

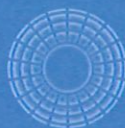
Black Diamond Solar Project

Swift Current Energy

Christian County, Illinois

Glint & Glare Analysis

December 20, 2019



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Summary

Swift Current Energy is proposing to construct solar arrays near Taylorville Municipal Airport (TAZ) and Tommy's Air Park (9LL5), in Christian County, Illinois ([Figure 1](#)). On behalf of Swift Current Energy, Capitol Airspace performed a Glint and Glare Analysis utilizing the Solar Glare Hazard Analysis Tool (SGHAT) in order to identify any potential impacts on Taylorville Municipal Airport and Tommy's Air Park operations. Specifically, this analysis considered the impact on aircraft approaching to land on Runways 18/36, 09L/27R, and 09R/27L at Taylorville Municipal Airport and Runways 18/36 at Tommy's Air Park. Since neither airport is a controlled airport, this analysis did not consider the potential for impact on air traffic personnel working in an air traffic control tower (ATCT). Additionally, this analysis considered impact on residents and vehicles.

The results of the study show that there is no predicted glare from the solar array for aircraft making approaches to Runways 18/36, 09L/27R, and 09R/27L at Taylorville Municipal Airport and Runways 18/36 at Tommy's Air Park. These results conform to, and are in accordance with, the FAA's interim policy for *Solar Energy System Projects on Federally Obligated Airports*.

There is no predicted glare for single story or second story residences. There was also no predicted glare from the solar arrays along identified routes for cars and large trucks. Capitol Airspace has applied FAA's glint and glare standards to residences and vehicular operations due to the absence of non-aviation regulatory guidelines.

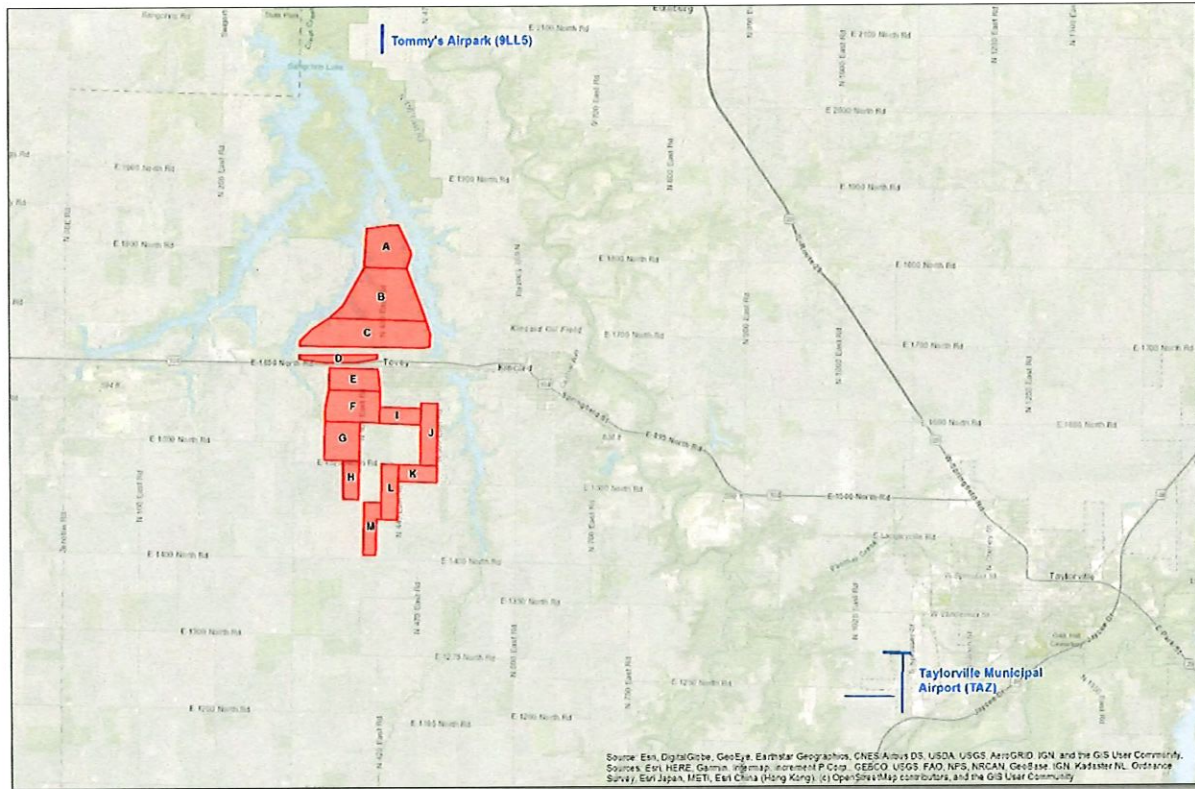


Figure 1: Location of Black Diamond Solar Project in Proximity to Local Airports

Methodology

The results of this analysis conform to, and are in accordance with, the FAA's interim policy for *Solar Energy System Projects on Federally Obligated Airports*.¹ The FAA adopted this interim policy in order to enhance safety by providing standards for measuring ocular impact of proposed solar energy systems on pilots and air traffic controllers. In cooperation with the Department of Energy (DOE), the FAA developed and validated the Sandia National Laboratories' "*Solar Glare Hazard Analysis Tool*" (SGHAT), now licensed through ForgeSolar. The FAA requires the use of the SGHAT to demonstrate compliance with the standards for measuring ocular impact.

In order for the FAA to approve a revised airport layout plan depicting a solar installation and/or issue a determination of no hazard, the airport sponsor is required to show that the solar installation meets the standards set forth in the interim policy. The interim policy states that a project:

1. Must not have a potential for glint or glare in the existing or planned ATCT cab, (Green, Yellow, or Red) and
2. Must not have a potential for glare (Yellow or Red) along the final approach path for any existing landing threshold or future landing thresholds (including any planned interim phases of the landing

¹ 78 FR 63276, 10/23/2013



thresholds) as shown on the current FAA-approved Airport Layout Plan (ALP). An airport may have a “low potential for after image” (Green) within these areas. The final approach path is defined as two (2) miles from fifty (50) feet above the landing threshold using a standard three (3) degree glidepath.

