PDC 5 – The nature of external surface materials of buildings should not detract from the visual character and amenity of the landscape

PDC 8(b) - Development should be screened through the establishment of landscaping using locally indigenous plant species… along allotment boundaries to provide permanent screening of buildings and structures when viewed from adjoining properties and public roads

Landscape, Fences and Walls:

OB 2 – Functional fences and walls that enhance the attractiveness of development

PDC 2(a) – Landscaping should… include the planting of locally indigenous species where appropriate

PDC 4(b) - Fences and walls, including retaining walls, should… be compatible with the associated development and with existing predominant, attractive fences and walls in the locality

Natural Resources:

OB 1 - Retention, protection and restoration of the natural resources and environment

OB 4 – Natural hydrological systems and environmental flows reinstated, and maintained and enhanced

OB 8 – Native flora, fauna and ecosystems protected, retained, conserved and restored

OB 10 - Minimal disturbance and modification of the natural landform

PDC 1 – Development should be undertaken with minimum impact on the natural environment, including air and water quality, land, soil, biodiversity, and scenically attractive areas

PDC 17 – Development should ensure watercourses and their beds, banks, wetlands and floodplains are not damaged or modified and are retained in their natural state, except where modification is required for essential access or maintenance purposes.

PDC 26 – Development should retain existing areas of native vegetation and where possible contribute to revegetation using locally indigenous plant species

PDC 27 – Development should be designed and sited to minimise the loss and disturbance of native flora and fauna.

PDC 30 – Development that proposes the clearance of native vegetation should address or consider the implications that removing the native vegetation will have on the following:

(a) provision for linkages and wildlife corridors between significant areas of native vegetation
(b) erosion along watercourses and the filtering of suspended solids and nutrients from runoff
(c) the amenity of the locality
(d) bushfire safety
(e) the net loss of native vegetation and other biodiversity.

PDC 31 – Where native vegetation is to be removed, it should be replaced in a suitable location on the site with locally indigenous vegetation to ensure that there is not a net loss of native vegetation and biodiversity

PDC 38 – Development should take place in a manner that will minimise alteration to the existing landform

Transport and Access:

PDC 22 – Development should have direct access from an all-weather public road

PDC 23 - Development should be provided with safe and convenient access which:

(a) avoids unreasonable interference with the flow of traffic on adjoining roads
(b) provides appropriate separation distances from existing roads or level crossings

(c) accommodates the type and volume of traffic likely to be generated by the development or land use and minimises induced traffic through over-provision
(d) is sited and designed to minimise any adverse impacts on the occupants of and visitors to neighbouring properties.

Design and Appearance:

OB 1 - Development of a high design standard and appearance that responds to and reinforces positive aspects of the local environment and built form

OB 2 - Roads, open spaces, paths, buildings and land uses laid out and linked so that they are easy to understand and navigate.

Hazards:

OB 5 – Development located to minimise the threat and impact of bushfires on life and property

PDC 1 – Development should be excluded from areas that are vulnerable to, and cannot be adequately and effectively protected from, the risk of hazards.

PDC 4 – Development should not occur on land where the risk of flooding is likely to be harmful to safety or damage property.

PDC 8 – Development in a Bushfire Protection Area should be in accordance with those provisions of the Minister's Code: Undertaking development in Bushfire Protection Areas that are designated as mandatory for Development Plan Consent purposes.

PDC 9 – Buildings and structures should be located away from areas that pose an unacceptable bushfire risk as a result of one or more of the following:

(a) vegetation cover comprising trees and/or shrubs
(b) poor access
(c) rugged terrain
(d) inability to provide an adequate building protection zone
(e) inability to provide an adequate supply of water for fire-fighting purposes

PDC 12 - Buildings and structures should be designed and configured to reduce the impact of bushfire through using simple designs that reduce the potential for trapping burning debris against the building or structure, or between the ground and building floor level in the case of transportable buildings

Energy Efficiency:

OB 2 - Development that provides for on-site power generation including photovoltaic cells and wind power

Orderly and Sustainable Development:

OB 2 – Development occurring in an orderly sequence and in a compact form to enable the efficient provision of public services and facilities.

OB 3 – Development that does not jeopardise the continuance of adjoining authorised land uses.

OB 4 – Development that does not prejudice the achievement of the provisions of the Development Plan.

PDC 1 – Development should not prejudice the development of a zone for its intended purpose

PDC 2 – Land outside of townships and settlements should primarily be used for primary production and conservation purposes.

PDC 3 – The economic base of the region should be expanded in a sustainable manner.

PDC 6 - Development should be located and staged to achieve the economical provision of public services and infrastructure, and to maximise the use of existing services and infrastructure

Waste:

OB 1 - Development that, in order of priority, avoids the production of waste, minimises the production of waste, re-uses waste, recycles waste for re-use, treats waste and disposes of waste in an environmentally sound manner.

PDC 1 – Development should be sited and designed to prevent or minimise the generation of waste (including wastewater) by applying the following waste management hierarchy in the order of priority as shown below:

- (a) avoiding the production of waste
- (b) minimising waste production
- (c) reusing waste
- (d) recycling waste
- (e) recovering part of the waste for re-use
- (f) treating waste to reduce the potentially degrading impacts
- (g) disposing of waste in an environmentally sound manner.

PDC 3 – Development should avoid as far as practical, the discharge or deposit of waste (including wastewater) onto land or into any waters (including processes such as seepage, infiltration or carriage by wind, rain, sea spray, stormwater or by the rising of the water table).

PDC 6 - Development that involves the production and/or collection of waste and/or recyclable material should include designated collection and storage area(s) that are:

- (a) screened and separated from adjoining areas
- (b) located to avoid impacting on adjoining sensitive environments or land uses
- (c) designed to ensure that wastes do not contaminate stormwater or enter the stormwater collection system
- (d) located on an impervious sealed area graded to a collection point in order to minimise the movement of any solids or contamination of water
- (e) protected from wind and stormwater and sealed to prevent leakage and minimise the emission of odours
- (f) stored in such a manner that ensures that all waste is contained within the boundaries of the site until disposed of in an appropriate manner.