Gustin Solar

Harrisville Township

Exhibit C

Glare Study

June 15, 2026

This Page Intentionally Left Blank

1898 & CO.®
PART OF BURNS McDONNELL

SOLAR GLARE STUDY

CONSUMERS ENERGY COMPANY

GUSTIN SOLAR ENERGY CENTER

192088

June 15, 2026

CONTENTS

TABLES

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
1898 & Co.	1898 & Co., a division of Burns & McDonnell Michigan, Inc.
FAA	Federal Aviation Administration
MWac	Megawatt alternating current
MWdc	Megawatt direct current
Owner	Consumers Energy Company
Project	Gustin Solar Energy Center
Project Site	Location of Project in Gustin and Harrisville Township, Alcona County, Michigan
PV	Photovoltaic
Study	Solar Glare Analysis

1.0 Introduction

1.1 Study Overview

1898 & Co., a division of Burns & McDonnell Michigan, Inc. ("1898 & Co.") is pleased to provide a glare study to Burns & McDonnell Michigan, Inc. for the Gustin Solar Energy Center (the "Project"), proposed by Consumers Energy Company ("Owner"). The objective of the Study is to estimate the potential for Project solar arrays to direct concentrated glare toward or onto nearby properties or roadways located in Harrisville Township.

1.2 Project Overview

Gustin Solar Energy Center is proposed on land located in Gustin and Harrisville Township, Alcona County, Michigan, approximately 4.5 miles west of the city of Harrisville. Within Harrisville Township, the Project will generate 116.5 megawatts direct current ("MWdc") and 94 megawatts alternating current ("MWac").

1.3 Glare Overview

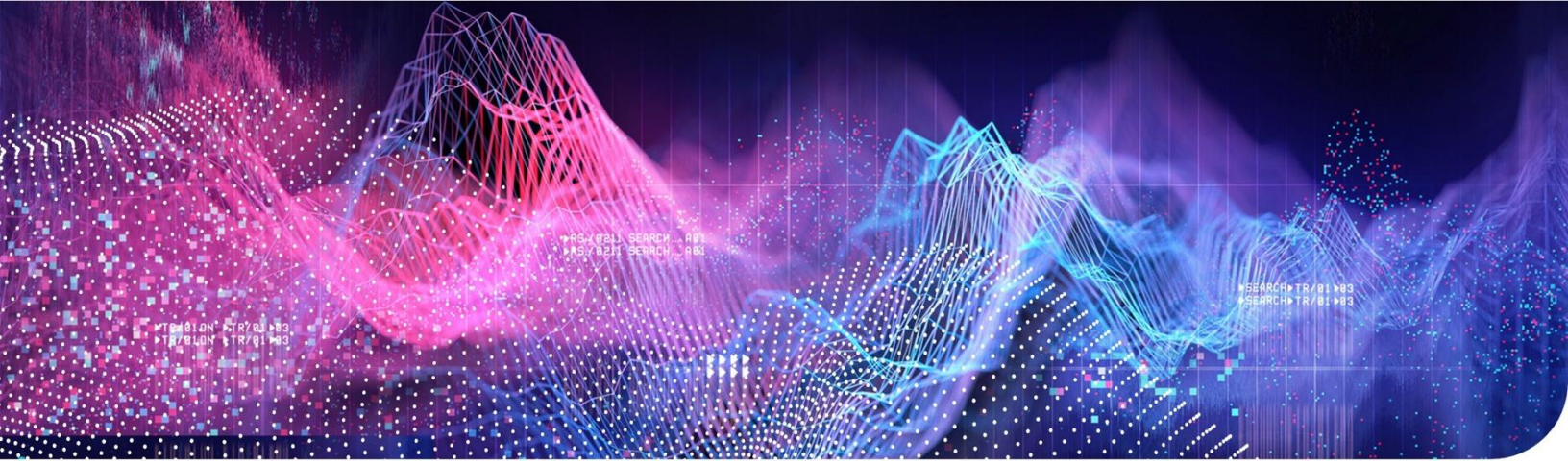
Glare is defined as a continuous source of bright light reflecting or refracting off a surface. Glare from a solar project occurs when the sun reflects or refracts off the solar panels, and only occurs under very specific conditions that are dependent on sun position, tracker position, time of day, and other similar factors.

