9 October 2020

Tatsiana Bandaruk
Department of Planning, Industry and Environment
4 Parramatta Square,12 Darcy Street
PARAMATTA NSW 2150

tatsiana.Bandaruk@planning.nsw.gov.au
Cc: iwan.davies@planning.nsw.gov.au

Dear Ms Bandaruk,

Re: Culcairn Solar Farm (SSD-10288) – Request to submit Amendment

I refer to your email dated 4 September 2020 requesting to update our application.

Following numerous discussions with the NSW DPIE and to address ongoing concerns from the Council and project neighbours after the lodgement of the Response to Submissions Report, Neoen has made the decision to significantly reduce the size of the Culcairn Solar Farm.

The new development footprint is 892 hectares, reduced from the original 1256 hectares in our Scoping Report. To achieve this reduction, the land north of Cummings Road is now excluded from the development application. According to the Agricultural Impact Statement prepared by Riverina Agriconsultants (Appendix A of the Amendment Report), this land is *"generally more productive due to the presence of more fertile soil on the Billabong Creek floodplain"* and has *"a higher production potential than the other two farms".*

Consequently, the following lots have been removed from the proposed development:

- Lots 9-11 DP 753735,
- Lot 1 DP 179854,
- Lot 114 DP 664997.

The updated project layout is presented in Appendix A and the updated regional context map is provided in Appendix B.

Furthermore, I would like to clarify the following items as requested by the NSW DPIE:

Project capacity

The proposed Culcairn Solar Farm would have a total installed capacity of up to 350 MW (AC). Despite the footprint reduction, this capacity could still be achieved as solar technology continues to improve. This represents approximately 900,000 modules.

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Distance from receivers to the project

Label	Distance Project Site (m)	Distance Development Footprint (m)	Distance Closest panel (m)	Distance Closest Inverter (m)	Distance Substation (m)	Distance BESS (m)
R01	4231	4234	4272	4456	5753	5899
R02	4430	4431	4476	4666	6048	6225
R03	2419	2428	2650	2861	4363	4569
R04	3056	3065	3308	3514	4989	5195
R05	4058	4067	4332	4508	5937	6148
R06	4240	4248	4514	4689	6118	6328
R07	2460	2468	2740	2907	4340	4550
R08	1623	1631	1901	2053	3482	3692
R09	499	502	585	703	1846	2059
R10	2153	2159	2262	2349	3521	3730
R11	3069	3072	3145	3249	4290	4490
R12	2961	2974	3010	3182	4080	4231
R13	2005	1548	2088	2209	3425	3471
R14	213	248	308	485	1661	1686
R15	2447	1989	2687	2867	4311	4318
R16	2685	2784	3118	3249	6153	6038
R17	629	863	1157	1308	4253	4107
R18	1143	1467	1649	1792	4401	4218
R19	250	341	363	556	3017	2835
R20	1758	1896	1909	2053	4465	4299
R21	2041	2181	2194	2353	4778	4614
R22	2085	2239	2252	2409	4860	4700
R23	2684	2797	2843	3023	4882	4811
R24	343	383	498	665	1560	1525
R25	1729	1764	1832	2009	3485	3484
R26	1714	1746	1806	1997	3521	3543
R27	1442	1463	1501	1697	3218	3280
R28	1440	1442	1481	1667	3099	3195
R29	1361	1372	1401	1585	2905	3039
R30	1994	1996	2034	2222	3518	3661
R31	1858	1859	1898	2082	3391	3560
R32	958	1109	1144	1330	3661	3540
R33	121	127	249	358	1429	1315
R34	297	300	385	589	1580	1595

Justification for the size of the project

- The site has a number of obstructions that Neoen has to avoid (e.g. diagonal transmission lines, gas pipeline). This increases the development footprint figure while no solar panels are being installed within these corridors.
- Neoen is not only a developer but a long-term owner therefore development choices, notably distance between the single axis tracker rows, are made to ensure the best operational outcome. Reducing the distance between the rows leads to a reduction of the electricity production and therefore increases the cost of the electricity that the client and eventually consumer will have to pay.
- The ratio ha/MWac at Culcairn Solar Farm is within the current norm.
- With regard to cumulative impact, Neoen notes that the combined development footprint of Walla Walla Solar Farm (SSD-9874), Jindera Solar Farm (SSD-9549) and Culcairn Solar Farm is less that the development footprint of the New England Solar Farm (SSD-9255).
- As for the concern around conflict of land use, it will be mitigated with sheep grazing. Sheep grazing is occurring on all Neoen operating solar farms in NSW and Victoria (see Appendix C).
- Finally, it should be noted that Neoen has reduced the project development footprint by almost one third since it started the SSD planning process.

Vegetation screening

The vegetation screening will be a mix of mid and upper stratum species, set out similar to the Concept Landscape Plan provided within our Response to Submissions report. Neoen would like to clarify that a minimum of two rows will be planted.

Biodiversity and heritage impacts

A summary of changes to the biodiversity and heritage impacts are provided in Appendix D. This includes the revised biodiversity credit obligations, an updated summary table of the heritage sites to be impacted, the updated credit report for paddocks trees and the updated Heritage Impact maps. The full revised BDAR is included in Appendix G.

Land to be developed

- Lots 70-73, 86 DP 753764
- Lots 45-47, 53, 54 DP 753735
- Lot 1 DP 575478
- Lot 1 DP 171815
- Lot 1 DP 945904
- Lot B DP 972054.

Traffic Impact Assessment

A revised traffic impact assessment is provided in Appendix E.

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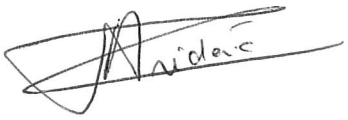
Subdivision

A revised subdivision figure is provided in Appendix F.

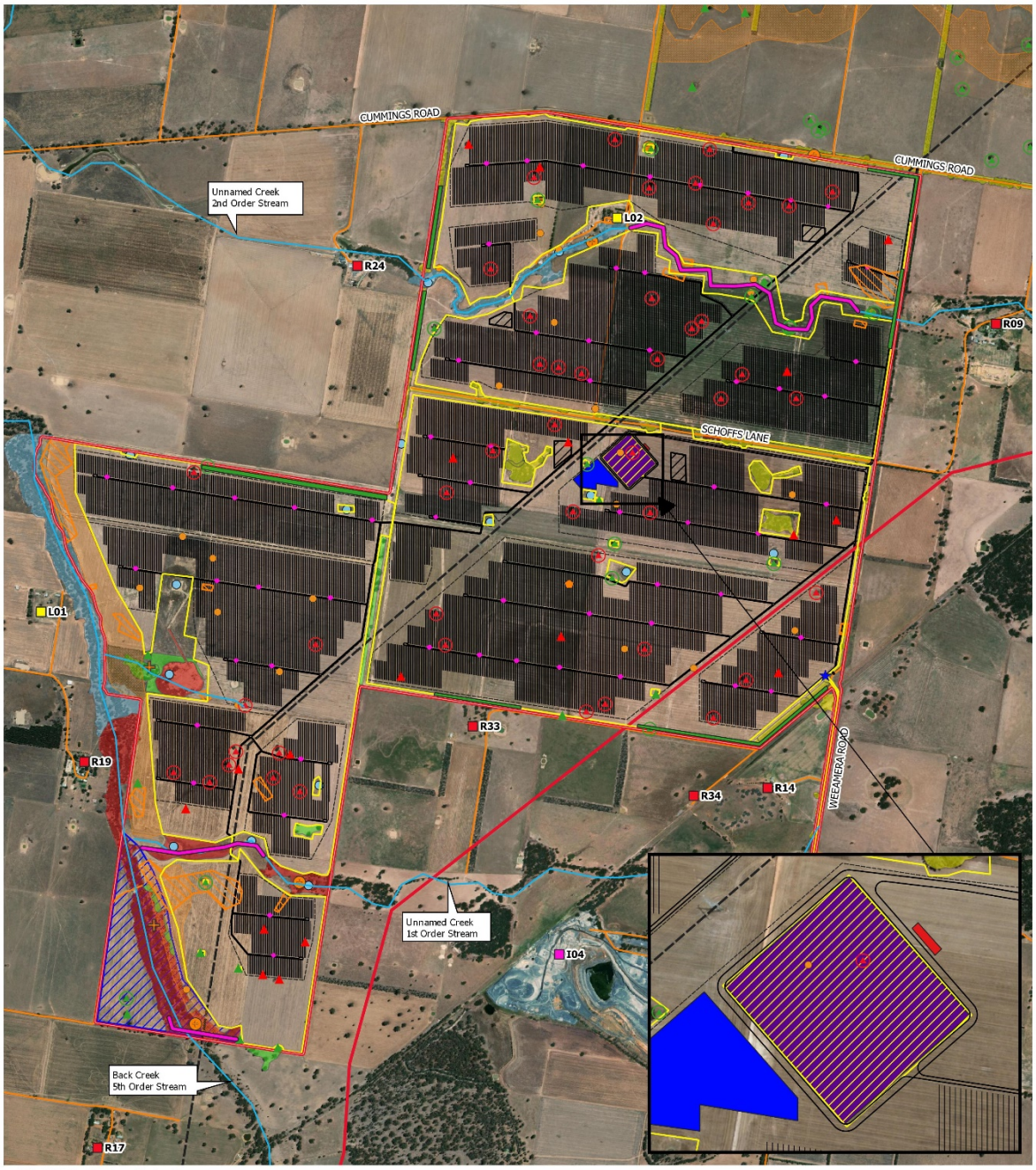
I trust the information provided will enable you to finalise the assessment of this proposal, however, should you have any further questions please do not hesitate to contact me.

