Rancho Viejo Solar Project Visual Impact Assessment Technical Report

JANUARY 2023

PREPARED FOR

AES Clean Energy Development, LLC

PREPARED BY

SWCA Environmental Consultants

RANCHO VIEJO SOLAR PROJECT
VISUAL IMPACT ASSESMENT TECHNICAL REPORT

Prepared for

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Prepared by

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SWCA Project No. 71537

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CONTENTS

Appendices

Figures

Tables

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1 INTRODUCTION

Rancho Viejo Solar, LLC (Rancho Viejo), is proposing to construct and operate the Rancho Viejo Solar Project (the Project) in Santa Fe County, New Mexico. Project construction and operation would require surface disturbance and built features that may impact the overall visual quality of the existing landscape.

This assessment report includes a Project overview; existing visual resources related to the Project; methods; existing conditions of the analysis area (defined in Section 2.1.1); characterization of potential visual impacts and concerns; suggested mitigation measures to reduce visual impacts associated with the Project. *Visual resources* are the physical features that make up the visible landscape (e.g., land, water, vegetation, topography, and human-made elements such as buildings, roads, utilities, and structures. The terms *scenery* and *visual character* refer to the overall visual appearance of a given landscape based on the visual aspects of the landscape's vegetation, landforms, water sources, and human-made modifications. *Viewing locations* are physical locations within the surrounding landscape from which the public could view the Project, including from residential areas, travel routes, recreation areas, and specially designated areas with management direction specific to visual resources.

1.1 Project Description

Rancho Viejo Solar, LLC (Rancho Viejo), is proposing to build the Rancho Viejo Solar Project (Project), which will include a 800-acre solar facility, a 2-acre collector substation, a, 4-acre BESS, a 2.3-mile generation tie-in line (gen- tie), and a 1.4-mile access road, on private land in Santa Fe County, New Mexico (analysis area). The Project will be approximately 1 mile south of Santa Fe city limits and approximately 4.2 miles east of La Cienega. The Project will generate 96 megawatts (MW), and will include 48 MW BESS, for storage and delivery of renewable solar energy to customers throughout New Mexico. The energy supplied by the solar facility is intended to replace part of PNM Public Service Company of New Mexico (PNM) fossil-based assets. The Project would be located entirely on private land to be leased by Rancho Viejo Solar, LLC and located in Sections 2–9 of Township 15 North, Range 9 East (Figure 1). Final layout of the solar infrastructure has not been finalized, though the entire facility would be located within the current project area boundary.

The Project would include solar photovoltaic (PV) arrays composed of bifacial monocrystalline module PV panels mounted on tracking structures that can tilt up to +/- 60 degrees and would be, at their highest, up to 12 to 14 feet aboveground. A perimeter fence is also included in the Project's design. The Project would operate 365 days per year during daylight hours. The 115-kilovolt gen-tie will connect to an existing transmission line located approximately 2.35 miles northeast of the project via H-frame structures, up to 50 feet in height and spaced around 250 feet apart (approximately 10 structures per mile).

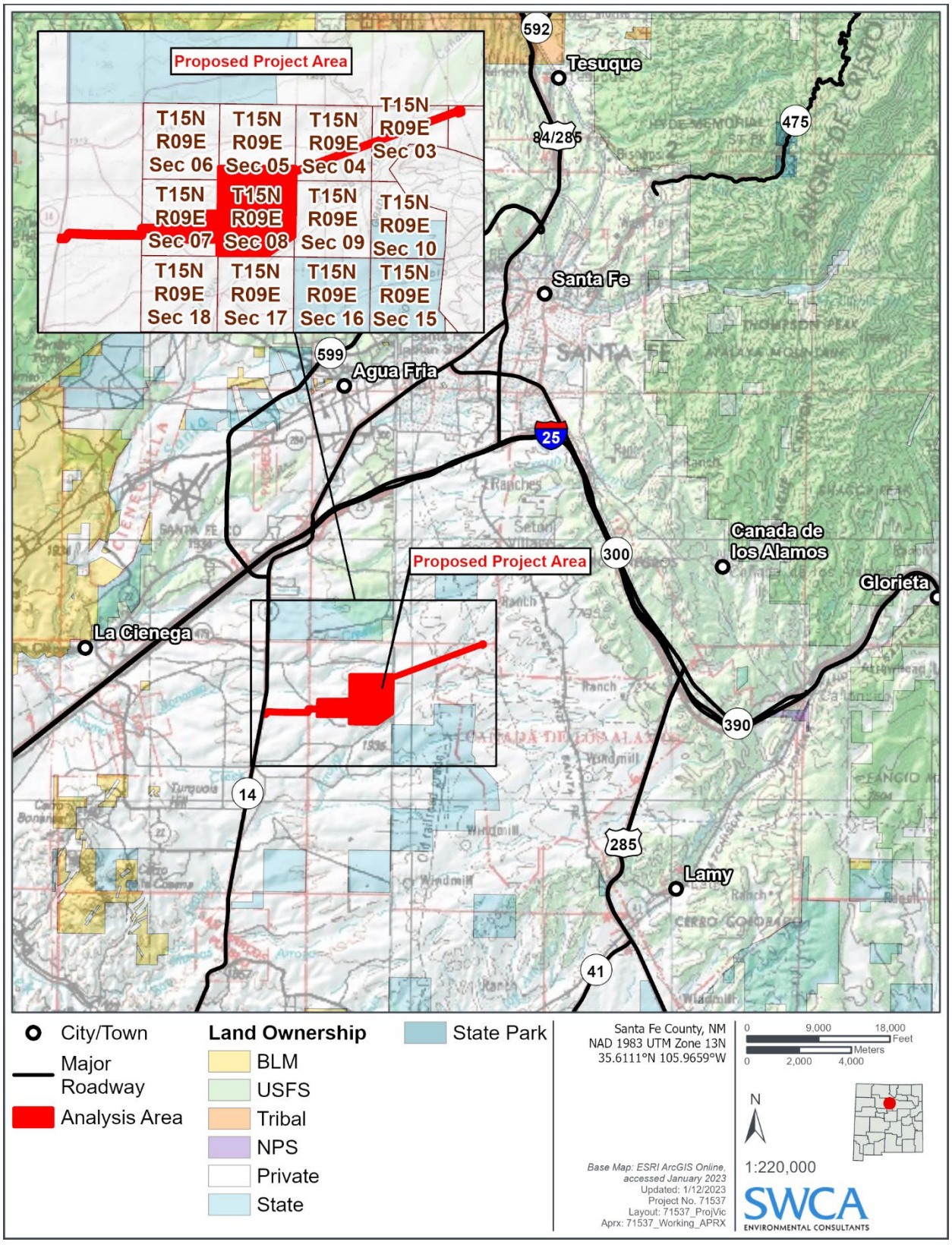

Figure 1. Project location map.

Portions of the project area will be cleared and graded for project construction, including the access road, laydown areas, inverter and transformer skids, and substation area. Surfaces would be leveled in areas where the elevation would need to be changed to accommodate equipment tolerances, site drainage, roads, laydown areas, and foundations. Grading would consist of the excavation and compaction of earth to meet the design requirements. Graded areas within the project area would match existing contours to the extent feasible. Some existing contours would need to be smoothed for access purposes, but the macro-level topography and stormwater drainage would remain similar to pre-graded conditions. Reclamation, including grading to pre-project conditions and seeding with native plants, would occur in areas of temporary construction disturbance. Upon Project decommissioning, all facility components would be removed and the site would be reclaimed to pre-project conditions.

2 METHODS

In general, impacts to scenery are changes in the character of the landscape through modifications to the existing environment's forms, lines, colors, and textures. An analysis of visual dominance, scale, and contrast was used in determining the degree to which the Project would attract attention and in assessing the relative change in character as compared to the existing landscape and its inherent scenic quality. During the analysis, SWCA completed viewshed analyses, visual contrast rating analyses, and visual simulations to determine Project impacts to sensitive viewing platforms such as residences and major roadways. The visual resource area of analysis was identified as the area within 5 miles of the proposed solar PV arrays and gen-tie line.

2.1 Viewshed Analyses

During the viewshed analysis, SWCA used the PV array and gen-tie specifications to establish analysis areas and determine areas from which the Project may be visible. Then, key observation points (KOPs) were selected.

2.1.1 Defining and Using Analysis Areas and Distance Zones

Generally, visual analysis areas are defined based on the design characteristics of key Project components, the topography of the landscape, and the potential views of Project infrastructure from sensitive viewing locations in the surrounding area. In this case, the location of the solar PV array, which will be 12 to 14 feet tall, served as the center of one viewshed model, while the location of the gen-tie, which will be 50 feet tall, served as the center of the other viewshed model; a 5-mile buffer around each center constitutes an analysis area (Figure 2). Effects from farther away were considered on a site-specific manner if warranted based on public concern.

SWCA conducted a viewshed model for the PV array and gen-tie using a 10-meter-resolution bare-earth digital elevation model with a typical viewer height of 6 feet. The bare-earth modeling approach does not account for screening from existing vegetation or structures, which results in a conservative assessment of potential Project visibility. To identify the areas from which the Project could be visible, SWCA conducted the viewshed analyses from KOPs facing toward the Project location. Additionally, aerial imagery (Google Earth 2022), site field reconnaissance, and elevation data were used to inform these analyses. This approach results in a conservative assessment of potential Project visibility.