3. Ocular impact must be analyzed over the entire calendar year in one (1) minute intervals from when the sun rises above the horizon until the sun sets below the horizon.

SGHAT Assumptions:

1. Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
2. Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover, and geographic obstructions.
3. The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
4. Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

Capitol Airspace utilized the SGHAT based guidance provided in User’s Manual v.3. Solar array specifications were provided by Swift Current Energy. The Black Diamond Solar Project Arrays are single axis tracking solar arrays. Flight path data was developed by reviewing airport’s specific operations before entering it into the SGHAT tool. Each flight path has configurable parameters and observation points. One of the configurable inputs allows for limiting the downward and azimuthal angles of view from the flight path to simulate a pilot’s view out the window of the cockpit. Swift Current Energy specified that the analysis be conducted from the FAA’s approved default settings in the SGHAT tool which utilizes the view from the pilot’s perspective.



Data

Solar Array

Swift Current Energy provided the data for the array, based on the input parameters defined in the SGHAT User’s Manual v.3.

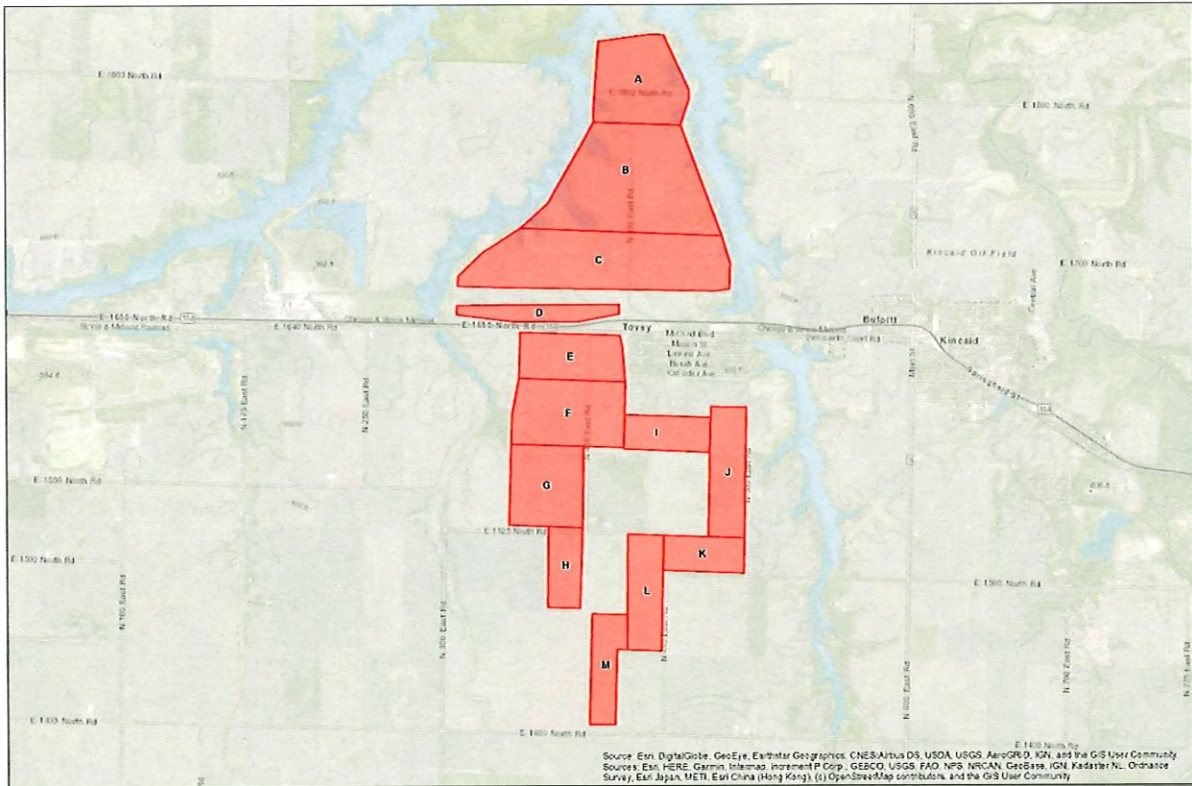


Figure 2: Overview of Black Diamond Solar Project Solar project

The data for the Black Diamond Solar Project Arrays are as follows:

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 1: Black Diamond Solar Project Array A Inputs



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.616936 | -89.455112 | 591.28 | 6 | 597.28 |
| 2 | 39.616931 | -89.453456 | 589.4 | 6 | 595.4 |
| 3 | 39.612025 | -89.450276 | 590.88 | 6 | 596.88 |
| 4 | 39.611156 | -89.450236 | 591.36 | 6 | 597.36 |
| 5 | 39.608803 | -89.451175 | 589.63 | 6 | 595.63 |
| 6 | 39.608846 | -89.461502 | 593.37 | 6 | 599.37 |
| 7 | 39.609739 | -89.461533 | 594.32 | 6 | 600.32 |
| 8 | 39.616183 | -89.461148 | 591.48 | 6 | 597.48 |

Table 2: Black Diamond Solar Project Array A Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 3: Black Diamond Solar Project Array B Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.5989 | -89.446062 | 594.48 | 6 | 600.48 |
| 2 | 39.599109 | -89.469815 | 590.07 | 6 | 596.07 |
| 3 | 39.601479 | -89.466556 | 599.86 | 6 | 605.86 |
| 4 | 39.606423 | -89.463123 | 590.85 | 6 | 596.85 |
| 5 | 39.608846 | -89.461502 | 593.37 | 6 | 599.37 |
| 6 | 39.608803 | -89.451175 | 589.63 | 6 | 595.63 |