Yours sincerely,



Anne Frederic
State Leader NSW
Neoen Australia

Appendix A



18-441 Culcairn Solar Farm
Culcairn Solar Farm Constraints Layout

Legend

Project Components
- Project Site
- Development Footprint
- Substation
- BESS
- Control Building
- Inverters
- Construction Compound

Subdivision
- Agricultural (32 ha)
- Substation (4 ha)
- Proposed Access
- Internal Access Network
- Fences
- PV Array

Existing Components/Features
- Existing Transmission Line
- Gas Pipeline
- Public Roads
- Waterways
- Dams

Proposed Vegetative Screening
- Visual Screening
- Biodiversity/Supplimentary Screening

Sensitive Receivers
- Associated Landowner
- Non-associated Landowner
- Industry

Archaeological Site Type
- Cultural Tree
- Modified Tree
- Isolated Find
- Cultural Object
- Artefact Scatter
- Potential Archaeological Deposits

Paddock Trees
- Hollow Bearing Retain
- Non-hollow Bearing Retain
- Hollow Bearing Remove
- Non-hollow Bearing Remove

Plant Community Types (PCT)
- PCT5: River Red Gum herbaceous-grassy very tall open forest woodland
- PCT74: Yellow Box - River Red Gum tall grassy riverine woodland
- PCT76: Western Grey Box tall grassy woodland
- PCT277: Blakely's Red Gum - Yellow Box Grassy Woodland

0 0.5 1 km

Data Attribution
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© Esri 2020

Ref: 200907 Culcairn SF \ Culcairn Solar Farm Constraints Layout
Author: D. Bambrick
Date created: 07.10.2020
Datum: GDA94 / MGA zone 55

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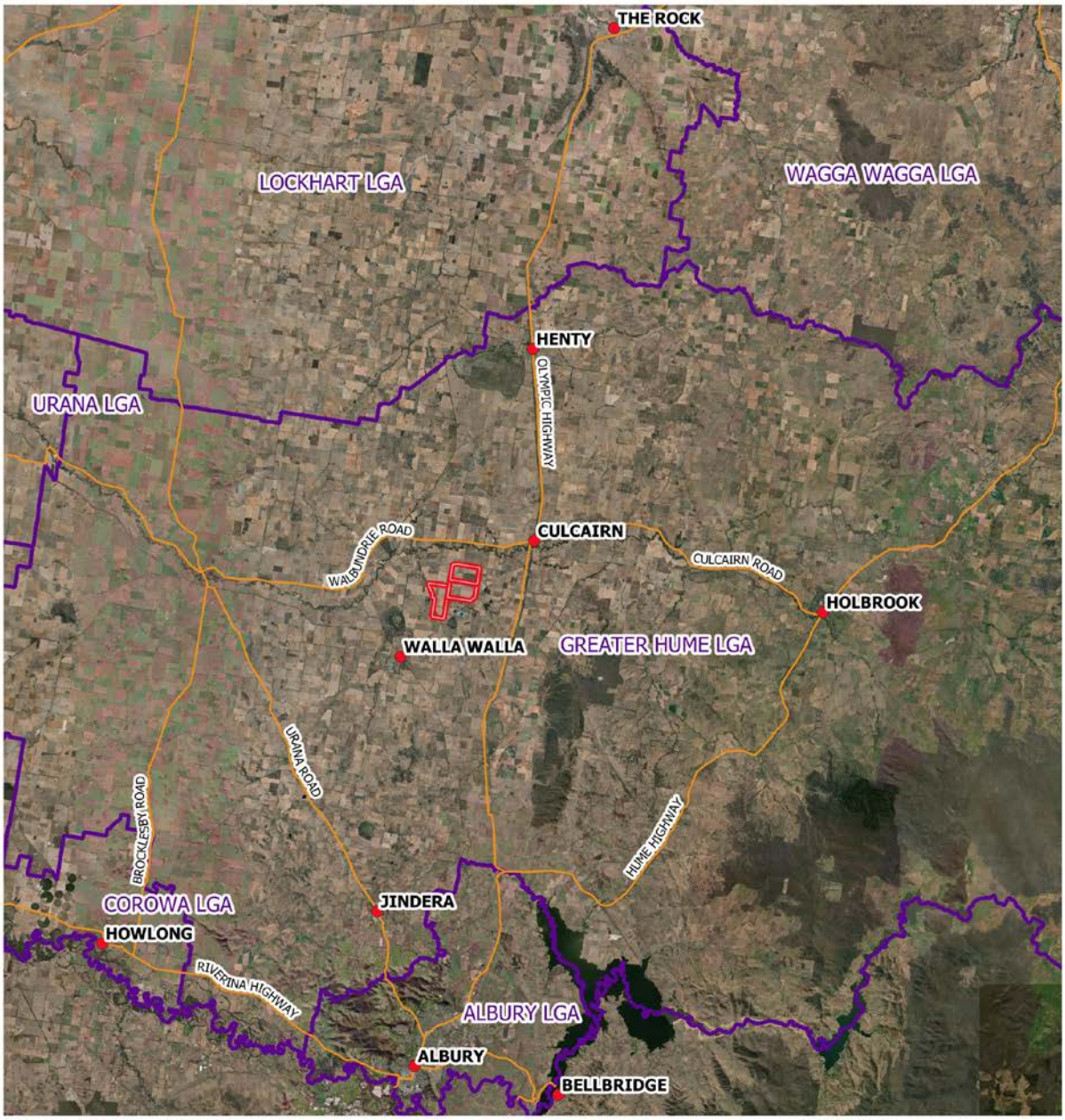
Appendix B



18-441 Culcairn Solar Farm
Culcairn SF Regional Context

Legend

- Subject Land
- NSW Local Government Areas
- NSW Major Roads
- Towns

0 7.5 15 km

Ref: 200907 Culcairn SF \ Culcairn SF Regional Context
Author: Sarah H
Date created: 07.10.2020
Datum: GDA94 / MGA zone 55

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Appendix C

Neoen's Leadership on Agrisolar
Combining Agriculture with Solar Farms

2017 Parkes Trial

Our first sheep grazing trial was conducted at Parkes Solar Farm in 2017 during a high rainfall and high produce year. It was a joint exercise between Neoen, local landowners and solar construction company Bouygues.

The 3 week trial involved 400 sheep within a 15 hectares zone to help reduce dry grass under the solar panels in order to manage grass fire hazard. It successfully showed that this combined land use had positive outcomes for farmers and solar operators.

2019 Expert Review

By 2019 sheep grazing had begun on all five of our operating solar farms in NSW and Victoria. These activities were assessed by an independent grazier expert to document existing practices and make recommendations on how to integrate grazing into each stage of the solar farm's lifecycle.

> *No change to the grazing productivity potential is expected…compared to as if the land did not host panels. This is explained by the fact that climate conditions are identical except that concentrated water occurs along the edges of the trackers with the potential of allowing for concentrated feed growth.*
>
> – Phil Graham, Livestock Specialist

2019 Dubbo Agrisolar

Tom Warren, host landowner at Dubbo Solar Hub has been grazing sheep on the land under the panels since 2018 and has learnt from this experience about how to make this work well.

A short video about his experience can be viewed on YouTube by searching 'Dubbo Agrisolar'.