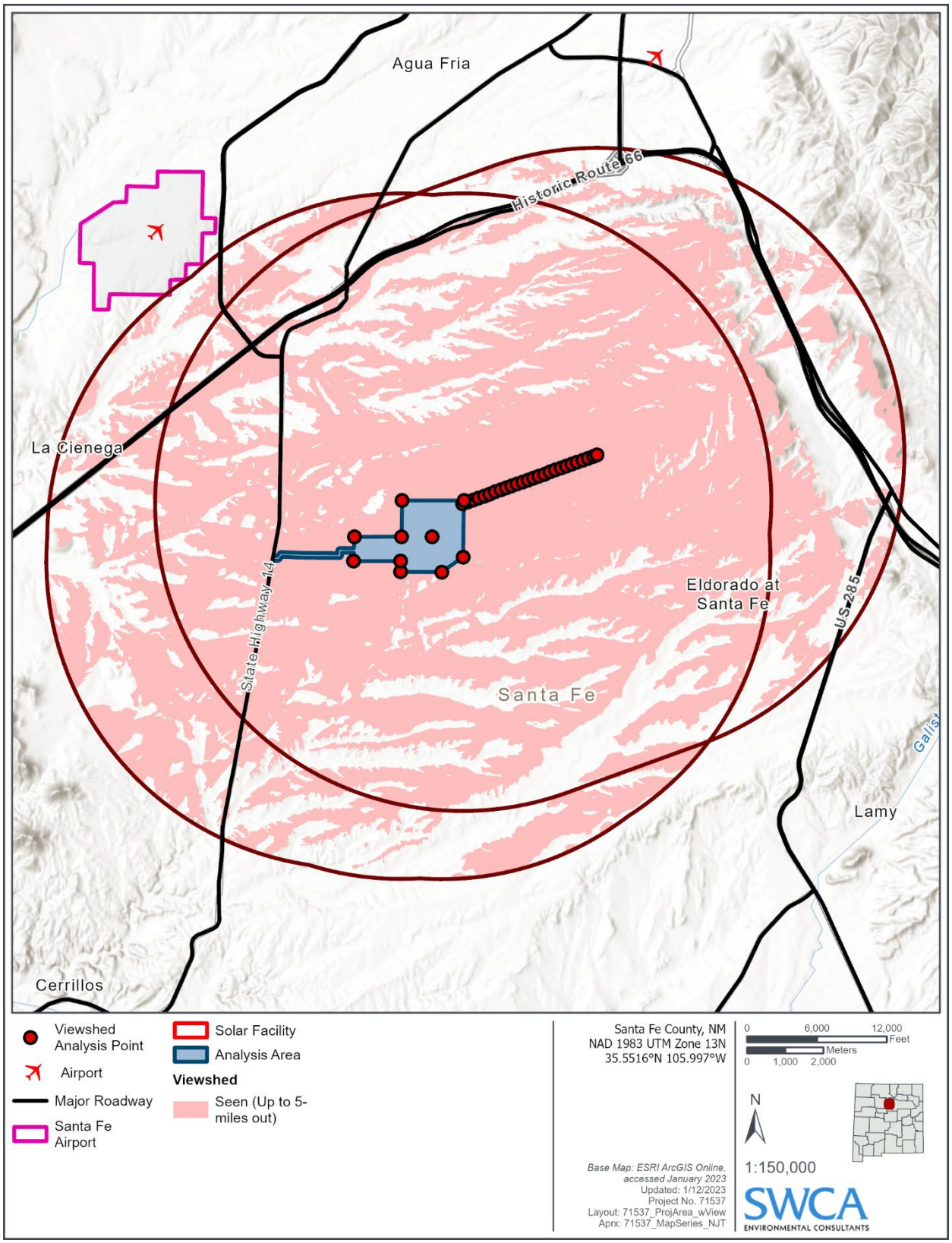

Figure 2. Viewshed analysis parameters for the solar PV array and gen-tie corridor.

2.1.2 Identifying Key Observation Points

Sensitive viewing platforms (key observation points [KOPs]) are specific places, areas, and features that have visual importance relative to home, social, business, and recreation environments. KOPs include viewing locations where the public could view the Project from stationary locations (e.g., a residential area) and linear locations (e.g., a major roadway). Potential changes in the viewshed are evaluated from identified KOPs. Identification of KOPs for this analysis was based on a review of the viewshed analyses, aerial photography, topographic maps, and field investigations.

Sensitive viewers around the project may include residents, travelers and commuters using local roads, and industry workers or those utilizing other adjacent land uses. Land uses around the project include transmission line corridors and the Turquoise Trail Charter School. The closest residential community to the project is the Rancho San Marcos subdivision, which is adjacent to the project area and consists of around 80 single-family homes. The Eldorado at Santa Fe residential community is located 1.3 miles east of the PV array location; however, the community is less than 0.5 mile from the gen-tie corridor.

KOPs selected for the Project area include the following:

- Vehicular travel routes: highways and roads used by origin/destination travelers and designated scenic byways
- Residences: single-family detached structures

SWCA selected six KOPs within the analysis area with viewing conditions typical of the sensitive viewing platforms in the area and that will provide prominent views of Project infrastructure (Table 1, Figure 3). Two of the KOPs represent travel routes, and four represent residential areas.

Table 1. Key Observation Points and Rationale for Selection

KOP	Viewer Type	Rationale for Selection
KOP 1 – Camerada Road	Residential Area	View represents vantagepoints from Eldorado at Santa Fe residences that are adjacent to the project area.
KOP 2 – Encantado Loop	Residential Area	View represents vantagepoints from Eldorado at Santa Fe residences that are adjacent to the project area.
KOP 3 – Southern Boundary East	Residential Area	View represents vantagepoints from the boundary of Rancho Viejo leased land Rancho San Marcos residences that are adjacent to the project area.
KOP 4 – Southern Boundary West	Residential Area	View represents vantagepoints from the boundary of Rancho Viejo leased land Rancho San Marcos residences that are in proximity of the project area.
KOP 5 –Turquoise Trail Charter School	Travel Route	View reflects travel on Highway 14/Turquoise Trail National Scenic Byway adjacent to the charter school.
KOP 6 – Highway 14	Travel Route	Highway 14/Turquoise Trail National Scenic Byway is a high-use travel route.

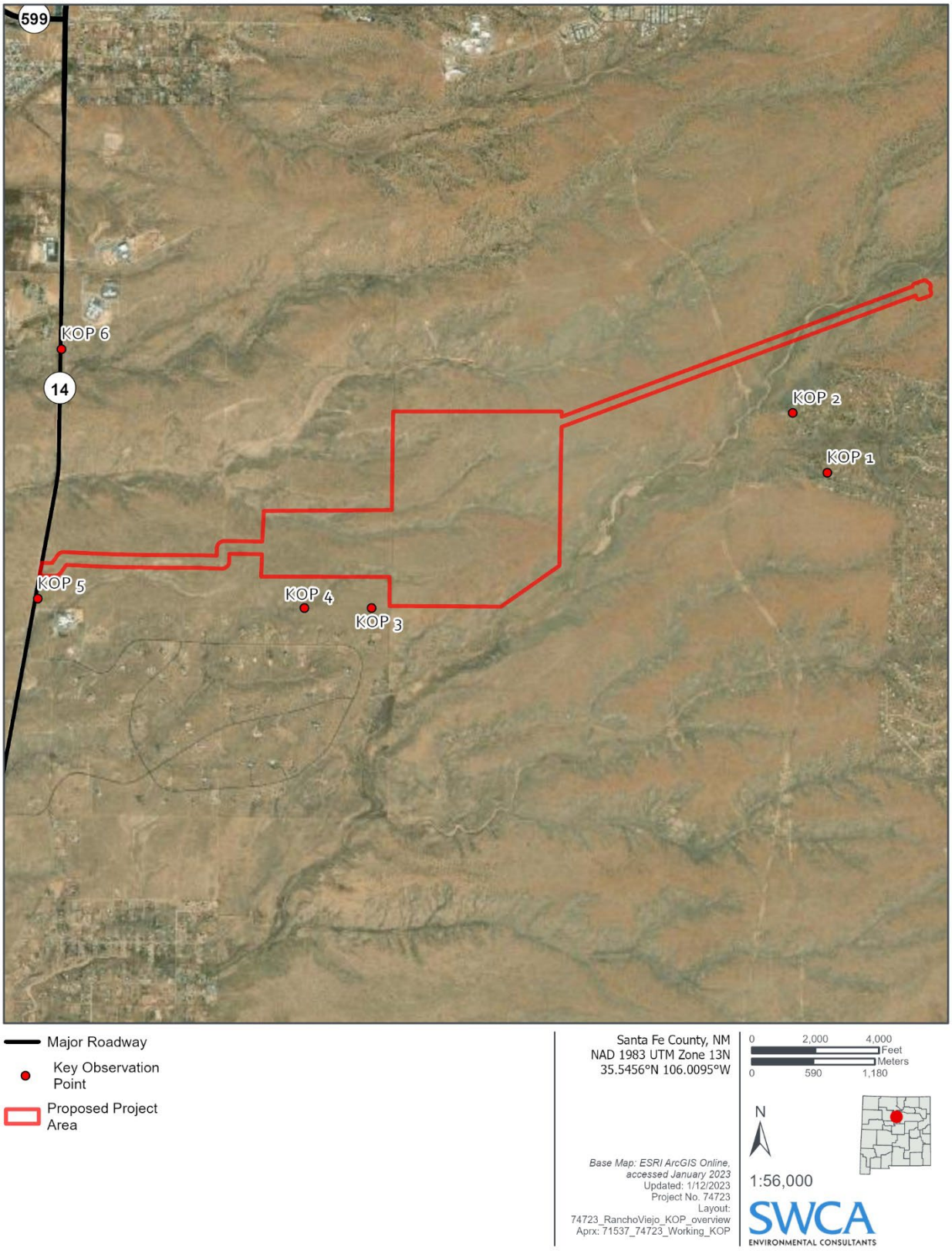

Figure 3. Key observation points.

2.2 Visual Contrast Rating

Visual contrast typically results from landform modifications that are necessary to prepare a project area or right-of-way for construction, the removal of vegetation to construct and maintain facilities, and the introduction of new aboveground facilities into the landscape. On June 7, 2022, SWCA conducted on-the-ground visual contrast ratings at each of the KOPs established, implementing protocols and methods in Bureau of Land Management (BLM) Manual H-8431, *Visual Resource Contrast Rating* (BLM 1986). Data collected at each of the KOPs include the following: global positioning system (GPS) location, digital photographic panorama of the viewshed (used for visual simulations), information needed to complete BLM Visual Contrast Rating Worksheets, time of day, atmospheric conditions, and existing structures and roads in the viewshed.

The contrast rating analysis method measures potential Project-related changes to the landscape. The method allows for a level of objectivity and consistency in the process and reduces subjectivity associated with assessing landscape character and scenic quality impacts. Using the BLM's Visual Resource Contrast Rating system, as outlined in BLM Manual H-8431 (BLM 1986), the level of contrast between the Project infrastructure, the existing landscape, and viewers' perception of the project was evaluated from each KOP. This level of contrast determines the degree to which the Project would affect the intrinsic visual character and, in turn, the scenic quality of the landscape. For this effort, SWCA recorded the form, line, color, and texture associated with the landform, water, vegetation, and existing structures within and adjacent to the project area and then evaluated the degree of contrast the Project would create for each of those landscape element as none, weak, moderate, or strong. Table 2 provides the criteria for assessing degrees of contrast.

Table 2. Criteria for Assessing Magnitude of Impact on Visual Resources

Magnitude of Impacts	Sensitive Viewing Platforms and Key Observation Points	Landscape Character and Scenic Quality
None	• Project components would repeat elements/patterns common in the landscape. • Project components would not be visually evident.	• The landscape would appear to be intact and would not attract attention • Project components would repeat form, line, color, texture, or scale common in the landscape and would not be visually evident (no contrast).
Low	• Project components would introduce elements/patterns common in the landscape that would be visually subordinate. • Project components would create weak contrast, compared with other features in the landscape.	• The landscape would be noticeably altered and begin to attract attention. • Project components would introduce form, line, color, texture, or scale common in the landscape and would be visually subordinate (weak contrast).
Moderate	• Project components would introduce elements/patterns not common in the landscape. • Project components would be visually prominent in the landscape and would create moderate contrast, compared with other features in the landscape.	• The landscape would appear to be substantially altered. • Project components would introduce form, line, color, texture, or scale not common in the landscape and would be visually prominent in the landscape (moderate contrast). • Project components would attract attention. • Project components would begin to dominate the visual setting.
High	• Project components would introduce elements/patterns that would be visually dominant and create strong contrast, compared with other features in the landscape.	• The landscape would appear to be severely altered. • Project components would introduce form, line, color, texture, or scale not common in the landscape and would be visually dominant in the landscape (strong contrast). • Project components would demand attention. • Project components would dominate the visual setting.