Table 4: Black Diamond Solar Project Array B Vertices



| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 5: Black Diamond Solar Project Array C Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.596391 | -89.445044 | 595.23 | 6 | 601.23 |
| 2 | 39.594074 | -89.445054 | 596.58 | 6 | 602.58 |
| 3 | 39.593874 | -89.446662 | 601.54 | 6 | 607.54 |
| 4 | 39.593694 | -89.471237 | 601.89 | 6 | 607.89 |
| 5 | 39.593692 | -89.477 | 595.49 | 6 | 601.49 |
| 6 | 39.594575 | -89.476992 | 596.36 | 6 | 602.36 |
| 7 | 39.596834 | -89.474149 | 596.6 | 6 | 602.6 |
| 8 | 39.599109 | -89.469815 | 590.07 | 6 | 596.07 |
| 9 | 39.5989 | -89.446062 | 594.48 | 6 | 600.48 |

Table 6: Black Diamond Solar Project Array C Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 7: Black Diamond Solar Project Array D Inputs



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.592146 | -89.470375 | 602.72 | 6 | 608.72 |
| 2 | 39.592326 | -89.462776 | 601.2 | 6 | 607.2 |
| 3 | 39.592426 | -89.457946 | 598.93 | 6 | 604.93 |
| 4 | 39.591572 | -89.457936 | 599.84 | 6 | 605.85 |
| 5 | 39.590758 | -89.462793 | 603.34 | 6 | 609.34 |
| 6 | 39.590629 | -89.470351 | 603.62 | 6 | 609.62 |
| 7 | 39.591135 | -89.477023 | 599.95 | 6 | 605.95 |
| 8 | 39.591974 | -89.477015 | 595.73 | 6 | 601.73 |

Table 8: Black Diamond Solar Project Array D Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 9: Black Diamond Solar Project Array E Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.589622 | -89.457796 | 603.3 | 6 | 609.3 |
| 2 | 39.58872 | -89.457457 | 601.86 | 6 | 607.86 |
| 3 | 39.585455 | -89.457025 | 598.95 | 6 | 604.95 |
| 4 | 39.585522 | -89.469571 | 604.64 | 6 | 610.64 |
| 5 | 39.589696 | -89.469572 | 604.32 | 6 | 610.32 |

Table 10: Black Diamond Solar Project Array E Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 11: Black Diamond Solar Project Array F Inputs



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.585455 | -89.457025 | 598.95 | 6 | 604.95 |
| 2 | 39.582475 | -89.456971 | 603.07 | 6 | 609.07 |
| 3 | 39.5795 | -89.45705 | 603.58 | 6 | 609.58 |
| 4 | 39.579554 | -89.470318 | 599.61 | 6 | 605.61 |
| 5 | 39.582169 | -89.470306 | 596.49 | 6 | 602.49 |
| 6 | 39.585522 | -89.469571 | 604.64 | 6 | 610.64 |

Table 12: Black Diamond Solar Project Array F Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 13: Black Diamond Solar Project Array G Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.579519 | -89.461751 | 604.71 | 6 | 610.71 |
| 2 | 39.572161 | -89.461646 | 607.47 | 6 | 613.47 |
| 3 | 39.572228 | -89.470352 | 606.09 | 6 | 612.09 |
| 4 | 39.579554 | -89.470318 | 599.61 | 6 | 605.61 |

Table 14: Black Diamond Solar Project Array G Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 15: Black Diamond Solar Project Array H Inputs



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.572161 | -89.461646 | 607.47 | 6 | 613.47 |
| 2 | 39.564859 | -89.461743 | 608.4 | 6 | 614.4 |
| 3 | 39.56488 | -89.465575 | 607.74 | 6 | 613.74 |
| 4 | 39.572192 | -89.465701 | 605.77 | 6 | 611.77 |

Table 16: Black Diamond Solar Project Array H Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 17: Black Diamond Solar Project Array I Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.582435 | -89.446893 | 603.58 | 6 | 609.59 |
| 2 | 39.579271 | -89.446925 | 604.19 | 6 | 610.19 |
| 3 | 39.579374 | -89.457025 | 603.32 | 6 | 609.32 |
| 4 | 39.5795 | -89.45705 | 603.58 | 6 | 609.58 |
| 5 | 39.582475 | -89.456971 | 603.07 | 6 | 609.07 |

Table 18: Black Diamond Solar Project Array I Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 19: Black Diamond Solar Project Array J Inputs



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.583423 | -89.442779 | 600.54 | 6 | 606.54 |
| 2 | 39.571611 | -89.442654 | 603.99 | 6 | 609.99 |
| 3 | 39.571634 | -89.446861 | 603.16 | 6 | 609.16 |
| 4 | 39.579271 | -89.446925 | 604.19 | 6 | 610.19 |
| 5 | 39.582435 | -89.446893 | 603.58 | 6 | 609.59 |
| 6 | 39.583383 | -89.446937 | 602.19 | 6 | 608.19 |

Table 20: Black Diamond Solar Project Array J Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 21: Black Diamond Solar Project Array K Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.56841 | -89.44262 | 604.77 | 6 | 610.77 |
| 2 | 39.568479 | -89.452114 | 606.35 | 6 | 612.35 |
| 3 | 39.571663 | -89.452128 | 604.81 | 6 | 610.81 |
| 4 | 39.571611 | -89.442654 | 603.99 | 6 | 609.99 |

Table 22: Black Diamond Solar Project Array K Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 23: Black Diamond Solar Project Array L Inputs



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.571663 | -89.452128 | 604.81 | 6 | 610.81 |
| 2 | 39.561181 | -89.452081 | 607.77 | 6 | 613.77 |
| 3 | 39.5612 | -89.456093 | 608.69 | 6 | 614.69 |
| 4 | 39.571686 | -89.456385 | 607.22 | 6 | 613.22 |

Table 24: Black Diamond Solar Project Array L Vertices

| Parameter | Value |
|----------------------------|------------------------------|
| Axis tracking: | Single-axis rotation |
| Tracking axis orientation: | 180.0° |
| Tracking axis tilt: | 0.0° |
| Max tracking angle: | 60.0° |
| Resting angle: | 5.0° |
| Panel material: | Smooth glass with AR coating |
| Reflectivity: | Vary with sun |
| Slope error: | Correlate with material |

