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ANL/EVS/R-12/6

Potential Visual Impacts of Utility-Scale Solar Energy Development within Solar Energy Zones on Selected Viewpoints in Death Valley and Joshua Tree National Parks, and El Camino Real De Tierra Adentro National Historic Trail

Environmental Science Division

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Potential Visual Impacts of Utility-Scale Solar Energy Development within Solar Energy Zones on Selected Viewpoints in Death Valley and Joshua Tree National Parks, and El Camino Real De Tierra Adentro National Historic Trail

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June 2013

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TABLE

LIST OF ACRONYMS

3-D	three-dimensional
Argonne	Argonne National Laboratory
BLM	Bureau of Land Management
CSP	Concentrating Solar Power
GIS	Geographic Information System
GMP	General Management Plan
KML	Keyhole Markup Language
KOP	key observation point
NED	National Elevation Data
NHT	National Historic Trail
NP	National Park
NPS	National Park Service
NWR	National Wildlife Refuge
PEIS	Programmatic Environmental Impact Statement
PV	photovoltaic
RMP	resource management plan
SEZ	solar energy zone
SVRA	sensitive visual resource area
USACE	U.S. Army Corps of Engineers
USFS	United States Department of Agriculture Forest Service
USFWS	U.S. Fish and Wildlife Service

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ABSTRACT

In connection with the Bureau of Land Management's (BLM's) Solar Programmatic Environmental Impact Statement (Solar PEIS), Argonne National Laboratory (Argonne) has conducted an extended visual impact analysis for selected key observation points (KOPs) within three National Park Service (NPS) units located within the 25-mi (40-km) viewshed of four solar energy zones (SEZs) identified in the Solar PEIS. The analysis includes only those NPS units that the Solar PEIS identified as potentially subject to moderate or strong visual contrasts associated with solar development within the SEZs. The NPS units included in the analysis are Death Valley and Joshua Tree National Parks and El Camino Real De Tierra Adentro National Historic Trail. The analysis showed that certain KOPs in each of these NPS units could potentially be subject to major visual contrast and impacts from solar development within the SEZs, but many of the KOPs would likely be subject to moderate, minor, or negligible contrasts and impacts, generally because they were relatively distant from the relevant SEZ, had views of the SEZ partially blocked by intervening terrain, and/or had very low vertical angles of view toward the SEZ. For all three NPS units, power tower facilities were found to be major contributors to potential visual contrasts, primarily because of the long-distance visibility of intensely bright reflection of light from the receivers on the central towers, but also because of the height and strong vertical line of the tower structures and the potential for night-sky impacts from FAA-mandated hazard navigation lighting.

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1 INTRODUCTION

1.1 ANALYSIS SCOPE AND PURPOSE

This document presents the results of an analysis of potential visual impacts on three units of the National Park Service (NPS) from future solar energy development in four solar energy zones (SEZs) identified in the Department of the Interior Bureau of Land Management's (BLM's) Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States (Solar PEIS).The analysis reported here is an extension of the Solar PEIS visual impact analysis that looks more closely at potential impacts on specific viewpoints in the lands surrounding the SEZs. It is more limited in geographic scope and uses slightly different methodology from the Solar PEIS analysis. This analysis assesses potential visual contrasts associated with solar energy facilities within SEZs that might be observed from specific key observation points (KOPs) within 25 mi (40 km) of the SEZs, and located in either Death Valley National Park (NP), Joshua Tree National Parks (NP), or on the El Camino Real de Tierra Adentro National Historic Trail (El Camino NHT). The visual impact analysis in the Solar PEIS was more general in nature, analyzed impacts on a much broader range of resource areas, and was not limited to a specific set of KOPs.

This report includes a summary and comparison of the visual impact analyses conducted for the Solar PEIS and the current extended analysis; a discussion of the methodology used for the extended analysis; and the impact analysis itself, which includes discussion of each KOP used in the analysis, the KOP viewsheds, the visibility of the SEZs from the KOPs, and the nature and magnitude of the visual contrast levels that would be observed at each KOP.

1.1.1 Solar PEIS Visual Impact Analysis Summary

The Department of Energy Office of Energy Efficiency and Renewable Energy and BLM prepared the Solar PEIS to evaluate potential environmental impacts of utility-scale solar energy development on BLM-administered lands in six southwestern states, i.e., Arizona, California, Colorado, New Mexico, Nevada, and Utah. The intent of the Solar PEIS is to assist in the development and implementation of agency-specific programs and guidance that would establish environmental policies and mitigation strategies for solar energy projects. It also is intended to provide information necessary to amend relevant BLM land use plans for the purpose of establishing a new BLM Solar Energy Program. These resource management plan (RMP) amendments were made through the Solar PEIS Record of Decision, which was published by BLM on October 12, 2012.

As part of the Solar PEIS, a visual impact analysis was conducted to assess the potential effects of solar development on lands visible from and within 25 mi (40 km) of the SEZs. The analysis included two major components: geographic information system-based (GIS-based) viewshed analyses to determine potential visibility of solar facilities within the SEZs, and impact analyses using Google Earth and Google SketchUp™ to create visualizations of the SEZs and

schematic three-dimensional computer models of hypothetical solar energy facility models placed within the SEZs.

Preliminary viewshed analyses were conducted to identify which lands surrounding the SEZs would have potential visibility of solar development within the designated zones. Four viewshed analyses were conducted for each of these identified areas, each at a different height representative of project elements associated with potential solar energy technologies, including photovoltaic (PV) and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and low-height power blocks for Concentrating Solar Power (CSP) technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). These heights were selected on the basis of a review of available literature on utility-scale solar technologies and in consultation with solar technology experts.

The Solar PEIS viewshed analyses identified a number of scenic resource areas, including NPS units (collectively referred to as sensitive visual resource areas [SVRAs]) within 25 mi (40 km) of the SEZs, and from which solar energy facilities within the SEZs might be visible. The visual impact analysis determined the magnitude of potential visual contrasts (changes in the visible landscape) that would be anticipated for each SVRA. In the impact assessment, anticipated contrast levels for potentially affected SVRAs were described as minimal, weak, moderate, or strong levels of visual contrast. A subset of the SVRAs was selected for this extended visual impact analysis.

1.2 EXTENDED ANALYSIS

The extended visual impact analysis approach presented in this document was proposed in the Supplement to the Draft Solar PEIS. This analysis employed more refined methods and a narrower geographic scope than the analysis in the Solar PEIS. The purpose of the refined analysis is to determine more precisely the potential visual contrasts from solar development within the SEZs at specific KOPs within selected SVRAs. The impact analysis in the Solar PEIS did not examine impacts on specific KOPs within the SVRAs, primarily because KOPs were not available for most of the more than 140 SVRAs for which potential impacts were analyzed in the Solar PEIS. Instead, potential impacts on each SVRA as a whole were described. While useful, analyzing impacts on the SVRA as a whole is less than ideal, because in many SVRAs, visitor use is limited to very specific areas while other areas within the SVRA may have very low visitor use. Impacts on high-use areas are more important than impacts on low-use areas, and it is very useful to be able to discriminate between the two when determining the significance of potential impacts and also when designing mitigation strategies. The KOP-based analysis in the extended analysis is better able to identify potential impacts on the high-use areas reflected in the KOPs identified for the SVRAs, and thus is a more precise analysis than that used in the Solar PEIS.

The visual impact analysis presented in the Solar PEIS included a *reverse viewshed analysis* for each SEZ. A reverse viewshed analysis identifies all lands within a specified radius of a point, line, or area of interest from which viewers might be able to see all or part of the point, line, or area of interest. In the context of the Solar PEIS, the reverse viewshed analysis

determined all land within 25 mi (40 km) of the SEZs from which viewers might see all or part of the SEZs. In addition to including reverse viewshed analyses from the SEZs, the extended analysis provides additional viewshed analyses from particular locations (KOPs) outside of the SEZs. These KOP viewsheds show how much of the relevant SEZ is visible from the KOP, an important determinant of potential visual contrasts that might result from solar development in the SEZ. Conducting this type of KOP-based viewshed analysis is more typical for visual impact analyses conducted for individual project proposals than employing only the reverse viewshed analyses used in the Solar PEIS analysis.

The results of the extended analysis provide more precise and complete information to BLM and other stakeholders, such as NPS, about the potential impacts of solar development in the SEZs on visitor experiences in these SVRAs. This information can be used to inform the project siting and design processes and impact mitigation planning for future projects proposed on lands within the SEZs.

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2 VISUAL RESOURCE ANALYSIS – METHODOLOGY

2.1 IDENTIFICATION OF UNITS FOR ANALYSIS

As summarized in Section 1.1.1, the Draft Solar PEIS visual impact analysis assessed potential levels of visual contrast from solar development within the SEZs for all lands visible from and within 25 mi (40 km) of all of the proposed SEZs. The extended analysis assesses potential levels of visual contrast from solar development within the SEZs for selected KOPs within the following NPS units: Death Valley and Joshua Tree National Parks (NPs), and the El Camino Real de Tierra Adentro National Historic Trail (El Camino NHT). These SVRAs were selected for the more detailed extended visual impact analysis because the Solar PEIS analysis indicated that they could be subject to moderate or strong visual contrasts from solar energy development in the SEZs.

2.2 IDENTIFICATION OF KEY OBSERVATION POINTS (KOPS)

The KOPs used in this analysis are the viewpoints from which potential impacts from solar development in the SEZs were assessed. They are points from which visitors to the SVRAs are likely to view lands outside the SVRA (including the SEZ), and which were determined by the agency administering the SVRA (NPS) to be important to the visitor experience of the SVRA. The KOPs include scenic overlooks; mountain peaks or other elevated viewpoints affording panoramic views of the surrounding landscape; segments or points along roadways in or near the SVRA that visitors would use to enter or travel through the SVRA; historic sites; and a variety of other locations where visitors would experience scenic views.

The KOPs were selected by NPS staff members on the basis of their knowledge of the SVRAs, data about visitor use (where available), and published documents describing the scenic values of the viewpoints and their importance to the experiences of SVRA visitors. The KOP names and locations were provided to Argonne by NPS in GIS format. Supporting information about the KOPs used in the analysis was also provided by NPS. The nature and amount of information about KOPs varied widely; little or no information was provided for some KOPs. For each KOP, an initial determination of potential visibility of the SEZ from the KOP was made by overlaying the GIS data layer containing the KOP locations onto the GIS data layers containing the SEZ viewshed maps, which were generated during the Solar PEIS analysis. SEZs that were located within the SEZ viewshed were included in the extended analysis. Viewers at KOPs falling outside the SEZ viewshed could not see the SEZ because of intervening topography, and were omitted from the extended analysis.

2.3 VIEWSHED ANALYSIS

The Spatial Analyst Extension of the ESRI ArcGIS 10 software was used to calculate the viewsheds for this extended analysis, including both the reverse viewshed analyses described above and the KOP viewshed analyses. The viewshed tool (or program) determines whether

there is an unobstructed line of sight between the viewshed origin (in this case, an SEZ or a KOP) and the area surrounding the viewshed origin. Inputs required for the viewshed tool are the viewshed origin point; a digital elevation model (a grid of rectangular cells, with a value for each cell representing the elevation at the cell's center); an observer height (generally about 5.7 ft [1.75 m]); a value for atmospheric refraction, if it is incorporated into the viewshed analysis; and whether or not to allow for the screening effect of Earth's curvature in the visibility calculation. The viewshed tool examines each cell in the digital elevation model and determines whether there are one or more cells of higher elevation between it and the viewshed origin point. If there are not, that cell is included as a visible cell in the calculated viewshed. The output of the viewshed analysis is another grid of cells; in this case, each cell has an assigned binary value that indicates whether it is visible from the viewshed origin or blocked from view by an intervening object, in this case, by topography.

For this analysis, the 10-m (32.8-ft) digital elevation models from the United States Geological Survey National Elevation Data (NED) were used as inputs. Ten-meter NED data have a vertical resolution that varies depending on the source data, but the average value is approximately 2.44 m (8.01 ft) Root Mean Square Error.

The viewshed analysis did not account for the presence of vegetation or structures that might screen views of the landscape; however, in most cases, this introduced little error, because most of the land within the six states in which the SEZs are located is devoid of vegetation or structures of sufficient height to screen solar facilities from view. It should be noted, however, that any given location may, in fact, be subject to vegetative or structural screening, the presence of which could only be determined by a detailed site-specific analysis.

Similarly to the analysis conducted for the Solar PEIS (see Section 1.1.1 above), heights representative of the various potential solar energy technologies were used as target heights in the viewshed analyses, and an observer height of 1.75 m (5.7 ft) was used for all viewshed analyses. This resulted in four separate viewsheds for each SEZ and KOP, each representing a view of one of the four potential solar energy technologies. Viewshed analysis results for the different-height viewsheds were combined in the viewshed figures in this report.

The screening effects of Earth's curvature and atmospheric refraction were incorporated into the viewshed analyses. The viewsheds for the SEZs were calculated to include the curvature of the earth, and a refractivity coefficient of 0.13 was used for the analyses. Refractivity varies depending on weather and location; the value used is a standard default value recommended for visual impact analysis by ESRI, provider of ArcGIS 10.

2.3.1 GIS Overlay of KOP Viewsheds and SEZs

The viewshed data layer generated by the viewshed analysis for the individual KOPs then was overlaid onto a data layer containing the footprint of the SEZs in order to determine how much and which parts of the SEZs could potentially be seen from the KOP. The GIS was used to calculate the acreage of the SEZ within the viewshed of each KOP, and to generate viewshed maps that show which parts of the SEZ could potentially be visible from each KOP.

2.4 THREE-DIMENSIONAL MODEL DEVELOPMENT AND VISUALIZATION

Following the same approach utilized for the Draft Solar PEIS visual impact analysis, Google Earth and Google SketchUp[1] were used to prepare three-dimensional (3-D) visualizations of virtual models of hypothetical solar facilities within the SEZs. The visualizations were used to assess the apparent size and viewing angles of the solar facilities within the SEZs as they would appear from the KOPs. They were not intended to be actual representations of solar facilities, or to represent any actual or proposed projects within the SEZ.

The following approach was used to develop 3-D models of solar facilities and create the Google Earth visualizations of the facilities within the SEZs for use in the impact analysis:

- Google SketchUp was used to create generalized but spatially accurate 3-D models of PV, parabolic trough, and power tower facilities, based on information contained in environmental assessments conducted for real solar facilities planned for development in the southwestern U.S.

- ESRI ArcGIS software Version 10 was used to generate keyhole markup language (KML) files for use in Google Earth. KML files were created for (1) the SEZ boundaries, (2) the SVRAs, and (3) the KOPs identified by NPS staff.

- The 3-D models of the solar facilities were then imported from Google SketchUp into Google Earth and placed within the SEZs. Multiple models of the various types of solar facilities were placed into the SEZs.

- Views of the SEZs and the models within the SEZs as they would be seen from each KOP were created in Google Earth. The visualizations were used by the impact analysts to assess how large typical solar facilities might appear when viewed from the KOP, their visual and spatial relationship to the surrounding landscape, and the viewing angle, which research has shown to be an important factor in determining the nature and magnitude of visual contrast associated with the facilities (Sullivan et al. 2012).

  Google Earth's "Snapshot View" tool was used to create screen captures of the visualizations, which were imported into Adobe Photoshop and converted to a suitable image format for inclusion in this report.

[1] Google SketchUp is a three-dimensional modeling software package that allows construction of three-dimensional models that can be imported and manipulated within Google Earth. By using drawings and other information contained in available utility-scale solar energy facility applications, simplified but spatially accurate scale models of the facilities can be built in Google SketchUp.

2.4.1 80% Development Scenario

For purposes of this analysis, consistent with the development scenario analyzed in the Solar PEIS, the developable area was assumed to be 80% of the total land area for each SEZ. The various 3-D facility models placed into the SEZ cumulatively occupied approximately 80% of the SEZ.

2.4.2 Solar Facility Models

Models for PV, parabolic trough, and power tower facilities were used in the analysis. It should be noted that the 3-D models used in the analysis are for specific proposed facilities with facility component heights that differ from those used in the viewshed analysis. The component heights used in the viewshed analysis are generalized representations of component heights for the various solar technologies; actual component heights vary by project.

2.4.2.1 Photovoltaic Facility Model

The PV facility model used in this analysis was based on the 550-MW (nominal capacity) Desert Sunlight Solar Farm, currently under construction in Riverside County, California. When finished, this facility will include a main generation area comprised of PV arrays (PV modules and power conversion units including inverters and transformers, combining switchgear, overheard lines, and access corridors); an operations and maintenance facility; a visitors' center; an on-site substation; and a 220-kV generation interconnection line (BLM 2011).

Model components consist of a series of PV arrays simplified for the model as one contiguous unit, measuring approximately 8 feet (2.4 m) in height; a substation measuring approximately 424 ft (129 m) long by 400 ft (122 m) wide by 50 ft (15 m) tall; and an administration building measuring approximately 240 ft (73 m) long by 120 ft (37 m) wide by 19 ft (5.7 m) tall. The shape and size of the PV arrays were adjusted to fit the size and shape of each SEZ, as these types of facilities utilize modular designs and can be constructed to fit the shape of almost any project area.

2.4.2.2 Parabolic Trough Facility Model

The parabolic trough model used in this analysis was based on the 250-MW Genesis Solar Energy Project, currently under construction in Riverside County, California. When finished, the facility will consist of two 125-MW adjacent but independent solar plants, each comprised of a solar field; a power block (steam turbine generator, solar steam generator, surface condenser, feedwater pumps and heaters, a wet cooling tower, evaporation ponds, and a natural-gas fired boiler); a solar collector assembly area; an on-site substation; access roads; a land treatment unit; administration, operations, and maintenance facilities; and a 230-kV gen-tie line (BLM 2010a).

Model components consist of a power block measuring approximately 1,000 ft (304 m) long by 790 ft (240 m) wide, with the tallest power block component measuring approximately 94 ft (29 m) tall; evaporation ponds each measuring approximately 850 ft (259 m) by 400 ft (122 m); an administration building measuring approximately 254 ft (77 m) long by 62 ft (19 m) wide by 22 ft (7 m) tall; an LTU measuring approximately 720 ft (219 m) by 600 ft (183 m); a solar collector assembly area measuring approximately 550 ft (168 m) by 300 ft (91 m); and a solar collector field, simplified in the model as one contiguous unit, measuring approximately 25 feet (8 m) in height. Similarly to the PV facility, the size and shape of the parabolic trough facility model was adjusted to fit the size and shape of each SEZ, as these types of facilities also utilize modular designs and can be constructed to fit the shape of almost any project area.

2.4.2.3 Power Tower Facility Model

The power tower facility used in the analysis was patterned after the 100-MW Crescent Dunes Solar Energy Project, currently under construction in Nye County, Nevada. When finished, this facility will contain a power block (a central receiving tower, conventional steam turbine, steam generator building, thermal storage tanks, a cooling system, and water treatment system) surrounded by a large field of heliostats measuring approximately 8,600 feet across; a heliostat assembly area; evaporation ponds; a transmission line; and various administrative, operations and management buildings (BLM 2010b).

Model components consist of the central receiving tower, measuring approximately 638 ft (194 m) tall by 60 ft (18 m) wide, and a circular power block measuring approximately 800 ft (244 m) in diameter, surrounded by a circular field of approximately 17,500 heliostats measuring approximately 8,600 feet in diameter; three evaporation ponds, each measuring approximately 900 ft (274 m) long by 480 ft (146 m) wide; and a heliostat assembly building measuring approximately 425 ft (130 m) long by 188 ft (57.3 m) wide by 50 ft (15 m) tall. The power tower facility model used in the analysis was not adjusted to fit the available space in the SEZs, as the power tower receiver height affects the size and configuration of the heliostat field. Therefore, the power tower model is the same for all SEZs.

2.4.2.4 Models within Visualizations

Each visualization depicts wire frame models of hypothetical PV, parabolic trough, and power tower solar facilities placed within the different SEZs relevant to each NPS unit to simulate the 80% development scenario within the SEZ, as described in the Final Solar PEIS. In all visualizations, the SEZ floor is shown in light orange. The tops of PV/parabolic trough solar collectors and the heliostat fields for the power tower facilities are shown in green and their sides are shown in light blue. Power Towers are portrayed in red. Evaporation ponds are depicted in dark blue. Support buildings are depicted in light and dark gray, and their ancillary components in light yellow and red. The colors chosen do not correspond to the real colors of the facility components, and were generally chosen to distinguish the SEZ and facility components from the background. As a result, the visualizations do not realistically simulate the appearance of the facilities in a real landscape. They do facilitate understanding the apparent size and viewing

angles for hypothetical facilities in the SEZ, and as noted above, this information is very useful in assessing the potential impacts.

2.5 ANALYSIS

For each KOP, the viewshed maps, affected acreages, and Google Earth visualizations were consulted to develop a potential visual contrast analysis, which included a discussion of the nature and magnitude of visual contrasts associated with solar energy development within the SEZ (under the 80% development scenario) that would be expected to be observed from the KOP. The contrast analyses for each KOP incorporate seven of the 10 environmental factors BLM suggests for use in visual impact analysis: distance, angle of observation, length of time the project is in view, relative size or scale, light conditions, spatial relationships, and motion. The other three environmental factors (season of use, recovery time, and atmospheric conditions) were considered but are not generally included in the individual KOP analyses because they apply equally to all KOPs. These factors are discussed below. On the basis of the available information about some of the KOPs, additional conclusions were drawn regarding the potential effects of the visible contrasts on SVRA visitors.

2.5.1 Viewsheds

Two viewshed analyses were conducted for each KOP. The first analysis was a reverse viewshed analysis from the SEZ to verify that the KOP is within the viewshed of the SEZ, and therefore viewers at the KOP might be able to see solar development within the SEZ. The second analysis depicts the areas within the SEZ where solar facility development would be expected to be visible from the KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. This analysis helps to determine the potential acreage of the SEZ that is visible from the KOP.

