LAND USE

The project site is materially inappropriate in its size, shape and location. This inappropriate site selection drives a higher trade off in land use.

1. Electricity Production

Elgin justify the site selection as it provides a "High quality solar resource". There is no evidence to support this assertion, as Elgin has not conducted an actual irradiance study at the site (despite having access for 3 years), and this site has poor solar irradiance when compared to other sites across western NSW.

Elgin based their site selection on a high level NASA report (see below), this indicates that no site based or local analysis was performance. There are numerous alternative sites with lower risks and impacts, and better solar irradiance.

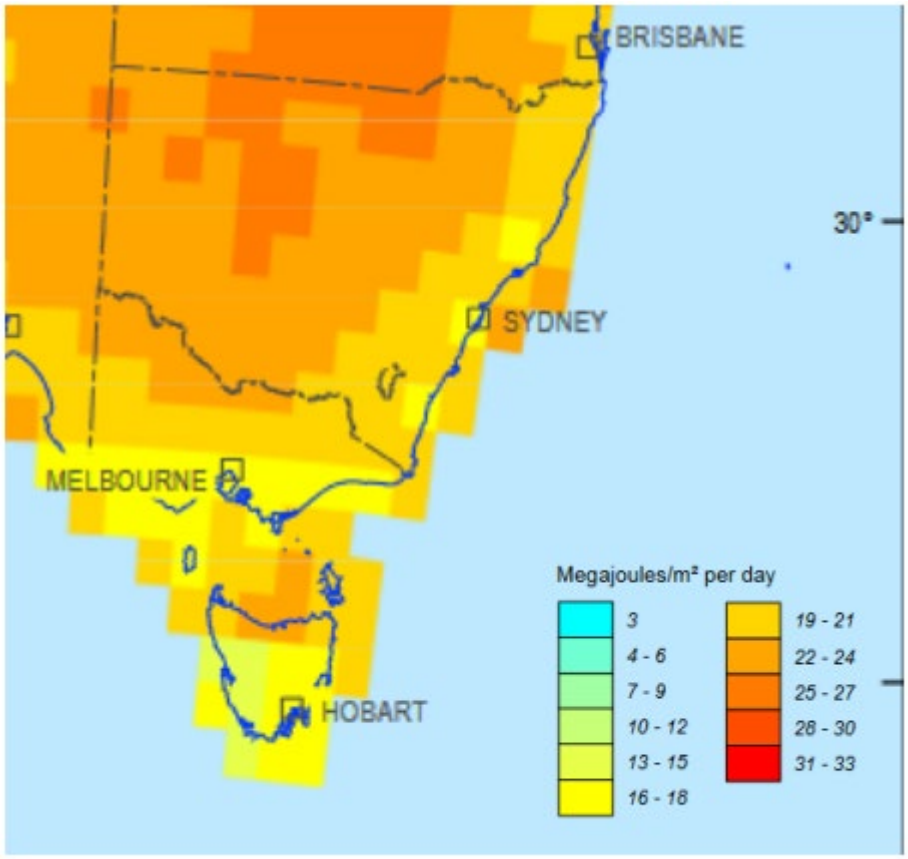


Figure 4-1 Solar irradiance levels per day Source: (NASA, 2009)

This site has the lowest solar generation potential as measured by kWh m-2 by the Bureau of Meteorology, compared to 20 sampled locations (with Bathurst Airport used to represent Glanmire) . The site is close to the Great Dividing Range, and is impacted by high incidence of cloud cover, mist, fog and frost. **Of the 20 sampled, this site is ~ 14% less productive than the statewide best, and ~9% less productive than the Central West Orana REZ best.**

The Glanmire site's actual results if measured would be expected to lower again, as its closer again to the Great Dividing Range and at a lower elevation than Bathurst Airport, where the BOM takes is recordings.