Table 25: Black Diamond Solar Project Array M Inputs

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground (feet) | Total Elevation |
|----|-----------|------------|-------------------------|----------------------------|-----------------|
| 1 | 39.564395 | -89.456182 | 609.58 | 6 | 615.58 |
| 2 | 39.5612 | -89.456093 | 608.69 | 6 | 614.69 |
| 3 | 39.561206 | -89.457262 | 608.08 | 6 | 614.08 |
| 4 | 39.554404 | -89.457297 | 609.15 | 6 | 615.15 |
| 5 | 39.554379 | -89.460351 | 609.73 | 6 | 615.73 |
| 6 | 39.56439 | -89.460357 | 608.71 | 6 | 614.71 |

Table 26: Black Diamond Solar Project Array M Vertices



Taylorville Municipal Airport (TAZ)

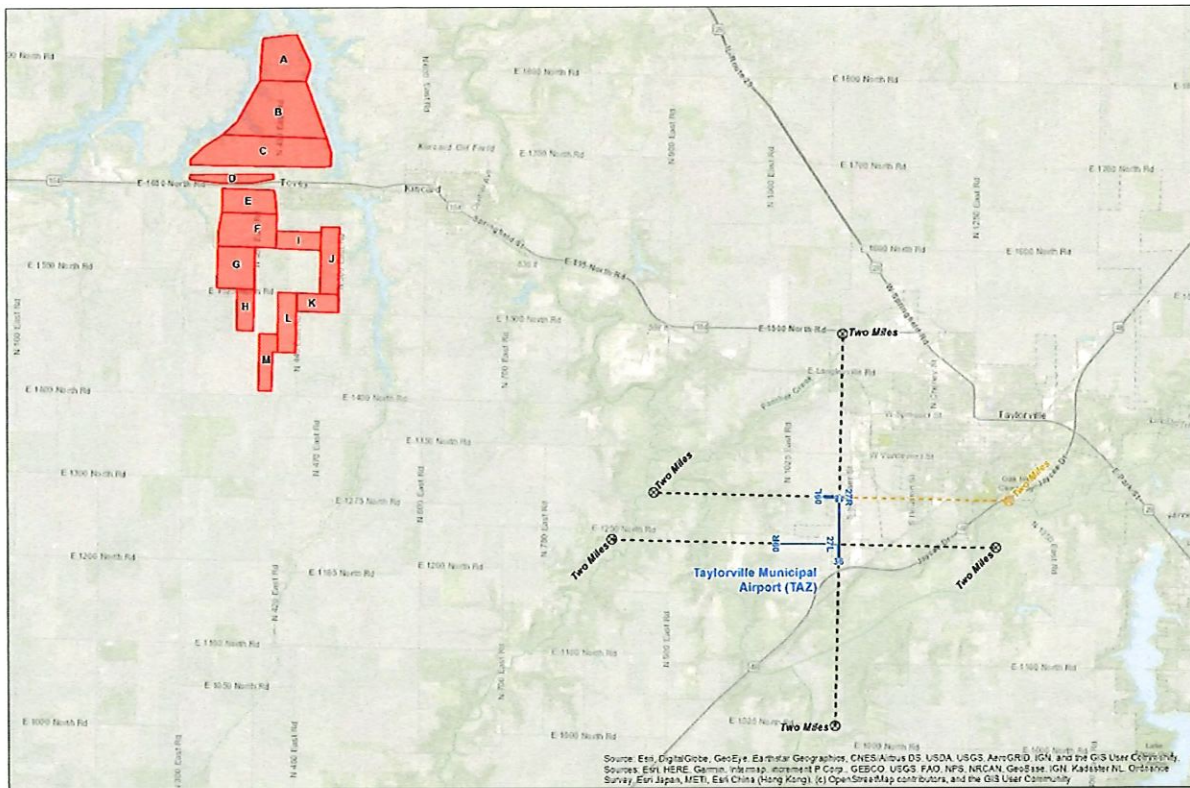


Figure 3: Taylorville Municipal Airport (TAZ) SGHAT flight paths and Black Diamond Solar Project

| Parameter | Runway 18 | Runway 36 |
|--|-----------|-----------|
| Threshold height (ft) | 50.0 | 50.0 |
| Direction (deg) | 180.0 | 0.0 |
| Glide slope (deg) | 3.0 | 3.0 |
| Consider pilot visibility from cockpit | Yes | Yes |

Table 27: Runway 18/36 flight path and viewing parameters

| Runway | Observation Point | Latitude | Longitude | Ground Elevation (feet) | Height above ground (feet) | Total Elevation (feet) |
|--------|-------------------|-----------|------------|-------------------------|----------------------------|------------------------|
| 18 | Threshold | 39.537836 | -89.327512 | 612.64 | 50 | 662.64 |
| | Two-mile | 39.566748 | -89.327512 | 597.39 | 618.71 | 1216.1 |
| 36 | Threshold | 39.526853 | -89.327344 | 619.56 | 50 | 669.56 |
| | Two-mile | 39.497941 | -89.327344 | 613.28 | 609.74 | 1223.02 |

Table 28: Runway 18/36 flight path observation points



| Parameter | Runway 09L | Runway 27R |
|--|------------|------------|
| Threshold height (ft) | 50.0 | 50.0 |
| Direction (deg) | 90.0 | 270.0 |
| Glide slope (deg) | 3.0 | 3.0 |
| Consider pilot visibility from cockpit | Yes | Yes |

Table 29: Runway 09L/27R flight path and viewing parameters

| Runway | Observation Point | Latitude | Longitude | Ground Elevation (feet) | Height above ground (feet) | Total Elevation (feet) |
|--------|-------------------|-----------|------------|-------------------------|----------------------------|------------------------|
| 09L | Threshold | 39.53816 | -89.332246 | 615.34 | 50 | 665.35 |
| | Two-mile | 39.53816 | -89.36978 | 560.59 | 658.21 | 1218.8 |
| 27R | Threshold | 39.538117 | -89.325392 | 611.4 | 50 | 661.4 |
| | Two-mile | 39.538117 | -89.287858 | 573.43 | 641.42 | 1214.86 |