Environmental factors can influence the amount of visual contrast and dominance introduced by Project components and the human attention those elements draw. For this analysis, the factors considered and evaluated as part of the determination of the level of contrast from each KOP include visibility conditions and the angle of view (relative viewer position and view orientation), duration of view (in time or distance), and scale and spatial relationship (degree of contrast) of the Project.

Visibility conditions refers to how the Project components (i.e., solar PV array, gen-tie, and associated infrastructure) would be viewed in the landscape from KOPs, not whether the Project would be seen from KOPs. These conditions are assessed by looking at the relationship of Project components in the context of the landscape. The first condition is whether Project components would be seen predominantly oriented along the horizon line of a landform or backdropped against a landform. The second condition is whether the views of Project components would be predominantly unobstructed or obstructed from the KOP. The angle of observation from the KOP is also evaluated to determine whether Project components would be seen in the same viewing direction as a dominant physical feature in the landscape.

Angle of view refers to the viewer position in relation to Project components. Inferior view position is when the viewer is located below the Project in elevation. Level view position is when the viewer is located at the same elevation as the Project. Superior view position is when the viewer is located above the Project in elevation.

Duration of view is how long the Project components would be seen from KOPs. For linear KOPs, the duration of view can be calculated in terms of both time and distance by determining the total travel time (typically minutes) along the total distance (miles) of the platform from which the Project components would be seen. To calculate travel time, the posted speed was used as the average rate of speed (35 miles per hour on local roads).

Scale and spatial relationship are used to evaluate the degree of contrast between the proposed Project components and the surrounding landscape when viewed from KOPs. Scale refers to the size of the Project components relative to various landscape features. The larger the Project components would appear, the less they would repeat the common elements and patterns in the surrounding landscape, and, therefore, the Project components would appear to dominate the landscape.

In addition to scale, the arrangement or spatial relationship of landscape features can affect the visual prominence of Project components from KOPs. The amount of visual contrast created is directly related to the amount of attention an element in the landscape draws from humans. For example, if the view from a platform is of a panoramic or expansive landscape, the Project components would be less prominent (lower contrast), whereas if the view is of an enclosed or encircled landscape such as a narrow valley, the Project components would be more prominent and would appear to dominate the landscape (higher contrast). For this analysis, SWCA assessed contrast by comparing the Project infrastructure with the major features in the existing landscape.

Changes in the visual setting due to variable atmospheric conditions and seasonal use differences were not evaluated as part of the environmental factors for the Project.

2.3 Visual Simulations

Visual simulations, which provide theoretical views of the proposed Project, were prepared for the KOPs identified. A digital rendering of Project components was superimposed on baseline photographs taken from the KOPs to illustrate a simulated view of the facility. This information was used in determining the level of visual contrast before and after Project construction.

Photorealistic simulations of the Project components were made using ArcGIS, Google Earth Pro, Autodesk products (AutoCAD and 3DS Max), and Adobe Photoshop software. Developing visual simulations involves creating a three-dimensional model of Project components, positioning the modeled Project components on a digital elevation model of the project area, and superimposing the resulting model onto the KOP photographs of existing conditions at the correct scale and distance. Date and time inputs determine shadows and reflected light, and the software accounts for distance and haze to increase accuracy of viewing conditions.

2.4 Glint and Glare Assessment

Large-scale solar facilities can cause health, safety, and visual impacts in relation to glint and glare, particularly for aircraft pilots. The source of potential glint and glare in relation to the Project is the proposed PV panels. However, PV panel surfaces are designed specifically not to reflect light, thus reducing the potential for glint and glare.

To determine the potential for significant glint or glare from solar panels and other built Project components to residents, travelers, recreation users, and pilots, SWCA applied simple Project parameters provided by AES Solar to the Sandia National Laboratory and Forge Solar's online Solar Glare Hazard Analysis Tools (Forge Solar 2022). The associated glare report includes an assessment of when and where glare related to the solar installation would occur and the potential effects on the human eye.

For the purposes of this analysis, *glint* is defined as a bright, momentary flash of light; *glare* is defined as a more continuous and sustained presence of light that may appear to "sparkle" from public viewing locations. Other assumptions for conducting a glint and glare analysis are listed below:

- "Green" glare is glare with low potential to cause an afterimage (flash blindness) when observed prior to a typical blink response time.
- "Yellow" glare is glare with potential to cause an afterimage (flash blindness) when observed prior to a typical blink response time.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover, and geographic obstructions.

3 EXISTING CONDITIONS

The project is located within the North Central New Mexico Valleys and Mesas U.S. Environmental Protection Agency (EPA) Level IV ecoregion (U.S. Environmental Protection Agency 2022). This ecoregion is described as having mesa, valley, piedmont slope, deep canyon, and scattered hill topography with perennial and intermittent streams associated with surrounding mountain landforms. Vegetation communities consist of pinyon-juniper woodland and juniper savanna. Land uses of the ecoregion include tribal land, public land (e.g., Bureau of Land Management [BLM]), urban areas associated with the city of Santa Fe and surrounding communities, livestock grazing, and undeveloped open spaces. The project area and its vicinity have generally been used for livestock grazing, although suburban development is increasing in the area. Residential areas are adjacent to the project area and New Mexico State Highway 14 is within approximately 1.5 miles of the project area. Industrial structures, such as transmission lines, are visible on the landscape.

The project area is located in a gently undulating valley bottom with surrounding mountain ranges visible on the horizon. Vegetation communities consist of common desert grassland and pinyon-juniper savanna species. In general, the landscape around the project area appears as tan and brown exposed soils with

green and yellow shades of shrubs and grasses. The composition of the vegetation communities creates a patchy texture. Some structures are visible around the residential areas. Overall, the paucity of development within the project area gives a rural, open-space character to the landscape.

4 RESULTS

The construction, operation, and maintenance of the proposed Project would result in effects on visual resources. Table 2 defines the threshold of the levels of visual resources impacts perceived by the casual observer at the viewing platforms, incorporating environmental factors and the existing landscape's scenic quality and landscape character. The magnitude of impact ranges from none to high. The following sections summarize impacts by Project phase. Appendix A provides the visual simulations for all KOPs used to support this analysis, and Appendix B provides the Visual Contrast Rating (VCR) worksheets associated with this analysis.

4.1 Impacts of Construction

During the construction phase, the assembly of arrays, movement of construction equipment, and potential fugitive dust from construction activities would be visually dominant and would be the primary focus of attention for viewers due to the introduction of new visual elements. Residents in the immediate foreground (0.00–0.25 mile from the project area) would experience strong visual impacts to the landscape character from construction activities. Residents and travelers on local county roads in the foreground (0.25–1.00 mile from the project area) could potentially experience strong to moderate visual impacts, depending on topography, vegetative barriers, and other visual hindrances that exist within the landscape. Any viewers within the middle ground (1.00–3.00 miles from the project area) are expected to experience weak visual impacts. During construction, the predominant visual impacts would be dust and vehicular traffic caused by grading, on-site traffic, and construction workers present at the site. Construction associated with the project would occur over a period of 9–12 months. At its longest duration, construction would cause a moderate visual impact.

Construction of the Project would require the removal of vegetation and grading to achieve a level grade to form the solar PV array footprint, foundations for equipment, access ways, and roadways. Grading would consist of the excavation and compaction of earth to meet the design requirements. Temporary laydown and staging areas would be used to store materials and equipment during construction and would be reclaimed upon Project completion.

4.2 Impacts of Operation and Maintenance

Once the facility has been constructed, dark-colored horizontal solar arrays would create a strong degree of change to the existing landscape character, and result in a strong visual contrast when viewed from within the immediate foreground. The intactness, unity, and vividness of the agrarian landscapes in the analysis area would be impacted because the change from grazing lands to PV panels would encroach on and begin to diminish the overall visual composition of the landscape's existing character. As viewers transition into the foreground and middle ground, perceivable visual contrast would begin to decrease. Transmission lines are within the analysis area. The gen-tie line would introduce elements common in the landscape and would be visually neutral. It is expected that gen-tie form, line, and color would be absorbed into the existing landscape character.

The flat, geometric form and dark, slightly reflective surfaces associated with PV panels are not common in the existing setting. The addition of the repetitive, vertical upright features associated with the gen-tie

and fence in this flat, panoramic landscape could be visually prominent, depending on the viewer's proximity to the Project.

4.3 Impacts of Decommissioning

Impacts associated with decommissioning would be of a nature and duration similar to that of impacts associated with construction activities. At the end of the Project's life, removal of Project infrastructure would create an immediate reversion and influence the degrees of visual change back to preconstruction characteristics. But the time needed for the Project footprint to no longer be visible and for the vegetation therein to return to its preconstruction state is unknown. The Project and the magnitude of change to the existing landscape character and scenic quality would vary, depending on distance, scale, and intervening terrain and/or vegetation.

4.4 Summary of Impacts

The Project is expected to have both long- and short-term visual impacts. Short-term visual impacts range from low to moderate due to the presence of construction crews, fugitive dust created by Project construction, and installation of permanent Project components. Long-term visual impacts include operation and maintenance of the Project. Overall, these new elements would initially be dominant compared to the existing landscape character but due to proximity of viewers to the project, it is expected that the new elements would be subordinate compared to the existing landscape character.

KOP 1 (Camerada Road) is within the middle ground of the analysis area and would have an obstructed view of the solar PV array and gen-tie line. The current landscape character is described as collection of single-family homes within the El Dorado subdivision, with low prairie grasses, and large stature pinyon-juniper trees. The landforms of the area are rolling hills. The level of change to the visual character of the area and impacts to viewers would be low due to sight distance, vegetation and intervening topography. Associated visual simulations and VCR worksheets can be found in Appendix A and B, respectively.

KOP 2 (Encantado Loop) is within the middle ground of the analysis area and would have an obstructed view of the solar PV array. The current landscape character is described as collection of single-family homes within the El Dorado subdivision, with low prairie grasses, and large stature pinyon-juniper trees. The landforms of the area are rolling hills. The level of change to the visual character of the area and impacts to viewers would be low due to sight distance, vegetation and intervening topography. Associated visual simulations and VCR worksheets can be found in Appendix A and B, respectively.

KOP 3 (Southern Boundary East) is within the foreground of the analysis area and would have an unobstructed view of the solar PV array. The current landscape character is described as is a flat high desert plain with isolated short stature vegetation. The vegetation community consists of low indistinct grasses and stippled arrangement of cactus. The mountains to the east of Santa Fe can be clearly seen in the distance. The level of change to the visual character of the area and impacts to viewers looking northeast from the KOP towards the solar PV array would be moderate due to the introduction of new structural elements and the general proximity of the KOP to project components. Associated visual simulations as viewed from the KOP looking northeast towards the Project and VCR worksheets can be found in Appendix A and B, respectively.

KOP 4 (Southern Boundary West) is within the foreground of the analysis area and would have an unobstructed view of the solar PV array when looking towards the northeast. The current landscape character is described as is a flat high desert plain with isolated short stature vegetation. The vegetation community consists of low indistinct grasses and stippled arrangement of cactus. The level of change to

the visual character of the area and impacts to viewers would be low to moderate based on overall distance and massing of new structural elements that are not common in the landscape. Associated visual simulations and VCR worksheets can be found in Appendix A and B, respectively.