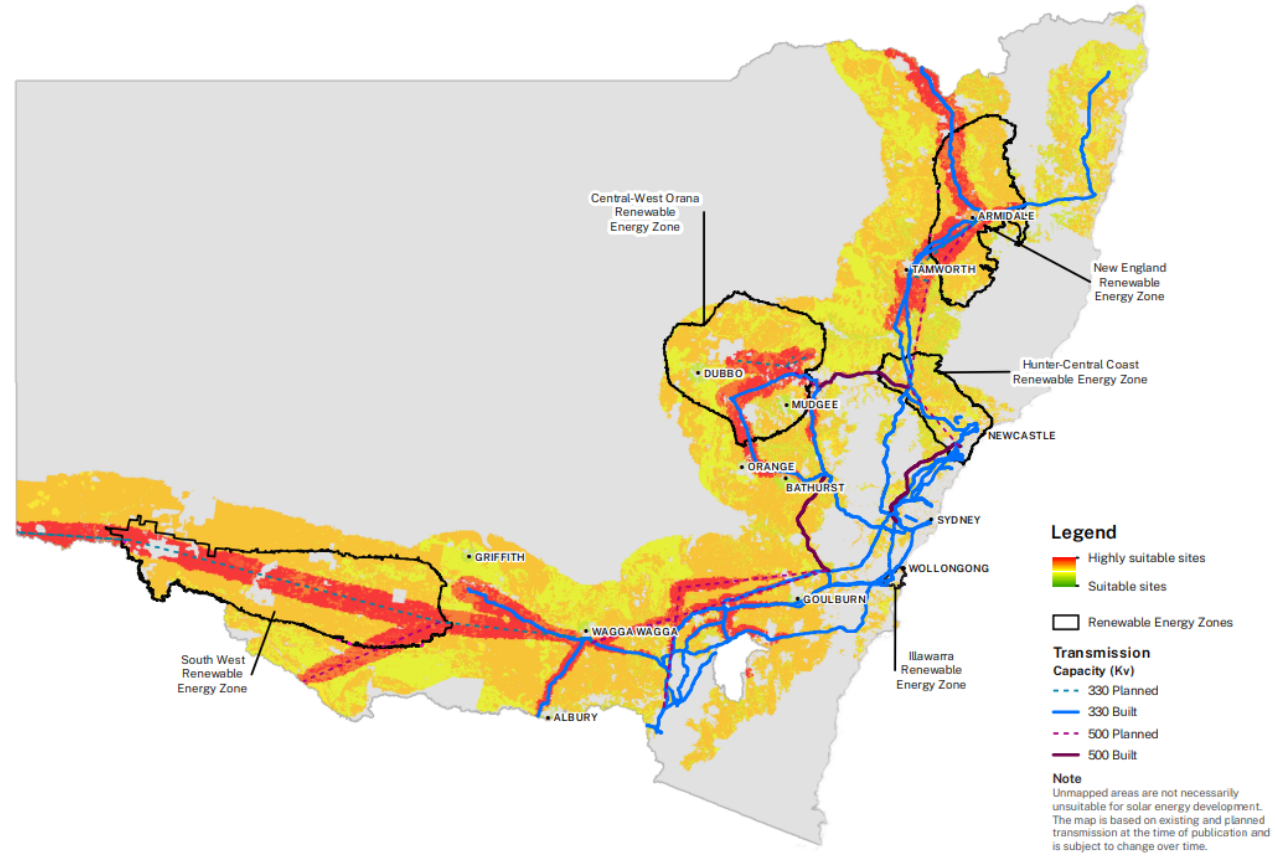
	Stat	Metric	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Improvement on Bathurst	% Improvement on Bathurst
Bathurst A/P	Mean	kWh m^{-2}	7.1	6.2	5.2	4	3	2.3	2.6	3.5	4.7	5.9	6.5	7.2	58.2	0	0.00%
Cobar A/P	Mean	kWh m^{-2}	7.6	6.8	5.9	4.5	3.4	2.8	3.1	4	5.2	6.4	7.1	7.7	64.5	6.3	10.82%
Broken Hill A/P	Mean	kWh m^{-2}	7.8	7	6	4.5	3.4	2.8	3.1	4.1	5.3	6.5	7.3	7.9	65.7	7.5	12.89%
Bourke A/P	Mean	kWh m^{-2}	7.6	6.8	6	4.8	3.7	3.1	3.4	4.3	5.4	6.6	7.2	7.7	66.6	8.4	14.43%
Nyngan A/P	Mean	kWh m^{-2}	7.6	6.7	5.8	4.5	3.4	2.9	3.1	4	5.2	6.3	7	7.6	64.1	5.9	10.14%
Walgett A/P	Mean	kWh m^{-2}	7.5	6.7	5.9	4.7	3.7	3.1	3.4	4.3	5.4	6.4	7	7.6	65.7	7.5	12.89%
Hillston A/P	Mean	kWh m^{-2}	7.6	6.8	5.8	4.3	3.2	2.6	2.8	3.7	4.9	6.2	7	7.7	62.6	4.4	7.56%
Ivanhoe A/P	Mean	kWh m^{-2}	7.7	6.8	5.8	4.4	3.2	2.7	2.9	3.8	5.1	6.3	7.1	7.8	63.6	5.4	9.28%
Coonamble A/P	Mean	kWh m^{-2}	7.5	6.6	5.7	4.5	3.5	2.9	3.2	4.1	5.3	6.3	6.9	7.6	64.1	5.9	10.14%