> *There are no issues with sheep-grazing co-existing with solar farms. Providing you have the right breed of merino or merino-cross and get stock numbers right, you can reach at least 80% of normal stocking rates. It's an opportunity and a win-win for farmers and renewable energy producers.*
>
> – Tom Warren, Farmer

CLEAN ENERGY COUNCIL

2020 CEC Agrisolar Report

We are leading a collaboration with the Clean Energy Council to bring together research, case studies and lessons from across the industry into a ground-breaking Agrisolar Report. This will help to guide and inform farmers, solar farm operators and government on how best to integrate agriculture and solar.

We are also continuing to explore other opportunities for combined land use including biodiversity and conservation, indigenous crops and carbon farming.

Appendix D

14 September 2020

Anne Frederic
State Leader NSW
Project Manager
Neoen
Level 10 - 227 Elizabeth Street
Sydney NSW 2000

anne.frederic@neoen.com

Dear Anne,

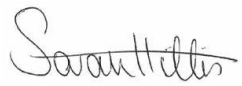
Re: 18-441 Culcairn Solar Farm updates September 2020

In consultation with DPIE the proposed Culcairn Solar Farm development footprint was reduced in September 2020. This included removal of the paddocks north of Cummings Road (Appendix A). The development footprint has been reduced from 1084 ha to 892 ha.

A summary of changes to the biodiversity and heritage impacts have been provided overleaf. This includes the revised biodiversity credit obligations and an updated summary table of the heritage sites to be impacted.

The updated credit report for paddock trees has been provided in Appendix B and the updated Heritage Impact maps in Appendix C.

Yours sincerely,



Sarah Hillis
Senior Environmental Consultant
0269 231 562
NGH

Biodiversity

Overview

Based on the revised development footprint (NGH, September 2020), the following changes have occurred:

- Paddock trees requiring offset has been reduced from 77 to 64. Of the further 13 paddock trees to be retained, 9 of these are hollow bearing. The number of hollow bearing trees has been reduced from 58 to 49. The credit obligations for paddock trees has been reduced from 73 to 61.
- Ecosystem credits for PCT 277 exotic understory have been reduced from 3 to 2. This is due to no longer requiring access across Cummings Road to the north. This has reduced the overall credit obligation for PCT 277 from 8 to 7.
- Species credits for each species have increased from 4 to 5. This has increased the overall credit obligation for species from 12 to 15.

The Credit Summary is provided in Appendix B.

Credit obligations

Updated paddock trees that require offset are provided in Table 1-1. Ecosystem and Species credits are provided in

Table 1-2 and Table 1-3.

Table 1-1 Paddock trees requiring offset. Updated 10/09/2020

Class of Paddock Tree being cleared	PCT	Number of trees with Hollows	Number of Paddock Trees to be cleared	Ecosystem credits required (paddock trees)
Class 3 >50cm DBH	**277**	35	46	44
Class 3 >50cm DBH	**76**	14	18	17
	TOTAL:	**49**	**64**	**61**

Table 1-2 Ecosystem credits requiring offset

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation Integrity Score	Vegetation integrity loss	Ecosystem credits required
5_Derived_Grassland	5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and	0.01	22.2	22.2	1

		the eastern Riverina Bioregion.				
277_derived_grassland	277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.03	23.5	23.5	1
277_exotic_understory	277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.13	31.3	31.3	2
277_native_understory	277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	0.16	47	47	4
					TOTAL:	**8**

Table 1-3 Species credits requiring offset. (No change)

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost (ha)	Species credits required
Small Scurf-pea *Cullen parvum*	2	0.2	5
Small Purple-pea *Swainsona recta*	2	0.2	5
Silky Swainson-pea *Swainsona sericea*	2	0.2	5
		TOTAL:	**15**

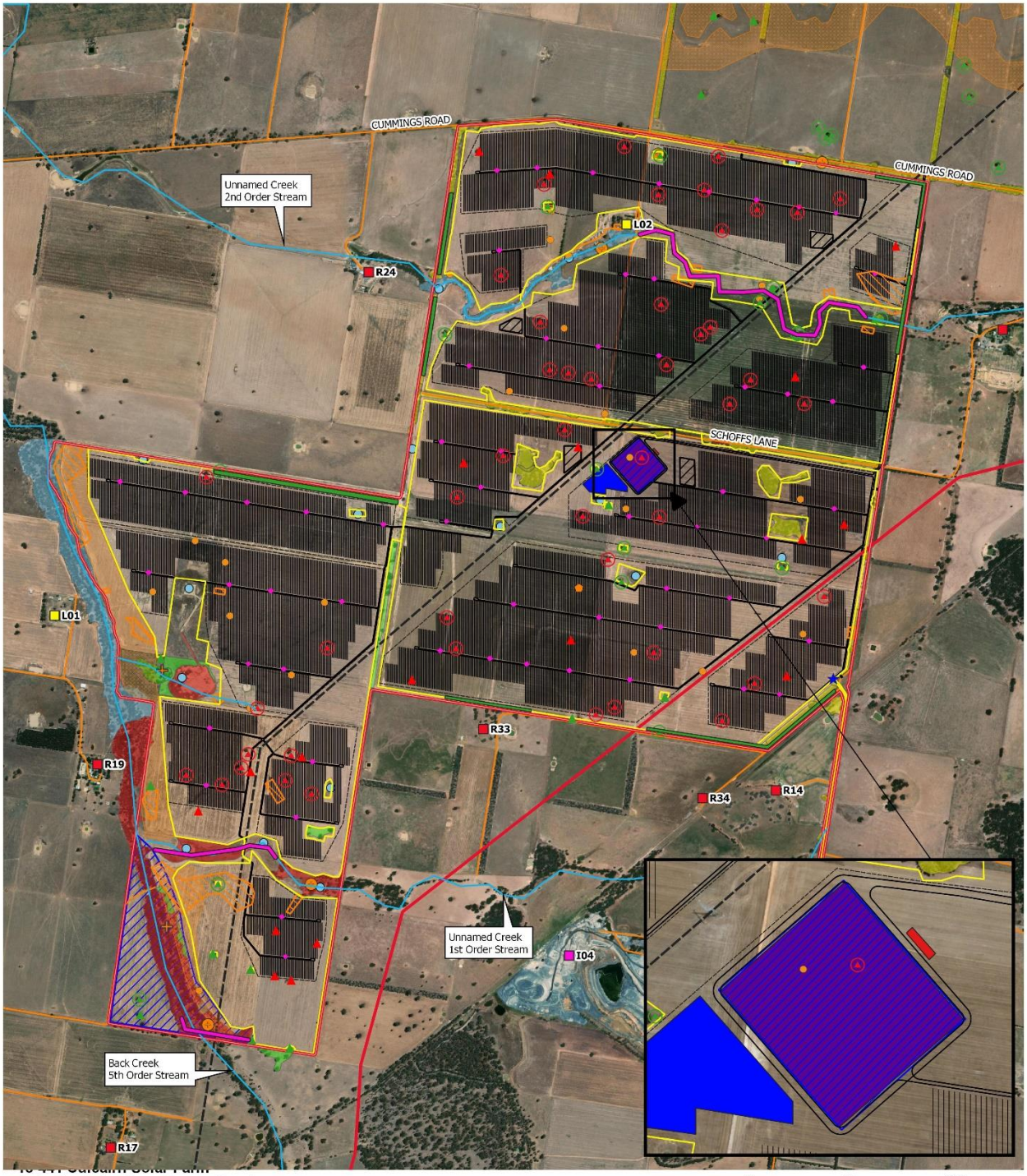
Heritage

The updated heritage sites to be impacted and avoided are provided in Table 2-1, with updated maps shown in Appendix C.