Glare is considered consequential if the yellow glare may cause ocular impacts to the observer and the glare does not occur within an hour of sunrise or sunset and from a similar direction as the sun. Since the intensity of the sun is significantly greater than the intensity of the glare from the Project, the impact of glare on the observer is negligible compared to the sun when the glare occurs within an hour of sunrise or sunset and from a similar direction as the sun.

1.4 Applicable Regulation

Glare associated with solar arrays is not currently regulated by any applicable county or state. However, Section 7.31.A.2 of the Harrisville Township Zoning Ordinance provide as follows:

> **Section 7.31.A.2:** *Solar Energy Systems shall be located or placed so that concentrated solar glare shall not be directed toward or onto nearby properties or roadways at any time of the day.*



2.0 Modeling Parameters and Inputs

2.1 Modeling Overview

Glare was modeled for the Project Site using ForgeSolar, a commercially licensed Solar Glare Hazard Analysis Tool, which was initially developed by Sandia National Laboratory in conjunction with the Federal Aviation Administration (FAA).

This software models the sun's paths with respect to the orientation of the solar panels during every minute over a full year. Any glare caused by the arrays is analyzed by receptor and array block for the entire year. ForgeSolar assigns a color value of "green", "yellow", or "red" to the glare intensity based on the potential to cause afterimage or permanent damage. The potential glare is measured by the intensity at the observer's retina and the size of glare in the observer's field of vision.

Green Glare	Yellow Glare	Red Glare
Low potential of causing afterimage.	Potential of causing afterimage.	Potential of causing retinal burns only exists for concentrated solar-thermal projects.

From 1898 & Co.'s experience on similar large solar energy systems, an appropriate threshold for glare is visible or marginally visible "yellow" glare that does not occur within an hour of sunrise or sunset and from a similar direction as the sun. Since the intensity of the sun is significantly larger than the intensity of the glare from the Project, the impact of glare on the observer is negligible compared to the sun when the glare occurs within an hour of sunrise or sunset and from a similar direction as the sun. This threshold is due to the conservative nature of ForgeSolar modeling assumptions, the low potential of afterimage from "green" glare for a typical observer, and the allowable thresholds used by the FAA.

The following sections summarize the inputs utilized in the ForgeSolar model for this Study.

2.2 Solar Arrays

The Project was modeled as 34 separate arrays within the ForgeSolar model. For each array, the model assessed glare for the entire area encompassed by the polygon, including all the gaps between rows, inverters, and access roads. The parameters for the arrays and photovoltaic ("PV") panels are summarized in Table 2-1.

Table 2-1: Parameters for PV Arrays and Modules

Array Type	Maximum Tracking Angle (degrees)	Array Azimuth (degrees)	Module Surface Material	Average Height Above Ground (ft)	Ground Coverage Ratio (%)
Single-axis tracking	+/- 52	180	Smooth glass with anti-reflective coating (revised)	5.5	37.2

Glare intensity is partially dependent on the distance between a receptor and the array where glare is occurring and partially dependent on the size of the glare. The Owner-provided layout of the arrays are graphically represented in Appendix A.

2.3 Receptors

The following receptors in Harrisville Township were modeled within Forge Solar:

- 32 residences and buildings were modeled six feet above the ground as "observation points".
- 8 roads were modeled four feet and eight feet above the ground as "path receptors" in ForgeSolar. The glare on a path receptor is limited to a 50-degree view angle in the direction of travel in accordance with FAA research on glare impacts for pilots.

The location of the receptors and roadways were determined using aerial imagery. The location of each receptor is presented graphically in Appendix A, and the coordinates of the residences and buildings are presented in Appendix B.

2.4 Terrain and Existing Vegetation

The ForgeSolar model utilizes topography data to place the arrays and receptors at the proper elevation. The model does not consider any natural features between the arrays and a receptor that may block the glare from being seen at a receptor.

Publicly-available terrain data was downloaded from the National Elevation Dataset, a product of the United States Geological Survey. The 10-meter resolution digital elevation model was exported as 5-meter intervals for use in the ForgeSolar model. Elevations were assigned by 1898 & Co. to each vertex of the arrays and each receptor using this data.