Colored portions within the analysis indicate lines of sight from the KOP to the SEZ based on the height of the facility component. For every viewshed analysis, PV and parabolic trough arrays are potentially visible within the SEZ in areas shaded light brown. Power blocks are potentially visible within the SEZ in areas shaded light brown and the additional areas shaded light blue. Transmission towers and short solar power towers are potentially visible within the SEZ in areas shaded light brown, light blue, and the additional areas shaded purple. Tall power towers are potentially visible within areas shaded light brown, light blue, purple, and orange.

2.6 SEASON OF USE, RECOVERY TIME, AND ATMOSPHERIC CONDITIONS

As noted in Section 2.5, three of the 10 BLM environmental factors were considered but are not discussed in the individual KOP analyses: season of use, recovery time, and atmospheric conditions. The factors and rationale for not including them in the individual KOP analyses are as follows:

- Season of use: BLM Handbook 8341-1 states that season of use considerations for contrast rating should consider the physical conditions that exist during the seasons of heaviest or critical visitor use, such as snow cover, tree defoliation, leaf color change, and lush vegetation and flowering in the spring. Due to the aridity of the desert regions in which the SEZs are located, the appearance of the landscape and vegetation changes little from season to season. Snow is extremely rare, the vegetation is generally sparse and evergreen, and except for rare and ephemeral desert blooms in response to larger rain events, there is no lush vegetation and blooming in the spring beyond a slight greening of vegetation in response to winter rains and lower temperatures. Whatever effects do occur would be generally similar across the KOPs for each NPS unit; therefore, no KOP-specific discussion is provided in the analysis.

- Recovery time: BLM Handbook 8341-1 states that the amount of time required for successful revegetation should be considered, in the context of construction versus post-construction impacts. In the desert regions of the southwestern United States, vegetation recovery is very slow, and can take several decades without supplementary irrigation. Visible scars from large-scale vegetation clearing are likely to remain long after the clearing activities, particularly for the Riverside East, Gold Point, and Amargosa Valley SEZs; they would likely remain for a slightly shorter time on the Afton SEZ, which has somewhat higher rainfall. Whatever effects do occur would be generally similar across the KOPs for each NPS unit; therefore, no KOP-specific discussion is provided in the analysis.

- Atmospheric conditions: BLM Handbook 8341-1 states that the visibility of projects due to atmospheric conditions or natural haze should be considered. In the desert regions of the southwestern United States, the air is very dry and pollutant levels are generally very low outside of urban areas and other select locations. Air quality is generally good and natural haze generally low for the four SEZs, and although all locations are subject to these effects, they vary widely from day to day and cannot be predicted easily. Similarly to seasonal effects and recovery times, whatever atmospheric effects do occur would be generally similar across the KOPs for each NPS unit; therefore, no KOP-specific discussion is provided in the analysis.

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3 VISUAL CONTRAST AND IMPACT ANALYSIS

This section of the report presents the visual contrast and impact analyses for each of the SVRAs examined in the extended analysis. The following SVRAs administered by NPS were included in the extended analysis because (1) some portion of the unit was located in the 25-mi (40-km) viewshed of an SEZ; (2) the Draft Solar PEIS analysis determined that the SVRA would be subject to moderate or strong visual contrasts associated with solar development within the SEZ; and (3) NPS could identify and provide KOPs for the SVRA that were located within the SEZ 25-mi (40-km) viewshed:

- Death Valley NP and Wilderness Area
- Joshua Tree NP and Wilderness Area
- El Camino NHT

3.1 DEATH VALLEY NATIONAL PARK AND WILDERNESS AREA

Death Valley NP, established in 1933 as Death Valley National Monument, contains some of the most unique and striking visual landscapes in the United States (NPS 2002). The original monument contained approximately 1,601,800 acres (6,482 km^2), and supplementary proclamations increased the overall acreage to 2,067,793 acres (8,368 km^2). The monument was renamed Death Valley National Park by Congressional action in October 1994, with the passage of the California Desert Protection Act. Approximately 1.3 million acres of new lands were added, bringing the total acreage of the new park to approximately 3,396,192 acres (13,744 km^2). Nearly 95% of the NP was designated as wilderness by that same act (NPS 2002).

The majority of the NP is located in Inyo and San Bernardino Counties, in California, with a small portion located in Nye and Esmeralda Counties in Nevada (NPS 2002). Much of the eastern portion of the park borders the California-Nevada border. Major highways surrounding the NP include U.S. 395, which runs north-south along the western border of the park, and U.S. 95, which runs north-south along the eastern border of the park. California State Highway 190 crosses the Park from east to west.

The Death Valley NP management plan notes that the park contains “extremely colorful, complex, and highly visible geology and steep, rugged mountains and canyons [which] provide some of the most dramatic visual landscapes in the United States (NPS 2002:3).” A stated park management goal is to “Preserve the unrivaled scenic, geologic, and natural resources of these unique natural landscapes (NPS 2002).”

Two SEZs are located near Death Valley NP. The Amargosa Valley SEZ encompasses 8,479 (34.3 km^2) developable acres within Nye County, Nevada. It is located approximately 7 mi (11 km) from the eastern border of Death Valley NP and approximately 11 mi (18 km) southeast of the Nevada State Highway 374 entrance to the park. The Amargosa Valley SEZ is managed

mostly as VRM Class III, but some small portions of the SW corner are managed as VRM Class IV. The Gold Point SEZ encompasses 4,596 developable acres (18.6 km^2) within Esmeralda County, Nevada. It is located approximately 15 mi (24 km) east-northeast of the northeasternmost corner of Death Valley NP, in Esmeralda County, Nevada. Gold Point SEZ is managed as VRM Class IV.

Within 25 mi (40 km) of Death Valley NP, approximately 88,457 acres (358 km^2), or 3%, of Death Valley NP have potential visibility of facilities within the Amargosa SEZ, while approximately 3,814 acres (15.4 km^2), or 0.001%, of the NP have potential visibility of facilities within the Gold Point SEZ. These SEZs are within the viewsheds of several KOPs identified in the eastern portion of the park.

3.1.1 KOP Visual Contrast and Impact Analysis

Death Valley NP staff provided Argonne with 31 KOPs throughout the park. Visitation at these KOPs is well documented, and each KOP provides outstanding opportunities for enjoying the scenic values of Death Valley NP and nearby lands (NPS 2012). Five of these KOPS have views of either the Amargosa Valley or Gold Point SEZs and fall within 25 mi (40 km) of one of the SEZs (Figure 3.1-1). These five KOPS were included in the extended visual impact analysis. Amargosa Valley SEZ is within the viewshed of two additional KOPs beyond 25 mi (40 km). Potential visual contrasts from solar development within the SEZ that might be observed from these two KOPs are discussed briefly in Section 3.1.1.2.

The following KOPs in Death Valley fall within the 25-mi (40-km) viewshed of the Amargosa Valley SEZ, and were included in this analysis:

- Pyramid Peak
- Chloride Cliff Road #1
- Chloride Cliff Road #2
- Daylight Pass Road
- Titus Canyon Road #2

The following KOP in Death Valley falls within the 25-mi (40-km) viewshed of the Gold Point SEZ (Figure 3.1-3), and was included in this analysis:

- Last Chance Mountain

Impact analyses for these KOPs are presented below.

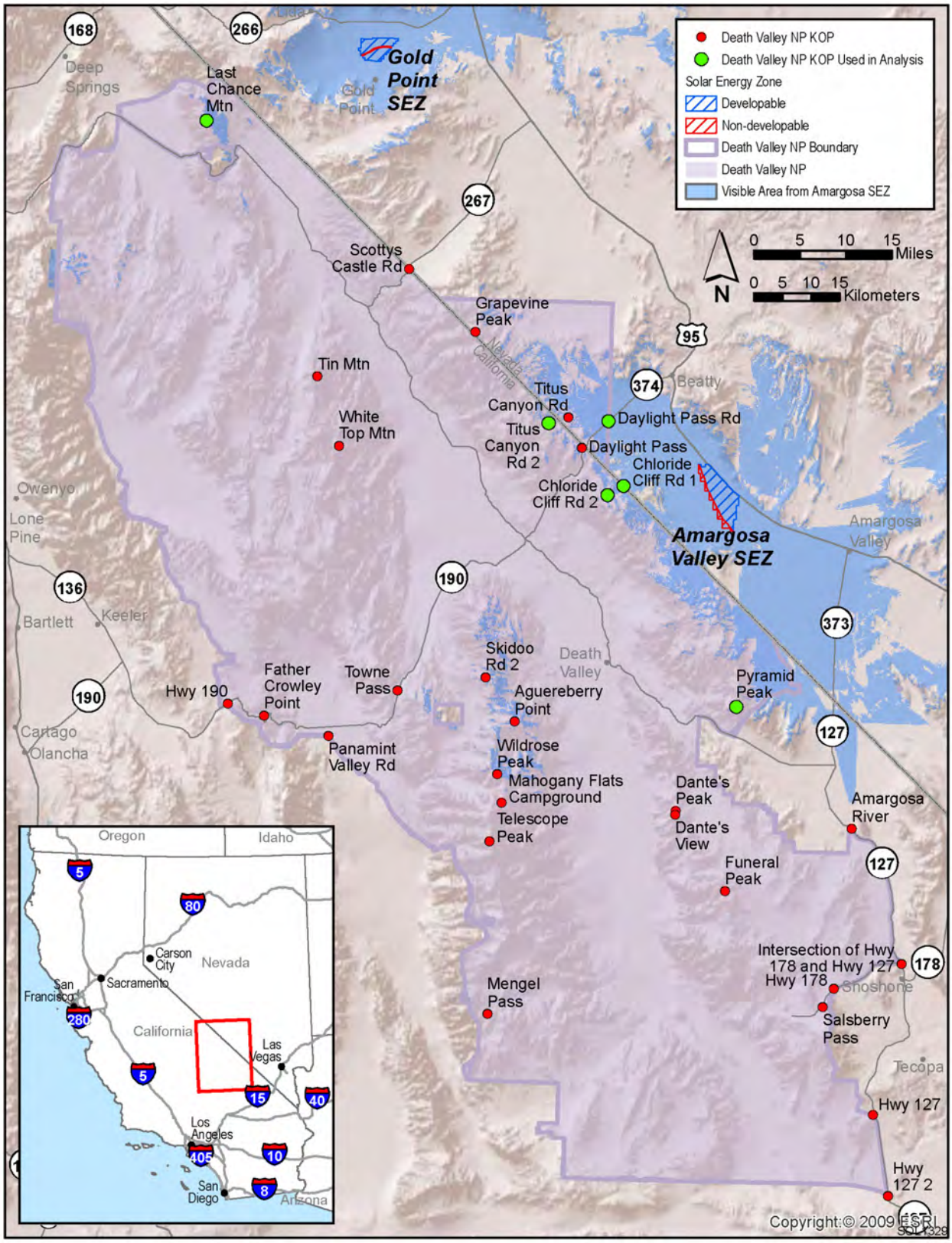

FIGURE 3.1-1 Death Valley NP: NPS-Identified KOPs

Two additional KOPs, Telescope Peak and Aguereberry Point, have views of the Amargosa Valley SEZ, but fall outside of the 25-mi boundary used for this analysis. Impacts to these KOPs are discussed below in Section 3.1.2.

3.1.1.1 Pyramid Peak KOP

Pyramid Peak is the highest point within the Funeral Mountains of the Amargosa Range, which runs along the eastern border of Death Valley NP. Pyramid Peak is located approximately 20 mi (32 km) south of the southeasternmost corner of the Amargosa Valley SEZ at an elevation of 6,703 ft (2,043 m) above mean sea level (Digonnet 2007); approximately 4,060 ft (1,237 m) above the center of the Amargosa Valley SEZ. From the KOP at the summit of Pyramid Peak, one can see Death Valley, the peaks of the Panamint Range, and the Sierra Mountains to the west; to the south, the peaks around Shoshone, CA, and Pahrump, NV, are visible; the Nevada Test Site is visible to the east beyond Amargosa Valley; and to the north, other mountains in the Amargosa Range are visible (SummitPost.org 2012). Pyramid Peak offers exceptional views of Death Valley NP and is identified as a hiking destination in Andy Zdon's (2000) *Desert Summits.* The peak is also included on the Sierra Club's Desert Peaks List (Sierra Club 2003). This KOP location is visited most often in the spring and fall.

Figure 3.1-2 shows the Pyramid Peak KOP within the Amargosa Valley SEZ viewshed. The colored portions indicate areas in the vicinity of the Pyramid Peak KOP from which solar development in some or all of the Amargosa Valley SEZ could potentially be visible. The figure shows that the Pyramid Peak KOP is clearly within the viewshed of the Amargosa Valley SEZ, but that visibility in the area is limited to the highest slopes on the peak.

Figure 3.1-3 depicts areas within the SEZ where solar facilities would be expected to be visible from the Pyramid Peak KOP, assuming the absence of screening vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. A total of 6,527 acres (26.4 km^2) or 77 % of the Amargosa Valley SEZ is potentially visible from the Pyramid Peak KOP.

The figure also shows that throughout nearly all of the visible area within the SEZ, even relatively low-height solar facilities such as PV and parabolic trough installations might be visible from the Pyramid Peak KOP. Only in scattered and very small areas of the SEZ would low-height components be screened, while taller components, such as central receiving towers for power tower facilities, would potentially be visible. The nearest visible point in the Amargosa Valley SEZ is approximately 19 mi (31 km) from the Pyramid Peak KOP, and the farthest visible point in the SEZ is approximately 23 mi (37 km) from the KOP.

Figure 3.1-4 depicts hypothetical solar energy facilities within the Amargosa Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Pyramid Peak KOP viewshed. The depicted facility layout was used in the Google Earth visualization discussed below. It should be noted that the arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

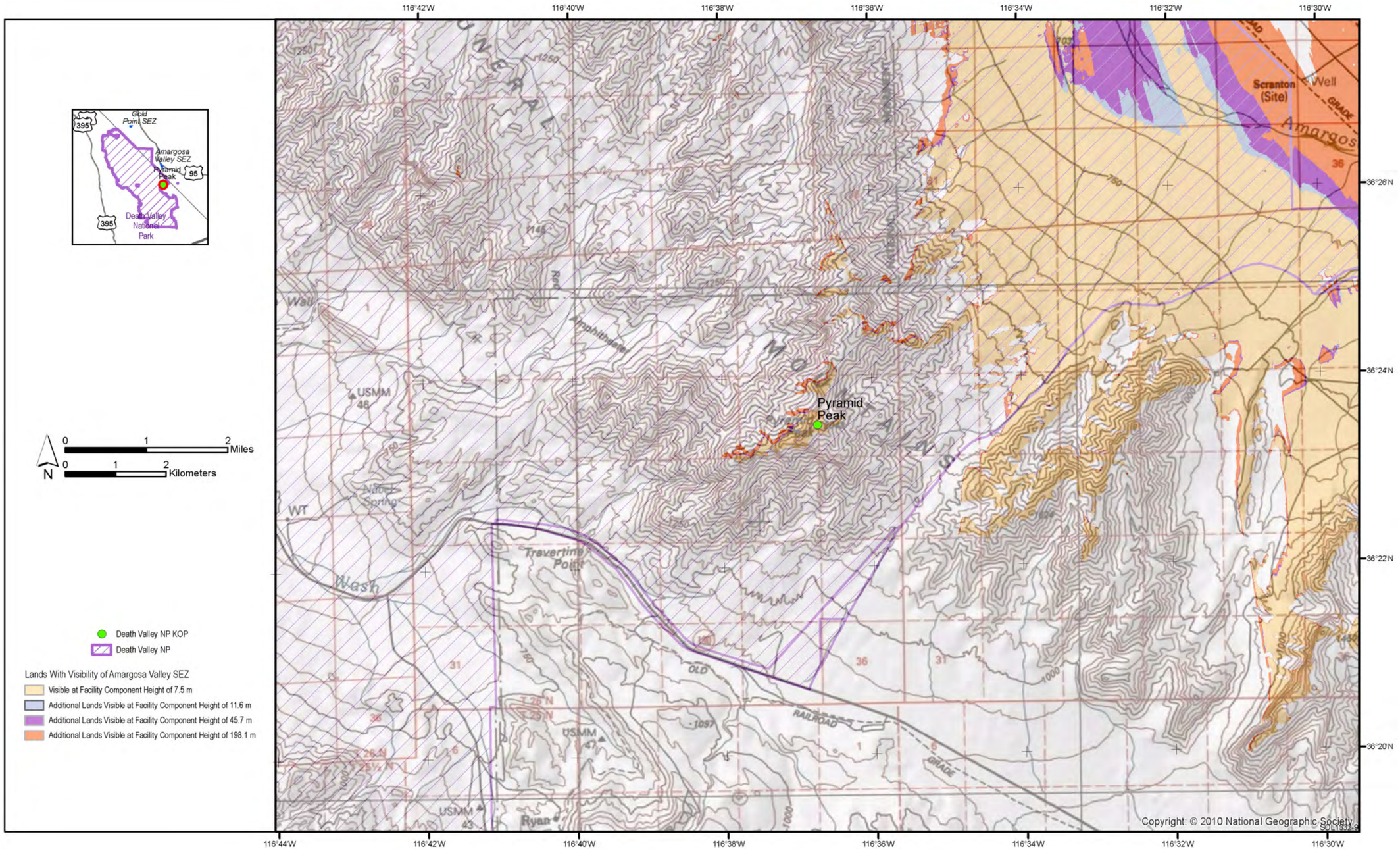

FIGURE 3.1-2 The Pyramid Peak KOP within the Amargosa Valley SEZ Viewshed

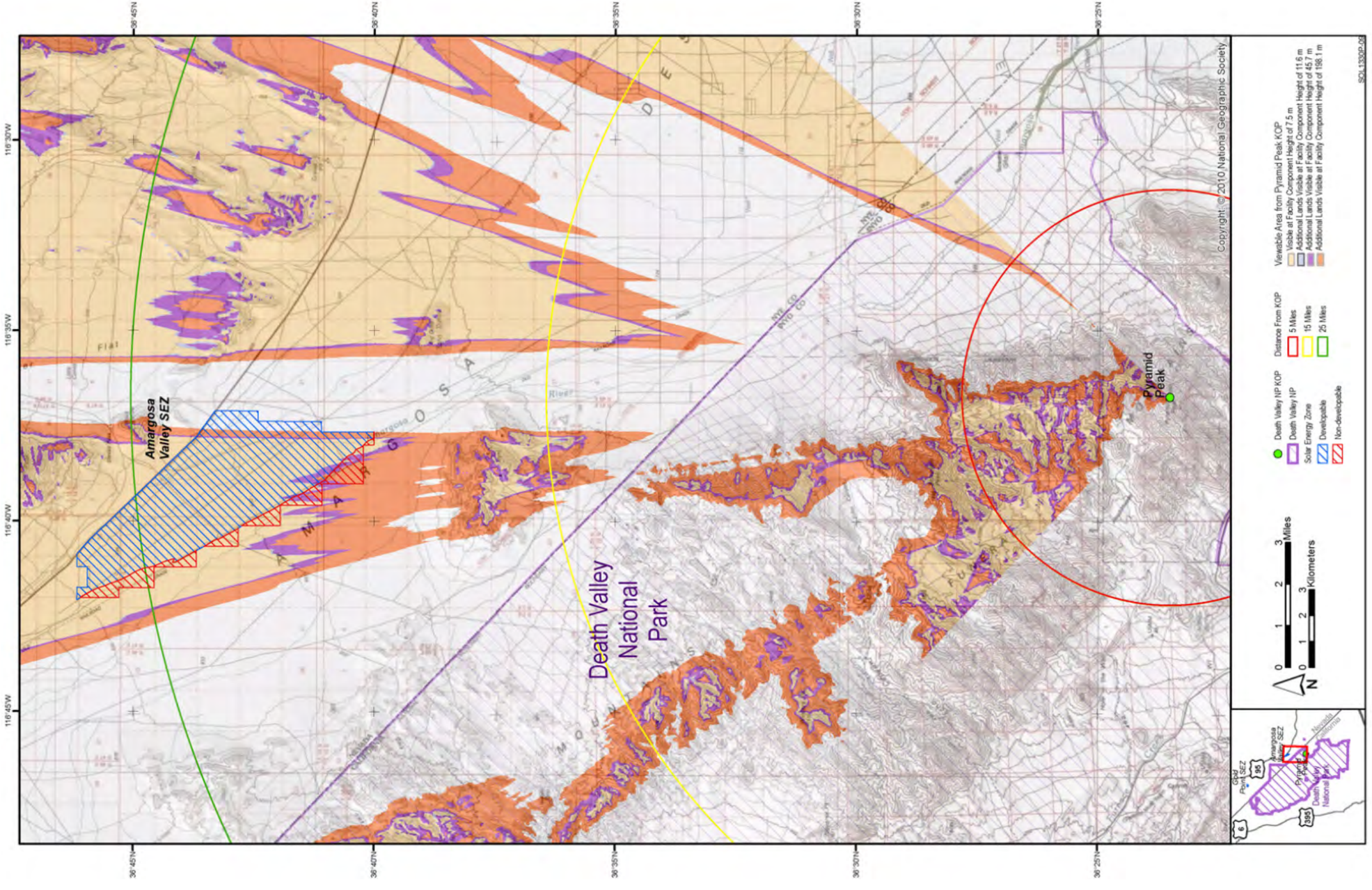

FIGURE 3.1-3 Portion of the Pyramid Peak KOP Viewshed Including the Amargosa Valley SEZ