Table 2-1 Heritage sites to be impacted and avoided

Sites to be Avoided (No Harm)	Sites to be Impacted	Degree of Harm
Culcairn Solar IF1 (Isolated Artefact)	Culcairn Solar IF4 (Isolated Artefact)	Whole
Culcairn Solar IF2 (Isolated Artefact)	Culcairn Solar IF5 (Isolated Artefact)	Whole
Culcairn Solar IF3 (Isolated Artefact)	Culcairn Solar IF7 (Isolated Artefact)	Whole
Culcairn Solar IF6 (Isolated Artefact)	Culcairn Solar IF8 (Isolated Artefact)	Whole
Culcairn Solar IF9 (Isolated Artefact)	Culcairn Solar IF11 (Isolated Artefact)	Whole
Culcairn Solar IF10 (Isolated Artefact)	Culcairn Solar IF12 (Isolated Artefact)	Whole
Culcairn Solar IF23 (Isolated Artefact)	Culcairn Solar IF13 (Isolated Artefact)	Whole
Culcairn Solar AFT3 (Subsurface Artefact Scatter)	Culcairn Solar IF14 (Isolated Artefact)	Whole
Culcairn Solar AFT6 (Artefact Scatter)	Culcairn Solar IF15 (Isolated Artefact)	Whole
Culcairn Solar AFT7 (Artefact Scatter)	Culcairn Solar IF16 (Isolated Artefact)	Whole
Culcairn Solar 497239 (Artefact Scatter)	Culcairn Solar IF17 (Isolated Artefact)	Whole
Cultural Solar 494492 (Artefact Scatter)	Culcairn Solar IF18 (Isolated Artefact)	Whole
Culcairn Solar ST1 (Scarred Tree)	Culcairn Solar IF19 (Isolated Artefact)	Whole
Culcairn Solar CT1 (Cultural Tree)	Culcairn Solar IF20 (Isolated Artefact)	Whole
Culcairn Solar 494924 (Scarred Tree)	Culcairn Solar IF21 (Isolated Artefact)	Whole
Culcairn Solar 494957 (Scarred Tree)	Culcairn Solar IF22 (Isolated Artefact)	Whole
Culcairn Solar 497151 (Cultural Tree)	Culcairn Solar IF24 (Isolated Artefact)	Whole
Culcairn Solar 497439 (Cultural Tree)	Culcairn Solar IF25 (Isolated Artefact)	Whole
Culcairn Solar 495666 (Cultural Tree)	Culcairn Solar 495094 (Isolated Artefact)	Whole
Culcairn Solar 4998265 (Cultural Tree)	Culcairn Solar AFT1 (Artefact Scatter)	Partial
Billabong and Back Creek PADs	Culcairn Solar AFT2 (Subsurface Artefact Scatter)	Partial
	Culcairn Solar AFT4 (Artefact Scatter)	Whole
	Culcairn Solar AFT5 (Artefact Scatter)	Whole
	Culcairn Solar AFT8 (Artefact Scatter)	Whole
	Culcairn Solar AFT9 (Artefact Scatter)	Partial
	Culcairn Solar AFT10 (Artefact Scatter)	Partial
	Culcairn Solar AFT11 (Artefact Scatter)	Whole
	Culcairn Solar AFT12 (Artefact Scatter)	Partial
	Culcairn Solar AFT13 (Artefact Scatter)	Partial
	Culcairn Solar AFT14 (Artefact Scatter)	Partial
	Culcairn Solar 497037 (Isolated Cultural Object)	Whole
20 Sites Avoided	**31 Sites Impacted**	

Appendix A Infrastructure Map



Culcairn Solar Farm Constraints Layout

Legend

Project Components
- Project Site
- Development Footprint
- Substation
- BESS
- Control Building
- Inverters
- Construction Compound
- Subdivision
- Proposed Access
- Internal Access Network

Fences
PV Array

Existing Components/Features
- Existing Transmission Line
- Gas Pipeline
- Public Roads
- Waterways
- Dams

Proposed Vegetative Screening
- Visual Screening
- Biodiversity/Supplimentary Screening

Sensitive Receivers
- Associated Landowner
- Non-associated Landowner
- Industry

Archaeological Site Type
- Cultural Tree
- Modified Tree
- Isolated Find
- Cultural Object
- Artefact Scatter
- Potential Archaeological Deposits

Paddock Trees
- Hollow Bearing Retain
- Non-hollow Bearing Retain
- Hollow Bearing Remove
- Non-hollow Bearing Remove

Plant Community Types (PCT)
- PCT5: River Red Gum herbaceous-grassy very tall open forest woodland
- PCT74: Yellow Box - River Red Gum tall grassy riverine woodland
- PCT76: Western Grey Box tall grassy woodland
- PCT277: Blakely's Red Gum - Yellow Box Grassy Woodland

0 0.5 1 km

Ref: 200907 Culcairn SF \ Culcairn Solar Farm Constraints Layout
Author: D. Bambrick
Date created: 25.09.2020
Datum: GDA94 / MGA zone 55

NGH

Appendix B Credit Summary Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017027/BAAS18074/19/00017029	Culcairn Solar Farm	20/08/2020
Assessor Name	Report Created	BAM Data version *
	24/09/2020	30
Assessor Number	BAM Case Status	Date Finalised
	Open	To be finalised
Assessment Revision	Assessment Type	
2	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion								
1	277_Native_Understory	47.0	0.16	0.25	High Sensitivity to Potential Gain	2.00	TRUE	4

2	277_Derived_Grassland	23.5	0.03	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
3	277_Exotic_Understory	31.3	0.13	0.25	High Sensitivity to Potential Gain	2.00	TRUE	2
							Subtotal	**7**
River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.								
4	5_Derived_Grassland	22.4	0.01	0.25	High Sensitivity to Potential Gain	1.50		1
							Subtotal	**1**
							Total	**8**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Cullen parvum / Small Scurf-pea (Flora)						
277_Native_Understory	47.0	0.15	0.25	2	False	4
277_Derived_Grassland	23.5	0.02	0.25	2	False	1
					Subtotal	**5**
Myotis macropus / Southern Myotis (Fauna)						
277_Native_Understory	47.0	0	0.25	2	False	0
277_Derived_Grassland	23.5	0	0.25	2	False	0
277_Exotic_Understory	31.3	0	0.25	2	False	0

					Subtotal	**0**
Swainsona recta / Small Purple-pea (Flora)						
277_Native_Understory	47.0	0.15	0.25	2	False	4
277_Derived_Grassland	23.5	0.02	0.25	2	False	1
					Subtotal	**5**
Swainsona sericea / Silky Swainson-pea (Flora)						
277_Native_Understory	47.0	0.15	0.25	2	False	4
277_Derived_Grassland	23.5	0.02	0.25	2	False	1
					Subtotal	**5**

BAM Credit Summary Report

Proposal Details

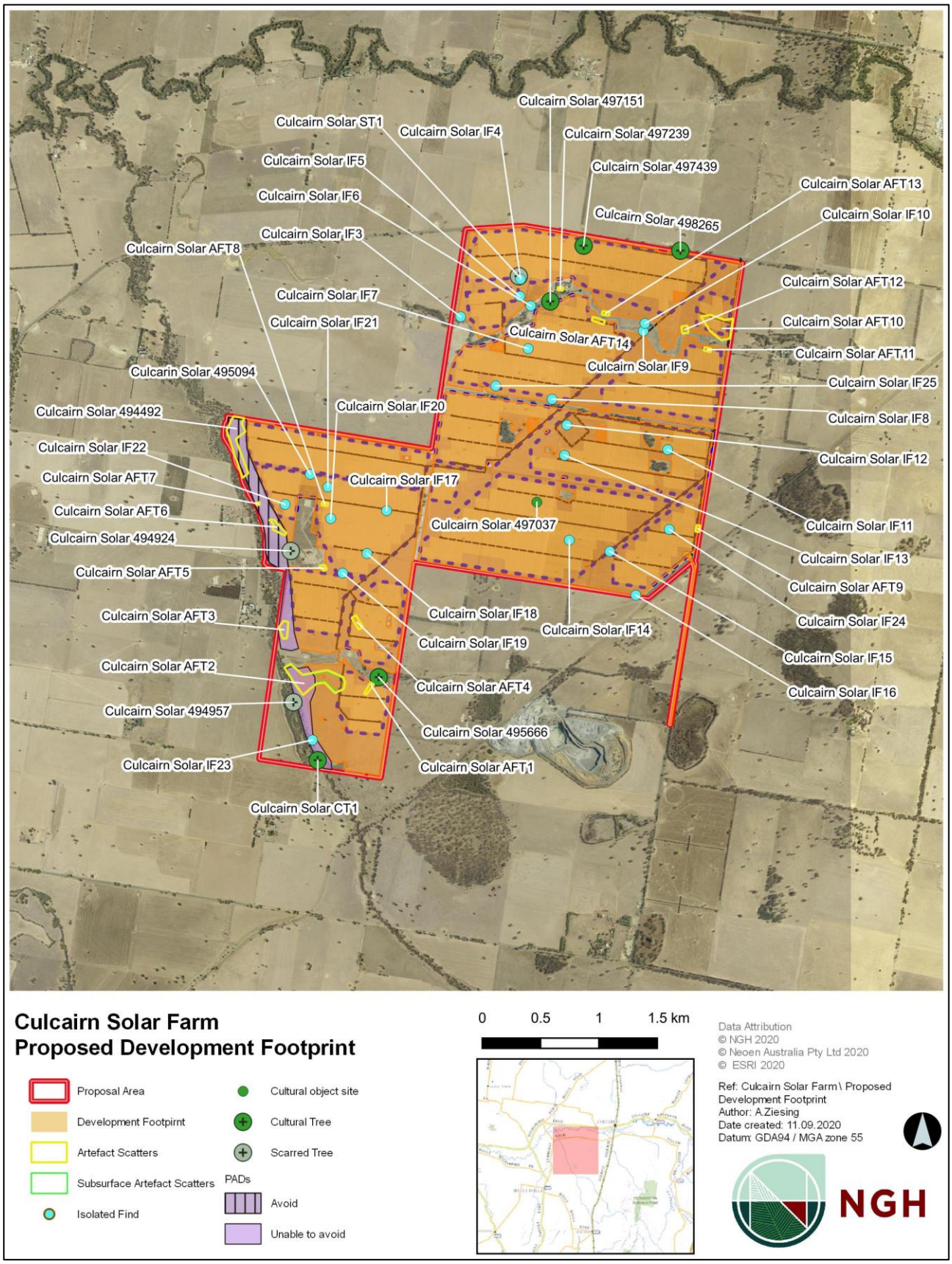
Assessment Id	Proposal Name	BAM data last updated *
00017027/BAAS18074/19/00017028	Culcairn Solar Farm_paddocktrees	20/08/2020
Assessor Name	Report Created	BAM Data version *
	24/09/2020	30
Assessor Number	BAM Case Status	Date Finalised
	Open	To be finalised
Assessment Revision	Assessment Type	
2	Paddock Trees	

