

WHERE EXPERIENCE AND PASSION MEET

Date: February 23, 2024
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To: Norah Jaffan
Site: North Coast Highway Solar Project
Subject: PV Array Installation Glare Analysis

This technical memorandum evaluates the potential solar glare resulting from the installation of 2.8 megawatt-alternation current (MWac) photovoltaic power generating facility in Humboldt County. The Assessor's Parcel Numbers for the site are 204-081-002, 204-081-004, 204-081-007, and 204-171-047. Access to the site is provided by County Route 36. The solar glare analysis assesses the compatibility of the proposed solar panels as per the requirements of Rohnerville Airport. The analysis and findings of this memo are intended for review and acceptance by Humboldt County, Humboldt County Airport Land Use Commission (ALUC) and Rohnerville Airport.

Project Description

As mentioned above, the proposed solar power generating facility would be located along County Route 36 in Humboldt County. The location of the project with respect to Rohnerville Airport and County Route 36 are shown in *Attachment A*. The site plan of the proposed solar generating facility is shown in *Attachment B*. The solar power generating facility that encompasses the solar panel area assumes approximately 11.24 acres in area. The solar panel installation was assumed to be smooth glass with anti-reflective coating, fixed mounted at 5 feet above the ground with a resting angle of 75° and a maximum tracking angle of 65° with the panel array orientated at 180.0°. These configurations were noted to result in maximum power.

Solar Glare Analysis Tools and Methodology

The potential impact of glint and glare from photovoltaic modules, concentrating solar collectors, receivers, and other components has received increased attention as a potential hazard or distraction for pilots, air-traffic control, and other airport personnel. Hazards from reflected solar radiation include the potential for permanent eye injury (e.g., retinal burn from concentrated sunlight) and temporary disability or distractions (e.g., glint, glare, after-images). The Federal Aviation Administration (FAA) requires the sponsor of proposed construction or alteration to confirm that the potential for glint and glare has been analyzed and determined to have no potential for ocular impacts to the airport's Air Traffic Control Tower (ATCT) cab¹.

Sandia National Laboratories (National Technology and Engineering Solutions of Sandia, LLC.) developed early Solar Glare Hazard Analysis Tools (SGHAT) which included programs for modeling and analyzing potential hazards from solar glare. These tools and programs had been adopted as a standard for FAA and other airport/user reviews. Due to new cybersecurity restrictions at Sandia, SGHAT is now available for internal Sandia use only. All external use of SGHAT is restricted, however the glare tool source code and algorithms were made available for licensing. The FAA policy to demonstrate compliance with 14 CFR 77.5 (c)² updated on May 11, 2021 withdrew their recommendation of the Solar Glare Hazard Analysis Tool (SGHAT) to analyze ocular impact as the tool is no longer available to all users at no cost. However, EPD Solutions obtained the use of the ForgeSolar Glare Analysis tool which utilizes the SGHAT glare tool source

¹ Federal Register. Referenced at <https://www.federalregister.gov/documents/2021/05/11/2021-09862/federal-aviation-administration-policy-review-of-solar-energy-system-projects-on-federally-obligated>

² Code of Federal Regulations. Referenced at [https://www.ecfr.gov/current/title-14/chapter-I/subchapter-E/part-77/subpart-B/section-77.5#p-77.5\(c\)](https://www.ecfr.gov/current/title-14/chapter-I/subchapter-E/part-77/subpart-B/section-77.5#p-77.5(c))

code and algorithms under subscription made available by Sims Industries (d/b/a ForgeSolar) which offers comparable tools for FAA-certifiable glare analysis.

This solar glare analysis memo incorporates the following:

- 1) Potential for glint or glare in the existing or planned Airport Traffic Control Tower (ATCT) cab. It is to be noted that there is no ATCT at Rohnerville Airport.
- 2) Potential for glare or “low potential for after-image” along the final approach path for any existing landing threshold or future landing thresholds. The final approach path is defined as 2 miles from 50 feet above the landing threshold using a standard 3° glidepath.
- 3) Ocular impact analyzed over the entire calendar year in one-minute intervals from when the sun rises above the horizon until the sun sets below the horizon.

Findings

The light reflected from the surface of solar panels can result in glint (a momentary flash of bright light) and glare (a continuous source of bright light). These two effects can cause a brief loss of vision which can hamper the safe maneuvering of the aircraft while in flight. Ocular impacts from solar glare can result in green glare or yellow glare. Green glare can be defined as glare with low potential to cause after image or flash blindness for a few seconds which would not hamper safe aircraft maneuvering. Yellow glare can be defined as glare with potential to cause temporary after-image lasting more than a few seconds that might hamper safe aircraft maneuvering. Yellow glare is not acceptable as per glare hazard model criteria and would require mitigation to reduce ocular impact to green glare or better.

As per the solar glare analysis conducted, the proposed solar power generating facility would result in green glare as shown in Table 1 below. No yellow glare is predicted. Therefore, the proposed solar power facility would pass the glare hazard model criteria, with zero minutes per year outside the ‘green zone’ of acceptable reflected solar energy. The glare analysis results for all flight paths are presented in Attachment C.

The maximum amount of resting angle before yellow glare is produced was tested in ForgeSolar. Do not set panels under 17° resting angle. Resting angles below 17° were noted to produce yellow glare. Configuration resulting in yellow glare is also presented in Attachment C for reference.

Table 1: Glare Minutes per Year

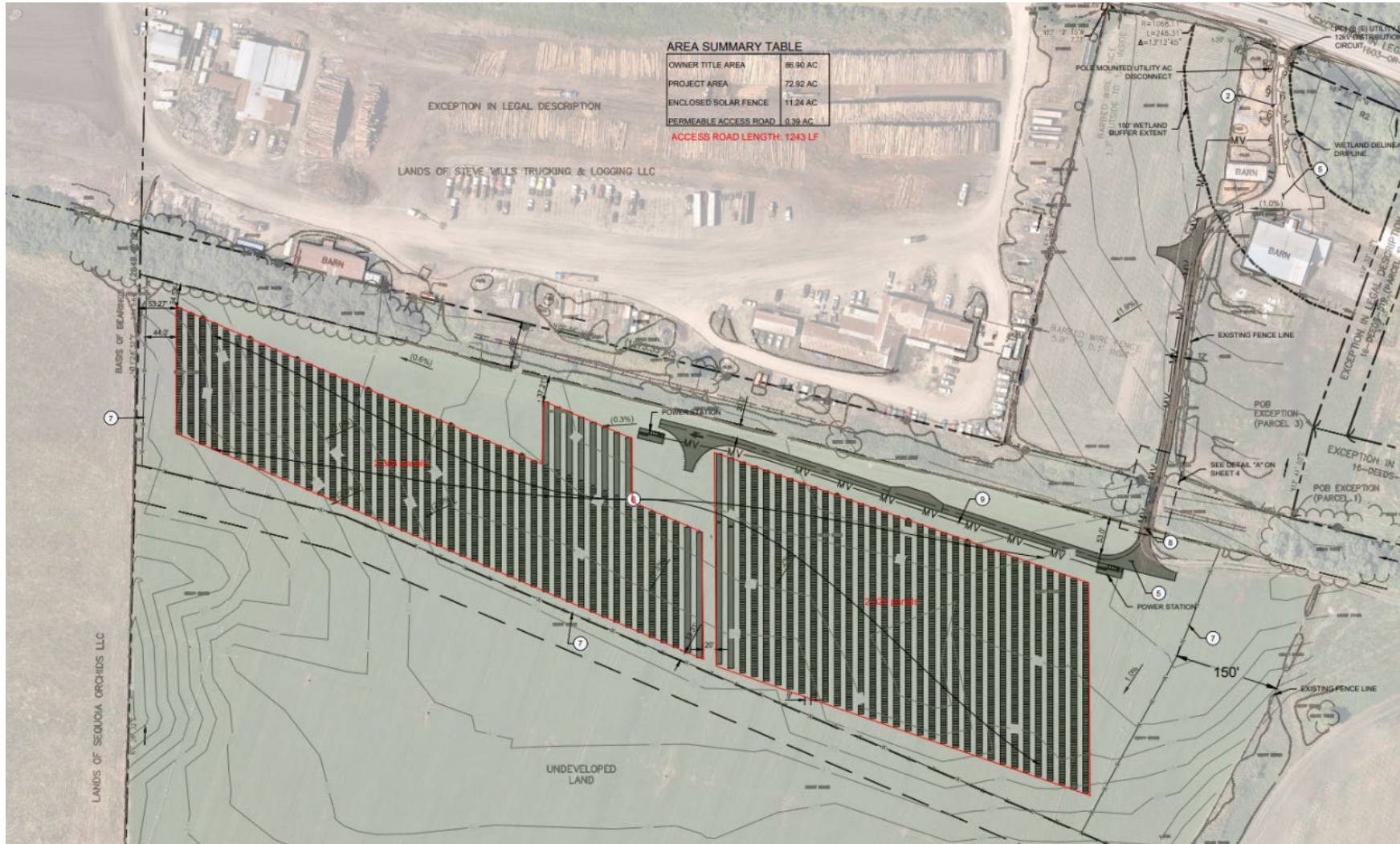
Analysis Component	Green Glare (min)	Yellow Glare (min)	Pass?
1. Runway 11 Final	0	0	Yes
2. Runway 29 Final	25,955	0	Yes

If you have any questions about this information, please contact me at (412) 636-2713 or abby@epdsolutions.com.

Attachment A: Solar Power Facility Location



Attachment B: Project Site Plan



Attachment C: North Coast PV Facility Solar Glare Analysis Results