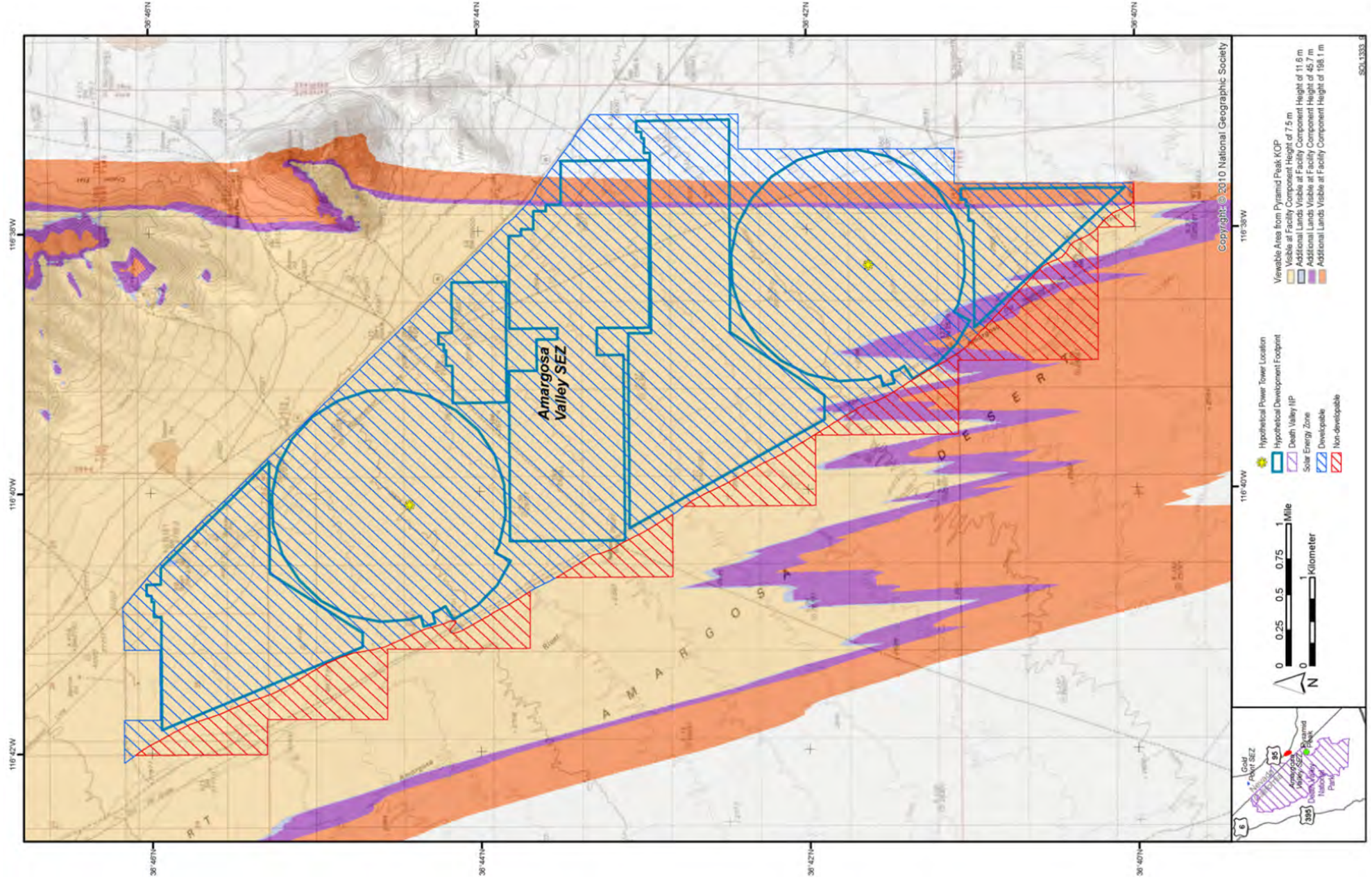

FIGURE 3.1-4 Close-up View of the Amargosa Valley SEZ with Facility Footprints within the Pyramid Peak Viewshed

Figure 3.1-5 is a Google Earth visualization of the Amargosa Valley SEZ as seen from the Pyramid Peak KOP, looking north. The visualization shows that looking north from the Pyramid Peak KOP, portions of the Amargosa Valley SEZ can be seen between two unnamed mountain peaks of the Amargosa Range. The visible portion of the SEZ occupies approximately 8° of the viewer's field of view.

The visualization suggests that the tops of solar collectors, heliostat arrays and power blocks within the SEZ would be seen; however, given the long distance between the KOP and the SEZ, the viewing angle would be low, which would reduce the visible surface area of solar facilities within the SEZ and make the strong regular geometry of the solar arrays less apparent, tending to reduce visual contrast. The facilities in the SEZ would likely appear as a flat, somewhat indistinct horizontal band, repeating the line of the flat valley floor. Taller components with vertical geometries and irregular forms, such as cooling towers, and thermal storage tanks, would project above the solar collector arrays, but at the long distance to the SEZ, would not likely be distinctly seen, and might not be visible at all under many lighting conditions. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ.

Field observations of 5- to 20-MW power towers (Sullivan et al. 2012) suggest that on sunny days, the reflected light from the central receiving towers of the 100+-MW power towers planned for several power tower facilities in the southwestern states would be visible as bright points of light at viewing distances of 19–26 mi (31–42 km). The bright points of light would be seen against the backdrop of Bare Mountain or the Amargosa Valley floor, depending on their placement within the SEZ.

Because the KOP is almost directly south of the SEZ, views would be directly toward the sunlit side of fixed PV panels and other collectors facing south, e.g., tracking PV panels or heliostats on the north side of power towers. It is possible that reflected light from the collectors might be visible from the KOP at certain times, increasing visibility of the facilities substantially at those times; however, given the long distance from the KOP to the facility, such reflected light would be unlikely to be bright enough to constitute glare, i.e., it would be unlikely to cause annoyance or visual discomfort. The chance of visible glinting or glare from parabolic trough arrays or power tower heliostats as seen from the KOP is uncertain, but unlikely because of the low vertical angle of view. More definite knowledge of glint/glare occurrence could be obtained through a glint/glare analysis that would be conducted during a project-specific environmental impact assessment.

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white, slowly flashing navigation warning lights that are visible for long distances at night and would likely be visible from the KOP, although it would be relatively uncommon for people to be at the KOP at night. At 19–26 mi (31–42 km), the light or lights would not likely be bright, but would be noticeable, and would be unlikely to be missed by casual observers, given the dark skies and relatively low number of visible lights in the area. Other lighting at the facilities could be visible as well, especially if it was not properly shielded and operated to reduce night-sky impacts.

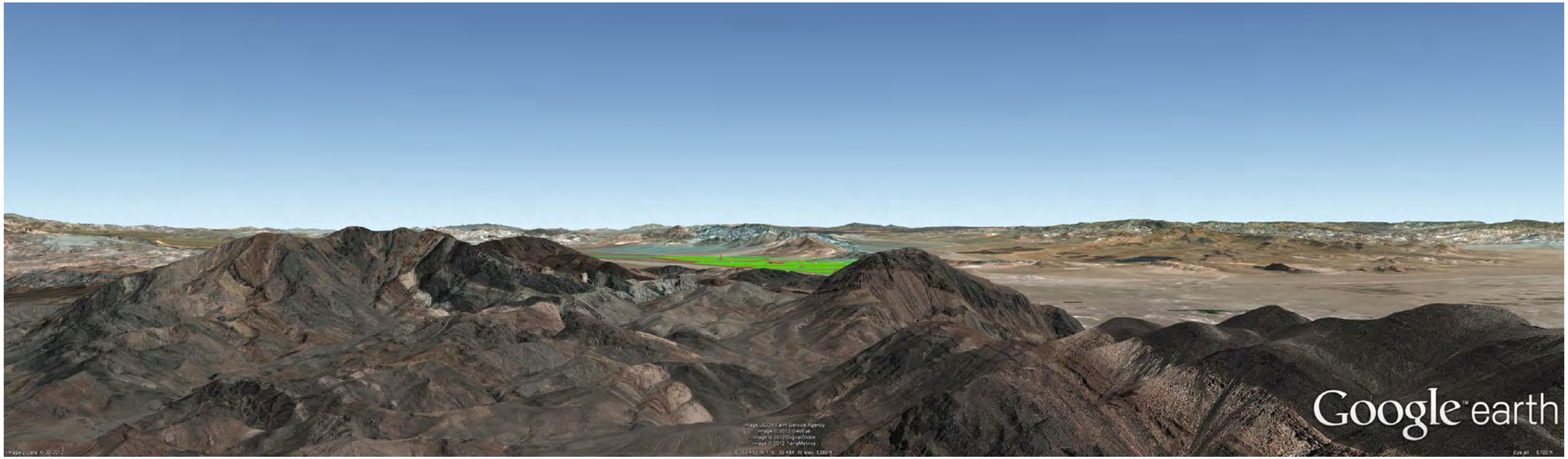

FIGURE 3.1-5 Google Earth Visualization of the Amargosa Valley SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Pyramid Peak KOP

Under the 80% development scenario, solar energy development within the Amargosa Valley SEZ would be expected to generate weak visual contrasts with the surrounding environment as viewed from the Pyramid Peak KOP. Because the KOP is a mountaintop that is a publicized hiking destination, although overall visitation may be low in absolute terms, visitors are likely to be enjoying the panoramic views from the mountain peak, and many might be looking closely at the landscape. These viewers are unlikely to miss the visual contrast presented by solar development in the SEZ, but at 19–26 mi (31–42 km), they are unlikely to be able to discern the nature of what they are looking at without prior knowledge. For some people, if there were no bright reflections or obvious symmetry to the facilities (as would be expected because of the low viewing angle), they might not recognize it as a man-made disturbance. If the development included power towers, their bright, steady, point-like light would appear as an obvious man-made element. Similarly, if power towers had hazard navigation lighting, it would be unmistakable as a man-made element, and might have a negative visual impact for some observers, especially if it was the only light, or one of a few visible lights on the horizon. Nonetheless, because of the small apparent size of the SEZ as seen from the KOP, the long distance to the SEZ from the KOP, and the low vertical angle of view, overall visual impact would be expected to be low, especially if development were limited to PV facilities, with somewhat higher impacts expected from parabolic trough and especially from power tower facilities within the SEZ.

3.1.1.2 Chloride Cliff Road #1 KOP

Chloride Cliff Road is a rugged dirt road that provides the most scenic route to the Chloride City ghost town and Chloride Cliff for visitors entering from the east side of the park (Digonnet 2007). It begins at U.S. 95 in Nevada and runs west through the Amargosa Valley, where it crosses the California-Nevada border and enters Death Valley NP in the Funeral Mountains. From there, the road passes roughly east-west through the Funeral Mountains and then turns south towards the Chloride City ghost town and Chloride Cliff, both of which are popular destinations for hikers and backcountry drivers who are interested in Death Valley's mining history and off-roading opportunities (Bryan and Tucker-Bryan 2009). Chloride Cliff provides several exceptional panoramic views of Death Valley and is identified as a destination in several Death Valley guidebooks (Automobile Club 2004; Bryan and Tucker-Bryan 2009; Digonnet 2007; Mitchell 2006). It is accessible and visited throughout the year (NPS 2012a).

The Chloride Cliff Road #1 KOP lies at the base of the Funeral Mountains, on the California-Nevada border as well as the border of Death Valley NP. The KOP is located approximately 9 mi (14 km) west of the western border of the Amargosa Valley SEZ at an elevation of approximately 3,800 ft (1,158 m) above mean sea level and 1,170 ft (357 m) above the center of the Amargosa Valley SEZ. Looking north from this KOP, one can see the northwestern end of Amargosa Valley and the Bull Frog Hills; Bare Mountain is visible to the northeast, and Black Marble and Yucca Mountain are visible to the east.

Figure 3.1-6 shows the Chloride Cliff Road #1 KOP within the Amargosa Valley SEZ viewshed. The colored portions indicate areas in the vicinity of the Chloride Cliff Road #1 KOP

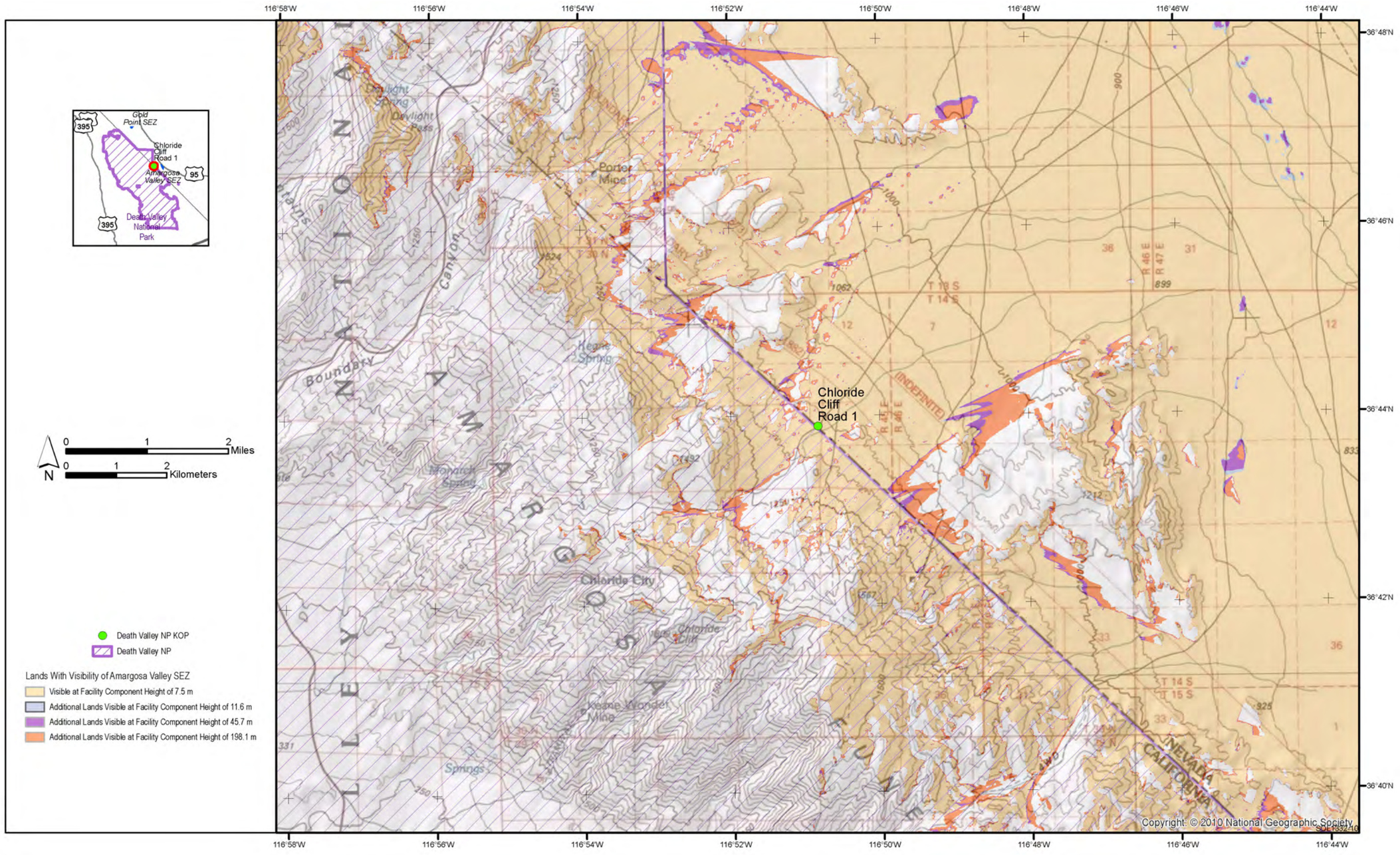

FIGURE 3.1-6 The Chloride Cliff Road #1 KOP within the Amargosa Valley SEZ Viewshed

from which solar development in some or all of the Amargosa Valley SEZ could potentially be visible. The figure shows that the Chloride Cliff Road #1 KOP is clearly within the viewshed of the Amargosa Valley SEZ, although visibility is cut off not far west of the KOP.

Figure 3.1-7 depicts areas within the SEZ where solar facilities would be expected to be visible from the Chloride Cliff Road #1 KOP, assuming the absence of screening vegetation, structures or lighting or atmospheric conditions that may cause reduced visibility. A total of 4,227 acres (17.106 km^2) of the Amargosa Valley SEZ are potentially visible from the Chloride Cliff Road #1 KOP. The figure shows that visibility from the Chloride Cliff Road #1 KOP is limited primarily to the northern half of the SEZ, with visibility of relatively low-height solar facilities, such as PV and parabolic trough installations, limited to roughly the northern one-fourth of the SEZ, while only taller components, such as the upper portions of transmission towers and central receiving towers for power tower facilities, would potentially be visible to the south. The closest point in the SEZ is approximately 8 mi (13 km) from the KOP. The farthest point in the SEZ is approximately 12 mi (19 km) from the KOP.

Figure 3.1-8 shows hypothetical solar energy facilities within the Amargosa Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Chloride Cliff Road #1 KOP viewshed. The depicted facility layout was used in the Google Earth visualization discussed below. It should be noted that the arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.1-9 is a Google Earth visualization of the Amargosa Valley SEZ as seen from the Chloride Cliff Road #1 KOP looking east. The visualization shows that looking east from the Chloride Cliff Road #1 KOP, the visible portion of the SEZ occupies approximately 10° of the viewer's horizontal field of view. The southern portion of the SEZ is obstructed by hilltops on the slopes of the eastern side of the Funeral Mountains.

The visualization shows that while the tops of solar arrays in the SEZ might be visible, the angle of view is very low, and the arrays would likely appear as a thin band on the Amargosa Valley floor, making the size and strong regular geometry of the facilities less apparent. Taller components such as support buildings, power blocks, cooling towers, and transmission towers would likely protrude above the collector/reflector arrays, causing some additional contrast, depending on the solar technology employed, the lighting, and other visibility factors. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ.

Central receiving towers would be visible as very bright points of light atop visible tower structures against the backdrop of Black Marble, the Yucca Mountains, or the Amargosa Valley floor, depending on their placement within the SEZ. Field observations of 5- to 20-MW power towers suggest that the 100+-MW power towers would produce moderate to strong visual contrasts at viewing distances of 9–13 mi (14–21 km) (Sullivan et al. 2012).

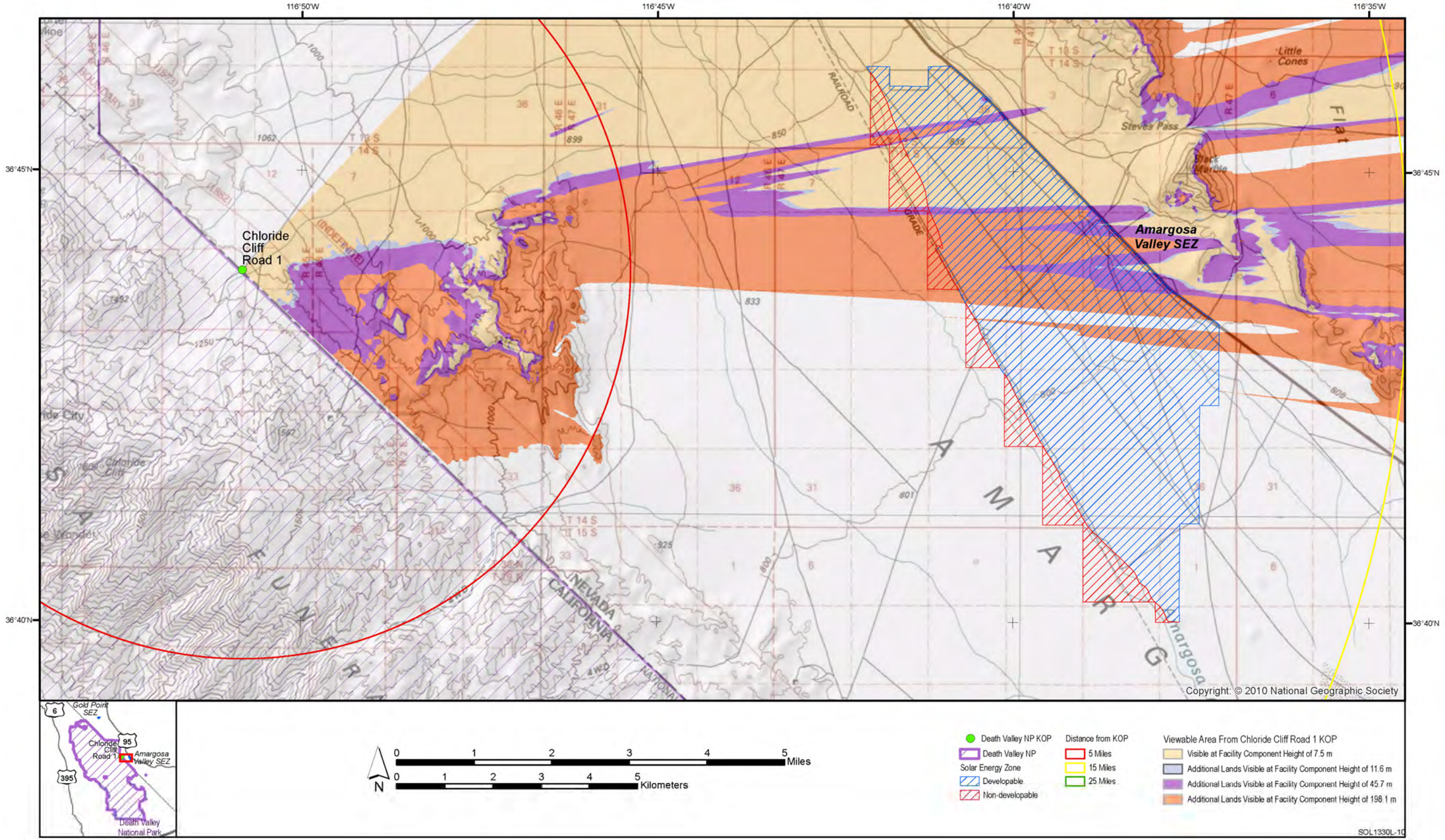

FIGURE 3.1-7 The Amargosa Valley SEZ within the Chloride Cliff Road #1 KOP Viewshed