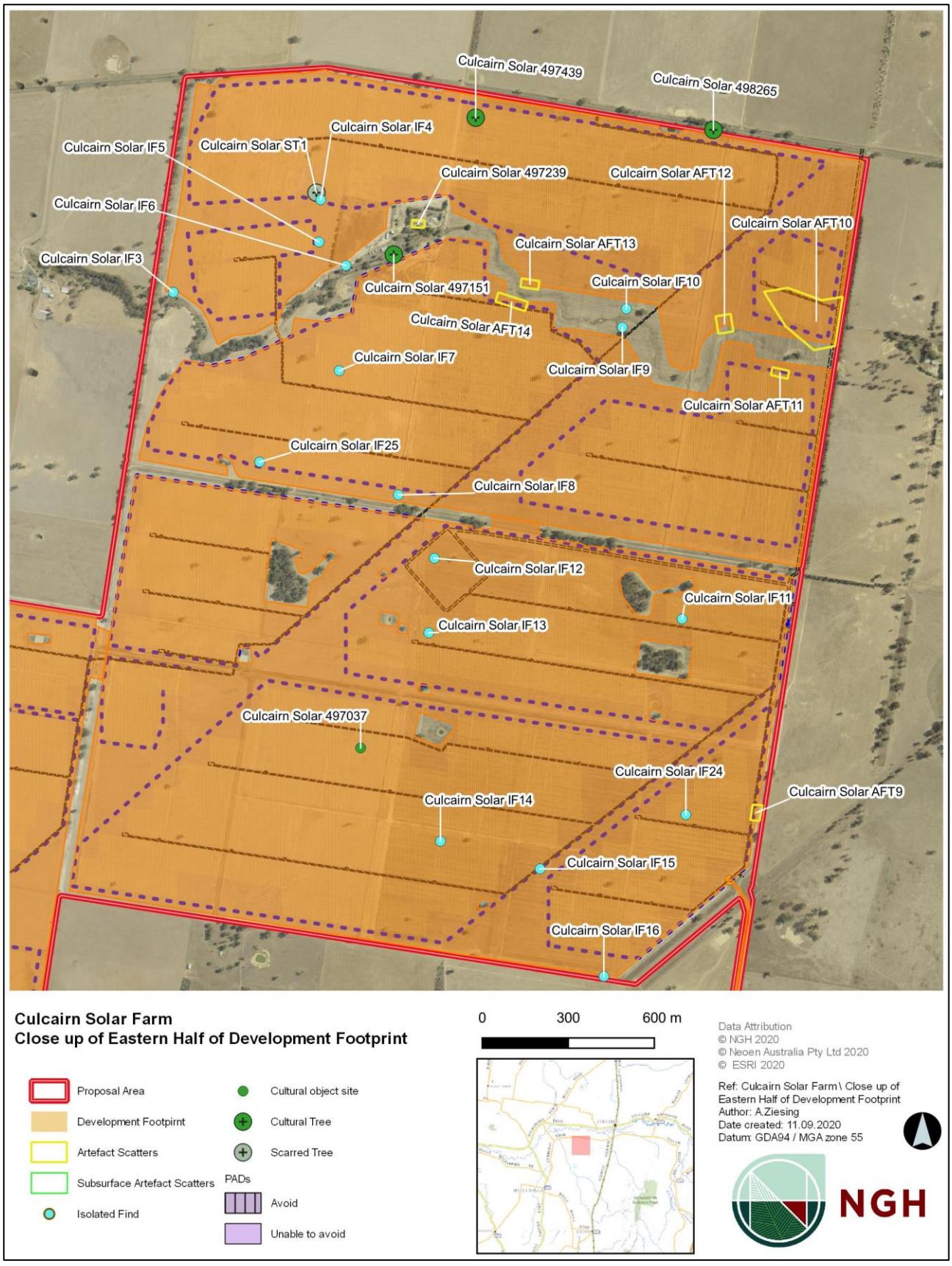
* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Paddock Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion			
3	True	24.0	24
3	False	6.0	5
3	True	5.0	5
3	True	1.0	1
3	True	2.0	2
3	True	3.0	3
3	False	5.0	4
			44
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions			
3	True	14.0	14
3	False	4.0	3
			17
			61