Moree A/P	Mean	kWh m^{-2}	7.4	6.6	5.9	4.7	3.7	3.1	3.4	4.3	5.4	6.3	6.9	7.4	65.1	6.9	11.86%
Gilgandra	Mean	kWh m^{-2}	7.5	6.6	5.7	4.4	3.4	2.8	3	3.9	5.1	6.2	6.9	7.6	63.1	4.9	8.42%
Mendoran PO	Mean	kWh m^{-2}	7.3	6.5	5.6	4.4	3.3	2.7	3	3.9	5.1	6.1	6.8	7.4	62.1	3.9	6.70%
Narromine A/P	Mean	kWh m^{-2}	7.6	6.7	5.7	4.4	3.3	2.7	2.9	3.8	5.1	6.2	6.9	7.6	62.9	4.7	8.08%
Wellington	Mean	kWh m^{-2}	7.4	6.5	5.5	4.3	3.2	2.6	2.8	3.7	4.9	6.1	6.8	7.4	61.2	3	5.15%
Dubbo A/P	Mean	kWh m^{-2}	7.5	6.6	5.6	4.4	3.3	2.6	2.9	3.8	5.1	6.2	6.9	7.6	62.5	4.3	7.39%
Binnaway	Mean	kWh m^{-2}	7.2	6.4	5.5	4.4	3.3	2.7	3	3.9	5.1	6.1	6.7	7.3	61.6	3.4	5.84%
Coolah	Mean	kWh m^{-2}	7.1	6.4	5.4	4.3	3.2	2.7	2.9	3.8	5	6.1	6.7	7.3	60.9	2.7	4.64%
Gulgong PO	Mean	kWh m^{-2}	7.3	6.4	5.4	4.2	3.2	2.6	2.9	3.8	5	6.1	6.7	7.3	60.9	2.7	4.64%
MudgeeA/P	Mean	kWh m^{-2}	7.2	6.3	5.3	4.2	3.2	2.6	2.8	3.8	4.9	6	6.6	7.3	60.2	2	3.44%
Hay A/P	Mean	kWh m^{-2}	7.7	6.8	5.6	4.1	3	2.4	2.6	3.6	4.8	6.1	7	7.7	61.4	3.2	5.50%