After the ForgeSolar model is run, the line of sight of any instances of "yellow" glare were further evaluated using aerial imagery to determine if the glare would be visible, marginally visible, or not visible to the observer. The line-of-sight designation for each instance of "yellow" glare is presented in Appendix B.

2.5 Obstacles

Obstacles located between a receptor and a solar array, such as trees or buildings, may significantly reduce or eliminate the duration and/or intensity of the glare.

Within the Project area, there are several existing and substantial forested areas with having a width greater than 100 feet. Ten forested areas were identified using aerial imagery and were modeled as twenty-foot obstacles in the ForgeSolar model. Other obstacles and trees were considered as part of the line-of-sight analysis for the receptors that received “yellow” glare.

2.6 Resting Angle

The sun’s path with respect to each solar array is calculated by the ForgeSolar model to determine the glare during every minute over a full year. Since the model assumes a flat horizon with no elevation change or obstacles, at low sun angles the model generates erroneous results if the resting angle is set to zero degrees. Thus, a resting angle of five (5) degrees is utilized for the maximum angle the trackers will rotate backward to during back-tracking. For the analysis, the resting angle does not reach the night-time stow position (zero-degree angle) until the sun is on or below the horizon.

2.7 Environment

Glare only occurs when the sun is shining. The model assumes the sun is always shining, with no consideration given for cloud cover, rainy days, fog, or other similar occurrences that may diminish the potential occurrence or severity of glare. This approach provides a conservative estimate of the amount of time when glare could occur.

3.0 Results

Using the inputs and parameters defined in Section 2.0, the ForgeSolar model calculated the potential for glare for the identified receptors in Harrisville Township. Table 3-1 summarizes the results. The tables included in Appendix B detail potential glare duration and intensity by receptor, including estimated daily minutes. The maps included in Appendix A identify the receptors impacted by potential glare.