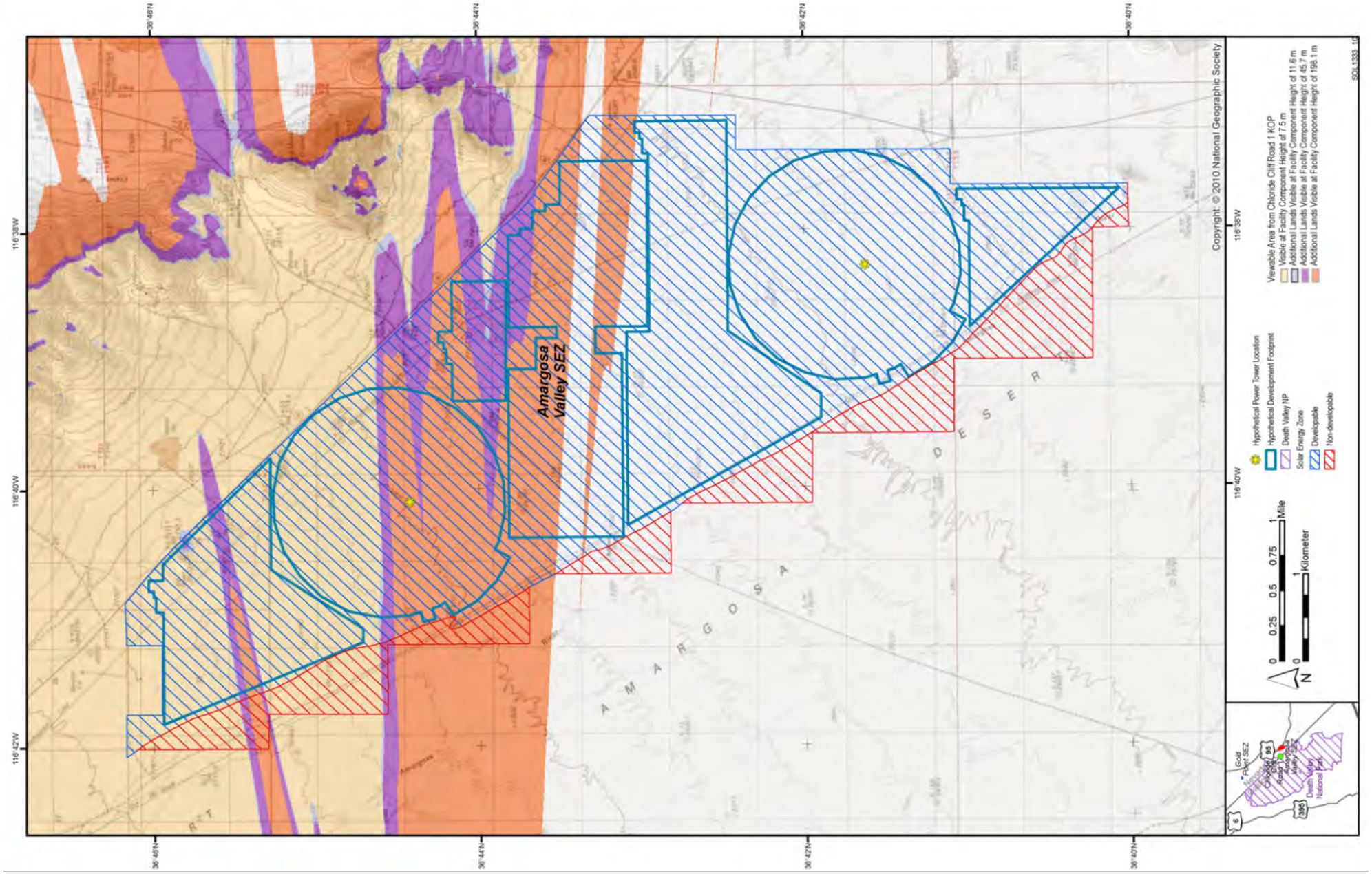

FIGURE 3.1-8 Close-up of the Amargosa Valley SEZ with Facility Footprints within the Chloride Cliff Road #1 KOP Viewshed

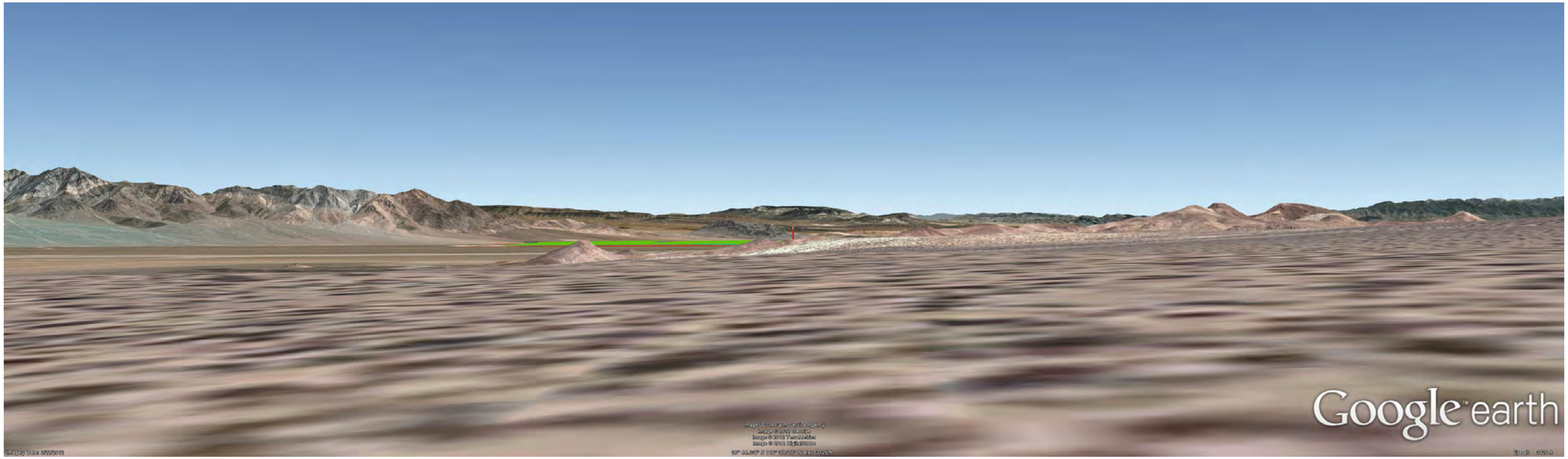

FIGURE 3.1-9 Google Earth Visualization of the Amargosa Valley SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Chloride Cliff Road #1 KOP

If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that are visible for long distances at night and would be visible from the KOP. At 9–13 mi (14–21 km), the light or lights would not likely be missed by casual observers, given the dark skies and relatively low number of visible lights in the area. Other lighting at the facilities would likely be visible as well, with the amount of contrast dependent on the degree to which lighting was minimized, shielded, and operated to reduce night-sky impacts.

Because the KOP is almost directly west of the SEZ, views in the late afternoon would be directly toward sunlit parabolic trough mirrors and other west-facing collectors, e.g., heliostats on the east side of power towers. Field observations of parabolic trough facilities (Sullivan et al. 2012) suggest that reflected light from the collectors might be visible from the KOP at certain times, increasing visibility of the facilities substantially at those times; however, given the very low viewing angle, reflections would likely be limited to a short period of time in the very late afternoon, and possibly for a longer period around midday. Reflected light might be seen as a small bright spot or potentially several bright spots in close proximity to each other in a horizontal row across the face or top of the trough array. The view of the reflections could change rapidly, appearing, disappearing, or moving across the face of the array in less than one minute or over the course of several minutes. At approximately 9–13 mi (14–21 km), it is unclear whether such reflected light might be bright enough to constitute glare, i.e., bright enough to be annoying or cause visual discomfort. Similar but probably less-intense reflected light might be seen from tracking PV panels as the panels were oriented to the west in the late afternoon. Fixed-array PV panels would be oriented to the south, and the chance of their causing glinting or glare as seen from the KOP is uncertain, but unlikely. Similarly, the chance of glinting or glare from west-facing power tower heliostats in the SEZ is uncertain, but unlikely because of the low vertical angle of view. More definite knowledge of glint/glare occurrence could be obtained through a glint/glare analysis that would be conducted during a project-specific environmental impact assessment.

For viewers at the Chloride Cliff Road #1 KOP, because of the relatively short distance from the KOP to the SEZ under the 80% development scenario, solar energy development within the Amargosa Valley SEZ would be expected to create weak visual contrasts with the surrounding landscape if development were limited to PV facilities and good mitigation practices were followed. Moderate or even high contrasts would be expected if development included multiple parabolic trough facilities that caused visible glare, and/or multiple power towers, regardless of potential glare from power tower heliostats. Because the KOP is a publicized destination with outstanding views, while overall visitation may be low, visitors are likely to be enjoying the panoramic views from the KOP, and many might be looking closely at the landscape. These viewers would be very unlikely to miss the visual contrast presented by solar development in the SEZ at 9–13 mi (14–21 km) if it included CSP facilities and especially power towers. If development were limited to PV facilities, some casual observers might miss the development because of the low angle of view and relatively low profile and reflectivity of PV panels. For some people, if there were no bright reflections or obvious symmetry to the facilities (which would be expected because of the low viewing angle), they might not recognize it as a man-made disturbance. If the development included power towers, their very bright, steady, point-like light atop a visible tower structure would appear as an obvious man-made element. Similarly, if power towers had hazard navigation lighting, it would be unmistakable as a

man-made element, and might have a negative visual impact for some observers, especially if it was the only light, or one of a few visible lights on the horizon. If development were limited to PV facilities, night-sky impacts would likely be considerably lower.

If the SEZ contained parabolic trough and power tower facilities, viewers looking eastward from the KOP would see solar development in the SEZ as an unmistakable man-made element in a predominantly natural-appearing landscape. At least some sensitive viewers would likely find that the visual intrusion detracted substantially from the scenic quality of the landscape, although the total visible area involved would not be large. If one or more power tower receivers were in view, the very bright lights would likely attract and hold visual attention, and would seem out of place in the daytime landscape. Under these circumstances, visual impacts would likely be moderate under a scenario of several power towers' being visible in the SEZ. If development were limited to PV, and especially non-tracking PV, installations, the reduced array height and lack of plumes or additional infrastructure associated with CSP facilities would result in substantially reduced impacts, and likely low impacts overall, particularly given the low vertical angle of view. PV facilities also use less lighting at night than CSP facilities, and thus night-sky impacts would be lower if development in the SEZ were limited to PV facilities.

3.1.1.3 Chloride Cliff Road #2 KOP

Chloride Cliff Road #2 KOP is located approximately 2 mi (18 km) east of the center of the eastern edge of the Amargosa SEZ. It is situated along Chloride Cliff Road, approximately 2 mi (3 km) southwest of Chloride Cliff Road #1 KOP, at an elevation of approximately 4,350 ft (1,326 m) above mean sea level and approximately 1,710 ft (520 m) above the center of the Amargosa Valley SEZ. The nearest visible point in the Amargosa Valley SEZ is approximately 11 mi (18 km) from the Chloride Cliff Road #2 KOP, and the farthest visible point in the SEZ is approximately 14 mi (23 km) from the KOP. In the vicinity of the KOP, Chloride Cliff Road slopes downward to the east, with views constricted by slopes on both sides of the road such that views for eastbound travelers tend to be directed toward the SEZ.

Figure 3.1-10 shows the Chloride Cliff Road #2 KOP within the Amargosa Valley SEZ viewshed. The colored portions indicate areas in the vicinity of the Chloride Cliff Road #2 KOP from which solar development in the Amargosa Valley SEZ could potentially be visible. The figure shows that visibility of the SEZ is very limited in the vicinity of the Chloride Cliff Road #2 KOP, and that solar development in the SEZ would have reduced visibility or not be visible at all from many nearby locations.

Figure 3.1-11 depicts areas within the SEZ where solar facilities would be expected to be visible from the Chloride Cliff Road #2 KOP, assuming the absence of vegetation, structures or lighting or atmospheric conditions that may cause reduced visibility [3,640 acres (14.7 km^2) or 43% of the Amargosa Valley SEZ]. The figure shows that visibility from the Chloride Cliff Road #2 KOP is limited primarily to central receiving towers for power tower facilities within the center of the SEZ. Parabolic trough and PV facilities would potentially be visible in a very small portion of the north central section of the SEZ. The northern and southern portions as well

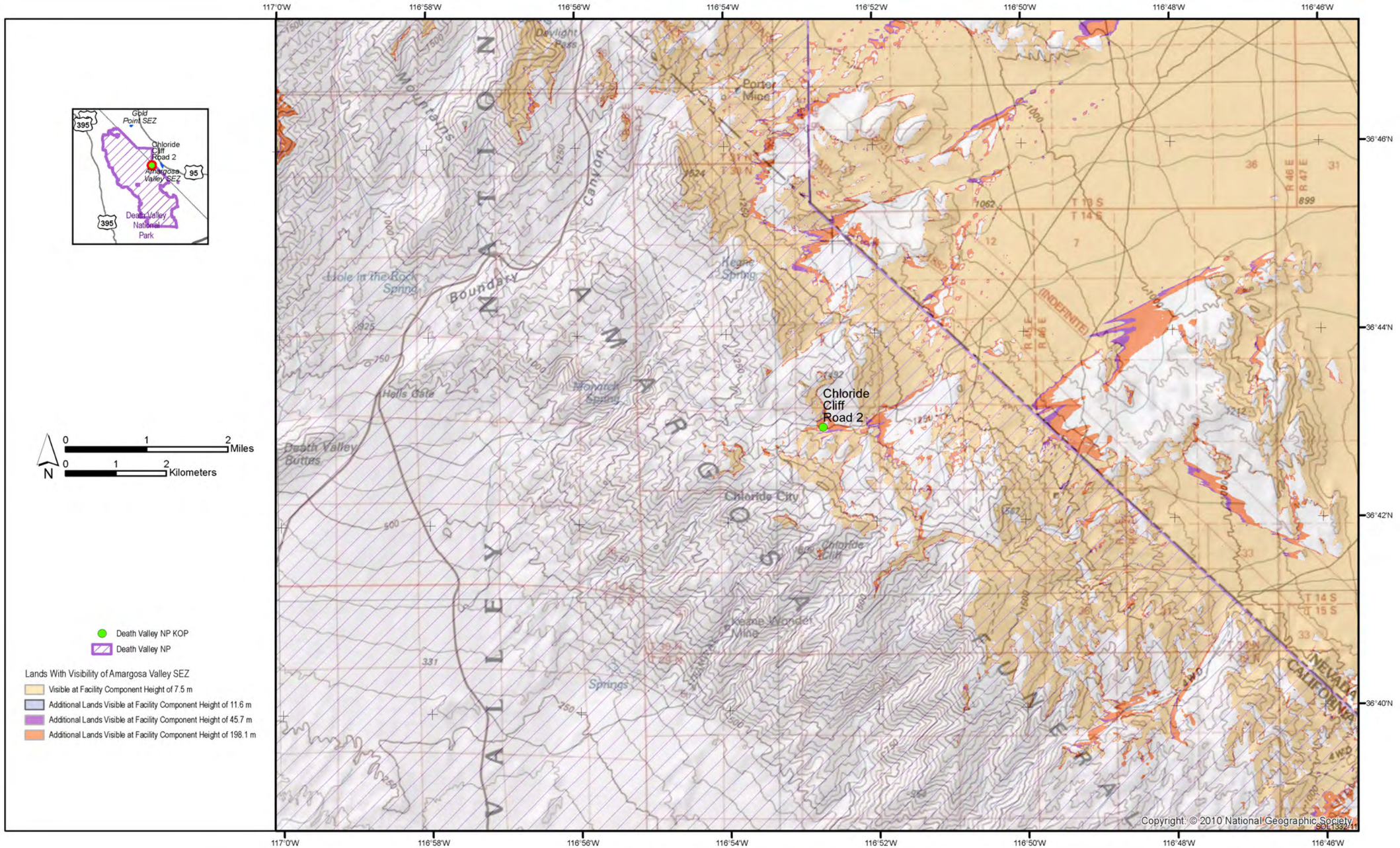

FIGURE 3.1-10 The Chloride Cliff Road #2 KOP within the Amargosa Valley SEZ Viewshed

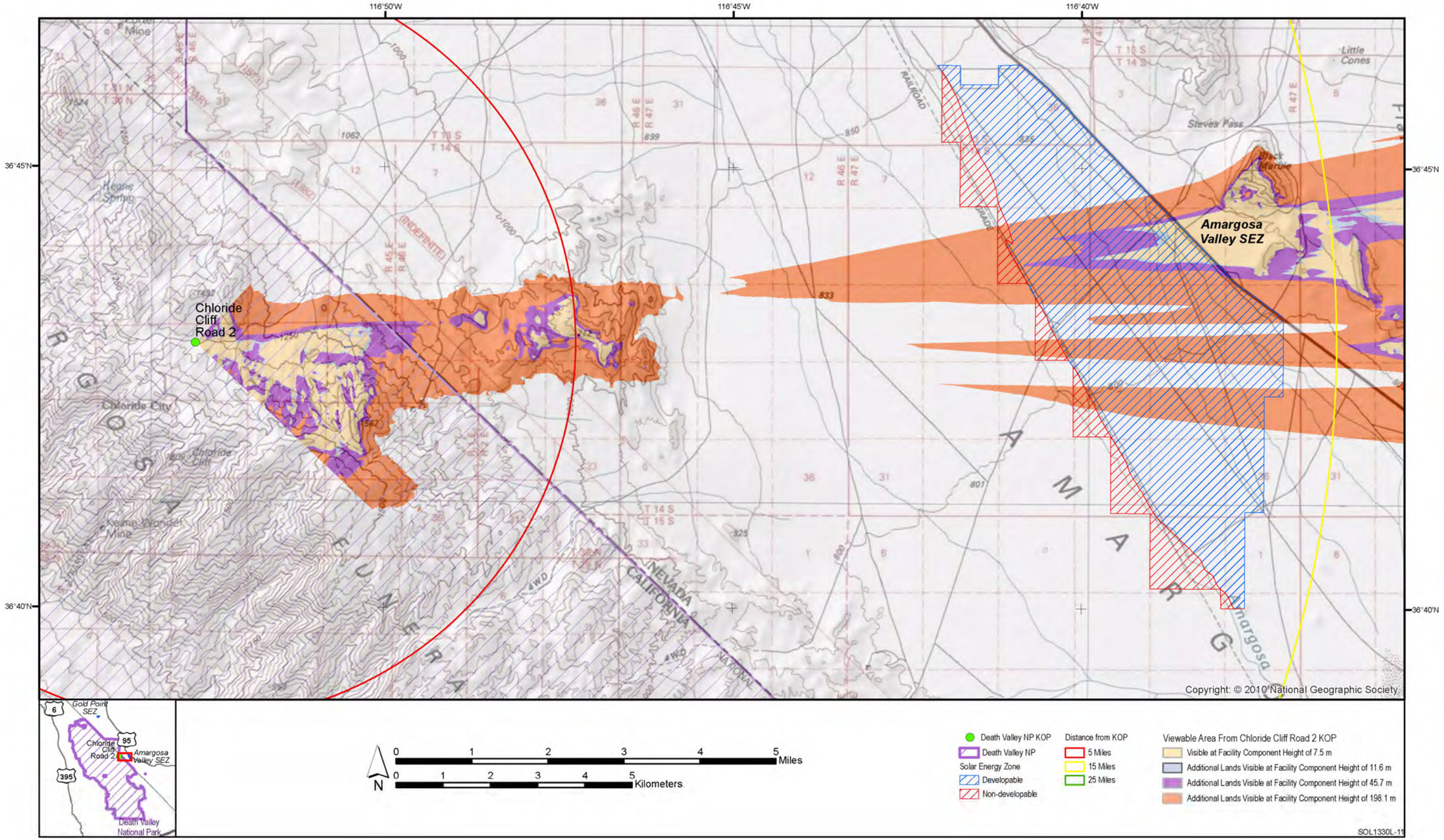

FIGURE 3.1-11 The Amargosa Valley SEZ within the Chloride Cliff Road #2 KOP Viewshed

as intermittent portions of the central section of the SEZ would not be visible from this KOP. The nearest visible point in the Amargosa Valley SEZ is approximately 9 mi (14 km) from the Chloride Cliff Road #2 KOP, and the farthest visible point in the SEZ is approximately 14 mi (23 km) from the KOP.

Figure 3.1-12 shows hypothetical solar energy facilities within the Amargosa Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Chloride Cliff Road #2 KOP viewshed. The depicted facility layout was used in the Google Earth visualization discussed below. It should be noted that the arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.1-13 is a Google Earth visualization of the Amargosa Valley SEZ as seen from the Chloride Cliff Road #2 KOP, looking east. The visualization suggests that looking east from the Chloride Cliff Road KOP #2, the visible portion of the SEZ would occupy approximately 7° of the horizontal field of view. The northern and southern portions as well as intermittent portions of the central section of the SEZ would be obstructed by the foothills of the Funeral Mountains.

The visualization shows that from this elevated viewpoint, the tops of solar arrays might be seen in the very small portion of the SEZ where low-height technologies would be visible; however, the angle of view is low, and the arrays would likely appear as a short and narrow band on the valley floor, making the size of the facilities and their strong regular geometry less apparent. Taller components such as support buildings, power blocks, cooling towers, and transmission towers would likely protrude above the collector/reflector arrays, causing additional contrast, depending on the solar technology employed, the lighting, and other visibility factors. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ.

Central receiving towers would be visible in a larger portion of the SEZ as bright points of light atop visible tower structures, against the backdrop of Black Marble or the Amargosa Valley floor, depending on their placement within the SEZ. Field observations of 5- to 20-MW power towers suggest that 100+-MW power towers might produce moderate visual contrasts at viewing distances of 11–14 mi (18–23 km) (Sullivan et al. 2012).

