

Gunnedah Solar Farm

SSD 8658

Response to Submissions

transport | community | mining | industrial | food & beverage | energy



Prepared for:

Photon Energy

Client representative:

Robert Ibrahim

Date:

29 June 2018

Rev01

Table of Contents

1.	Introduction	4
1.1	Purpose of this Submissions Report	4
1.2	Summary of Key Issues	7
1.3	Assessment and Determination Process.....	8
1.4	Project Benefits.....	9
2.	Exhibition and Consultation	10
2.1	Consultation during EIS public exhibition	10
3.	Actions since Exhibition Period	12
3.1	Revised Subdivision Plan.....	12
3.2	Revised Fence Configuration	12
3.3	Updated Environmental Assessments	14
4.	Submissions Received and Responses	15
4.1	Response to Government agency submissions	17
4.2	Responses to Organisation submissions.....	44
4.3	Responses to community submissions	47
5.	Conclusion	70

List of figures


Figure 1-1	Locality map of the Proposal	5
Figure 1-2	Updated Constraints Map	6
Figure 3-1	Proposed fence design as Fence Configuration 4	13

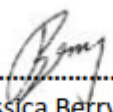
List of tables


Table 4-1	Number of responses received during public exhibition per stakeholder group.....	15
Table 4-2	Key issues raised in submissions and percentage of submitters commenting on key aspects.....	16
Table 4-3	Other aspects raised within government, organisation and community submissions	16
Table 4-4	Summary of Responses to Government Agency Submissions	18
Table 4-5	Health services in proximity to Gunnedah Solar Farm	42
Table 4-6	Summary of responses to organisation submissions	45
Table 4-7	Summary of response to Community.....	48

Appendices

- Appendix A: Consultation Material
- Appendix B: Revised Mitigation Measures
- Appendix C: Updated Flood Impact Assessment
- Appendix D: Updated Traffic Impact Assessment
- Appendix E: Orange Grove Road Site Access Alignment Plan
- Appendix F: Revised Subdivision Plan
- Appendix G: Updated LUCRA

Prepared by:  Date: 29 June 2018
Genevieve Daneel

Reviewed by:  Date: 29 June 2018
Jessica Berry

Authorised by:  Date: 29 June 2018
Malinda Facey

Revision History					
Rev No.	Description	Prepared by	Reviewed by	Authorised by	Date
A	Internal Draft	G. Daneel	J.Berry	J.Berry	19/06/2018
B	Internal Draft	G. Daneel	J.Berry	M.Facey	22/06/2018
C	Draft for client	G. Daneel	J.Berry	J.Berry	22/06/2018
00	Final for client	G. Daneel	J.Berry	M.Facey	28/06/2018
01	Final	G. Daneel	J.Berry	J.Berry	29/06/2018

© 2018 **pitt&sherry**

This document is and shall remain the property of **pitt&sherry**. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form is prohibited.

1. Introduction

Gunnedah Solar Farm Pty Ltd (GSF) is owned by Photon Energy NV (Photon Energy), Canadian Solar Energy Holdings Singapore 4 Pte Ltd (Canadian Solar) and Polpo Investments Ltd (Polpo) (referred to herein as GSF). GSF propose to develop and operate a 115-megawatt (MW AC) (150 MW DC) solar photovoltaic (PV) facility including ancillary works and associated infrastructure at 765 Orange Grove Road, Gunnedah, NSW 2380 (“the Proposal”).

The facility would operate for a duration of approximately 25 years following which GSF would reassess the viability and in agreement with the landowner either continue operations, upgrade the infrastructure or undertake decommissioning of the facility. Decommissioning would include removal of all ancillary works, associated infrastructure and remediation of the land (as required) to enable continued agricultural use. However, the substation may remain following decommissioning of the solar farm to continue to service the region.

An Environmental Impact Statement (EIS) was prepared by pitt&sherry on behalf of GSF and submitted to the Department of Planning and Environment (DP&E) in April 2018. The EIS, including all of the specialist reports were made available for download on the DP&E Major Projects Website during Public Exhibition from Friday 27th of April to Saturday 26th May 2018. During this period submissions were sought from members of the local community, government stakeholders and other interested parties.

The locality of the GSF is shown in Figure 1-1. An updated site constraints map, as requested by Gunnedah Shire Council is shown in Figure 1-2.

1.1 Purpose of this Submissions Report

As per the letter received from DP&E on 1st of June, DP&E requested that the proponent (GSF) prepare and submit a report detailing a response to the full range of matters and recommendations raised in the submissions.

This submissions report has been prepared by pitt&sherry on behalf of GSF to meet the requirements of DP&E, and is structured as follows:

- **Section 1: Introduction.** Provides a summary of the key issues.
- **Section 2: Exhibition and Consultation.** Provides detail of the consultation undertaken during the preparation of the EIS and public exhibition period.
- **Section 3: Actions Since the Exhibition period.** Provides detail of the consultation and assessment undertaken subsequent to the closing of the public exhibition period, during the preparation of the submissions report.
- **Section 4: Submissions Received and Responses.** Provides summaries of the submissions received by government agencies, interested parties and the community with associated responses and any changes to the proposal or revised mitigation measures.

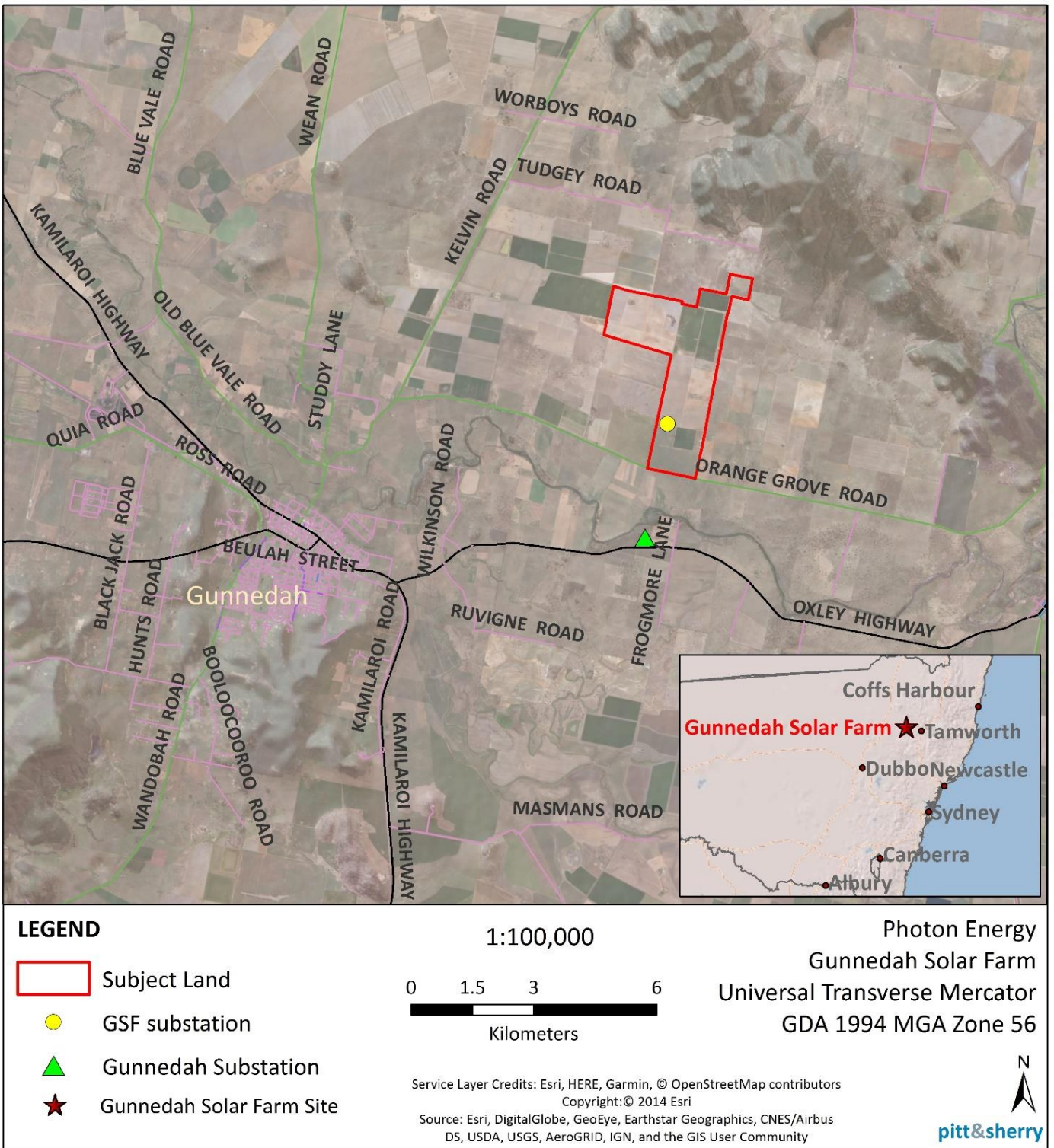


Figure 1-1 Locality map of the Proposal

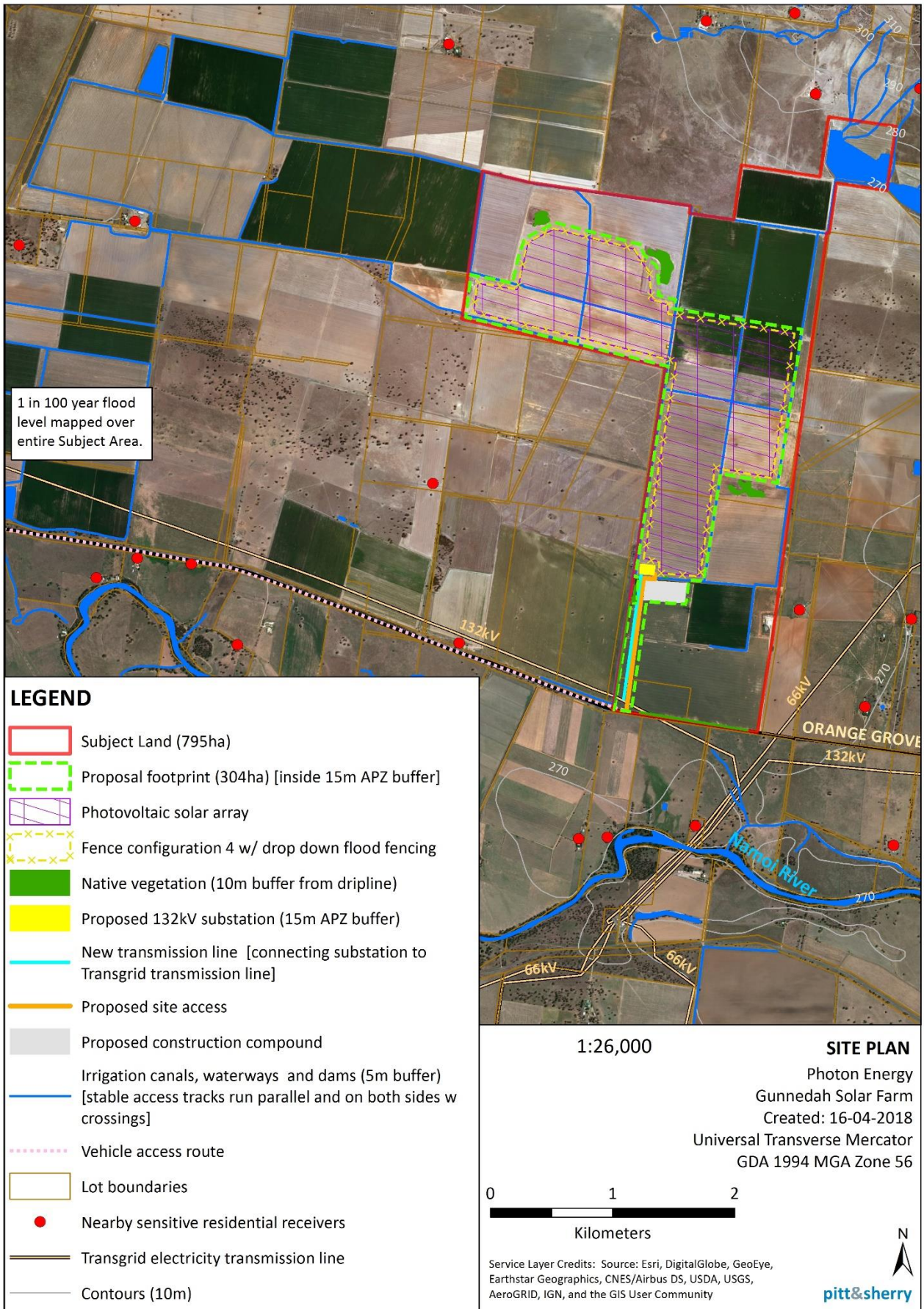


Figure 1-2 Updated Constraints Map

1.2 Summary of Key Issues

DP&E identified four key issues within their request for response to submissions for particular consideration. These have been addressed throughout Section 4 and are summarised below.

Accuracy of the Flood Impact Assessment

Submissions from government stakeholders, agencies and the community identified concerns associated with the data input into the flooding model used in the Flood Impact Assessment (Appendix J in the EIS).

The flood modelling has been updated to include additional and improved data, assumptions and modelling as per mitigation measure SW5 in the EIS and in response to submissions received including:

- More accurate ground surface data from three sources:
 - Aerial Laser Survey (ALS) surveyed in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003)
 - LiDAR surveyed by drone for Photon in 2017
 - Construction drawing for the ring levee around the property (765 Orange Grove Road).
- Processing of the ALS data to smooth the swathe overlap areas to avoid ‘steps’ in topography that were not representative of the real ground surface
- Update to flood model flows in accordance with Carroll to Boggabri Flood Study (SMEC, 2003)
- Assumption that the 1955 flood approximated a 1%AEP flow.
- Distribution of flows between the Namoi and Mooki Rivers based on information from *Gunnedah and Carroll Floodplain Management Plan 1999* (SMEC Study, updated 2014).
- Development and modelling of a new fence configuration to address concerns around impacts to flow from debris collecting on the proposed security fence. Fence Configuration 4 has been developed and involves drop-down fencing in key areas and represents an alternate approach to mitigating the effects of the fence on floodwaters.

As a result, the flood model was re-run with the updated data, assumptions and new fence configuration the outcomes of which are presented in the Updated Flood Impact Assessment (Appendix C).

Adequacy of Aboriginal Cultural Heritage Consultation

Submissions from the Office of Environment and Heritage (OEH) and Gomeroi People identified concerns associated with the consultation process undertaken as part of the Aboriginal Heritage Impact Assessment.

The heritage consultant, Kelleher Nightingale Consulting (KNC), contacted OEH regarding their submission confirming consultation was undertaken in accordance with OEH requirements.

It was identified that OEH had received feedback from local aboriginal stakeholders regarding the project and OEH would consider consultation with these groups and the Gomeroi People to represent adequate consultation for the Project.

As outlined in Appendix B, GSF has committed to inviting local aboriginal stakeholders identified by OEH to undertake a site visit with KNC prior to commencing construction.

Review of the Biodiversity Assessment

Submissions from OEH and Gunnedah Shire Council identified concerns associated with inconsistencies within the biodiversity assessment and the need for a Koala Habitat Assessment in accordance with State Environmental Planning Policy (SEPP) 44.

Clarifications have been provided to remove inconsistencies and confirm that a Koala Habitat assessment is not required under SEPP 44 due to the lack of primary feed trees and koala habitat. Further information is contained in Section 4.

Use of Biophysical Strategic Agricultural Land

Submissions from government stakeholders, agencies and the community identified concerns associated with the use of biophysical strategic agricultural land.

Land use impacts (including mineral resources) were assessed in Section 6.3 of the Gunnedah EIS.

Land use conflicts occur when one land user does, or is perceived to, infringe upon the rights, values or amenity of another. In rural areas land use conflicts commonly occur between agricultural and residential uses. However, land use conflicts can also occur between different agricultural enterprises and other industries such as mining, forestry or energy production. Due to the potential for land use conflicts between the solar farm development and the existing agricultural land use, a land use conflict risk assessment (LUCRA) based on the Department of Primary Industries (DPI) '*Land Use Conflict Risk Assessment Guide*' (Department of Trade and Investment, 2011) was conducted as part of the EIS.

The LUCRA has been updated to include consideration of the *Right to Farm Policy* (Appendix G) and mitigation associated with the potential land use conflict are contained in the Draft Land Management Plan (Appendix G of the EIS).

1.3 Assessment and Determination Process

The Environmental Planning and Assessment Act 1979 (EP&A Act) is the principal piece of legislation covering assessment and determination of development proposals in NSW. It aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. The development assessment and approval system in NSW is set out in Parts 4 and 5 of the EP&A Act.

Under Schedule 1, Part 20 of the State Environmental Planning Policy (State and Regional Development) 2011 electricity generating works with a capital investment value of more than \$30million, or a capital investment of more than \$10 million and located in an environmentally sensitive area of State significance, are deemed State Significant Developments (SSDs). The Proposed solar farm exceeds the \$30million capital investment value and is therefore declared SSD. Development consent for the Proposal is therefore being sought under Part 4 of the EP&A Act.

On 28 July 2017, GSF submitted a Preliminary Environmental Assessment (PEA) along with a request to the Secretary for the Secretary's Environmental Assessment Requirements (SEARs), as required by clause 3 of Schedule 2 of the EP&A Act Regulations 2000. The PEA provided information about the proposed development and preliminary assessment of the potential environmental impacts. In formulating the SEARs, requests were sent to relevant public authorities and agencies to inform the key issues raised in Section 4 of the EIS. The SEARs were issued to GSF on the 25 August 2017.

An Environmental Impact Statement (EIS) was prepared by pitt&sherry on behalf of GSF and submitted to the Department of Planning and Environment (DP&E) in April 2017. The EIS was put on Public Exhibition from Friday 27th of April to Saturday 26th May 2018. Following the closing of the Exhibition period, DP&E issued a letter Request for Response to Submissions (RTS) to GSF in June 2018.

pitt&sherry have prepared this Response to Submissions Report on behalf of GSF in response to DP&E request.

1.4 Project Benefits

The key benefit of the Proposal is the production of renewable electricity reducing greenhouse gas emissions and reliance on fossil fuels. The production of renewable electricity will help contribute to NSW Governments Renewable Energy Action Plan and other schemes and agreements made. On an annual basis, the Proposal will produce enough electricity to meet the needs of approximately 48,000 households.

Additionally, the proposal will reduce greenhouse gas emissions by over 290,000 tonnes of carbon dioxide (CO₂) equivalent per annum (based on 0.948t/MWh from fossil fuels). This is roughly equivalent to removing approximately 125,000 cars from the road.

The Proposal would also provide the following national benefits:

- Develop the solar power industry and supply chain in Australia
- Develop Australian intellectual property and expertise in solar power
- Assist with Australia's commitments under national and international agreements
- Diversify sources of income for the agricultural sector, allowing financial resilience for farmers
- Provide energy security.

The proposal would also generate regional and local benefits including:

- Generating employment:
 - 150 construction jobs (at peak) as well as indirect supply chain jobs
 - Support up to ten operational jobs.
- Encouraging regional development:
 - Employee expenditure in the Gunnedah region (fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies)
 - Maximising the use of local contractors and equipment hire
 - Increasing local skills and trades through project experience.

2. Exhibition and Consultation

A Community and Stakeholder Engagement Plan (CSEP) was prepared in October 2017 in accordance with *The Community and Stakeholder Engagement Draft Environmental Assessment Guidance Series June 2017* (Draft Guidelines) prepared by DP&E. The CSEP documented the objectives of engagement, identification of relevant stakeholders, as well as the community and potential issues associated with the development. The CSEP also included an implementation plan which was updated as required through the duration of the community and stakeholder engagement. Table 6 from the CSEP, attached as Appendix L in the Gunnedah EIS, outlines the implementation plan, which was used as the guiding document throughout stakeholder engagement. Consultation undertaken during the preparation of the EIS is outlined in Section 5 of the EIS.

2.1 Consultation during EIS public exhibition

Community

In anticipation of the commencement of public exhibition period on Friday 27th of April correspondence (email or SMS) was sent (23/04/2018) to the 19 registered community members to advise them of the public exhibition period.

In accordance with agreements made during consultation, hard copies of selected specialist reports were express posted to receiver 4 and 7.

In addition to notifying the community, further one on one consultation was conducted with the following sensitive receivers:

- Receiver 34: Multiple emails were exchanged between pitt&sherry and receiver 34 from 20/03/2018 – 26/03/2018. Receiver 34 requested further information on the potential impacts to their property. pitt&sherry provided the draft landscape plan, Orange Grove Road photomontage and multiple maps indicating the distance from the receiver’s property to the closest solar panel.
- Receiver 7: On 1/04/2018 the receiver responded to an email from pitt&sherry providing the Gunnedah factsheet (dated 21/03/2018). Receiver 7 requested a phone call to further discuss flooding and fencing concerns. pitt&sherry attempted to contact the receiver however was unsuccessful. Due to the lack of new information available at that time regarding flooding and fencing and the pending public exhibition period no further contact was attempted with this receiver.
- Interested community member: On 17/05/2018 phone calls and email correspondence took place between an interested community member and pitt&sherry. The main concern discussed was regarding flood modelling and use of data. The community member provided suggestions and updated information for use in the revised flood modelling, including details of a contact within OEH that might be able to provide access to LiDAR data for the local floodplain that was obtained as part of the 2003 SMEC study. This was ultimately successful and the forthcoming data has been used in the updated flood model. Email exchanges occurred between 27/03/2018, 16/05/2018 - 17/05/2018, 23/05/2018, 25/05/2018 and 28/05/2018.

Aboriginal Heritage

No further consultation was undertaken with Aboriginal stakeholders during the exhibition period. Further consultation occurred with OEH and as a result of this consultation an invitation for a Site Visit prior to construction will be undertaken with interested local aboriginal stakeholders as identified by OEH.

Agency Stakeholders

Department of Planning & Environment (DP&E)

pitt&sherry on the behalf of GSF continued ongoing consultation with DP&E, to supply information requested including contact details for identified sensitive receivers.

In accordance with DP&E requirements hard copies of the Gunnedah Solar EIS were posted to the following:

- One copy to Department of Planning & Environment
- Two copies to Gunnedah Shire Council
- One copy to Nature Conservation Council.

Gunnedah Shire Council

GSF continued to engage with Gunnedah Shire Council following the submission of the EIS.

A meeting was held at the Gunnedah Shire Council headquarters on 23/06/2018 with representatives from GSF and pitt&sherry. Attendees included the Mayor, Councillors and members of the senior executive team. The correspondence, attendees list and presentation are provided in Appendix A.

Santos

As requested by Santos during consultation, pitt&sherry provided Santos with an email update informing them that the EIS was on public exhibition on 9/05/2018, see Appendix A.

Overland Sun Farming

GSF was also contacted by Overland the proponents for Orange Grove Sun Farm (23/04/2018) via phone to discuss respective projects and ongoing consultation occurring within the community.

3. Actions since Exhibition Period

GSF does not propose any changes to the layout or description for the Proposal to what was outlined in Section 3 of the EIS. Changes are proposed to the subdivision plan and fence configuration. Additional mitigation measures have been proposed to address submissions and in response to updated assessments. Further information is outlined below.

3.1 Revised Subdivision Plan

Changes are proposed to the subdivision as presented in Section 4.5.7 of the EIS.

A revised subdivision plan is presented in Appendix F which identifies an additional subdivision of 4800m² on part of Lot 264 DP754954 containing the TransGrid substation. The need for this additional subdivision is to provide a separate lot to be owned by TransGrid to contain the substation.

As such the following subdivision is proposed:

- Lot 1 – comprising the TransGrid substation which is estimated to occupy a 60m x 80m footprint and as such the lot would be 4800m². This lot would comprise part of Lot 264 DP 754954.
- Lot 2 – comprising the Gunnedah Solar Farm and access road which is estimated to occupy 304ha. This lot would comprise parts of Lot 1 DP 1202625, Lot 153 DP 754954, Lot 264 DP 754954, Lot 2 DP 801762, Lot 151 DP 754954 and Lot 1 DP 186590.
- Lot 3 – comprising the remaining land associated with the Property to occupy 200ha and be reconfigured into a single lot in accordance with Gunnedah Shire Council request. This lot would comprise:
 - Approximately 93ha of Lot 1 DP 1202625
 - Approximately 165ha of Lot 153 DP 754954
 - Approximately 14ha of Lot 264 DP 754954
 - Approximately 40ha of Lot 2 DP 801762
 - Approximately 114ha of Lot 151 DP 754954
 - Approximately 151ha of Lot 1 DP 186590.

3.2 Revised Fence Configuration

A new fence configuration (referred to as Fence Configuration 4) has been developed and modelled as depicted in Figure 3-1, and further described in Appendix C. It represents an alternative fencing design aimed at minimising blockage and redirection of floodwater and the potential impacts of the Proposal on the surrounding landscape and residents during a flood event. Fence Configuration 4 incorporates drop down fencing in key areas. The model indicates that Fence Configuration 4 further reduces flooding impacts compared to the preferred fence configuration presented in Appendix J of the EIS (Configuration 3) and produces an entirely acceptable outcome that is compliant with the Carroll-Boggabri Flood Management Plan 2006 and have negligible flood impacts on surrounding properties.

This change has been reflected in mitigation measure SW6 as follows:

GSF commits to construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.

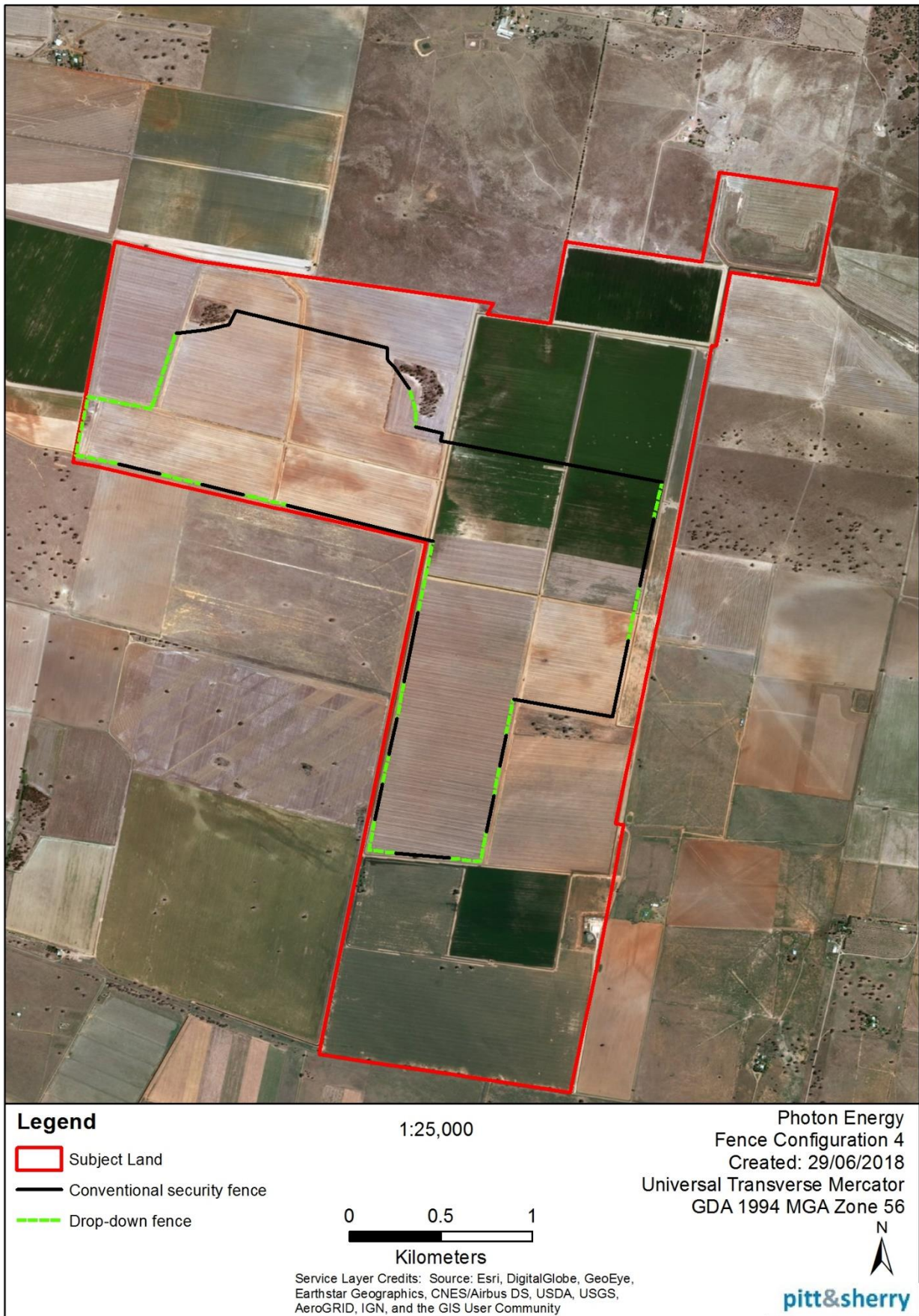


Figure 3-1 Proposed fence design as Fence Configuration 4

3.3 Updated Environmental Assessments

The following assessments were updated and plans developed in preparation of this response to submissions:

- Updated Flood Impact Assessment (Appendix C) including:
 - More accurate ground surface data from three sources:
 - Aerial Laser Survey (ALS) surveyed in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003)
 - LiDAR surveyed by drone for Photon in 2017
 - Construction drawing for the ring levee around the property (765 Orange Grove Road).
 - Processing of the ALS data to smooth the swathe overlap areas to avoid ‘steps’ in topography that were not representative of the real ground surface
 - Update to flood model flows in accordance with Carroll to Boggabri Flood Study (SMEC, 2003)
 - Assumption that the 1955 flood approximated a 1%AEP flow
 - Distribution of flows between the Namoi and Mooki Rivers based on information from *Gunnedah and Carroll Floodplain Management Plan 1999* (SMEC Study, updated 2014)
 - Development of a new fence configuration to address concerns around impacts to flow from debris collecting on the proposed security fence. Fence Configuration 4 has been developed and involves drop-down fencing in key areas.
- Updated Constraints Map (Figure 1-2)
- Updated Traffic Impact Assessment (Appendix D)
- Preparation of a concept design for the access road (Appendix E)
- Revision of the subdivision plan (Appendix F)
- Updated LUCRA (Appendix G).

As a result of these additional assessments and in response to submissions a number of additional mitigation measures are proposed as outlined in Appendix B.

4. Submissions Received and Responses

A total of 63 submissions were received from government stakeholders, organisations and the community, as described in Table 4-1. Out of a total of 63 submissions received 49* were objections, 13 requested further information and 1 confirmed support of the project.

*It should be noted that two duplicated submissions (objections) were received.

Nine submissions were received from government stakeholders in the form of comments and have been addressed within Section 4.1 of this report. Two submissions were received from interested organisations, 1 of which objected to the proposal and one provided comments. These 2 submissions are addressed in Section 4.2 of this report.

Fifty-two submissions were received from the local and wider community collectively. Forty-eight of the submissions objected to the proposal, 3 provided comments and 1 submission expressed support of the proposal. These submissions have been addressed in Section 4.3.

Table 4-1 Number of responses received during public exhibition per stakeholder group

Stakeholder	Number of responses received
Government: <ul style="list-style-type: none"> • Department of Planning & Environment: Resources & Geoscience • Gunnedah Shire Council • Office of Environment & Heritage • NSW Rural Fire Service • Fire & Safety NSW • NSW Roads and Maritime Services • Department of Industry Crown Lands and Water Division • Environment Protection Agency • Office of Environment and heritage, Heritage Division 	9
Agency / Organisation: <ul style="list-style-type: none"> • NTSCORP Limited (Gomerioi People) • Orange Grove Sun Farm 	2
Community	52
Total	63

pitt&sherry have reviewed each submission to understand the key aspects and concerns.

Determination of key aspects was based on the percentage (>10%) of submitters who commented or raised concern regarding that aspect, as depicted in Table 4-2. All other aspects raised have been listed in Table 4-3.

The five key aspects raised by the government, agency and community stakeholders are:

- **Flooding:** Concerns were raised around the accuracy of the flood modelling performed, and the impact of security fencing on water flows and velocity during a flood event.
- **Prime Agricultural Land:** Concerns were raised around the use of prime agricultural land.

- **Traffic during construction:** Concerns were raised regarding the impact on road safety and condition due to the increase in heavy vehicle traffic, with particular concern raised around school bus routes and pedestrian safety.
- **Visual Impact:** Concerns were raised about the visual impact of the solar panels on neighbouring residents, as well as commuters using Orange Grove Road.
- **Land Value:** Concerns were raised around the potential impact the development would have on neighbouring land values.

Out of the 52 community submissions, it should be noted that 21 submitters (40%) stated that they were supportive of solar and/or renewable energy in general. 6 objectors are understood to reside outside of Gunnedah and would not be directly impacted by the Proposal.

Table 4-2 Key issues raised in submissions and percentage of submitters commenting on key aspects

Key Aspects	No. of submissions commenting on aspect	% of submissions raising key aspect
Flooding	52	83
Prime Agricultural Land (alternate land use)	18	29
Traffic during construction	13	21
Visual Impact	9	14
Land value	7	11

Table 4-3 Other aspects raised within government, organisation and community submissions

Other Aspects	No. of submissions commenting on aspect	% of submissions raising aspect
Noise during construction	4	7
Employment	3	5
Bushfire	3	5
Biodiversity	3	5
School bus routes	2	3
Decommissioning	2	3
Soil Quality, Air and noise pollution	2	3
Aboriginal Heritage consultation	2	3
Operation	1	2
Proximity to town	1	2
94A contributions	1	2
CEMP	1	2
Constraints Map	1	2
Emergency Response Plan	1	2
LUCRA	1	2
Social and Economic	1	2
Subdivision	1	2
Stakeholder consultation	1	2
Waste disposal	1	2

4.1 Response to Government agency submissions

Specific responses to government agency submissions is provided in Table 4-4.

Table 4-4 Summary of Responses to Government Agency Submissions

Aspect	Detail of submission	GSF Response
Department of Planning & Environment: Resources & Geoscience		
Stakeholder consultation	Acknowledges that the proponent has effectively consulted with the affected titleholders to date. GSNSW notes that Santos has requested their inclusion on the Proponent's distribution list in order to receive information about progress in relation to the proposal	<p>pitt&sherry contacted Santos on 09/05/2018 via email to advise that the Gunnedah Solar Farm was on public exhibition. Correspondence is provided in Appendix A.</p> <p><i>No further mitigation measures are proposed.</i></p>
Gunnedah Shire Council		
Constraints Map	The Site plans provided are difficult to review. Clarification is requested in regard to the proposed use of unsealed, unnamed road off Orange Grove Road (western boundary) as a Site access route	<p>The description of the access road into the Site, provided in Section 3.2 and Section 6.6 of the EIS describes 'An existing unsealed unnamed access road off Orange Grove Road will be used to access the Site. The access road is located near the western boundary and would be upgraded as part of the works'. To clarify this access road is an existing private access road into the property.</p> <p>Figure 1-2 provides an updated site constraints map.</p> <p><i>No further mitigation measures are proposed.</i></p>
Traffic	Volume of light vehicle traffic per day is to be 40 vehicle movements with an average occupancy of 4 people per vehicle. This is considered conservative and should be updated to 1-2 people per vehicle	<p>The Traffic Impact Assessment has been updated to consider a lower occupancy per vehicle. Based on a worst-case scenario of 2 people per vehicle the light vehicle traffic at peak construction has been estimated at 75 light vehicles entering and exiting the site for staff movements.</p> <p>See Appendix D for further information.</p> <p>As outlined in mitigation measure T2, GSF commits to ensuring carpooling and shuttle bus arrangements are included in the Traffic Management Plan to minimise vehicle numbers during construction.</p> <p>As outlined in Section 8.1 of the EIS the identified management and mitigation measures will be incorporated into contractual arrangements with any future</p>



Aspect	Detail of submission	GSF Response
		<p>contractors for construction of the Proposal. As such, the Traffic Management Plan will be enforced through contractual arrangements.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>A new access should be provided at the development site, as a minimum the RMS Typical Rural Property Access Standard for articulated vehicles should be provided</p>	<p>Access for the development will be provided via upgrading the existing private access road into the property. The upgrades will meet the RMS Typical Rural Property Access Standard for articulated vehicles as identified in the concept design prepared.</p> <p>GSF commits to upgrade of the existing access road in accordance with Orange Grove Road Site Access Alignment Plan (SY17199-P1). See Appendix E.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>Working hours during construction should consider the existing school bus route and times and should be adjusted if required</p>	<p>The Traffic Impact Assessment has been updated to reflect a commitment to manage deliveries and access to the site to ensure they do not occur during school bus times. See Appendix D and revised Mitigation Measures in Appendix B.</p> <p>As outlined in mitigation measure T2, schedule of deliveries will form part of the Traffic Management Plan.</p> <p>GSF commits to a new mitigation measure (T12) placing restrictions on deliveries and access to the site during school bus route times as part of the Traffic Management Plan.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>TIA relies on a Code of Conduct to be agreed to by supply contractors. Need to clarify the consequences if there is a breach of the Code of Conduct</p>	<p>As outlined in mitigation measure T2, GSF commits to the Code of Conduct forming part of the Traffic Management Plan.</p> <p>As outlined in Section 8.1 of the EIS the identified management and mitigation measures will be incorporated into contractual arrangements with any future contractors for construction of the Proposal.</p>



Aspect	Detail of submission	GSF Response
	<p>The complaint handling process and resolution process should be established prior to the commencement of works</p>	<p><i>No further mitigation measures are proposed.</i></p> <p>Mitigation Measure G4 within the EIS addresses this concern.</p> <p>A complaint handling procedure and register will be implemented to assist in recording and managing potential conflict with the local community during construction.</p> <p>GSF commits to revision of mitigation measure (T2) establishing the complaint handling procedure and register prior to the commencement of works.</p> <p><i>A mitigation measure has been revised.</i></p>
	<p>A Road Safety Audit should be prepared by a suitably Qualified Road Safety Auditor and made available to council</p>	<p>Section 5.4 within the Gunnedah EIS addresses the Gunnedah Shire Council request for Road Safety Audit as stated in the SEARs.</p> <p>The Traffic Impact Assessment identified through its assessment of the proposed routes that there are no safety concerns, and therefore a Road Safety Audit was not required.</p> <p>A letter was sent to Gunnedah Shire Council 05/02/2018 to inform the council of the report's findings. A response was received 05/03/2018, confirming that a Road Safety Audit will not need to be completed with the submission for development approval, (Appendix L of Gunnedah EIS). As such, a Road Safety Audit is not proposed to be undertaken.</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>Commensurate light vehicle car parking should be provided for the proposed 150 staff during construction period</p>	<p>As identified in Section 6.6.3 of the EIS all parking will be contained on site within a temporary construction parking area. This area will allow up to 100 vehicles to park within the compound area which aligns with the expected vehicle numbers associated with staff movements.</p> <p>The number of vehicles to park on the Site is lower than the peak staff numbers as carpooling and shuttle buses will be utilised for transporting staff to Site.</p>



Aspect	Detail of submission	GSF Response
		<p><i>No further mitigation measures are proposed.</i></p>
	<p>All internal driveways, parking areas, loading bays and vehicular turning areas are to be constructed with a base course of adequate depth to suit design traffic to be approved by council</p>	<p>GSF commits to a new mitigation measure (T14) constructing the access road for the development, parking areas, loading bays and vehicular turning areas with a base course of adequate depth in consultation with Gunnedah Shire Council and in alignment with Gunnedah Shire Council Guidelines with consideration of the Project's requirements during construction, operation and decommissioning.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>Parking areas must comply with AS 2890 - Parking Facilities and Councils Engineering Guidelines for Subdivisions and Developments 2013</p>	<p>The parking area to be provided during construction of the solar farm will provide an area for up to 100 vehicles for a 12-month duration. Due to the temporary nature of the parking area and the rehabilitation of the area to former condition at the end of construction, these parking areas will not be constructed in compliance with AS 2890 – Parking Facilities and Councils Engineering Guidelines for Subdivisions and Developments 2013.</p> <p>GSF commits to a new mitigation measure (T17) that if permanent parking areas are deemed to be required to facilitate operation of the site, these parking areas must comply with AS 2890 – Parking Facilities ad Councils Engineering Guidelines for Subdivisions and Developments 2013.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>Variable Message Signage should be maintained on Kelvin road during construction period. Temporary speed limits should also be considered for the duration of the construction period</p>	<p>As outlined in mitigation measure T2, traffic controls including signage and speed limits, will be included in the Traffic Management Plan (TMP).</p> <p>GSF commits to a new mitigation measure (T13) Variable Message Signage on Kelvin Road for the duration of construction and its ongoing management will be outlined in the TMP.</p> <p><i>A new mitigation measure has been proposed.</i></p>



Aspect	Detail of submission	GSF Response
	<p>Old Blue Vale Road proposed as part of the HV Route has a nominal 5m wide seal</p>	<p>The TIA has been updated to include reference to the nominal 5m wide seal present on Old Blue Vale Road.</p> <p>GSF commits to a new mitigation measure (T15) establishing a maintenance agreement with Gunnedah Shire Council for Old Blue Vale Road for the duration of construction.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>Mitigation measures listed in Section 2.3 should be applied, in particular - Upgrading of the pavement width at the eastern end of Old Blue Vale Road, a maintenance agreement with Gunnedah Shire Council for the construction period on Old Blue Vale Road</p>	<p>GSF commits to a revised mitigation measure (T1) for consultation with the Road Authority regarding upgrades to the pavement width at the eastern end of Old Blue Vale Road.</p> <p>GSF commits to a new mitigation measure (T15) establishing a maintenance agreement with Gunnedah Shire Council for Old Blue Vale Road for the duration of construction.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>Standard hours of work are listed as 7am to 4pm on Saturday in TIA and Management Plan. This is considered to be outside 'typical' standard working hours of 8am to 1pm on Saturdays</p>	<p>This was a typographical error.</p> <p>The Traffic Impact Assessment has been updated to reflect the proposed working hours which are in accordance with the <i>Interim Construction Noise Guideline</i> for Saturdays 8am – 1pm.</p> <p>GSF commits to the existing mitigation measure, N3, Works are to be carried out during standard work hours (i.e., 7am to 6pm Monday to Friday; 8am to 1pm Saturdays).</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>The dilapidation assessment and report should be undertaken by a suitably qualified and independent civil or structural engineer. Geotechnical test pits should be considered as part of this</p>	<p>GSF commits to a revised mitigation measure (T10) with the dilapidation assessment and report being undertaken by a suitably qualified and independent civil or structural engineer through the construction period.</p>



Aspect	Detail of submission	GSF Response
	assessment to determine existing depth of pavement on Old Blue Vale road to accurately determine cumulative impacts	<i>A mitigation measure has been revised.</i>
	Records of daily monitoring of road conditions should be maintained and made available on request	GSF commits to a new mitigation measure (T15) providing records for road condition monitoring undertaken in accordance with the maintenance agreement to be made with Gunnedah Shire Council. <i>A new mitigation measure has been proposed.</i>
	The required intervention level should be established with the Road Authority prior to the commencement of works	GSF commits to revised mitigation measure (T1), undertake consultation with the Road Authority on all proposed works and obtaining a Section 138 approval prior to the commencement of works. <i>A mitigation measure has been revised.</i>
	A Road Opening Permit (Section 138) will be required for any works undertaken on council's road network	As identified in Section 4.6 of the EIS, a Section 138 approval for work within a public road has been identified as an approval required for the Gunnedah Solar Farm. This will be undertaken after Project approval. <i>No further mitigation measures are proposed.</i>
	A Maintenance Bond/Defects Liability Period may be a satisfactory compromise to mitigate the recommended requirements of Section 4.1.4	GSF commits to a new mitigation measure (T15) establishing a maintenance agreement with Gunnedah Shire Council for Old Blue Vale Road for the duration of construction. The option for a Maintenance Bond/ Defects Liability Period would also be discussed at this time. <i>A new mitigation measure has been proposed.</i>
Flooding	EIS mapping of proposed security fencing, illustrating the locations of the proposed laneways is not of an adequate scale to review	GSF recognises the community concerns about the potential impacts of the security fence when blocked by flood debris. In response to these concerns, GSF has revised the design for the perimeter security fence (Appendix C). It is proposed to install perimeter security fencing which is designed to allow flood water into and through the development site. One option is drop-down fencing in strategic locations around the development perimeter. This option replaces the laneways previously proposed and will be even more effective in allowing free flow of flood water into and through the development, with less redistribution of flood flows through the site.

Aspect	Detail of submission	GSF Response
		<p>The concept design and location of a drop-down fencing option were designed by reviewing the flood modelling and by targeting strategic locations to break up long runs of continuous fence. Nominally 200m sections of drop-down fence have been positioned around the perimeter in locations including:</p> <ul style="list-style-type: none"> • The southern part of the development which is known to flood more regularly, i.e. within the Namoi River breakout • At the perimeter positions of previously proposed laneways • Western part of the development. <p>Figure 25 in the Updated Flood Impact Assessment shows the proposed positions of drop-down fencing, which are referred to as Scenario 4. This fencing option has been modelled as Scenario 4 in the Updated Flood Impact Assessment. The modelling of Scenario 4 shows that the fencing would achieve the objective of allowing water into and through the development site and preventing offsite impacts in relation to flood levels and flood velocity. Full details are provided in the Updated Flood Impact Assessment (Appendix C).</p> <p>GSF commits to a new mitigation measure, SW6, for construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.</p> <p><i>A new mitigation measure has been proposed.</i></p>



Aspect	Detail of submission	GSF Response
	<p>Provide response on why the 1955 flood data (being the event closest to the 1% AEP flood event) or records from the gauge at Gunnedah was not utilised in the hydraulic modelling</p>	<p>The 1984 flood was used as the basis for setting up the previous flood model as it is the largest flood on record for which the nearest gauges recorded data. This flood occurred after construction of the Keepit Dam while the 1955 flood predates Keepit Dam.</p> <p>As part of the Updated Flood Impact Assessment a review of the hydrology and revised flood modelling has been undertaken. To address numerous submissions the updated modelling specifically presents results for the 1955 flood (a close approximation to the 1% AEP flood) as well as results for the 10% AEP, 5% AEP and Probable Maximum Flood (PMF) events. The major flood event of January 1984 has been used to generate a hydrograph shape for the 10%, 5% and PMF design events. The 1984 event is the largest on record for Gauge 419006, and it falls between the 5% AEP and 2% AEP probabilities. The 1955 flood event (a close approximation for the 1% AEP event) was used as a scenario and calibration event. The recorded gauge height for 1955 at 419001 and a flood level within the model boundary from the Carroll to Boggabri Flood Study (SMEC, 2003) was available for calibration. The updated flood model was calibrated by comparing computed and observed flood levels for the 1955 flood, which resulted in a good fit between the two.</p> <p>Whereas the previous model assumed that flows approached the site from the Namoi River, the current model includes flows approaching the site from the Namoi and Mooki rivers. The distribution of flows between the Namoi and Mooki Rivers was based on further information obtained from the Gunnedah and Carroll Floodplain Management Plan 1999 (SMEC Study, updated 2014). The site is located where the flows from the two river systems merge over the flood plain, and the current model includes this mechanism by its representation of the terrain surface of the channels and flood plains. Inflows from the Rangari Creek were included in the Namoi and Mooki total flow, and were not modelled explicitly, because of the lack of flow data. Flows from the Rangari Creek merge with Namoi and Mooki flows on the flood plain over a wide area generally downstream of the site. The model was verified by</p>



Aspect	Detail of submission	GSF Response
		<p>comparing modelled flood levels and depths for the 1955 flood, which agree well with observed flood levels and depths.</p> <p>It is considered that the current model improves the representation of flood behaviour around the proposed solar farm primarily through the acquisition and use of updated terrain data. It therefore provides a more accurate assessment of potential impacts compared with the previous (March 2018) flood assessment. The updated flood model shows a lower risk of flood impact than the previous, more conservative model.</p> <p>Additional detail on the updated flood modelling is contained in the Updated Flood Impact Assessment (refer Appendix C).</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions.</i></p>
	<p>The EIS has limited details regarding the proposed earth mound for the substation and whether it will result in any impact on the adjoining property - recommended that the flood configuration modelling be updated to include the substation earth mound</p>	<p>An electrical substation is proposed at the south-west corner of the site, which would be constructed on a new fill platform above the flood levels. The effect of the electrical substation was modelled as part of the Updated Flood Assessment and recommended substation platform heights are provided (Appendix C). The fill platform has assumed dimensions 90 m x 70 m and of infinite height for the purpose of modelling so it is not inundated. The results show that the substation fill mound would not have an impact on adjoining properties.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions.</i></p>
<p>Social and Economic</p>	<p>Accommodation within Gunnedah is noted - no assessment in regard to the availability of this accommodation, particularly during the construction phase</p>	<p>Section 6.12 of the EIS assessed the socio-economic impacts of the Proposal.</p> <p>The proposed development will have a positive employment impact during construction, and is likely to create in the order of 150 onsite jobs during the peak construction period.</p>



Aspect	Detail of submission	GSF Response
		<p>As per new mitigation measure Socio 2, GSF commits to the preparation of an Australian Industry Participation Plan which will identify strategies to maximise the percentage of labour sourced from within 100km of the Site.</p> <p>Where required, the Proposal would engage with local accommodation providers and Gunnedah Shire Council to provide additional short term and temporary accommodation.</p> <p>There are 11 accommodation options (257 rooms) within Gunnedah (<i>Gunnedah Shire Council, 2018</i>). There is also the possibility to stay in the local caravan park or to rent a house within Gunnedah through an accommodation website such as Stayz. Tamworth and Narrabri have over 60 accommodation options available that should be able to accommodate the overflow of people travelling to Gunnedah during tourism events or competing events and developments.</p> <p>Local accommodation within 100km of the Site is therefore considered adequate as over 70 accommodation options are likely to be available for the approximate number of 75 non-local employees (with anticipated 50% labour sourced locally) that will require accommodation during peak construction.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>The impact on health services is identified, suggesting workers utilise services in adjoining towns - no assessment of the availability of these services or any proposed actions if services are not available</p>	<p>The closest health service is the Gunnedah Hospital which has a total of 43 hospital beds and is located a 14.6km drive from the site. The Gunnedah Hospital has an emergency department as well as other services listed in Table 4-5. There are four other identified hospitals located within a 100km radius drive of the Site. The two larger hospitals offering the largest range of services are located in Tamworth. However, due to the travel distance, it is recommended that workers utilise services within Gunnedah, or Boggabri as an alternate service.</p> <p><i>No further mitigation measures are proposed.</i></p>



Aspect	Detail of submission	GSF Response
	<p>The EIS does not provide adequate detail regarding the proposed workforce and any potential for training programs. The availability of workers has not been considered. It is requested that the skills and employment strategy be developed prior to the commencement of works</p>	<p>As identified in Section 6.12.5, both local and non-local labour is expected to be used with a commitment to maximise local labour as outlined in mitigation measure Socio 2.</p> <p>GSF commits to the preparation of an Australian Industry Participation Plan which will identify strategies to maximise the percentage of labour sourced from within 100km of the Site.</p> <p>GSF commits to the preparation of a skills and employment strategy for the Proposal in consideration of the NSW Infrastructure Legacy Program.</p> <p>As outlined in Section 8.1 of the EIS the identified management and mitigation measures will be incorporated into contractual arrangements with any future contractors for construction of the Proposal. As such, both the plan and strategy will form part of the engineering, procurement and construction (EPC) contract.</p> <p><i>A new mitigation measure has been proposed.</i></p>
Biodiversity	<p>The assessment provided in the EIS does not address the provisions of SEPP 44 - Koala Habitat Protection. As the site is identified as containing potential Koala habitat, an assessment as to whether the site contains core Koala habitat is to be undertaken</p>	<p>The Biodiversity Impact Assessment (Appendix D of the EIS) states that the following native vegetation communities exist on site:</p> <ul style="list-style-type: none"> • River Red Gum (<i>Eucalyptus camaldulensis</i>) – Yellow Box (<i>Eucalyptus melliodora</i>) Dry Sclerophyll Woodland/Open Woodland • Bimble Box (<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>) Dry Sclerophyll Open Woodland. <p>The two tree species, Blakely’s Red Gum (<i>Eucalyptus blakelyi</i>) and Yellow Box (<i>Eucalyptus melliodora</i>) have been identified within the three native tree stands on Site. These species are considered secondary food trees for Koala populations. For this reason, a search for evidence for the presence of Koalas on site was conducted during the site visit. It should be noted that there were no primary food trees identified within the Site.</p>



Aspect	Detail of submission	GSF Response
		<p>No evidence of the presence of Koalas such as tree scratchings or droppings on the site could be found. The owners of the property were also interviewed and confirmed that they had never seen Koalas on the site.</p> <p>The three main tree stands on the Site are all widely separated from each other (by more than 500 metres of open field) and are quite small (with between 12 and 39 potential food trees present). Being isolated, Koalas would not seek out these trees as they would be too conspicuous once they reached the trees (the foliage is sparse and trees widely spaced). To reach the trees the Koalas would have to cross between 200 and 400m of open ground (this they are very unlikely to do because they are prone to easy predation when in the open away from tree cover).</p> <p>Based on these findings the secondary food trees were identified as not representative of potential Koala habitat and no further assessment in accordance with SEPP 44 was warranted.</p> <p><i>No further assessment on potential core Koala habitat is required.</i></p>
Visual Impact	It is recommended that all proposed landscaping should be undertaken prior to the commencement of construction works	<p>As per mitigation measure V3 in the EIS it is proposed that implementation of the concept landscape plan (including visual screening) occurs during the construction phase of the proposal.</p> <p>GSF commits to a revised mitigation measure (V3) undertaking the implementation of proposed landscaping works prior to commencing construction works, where possible. This excludes areas that would impact or be impacted by construction works.</p> <p><i>A new mitigation measure has been proposed.</i></p>
Waste disposal	It is noted that waste from the development will be taken to licenced waste facility. For the disposal of large volumes of waste at council's waste management facility, notification is to be provided in advance to assist with the disposal	As outlined in mitigation measure W7 Gunnedah Waste Management Depot will be given appropriate notification before any large quantities of waste are deposited at the Gunnedah Waste Management Depot.



Aspect	Detail of submission	GSF Response
		<i>No further mitigation measures are proposed.</i>
Subdivision	As the development will require subdivision of land, it is requested that the residual land be consolidated into one lot to prevent any further fragmentation of agricultural land	<p>Proposed subdivision of the land has been addressed in Section 4.5.7 of the Gunnedah EIS. GSF has agreed to the recommendation made by Gunnedah Shire Council to consolidate land remaining within the Site, outside of the solar panel and substation footprint in to one single lot. Revised subdivision proposal has been outlined in Section 3.1 and provided in Appendix F of this report.</p> <p><i>Amendment has been made as a result of this submission</i></p>
94A Contributions	Councils Section 94A Contributions Plan applies to the development site. It is requested that any requirement for the payment of contributions be included on the notice of determination	<p>GSF will provide significant investment into the Gunnedah community and wider region. This will be in the form of employment / contracting opportunities during construction and operations, waste management, accommodation, transport and general living expenses. GSF will also undertake appropriate road works and resealing as required. GSF will not be using Council facilities e.g. water and waste once the farm is operational. As such the development, will not result in net increased impost on council services and infrastructure but rather provided localised improvements and broader economic benefit.</p> <p>The roads will be used as required however, it will only be for general use as is now the case. Given this, GSF is requesting that there are no contributions in the determination.</p> <p><i>No further mitigation measures are proposed.</i></p>
Office of Environment & Heritage		
Biodiversity	Resolve the contradictory information in the EIS and confirm the extent of the proposed impacts on the site on native vegetation and threatened species habitat	<p>It is assumed that the contradictory information referred to by OEH is regarding the mention of tree removal in the Fauna Impact Assessment (Appendix C of the Gunnedah EIS). This reference related to a superseded version of the report which was not updated appropriately within the final version of the EIS submitted to DP&E. This has now been completed.</p> <p>GSF has committed to retaining all native stands of trees within the Site, as well as isolated trees located along fence lines of the property boundary. As per</p>

Aspect	Detail of submission	GSF Response
		<p>Section 6.1 of the EIS, clearing of native vegetation will be limited to grasses and shrubs.</p> <p>The existence of <i>White Box, Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i> within the project area or immediate surrounds as identified within the Fauna Impact Assessment has the potential to represent Koala habitat. Whilst this broad fauna habitat type exists within the region, the Flora Impact Assessment revealed that there is no presence of <i>White Box (Eucalyptus albens)</i> within the Site which is considered a primary food type for Koalas. Other indicator flora species of this fauna habitat type do exist within the Site; however these species are not identified as primary food trees for Koala populations.</p> <p>The Fauna Impact Assessment determined that Koala populations do not exist within the Site, due to the degraded condition and sparse distribution of the existing native tree stands. Further, the summary provided in the Fauna Impact Assessment concludes that the Proposal would be unlikely to significantly impact any threatened species due to the poor condition and sparse location of the remaining native tree stands.</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>Update the threatened species assessment to include details of the nearby common Planigale record and evaluate the likelihood of this species occurring on the solar farm site</p>	<p>Section 2.2 of the Fauna Impact Assessment (Appendix D of the EIS) identifies that a fauna survey was completed on an adjoining property in 2011 and the Common Planigale (<i>Planigale maculata</i>) was located on site.</p> <p>A fauna assessment was carried out on Site during 26/10/2017 – 27/10/2017 by Biosphere Environmental Consultants Pty Ltd. The surveys conducted on site resulted in finding no explicit evidence of the presence of the Common Planigale. The summary provided in the Fauna Impact Assessment concludes that the Proposal would be unlikely to significantly impact any threatened species due to the poor condition and sparse location of the remaining native tree stands.</p>



Aspect	Detail of submission	GSF Response
	<p>The proponent has not completed the biodiversity assessments in accordance with the Framework for Biodiversity Assessment (FBA). No shapefiles, plot data or site value scores have been provided for the flora assessment</p>	<p><i>No further mitigation measures are proposed.</i></p> <p>GSF commissioned an appropriately accredited botanist to conduct a Flora Impact Assessment (FIA). The report was prepared in accordance with the following policies and guidelines:</p> <ul style="list-style-type: none"> • Framework for Biodiversity Assessment (FBA) (OEH, 2014) • Biobanking assessment methodology (BBAM) (OEH, 2014) • Guidelines for Threatened Species Assessment (DECC, 2007). <p>A summary of the FIA is provided in Section 6.1 of the Gunnedah EIS.</p> <p>The FIA determines that; given that the proposal does not involve the removal of remnant native vegetation stands on the Site and given the absence of any predicted indirect impacts to retained native vegetation (via the establishment of nominated buffers), an FBA/BBAM (2014) assessment was not required to be undertaken nor a Biodiversity Assessment Report (BAR) prepared. Instead a flora survey and assessment report were prepared, see Appendix D of the EIS.</p> <p><i>No further actions are proposed. No further mitigation measures are proposed.</i></p>
	<p>Fauna impact assessment - 'the main cumulative impact associated with the proposal is the loss of 15 trees in field B1' - contradicts flora assessment</p>	<p>This reference to removal of trees is residual information from a superseded version of the Fauna Impact Assessment and is incorrect. As per Section 6.1 of the EIS, clearing of native vegetation will be limited to grasses and shrubs. The main clusters of vegetation (V1, V2 and V3), as well as isolated trees on fence lines will be retained as part of the proposal (via the establishment of buffers).</p> <p><i>No further actions are proposed. No further mitigation measures are proposed.</i></p>
<p>Aboriginal Heritage</p>	<p>The proponent must consult more extensively with the Aboriginal community to ensure adequate consultation has occurred and not just rely on the LALC as the only source of information. The proponent should adhere to the 'Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010'</p>	<p>The Gunnedah Solar Farm Aboriginal heritage assessment complies with OEH 'Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010'.</p> <p>No impact to Aboriginal heritage will result from the proposed solar farm as determined by archaeological assessment and survey with Red Chief Local Aboriginal Land Council.</p>



Aspect	Detail of submission	GSF Response
		<p>The OEH consultation requirements apply when Aboriginal objects will be impacted. The location of the Gunnedah Solar Farm, within a featureless floodplain spread across heavily cropped fields, exhibits no Aboriginal objects or potential archaeological deposit/s. The property was heavily modified by natural erosion and agricultural activities which preclude the deposition or survivability of Aboriginal objects. Because no impact will occur to Aboriginal heritage the level of consultation is in accordance with OEH’s requirements.</p> <p>The heritage consultant, Kelleher Nightingale Consulting, contacted OEH regarding their submission. It was identified that OEH had received feedback from local aboriginal stakeholders regarding the project and OEH would consider consultation with these groups and the Gomerai People to represent adequate consultation for the Project.</p> <p>GSF commits to a new mitigation measure (H4) to inviting local aboriginal stakeholders as identified by OEH to undertake a site visit with a heritage consultant prior to commencing construction.</p> <p><i>A new mitigation measure has been proposed.</i></p>
NSW Rural Fire Service		
Bushfire	A Fire Management Plan shall be prepared in consultation with the NSW RFS Liverpool Range Fire Control Centre: 24hr emergency contact details, site infrastructure plan, firefighting water supply, site access and internal road plan, APZ and continued maintenance, location of hazards and procedures to manage hazards, additional matters as required by the NSW RFS District Office	<p>The Bushfire Impact Assessment prepared by Eco Logical (Appendix F of the EIS) will provide the basis of the Fire Management Plan (FMP). GSF will complete a FMP as part of the Construction Environmental Management Plan (CEMP).</p> <p>GSF commits to a new mitigation measure (BF12) that prior to construction, a Fire Management Plan will be completed as part of the CEMP.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	Entire solar array footprint to be managed as an Asset Protection Zone as outlined in Section 4.1.3	GSF has agreed to manage the solar array footprint as an Asset Protection Zone. GSF will commit to maintaining the ground cover within the footprint through



Aspect	Detail of submission	GSF Response
		<p>grazing, mowing and slashing as required, as part of the Land Management Plan.</p> <p>GSF commits to a new mitigation measure (BF13) that the solar array footprint will be managed as an Asset Protection Zone, ensuring ground cover maintenance to maintain low fuel loads.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>A 20,000 litre water supply tank fitted with a 65 mm Storz fitting located adjoining the internal property access road within required APZ</p>	<p>As per mitigation measure BF10 in Section 6.9 of the Gunnedah EIS, one water supply tank with a capacity of 50,000L will be located near the substation, out of the APZ.</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>Allow for emergency service personnel to undertake property protection activities, a 10 metre defendable space (APZ) that permits a minimum 4 metre wide, unobstructed vehicle access is to be provided around the perimeter of the solar array and associated infrastructure</p>	<p>GSF commits to the requirements of mitigation measure BF6 of the Gunnedah EIS. BF6 states 'An APZ will be constructed around the solar farm with the following requirements:</p> <ul style="list-style-type: none"> • The APZ will be 15 m wide around the entire perimeter of the solar farm footprint, and 20 m wide for areas abutting the remnant treed areas and landscaping areas • The external edge of the APZ setback at least 25 m from the external edge of PV panels or other components • The APZ must be either a mineral earth fire break (i.e. dirt or gravel) or a heavily grazed area • Trees and tall shrubs associated with the landscape plan should not be planted close to the APZ • APZ preferably located external to any security fence. <p>The substation should have a 20m asset protection zone with no internal vegetation (gravel surface).'</p> <p>In accordance with the submission from NSW Rural Fire Service, this mitigation measure has been revised to include the following additional point:</p>



Aspect	Detail of submission	GSF Response
		<ul style="list-style-type: none"> A 10 metre defensible space that permits a 4 metre wide, unobstructed vehicle access will be provided around the perimeter of the solar array and associated infrastructure. <p>Revised mitigation measures table is provided in Appendix B.</p> <p><i>A mitigation measure has been revised.</i></p>
Fire & Rescue NSW		
Emergency Response Plan	A comprehensive Emergency Response Plan (ERP) is developed for the site	<p>As per mitigation measure BF4 in Section 6.9 of the EIS, an Emergency Response Plan (ERP) will be developed in consultation with the NSW RFS District Fire Control Centre prior to construction. GSF commits to complying with this mitigation measure.</p> <p><i>No further mitigation measures are proposed.</i></p>
	The ERP specifically addresses foreseeable on-site and off-site fire events and other emergency incidents e.g. fires involving solar panel arrays, bushfires in the immediate vicinity or potential hazmat incidents	<p>GSF commits to the requirements of mitigation measure BF4 of the Gunnedah EIS. BF4 states that requirements of FMP to be developed will include:</p> <ul style="list-style-type: none"> Foreseeable on-site and off-site fire events Clearly states work health safety risks and procedures to be followed by fire-fighters, including: <ul style="list-style-type: none"> Personal protective clothing Minimum level of respiratory protection (e.g. rubber fire fighter's boots and gloves, a self-contained breathing apparatus) Minimum evacuation zone distances A safe method of shutting down and isolating the PV system Training for fighting fires within solar farms Any other risk control measures required to be followed by fire-fighters Evacuation triggers and protocols



Aspect	Detail of submission	GSF Response
		<ul style="list-style-type: none"> • Suppression response strategies and tactics, including aerial suppression options/management. <p><i>No further mitigation measures are proposed.</i></p>
	<p>ERP details the appropriate risk control measures to safely mitigate potential risks to the health and safety of firefighters. Including level of personal protective clothing, minimum level of respiratory protection, decontamination procedures, minimum evacuation zone distances and a safe method of shutting down and isolating the photovoltaic system</p> <p>Other risk control measures that may need to be implemented in a fire emergency due to any unique hazards specific to the site should also be included in the ERP</p>	<p>GSF commits to the requirements of mitigation measure BF4 of the Gunnedah EIS. Mitigation Measure BF4 outlines the requirement of the FMP to be developed during construction of the solar farm (see above).</p> <p>The potential hazards to fire fighters were also addressed in Section 6.9.2 of the Gunnedah EIS. The risks to fire-fighter safety associated with a fire burning the solar panels and associated equipment include:</p> <ul style="list-style-type: none"> • Electrocution – solar panels would be energised under any natural or artificial light conditions • Conduction of electrical current through water is also a risk when operational personnel spray the high-powered engine hose at the inverter or the components of the solar PV system • Inhalation of potentially toxic fumes and smoke from any plastic components such as cables or other decomposed products of the panels, although the majority of the site, would be largely constructed of glass, silicon, steel and aluminium. <p>Each inverter station will be fitted with an isolation switch allowing for the isolation and the turning off parts or all of the solar farm. This can be done remotely from GSF’s or Photon’s control centre. When the inverter station is turned off then the solar panels will be isolated and disconnected from the grid. This will mitigate risks to fire fighters by reducing their risk of electrocution.</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>Two copies of the ERP be stored in a prominent 'Emergency Information Cabinet' located in a position directly adjacent to the sites main entry points</p>	<p>GSF commits to the requirements of mitigation measure BF5 of the Gunnedah EIS. BF5 states ‘two copies of the ERP should be permanently stored in a prominent ‘Emergency Information Cabinet’ to be located at the main entrance</p>



Aspect	Detail of submission	GSF Response
		<p>point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.'</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>Once constructed and prior to operation, the operator of the facility contacts the relevant local emergency management committee (LEMC). LEMC is a committee established by Section 28 of the State Emergency and Rescue Management Act 1989</p>	<p>Section 3.5 of the Bushfire Impact Assessment (Appendix F of the EIS) states the following 'once constructed and prior to operation, contact should be made by the site operator with the Local Emergency Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the site. The operator of the solar farm should brief the local volunteer fire brigades and neighbouring farmers at appropriate intervals, for example, at annual pre-season fire meetings, on safety issues and procedures.'</p> <p>GSF commits to a new mitigation measure (BF11) that consultation with the Local Emergency Management Committee will take place prior to operation to establish emergency management procedures and revise the ERP if required.</p> <p><i>A new mitigation measure has been proposed.</i></p>
NSW Roads and Maritime Services		
Traffic	<p>A Traffic Management Plan should be prepared for the construction, operation and decommission stages of the development, to the satisfaction of RMS and Gunnedah Shire Council</p>	<p>GSF commits to mitigation measure T2 of the Gunnedah EIS that a traffic management plan shall be developed in accordance with Roads and Maritime Guidelines and the Australian Standard AS1742.3.</p> <p><i>No further mitigation measures are proposed.</i></p>
	<p>TMP may include relevant Traffic Control Plans designed and approved by qualified persons in accordance with the RTA Traffic Control at Work Sites Manual. Implementation of TCPs on classified roads (Oxley or Kamilaroi Highway) would require a Road Occupancy Licence from RMS</p>	<p>GSF commits to mitigation measure T2 of the Gunnedah EIS that a traffic management plan shall be developed in accordance with Roads and Maritime Guidelines and the Australian Standard AS1742.3.</p> <p>GSF commits to revision of mitigation measure T2 to include:</p> <ul style="list-style-type: none"> • Consultation with Roads and Maritime Services for any traffic control plans to be implemented on the Oxley of Kamilaroi Highway.