KOP 5 (Turquoise Trail Charter School) is within the middle ground of the analysis area. The current landscape character is described as is a flat high desert plain with stippled short stature vegetation. The vegetation community consists of low indistinct grasses and stippled arrangement of cactus. The level of change to the visual character of the area and impacts to viewers would be low to moderate due to new structural elements. The level of change to landscape character and viewers would be low. Associated visual simulations and VCR worksheets can be found in Appendix A and B, respectively.

KOP 6 (Highway 14) is within the middle ground of the analysis area. The current landscape character is described as is a mainly flat high desert plain with stippled short stature vegetation. The vegetation community consists of low indistinct grasses and stippled arrangement of cactus. The level of change to the visual character of the area and impacts to viewers would be low due limited opportunities to see the project caused by topographical constraints. The level of change to landscape character and viewers would be low. Associated visual simulations and VCR worksheets can be found in Appendix A and B, respectively

AES conducted a glint and glare analysis (Appendix C) focused on the potential of Project-related glare to affect aircraft pilots approaching the Santa Fe Regional Airport. The analysis identified no predicted glare occurrences for approaches for any runways associated with the Santa Fe Regional Airport (Forge Solar 2022). Sensitive receptors were also identified within the area that includes residences and travel ways. The analysis identified no predicted glare for these viewers (Forge Solar 2022).

5 RECOMMENDED MITIGATION

To limit the visual impact of the Project, Rancho Viejo should minimize the footprint and soil disturbance during the construction, operation and maintenance, and decommissioning phases of the Project. Where visual disturbance is inevitable, mitigation measures should be employed.

The primary visual impacts from construction (i.e., dust caused by grading and facility construction) can be reduced via the implementation of dust abatement measures, such as restricting vehicle speeds and watering active areas and roadways. Construction activities would primarily be limited to daytime hours. If night work is required during construction, lighting would be the minimum brightness required for safety, and lighting would be extinguished when not in use. Disturbed soils would be restored to original contours and reseeded with a native seed mix.

The facility should be designed to blend in with the existing surrounding landscape to be minimally visually obtrusive. SWCA recommends that all panels reset to a 5-degree resting angle. This resting angle will effectively nullify any glint and glare effects to sensitive receptors within the area.

Environmental commitments from the environmental assessment for the Project are listed below.

- All surface disturbances would be kept to the minimum necessary to accomplish construction of Project components.
- Reclamation of all temporary surface disturbances would be initiated upon completion of activities. Reclamation of disturbed areas shall, to the extent practicable, include contouring disturbances to blend with the surrounding terrain, replacing topsoil, smoothing and blending the original surface colors to minimize impacts to aesthetics and scenery resources, and seeding the disturbed areas with native seeds.

- Construction activities would primarily be limited to daytime hours. If night work is required during construction, lighting would be the minimum necessary for safety, and lighting would not be left on when not in use.
- Low-elevation motion-controlled lighting would be installed at primary access gates, substation, and entrance to energy storage facility. These security lights would be shielded to protect dark skies and only used in areas where it is required for safety.
- Vegetation clearing would be minimized to the extent practicable. Drive-and-crush practices would be maximized to avoid excessive root damage and allow for resprouting.

6 LITERATURE CITED

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APPENDIX A

Visual Simulations

Rancho Viejo Solar Facility

Sun and Weather

Sunny

Date: **6-07-22**

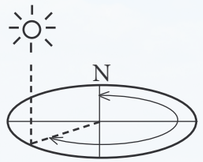
Photo Time: **1:50 pm**

Visibility:

Good — Poor

Air Quality: Good

Sun Azimuth: **220.87°**



Sun Angle: **74.31°**

Lighting Angle on Project: **Side Lit**

Wind: **22 mph**

Cloud Cover: **75 %**

Temperature (°F): **88°F**

Solar panels at 60 degrees facing westward.

Simulation was prepared using information provided by client. Locations, colors, and heights may vary based on final engineering and design.

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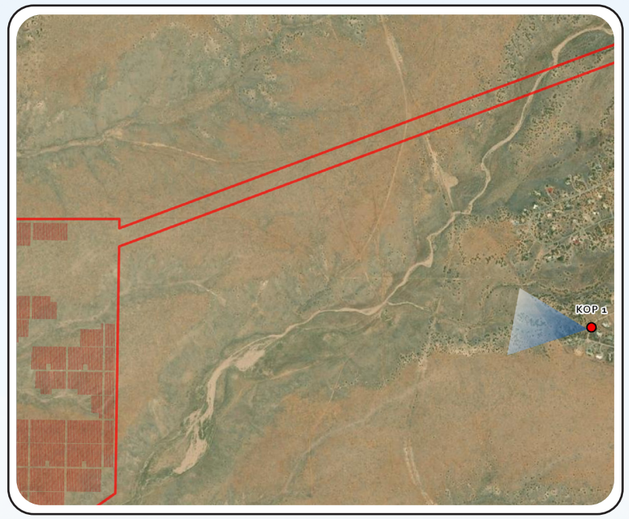
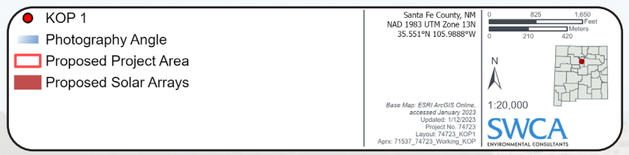
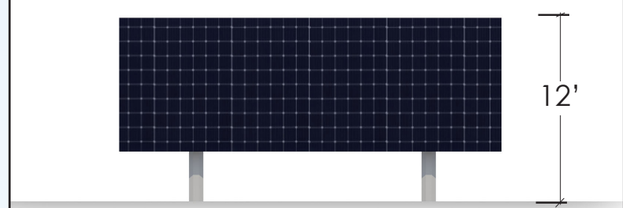


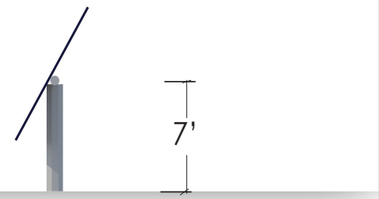


Approximate Distance to Solar Facility Corridor: **1.6 miles**

Project Location

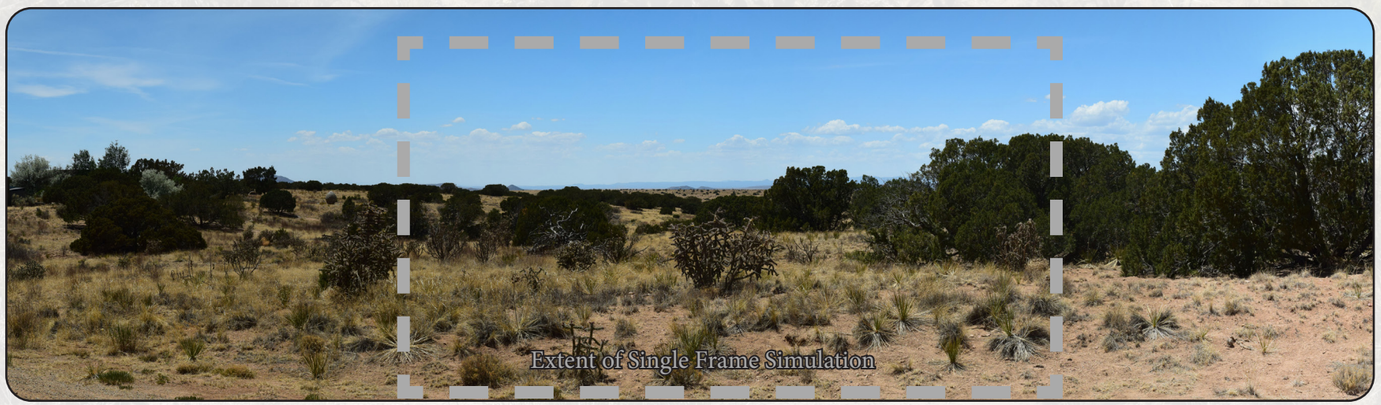


Front Elevation



Side Elevation

Structure Diagram



KOP 1-Camerada Road

Base Photographic Documentation

Latitude (°): **35.5495**

Longitude (°): **-105.972**

Viewpoint Elevation (feet): **6563**

Camera Height (meters): **1.5**

Camera Heading (degrees): **270**

Camera Make & Model: **Nikon D3300**

Camera Sensor Size (mm): **23.6 x 15.6**

Crop Factor: **1.53**

Lens Make & Model: **AF-P Nikkor**

Lens Focal Length (mm): **32**

Image Size (pixels): **6000 x 4000**

Single frame simulation approximates 50mm full frame equivalent.

Viewing Instructions: Printed at 100% the resulting simulation is 16 inches wide by 10 inches high. At this size and focal length, the simulation should be viewed at arms length (24 inches). If viewed on a computer monitor, scale should be 100%.

SWCA® ENVIRONMENTAL CONSULTANTS

KOP 1: View from Camerada Road looking west - Existing Condition

KOP 1: View from Camerada Road looking west - Simulated Condition

Rancho Viejo Solar Facility

Sun and Weather

Sunny

Date: **6-07-22**

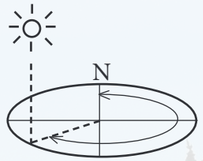
Photo Time: **1:39 pm**

Visibility:

Good — Poor

Air Quality: Good

Sun Azimuth:



214.18°

Sun Angle: **75.43°**

Lighting Angle on Project: **Side Lit**

Wind: **22 mph**

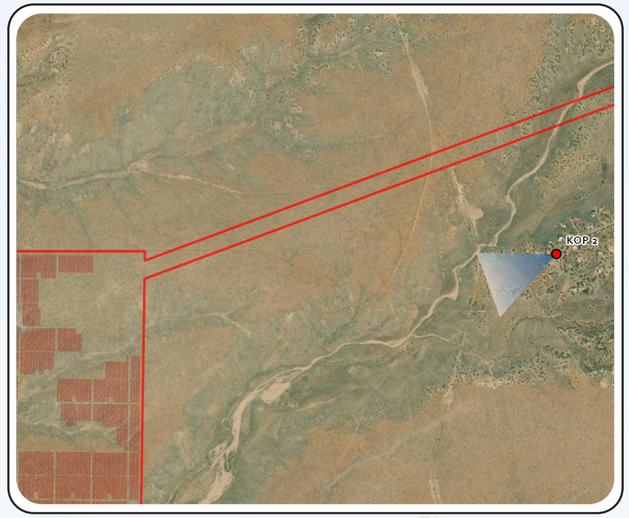
Cloud Cover: **76 %**

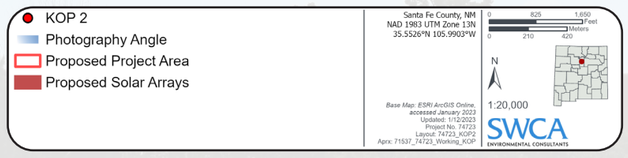
Temperature (°F): **88°F**

Solar panels at 60 degrees facing westward.

Simulation was prepared using information provided by client. Locations, colors, and heights may vary based on final engineering and design.