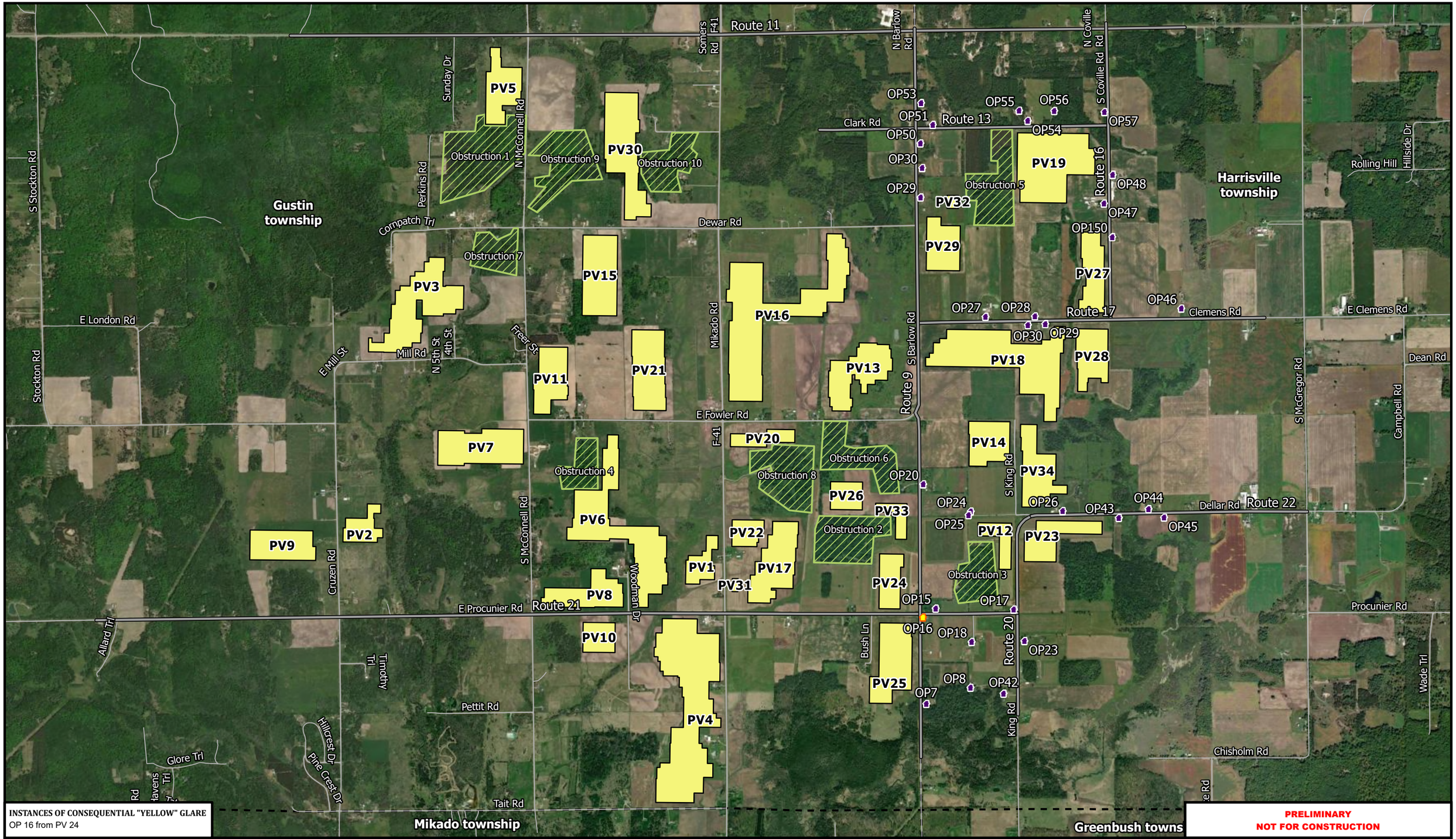
Table 3-1: Summary of Results

Type of Receptor	No. of Receptors	No. of Instances of "Yellow Glare"	
		Inconsequential	Consequential
Residences	32	4	1
Roads	8	2	0

The following summarizes key observations from the results of the Study:

- Six of the 40 identified receptors are estimated to receive seven instances of potential “yellow” glare. (A single receptor can have multiple instances of glare from different arrays.) Instances of “yellow” glare are considered inconsequential if the glare is not visible at the receptor or the glare occurs from the same direction as the sun during sunrise or sunset.
    - Of the seven instances of potential “yellow” glare, two instances of glare are not visible at the receptor and is not considered consequential.
    - Of the five instances of potential “yellow” glare visible or marginally visible at the receptor, four instances of glare occur within an hour of sunrise or sunset and from a similar direction as the sun for the observer. Since the sun is significantly more intense than estimated glare from the Project, the impacts of the glare during these times are negligible compared to the impact of the sun.
    - For the one remaining instance of potential “yellow” glare visible at one residence, planned visual screening may reduce or eliminate the impact of the glare. Alternatively, operational controls can be used to adjust the angle of the PV panels that are the source of the glare and thereby eliminating it.
- The Study was performed using a conservative modeling approach with Project Site-specific conditions. Further, the Project Site was modeled with sunny conditions, complete coverage of PV panels in the modeled arrays, a flat horizon, and a terrain between the Project Site and the receptors. Due to the conservative approach of the Study, the actual duration and intensity of glare experienced at each receptor is expected to be less than those reported in the Study.

APPENDIX A – GLARE INTENSITY MAP



INSTANCES OF CONSEQUENTIAL "YELLOW" GLARE
OP 16 from PV 24

LEGEND

- Array
- Obstacle
- Township
- Observation Point: Yellow Glare, No Glare
- Route: No Glare

REFERENCE

0 0.5 1 MILES

0 0.45 0.9 KILOMETERS

N

PRELIMINARY
NOT FOR CONSTRUCTION

Gustin Solar Energy Center
Solar Glare Study

LOCATION:	Harrisville Township, Alcona County, Michigan
CLIENT:	Consumers Energy Company
PROJ. NO.:	192088
CREATED:	06/04/2026

BURNS McDONNELL
www.burnsmcd.com

APPENDIX B – GLARE RESULTS BY RECEPTOR

Table B-1: Glare Results by Receptor – Residences

Receptor Name	Latitude	Longitude	Daily Yellow Glare Duration (minutes)	Time of Day (EST)	Time of Year	Visibility	Sunrise/Sunset[1]	Consequential
OP-7	44.606	-83.402	0	-	-	-	-	-
OP-8	44.607	-83.397	0	-	-	-	-	-
OP-15	44.613	-83.401	PV24: 20 minutes	6:45PM - 7:45PM	April - August	Not Visible	No	No
OP-16	44.612	-83.402	PV24: 25 minutes	6:45PM - 7:45PM	April - August	Marginally Visible	No	Yes
OP-17	44.613	-83.393	0	-	-	-	-	-
OP-18	44.611	-83.397	PV24: 10 minutes	7:00PM - 7:45PM	May - July	Not Visible	No	No
OP-20	44.622	-83.402	0	-	-	-	-	-
OP-23	44.611	-83.391	0	-	-	-	-	-
OP-24	44.620	-83.397	0	-	-	-	-	-
OP-25	44.620	-83.397	0	-	-	-	-	-
OP-26	44.620	-83.388	0	-	-	-	-	-
OP-27	44.635	-83.396	0	-	-	-	-	-
OP-28	44.635	-83.390	PV29: 5 minutes	7:00PM - 8:00PM	June	Marginally Visible	Yes	No
OP-29	44.634	-83.389	0	-	-	-	-	-
OP-30	44.634	-83.391	0	-	-	-	-	-
OP-31	44.644	-83.402	0	-	-	-	-	-
OP-32	44.646	-83.402	0	-	-	-	-	-
OP-42	44.607	-83.394	0	-	-	-	-	-
OP-43	44.620	-83.382	0	-	-	-	-	-
OP-44	44.621	-83.379	0	-	-	-	-	-
OP-45	44.620	-83.377	0	-	-	-	-	-
OP-46	44.635	-83.375	0	-	-	-	-	-
OP-47	44.643	-83.383	0	-	-	-	-	-
OP-48	44.645	-83.382	PV19: <5 minutes	7:45PM - 8:00PM	June	Visible	Yes	No

[1] Sunrise/Sunset column summarizes if the glare occurs within an hour of sunrise or sunset and from a similar direction as the sun. Since the intensity of the sun is significantly larger than the intensity of the glare from the Project, the impact of glare on the observer is negligible compared to the sun during the instance of glare.

Receptor Name	Latitude	Longitude	Daily Yellow Glare Duration (minutes)	Time of Day (EST)	Time of Year	Visibility	Sunrise/Sunset[1]	Consequential
OP-50	44.648	-83.402	0	-	-	-	-	-
OP-51	44.649	-83.401	0	-	-	-	-	-
OP-53	44.651	-83.402	0	-	-	-	-	-
OP-54	44.649	-83.391	0	-	-	-	-	-
OP-55	44.650	-83.392	0	-	-	-	-	-
OP-56	44.650	-83.388	0	-	-	-	-	-
OP-57	44.650	-83.383	0	-	-	-	-	-
OP-150	44.641	-83.382	0	-	-	-	-	-

Table B-2: Glare Results by Receptor – Roads

Receptor Name	Associated Road	Daily Yellow Glare Duration (minutes)	Time of Day (EST)	Time of Year	Visibility	Sunrise/Sunset[2]	Consequential
Route 9	S Barlow Road	0	-	-	-	-	-
Route 11	Hwy 72	0	-	-	-	-	-
Route 13	Clark Rd	0	-	-	-	-	-
Route 16	S Coville Rd	0	-	-	-	-	-
Route 17	Clemens Rd	PV27: 5 minutes PV29: 10 minutes	5:00PM - 5:45PM 7:00PM - 8:00PM	June - July June - July	Visible Marginally Visible	Yes Yes	No No
Route 20	King Rd	0	-	-	-	-	-
Route 21	E Procunier Road	0	-	-	-	-	-
Route 22	Dellar Rd	0	-	-	-	-	-

[2] Sunrise/Sunset column summarizes if the glare occurs within an hour of sunrise or sunset and from a similar direction as the sun. Since the intensity of the sun is significantly larger than the intensity of the glare from the Project, the impact of glare on the observer is negligible compared to the sun during the instance of glare.

1898andco.com