Appendix C Updated Heritage Maps




Culcairn Solar 497439
Culcairn Solar 498265
Culcairn Solar IF4
Culcairn Solar IF5
Culcairn Solar ST1
Culcairn Solar 497239
Culcairn Solar AFT12
Culcairn Solar IF6
Culcairn Solar AFT10
Culcairn Solar AFT13
Culcairn Solar IF3
Culcairn Solar IF10
Culcairn Solar 497151
Culcairn Solar AFT14
Culcairn Solar IF7
Culcairn Solar IF9
Culcairn Solar AFT11
Culcairn Solar IF25
Culcairn Solar IF8
Culcairn Solar IF12
Culcairn Solar IF11
Culcairn Solar IF13
Culcairn Solar 497037
Culcairn Solar IF24
Culcairn Solar AFT9
Culcairn Solar IF14
Culcairn Solar IF15
Culcairn Solar IF16
Culcairn Solar Farm
Close up of Eastern Half of Development Footprint
Proposal Area
Development Footpirnt
Artefact Scatters
Subsurface Artefact Scatters
Isolated Find
Cultural object site
Cultural Tree
Scarred Tree
PADs
Avoid
Unable to avoid
0
300
600 m
Data Attribution
© NGH 2020
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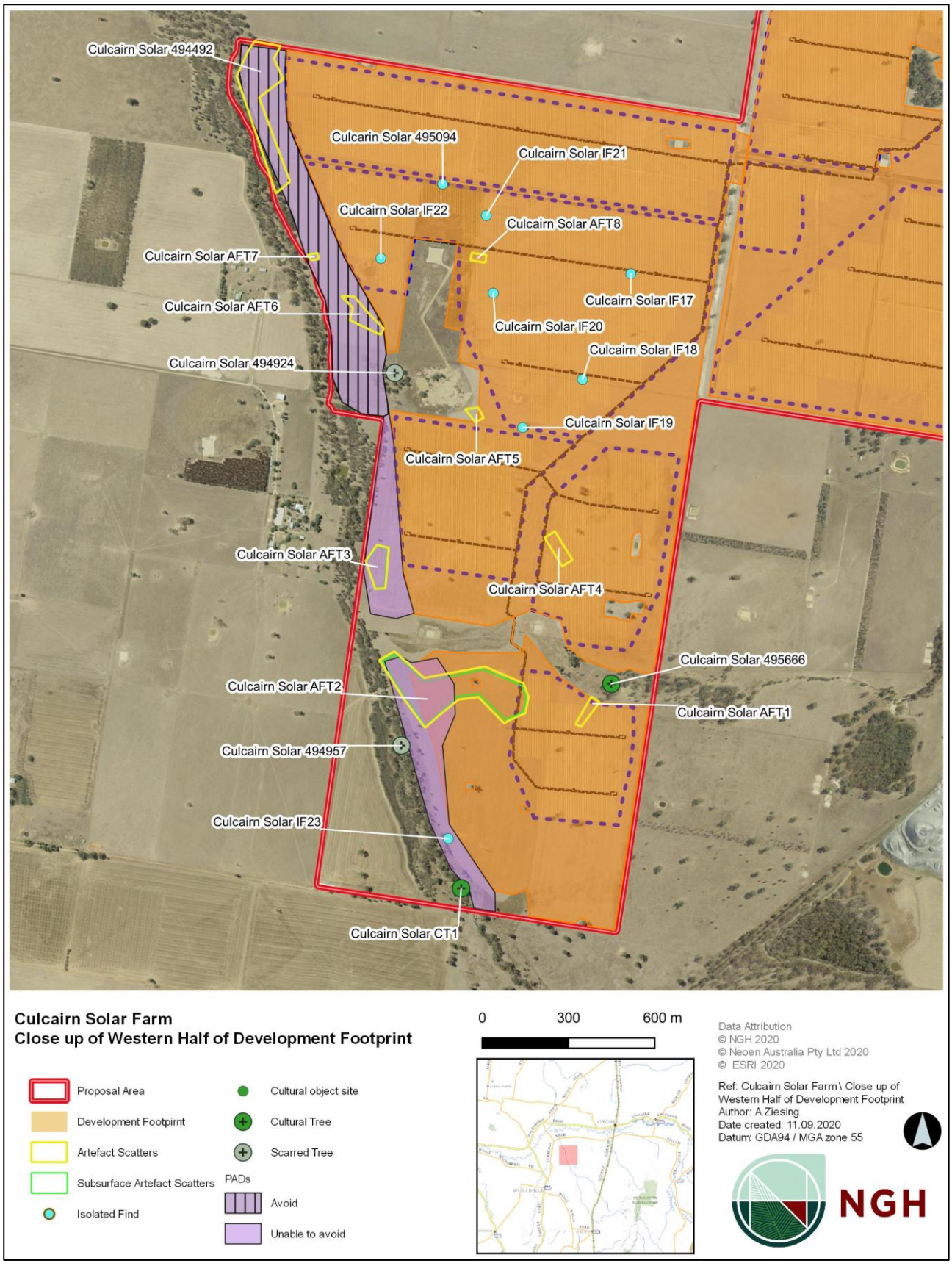
© ESRI 2020
Ref: Culcairn Solar Farm \ Close up of Eastern Half of Development Footprint
Author: A.Ziesing
Date created: 11.09.2020
Datum: GDA94 / MGA zone 55
NGH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Culcarin Solar 495094
Culcairn Solar IF21
Culcairn Solar IF22
Culcairn Solar AFT8
Culcairn Solar AFT7
Culcairn Solar IF17
Culcairn Solar AFT6
Culcairn Solar IF20
Culcairn Solar IF18
Culcairn Solar 494924
Culcairn Solar IF19
Culcairn Solar AFT5
Culcairn Solar AFT3
Culcairn Solar AFT4
Culcairn Solar 495666
Culcairn Solar AFT2
Culcairn Solar AFT1
Culcairn Solar 494957
Culcairn Solar IF23
Culcairn Solar CT1
Culcairn Solar Farm
Close up of Western Half of Development Footprint
Proposal Area
Development Footpirnt
Artefact Scatters
Subsurface Artefact Scatters
Isolated Find
Cultural object site
Cultural Tree
Scarred Tree
PADs
Avoid
Unable to avoid
0
300
600 m
Data Attribution
© NGH 2020
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© ESRI 2020
Ref: Culcairn Solar Farm\ Close up of Western Half of Development Footprint
Author: A.Ziesing
Date created: 11.09.2020
Datum: GDA94 / MGA zone 55
NGH

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Appendix E

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Ref: 012
2 October 2020

Issued via email: sarah.h@nghenvironmental.com.au

Dear Sarah

Culcairn Solar Farm – Traffic Impact Assessment

Amber has been asked to assess the traffic matters of the proposed solar farm located approximately 4.0 kilometres southwest of Culcairn, New South Wales. The solar farm is proposed to have a capacity of 350MW, and access to the site will be provided via Weeamera Road, which connects to Benambra Road and Olympic Highway. Staff will be located within the nearby regional towns, and the majority of plant is expected to be delivered from the south along Olympic Highway. An assessment of the traffic impacts of the solar farm is provided below.

1. Existing Conditions

1.1 Road Network

Weeamera Road is a local road that runs in a north-south alignment between Cummings Road and Benambra Road. Between Benambra Road and the Boral Quarry site access it has a sealed width of 8.0 metres. North of the quarry access the road is unsealed and has a width of 5.5 metres, and accommodates two-way vehicle movement.

Benambra Road is also a local road under the care and management of Council. It runs in an east-west alignment between Coach Road and Cummings Road. Between Olympic Highway and Weeamera Road it has a sealed carriageway width of 8.5 metres and accommodates two-way vehicle movement. West of Weeamera Road it has an unsealed surface for approximately 3.3 kilometres before widening to have a sealed surface through to its connection with Cummings Road.

Olympic Highway is a State Road under the care and management of TfNSW. It generally runs in a north-south alignment from its continuation as Colin Knott Drive and its connection with the Hume Highway. Within the vicinity of the site, it typically accommodates one lane of traffic in each direction and has a sealed width of approximately 9.0 metres.

The intersection of Olympic Highway with Benambra Road is priority controlled, with vehicles exiting Benambra Road required to give way to vehicles on Olympic Highway. An Auxiliary Left Turn (AUL) turning treatment is provided for vehicles turning left into Benambra Road, and widening of the southbound carriageway allows southbound vehicles to pass around vehicles waiting to turn right into Benambra Road. An acceleration lane is also provided for vehicles turning left from Benambra Road. The intersection of Weeamera Road and Benambra Road is priority controlled.

All roads within the vicinity of the site have a speed limit of 100km/hr.

1.2 Traffic Volumes

Traffic volume data for Olympic Highway was obtained from the TfNSW traffic volume viewer. The closest available data was located 290 metres north of Calool Lane, where the 2011 data recorded an average daily traffic count of 2,753 vehicles per day (vpd). Greater Hume Council have advised that the average daily traffic for Benambra Road and Weeamera Road between Olympic Highway and the quarry site access is 42vpd, with Weeamera Road carrying 15vpd north of the access.

2. Traffic Assessment

2.1 Traffic Generation

Construction activities would be undertaken during standard daytime construction hours (7:00am to 6:00pm Monday to Friday, and 7:00am to 1:00pm on Saturdays). Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities.

Approximately 15 trucks will access the site per day during typical construction periods. The delivery trucks will predominantly be Medium and Heavy Rigid Trucks (MRV and HRV as defined within AS 2890.2:2009). Articulated Vehicles (AV as defined within AS 2890.2:2009) and B-Doubles will occasionally be used to transport larger plant such as the PV panels.

It is anticipated that during peak construction the site could generate up to 100 heavy vehicles per day and 150 light vehicles per day. Accordingly, the site is expected to generate approximately 200 heavy vehicle movements and 300 passenger vehicle movements per day during the peak construction period of the solar farm. Table 1 summarises the traffic movements generate during the peak construction period of the solar farm.

Table 1: Traffic Generation During Peak Construction Periods

Vehicle Type	Vehicle Movements per Day
Light Vehicle (car / 4WD / minibus)	300
MRV/HRV/AV/B-Double	200
Total	**500**

Accordingly, the site is expected to generate approximately 500 vehicle movements per day during peak periods. For the purposes of this assessment, all construction vehicles have been assessed as travelling from the north and the south along the Olympic Highway to access the site via Benambra Road and Weeamera Road. Approximately 30% of vehicles will access the site from the north and 70% from the south along Olympic Highway.

During operation the solar farm is expected to typically generate a maximum of 10 light vehicle movements per day. Occasionally, larger plant may need to be delivered to the site as part of routine maintenance. At these times the site is expected to generate up to an additional 10 heavy vehicle movements per day.

2.2 Traffic Assessment

Level of Service is a qualitative measure used to describe the operating conditions of a section of road or an intersection. Levels of Service are designated from A to F from best (free flow conditions) to worst (forced flow with stop start operation, long queues and delays) and represent the perception of the road conditions by motorists including speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety.