Table 30: Runway 09L/27R flight path observation points

| Parameter | Runway 09R | Runway 27L |
|--|------------|------------|
| Threshold height (ft) | 50.0 | 50.0 |
| Direction (deg) | 90.0 | 270.0 |
| Glide slope (deg) | 3.0 | 3.0 |
| Consider pilot visibility from cockpit | Yes | Yes |

Table 31: Runway 09R/27L flight path and viewing parameters

| Runway | Observation Point | Latitude | Longitude | Ground Elevation (feet) | Height above ground (feet) | Total Elevation (feet) |
|--------|-------------------|-----------|------------|-------------------------|----------------------------|------------------------|
| 09R | Threshold | 39.529741 | -89.341708 | 614.47 | 50 | 664.47 |
| | Two-mile | 39.529741 | -89.379237 | 591.14 | 626.78 | 1217.93 |
| 27L | Threshold | 39.529854 | -89.329294 | 614.09 | 50 | 664.09 |
| | Two-mile | 39.529854 | -89.291765 | 575.3 | 642.24 | 1217.54 |

Table 32: Runway 09R/27L flight path observation points



Tommy's Air Park

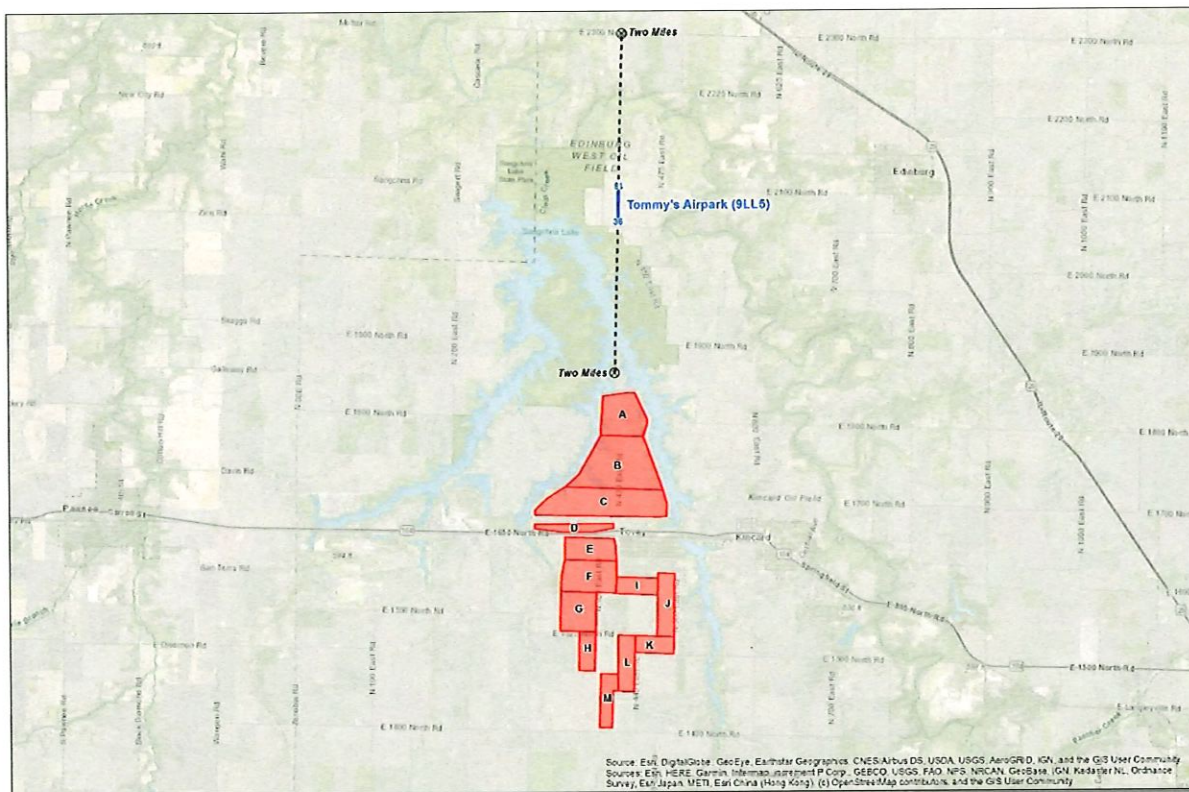


Figure 4: Tommy's Air Park SGHAT flight path and Black Diamond Solar Project Solar project

| Parameter | Runway 18 | Runway 36 |
|--|-----------|-----------|
| Threshold height (ft) | 50.0 | 50.0 |
| Direction (deg) | 180.0 | 0.0 |
| Glide slope (deg) | 3.0 | 3.0 |
| Consider pilot visibility from cockpit | Yes | Yes |

Table 33: Runway 18/36 flight path and viewing parameters

| Runway | Observation Point | Latitude | Longitude | Ground Elevation (feet) | Height above ground (feet) | Total Elevation (feet) |
|--------|-------------------|-----------|------------|-------------------------|----------------------------|------------------------|
| 18 | Threshold | 39.654876 | -89.458478 | 587.35 | 50 | 637.36 |
| | Two-mile | 39.683789 | -89.458478 | 583.05 | 607.76 | 1190.81 |
| 36 | Threshold | 39.649426 | -89.458407 | 589.84 | 50 | 639.84 |
| | Two-mile | 39.620514 | -89.458407 | 589.41 | 603.89 | 1193.3 |