If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that are visible for long distances at night and could be visible from this KOP. At 11–14 mi (18–23 km), navigation lighting would not likely be missed by casual observers, given the dark skies and relatively low number of visible lights in the area. In addition, in the small portion of the SEZ where low-height technologies could be visible from the KOP, other lighting at the facilities would likely be visible, with the amount of contrast dependent on the degree to which lighting was maintained, shielded, and operated to minimize night-sky impacts.

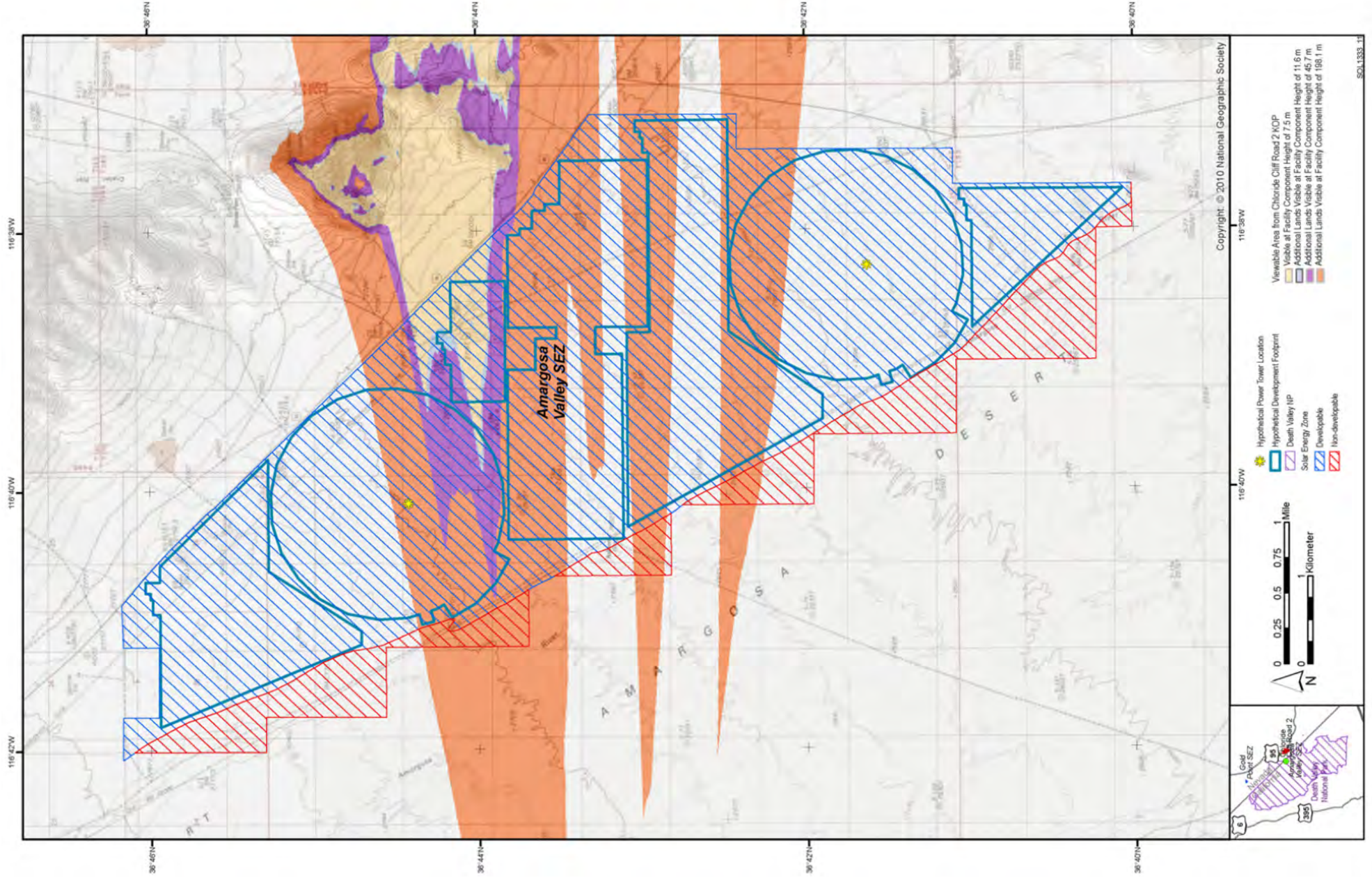

FIGURE 3.1-12 Close-up of the Amargosa Valley SEZ with Facility Footprints within the Chloride Cliff Road #2 KOP Viewshed

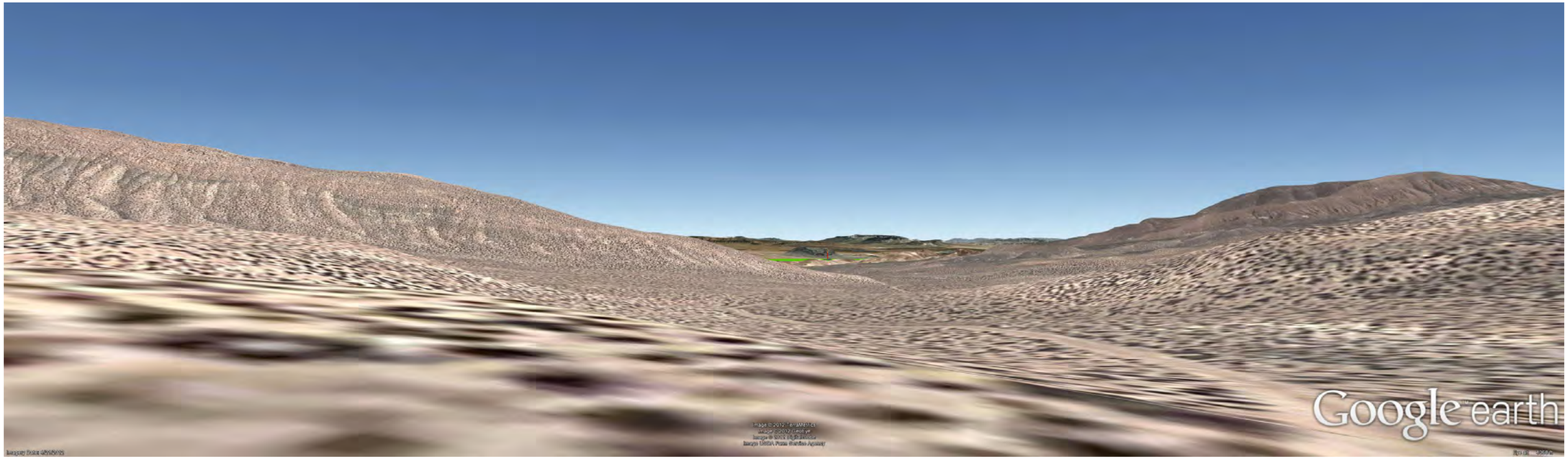

FIGURE 3.1-13 Google Earth Visualization of the Amargosa Valley SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Chloride Cliff Road #2 KOP

Similarly to the Chloride Cliff Road #1 KOP, the Chloride Cliff Road #2 KOP is located almost directly west of the SEZ. In the late afternoon, views from this KOP would be towards west-facing, sunlit, parabolic trough mirrors as well as western-facing heliostats on the eastern side of the power tower facilities. Reflected light from the collectors might be visible from this KOP, substantially increasing the visibility of these facilities if and when it was present.

The Chloride Cliff Road #2 KOP is approximately 550 ft (168 m) higher in elevation than the Chloride Cliff Road #1 KOP, and while its viewing angle is slightly higher than that of the Chloride Cliff Road #1 KOP, it still remains relatively low. If parabolic trough facilities were located in the very small portion of the SEZ where low-height technologies could be visible from the KOP, bright reflections from the trough array would likely be limited to a short period of time in the late afternoon when parabolic trough arrays were facing towards the west, and possibly a longer period of time at midday. Similar reflections of light might be caused by tracking PV panels in the late afternoon, when the PV panels would be oriented to the west, although the reflections would probably be less bright. It is uncertain whether fixed-array PV panels (oriented south) and west-facing heliostats could cause glint or glare when viewed from this KOP, but it is unlikely; given the low vertical angle of view, and given the very small portion of the SEZ where the collector arrays would be visible, the overall contrast would likely be low, if reflections occurred at all.

Under the 80% development scenario presented here, solar energy development within the Amargosa Valley SEZ is expected to yield weak visual contrasts with the surrounding environment when viewed from the Chloride Cliff Road #2 KOP, especially if development is limited to PV facilities only. Primarily because of the restricted visibility of the SEZ, higher, but still low, contrasts would be expected if development included parabolic trough facilities. If several power towers were located in those portions of the SEZ visible from the KOP, contrasts and associated visual impacts could be moderate.

Viewers driving east on Chloride Cliff Road between the Chloride Cliff Road #2 KOP and the Chloride Cliff Road #1 KOP would be unlikely to miss the visual contrast of solar facilities in the SEZ, located about 11 mi (18 km) away, because the enclosed landscape would tend to draw the viewers' attention to any visible solar development in the SEZ. Some drivers on this road would likely be enjoying the dramatic views of the surrounding landscape, and sensitive viewers might see a man-made intrusion such as a solar facility as a distraction from the scenic quality of the landscape. However, if development were limited to PV facilities, some casual observers traveling east on Chloride Cliff Road near the Chloride Cliff Road #2 KOP might miss the development because of the low angle of view and relatively low profile and reflectivity associated with PV panel arrays, the lack of plumes, and lack of the additional infrastructure associated with other solar facilities. Visitors travelling west by vehicle along Chloride Cliff Road would likely be subject to lower impacts than those experienced by stationary viewers because of the reduced viewing time from moving vehicles.

If development within the SEZ included parabolic trough and power tower facilities that were visible from the road, casual observers looking eastward from the KOP would likely recognize them as man-made elements. If power towers were present within the area of the SEZ visible from the road, their bright lights atop visible tower structures would be conspicuous;

however, given that most individuals traveling on Chloride Cliff Road would be driving, views of solar development within the SEZ would be brief.

3.1.1.4 Daylight Pass Road

Daylight Pass Road (Nevada State Highway 394 outside of the Park) is an all-weather paved road used for visitor access to Death Valley NP. The 17-mi (27-km) road extends from the entrance to Death Valley NP on Nevada State Highway 394, through the Grapevine Mountains, to Scotty's Castle Road near its intersection with California State Highway 190.

The Daylight Pass Road KOP is located at the entrance to Death Valley NP, alongside Daylight Pass Road, approximately 11 mi (18 km) northwest of the northwest corner of the Amargosa Valley SEZ. The farthest visible point in the SEZ is approximately 18 mi (29 km) southeast of the KOP. The KOP is located at an elevation of approximately 3,560 feet (1,085 m) above mean sea level and 920 ft (280 m) above the center of the Amargosa Valley SEZ. This KOP provides sweeping views of the Amargosa Desert to the southeast, the Bullfrog Hills to the north-northeast, the Grapevine Mountains to the northwest and the Funeral Mountains to the south and southeast. It is identified as a gateway to Death Valley NP on the NPS map distributed to visitors and on the Automobile Club of Southern California's *Death Valley National Park Guide Map (2004).* The location is visited throughout the year (NPS 2012a).

Visible cultural modifications near the KOP include a surface mine or quarry on the north side of the Daylight Pass Road, about 4.9 mi (7.9 km) northeast of the KOP, although it is partly screened by a landform. There is a cleared area with a few low-profile buildings (likely support facilities for the quarry) immediately south of the road, about 4.2 mi (6.8 km) northeast of the KOP, although they are partly screened from view of the road by an earthen berm. There is a small airstrip approximately 5.4 mi (8.7 km) east-northeast of the KOP, and several unpaved roads cross the area between the KOP and the mine.

Figure 3.1-14 shows the Daylight Pass Road KOP within the Amargosa Valley SEZ viewshed. The colored portions indicate areas in the vicinity of the Daylight Pass Road KOP from which solar development in some or all of the Amargosa Valley SEZ could potentially be visible. The figure shows that the Daylight Pass Road KOP is clearly within the viewshed of the Amargosa Valley SEZ.

Figure 3.1-15 depicts areas within the SEZ where solar facilities would be expected to be visible from the Daylight Pass Road KOP, assuming the absence of screening vegetation or structures or lighting or atmospheric conditions that may cause reduced visibility. The figure shows that the entire SEZ [8,479 acres (34.3 km^2)] would be visible from the Daylight Pass Road KOP, and that solar facilities using solar technology of any height could potentially be visible from the KOP.

Figure 3.1-16 shows hypothetical solar energy facilities within the Amargosa Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Daylight Pass Road KOP viewshed. The depicted facility layout was used in the Google Earth visualization discussed

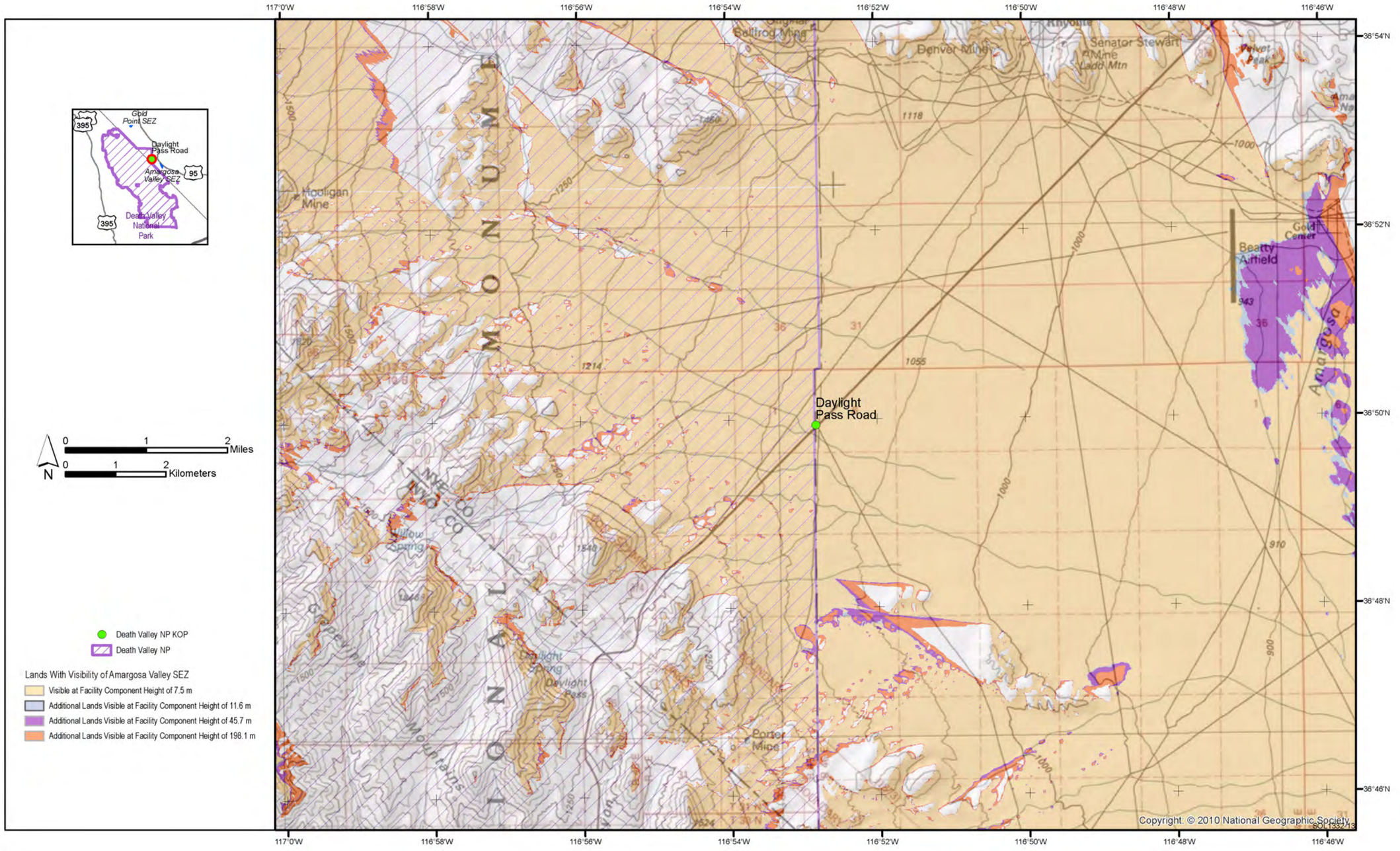

FIGURE 3.1-14 The Daylight Pass Road KOP within the Amargosa Valley SEZ Viewshed

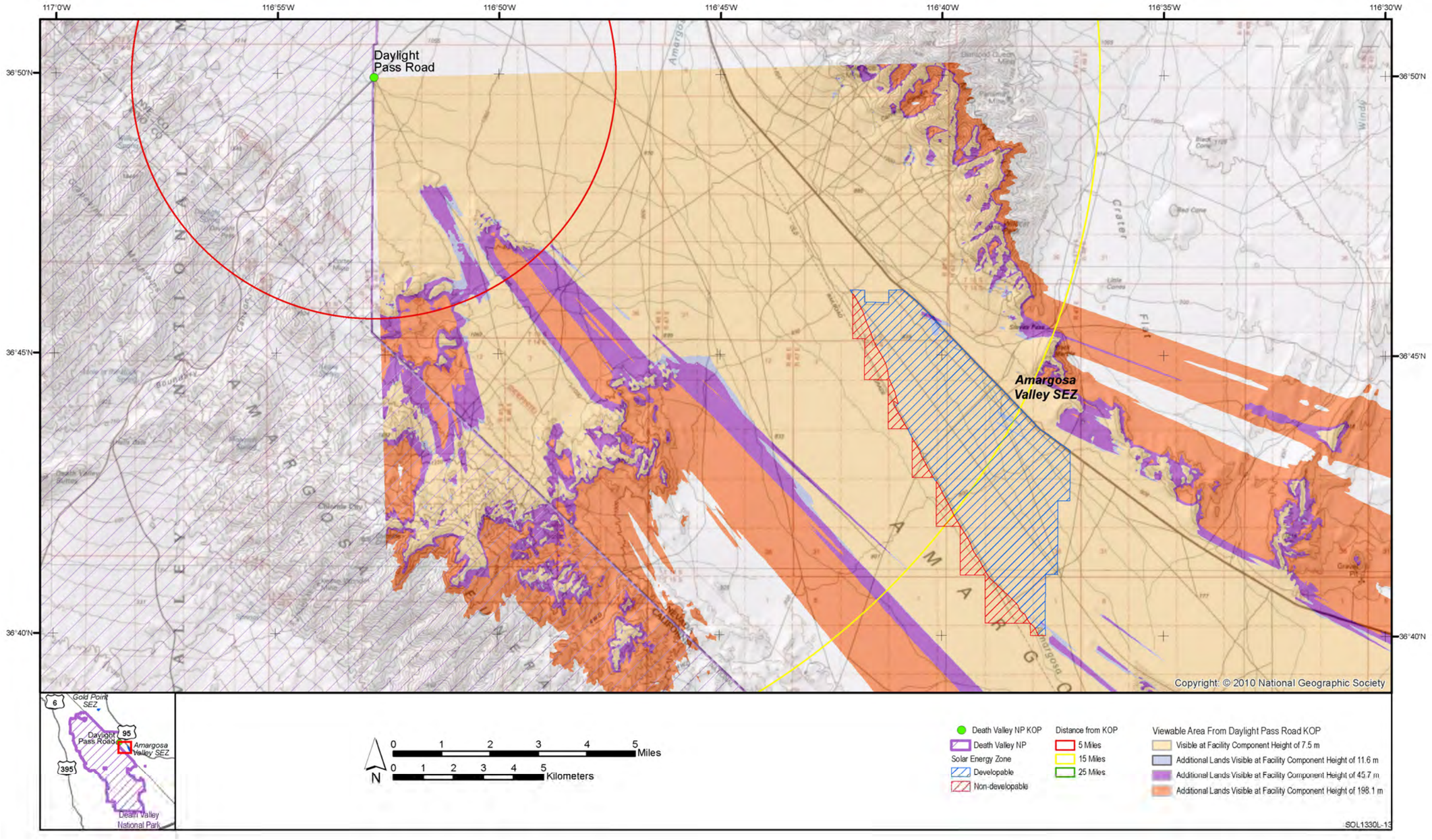

FIGURE 3.1-15 The Amargosa Valley SEZ within the Daylight Pass Road KOP Viewshed

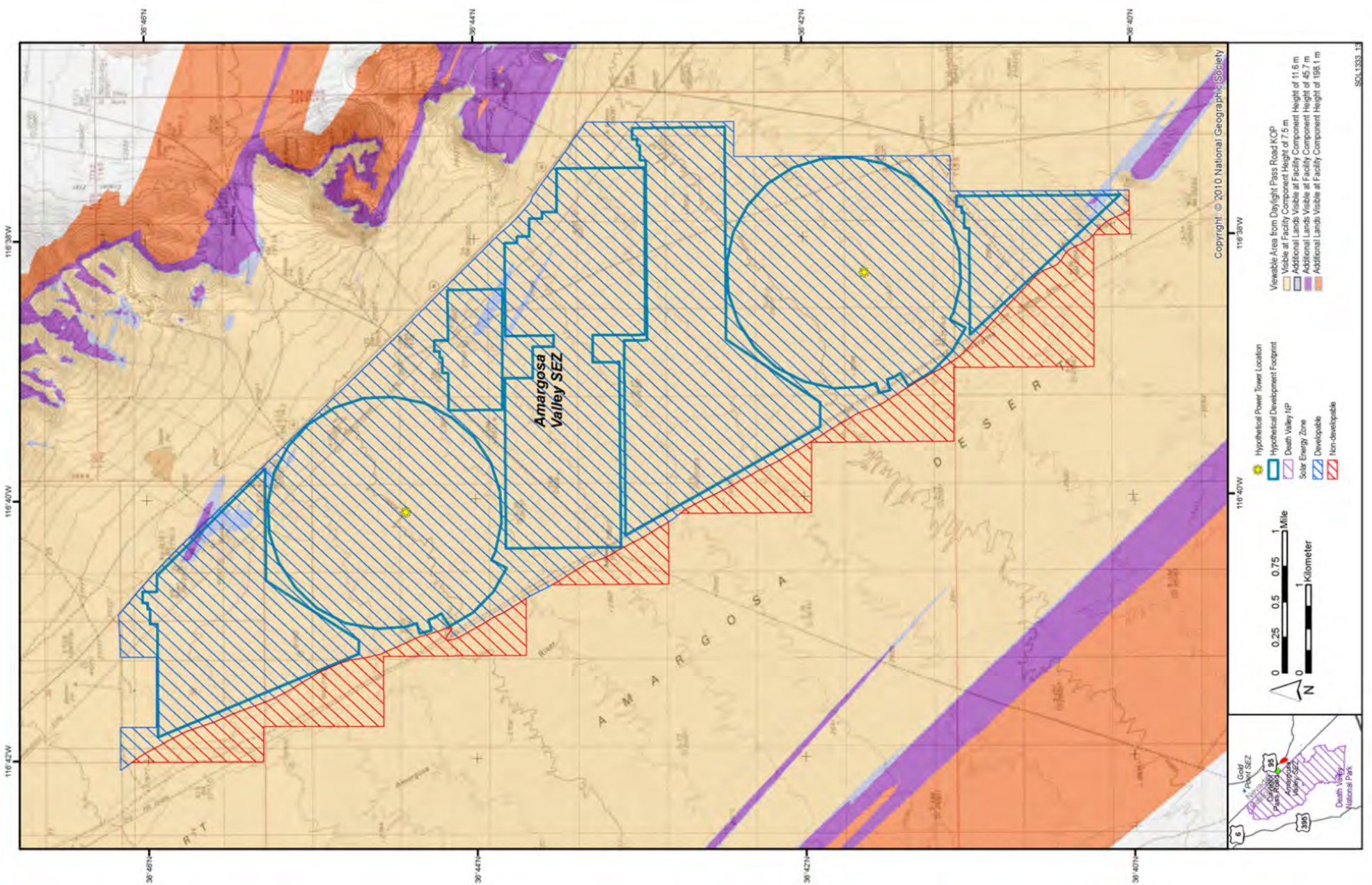

FIGURE 3.1-16 Close-up of the Amargosa Valley SEZ with Facility Footprints within the Daylight Pass Road KOP Viewshed

below. It should be noted that the arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.1-17 is a Google Earth visualization of the Amargosa Valley SEZ as seen from the Daylight Pass Road KOP, looking southeast. The visualization confirms that looking southeast from Daylight Pass Road, the entire Amargosa Valley SEZ could be seen, and the visible portion of the SEZ would occupy approximately 26° of the viewer's field of view.