The *RTA Guide to Traffic Generating Developments*, dated October 2002, suggests that ideally rural roads should not exceed service volumes at Level of Service C. At this level, whilst most drivers are restricted in their freedom to manoeuvre, operating speeds are still reasonable and acceptable delays are experienced. Table 4.5 of the RTA Guide sets out two-way hourly road capacities for two-lane roads for different levels of service with a design speed of 100 km/hr based on different terrain types. For the purposes of this assessment the following assumptions have been applied:

- The Walla Walla Solar Farm is located to the southwest of the site and is proposed to gain access via Olympic Highway and Benambra Road. The project is currently at the Assessment stage and a response to the SEARs has been submitted. A Traffic Impact Assessment has been prepared by Ontoit for the project which estimates the construction phase of the project could generate up to 490 vehicle movements per day. The projects have the potential for the construction stages to overlap and as such, the traffic associated with the Walla Walla Solar Farm has been assumed to be present on the road network;
- Benambra Road is expected to accommodate up to 1,032 vehicles per day with the existing base level of traffic of 42vpd, the site traffic of 500vpd, and the 490vpd generated by the Walla Walla Solar Farm;
- Weeamera Road is expected to accommodate up to 542 vehicles per day with the existing base level of traffic of 42vpd and the site traffic of 500vpd;
- Approximately 10% of vehicle movements are generated during the peak hour;
- The road network has a flat terrain; and
- The road network currently accommodates 15% heavy vehicles.

Based on the above assumptions, Benambra Road and Weeamera Road are expected to carry in the order of 103 and 54 vehicles during the peak hour, respectively, which equates to a Level of Service A. Accordingly, the road network can readily accommodate the increase in traffic generated by the solar farm during construction and operation, including if the peak construction periods for both projects overlap.

3. Access Route Assessment

The *Unsealed Roads Manual: Guidelines to Good Practice*, dated March 2009, notes that the average traffic for gravel roads usually varies between 20 and 200 vehicles per day. The document also notes that roads may warrant paving when maintenance costs increase to unacceptable levels, in wet climates, or when economic or social benefits are evident.

Weeamera Road north of the quarry access is estimated to currently accommodate 15 vehicle movements per day, which would increase to 515 vehicle movements per day during peak construction periods (an increase of 500 vehicle movements generated by construction traffic). Therefore, the traffic volumes would exceed the recommended loading for gravel roads.

In order to accommodate the traffic volumes generated by the development it is recommended that Weeamera Road north of the quarry access be upgraded to have a light spray seal and a width of 6.0 metres. The light spray seal is expected to be able to accommodate the level of traffic generated by the construction traffic and will also act to reduce the dust impact to the nearby dwellings. The increased carriageway width will also allow two trucks to pass.

It is understood that following consultation with Greater Hume Council the Applicant has agreed to widen Weeamera Road north of the quarry site to 7.0 metre wide and provide a light spray seal, which exceeds the recommended road upgrade.

Weeamera Road south of the quarry access, and Benambra Road between Olympic Highway and Weeamera Road, both have sealed widths of 8.0 metres, which accommodates simultaneous two-way vehicle movement. Further, both roads are rated to accommodate B-Double trucks. Therefore, this section of the access route is currently able to accommodate the sized vehicles that are proposed as part of the construction of the solar farm.

A Construction Traffic Management Plan (CTMP) will be prepared prior to construction of the site. It is recommended that the following form part of the CTMP to minimise the impact of construction traffic along the unsealed roads:

- Prior to construction, a pre-condition survey of the relevant sections of the existing road network be undertaken, in consultation with Council. During construction the sections of the road network utilised by the proposal are to be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the solar farm would be rectified. At the end of construction, a post-condition survey would be undertaken to ensure the road network is left in the consistent condition as at the start of construction.

- Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.

Given the expected traffic along Weeamera Road and Benambra Road during construction, it is concluded that the surface of the roads, with the inclusion of the proposed upgrades to Weeamera Road, is suitable to accommodate the future traffic volumes. In addition, the adoption of the above recommendations will assist to mitigate any impact to the road surface and adjacent properties.

It is noted that the proposed access route has been determined in consultation with Council and TfNSW. Alternative access routes have been reviewed, including the use of Cummings Road to access the site. However, given the angle of the intersection of Cummings Road with Olympic Highway the use of Benambra Road was concluded to provide a safer access route.

4. Intersection Assessment

4.1 Olympic Highway / Benambra Road

Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings specifies the turning treatments required at intersections. Figure 2.26 of the guide, shown below in Figure 1, specifies the required turn treatments on the major road at unsignalised intersections, and is provided below for a design speed of greater than or equal to 100km/hr.

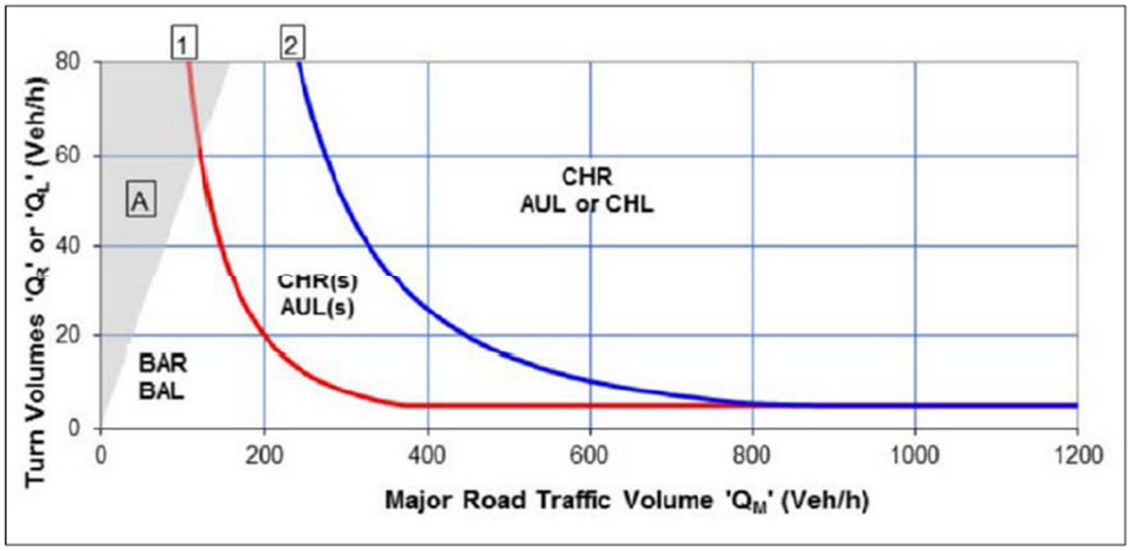
During the construction phase of the solar farm, when traffic generated will be at its peak, Benambra Road has the potential to accommodate up to 1,032vpd including the peak construction traffic from the Walla Walla Solar Farm. Olympic Highway is expected to accommodate approximately 2,981vpd based on the 2011 traffic volume count and applying a 1% growth factor.

The turning volumes for the assessment have been calculated assuming 10% of these trips are generated during peak periods and traffic travelling to/from Benambra Road is distributed with 30% of vehicles travelling north and 70% of vehicles travelling south. Therefore, the Major Road Traffic Volume is 298vph and the Turning Volumes are 31vph and 72vph for the right and left turns, respectively. Based on these volumes, the intersection would require Channelised Right Turn (CHR) and Auxiliary Left Turn (AUL) turning treatments.

The intersection is currently provided with an AUL turning treatment and widening of the southbound carriageway allows southbound vehicles to pass vehicles waiting to turn right into Benambra Road. Therefore, the left-turn treatment meets the requirement of the Austroads Guide. The right turn treatment is considered to be suitable to accommodate the increase in traffic generated during the construction of the solar farm given the short duration of peak construction (approximately

7 months), and the existing treatment effectively acts as a CHR allowing southbound vehicles to pass a right-turning vehicle. Therefore, no upgrades are required at the intersection as part of the solar farm project.

Figure 1: Figure 2.26 of Austroads Guide to Traffic Management Part 6



4.2 Benambra Road / Weeamera Road

A swept path assessment has been undertaken for the Benambra Road / Weeamera Road intersection using the AutoTurn software package, which is presented in Appendix A. The swept paths have been based on AVs and demonstrates simultaneous two-way movement is provided at the intersection. The 19.0 metre semi-truck represents the 'worst case' vehicle due to the longer trailer when compared to the 26 metre long B-Double resulting in a wider swept path.