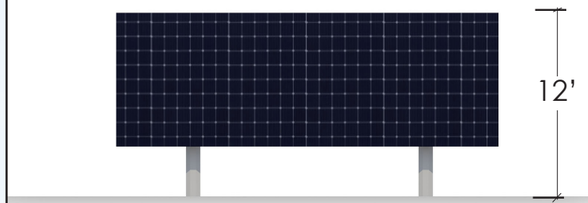
.



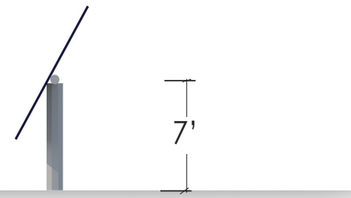


Approximate Distance to Solar Facility Corridor: **1.4 miles**

Project Location



Front Elevation



Side Elevation

Structure Diagram

KOP 2-Encantado Loop

Base Photographic Documentation

Latitude (°): **35.5546**

Longitude (°): **-105.976**

Viewpoint Elevation (feet): **6568**

Camera Height (meters): **1.5**

Camera Heading (degrees): **265**

Camera Make & Model: **Nikon D3300**

Camera Sensor Size (mm): **23.6 x 15.6**

Crop Factor: **1.53**

Lens Make & Model: **AF-P Nikkor**

Lens Focal Length (mm): **32**

Image Size (pixels): **6000 x 4000**

Single frame simulation approximates 50mm full frame equivalent.

Viewing Instructions: Printed at 100% the resulting simulation is 16 inches wide by 10 inches high. At this size and focal length, the simulation should be viewed at arms length (24 inches). If viewed on a computer monitor, scale should be 100%.

SWCA® ENVIRONMENTAL CONSULTANTS

KOP 2: View from Encantado Loop looking west - Existing Condition

KOP 2: View from Encantado Loop looking west - Simulated Condition

Rancho Viejo Solar Facility

Sun and Weather

Cloudy

Date: **8-4-22**

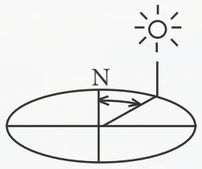
Photo Time: **10:59 am**

Visibility:

Good — Poor

Air Quality: Good

Sun Azimuth:



113.03°

Sun Angle: **55.86°**

Lighting Angle on Project: **Side Lit**

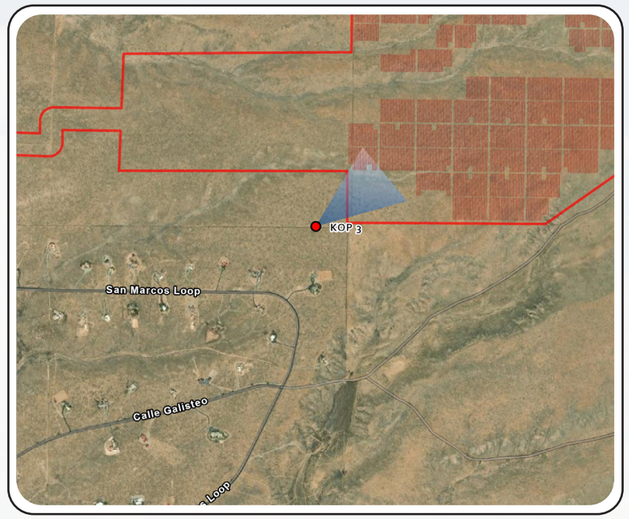
Wind: **7 mph**

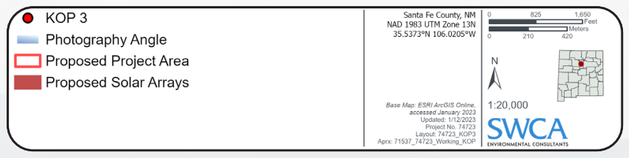
Cloud Cover: **65 %**

Temperature (°F): **87°F**

Solar panels at 60 degrees facing eastward.

Simulation was prepared using information provided by client. Locations, colors, and heights may vary based on final engineering and design.

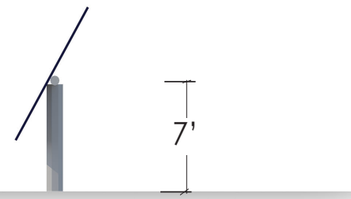




Approximate Distance to Solar Facility Corridor: **0.2 miles**

Project Location

Front Elevation



Side Elevation

Structure Diagram

KOP 3 - Southern Boundary East

Base Photographic Documentation

Latitude (°): **35.5373**

Longitude (°): **-106.0204**

Viewpoint Elevation (feet): **6363**

Camera Height (meters): **1.5**

Camera Heading (degrees): **40**

Camera Make & Model: **Nikon D3300**

Camera Sensor Size (mm): **23.6 x 15.6**

Crop Factor: **1.53**

Lens Make & Model: **AF-P Nikkor**

Lens Focal Length (mm): **32**

Image Size (pixels): **6000 x 4000**

Single frame simulation approximates 50mm full frame equivalent.

Viewing Instructions: Printed at 100% the resulting simulation is 16 inches wide by 10 inches high. At this size and focal length, the simulation should be viewed at arms length (24 inches). If viewed on a computer monitor, scale should be 100%.

SWCA® ENVIRONMENTAL CONSULTANTS

KOP 3: View near San Marcos Loop Residence looking northeast - Existing Condition

KOP 3: View near San Marcos Loop Residence looking northeast - Simulated Condition

Rancho Viejo Solar Facility

Sun and Weather

Cloudy

Date: **8-4-22**

Photo Time: **10:48 am**

Visibility:

Good — Poor

Air Quality: Good

Sun Azimuth: **110.03°**

Sun Angle: **53.58°**

Lighting Angle on Project: **Side Lit**

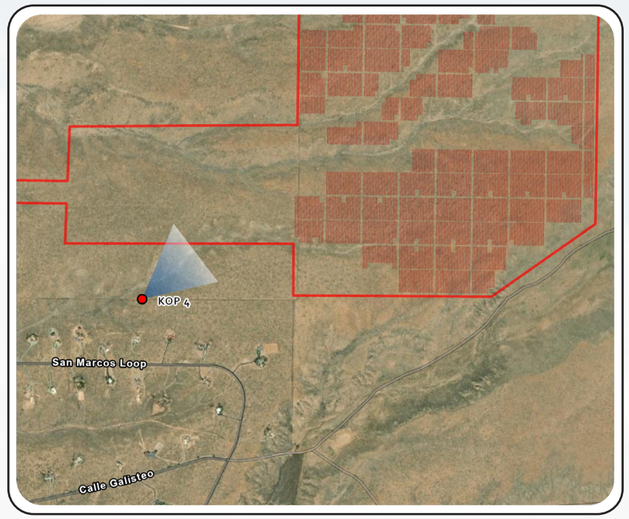
Wind: **7 mph**

Cloud Cover: **90 %**

Temperature (°F): **87°F**

Solar panels at 60 degrees facing eastward.

Simulation was prepared using information provided by client. Locations, colors, and heights may vary based on final engineering and design.



KOP 4
Photography Angle
Proposed Project Area
Proposed Solar Arrays

Santa Fe County, NM
NAD 1983 UTM Zone 13N
35.5409°N 106.0173°W

0 825 1,650 Feet
0 210 420 Meters

N

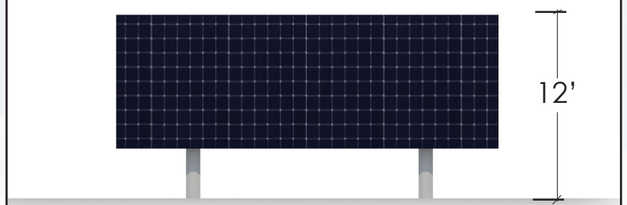
1:20,000

Base Map: ESRI ArcGIS Online, accessed January 2023
Updated: 1/12/2023
Project No. 74723
Layout: 74723_KOP4
Aprx: 71537_74723_Working_KOP

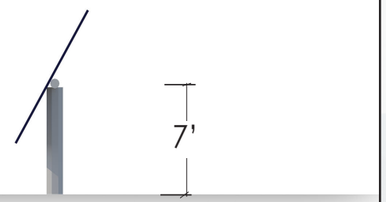
SWCA ENVIRONMENTAL CONSULTANTS

Approximate Distance to Solar Facility Corridor: **0.6 miles**

Project Location



Front Elevation



Side Elevation

Structure Diagram

KOP 4 - Southern Boundary West

Base Photographic Documentation

Latitude (°): **35.5373**

Longitude (°): **-106.0275**

Viewpoint Elevation (feet): **6363**

Camera Height (meters): **1.5**

Camera Heading (degrees): **0.45**

Camera Make & Model: **Nikon D3300**

Camera Sensor Size (mm): **23.6 x 15.6**

Crop Factor: **1.53**

Lens Make & Model: **AF-P Nikkor**

Lens Focal Length (mm): **32**

Image Size (pixels): **6000 x 4000**

Single frame simulation approximates 50mm full frame equivalent.

Viewing Instructions: Printed at 100% the resulting simulation is 16 inches wide by 10 inches high. At this size and focal length, the simulation should be viewed at arms length (24 inches). If viewed on a computer monitor, scale should be 100%.

SWCA® ENVIRONMENTAL CONSULTANTS

KOP 4: View near San Marcos Loop Residence looking northeast - Existing Condition

KOP 4: View near San Marcos Loop Residence looking northeast - Simulated Condition

Rancho Viejo Solar Facility

Sun and Weather

Sunny

Date: **6-07-22**

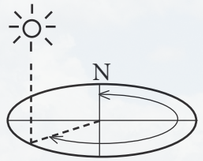
Photo Time: **12:52 pm**

Visibility:

Good — Poor

Air Quality: Good

Sun Azimuth:



166.51°

Sun Angle: **77.31°**

Lighting Angle on Project: **Back Lit**

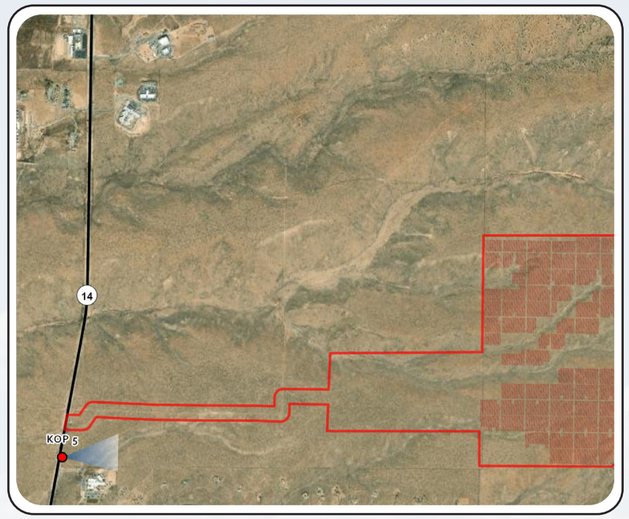
Wind: **24 mph**

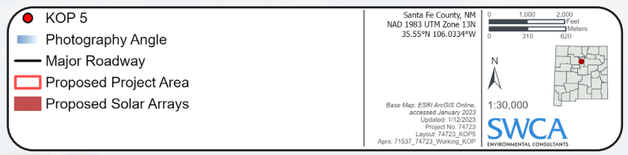
Cloud Cover: **75 %**

Temperature (°F): **89°F**

Solar panels at 0 degrees facing flat.