Aspect	Detail of submission	GSF Response
	<p>TMP should include a Drivers Code of Conduct to include the following:</p> <ul style="list-style-type: none"> • A map of primary access routes highlighting critical locations, safety initiatives for transport through residential areas (school zones, bus routes) • Consideration for coordination of construction traffic with seasonal agricultural haulage • An induction process for vehicle operators and regular toolbox meetings • A complaint resolution and disciplinary procedure • Any community consultation measures for the peak construction period. 	<p><i>A mitigation measure has been revised.</i></p> <p>GSF commits to mitigation measure T2 of the Gunnedah EIS that a Traffic Management Plan shall be developed in accordance with Roads and Maritime Guidelines and the Australian Standard AS1742.3. The plan will would include:</p> <ul style="list-style-type: none"> • The designated routes of construction traffic to the site • A map of the primary access routes highlighting critical locations • Drivers Code of Conduct • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction • Scheduling of deliveries • Community consultation requirements • Any restrictions on traffic movements (such as residential areas, school pickup and drop-off times) • Traffic controls (speed limits, signage, etc.) • A complaint handling procedure • An induction process for vehicle operators. <p>The Traffic Impact Assessment within the EIS identified that the roads associated with the haulage route carry a high number of heavy vehicles, including B-doubles associated with local and regional agricultural demands. These agricultural demands are seasonal in nature and occur 24 hours a day often involving night travel and operations. There are a number of farms in the general locality of the project site as well as in the wider Gunnedah area that use these local and regional roads during these seasonally high demand periods. Due to the seasonal nature of this work and the requirement for quick turnaround of crop deliveries the TIA considered that it was not appropriate to limit truck movements for these existing farms. Similarly, it is considered that it</p>



Aspect	Detail of submission	GSF Response
		<p>is not appropriate to limit truck movements to and from the project site at these times as the traffic movements on the local roads will continue to remain low.</p> <p>However, in response to the submission from Roads and Maritime, GSF commits to revision of mitigation measure T2 to include:</p> <ul style="list-style-type: none"> • Consideration of construction traffic with seasonal agricultural haulage. <p><i>A mitigation measure has been revised.</i></p>
	<p>Should over mass, over dimension (OMOD) vehicles be required at any stage of the development then a Permit from RMS is required</p>	<p>GSF commits to a new mitigation measure (T16) to obtain relevant permits for OMOD vehicles should they be required at any stage of the development.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	<p>Access to the development is proposed from local road. Access should be designed and constructed in accordance with Austroads Guidelines and Australian Standards, to the satisfaction of Gunnedah Shire Council. It is recommended that swept path analysis be undertaken to ensure the largest design vehicle can safely enter and exit the site in a forward manner</p>	<p>Access for the development will be provided via upgrading the existing private access road into the property. The upgrades will meet the RMS Typical Rural Property Access Standard for articulated vehicles as specified by Gunnedah Shire Council. A concept design has been prepared in accordance with this specification and the Austroads Guidelines and Australian Standards.</p> <p>The concept design prepared also includes a swept path analysis to illustrate safe entry and exit to the site in a forward manner.</p> <p>GSF commits to a revised mitigation measure (T1) which includes upgrade of the existing access road in accordance with Orange Grove Road Site Access Alignment Plan (Sy17199-P1). See Appendix E.</p> <p><i>A mitigation measure has been revised.</i></p>
	<p>It is the landowner's responsibility to maintain any access driveways to the development to improve safety and efficiency of access - minimise dust and/or tracking of material onto the public road</p>	<p>As identified in mitigation measure, S4, GSF commits to employing dust management measures on unsealed roads, stockpiles and other areas of loose or disturbed soil prone to dust generation. Controls may include covering of stockpiles, watering roads and synthetic soil stabilisers. Dust management techniques shall be outlined in the Soil and Water Management Plan.</p>



Aspect	Detail of submission	GSF Response
		<p>As identified in mitigation measure, S6, GSF commits to installing a stabilised site entrance that all construction vehicles will use to access the site. The stabilised entrance shall be designed to minimise tracking of sediment onto adjoining roads from departing vehicles.</p> <p><i>No further mitigation measures are proposed.</i></p>
Department of Industry Crown Lands and Water Division		
Land Use	Proponent should revise the LUCRA to consider potential impacts from surrounding land use on solar farm operations - e.g. dust and the Right to Farm Policy	<p>Land use impacts (including mineral resources) were assessed in Section 6.3 of the Gunnedah EIS.</p> <p>Land use conflicts occur when one land user does, or is perceived to, infringe upon the rights, values or amenity of another. In rural areas land use conflicts commonly occur between agricultural and residential uses. However, land use conflicts can also occur between different agricultural enterprises and other industries such as mining, forestry or energy production. Due to the potential for land use conflicts between the solar farm development and the existing agricultural land use, a land use conflict risk assessment (LUCRA) based on the Department of Primary Industries (DPI) 'Land Use Conflict Risk Assessment Guide' (Department of Trade and Investment, 2011) was conducted as part of this EIS.</p> <p>As per the request of the Department of Industry Crown Lands and Water Division, the LUCRA has been updated to consider potential impacts of the Proposal on neighbouring land uses, see Appendix G.</p> <p><i>Amendment has been made as a result of this submission.</i></p>
Flooding	Additional flood modelling should be provided which includes the inputs of both the Mooki River and the Namoi River to ensure impacts are consistent with the requirements of the Carroll to Boggabri Floodplain Management Plan (FMP). May require modifications to the infrastructure. Must ensure that the predicted increased flood levels on adjacent landholders properties is less	As detailed in the response to Gunnedah Council's submission, additional flood modelling has been undertaken and is detailed in the Updated Flood Impact Assessment (refer Appendix C).



Aspect	Detail of submission	GSF Response
	<p>than 100mm and that drainage it to be within 24hrs of natural/existing drainage time</p>	<p>The Updated Flood Impact Assessment addresses relevant complying works criteria of the Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016 and the Carroll to Boggabri FMP.</p> <p>The updated modelling demonstrates that the complying works criteria would be met. In particular, the development would NOT:</p> <ul style="list-style-type: none"> • Redistribute peak flood flow by more than 5% on adjacent landholdings • Increase flood levels by more than 100mm on adjacent landholdings • Increase flow velocity by more than 50% for a range of flood scenarios including the relevant large design flood, unless increases by more than 50% are in isolated areas • Increase flow velocity by more than 50% at the boundary • Increase drainage time by more than 24 hours of natural/existing drainage time. <p><i>Amendment has been made as a result of this submission.</i></p>
<p>Decommissioning</p>	<p>All underground infrastructure is to be removed during decommissioning</p>	<p>GSF commits to mitigation measure L5 of Section 6.3 of the Gunnedah EIS, see that all the infrastructure will be removed upon decommissioning with the possible exception of the substation, transmission lines to the substation and access road to the substation.</p> <p><i>No further mitigation measures are proposed.</i></p>
<p>Construction Environmental Management Plan (CEMP)</p>	<p>The proponent prepares a Soil and Water Management Plan as part of the CEMP in consultation with NRAR, prior to commencement of activities</p>	<p>GSF commits to mitigation measure G1 of Section 8.1 of the Gunnedah EIS that a project specific Construction Environmental Management Plan (CEMP) and all relevant sub-plans will be prepared by the Contractor prior to commencing Stage 1 construction. The sub-plans will include:</p> <ul style="list-style-type: none"> • Land Management Plan (LMP) including a weed management plan • Soil and Water Management Plan (SWMP) including erosion and sediment (ERSED) control



Aspect	Detail of submission	GSF Response
		<ul style="list-style-type: none"> • Unexpected Finds protocol • Waste Management Plan (WMP) • Traffic Management Plan (TMP) • Emergency Contingency Plan. <p><i>No further mitigation measures are proposed.</i></p>

Additional information regarding the location and offering of health services in proximity to the Proposal has been provided in Table 4-5.

Table 4-5 Health services in proximity to Gunnedah Solar Farm

Hospital	No. of beds	Location	Distance from Site	Services Offered
Gunnedah Hospital	<50 (43)	Gunnedah	14.6km	<ul style="list-style-type: none"> • Domiciliary care unit • Emergency department • Hospice care unit • Obstetric services.
Boggabri Multipurpose service hospital	<50	Boggabri	50km	<ul style="list-style-type: none"> • Domiciliary care unit • Emergency department • Hospice care unit • Nursing home care unit.
Manilla Health Service	Unknown	Manilla	70km	<ul style="list-style-type: none"> • Aged care • Palliative care • GP services • X-ray



				<ul style="list-style-type: none"> • Physiotherapist • Optometrist • Community health • Emergency department 	
Tamworth Hospital		>50	Tamworth	90km	<ul style="list-style-type: none"> • Gastroenterology • General Medicine • Kidney Medicine • Maternity • Mental Health • Ophthalmology • Orthopaedics • Urology • Medical and Radiation Oncology • Hospital in the Home
Tamara hospital	Private	>50 (53)	Tamworth	90km	<ul style="list-style-type: none"> • General Surgery • Urology • Endoscopy • Ophthalmology • Gynaecology • ENT • Orthopaedic (including major Joint replacements) • Oral Maxillary & Dental • Plastic Surgery

4.2 Responses to Organisation submissions

Responses to organisation submissions is provided in Table 4-6.

Table 4-6 Summary of responses to organisation submissions

Issue	Detail of issue	GSF Response
NTSCORP Limited (Gomerioi People)		
Aboriginal Heritage	The requirement for adequate consultation with the local Aboriginal community has not been met	<p>The Gunnedah Solar Farm will have no impact on Aboriginal heritage. Detailed survey and consultation with the Red Chief Local Aboriginal Land Council was completed as part of the EIS and exceeds OEH consultation requirements where no impact to Aboriginal heritage objects will occur.</p> <p>Following consultation with OEH, GSF commits to a new mitigation measure (H4) that prior to commencing construction, local aboriginal stakeholders (as identified by OEH) will be invited to participate in a site visit with the heritage consultant.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	A condition be placed on the proponent/consultant to consult directly with the applicant for the Gomerioi People native title determination application in respect of the project	
	The Proponent/consultant organise a further cultural heritage site survey with monitors selected by the Applicant for the Gomerioi People native title determination application	
	A revised Aboriginal cultural heritage assessment report be submitted following the above consultation and site survey	
Orange Grove Sun Farm (OGSF)		
Flooding	Concerned with the accuracy of the flood impact assessment, it negatively misrepresents the potential for flood across the OGSF development footprint. Recommend that GSF undertake reassessment of the flood modelling utilising topographical and spatial data of appropriate resolution	<p>An updated flood model has been prepared using more accurate ground surface data from three sources; LiDAR surveyed in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003), LiDAR surveyed by drone for Photon in 2017 and the construction drawing for the ring levee around the property at 765 Orange Grove Road (Myalla, or “Lou’s Place”).</p> <p>The available survey data was combined and processed into a single elevation model. With the new data, the flood model indicated more uniform flow depths across the site, with flood depths and patterns of flow that reflected observed conditions.</p>

Issue	Detail of issue	GSF Response
		<p>The revised model was then used to estimate the potential impacts of the proposed solar farm. These are presented in the Updated Flood Impact Assessment (Appendix C).</p> <p><i>Amendment has been made as a result of this submission</i></p>
Traffic	<p>Recommends GSF undertakes reassessment of the TIA using all available traffic data from NSW RMS and the Gunnedah Shire Council</p>	<p>The Traffic Impact Assessment has been updated to include additional traffic data (where available) for roads surrounding the site. The updated TIA is provided in Appendix D.</p> <p><i>Amendment has been made as a result of this submission</i></p>

4.3 Responses to community submissions

Responses to organisation submissions is provided in Table 4-7

Table 4-7 Summary of response to Community

Aspect	Number of submissions	Detail of issue	GSF Response
Flooding: 48			
	46	<p>Inappropriate location of solar farm in a floodplain / floodway. Concern over security fence and how it could block and redirect flows, worsening flood impacts to surrounding properties. Specific concerns relate to the effects of increasing flood depths and velocities, duration of flood and redirecting flood waters, damage caused by the washed away security fence. Potential impacts of concern include damage to fences, houses, pastures, farming operations, access restrictions, public safety, emergency services, erosion and sedimentation</p>	<p>GSF recognises and accepts the concerns of the community in relation to potential flood impacts. To address this additional flood modelling has been undertaken using new terrain data and updated hydrology assumptions, and is detailed in the Updated Flood Impact Assessment (refer Appendix C).</p> <p>A new fence configuration (Fence Configuration 4) has been developed and modelled (refer Appendix C) and represents an alternative fencing design aimed at mitigating the blockage and redirection of floodwater, and the potential impacts of the Proposal on the surrounding landscape and residents during a flood event. Fence Configuration 4 incorporates drop down fencing in key areas. The model indicates that Fence Configuration 4 further reduces flooding impacts compared to the fence configuration presented in Appendix J of the EIS (Configuration 3), is compliant with the Carroll-Boggabri Flood Management Plan 2006 and would have negligible flood impacts on surrounding properties.</p> <p>In particular, the development would NOT:</p> <ul style="list-style-type: none"> • Redistribute peak flood flow by more than 5% on adjacent landholdings • Increase flood levels by more than 100mm on adjacent landholdings • Increase flow velocity by more than 50% for a range of flood scenarios including the relevant large design flood, unless Increases by more than 50% are in isolated areas • Increase flow velocity by more than 50% at the boundary • Increase drainage time by more than 24 hours of natural/existing drainage time. <p>The modelling indicates that the proposed solar farm would not cause appreciable impacts on surrounding properties due to increasing flood depths and velocities. Nonetheless, GSF recognises that modelling alone may not entirely address community concerns. GSF therefore commits to constructing a perimeter security fence that is designed to allow flood water into and through the development site during significant flood events, which will mitigate the impacts of potential fence blockage on flooding.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>Design of the fencing shall seek to mitigate offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. It is noted that “drop-down” fencing is employed commonly by surrounding landowners and is just one potential design that GSF is investigating.</p> <p>GSF commits to a new mitigation measure, SW6, construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.</p> <p><i>A new mitigation measure has been proposed.</i></p>
	25	<p>Questions raised over accuracy of the flood model and data inputs, in particular:</p> <ul style="list-style-type: none"> - Terrain data (SRTM), incl +/- 9.8m levels, 30m tiles. Why not use accurate terrain data? Concern at cutting corners and trying to push it through with more “malleable” terrain data - Should use LiDAR data which is now economical and would 	<p>The updated Flood Impact Assessment (Appendix C) includes a more accurate flood model with new data inputs. A summary is provided below and further detail is contained within the updated Flood Impact Assessment (Appendix C).</p> <p><u>Terrain data, LiDAR and landscape features</u></p> <p>It is acknowledged that the previous flood modelling utilised the SRTM DEM-H terrain data (which has a vertical accuracy of about $\pm 9.8\text{m}$ against 90% of tested heights across Australia), and approximated flows approaching the site from the Namoi River. The intent of the previous modelling was to carry out a preliminary assessment that focused on potential flood changes due to the solar farm. It demonstrated that:</p> <ul style="list-style-type: none"> • The site is flood affected • The security fencing could cause impacts in terms of increased flood levels and changed velocities, though these impacts were minor • The security fence should be designed in a way that reduces flood impacts.

Aspect	Number of submissions	Detail of issue	GSF Response
		<p>be worthwhile for a project of this scale and potential impact</p> <ul style="list-style-type: none"> - Landscape features of importance not included in model (e.g. major irrigation channels) - Use of 1984 flood data as a template. Why not use the 1955 flood - Use of river gauges that don't relate to the area - Effect of Mooki River and its contribution – all floods are different. - Effect of Rangari Creek - More accurate modelling is required - Unpredictability of flooding – all floods are different lending uncertainty to the model outcomes - Velocity was 4.7m/s in 1955 flood (from SMEC), much higher than we have predicted. 	<p>Though the results demonstrated that the site would be affected by flooding, and the fences were likely to result in small increases to flood levels, the terrain model was considered too coarse to provide an accurate estimation of flood depths and increases at an appropriate scale (less than 1.0 m).</p> <p>The SRTM DEM-H data were used in the previous assessment because better terrain data were not available at the time. Better data have now been acquired in the form of Aerial Laser Survey (ALS) data surveyed in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003); and LiDAR surveyed by drone for Photon in 2017. These data provide a far more accurate terrain model and do include landscape features such as drainage channels within the GSF site.</p> <p>The updated flood modelling based on these terrain data yields more credible results in terms of the distribution and depths of flooding around the site, which agree better with observed flood levels. In the previous model, the terrain was much more 'lumpy', falsely creating a network of channels and islands, which yielded over-estimates of velocities and impacts. In the current model, the terrain is much flatter and is crisscrossed with farm drains and levees, yielding more uniform flow distribution with lower velocities and lower potential impacts due to the solar farm.</p> <p><u>Use of 1955 and 1984 flood data</u></p> <p>The earlier response to Gunnedah Shire Council submission explains the use of 1984 flood data in the establishment of a hydraulic model. The 1984 flood was used as the basis for setting up the previous flood model as it is the largest flood on record for which the nearest gauges recorded data. This flood occurred after construction of the Keepit Dam while the 1955 flood predates Keepit Dam. This is explained in the Updated Flood Impact Assessment (Appendix C).</p> <p>A review of the hydrology and revised flood modelling has been undertaken. To address numerous submissions the updated modelling specifically presents results for the 1955 flood (a close approximation to the 1% AEP flood) as well as results for the 10% AEP, 5% AEP and Probable Maximum Flood events.</p> <p><u>Flood Gauges</u></p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>The nearest flood gauges were used in developing and verifying the hydraulic model and are considered appropriate.</p> <p><u>Mooki River and Rangari Creek effects</u> Whereas the previous model assumed that flows approached the site from the Namoi River, the current model includes flows approaching the site from the Namoi and Mooki rivers. The distribution of flows between the Namoi and Mooki Rivers was based on further information obtained from the Gunnedah and Carroll Floodplain Management Plan 1999 (SMEC Study, updated 2014).</p> <p>The site is located where the flows from the two river systems merge over the flood plain. The current model includes this mechanism by its representation of the terrain surface of the channels and flood plains. Inflows from the Rangari Creek were included in the Namoi and Mooki total flow, and were not modelled explicitly, because of the lack of flow data. Flows from the Rangari Creek merge with Namoi and Mooki flows on the flood plain over a wide area generally downstream of the site. The model was verified by checking modelled flood levels and depths for the 1955 flood, which agree well with observed flood levels and depths.</p> <p>It is considered that the current model improves the representation of flood behaviour around the proposed solar farm primarily through the acquisition and use of updated terrain data. It therefore provides a more accurate assessment of potential impacts compared with the previous (March 2018) flood assessment.</p> <p><u>Comparison with Previous (SMEC) Model</u> The hydraulic modelling software used for the peak flood level estimation was HEC-RAS Version 5.0.4 in 2D mode. The previous modelling carried out by SMEC relies on 1D modelling. The difference is that the 1D approach comprises a network of interconnected channels and flow paths and water is constrained to follow these channels and flow paths, and the 2D approach comprises a grid of cells in which water can flow in any direction into adjoining cells. A well-constructed 1D model can accurately represent overland flows in flood plains, but the accuracy depends on pre-emptive decisions made by the modeller about where the channels and flow paths are located, how they are interconnected, and what over-bank storage should be allocated to each channel or flow path. A</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>well-constructed 2D model removes the need for these pre-emptive decisions because it explicitly includes issues of flow direction, interconnectivity and storage in its grid.</p> <p>Both the 1D and 2D models rely on the quality of terrain data. Recent advances in survey techniques (especially LiDAR or ALS) have made it possible to move from surveying discrete cross sections (used in 1D modelling) to compiling entire ground surfaces in the form of digital elevation models, or DEMs (used in 2D modelling).</p> <p>It is considered that the 2D approach used in the current study provides a better representation of flows over the flood plain, and hence a better way to estimate the potential impacts of the proposal solar farm.</p> <p>Finally, the differences in the approaches 1D and 2D models makes it difficult to directly compare velocities. In a 1D model, velocities are averaged over entire cross sections, but in a 2D model, velocities vary from grid cell to grid cell in magnitude and direction. In the case of a uniform channel, the 1D average velocity and 2D distribution of velocities may be comparable. However, in the case of overland flow over a flood plain, the 1D average velocity could be quite different from the 2D distribution of velocities. It is considered that the 2D approach is more realistic for flood flows in a flood plain, and a comparison with 1D average velocities can only be tentative, at best.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions.</i></p>
	11	<p>Concern at failure to use information from Carroll to Boggabri Flood Management Plan (2006). Inconsistencies between the pitt&sherry flood modelling and data in the FMP (e.g. flood depths, velocities). Incorrectly identify the volume and</p>	<p>The Updated Flood Impact Assessment (Appendix C) has been undertaken with reference to the Carroll to Boggabri Flood Management Plan 2006 and study; and the Gunnedah and Carroll Floodplain Management Plan 1999 (SMEC Study, updated 2014).</p> <p>Inconsistencies between the SMEC flood model results and this study are to be expected due to the different models that were used. Please see comparison with Previous (SMEC) model above.</p> <p>The Namoi River flood breakout over Orange Grove Road to the south of the Site is clearly depicted in the flood model results in Appendix C. This breakout is very noticeable in the flood imagery for the 10% and 5% AEP flood events.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
		velocity at the breakout over Orange Grove Road	<i>The updated Flood Impact Assessment has been prepared in response to submissions.</i>
	10	Cyclone wire fence blockage assessment and predicted impact on flooding is inaccurate. Flood would flatten the fence. Blockage would be 100% causing full redirection of flows. Need to redesign or remove the fence	<p>The Updated Flood Impact Assessment (Appendix C) has incorporated what we consider realistic conservative assumptions regarding the blockage of the security fence, that is full (100%) blockage below 0.5m height and 50% above that, in all model scenarios run to date.</p> <p>Nevertheless, to address the community concerns over the fencing and for operational reasons, GSF commits to construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events, to minimise potential redirection of flood flows due to fence blockage.</p> <p>The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval. It is noted that “drop-down” fencing is employed commonly by surrounding landowners and is just one potential design that GSF is investigating.</p> <p>GSF commits to a new mitigation measure, SW6, construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions. A new mitigation measure has been proposed.</i></p>
	7	Inconsistencies between pitt&sherry flood model and actual observations of dry land vs inundated areas	<p>The Updated Flood Impact Assessment (Appendix C) has been undertaken with more accurate terrain data.</p> <p>The observed differences between the previous model and actual observations of dry land vs inundated areas is a result of the limitations of the previous terrain data, which are addressed above.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>By utilizing much more accurate terrain data the flood model now provides a better representation of the distribution of floodwaters across the floodplain which align with actual observations.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions.</i></p>
	5	Support development without a security fence, or with reconfigured fence or drop-down fence and designed floodways	<p>GSF commits to a new mitigation measure, SW6, construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions. A new mitigation measure has been proposed.</i></p>
	2	Questioned whether we checked landholder records of flood observations to validate our model	<p>The Updated Flood Impact Assessment (Appendix C) records publicly available flood observations which were used to validate model performance. A list of recorded flood levels was included in the 2003 SMEC report. A 1955 flood level mark within the model boundary was available as verification on model performance. The flood level is located on a post found behind Battery Hill house, which was 272.61 m RL.</p> <p>The 1955 flood event was simulated to provide confidence that the model can simulate large historical flood events. The historical flows were applied to the upstream boundary conditions. Several scenarios were run for the 1955 flood event with varying roughness and a downstream boundary gradient. The scenario which achieved best fit against historical flood data was selected. The model achieves a reasonable fit between the available flood levels for the 1955 event.</p> <p>It is considered that model conditions developed for the 1955 flood provide a close representation of actual conditions and are valid for the purpose of the assessment.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions.</i></p>
	1	Why would Photon build in a floodplain and risk	<p>Site selection was addressed in Section 2.4 of the EIS.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
		<p>damage to such expensive infrastructure and to their neighbours? Who covers damage bill and pays for repairs? Is there Insurance for the neighbours?</p>	<p>As identified with the updated Flood Impact Assessment (Appendix C) the solar panels are elevated on posts and above the flood heights in the 1% AEP and PMF flood events. The substation would be raised on a fill pad to ensure a sufficient level of flood immunity, as would the many inverters located throughout the solar farm.</p> <p>There is potential for some damage, especially during very large events, for example due to impact by floating logs. However, the risk is relatively minor in terms of likelihood and consequence of significant damage. GSF recognizes that the element of the solar farm that is at greatest risk of damage during a flood is the security fence. The security fence also has the greatest potential to redirect floodwaters if blocked by debris, which is of greater concern to the community.</p> <p>As explained earlier, GSF is reviewing the design of the fence and commits to installing security fencing which is designed to mitigate potential redirection of flood flows due to fence blockage. This reflects an amendment to the fence configuration presented in Appendix J of the EIS (Configuration 3) that was presented in the EIS (perimeter fence with laneways) and would be designed post approval as part of detailed design.</p> <p>The flood modelling undertaken to date indicates that the proposed solar farm would not appreciably increase the risk of flood impacts to surrounding properties which are already flood susceptible. A sympathetic fence design that allows the free flow of floodwaters through the solar farm site will further mitigate the risk of any offsite impacts.</p> <p>GSF commits to a new mitigation measure, SW6, construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.</p> <p><i>The updated Flood Impact Assessment has been prepared in response to submissions. A new mitigation measure has been proposed.</i></p>

Aspect	Number of submissions	Detail of issue	GSF Response
	1	Consider lowering/removing channel banks to reduce flood impacts	<p>At this stage GSF does not propose any lowering of channel banks. However, this can be considered as part of the detailed design phase. Many of the channel banks and levees around the site have been formed from the spoil from the excavation of irrigation channels, and they may serve no specific operational purpose to the ongoing irrigation operations. If this were the case, these banks could be excavated, and the spoil used for the substation fill pad, subject to agreement with the landowner.</p> <p><i>No further mitigation measures are proposed.</i></p>
Traffic During Construction:		10	
Adequate capacity of haulage route	4	<ul style="list-style-type: none"> - Width of Orange Grove Road too narrow - Width of Old Blue Vale Road too narrow - Width of Kelvin Rd too narrow - No intent to perform road upgrades, resulting in no benefit for the community 	<p>The updated TIA (Appendix D) identifies that Kelvin Road is 7m wide, Orange Grove Road is 6m wide and Old Blue Vale Road is 5m wide all allowing for two-way traffic movements as required. However, it was noted that the sealed width of Old Blue Vale Road only allows for a single vehicle and as such opposing vehicles must put two wheels on the dirt to the side of the seal when passing.</p> <p>It also identified that daily flows on Orange Grove Road are less than 200 vehicles (measured as 166 in 2015) and similarly Kelvin Road carries low traffic flows with 559 vehicles measured in 2015. Old Blue Vale Road carries very low traffic flows as it provides access to a low number of dwellings along its length and does not provide any through traffic movements. It is considered that the daily traffic flows along this road would be less than 100 vehicles per day. As the increased demands, will be limited to the construction period it is considered that this road can continue to operate as a single sealed lane with the implementation of mitigation measures.</p> <p>Mitigation measure T1 commits to road improvements prior to construction of the proposal. This mitigation measure has been revised to provide further clarification on the proposed road improvements as follows:</p> <p>GSF commits to the following road improvements to be completed prior to the construction of the proposal in consultation with the Road Authority:</p> <ul style="list-style-type: none"> • Increasing the extent of two-lane seal width (7m) for a distance of 100m at the western and eastern ends of Old Blue Vale Road • Removal of loose gravel material at the Old Blue Bale Road and Kelvin Road intersection.

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>GSF also commits to a new mitigation measure (T15) to establish a maintenance agreement with Gunnedah Shire Council for Old Blue Vale Road for the duration of construction. The option for a Maintenance Bond/ Defects Liability Period would also be discussed at this time.</p> <p><i>A new mitigation measure has been proposed.</i></p>
Safety of community due to increased traffic	2	<ul style="list-style-type: none"> - Consistent traffic of large vehicles causing disruption to local commuters - Existence of wet weather procedure - Safety of school children during school bus service 	<p>As outlined in the updated Traffic Impact Assessment the existing traffic flows on Kelvin Road, Orange Grove Road and Old Blue Vale Road are low and the increase in traffic associated with the Proposal is only associated with the construction phase of the Proposal and would peak at 75 light vehicles and on average 16 heavy vehicles entering and exiting the site per day.</p> <p>As identified in Section 6.6.3 of the EIS during operation, vehicle movements generated by the proposal are very low with a maximum on-site workforce of 10 people and no need for regular heavy vehicle access.</p> <p>GSF commits to revision of mitigation measure T2 to include a wet weather access procedure within the Traffic Management Plan.</p> <p>GSF commits to a new mitigation measure (T12) to restrict heavy vehicle deliveries and access to the Site during school bus route times. During the school holidays these restrictions for delivery and access will not apply.</p> <p><i>A new mitigation measure has been proposed.</i></p>
Maintenance of haulage route	2	<ul style="list-style-type: none"> - Proponent lack of commitment to maintain quality of the road - Council lack of resourcing to maintain roads 	<p>Mitigation measure T1 commits to road improvements prior to construction of the proposal. This mitigation measure has been revised to provide further clarification on the proposed road improvements as follows:</p> <p>GSF commits to the following road improvements to be completed prior to the construction of the proposal in consultation with the Road Authority:</p> <ul style="list-style-type: none"> • Increasing the extent of two-lane seal width (7m) for a distance of 100m at the western and eastern ends of Old Blue Vale Road

Aspect	Number of submissions	Detail of issue	GSF Response
			<ul style="list-style-type: none"> Removal of loose gravel material at the Old Blue Bale Road and Kelvin Road intersection. <p>GSF also commits to a new mitigation measure (T15) to establish a maintenance agreement with Gunnedah Shire Council for Old Blue Vale Road for the duration of construction. The option for a Maintenance Bond/ Defects Liability Period would also be discussed at this time.</p> <p><i>A new mitigation measure has been proposed.</i></p>
Scheduling of truck/vehicle movements	2	- Proponent lack of commitment to ensure vehicle movements are outside of school bus runs	<p>GSF commits to a new mitigation measure (T12) to restrict heavy vehicle deliveries and access to the Site during school bus route times. During the school holidays these restrictions for delivery and access will not apply.</p> <p><i>A new mitigation measure has been proposed.</i></p>
Management of air and noise quality	3	- Increased noise and dust on haulage route due to traffic	<p>As identified in Section 6.12.5, traffic generated by the Proposal has the potential to impact on sensitive receivers through the generation of noise and dust however these potential environmental impacts can be managed through implementation of the mitigation measures outlined in the EIS including mitigation measure G1, a project specific Construction Environmental Management Plan (CEMP).</p> <p><i>No further mitigation measures are proposed.</i></p>
Adequate space for parking of truck/vehicles	1	- Where is adequate space located for parking of 50 B-Doubles a day	<p>As identified in the updated Traffic Impact Assessment (Appendix D) parking will be provided for up to 100 light vehicles in accordance with anticipated movements associated with workers commuting to the site during construction. All staff vehicles will be able to park within the site adjacent to the site office with no external parking demands. There will be no formal parking area constructed for the project, however given the overall footprint of the project site it can be seen that the parking demands will be contained within the site. The car park area is a temporary feature of the project and to reduce the overall impact of the project, the existing surface will be maintained for the parking and will be managed / maintained throughout the project. Once the construction phase is complete, this car park will not be required and this area will be cleaned up and returned to its existing condition.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>Parking is not required for heavy vehicles as they are associated with the delivery of plant, equipment and materials.</p> <p><i>No further mitigation measures are proposed.</i></p>
Use of Prime Agricultural Land: 17			
Reduction of prime agricultural land, when arable land in Australia is already limited	17	<ul style="list-style-type: none"> - Reduction of highly productive farming land which should be protected - Solar farms are not dependant on soil quality, so do not need to be placed on 'valuable food producing land' - The area is currently in drought and needs all usable land available 	<p>Land use impacts were assessed in Section 6.3 of the Gunnedah EIS.</p> <p>The land for the Proposal has been mapped as Biophysical Strategic Agricultural Land (BSAL) by the <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i> (New England North West Region – Map 008). BSAL is classified as naturally fertile and highly productive and can be used for intensive agriculture such as cultivation.</p> <p>The solar farm is located on land mapped in capability Class 2 under the Land and Soil Capability (LSC) Mapping for NSW (<i>OEH, 2017</i>). Class 2 land is 'arable land suitable for regular cultivation for crops, but not suited to continuous cultivation.' (<i>NSW Agriculture, 2002</i>). The Proposal will cover approximately 38% of the Subject Land with a percentage of the remaining area to continue to be used for cropping agriculture.</p> <p>The Proposal will result in a change from cropping agriculture to electricity generation accompanied by grazing agriculture. It should be noted that the Site has operated as grazing land approximately 20 years prior to operating as cropping lands. As such, the Proposal can be seen as reverting the Site to a former land use, albeit at a reduced capacity. Except for limited and short-term earthworks associated with construction and operational use of internal tracks the majority of the soil surfaces would not be impacted by the development in the long term; no large areas of reshaping or excavation are proposed.</p> <p>The Proposal has a reversible nature as it can be easily decommissioned and rehabilitated returning the land to its former agricultural use at the end of the operational period. The proponent has demonstrated their intentions to ensure the rehabilitation of the site through the development of a draft Land Management Plan, provided in Appendix G of the EIS.</p> <p>The Gunnedah Solar Farm Site was considered a preferred location due to:</p> <ul style="list-style-type: none"> • The suitability of commercial scale solar electricity generation on the land, in terms of solar yield

Aspect	Number of submissions	Detail of issue	GSF Response
			<ul style="list-style-type: none"> • Availability of suitably sized lots • Aspect of the land (north facing) • Ease of access to major transport networks such as the Kamilaroi and Oxley Highways • Limited site vegetation present • Limited potential for aboriginal or historic heritage items to be present • Flat landscape requiring minimal earthworks • Proximity to and capacity of connection infrastructure (132kV transmission line and Gunnedah substation) • Lease agreement with landowner • Water licencing constraints reducing the agricultural use of the site by the landowner. <p>Due to the availability of water the landowner estimates they can successfully irrigate up to 180 hectares of land, which is approximately 23% of the Subject Land. This limits the agricultural use of the remaining land and as such this Proposal allows the irrigated section of land to continue to be used for cropping agriculture whilst the unirrigated land can be used for energy generation and limited grazing.</p> <p>The remaining 62% of the available land within the property will continue to be used for cropping agriculture. The 38% of the land occupied by the solar footprint will be maintained with sheep grazing. It is anticipated that the solar panels will provide shelter and a 'microclimate' for the ground cover beneath allowing some protection from extreme temperatures, which may improve ground cover health and longevity. It is recognised that agricultural use of the land will be reduced during the solar farm lifetime.</p> <p>Due to the reversible nature of this infrastructure, and commitment to rehabilitation it is anticipated that this property could be used for cropping agriculture following the decommissioning of the Proposal. The layout and design of the project has been designed to ensure that ongoing farm operations will not be adversely affected.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<i>No further mitigation measures are proposed.</i>
Loss of specifically 'intensive irrigation property'	1	- The proposal will reduce irrigation intensive cropping land	<p>Due to the availability of water the landowner estimates they can successfully irrigate up to 180 hectares of land, which is approximately 23% of the Subject Land. This limits the agricultural use of the remaining land and as such this Proposal allows the irrigated section of land to continue to be used for cropping agriculture whilst the unirrigated land can be used for energy generation and limited grazing.</p> <p><i>No further mitigation measures are proposed.</i></p>
Secondary economic impacts of reducing agricultural practices	1	- Not only does the land holder profit, but numerous associated support services like freight providers, agronomists, farm input businesses (i.e. fertilizer, chemical) which provide sustainable employment to the broader community	<p>Short term economic benefits of the proposal (12 months) include the opportunity for up to 150 construction jobs (at peak) as well as indirect supply chain jobs. Regional economic benefits will include:</p> <ul style="list-style-type: none"> • Employee expenditure in the Gunnedah region (fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies) • Maximising the use of local contractors and equipment hire • Increasing local skills and trades through project experience. <p>Long term economic benefits of the Proposal include the opportunity of up to 10 operational jobs for the solar farm development. Job opportunities and associated benefits of the continued cropping and grazing of a proportion of the land will continue throughout the lifetime of the Proposal as well.</p> <p>The percentage of land proposed for use is not able to be irrigated and represents a very small percentage of the total productive land in the region. It is considered that the long term benefits and increase in renewable energy sources outweigh this minor loss of productive land.</p> <p><i>No further mitigation measures are proposed.</i></p>
Visual Impact: 8			
Glint/glare of solar panels	4	- 'Now we are faced with overlooking a veritable sea of	The visual impact from public and private viewpoints was assessed in the Visual Impact Assessment (Appendix C of the EIS) and summarised in Section 6.4 of the EIS.

Aspect	Number of submissions	Detail of issue	GSF Response
		<p>reflecting, glaring solar panels as far as the eye can see.'</p> <ul style="list-style-type: none"> - Creates a traffic distraction 	<p>The level of impact to landscape character and viewpoints is based on the combination of two criteria – sensitivity and magnitude. When assessing private viewpoints, such as residences, the closer the proximity and clearer the potential view, generally the greater sensitivity to change, and therefore the higher potential for visual impact</p> <p>The solar farm is not located on elevated land that is prominent within the landscape. The solar farm is setback at least 800 meters from nearest receivers and solar panels will have a maximum height of 3 metres. As such it will not be visually prominent feature within the landscape in terms of height. The project will be a visible feature however this will appear as a feature of low height and comprised of large geometric shapes and repetitive rows, elementally similar in form to large mature crops viewed at similar distances but different in colour.</p> <p>The solar Photovoltaic (PV) modules proposed to be installed at the Site do not use mirrors to reflect the sun to one point to concentrate and harness the sunlight. PV panels are designed to reflect as little light as possible (generally around 2% of the light received) to maximise their efficiency, absorb sunlight and convert it to electricity (NSW Department of Industry Solar Farm Fact Sheet 2016).</p> <p>Furthermore, previous studies have identified that the overall expected impact upon road users from solar farms with respect to safety is classified as Low (at worst) where the solar panels are visible.</p> <p><i>No further mitigation measures are proposed.</i></p>
Night lighting impact	1	<ul style="list-style-type: none"> - Address impact to night lighting 	<p>The impact of night lighting was raised as a concern during community consultation and addressed in Section 5.7 of the EIS. Lighting will be limited to compulsory lighting required for the substation. Substation lighting will be turned on if an intrusion is detected or if staff are on site undertaking works outside of daylight hours which is anticipated to only happen in case of an emergency. As such, there will be no night lighting permanently switched on at the Site.</p> <p><i>No further mitigation measures are proposed.</i></p>
Visual Impact from Orange Grove Road	1	<ul style="list-style-type: none"> - Tree screening requested along Orange Grove 	<p>The visual impact from Orange Grove Road was assessed in the Visual Impact Assessment (Appendix C) and summarised in Section 6.4 of the EIS.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
		Road to mitigate view	<p>The level of impact to landscape character and viewpoints is based on the combination of two criteria – sensitivity and magnitude. The sensitivity of Orange Grove Road is considered low as the nearest solar PV panel is approximately 1km to the north.</p> <p>The predicted magnitude of visual change would be low – moderate, due to: the flat terrain between the road and the substation; the separation distance; that the panels would be seen from the rear and/or side view; and the mostly low height of the substation.</p> <p>Therefore, the visual impact to viewpoints from Orange Grove Road has been assessed as low-moderate. No visual mitigation is considered necessary due to the assessed low-moderate impact.</p> <p><i>No further mitigation measures are proposed.</i></p>
Elevation of Tudgey road residents north of the proposal	4	<ul style="list-style-type: none"> - Impact to lifestyle acreages relying on aspect as source of property value - Perceived impact from this view is ‘extremely high’ as it will be visible from all points of the property - Implementation of vegetation screening will not improve visual impact 	<p>The visual impact from public and private viewpoints on Tudgey Road was assessed in the Visual Impact Assessment (Appendix C), and summarised in Section 6.4 of the EIS.</p> <p>The level of impact to landscape character and viewpoints is based on the combination of two criteria – sensitivity and magnitude. When assessing private viewpoints, such as residences, the closer the proximity and clearer the potential view, generally the greater sensitivity to change, and therefore the higher potential for visual impact</p> <p>The solar farm is not located on elevated land that is prominent within the landscape. The solar farm is setback at least 800 meters from nearest receivers and solar panels will have a maximum height of 3 metres. As such it will not be visually prominent feature within the landscape in terms of height. The project will be a visible feature however this will appear as a feature of low height and comprised of large geometric shapes and repetitive rows, elementally similar in form to large mature crops viewed at similar distances but different in colour.</p> <p>The visual impact will be further reduced and mitigated by the introduction of proposed landscape screening. On this basis, it not considered the solar farm will be visually obtrusive to the landscape or unreasonable impact on the visual amenity of nearby residents.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>Within the Visual Impact Assessment report (Appendix C of the EIS), impact to public views from Tudgey Road were classified as low – moderate. A key reason for this classification was due to the limited number of regular users of the road, as it is mainly used by residents.</p> <p>Impact from private viewpoints along Tudgey Road were assessed on a case by case basis (Table 6-9 in the EIS). Out of the eight receivers identified on Tudgey Road, the visual impact without mitigation was considered moderate - high for two receivers, moderate for four receivers, low – moderate for one receiver and low for the last receiver.</p> <p>Revised assessment of visual impact including mitigation measures to plant vegetative screening resulted in the lowering of classification of the two moderate-high impacts. These two receivers would have moderate visual impact once screening was established. It is noted that screening would aid in breaking up the view of the panels, although it would not completely mitigate visual impact due to the elevation of the two receivers.</p> <p>It is acknowledged that plantings will take some time to mature and provide maximum screening.</p> <p>GSF has committed to mitigation measure (V3), to implement Concept Landscape Plan, which includes visual screening prior to commencing construction works, where possible.</p> <p><i>Mitigation measure has been revised</i></p>
Land Value: 7			
Property value will be negatively impacted due to construction of solar farm	7	<ul style="list-style-type: none"> - Local real estate agent has suggested a 10-15% reduction in property value - 'It has been suggested to us by local real estate agents that this 	<p>The impact of the Proposal on surrounding land and property value was assessed in Section 6.3.4 of the EIS.</p> <p>The impacts of a solar farm on neighbouring property values has not been studied in-depth however there have been numerous studies on the impacts of wind generation on neighbouring property values in the United States (<i>Hoehn et al., 2010; Hoehn et al. 2015; Vyn and McCullough 2014</i>). These studies found the impact of wind energy generation on neighbouring property values to be negligible. As solar farms are perceived to have less visual impact than wind farms, the impacts to property values caused by solar farms are anticipated to be less than the impacts of wind farms.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
		<p>may reduce the value of our land by up to 20%'</p> <ul style="list-style-type: none"> - 'Prospective buyers will be concerned about environmental, aesthetic, and adverse economic impacts of a solar farm' - Decrease the value of neighbouring landholders due to shimmer & glare 	<p>A number of large scale farms have now been operating in Australia for several years and there have been no formal or informal reported impacts on local land values.</p> <p><i>No further mitigation measures are proposed</i></p>
Noise during construction: 5			
Use of pile drivers during construction	4	<ul style="list-style-type: none"> - Noise of ten pile drivers operating 60 hours per week for up to 12 months 	<p>The Noise Impact Assessment (NIA) (Appendix G within the EIS) identified that the key noise generating activities that will occur are listed below:</p> <ul style="list-style-type: none"> • Earthworks involving trenching for cabling • Piling of panel supports • Assembly of the panels. <p>It is envisaged that all three-key noise generating activities could occur simultaneously at up to 10 locations across the Site, along with substation construction, vehicle movements on the site and deliveries of materials to site. This represents a worst case construction scenario with respect to noise impacts.</p> <p>The NIA, used this worst-case construction scenario to model potential noise impacts upon sensitive receivers and identified that while construction activities would result in a temporary increase in</p>

Aspect	Number of submissions	Detail of issue	GSF Response
			<p>localised noise levels however all works have been modelled to comply with the applicable noise management level criteria.</p> <p>In accordance with mitigation measure N1, GSF commits to preparing a construction noise management protocol. GSF commits to comply with the Australian Standard AS 2436-2010(2016) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites.</p> <p>As identified in 6.5.5 of the EIS, GSF commits to a number of mitigation measures to reduce potential noise associated with construction of the Proposal including N1 preparing a construction noise management protocol and N2 to implement a formal complaint handling procedure with appropriate noise amelioration measures to be put in place where noise is in excess of allowable limits.</p> <p><i>No further mitigation measures are proposed</i></p>
Inadequate testing performed by noise specialist	5	<ul style="list-style-type: none"> - Lack of ground truthing or testing from at neighbouring residences - Neighbouring residents unaware of any noise testing that was conducted 	<p>Noise testing was completed to quantify background noise levels to determine relevant criteria. The unattended noise monitoring survey was conducted in general accordance with the procedures described in Australian Standard AS 1055- 1997, “Acoustics – Description and Measurement of Environmental Noise”.</p> <p>The monitoring sites selected were considered representative of noise catchments surrounding the project which were anticipated to have low background noise levels and were unlikely to vary significantly throughout the locality. Noise logging results confirm this, as background noise levels between sites are generally consistent for all periods. Notwithstanding, measured noise levels were below the minimum default as prescribed in relevant NSW Noise Policy for Industry (EPA 2017). Hence, background levels have been set to default levels as per the policy which are the lowest permissible (i.e. the most conservative) under policy.</p> <p><i>No further mitigation measures are proposed</i></p>
Lack of vegetative screening and	1	<ul style="list-style-type: none"> - ‘There is little vegetation between the construction zone 	<p>The 3D noise modelling completed for the project incorporated both ground type (i.e. rural pastures) and topography (i.e. elevations) for the project site and surrounds. As described in the summary provided in Section 6.5 of the EIS, despite the flat topography results show that the modelled noise</p>

Aspect	Number of submissions	Detail of issue	GSF Response
buffers for noise		and the sensitive receptors, and the ground is flat so there is not much to reduce noise'	generated during construction works comply with the Noise Management Level standards at all residential receptors for the day period. <i>No further mitigation measures are proposed</i>
Employment: 3			
Minimal prospect of ongoing jobs for local community	3	<ul style="list-style-type: none"> - No, to limited (2 people) long term employment benefits flowing back to the community - Development will be taking away farming jobs for the local community, including profits from farming spent in the town 	<p>The EIS addresses benefits of the Proposal in Section 2.3 of the Proposal. The proposal would generate regional and local benefits including:</p> <ul style="list-style-type: none"> • Generating employment: <ul style="list-style-type: none"> - 150 construction jobs (at peak) as well as indirect supply chain jobs - Support up to ten operational jobs. • Encouraging regional development: <ul style="list-style-type: none"> - Employee expenditure in the Gunnedah region (fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies) - Maximising the use of local contractors and equipment hire - Increasing local skills and trades through project experience. <p><i>No further mitigation measures are proposed</i></p>
Operation: 1			
Management of impacts during the operation of the farm	1	<ul style="list-style-type: none"> - 'Following construction, that any unacceptable glint, glare, noise, lighting or other unforeseen impacts which arise during the operation of the 	<p>As identified in mitigation measures GO1 and GO2 an Operational Environmental Management Plan will be prepared and a complaint handing procedure and register implemented.</p> <p>Any complaints relating to glint, glare, noise or lighting would be managed via these mitigation measures.</p> <p><i>No further mitigation measures are proposed</i></p>

Aspect	Number of submissions	Detail of issue	GSF Response
		solar farm are mitigated to the satisfaction of those impacted'	
Decommissioning: 1			
Obligations to rehabilitate the site	1	<ul style="list-style-type: none"> - 'There is the possibility for the farm to simply be decommissioned and the area does not have any party committed to rehabilitation of the area.' - 'It is likely a different generation of parties involved will be managing the aftermath that did not originally survey and appreciate the area' 	<p>GSF commits to the requirements of mitigation measure L2 of the Gunnedah EIS. Mitigation measure L2 states that GSF will 'create and implement a remediation plan during end of operation and decommissioning' of the Site.</p> <p><i>No further mitigation measures are proposed</i></p>
Soil Quality			
Increase in sediment and nutrient profile due to construction of solar farm	1	<ul style="list-style-type: none"> - 'There will be an increase in the amount of sediment and nutrients transferred to the 	<p>GSF commits to all of the mitigation measures outlined in the EIS as S1-S11 to reduce the potential impacts to soils as a result of the proposal including preparation and implementation of a Soil and Water Management Plan in accordance with <i>Managing Urban Stormwater: Soils and Construction (Landcom, 2004)</i>. This will include an erosion and sediment control plan for implementation during construction.</p>

Aspect	Number of submissions	Detail of issue	GSF Response
		land which could impact the quality of the soil, especially to areas that would be introduced to flooding'	<i>No further mitigation measures are proposed</i>
Bushfire			
Potential to start bushfires	1	- Electrical infrastructure to be a source of ignition for bushfires	<p>As identified in Section 6.9.2 of the EIS, the bushfire risks can be managed including potential ignition from electrical equipment. The solar panels present no risk of ignition however ignitions from other PV equipment is theoretically possible from electrical faults such as arc faults, short circuits, ground faults and reverse currents. These risks can be adequately managed through proper installation and testing of equipment.</p> <p>GSF commits to mitigation measure, BF1, all electrical components would be designed and managed to minimise the potential for ignition and BF9 installation of electrical equipment to be in accordance with <i>AS 3000:2007 Electrical installations</i> and undertaken by qualified professionals.</p> <p><i>No further mitigation measures are proposed</i></p>
Proximity to town			
Proposal is in close proximity to town	1	- 'The close proximity to town is also a concern. Surely there are places further out of site, that would be more suitable for a solar farm.'	<p>As identified in Section 1.1.2, the Proposal is located approximately 9km north east of the Gunnedah township. At this distance, it is not considered to be in close proximity to Gunnedah township.</p> <p>Any impacts upon the township of Gunnedah, such as a limited increase in traffic, are manageable in accordance with the mitigation measures outlined in the EIS.</p> <p><i>No further mitigation measures are proposed</i></p>

5. Conclusion

This submissions report has been prepared by pitt&sherry on behalf of GSF (the proponent) to meet the requirements of DP&E and Section 75H of the *Environmental Planning and Assessment Act 1979*.

As outlined within Section 3 the amendments to the Proposal as presented in the EIS are proposed as follows:

1. A revised subdivision plan is presented in Appendix F which identifies an additional subdivision of 4800m² on part of Lot 264 DP754954 containing the TransGrid substation (Section 3.1)
2. A new fence configuration (referred to as Fence Configuration 4) has been developed and modelled (See Appendix C) and represents an alternative fencing design aimed at minimising blockage and redirection of floodwater and the potential impacts of the Proposal on the surrounding landscape and residents during a flood event (Section 3.2).

A total of 63 submissions were received from government stakeholders, organisations and the community, as described in Table 4-1. Out of a total of 63 submissions received 49 were objections, 13 requested further information and 1 confirmed support of the project.

DP&E identified the following 4 key issues from the submissions which have been addressed throughout Section 4:

1. Accuracy of the Flood Impact Assessment - Submissions from government stakeholders, agencies and the community identified concerns associated with the data input into the flooding model used in the Flood Impact Assessment (Appendix J in the EIS). The flood modelling has been updated to include additional and improved data, assumptions and modelling in response to submissions received.
2. Adequacy of Aboriginal Cultural Heritage Consultation - Consultation with OEH confirmed GSF undertook consultation in accordance with OEH requirements however OEH would consider consultation with the Gomeri People and other interested stakeholders who contacted OEH to represent adequate consultation for the Project. As outlined in Appendix B, GSF has committed to inviting local aboriginal stakeholders identified by OEH to undertake a site visit with KNC prior to commencing construction (mitigation measure H4).
3. Review of the Biodiversity Assessment - Clarifications have been provided to remove inconsistencies and confirm that a Koala Habitat assessment is not required under SEPP 44 due to the lack of primary feed trees and Koala habitat. Further information is contained in Section 4.
4. Use of Biophysical Strategic Agricultural Land - The LUCRA has been updated to include consideration of the *Right to Farm Policy* (Appendix G) and mitigation associated with the potential land use conflict are contained in the Draft Land Management Plan (Appendix G of the EIS).

These key issues alongside the other issues raised within government agency, organisation and community submissions have all been considered in Section 4. This has included further assessment and in some cases revision or additional mitigation measures (as summarised in Appendix B).

The Proposal, as presented in the EIS, would provide local, regional and national benefits including:

- Develop the solar power industry and supply chain in Australia
- Develop Australian intellectual property and expertise in solar power
- Assist with Australia's commitments under national and international agreements
- Diversify sources of income for the agricultural sector, allowing financial resilience for farmers
- Provide energy security
- Local and regional economic benefits.

In consideration of the assessment presented in the EIS and this Response to Submissions (RTS) and the revised mitigation measures presented in Appendix B, GSF consider all the issues raised from submissions have been addressed and the project should proceed for approval by the Minister.

Appendix A

Consultation Material

Appendix B

Revised Mitigation Measures

Appendix C

Updated Flood Impact Assessment

Appendix D

Updated Traffic Impact Assessment

Appendix E

Orange Grove Road Site Access Alignment Plan



Appendix F

Revised Subdivision Plan

Appendix G

Updated LUCRA

Contact

Jessica Berry
JBerry@pittsh.com.au

Gunnedah Solar Farm
SSD 8658
Response to Submissions

transport | community | mining | industrial | food & beverage | energy



Brisbane

Level 10
241 Adelaide Street
PO Box 5243
Brisbane City QLD 4000
T: (07) 3058 7499

Launceston

Level 4
113 Cimitiere Street
PO Box 1409
Launceston TAS 7250
T: (03) 6323 1900
F: (03) 6334 4651

Newcastle

Level 1
81 Hunter Street
Newcastle NSW 2300
T: (02) 4910 3600

E: info@pittsh.com.au
W: www.pittsh.com.au

incorporated as
Pitt & Sherry (Operations) Pty Ltd
ABN 67 140 184 309

Devonport

Level 1
35 Oldaker Street
PO Box 836
Devonport TAS 7310
T: (03) 6451 5599

Melbourne

Level 1, HWT Tower
40 City Road
Southbank VIC 3006
PO Box 259
South Melbourne VIC 3205
T: (03) 9682 5290
F: (03) 9682 5292

Sydney

Suite 902, Level 9,
North Tower
1-5 Railway Street
Chatswood NSW 2067
PO Box 5487
West Chatswood NSW 1515
T: (02) 9468 9300



Hobart

Level 1, Surrey House
199 Macquarie Street
GPO Box 94
Hobart TAS 7001
T: (03) 6210 1400
F: (03) 6223 1299

pitt&sherry

Genevieve Daneel

From: Moody, Annie <Annie.Moody@santos.com>
Sent: Thursday, 10 May 2018 11:31 AM
To: Genevieve Daneel
Subject: RE: Exploration Licence PEL001: Proposed Solar Farm in Gunnedah

Thanks for advising Genevieve, much appreciated.

Rgds, Annie

Annie Moody | Team Leader Community and Land
Narrabri Gas Project | Asia, NSW & WA Oil
Telephone: (02) 6792 9035 | Direct: (02) 6792 9031 | Mobile: +61 407 759 264

From: Genevieve Daneel [mailto:gdaneel@pittsh.com.au]
Sent: Wednesday, 9 May 2018 3:32 PM
To: Moody, Annie <Annie.Moody@santos.com>
Cc: Jessica Berry <jberry@pittsh.com.au>; Malinda Facey <mfacey1@pittsh.com.au>
Subject: RE: Exploration Licence PEL001: Proposed Solar Farm in Gunnedah

Hi Annie,

To provide an update on the project discussed within the attached letter from Santos; The EIS for the Gunnedah Solar Farm has now been submitted to DP&E and is currently on public exhibition. You will be able to review the documents on the DP&E Major Projects Website:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8658

If you have any further questions, please do not hesitate to get in contact - 0438 693 279.

Kind regards,
Genevieve

Genevieve Daneel BSc(Hons)

Environmental Consultant

pitt&sherry

| M: 0438 693 279

E: gdaneel@pittsh.com.au | W: www.pittsh.com.au



Santos Ltd A.B.N. 80 007 550 923

Disclaimer: The information contained in this email is intended only for the use of the person(s) to whom it is addressed and may be confidential or contain privileged information. If you are not the intended recipient you are hereby notified that any perusal, use, distribution, copying or disclosure is strictly prohibited. If you have received this email in error please immediately advise us by return email and delete the email without making a copy. **Please consider the environment before printing this email**

Genevieve Daneel

From: Chaffey - Jamie <jamiechaffey@infogunnedah.com.au>
Sent: Tuesday, 24 April 2018 10:30 AM
To: Genevieve Daneel
Cc: Malinda Facey; Pearson - Laura
Subject: RE: Request for Meeting - Gunnedah Solar Farm

Genevieve I appreciate your willingness to discuss your proposal in detail, I would like the briefing to be attended by all nine elected members of the Gunnedah Shire Council and senior executive team members.

Laura please work with Genevieve to lock in a mutually suitable date and time for this meeting to be held in our council chambers, preferably on a Wednesday after lunch.

Regards



Jamie Chaffey | Mayor Gunnedah Shire Council,
PO Box 63 (63 Elgin Street), GUNNEDAH NSW 2380
t 02 6740 2115 | f 02 6740 2119 | e jamiechaffey@infogunnedah.com.au
Find us at: www.infogunnedah.com.au or www.facebook.com/gunnedahshire

I acknowledge the Kamilaroi Aboriginal Nation as the traditional owners and custodians of the land on which I live, work and play. I pay my respect to Elders past and present and to the young leaders of tomorrow.

PRIVACY AND CONFIDENTIALITY NOTICE | The information contained in this email is intended for the named recipients only. It may contain privileged, private and confidential information and if you are not the named intended recipient, you must not copy, distribute or take any action in reliance on it. If you have received this email in error, please notify us immediately by email or by the telephone number listed above.

From: Genevieve Daneel [<mailto:gdaneel@pittsh.com.au>]
Sent: Monday, 23 April 2018 5:13 PM
To: Chaffey - Jamie
Cc: Malinda Facey
Subject: Request for Meeting - Gunnedah Solar Farm

Dear Jamie,

I am writing to you on behalf of Photon Energy and Canadian Solar (the proponents), who are proposing to develop and operate a 150-megawatt (MWp) solar photovoltaic (PV) facility including ancillary works and associated infrastructure at 765 Orange Grove Road, Gunnedah (Gunnedah Solar Farm).

The Environmental Impact Statement for the Gunnedah Solar Farm was submitted to the Department of Planning and Environment (DP&E) on April 3rd 2018. It has now been approved by DP&E for public exhibition. The public exhibition period will begin on Friday 27th April and ends on Saturday 26th May 2018.

The proponents would like to organise a meeting with yourself to discuss the proposal and answer any questions you may have. If you are interested in participating in such a meeting, could you please provide indication of any availability you may have during the exhibition period.

I look forward to hearing your response,

Kind regards,
Genevieve

Genevieve Daneel

From: Pearson - Laura <laurapearson@infogunnedah.com.au>
Sent: Tuesday, 22 May 2018 5:15 PM
To: Genevieve Daneel
Subject: RE: Request for Meeting - Gunnedah Solar Farm

Hi Genevieve,

Thank you for your email and the copy of the presentation to council.

Will your team require any other resources for the presentation?
The Council Chambers where the presentation will be conducted has a PC and projection screens available.

The attendees of the meeting will include;

Eric Groth – General Manager
Jamie Chaffey – Mayor
Andrew Johns – Director of Planning and Environmental Services
Carolyn Hunt – Manager Development and Planning
Daniel Noble – Acting Director Infrastructure Services
Damien Connor – Chief Financial Officer
Gae Swain – Deputy Mayor
John Campbell – Councillor
Colleen fuller – Councillor
Owen Hasler – Councillor
Rob Hooke – Councillor
Ann Luke – Councillor
David Moses – Councillor
Murray O’Keefe - Councillor

Kind Regards,

Laura Pearson | Executive Assistant to General Manager and Mayor |
Gunnedah Shire Council, PO Box 63 (63 Elgin Street), GUNNEDAH NSW 2380
t 02 6740 2115 | f 02 6740 2119 | e laurapearson@infogunnedah.com.au

Find us at: www.infogunnedah.com.au or www.facebook.com/gunnedahshire



I acknowledge the Kamilaroi Aboriginal Nation as the traditional custodians of the land on which I live, work and play. I pay my respect to Elders past and present and to the young leaders of tomorrow.

PRIVACY AND CONFIDENTIALITY NOTICE | The information contained in this email is intended for the named recipients only. It may contain privileged, private and confidential information and if you are not the named intended recipient, you must not copy, distribute or take any action in reliance on it. If you have received this email in error, please notify us immediately by email or by the telephone number listed above.

Gunnedah Solar Farm: 765 Orange Grove Road



CanadianSolar

POLPO
INVESTMENTS



pitt&sherry

State Significant Development Approvals Process




Initiation

- Request for Secretary's Environmental Assessment Requirements (SEARS)
- SEARS received

Assessment

- Environmental Impact Assessment (EIS)
- Including: Specialist site visit, community and stakeholder engagement, specialist reports complete & design finalized

Submission

- Submission of the Development Application (EIS) to Department of Planning and the Environment (DP&E)
- EIS Public Exhibition Period (31 days)  *Exhibition Period: 27/04/2018 – 26/05/2018*
- Prepare Submission Report in response to submissions within the exhibition period

Determination

- DP&E will assess the submission
- DP&E determination

Construction

- If approved, construction is anticipated to begin late 2018 – early 2019



Need and Justification for the Proposal

- Australia is a signatory - **United Nations Framework Convention on Climate Change** and the **Paris Agreement**.
- NSW and the Australian Government have developed renewable energy targets (RETs) and strategies to meet international agreement targets
- This proposal will contribute to meeting those targets

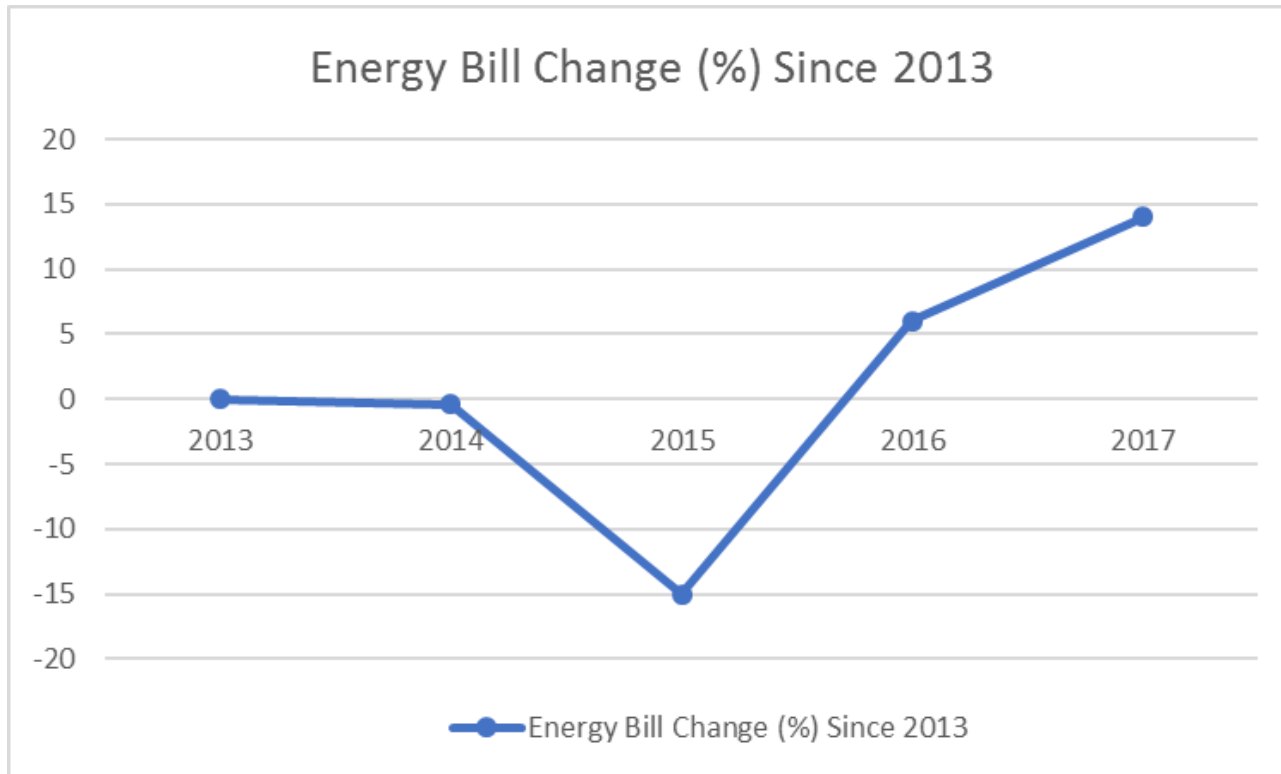
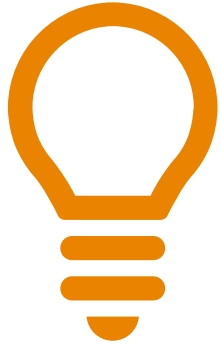


Chart of average residential energy bill across NSW, reported by Independent Pricing and Regulatory Tribunal (IPART 2017)

The RET Scheme aims to:

- ✓ Produce 33 000 GWh from renewable energy sources by 2020
- ✓ Reduce emissions of greenhouse gases in the electricity sector
- ✓ Provide for increased energy security through diversifying the energy mix and transitioning to low carbon intensive energy sources.

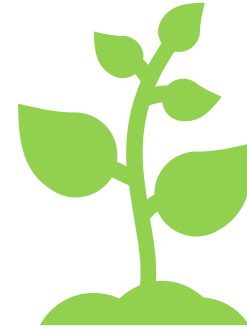
Gunnedah Solar Farm



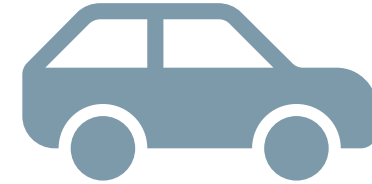
Produce an estimated 300 gigawatt hours (GWh) per year of renewable electricity



Produce enough electricity to meet the needs of approximately 48,000 households annually

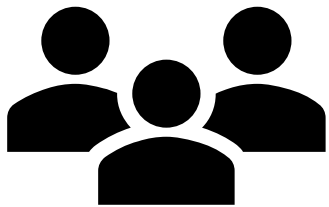


Reduce greenhouse gas emissions by over 290,000 tonnes of CO₂ equivalent per annum



Equivalent to removing approximately 125,000 cars from the road

Generating employment:



- **150** construction jobs (at peak) as well as indirect supply chain jobs
- Support up to **10** operational jobs.