The visualization shows that because of a very low vertical angle of view, solar collector/reflector arrays within the SEZ would be seen nearly edge-on, appearing as a very thin band below the horizon line. The edge-on view would reduce the visibility of the facilities' strong, regular geometry, would make the facility size less apparent, and would reduce overall visual contrast. However, taller facility components, such as support buildings, power blocks, cooling towers, and transmission towers would extend above the collector/reflector arrays, and their vertical elements would contrast with the strong horizontal line of the arrays and the valley floor. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ. Because the SEZ would occupy a relatively wide horizontal angle of view (26°) as seen from the KOP, these contrasts could potentially be substantial.

Under sunny conditions, the central receiving towers of power tower facilities located in the northern portion of the SEZ would likely be visible as very bright points of light atop visible tower structures against the Spring Mountains or the Amargosa Valley floor, with brightness and detail decreasing for facilities located in the southern portion of the SEZ, farther from the KOP. Based on field observations of 5- to 20-MW power towers (Sullivan et al. 2012), 100+-MW power towers likely could produce moderate or possibly strong visual contrasts at viewing distances of 11–18 mi (18–29 km), with stronger contrasts at shorter distances.

Because the KOP is northwest of the SEZ, views would be toward the shaded side of fixed PV panels and other collectors facing south, e.g., tracking PV panels, or heliostats on the north side of power towers. Field observations of non-tracking thin film PV facilities (Sullivan et al. 2012) suggest that the reflector arrays might be visible from the KOP, but because of the shading and very low angle of view, the arrays might often not be apparent to casual observers. Because of the viewing direction and low viewing angle, glinting and glare from parabolic trough arrays or power tower heliostats is unlikely, but might be possible in some circumstances. More definite knowledge of glint/glare occurrence could be obtained through a glint/glare analysis that would be conducted during a project-specific environmental impact assessment.

If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that might be visible for long distances at night and would likely be visible from the KOP. At 11–18 mi (18–29 km), the light or lights would not likely be missed by casual observers, given the dark skies and relatively low number of visible lights in the area.

FIGURE 3.1-17 Google Earth Visualization of the Amargosa Valley SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Daylight Pass Road KOP

Other lighting at the facilities would likely be visible as well, with the amount of contrast dependent on the degree to which lighting was minimized, shielded, and operated to reduce night-sky impacts.

For viewers at the Daylight Pass Road KOP, because of the relatively short distance from the KOP to the closest portion of the SEZ, under the 80% development scenario, solar energy development within the Amargosa Valley SEZ would be expected to create moderate or even high contrasts if development included multiple power towers in the northern portions of the SEZ, with weak visual contrasts with the surrounding landscape expected if development were limited to PV facilities and good mitigation practices were followed.

Because the KOP is a publicized park entrance, visitation is relatively high. Viewers traveling west into the park would be past the SEZ when they reached the KOP and would be unlikely to be looking at the SEZ at that point, though they might see it out of the left side of their vehicles before reaching the KOP as they crossed the Amargosa Valley. Viewers traveling east out of the park would be more likely to see solar development in the SEZ, which would be on the right of their vehicles. Persons looking toward the SEZ would be unlikely to miss the visual contrast presented by solar development in the SEZ at 9–11 mi (14–18 km) if it included CSP facilities and especially power towers. If development were limited to PV facilities, some casual observers might miss the development because of the low angle of view and because the panels would be tilted to the south, away from the observers. For some people, if there were no bright reflections or obvious symmetry to the facilities (which would be expected because of the low viewing angle), they might not recognize it as a man-made disturbance. If the development included power towers, their very bright, steady, point-like light atop a visible tower structure would appear as an obvious man-made element. Similarly, if power towers had hazard navigation lighting, it would be unmistakable as a man-made element, and might have a negative visual impact for some observers, especially if it were the only or one of a few visible lights on the horizon. If development were limited to PV facilities, night-sky impacts would likely be considerably lower.

If the SEZ contained parabolic trough facilities in the northern portions of the SEZ or power towers anywhere in the SEZ, viewers looking southeastward from the KOP would see solar development in the SEZ as an unmistakable man-made element in a predominantly natural-appearing landscape. At least some sensitive viewers would likely find that the visual intrusion detracted from the scenic quality of the landscape. If one or more power tower receivers were visible in the northern portion of the SEZ, the bright lights would likely attract and hold visual attention, and would seem out of place in the daytime landscape. Under these circumstances, visual contrasts would likely be moderate or even large in a worst-case scenario of several power towers' being visible in the northern portion of the SEZ, which covers a substantial portion of the horizontal field of view. Associated impacts would be expected to be moderate for sensitive viewers. If development were limited to PV, and especially non-tracking PV, the reduced array height, and lack of plumes or additional infrastructure associated with CSP facilities would result in substantially reduced impacts, and likely moderate or even low impacts overall, particularly given the low vertical angle of view. PV facilities also use less lighting at night than CSP facilities, and thus night-sky impacts would be lower if development in the SEZ were limited to PV facilities.

3.1.1.5 Titus Canyon Road #2 KOP

Titus Canyon Road is a 27-mi (43-km) one-way scenic mountain byway that travels westward across the Grapevine Mountains. Noted for its dramatic views, striking geology, and significant Native American and mining-related historic properties, it is one of the most popular dirt road drives in Death Valley NP (Digonnet 2007; NPS 2012a). It is identified as a premier destination on the NPS visitor map and newspaper and in a number of Death Valley NP guidebooks (Automobile Club 2004; Digonnet 2007; Mitchell 2006; Bryan and Tucker-Bryan 2009; NPS 2012a). Roger Mitchell's *Death Valley SUV Trails* (2006) states "Do not go into Titus Canyon seeking solitude. It is one of the most popular destinations in the Park." This drive is visited most often in the spring, fall, and winter (NPS 2012). The road may be closed to motorized traffic in the summer and after periods of snowfall in the winter (Digonnet 2007).

The Titus Canyon Road #2 KOP is located in Titus Canyon, on Titus Canyon Road, 9.5 mi (15 km) west of the junction of Titus Canyon Road and Daylight Pass Road. The KOP lies at an elevation of approximately 5,080 ft (1,548 m) above mean sea level and 2,440 ft (744 m) above the center of the Amargosa Valley SEZ. From this KOP, Bare Mountain is visible to the east, Yucca Mountain is visible to the southeast, and portions of the Amargosa Valley floor are visible to the east and southeast.

Figure 3.1-18 shows the Titus Canyon Road #2 KOP within the Amargosa Valley SEZ viewshed. The colored portions indicate areas in the vicinity of the Titus Canyon Road #2 KOP from which solar development in some or all of the Amargosa Valley SEZ could potentially be visible. The figure shows that visibility of the Amargosa Valley SEZ from Titus Canyon Road is generally very poor until the road is east of the Grapevine Mountains, and that Titus Canyon Road #2 KOP is located in the only stretch of Titus Canyon Road west of the eastern border of the Grapevine Mountains that would have visibility of the Amargosa Valley SEZ. This stretch of road is less than 0.25 mi (0.40 km) in length, and for part of it, visibilitywithin the SEZ would be limited to the upper portions of power towers.

Figure 3.1-19 depicts areas within the SEZ where solar facilities would be expected to be visible from the Titus Canyon Road #2 KOP, assuming the absence of screening vegetation or structures or lighting or atmospheric conditions that may cause reduced visibility [1,775 acres (7.2 km^2) or 21% of the Amargosa Valley SEZ].

The nearest visible point in the Amargosa Valley SEZ is approximately 19 mi (31 km) from the Titus Canyon Road #2 KOP, and the farthest visible point in the SEZ is approximately 23 mi (37 km) from the KOP. In most of this area, only the upper portions of power towers could potentially be visible. Low-height solar technologies (PV facilities, parabolic trough arrays, and solar dish engines) would be visible on only about 550 acres (2.2 km^2) of the SEZ. Visibility of solar technologies would be limited to a strip running across the SEZ from northwest to southeast in the southern portion of the SEZ, between approximately 19 and 23 mi (31 and 37 km) from the Titus Canyon Road #2 KOP.

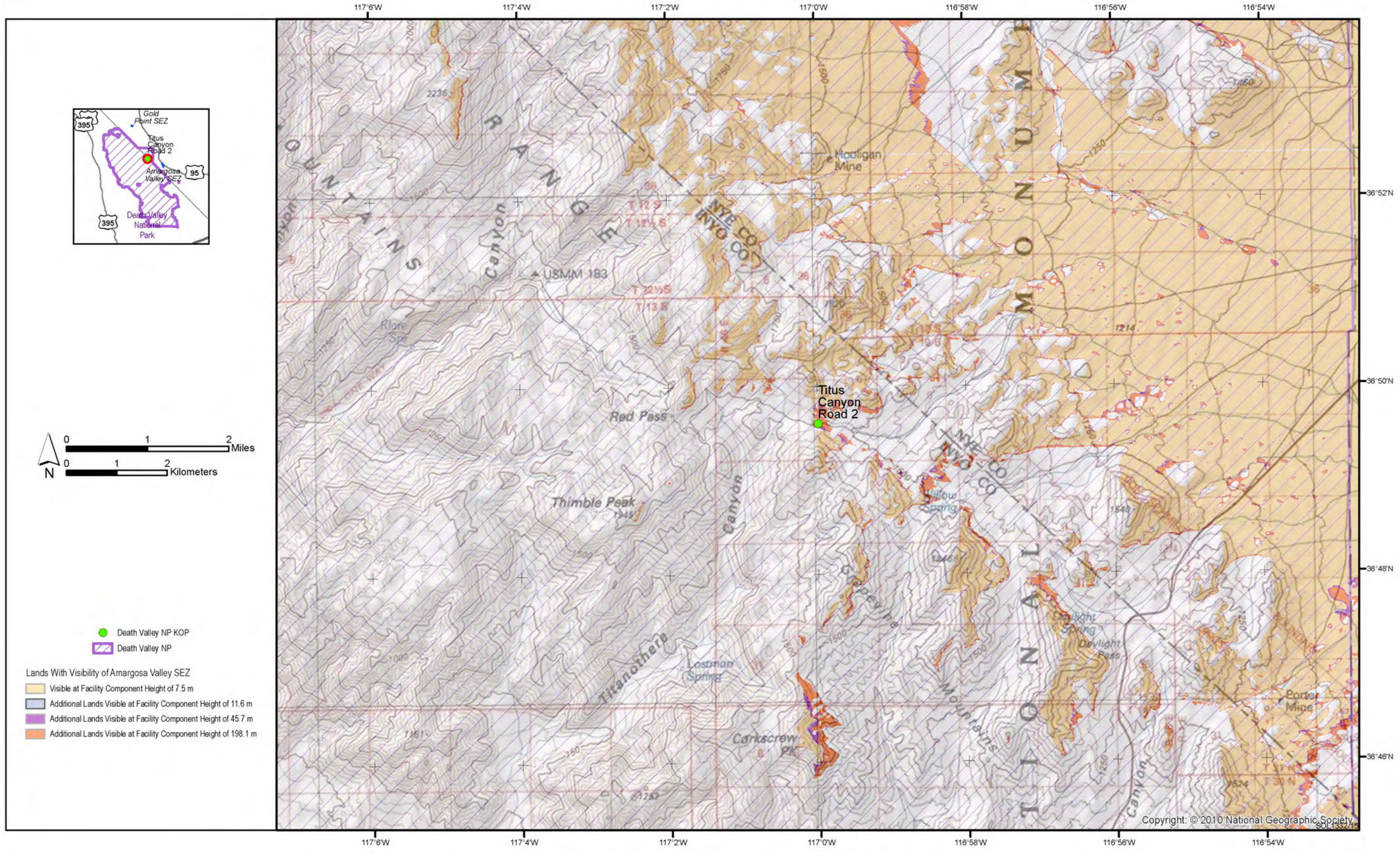

FIGURE 3.1-18 The Titus Canyon #2 KOP within the Amargosa Valley SEZ Viewshed

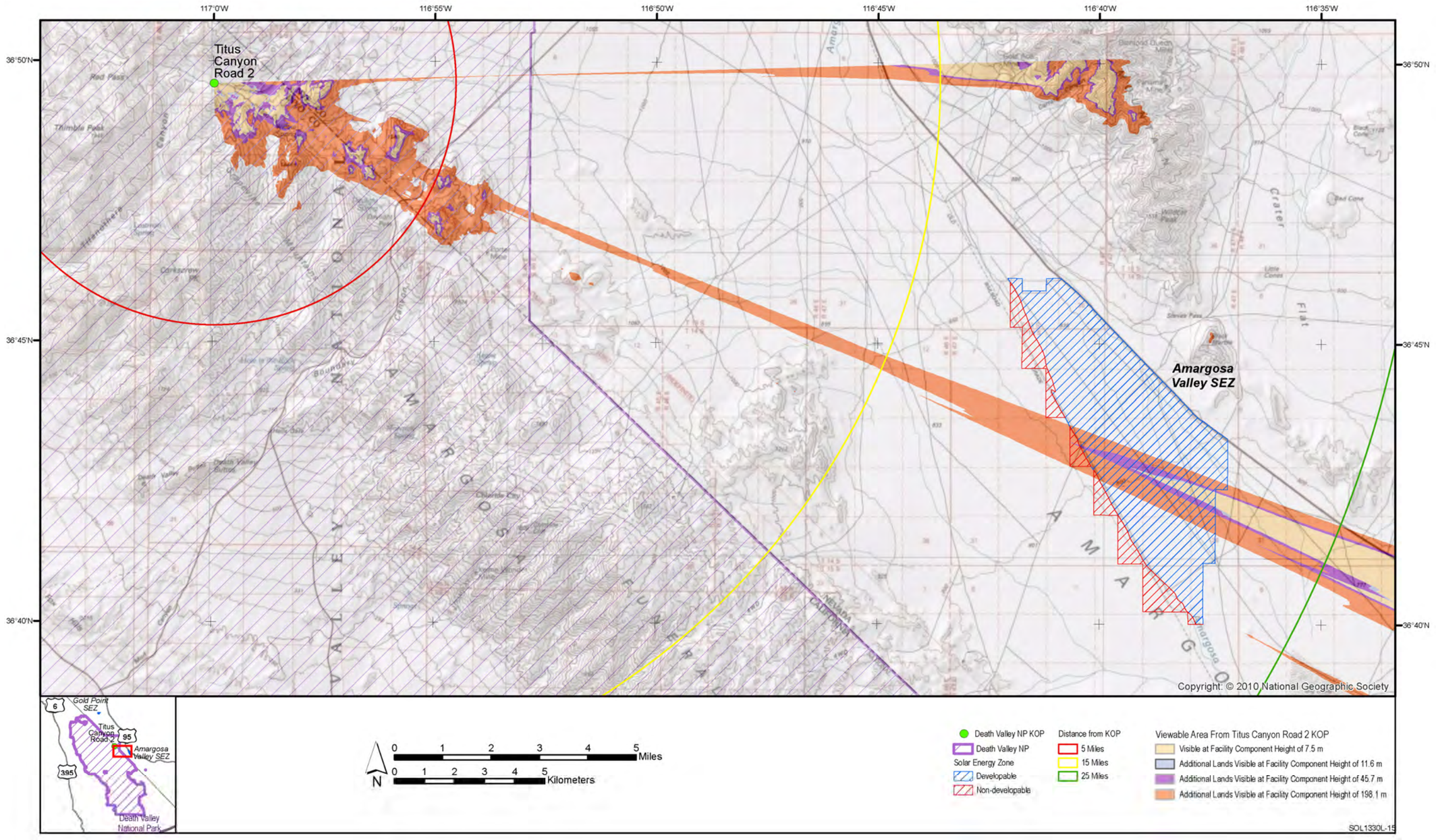

FIGURE 3.1-19 The Amargosa Valley SEZ within the Titus Canyon #2 KOP Viewshed

Figure 3.1-20 shows hypothetical solar energy facilities within the Amargosa Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Titus Canyon Road #2 KOP viewshed. The depicted facility layout was used in the Google Earth visualization discussed below. It should be noted that the arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.1-21 is a Google Earth visualization of the Amargosa Valley SEZ as seen from the Titus Canyon Road #2 KOP. The visualization confirms that the majority of the Amargosa Valley SEZ is obstructed from view by the foothills of the Funeral Mountains, when looking southeast from Titus Canyon #2 KOP. The visible portion of the SEZ occupies only 1–2° of the viewer's field of view and is just visible through a gap in mountain ridges.

The visualization suggests that if solar facilities were located in the 550 acres (2.2 km^2) of the SEZ where low-height solar technology arrays might be visible, the tops of solar collector/reflector arrays could theoretically be visible; however, given the very low and very narrow angle of view, and the 19- to 23-mi (31- to 37-km) distance from the KOP, in the unlikely event they were visible at all, they would be very small and indistinct, and would be very difficult to distinguish from the background. Because of the very limited visibility and the fact that the KOP is north of the facility, it is very unlikely that glinting or glare from the facility would be observed, and in any event, its brightness would be partially mitigated by the long distance.

If a power tower receiver were located in the SEZ such that it fell within the visible portion of the SEZ, on sunny days it would likely be visible as a bright point of light against a mountain backdrop; also, any hazard navigation lighting on it would be visible at night, and would likely attract the attention of casual viewers because from within Titus Canyon there are very few (if any) visible lights.

Because Titus Canyon Road is a one-way road going west, persons in vehicles traveling on the road would have to look out the left rear of their vehicles to see any solar development in the SEZ, which would limit views for travelers substantially. Stationary viewers at the KOP would be more likely to see any development, if it were visible.

Under the 80% development scenario, for stationary viewers at the Titus Canyon Road #2 KOP, because of the very limited visibility of the SEZ, and the long distance between the KOP and the SEZ, if solar development in the SEZ were limited to PV facilities, it is doubtful whether it would be visible at all, and in any event, the expected visual impact level would negligible. If power towers or parabolic trough facilities were allowed in the SEZ, the trough facilities would probably not be visible, and their expected impacts would be negligible, while if a power tower were located in the visible portion of the SEZ, the expected visual impacts would be low. Because of the direction of travel and the brief duration of visibility of the SEZ from the road in any event, the expected impacts on travelers on Titus Canyon Road in the vicinity of the KOP is negligible.

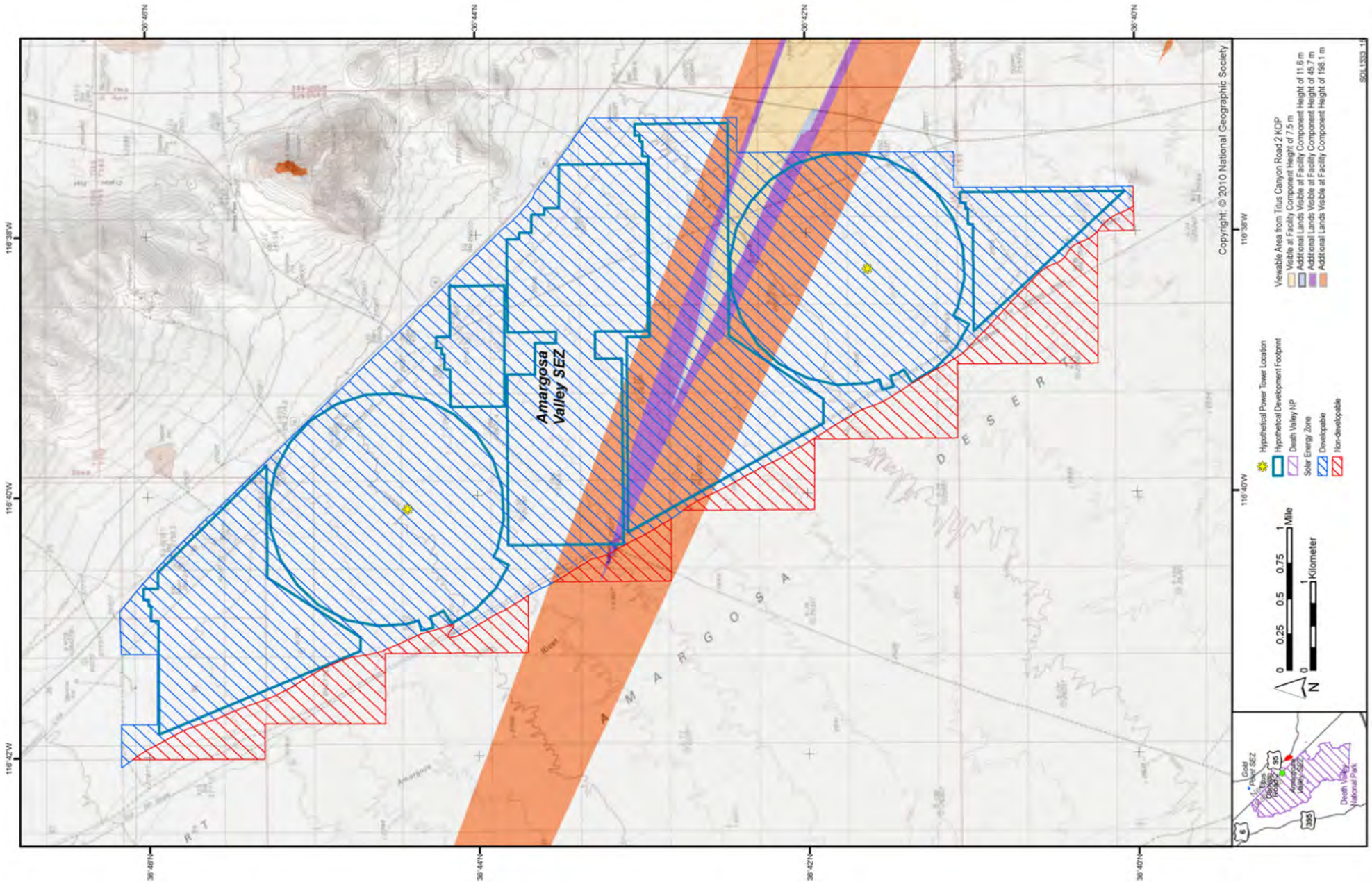

FIGURE 3.1-20 Close-up of the Amargosa Valley SEZ with Facility Footprints within the Titus Canyon #2 KOP Viewshed

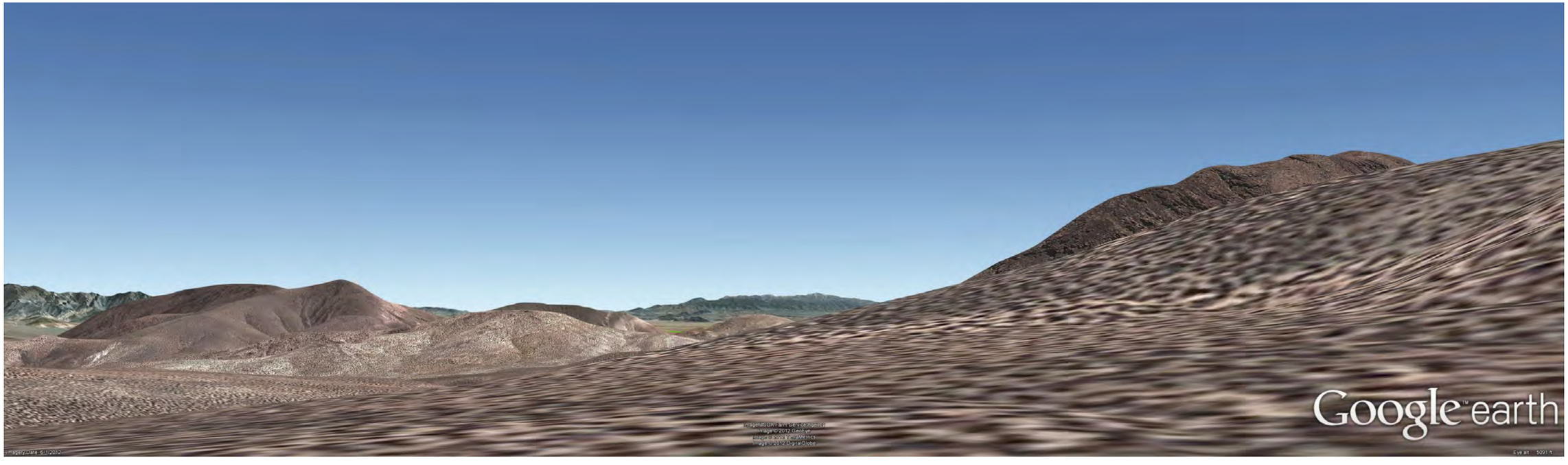

FIGURE 3.1-21 Google Earth Visualization of the Amargosa Valley SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Titus Canyon #2 KOP

3.1.1.6 Last Chance Mountain

Last Chance Mountain is located in the north end of the Last Chance Range, in the northernmost corner of Death Valley NP. Last Chance Mountain is identified as a premier desert mountain hike destination in multiple guidebooks and is most visited in the spring and fall (Digonnet 2007; NPS 2012a; Zdon 2000). The peak is noted for its summit view, which offers exceptional vistas of the surrounding landscape (Digonnet 2007).

The Last Chance Mountain KOP is located at the summit of Last Chance Mountain. It is situated approximately 18 mi (29 km) west-southwest of the western edge of the Gold Point SEZ at an elevation of 8,456 ft (2,578 m) above mean sea level (Digonnet 2007); 3,514 ft (1,071 m) above the center of the Gold Point SEZ. For a viewer facing southwest from the summit of Last Chance Mountain, the entire length of Death Valley can be seen. To the south, the length of the Last Chance Mountain, Panamint, and Cottonwood Ranges dominates the view. Eureka Valley lies to the west, its western side framed by the Saline Range. Beyond this, the Inyo and White Mountains are visible, and still beyond, the Sierra Nevada can be seen. On a clear day in early spring, views can extend for over 100 mi (Digonnet 2007).

Figure 3.1-22 shows the Last Chance Mountain KOP within the Gold Point SEZ viewshed. The colored portions indicate areas in the vicinity of the Last Chance Mountain KOP from which solar development in some or all of the Gold Point SEZ could potentially be visible. The figure shows that visibility is limited to the peak and eastern slopes of Last Chance Mountain.

Figure 3.1-23 depicts the area within the Gold Point SEZ where solar facilities would be expected to be visible from the Last Chance Mountain KOP, assuming absence of screening vegetation, structures or lighting and atmospheric conditions that may cause reduced visibility. (It should be noted that satellite imagery and photographs indicate scattered vegetation near the summit that may screen views from particular viewpoints, but is not dense enough to screen most views from the summit.) The entire SEZ [4,596 acres (18.6 km^2)] would be visible from the Last Chance Mountain KOP. Solar technologies of any height would be visible throughout the entire Gold Point SEZ as seen from the Last Chance Mountain KOP. The nearest visible point in the Gold Point SEZ is approximately 18 mi (29 km) from the KOP, and the farthest visible point in the SEZ is approximately 23 mi (37 km) from the KOP.

Figure 3.1-24 shows hypothetical solar energy facilities within the Amargosa Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Last Chance Mountain KOP. The depicted facility layout was used in the Google Earth visualization discussed below. It should be noted that the arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.1-25 is a Google Earth visualization of the Gold Point SEZ as seen from the Last Chance Mountain KOP, looking east-northeast. This visualization confirms that looking east-northeast from Last Chance Mountain, the entire Gold Point SEZ would be visible. The SEZ occupies approximately 10° of the horizontal field of view.

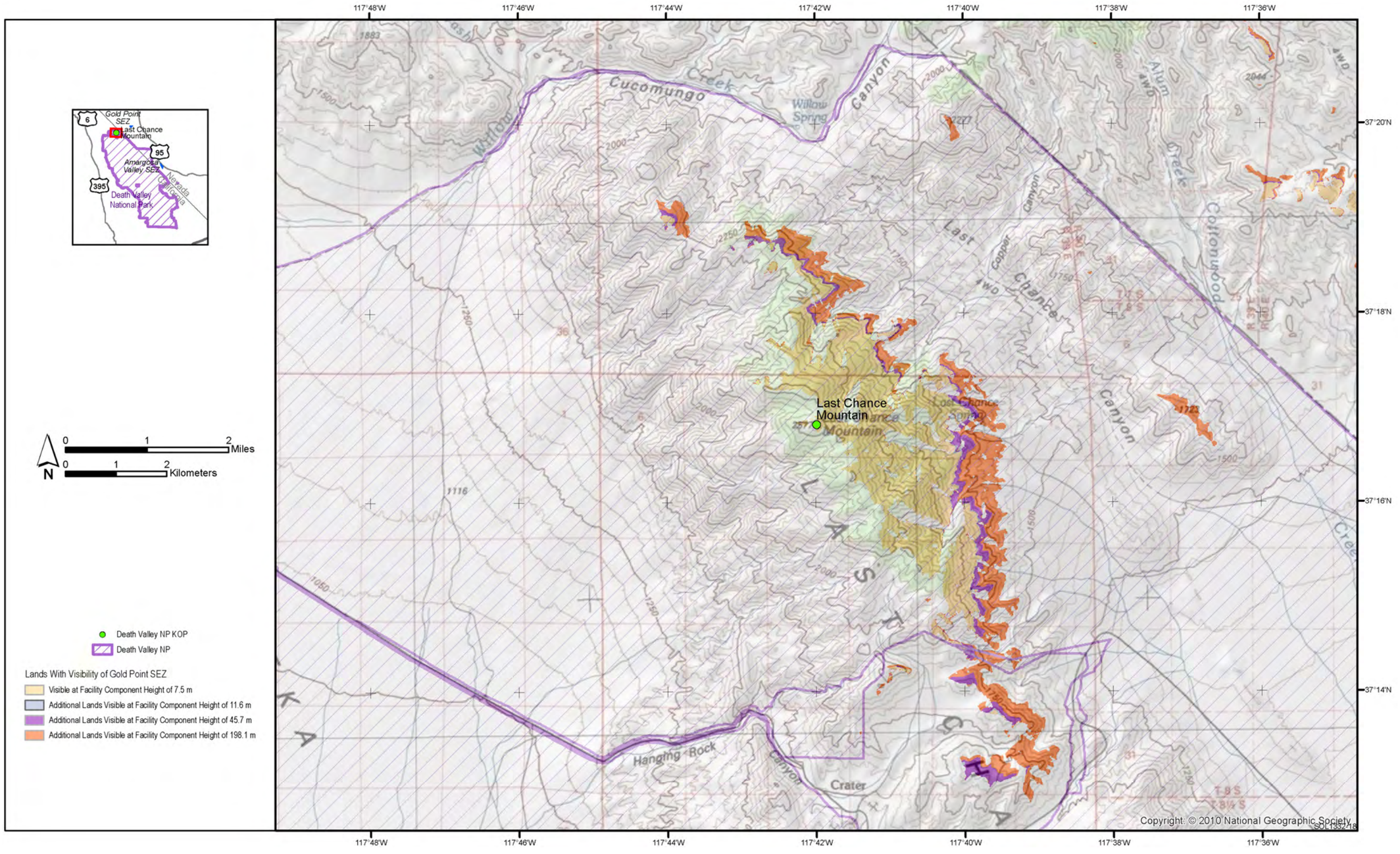

FIGURE 3.1-22 The Last Chance Mountain KOP within the Gold Point SEZ Viewshed

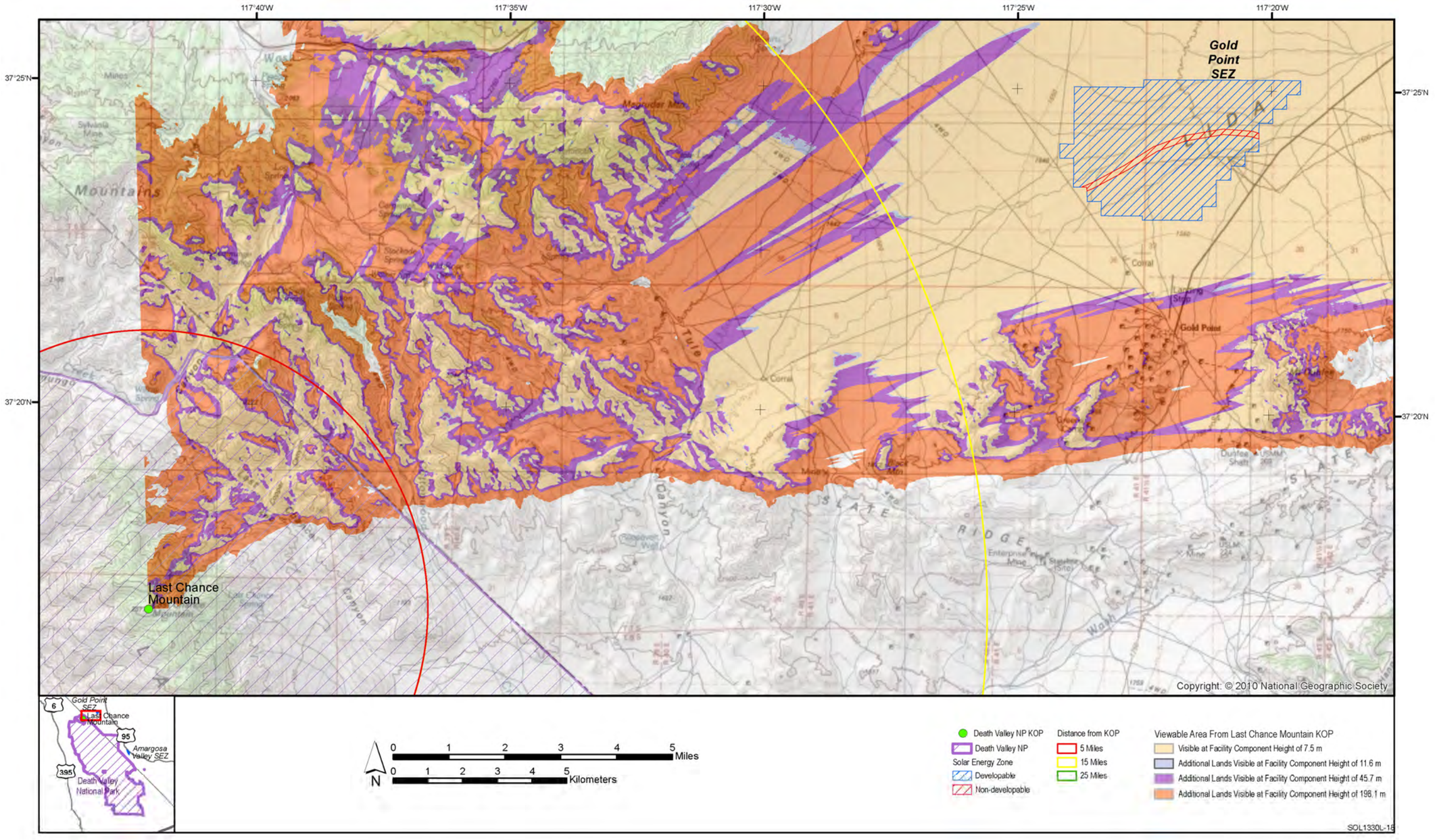

FIGURE 3.1-23 The Gold Point SEZ within the Last Chance Mountain KOP Viewshed

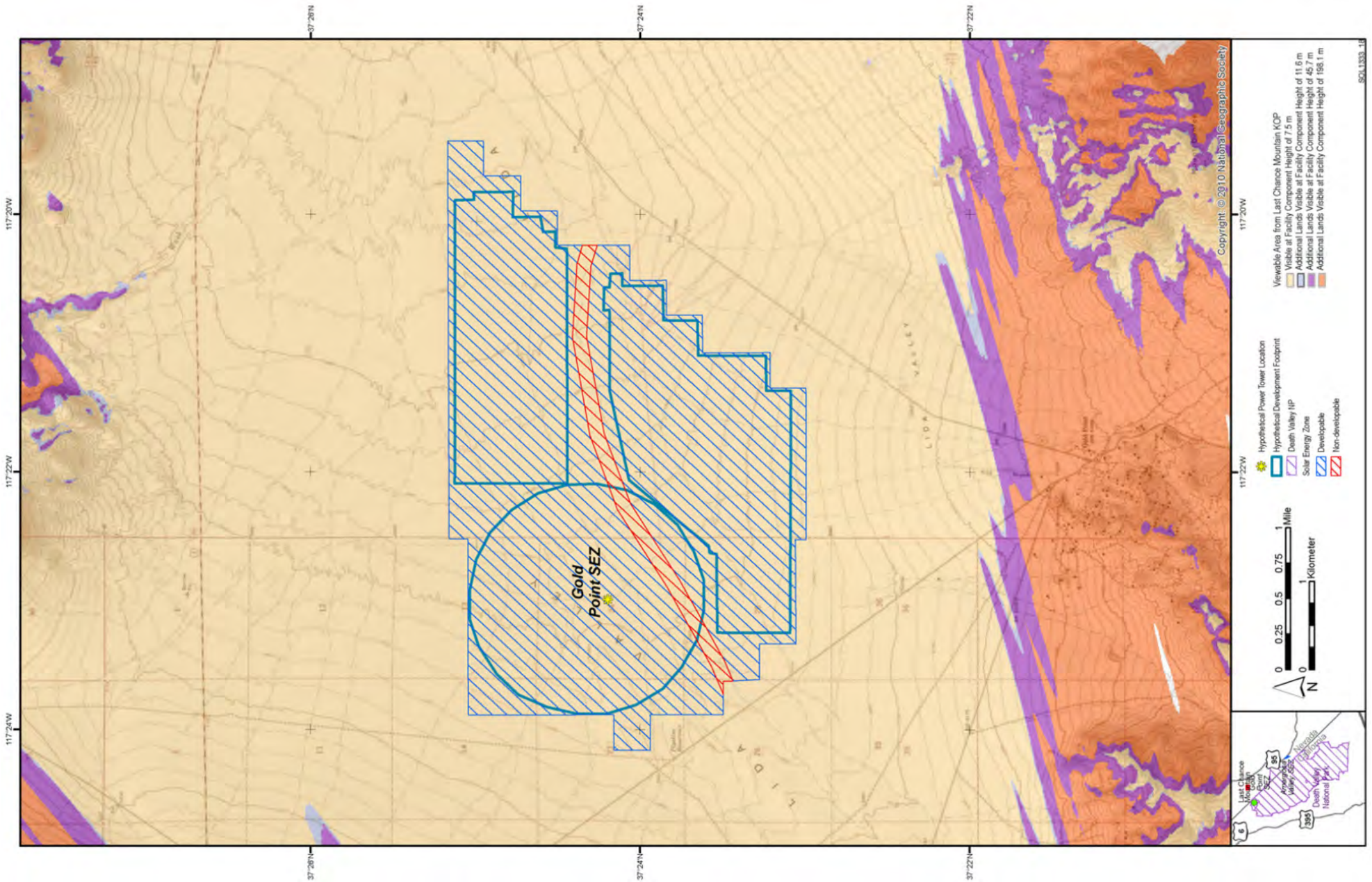

FIGURE 3.1-24 Close-up of the Gold Point SEZ with Facility Footprints within the Last Chance Mountain KOP Viewshed

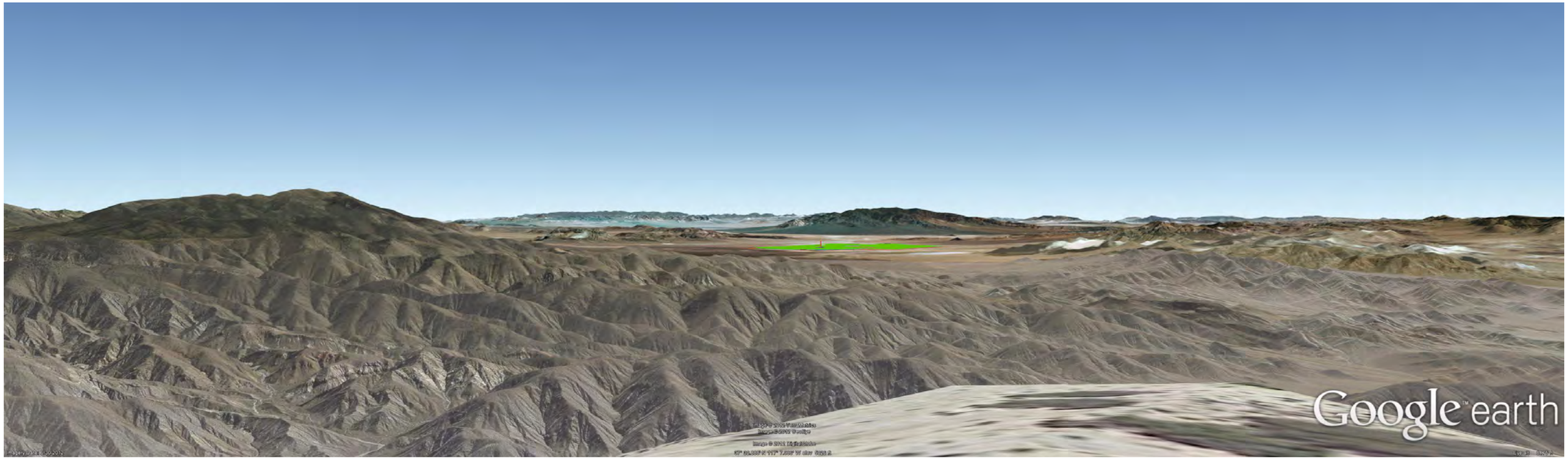

FIGURE 3.1-25 Google Earth Visualization of the Gold Point SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Last Chance Mountain KOP

The visualization suggests that the tops of solar collectors, heliostat arrays and power blocks within the SEZ would be seen. However, given the long distance between the KOP and the SEZ, the viewing angle would be low; this would reduce the visible surface area of solar facilities within the SEZ and make the size and strong regular geometry of the solar arrays less apparent, tending to reduce visual contrast. The facilities in the SEZ would likely appear as a flat, somewhat indistinct, thin horizontal band at the base of Stonewall Mountain, repeating the line of the flat Lida Valley floor. Taller components with vertical geometries and irregular forms, such as cooling towers, thermal storage tanks, and plumes would project above the solar collector arrays, but at the long distance to the SEZ, would not likely be distinctly seen, and might not be visible at all under many lighting conditions. Field observations of 5- to 20-MW power towers suggest that on sunny days, the reflected light from the central receiving towers of 100+-MW power towers would be visible as bright points of light at viewing distances of 19–23 mi (31–37 km) (Sullivan et al. 2012). The bright points of light would be seen against the backdrop of the valley floor.