Simulation was prepared using information provided by client. Locations, colors, and heights may vary based on final engineering and design.

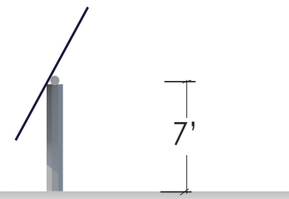




Approximate Distance to Solar Facility Corridor: **2.1 miles**

Project Location

Front Elevation



Side Elevation

Structure Diagram

KOP 5 - Turquoise Trail Charter School

Base Photographic Documentation

Latitude (°): **35.5378**

Longitude (°): **-106.056**

Viewpoint Elevation (feet): **6302**

Camera Height (meters): **1.5**

Camera Heading (degrees): **80**

Camera Make & Model: **Nikon D3300**

Camera Sensor Size (mm): **23.6 x 15.6**

Crop Factor: **1.53**

Lens Make & Model: **AF-P Nikkor**

Lens Focal Length (mm): **32**

Image Size (pixels): **6000 x 4000**

Single frame simulation approximates 50mm full frame equivalent.

Viewing Instructions: Printed at 100% the resulting simulation is 16 inches wide by 10 inches high. At this size and focal length, the simulation should be viewed at arms length (24 inches). If viewed on a computer monitor, scale should be 100%.

SWCA® ENVIRONMENTAL CONSULTANTS

KOP 5: View from NM-14 looking northeast- Existing Condition

KOP 5: View from NM-14 looking northeast- Simulated Condition

Rancho Viejo Solar Facility

Sun and Weather

Sunny

Date: **6-07-22**

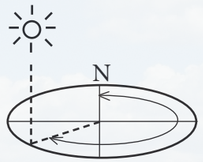
Photo Time: **1:00 pm**

Visibility:

Good — Poor

Air Quality: Good

Sun Azimuth: **173.84°**



Sun Angle: **77.55°**

Lighting Angle on Project: **Side Lit**

Wind: **30 mph**

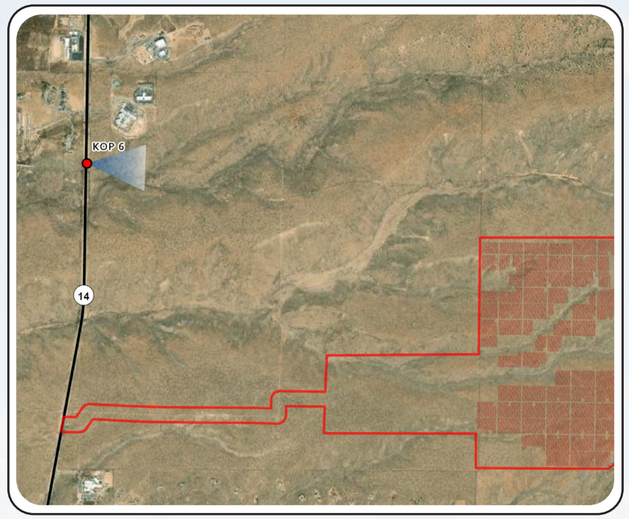
Cloud Cover: **75 %**

Temperature (°F): **89°F**

Solar panels at 60 degrees facing westward.

Simulation was prepared using information provided by client. Locations, colors, and heights may vary based on final engineering and design.

.



KOP 6
Photography Angle
Major Roadway
Proposed Project Area
Proposed Solar Arrays

Santa Fe County, NM
NAD 1983 UTM Zone 13N
35.5501°N 106.0331°W

0 1,000 2,000 Feet
0 310 620 Meters

N

1:30,000

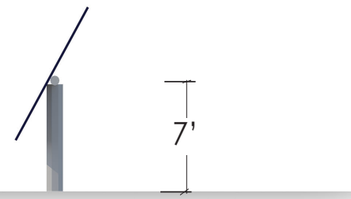
Base Map: ESRI ArcGIS Online, accessed January 2023
Updated: 1/12/2023
Project No. 74723
Layout: 74723_KOP6
Aprx: 71537_74723_Working_KOP

SWCA ENVIRONMENTAL CONSULTANTS

Approximate Distance to Solar Facility Corridor: **2 miles**

Project Location

Front Elevation



Side Elevation

Structure Diagram

KOP 6 - Highway 14

Base Photographic Documentation

Latitude (°): **35.5595**

Longitude (°): **-106.054**

Viewpoint Elevation (feet): **6311**

Camera Height (meters): **1.5**

Camera Heading (degrees): **125**

Camera Make & Model: **Nikon D3300**

Camera Sensor Size (mm): **23.6 x 15.6**

Crop Factor: **1.53**

Lens Make & Model: **AF-P Nikkor**

Lens Focal Length (mm): **32**

Image Size (pixels): **6000 x 4000**

Single frame simulation approximates 50mm full frame equivalent.

Viewing Instructions: Printed at 100% the resulting simulation is 16 inches wide by 10 inches high. At this size and focal length, the simulation should be viewed at arms length (24 inches). If viewed on a computer monitor, scale should be 100%.

SWCA® ENVIRONMENTAL CONSULTANTS

KOP 6: View from NM-14 looking east- Existing Condition

KOP 6: View from NM-14 looking east- Simulated Condition

APPENDIX B

Visual Contrast Rating Worksheets

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 06/07/2022
District Office: N/A
Field Office: N/A
Land Use Planning Area: N/A

SECTION A. PROJECT INFORMATION

1. Project Name	4. KOP Location (T.R.S)	5. Location Sketch
Rancho Viejo Solar Project	N/A - KOP outside of PLSS area	See report figure
2. Key Observation Point (KOP) Name: KOP 01 - Camerada Road		
3. VRM Class at Project Location: N/A	(Lat. Long): 35.5495, -105.9723	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently undulating valley floor in foreground. Distant trapezoidal mountain ranges in background.	Globular pinyon-juniper; geometric, complex cactus and yucca; dense, bristly grasses.	None visible or apparent.
LINE	Horizontal valley floor. Horizontal mountain range horizon with diagonal peaks and slopes throughout.	Rounded pinyon-juniper with diffuse edges, angular cactus and yucca, horizontal grass canopy.	None visible or apparent.
COLOR	Brown exposed soils on valley floor. Hazy blue distant mountains.	Dark green pinyon-juniper, woody gray cactus, yellow-green yucca, straw yellow grasses.	None visible or apparent.
TEX-TURE	Continuous valley floor with rippled undulations. Distinct, abrupt mountain ranges.	Patchy pinyon-juniper; scattered cactus and yucca; low, smooth, continuous grasses.	None visible or apparent.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change.	No perceived change.	Tall, columnar H-frame transmission structures. Low, sprawling solar array.
LINE	No perceived change.	No perceived change.	Vertical and horizontal components to H-frame structures. Horizontal solar array.
COLOR	No perceived change.	No perceived change.	Dark brown H-frames. Black solar array.
TEX-TURE	No perceived change.	No perceived change.	Repetitive, organized series of H-frame structures. Rigid solar array.

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1) STRONG	MODERATE	WEAK	NONE	VEGETATION (2) STRONG	MODERATE	WEAK	NONE	STRUCTURES (3) STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓			✓	
	LINE				✓				✓			✓	
	COLOR				✓				✓			✓	
	TEXTURE				✓				✓			✓	

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants

Date: 07/21/2022

(Continued on Page 2)

Comments from item 2.

Additional Mitigating Measures (See item 3)

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 06/07/2022
District Office: N/A
Field Office: N/A
Land Use Planning Area: N/A

SECTION A. PROJECT INFORMATION

1. Project Name	4. KOP Location (T.R.S)	5. Location Sketch
Rancho Viejo Solar Project	N/A - KOP outside of PLSS area	See report figure
2. Key Observation Point (KOP) Name: KOP 02 - Encantado Loop		
3. VRM Class at Project Location: N/A	(Lat. Long): 35.5546 -105.9760	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently undulating valley floor in foreground. Pyramidal mountains in background.	Globular and conical pinyon-juniper; geometric, complex cactus and yucca; dense, bristly grasses.	Rectangular building and fencing. Low, meandering gravel road.
LINE	Horizontal valley floor. Diagonal mountain peaks and slopes.	Amorphous pinyon-juniper with diffuse edges, angular cactus and yucca, horizontal grass canopy.	Angular, horizontal and vertical building edges and fence panels. Sinuous gravel road.
COLOR	Brown exposed soils on valley floor. Pale gray and brown exposed rocks and soils on mountains.	Dark green pinyon-juniper, yellow-green cactus and yucca, straw yellow grasses.	Clay brown building, pale gray-brown fence, light gray gravel road.
TEX-TURE	Continuous valley floor with rippled undulations. Coarse mountain formations.	Patchy pinyon-juniper; scattered cactus and yucca; low, smooth, continuous grasses.	Rigid building. Directional fence and road.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change.	No perceived change.	Columnar H-frame transmission structures. Low, sprawling solar array. Geometric fencing.
LINE	No perceived change.	No perceived change.	Vertical and horizontal components to H-frame structures. Horizontal solar array. Linear, continuous fencing.
COLOR	No perceived change.	No perceived change.	Light steel gray H-frames and fencing. Black solar array.
TEX-TURE	No perceived change.	No perceived change.	Repetitive, organized series of H-frame structures. Rigid solar array. Continuous fencing.

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1) STRONG	MODERATE	WEAK	NONE	VEGETATION (2) STRONG	MODERATE	WEAK	NONE	STRUCTURES (3) STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓			✓			✓		
	LINE				✓				✓			✓	
	COLOR				✓				✓			✓	
	TEXTURE				✓				✓		✓		

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants

Date: 07/21/2022

(Continued on Page 2)

Comments from item 2.

Additional Mitigating Measures (See item 3)

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 06/07/2022
District Office: N/A
Field Office: N/A
Land Use Planning Area: N/A

SECTION A. PROJECT INFORMATION

1. Project Name	4. KOP Location (T.R.S)	5. Location Sketch
Rancho Viejo Solar Project	T. 15N, R. 9E, S. 18	See report figure
2. Key Observation Point (KOP) Name KOP 03 - Southern Boundary East		
3. VRM Class at Project Location N/A	(Lat. Long) 35.537299, -106.027556	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat, smooth valley floor below a trapezoidal mountain range with pyramidal peaks.	Globular pinyon-juniper; low, dwarfed shrubs; geometric cactus; dense, bristly grasses.	NA
LINE	Horizontal valley floor. Diagonal mountain peaks and slopes.	Amorphous pinyon-juniper and shrubs, angular cactus, horizontal grass canopy.	NA
COLOR	Brown exposed soils on valley floor. Blue mountains with patches of gray and brown exposed rocks and soils.	Dark green pinyon-juniper, shrubs and cactus, straw yellow grasses.	NA
TEX-TURE	Continuous valley floor. Abrupt, coarse mountain formations.	Scattered pinyon-juniper, shrubs, and cactus; low, smooth, continuous grasses.	NA

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change.	No perceived change.	Columnar H-frame transmission structures. Low, sprawling solar array. Geometric fencing.
LINE	No perceived change.	No perceived change.	Vertical and horizontal components to H-frame structures. Horizontal solar array. Linear, continuous fencing.
COLOR	No perceived change.	No perceived change.	Light steel gray H-frames and fencing. Black solar array.
TEX-TURE	No perceived change.	No perceived change.	Repetitive, organized series of H-frame structures. Rigid solar array. Continuous fencing.