Encouraging regional development:

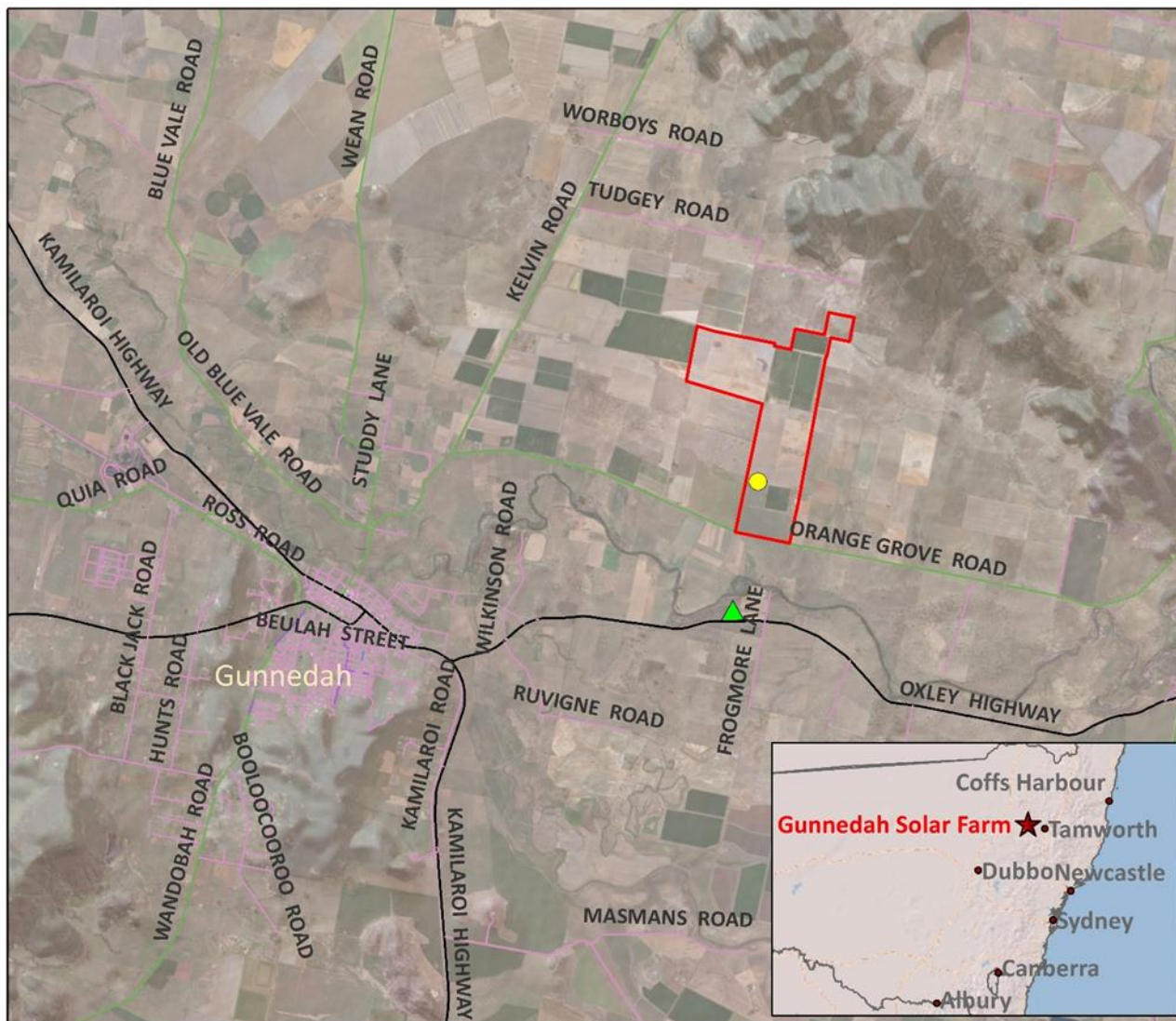
- Employee expenditure in the Gunnedah region (fuel supply, vehicle servicing, uniform suppliers, hotels/motels, B&B's, cafés, pubs, catering and cleaning companies)
- Maximising the use of local contractors and equipment hire
- Increasing local skills and trades through project experience.



Site Selection

The Gunnedah Solar Farm Site was considered a preferred location due to:

- Proximity to and capacity of connection infrastructure (Gunnedah substation)
- Solar yield
- Availability of suitably sized lots
- North facing land
- Access to major transport routes
- Limited potential for aboriginal or historic heritage items to be present
- Flat landscape requiring minimal earthworks
- Lease agreement with landowner
- Water licencing constraints reducing the agricultural use of the site by the landowner.



LEGEND

- Subject Land
- GSF substation
- Gunnedah Substation
- Gunnedah Solar Farm Site

1:100,000

0 1.5 3 6

Kilometers

Photon Energy
Gunnedah Solar Farm
Universal Transverse Mercator
GDA 1994 MGA Zone 56

Service Layer Credits: Esri, HERE, Garmin, © OpenStreetMap contributors

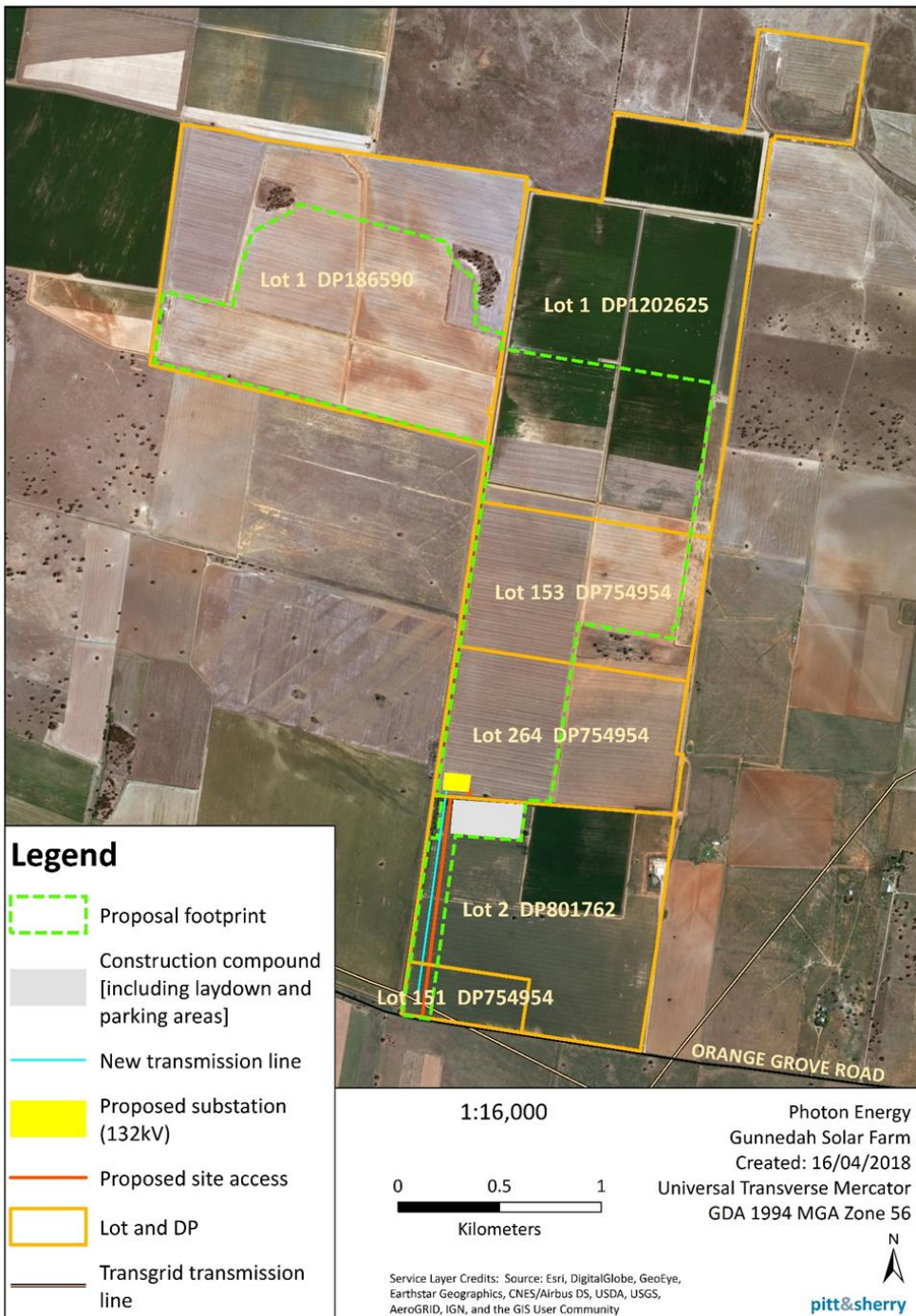
Copyright: © 2014 Esri

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



pitt&sherry

Gunnedah Solar Farm (GSF)



The Proposal will be located at 765 Orange Grove Road, Gunnedah NSW on:

- Part of Lot 1 DP 1202625
- Lot 153 DP 754954
- Lot 264 DP 754954
- Lot 2 DP 801762
- Lot 151 DP 754954 and
- Lot 1 DP 186590

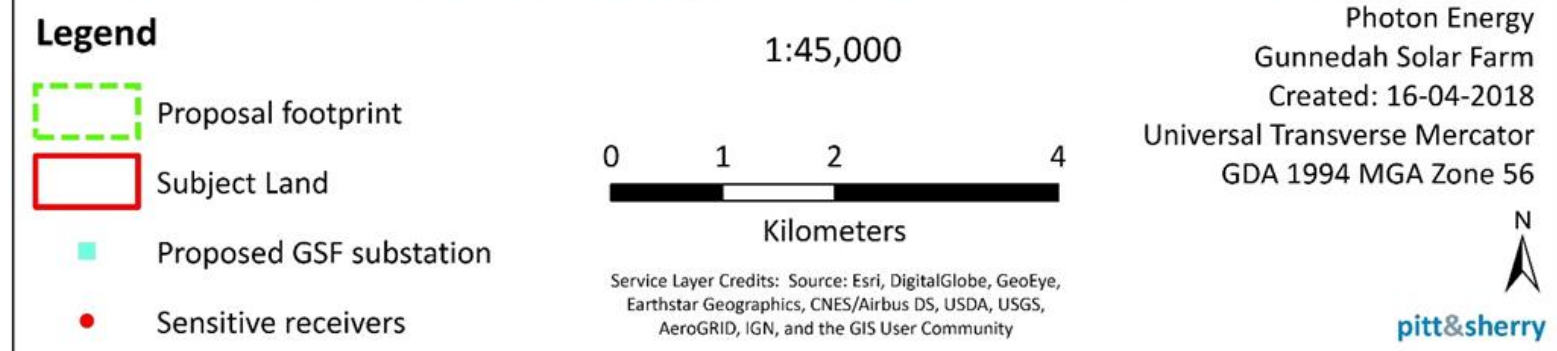
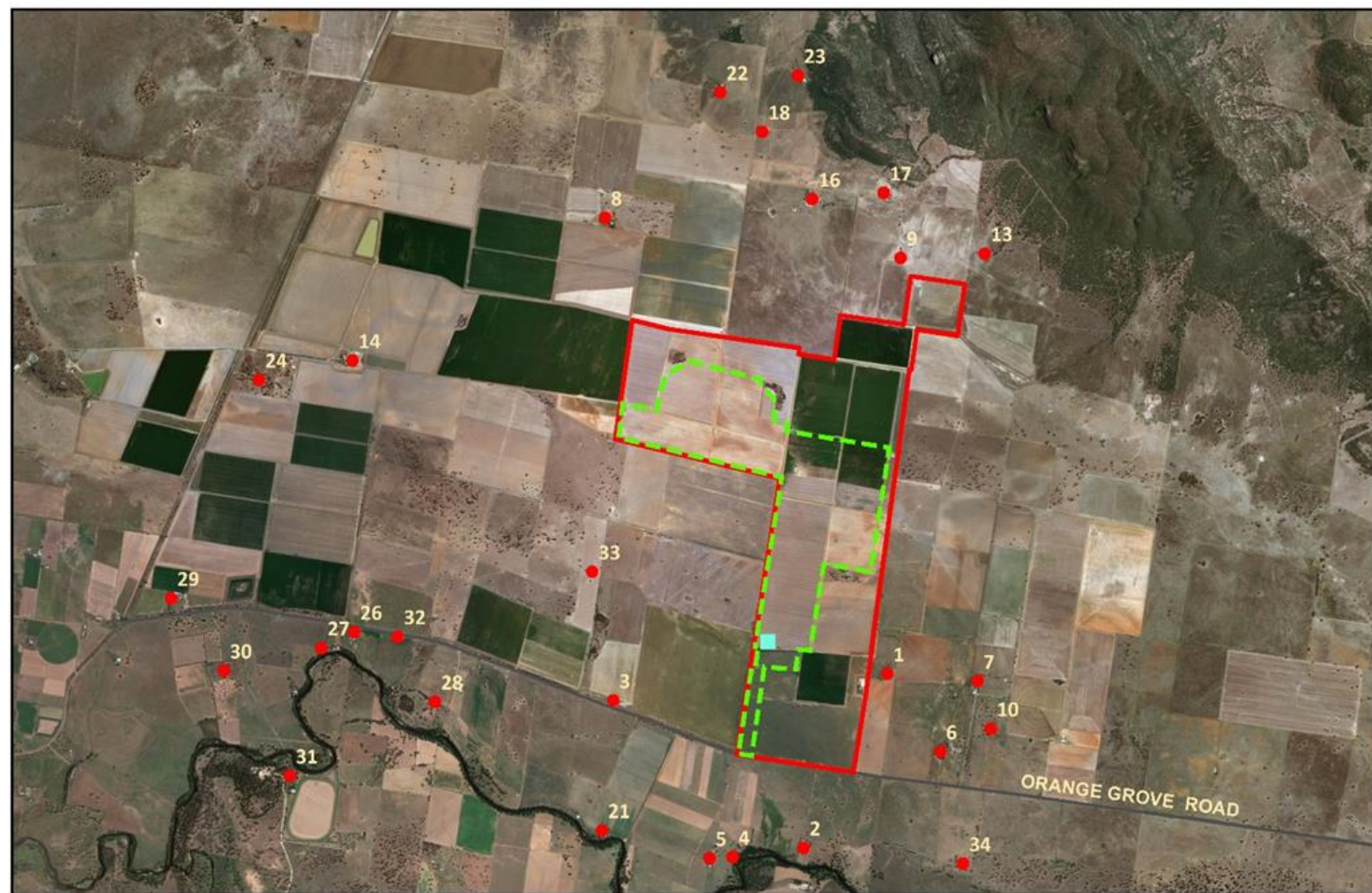
GSF is proposing to construct and operate a 150MW (DC) (or 115MW AC) photovoltaic (PV) solar farm located approximately 9km north-east of the township of Gunnedah.

Stakeholder Engagement

pitt&sherry were engaged by GSF to assist with community and stakeholder engagement. **pitt&sherry** facilitated meetings with GSF and Gunnedah Shire Council.

Other government stakeholders were also engaged including:

- DP&E
- OEH
- DPI – Water & Lands
- DRG
- RMS
- SES
- RFS



Map of sensitive receivers identified through visual and flooding impact assessments

Community Engagement

34 residents within the locality of the site were contacted directly as a result of the community engagement process

Methods of Engagement



- *Community meeting*
- *Email*
- *Phone Calls*
- *Letter*
- *One on One*
- *Group meeting*
- *Website*
- *Hotline*
- *Factsheets*
- *Newspaper*
- *Social Media*

29 registered attendees

Methods used to contact **34** residents within the locality of the site

26 community members (15 neighbouring residents)

Methods used to reach the wider community & provide regular updates

- **Flooding**
- **Visual**
- **Noise**

Concerns Raised

Flooding – and the impact of fencing on neighbouring properties

During round one consultation

GSF commissioned detailed flood modelling to assess scenarios, including the following options for security fencing:

- Drop down / sacrificial fencing; Farm fencing; Chain wire fencing.
- Chain wire fencing was only option that achieved the safety and security requirements.

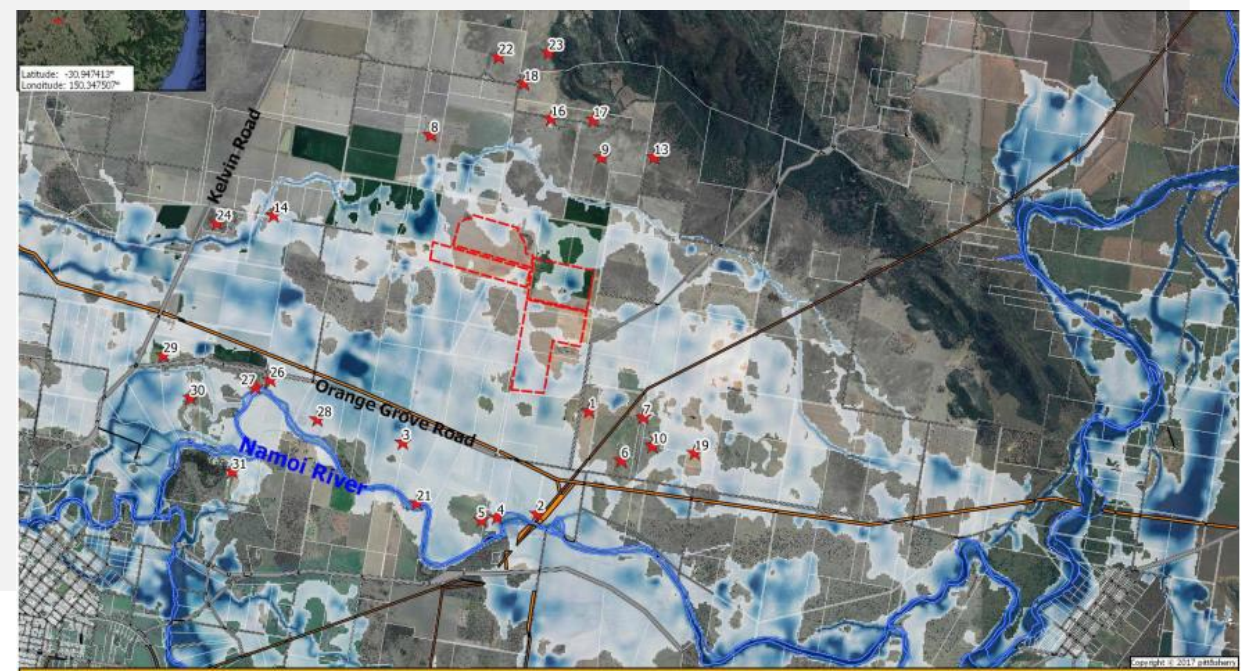
Three scenarios were then modelled (using catchment data) to assess and mitigate the use of the chain wire fence. This included:

- Chain wire fence being 100% blocked during a 1:100-year flood
- Assuming 100% blocked to 500mm and 50% blockage there after around the perimeter of the farm. Includes using 6m gates every 100m with the intention these would be opened. Two 20m channels running east west across the farm to allow for unimpeded water flow
- As above scenario, without 6m gates at every 100m.

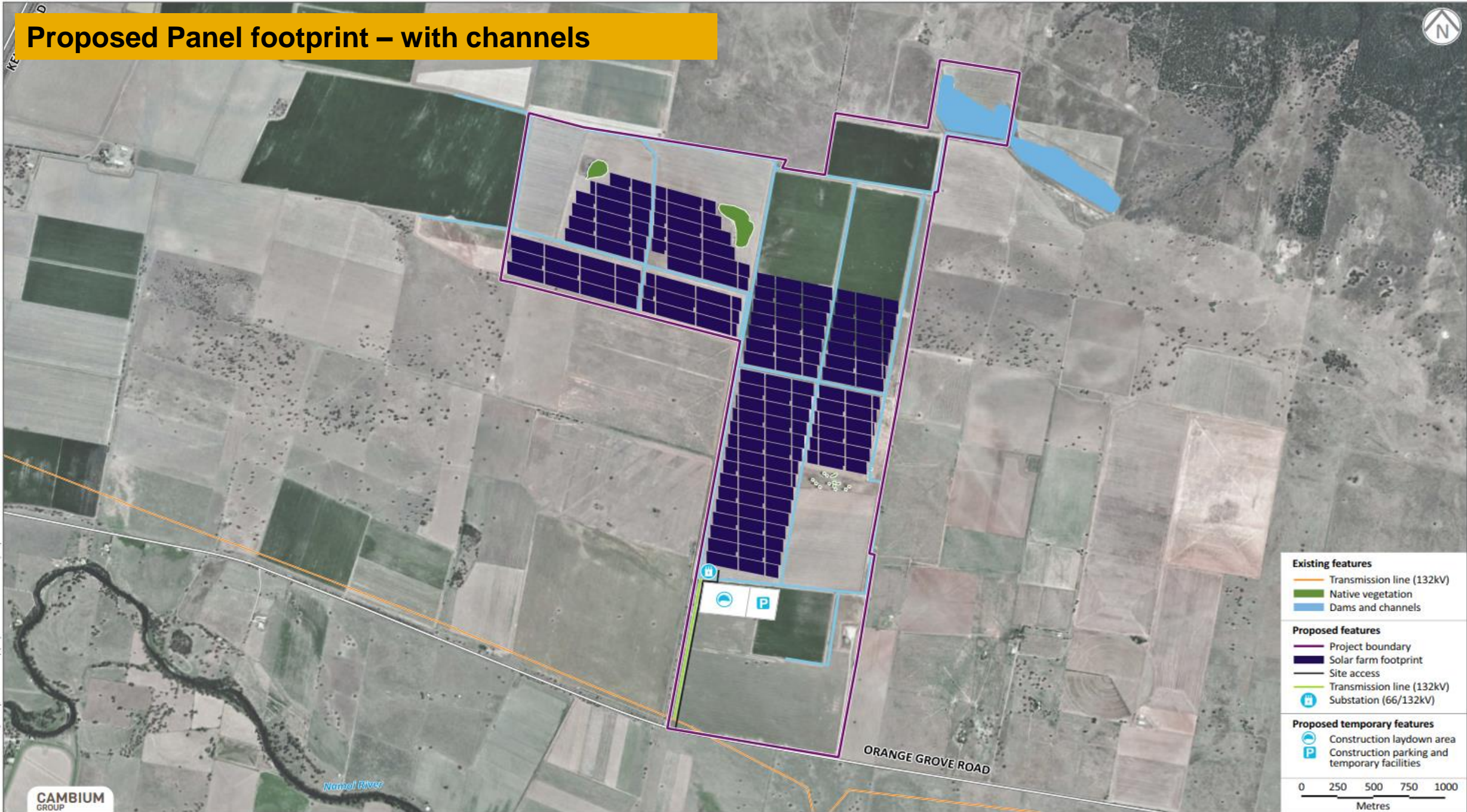
During round two consultation

After the second round of one on one's the model was revised and additional measures were used. This includes:

- A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP
- Minimising footprint of disturbance by progressive construction and remediation works
- Design to allow space between panels to establish and maintain ground cover beneath the panels.



Proposed Panel footprint – with channels



Existing features

- Transmission line (132kV)
- Native vegetation
- Dams and channels

Proposed features

- Project boundary
- Solar farm footprint
- Site access
- Transmission line (132kV)
- Substation (66/132kV)

Proposed temporary features

- Construction laydown area
- Construction parking and temporary facilities

0 250 500 750 1000
Metres

Concerns Raised

Visual Impact – particularly north of the proposed development

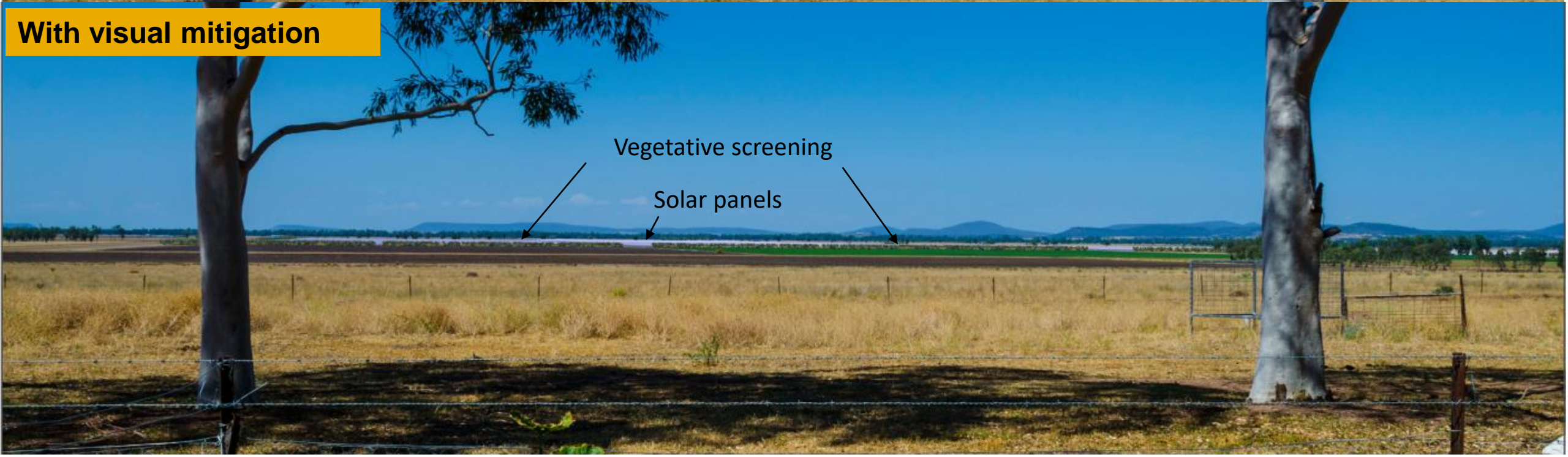
During round one consultation

- GSF commissioned 9 more photomontages to be completed.
- Photomontage locations were chosen in consultation with the sensitive receivers, to ensure accurate representation of impact.
- Draft landscape plan was updated - include more screening

During round two consultation

- The Solar footprint was revised to ensure existing tree stands remained on site, allowing for increased visual mitigation.





Concerns Raised

Noise – Particularly use of pile drivers

During consultation

Residents were concerned about level of noise impact during construction, in particular pile driving.

During Geotechnical survey - There was no feedback about noise from pile driving when completing the one on ones.

Response to key issue

Noise Impact Assessment - there will be no significant impact to noise levels during construction.

The hours of operation for the construction will be standard construction hours.

Monday to Friday 0700 – 1800

Saturday 0800 – 1300

Sunday and Public Holidays – no work

There will be no audible construction activities performed outside of these timeframes, unless in the case of an emergency.

Receiver ID	Description	Highest Predicted	NML Standard Hours	Comply
		Noise Level dB LAeq,15min	dB LAeq,15min	
K1	351 Kelvin Road	44	45	Yes
K2	210 Kelvin Road	36	45	Yes
K3	632 Kelvin Road	24	45	Yes
K4	554 Kelvin Road	26	45	Yes
OG1	767 Orange Grove Road	43	45	Yes
OG2	875 Orange Grove Road	32	45	Yes
OG3	897 Orange Grove Road	42	45	Yes
OG4	851 Orange Grove Road	29	45	Yes
OG5	898 Orange Grove Road	38	45	Yes
OG6	726 Orange Grove Road	34	45	Yes
OG7	640 Orange Grove Road	27	45	Yes
OG8	640 Orange Grove Road	29	45	Yes
OG9	476 Orange Grove Road	38	45	Yes
OG10	515 Orange Grove Road	36	45	Yes
OG11	306 Orange Grove Road	36	45	Yes
OG12	242 Orange Grove Road	34	45	Yes
OG13	224 Orange Grove Road	34	45	Yes
OG14	118 Orange Grove Road	33	45	Yes
OG15	88 Orange Grove Road	44	45	Yes
OG16	43 Orange Grove Road	36	45	Yes
S1	133 Shanley Lane	24	45	Yes
T1	Tudgey Road Lot 2 DP1202625	26	45	Yes
T2	254 Tudgey Road	43	45	Yes
T3	526 Tudgey Road	36	45	Yes
T4	615 Tudgey Road	34	45	Yes



Concerns Raised

Traffic During Construction – Including school pick up and drop off times

Actions

Consultation with sensitive receivers prompted a review of the Traffic Impact Assessment, to ensure concerns raised have been addressed.

GSF is considering putting in restrictions to vehicle operation hours between school pick up and drop off times.

Response to key issues

The Traffic Impact Assessment has addressed concerns through encouraging vehicles to be restricted from travelling outside of standard construction hours.

A detailed traffic management plan will be prepared for the proposal.

It will ensure this concern is appropriately managed through restrictions, temporary speed limits or other active management measures.

Bushfire Risk – Electrical infrastructure potential to cause fire

Actions

Consultation with sensitive receivers prompted a review of the Bushfire Risk Assessment, to ensure concerns raised have been addressed.

Bushfire impact specialist have consulted with the Rural Fire Services, as well as Fire and Rescue NSW at Gunnedah to be advised on fire history, resources, mitigation measures and fire suppression.

Response to key issues

Implementation of an asset protection zone of 15m.

Ensuring appropriate equipment on site for fire protection

An emergency response plan will be written as part of the CEMP

Concerns Raised



Decommissioning & Site Rehabilitation

Actions

Consultation with receivers prompted review of the Land Management Plan.
The remediation chapter was updated to ensure roles, responsibilities and commitments to remediation of the site were clear.

Response to key issues

Land Management Plan - clearly stating the responsibilities of GSF to remediate the land.

A detailed Remediation plan will be written for CEMP

Emergency Contingency Plan

Actions

Emergency Contingency Plans for events such as bushfire and flooding will be completed as part of the CEMP

Response to key issues

Prepare as part of the CEMP in consultation with the RFS.

Light interference outside of daylight hours

Actions

Use of lighting for security purposes is addressed in the EIS.
Lighting will be amber coloured and movement activated.

Response to key issues

Lighting will be limited to compulsory lighting required for the substation.

Substation lighting will be turned on if an intrusion is detected or if staff are on site undertaking works outside of daylight hours.

Concerns Raised



Land Use Conflict

Actions

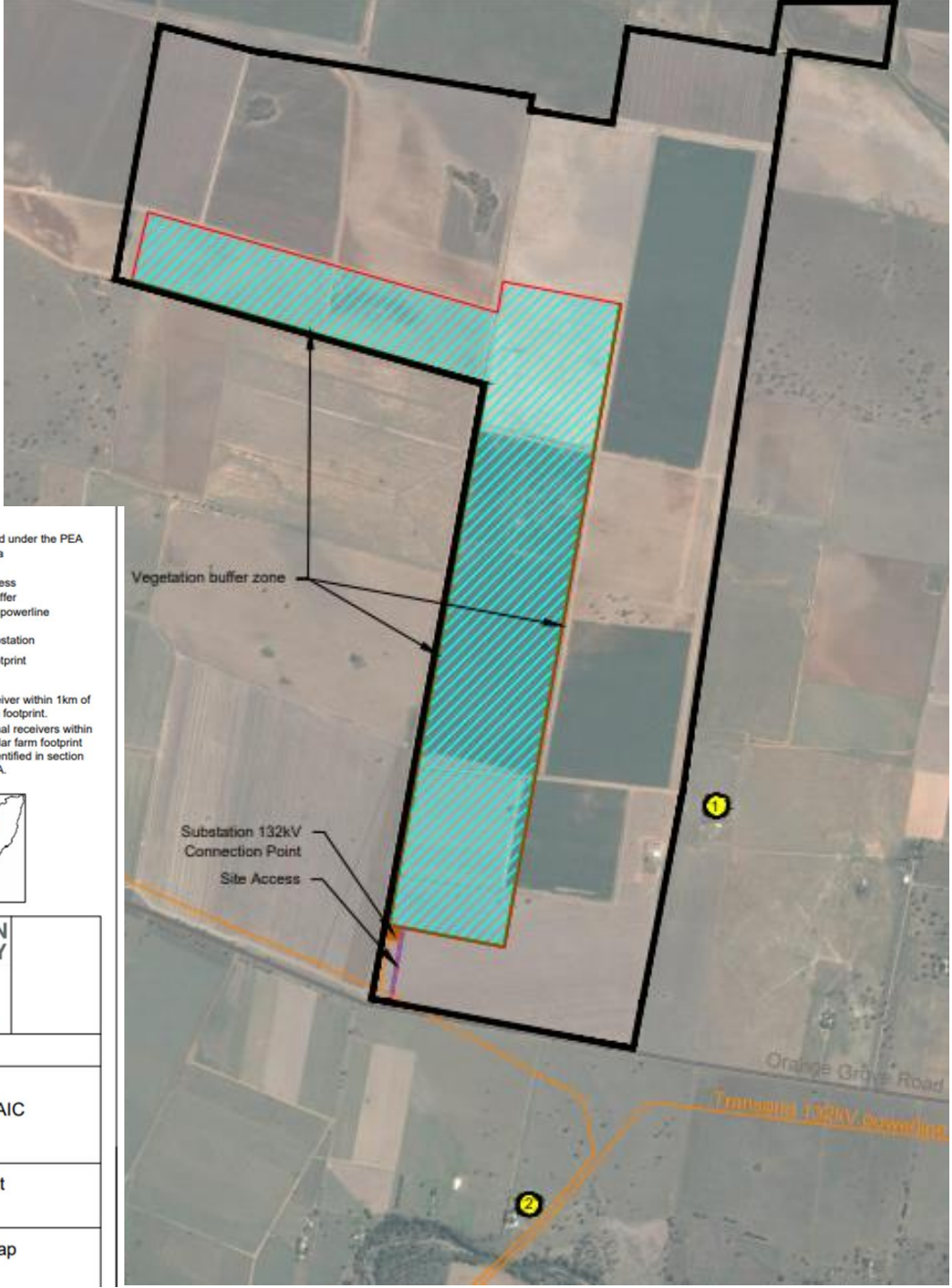
Consultation with receivers prompted a review of the Land-Use Conflict Risk Assessment (LUCRA), to ensure concerns raised have been addressed.

Response to key issues

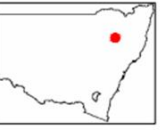
This assessment addresses justification for use of agricultural land and rehabilitation of the site post development. As a part of the LUCRA, a draft land management plan has been prepared to ensure long term viability of the land for future agricultural use

Grazing activities will continue on site, as sheep will be used to maintain the fuel level of the grass beneath the panels





- Area assessed under the PEA
- Proposed area
- Road
- Proposed access
- Vegetation buffer
- Transmission powerline
- Proposed Substation
- Solar farm footprint
- Sensitive receiver within 1km of the solar farm footprint.
Note: Additional receivers within 2km of the solar farm footprint have been identified in section 2.3 of the PEA.

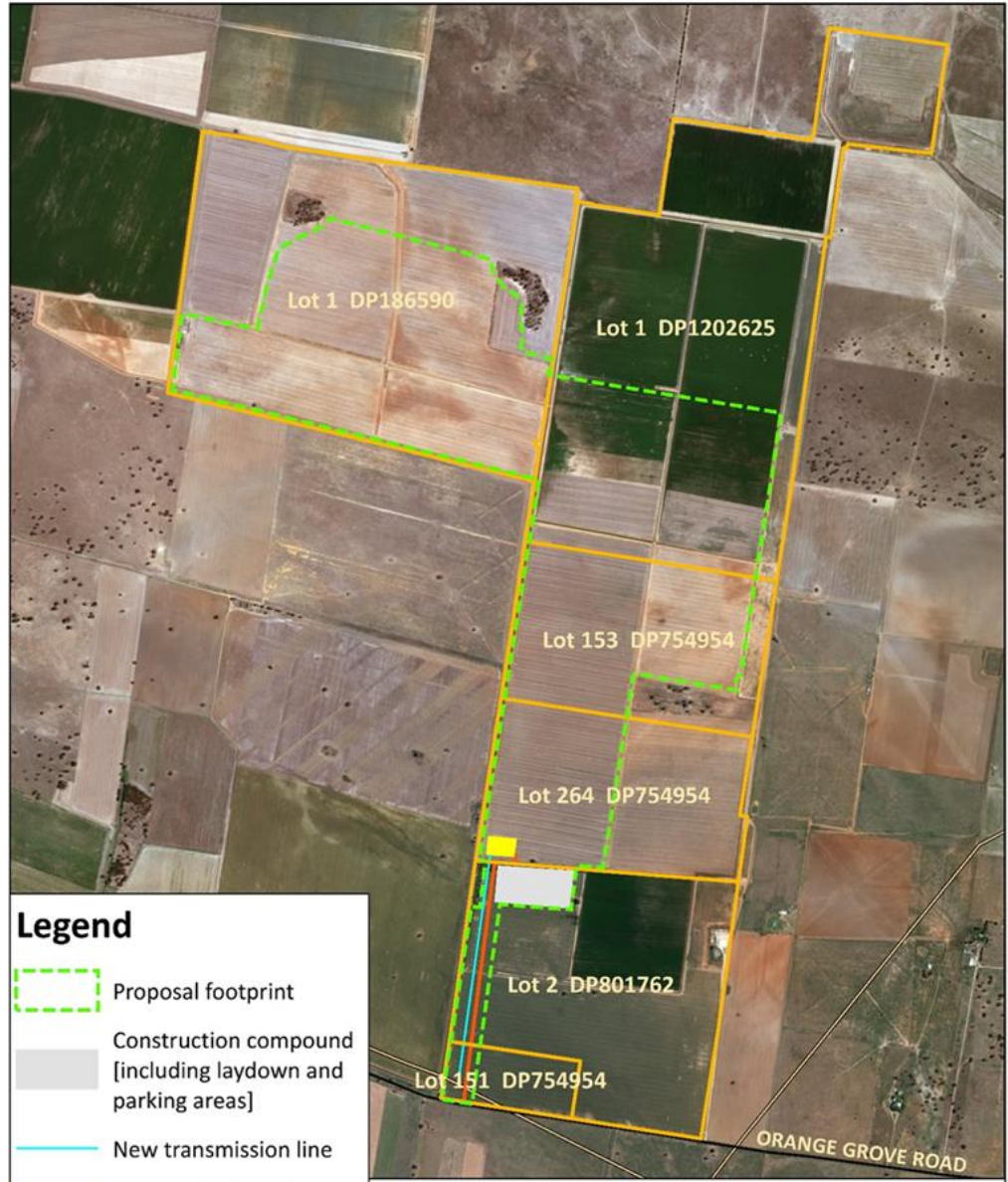


PHOTON ENERGY
 Photon Energy Australia Pty Ltd
 204/05 Griffin Street
 Berrimba Junction 2022, N.S.W.
 Australia
 Tel: +61 2 8021 3363
 Business.enquiries@photonenergy.com
 www.photonenergy.com

Project
GUNNEDAH PHOTOVOLTAIC SYSTEM

Plan
System Layout

Drawing Title
Constraints Map



- Legend**
- Proposal footprint
 - Construction compound [including laydown and parking areas]
 - New transmission line
 - Proposed substation (132kV)
 - Proposed site access
 - Lot and DP
 - Transgrid transmission line

1:16,000

0 0.5 1
 Kilometers

Photon Energy
 Gunnedah Solar Farm
 Created: 16/04/2018
 Universal Transverse Mercator
 GDA 1994 MGA Zone 56

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

pitt&sherry

Gunnedah Solar Farm: 765 Orange Grove Road



QUESTIONS...



Table 1 Summary of General Management and Mitigation Measures for Construction and Decommissioning

Mitigation Measure Reference	Description
G1	<p>A project specific Construction Environmental Management Plan (CEMP) and all relevant sub-plans will be prepared by the Contractor prior to commencing Stage 1 construction. The sub-plans will include:</p> <ul style="list-style-type: none"> • Land Management Plan (LMP) including a weed management plan • Soil and Water Management Plan (SWMP) including erosion and sediment (ERSED) control • Unexpected Finds protocol • Waste Management Plan (WMP) • Traffic Management Plan (TMP) • Emergency Contingency Plan.
G2	<p>All employees, contractors and subcontractors are to receive a project induction. The environmental component may be covered in toolbox talks and should include:</p> <ul style="list-style-type: none"> • Environmental mitigation measures • Vegetation clearing operations and controls to prevent unauthorised clearing • The Unexpected Finds Protocols (historic heritage, Aboriginal heritage and waste) • Aboriginal heritage (Types of aboriginal heritage objects, details of the NMH heritage object, legislative requirements and penalties associated with the harm or desecration of Aboriginal heritage objects) • Waste management strategies and mitigation measures.
G3	<p>Implement community consultation measures to inform the community of construction activity and potential impacts.</p>
G4	<p>A complaint handling procedure and register will be implemented prior to commencement of works to assist in recording and managing potential conflict with the local community during construction.</p>
G5	<p>Mud and other debris shall be removed from the wheels and bodies of construction vehicles and equipment prior to leaving the project site and before entering the sealed public road network.</p> <p>Soil, earth, mud and other similar materials must be removed from the roadway preferably by dry methods (sweeping, shovelling).</p>

Table 2 Summary of Management and Mitigation Measures for Construction and Decommissioning

Reference	Mitigation Measure
Biodiversity	
B1	<p>A 10-m buffer shall be established between the perimeter of the remnant vegetation stands (V1, V2 and V3) and the works footprint.</p>

Reference	Mitigation Measure
B2	The works (e.g. plant, material stockpiling) should not encroach into remnant vegetation and buffer areas.
B3	A Land management plan which includes weed management has been developed (refer Appendix G) and will be incorporated into an overall construction environmental management plan (CEMP).
B4	Trenches should be backfilled as soon as possible to minimise the chance of fauna becoming trapped. Any trench sections left open for greater than a day would be inspected daily, early in the morning and any trapped fauna removed. The use of ramps or ladders to facilitate trapped fauna escape is recommended.
B5	Speed limits should be set to 20km per hour on internal roads and tracks.
B6	Preparation of procedures within the CEMP which detail how to care for animals found at risk of harm or injured at the solar farm Site.
Heritage	
<i>Aboriginal Heritage</i>	
AB1	An Unexpected Finds Protocol which addresses unexpected aboriginal heritage finds will be included in the CEMP to be completed by the construction contractor.
AB2	The Unexpected Finds Protocol will form part of the site induction and must be viewed by all relevant employees and contractors before working on site.
AB3	If suspected Aboriginal objects, such as stone artefacts are identified during works, works must cease within 10m of the affected area and an archaeologist called in to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under section 89A of the NPW Act. Appropriate management or avoidance should be sought if Aboriginal objects are to be moved or harmed.
AB4	In the extremely unlikely event that human remains are found, works should immediately cease and the NSW Police are to be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted at this time to assist in determining appropriate management.
<i>Heritage</i>	
H1	An Unexpected Finds Protocol which addresses unexpected non-indigenous heritage finds will be included in the CEMP to be completed by the construction contractor.
H2	The Unexpected Finds Protocol will form part of the site induction and must be viewed by all relevant employees and contractors before working on site.
H3	If an item (or suspected item) of heritage is discovered during construction, all work in the area of the find will cease immediately, and the Unexpected Finds Protocol implemented including notifying an officer from the Heritage branch of OEH immediately (in accordance with section 146 of the <i>Heritage Act 1977</i>) and seeking advice for management of the object.

Reference	Mitigation Measure
H4	Prior to commencing construction, local aboriginal stakeholders (as identified by OEH) will be invited to participate in a site visit with the heritage consultant.
Land Use	
L1	Managed grazing will be used to maintain the height of ground cover during operation of the solar farm.
L2	Create and implement a remediation plan during end of operation and decommissioning.
L3	Implement the Landscape Plan (refer Appendix C)
L4	All pesticides will be used in accordance with the <i>Pesticides Act 1999</i> , such that only registered pesticides are used based on label instructions that are designed to minimise impacts on surrounding land
L5	All the infrastructure will be removed upon decommissioning with the possible exception of the substation, transmission lines to the substation and access road to the substation.
Visual	
V1	<p><i>Minimise impact through use of siting and design features</i></p> <ul style="list-style-type: none"> • Group ancillary facility structures where possible to minimise sprawl • Stabilise new access tracks formed within the Site required for operations, but do not seal with bitumen or other dark coating.
V2	<p><i>Minimise and repair ground disturbance</i></p> <ul style="list-style-type: none"> • Minimise grading across the Site and undertake the minimum levelling necessary to install panel supports • Rehabilitate exposed ground surfaces as soon as possible.
V3	Implement Concept Landscape Plan (refer Appendix C), which includes visual screening prior to commencing construction works, where possible.
V4	Retain all existing trees
V5	Retain as much existing ground cover (pasture grasses) beneath solar panels as possible.
V6	Progressively stabilise disturbed area with pasture grasses.
Noise	
N1	Prepare a construction noise management protocol for site to manage noise emissions.
N2	<p>Implement a formal complaint handling procedure to manage any potential concerns from the community. This will include:</p> <ul style="list-style-type: none"> • Details of a readily accessible contact person • A well-documented process that includes an escalation procedure so that (if required) there is a path to follow should the complainant not be satisfied • Details regarding setting up a complaint's register.

Reference	Mitigation Measure
	Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.
N3	Works are to be carried out during standard work hours (i.e., 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any construction outside of these normal working hours would only be undertaken in the event of an emergency or with prior approval from relevant authorities. For non-emergency works outside standard hours, residents and other sensitive land use occupants should be informed of the works between 5 and 14 days before commencement.
N4	Toolbox and induction of personnel prior to start of shift to discuss noise control measures that may be implemented to reduce noise emissions to the community, construction hours and nearest sensitive receivers.
N5	All plant should be shut down when not in use. Plant to be parked/started at farthest point from relevant assessment locations
N6	Avoid the operation of noisy equipment near noise sensitive areas and where possible, loading and unloading would be conducted away from sensitive areas.
N7	Noise levels will be considered when procuring equipment.
N8	All plant is to utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm.
N9	Ongoing community consultation for residences within close proximity of the works. The information would include details of: <ul style="list-style-type: none"> • The proposed works and when these will occur • The duration and nature of the works • Details of what to do should they have a noise complaint • Updates on the progress of works.
N10	Where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers, particularly where equipment is near the site boundary and/or a residential receiver including areas in constant or regular use (e.g. unloading and laydown areas)
Traffic, Transport and road Safety	
T1	Undertake the following road improvements to be completed prior to the construction of the proposal in accordance with a Section 138 approval and in consultation with the Road Authority: <ul style="list-style-type: none"> • Increasing the extent of two-lane seal width (7m) for a distance of 100m at the western and eastern ends of Old Blue Vale Road • Removal of loose gravel material at the Old Blue Bale Road and Kelvin Road intersection • Upgrade of the existing access road in accordance with Orange Grove Road Site Access Alignment Plan
T2	A Traffic management plan (TMP) for construction shall be developed in accordance with Roads and Maritime Guidelines and the Australian Standard AS1742.3 prior to the commencement of works. The plan would include:

Reference	Mitigation Measure
	<ul style="list-style-type: none"> • The designated routes of construction traffic to the site • A map of the primary access routes highlighting critical locations • Drivers Code of Conduct • Carpooling/shuttle bus arrangements to minimise vehicle numbers during construction • Scheduling of deliveries • Community consultation requirements • Any restrictions on traffic movements (such as residential areas, school pick-up and drop-off times) • Traffic controls (speed limits, signage, etc.) • A complaint handling procedure • An induction process for vehicle operators • Consideration of construction traffic with seasonal agricultural haulage. • Consultation with Roads and Maritime Services for any traffic control plans to be implemented on the Oxley of Kamilaroi Highway • Wet weather access procedure.
T3	All Proposal personnel will be provided training on the requirements of the TMP through site inductions, toolbox talks or specific training
T4	The heavy vehicle route will be included within the Driver's Code of Conduct and will form part of the project inception meeting for the project for all staff and drivers
T5	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction and maintain the flow of traffic within the site and on surrounding public roads
T6	Traffic management controls will be communicated to appropriate stakeholders which will include the local community in the site vicinity via a letter box drop
T7	Directional signage will be installed to direct construction traffic, and warn other motorists of construction traffic. This signage is positioned in accordance with the approved Traffic Control Plans.
T8	<p>All employees, subcontractors and suppliers will comply with the speed limits within the worksite, which are as follows:</p> <ul style="list-style-type: none"> • 40km/h on formed roads • 20km/h during foggy/dusty conditions with headlights on • 10km/h when passing pedestrians.
T9	<p>Develop a protocol will be provided for both undertaking dilapidation surveys and making any necessary repairs following construction.</p> <p>The dilapidation surveys will assess the existing condition of Old Blue Vale Road prior to construction and identify any damage once construction is complete.</p> <p>Should any damage be identified the road will be repaired in line with Council standards.</p>

Reference	Mitigation Measure
T10	A dilapidation survey will be completed by a suitably qualified and independent civil or structural engineer along Old Blue Vale Road prior to upgrades on this road and after the works are complete. A dilapidation survey protocol is provided in Appendix I .
T11	A Traffic management plan (TMP) for decommissioning will be developed as part of the decommissioning management plan. This will include a decommissioning haulage route. The indicative decommissioning route provided in this EIS will be reviewed prior to the start of decommissioning.
T12	Restrictions will be placed on heavy vehicle deliveries and access to the site during school bus route times as part of the Traffic Management Plan. During the school holidays these restrictions for delivery and access will not apply.
T13	Variable Message Signage on Kelvin Road for the duration of construction and its ongoing management will be outlined in the Traffic Management Plan.
T14	Construction of the access road for the development, parking areas, loading bays and vehicular turning areas will have a base course of adequate depth, as agreed in consultation with Gunnedah Shire Council and in alignment with Gunnedah Shire Council Guidelines with consideration of the Project's requirements during construction, operation and decommissioning.
T15	Establishing a maintenance agreement with Gunnedah Shire Council for Old Blue Vale Road for the duration of construction. The option for a Maintenance Bond/ Defects Liability Period would also be discussed at this time. Records will be provided for road condition monitoring undertaken in accordance with the maintenance agreement to be made with Gunnedah Shire Council.
T16	Obtain relevant permits for Over Mass, Over Dimension (OMOD) vehicles should they be required at any stage of the development.
T17	If permanent parking areas are deemed to be required to facilitate operation of the site, these parking areas must comply with AS 2890 – Parking Facilities and Councils Engineering Guidelines for Subdivisions and Developments 2013.
Surface Water, Hydrology and Groundwater	
SW1	A Soil and Water Management Plan (SWMP) will be prepared and implemented by the Contractor as part of the CEMP.
SW2	Minimise the footprint of disturbance by implementing progressive construction and remediation works
SW3	Design solar panel arrays to allow sufficient space between panels to establish and maintain ground cover beneath the panels and facilitate weed control
SW4	Ensure all refuelling activities are undertaken in a bunded area at least 40m from any waterways.
SW5 This mitigation measure has been	Prior to construction, further flood modelling is undertaken including: <ul style="list-style-type: none"> • A revised hydrological model which identifies representative combinations of flooding from the Namoi and Mooki Rivers • New LiDAR data (north of Oxley Highway) to replace the current SRTM terrain data

Reference	Mitigation Measure
fulfilled within the Submissions Report.	<ul style="list-style-type: none"> ● Identification of additional mitigation measures such as further refinements to the fence configuration, if required, to reduce changes to flood levels and flow associated with the Proposal ● Preparation of an addendum flood impact assessment report to describe the revised modelling outcomes and any subsequent flood mitigation requirements.
SW6	Construction of perimeter security fencing which is designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Design of the fencing shall seek to prevent offsite impacts in relation to flood levels and flood velocity, consistent with the complying works criteria in the Carroll to Boggabri Floodplain Management Plan 2006. The detailed design of the perimeter security fencing would be undertaken post consent and as part of construction certificate approval.
Soils, Geology and Contamination	
S1	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP, in accordance with <i>Managing Urban Stormwater: Soils and Construction</i> (Landcom, 2004). This will include an erosion and sediment control plan for implementation during construction.
S2	Minimise the footprint of disturbance during construction and employ progressive rehabilitation strategies to reduce the erosion hazard
S3	During trenching activities and backfilling, as far as practicable separate topsoil and subsoil and when backfilling return the soil layers in their original order.
S4	Employ dust management measures on unsealed roads, stockpiles and other areas of loose or disturbed soil prone to dust generation. Controls may include covering of stockpiles, watering roads and synthetic soil stabilisers. Dust management techniques shall be outlined in the Soil and Water Management Plan.
S5	Maintain erosion and sediment controls until construction works are complete.
S6	Install a stabilised site entrance that all construction vehicles will use to access the site. The stabilised entrance shall be designed to minimise tracking of sediment onto adjoining roads from departing vehicles.
S7	Undertake site inspections at least weekly and following significant rainfall events to observe the condition and operation of erosion and sediment controls and water management systems, and schedule any required maintenance.
S8	Undertake soil amelioration and vegetation improvement works in line with the requirements of a Land Management Plan. This should include undertaking required land or vegetation improvement works at an appropriate stage during solar farm development. For example, soil amelioration and fertilising might be most practically undertaken prior to solar panel installation. For similar reasons the desired pasture crop should be sown before solar panel installation.
S9	Design arrays to allow sufficient space between panels for essential maintenance activities and to facilitate maintenance of an effective ground cover beneath the panels to reduce erosion and help suppress weeds.

Reference	Mitigation Measure
S10	Develop and implement a protocol for management of unexpected finds of soil contamination
S11	Stabilise batters required for ancillary infrastructure raised off the ground.
Bushfire	
BF1	All electrical components would be designed and managed to minimise potential for ignition
BF2	The design would consider that the access track must be trafficable by Category 1 fire appliances.
BF3	Maximise use of construction components using materials such as glass, silicon, steel and aluminium rather than plastic
BF4	<p>Develop an Emergency Response Plan (ERP) in consultation with the NSW RFS District Fire Control Centre prior to construction. The FMP should include:</p> <ul style="list-style-type: none"> • Foreseeable on-site and off-site fire events • Clearly states work health safety risks and procedures to be followed by fire-fighters, including: <ul style="list-style-type: none"> – Personal protective clothing – Minimum level of respiratory protection (e.g. rubber fire fighter’s boots and gloves, a self-contained breathing apparatus) – Minimum evacuation zone distances – A safe method of shutting down and isolating the PV system – Training for fighting fires within solar farms – Any other risk control measures required to be followed by fire-fighters • Evacuation triggers and protocols. <p>Suppression response strategies and tactics, including aerial suppression options/management</p>
BF5	Two copies of the ERP should be permanently stored in a prominent ‘Emergency Information Cabinet’ to be located at the main entrance point to the solar farm, external to any security fence or locked gate, and a copy provided to local emergency responders.
BF6	<p>An APZ will be constructed around the solar farm with the following requirements:</p> <ul style="list-style-type: none"> • The APZ will be 15 m wide around the entire perimeter of the solar farm footprint, and 20 m wide for areas abutting the remnant treed areas and landscaping areas • The external edge of the APZ setback at least 25 m from the external edge of PV panels or other components • The APZ must be either a mineral earth fire break (i.e. dirt or gravel) or a heavily grazed area • Trees and tall shrubs associated with the landscape plan should not be planted close to the APZ • APZ preferably located external to any security fence

Reference	Mitigation Measure
	<ul style="list-style-type: none"> The substation should have a 20m asset protection zone with no internal vegetation (gravel surface). A 10 metre defensible space that permits a 4 metre wide, unobstructed vehicle access will be provided around the perimeter of the solar array and associated infrastructure.
BF7	The APZ or a fire break is to be constructed as part of the first stage of the development.
BF8	<p>Construction between 1 December and 31 March would be undertaken in accordance with the following:</p> <ul style="list-style-type: none"> All plant, vehicles and earth moving machinery will be cleaned of any accumulated flammable material (e.g. soil and vegetation) A suitable fire appliance (e.g. fire extinguisher) is present on site with at least two personnel trained in bushfire fighting On days when Very High fire danger or worse is forecast for Gunnedah, the "fires near me" app is to be checked hourly for the occurrence of any fires likely to threaten the site <p>All operations involving machinery will cease while the GFDI is or forecast to be 35 or greater</p>
BF9	Installation of electrical equipment such as, junction boxes, inverters, transformer and electrical cabling, is to be in accordance with AS 3000:2007 Electrical installations and undertaken by qualified professionals.
BF10	Install a water supply tank with a capacity of 50,000L outside the APZ near the substation.
BF11	Consultation with the Local Emergency Management Committee will take place prior to operation to establish emergency management procedures and revise the ERP if require
BF12	Prior to construction, a Fire Management Plan will be completed as part of the CEMP.
BF13	The solar array footprint will be managed as an Asset Protection Zone, ensuring ground cover maintenance to maintain low fuel loads.
Hazardous Goods	
Haz 1	Dangerous or hazardous materials would be transported, stored and handled in accordance with AS1940-2004: The storage and handling of flammable and combustible liquids and the ADG Code where relevant.
Haz 2	All electrical equipment would be designed in accordance with relevant codes and industry best practice standards in Australia.
Haz 3	The layout of the Proposal has been designed considering buffer distances between the solar farm and sensitive receivers, road users and the general public.
Air Quality	

Reference	Mitigation Measure
A1	Activities shall be assessed during adverse weather conditions and modified as required to reduce dust generation (e.g. cease activity where reasonable levels of dust cannot be maintained).
A2	Engines to be switched off when not in use for any prolonged period.
A3	Water suppression on exposed areas, haul roads and stockpiles when required.
A4	Temporarily excavated soil and other materials that exhibit significant dust lift off would be wet down, stabilised or covered to manage dust.
A5	Development of a complaints procedure to promptly identify and respond to complaints.
A6	Vehicles and plant would be fitted with suitable pollution reduction devices wherever possible and maintained according to manufacturer's specifications.
Socio-economic	
Socio 1	The Community Stakeholder Engagement Program (CSEP) will continue to be implemented, including: <ul style="list-style-type: none"> • Providing regular updates to the community • Inform relevant stakeholders of potential impacts (for example noise impacts) • Establishment of a complaints handling procedure and a response protocol Responding to any complaints received.
Socio 2	Liaise with local industry representatives to maximise the use of local contractors, manufacturing facilities and materials. Create a resourcing plan to ensure jobs will be local.
Socio 3	Local accommodation options for staff will be maximised.
Socio 4	Continued engagement with Shire of Gunnedah to discuss community and business concerns.
Socio 5	Preparation of an Australian Industry Participation Plan will be achieved which will identify strategies to maximise the percentage of labour sourced from within 100km of the Site
Socio 6	Preparation of a skills and employment strategy for the Proposal will be achieved in consideration of the NSW Infrastructure Legacy Program.
Waste	
W1	A WMP will be prepared and implemented as part of the CEMP to manage any construction waste. The WMP will include but not be limited to: <ul style="list-style-type: none"> • Measures to avoid and minimise waste associated with the Proposal • The procedure for assessing, classifying and storing waste in accordance with the EPA 's Waste Classification Guidelines (EPA, 2014) and management options • Procedures for storage, transport and disposal of waste

Reference	Mitigation Measure
	<ul style="list-style-type: none"> Monitoring, record keeping and reporting, e.g. waste tracking data demonstrating the lawful disposal of contaminated products, waste or residues generated at the facility.
W2	An Unexpected Finds (Waste) Protocol would be established and implemented in case potentially contaminated, hazardous or unsuitable material are encountered during the site works.
W3	Waste management strategies and mitigation measures will be communicated to all employees and contractors during site induction, prior to commencing works at the site.
W4	A scheduled will be created with the temporary amenity hire contractor to remove sewage.
W5	The proposed facility will comply with the relevant Protection of Environment Operations Act waste-tracking requirements for any wastes assessed or classified as hazardous waste, industrial waste or 'Group A' waste (such as solvents, paints or oils).
W6	Waste generated from the Proposal will be managed in accordance with the principles of the waste hierarchy. A decommissioning environmental management plan will be prepared for the proposed facility with a Waste Management Plan.
W7	Gunnedah Waste Management Depot given appropriate notification before any large quantities of waste are deposited at the Gunnedah Waste Management Depot. Consultation will be undertaken with Shire of Gunnedah to determine what these notification periods will be and what waste can be taken by the facility.
Cumulative Impacts	
CU1	The CEMP would be updated as required to incorporate potential cumulative impacts from surrounding development activities as they become known. This would include a process to review and update mitigation measures as new work begins or if complaints are received. Key areas within the CEMP include WMP and TMP.

Table 3 Summary of general operational management and mitigation measures

Reference	Mitigation Measure
Operational Management Mitigation Measures	
GO1	A project specific Operational Environmental Management Plan (OEMP) will be prepared by the Hospital Operator. This will consider and incorporate: <ul style="list-style-type: none"> A Land Management Plan including weed management An operational WMP An Emergency Response plan.
GO2	A complaint handling procedure and register will be implemented to assist in recording and managing potential conflict with the local community during operations.

Table 4

Summary of Management and Mitigation Measures for Operation

Reference	Mitigation Measure
Biodiversity	
B7	<p>The OEMP will include:</p> <ul style="list-style-type: none"> • The land management plan – which will have a procedure or plan for monitoring vegetation cover and composition and allow for adaptive management • The weed management plan – which will include weed monitoring and control • Vehicle speed limits, to reduce risk of collision with fauna.
Land Use	
L6	<p>An OEMP will be prepared for the Proposal and will incorporate:</p> <ul style="list-style-type: none"> • The land management plan • The weed management plan • Ongoing landscaping commitments.
Visual	
V7	<p><i>Minimise impact through use of siting and design features</i></p> <ul style="list-style-type: none"> • Signage required at the Site should be of sufficient size to be readable at driver height within short range (0-20m) and contain only information sufficient for basic facility and company identification, for safety, navigation, and delivery purposes. Large scale signage will not be installed.
V8	<p><i>Avoid Night Sky Impacts</i></p> <ul style="list-style-type: none"> • Lighting will be limited to compulsory lighting required for the substation. Substation lighting will be turned on if an intrusion is detected or if staff are on site undertaking works outside of daylight hours • Amber colour lights will be used rather than bluish-white lighting.
V9	<p>An OEMP will be prepared for the Proposal and will incorporate:</p> <ul style="list-style-type: none"> • A complaints management process.
V10	<p>Monitor performance of screen planting areas six-monthly for first three years then annually. Replant as necessary if plants die, and supplement planting with alternative species of plants are not adapting to the Site.</p>
Noise	
N11	<p>Complete a one-off noise validation monitoring assessment to quantify emissions from site and to confirm emissions meet relevant criteria.</p>
N12	<p>Prepare an operational noise protocol that can be implemented to address any community concerns regarding project noise emissions for future operations of the project.</p>
Surface water, Hydrology and Groundwater	

Reference	Mitigation Measure
SW7	Construct fencing in accordance with Final Flood Impact Assessment to be prepared prior to construction.
SW8	Implement the Land Management Plan to ensure at least 80% groundcover is restored and maintained (Refer Appendix G)
Soils, Geology and Contamination	
S12	<p>Implement a Land Management Plan that addresses the ongoing land management and maintenance activities (Refer Appendix G). This would address:</p> <ul style="list-style-type: none"> • ongoing agronomic management of the land including stock, water, vegetation and soils management • measures required to maintain healthy soil and plant systems and maintain the agricultural capability of the land • stock management programs and infrastructure (eg fencing, watering points) • soil amelioration, pasture management and weed control • monitoring programs for soil fertility and groundcover measures to manage the site before, during and after a flood.
Bushfire	
BF12	Fit PV arrays with an earthing and lightning protection system connected to the main earth link.
BF13	Vegetation fuel levels internal to the APZ and throughout the solar farm will be maintained by grazing, slashing or mowing
BF14	The solar farm will be monitored via off-site control centres to monitor to ensure systems are working correctly, investigate any alarms and monitor panel performance
Air Quality	
A7	Establish and maintain ground cover in accordance with the Land Management Plan for the site.
Waste	
W8	A WMP will be prepared and implemented as part of the OEMP to manage any waste operational waste.

Gunnedah Solar Farm - Updated Flood Impact Assessment

transport | community | mining | industrial | food & beverage | energy



Prepared for:

Photon

Client representative:

Robert Ibrahim

Date:

29 June 2018

Rev05

Table of Contents

Executive summary.....	i
1. Context and purpose.....	1
2. Location.....	1
3. Gunnedah SEARs - Flooding and Coastal Erosion	2
4. Key comments received from the community.....	5
5. Construction of updated flood model.....	6
5.1 General approach.....	6
5.2 Terrain data.....	6
5.3 Previous assessments, studies and sources of flood information	9
5.4 Hydrology.....	9
5.5 Hydraulics.....	18
6. Flood model results.....	24
6.1 Existing situation	24
6.2 Fence Configuration 4 – drop down fences	25
6.3 Electrical substation	27
6.4 Flow distribution	28
6.5 Flood levels	28
6.6 Velocities.....	29
6.7 Impacts at sensitive receivers	29
7. Effects of Solar Farm on flood behaviour.....	34
8. Refences	35

List of figures

Figure 1: Gunnedah Solar Farm property boundary and nearby river gauges.....	2
Figure 2: Aerial laser survey carried out in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003)	7
Figure 3: LiDAR survey carried out in 2017 for Photon Energy	8
Figure 4: Comparison of Lidar data, (2000 Lidar – Blue and 2017 drone lidar – Red)	8
Figure 5: Construction details for ring levee at 765 Orange Grove Road (Myalla, or “Lou’s Place”).....	9
Figure 6: Results of LPIII flood frequency analysis of flow records from 1968 to 2017 at Gauge 419001 (units, cms = m ³ /s).....	11
Figure 7: Results of LPIII flood frequency analysis of flow records from 1973 to 2017 at Gauge 419006 (units, cms = m ³ /s).....	11
Figure 8: Results of LPIII flood frequency analysis of flow records from 1973 to 2017 at Gauge 419007 (units, cms = m ³ /s).....	12
Figure 9: Results of LPIII flood frequency analysis of flow record from 1973 to 2017 at site (units, cms = m ³ /s)	13
Figure 10: Double Mass Curve that compares cumulative flow at Gauge 419007 with cumulative flow from Gauges 419006 and 419001 for the period between 1973 and 2017	14
Figure 11: Key heights in metres at Gunnedah (Cohen’s Bridge) Gauge. Source SES NSW FloodSafe brochure	15
Figure 12: Rating Table of Gauge 419001, obtained from NSW Department of Primary Industries	15
Figure 13: Cross Section at Gauge 419001, obtained from NSW Department of Primary Industries, dated 06-11-2017.....	16
Figure 14: Comparison of SMEC FFA for gauge 419001	17
Figure 15: Example of grid cell adjustments at levees and channels around the solar farm site	18
Figure 16: Flood Hydrographs for 10%, 5% and PMF events for the Namoi River based on 1984 event	19
Figure 17: Flood Hydrographs for 10%, 5% and PMF events for the Mooki River based on 1984 event, using scaling factor from 1955 event.....	20

Figure 18: 1955 Gauged discharge hydrographs for the 1955 event for the Namoi River and Mooki River (SMEC, 2003)	21
Figure 19: Model domain and boundaries	22
Figure 20: Google street view of Chandos Street crossing over Namoi River at Gunnedah	23
Figure 21: Location of Gauge and flood mark (red boundary is the property boundary).....	24
Figure 22: Fence Configuration 4 layout (red lines are the drop down fences modelled as fence openings).26	
Figure 23: Location of electrical substation and flood depths for 1955 flood event Configuration 4	28

List of tables

Table 1: Property details	2
Table 2: Relevant SEARs items.....	2
Table 3: Available river gauge information	10
Table 4: Results of LPIII flood frequency analysis of flow record at river Gauges.....	12
Table 5: 1%AEP Catchment Yield.....	12
Table 6: Results of LPIII flood frequency analysis of flow record at site	13
Table 7: SMEC Study Peak Discharges and Volumes, Gunnedah (419001) (Source SMEC, 2003)	16
Table 8: SMEC Study Flood Frequency Analysis Results.....	17
Table 9: 1955 model result.....	25
Table 10: Flood depths at electrical substation – Configuration 4.....	27
Table 11: Flood model results at sensitive receivers - 10%AEP event	30
Table 12: Flood model results at sensitive receivers - 5%AEP event	31
Table 13: Flood model results at sensitive receivers – 1955 flood event	32
Table 14: Flood model results at sensitive receivers PMF event	33

Appendices

Appendix A: Model results

Prepared by: Date: 29 June 2018
 Mark Dugan

Reviewed by: Date: 29 June 2018
 Martin Jacobs

Authorised by: Date: 29 June 2018
 Adam Bishop

Revision History					
Rev No.	Description	Prepared by	Reviewed by	Authorised by	Date
00	First Draft	Martin Jacobs	Haydn Betts	Adam Bishop	02/03/2018
01	Revision 01	Martin Jacobs	Haydn Betts	Haydn Betts	09/03/2018
02	Revision 02	Martin Jacobs	Haydn Betts	Haydn Betts	22/03/2018
03	Revision 03	Mark Dugan	Martin Jacobs	Adam Bishop	14/06/2018
04	Revision 04	Mark Dugan	Martin Jacobs	Adam Bishop	26/06/2018
05	Revision 05	Mark Dugan	Martin Jacobs	Adam Bishop	29/06/2018

© 2018 **pitt&sherry**

This document is and shall remain the property of **pitt&sherry**. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form is prohibited.

Executive summary

An updated flood impact assessment has been carried out on the proposed Solar Farm located at 765 Orange Grove Road Gunnedah (the Site), NSW for inclusion in the Environmental Impact Statement (EIS), in accordance with the Secretary's Environmental Assessment Requirements (SEARs). The Site is located within the Upper Namoi Management Zone BL of the Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016, and is affected by flooding.

This report presents the results of updated flood modelling undertaken after submission of the EIS to addresses a number of submissions received from the community and government agencies. Flood modelling was undertaken to estimate flood levels for a range of design events, and to estimate the impacts of the Solar Farm. The modelling indicated that the greatest impacts on flood levels would arise from the security fencing and the blockage caused by the accumulation of vegetative debris mats as debris on the fencing. These impacts are assessed in terms of afflux, which is the expected increase in flood level caused by the proposed development. Because of the potential impacts, the security fence has been realigned and designed to reduce afflux.

A preliminary flood model was constructed using ground surface data from the Shuttle Radar Topography Mission (SRTM), which represents the ground surface with a grid of about 30m and a vertical accuracy of about 9.8m across Australia. Though the results demonstrated that the site would be affected by flooding, and the fences were likely to result in small increases to flood levels, the terrain model was considered too coarse to provide an accurate estimation of flood depths and increases at an appropriate scale (less than 1.0 m). This flood model was presented for community consultation in March 2018 and submitted as part of the EIS.

In response to comments received from the community an updated flood model has been prepared. The flood model was revised using much more accurate ground surface data from three sources; LiDAR surveyed in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003), LiDAR surveyed by drone for Photon in 2017 and the construction drawing for the ring levee around the property at 765 Orange Grove Road (Myalla, or "Lou's Place"). These terrain data were found to be generally consistent with each other, but the 2000 LiDAR showed some inaccuracies of up to about 0.6m between swathes of survey, which appeared to be a survey artefact that did not reflect the real ground surface. **pitt&sherry** has processed the ALS data to smooth the swathe overlap areas as much as possible to avoid 'steps' or sudden jumps in topography in the hydraulic model. The available survey data was combined and processed into a single elevation model. With the new data, the flood model indicated more uniform flow depths across the site, with flood depths and patterns of flow that reflected observed conditions. The revised model was then used to estimate the potential impacts of the proposed solar farm.

For the updated flood model flood flows were also revised following receipt of further information on the flood study carried out for the Carroll to Boggabri Flood Study (SMEC, 2003). Some inconsistencies were found in comparing flows and flood levels for the 1%AEP and 1955 flood floods. The SMEC 1%AEP estimation includes the 1955 flood event which was one of the largest recorded flood events, however this event was prior to the construction of Keepit Dam in 1960. The purpose of Keepit Dam is for flood mitigation among other uses (Water NSW, 2018). The FFA estimated during this study uses gauge data post Keepit Dam and therefore excludes the 1955 event and results in lower design event flow estimates. It appears that the construction of the Keepit Dam has reduced flows. A detailed reconciliation of flows and flood levels was not attempted, and it was assumed that the 1955 flood approximated a 1%AEP flow. Simplified methods were used to estimate 10%AEP, 5%AEP and Probable Maximum Flood (PMF) flows for the purposes of estimating impacts. The updated flood model was calibrated by comparing computed and observed flood levels for the 1955 flood, which resulted in a good fit between the two.

Considering the many comments from the community expressing concern over the security fence and the impacts it may cause when blocked by flood debris. A number of configurations were considered, culminating in a new fence configuration, Fence Configuration 4, which was developed to mitigate potential impacts to flooding. Fence Configuration 4 involves drop-down fencing designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage. Fence Configuration 4 was developed and modelled to estimate the additional mitigating benefit of drop-down fencing designed to minimise blockage and redirection of floodwater. The model shows that drop-down fencing further reduces flooding impacts and produces an entirely acceptable outcome whereby the proposed development would have negligible flood impacts on surrounding properties.

It was found that during the 1955 flood conditions:

- modelling of Fence configuration 4 indicates this option would increase flood levels by a maximum of 0.122 m (122 mm) at the fence, but these impacts are reduced to less than 0.063 m (63 mm) at the eastern property boundary, to about 0.027 m (27 mm) at the northern property boundary, and to about 0.002 m (2 mm) at the worst affected residential receiver.
- under fence configuration 4, the changes in velocity are less than -4% within the fences, up to -1% at the eastern property boundary and up to +4% on the north western property boundary. Localised higher increases to velocity are shown in areas where the water overtops the blocked fence or where water flows around a corner in the fence.

Flood maps have been prepared that show the spatial distribution of the impacts, and tables show how the impacts affect various sensitive receivers (especially residences and farm buildings) and other features (e.g. roads) near the proposed Solar Farm.

1. Context and purpose

Photon Energy Australia Pty Ltd has engaged the services of **pitt&sherry** to undertake a flood impact assessment for the proposed Gunnedah Solar Farm at 765 Orange Grove Road Gunnedah, NSW (the Site). The intent of the flood assessment is to:

- Understand the nature of flooding at the site
- Estimate flood levels
- Estimate the potential impacts of the proposed Solar Farm on flood levels and flow velocity
- Assess the effectiveness of various mitigation strategies designed to reduce potential flood impacts
- Respond to comments received from the community consultation, following the presentation and exhibition of a preliminary flood assessment, which is described in *Gunnedah Solar Farm – Flood Impact Assessment, SY17199B005 REP 31P Rev02*, **pitt&sherry**, 22 March 2018.

2. Location

The Site is located at 765 Orange Grove Road, Gunnedah, New South Wales, and is located on the floodplain of the Namoi River approximately 9km north-east of the town of Gunnedah, as shown in Figure 1. The Lot details of the subject property are summarised in Table 1.

The Site is located within the Upper Namoi Management Zone BL of the *Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016* (Government of NSW, 2016). This zone includes areas of the Lower Liverpool Plains Floodplain (which is the area of the floodplain north of the Binnaway to Werris Creek railway) that are important for the conveyance of floodwaters during the passage of a flood. Its outer boundary is defined by a slope of less than or equal to 0.5%.



Figure 1: Gunnedah Solar Farm property boundary and nearby river gauges

Table 1: Property details

Location	Address	Lot and DP
Gunnedah	765 Orange Grove Road, Gunnedah, NSW, 2380	Lot 1 DP 186590 Lot 1 DP 1202625, Lot 153 DP 754954, Lot 264 DP 754954, Lot 2 DP 801762, Lot 151 DP 754954

3. Gunnedah SEARs - Flooding and Coastal Erosion

Secretary’s Environmental Assessment Requirements (SEARs) for the proposed Gunnedah Solar Farm were issued on 25 August 2017 from the Office of Environment and Heritage. The SEARs addressed in this document are outlined in Table 2.

Table 2: Relevant SEARs items

Item number	Sub-item	Comments
10. The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:	a. Flood prone land	The site is located within an area that is prone to flooding in events less than 5%AEP
	b. Flood planning area, the area below the flood planning level.	The site is located within the Flood Planning area under the Gunnedah Local Environment Plan (published 26-02-2012)

Item number	Sub-item	Comments
	c. Hydraulic categorisation (floodways and flood storage areas).	The site is located in the floodplain of the Namoi River and functions principally as flood storage. The Site is located within the Upper Namoi Management Zone BL of the <i>Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016</i>
11. The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.		See Sections 4 and 6
12. The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios:	a. Current flood behaviour for a range of design events as identified in item 11 above. This includes the 1 in 200 and 1 in 500 year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.	See Section 4 The Probable Maximum Flood (PMF) has been included as a proxy for the 200 year ARI and 500 year ARI floods.
13. Modelling in the EIS must consider and document:	a. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood.	See Sections 4 and 6 The range of flood events comprises 10%AEP, 5%AEP, 1%AEP and PMF
	b. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories.	Changes to flood levels and velocities are shown in the flood maps in Appendix A, and the tables of changes at sensitive receivers in Section 0
	c. Relevant provisions of the NSW Floodplain Development Manual 2005.	The NSW Floodplain Development Manual has been addressed where practical in the model preparation for this assessment.
14. The EIS must assess the impacts of the proposed development on flood behaviour, including:	a. Whether there will be detrimental increases in the potential flood affection of other properties, assets and infrastructure.	Changes to flood levels are shown in the flood maps in Appendix A, and the tables of changes at sensitive receivers in Section 0
	b. Consistency with Council floodplain risk management plans.	Council's floodplain risk management plans have been consulted during this Flood Impact Assessment

Item number	Sub-item	Comments
	c. Compatibility with the flood hazard of the land.	Council's floodplain risk management plans have been consulted during this Flood Impact Assessment
	d. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.	It is considered that the proposed development is compatible with the hydraulic functions of flow conveyance and flood storage in the vicinity.
	e. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.	It is considered that the development will not appreciably change the beneficial effects of inundation in the vicinity.
	f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.	The site is not located close to the Namoi River, and will not affect the river's erosion, siltation, vegetation, and bank stability
	g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council.	It is considered that the development will not affect community emergency management arrangements.
	h. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council.	It is considered that the development will not change risks to life from flooding.
	i. Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES.	It is considered that the development will not change emergency evacuation and access.

Item number	Sub-item	Comments
	j. Any impacts the development may have on the social and economic costs to the community as consequence of flooding.	It is considered that the development will not change social costs to the community. The economic costs relate to changes in flooding, which are mapped in Appendix A. There are economic benefits associated with the development of the proposed Solar Farm, but a comprehensive economic assessment is beyond the scope of the current study.

4. Key comments received from the community

Following exhibition of the EIS in May 2018, 52 submissions were received from the community. Most of these raised concerns about flood impacts and the accuracy of the previous flood modelling. The key themes expressed in community submissions related to flooding, are summarised as follows:

- Concerns were expressed over the location of the solar farm on a floodplain and potential impacts on flood conditions and impacts to neighbouring properties. Particular concerns relate to the security fence which would likely become blocked by debris in a flood, causing redirection of flows and worsening of flood effects on surrounding properties.
- Questions were raised over the accuracy of the flood model and data inputs, including:
 - terrain data (SRTM). Would have been better to use more accurate LiDAR data
 - doesn't reflect key landscape features (eg major irrigation channels)
 - use of 1984 flood data as a template. Why not use the 1955 flood?
 - reference to river gauges for historic data
 - effect of Mooki River and other local waterways including Rangari Creek
 - whether landholder records of flood observations were checked
 - how the model addresses the unpredictability of flooding
 - Inconsistencies between P&S flood model and actual observations of dry land vs inundated areas
- Concerns were expressed over lack of reference to the Carroll to Boggabri Flood Management Plan (2006) and apparent inconsistencies between the P&S flood modelling and data in the FMP from SMEC modelling (eg flood depths, velocities).
- Disagreement with the security fence blockage assessment and predicted impact on flooding. Respondents felt blockage would be 100% and a flood would flatten the fence. Suggested redesign or remove the fence.
- Some respondents suggested lowering/removing channel banks to reduce flood impacts; and provided support for the development without a security fence, or with reconfigured fence or drop-down fence and designed floodways.

It is acknowledged that the previous modelling depended on the SRTM DEM-H terrain data (which has a vertical accuracy of about $\pm 9.8\text{m}$ against 90% of tested heights across Australia), and approximated flows approaching the site from the Namoi River. The intent of the previous modelling was to carry out a preliminary assessment that focused more on modelling changes due to the solar farm. It demonstrated that:

- the site is flood affected

- the security fencing could cause impacts in terms of increased flood levels and changed velocities
- the security fence should be designed in a way that reduces flood impacts.

The SRTM DEM-H data were used in the previous assessment because better terrain data were not available at the time. Better data have now been acquired in the form of LiDAR from OEH and other sources as described in Section 5.2, which also notes their limitations. The flood modelling based on these terrain data yields more credible results in terms of the distribution and depths of flooding around the site, which agree better with observed flood levels. In the previous model, the terrain was much more 'lumpy', falsely creating a network of channels and islands, which yielded over-estimates of velocities and impacts. In the current model, the terrain is much flatter and is criss-crossed with farm drains and levees, yielding more uniform flow distribution with lower velocities and lower potential impacts due to the solar farm.

Whereas the previous model only addressed flows approaching the site from the Namoi River, the current model includes a distribution of flows between the Namoi and Mooki rivers, based on further information obtained from the *Gunnedah and Carroll Floodplain Management Plan 1999* (SMEC Study, updated 2014). As illustrated in the flood maps, the site is located where the flows from the two river systems merge over the flood plain, and the current model includes this mechanism by its representation of the terrain surface of the channels and flood plains. Inflows from the Rangari Creek were included in the Namoi and Mooki total flow, and were not modelled explicitly, because of the lack of flow data. Flows from the Rangari Creek merge with Namoi and Mooki flows on the flood plain over a wide area generally downstream of the site. Modelled flood levels and depths for the 1955 flood also agree well with observed flood levels and depths.

It is considered that the current model improves the representation of flood behaviour around the proposed solar farm, and hence provides a more accurate assessment of potential impacts compared with the previous (March 2018) flood assessment.

Photon has been investigating drop-down fencing options and is now committed to installing a suitable drop-down fence so as to minimise potential impacts due to fence blockage and redirection of flows. The drop-down fence would be designed to permit relatively unimpeded flow of floodwaters through the solar farm site. Modelling of a drop-down fence configuration has been undertaken. Detailed design of the drop-down fence would be undertaken post approval.

5. Construction of updated flood model

5.1 General approach

A flood model was constructed using the program HEC-RAS 5.0.4 in 2D mode. The model was calibrated by adjusting roughness parameters to yield flood levels consistent with observed flood levels for the 1955 flood event.

The flood model has been constructed from available rainfall and terrain data and has been verified by comparing flood levels with historic records and other flood studies, especially river gauge records and the *Gunnedah and Carroll Floodplain Management Plan 1999* (SMEC Study, updated 2014).

5.2 Terrain data

The terrain data used were acquired from three sources:

- Aerial laser survey (ALS) carried out in 2000 for the Carroll to Boggabri Flood Study (SMEC, 1999, updated 2003), as illustrated in Figure 2. These data have a vertical accuracy of about 0.05 m. The surveyor notes that in some swathe overlap areas the vertical accuracy decreases by up to 0.60 m due to excessive turbulence. **pitt&sherry** has processed the ALS data to smooth the swathe overlap areas as much as possible to avoid artificial 'steps' or sudden jumps in topography in the hydraulic model, which will

provide a more realistic representation of flow across the flood plain. The ALS data was compared against current aerial imagery to ensure that key hydraulic features are included.

- Drone survey data of the proposed solar farm site, which was carried out in 2017 for Photon Energy, as illustrated in Figure 3. This survey includes the current irrigation channels and flood levee banks on the site.
- The construction drawing for a ring levee at 765 Orange Grove Road (Myalla, or “Lou’s Place”) as illustrated in Figure 5. This drawing was developed by Stewart Surveys and shows spot levels on the existing ground and design levels for the levee.

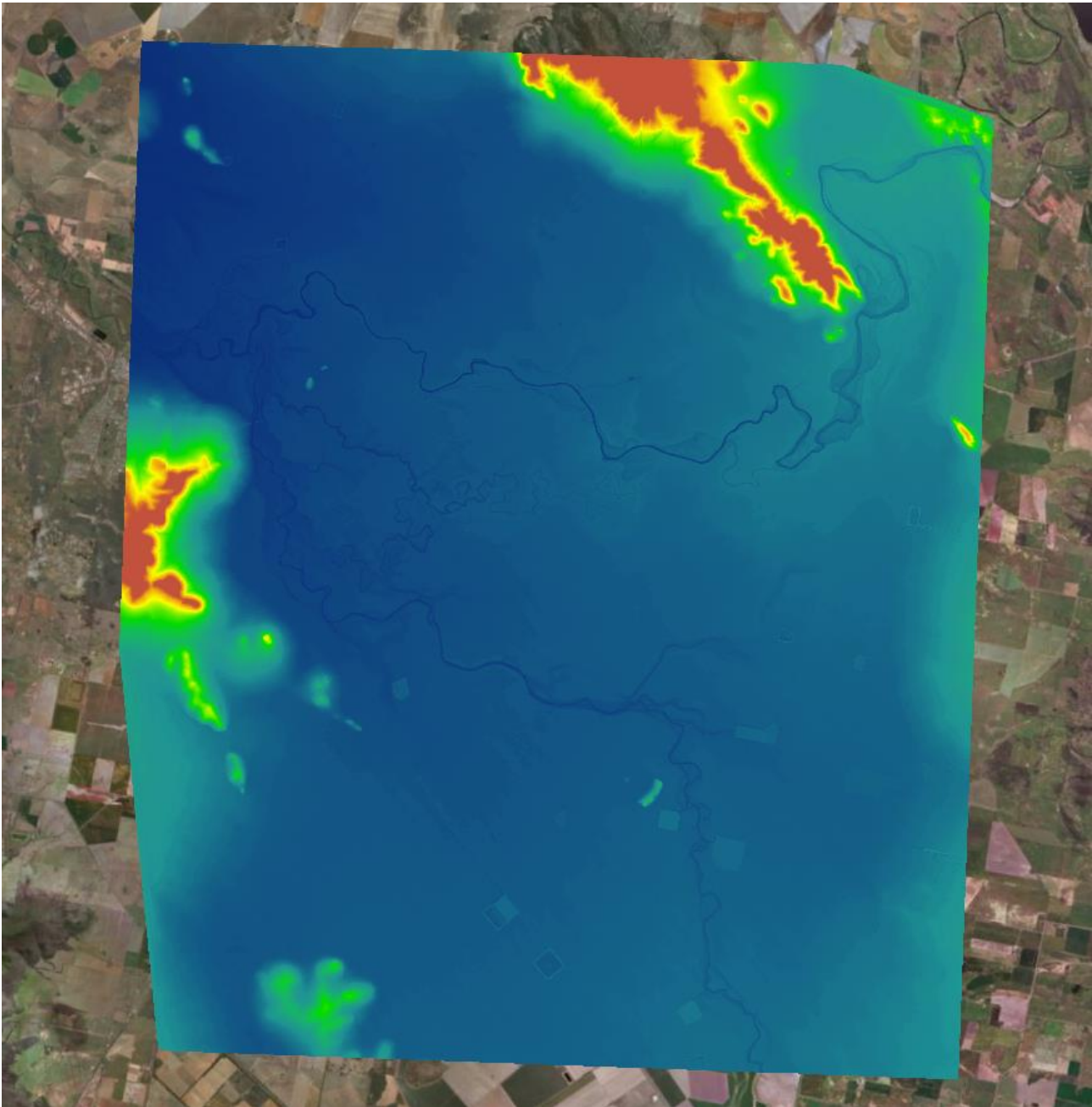


Figure 2: Aerial laser survey carried out in 2000 for the Carroll to Boggabri Flood Study (SMEC, 2003)



Figure 3: LiDAR survey carried out in 2017 for Photon Energy

Figure 4 illustrates the comparison between the 2000 Lidar (Blue) and the 2017 drone survey over the site (Red) using a east-west cross section positioned centrally on the property. There are some differences between the levels, but there is a good overall match between the two sets of data.

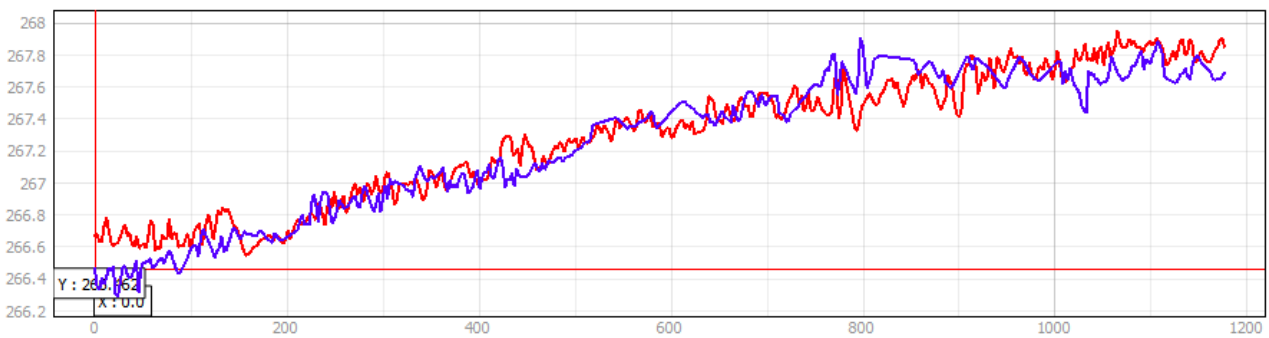


Figure 4: Comparison of Lidar data, (2000 Lidar – Blue and 2017 drone lidar – Red)

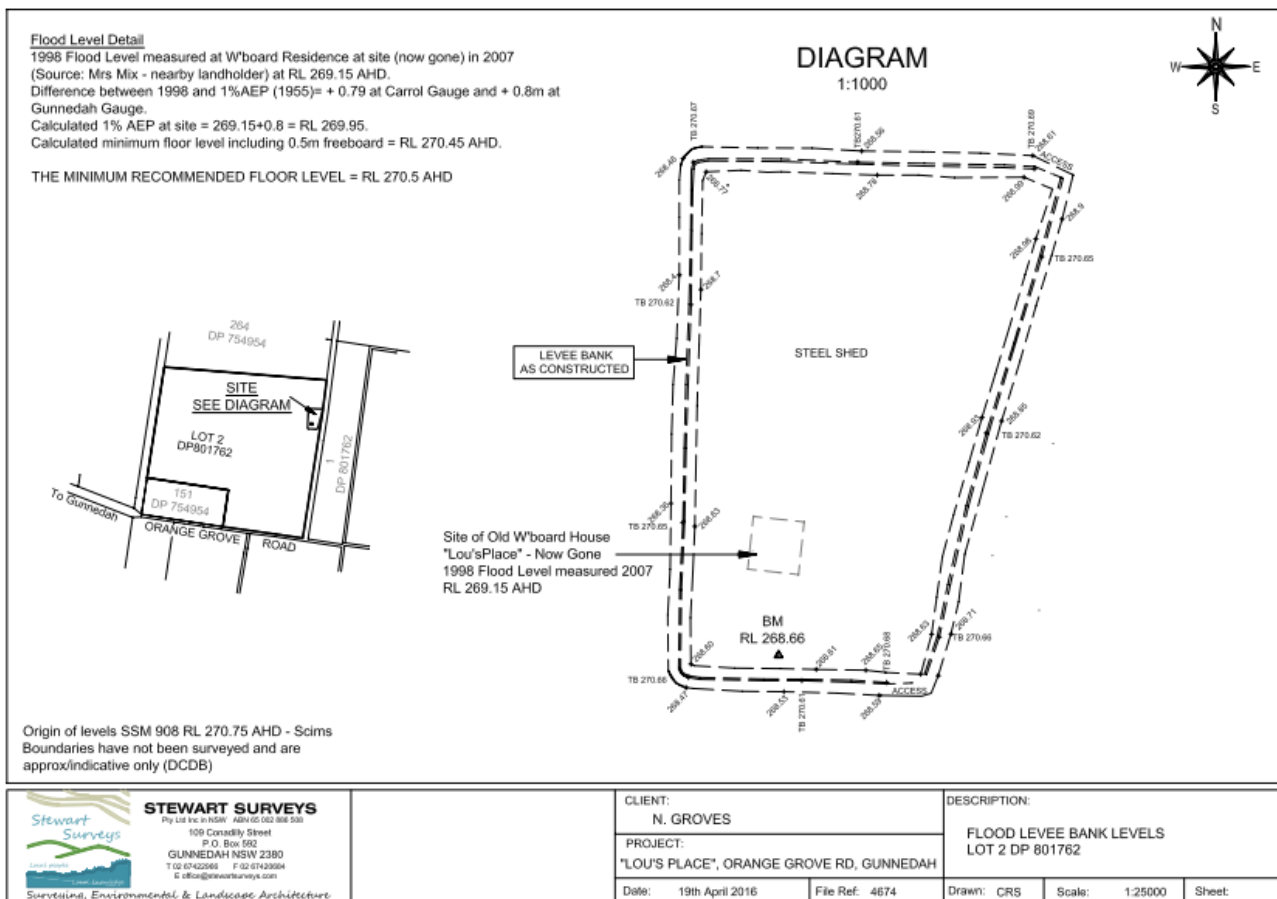


Figure 5: Construction details for ring levee at 765 Orange Grove Road (Myalla, or “Lou’s Place”)

5.3 Previous assessments, studies and sources of flood information

Previous assessments of flood levels around the site include the following:

- Stewart Surveys, which estimated a 1% AEP flood level at RL 269.95 at 765 Orange Grove Road (Myalla, or “Lou’s Place”, Lot 2 DP 801762)
- NSW SES FloodSafe brochure, which refers to estimated flood levels at the Gunnedah Gauge (Cohen’s Bridge) for the 1998, 1955 and the 1% AEP flood level (available [on-line](#))
- Gunnedah and Carroll Floodplain Management Plan 1999, SMEC Study, updated 2014, which approximates the 1955 flood to the 1% AEP flood event. (available [on-line](#))
- Carroll to Boggabri Flood Study and Compendium of Data 2003, SMEC Study, which discusses the flood history and flood data and provides a Flood Frequency Analysis for the gauges.
- Carroll to Boggabri Floodplain Management Plan 2006, Webb McKeown & Associates on behalf of Department of Natural Resources (available [on-line](#)), which relies on earlier modelling by SMEC and infers conclusions for the purposes of planning.
- Preliminary flood impact assessment described in *Gunnedah Solar Farm – Flood Impact Assessment, SY17199B005 REP 31P Rev02*, **pitt&sherry**, 22 March 2018.

5.4 Hydrology

5.4.1 Gauges

The nearest River Gauges to the site are as follows:

- Gauge 419001 – Catchment area = 17100 km², Namoi River at Gunnedah located about 10 km downstream of the proposed solar farm site

- Gauge 419006 – Catchment area = 4670 km², Peel River at Carroll Gap, located about 25 km upstream of the proposed solar farm site
- Gauge 419007 – Catchment area = 5700 km², Namoi River, Downstream Keepit Dam located about 28 km upstream of the proposed solar farm site.

The gauge catchment areas and flow records were obtained from the NSW Department of Primary Industries Office of Water Real Time Data – Rivers and Streams data portal, <http://realtimedata.water.nsw.gov.au/water.stm>. Flood frequency analyses were carried out on the flow records at Gauges 419001, 419006 and 419007, as described in Section 5.4.3.

No flood frequency analyses were done on the available gauges on the Mooki River, Gauge 419084 and Gauge 419027. The Mooki river banks are about 10 km to the South of the site. A scaling factor was applied, based on the design flows from the Namoi River.

The catchment of the Namoi River at the site is 9961km², which is about 58% of the total area of the catchment at Gauge 419001.

A summary of the river gauge data is provided in Table 3.

Table 3: Available river gauge information

	Gauge 419001	Gauge 419006	Gauge 419007
Site commence	27/11/1891	04/12/1923	14/01/1924
Available discharge rate	02/12/1968 to current	26/02/1973 to current	19/06/1973 to current
Available stream water level	02/12/1968 to current	26/02/1973 to current	19/06/1973 to current
Available discharge volume	01/12/1891 to 01/01/2017	01/12/1923 to 01/01/2017	01/12/1923 to 01/01/2017

5.4.2 Flood frequency analysis of gauge data

The flood frequency analysis of gauge data was analysed using the available discharge rate data as the discharge volume data contained missing data during some of the extreme flood events.

The annual maxima flood data were extracted from the NSW Department of Primary Industries Office of Water Real Time Data – Rivers and Streams data portal records for each gauge and each calendar year and subject to a Flood Frequency Analysis (FFA) using the program HEC-SSP and the Log Pearson III (LP III) statistical distribution. The results are illustrated in Figure 6, Figure 7 and Figure 8, and Table 4, which show the computed flow distribution and the 95%ile and 5%ile confidence limits. Catchment yields (flow per km²) are summarised in Table 5.

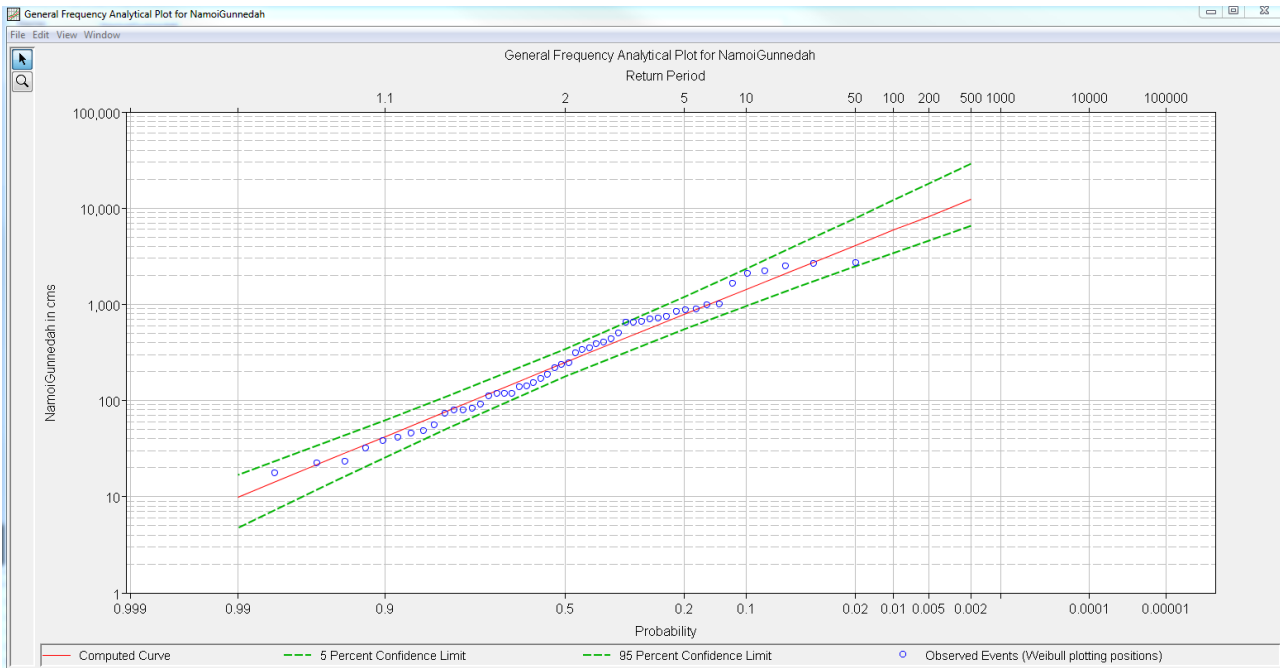


Figure 6: Results of LPIII flood frequency analysis of flow records from 1968 to 2017 at Gauge 419001 (units, cms = m³/s)

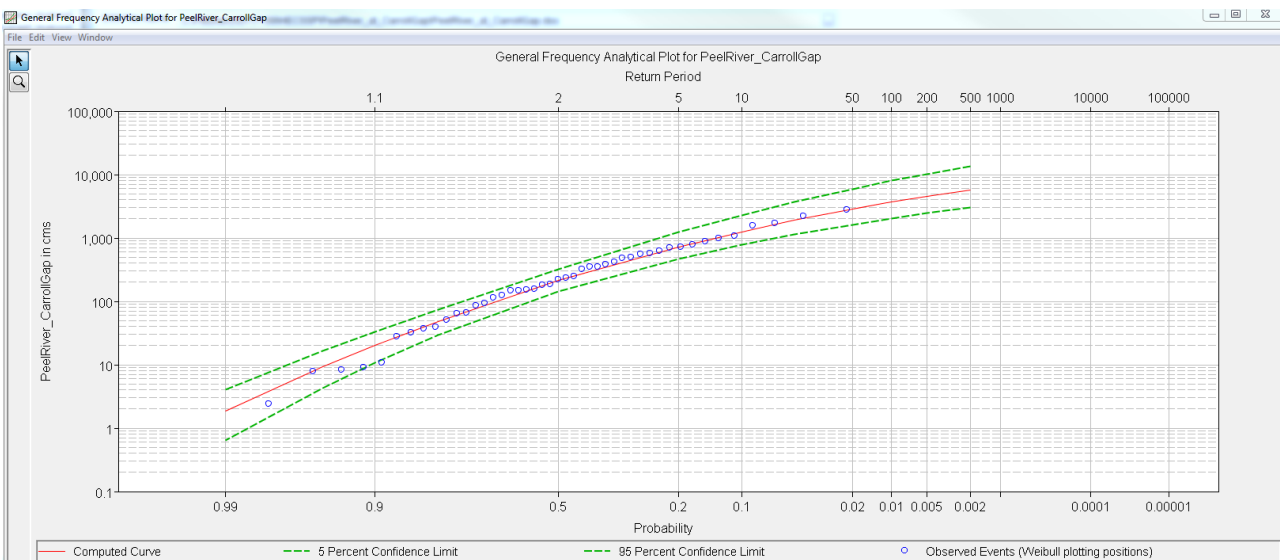


Figure 7: Results of LPIII flood frequency analysis of flow records from 1973 to 2017 at Gauge 419006 (units, cms = m³/s)

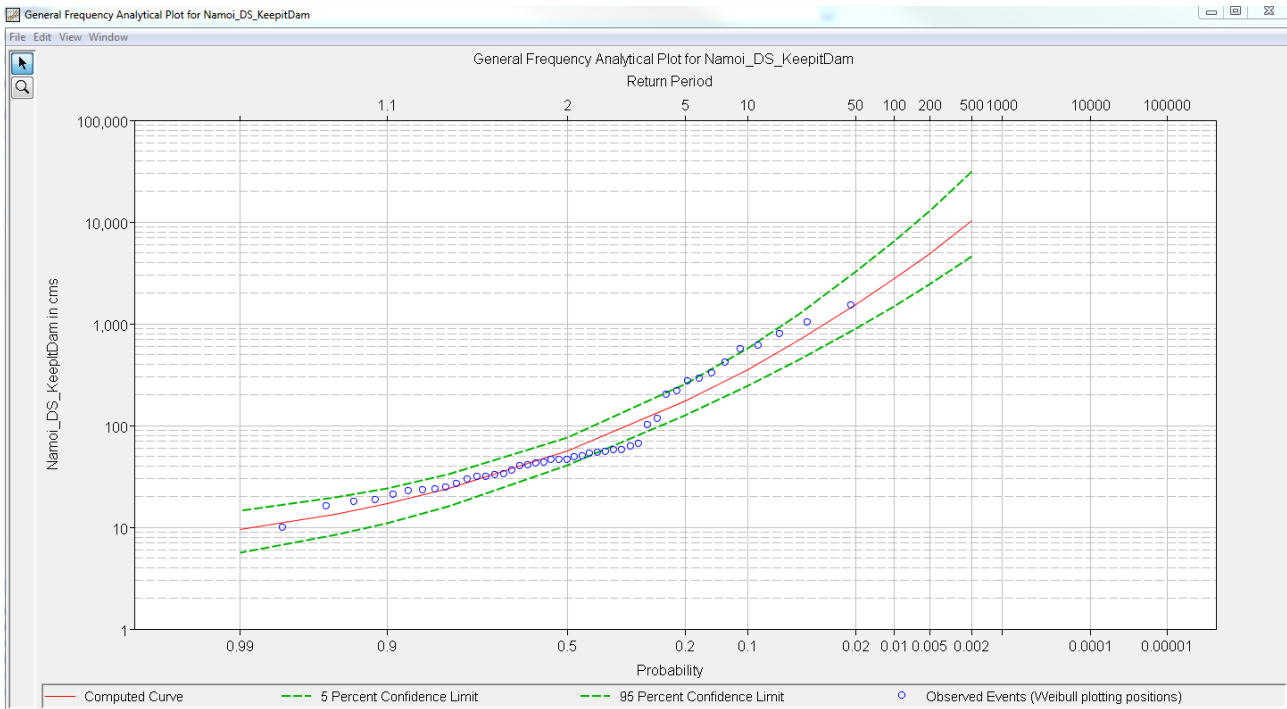


Figure 8: Results of LPIII flood frequency analysis of flow records from 1973 to 2017 at Gauge 419007 (units, cms = m³/s)

Table 4: Results of LPIII flood frequency analysis of flow record at river Gauges

AEP%	Gauge 419001 Namoi @ Gunnedah			Gauge 419006 Peel @ Carroll Gap			Gauge 419007 Namoi @ D/S Keepit Dam		
	95% (m ³ /s)	Computed (m ³ /s)	5% (m ³ /s)	95% (m ³ /s)	Computed (m ³ /s)	5% (m ³ /s)	95% (m ³ /s)	Computed (m ³ /s)	5% (m ³ /s)
0.2%	6,555	12,332	28,967	3,009	5,695	13,427	4,606	10,229	31,213
0.5%	4,596	8,223	17,955	2,450	4,511	10,195	2,450	4,916	12,939
1%	3,422	5,881	12,102	2,034	3,656	7,959	1,496	2,779	6,534
2%	2,473	4,074	7,868	1,631	2,851	5,943	897	1,544	3,238
5%	1,511	2,344	4,134	1,127	1,888	3,672	438	684	1,234
10%	967	1,432	2,343	779	1,255	2,291	243	354	572
20%	556	787	1,189	469	725	1,226	126	173	253
50%	180	248	344	142	212	321	41	56	76
80%	51	78	110	29	48	74	16	24	33
90%	26	42	62	11	20	33	11	17	24

Table 5: 1%AEP Catchment Yield

Gauge	1%AEP computed flow (m ³ /s)	Catchment (km ²)	1%AEP Yield (m ³ /s per km ²)
419001 Namoi @ Gunnedah	5,881	17,100	0.34
419006 Peel @ Carroll Gap	3,656	4,670	0.78
419007 Namoi @ D/S Keepit Dam	2,779	5,700	0.49

5.4.3 Flood frequency analysis at the site

The flood frequency analysis (FFA) at the site was estimated by combining the daily flows from the two river Gauges 419006 and 419007 with data obtained from the NSW Department of Primary Industries – Office of Water. No routing was applied at the upstream gauge locations because they were close to upstream boundary of the hydraulic model, and the hydraulic model routes the flood hydrograph to the site as part of its computations. The FFA was generated using HEC-SSP as per Section 5.4.2 and the results are shown in Table 6 and Figure 9.

Table 6: Results of LPIII flood frequency analysis of flow record at site

AEP%	Flow: 5% Confidence Limit (m ³ /s)	Flow: Computed (m ³ /s)	Flow: 95% Confidence Limit (m ³ /s)
0.2%	6,810	13,400	34,300
0.5%	4,630	8,620	20,200
1%	3,370	5,990	13,100
2%	2,380	4,030	8,190
5%	1,420	2,250	4,110
10%	893	1,340	2,260
20%	506	725	1,120
50%	163	228	320
80%	47.9	73.8	106
90%	24.8	41.4	62.1
95%	14.3	25.9	40.6
99%	5.1	10.8	18.8

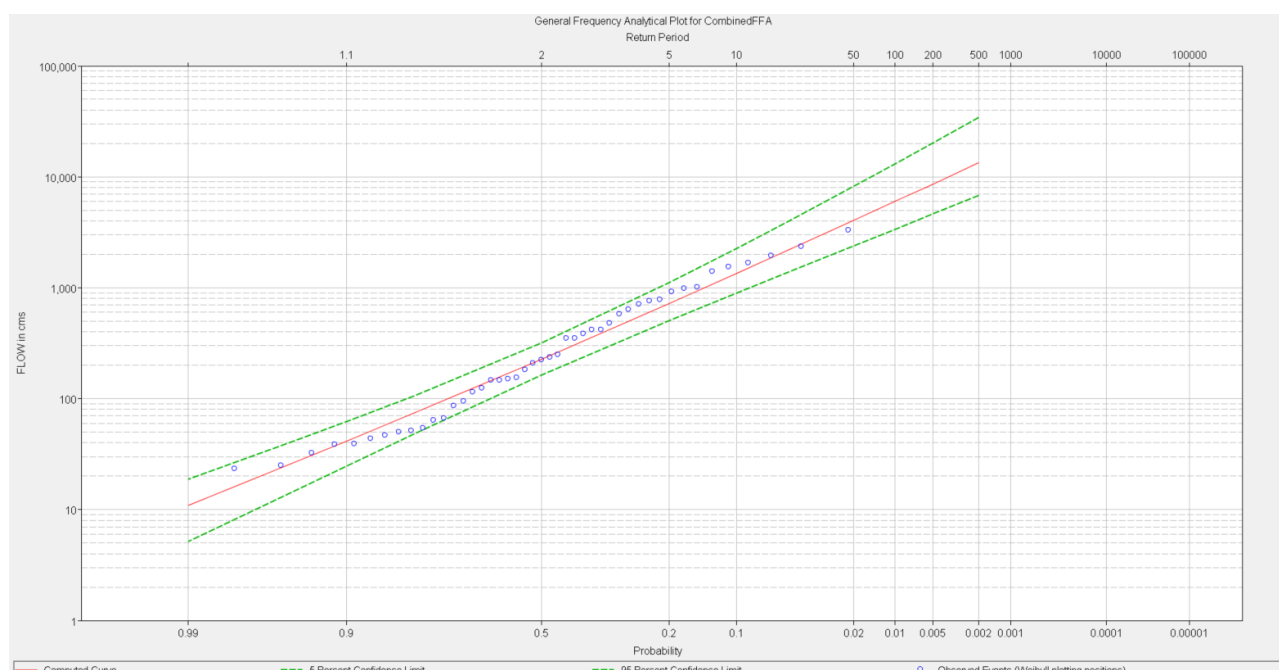


Figure 9: Results of LPIII flood frequency analysis of flow record from 1973 to 2017 at site (units, cms = m³/s)

The computed flow of 5,990m³/s for the Namoi River at the proposed Solar Farm site represents a yield of 0.60m³/s per square kilometre for the 1% AEP flood event, which agrees fairly with the observed yields at the nearby gauges as summarised in Table 5.

5.4.4 Hydrological verification

Testing for changes to Keepit Dam releases and catchment

A double mass curve was created that compares the cumulative flows from river Gauge 419007 with cumulative flows from river Gauges 419001 and 419006 for the period 1973 to 2017, as shown in Figure 10. The double mass curve illustrates the consistency of flows in these gauges, and changes in the slope of the curve indicate a change in the flow releases from Keepit Dam, or a change to the catchment characteristics.

Gauge 419007, downstream of Keepit Dam, was installed after construction of the dam. The Gauge records therefore include the effects of the dam on flows.

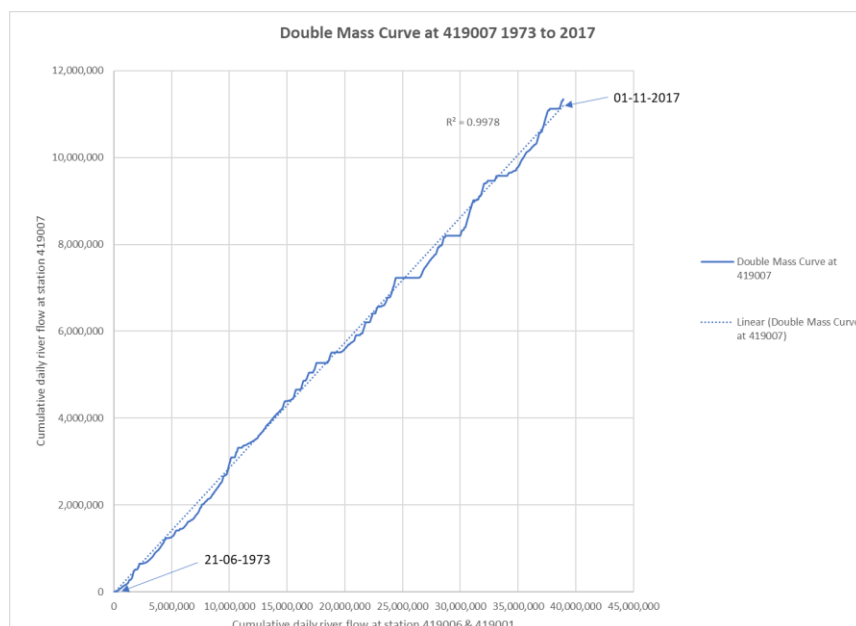


Figure 10: Double Mass Curve that compares cumulative flow at Gauge 419007 with cumulative flow from Gauges 419006 and 419001 for the period between 1973 and 2017

The construction of the Keepit Dam in 1960 has changed flows downstream, as indicated in the changes to the slope of the double mass curve in Figure 10. These changes have reduced the 1%AEP flows in the Namoi River, and may account for the differences between flows and flood levels for the 1955 flood and 1%AEP flood, as discussed elsewhere in this assessment (e.g. Figure 14).

Previous assessments – NSW SES

NSW SES has estimated flood levels at the Gunnedah Gauge (Cohen’s Bridge) for the 1998, 1955 and the 1% AEP flood level, as shown in Figure 11. It is unknown how the 1% AEP flood level was derived.

The Table in Figure 11 suggests that the 1%AEP is equivalent to the 1955 flood water level plus 0.13m, and that the 1955 flood was of a lesser magnitude than the 1%AEP flood.

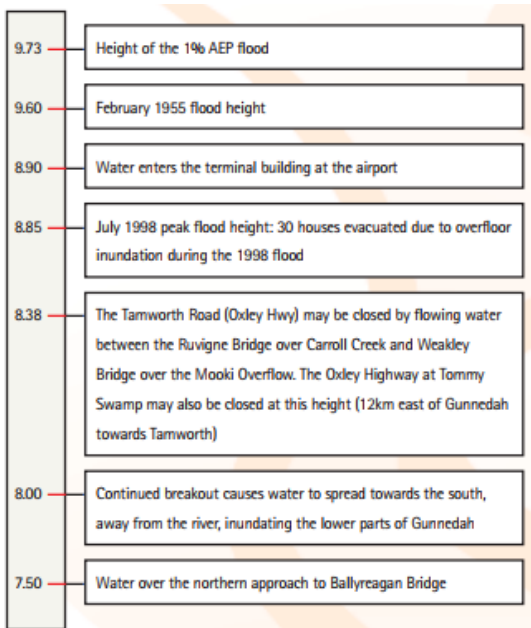


Figure 11: Key heights in metres at Gunnedah (Cohen's Bridge) Gauge. Source SES NSW FloodSafe brochure

Previous assessments – NSW DPI Gauge Rating

The NSW Department of Primary Industries current rating curve for Gauge 419001 Namoi @ Gunnedah is shown in Figure 12, and it is based on the cross section shown in Figure 13.

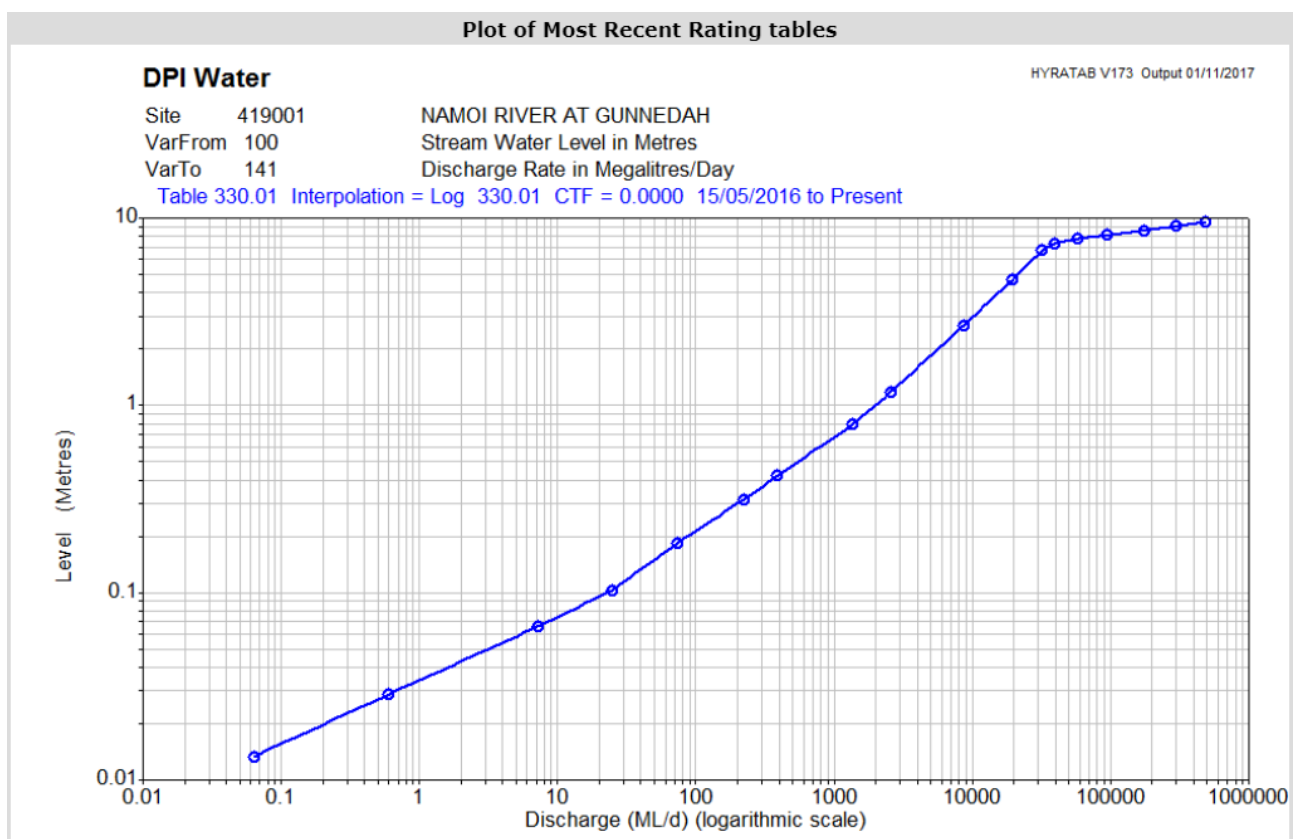


Figure 12: Rating Table of Gauge 419001, obtained from NSW Department of Primary Industries

DPI Water

HYSECPIC V37 Output 06/11/2017

Cross section status report

Site 419001 NAMOI @ GUNNEDAH Height 0.554 metres
 Sect 200901 23/06/2009 Control 0/0 Cease to flow 254.885 metres
 Time 09:00_06/11/2017 Flow 675.3 ML/d

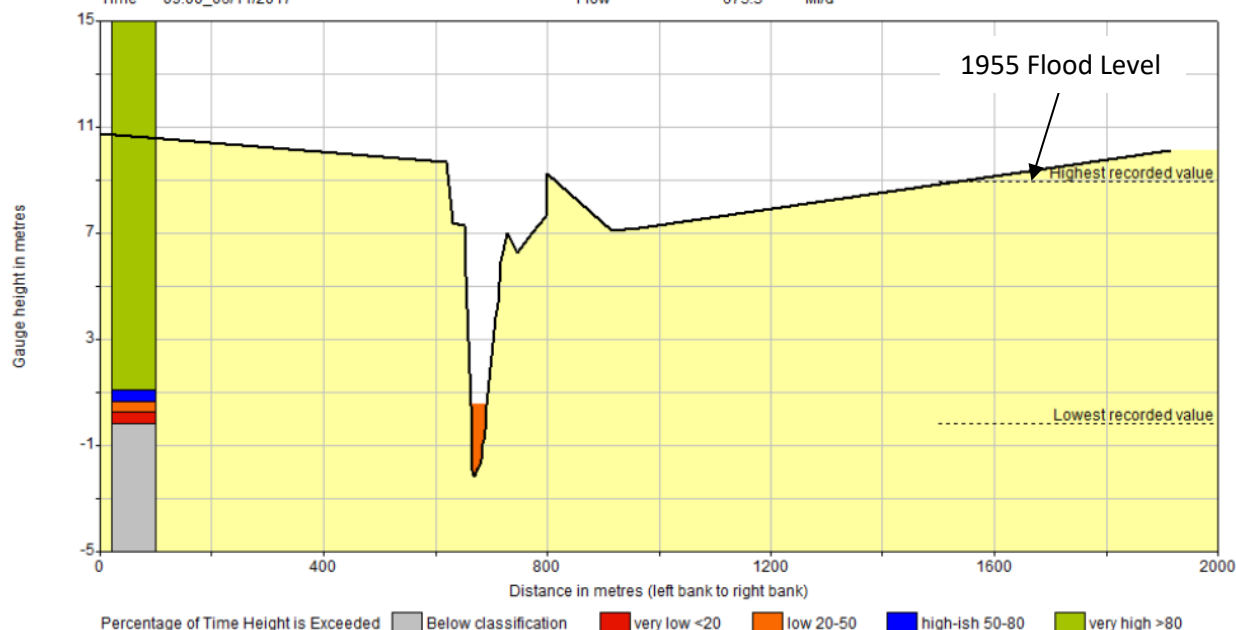


Figure 13: Cross Section at Gauge 419001, obtained from NSW Department of Primary Industries, dated 06-11-2017

Regional Flood Frequency Estimation (RFFE)

The website rffe.arr-software.org includes a function for Regional Flood Frequency Estimation (RFFE), which is commonly used to estimate flood flows under the following conditions and limitations:

- Catchments should be less than 1,000km²
- Catchments should not contain dams or weirs that could significantly affect the rainfall-runoff behaviour.

As the catchment for the site greatly exceeds 1,000km², and it contains the Keepit Dam, the RFFE was not used to verify or estimate flood flows at the site.

Previous flood studies – Carroll to Boggabri Flood Study and Compendium of Data (SMEC, 2003)

The Carroll to Boggabri Flood Study and Compendium of Data was reviewed for this study. Relevant findings are reproduced in Table 7 and Table 8.

Table 7: SMEC Study Peak Discharges and Volumes, Gunnedah (419001) (Source SMEC, 2003)

Event	Peak Flow (ML/d)
February 1955	800,030
January 1962	134,365
January 1964	281,356
February 1971	401,585
January 1974	237,354
January 1976	313,031
January 1984	341,951
July 1998	227,504
November 2000	234,051

Table 8: SMEC Study Flood Frequency Analysis Results

Gauge 419001 Namoi @ Gunnedah	
Year	AEP (%)
February 1955	1.0
November 2000	5.4
July 1998	7.3
Jan – Feb 1984	7.3

Comparison of SMEC FFA

The 2003 SMEC study estimated the 1% AEP discharge at Gauge 419001 to be about 9,160m³/s (February 1955 event), but this study estimates it to be 5,881m³/s (see Table 4), based on the available gauge data online (1973 to present).

The SMEC FFA includes the 1955 flood event which was one of the largest recorded flood events, however this event was prior to the construction of Keepit Dam in 1960. The purpose of Keepit Dam is for flood mitigation among other uses (Water NSW, 2018). The FFA estimated during this study uses gauge data post Keepit Dam and therefore excludes the 1955 event and results in lower design event flow estimates.

It appears that the construction of the Keepit Dam has reduced flows as illustrated in Figure 14.

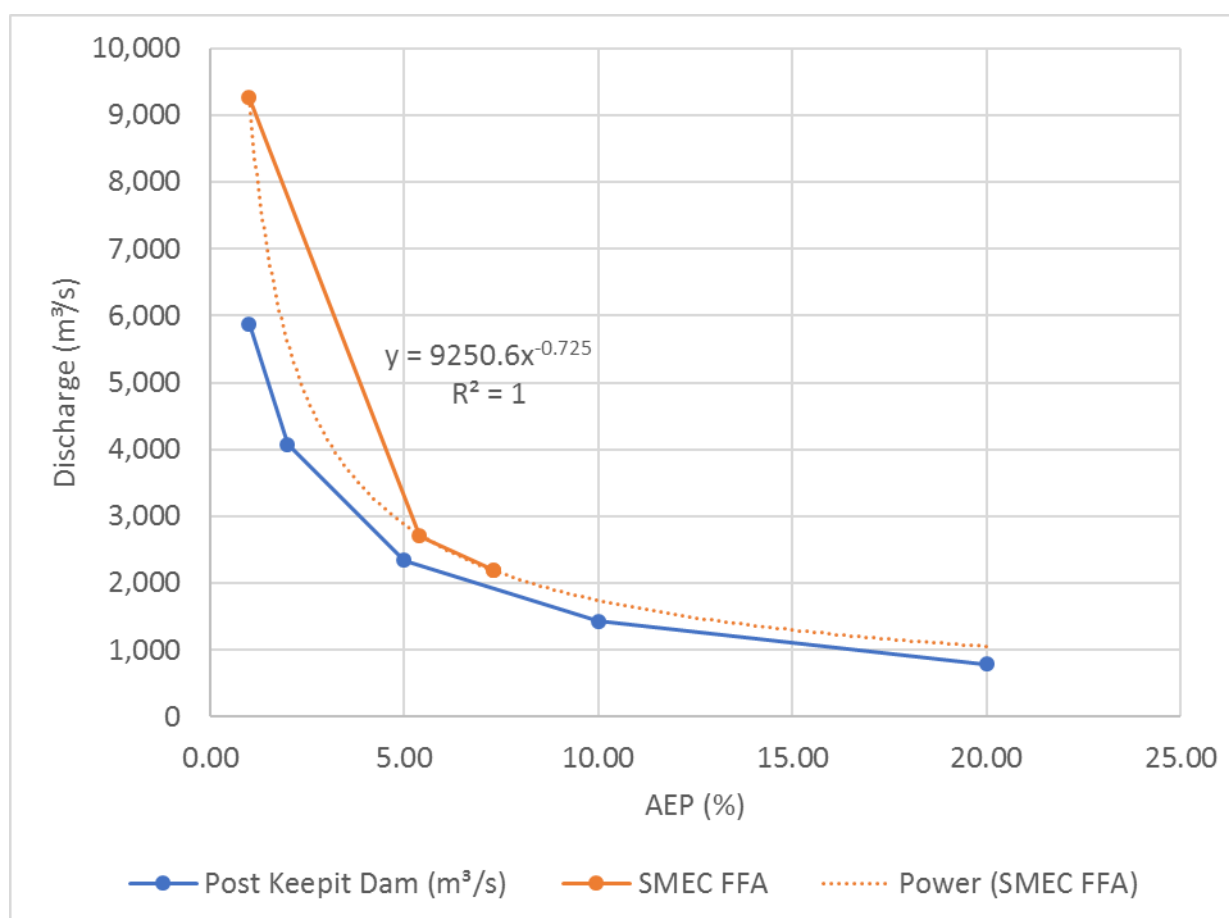


Figure 14: Comparison of SMEC FFA for gauge 419001

5.5 Hydraulics

5.5.1 Software

The hydraulic modelling software used for the peak flood level estimation was HEC-RAS Version 5.0.4 in 2D mode. 2D mode was preferred as water is allowed to flow naturally whereas in 1D mode the modeller makes decisions on flow paths. 2D mode also provides a better representation of the floodplain storage.

5.5.2 Input data

Terrain Data

The sources of the revised terrain data are described in Section 5.2. The data were processed using the HEC-RAS program to yield a grid with a grid size of up to 30m for the floodplain. The grid size and cell orientation was varied to provide finer detail at hydraulic features such as rivers, tributaries, table drains, irrigation drains and levees to represent channel invert levels and levee crest levels, as illustrated in Figure 15.

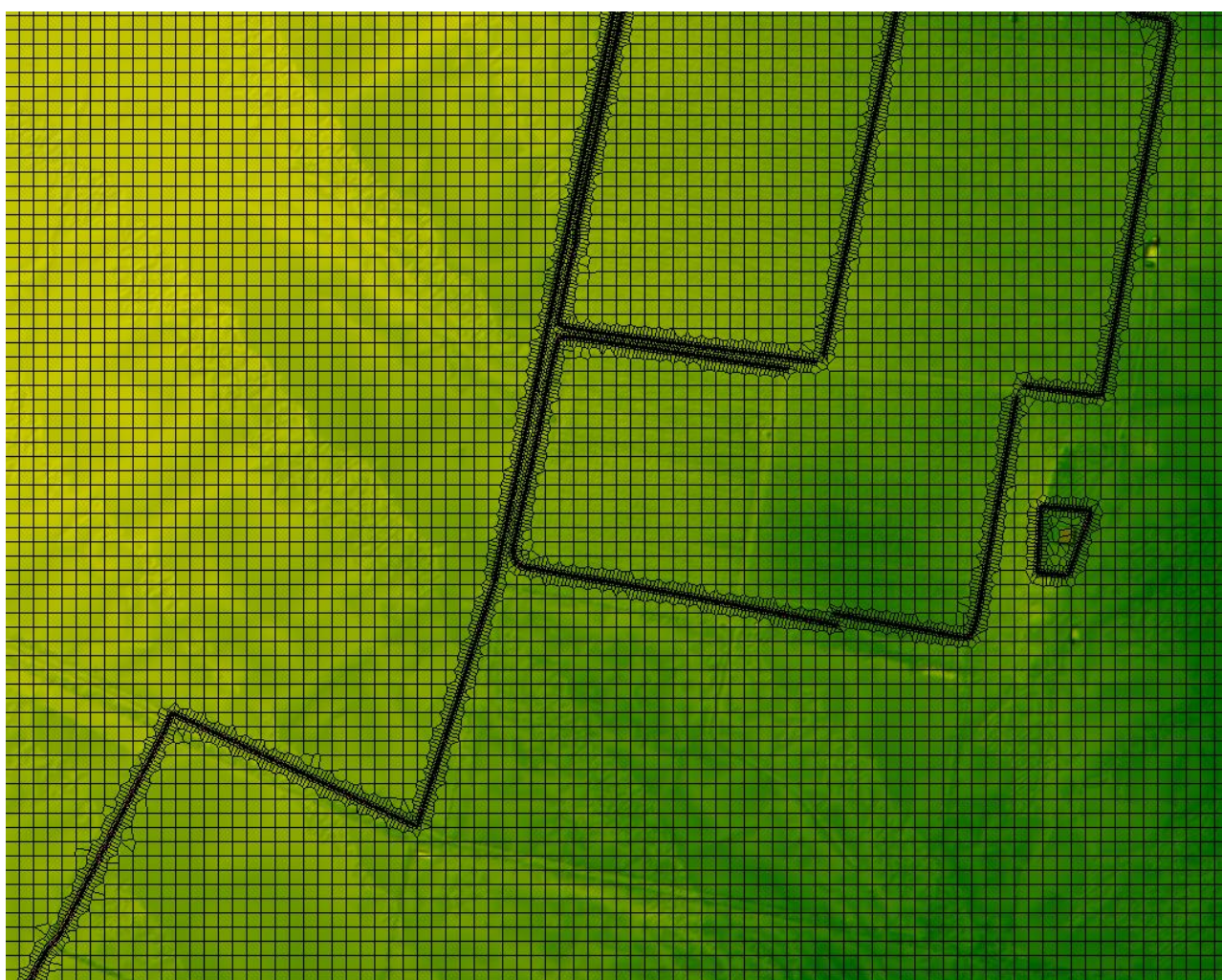


Figure 15: Example of grid cell adjustments at levees and channels around the solar farm site

The roughness of the floodplain was described as a single roughness value that covers the state of crops, vegetation and general farm fences. A low estimate of the roughness was used because it conservatively over-estimates impacts. The fences around the Solar Farm were described as discrete features that included representations of the nature and degree of blockage that would occur from flood debris.

Flows

An assessment of the gauge records is described in Section 5.4. Four design events were modelled

- 10%AEP, scaled from 1984 event
- 5% AEP, scaled from 1984 event
- 1955 event, which approximates 1%AEP
- PMF scaled from 1984 event

Design events based on 1984 event

The major flood event of January 1984 was used to generate a hydrograph shape for the 10%, 5% and PMF design events. The 1984 event is the largest on record for Gauge 419006, and it falls between the 5% AEP and 2% AEP probabilities.

The 10%, 5% and PMF design flow hydrographs in the Namoi River were scaled from the 1984 event hydrographs, as illustrated in Figure 16.

The 10%, 5% and PMF design flow hydrographs in the Mooki River were similarly based on the 1984 event hydrographs, scaled from the ratio of flows between the Namoi and Mooki Rivers, as illustrated in Figure 17.