5. Access Design

Access to the site is proposed at the south-eastern boundary of the site via Weeamera Road. The access design and a swept path assessment showing access to the site by an AV are shown within Appendix A. Accordingly, the access is able to accommodate the worst-case design vehicle expected to access the site. The swept path assessment also demonstrates that Weeamera Road will need to be widened in the proximity of the railway crossing to allow simultaneous two-way movement.

Clear sight distances are provided along Weeamera Road in both directions for vehicles exiting the site.

6. Conclusions

Amber has assessed the traffic impacts of the solar farm located approximately 4.0 kilometres southwest of Culcairn, New South Wales. Access to the site is to be provided to/from Weeamera Road, via Olympic Highway and Benambra Road. The above assessment determined the following:

- The site will generate up to 500 vehicle movements per day during peak construction times, including 200 truck movements;
- The road network is able to accommodate the traffic generated by the development during the construction and operational periods;

- Weeamera Road north of the Boral Quarry site access is proposed to be widened to 7.0 metres and be provided with a light spray seal in order to accommodate simultaneous two-way movement and limit the impact of dust to nearby dwellings;

- In order to mitigate the impacts of the development during construction a CTMP will be prepared which should include the following recommendations:

  - Prior to construction, a pre-condition survey of the relevant sections of the existing road network be undertaken, in consultation with Council. During construction the sections of the road network utilised by the proposal are to be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the solar farm would be rectified. At the end of construction, a post-condition survey would be undertaken to ensure the road network is left in the consistent condition as at the start of construction.

  - Neighbours of the solar farm be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access.

- The access from Weeamera Road is able to accommodate 19.0 metre articulated vehicles and B-Doubles, with some widening required in the proximity of the railway crossing to allow for simultaneous two-way truck movement.

Accordingly, based on the assessment and recommendations above, it is concluded that the proposed access arrangements for the solar farm are suitable to accommodate the expected vehicle types and traffic volumes during the construction and operation phase of the project.

If you have any questions please feel free to contact the undersigned.

Yours sincerely
Amber Organisation

Michael Willson
Director

Attach: Appendix A – Swept Path Assessment
Appendix B – Access Design

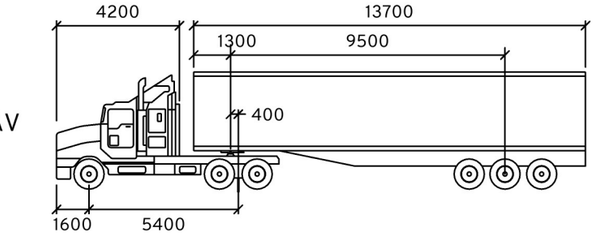
Appendix A

Swept Path Assessment

Vehicle Envelope

300mm Clearance

AV



	mm
Tractor Width	: 2500
Trailer Width	: 2500
Tractor Track	: 2500
Trailer Track	: 2500
Lock to Lock	: 6.0s
Steering Angle	: 28.3
Articulating Angle	: 70.0

Culcairn Solar Farm

Southern Access Design

Swept Path Assessment

DRAWN: MW

DATE: 25/03/2019

SCALE: 1:500 @ A3

DWG NO: 012-S1A

Amber

Appendix B

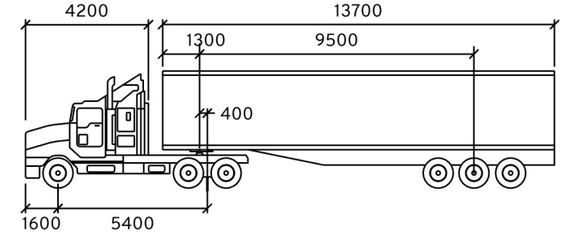
Access Design

Widen Weeamera Road to
accommodate two–way movement

Vehicle Envelope

300mm Clearance

AV



	mm
Tractor Width	: 2500
Trailer Width	: 2500
Tractor Track	: 2500
Trailer Track	: 2500
Lock to Lock	: 6.0s
Steering Angle	: 28.3
Articulating Angle	: 70.0

Culcairn Solar Farm

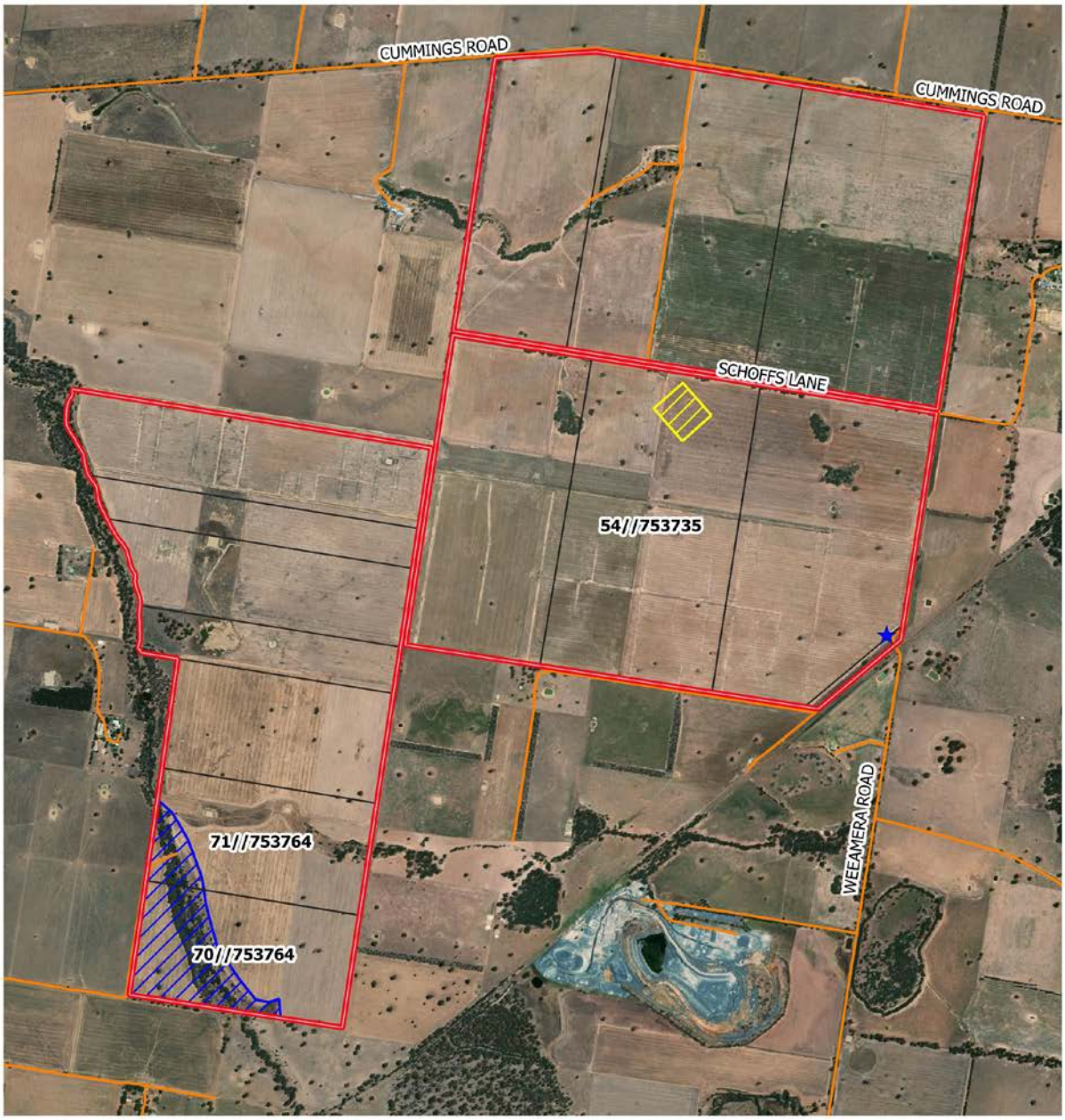
Southern Access Design

Swept Path Assessment

DRAWN: MW
DATE: 25/03/2019
SCALE: 1:750 @ A3
DWG NO: 012-S1A

Amber 2

Appendix F



18-441 Culcairn Solar Farm
Culcairn SF Subdivision

Legend

- Subject Land
- Cadastre
- Proposed Subdivision
- Public Roads
- Agricultural (32 ha)
- Site Access
- Substation (4 ha)

0 0.5 1 km

Data Attribution
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Ref: 200907 Culcairn SF \ Culcairn SF Subdivision
Author: Sarah H
Date created: 07.10.2020
Datum: GDA94 / MGA zone 55

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