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓			✓			✓		
	LINE				✓			✓			✓		
	COLOR				✓				✓		✓		
	TEXTURE				✓				✓		✓		

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants
Date: 07/21/2022

(Continued on Page 2)

Comments from item 2.

Additional Mitigating Measures (See item 3)

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 06/07/2022
District Office: N/A
Field Office: N/A
Land Use Planning Area: N/A

SECTION A. PROJECT INFORMATION

1. Project Name	4. KOP Location (T.R.S)	5. Location Sketch
Rancho Viejo Solar Project	T. 15N, R. 9E, S. 7	See report figure
2. Key Observation Point (KOP) Name KOP 04 - Southern Boundary West		
3. VRM Class at Project Location N/A	(Lat. Long) 35.537342, -106.020464	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat, smooth valley floor below a trapezoidal mountain range with pyramidal peaks.	Globular pinyon-juniper; low, dwarfed shrubs; geometric cactus; dense, bristly grasses.	NA
LINE	Horizontal valley floor. Diagonal mountain peaks and slopes.	Amorphous pinyon-juniper and shrubs, angular cactus, horizontal grass canopy.	NA
COLOR	Brown exposed soils on valley floor. Blue mountains with patches of gray and brown exposed rocks and soils.	Dark green pinyon-juniper, shrubs and cactus, straw yellow grasses.	NA
TEX-TURE	Continuous valley floor. Abrupt, coarse mountain formations.	Scattered pinyon-juniper, shrubs, and cactus; low, smooth, continuous grasses.	NA

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change.	No perceived change.	Columnar H-frame transmission structures. Low, sprawling solar array. Geometric fencing.
LINE	No perceived change.	No perceived change.	Vertical and horizontal components to H-frame structures. Horizontal solar array. Linear, continuous fencing.
COLOR	No perceived change.	No perceived change.	Light steel gray H-frames and fencing. Black solar array.
TEX-TURE	No perceived change.	No perceived change.	Repetitive, organized series of H-frame structures. Rigid solar array. Continuous fencing.

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓			✓		✓			
	LINE				✓				✓	✓			
	COLOR				✓				✓	✓			
	TEXTURE				✓				✓	✓			

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants

Date: 07/21/2022

(Continued on Page 2)

Comments from item 2.

Additional Mitigating Measures (See item 3)

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 06/07/2022
District Office: N/A
Field Office: N/A
Land Use Planning Area: N/A

SECTION A. PROJECT INFORMATION

1. Project Name	4. KOP Location (T.R.S)	5. Location Sketch
Rancho Viejo Solar Project	T. 15N, R. 8E, S. 11	See report figure
2. Key Observation Point (KOP) Name KOP 05 - Turquoise Trail Charter School		
3. VRM Class at Project Location N/A	(Lat. Long) 35.5378, -106.0558	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat, smooth valley floor below a distant trapezoidal mountain range in background.	Amorphous cactus shrubs scattered within continuous grass cover.	Columnar, rectangular, and pyramidal structures.
LINE	Horizontal valley floor. Horizontal mountain range horizon with diagonal peaks and slopes throughout.	Complex branches on individual cactus. Horizontal grass canopy.	Angular structure edges.
COLOR	Brown exposed soils on valley floor. Blue, brown, and gray shades on mountain range.	Dark green cactus, straw yellow grasses.	Brown, green, blue, and white shades of structures.
TEX-TURE	Continuous valley floor. Abrupt, coarse mountain formations.	Scattered cactus throughout dense grass cover.	Organized, rigid patch of structures.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change.	Continuous grass canopy is slightly interrupted by solar array.	Columnar H-frame transmission structures. Low, sprawling solar array. Geometric fencing.
LINE	No perceived change.	No perceived change.	Vertical and horizontal components to H-frame structures. Horizontal solar array. Linear, continuous fencing.
COLOR	No perceived change.	No perceived change.	Light steel gray H-frames and fencing. Black solar array.
TEX-TURE	No perceived change.	No perceived change.	Repetitive, organized series of H-frame structures. Rigid solar array. Continuous fencing.

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓			✓				✓	
	LINE				✓				✓			✓	
	COLOR				✓				✓			✓	
	TEXTURE				✓				✓		✓		

2. Does project design meet visual resource management objectives? ✓Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ✓No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants

Date: 07/21/2022

(Continued on Page 2)

Comments from item 2.

Additional Mitigating Measures (See item 3)

Form 8400-4
(June 2018)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date: 06/07/2022
District Office: N/A
Field Office: N/A
Land Use Planning Area: N/A

SECTION A. PROJECT INFORMATION

1. Project Name	4. KOP Location (T.R.S)	5. Location Sketch
Rancho Viejo Solar Project	T. 15N, R. 8E, S. 01	See report figure
2. Key Observation Point (KOP) Name KOP 06 - Highway 14		
3. VRM Class at Project Location N/A	(Lat. Long) 35.5595, -106.0536	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Gently undulating valley floor below a distant mountain range with pyramidal peaks.	Even cover of shrubs with complex cactus and yucca and rounded shrubs. Scattered, clumpy bunch grasses.	Low, columnar fence posts with perpendicular fence wire.
LINE	Horizontal valley floor with subtle diagonal slopes. Diagonal peaks and slopes throughout mountains.	Geometric cactus and yucca, bristly shrubs, wispy bunch grasses.	Vertical fence posts, horizontal fence wire.
COLOR	Brown exposed soils on valley floor. Blue, brown, and gray shades on mountain range.	Dark green, yellow-green, and woody gray cactus, yucca, and shrubs. Straw yellow bunch grasses.	Dark brown fence posts, dark gray fence wire.
TEX-TURE	Continuous valley floor. Abrupt, coarse mountain formations.	Mottled shrub overstory, patchy bunch grasses.	Linear, continuous fencing.

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	No perceived change.	No perceived change.	Low, sprawling solar array. Tall, columnar H-frame transmission structures.
LINE	No perceived change.	No perceived change.	Angular extent of solar arrays. Vertical, geometric H-frame structures.
COLOR	No perceived change.	No perceived change.	Black solar array. Light steel gray H-frame structures.
TEX-TURE	No perceived change.	No perceived change.	Rigid solar array. Repeating H-frame structures.

SECTION D. CONTRAST RATING __SHORT TERM ✓LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1) STRONG	MODERATE	WEAK	NONE	VEGETATION (2) STRONG	MODERATE	WEAK	NONE	STRUCTURES (3) STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				✓				✓			✓	
	LINE				✓				✓			✓	
	COLOR				✓				✓			✓	
	TEXTURE				✓				✓			✓	

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)

3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)

Evaluator's Names: SWCA Environmental Consultants

Date: 07/21/2022

(Continued on Page 2)

Comments from item 2.

Additional Mitigating Measures (See item 3)

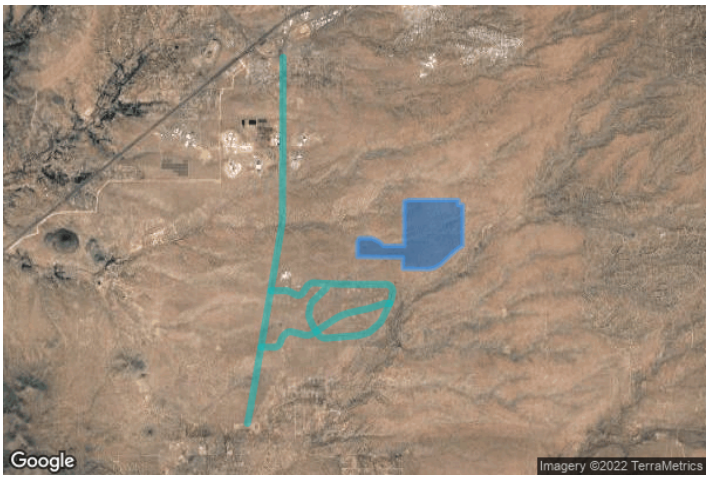
APPENDIX C

Glint and Glare Analysis

FORGESOLAR GLARE ANALYSIS

Project: **Rancho Viejo**
Site configuration: **Rancho Viejo**

Created 09 Aug, 2022
Updated 11 Aug, 2022
Time-step 1 minute
Timezone offset UTC-7
Site ID 73811.13011
Category 10 MW to 100 MW
DNI peaks at 1,000.0 W/m^2
Ocular transmission coefficient 0.5
Pupil diameter 0.002 m
Eye focal length 0.017 m
Sun subtended angle 9.3 mrad
Methodology V2



Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV1	SA tracking	SA tracking	0	0.0	0	0.0	162,400.0

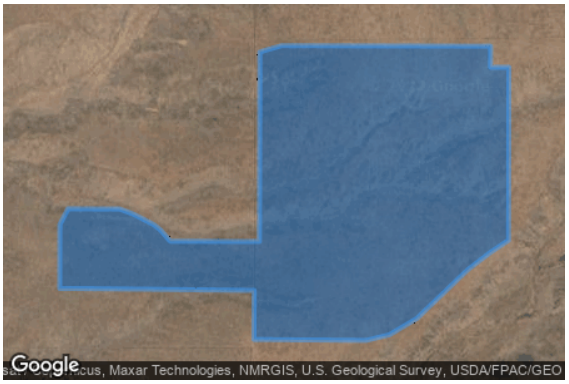
Total annual glare received by each receptor; may include duplicate times of glare from multiple reflective surfaces.