Source: BOM data

There are numerous alternative sites with lower risks and impacts, and better solar irradiance. The solar irradiance inefficiency of this site translates into an opportunity cost of electricity production of many years.

2. DPE suitable sites and proximity to Transmission Lines

DPE's suitable sites from their Draft Energy Policy Framework (Nov 2023), **indicate that this site is not mapped suitable** (as its within 5km of land zoned residential for a Regional City and not near transmission lines and is surrounded by land mapped as "less suitable"). I believe this map also debunks Elgin's reason for being within the 5kms and not in a REZ, as its not close to either planned or built 330 or 500 KVA transmission lines.



ure 3. Suitable locations for solar development

Source: page 9 DPE's Draft Energy Policy Framework Nov 2023

3. Social Licence

The NSW government in its selection of Renewable Energy Zones (REZ) has provided a social licence for solar development within in the REZ, this is not the case for sites outside of the REZ, where a social licence needs to be obtained by the proponent by either site selection, consultation and mitigation. Elgin have not obtained a Social Licence from the local Glanmire community. Elgin's community survey was not done on a rigorous basis. Questions were glib, e.g. do you support renewables, and directly impacted neighbours were only sampled, and discouraged from obtaining input from other impacted landholders, although the same questions were available on their website to be answered by anyone whether impacted or not. 90% of the Glanmire Community within 3.25 km of the site have expressly said that they oppose this development.

The proposed site is 4.1 km from residential land zoned by Bathurst Regional Council and is included in the DPIE mapped area of the Bathurst Regional City Area. Elgin have not provided any strategic imperative as to why this development should be located within 5km of a regional city or outside a REZ, other than that its near transmission lines (although these lines are not site ready and need to be upgraded). There are numerous sites in NSW with better characteristics or less impacts and risks.

4. Agricultural impact assessment

Page 41 of the Large Scale Energy Guidelines (Aug 22) states that land mapped as LSE Classes 1-3 "should generally be avoided if possible. Where it is not possible to avoid this land, the applicant must prepare a comprehensive assessment …." Including "an analysis of whether site design could be amended to reduce impacts". I believe that this assessment has not been adequately performed, as Minesoils has not provided a detailed assessment as to why all LSE Class 3 land is not excluded from the development site, and that avoiding all Class 3 land is possible by amending the site plan.

David McMahon (Certified Environmental Practitioner from DM McMahon Pty Ltd) provided the following comments (see appendix 1 for his full report)

"e) Level 3 assessment

The key principle of the Level 3 assessment as described in the Large-Scale Solar Energy Guideline is to provide a detailed justification for the project and include an assessment of whether the project would significantly impact the local or regional agricultural industry for project area with a land and soil capability of Class 1, 2 and 3. The assessment undertaken by Minesoils appears to be a formality at best. **The issue of avoidance or alternative management of Class 1, 2 and 3 land has not been explored thoroughly**, and as the land and soil capability assessment completed by Minesoils is based on a fundamentally compromised soil survey it appears most of the project area is Class 3 land or better.

f) Summary and conclusion

In summary Class 1, 2 and 3 land should generally be avoided for the siting of solar energy infrastructure as outlined in the Large-Scale Solar Energy Guideline. **The Minesoils Soil, Land and Agricultural Impact Assessment contains many inadequacies and inaccuracies that has led to the project area being mischaracterised and misclassified. In conclusion based on the available data the project area is likely Class 3 land or better and the assessment provided to support the proposal is inadequate to provide a risk assessment framework to protect agricultural land**."

5. BSAL (Biophysical Strategic Agricultural Land) assessment (see Appendix 2)

Below is David McMahon's BSAL assessment

Hazard	BSAL
Reliable water supply	Yes (reliable rainfall ≥ 350mm per annum)
Contiguous area of ≥ 20ha	Yes (contiguous area of ≥ 20ha)
Slope (≤ 10%)	Yes (maximum slope is 7.1%)
Rock outcrop (< 30%)	Yes (rock outcrop < 30%)
Surface rock fragments (≤ 20%)	Yes (no surface rock fragments)
Gilgai (≤ 50%)	Yes (no gilgais)
Soil fertility (soil type)	Yes (moderate - Soils usually require fertilisers and/or have some physical restrictions for arable use)
Effective rooting depth to a physical barrier (≥ 750mm)	Yes (no physical barriers or hard pans noted)
Soil drainage (better than poor)	Yes
Soil pH (4.5-8.1 in $CaCl_2$ in the top 600mm of the profile)	Yes (average 6.4 (H_2O) from 55 samples – allow one pH unit adjustment for $CaCl_2$ – 5.4)
Salinity (ECe ≤ 4dS/m and chloride < 800 mg/kg in the top 600mm of the profile)	Yes (highest EC was 2.7dS/m. Chloride not tested but improbable to be above 800 mg/kg based on the EC)
Effective rooting depth to a chemical barrier (≥ 750mm)	Yes (roots found at ≥ 750mm 16 of the 22 sampling locations)

David concluded **" In summary based on the available data it is assessed that the Glanmire Solar Energy Project area is highly likely to be BSAL but further investigation is required to confirm this**." Similar to the LSE analysis, BSAL land should generally be avoided for the siting of solar energy infrastructure as outlined in the Large-Scale Solar Energy Guideline.

It is also significant that **Elgin has not prepared a BSAL assessment.**

Significant impacts and risks exported onto neighbouring farms.

1. Buffer Zone

4985 Great Western Highway has a 1.2 KM common boundary with this proposed development. Elgin's design provides inconsistent buffer zones along this boundary and **plans to use 10m of 4985 Great Western Highway land for a distance of 830m as their buffer. This claim is without consultation, compensation, is restrictive on land use and lacks understanding of any legal implications. This also contravenes the NSW Agriculture Commissioner's 'Agent of Change Principle', where all impacts and risks are to be contained within the development site.**

2. Insurance

Neighbouring farms, contractors and other farms and business in the district will need to increase their insurance cover to reflect this new land use, its value and introduced risk. **All insurance cost and availability impacts should be incurred by Elgin. Policy terms and conditions should not change or be restrictive so as to change land use or activities** and should also be future proofed for changes in technology as which continually occurs in agriculture.

Public liability insurance currently available to farmers is typically $20 million, and if farmers or contractors create a fire from normal activities like harvesting, solar operators would litigate for plant damages and business losses. These claims would potentially be more than $250 million, exceeding insurance policies and bankrupting landowners.

The following is an impact statement from O'Brien Agriculture who adjoin the Suntop Solar Farm at Wellington NSW

"5 years on from that submission & 2 years on from the Project build completion, we are still unable to access Public Liability insurance above $20million. Numerous insurance agents & brokers have discussed the complex nature for underwriters to share the risk above the current $20million for primary producers. At most, $50million may be accessible but very expensive, if at all able to access. Achmea insurance (specific to the farming industry) more recently advised that they would have to go offshore to seek underwriters to split the risk.

All in all, not an easy task for neighbouring farmland to insure their risk - despite government promises (& Project proponents) to seek indemnification in the approval process! Best case scenario for us has been to mitigate risk in the short term by sowing most of the paddocks that adjoin the solar farm with pastures (max only 5 years mitigation strategy for mixed farming country!)."

Use of machinery to slash, spray, work, sow or harvest the pastures and crops will all present a risk that we are unsure how to properly manage without exposing ourselves to potential liability that could financially ruin us if a liability issue were to happen!

This project if approved without mitigation will also drive changes in land use on neighbouring properties.

3. Heat Island

Both the site plan and **DPE's assessment fail to recognise cropping on "The Oaks" 4985 Great Western Highway**, which is cropped on a rotational basis depending on market and seasonal conditions, for seed oats, feed oats, oaten silage and oaten hay. All 3 paddocks adjoining the proposed development site are suitable for cropping, have been cropped, and will be cropped on a rotational basis. Currently, the northern most paddock adjoining the proposed development is sown down with oats.

Ken Guthrie, in his 7 May 2018 report to the City of Greater Shepparton, commented

95. In my opinion a dense vegetation buffer will effectively stop heat transmission to neighbouring properties. There will be minimal effect on temperatures more than 100m from the outside of the vegetation.

This opinion notes that with a dense vegetation buffer, heat continues to and beyond 100m from the outside of the vegetation.

Ken Guthrie also recommended the following Setback

101. Whilst there is limited data upon which to make a definitive recommendation, in my opinion, if the screening is adequately defined and maintained, then that will provide an adequate buffer to heat flow so that there will not need to be a large setback. In my view this condition could be reduced to a setback of 20 metres from the vegetation screen, or approximately 30 metres from the boundary.

It should be noted that this opinion is yet to be supported by scientific evidence and is after the establishment and maintenance of effective visually dense buffer from the ground to higher than the top of the PV array at its highest point.

It should also be noted that this setback is not viewed be a full mitigation, with heat continuing to be transferred to neighbouring farms (impacting crops etc), as Ken Guthrie expects heat to continue for at least another 100m beyond the vegetation (see his point 95 above)

Given that Temperature measurement in the localised area surrounding a solar farm has been reported in the literature only by Fthenakis and Yu, this 18 month Canadian study provides the best scientific study of heat radiating from panels compared to ambient, ie

TABLE I

DIFFERENCE OF AIR TEMPERATURE (@2.5 M HEIGHTS) BETWEEN THE LISTED WEATHER AND HAWK STATIONS AND THE AMBIENT

Met Station	WS2	WS7	HK1	HK2	HK3	HK4	HK5	HK9
Temp Difference from H6 (°C)	1.878	1.468	0.488	1.292	0.292	0.609	0.664	0.289
Distance to solar farm perimeter (m)	-440	-100	100	10	450	210	20	300

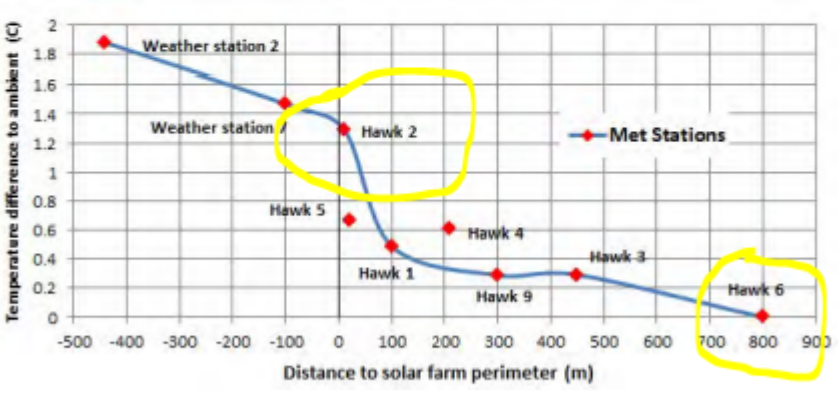


Fig. 8. Air temperature difference as a function of distance from the perimeter of the solar farm. Negative distances indicate locations within the solar farm.

I.e., an increase in temperature from ambient of 1.292 °C at 10m from the solar farm perimeter, with the air temperatures increase of 0.289 °C at 300 m, 0.292 °C at 450 m, dissipating to ~ 0 oC at 800 m from the perimeter.

In summary my view is that

i. Heat impacts growth and nutrition on pasture as well as cropping and horticulture and the wellbeing of stock.
ii. Elgin have not included Heat Island in their current site design and should fully mitigate this impact within their site (Agent of Change Principle).
iii. Ken Guthrie notes that there is limited data upon which to make a definitive recommendation, and that with a dense vegetation buffer heat continues to and beyond 100m from the outside of the vegetation. His opinion on a setback of 20 metres from the vegetation screen is also yet to be supported by scientific evidence.
iv. The 20m setback setback is not viewed be a full mitigation, with heat continuing to be transferred to neighbouring farms (impacting crops etc), as Ken Guthrie expects heat to continue for at least another 100m beyond the vegetation.
v. if a visually dense buffer from the ground to higher than the top of the PV array at its highest point is planned, it would take many years before these plantings were effective. Elgin should not rely on this mitigation until it's effective and maintained, as until heat is mitigated it will damage

neighbouring crops and impede farming operations. **Their current site plan should allow for a 800m buffer**, aligned to the scientific results of Fthenakis and Yu. Any change from a 800m buffer during the life of the project should be scientific and evidence based.

David Guthrie's report to the City of Greater Shepparton is:

https://greatershepparton.com.au/assets/files/documents/planning/solar/Guthrie_Report.PDF

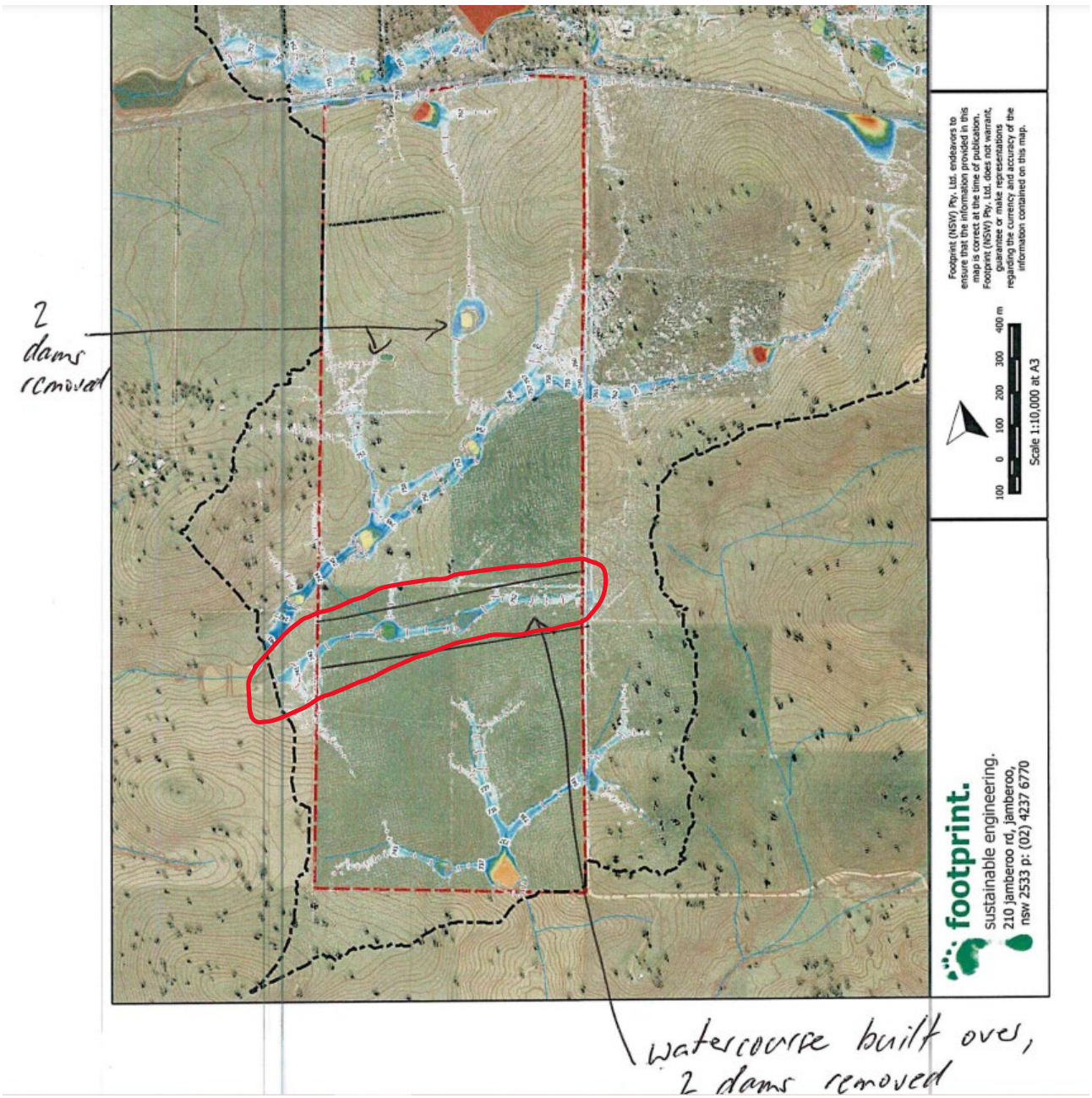
Analysis of the Potential for a Heat Island Effect in Large Solar Farms by Fthenakis and Yu,

https://legalectric.org/f/2021/02/Ex.-Grant-County-Intervenors-Frear-5.pdf

4. Hydrology

My understanding is that Elgin's Hydrology report is 'desktop' study and is significantly flawed. This study misrepresents the water flows showing water on the 2nd watercourse flowing uphill to join the watercourse reserved as a riparian zone, ie

The correct waterflows are shown below highlighted in red



Water running along watercourse proposed to be overbuilt by panels

Elgin's site plan is also proposing to cutdown trees, fill in dams and install panels along watercourses.