Table 34: Runway 18/36 flight path observation points



Black Diamond Solar Project Discrete Observation Points - Residents

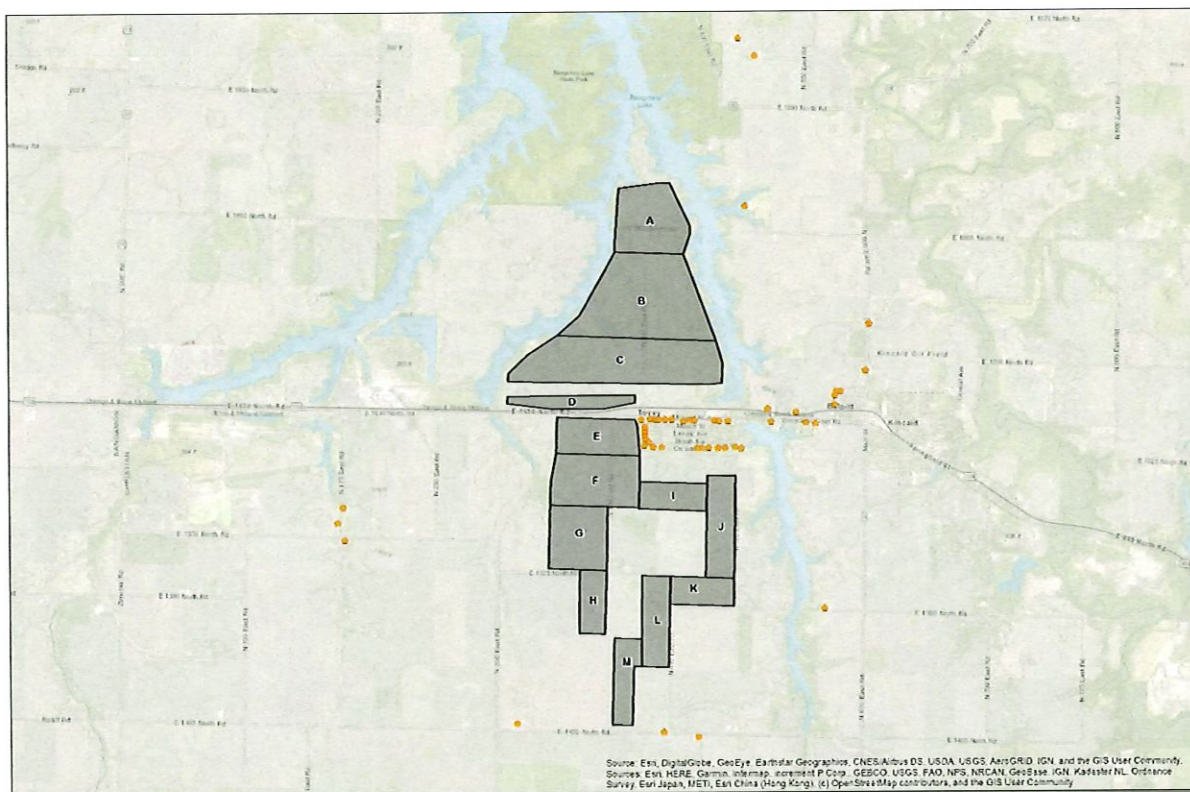


Figure 5: Location of Black Diamond Solar Project Arrays Discrete Observation Points - Residents



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground - Single Story (feet) | Total Elevation - Single Story | Height Above Ground - Second Story (feet) | Total Elevation - Second Story |
|-------|-----------|------------|-------------------------|---|--------------------------------|---|--------------------------------|
| OP 1 | 39.553727 | -89.452613 | 610.04 | 8 | 618.04 | 16 | 626.07 |
| OP 2 | 39.553254 | -89.447414 | 615.18 | 8 | 623.19 | 16 | 631.21 |
| OP 3 | 39.554297 | -89.474516 | 612.92 | 8 | 620.92 | 16 | 628.95 |
| OP 4 | 39.568408 | -89.428962 | 615.4 | 8 | 623.4 | 16 | 631.43 |
| OP 5 | 39.586629 | -89.441968 | 596.94 | 8 | 604.94 | 16 | 612.97 |
| OP 6 | 39.586712 | -89.442837 | 598.23 | 8 | 606.23 | 16 | 614.26 |
| OP 7 | 39.586596 | -89.444366 | 604.09 | 8 | 612.09 | 16 | 620.12 |
| OP 8 | 39.586587 | -89.445404 | 603.06 | 8 | 611.06 | 16 | 619.09 |
| OP 9 | 39.586577 | -89.446784 | 605.55 | 8 | 613.55 | 16 | 621.58 |
| OP 10 | 39.586535 | -89.447793 | 607.67 | 8 | 615.67 | 16 | 623.7 |
| OP 11 | 39.586516 | -89.448465 | 609.42 | 8 | 617.42 | 16 | 625.45 |
| OP 12 | 39.586492 | -89.453787 | 598.68 | 8 | 606.68 | 16 | 614.71 |
| OP 13 | 39.586542 | -89.455076 | 601.19 | 8 | 609.19 | 16 | 617.22 |
| OP 14 | 39.586655 | -89.456398 | 601.99 | 8 | 609.99 | 16 | 618.02 |
| OP 15 | 39.587092 | -89.455728 | 602.21 | 8 | 610.21 | 16 | 618.24 |
| OP 16 | 39.587477 | -89.456284 | 603.61 | 8 | 611.61 | 16 | 619.64 |
| OP 17 | 39.58795 | -89.456339 | 602.94 | 8 | 610.94 | 16 | 618.97 |
| OP 18 | 39.588328 | -89.456365 | 605.5 | 8 | 613.5 | 16 | 621.53 |
| OP 19 | 39.588822 | -89.456354 | 604.49 | 8 | 612.49 | 16 | 620.52 |
| OP 20 | 39.589647 | -89.456947 | 602.6 | 8 | 610.6 | 16 | 618.63 |
| OP 21 | 39.589754 | -89.455616 | 604.66 | 8 | 612.66 | 16 | 620.69 |
| OP 22 | 39.589721 | -89.454922 | 603.96 | 8 | 611.96 | 16 | 619.99 |
| OP 23 | 39.589726 | -89.454354 | 603.38 | 8 | 611.38 | 16 | 619.41 |
| OP 24 | 39.589738 | -89.453394 | 600.98 | 8 | 608.98 | 16 | 617.01 |
| OP 25 | 39.589736 | -89.452402 | 593.39 | 8 | 601.39 | 16 | 609.42 |
| OP 26 | 39.589597 | -89.450639 | 598.23 | 8 | 606.23 | 16 | 614.26 |
| OP 27 | 39.589743 | -89.44969 | 601.75 | 8 | 609.75 | 16 | 617.78 |
| OP 28 | 39.589723 | -89.449014 | 603.76 | 8 | 611.76 | 16 | 619.79 |
| OP 29 | 39.589752 | -89.446016 | 602.95 | 8 | 610.95 | 16 | 618.98 |
| OP 30 | 39.589725 | -89.445346 | 602.67 | 8 | 610.67 | 16 | 618.7 |
| OP 31 | 39.589723 | -89.444026 | 604.18 | 8 | 612.18 | 16 | 620.21 |
| OP 32 | 39.591261 | -89.438111 | 601.01 | 8 | 609.01 | 16 | 617.04 |
| OP 33 | 39.593405 | -89.427876 | 606.74 | 8 | 614.74 | 16 | 622.77 |
| OP 34 | 39.592954 | -89.428064 | 608.19 | 8 | 616.19 | 16 | 624.22 |
| OP 35 | 39.591863 | -89.428069 | 602.06 | 8 | 610.06 | 16 | 618.09 |
| OP 36 | 39.593459 | -89.427238 | 607.3 | 8 | 615.3 | 16 | 623.33 |
| OP 37 | 39.589752 | -89.437573 | 596.32 | 8 | 604.32 | 16 | 612.35 |
| OP 38 | 39.590914 | -89.433819 | 603.14 | 8 | 611.14 | 16 | 619.17 |