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Calle Galisteo	0	0.0	0	0.0
Route 14	0	0.0	0	0.0
San Marcos Loop	0	0.0	0	0.0

Component Data

PV Arrays

Name: PV1
Axis tracking: Single-axis rotation
Backtracking: Shade-slope
Tracking axis orientation: 180.0°
Max tracking angle: 60.0°
Resting angle: 5.0°
Ground Coverage Ratio: 0.5
Rated power: 60.0 kW
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: correlate with material



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	35.544212	-106.031796	6406.31	0.00	6406.31
2	35.540644	-106.031805	6406.31	0.00	6406.31
3	35.540536	-106.018441	6406.31	0.00	6406.31
4	35.537803	-106.018449	6406.31	0.00	6406.31
5	35.537747	-106.010756	6406.31	0.00	6406.31
6	35.538067	-106.009139	6406.31	0.00	6406.31
7	35.538964	-106.007271	6406.31	0.00	6406.31
8	35.541691	-106.003757	6406.31	0.00	6406.31
9	35.542645	-106.002220	6406.31	0.00	6406.31
10	35.543331	-106.000963	6406.31	0.00	6406.31
11	35.552970	-106.000933	6406.31	0.00	6406.31
12	35.552973	-106.002202	6406.31	0.00	6406.31
13	35.554144	-106.002198	6406.31	0.00	6406.31
14	35.554173	-106.016566	6406.31	0.00	6406.31
15	35.553820	-106.018050	6406.31	0.00	6406.31
16	35.543263	-106.018080	6406.31	0.00	6406.31
17	35.543275	-106.024211	6406.31	0.00	6406.31
18	35.543905	-106.024891	6406.31	0.00	6406.31
19	35.544182	-106.025307	6406.31	0.00	6406.31
20	35.544797	-106.026787	6406.31	0.00	6406.31
21	35.545075	-106.027703	6406.31	0.00	6406.31
22	35.545081	-106.031228	6406.31	0.00	6406.31
23	35.544212	-106.031796	6406.31	0.00	6406.31

Route Receptors

Name: Calle Galisteo
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	35.519163	-106.060010	6250.53	0.00	6250.53
2	35.519141	-106.056426	6257.35	0.00	6257.35
3	35.519167	-106.055965	6259.28	0.00	6259.28
4	35.519263	-106.055595	6260.84	0.00	6260.84
5	35.519416	-106.055225	6262.82	0.00	6262.82
6	35.519573	-106.054973	6263.00	0.00	6263.00
7	35.519805	-106.054699	6263.84	0.00	6263.84
8	35.520104	-106.054471	6265.06	0.00	6265.06
9	35.520905	-106.054122	6264.31	0.00	6264.31
10	35.521095	-106.054042	6264.21	0.00	6264.21
11	35.521311	-106.053908	6263.97	0.00	6263.97
12	35.521596	-106.053704	6262.66	0.00	6262.66
13	35.521819	-106.053489	6262.08	0.00	6262.08
14	35.522059	-106.053232	6263.27	0.00	6263.27
15	35.522339	-106.052894	6265.57	0.00	6265.57
16	35.522735	-106.052233	6265.59	0.00	6265.59
17	35.522835	-106.051772	6265.65	0.00	6265.65
18	35.522862	-106.051423	6267.59	0.00	6267.59
19	35.522814	-106.051005	6269.65	0.00	6269.65
20	35.522128	-106.047572	6279.19	0.00	6279.19
21	35.522067	-106.047266	6281.52	0.00	6281.52
22	35.522028	-106.046928	6281.53	0.00	6281.53
23	35.522015	-106.046601	6282.06	0.00	6282.06
24	35.522032	-106.046166	6282.77	0.00	6282.77
25	35.522089	-106.045780	6284.42	0.00	6284.42
26	35.522242	-106.045249	6285.46	0.00	6285.46
27	35.522517	-106.044648	6284.95	0.00	6284.95
28	35.525686	-106.038747	6311.70	0.00	6311.70
29	35.525983	-106.038200	6316.55	0.00	6316.55
30	35.526259	-106.037604	6319.40	0.00	6319.40
31	35.526433	-106.037201	6321.85	0.00	6321.85
32	35.526647	-106.036686	6323.01	0.00	6323.01
33	35.526892	-106.035988	6325.42	0.00	6325.42
34	35.527198	-106.034931	6327.71	0.00	6327.71
35	35.527336	-106.034359	6329.88	0.00	6329.88
36	35.528200	-106.029456	6344.79	0.00	6344.79
37	35.528407	-106.028353	6349.86	0.00	6349.86
38	35.528494	-106.027978	6352.23	0.00	6352.23
39	35.529146	-106.025484	6361.14	0.00	6361.14
40	35.529308	-106.024905	6362.52	0.00	6362.52
41	35.529516	-106.024129	6364.64	0.00	6364.64
42	35.529586	-106.023883	6363.67	0.00	6363.67
43	35.529612	-106.023620	6365.08	0.00	6365.08
44	35.529617	-106.023352	6365.92	0.00	6365.92
45	35.529537	-106.022335	6366.08	0.00	6366.08

Name: Route 14
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	35.501059	-106.064025	6177.76	0.00	6177.76
2	35.502334	-106.063720	6177.53	0.00	6177.53
3	35.504775	-106.063119	6205.12	0.00	6205.12
4	35.505155	-106.063038	6206.75	0.00	6206.75
5	35.508511	-106.062323	6224.19	0.00	6224.19
6	35.510614	-106.061881	6227.99	0.00	6227.99
7	35.511194	-106.061753	6225.56	0.00	6225.56
8	35.524116	-106.058997	6251.85	0.00	6251.85
9	35.535566	-106.056589	6285.05	0.00	6285.05
10	35.548119	-106.053949	6257.79	0.00	6257.79
11	35.549359	-106.053778	6268.70	0.00	6268.70
12	35.559023	-106.053722	6293.08	0.00	6293.08
13	35.567869	-106.053663	6318.75	0.00	6318.75
14	35.588065	-106.053595	6306.27	0.00	6306.27

Name: San Marcos Loop
Path type: Two-way
Observer view angle: 50.0°

Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	35.532584	-106.057092	6276.62	0.00	6276.62
2	35.532619	-106.052714	6277.42	0.00	6277.42
3	35.532593	-106.052350	6275.84	0.00	6275.84
4	35.532340	-106.051534	6275.07	0.00	6275.07
5	35.531790	-106.050247	6282.38	0.00	6282.38
6	35.531606	-106.049743	6288.72	0.00	6288.72
7	35.531536	-106.049410	6292.18	0.00	6292.18
8	35.531528	-106.049024	6292.58	0.00	6292.58
9	35.531555	-106.048750	6294.22	0.00	6294.22
10	35.531646	-106.048445	6295.07	0.00	6295.07
11	35.531804	-106.048133	6294.81	0.00	6294.81
12	35.531996	-106.047876	6294.96	0.00	6294.96
13	35.532306	-106.047618	6296.97	0.00	6296.97
14	35.533342	-106.046785	6297.81	0.00	6297.81
15	35.533750	-106.046431	6300.94	0.00	6300.94
16	35.533916	-106.046227	6304.38	0.00	6304.38
17	35.534124	-106.045899	6303.30	0.00	6303.30
18	35.534242	-106.045636	6304.67	0.00	6304.67
19	35.534329	-106.045406	6305.62	0.00	6305.62
20	35.534386	-106.045180	6306.88	0.00	6306.88
21	35.534443	-106.044875	6310.42	0.00	6310.42
22	35.534471	-106.044514	6314.79	0.00	6314.79
23	35.534300	-106.040698	6331.05	0.00	6331.05
24	35.534195	-106.038107	6322.53	0.00	6322.53
25	35.534150	-106.036889	6321.41	0.00	6321.41
26	35.534117	-106.031297	6352.59	0.00	6352.59
27	35.534125	-106.023988	6375.19	0.00	6375.19
28	35.534120	-106.023451	6376.46	0.00	6376.46
29	35.534085	-106.023119	6376.53	0.00	6376.53
30	35.534033	-106.022851	6377.70	0.00	6377.70
31	35.533963	-106.022625	6377.35	0.00	6377.35
32	35.533854	-106.022400	6377.54	0.00	6377.54
33	35.533680	-106.022128	6376.81	0.00	6376.81
34	35.533496	-106.021908	6378.24	0.00	6378.24
35	35.533309	-106.021736	6378.92	0.00	6378.92
36	35.533090	-106.021613	6377.74	0.00	6377.74
37	35.532885	-106.021521	6378.23	0.00	6378.23
38	35.532641	-106.021462	6378.81	0.00	6378.81
39	35.532436	-106.021441	6379.24	0.00	6379.24
40	35.532196	-106.021468	6379.72	0.00	6379.72
41	35.530539	-106.021842	6373.62	0.00	6373.62
42	35.530332	-106.021926	6373.01	0.00	6373.01
43	35.528254	-106.023106	6359.01	0.00	6359.01
44	35.525696	-106.024607	6342.51	0.00	6342.51
45	35.525418	-106.024774	6341.00	0.00	6341.00
46	35.525134	-106.025026	6338.94	0.00	6338.94
47	35.524879	-106.025279	6336.17	0.00	6336.17
48	35.523753	-106.026845	6330.50	0.00	6330.50
49	35.523186	-106.027652	6326.89	0.00	6326.89
50	35.522908	-106.028074	6325.59	0.00	6325.59
51	35.522714	-106.028446	6324.83	0.00	6324.83
52	35.522618	-106.028674	6323.66	0.00	6323.66
53	35.522452	-106.029310	6323.46	0.00	6323.46
54	35.522013	-106.031244	6324.61	0.00	6324.61
55	35.521965	-106.031536	6325.04	0.00	6325.04
56	35.521917	-106.032012	6324.13	0.00	6324.13
57	35.521629	-106.036389	6311.12	0.00	6311.12
58	35.521327	-106.040782	6299.92	0.00	6299.92
59	35.521322	-106.041280	6300.80	0.00	6300.80

Glare Analysis Results

Summary of Results No glare predicted

PV Array	Tilt	Orient	Annual Green Glare		Annual Yellow Glare		Energy
	°	°	min	hr	min	hr	kWh
PV1	SA tracking	SA tracking	0	0.0	0	0.0	162,400.0

Total annual 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
Calle Galisteo	0	0.0	0	0.0
Route 14	0	0.0	0	0.0
San Marcos Loop	0	0.0	0	0.0

PV: PV1 no glare found

Receptor results ordered by category of glare

Receptor	Annual Green Glare		Annual Yellow Glare	
	min	hr	min	hr
Calle Galisteo	0	0.0	0	0.0
Route 14	0	0.0	0	0.0
San Marcos Loop	0	0.0	0	0.0

PV1 and Calle Galisteo

Receptor type: Route
No glare found

PV1 and Route 14

Receptor type: Route
No glare found

PV1 and San Marcos Loop

Receptor type: Route
No glare found

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
"Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
The algorithm does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results. However, we have validated our models against several systems, including a PV array causing glare to the air-traffic control tower at Manchester-Boston Regional Airport and several sites in Albuquerque, and the tool accurately predicted the occurrence and intensity of glare at different times and days of the year.
Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare. This primarily affects V1 analyses of path receptors.
Random number computations are utilized by various steps of the annual hazard analysis algorithm. Predicted minutes of glare can vary between runs as a result. This limitation primarily affects analyses of Observation Point receptors, including ATCTs. Note that the SGHAT/ ForgeSolar methodology has always relied on an analytical, qualitative approach to accurately determine the overall hazard (i.e. green vs. yellow) of expected glare on an annual basis.
The analysis does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc.
The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
The variable direct normal irradiance (DNI) feature (if selected) scales the user-prescribed peak DNI using a typical clear-day irradiance profile. This profile has a lower DNI in the mornings and evenings and a maximum at solar noon. The scaling uses a clear-day irradiance profile based on a normalized time relative to sunrise, solar noon, and sunset, which are prescribed by a sun-position algorithm and the latitude and longitude obtained from Google maps. The actual DNI on any given day can be affected by cloud cover, atmospheric attenuation, and other environmental factors.
The ocular hazard predicted by the tool depends on a number of environmental, optical, and human factors, which can be uncertain. We provide input fields and typical ranges of values for these factors so that the user can vary these parameters to see if they have an impact on the results. The speed of SGHAT allows expedited sensitivity and parametric analyses.
The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
Refer to the Help page at **www.forgesolar.com/help/** for assumptions and limitations not listed here.

Default glare analysis parameters and observer eye characteristics (for reference only):

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians