PROJECT MEMORANDUM

mansergh graham
LANDSCAPE ARCHITECTS

Project:	Darfield Agrivoltaic Development	**Memo: 1**/R2	**Page:** 1 of 8
Topic:	Request for Additional Information (S92) Response		
Date:	9 December 2024		
Attention:	Tracey Morse – NZ Clean Energy		
From:	Dave Mansergh - MGLA		

Introduction

Darfield Solar and Energy Storage Ltd is proposing to develop a ground-mounted agrivoltaic development approximately 1.5km northwest of Darfield within a block of land bounded by West Coast Road (State Highway (SH) 73) to the southwest, Homebush Road to the south, Loes Road to the east, Auchenflower Road to the north and the Fonterra Darfield dairy factory site to the west/ northwest.

S92 Request

Velden Aviation Consulting Ltd was engaged by the Selwyn District Council (SDC) to peer review the glint and glare assessment prepared for the application and provide an analysis of the adequacy of the assessment method and proposed mitigation.

In an email to the applicant, the Council said:

> *Glint and Glare*
> *Further to our discussions, I have received the peer review of the Glint and Glare report from Mr Van der Velden. In consideration of the potential for adverse effects on road and rail users, Mr Van der Velden has identified concerns that the minimum 2m landscaping proposed in the landscape assessment will not be sufficient to mitigate the glint and glare effects. He notes that "given that the driver eye level height for large vehicles is 2.5m and the top of the PV arrays may be 2.8m as a minimum and 3.1m as a maximum then I not sure how they arrived at the 2m height for shade cloth and mitigation planting height given the drivers of larger vehicles will potentially see over this directly to the PV arrays and any potential reflected glare." In consideration of train drivers, he notes that the eye levels have been simulated by MGLA (and in the peer review) at 3m, and that the mitigation planting should be at least half a metre more than the diver eye level of the largest vehicles expected to be on the roads and rail. Mr Van der Velden notes that "it is more important for road traffic that glare is mitigated as far as practicable given the more immediate safety implications for drivers especially for larger vehicles expected along rural roads such as tractors and other large farm vehicles, school buses and haulage vehicles etc." I note that the MGLA report concludes with "Potential green and yellow glare on the road network should however be mitigated for traffic safety purposes through tracking adjustments and / or additional screening measures" but does not appear to provide any further information regarding the required extent of screening measures for traffic safety purposes. Mr Van der Velden has offered the following recommendation for further consideration by the applicant:*
>
> 1. *That given the maximum height of the proposed solar arrays are potentially 3.1m based on the drawings provided by the applicant NZ Clean Energy Ltd, that any proposed landscape mitigation planting be at least 4m high to ensure adequate screening from any potential view by observer points.*

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2. *That landscape planting along Auchenflower Road and towards and around the Homebush Road and State highway 73 intersection be at least 4m high to ensure it is above any potential view of the solar arrays and be sufficiently dense enough to eliminate potential glare from the solar array.*
3. *In relation to the above, to provide interim screening where plants still need to reach expected established heights to ensure mitigation of glare towards road traffic and so provide margins of safety to road traffic until planned established heights of plants can be reached.*
4. *To ensure that the planned mitigation landscape plantings themselves do not create any hazard by obscuring any view towards oncoming traffic especially at the road intersections being considered.*

In response to a request for further clarification from the Applicant, the Council responded as follows:

> *Mitigation Landscaping and Road Safety*
> *Mr Van der Velden has noted that there is a potential safety effect associated with clear sightlines for traffic movements around the site resulting from the proposed 2 – 3m or 4m mitigation plantings. As I understand it, Mr Van der Velden was raising this as a matter for consideration by the applicant to ensure that one mitigation measure does not cause any additional issues. Addressing this issue may be addressed through the transport assessment and / or through the planting plan.*

Response

The following has been prepared in response to the request for further information (above).

The mitigation approach identified in the landscape and visual assessment report differs from that required in the proposed condition. It is unknown if that report was made available to Mr Van der Velden. The landscape and visual assessment report recommended the use of screen planting as per the following figure:

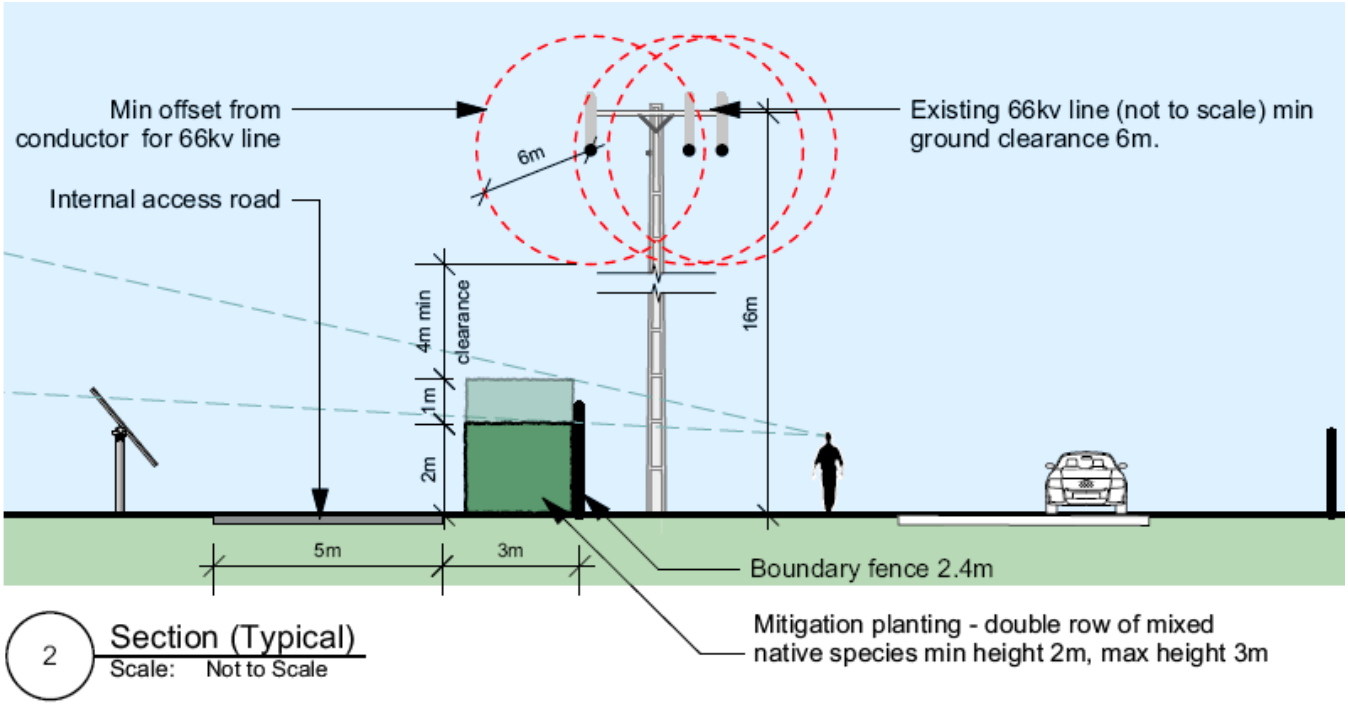

Figure 1: Proposed Mitigation (as per the Landscape Assessment Report)

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At the time of assessment, the approach proposed by the applicant was to use screen planting to mitigate the landscape and visual effects of the solar farm. The planting would be retained at a height of between 2m and 3m (to minimize shading of the PV panels). To partially mitigate the effects of glint and glare on surrounding properties and the road and rail network, a combination of screen planting and PV tracking management was proposed.

Contrary to the above recommendation, the suggested glare condition put forward in the application says:

> ***Glare***
> *22. Glare at the following locations shall be mitigated by installing shade cloth (or similar) screens of 2.0m height until the mitigation planting establishes to a minimum height of 2.0m:*
> *(a) the intersections of Homebush Road and the Fonterra access road with SH73*
> *(b) the McHughs Forest Park walkway entrance*
> *(c) Auchenflower Road*
> *(d) Homebush Road*

The above condition does not align with the recommendations contained in the landscape and visual assessment report, which recommended the use of screen planting and tracking management instead of shade cloth. The use of shade cloth was not originally proposed because of the potential for the winds in the area to damage it (potentially affecting visual amenity).

The Landscape and Visual Assessment report states:

> ***Mitigation***
> *Glint and glare mitigation is required to reduce the traffic safety effects of glint and glare on road users along SH73, the Midland Railway line, Homebush Road and Auchenflower Road, and on the railway line.*
>
> *Mitigation is also required to reduce the effects of the proposal on landscape character and visual amenity values on No. 32 and 68 Loes Road and visitors to McHughs Forest Park.*
>
> *In most cases, the screening required to mitigate the effects of glint and glare (for traffic safety reasons) will mitigate the landscape and visual amenity effects. Where required, PV tracking management will be used to mitigate the effects of glare while the screen planting grows.*
>
> *While the mitigation planting will alter the spatial characteristics of the site and restrict the ability to look across the wider open rural landscape, it will help maintain rural character by screening the proposed agrivoltaic development while retaining views of the mountains beyond above the planting. Mitigation is not proposed along the less populated sections of the surrounding road, from where the site will be experienced as a hybrid agricultural-energy generation site.*

In response to point 1 of the peer reviewer's comments (above), the intended approach to the mitigation of glint and glare was a combination of physical screening (maintained at a height of between 2 & 3m), installation of the PV arrays at the minimum height and PV tracking management.

While the above approach will achieve the intended mitigation, it relies on tracking management to mitigate the effects of yellow glare on the intersection of Homebush Road and SH73.

It is now proposed that yellow glare will be mitigated by screening and ensuring that the PV Arrays in the locations expected to produce yellow glare are installed at minimum height. Any effects of green glare that are identified as a traffic safety issue by Mr McKenzie (Traffic expert) will be addressed through tracking management (if necessary) This approach will further reduce the risk of glint and glare becoming a traffic safety issue.

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In response to point 2, the modelling shows that along Auchenflower Road the height of the mitigation planting/screening only needs to be 2m high to mitigate the glare from the proposed solar farm (if installed at either minimum height or maximum height). Refer to attachement 1 below.

At the intersection of SH73 and Homebush Road, a minimum height of 3m is required (as identified above) to mitigate the effects of yellow glare in the intersection. Green glare is still expected to occur for up to five minutes per day between 7am and 9am from April until October.

In response to point 3, mitigation can be achieved instantly through the establishment of a shade cloth fence to 3m until the mitigation planting becomes established and reaches a height of 3m. This will provide a margin of safety.

Recommendations

In response to the change identified above and the concerns outlined by Mr Van der Velden's review, it is recommended that the proposed screen planting be established and maintained at a minimum height of 3m and that the PV arrays (in the locations likely to produce glare) are installed at the minimum installation height. Until the mitigation planting reaches a height of at least 3m and canopy closure occurs or post-implementation monitoring shows that glare is not an issue, a 3m high section of shade cloth fence should be erected along the boundary of the site and SH73.

The extent of the temporary mitigation required (to 3.0m) is shown as a dark blue line in the following figure, which also shows that part of the solar farm expected to produce the glare.

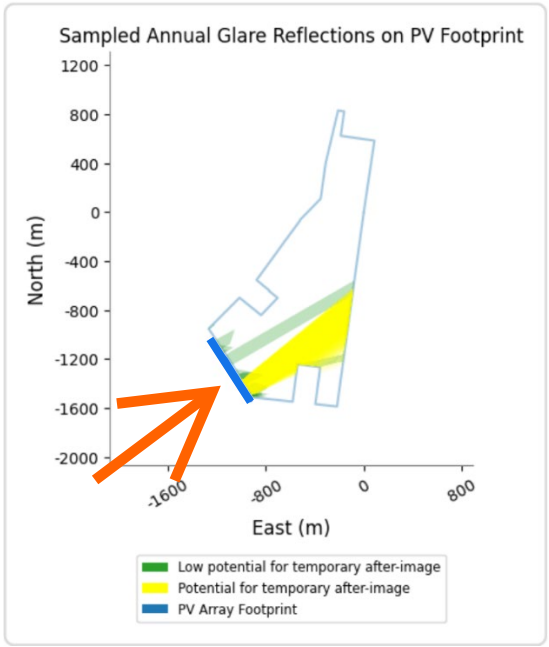

Figure 2: Temporary mitigation requirements (dark blue line)

Further analysis, using the NZTA driver height for trucks, showing the effectiveness of 3m high mitigation on glare on SH73 and its intersection with Homebush Road is appended to this response. This shows yellow glare (refer to the indicator arrows on the attached pages) is mitigated and that only a short period of green glare is expected to be experienced in the morning when the proposed PV Arrays are installed at minimum height. The extent to which any amendments to the mitigation will affect traffic safety and if the green glare is an issue will be responded to separately by Mr McKenzie (Traffic Safety Expert). Should Mr McKenzie recommend that the green glare requires mitigation, then this will be undertaken through tracking management techniques.

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It is however understood from discussions with Mr McKenzie that, due to the nature of the traffic on Auchenflower Road, and the time and duration of the expected glare, temporary mitigation measures are not required in this location.

It is also recommended that an adaptive management approach is adopted for glare management and that the suggested condition (above) be replaced with the following condition:

1. ***Glint and Glare Adaptive Management Plan***
   The Consent Holder must prepare and implement a Glint and Glare Adaptive Management Plan (GGAMP) to address any substantiated adverse glint and glare impacts on affected parties and/or the surrounding road network as identified in the Glint and Glare Analysis Report (dated 25 June 2024). The GGAMP must include the following:
   a) *Contact Information: The GGAMP must provide contact details for the Consent Holder and their agent responsible for addressing glint and glare complaints, ensuring that affected parties have a direct line of communication for reporting issues.*
   b) *Reporting Procedures: The plan must include procedures for reporting glint and glare issues by affected parties. This includes:*
      i. *The process for lodging a complaint.*
      ii. *The timeline within which the Consent Holder must acknowledge receipt of the complaint.*
      iii. *A detailed timeline for the investigation and response process, ensuring that any substantiated glare issues reported are addressed promptly and effectively within a specified timeframe.*
      iv. *Adaptive Management Strategies: The GGAMP should detail a range of possible mitigation solutions to address reported glint and glare issues. These solutions may include but are not limited to, physical alterations to the solar farm setup, installation of screening or landscaping to block or diffuse glare, and adjustments to the operational procedures of the solar farm (such as tracking management).*
   c) *Monitoring and Evaluation: The Consent Holder must implement a monitoring regime to assess the effectiveness of the mitigation measures implemented under the GGAMP. This includes feedback from affected parties on the resolution of reported glare issues.*
   d) *Duration of the Plan: Unless otherwise authorised by the Consent Authority, the GGAMP must be implemented for whichever is the greater duration of the following:*
      i. *A period of three years following the mitigation planting obtaining the minimum 3m height;*
      Or
      ii. *For a year following any remedial action undertaken.*
      During this period, the Consent Holder is obligated to respond to and manage glint and glare complaints as per the procedures outlined in the GGAMP.
   e) *Review and Reporting: The Consent Holder must submit an Annual Report to the Consent Authority if requested, summarising the glint and glare complaints received, actions taken, and the effectiveness of the mitigation measures implemented. The Annual Report may also recommend whether ongoing management of glint and glare issues is required along with any relevant supporting information.*

   Advice Note
   An adaptive management plan offers a flexible and responsive approach to managing glint and glare that may arise from the approved agrivoltaic activity, recognising the inherent challenges and uncertainties in accurately predicting glare impacts ahead of time. This approach allows for real-time monitoring and addressing of actual impacts as they occur, rather than relying solely on predictive models that may not fully capture the dynamic and variable nature of sunlight and its interactions with the environment. By focusing on adaptive measures, the plan can more efficiently respond to affected parties' concerns, ensuring that mitigation strategies are directly tailored to the specific conditions and experiences of those impacted.

This would enable better management of any glare effects that might occur and ensure that such issues are addressed as soon as possible.

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Attachment 1: Mitigation Parameters & Results Auchenflower Road

Obstruction Components

Name: Auchenflower Road Mitigation
Top height: 2.0 m

Vertex	Latitude (°)	Longitude (°)	Ground elevation (m)
1	-43.444100	172.094364	239.00
2	-43.444350	172.096467	238.00
3	-43.446110	172.096177	238.00
4	-43.446001	172.094868	238.00
5	-43.444225	172.095212	239.00

Glare Analysis Results

Summary of Results

Glare with potential for temporary after-image predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy	Peak Luminance
	°	°	min	hr	min	hr	kWh	cd/m²
Darfield Preliminary	SA tracking	SA tracking	1,687	28.1	222	3.7	-	472,950

Total glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Auchenflower Road	0	0.0	0	0.0
Bleak House Road	0	0.0	0	0.0
Boultons Road	0	0.0	0	0.0

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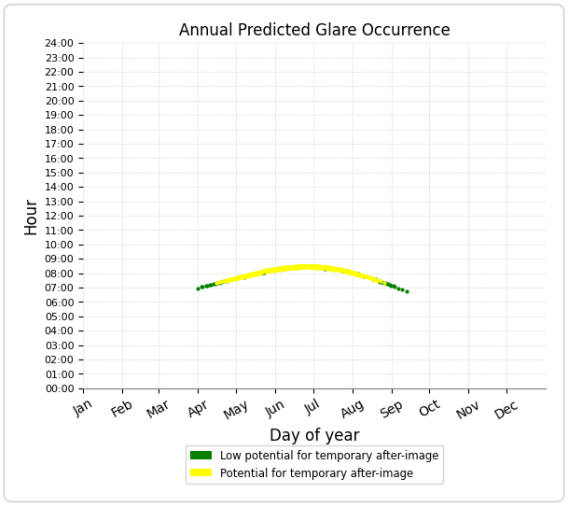
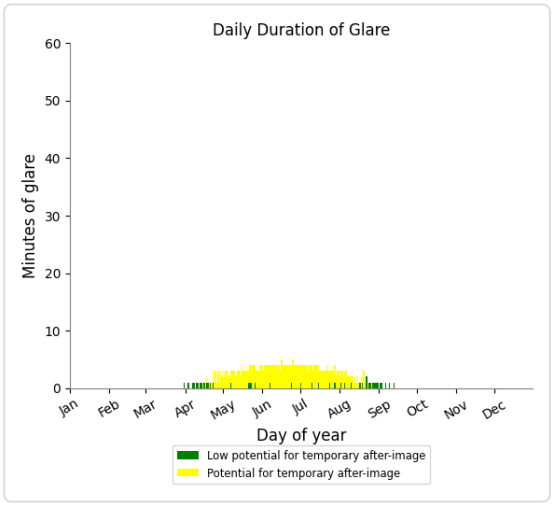
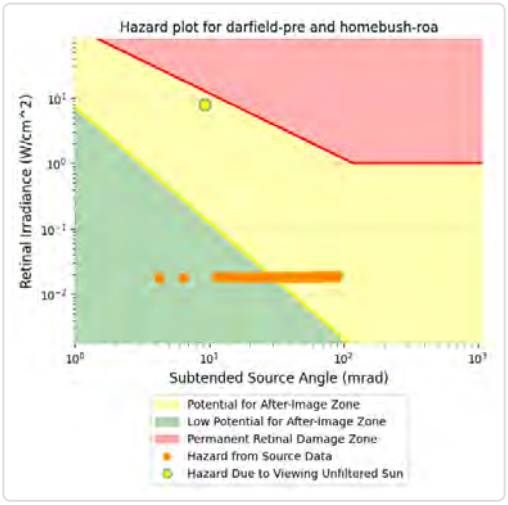
Darfield Preliminary and Route: Homebush Road West of Railway No Mitigation

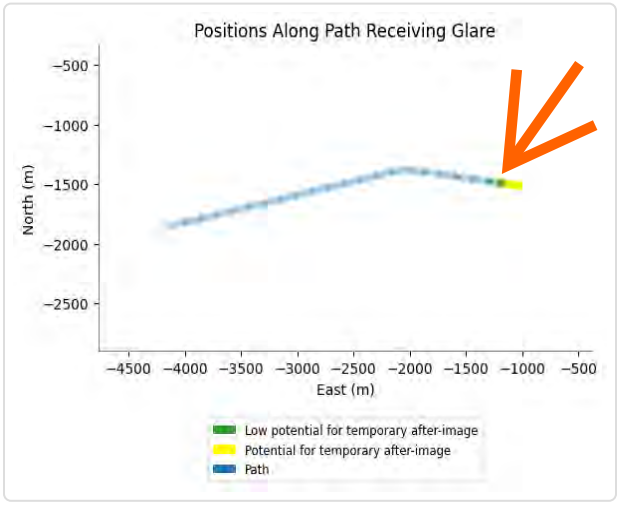
Yellow glare: 370 min.

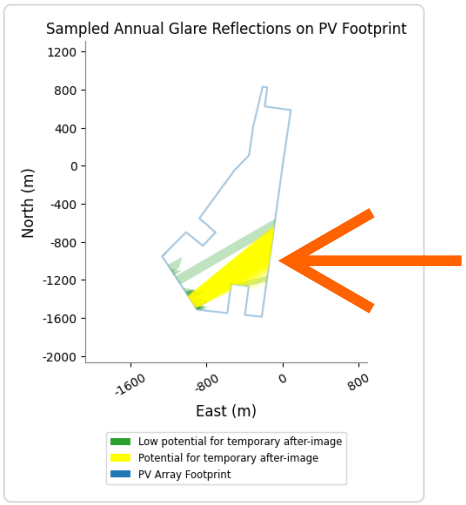
Green glare: 45 min.

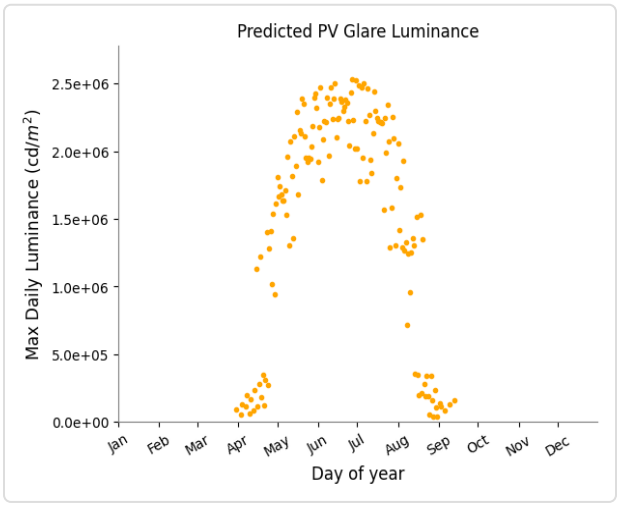












Darfield Preliminary and Route: Homebush Road West of Railway 3m High Mitigation

Yellow glare: none

Green glare: 415 min.