| | | | | | | | |
|-------|-----------|------------|--------|---|--------|----|--------|
| OP 39 | 39.589728 | -89.432361 | 604.67 | 8 | 612.67 | 16 | 620.7 |
| OP 40 | 39.589673 | -89.430881 | 603.84 | 8 | 611.85 | 16 | 619.87 |
| OP 41 | 39.5959 | -89.423617 | 602.1 | 8 | 610.1 | 16 | 618.13 |
| OP 42 | 39.601288 | -89.42318 | 605.64 | 8 | 613.64 | 16 | 621.67 |
| OP 43 | 39.614515 | -89.44222 | 596.43 | 8 | 604.43 | 16 | 612.46 |
| OP 44 | 39.633854 | -89.44381 | 596.72 | 8 | 604.72 | 16 | 612.75 |
| OP 45 | 39.631867 | -89.441231 | 596.26 | 8 | 604.26 | 16 | 612.29 |
| OP 46 | 39.574944 | -89.500892 | 600.27 | 8 | 608.27 | 16 | 616.3 |
| OP 47 | 39.576917 | -89.501982 | 602.34 | 8 | 610.34 | 16 | 618.37 |
| OP 48 | 39.578719 | -89.501212 | 600.45 | 8 | 608.45 | 16 | 616.48 |

Table 35: Black Diamond Solar Project Arrays Discrete Observation Receptors



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.590237 | -89.487521 | 595.83 | 4 | 599.83 | 8 | 603.83 |
| 2 | 39.590295 | -89.476674 | 598.09 | 4 | 602.09 | 8 | 606.09 |
| 3 | 39.590311 | -89.468896 | 598.9 | 4 | 602.9 | 8 | 606.9 |
| 4 | 39.59032 | -89.464851 | 601.62 | 4 | 605.62 | 8 | 609.62 |
| 5 | 39.590369 | -89.463778 | 599.38 | 4 | 603.38 | 8 | 607.38 |
| 6 | 39.590535 | -89.462094 | 600.41 | 4 | 604.41 | 8 | 608.41 |
| 7 | 39.590816 | -89.460216 | 599.39 | 4 | 603.39 | 8 | 607.39 |
| 8 | 39.590956 | -89.458771 | 598.86 | 4 | 602.86 | 8 | 606.86 |
| 9 | 39.591031 | -89.457409 | 597.87 | 4 | 601.87 | 8 | 605.87 |
| 10 | 39.591031 | -89.456067 | 598.55 | 4 | 602.55 | 8 | 606.55 |
| 11 | 39.591056 | -89.443976 | 591.13 | 4 | 595.13 | 8 | 599.13 |
| 12 | 39.591064 | -89.442152 | 580.91 | 4 | 584.91 | 8 | 588.91 |
| 13 | 39.591035 | -89.440872 | 598.66 | 4 | 602.67 | 8 | 606.67 |
| 14 | 39.590977 | -89.439719 | 598.06 | 4 | 602.06 | 8 | 606.06 |
| 15 | 39.590895 | -89.438609 | 599.14 | 4 | 603.14 | 8 | 607.14 |
| 16 | 39.590686 | -89.43661 | 594.79 | 4 | 598.79 | 8 | 602.79 |

Table 36: Black Diamond Solar Project Arrays Observation Receptors Route 1

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.59022 | -89.487465 | 596.01 | 4 | 600.01 | 8 | 604.01 |
| 2 | 39.586768 | -89.487425 | 597.54 | 4 | 601.54 | 8 | 605.54 |
| 3 | 39.581507 | -89.487368 | 602.06 | 4 | 606.06 | 8 | 610.06 |
| 4 | 39.575326 | -89.487347 | 601.84 | 4 | 605.84 | 8 | 609.84 |

Table 37: Black Diamond Solar Project Arrays Observation Receptors Route 2

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.57533 | -89.487341 | 601.84 | 4 | 605.84 | 8 | 609.84 |
| 2 | 39.57538 | -89.478302 | 593.77 | 4 | 597.77 | 8 | 601.77 |
| 3 | 39.575305 | -89.478018 | 594.11 | 4 | 598.11 | 8 | 602.11 |
| 4 | 39.57516 | -89.477862 | 594.83 | 4 | 598.83 | 8 | 602.83 |
| 5 | 39.574974 | -89.477809 | 594.81 | 4 | 598.81 | 8 | 602.81 |
| 6 | 39.55345 | -89.477726 | 606.14 | 4 | 610.14 | 8 | 614.14 |

Table 38: Black Diamond Solar Project Arrays Observation Receptors Route 3



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.553465 | -89.477739 | 606.14 | 4 | 610.14 | 8 | 614.14 |
| 2 | 39.553558 | -89.450424 | 605.86 | 4 | 609.86 | 8 | 613.86 |
| 3 | 39.553564 | -89.423108 | 602.34 | 4 | 606.34 | 8 | 610.34 |