We believe that changes in volume, velocity and direction of waterflows will not be mitigated within the site and will create erosion, sedimentation, damage boundary fencing, damage internal farm access roads, and spread weed seed banks as well as harmful pollutants. This is due to:

i. The removal of trees with their takeup of water. These ~ 80 year old trees, will take 120 years to restore to site (assuming a 40 year project life).
ii. The removal of 4 dams which slowdown waterflows. This dam removal will reduce water absorption and evaporation (where the total annual evaporative loss could be up to 50% of a dams total storage volumes).
iii. reduced water volumes taken from dams by stock drinking, due to reduced stocking rates. Assuming a reduction in stocking rates of 1000 ewes and lambs, this equates to ~ 2,500,000 L of additional water.
iv. a change in land use and farming practice, from cropping to grazing will mean that surface soils are not 'softened' by tillage each year, leading to significantly less infilitration into the soil, and overtime surface compaction. This will lead to a significant increase in run off.
v. A concentration of flows within the site especially at the discharge end of the panels and the panel arrays. This concentration of flows would require a stormwater collection and dispersal plan to mitigate additional water flows, the risk of soil erosion on site / neighbouring farms, and the discharge of sediment off site to the neighbouring properties and the natural and anthropogenic drainage systems off site.

vi. The change from a grassed paddock surface to solar panels would concentrate flows in the area below the panels, causing significantly increased peak discharge. No erosion control measures have been allowed underneath the solar panel arrays or between rows of solar panels.

vii. Elgin has not provided an engineering design for their proposed perimeter road, including any culverts and elevations which will funnel water into neighbouring properties.

These changes will alter surface water and runoff behaviours (ie volume, infiltration and peak flows). I understand that the EIS does not adequately represent and assess these changes, nor does it represent and assess the stormwater management and / or erosion control measures and drainage that will likely be required. A revised model and additional mitigation measures are required to ensure that the development does alter the site's hydrological regime, impact / damage neighbouring farms, and all changes are mitigated within the site. Existing dams and trees, or existing watercourses should not be removed, they should also be also reserved as riparian zones. This mitigation should also consider impacts to the bore on 4985 Great Western Highway, ~ 100m to the west of the site (previously advised to Elgin).

5. Fire

The proposed site design is not best practice, and hence accepts risk as well as creates & cascades fire risk onto neighbouring farms. The site design should be remedied to align with Victoria's CFA 'Design Guidelines and Model Requirements Renewable Energy Facilities v4' August 2023 (see Appendix 1).

https://www.cfa.vic.gov.au/ArticleDocuments/1933/231128-CFA%20DGMR%20Renewable%20Energy%20Facilities%20v4.1.pdf

It should be noted that NSW RFS has to date not released a similar design guideline for renewable energy projects.

In addition to an Asset Protection Zone, our consultant Australian Bushfire Protection Planners Pty Ltd advice a requirement of an additional 300m wide fuel reduced buffer zone, managed either by intense grazing or slashing when the fuel hazard is higher than 100mm and exceeds 70% cured.

Recently both the Williamsdale and Royalla solar farms in the ACT implemented a 300 metre wide Outer Asset Protection Zone (buffer) to reduce fire risk.

Conclusion

I believe that the development approval for this project should be refused as this proposal is fundamentally flawed, given that the site is inappropriate, and all impacts / risks have not been properly assessed or mitigated.

Appendix 1 – David McMahon report on Soil, Land and Agricultural Impact Assessment August 2023

DMM_Glanmire_IR_9652_171023 (2).pdf

Appendix 2 – David McMahon BSAL Assessment Dec 2023

DMM_Glanmire_BSAL_9652_071223.pdf

Appendix 3

231128-CFA DGMR Renewable Energy Fa