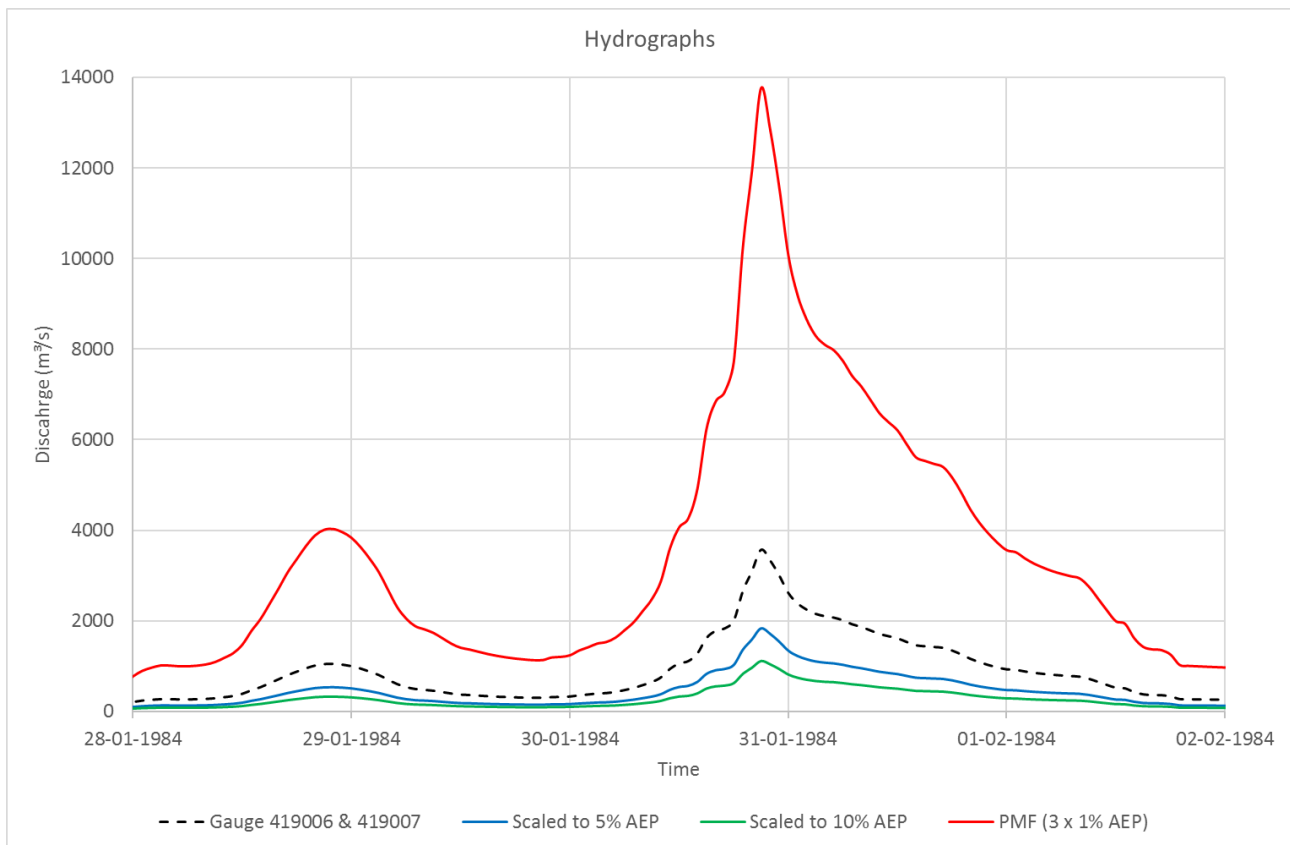


Figure 16: Flood Hydrographs for 10%, 5% and PMF events for the Namoi River based on 1984 event

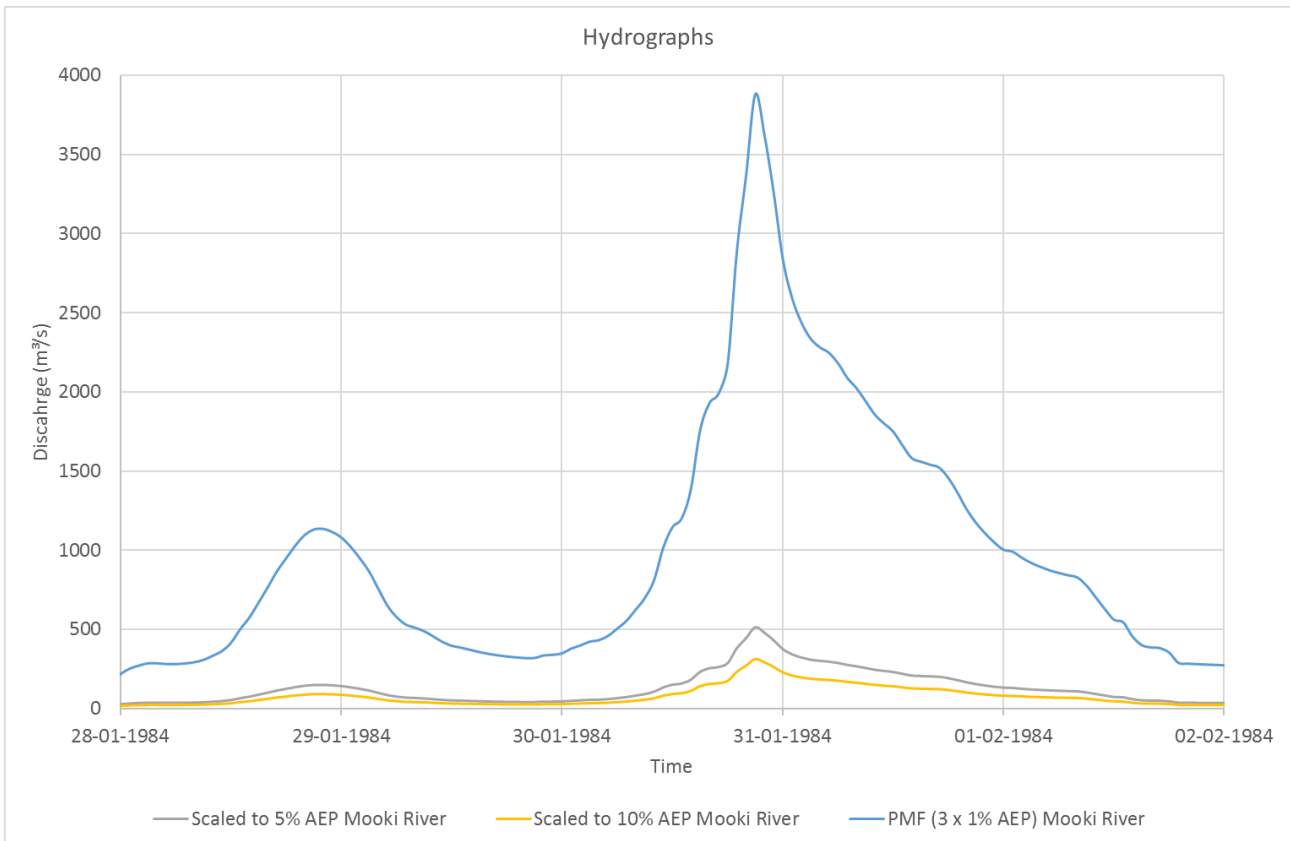


Figure 17: Flood Hydrographs for 10%, 5% and PMF events for the Mooki River based on 1984 event, using scaling factor from 1955 event

1955 event

The 1955 flood event was used as a scenario and calibration event. The recorded gauge discharge for the Namoi River at Peel River and the Mooki River at Breeza were acquired from the SMEC 2003 study and used as inflow into the hydraulic model as illustrated in Figure 18. Two flood levels within the model boundary were available for calibration, these were also acquired from the SMEC 2003 study. The recorded levels were at Gauge 419001 and a post found behind Battery Hill house.

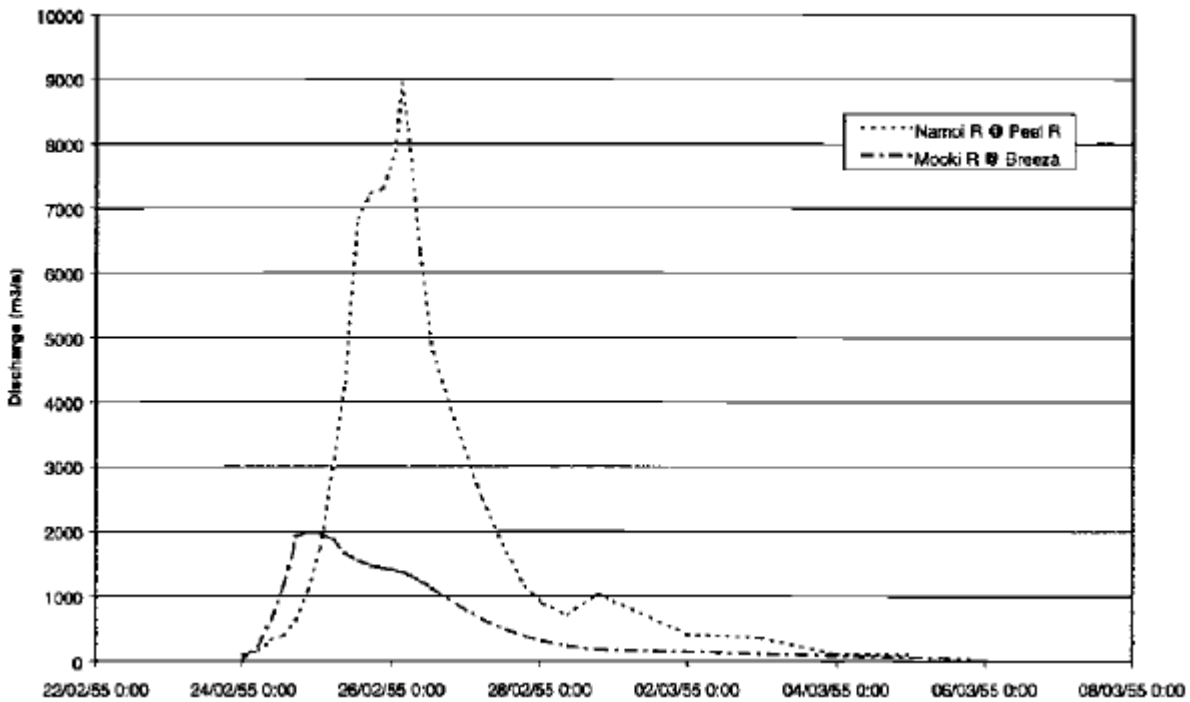


Figure 18: 1955 Gauged discharge hydrographs for the 1955 event for the Namoi River and Mooki River (SMEC, 2003)

Boundaries

Three boundary conditions were applied:

- The tail water condition at the downstream boundary, which was set to a normal depth with a hydraulic gradient of 0.00075 (m/m)
- Inflows at the upstream boundaries for the Namoi River and Mooki River were applied as hydrographs

The upstream and downstream boundaries were set at about 15km and 21km upstream and 9km downstream of the site respectively, as illustrated in Figure 19. The distances between the boundaries and the site are sufficient to ensure that hydraulic conditions at the site are not significantly affected by assumptions of conditions at the boundaries.

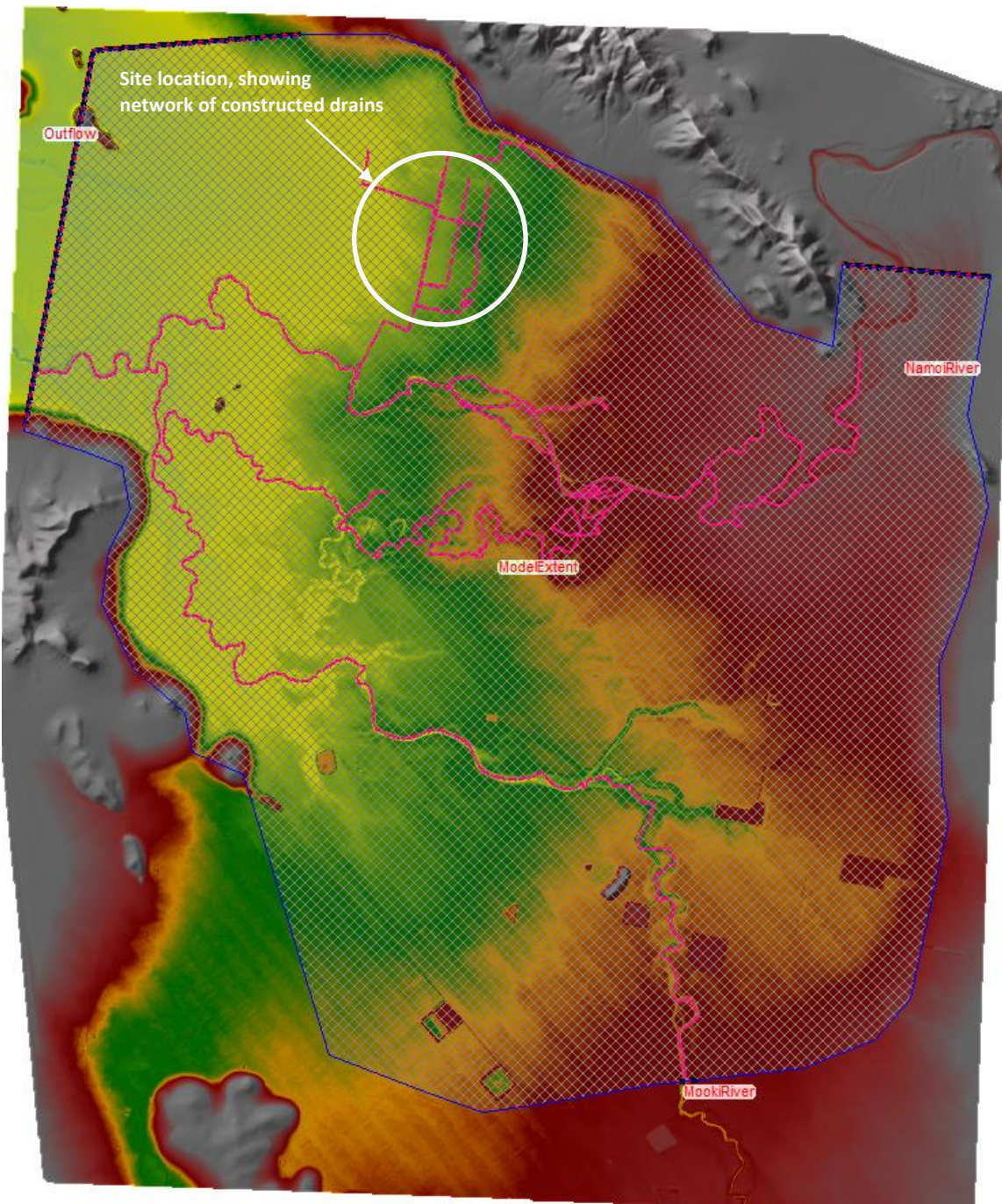


Figure 19: Model domain and boundaries

Fences and floodplain roughness

A uniform Manning’s roughness coefficient was applied to the 2D model domain. A variety of Manning’s values were tested during the 1955 calibration event, a Manning’s roughness value of 0.045 achieved a good match with the recorded gauge and historical flood mark. This roughness value was used for the design event modelling and the fence configuration modelling.

General farm fences and stock fences are not represented in the model as individual fence lines but are included in the floodplain roughness. The resistance to flow by the stock fences is difficult to predict because it depends on the degree of blockage by flood debris. There are further uncertainties related to whether gates are open or closed, or whether fences are pushed over by flood water, or where fences have been added or removed. The approach taken is considered appropriate for the purposes of this study.

Security fences for the Solar Farm are represented in the model as lateral structures with vertical barriers and slots to represent the blocked and open sections of the fence, and open gates. Several fence configurations were tested, which included different fence plans, degrees of blockage, and numbers of open gates which was discussed in the previous report (SY17199B005 REP 31P Rev02).

Individual solar panels were not represented as discrete structures or as changes in the floodplain roughness value for the following reasons

- The solar panels stand on posts above the ground, and the ground will be grassed. The effects on flooding would not be pronounced, because floodwaters would generally pass below the panels and around posts, and the combined cross-sectional area of these posts is negligible in the context of the floodplain.
- The solar panels are corralled behind the security fences such that they would only influence flow within the area enclosed by the fences
- The final arrangement of solar panels within the security fences has not been determined accurately, and it is unlikely that the modelling will reflect the final arrangements of the panels in plan.

Bridges and structures

The Chandos Street bridge (Figure 20) is located at the downstream boundary of the model and does not significantly affect flooding at the subject site. The difference between invert levels along the Namoi River at the Chandos Street bridge and the site is about 9m. The bridge is located about 16km downstream and any head losses caused by the bridge are unlikely to extend this far upstream.

Culverts at farm drains were not modelled as culverts, but the drainage channels were extended to provide hydraulic continuity along the drainage channels.

5.5.3 River behaviour

On-line imagery of the site shows a varying width, low flow channel about 20 to 25m wide, as shown in Figure 20. Figure 20 shows the view upstream from the Chandos Street crossing over the Namoi River, which is located at the downstream boundary of the model. There is an extensive floodplain that extends beyond the river that is inundated in flood events.



Figure 20: Google street view of Chandos Street crossing over Namoi River at Gunnedah

6. Flood model results

6.1 Existing situation

The 1955 flood event was simulated to provide confidence that the model can simulate large historical flood events. The historical flows were applied to the upstream boundary conditions. Several scenarios were run for the 1955 flood event with varying roughness and a downstream boundary gradient.

The recorded peak water level at Gauge 419001 for the 1955 flood event was 264.46 m AHD at 11:00 am on the 26th of February.

A list of recorded flood levels was included in the 2003 SMEC report. A 1955 flood level mark within the model boundary was available as verification on model performance. The flood level is located on a post found behind Battery Hill house, which was 272.61 m RL. The location of the Gauge and the historical flood mark in relation to the site and hydraulic model domain is illustrated in Figure 21.

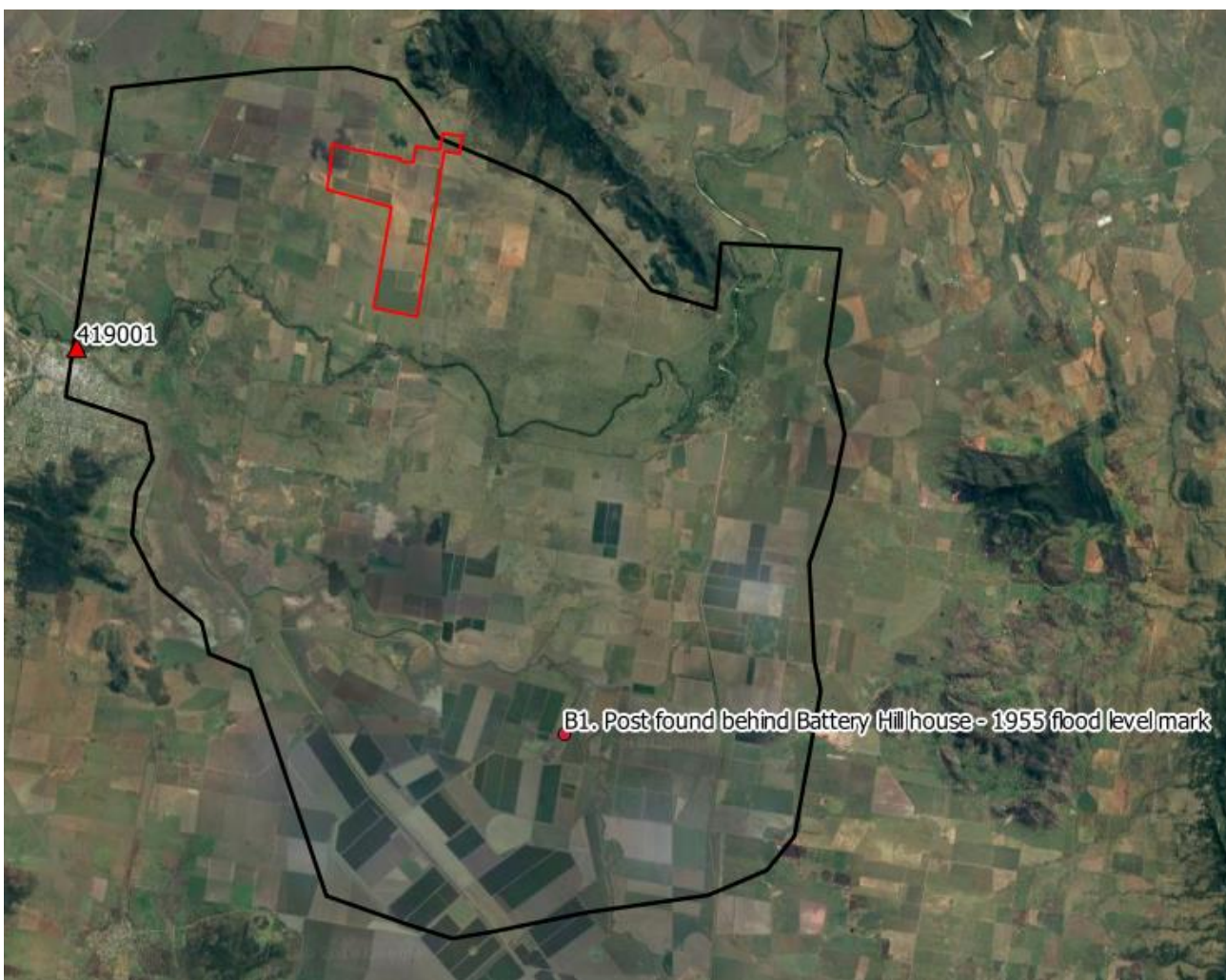


Figure 21: Location of Gauge and flood mark (red boundary is the property boundary)

The scenario which achieved best fit against historical flood data is shown in Table 9. The model achieves a reasonable fit between the available flood levels for the 1955 event.

Table 9: 1955 model result

Manning's Roughness	Downstream Gradient (m/m)	Model minus Gauge 419001 level (m)	Model minus 1955 flood mark (m)
0.045	0.00075	-0.01	0.05

The design events included in the modelling are the 10% AEP, 5% AEP, 1955, and PMF. The design events use the same Manning's roughness and downstream boundary gradient as the 1955 flood event.

The model results for flood levels in the existing (base line) situation, are shown in the flood maps in Appendix A.

6.2 Fence Configuration 4 – drop down fences

The original flood report (SY17199B005 REP 31P Rev02) discussed a number of potential fence configurations which are modelled to assess flood behaviour and impact of the solar farm. Fence Configuration 3 was developed and modelled and included measures to reduce flood impact (ie laneways) while also acknowledging potential blockage of the chain wire fence. In terms of blockages pattern it assumed:

- Fence 100% blocked up to 0.5m above ground
- Fence 50% blocked above 0.5m above ground

A number of alternate fence configurations have been considered culminating in a new configuration, Fence Configuration 4. Fence Configuration 4 involves a combination of conventional security fencing and drop-down fencing designed to allow flood water into and through the development site during significant flood events to minimise potential redirection of flood flows due to fence blockage.

It comprises the following:

- A single perimeter fence around the solar farm footprint; and
- Drop-down fences in certain locations (modelled as fencing being removed from locations of early flooding and key high velocity areas)
- No laneways

Figure 22 details the location of drop down fencing for Configuration 4. This layout was selected based on the flood model results with drop-down fencing applied in areas of greatest flood flows and generally where fences are aligned perpendicular to the flood flows. The layout was optimised through various iterations using the flood model. The precise location and details of the drop-down fence would be finalised as part of detailed design. Note that in relation to blockage the modelling assumes:

- In areas of drop-down fence the blockage is nil, presenting no barrier to flood flow
- In the areas of conventional security fence, 100% blocked to 0.5m; 50% blocked above.

Configuration 4 represents one possible layout for the drop-down fencing and is modelled within this updated flood assessment to assess its effectiveness as a mitigation option. Should it be considered necessary, further flood modelling can be undertaken once the fence layout is finalised at detailed design stage, post approval.

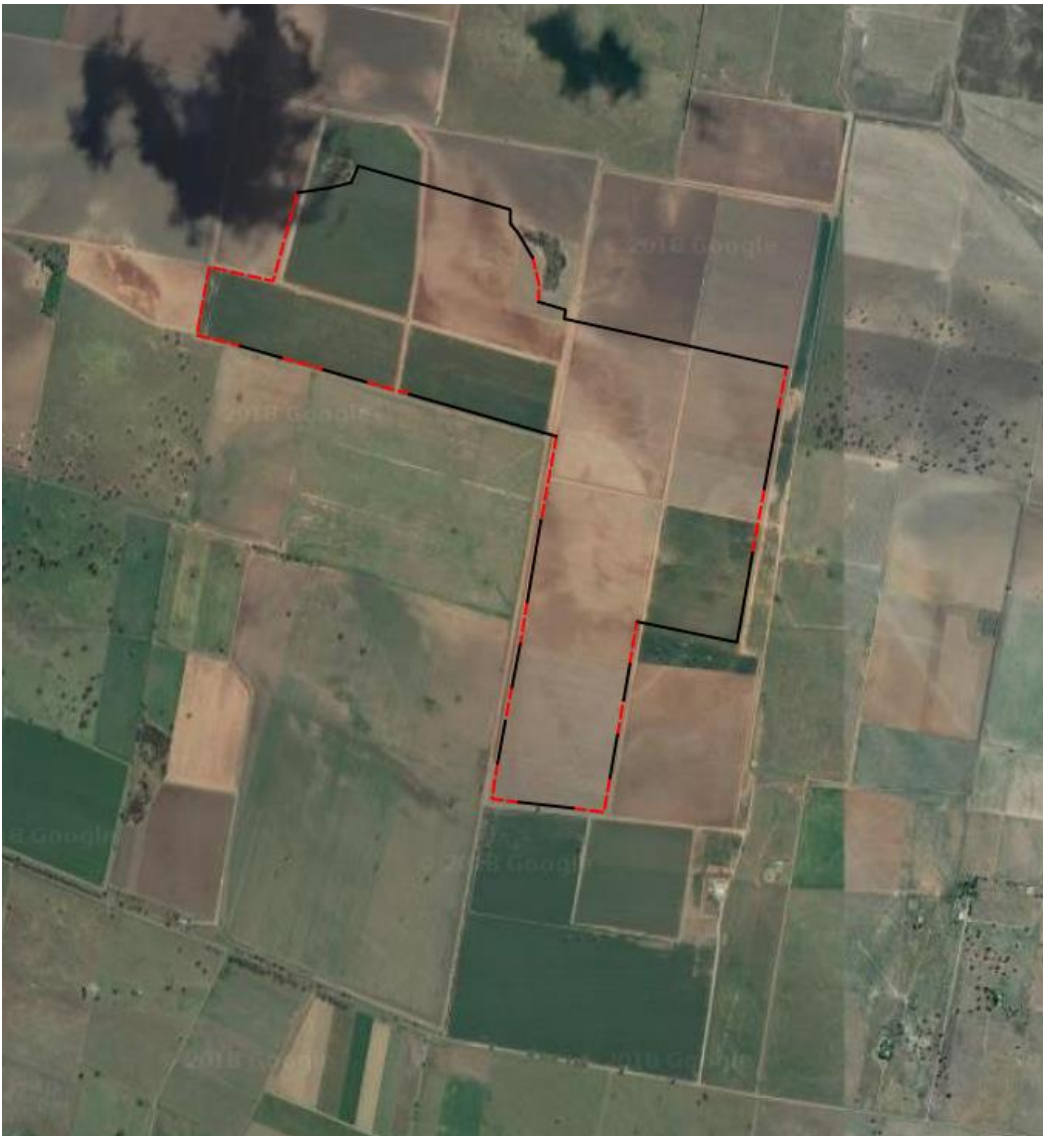


Figure 22: Fence Configuration 4 layout (red lines are the drop down fences modelled as fence openings)

The model results for flood levels in Configuration 4 are shown in the flood maps in Appendix A and in the tables of flood levels at the sensitive receivers in Table 11, Table 12, Table 13 and Table 14.

The model results indicate that Configuration 4 produces a maximum change in the 1955 flood level of up to about 0.063 m (63mm) directly adjacent to the eastern boundary, about 0.027 m (27 mm) at the north-west property boundary and up to about 0.002m (2mm) at the most affected sensitive receiver. Compared to the baseline, flood levels are reduced to the north and west of the fence and increase to the east, southeast and southwest.

The model results indicate that Configuration 4 produces the following:

- In the 10% AEP event, the fences increase water levels by about 0.004 m (4mm) for about 300 m from the eastern fence boundary in the southern-most part of the site. There is no increase in water level at the property boundary on the east. Water levels are reduced on the western side of the boundary on average by about 0.002 m (2 mm).
- In the 5% AEP event, the fences increase water levels by about 0.016 m (16 mm) for about 300 m from the eastern fence boundary in the southern-most part of the site. The typical increase in water level along the property boundary on the east is about 0.001 m (1 mm). Water levels are reduced on the western side of the boundary by about 0.005 m (5 mm).

- the 1955 event, the fences increase water levels by about 0.02 m (20 mm) for about 300 m from the fence boundary to the North-West and East. The typical increase in water level along the property boundary on the East is about 0.02 m (20 mm); about 0.018 m (18 mm) in the North and about 0.04 m (40 mm) in the North-West. Water levels are reduced on the western side of the boundary by about 0.007m (7 mm).
- In the PMF event, the fences increase water levels by about 0.02 m (20 mm) for about 300 m from the fence boundary to the North-West and East. The typical increase in water level along the property boundary on the East is about 0.04 m (40 mm); about 0.014 m (14 mm) in the North and about 0.01 m (10 mm) in the North-West. Water levels are reduced on the western side of the boundary by about 0.007m (7 mm).

The model clearly indicates the benefits of the drop-down fence. Any changes to flood conditions (afflux and velocity) are virtually negated under Fence Configuration 4 with the drop-down fences.

6.3 Electrical substation

An electrical substation is proposed at the south-west corner of the site and would be constructed on a new fill platform above the flood levels, as illustrated in Figure 23. The effect of the electrical substation was modelled by raising the land at the approximate substation location so that it would not become inundated during the model scenarios. Table 10 summarises the flood levels from Configuration 4 and adds a freeboard of 0.5m to recommend a height of the fill platform, depending on the degree of flood immunity desired.

Table 10: Flood depths at electrical substation – Configuration 4

AEP	Flood level (mAHD)	Recommended height of fill platform above ground (mAHD)
10%	268.16	268.66
5%	268.32	268.82
1955 flood event	268.78	269.28
PMF	269.04	269.54

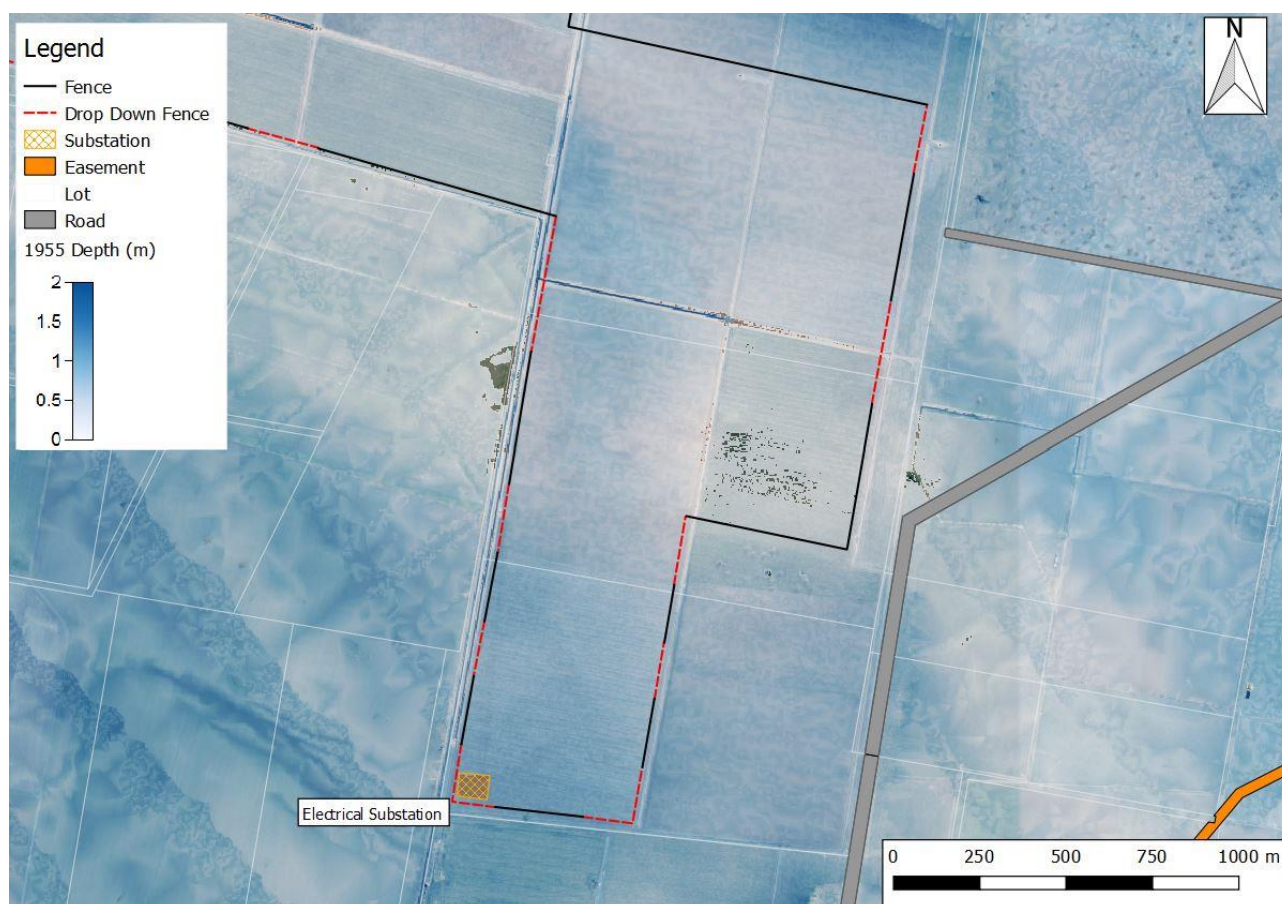


Figure 23: Location of electrical substation and flood depths for 1955 flood event Configuration 4

6.4 Flow distribution

The *Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016* (Government of NSW, 2016) includes the following assessment criteria for the distribution of flows (Section 45.5a)

A flood approval must not be granted ... if ... the flood work is likely to ... redistribute peak flood flow by more than 5% on adjacent landholdings ...

As illustrated in the figures of flow depths and velocities for both fence configurations in Appendix A, and the impacts tabulated in Table 11, Table 12, Table 13 and Table 14, the modelling indicates that the criteria that limit changes to flow distribution will be met.

6.5 Flood levels

The *Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016* (Government of NSW, 2016) includes the following assessment criteria for flood levels (Section 45.5b)

A flood approval must not be granted ... if ... the flood work is likely to ... increase flood levels by more than 20cm on adjacent landholdings ...

As described below, illustrated in the Figures in Appendix A and according to the impacts tabulated in Table 11, Table 12, Table 13 and Table 14, the modelling indicates that the criteria that limit changes to flood levels will be met.

6.6 Velocities

The modelling provides indications of the velocities in the existing scenario and for the proposed development and adopted fence configuration.

The *Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016* (Government of NSW, 2016) includes the following assessment criteria for velocities (Section 45.5c)

A flood approval must not be granted ... if ... the flood work is likely to ... increase flow velocity by more than 50% ... for a range of flood scenarios including at a minimum the relevant large design flood, unless increases by more than 50% are in isolated areas ... , and flow velocity is not increased by more than 50% at the boundary ...

As described below, the modelling indicates that the criteria that limit changes to velocities will be met.

Velocity maps for 1955 flood event and PMF flows for the existing situation are shown in Appendix A, Figure SY17199-F006 and SY17199-F008 respectively. These show that the maximum velocities in the floodplain are about 0.6 m/s for the 1955 flood event and about 0.8 m/s for the PMF.

The Carroll-Boggabri Floodplain Management Plan (FMP) September 2006 includes maximum permissible velocities for different ground conditions for crop, bare soil and native grass (FMP Table 4). These recommended maximum permissible velocities are 0.6, 0.4 and 0.8 m/s respectively. The FMP also notes, however, that "... in the majority of the floodplain, the velocity of flood flow is already greater than that which will cause significant erosion" (FMP Section 8.4.4).

Velocity maps for 1955 flood event and PMF flows for Fence Configuration 4 are shown in Appendix A, Figure SY17199-F406 and SY17199-F408 respectively. These show that the maximum velocities in the floodplain are about 0.6 m/s for the 1955 flood event and about 0.8 m/s for the PMF, and that they occur in the same location as the existing case. Localised higher velocities are shown where floodwaters flow through the drop-down fence and over the gaps in the partially blocked fence.

The following are inferred from these results:

- When the water depth exceeds 0.5m, water begins to flow through the partially blocked section of the fence above 0.5m. The velocity pattern follows the idealised representation of the partial blockage in the model, but it illustrates how the model works, and is a credible indication of how flow might pass through a fence that is partially blocked by debris. Importantly, the pattern is less visible in areas where there are maximum depths and velocities, and this is because the 0.5m blockage has proportionally less effect in these areas than in areas where the depth is closer to 0.5m
- Maximum velocities around the fences occur where flood water passes through drop-down sections or over or through gaps in the debris at the fences
- The maximum velocities at the boundaries of the site will correspond to drop-down sections and the gaps in the debris blockage at the fences, which is a comparable situation to the blockage of ordinary stock fences in neighbouring paddocks

6.7 Impacts at sensitive receivers

Flood behaviour was considered at the sensitive receivers surrounding the Solar Farm by comparing predicted flood levels under the baseline (existing) situation with flood levels under Fence Configuration 4.

The locations of sensitive receivers are indicated in the flood maps in Appendix A. Further details of the sensitive receivers, such as the names and addresses of individual landowners, are withheld from this flood study for reasons of privacy.

Flood levels and changes to flood levels at sensitive receivers are tabulated in Table 11, Table 12, Table 13 and Table 14.

Flow depths are categorised as follows

- Shallow flow depths: depths less than 0.1m (100mm), which is typically less than the depth of flow needed to rise above the floor levels of slab-on-ground houses and sheds
- Moderate flow depths; depths between 0.1m (100mm) and 0.45m (450mm), which is typically up to knee-deep
- Deep flow depths; depths above 0.45m. Water this deep is difficult to keep out of houses by sand-bagging.

Results shown as ‘-’, indicate that the sensitive receiver is not affected by flooding under the nominated event.

Table 11: Flood model results at sensitive receivers - 10%AEP event

Receiver	Peak flood level (m AHD)		Change Conf. 4 (m)	Comments
	Existing	Conf. 4		
01.	-	-	-	
02.	0.033	0.033	0.000	No change
03.	-	-	-	
04.	-	-	-	
05.	0.019	0.019	0.000	No change
06.	-	-	-	
07.	-	-	-	
08.	-	-	-	
09.	-	-	-	
10.	-	-	-	
13.	-	-	-	
14.	-	-	-	
16.	-	-	-	
17.	-	-	-	
18.	-	-	-	
19.	-	-	-	
21.	-	-	-	
22.	-	-	-	
23.	-	-	-	
24.	-	-	-	
26.	-	-	-	
27.	-	-	-	
28.	-	-	-	
29.	-	-	-	
30.	-	-	-	
31.	0.193	0.193	0.000	No change

Table 12: Flood model results at sensitive receivers - 5%AEP event

Receiver	Peak flood level (m AHD)		Change Conf. 4 (m)	Comments
	Existing	Conf. 4		
01.	0.092	0.092	0.000	No change
02.	0.092	0.092	0.000	No change
03.	-	-	-	
04.	-	-	-	
05.	0.067	0.067	0.000	No change
06.	-	-	-	
07.	-	-	-	
08.	-	-	-	
09.	-	-	-	
10.	0.119	0.119	0.000	No change
13.	-	-	-	
14.	0.103	0.102	-0.001	Small decrease to moderate flood depths
16.	-	-	-	
17.	-	-	-	
18.	-	-	-	
19.	-	-	-	
21.	-	-	-	
22.	-	-	-	
23.	-	-	-	
24.	-	-	-	
26.	-	-	-	
27.	-	-	-	
28.	-	-	-	
29.	0.025	0.025	0.000	No change
30.	-	-	-	
31.	0.206	0.206	0.000	No change

Table 13: Flood model results at sensitive receivers – 1955 flood event

Receiver	Peak flood level (m AHD)		Change Conf. 4 (m)	Comments
	Existing	Conf. 4		
01.	0.613	0.615	0.002	Small increase to deep flood depths
02.	0.172	0.172	0.000	No change
03.	-	-	-	
04.	-	-	-	
05.	0.126	0.126	0.000	No change
06.	-	-	-	
07.	0.070	0.070	0.000	No change
08.	-	-	-	
09.	-	-	-	
10.	0.441	0.441	0.000	No change
13.	-	-	-	
14.	0.758	0.760	0.002	Small increase to deep flood depths
16.	-	-	-	
17.	-	-	-	
18.	-	-	-	
19.	0.407	0.407	0.000	No change
21.	-	-	-	
22.	-	-	-	
23.	-	-	-	
24.	0.153	0.153	0.000	No change
26.	-	-	-	
27.	0.010	0.010	0.000	No change
28.	-	-	-	
29.	1.028	1.027	0.000	No change
30.	0.861	0.861	0.000	No change
31.	0.926	0.927	0.000	No change

Table 14: Flood model results at sensitive receivers PMF event

Receiver	Peak flood level (m AHD)		Change Conf. 4 (m)	Comments
	Existing	Conf. 4		
01.	0.905	0.909	0.004	Small increase to deep flood depths
02.	0.244	0.244	0.000	No change
03.	-	-	-	-
04.	-	-	-	-
05.	0.167	0.167	0.000	No change
06.	0.144	0.144	0.000	No change
07.	0.232	0.232	0.000	No change
08.	-	-	-	-
09.	-	-	-	-
10.	0.626	0.626	0.000	No change
13.	-	-	-	-
14.	1.042	1.043	0.001	Small increase to deep flood depths
16.	-	-	-	-
17.	-	-	-	-
18.	-	-	-	-
19.	0.682	0.682	0.000	No change
21.	-	-	-	-
22.	-	-	-	-
23.	-	-	-	-
24.	0.478	0.478	0.000	No change
26.	0.226	0.224	-0.002	Small decrease to moderate flood depths
27.	0.241	0.241	0.000	No change
28.	-	-	-	-
29.	1.414	1.414	0.000	No change
30.	1.255	1.255	0.000	No change
31.	1.379	1.379	0.000	No change

7. Effects of Solar Farm on flood behaviour

The construction of security fences of any configuration will affect flood levels in the floodplain assuming that flood debris mats could accumulate on the security fences and partially obstruct or hinder flows. The blockages will cause flows to back up on the upstream sides of the fences and to drop on the downstream sides of the fences. The degree of flood debris blockage is difficult to predict and is likely to be uneven in the horizontal and vertical dimensions. The range of impacts is indicated by the impacts for the different Fence Configurations that have been reviewed.

The distribution of areas of increased flood levels and decreased flood levels changes with the direction of flow across the floodplain, which changes according to the AEP of the event, and the timing within the event. For instance, in the 10% AEP event, flow breaks out of the Namoi River, approaches the site from the south and is hindered from escaping to low ground to the north by the fence, thus creating an area of increased flood levels to the south and west of the site. Fence Configuration 4 was developed with this flood in mind and includes drop down fencing in the southern part of the site to reduce impedance to floodwaters. Likewise, in the 1955 flood event, flow approaches from the south and east at different times in the flood event, and it is the hindrance to the eastern flows that causes an increase to flood levels to the east of the site.

Fence Configuration 4 was developed and modelled to estimate the additional mitigating benefit of drop-down fencing option designed to minimise blockage and redirection of floodwater. The model shows that drop-down fencing produces an entirely acceptable outcome whereby the proposed development would have negligible flood impacts on surrounding properties. Modelling of Fence Configuration 4 indicates that the fences and their debris blockages could increase the 1955 flood event upstream flood levels by about 0.063m (63mm) directly adjacent to the eastern boundary, about 0.027 (27mm) at the northern property boundary and up to about 0.002m (2mm) at the most affected sensitive receiver. Some areas could experience reduced flood levels, particularly to the north and west of the Solar Farm. These impacts are within the limits recommended in the Carroll-Boggabri Flood Management Plan and are considered minor.

The model indicates that the development:

- would not adversely affect beneficial inundation; the modelling predicts no appreciable change to inundation area
- would not cause changes to erosion, siltation and riparian vegetation; as the site is not located close to the Namoi River, it is considered that the proposed development will not appreciably change erosion, siltation, riparian vegetation or the stability of river banks
- would not affect existing flood Emergency Management and access procedures in place for the region
- would not increase the risk to life from flood
- would not have appreciable adverse social or economic costs to the community.

With respect to this last point, the economic costs relate to the changes to flooding, which are mapped in Appendix A. There are many social and economic benefits associated with the construction and operation of the proposed Solar Farm, however a more comprehensive economic assessment in the context of flooding is beyond the scope of the current study.

The proposed development is compatible with the hydraulic function of flood storage. Though the proposed security fences create a hindrance to flow as it is distributed through the site, there is no appreciable reduction in flood storage as there would be with, for instance, the placement of a significant volume of fill in the area. It is expected that floodwaters will continue to seep or flow through the fences to occupy the same volume of flood storage as is currently available.

The *Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016* (Government of NSW, 2016) includes assessment criteria for compliant development relating to flow distribution (less than 5%

change), flood levels (less than 20cm increase) and flow velocity (less than 50% increase). The proposed development meets these criteria based on Fence Configuration 4.

8. Refences

- Government of NSW, *Draft Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016*, viewed on-line 07 June 2018
https://www.water.nsw.gov.au/_data/assets/pdf_file/0017/672011/Draft-Floodplain-Management-Plan-for-the-Upper-Namoi-Valley-Floodplain-2016.pdf
- SMEC 2013, *CARROLL to BOGGABRI Flood Study and Compendium of Data*, SMEC Australia Pty Ltd, viewed 23 January 2018.
- Water NSW 2018, Keepit Dam, Water NSW, <https://www.waternsw.com.au/supply/visit/keepit-dam>, viewed 24 January 2018.

Appendix A

Model results

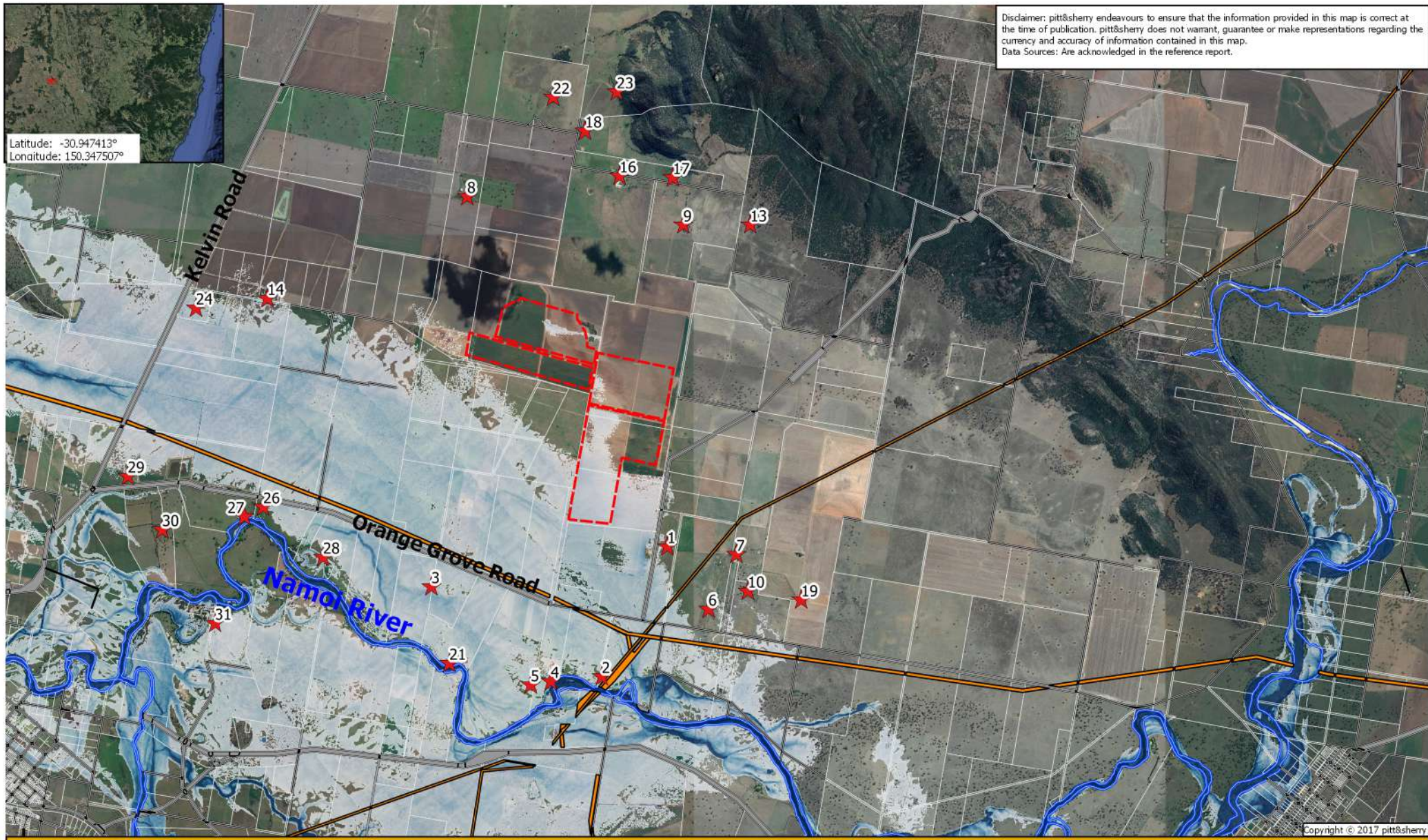
List of Figures

SY17199-F001 10%AEP Flood Depth, Existing scenario
SY17199-F002 10%AEP Flood Velocity, Existing scenario
SY17199-F003 5%AEP Flood Depth, Existing scenario
SY17199-F004 5%AEP Flood Velocity, Existing scenario
SY17199-F005 1955 Flood Depth, Existing scenario
SY17199-F006 1955 Flood Velocity, Existing scenario
SY17199-F007 Probable Maximum Flood Depth, Existing scenario
SY17199-F008 Probable Maximum Flood Velocity, Existing scenario

SY17199-F401 10%AEP Flood Depth, Configuration 4 scenario
SY17199-F402 10%AEP Flood Velocity, Configuration 4 scenario
SY17199-F403 5%AEP Flood Depth, Configuration 4 scenario
SY17199-F404 5%AEP Flood Velocity, Configuration 4 scenario
SY17199-F405 1955 Flood Depth, Configuration 4 scenario
SY17199-F406 1955 Flood Velocity, Configuration 4 scenario
SY17199-F407 Probable Maximum Flood Depth, Configuration 4 scenario
SY17199-F408 Probable Maximum Flood Velocity, Configuration 4 scenario
SY17199-F409 10%AEP Flood Depth change, Existing to Configuration 4
SY17199-F410 5%AEP Flood Depth change, Existing to Configuration 4
SY17199-F411 1955 Flood Depth change, Existing to Configuration 4
SY17199-F412 Probable Maximum Flood Depth change, Existing to Configuration 4
SY17199-F421 10%AEP Flood Velocity change, Existing to Configuration 4
SY17199-F422 5%AEP Flood Velocity change, Existing to Configuration 4
SY17199-F423 1955 Flood Velocity change, Existing to Configuration 4
SY17199-F424 Probable Maximum Flood Velocity change, Existing to Configuration 4

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



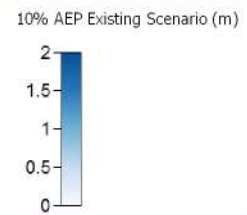
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers



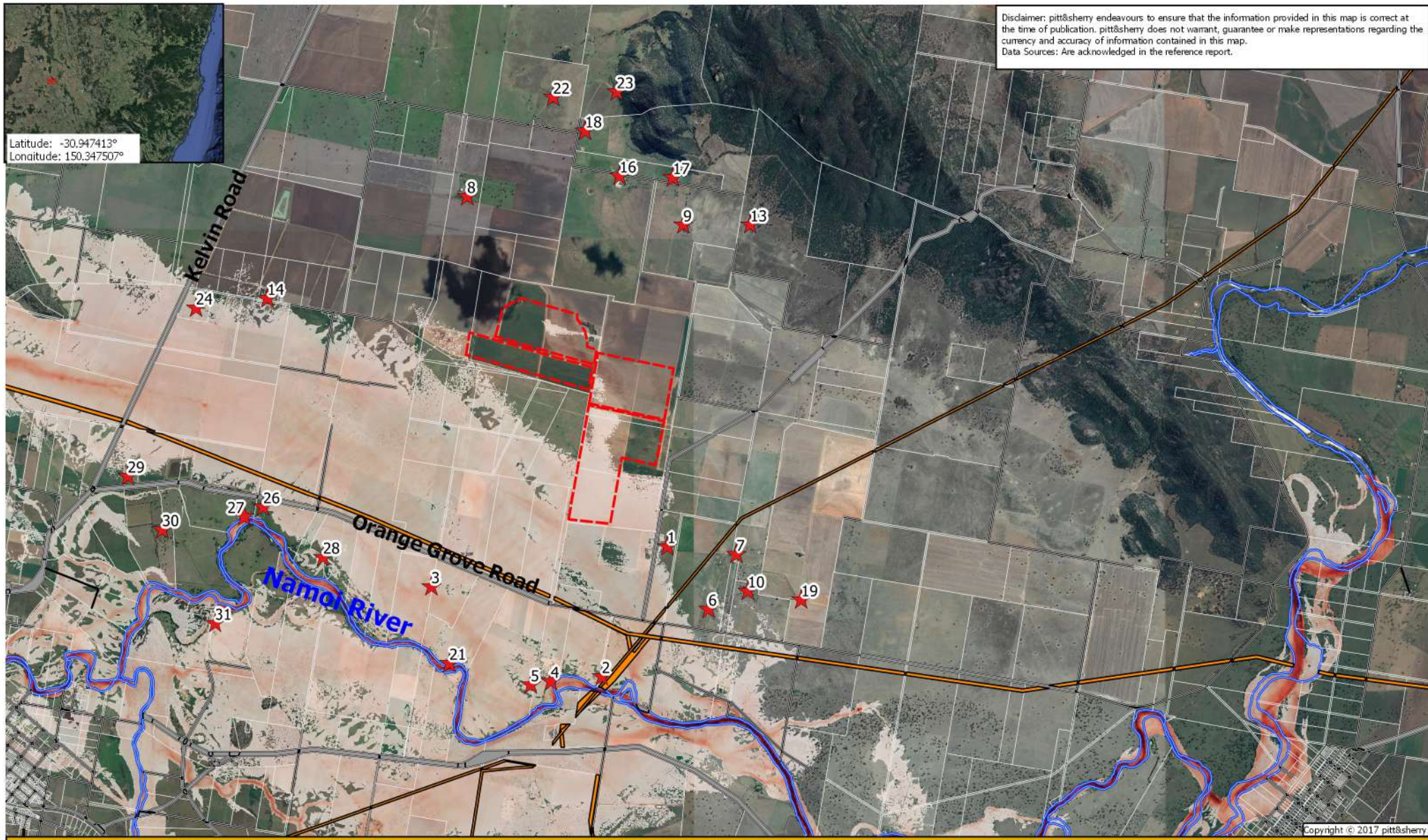
Project Number SY17199
Figure Number SY17199-F001
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering Australia Pty Ltd

Orange Grove Road, Gunnedah
10% AEP Flood Depth Existing Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



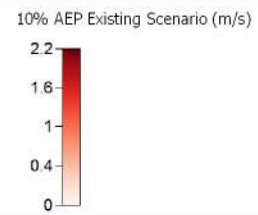
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers



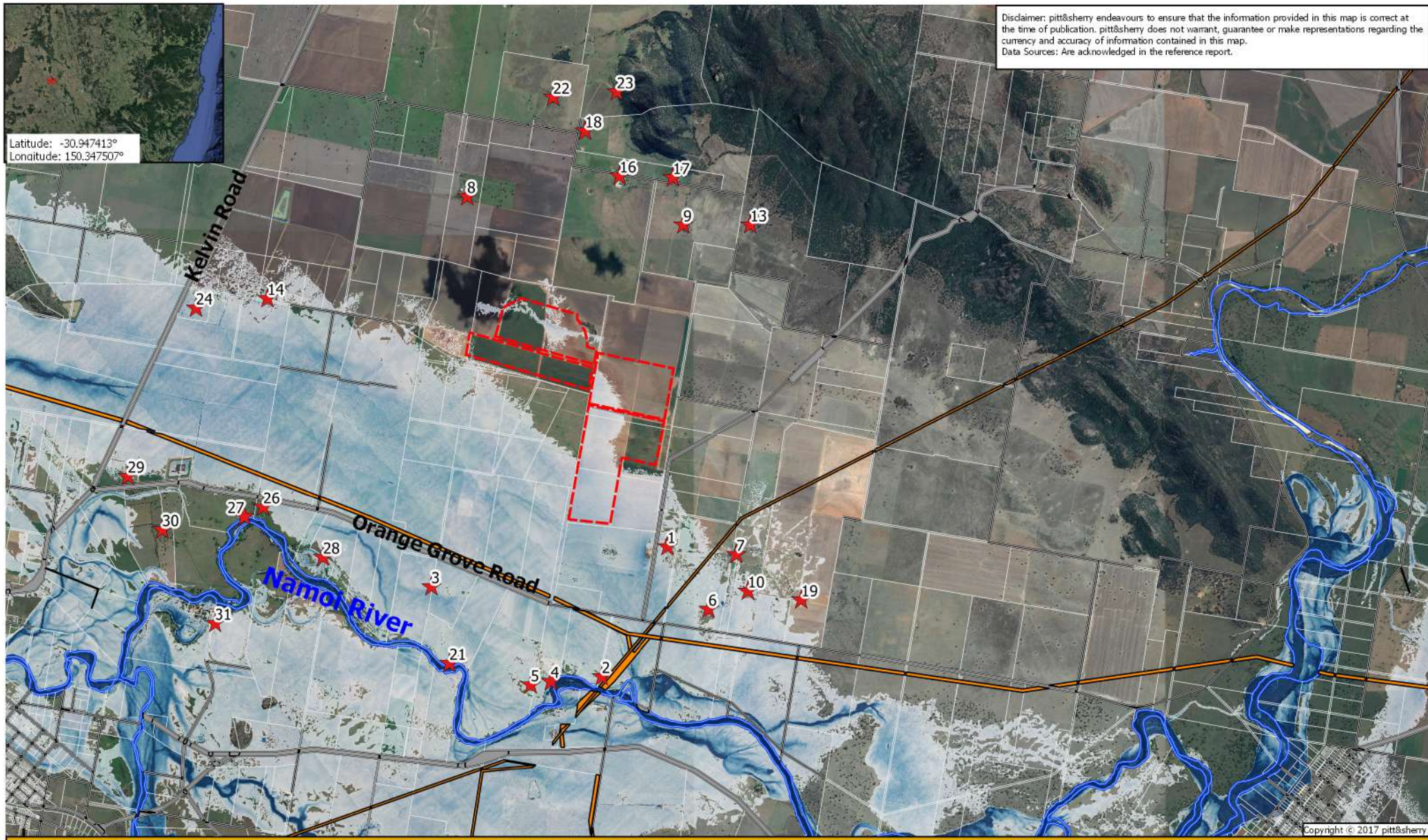
Project Number SY17199
Figure Number SY17199-F002
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
10% AEP Flood Velocity
Existing Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



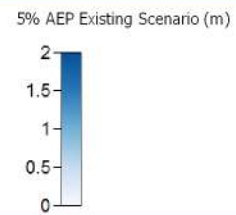
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers



pitt&sherry

Project Number	SY17199
Figure Number	SY17199-F003
Revision	3
Author	mdugan
Reviewer	mjacobs
Date	28-06-2018

Photon Energy Engineering Australia Pty Ltd

PHOTON ENERGY

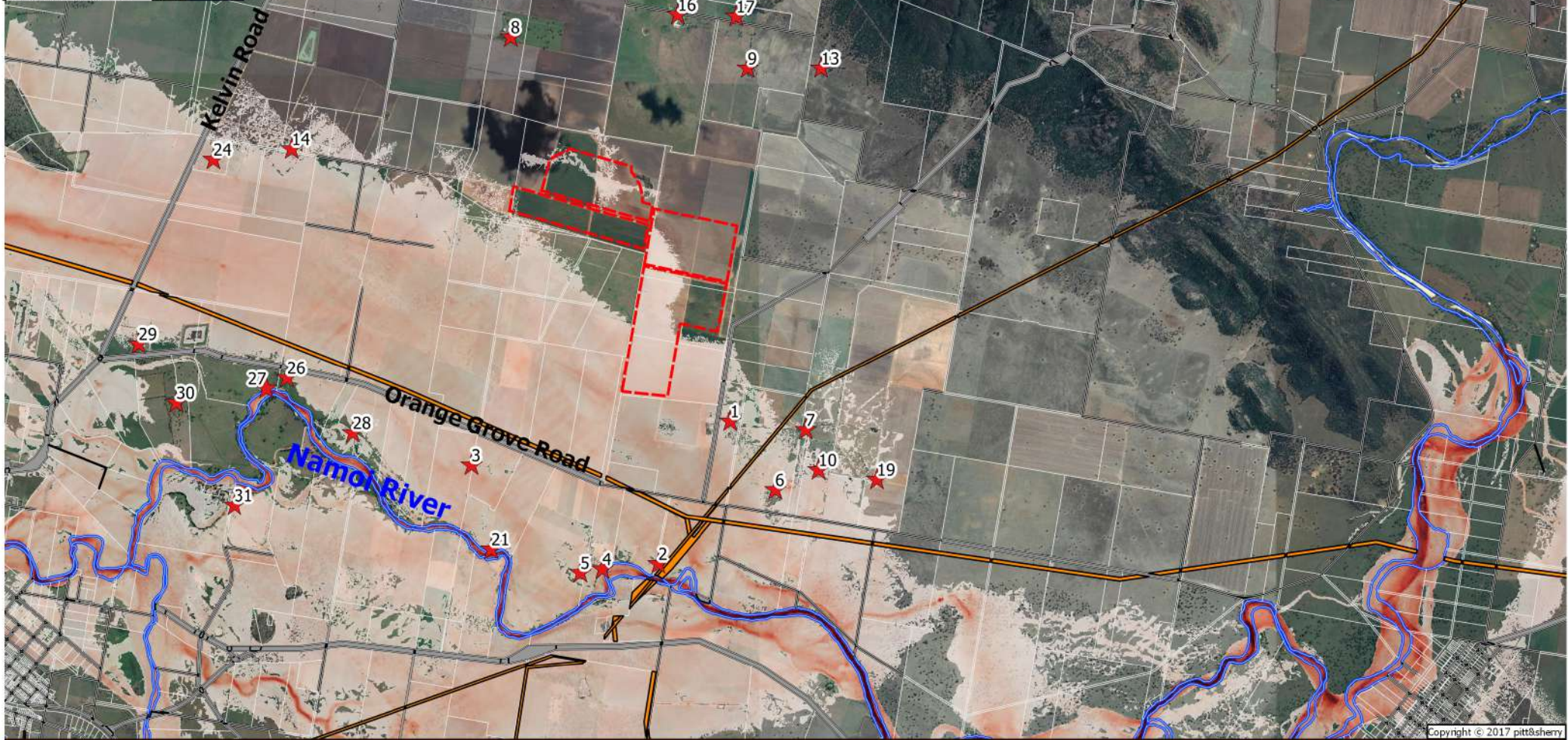
Orange Grove Road, Gunnedah

5% AEP Flood Depth Existing Scenario



Latitude: -30.947413°
Longitude: 150.347507°

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.



Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



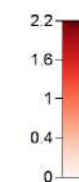
0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers

5% AEP Existing Scenario (m/s)



Project Number SY17199
Figure Number SY17199-F004
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

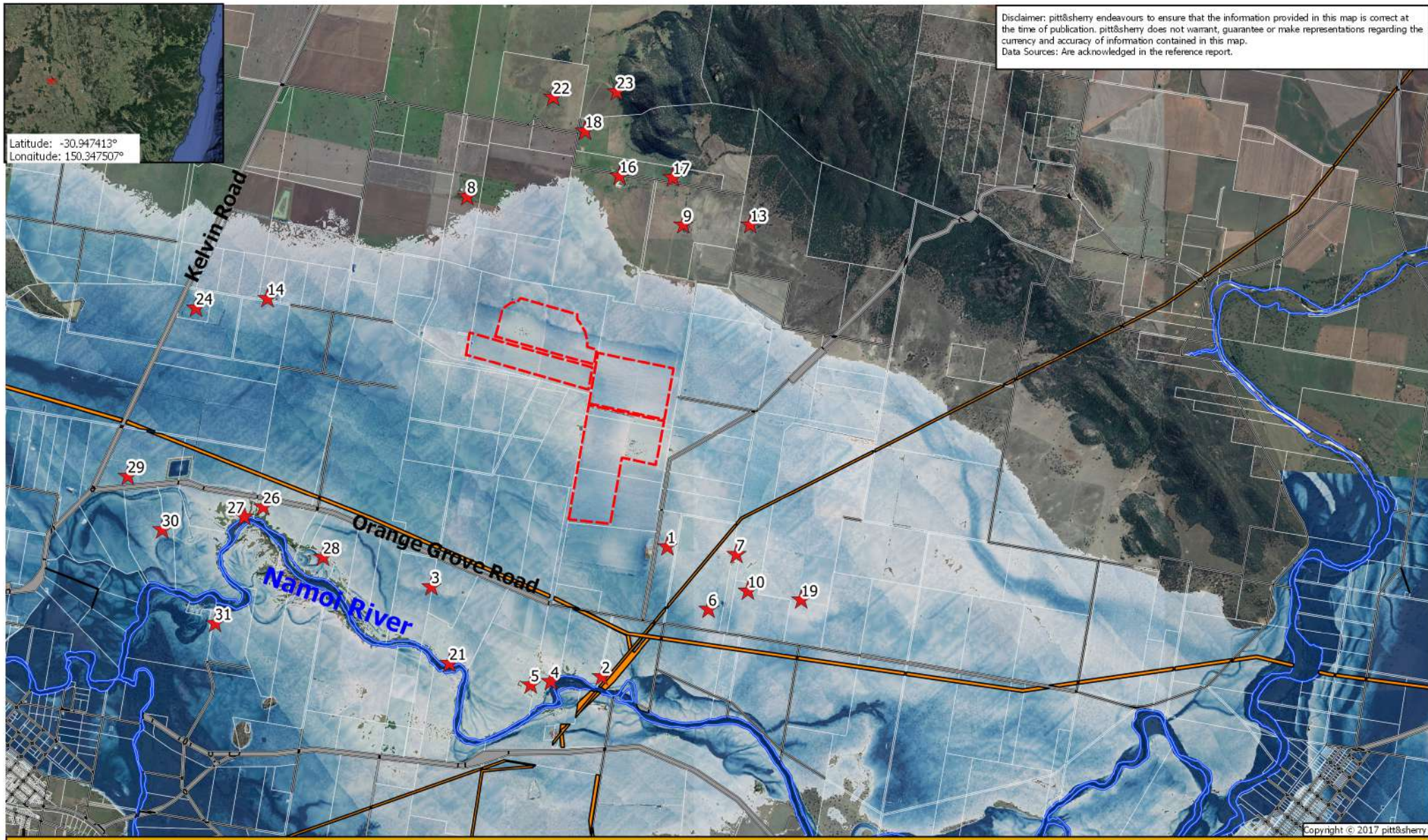
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunnedah
5% AEP Flood Velocity
Existing Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



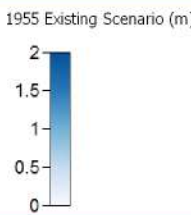
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

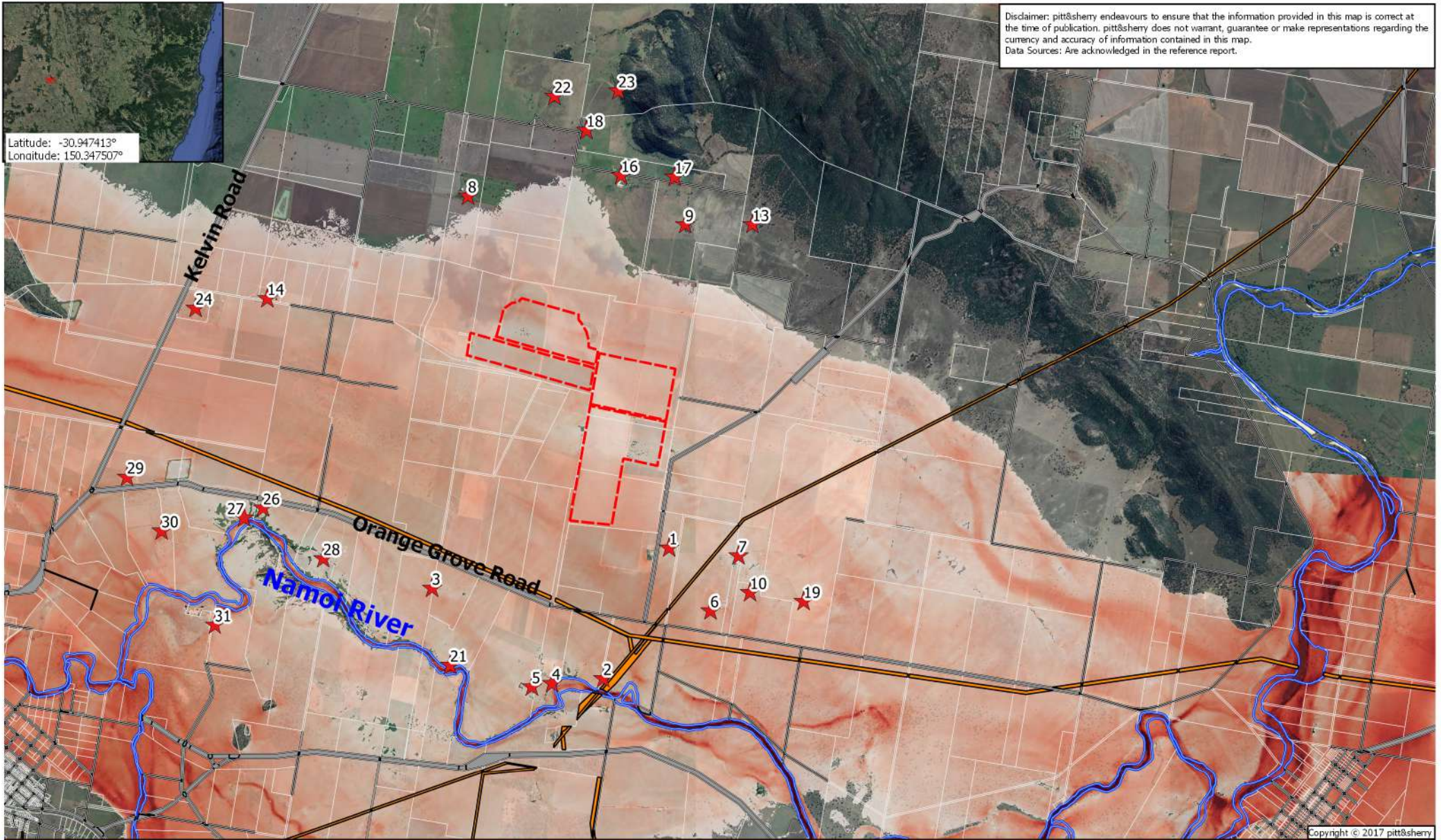
Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers



Project Number SY17199
Figure Number SY17199-F005
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd
PHOTON ENERGY
Orange Grove Road, Gunnedah
1955 Flood Depth Existing
Scenario



Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



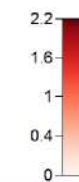
0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers

1955 Existing Scenario (m/s)



Project Number SY17199
Figure Number SY17199-F006
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

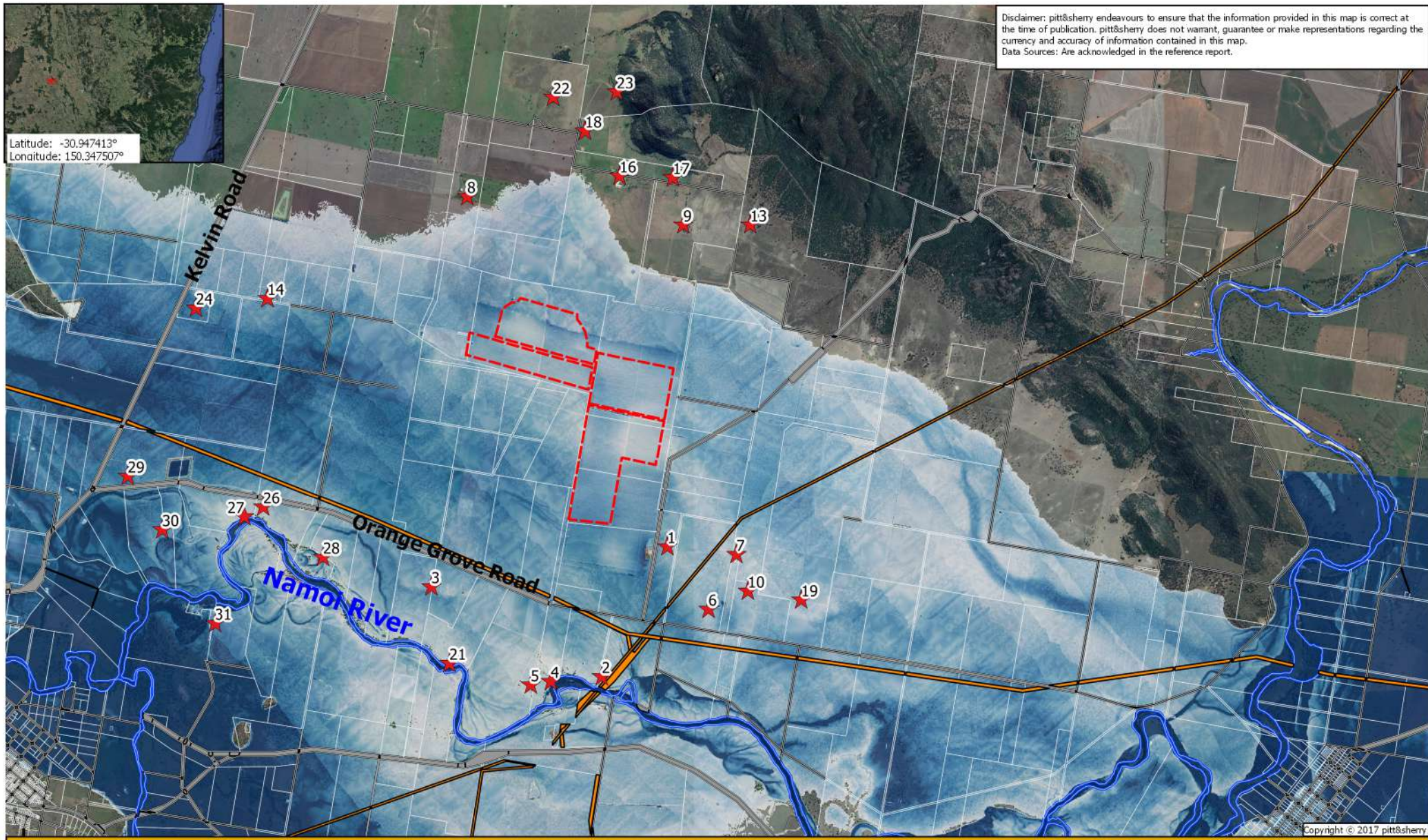
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunndah
1955 Flood Velocity Existing
Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



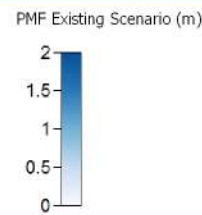
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

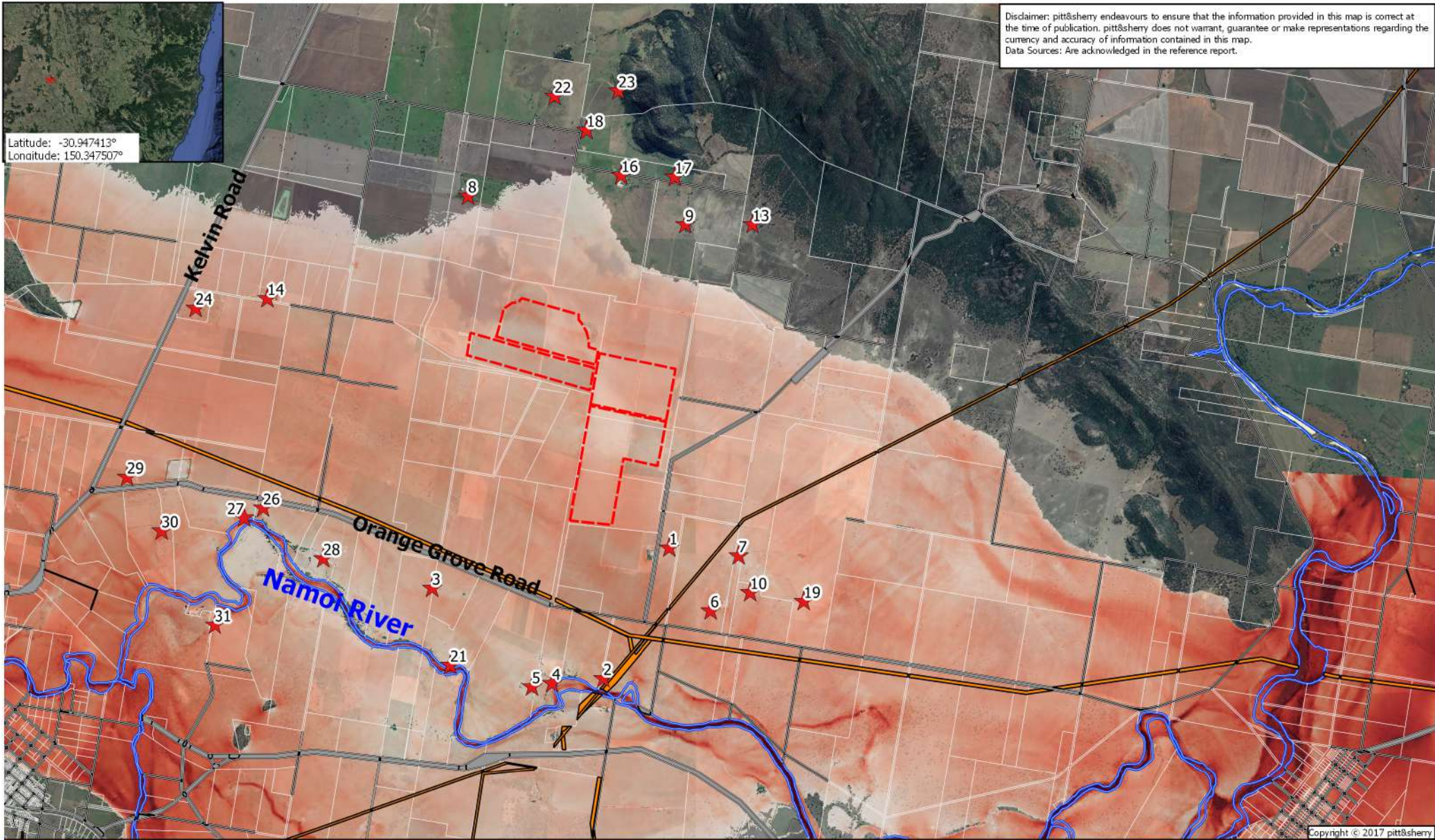
- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers



Project Number SY17199
Figure Number SY17199-F007
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering Australia Pty Ltd

Orange Grove Road, Gunnedah
Probable Maximum Flood Depth Existing Scenario



Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



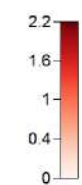
0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Solar Farm
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers

PMF Existing Scenario (m/s)



Project Number SY17199
Figure Number SY17199-F008
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

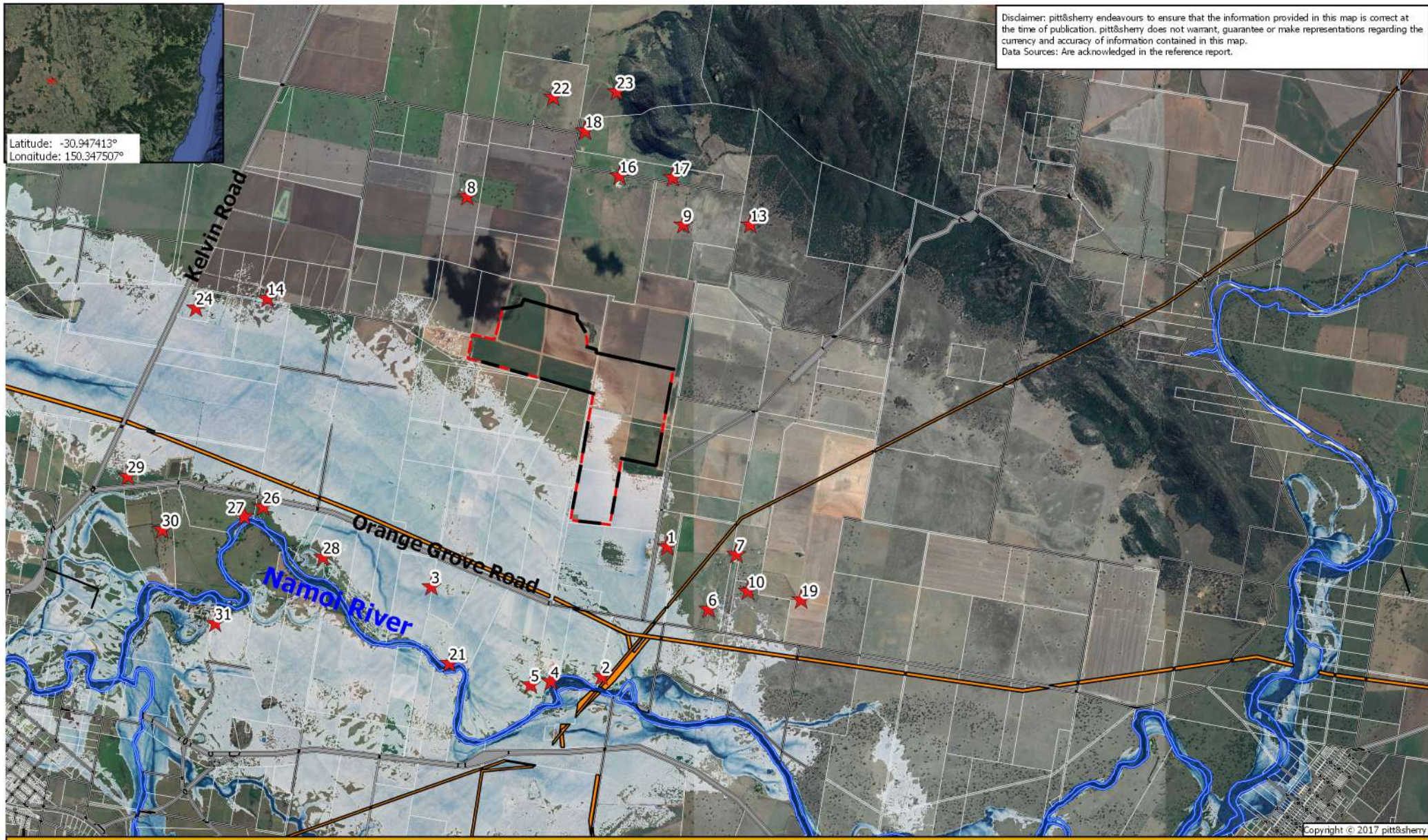
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunndah
Probable Maximum Flood Velocity
Existing Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



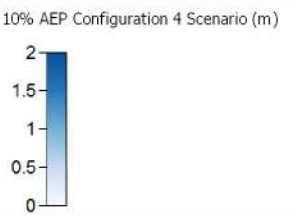
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



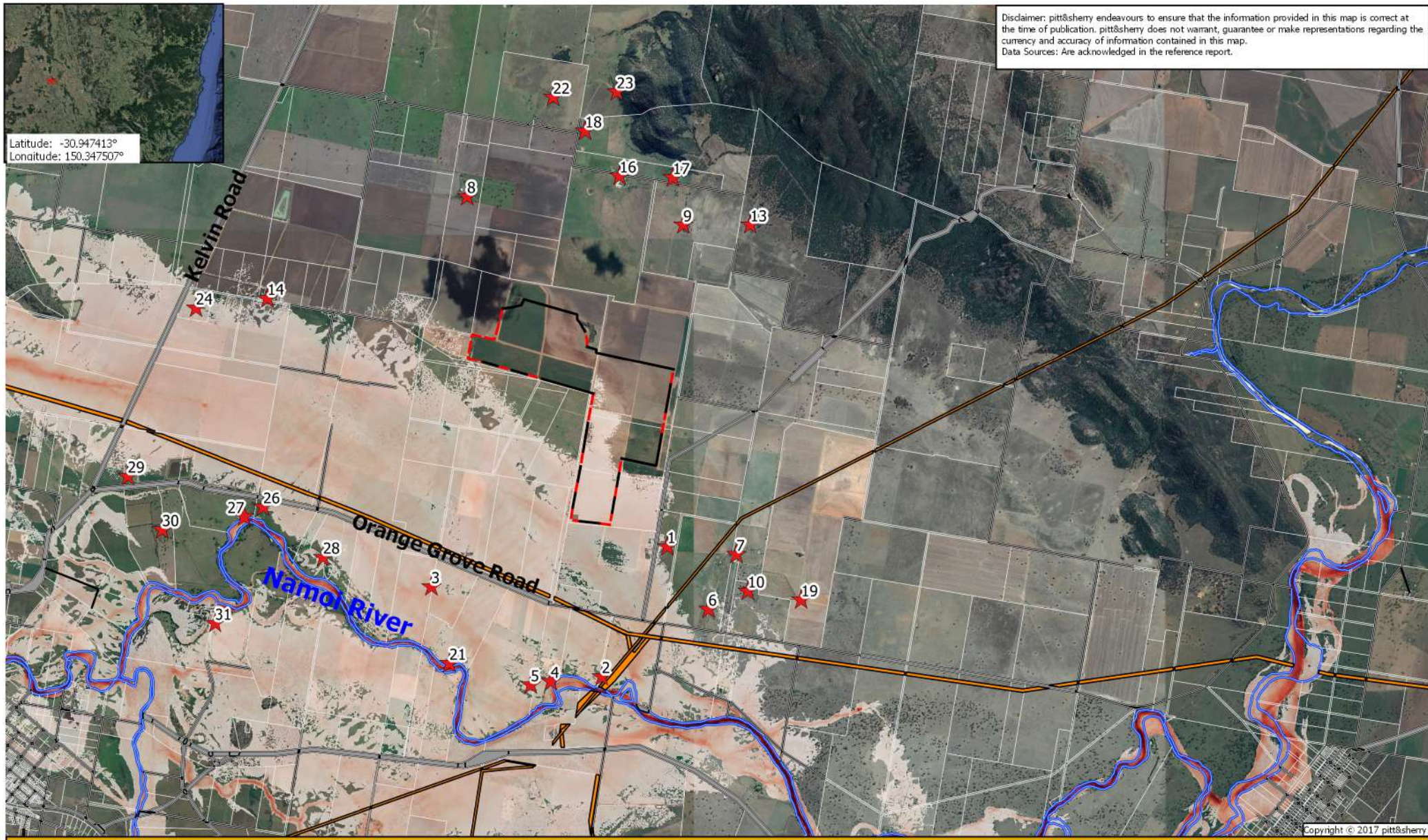
Project Number SY17199
Figure Number SY17199-F401
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
10% AEP Flood Depth
Configuration 4 Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



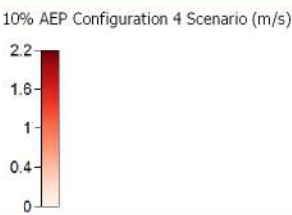
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



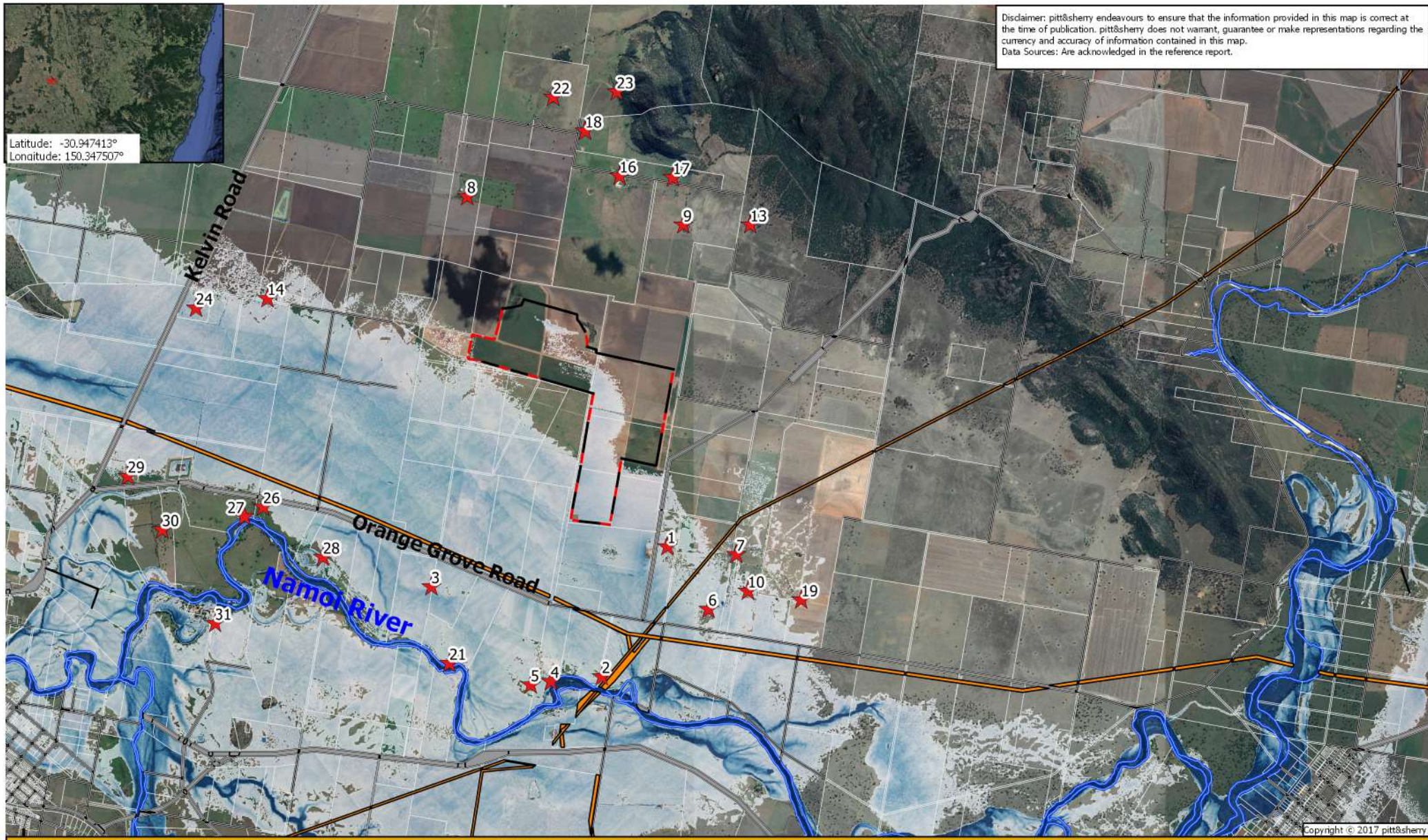
Project Number SY17199
Figure Number SY17199-F402
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
10% AEP Flood Velocity
Configuration 4 Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

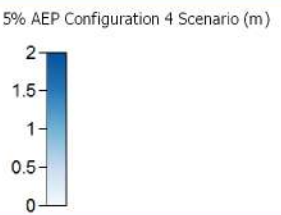


Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

- Legend**
- Fence
 - Drop Down Fence
 - Easement
 - Cadastre
 - Road
 - Water Corridor
 - Sensitive Receivers



pitt&sherry

Project Number	SY17199
Figure Number	SY17199-F403
Revision	3
Author	mdugan
Reviewer	mjacobs
Date	28-06-2018

Photon Energy Engineering
Australia Pty Ltd

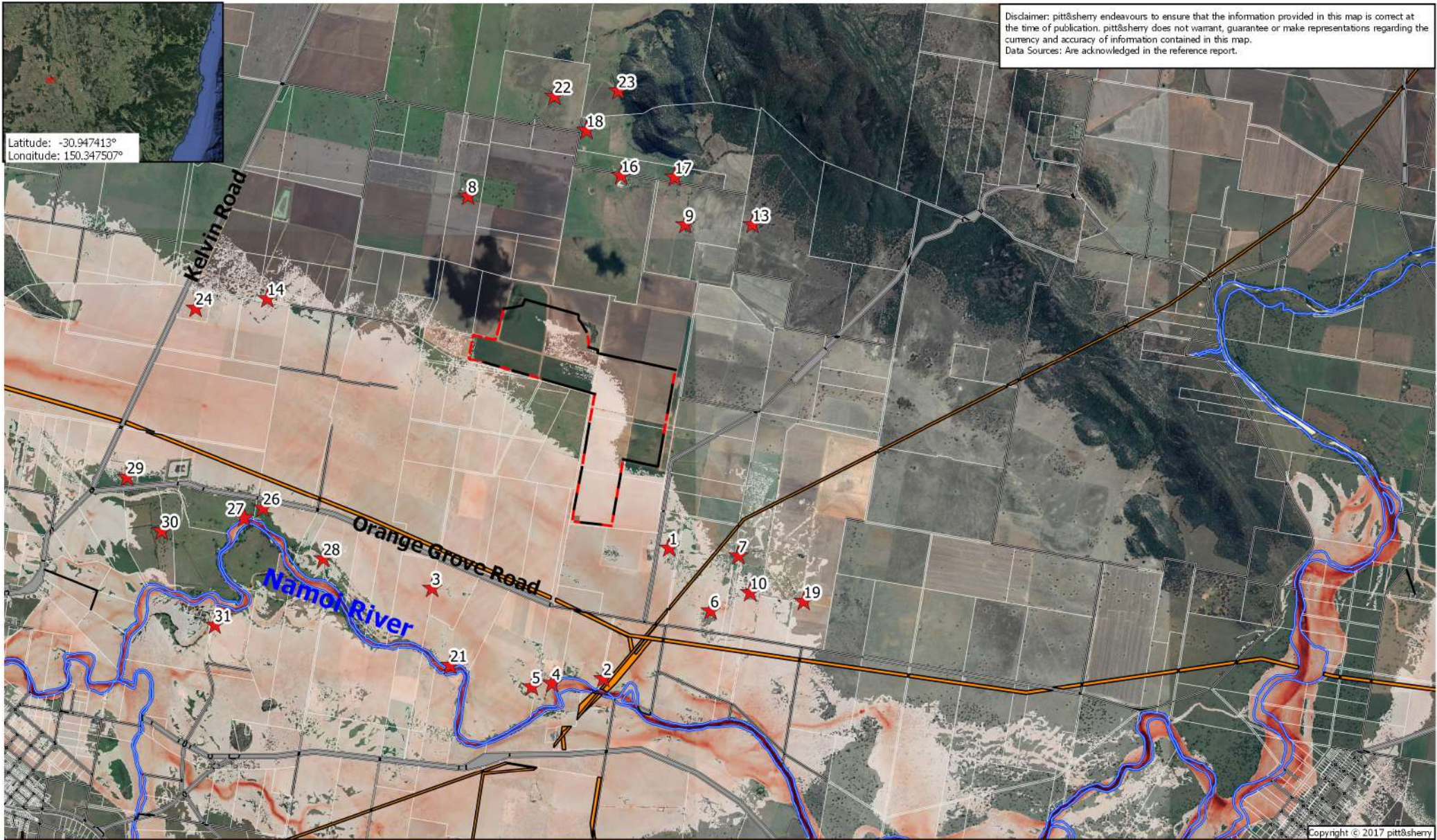
PHOTON ENERGY

Orange Grove Road, Gunnedah

5% AEP Flood Depth
Configuration 4 Scenario

Latitude: -30.947413°
Longitude: 150.347507°

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.



Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers

5% AEP Configuration 4 Scenario (m/s)



Project Number SY17199
Figure Number SY17199-F404
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

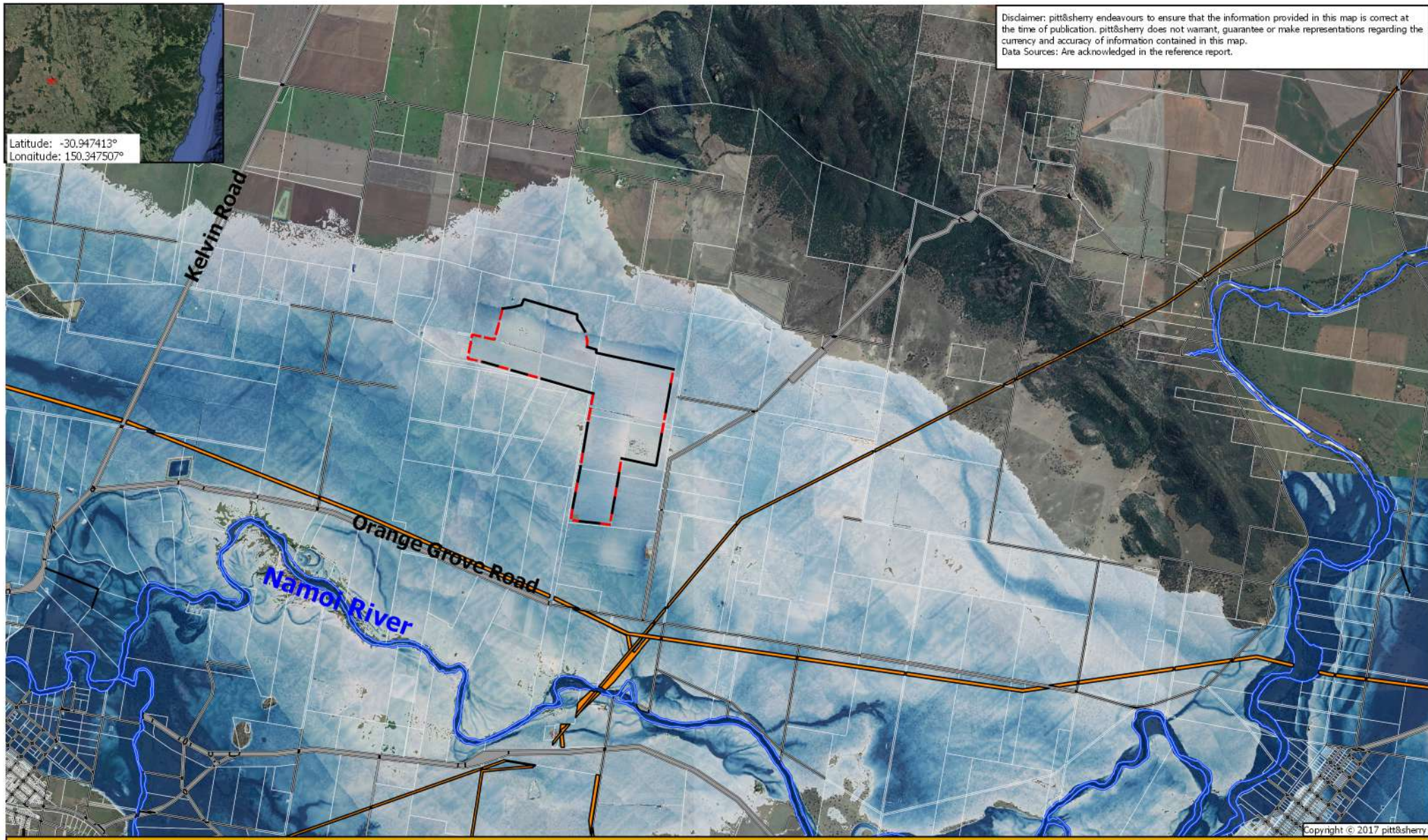
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunnedah
5% AEP Flood Velocity
Configuration 4 Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



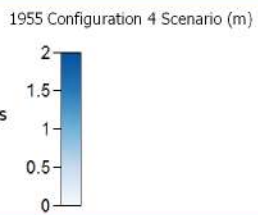
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

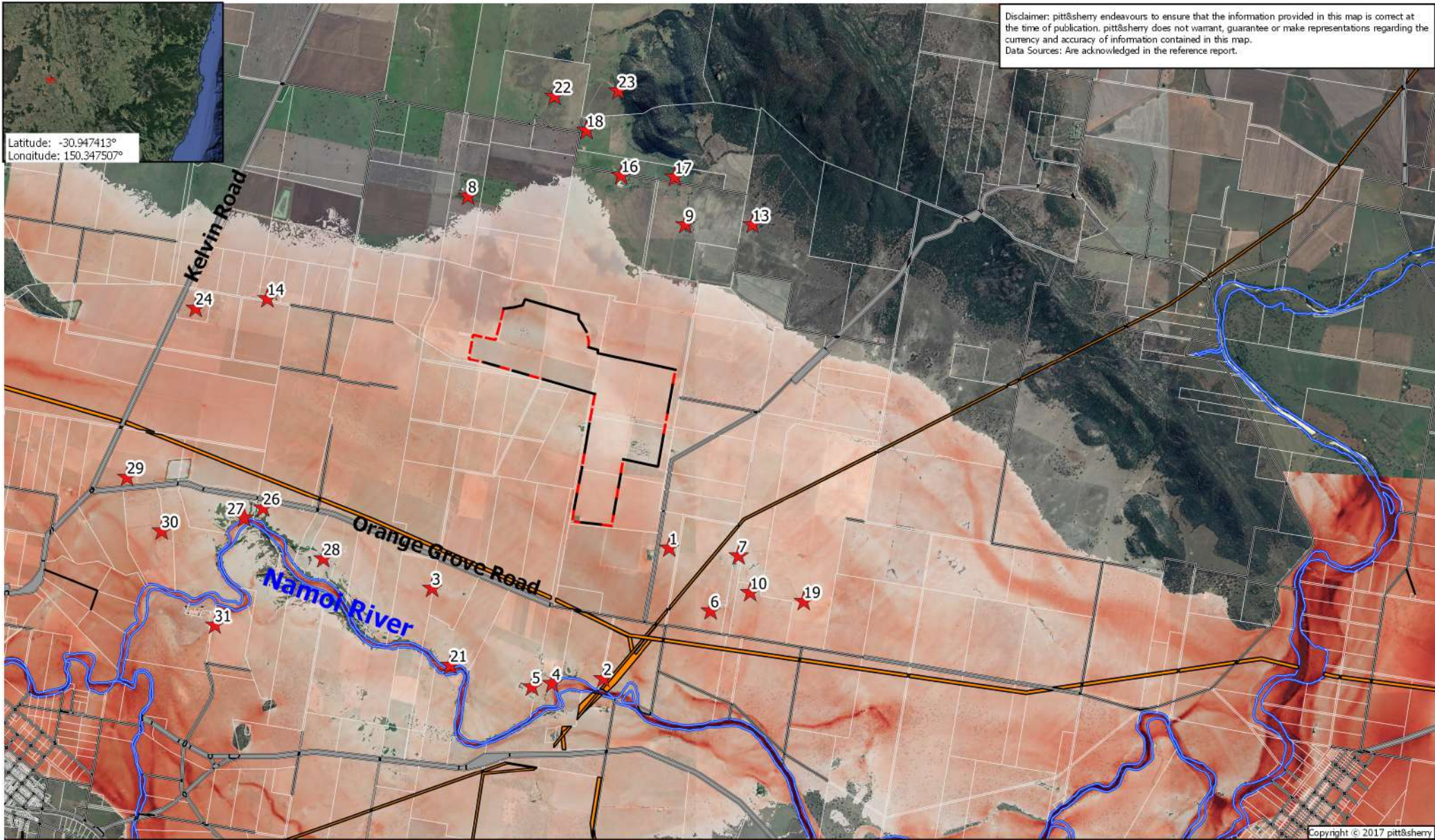
- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



Project Number	SY17199
Figure Number	SY17199-F405
Revision	3
Author	mdugan
Reviewer	mjacobs
Date	28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
1955 Flood Depth
Configuration 4 Scenario



Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



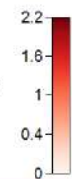
0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- - - Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- ★ Sensitive Receivers

1955 Configuration 4 Scenario (m/s)



Project Number SY17199
Figure Number SY17199-F406
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

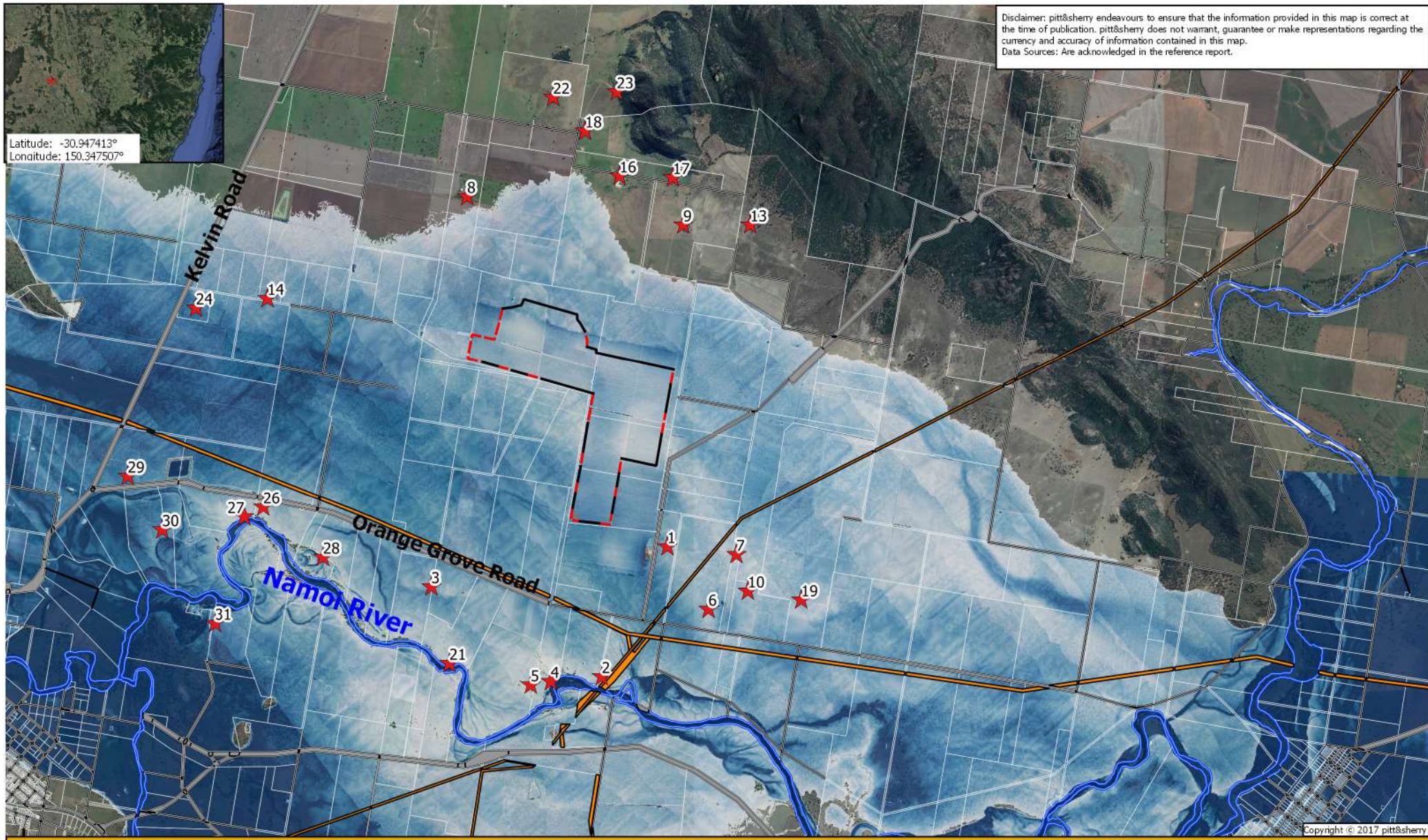
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunnedah
1955 Flood Velocity
Configuration 4 Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

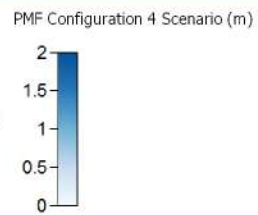


Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

- Legend**
- Fence
 - Drop Down Fence
 - Easement
 - Cadastre
 - Road
 - Water Corridor
 - Sensitive Receivers



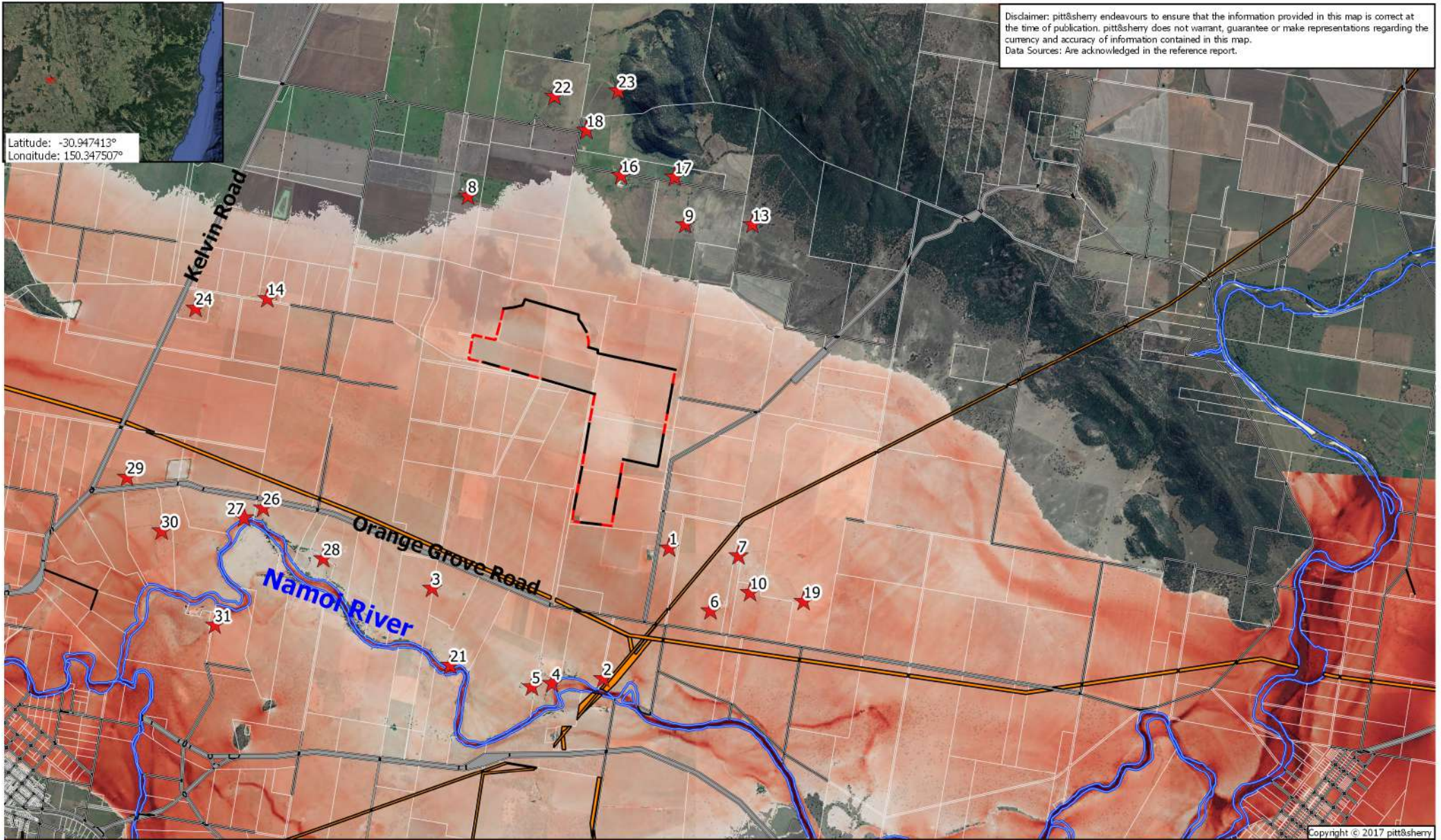
pitt&sherry

Project Number SY17199
Figure Number SY17199-F407
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

PHOTON ENERGY

Orange Grove Road, Gunnedah
Probable Maximum Flood Depth
Configuration 4 Scenario



Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers

PMF Configuration 4 Scenario (m/s)



Project Number	SY17199
Figure Number	SY17199-F408
Revision	3
Author	mdugan
Reviewer	mjacobs
Date	28-06-2018

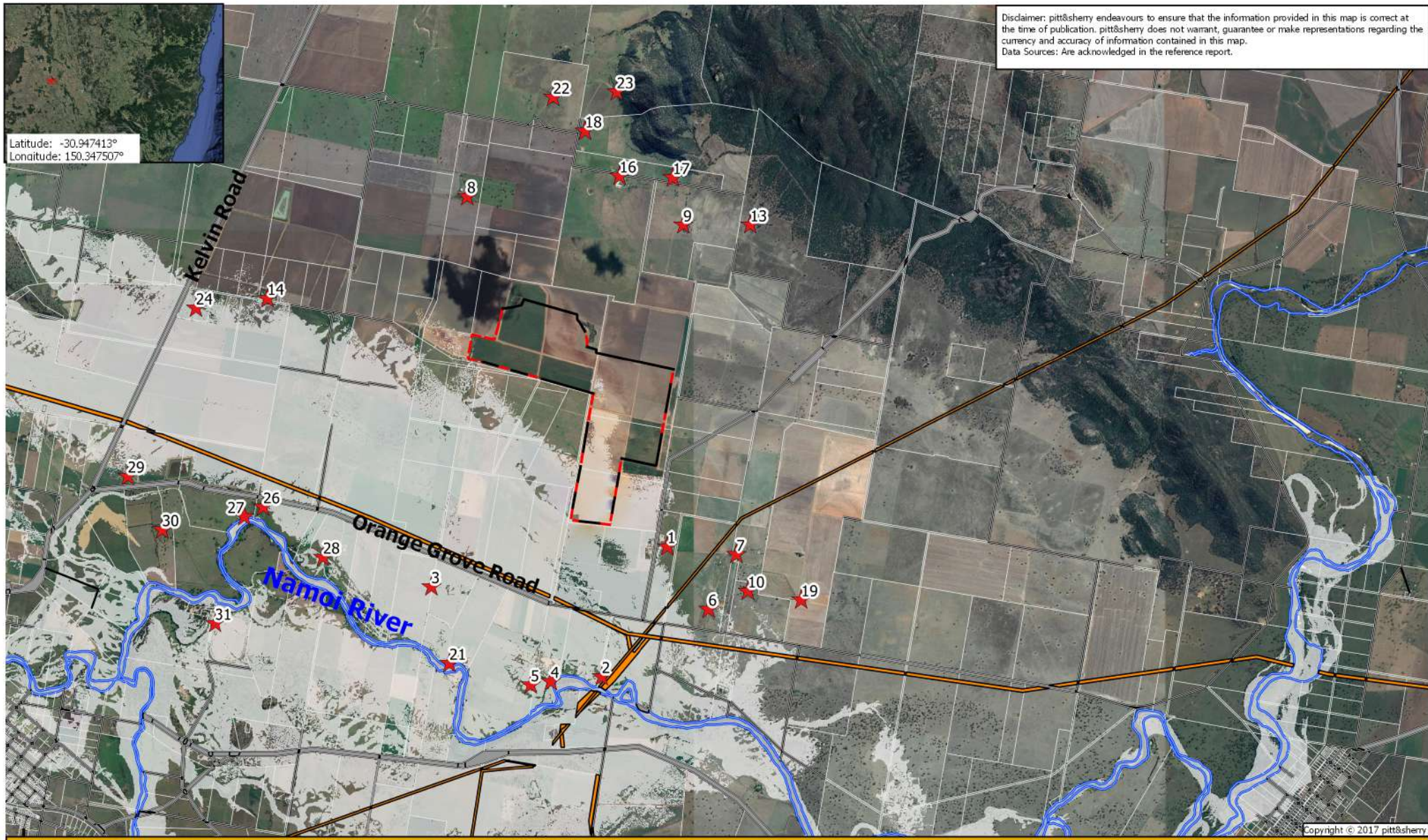
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunndah
Probable Maximum Flood Velocity
Configuration 4 Scenario

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



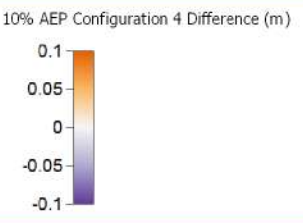
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

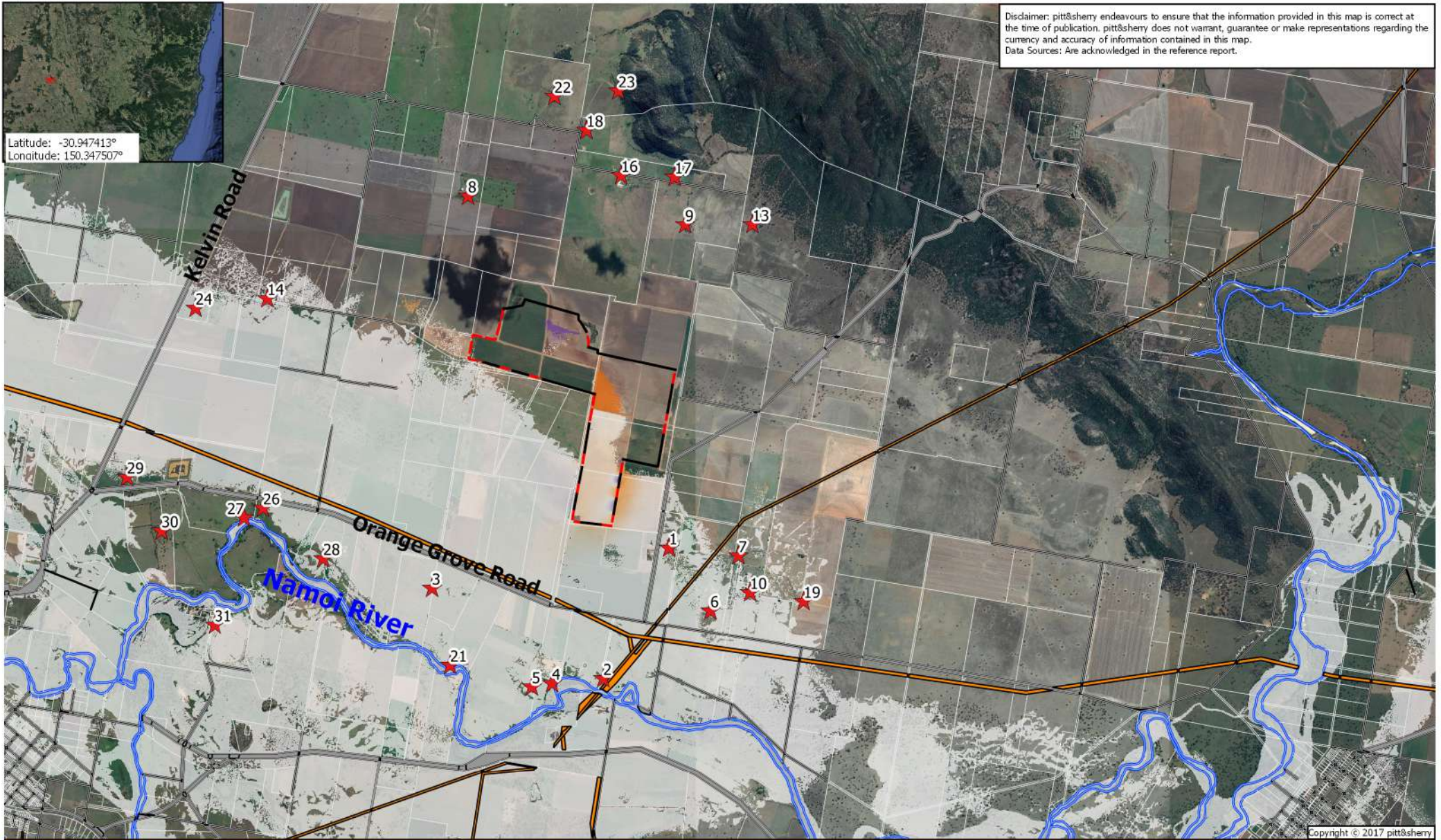
- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



Project Number SY17199
Figure Number SY17199-F409
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
10% AEP Flood Depth change,
Existing to Configuration 4



Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



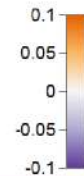
0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers

5% AEP Configuration 4 Difference (m)



Project Number SY17199
Figure Number SY17199-F410
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

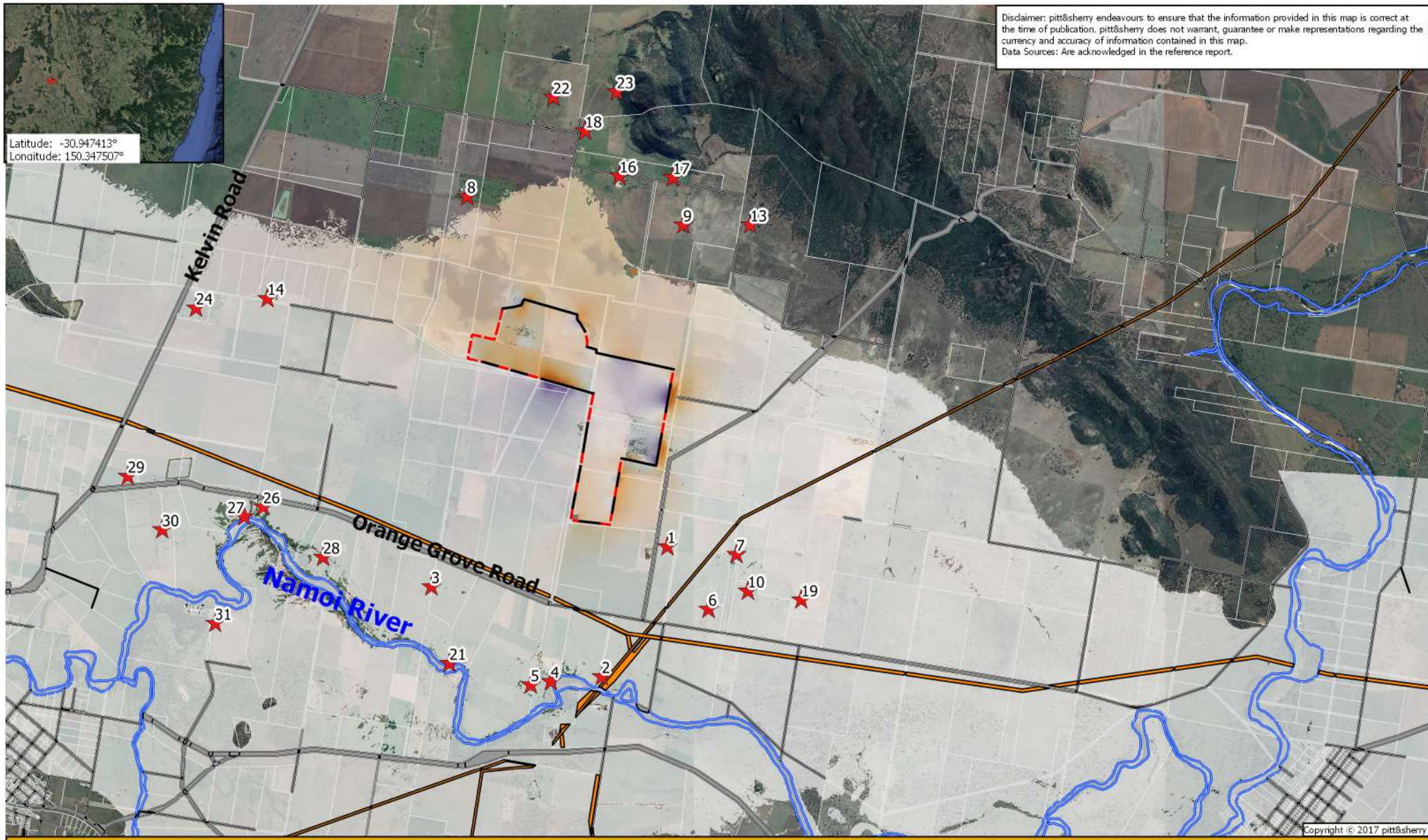
Photon Energy Engineering
Australia Pty Ltd



Orange Grove Road, Gunndah
5% AEP Flood Depth change,
Existing to Configuration 4

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



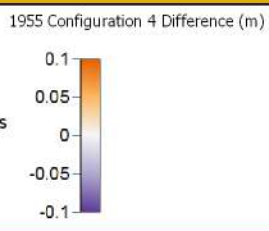
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

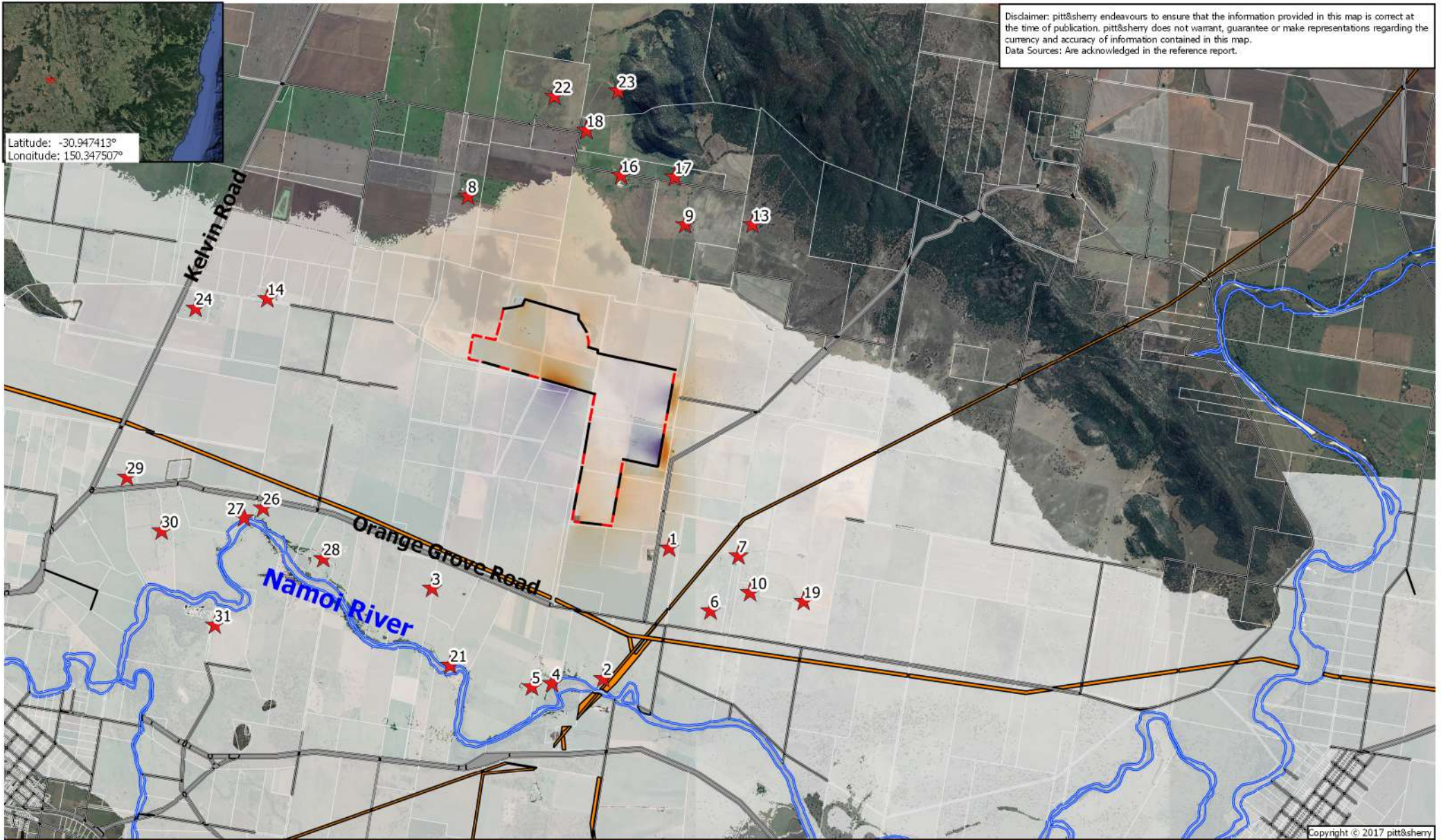
- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



Project Number SY17199
Figure Number SY17199-F411
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
1955 Flood Depth change,
Existing to Configuration 4



Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°

Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05



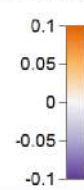
0 1 2 km

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers

PMF Configuration 4 Difference (m)



Project Number SY17199
Figure Number SY17199-F412
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

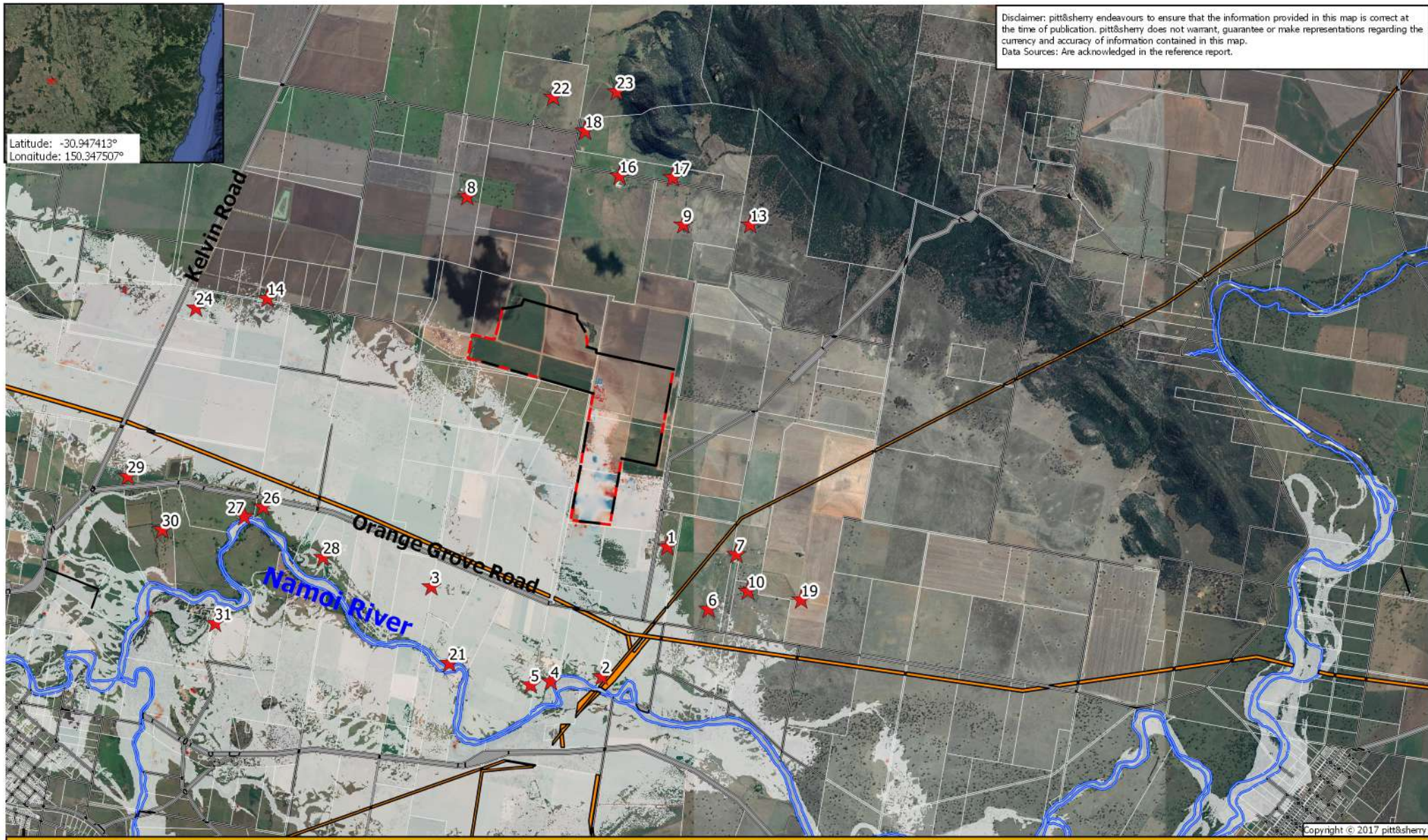


Orange Grove Road, Gunndah

Probable Maximum Flood Depth
change, Existing to Configuration 4

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



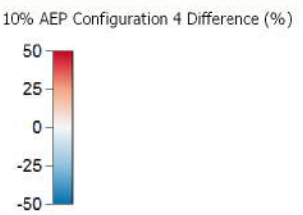
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



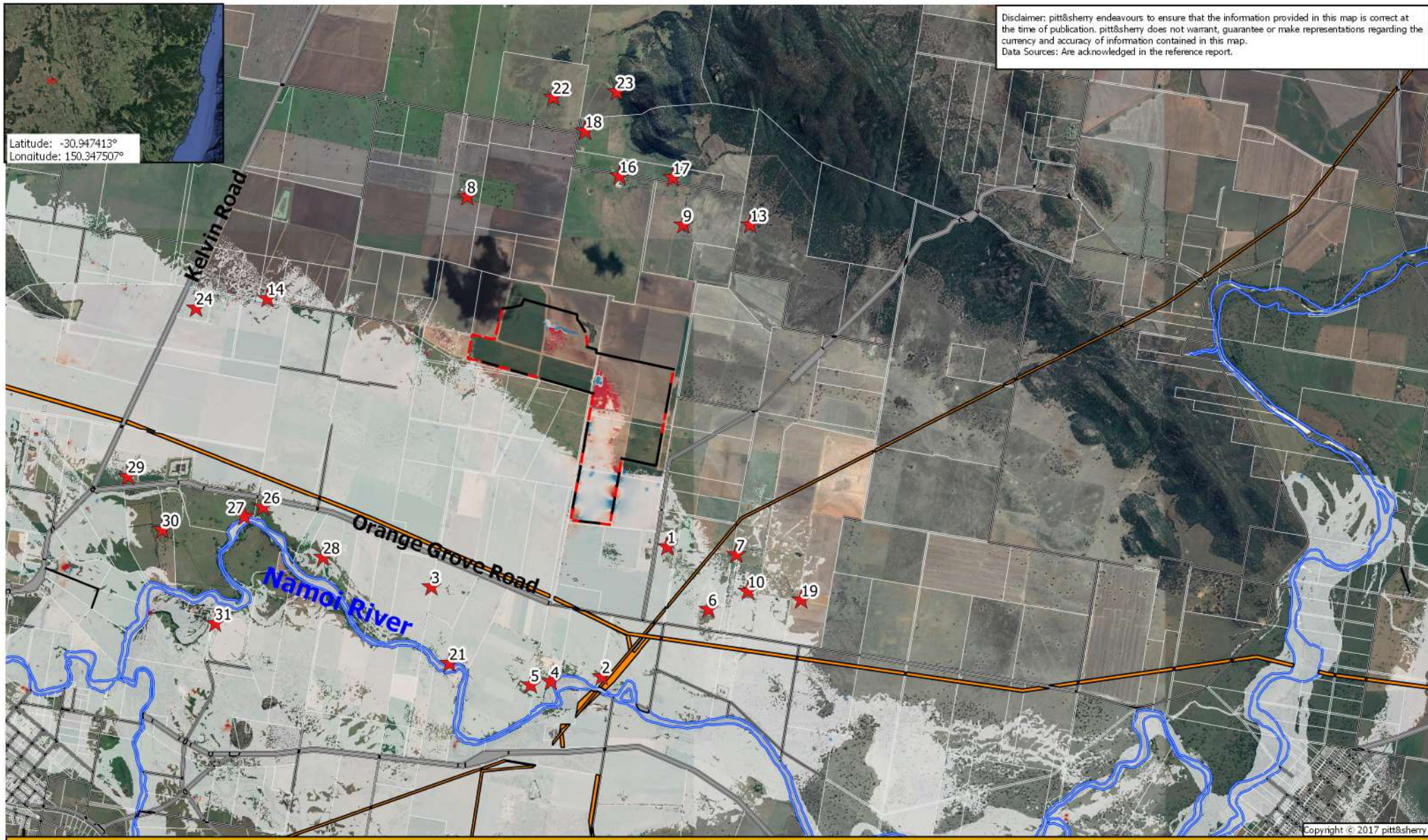
Project Number SY17199
Figure Number SY17199-F421
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
10% AEP Flood Velocity change,
Existing to Configuration 4

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



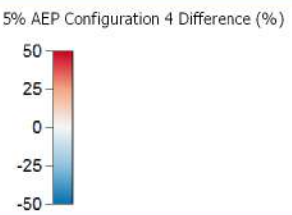
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



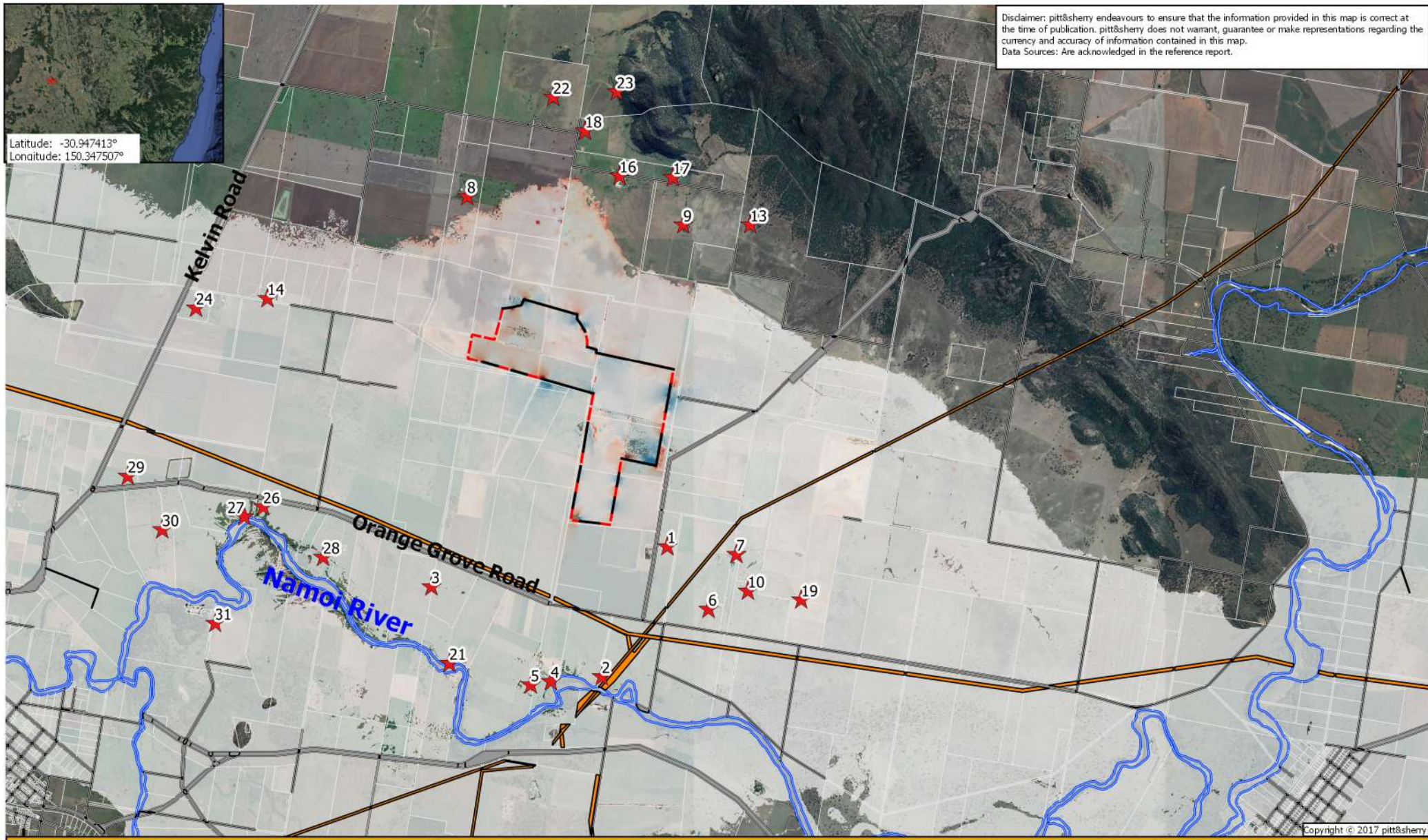
Project Number SY17199
Figure Number SY17199-F422
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
5% AEP Flood Velocity change,
Existing to Configuration 4

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



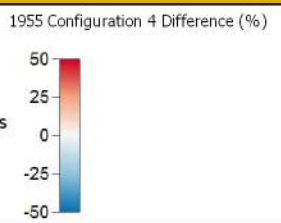
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



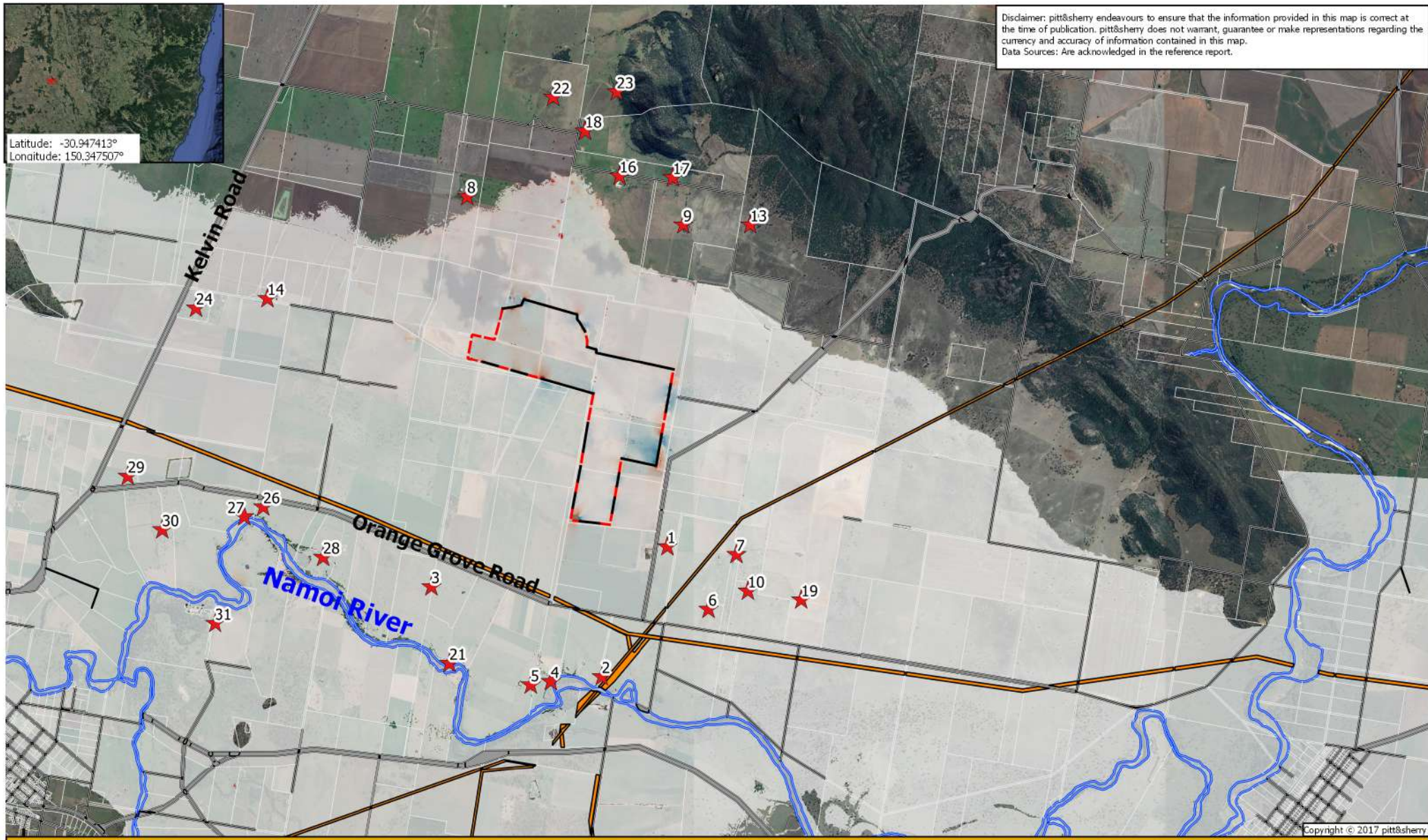
Project Number SY17199
Figure Number SY17199-F423
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering Australia Pty Ltd

Orange Grove Road, Gunnedah
1955 Flood Velocity change, Existing to Configuration 4

Disclaimer: pitt&sherry endeavours to ensure that the information provided in this map is correct at the time of publication. pitt&sherry does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
Data Sources: Are acknowledged in the reference report.

Latitude: -30.947413°
Longitude: 150.347507°



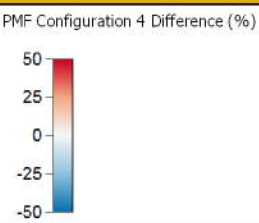
Copyright © 2017 pitt&sherry

Data sources:
Base image from Google Earth
Reference Report:
SY17199B005 REP 31P REV05

Coordinate System: GDA 1994 MGA Zone 55
1:80,922 When printed at A4

Legend

- Fence
- Drop Down Fence
- Easement
- Cadastre
- Road
- Water Corridor
- Sensitive Receivers



Project Number SY17199
Figure Number SY17199-F424
Revision 3
Author mdugan
Reviewer mjacobs
Date 28-06-2018

Photon Energy Engineering
Australia Pty Ltd

Orange Grove Road, Gunnedah
Probable Maximum Flood Velocity
change, Existing to Configuration 4

Contact

Martin Jacobs
0427 670 395
mjacobs@pittsh.com.au

Gunnedah Solar Farm – Updated Flood Impact Assessment

transport | community | mining | industrial | food & beverage | energy



Brisbane

Level 10
241 Adelaide Street
PO Box 5243
Brisbane City QLD 4000
T: (07) 3058 7499

Launceston

Level 4
113 Cimitiere Street
PO Box 1409
Launceston TAS 7250
T: (03) 6323 1900
F: (03) 6334 4651

Newcastle

Level 1
81 Hunter Street
Newcastle NSW 2300
T: (02) 4910 3600

E: info@pittsh.com.au
W: www.pittsh.com.au

incorporated as
Pitt & Sherry (Operations) Pty Ltd
ABN 67 140 184 309

Devonport

Level 1
35 Oldaker Street
PO Box 836
Devonport TAS 7310
T: (03) 6451 5599

Melbourne

Level 1, HWT Tower
40 City Road
Southbank VIC 3006
PO Box 259
South Melbourne VIC 3205
T: (03) 9682 5290
F: (03) 9682 5292

Sydney

Suite 902, Level 9,
North Tower
1-5 Railway Street
Chatswood NSW 2067
PO Box 5487
West Chatswood NSW 1515
T: (02) 9468 9300



Hobart

Level 1, Surrey House
199 Macquarie Street
GPO Box 94
Hobart TAS 7001
T: (03) 6210 1400
F: (03) 6223 1299

pitt&sherry



Proposed Solar Farm, Orange Grove Road, Gunnedah

pitt and sherry (Operations) Pty Ltd

Traffic Impact Assessment
and Management Plan

June 2018

SECAsolution 

Solar Farm Project, Gunnedah NSW

Traffic Assessment Report

Author: Sean Morgan

Client: pitt and sherry (Operations) Pty Ltd

Issue: Ver04/22062018

Reference: P0987A

27 June 2018

Quality Review and Document History

Version	Date	Description	Prepared By	Checked By
Ver01	9/1/18	Draft	S Morgan	C.Thomas
Ver02	2/2/18	Draft	S Morgan	C Thomas
Ver03	14/3/18	Final	S Morgan	C Thomas
Ver04	26/6/18	Final	S Morgan	C Thomas



Ground Floor, 161 Scott Street Newcastle NSW 2300
Ph (02) 4032 7979
www.secasolution.com.au

© Seca Solution Pty Ltd 2018
The information contained in this document is confidential and intended solely for the use of the client for the purpose for which is has been prepared. Use or copying of this document in whole or in part without the written permission of Seca Solution constitutes an infringement of copyright. The intellectual property contained in this document remains the property of Seca Solution.

Contents

1	Introduction.....	2
1.1	Consultation and Authority Requirements	4
2	Existing Road Network and Local Characteristics.....	7
2.1	Traffic Volumes and Road Operation	13
2.2	Road Safety.....	14
2.3	Mitigation Measures	21
3	Construction Activities.....	23
3.1	Timing.....	24
3.2	Working Hours.....	24
3.3	Construction staff numbers.....	25
3.4	Heavy vehicle requirements	25
3.5	Vehicle movements	26
4	Traffic Management Assessment.....	28
	Appendix A. Safe Construction Activities.....	41
	Appendix B. Drivers Code of Conduct	45
1.1	General Requirements	45
1.2	Vehicle Speeds	45
1.3	Driver Fatigue.....	45
1.4	Operating Hours	47
1.5	Transport Routes.....	47
1.6	Vehicle Departure and Arrival.....	49
1.7	Overtaking.....	49
1.8	Breakdowns and Incidents	49
1.9	Penalties and Disciplinary Action	49
1.10	Emergency Contact Numbers	49
1.11	Driver Declaration.....	50

1 Introduction

Seca Solution have been commissioned by Pitt and Sherry (Operations) Pty Ltd to review the traffic impacts associated with the construction and operational phase of a new Solar Farm development and to determine traffic management measures associated with the construction activities for the project. The project involves construction, operating and eventually decommissioning of a 115 megawatt AC solar farm to the north-east of Gunnedah in NSW.

The following works and infrastructure would be required to support the construction and operation of the solar farm:

- Construction of access roads including:
 - A main access road for all access and egress for the site and substation off Orange Grove Road
- Installation of Electrical infrastructure including:
 - A 132kV Substation including one transformer and associated 132kV switchgear.
 - New transmission line (powerlines and poles for a distance of approximately 1.2 kms)
 - Inverters to convert DC to AC.
 - Cabling and other electrical infrastructure (e.g. security systems).
- Ancillary works at Gunnedah Substation and the existing 132kV transmission line adjacent the site.
- A maintenance compound and buildings.
- Fencing, landscaping and environmental works.

Power generated by the facility will be transmitted via existing 132kV transmission lines, in an easement owned by TransGrid south of the Gunnedah Solar Farm Site along Orange Grove Road, to the local energy grid via the Gunnedah substation which is located 2.3km south of the Site on the Oxley Highway. A tee in connection will be used to connect the new substation on Site to the existing TransGrid 132kV transmission line via approximately 1.2 kms of new overhead powerlines and poles.

The operational life of the solar farm is expected to be 25 years at which point the panels are either replaced and operations continue or removed, and the site is decommissioned and rehabilitated.

An estimated 470,000 PV panels would be installed on a single axis tracker system across the Site.

Construction of the site will take approximately 12 months.

As part of the development consent and prior to work on site a Traffic Management Plan will need to be prepared to the satisfaction of the road authorities (Gunnedah Shire Council and the Roads and Maritime Services (RMS)). The busiest period associated with the development with regards to traffic is during construction, with the operational phase of the project only requiring between 6-10 staff on site for the majority of the time. Seca Solution has prepared this Construction Traffic Management Plan (CTMP) for the project to ensure traffic issues can be safely and efficiently managed during the construction activities on site.

This CTMP has been developed for the construction activity for the project and the potential decommissioning element for the project, which may occur in 25 years' time. The potential decommissioning of the project site will require a similar level of activity, although will probably require less staff and would be completed over a shorter timeframe. The requirements and protocols for the decommission stage of the project will be as per the construction phase, although it is acknowledged these may need to be reviewed and altered in 25 years to suit the road conditions at that time as well as the work requirements.

The site is located within the locality of Gunnedah and is shown in Figure 1-1 and 1-2 below.

The site is currently arable land.

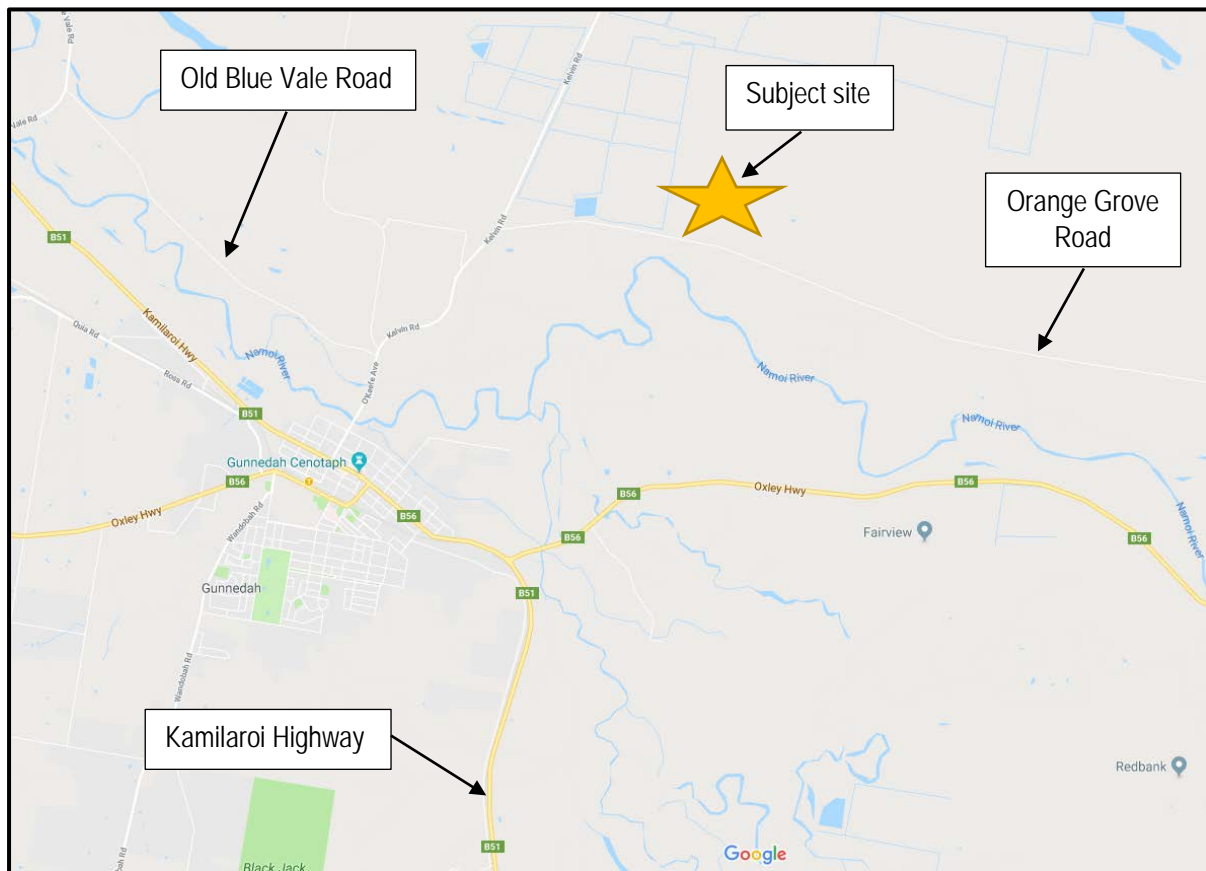


Figure 1-1 – Site Location within the greater road network

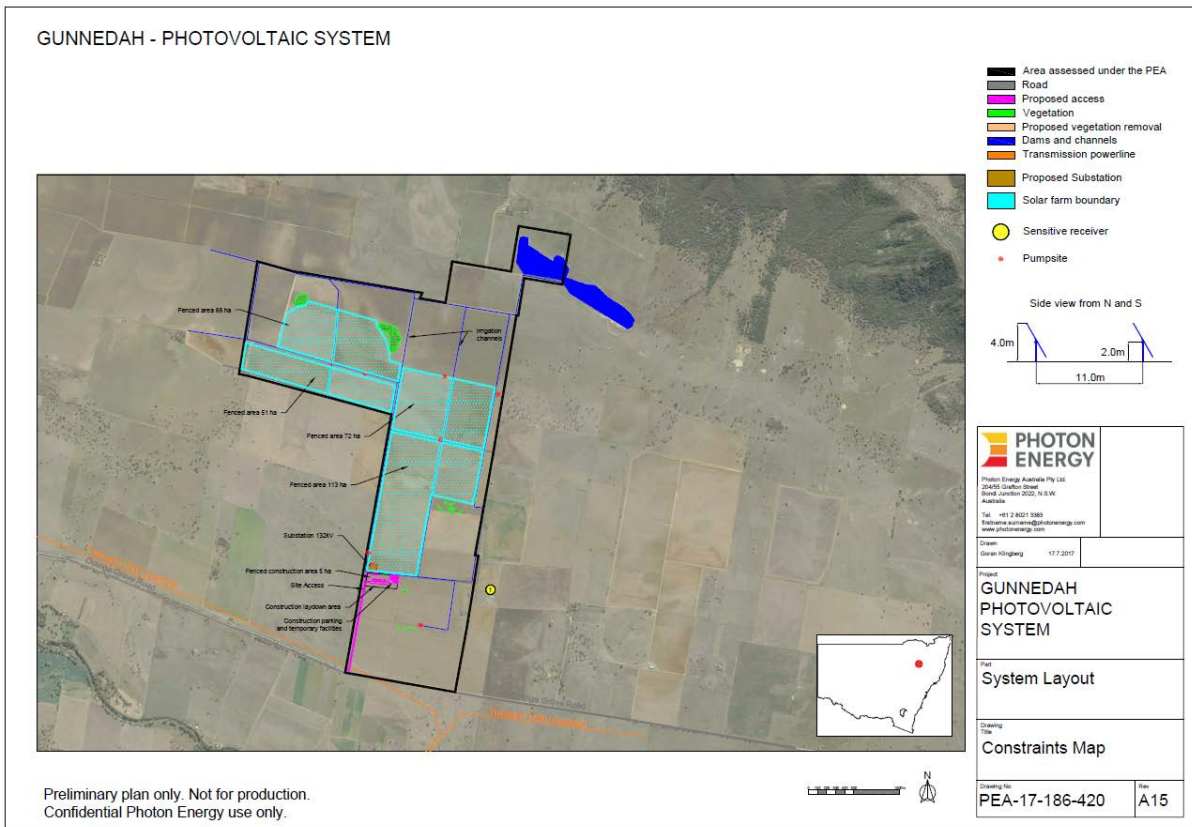


Figure 1-2 – detailed site location

The site has road frontage to Orange Grove Road only.

1.1 Consultation and Authority Requirements

As part of the project, there has been consultation with the Department of Planning and Environment by the project manager and SEARs have been issues. A summary of the SEARs as they relate to traffic and access issues is presented below and the response is provided within this table.

SEARs issue	Response / Section of report
The total impact of the existing and proposed development on the road network and 10 year horizon	The major impact of the project is during the construction phase which will be over approximately 12 months. The impact of this construction phase has been assessed based on current traffic flows. For the 10 year horizon the traffic will be that associated with the on-going maintenance / operation of the facility. 6-10 staff will be located on the site once the facility is operational. Refer Section 3.1.1
The volume and distribution of traffic	The volume of traffic has been assessed for both the construction and operational phase. <i>Construction:</i> Up to 75-100 light vehicles at peak construction activities inbound per day and 10 heavy vehicle inbound movements per day and similar outbound. <i>Operational:</i> 10 light vehicles per day inbound and outbound. Infrequent heavy vehicle for specific maintenance work only

	<p><i>Distribution:</i> Heavy vehicles via the designated heavy vehicle route to connect with Kamilaroi Highway to north-west of Gunnedah and light vehicles via Chandos Street / O’Keefe Avenue.</p> <p>Refer Section 2.3, 2.4 3.1.1</p>
Intersection sight distances at key intersections on the haulage route	<p>Sight distances have been assessed on site during the site visit along the haulage route between the Kamilaroi Highway and the site access.</p> <p>Refer Section 1.4.1/2/3/4</p>
Existing and proposed site access arrangements	<p>A new access will be provided for the construction work direct off Orange Grove Road with appropriate road frontage upgrade to provide sealed road. Existing gated access will remain.</p> <p>Refer Section 1.5</p>
Servicing and parking	<p>Once operational the servicing demands will be met with between 6-10 staff located on site.</p> <p>All parking will be contained on site within a temporary parking area adjacent to the site office.</p> <p>Refer Section 2</p>
Impact on public transport (public and school bus routes) and consideration of walking and cycling	<p>Existing school bus run on Kelvin Road will have minimal interaction with construction traffic. Drivers will be advised of presence of school bus run and will drive in accordance with all road rules.</p> <p>Location of the site is relatively remote and no footpaths available for walking to the site. Cycling to the site is an option as site is within 20 minutes of centre of Gunnedah. Cyclists can ride on the road due to low traffic flows and can park bikes on site as required.</p> <p>Refer Section 3.1.1, 3.1.3</p>
<p>Transport Management Plan to manage impacts of construction and operational traffic. Include any Traffic Control Plans. A Driver Code of Conduct:</p> <ol style="list-style-type: none"> Map of primary access routes Safety initiatives for transport through residential and school zones Consideration of coordination of construction traffic with seasonal agricultural haulage Induction process for vehicle operators Complaint resolution and discipline process Any community consultation measures during peak construction 	<p>Map of route for heavy vehicles provided –</p> <p>Refer Section 3 Figure 3.1.</p> <p>All drivers will sign code of conduct which specifies all road rules must be obeyed including driving through school zones - Refer Appendix A.</p> <p>The applicant shall enter into a formal commitment that no deliveries would be scheduled/received during school bus times to reduce potential safety issues associated with heavy vehicles using the route during school bus pick up and drop offs. These limits will not apply during school holidays.</p> <p>Given the volume of vehicle movements associated with the construction phase of the project no coordination with agricultural haulage is considered necessary - Refer Section 3.1.1</p> <p>All staff and delivery drivers will be inducted to site and sign a driver code of conduct – Refer Appendix A</p> <p>The contractor on site shall establish a complaint handling process and resolution process.</p> <p>During construction activities all properties along the local haulage route from the Kamilaroi Highway will be notified via a letter drop of on-going construction work on a fortnightly basis – Refer Appendix A.</p>

Road Safety Audit at any specific locations identified as safety concern on haulage route	No specific road safety issues were identified along the haulage route. Whilst no formal audit has been completed, the safety along the haulage roads have been reviewed by an accredited road safety auditor, taking into account all road users and all facets of road safety. Where safety concerns have been determined mitigation methods have been put forward.
---	--

RMS Consultation

Consultation has been held via a phone conversation with Andrew McIntyre, manager Land Use Assessment, Western Region with regard to a number of solar farms proposed to be constructed across rural NSW. The relevant outcome of the discussion with Andrew McIntyre are provided below:

- The critical phase for the assessment is the construction activities as this involves heavy vehicle access to the site along regional and local roads as well as a high number of workers;
- Consideration to the movement of staff to and from the site must be given. In remote areas where the solar farms are constructed, there are a large number of staff who can be fly in and fly out locating for temporary work from the established east coast centres such as Sydney and Newcastle. This requires staff to drive a long distance home after working on the site for long hours for a week or more – consideration to controls for staff driving home after working on site should be considered;
- Provide details on the access routes to the site for heavy vehicles and the size / number of heavy vehicle movements associated with the construction and operation of the site;
- Provide details on the operational characteristics of the project – it is recognised that the staff levels and traffic volumes for the operational stage of the project are low;
- Provide comment with regard to the decommissioning stage of the project and the potential traffic impacts;
- Prepare a driver code of conduct for the project to control vehicle access and maintain safety;
- Assess impacts on road safety, including pedestrians and cyclists and any bus routes impacted
- Review alternative transport options for the site including pedestrians, cyclists and bus use
- Provide details on any road upgrades identified as part of the project and include a Road Safety Audit as required

Consultation with Gunnedah Shire Council

Consultation with Gunnedah Shire Council has been held with the project team and the following issues have been discussed with Council in relation to traffic:

- Photon and p&s met with the Chief Engineer on Tuesday 16th January 18 and discussed the potential transport route. This included using Old Blue Vale Rd, Kelvin Rd and Orange Road. It was agreed in principle that the gravel part of Orange Grove Rd to the property would have some work completed before construction commences to minimise dust and damage to the road.
- Council are unable to provide any resources to work on the road. They suggested several contractors who know Council standards and may be able to complete the work. It was agreed more discussion was required before construction.
- School bus times were also discussed. Photon will investigate the feasibility of minimising truck access to the site between 0800- 0900 and 1500-1600 during school days to avoid bus pick up and drop off times.

2 Existing Road Network and Local Characteristics

Orange Grove Road is a local road (managed by Gunnedah Shire Council) which runs parallel to the southern border of the Site. The north, east and west boundaries of the Subject lands are defined by neighbouring agricultural lots with some sections of unnamed, unsealed rural roads. Orange Grove Road connects with Kelvin Road to the west of the site via a simple give way controlled intersection with Kelvin Road being the priority road. Orange Grove Road is generally sealed (refer Photo 2 below) and provides a width of approximately 6 metres allowing for 2-way traffic movements as required. Adjacent to the subject site the road is unsealed (refer Photo 1 below). It operates under the speed limit of 100 km/h although the current vehicle speeds would be slightly lower than this due to the un-sealed road surface.



Photo 1 – View along Orange Grove Road showing existing unsealed section adjacent to the subject site



Photo 2 – View along Orange Grove Road to the west of the subject site where the road has a sealed pavement and edge marker posts

Kelvin Road to the west of the site is a sealed two-way road with an overall width of 7 metres (refer Photo 3 below). It intersects with Orange Grove Road via a simple give way controlled intersection with Kelvin Road being the priority road. In this location Kelvin Road provides a straight alignment and ensures that good visibility is available for drivers turning in and out of the side road. Kelvin Road runs in a north south direction and connects with O’Keefe Avenue to the south for direct access into the centre of Gunnedah. **O’Keefe Avenue** provides a sealed pavement allowing for 2-way traffic movements and connects with **Chandos Street** at the bridge crossing over the Namoi River on the northern edge of Gunnedah (refer Photo 4 below). It is noted that whilst there is no weight limit imposed on the bridge over the Namoi River, there is a warning sign due to the restricted width to advise drivers to be wary of approaching heavy vehicles. The width of this bridge would not permit two heavy vehicles to pass.

These roads all operate under the posted speed limit of 100 km/h.



Photo 3 – Typical cross section for Kelvin Road to the south of Orange Grove Road



Photo 4 – Section of Chandos Street to the immediate north of the Namoi River bridge. Note 50 km/h urban area speed limit is located here.

As part of the project, it is proposed that all heavy vehicles will avoid travel via Chandos Street / O'Keefe Avenue but will use Old Blue Vale Road and Blue Vale Road to connect with the Kamilaroi Highway.

Old Blue Vale Road connects with Kelvin Road at its eastern end and Blue Vale Road at its western end. Old Blue Vale Road allows for 2-way traffic movements although it is noted that the sealed width (nominal 5 metres) allows for a single vehicle only and as such opposing vehicles must put two wheels on the dirt to the side of the seal when passing (refer Photo 5 below). There are a number of rural residents located along this road as well as Gunnedah airport at its eastern end (which connects to Kelvin Road). During the site work, a number of heavy vehicles were observed on this road, associated with farm activities and an industrial type user located on the southern side of the road.



Photo 5 – Typical cross section of Old Blue Vale Road

Old Blue Vale Road connects with Kelvin Road via a simple give way controlled T intersection with Kelvin Road being the priority road. This intersection is located on a straight section of road allowing for good visibility for drivers turning in and out of the side road. It is noted that there is poor delineation in this location and drivers cut the corner when turning left out of Old Blue Vale Road (refer Photo 6 below). This intersection also requires maintenance due to loose gravel on the road causing a safety concern.



Photo 6 – View on Old Blue Vale Road at eastern end showing poor road maintenance at Kelvin Road intersection.

At its western end, Old Blue Vale Road connects with Blue Vale Road via a simple give way controlled intersection with Blue Vale Road being the priority road. This intersection is well laid out and provides good visibility in both directions for drivers exiting the side road. It is noted that there is no dedicated sheltered right turn lane on Blue Vale Road (requiring a vehicle to stop in the through traffic lane on Blue Vale Road) for the traffic turning onto Old Blue Vale Road in this location.

Blue Vale Road is a sealed road allowing for two-way traffic movements. It provides a sealed width of 7 metres and currently carries a high volume of heavy vehicles associated with Whitehaven mining activities to the north of this location. These vehicles are typically 25-metre-long trucks which run along Blue Vale Road, connect with the Kamilaroi Highway to the south, then turn into the loading facility to the south of the Kamilaroi Highway to the east of Blue Vale Road. The intersection of Blue Vale Road and the Kamilaroi Highway is well laid out, allowing for a left turn acceleration lane for the vehicles turning out of Blue Vale Road as well as a sheltered right turn lane for vehicles turning right into Blue Vale Road off the Kamilaroi Highway.

The Kamilaroi Highway forms part of the regional and State road network that is a key freight route in NSW and forms part of the road network designated by the Roads and Maritime to carry oversize, over mass vehicles. It provides a single lane of travel in both directions between Blue Vale Road and Gunnedah to the east (refer Photo 7 below). It operates under the posted speed limit of 100 km/h although to the immediate west of the intersection with Blue Vale Road the posted speed limit is 70 km/h adjacent to the heavy vehicle checking station. As part of the regional road network, the Kamilaroi Highway carries a mixture of local and regional traffic with a significant number of trucks including B-double combinations. Based on RMS data from the count station on the Oxley Highway to the east of Gunnedah it is considered that this road would carry a high level (16%) of heavy goods vehicles.



Photo 7 – View east along the Kamilaroi Highway showing sheltered right turn lane for vehicles turning into Blue Vale Road

The Kamilaroi Highway runs through the centre of Gunnedah, although there is a sign on the eastern and western approaches to the centre of Gunnedah to direct heavy vehicles away from the centre of town. This heavy vehicle route is used by the majority of the heavy vehicles passing through town and runs along Warrabungle Street / Bloomfield Street / Boundary Road. This alternate route provides a wide sealed pavement of approximately 12 metres and allows for the safe movement of heavy vehicles whilst accommodating local parking demands (refer Photo 8 below). This route ensures heavy vehicles do not need to pass through the centre of Gunnedah.



Photo 8 – Typical cross section along Bloomfield Street allowing for kerb side parking and two-way heavy vehicle movements

Staff and local supplies may be sourced from Tamworth and access to Tamworth is provided via the **Oxley Highway**. The Oxley Highway also forms part of the regional and State road network that is a key freight route in NSW and forms part of the road network designated by the Roads and Maritime to carry oversize, over mass vehicles. It generally provides a single lane of travel in both directions (refer Photo 9 below). It operates under the posted speed limit of 100 km/h. As part of the regional road network, it carries a mixture of local and regional traffic with a significant number of trucks including B-double combinations. Based on RMS data from the count station on the Oxley Highway to the east of Gunnedah it carries a high level (16%) of heavy goods vehicles.

2.1 Traffic Volumes and Road Operation

Traffic volumes in the immediate vicinity of the subject site are very low, reflective of the rural environment. Orange Grove Road provides access to a number of rural land holdings and does not provide a direct access for through traffic movements nor does it provide access to a town or village. As such the traffic flows on this road are considered to be less than 200 vehicles per day two-way. Data available from Gunnedah Shire Council shows that the daily flows on this road on the sealed section were 166 in 2015. Kelvin Road similarly carries low traffic flows with traffic data available from Council indicating that in 2015 the daily traffic flows south of Orange Grove Road were 559 vehicles.

Old Blue Vale Road also carries very low traffic flows as it provides access to a low number of dwellings along its length and does not provide any through traffic movements. It is considered that the daily traffic flows along this road would be less than 100 vehicles per day.

Observations on site show that Blue Vale Road currently carries a significant number of truck and dog combinations associated with the Whitehaven mining operations, with heavy vehicles observed travelling in both directions hauling coal south and empty trucks heading north. Traffic flows on this road are impacted upon by these trucks and daily traffic flows are considered to be much higher than those on Old Blue Vale Road but less than 500 vehicles per day two-way.

As part of the regional road network, it can be seen that the Kamilaroi Highway carries higher traffic flows, associated with both local and regional demands. There is no traffic data available from the RMS web page for this road, however the RMS web page does indicate that the daily traffic flows on the Oxley Highway to the east of Gunnedah are in the order of 3,500 vehicles per day with 16% heavy vehicle content. It is considered that the flows on the Kamilaroi Highway could be similar with similar heavy vehicle content.

Observations on site during a typical morning peak period shows that the current road network in the vicinity of the subject site and around Gunnedah operates very well with minimal delays and congestion. The route proposed to be used for the project all carries low traffic flows and operates with no delays except for those associated with drivers slowing down to observe traffic flows on the approaches to the various intersections and negotiating the intersections. The only delays noted were along the Kamilaroi Highway through the centre of Gunnedah and the project traffic will not operate through the centre of Gunnedah. All heavy vehicles will operate along the heavy vehicle route through Gunnedah which currently operates very well with minimal delays.

2.2 Road Safety

It is recognised that as part of the project work, there will be a significant number of heavy vehicle movements associated with the construction work which will impact along the local road network. As stated above, ALL heavy vehicle access to the project site will be via the Kamilaroi Highway – Blue Vale Road – Old Blue Vale Road to Orange Grove Road. The heavy delivery vehicles will not use the bridge crossing over the Namoi River via Chandos Street / O'Keefe Avenue.

The major road safety impact is associated with the delivery trucks accessing the site and their impact upon the operation of the intersections. The trucks will be accessing the site from either Newcastle or Port Botany in Sydney, where the solar panels will be shipped to. The trucks will then access Gunnedah via the regional road network which will include the New England Highway to Willow Tree and then the Kamilaroi Highway to Gunnedah. Both of these roads currently provide a high standard of road and allow for the movement of local, regional and national road freight and carry B-double trucks. It is considered that the additional truck movements associated with the construction activities for the project will have a minimal and acceptable impact upon road safety along these roads.

For the local traffic impacts, to ensure minimal impact upon road safety ALL heavy vehicles associated with the project will be directed to drive along the following route:

- Kamilaroi Highway to Gunnedah
- Utilise the heavy vehicle route to avoid the centre of Gunnedah
- Travel along Blue Vale Road via its intersect with the Kamilaroi Highway
- Old Blue Vale Road
- Kelvin Road
- Orange Grove Road.

This route is provided below (Figure 2-3) and will be included within the Driver's Code of Conduct and will form part of the project inception meeting for the project for all staff and drivers.



Figure 2-1 – Designated Heavy Vehicle route to project site

The heavy vehicle route through Gunnedah currently caters for a large number of heavy vehicles including B-double combinations. This route provides a wide road pavement to cater for kerb side parking and the safe 2-way movement of trucks along the road. The intersections along this route are well laid out and provide good visibility in all directions to allow for the safe turning movements of vehicles. It is considered that this route can safely accommodate the additional traffic movements associated with the project.

2.2.1 Intersection of Kamilaroi Highway and Blue Vale Road

The intersection of the Kamilaroi Highway and Blue Vale Road is very well laid out and has been upgraded as part of the Whitehaven mining operations to provide a sheltered right turn lane on the Kamilaroi Highway for traffic turning into Blue Vale Road as well as a left turn acceleration lane for vehicles turning left out of Blue Haven Road into Kamilaroi Highway. All heavy vehicle movements associated with the project will require right turns into Blue Vale Road (laden) with left turn out movements associated with unladen trucks. The existing intersection layout can safely accommodate these movements.

The posted speed limit on the Kamilaroi Highway in this location is 70 km/h and from Austroads Guidelines the sight visibility requirement is 151 metres. The sight distance has been measured and assessed on site and exceeds 250 metres in both directions.

Overall it is considered that this intersection provides a high level of control and operates to a high safe standard and as such no upgrade works are required at this intersection to accommodate the traffic movements associated with the proposed solar farm (construction and operation phase).

2.2.2 Intersection of Blue Vale Road and Old Blue Vale Road

This intersection is well laid out and provides good visibility in both directions for drivers exiting the side road. It is noted that there is no dedicated sheltered right turn lane on Blue Vale Road (requiring a vehicle to stop in the through traffic lane on Blue Vale Road) for the traffic turning onto Old Blue Vale Road in this location, however the flat vertical road alignment and the horizontal alignment of the road ensures there is good visibility for a driver approaching this intersection from either direction on Blue Vale Road.

All traffic movements associated with the project will require right turns into Old Blue Vale Road for laden trucks and then left turn out of Old Blue Vale Road for unladen trucks. The critical issues for road safety in this location is forward visibility for drivers approaching the intersection on Blue Vale Road, to observe any vehicle waiting to turn right into Old Blue Vale Road) and the visibility to the right for a driver turning out of Old Blue Vale Road.

Visibility to the right for drivers exiting Old Blue Vale Road has been assessed on site and is considered to be appropriate. The posted speed limit in this location is 100 km/h and from the Austroads Road Design the distance required is 285 metres. The distance has been measured onsite and exceeds 350 metres in both directions for a driver exiting Old Blue Vale Road (refer Photo 9 and 10 below).



Photo 9 – View to right for driver exiting Old Blue Vale Road onto Blue Vale Road



Photo 10 – View to left for driver turning out of Old Blue Vale Road onto Blue Vale Road

Whilst it can be seen that this intersection does not provide a sheltered right turn lane, given the low traffic flows along both of these roads and the forecast additional traffic movements associated with the construction of the project, it is considered that the existing intersection provides a safe and acceptable layout. The critical issue for road safety is the right turn into the side road off Blue Vale Road and in particular the visibility for a driver northbound on Blue Vale Road. A driver wishing to turn into Old Blue Vale Road has good visibility to observe gaps in the on-coming traffic and can adjust their vehicle speed accordingly to ensure they do not need to stop to turn right into Old Blue Vale Road. The southbound traffic flow is less than 50 vehicles per hour ensuring large gaps between vehicles appropriate to turn right. Thus, there will be no requirement for vehicles to be stopped on Blue Vale Road waiting to turn right into Old Blue Vale Road. Drivers following a vehicle turning right into Old Blue Vale Road have good forward visibility and will be able to adjust their vehicle speed if required to avoid colliding with the rear of a turning vehicle. It is therefore considered that no upgrade to this intersection is required on road safety grounds to accommodate the traffic movements associated with the proposed solar farm (construction and operation phase).

2.2.3 Intersection of Old Blue Vale Road and Kelvin Road

The intersection of Old Blue Vale Road and Kelvin Road is a simple give way controlled intersection with Old Blue Vale Road being the minor road. Trucks associated with the project will be turning left out of Old Blue Vale Road (laden) and the right turn off Kelvin Road (unladen) into Old Blue Vale Road. This intersection is well laid out and provides good vertical and horizontal visibility. Whilst there is no sheltered right turn lane provided on Kelvin Road the existing traffic flows are very low at this location and the additional traffic movements associated with the project will have a minimal and acceptable impact on the operation and safety of this intersection.

The posted speed limit in this location is 100 km/h and under Austroads Guidelines the visibility requirement is 285 metres. The distance available has been assessed on site and exceeds 320 metres (refer photo 11 and 12 below). The road in this location is flat and southbound drivers approaching the intersection have good visibility allowing them to adjust their vehicle speed to allow for right turn movements into Old Blue Vale Road.

It is considered that this intersection can continue to operate in a safe and appropriate manner with the additional traffic movements associated with the proposed solar farm project and does not require any road upgrades. However, it is considered that maintenance work is required at this intersection to remove the large amount of loose gravel material which has accumulated over the intersection. This could create a safety issue especially for 2-wheeled vehicles turning in and out of the side road.



Photo 11 – View to right for driver exiting Old Blue Vale Road onto Kelvin Road



Photo 12 – View for drivers turning right into Old Blue Vale Road off Kelvin Road

2.2.4 Intersection of Kelvin Road and Orange Grove Road

The intersection of Kelvin Road and Orange Grove Road provides for a simple T intersection control with Kelvin Road being the priority road. This intersection is well laid out and provides good visibility for drivers on all approaches (refer photo 13 and 14 below). The posted speed limit in this location is 100 km/h and under Austroads Guidelines the visibility requirement is 285 metres. The visibility available has been assessed on site and exceeds 400 metres ensuring that drivers can use this intersection in a safe and appropriate manner. It is considered that this intersection can continue to operate in a safe and appropriate manner with the additional traffic movements associated with the proposed solar farm project and does not require any road upgrades.



Photo 13 – View to right for driver exiting Orange Grove Road onto Kelvin Road



Photo 14 – View north along Kelvin Road for driver wishing to turn right into Orange Grove Road

2.3 Mitigation Measures

Temporary signage including a Variable Message Sign (VMS) should be installed on the approaches to these intersections to advise drivers of increased heavy vehicle turning movements to increase road safety awareness. It can be seen that the vast majority of the drivers on these roads are local drivers and as such will be aware of the increased movements and will be alert to these increased demands. Residents along the heavy vehicle route will also be notified of the works program via a regular letter drop.

For the length of Old Blue Vale Road, the increased truck movements (refer Section 2.5 below) could impact upon the operation of this road, due to the single sealed travel lane along the centre of the road only. The layout of the road requires opposing drivers to place the kerb side wheels of their vehicle on the dirt to the side of the seal to allow passing. However, the increased demands will only occur during the construction period (being less than 12 months) and once the facility is constructed and operational, there will be little if any demand for additional traffic to travel along this road. It is considered that this road can continue to operate as a single sealed lane however the following mitigation measures are put forward for the project:

- Upgrade the eastern end of Old Blue Vale Road to allow for two opposing heavy vehicles to pass close to Kelvin Road, with the provision of a full width sealed pavement for a distance of 50 metres. This will be agreed with Council prior to any construction work commencing on site;
- Provide regular community updates for residents along Old Blue Vale Road to advise of construction activities and increase heavy vehicle movements along Old Blue Vale Road;
- Agree a maintenance schedule with Gunnedah Shire Council prior to construction work commencing on site that allows for monitoring for the construction period to allow for increased wear along the edges of the sealed pavement (nominal 5 metres) due to the increased passage of heavy vehicles and the demand for placing two wheels in the dirt to the side of the sealed central pavement lane. This maintenance schedule shall include details on repair work to be completed, timeframe for this repair work to be

completed and an agreement to the frequency of the road inspections e.g. weekly. This can be completed with appropriate Council staff.

- Access to the subject site shall be via a an access designed in accordance with the RMS Typical Rural Property Access Standard for articulated vehicles, Austroad Guidelines and Australian Standards. This will include a length of 30 metres of seal provided for the site access road from its connection to Orange Grove Road be provided to minimise the transport of dust from the site onto the public road. It is noted that the site access is adjacent to the existing length of seal on Orange Grove Road and as such no upgrade works are required on Orange Grove Road. The plan for this is included in **Appendix C** to this report.

To limit the impact on school bus runs in this location, the applicant has committed to manage deliveries and access to the site by heavy vehicles to ensure they do not occur during school bus times. This will be a formal commitment that no deliveries would be scheduled/received during school bus times to reduce potential safety issues associated with heavy vehicles using the route during school bus pick up and drop offs. During school holidays there will be no restriction on delivery and access to the site for heavy vehicles.

2.3.1 Light Vehicle Route

For light vehicles associated with workers, the proposed access route will be via Chandos Street and O'Keefe Avenue to allow for direct access between the subject site and the centre of Gunnedah. This route provides a safe and acceptable route for light vehicles which can safely and conveniently cross the Namoi River on the existing bridge.

3 Construction Activities

The construction and commissioning phase is expected to last approximately 9-12 months. The main construction activities include:

- Site establishment and preparation for construction:
 - Installation of security measures including fencing.
 - Establishment of site compound, material layout and wash down areas.
 - Ground preparation.
- Installation of environmental controls
 - A detailed Construction Environmental Management Plan (CEMP) would outline the environmental controls required.
- Minor vegetation clearing (grasses, shrubs and isolated trees).
 - Targeted clearance of low lying vegetation around trenching areas to steel post installation to minimise disturbance to existing ground cover.
 - Establishment of tree and vegetation protection measures as required.
 - Clearance of larger vegetation such as bushes and isolated trees.
 - Establishment of additional sedimentation and erosion controls as required.
- Preliminary civil works including:
 - Drainage works
 - Setting up foundations for the substation
 - Earthing works (see below)
- Installation of steel post and rail foundation system for the solar panels.
- Installation of PV panels and DC wiring beneath the panels.
- Installation of underground cabling (trenching) and installation of inverter stations.
- Construction of internal access tracks.
- Construction of 132kV substation.
 - Site Establishment and clearing (if required)
 - Bulk earthworks via a range of plant that may include scrapers, bulldozers, excavators, rollers, trucks and loaders for carrying plant in and out of the site
 - Detailed civil works including drainage, earthing, foundations etc. generally using excavators, piling rigs, trucks and cranes
 - Erection of steelwork, equipment, demountable buildings and transformer generally using trucks, EWP's and cranes
 - Electrical connections generally EWP's and other minor plant
 - Testing and commissioning generally EWP's and other minor plant
- Construction of new transmission line from substation to existing 132 kV transmission line.
 - Transmission line stringing for new conductor and OPGW will be completed generally by trucks, cranes, EWPs, winches and other minor plant and vehicles. Civil works may be required for construction benches.
 - For the new transmission line structure excavators, piling rigs, cranes, trucks, winches and EWPs are generally required.
- Offsite electrical works by Transgrid including
 - Approx. 1.6km of high capacity fibre (OPGW retrofit) to connect the 132kV Solar Farm Substation to TransGrid's Gunnedah Substation
 - Installation of switchgear at Gunnedah Substation
- Testing of electrical infrastructure
- Removal of temporary construction facilities and rehabilitation of disturbed areas.

The project does not require any concrete footings to be provided for the solar panels construction. The substation will require a hardstand base with material imported for this.

A site office and compound will be established on site for the duration of the works with temporary access tracks provided to allow for access across the site as required. These access tracks will be similar to the existing farm tracks that cross the property and will allow for safe and convenient movement of vehicles across the site as required. Internal traffic movements will be controlled by the drivers code of conduct and will be reinforced by daily toolbox meetings on site. This will include on site speed limits and requirements around pedestrian and heavy vehicle movements on site.

All staff vehicles will be able to park within the site adjacent to the site office with no external parking demands. The car park area will allow for up to 100 vehicles to park within this compound area. As part of the project construction it is proposed to maximise the local workers content (from Gunnedah and Tamworth) and carpooling will be encouraged and supported as part of these trips. Based on similar construction projects, it is considered that 3 or 4 people arriving in a single vehicle is appropriate due to the fixed hours of operation allowing for carpooling. As a worst-case scenario, 2 people per vehicle on average has also been assessed, which could see parking demand for approximately 100 vehicles during peak activities on site.

There will be no formal parking area constructed for the project, but given the overall footprint of the project site it can be seen that the parking demands will be contained within the site. The car park area is a temporary feature of the project and to reduce the overall impact of the project, the existing surface will be maintained for the parking and will be managed / maintained throughout the project. Once the construction phase is complete, this car park will not be required and this area will be cleaned up and returned to its existing condition.

The current access road to the site is via an unnamed, unsealed road off Orange Grove Road near the western boundary of the Site in the south-west corner of Lot 151 DP754954. This access road would be utilised as the Main Access Road following upgrade of the intersection with Orange Grove Road. This access will be upgraded as part of the project and a concept plan has been developed for this upgrade (refer Appendix C) which allows for 30 metres of seal within the site to limit the extent of dirt carried off the site onto the public road.

TransGrid will require a permanent sealed access road off Orange Grove Road and the new Gunnedah Solar Farm substation.

3.1 Timing

The construction of the solar farm is expected to commence in Quarter 4 2018 or Quarter 1 2019 and be completed within a 12 month timeframe.

The first stage of the associated works requires the road upgrade work on Orange Grove Road to be completed prior to commencement of construction activities on site.

3.2 Working Hours

Construction hours are in accordance with the *Interim Construction Noise Guidelines* (DECC 2009) (ICNG) with standard construction hours being

- 7:00am and 6:00pm Monday to Friday
- 8.00 AM to 1 .00 PM on a Saturday
- No construction work is to be carried out on a Sunday or public holiday.

No construction work, upgrading or decommissioning activities will be undertaken outside of these hours with the exception of:

- The delivery of material as requested by the NSW Police Force to other authorities for safety reasons; or
- Emergency work to avoid the loss of life, property and / or material harm to the environment.

3.3 Construction staff numbers

Peak demand levels for the construction work will vary with a peak of 150 people and a lower level outside of the peak period. The staff will be sourced locally where appropriate with some specialist and project management staff being temporarily located in Gunnedah. Staff will be encouraged to car pool as appropriate with other staff transferred to and from the site via mini coaches to reduce vehicle demands. Due to the size of the site footprint, these same vehicles will also be used on site to move staff across the site.

With a peak of 150 staff, a vehicle occupancy rate of 4 people per vehicle has been assumed based upon carpooling and the use of a mini bus e.g. Toyota Coaster. This would give 40 vehicle movements inbound and outbound for staff movements. As a worst case scenario, assuming 2 people per car this would give 75 light vehicles entering and exiting the site for staff movements.

All construction light vehicles will be able to park on site within the office compound area as required.

3.4 Heavy vehicle requirements

The level of heavy vehicles accessing the site will vary throughout the project timeframe. At the beginning of the project there will be a requirement for some earthwork moving equipment to construct the access tracks and some minor earthworks across the site as required. This may require a scrapper or bull dozer which will be transported to site on a low loader. This machinery will remain on site for the duration of the earthworks portion of the project construction work.

While extensive earthworks are not proposed, some land forming (including localised cut and fill areas) may be undertaken to achieve more consistent gradients beneath the PV modules. Additionally, earthworks are required for trenching works.

In total, approximately

- 900 m³ of gravel would be required to cap the access road
- 7850m³ of sand (subject to detailed design) would be required for the bedding of cables that are to be buried throughout the site
- 2400m³ of imported fill to construct the raised platform (0.5m) for the substation

Should any excavated material not be suitable for reuse or additional fill material is required the maximum amount of fill is estimated to be 12,000 m³.

Once the earthworks have been completed, the balance of the construction work will commence requiring machinery shown below in Table 3-1:

Table 3-1 – Construction machinery requirements

Equipment	Quantity	Model Type
Pile Driver	10	Gayk HRE 1000 or similar
All terrain fork-lift (tele handler)	10	Manitou MHT-X or similar
All terrain utility vehicle	10	John Deere XUV560 or similar
Backhoe	5	New Holland LB90B or similar
Excavator	4	Cat C13 ACERT or similar
Bulldozer	4	Cat C9.3 ACERT or similar

Scraper	2	Open Bowl Scrapers or similar
Roller	4	Vibratory Soil Compactors
Winches	4	Attached to medium sized dozers or similar
Flatbed truck	5	Isuzu FVZ 1400 or similar
Mobile crane	1 – 2	KATO NK550VR or similar
Elevated work platforms	1	Bravi Lui 460 Elevated Work Platform 280kg Capacity or similar

Other equipment if required may include an elevated work platform, scraper, roller and winches. All of the plant will be located on site and will therefore be only required to access the site once for the construction works.

The solar panels are expected to be all delivered from the Port at Newcastle or Port Botany in Sydney. Other specialist equipment is generally sourced from Newcastle or Greater Sydney as required whilst consumables such as concrete and general material supplies will be local from the Gunnedah area.

3.5 Vehicle movements

A summary of the vehicle movements is provided below in Table 3-2.

Table 3-2 – Summary of vehicle movements for full project

Phase	Purpose	Vehicle Type / Trailer Type	No. of one-way vehicle movements
Site Set-Up and Demobilisation	Portacabin delivery and removal	Low loader	10
	Skip delivery and removal	Low loader	20
	Generator delivery and removal	Semi-trailer	2
	General deliveries	Semi-trailer	20
	Crane mobilization and demobilization	Crane	4
	Water tank delivery and removal		2
Roads and hardstands	Delivery of imported capping for road laydowns and crane hardstands	Truck and dog	375
	Plant delivery and removal: excavators, compactors drill rig	Low loader	20
	Concrete deliveries for maintenance container hardstands	Concrete agitator	60
Generating Equipment	Tool container delivery and removal	Low loader	2
	Module deliveries	Semi-trailer or B-double	1,300
	Mounting structure and pile deliveries	Semi-trailer or B -double	1,000
	Inverter Station deliveries	Low loader	26
	DC cabling trays and combiner boxes	Semi-trailer or B-double	200

Phase	Purpose	Vehicle Type / Trailer Type	No. of one-way vehicle movements
AC Cable Installation	AC Cable delivery	Semi-trailer or B -double	180
	Backfill material delivery	Dump Truck	1,500
Plant delivery and removal	Telescopic handler and excavator	Low loader	28
Overhead Line	Conductor delivery	Semi-trailer	20
	Pole deliveries	RAV	5
	Pole dressing delivery	Semi-trailer	1
Other	Employee vehicle movements per day per direction	Light vehicle / mini coaches	40-75
	Monitoring equipment fibre SCADA servers etc	Truck	2
	Waste Collection	Truck	200
	Consumables (Oil and Fuel)	Truck	20
	Miscellaneous deliveries	Light vehicle	20
		TOTAL	5,092

In summary, peak vehicle movements are up to 75 light and 16 heavy vehicles two-way (75/16 inbound, 75/16 outbound) per day. For the light vehicles, the vast majority of these will be inbound movements in the morning bringing workers to the site with these vehicles then remaining on site for the full working day before leaving at the end of the working day. It is expected that there will be limited light vehicle movement outside of these periods, other than support staff e.g. office staff or the occasional visitor to the site.

For the heavy vehicles, these will typically be spread out across the working day. For the solar panel deliveries, these trucks are arriving from either the Port of Sydney or the Port of Newcastle and the journey length will be over 5 hours, ensuring that these vehicles will not all arrive at the same time. Allowing for each truck to be emptied on site one at a time, the outbound movements will also be spread out and not all leave at the same time. All other heavy vehicles will also be spread out over the normal working day with no concentration of heavy movements expected.

4 Traffic Management Assessment

The proposed traffic management measures allow for all access off Orange Grove Road only. The access to be used will be for the construction traffic movements as well as the future on-site operational demands. This access is to be provided in accordance with the requirements for the site operations and take into account the specific design requirements of Gunnedah Shire Council.

All heavy vehicle movements in and out of the site are as shown below in Figure 4-1.



Figure 4-1 – Heavy Vehicle access route to subject site

All light vehicle movements in and out of the site are shown below in Figure 4-2.

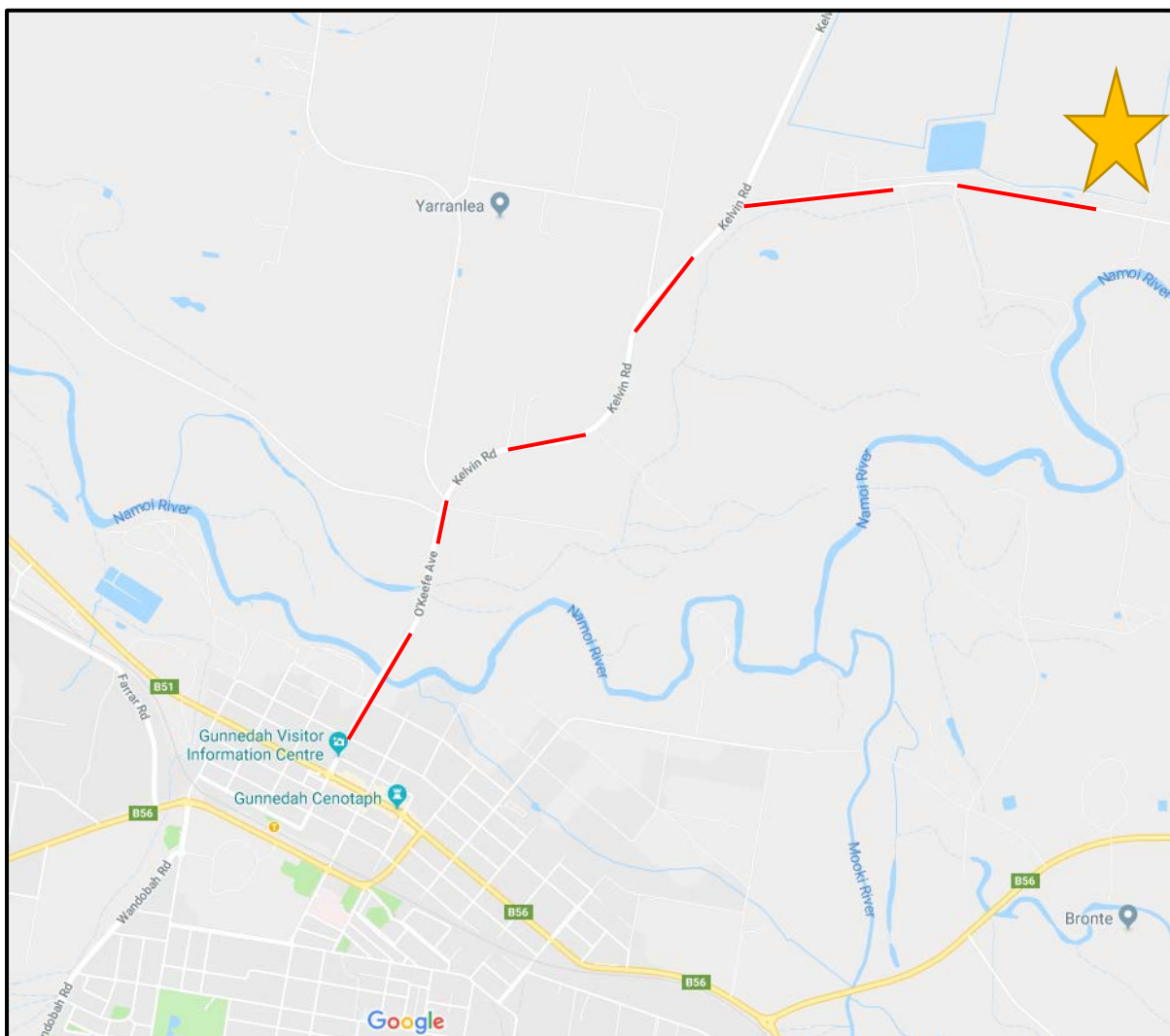


Figure 4-2 – Light vehicle access in and out of the subject site

4.1.1 Impact Assessment

The project will require the delivery of the solar panels and other specialist equipment from Newcastle or Sydney with the access route via:

- Newcastle or Sydney metropolitan regional road network;
- M1 Motorway to Hunter Expressway (Sydney source);
- New England Highway to just north of Willow Tree;
- Kamilaroi Highway from New England Highway to Gunnedah.

These roads all form part of the road freight routes within the State road network and all currently carry heavy vehicle movements including B-double access for the full length of the routes. These routes will be documented as the Haulage Route for all delivery vehicles to enter and exit the site for the vehicles associated with haulage of the solar panels for the project site.

These roads carry a high number of heavy vehicles, including B-doubles associated with local and regional agricultural demands. These agricultural demands are seasonal in nature and occur 24 hours a day often involving night travel and operations. There are a number of farms in the general locality of the project site as well as in the wider Gunnedah area that use these local and regional roads during these seasonally high demand periods. Due to the seasonal nature of this work and the requirement for quick turnaround of crop deliveries it is considered that it is not appropriate to limit truck movements for these existing farms. Similarly, it is considered that it is not appropriate to limit truck movements to and from the project site at these times as the traffic movements on the local roads will continue to remain low.

For the regional road network e.g. Kamilaroi and Oxley highways the total traffic flows will remain well within acceptable limits and as such will continue to operate to a good level of service for all road users. Current daily traffic flows on these highways are considered to be in the order of 3,500 vehicles per day. Assuming 10% of the traffic movements occur in the peak hour, this would give 2-way flows on these roads of 350 vehicles. The RMS Guide to Traffic Generating Developments indicates that for rural roads, allowing for 15% heavy vehicles the 2-way flow for a level of service of B is 530 vehicles. With the additional traffic associated with the critical construction period on the site the level of service on these roads will remain at B.

The traffic flows along the local roads giving access for the heavy and light vehicle movements associated with the project are currently very low based on-site observations. Therefore, the additional 50 light vehicle movements associated with the staff movements and 10 daily truck movements (per direction) will have a minimal and acceptable impact upon the operation of these local roads during construction. Once operational, the traffic movements are much lower with 10 staff based on site and as such the impact will be negligible.

There is minimal background traffic growth in this location. The RMS count data from the station east of Gunnedah on the Oxley Highway (Station I.D. 6167) shows traffic flows of 3,588 in 2017 and 3,356 in 2015, representing an increase of around 3% per annum. Other counts along the regional road network show similar or lower increase values. For the assessment of the future impacts in 10 years-time, it can be seen that the site at that time will be operational with 10 staff located on the site. The impact of these ten staff will be very low on the local road network.

The site is expected to be operational for more than 10 years so that the impact of the decommissioning of the site cannot be assessed in detail at this stage. The site could remain operational beyond 10 years and the impact will remain low beyond the 10 year design horizon.

There will be no public vehicle access within the work site during the construction works, with a fence provided at the commencement of the project along the entire site boundary. This fence will remain once the project is constructed for security purposes with a locked gate to be provided at the site access off Orange Grove Road.

There will be no pedestrian access to the site for the general public. There are no pedestrian paths in the locality of the site or expected demands in this remote rural area so there will be no impacts for pedestrians created by the project works.

There is no school within the general locality of the subject site that will be impacted upon by the project. The majority of the heavy vehicle route proposed for the project does not form part of the local school bus run, with the section of Kelvin Road between Orange Grove Road and Old Blue Vale Road (approximately 2.5 kms) only being located on a school bus run. As part of the employee and site induction for all heavy vehicle drivers this school bus route will be highlighted so that drivers are aware of a potential school bus over this section. It is noted that the light vehicles associated with the staff movements will typically occur in the morning prior to this school bus inbound movement and staff leaving the site at the end of the day will be after the return of this school bus run and as such will not have any interaction. Once on the regional and state road network all school zones will be delineated in accordance with RMS Guidelines with reduced speed limits in accordance with normal NSW road rules. All drivers associated with the project construction work will adhere to the road rules as applicable.

The applicant has committed to a formal agreement to manage deliveries and access by heavy vehicles to the site to ensure they do not occur during school bus times. This formal commitment ensures that no deliveries would be scheduled/received during school bus times to reduce potential safety issues associated with heavy vehicles using the route during school bus pick up and drop offs. During the school holidays these restrictions for delivery and access will not apply.

There will be no impact upon public transport services with no diversions required. There are no bus stops impacted upon by the proposal. Gunnedah is not serviced by a train and is reliant upon a coach link with infrequent operation.

There will be minimal impact for emergency vehicles and heavy vehicles with no diversions required.

There will be minimal impact upon any other development within the locality of the site.

There will be minimal impact upon adjoining Council areas. Traffic routes in and out of the locality will be along the arterial road network which will experience minimal impacts due to the works.

There are no residential dwellings in the immediate locality of the site access that will be impacted upon by the project and construction work. There are a number of residences along the heavy and light vehicle access routes and these residents will be notified in writing of the construction works and the activities as required.

Construction vehicle movement on internal roads may lead to dust generation. A water truck will be used for dust suppression to minimise the production of dust, with the amount of water spreading adjusted accordingly to reflect the conditions. Additionally, any significant deposits of dirt and other construction materials will be promptly removed from public roadways.

Post construction, the traffic numbers generated by the project are very low, with a maximum on-site workforce of 10 people. There will not be any need for regular heavy vehicle access to the site once the solar farm is operational except for the occasional heavy vehicle for emergency repairs or irregular maintenance.

4.1.2 Delivery vehicles

All deliveries for the project will be via 19 metres semi-trailers or B-double combinations (26 metres in length maximum).

The access routes along the regional / state road network to the site are all along approved B double routes whilst the local roads between the Kamilaroi Highway and the project site carries B-doubles associated with local agricultural demands and as such the use of B double trucks for deliveries to the site are considered appropriate. These trucks will only use the designated heavy vehicle route to access the site and will not use O'Keefe Avenue to cross the Namoi River.

Delivery vehicles would be required throughout the project period. The travel time between the ports (Newcastle or Sydney) and the site for the solar panels is approximately 4 to 6 hours and these deliveries will be spaced out

over the construction period, to minimise the impact upon the road network and to reduce the need to store the panels on site. Other deliveries will include the metal structures for the solar panels, sand and gravel for the foundations and internal tracks and cabling. There will also be some deliveries of specialist equipment such as photovoltaic boxes or skids and delivery stations.

The trucks associated with the delivery of the supplies will all travel along the State and regional road network. There are a number of schools located along these routes, however all have marked school zones and speed limit restrictions as per State guidelines. As these routes are all on the State and regional road network it can be seen that heavy vehicles currently operate on these roads safely. It is considered that there will be no noticeable impact upon road safety adjacent to these schools associated with the additional truck movements associated with the construction work.

There is no requirement to divert traffic as part of this construction work. The existing heavy vehicle detour for Gunnedah shall be utilised as appropriate.

4.1.3 Construction staff movements

For the construction work, the staffing levels will peak at 150 on site and as part of the project, staff will be encouraged and supported to carpool and use mini buses provided to allow for shared trips from shared accommodation in Gunnedah to the site, approximately 6 kilometres. There will be 40-75 vehicles inbound in the morning associated with on-site staff and a similar number departing at the end of the working day.

The site is located approximately 6 kms from the centre of Gunnedah and with no footpaths provided on any of the local roads construction staff are unlikely to walk to the site. Some construction staff however could cycle to the site, as the 6 km ride would take 20 minutes or less to complete. The route via the light vehicle access route could be used by cyclists with the wide sealed pavement allowing for a safe cycling environment. Cyclists will be able to park their bikes on site close to the site office and showers should be provided together with work lockers to cater for cyclists.

The vehicle numbers associated with the construction work are relatively low and it is considered that the movement of vehicles in and out of the site for construction works can safely occur with minimal delays to pedestrians and in a safe manner. No limitation on truck access times is considered appropriate for the project. Given the journey length between the port and the subject site, the vehicles as they are approaching the site will be spread out ensuring the impact is not occurring all together. With unloading of vehicles taking 30 minutes or more, trucks exiting the site will also be spread out.

4.1.4 Impacts on Old Blue Vale Road

A protocol will be provided for both undertaking dilapidation surveys and making any necessary repairs following construction to Old Blue Vale Road (refer Figure 4-3 below). The dilapidation surveys will assess the existing condition of Old Blue Vale Road prior to construction and the repair of Old Blue Vale Road should it be identified in the dilapidation surveys to have been damaged during construction. The condition of the road shall be assessed on a daily basis with a daily log kept on site for these surveys. This protocol will be agreed with Council prior to construction commencing on site.

With regards to any emergency repairs required, the contractor on site would contact the relevant authorities and will ensure the road is safe. Repairs will be made in accordance with the relevant authority standard.

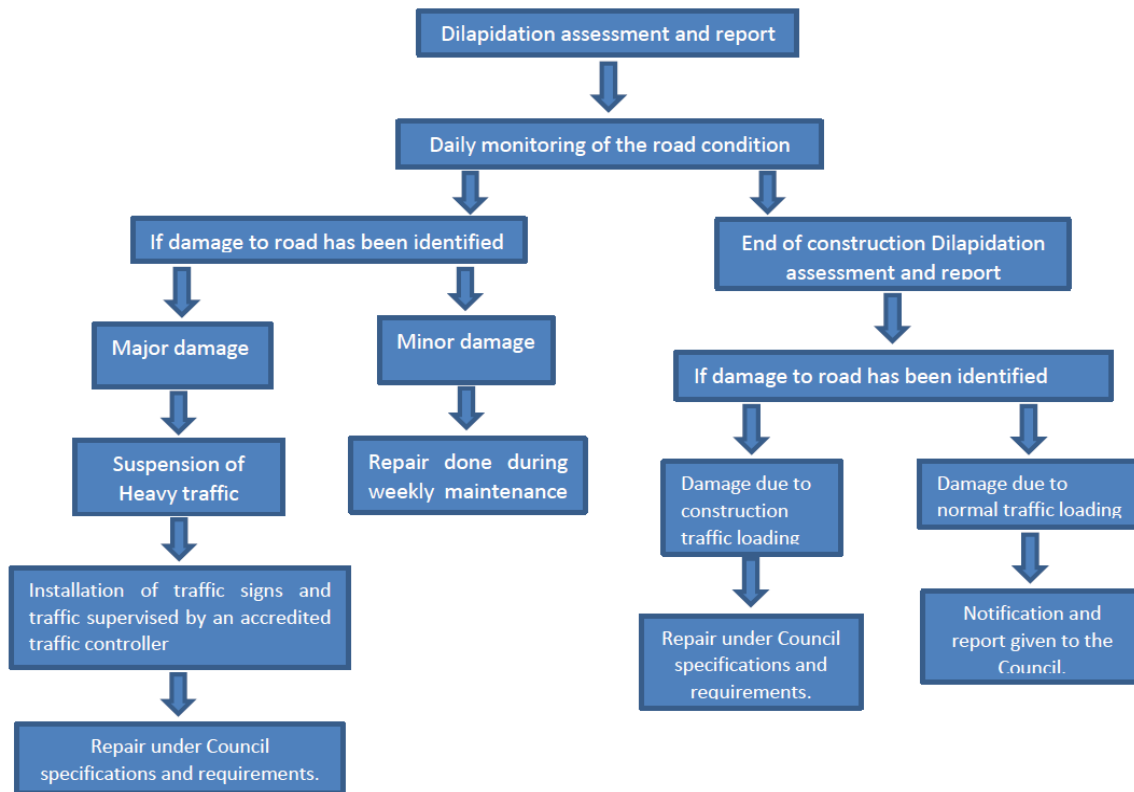


Figure 4-3 Dilapidation Assessment Protocol

4.1.5 Cumulative Impacts from other developments

Other know developments in the locality have been determined to be:

- Orange Grove Solar Farm
- Vickery Mine Extension project
- Rocglen Mine
 - Modification
 - Coal extension project
- Sunnyside Mine – Five-year extension to mining operations
- Whitehaven coal handling and preparation plant
- Watermark Coal mine
- Queensland Hunter Gas Pipeline
- Keepit dam upgrade – This project was approved in April 2009 and completed in 2011 and thus will not affect the Gunnedah Solar Farm.

Table 4-1 – Cumulative Impacts of other know developments

Project	Cumulative Construction Impacts	Cumulative operational Impacts
<p>Orange Grove Solar The proposal intends to build a PV solar facility generating over 30MW of power and occupying 417 ha of land off Orange Grove Road located approximately 12km east of the township of Gunnedah and approximately 4km from the Gunnedah Solar Farm.</p>	<p>Note: TransGrid have already confirmed that they do not have the infrastructure for both projects to proceed and they will not be undertaking any major upgrade works. An EIS has been prepared for this project and has documented the traffic impacts of this project. As both the subject site and the Orange Grove Solar farm cannot both proceed there is no cumulative impact assessment required.</p>	<p>Note: TransGrid have already confirmed that they do not have the infrastructure for both projects to proceed and they will not be undertaking any major upgrade works. As such only one project can proceed to construction and operation and there will not be any cumulative operational impacts.</p>
<p>Vickery Mine Extension project The Vickery Coal Project, owned by Whitehaven Coal Limited (Whitehaven) is an approved, but yet to be developed, open cut coal mining operation situated in the Gunnedah Coalfield approximately 25km north of Gunnedah. Whitehaven is seeking a new Development Consent for extension of open cut mining operations at the Vickery Coal Project.</p>	<p>Cumulative construction impacts of the proposal may include:</p> <ul style="list-style-type: none"> Additional construction traffic causing increased traffic flows along haulage route and specifically Blue Vale Road at the southern end between Old Blue Vale Road and the Kamilaroi Highway. <p>These impacts would be temporary for the duration of the construction work only and will not have a significant impact upon the overall operation of this section of the road. The project works at Vickery Coal Project will not generate any additional traffic movements but will allow for an extension in time for the on-going operations. The traffic flows on Blue Vale Road will remain at the current levels and well within acceptable limits.</p> <p>The intersection of Blue Vale Road and the Kamilaroi Highway is well laid out and provides a full length sheltered right turn lane as well as a left turn acceleration lane. It is therefore considered that the intersection has adequate capacity to accommodate the flows associated with the construction traffic operations.</p>	<p>Operational traffic impacts associated with the mine will need to be assessed and managed by the proponent of that development as part of their development application processes. It is considered that the project will not generate any additional traffic movements but will allow for an extension in time for the on-going operations.</p> <p>Existing traffic flows on Blue Vale Road are less than 500 vehicles per day on this road and the project site, during the operational phase will typically generate less than 30 vehicle movements per day and thus have a minimal and acceptable impact upon the operation of this road.</p> <p>The operational traffic will typically be light traffic only and will therefore not use Blue Vale Road but rather the light vehicle route via Chandos Street / Kelvin Road.</p>

<p>Rocglen Mine <i>Modification</i>Rocglen mine is located 28km north of the Gunnedah township. The Road Haulage modification was only approved for the 2016 and 2017 calendar years and will not affect this development.</p>	<p>Due to the timeframe of this modification there are no impacts.</p>	<p>Due to the timeframe of this modification there are no impacts.</p>
<p>Rocglen Mine <i>Coal rejects management</i> Relates to coal rejects management and disposal methods. The proposal will change the rejects management strategy so that the rejects disposed of at Rocglen will not be restricted to just Rocglen-sourced coal. This modification would involve a combination of back-haulage using returning coal trucks as well as trucks specifically to carry reject material.</p>	<p>The environmental assessment submitted to DP&E showed the average daily heavy vehicle movements associated with the transport of coal rejects to and from the mine would remain unchanged.</p> <p>These impacts would be temporary for the duration of the construction work only and will not have a significant impact upon the overall operation of this section of the road. The project works at Rocglen Mine will not generate any additional traffic movements but will allow for an extension in time for the on-going operations. The traffic flows on Blue Vale Road will remain at the current levels and well within acceptable limits.</p> <p>The intersection of Blue Vale Road and the Kamilaroi Highway is well laid out and provides a full length sheltered right turn lane as well as a left turn acceleration lane. It is therefore considered that the intersection has adequate capacity to accommodate the flows associated with the construction traffic operations.</p>	<p>As the daily heavy vehicle movements would remain unchanged there are no expected operational impacts.</p> <p>Existing traffic flows on Blue Vale Road are less than 500 vehicles per day on this road and the project site, during the operational phase will typically generate less than 30 vehicle movements per day and thus have a minimal and acceptable impact upon the operation of this road.</p> <p>The operational traffic will typically be all light traffic only and will therefore not use Blue Vale Road but rather the light vehicle route via Chandos Street / Kelvin Road.</p>
<p>Rocglen Mine <i>Coal extension project</i> The Project, will permit up to 5 million tonnes (Mt) of coal, not previously considered in the life of mine plan, to be</p>	<p>Operational traffic impacts associated with the mine will need to be assessed and managed by the proponent of that development as part of their development application processes. It is considered that the project will not generate</p>	<p>Additional traffic associated with haulage of coal. However, as the environmental assessment states that the Project does not involve any change to the coal production rate, transport fleet, hours of</p>

<p>extracted. This represents an increase in coal recovery from Rocglen by close to 30 %. At a maximum recovery rate of 1.5 Mt run-of-mine (ROM) coal annually, this will increase the projected life of the operation for coal extraction by up to four years.</p> <p>The footprint of the open cut pit will increase by approximately 50 hectares to a total open cut mined area of approximately 164 hectares.</p>	<p>any additional traffic movements but will allow for an extension in time for the on-going operations.</p>	<p>coal haulage or coal haulage route used between Rocglen and the Whitehaven CHPP.</p> <p>On this basis, the Project does not pose any additional annual impacts upon the local road network or traffic volumes, nor does it pose any additional conflict with other road users.</p>
<p>Sunnyside Mine</p> <p>The Sunnyside Coal Mine is located approximately 15km west of Gunnedah township.</p> <p><i>Modification</i></p> <p>The modification requires approval to continuation of mining of the approved coal reserves beyond November 2015 for a further period of 5 years (i.e. until the end of 2020). This modification was approved in November 2015.</p>	<p>As this is merely a continuation of a mine already in operation at the time that this EIS is being prepared there will be no construction impacts from the mine that will create any cumulative impacts as they have already been considered in the above assessment.</p> <p>This mine is located to the west of Gunnedah and gains access to the wider road network via the Oxley Highway.</p> <p>The construction traffic associated with the project will not travel along the Oxley Highway and therefore will not impact upon the Sunnyside Mine traffic.</p>	<p>During operation, traffic from Sunnyside Mine would utilise the Oxley Highway and the Kamilaroi Highway causing additional heavy vehicle traffic on the road network.</p> <p>Both the Oxley Highway and the Kamilaroi Highway have suitable capacity to cater for operation traffic from the mine and construction traffic from the solar farm as both are key freight routes in NSW and designated as 'oversize, over mass load carrying vehicles network approved roads' by Roads and Maritime Services.</p>
<p>Whitehaven Coal Handling and Preparation Plant (CHPP)</p> <p>The Whitehaven CHPP is located approximately 5km north-west of Gunnedah township.</p> <p>Rejects from Whitehaven CHPP need to be disposed of at an alternative site.</p> <p>The proposal is to install belt press filters (BPF) at the Whitehaven CHPP and use them to produce a dewatered fine rejects 'filter cake' which would be</p>	<p>As this project was approved in August 2015 it is assumed that the BPF has been constructed and therefore there would not be any cumulative construction impacts.</p>	<p>The trucks used to transport the rejects back to the mine site would be a combination of returning coal trucks and reject-specific trucks. However, the environmental impact statement for the projects states that the total number of heavy vehicle movements transporting coal and/or rejects would remain unchanged and operating hours would also remain the same. As a result, no material impacts on the local road network, other road users or adjoining residences would occur.</p>

<p>transported to Whitehaven open cut mines (Melville or Rocglen) via truck (either combined with coarse rejects or separately)</p>		<p>This is therefore consistent with the existing situation that were observed as part of the site work. The existing traffic flows on Blue Vale Road are considered to be less than 500 vehicles per day. Operational traffic for the project site will not use Blue Vale Road as they can use the light vehicle route.</p>
<p>Watermark Coal Mine The project is located approximately 25km south south-east of the Township of Gunnedah and to the immediate west of the village of Breeza within the Gunnedah LGA. The proposal is the construction and operation of an open cut mine extracting up to 10 million tonnes of coal per annum over 30 years. This project was approved in January 2015 but construction had not started at the time this EIS was written.</p>	<p>Construction requirements for open cut mine are reasonably low as the machinery requirements for the establishment are used for the future operations. The construction work will require plant to be moved to site and will remain on site for the duration of the project. Limited material and supplies demand for a quarry. Impact will be along the Kamilaroi Highway where the connection to the local road network is for the new mine. As part of the approval process, Watermark Coal Mine will have reviewed impacts of their vehicles turning in and out of the site road and will have assessed the required intersection control (and upgrade as required). This will have allowed for background growth on the Kamilaroi Highway and will cater for the development traffic associated with the project, which has a low hourly increase on the Kamilaroi Highway flow.</p>	<p>The operation of the mine will create increased traffic in the Breeza area and on the Kamilaroi Highway from staff moving to and from work and also operational traffic from the haulage of coal. Operational traffic impacts associated with the mine would have been assessed and managed by the proponent of that development as part of their development application processes at that time. The operational traffic of the Proposal will be minimal and is expected to be local to Gunnedah and as such will not travel on the Kamilaroi Highway.</p>
<p>Queensland Hunter Gas Pipeline Hunter Gas Pipeline Pty. Ltd. (HGP) proposes to build and operate a high pressure, underground (minimum depth of cover 750mm) 420km steel gas pipeline to transport gas from the proposed Narrabri Gas Project to Newcastle via, Gunnedah, Quirindi, Scone, Muswellbrook, Singleton and Maitland.</p>	<p>The proposed underground pipeline route will cross Kelvin Road and Orange Grove Road causing potential short-term traffic disruptions. Short-term partial road closures may occur however all public roads would remain open with controlled single direction traffic flow (as required) through the works areas.</p>	<p>There are no expected cumulative operational impacts</p>

<p>The project was approved in 2009 but construction had not started at the time the EIS was written.</p>	<p>These impacts would be temporary, and the project construction activities shall not impact upon the construction work for the gas pipeline when this construction commences.</p>	
<p>Kamilaroi Highway overpass A second rail overpass (road-over-rail bridge) is due for construction in Gunnedah. The rail overpass will be located within the town of Gunnedah and will run from the Oxley Highway on the western side of the township of Gunnedah over the railway and exit onto Warrabungle Street. The project is expected to commence in July 2018 and take 2 years to construct.</p>	<p>The overpass is on the western side of the town however there will be traffic impacts from required traffic management measures along the Oxley Highway and construction traffic.</p> <p>Cumulative construction impacts of the proposal may include:</p> <ul style="list-style-type: none"> • Increased heavy vehicle movements for hauling of construction materials and equipment, staff and service vehicles causing congestion, increased collision risk and damage to road infrastructure. • Additional traffic management during construction causing congestion and delays. However, no works are proposed on the Kamilaroi Highway so there will be no impacts for heavy vehicle movements to the project site that will operate along the heavy vehicle route around the town. • Increased traffic movements in the surrounding road network resulting from diversion of vehicles during temporary road closures (View Street, New Street, Barber Street, Warrabungle Street). However, this will not impact upon the designated heavy vehicle route to the north of the township along Bloomfield Street. <p>These impacts would be temporary and will be managed by the Construction Traffic Management Plan that will be prepared for the rail overpass construction.</p> <p>There could be impacts due to the cross use of the Kamilaroi Highway and Oxley Highway for supplies and staff for this overpass construction and the project site. However, both the Kamilaroi Highway and the Oxley Highway are key freight</p>	<p>There are no cumulative operational impacts expected from the operation of the railway overpass and the project site.</p>

	routes in NSW and designated as ' <i>oversize, over mass load carrying vehicles network approved roads</i> ' by Roads and Maritime Services and have adequate capacity to cater for these additional traffic flows.	
--	---	--

The major road networks affected by the additional projects include the Kamilaroi Highway, the Oxley Highway and Blue Vale Road. The Queensland Hunter Gas Pipeline may also affect Old Blue Vale Road and Kelvin Road.

Both the Oxley Highway and the Kamilaroi Highway have suitable capacity to cater for construction and operational traffic as both are key freight routes in NSW and designated as '*oversize, over mass load carrying vehicles network approved roads*' by Roads and Maritime Services. Both highways are State roads, which carry high traffic volumes and any additional construction or operational vehicle traffic on these major roads would be within the range of daily variation in traffic on these routes.

Blue Vale Road already has a number of heavy vehicle movements associated with Whitehaven Mining activities. The increase in heavy vehicle movements could cause some minor delays. However, the movements associated with the Proposal would only impact 1.4km of Blue Vale Road before turning into Old Blue Vale Road so impacts would be limited to this section of road and its intersections with the Kamilaroi Highway and Old Blue Vale Road.

In addition to causing some minor delays along haulage routes, additional construction traffic may also increase collision risk, have the potential to cause damage to road infrastructure and increase noise levels along haulage routes. Traffic impacts would largely be temporary and are considered acceptable.

Appendix A. Safe Construction Activities

The contractor on site is responsible for the management of all traffic in connection with its activities and the construction works conducted on the site. The Contractor will provide all traffic management, safety warnings and signage including such persons as necessary to direct traffic, as required by AS 1742:2009 – Manual of uniform traffic control devices.

External traffic movements

The Contractor will:

Ensure traffic management controls are established, maintained and monitored to underpin the safety of workers, other personnel and the general public

Establish traffic management controls in consultation with relevant stakeholders

Ensure traffic management controls comply with regulatory and legislative requirements

Ensure traffic management controls comply with the contract

Ensure traffic management controls maintain the flow of traffic within the site and on surrounding public roads

Reinstate any areas affected by the temporary construction access requirements to their original condition

The primary drivers for determining the traffic management controls during the construction period are:

- Safety of personnel, the general public and construction workers
- Minimising impact (if any) on operations
- Contractual requirements (including site access)
- Road traffic authority and local government requirements
- OHS requirements in relation to the movement of all vehicular traffic and pedestrians either within or adjacent to sites
- Environmental management requirements
- The impact construction traffic has on the local community in the surrounding area, and
- The need to meet construction requirements (including any schedule and cost constraints)

The traffic management controls will be communicated to appropriate stakeholders which will include the local community in the site vicinity via a letter box drop.

The Contractor will ensure:

Any significant deposit of dirt and other materials caused by construction traffic and other operations (in relation to the works) will be promptly removed from existing public roadways

Suitable precautions are taken to ensure no rock is dislodged onto any roadway from construction vehicles

Construction plant and equipment do not park on or within the pavement or shoulders of any existing trafficked roadway

Construction vehicles (when loaded) comply with the mass, loading and access requirements of the road traffic authority

Construction traffic will cause the least possible obstruction to public and other traffic

Directional signage will be installed to direct construction traffic and warn other motorists of construction traffic.

This signage is positioned in accordance with the approved Traffic Control Plans.

All drivers will be provided with a copy of the access routes to and from the site as part of their induction for the project;

A Vehicle Movement Strategy has been developed to eliminate the impact on local roads arising from additional construction traffic (e.g. solar panel delivery vehicles). The Vehicle Movement Strategy directs all drivers to access the site from the south via the Kamilaroi Highway to eliminate the impact on the local roads. There is no requirement to restrict the direction of flow and/or time of day for movements.

The Contractor will comply with any client or Road Traffic Authority signage requirements for traffic control. Where construction work is to be undertaken either on or adjacent to a public roadway that is open to traffic, the work must be undertaken in accordance with all regulatory and legislative requirements that govern the movement of vehicles and pedestrians on any public roadway.

Within the Worksite

All employees, subcontractors, suppliers and any other persons connected with the project must adhere to all such Statutory Requirements and comply with all lawful directions. Any breach of such requirements may result in disciplinary action of the persons concerned.

The maximum speed limits within the Worksite are:

- 40 kph on formed roads
- 20 kph during foggy/dusty conditions with headlights on
- 10 kph when passing pedestrians

The Contractor will manage access to and from the site by all employees, subcontractors, suppliers and any other persons connected with its activities and the works; and all occupants within the worksite and through each area of the site.

The Contractor shall provide for safe and continuous operation of normal pedestrian and vehicular traffic along all roads, pedestrian paths and vehicular access to the worksite and must provide and maintain all necessary watchmen, lights, barriers, notices and signs.

The Contractor will not unnecessarily obstruct any side road, branch track, drain or watercourse and will not break down or remove any fences or gates without prior notification to the client. If unavoidable, the Contractor will remove such obstruction or repair such breakage as soon as possible, or as directed by the Client.

A Vehicle and Traffic Management Procedures briefing will be included in the Project Site Induction.

Pedestrian Traffic

The Contractor may encounter pedestrian traffic at and near to the site. The Contractor will ensure that sites are appropriately isolated and secured from unauthorised entry; and that the Site is appropriately sign-posted and controlled. Given the location of the site it is considered that any pedestrian activity will be negligible.

Site Construction Traffic

Traffic within the Site will be managed in accordance with the Site Management Plan. The Sites Layout Plans will indicate site access and egress points and detail any required separation of construction plant and personnel. These plans will be communicated during Tool Box Meetings and/or Daily Pre-start Meetings.

The Site Layout Plan will incorporate details of parking arrangements for the site construction workers, speed limits within the construction works or through access roads established for vehicular and plant construction traffic.

The Sites Layout Plan will detail traffic management controls that are appropriate within each site.

Traffic controls shall be regularly reviewed for effectiveness and will be amended to maintain or improve a safe work environment. Traffic management controls established for sites will be inspected at ***weekly intervals*** to verify that a safe work environment is being maintained. Records of inspections shall be maintained.

Access Roads and Site Movement

Unless sign-posted otherwise, load limits on public roads adjoining the sites apply within them.

If required the Contractor shall request approval from the client prior to any over-dimensional load, or load in excess of load limits entering the site, or using the roads within the site.

All workers must travel to and from the site via the nominated access roads.

Parking

All workers must park in the Designated Parking Areas as specified in the Site Management Plan. The Contractor shall ensure no persons (in connection with its activities) parks in any other area of the site or in any other area without prior written consent.

Monitoring, Measurement and Review

The purpose of Monitoring and Measurement is to ensure that all construction works, including subcontracted activities, are being performed in accordance with the contract requirements, statutory requirement and in a controlled and safe environment. Ongoing monitoring and audit of Traffic Management procedures and the worksite implementation of traffic control shall be conducted.

Audits of the Traffic Control measures under differing operating conditions are to be carried out including during overcast and rainy weather, at night or at any other restrictive times where conditions may change in accordance with the requirements of AS1742.3.

Results of audits, inspections and improvements are to be reported in the reporting cycle of the contract to enable assessment of the adequacy of the implementation of the Traffic Control within contract performance and system review meetings.

Inspection and Auditing of Traffic Control Plan (TCP)

Regular Site Inspections by designated supervisory and field staff of worksite protection are to be arranged on a **daily frequency** depending on the complexity of traffic control on the site.

Site Inspections will be carried out and the following Traffic Management Forms completed:

- Traffic Control Daily Checklist
- Traffic Control Weekly Checklist

A daily record of the inspections should be kept. This should include:

- When traffic controls were erected
- When changes to controls occurred and why the changes were undertaken
- Any significant incidents or observations associated with the traffic controls and their impacts on road users or adjacent properties
- Where significant changes to the work or traffic environment or adverse impacts are observed, the controls should be reviewed as a matter of urgency.

The monitoring program should generally incorporate inspections:

- Before the start of work activities on site
- During the hours of work
- Closing down at the end of the shift period

The inspection program shall be adjusted to suit changing circumstances and/or risk environment such as during times of increased traffic flows or speeds, contra-flow arrangements or when changed controls are introduced.

The Audits of the implemented Traffic Management features will be undertaken following setup in accordance with the TCP and prior to the TCP being put into service.

Appendix B. Drivers Code of Conduct

1.1 General Requirements

All vehicles / drivers accessing the site must:

- i) Be registered and hold a valid driver's licence for the class of vehicle being operated;
- ii) Operate the vehicle in a safe and appropriate manner whilst travelling to / from the site or when operating within the site. This includes obeying all New South Wales state road rules.
- iii) ALL heavy vehicles must adhere to the designated heavy vehicle routes as far as practical;
- iv) Comply with the directions of authorised personnel when operating within the site and obey any relevant signage installed along the internal roads.
- v) Not use a mobile phone while operating any vehicle.
- vi) Must always wear a seatbelt when operating any vehicle.

1.2 Vehicle Speeds

Drivers shall observe the posted speed limit along the designated transport route and adjust their vehicle speed as required to suit the road environment and prevailing weather conditions. Vehicle speeds must be appropriate to ensure the safe movements of the vehicle with consideration to the vehicle configuration.

Maximum speeds limits within the project site shall be as follows:

- i) 40 km/hr along formed roads.
- ii) 20 km/hr during foggy / dusty conditions. Headlights must be on.
- iii) 10 km/hr when passing pedestrians or any plant equipment.

1.3 Driver Fatigue

Drivers shall not be permitted to operate a vehicle or plant equipment when impaired by fatigue. If you suspect that you or someone else is experiencing fatigue, please inform your supervisor.

Operators of heavy vehicles shall be aware of the requirements relating to fatigue as outlined in the Heavy Vehicle National Law. Drivers shall also be aware of their adopted fatigue management scheme (shown below) and ensure that they are operating within its requirements.

- i) Standard Hours of Operation
- ii) Basic Fatigue Management (BFM)
- iii) Advanced Fatigue Management (AFM)

Basic Fatigue Management (single driver)

Time	Work	Rest
In any period of...	A driver must not work for more than a maximum of...	And must have the rest of that period off work with at least a minimum rest break of...
6 ¼ hours	6 hours work time	15 continuous minutes rest time
9 hours	8 1/2 hours work time	30 minutes rest time in blocks of 15 continuous minutes
12 hours	11 hours work time	60 minutes rest time in blocks of 15 continuous minutes
24 hours	14 hours work time	7 continuous hours stationary rest time*
7 days	36 hours long/night work time**	No limit has been set
14 days	144 hours work time	24 continuous hours stationary rest time taken after no more than 84 hours work time and 24 continuous hours stationary rest time and 2 x night rest breaks# and 2 x night rest breaks taken on consecutive days.

Advanced Fatigue management:

The seven principles are grouped into three categories:

Work-related rest breaks (such as short rest breaks):

1. Reduce the time spent continuously working in the work opportunity
2. The more frequent breaks from driving, the better

Recovery breaks (such as major rest breaks):

1. Ensure an adequate sleep opportunity in order to obtain sufficient sleep
2. Maximise adequate night sleep
3. Minimise shifts ending between 00:00-06:00
4. Minimise extended shifts

Reset breaks (such as long periods of rest or extended leave):

1. Prevent accumulation of fatigue with reset breaks of at least 30hrs (and include two night periods, 00:00 – 06:00) between work sequences

ALL details relating to fatigue management for delivery vehicles are covered by the National Heavy Vehicle Regulator

1.4 Operating Hours

Construction

Construction is to be completed in accordance with the *Interim Construction Noise Guideline* (DECC 2009) which defined standard construction work hours as:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sunday and Public holidays: No work

The following construction, upgrading and decommissioning activities may be undertaken outside these hours without the approval of the secretary:

- The delivery of materials as requested by the NSW Police Force or other authorities for safety reasons; or
- Emergency work to avoid loss of life, property and / or material harm to the environment.

Vehicle movements shall be undertaken during standard construction hours (or just before to allow workers to get to site). Oversize vehicles up to 26 metres long may require access to the site after hours however this would be subject to the requirements of Roads and Maritime, Gunnedah Shire Council or NSW Police.

Normal Operations

Daily operations and maintenance by site staff would be undertaken during standard working hours:

- Monday to Friday: 7am to 6pm
- Saturday: 7am to 4pm
- Sunday and Public holidays: No work

During normal operations, all vehicle movements shall be undertaken during the standard operating hours (or just before to allow workers to get to site). There may be a requirement for vehicles to access the site after hours during an emergency however these would be infrequent.

Vehicles which arrive at the site prior to commencement of working hours shall have the engine turned off to minimise noise impacts on surrounding residences.

1.5 Transport Routes

All vehicles must travel to and from the project site via the approved route as shown below (Figure 1 Heavy vehicles and Figure 2 Light vehicles).



Figure 1 - Transport route to/from the site for HEAVY vehicles.

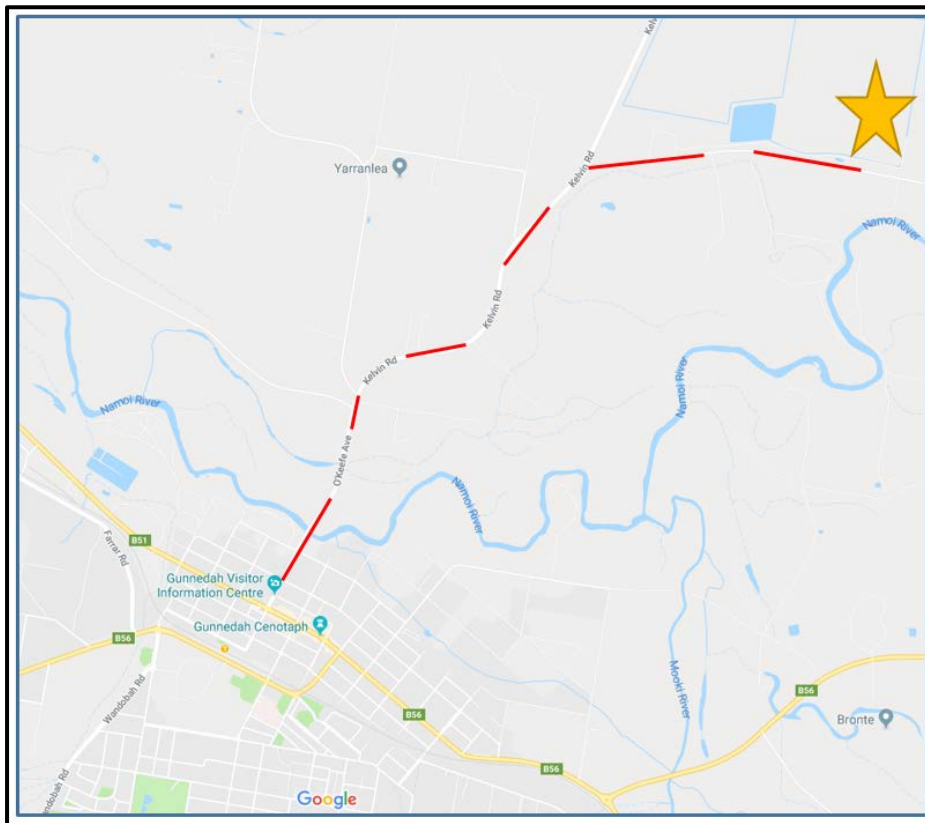


Figure 2 - Transport route to/from the site for LIGHT vehicles

1.6 Vehicle Departure and Arrival

Heavy vehicles departing the site shall have a minimum 5 minute separation to reduce the impacts upon the local road network.

Always maintain a minimum separation of at least 50 metres between vehicles when travelling within the site.

Drivers must contact the site supervisor upon arrival and await further instructions or direction before proceeding.

Drivers must also report to the site supervisor prior to departure.

All vehicles must enter and exit the site in a forward direction. Vehicles are to be washed down and in a clean condition upon exiting the site to prevent dirt being tracked onto the public road network.

1.7 Overtaking

Overtaking shall not be permitted within the site unless the intention to overtake has been communicated to the driver of the leading vehicle and consent to overtake granted.

1.8 Breakdowns and Incidents

Heavy Vehicles

In the case of a breakdown, the vehicle must be towed to the nearest breakdown point as soon as possible. All breakdowns must be reported to the RMS Transport Management Centre on 131 700 and the vehicle protected in accordance with the Heavy Vehicle Drivers Handbook. The relevant shift manager on site shall also be notified.

If a breakdown occurs on-site please remain inside your vehicle, notify the shift manager of your location and await further instruction.

If you are involved in an accident, please notify the shift manager immediately and contact emergency services if required.

Light Vehicles

In the case of a breakdown, ensure that the vehicle is secure, notify the shift manager of your location and await further instruction.

If you are involved in an accident, please notify the shift manager immediately and contact emergency services if required.

1.9 Penalties and Disciplinary Action

Any driver who fails to comply with the above requirements will have their details recorded and may be subject to disciplinary action.

1.10 Emergency Contact Numbers

i)	RMS Transport Management Centre	131 700
ii)	Gunnedah Shire Council	(02) 6740 2119
iii)	NSW Polic Service (Griffith)	(02) 6742 9099
iv)	Site Office	_____
v)	Shift Manager on Duty	_____

1.11 Driver Declaration

I, the undersigned, hereby agree to abide by this Driver Code of Conduct for the transport of equipment or personnel to / from the Gunnedah Solar Farm, located off Orange Grove Road, Gunnedah, NSW. I have read and understand the requirements outlined in the attached document and will, to the best of my ability, comply and assist with their implementation, requirements or ongoing administration.

The subject document to which this declaration relates is included as part of this overall document and signing of this declaration confirms that the signee has read and understood their requirements as outlined throughout.

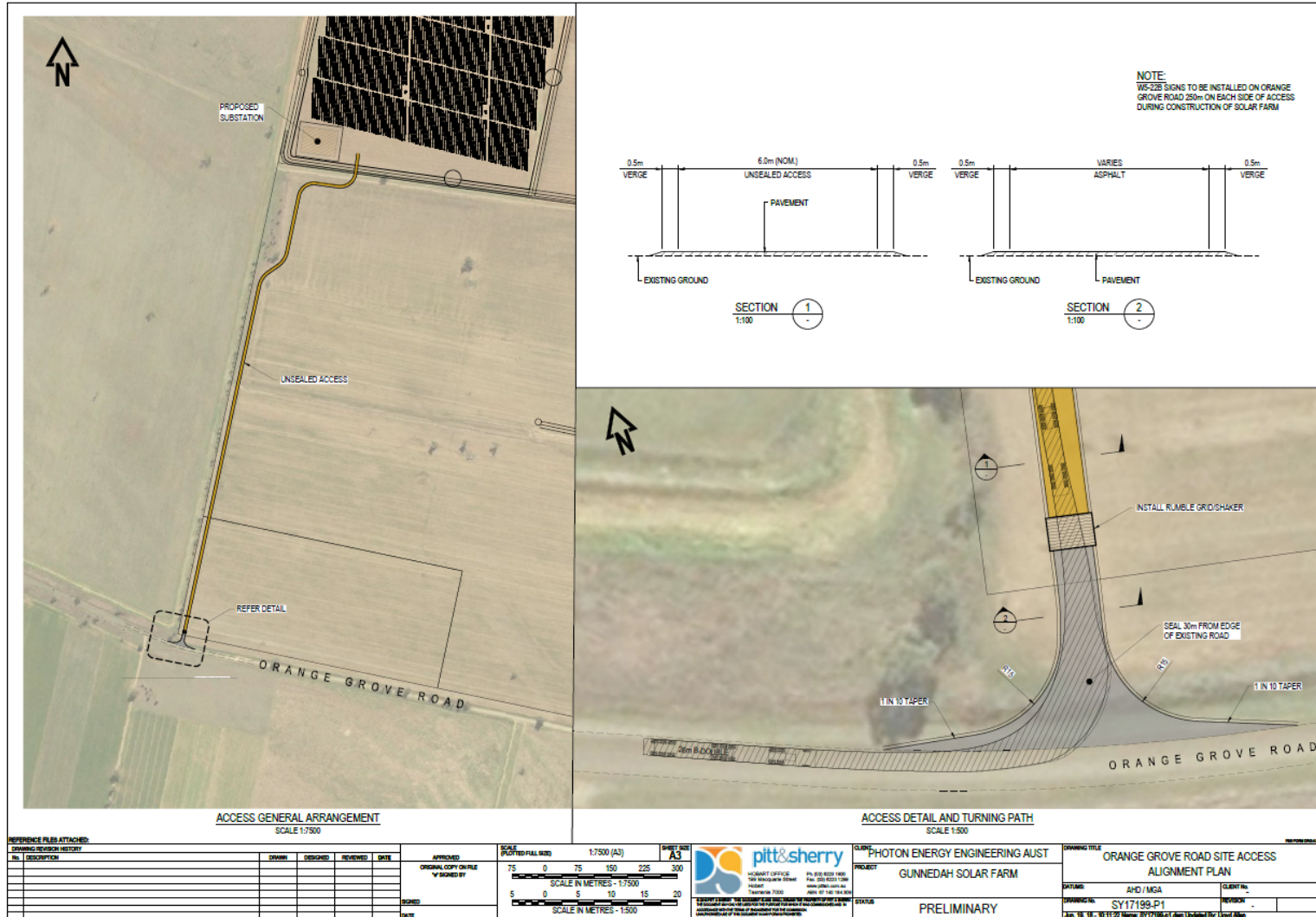
Driver Details

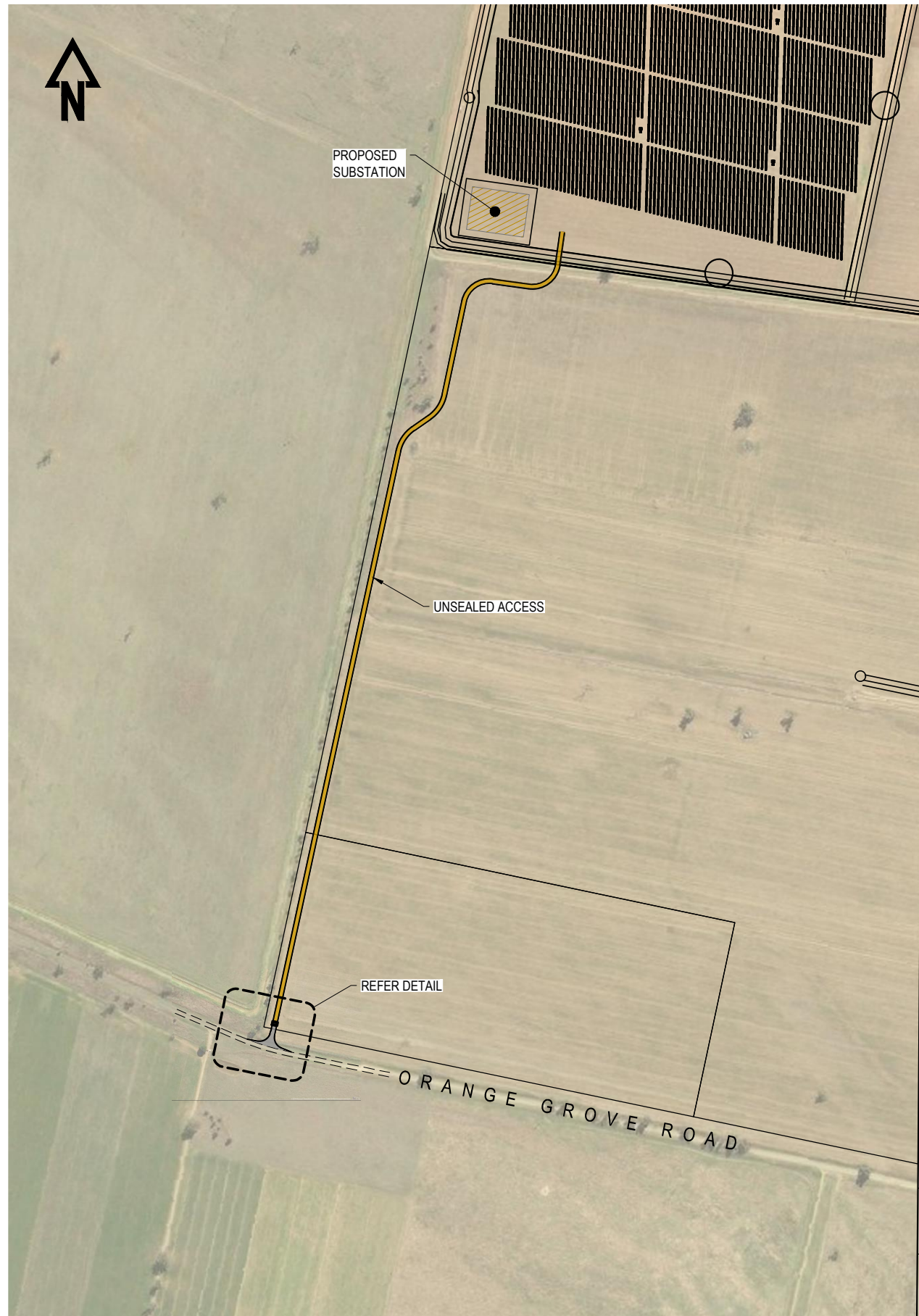
Full Name	
Organisation	
Signature	
Date	

Representative of:

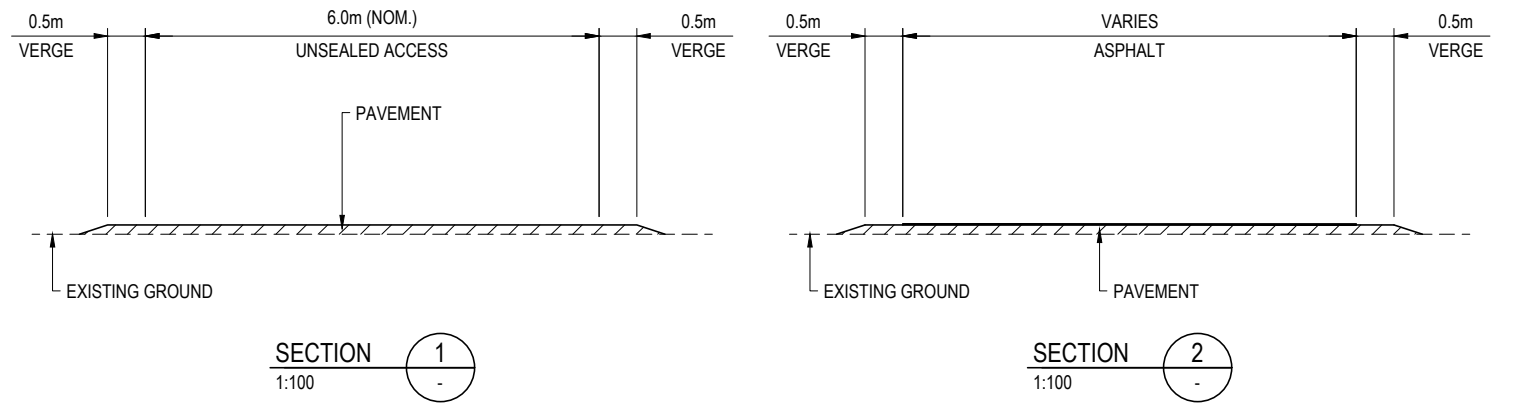
Full Name	
Signature	
Date	

Appendix C. Orange Grove site access alignment plan

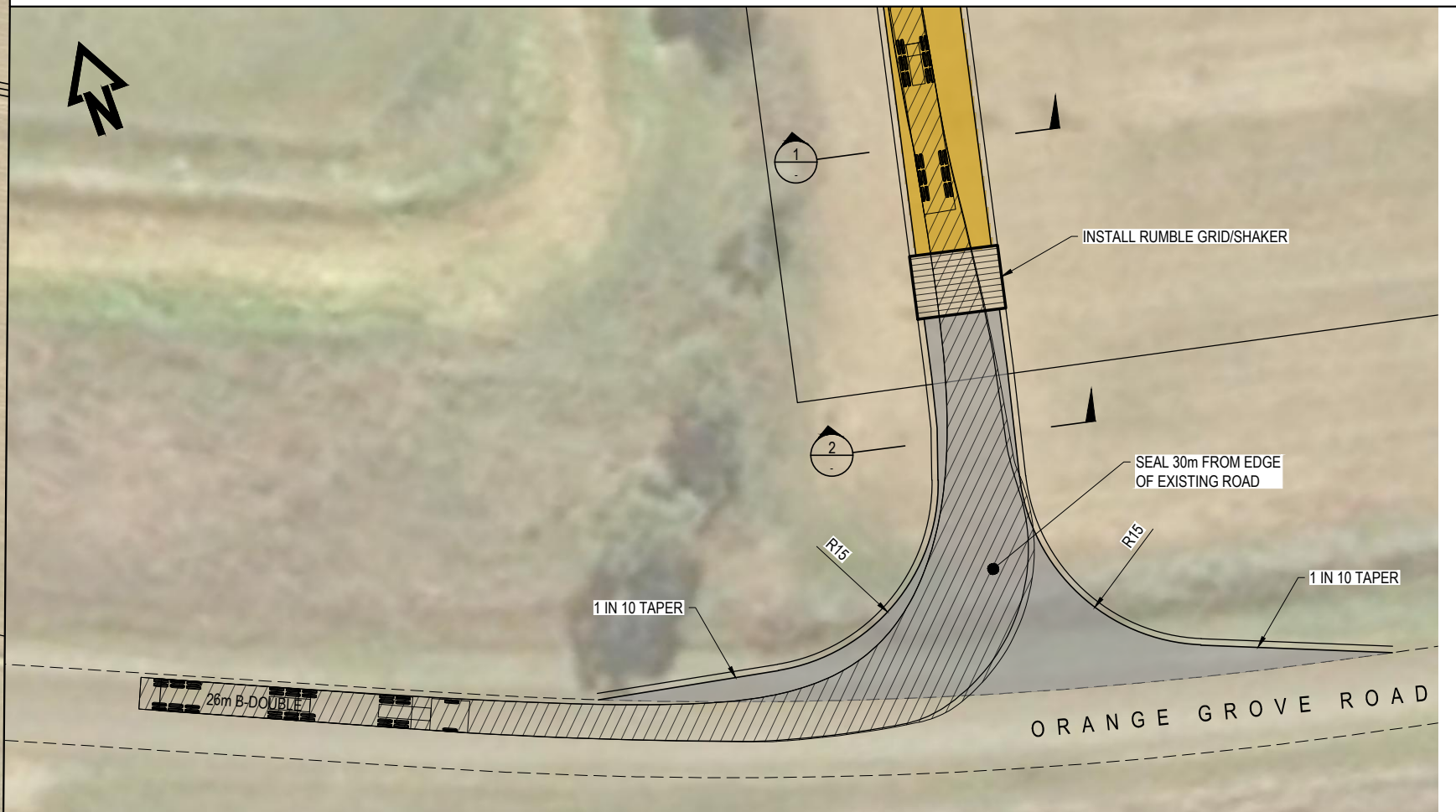




ACCESS GENERAL ARRANGEMENT
SCALE 1:7500



NOTE:
W5-22B SIGNS TO BE INSTALLED ON ORANGE GROVE ROAD 250m ON EACH SIDE OF ACCESS DURING CONSTRUCTION OF SOLAR FARM

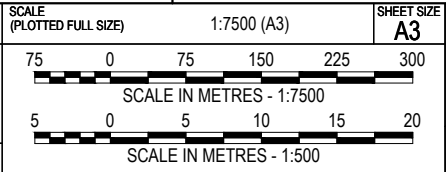


ACCESS DETAIL AND TURNING PATH
SCALE 1:500

REFERENCE FILES ATTACHED:

DRAWING REVISION HISTORY					
No.	DESCRIPTION	DRAWN	DESIGNED	REVIEWED	DATE

APPROVED	
ORIGINAL COPY ON FILE "e" SIGNED BY	
SIGNED	
DATE	



pitt&sherry

HOBART OFFICE
199 Macquarie Street
Hobart
Tasmania 7000

Ph. (03) 6223 1800
Fax. (03) 6223 1299
www.pittsh.com.au
ABN: 67 140 154 309

© 2016 PITT & SHERRY. THIS DOCUMENT IS AND SHALL REMAIN THE PROPERTY OF PITT & SHERRY. THE DOCUMENT MAY ONLY BE USED FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED AND IN ACCORDANCE WITH THE TERMS OF ENGAGEMENT FOR THE COMMISSION. UNAUTHORISED USE OF THIS DOCUMENT IN ANY FORM IS PROHIBITED.

CLIENT	PHOTON ENERGY ENGINEERING AUST
PROJECT	GUNNEDAH SOLAR FARM
STATUS	PRELIMINARY

DRAWING TITLE		ORANGE GROVE ROAD SITE ACCESS ALIGNMENT PLAN	
DATUMS:	AHD / MGA	CLIENT No.	
DRAWING No.	SY17199-P1	REVISION	
Jun. 19, 18 - 10:11:22 Name: SY17199-p1.dwg Updated By: Lloyd Allen			

Revised Subdivision Plan

Changes are proposed to the subdivision as presented in Section 4.5.7 of the EIS.

Existing subdivision of land is depicted in Figure 1. This revised subdivision plan identifies an additional subdivision of 4800m² on part of Lot 264 DP754954 containing the TransGrid substation. The need for this additional subdivision is to provide a separate lot to be owned by TransGrid to contain the substation.

Advice was sought from the Department of Planning by the consulting surveyor in relation to the exclusion of a lot for the TransGrid substation (27/06/2018). It was advised that this exclusion would be acceptable under SEPP Exempt and Complying Development Codes 2008, Clause 2.75 – Subdivision.

Under subclause (f) of the clause, land can be excised from a lot that is, or is intended to be, used for public purposes. Because the site currently comprises 6 lots, and even with a separate lot for the substation the final layout will be 3 lots, there are no new lots being created.

As such the following subdivision is proposed:

- Lot 1 – comprising the TransGrid substation which is estimated to occupy a 60m x 80m footprint and as such the lot would be 4800m². This lot would comprise part of Lot 264 DP 754954.
- Lot 2 – comprising the Gunnedah Solar Farm and access road which is estimated to occupy 304ha. This lot would comprise parts of Lot 1 DP 1202625, Lot 153 DP 754954, Lot 264 DP 754954, Lot 2 DP 801762, Lot 151 DP 754954 and Lot 1 DP 186590.
- Lot 3 – comprising the remaining land associated with the Property to occupy 200ha and be reconfigured into a single lot in accordance with Gunnedah Shire Council request. This lot would comprise:
 - Approximately 93ha of Lot 1 DP 1202625
 - Approximately 165ha of Lot 153 DP 754954
 - Approximately 14ha of Lot 264 DP 754954
 - Approximately 40ha of Lot 2 DP 801762
 - Approximately 114ha of Lot 151 DP 754954
 - Approximately 151ha of Lot 1 DP 186590.

The proposed revised subdivision plan layout is provided in Figure 2.

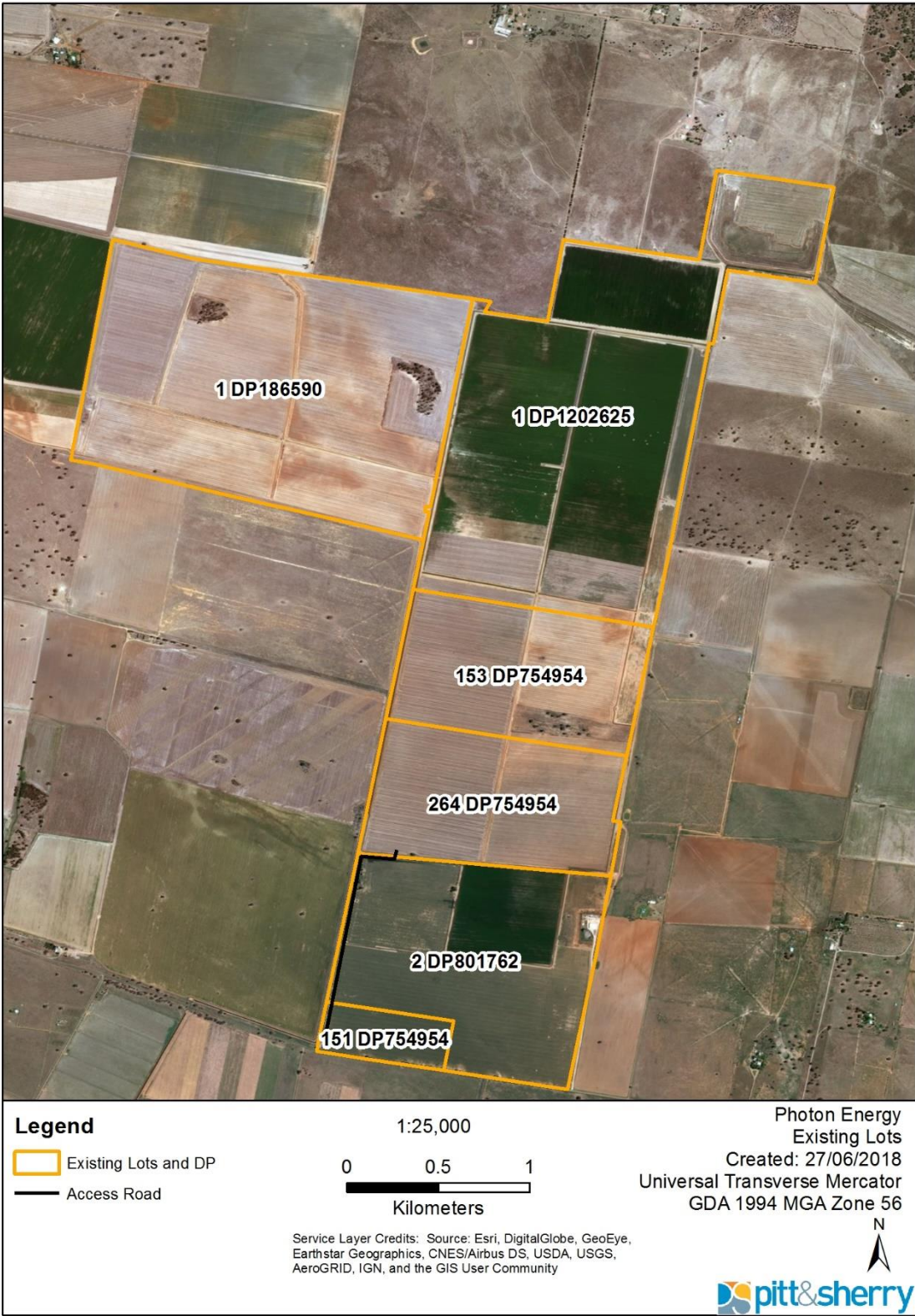
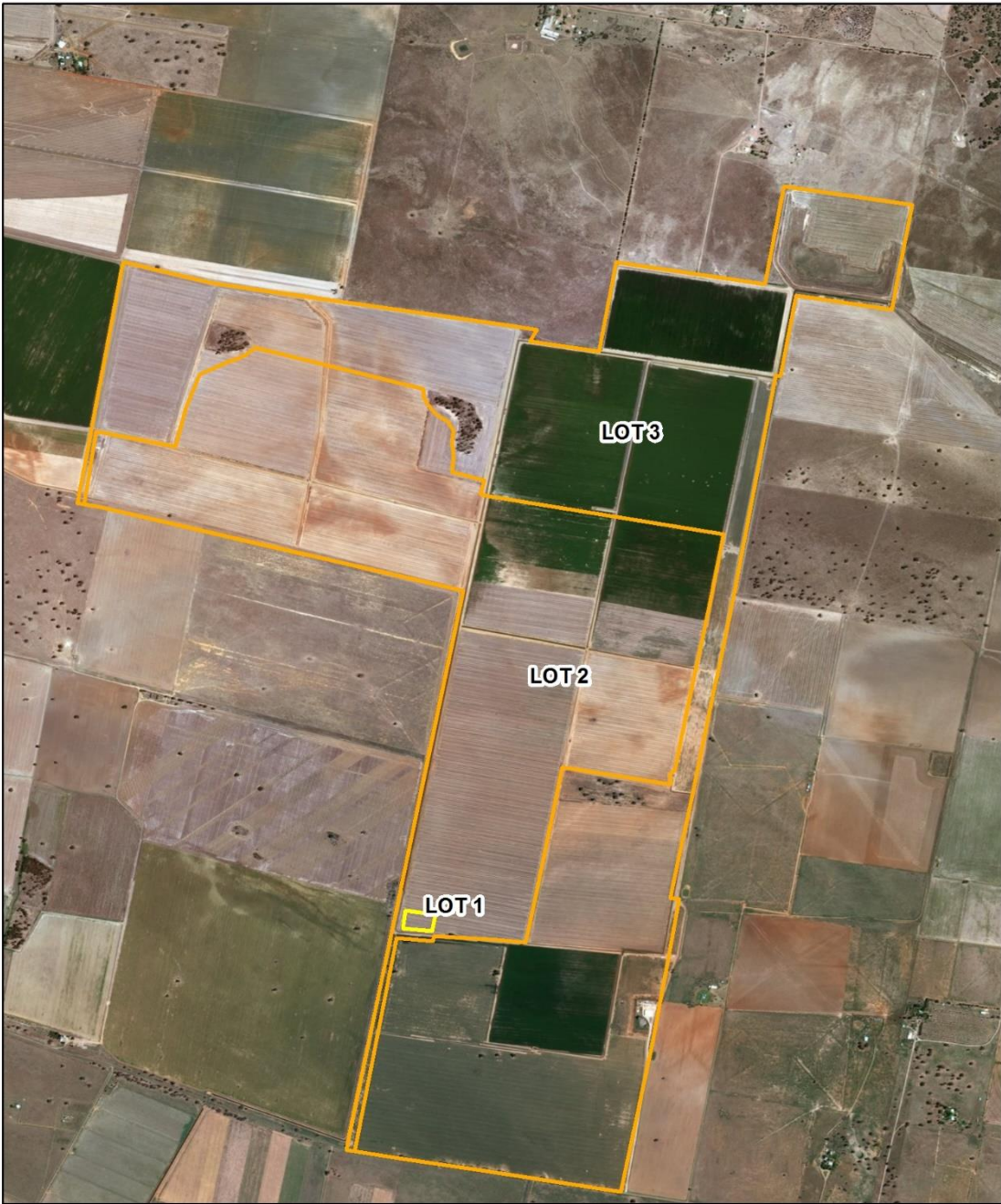


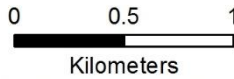
Figure 1 Existing subdivision layout of the Site



Legend

- Lot 1 (Proposed substation)
- Lot 2 (Gunnedah Solar Farm and access road)
- Lot 3 (Remaining land)

1:25,000



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

Photon Energy
 Proposed Solar Farm Layout
 Created: 27/06/2018
 Universal Transverse Mercator
 GDA 1994 MGA Zone 56



Figure 2 Revised subdivision plan layout

Revised Land Use Conflict Risk Assessment (LUCRA)

Risk Evaluation, which considers the probability (P), consequence (C) of the activity and the residual risk rating (RRR). Definitions of probability and consequence are outlined in the Land Use Conflict Risk Assessment Guide' (Department of Trade and Investment, 2011)

Activity	Identified Potential Conflict	Mitigating factors	P	C	RRR
Use of Agricultural Land	<p>Impacts to agricultural land are summarised below:</p> <ul style="list-style-type: none"> Disturbance to protected agricultural land uses (Good Quality Agricultural Land, Strategic Cropping Land and Priority Agricultural Land Uses) Loss of productive agricultural land for the life of the proposal (expected to be approximately 25 years). This loss of agricultural activity would occur within the direct footprint only Potential changes to soil properties. 	<ul style="list-style-type: none"> The solar farm will cover approximately 38% of the Subject Land and the remaining area will continue to be used for cropping agriculture Managed grazing will be used to maintain the height of ground cover during operation of the Proposal. So, the land can continue to be used for agricultural purposes but represents a change from cropping agriculture to grazing agriculture albeit at a reduced capacity to grazing of the site without solar panel infrastructure Except for limited and short-term earthworks associated with construction and operational use of internal tracks the majority of the soil surfaces would not be impacted by the development in the long term; no large areas of reshaping or excavation are proposed The solar farm will help rest the land and allow the nitrogen content of the soil to rise naturally The development has a reversible nature so the land can be returned to its former agricultural use at the end of the operational period Preparation of a land management plan as part of the EIS to determine how the land will be managed during operation of the solar farm so it can go back into agricultural production upon decommissioning. 	C	4	8
Adjacent land use activities	<p>Impacts to solar farm operations from neighbouring land use are summarised below:</p> <ul style="list-style-type: none"> Agricultural activities such as lime, fertiliser and pesticide application may result in the dispersal of dust and/or agricultural products on to solar panels 	<p>The <i>Right to Farm Policy</i> (2015) was formed to ensure farmers could undertake lawful agricultural practices without conflict or interference arising from complaints from neighbours and other land users.</p> <p>The main objective of this policy as described in the <i>Right to Farm Policy Summary</i> document is to 'reduce the number of complaints and legal</p>	B	5	7

Activity	Identified Potential Conflict	Mitigating factors	P	C	RRR
	<ul style="list-style-type: none"> Dust generation caused by agricultural cultivation activities 	<p>claims made against farmers, while preserving the rights of legitimate complaints' (NSW Department of Primary Industries 2015).</p> <p>GSF fully appreciates the implications of installing and operating solar infrastructure adjacent to land where agricultural practices occur. Consideration of neighbouring activities will be taken during the preparation of the Operational Environment Management Plan.</p> <p>It is anticipated that compliant agricultural operations undertaken in proximity of the Solar Farm will not have significant impacts on the operation and functionality of the solar farm. Operational maintenance of the solar panels will address short term potential impacts of dust and spray drift from neighbouring practices.</p> <p>The Yearly Update 2019-17 report on the Right to Farm Policy provided by the Department of Primary Industries found that 'there is limited evidence from the survey or interviews that agricultural land use conflict is having an adverse impact on agriculture'.</p> <p>GSF undertook consultation with nearby landholders during preparation of the EIS and will continue to consult with these landholders during operation of the solar farm to ensure successful operations within the agricultural setting.</p>			
Use of land with mineral resources	<p>Impacts to land with mineral resources are summarised below:</p> <ul style="list-style-type: none"> The potential exploration, assessment or extraction of minerals onsite would be impeded by the solar farm for a 25-year period. 	<ul style="list-style-type: none"> The proposal is expected to have a 25-year operational period and as the inground infrastructure will be relatively shallow (<4m) and all the infrastructure will be removed upon decommissioning no long-term mineral exploration impacts are expected and the land could be explored upon decommissioning Mining titleholders have been contacted and both have confirmed that they have no immediate plans to develop the area (refer Section 5 of the EIS). 	D	3	9

Activity	Identified Potential Conflict	Mitigating factors	P	C	RRR
Land use change	Change from cropping agriculture to electricity generation coupled with grazing agriculture.	<ul style="list-style-type: none"> The site has only been used for cropping for the last 20 years. Prior to that it was used for grazing land. The proposal will revert the land to a former use whilst adding a new land use The development is reversible and the land can be returned to its former use upon decommissioning. 	C	4	8
Visual	<p>Visual impact to sensitive receivers nearby and loss of scenic agricultural views.</p> <p>The proposed development has a variable level of visibility but the EIA process has identified two public viewpoints and 22 potentially affected private viewpoints.</p> <p>The majority of these residences have some localised vegetation screening around their properties. On-site there is a temporary residential dwelling and sheds for storing agricultural equipment. The residence is located onsite and faces Orange Grove Road. The property is surrounded by native trees with current views towards the Site.</p> <p>The change in the use of the land provides a moderate impact visual transition between commercial electricity generating uses and agricultural areas and includes changes to general amenity and the character of the landscape.</p>	<ul style="list-style-type: none"> The mitigation measures required to alleviate visual impacts are provided in Section 6.4 of the EIS. Updated mitigation measures are provided in Appendix B of the RTS report. 	B	3	17
Flooding	Concerns about the effect the solar panels will have on the direction and flow of the flood waters.	<ul style="list-style-type: none"> The most significant influence on the flood levels associated with the Solar Farm is the fencing, and the degree of blockage caused by flood debris. A number of configurations were modelled to identify 	C	2	18

Activity	Identified Potential Conflict	Mitigating factors	P	C	RRR
		<p>a suitable fencing configuration that would meet both the public safety and security requirements whilst minimising flood impacts upon sensitive receivers and the environment</p> <ul style="list-style-type: none"> Flood modelling results and mitigation measures are detailed in Appendix J of the EIS. Updated flood modelling is provided in Appendix C of the Gunnedah RTS report. 			
Fencing	Visual impact of fences on local amenity. Perimeter fences up to 2.5 m high will be constructed around the Proposed Development.	<ul style="list-style-type: none"> Visual amenity impacts and mitigation measures are detailed in Section 6.4 of the EIS. Updated mitigation measures are provided in Appendix B of the Gunnedah RTS report. 	D	3	9
Impact on public roads	<p>Increase in heavy vehicle movements on local roads due to construction traffic.</p> <p>Impact of construction traffic along school bus routes.</p>	<ul style="list-style-type: none"> Construction traffic management mitigation measures are detailed in Section 6.6 of the EIS. Updated traffic mitigation measures resulting from public exhibition submissions are provided in Appendix B of the Gunnedah RTS report. Updated traffic Impact Assessment resulting from public exhibition submissions is provided in Appendix D of the Gunnedah RTS report. 	C	3	13
Property	Potential decrease in land and property values.	<p>The impacts of a solar farm on neighbouring property values has not been studied in-depth however there have been numerous studies on the impacts of wind generation on neighbouring property values in the United States (<i>Hoehn et al., 2010; Hoehn et al. 2015; Vyn and McCullough 2014</i>). These studies found the impact of wind energy generation on neighbouring property values to be negligible. As solar farms, do not have the same impacts as wind farms the impacts on property values caused by solar farms are anticipated to be less than the impacts of wind farms.</p>	D	2	14

Activity	Identified Potential Conflict	Mitigating factors	P	C	RRR
Aviation	<ul style="list-style-type: none"> Perceived glare impacts Impact to the flight path Tall infrastructure may present a direct hazard to aircraft. 	<ul style="list-style-type: none"> Glare impacts are assessed in Section 6.4 of the EIS. The Proposal is approximately 9km east of the Gunnedah aerodrome and not runway aligned The majority of the infrastructure is low-lying (approximately 4.0m tall). The tallest component would come from the lightning pole which is expected to be approximately 22m tall and as such would not impact the flight path or present a direct hazard to aircraft. Consultation with Gunnedah Airport and CASA is discussed in Section 5 of the EIS. 	D	4	5
Noise	<p>Noise will impact sensitive receivers during the construction period (approximately 12 months). Construction activities will be limited to standard working hours:</p> <ul style="list-style-type: none"> Monday to Friday, 7am to 6pm Saturday, 8am to 1pm No construction work is to take place on Sundays or public holidays. <p>Construction noise and associated impacts are discussed in Section 6.5 of the EIS.</p>	<ul style="list-style-type: none"> The mitigation measures required to alleviate noise impacts are provided in Section 6.5 of the EIS. 	C	3	13
	<p>Noise will impact sensitive receivers during operation due to the presence of a substation onsite.</p> <p>Operational noise and associated impacts are discussed in Section 6.5 of the EIS.</p>	<ul style="list-style-type: none"> The mitigation measures required to alleviate noise impacts are provided in Section 6.5 of the EIS. 	C	3	13
Weed and Pest management	<p>The proposal has the potential to introduce disease, weeds, vermin or destructive influences to the site.</p> <p>Weed and pest control at the Site is the responsibility of the Proponent. The risk from</p>	<ul style="list-style-type: none"> A Land Management Plan which includes weed management shall be developed and incorporated into a CEMP and OEMP to prevent further weed dispersal into retained native woodland habitats. 	D	4	5

Activity	Identified Potential Conflict	Mitigating factors	P	C	RRR
	noxious weeds and pests is low but would be subject to ongoing monitoring and management.				
Use of pesticides	<p>Pesticides may be used to control weeds at the site to ensure that the land can be returned to agricultural use upon decommissioning.</p> <p>The distance from neighbouring properties means the potential conflict is assessed as low.</p>	<p>Vegetation management practices will be implemented to minimised pesticide use such as:</p> <ul style="list-style-type: none"> • The use of sheep to graze between the panel rows to manage vegetation loads • Applying pesticides in accordance with the <i>Pesticides Act 1999</i>, such that only registered pesticides are used based on label instructions that are designed to minimise impacts on surrounding land. 	D	5	2