Table 39: Black Diamond Solar Project Arrays Observation Receptors Route 4

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.568111 | -89.451736 | 605.23 | 4 | 609.23 | 8 | 613.23 |
| 2 | 39.568078 | -89.435428 | 600.23 | 4 | 604.23 | 8 | 608.23 |

Table 40: Black Diamond Solar Project Arrays Observation Receptors Route 5

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.568061 | -89.451715 | 605.16 | 4 | 609.16 | 8 | 613.16 |
| 2 | 39.55355 | -89.451715 | 603.79 | 4 | 607.79 | 8 | 611.79 |

Table 41: Black Diamond Solar Project Arrays Observation Receptors Route 6

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.571796 | -89.461349 | 608.55 | 4 | 612.55 | 8 | 616.55 |
| 2 | 39.571813 | -89.452037 | 602.18 | 4 | 606.18 | 8 | 610.18 |

Table 42: Black Diamond Solar Project Arrays Observation Receptors Route 7

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.579321 | -89.461328 | 604.61 | 4 | 608.61 | 8 | 612.61 |
| 2 | 39.571813 | -89.461328 | 608.55 | 4 | 612.56 | 8 | 616.56 |

Table 43: Black Diamond Solar Project Arrays Observation Receptors Route 8

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.589913 | -89.461247 | 600.55 | 4 | 604.55 | 8 | 608.55 |
| 2 | 39.589968 | -89.44246 | 590.09 | 4 | 594.09 | 8 | 598.09 |

Table 44: Black Diamond Solar Project Arrays Observation Receptors Route 9



| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.589902 | -89.442406 | 594.31 | 4 | 598.31 | 8 | 602.31 |
| 2 | 39.586383 | -89.442399 | 597.52 | 4 | 601.52 | 8 | 605.52 |

Table 45: Black Diamond Solar Project Arrays Observation Receptors Route 10

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.586365 | -89.442462 | 597.35 | 4 | 601.35 | 8 | 605.35 |
| 2 | 39.586059 | -89.44247 | 596.76 | 4 | 600.76 | 8 | 604.76 |
| 3 | 39.585803 | -89.442483 | 595.57 | 4 | 599.57 | 8 | 603.57 |
| 4 | 39.582128 | -89.442449 | 602.02 | 4 | 606.02 | 8 | 610.02 |
| 5 | 39.576382 | -89.442406 | 593.7 | 4 | 597.7 | 8 | 601.7 |
| 6 | 39.571714 | -89.442361 | 602.32 | 4 | 606.32 | 8 | 610.32 |
| 7 | 39.568078 | -89.442334 | 603.06 | 4 | 607.06 | 8 | 611.06 |

Table 46: Black Diamond Solar Project Arrays Observation Receptors Route 11

| ID | Latitude | Longitude | Ground Elevation (feet) | Height Above Ground – Cars (feet) | Total Elevation - Cars | Height Above Ground – Trucks (feet) | Total Elevation - Trucks |
|----|-----------|------------|-------------------------|-----------------------------------|------------------------|-------------------------------------|--------------------------|
| 1 | 39.571707 | -89.477662 | 602.48 | 4 | 606.48 | 8 | 610.45 |
| 2 | 39.571674 | -89.465925 | 603.74 | 4 | 607.74 | 8 | 611.71 |

Table 47: Black Diamond Solar Project Arrays Observation Receptors Route 12



Results

Capitol Airspace utilized the above specified inputs to analyze potential glint and glare at various points along the flight paths. Runway end coordinates were obtained from the FAA National Flight Data Center (NFDC) National Airspace System Resources (NASR) dataset. SGHAT uses this information to analyze each flight path between a two-mile final and the runway threshold.

If glare is detected, “Glare Occurrence Plots” are generated by SGHAT. The plots show when glare can occur (as viewed from the prescribed observation point) throughout the year. The color indicates the potential ocular hazard. The colors are defined as:

- **Green:** Low potential for temporary after-image glare
- **Yellow:** Potential for temporary after-image glare
- **Red:** Potential for permanent eye damage glare

The results of this analysis predicted no glare for any receptor ([Table 48](#)).

| Receptor | Green Glare (minutes / year) | Yellow Glare (minutes / year) | Red Glare (minutes / year) |
|-------------------------|---------------------------------|----------------------------------|-------------------------------|
| Runway 18 (9LL5) | 0 | 0 | 0 |
| Runway 36 (9LL5) | 0 | 0 | 0 |
| Runway 18 (TAZ) | 0 | 0 | 0 |
| Runway 36 (TAZ) | 0 | 0 | 0 |
| Runway 09L (TAZ) | 0 | 0 | 0 |
| Runway 27R (TAZ) | 0 | 0 | 0 |
| Runway 09R (TAZ) | 0 | 0 | 0 |
| Runway 27L (TAZ) | 0 | 0 | 0 |
| Residences Single Story | 0 | 0 | 0 |
| Residences Two Story | 0 | 0 | 0 |
| Route Cars | 0 | 0 | 0 |
| Route Trucks | 0 | 0 | 0 |

Table 48: Black Diamond Solar Project Glint and Glare Summary



Conclusion

The SGHAT analyzed the expected total footprints of the arrays for the Black Diamond Solar Project. The SGHAT findings indicated that no glare is predicted from the project arrays for the approaches to Runways 18/36, 09L/27R, and 09R/27L at Taylorville Municipal Airport and Runways 18/36 at Tommy's Air Park. The findings show that the project is compliant with the FAA interim policy for *Solar Energy System Projects on Federally Obligated Airports*.

There is no predicted glare for residences with an estimated single story viewing height of 8 feet and a second story viewing height of 16 feet. Additionally, there was no predicted glare from the solar arrays along Routes 1 through 12 for cars with an estimated viewing height of 4 feet and large trucks with an estimated viewing height of 8 feet. Capitol Airspace has applied FAA's glint and glare standards to vehicular operations due to the absence of non-aviation regulatory guidelines.

If you have any questions regarding the findings in this analysis, please contact [Rick Coles](#) at (703) 256-2485.