Because the KOP is southwest of the SEZ, views would be toward the sunlit side of fixed PV panels and other collectors facing southwest, e.g., tracking PV panels in the afternoon and heliostats on the northeast side of power towers. It is possible that reflected light from the collectors might be visible from the KOP at certain times, increasing visibility of the facilities substantially at those times; however, given the long distance from the KOP to the facility, such reflected light would be unlikely to be bright enough to constitute glare, i.e., it would be unlikely to cause annoyance or visual discomfort. The chance of visible glinting or glare from parabolic trough arrays or power tower heliostats as seen from the KOP is uncertain, but unlikely because of the low vertical angle of view. More definite knowledge of glint/glare occurrence could be obtained through a glint/glare analysis that would be conducted during a project-specific environmental impact assessment.

If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white, slowly flashing navigation warning lights that are visible for long distances at night and would likely be visible from the KOP, although it would be relatively uncommon for people to be at the KOP at night. At 19–23 mi (31–37 km), the light or lights would not likely be bright, but would be noticeable, and would be unlikely to be missed by casual observers, given the dark skies and relatively low number of visible lights in the area. It is possible that other lighting at the facilities could be visible as well, especially if it was not properly shielded and operated to reduce night-sky impacts.

Under the 80% development scenario, solar energy development within the Gold Point SEZ would be expected to generate weak visual contrasts with the surrounding environment as viewed from the Last Chance Mountain KOP. Because the KOP is a mountaintop that is a publicized hiking destination, while overall visitation may be low in absolute terms, visitors are likely to be enjoying the panoramic views from the mountain peak, and many might be looking closely at the landscape. These viewers are unlikely to miss the visual contrast presented by solar development in the SEZ, but at 19–23 mi (31–37 km), they are unlikely to be able to discern the nature of what they are looking at without prior knowledge. If there were no bright reflections or obvious symmetry to the facilities (which would be expected because of the low viewing angle),

some people might not recognize it as a man-made disturbance. If the development included power towers, their bright, steady, point-like light would appear as an obvious man-made element. Similarly, if power towers had hazard navigation lighting, it would be unmistakable as a man-made element, and might have a negative visual impact on some observers, especially if it were the only or one of a few visible lights on the horizon. Nonetheless, because of the small apparent size of the SEZ as seen from the KOP, the long distance to the SEZ from the KOP, and the low vertical angle of view, overall visual impact would be expected to be low, especially if development were limited to PV facilities, with somewhat higher impacts expected from parabolic trough and especially from power tower facilities within the SEZ.

3.1.2 Additional KOPs Outside of the 25-mi Boundary

Two additional KOPs provided by NPS have views of the Amargosa Valley SEZ, but fall outside of the 25-mi boundary used for this analysis. These KOPs are:

- Aguereberry Point
- Telescope Peak

A complete analysis was not done for these KOPs; however, it is expected that solar energy development within the Amargosa Valley SEZ could be visible from these KOPs. A brief description of each KOP and potential contrasts associated with solar development in the Amargosa Valley SEZ that might be observed form the KOPs are presented below.

Aguereberry Point. Aguereberry Point is one of the Park's premier scenic overlooks. Located in the Panamint Range, the peak is accessible by a graded dirt road and is visited year round (Bryan and Tucker-Bryan 2009; NPS 2012a). It is identified as a point of interest in several guidebooks (Bryan and Tucker-Bryan 2009; Mitchell 2006; NPS 2012) and is best to visit in "late afternoon, when the sunlight reflects the varied colors of the Funeral Mountains" (Automobile Club 2004).

The Aguereberry Point KOP is located at the Aguereberry Point overlook, approximately 31 mi (50 km) southwest of the southwestern portion of the Amargosa Valley SEZ. It is situated at an elevation of 6,433 ft (1,960 m) above mean sea level (Digonnet 2007) and approximately 3,809 ft (1,160 m) above the center of the Amargosa Valley SEZ. To the east, Death Valley, Furnace Creek Ranch, and the southern extent of the Funeral and Panamint Mountains can be seen. To the north and northeast, the Grapevine Mountains, the northern extent of the Panamint Range, and the northern extent of Death Valley are visible. To the west and south, the ridge tops of the Panamint Range dominate the view.

At 31 mi (50 km) from the SEZ, weak visual contrast from solar development would be expected for views from Aguereberry Point; however, the light from illuminated power tower receivers would likely be visible on sunny days, and power tower hazard navigation and possibly

other lighting from solar facilities in the SEZ might be visible at night, although KOP visitation is likely low at night. Expected visual impact levels would be low.

Telescope Peak. Telescope Peak is the highest summit in Death Valley NP and one of the highest desert mountain summits in California (Digonnet 2007). Located in the Panamint Range, the peak can be reached by foot via the Telescope Peak Trail and is most accessible in May and June.

The Telescope Peak KOP is located at the summit of Telescope Peak, approximately 43 mi (69 km) southeast of the Amargosa Valley SEZ. At an elevation of 11,049 ft (3,368 m) above mean sea level (Digonnet 2007) and approximately 8,425 ft (2,568 m) above the center of the Amargosa Valley SEZ, this KOP offers unobstructed, spectacular views of the entire park and surrounding landscape in all directions.

At 43 mi (69 km) from the SEZ, negligible visual contrast from solar development would be expected for views from Telescope Peak; however, the light from illuminated power tower receivers might be visible on sunny days. It is possible but unlikely that power tower hazard navigation and possibly other lighting from solar facilities in the SEZ might be visible at night. KOP visitation is likely low at night. Expected visual impact levels would be negligible.

3.1.3 Summary of Visual Impacts to Death Valley NP KOPs

Death Valley NP staff provided Argonne with 31 KOPs throughout Death Valley NP. Eight of these KOPs could have potential views of solar energy development in the two SEZs; seven KOPs could have potential views of solar energy development in the Amargosa Valley SEZ; and one KOP (Last Chance Mountain) could have potential views of solar energy development in the Gold Point SEZ.

Two of the KOPs (Telescope Peak and Aguereberry Point) are beyond the 25-mi (40-km) radius of the extended solar analysis and were not examined in detail, but because of the long distance from these KOPs to the Amargosa Valley SEZ, expected visual impacts on viewers at these KOPs from solar energy development in the SEZ would be negligible to low.

Two of the remaining KOPs (Pyramid Peak and Last Chance Mountain) are peaks in mountain ranges in the eastern portion of Death Valley NP. Despite their high elevations, they are sufficiently far from the SEZs (18–19 mi [29–31 km] to the closest points in the SEZs) that solar facilities in the SEZs would be seen at very low vertical angles of view, so that they would appear as an indistinct thin band on the distant horizon. If solar development in the SEZs were limited to PV technology, the facilities would be difficult to distinguish as man-made objects, would normally present low contrasts, and would likely have very low visual impacts. Power towers within the SEZs would almost certainly be visible and obvious as man-made disturbances that could be considered a negative visual impact by sensitive viewers at the KOPs, which are important scenic overlooks. Glinting from the reflective surfaces is possible (but not certain), but

the facilities are likely too far away for reflections to be bright enough to be considered glare. Overall, visual impacts would be expected to be low.

The remaining four KOPs are on roads. One KOP (Titus Canyon Road #2) is in an internal canyon. Topographic screening limits the view of the SEZ substantially. The vertical angle of view is low, and the distance to the nearest point in the SEZ is 19 mi (31 km). Because of the long distance and the severely restricted view of the SEZ, both visual contrast and impacts at this KOP are expected to be negligible.

Two of the remaining KOPs are on Chloride Cliff Road. The Chloride Cliff Road #1 KOP is at the boundary of the NP, and somewhat elevated with respect to the SEZ 9 mi (13 km) to the southeast. Visibility of the solar development in the SEZ would be limited, and the viewing angle is low. Because of the restricted SEZ visibility and low angle of view, contrasts and impacts would be expected to be low if development were limited to PV facilities, but could be moderate if several power towers were located in the closest portions of the SEZ. The Chloride Cliff Road #2 KOP is slightly farther west in the NP, and topographic screening substantially restricts views of the SEZ. Views of low-height solar technologies are limited to a very small portion of the SEZ, and very low contrast would be expected if solar development were limited to low-height technologies. The greatest contrast would be expected if multiple power towers were located in the areas of the SEZ where they would be visible. Under this scenario, the receiver lights would be bright, but limited to a small portion of the view, and expected contrast and impacts could be moderate.

The Daylight Pass Road KOP is 11 mi (17 km) northwest of the Amargosa Valley SEZ, and has unobstructed views of the entire SEZ. As a result, the SEZ covers a much larger portion of the horizontal field of view compared to the views from the other KOPs. The vertical angle of view is low, and because the KOP is northwest of the SEZ, glinting and glare effects are less likely than for the other SEZs. If solar development were limited to low-height technologies, contrast and impacts would likely be low, but if multiple power towers were located in the northern portion of the SEZ, because of the relatively short distance to the SEZ and the large horizontal field of view covered by the SEZ, contrast could be moderate or even high under a worst-case scenario. Impacts would be lower for travelers entering the NP than for travelers leaving the NP, because travelers leaving the NP would be more likely to be looking toward the SEZ.

3.2 JOSHUA TREE NATIONAL PARK AND WILDERNESS AREA

Joshua Tree NP is located at the transition point between the Colorado and Mojave Deserts in San Bernardino and Riverside Counties in southern California. It is home to 900 species of flowering plants, 250 species of birds, hundreds of archaeological sites, and more native palm oases that any other NP unit (Jette et al. 2011). Its combination of mountain ranges, unique geological features, extensive plant and animal life, and open desert draws over 1.3 million visitors a year (Jette et al. 2011, Kaiser 2010).

Joshua Tree was established as a National Monument in 1936 by President Franklin D. Roosevelt. In 1984, the monument was designated as part of the biosphere reserve system, which aims to protect samples of the world's major types of ecosystems. In 1994, the California Desert Protection Act re-designated the monument as a National Park and added 234,000 acres (947 km^2) to the park. The current park boundary contains 772,676 acres (3,127 km^2) of federally owned land, 595,370 acres (2,409 km^2) of which are designated wilderness and 70,557 acres (285 km^2) potential wilderness. A total of 19,834 acres of non-federal land is also within the park boundaries (Jette et al. 2011). The NP contains all or portions of the San Bernardino, Cottonwood, Hexie, Pinto, Coxcomb, and Eagle mountain ranges as well as several major valleys, including Pinto Basin, Juniper Flats, Covington Flats, Pleasant Queen, and Lost Horse. The southern boundary of the park follows the east-west transverse ranges of the Little San Bernardino Mountains, the Cottonwood Mountains, and the Eagle Mountains, along the northern end of the Coachella Valley. The northern boundary of the park is generally defined by the Morongo Basin. The park is flanked on the west by California State Highway 62 and on the east by California State Highway 177 (Jette et al. 2011). Elevations range in height from 1,000 to 5,900 feet (304.8 to 1,798.3 m) above sea level (NPS 1995).

The conservation of visual resources plays an important role in visitor enjoyment and federal management of Joshua Tree NP. In 2010, NPS began steps towards developing a new general management plan (GMP) for Joshua Tree National Park. During the GMP public comment period, the majority of comments received were in relation to the visitor's experience of scenic views, unique desert landscape, and quiet desert solitude. Several commenters expressed concern with external threats to the park's visual resources and visitor experiences from urban encroachment and night-sky degradation (NPS 2010).

In November 2010, Joshua Tree NP conducted a Visitor's Study using a systematic random-sample questionnaire survey intended to gauge visitor use and opinion about the park. When asked to rank how important certain attributes/resources were to their park experience, 90% of respondents to the question identified "views without development" as an "extremely important" or "very important" park attribute. In response to the same question, 65% of respondents ranked "dark, starry night skies" as "extremely important" or "very important". When asked to imagine that they were a manager planning for the future of Joshua Tree NP, 2% of respondents indicated they would "protect the park from surrounding development" (Jett et al. 2011).

The Joshua Tree NP Foundation Statement contains two significance statements that incorporate elements of visual resource values. Significance Statement 3 identifies poor night-sky conditions within the park as an area of major concern. Growing commercial activities around the park have been identified as a current and potential threat for further degradation of night-sky viewing. Significance Statement 8, "Geological, climatic, and ecological processes create scenic landscapes unique to deserts and fundamental to the character of Joshua Tree National Park," deals explicitly with viewsheds, access to scenic vistas, and visibility. Joshua Tree NP has determined that views of surrounding lands from the park are "poor or at risk," and land-use change due to alternative energy development has been identified as a current and potential threat to viewing aesthetics (NPS 2011).

The Riverside East SEZ is the only SEZ within the viewshed of Joshua Tree NP. It encompasses 147,915 developable acres (598.6 km^2) within the Chuckwalla Valley, the southern portion of Palen Dry Lake, and Palo Verde Mesa in Riverside County, California. The SEZ is located generally southeast of the NP, with the western end of the SEZ approximately 2 mi (3 km) from the NP at its closest point. The SEZ begins in the Chuckwalla Valley, between the Eagle Mountains and the Palen Mountains, and extends north into the southern reaches of Palen Dry Lake and southeast, through the Chuckwalla Valley, to the City of Blythe. Throughout the Chuckwalla Valley, the SEZ runs southeast, north of I-10. South and east of the McCoy Mountains, the SEZ runs north-south on the Palo Verde Mesa, encompassed by the Little Chuckwalla Mountains to the south, the City of Blythe to the east, the Big Maria Mountains to the northeast, and the McCoy Mountains to the west. A small section of the SEZ resides south of I-10, north of the Mule Mountains. As a result of its position on the Palo Verde Mesa, the eastern portion of the SEZ, north of I-10, is obstructed from view from a majority of the Joshua Tree NP KOPs. VRM classes have not been determined for the SEZ.

Within 25 mi (40 km) of the SEZ, approximately 117,306 acres (474.7 km^2) of Joshua Tree National Park and Wilderness Area have potential visibility of facilities within the Riverside East SEZ. Fifteen KOPs located within 25 mi (40 km) of the SEZ would potentially have views of solar facilities in the SEZ.

3.2.1 Key Observation Points

Joshua Tree NP staff provided Argonne with 54 KOPs (Figure 3.2-1). Fourteen of these KOPs would potentially have views of solar facilities in the Riverside East SEZ from within 25 mi (40 km) of the SEZ. These KOPs were used to identify potential visual impacts to Joshua Tree NP from solar development within the Riverside East SEZ. Joshua Tree did not provide visitor usage information for any of the KOPs. Visitor levels for the KOPs in this analysis are likely to be very low, because visitor use of the far eastern portion of Joshua Tree NP is low.

The following KOPs would potentially have views of solar facilities from within 25 mi (40 km) of the SEZ and were included in this analysis:

- Anschutz Peak and Cultural Sites
- Aqua Peak
- Big Wash Trail and Cultural Sites
- Coxcomb Alluvial Fans
- Coxcomb Peak
- Dyadic Peak
- Eagle Mountain

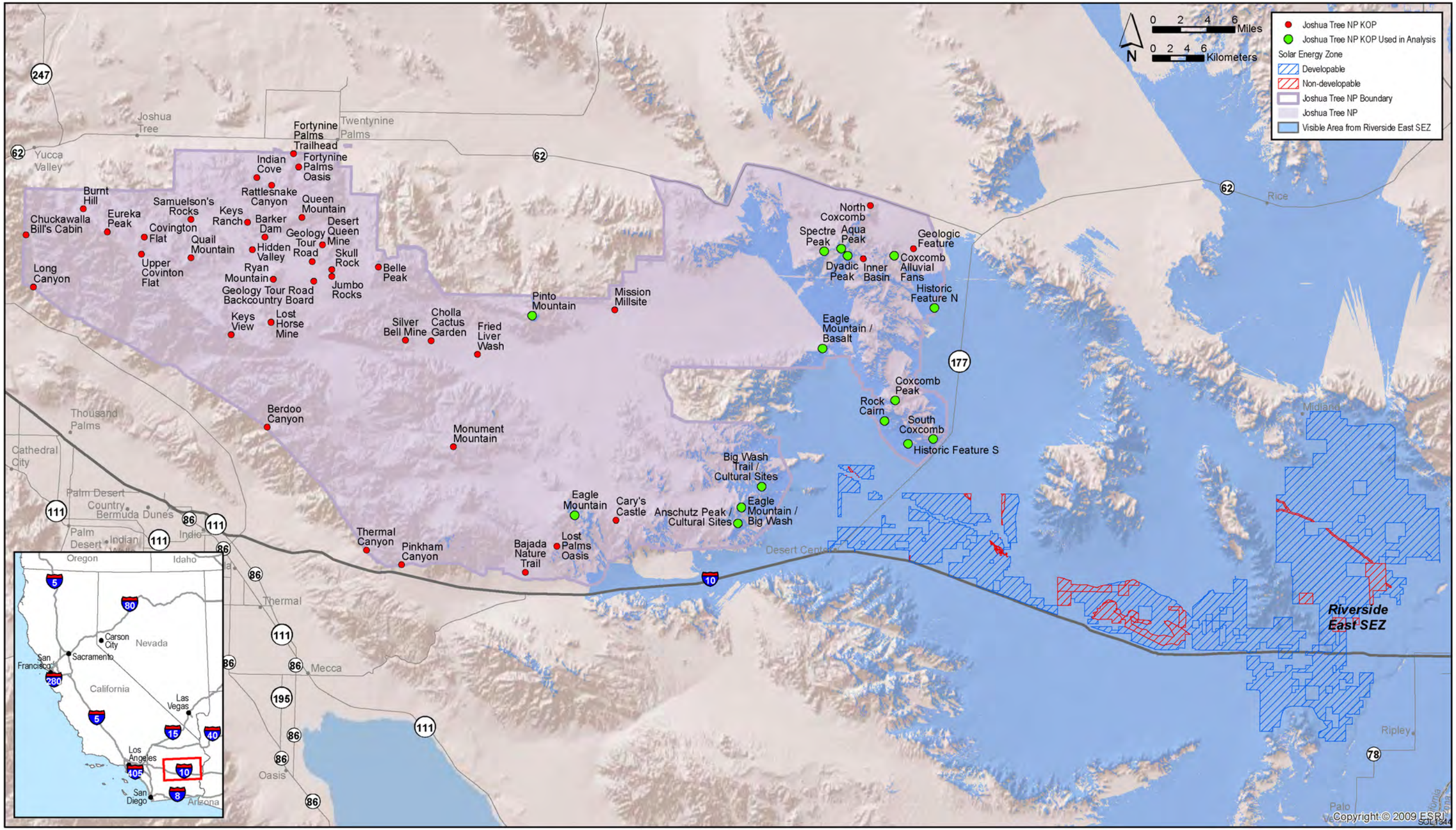

FIGURE 3.2-1 Joshua Tree National Park KOPs Identified by NPS

- Eagle Mountain/Basalt
- Eagle Mountain/Big Wash
- Historic Feature North
- Historic Feature South
- Rock Cairn
- South Coxcomb Peak
- Spectre Peak

3.2.1.1 Anschutz Peak and Cultural Sites

Anschutz Peak is located in the south end of Joshua Tree NP, in the southeastern end of the Eagle Mountains. The Anschutz Peak and Cultural Sites KOP is located at the summit of Anschutz Peak. It is situated 6.8 mi (10.9 km) west of the Riverside East SEZ at an elevation of approximately 3,140 feet (957 m) above mean sea level and approximately 2,730 ft (832 m) above the center of the western portion of the Riverside East SEZ. From the Anschutz Peak and Cultural Sites KOP, the Eagle Mountains and the Coxcomb Mountains are visible to the north and west. The Chuckwalla Valley stretches out below Anschutz Peak to the south and the east. The Chuckwalla Mountains are visible to the southeast and the Palen Mountains are visible to the east.

Cultural modifications visible from the KOP include I-10 and several smaller roads, the community of Desert Center, the Lake Tamarisk housing development, a high-voltage transmission line, and abandoned and actively farmed agricultural lands. These modifications would likely detract noticeably from the scenic qualities of the western portion of the SEZ, as seen from the KOP.

Figure 3.2-2 shows the Anschutz Peak and Cultural Sites KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. The figure shows that there is somewhat scattered visibility of the SEZ in the vicinity of the KOP, with visibility limited primarily to the southern and eastern face of Anschutz Peak.

Figure 3.2-3 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Anschutz Peak and Cultural Sites KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. The figure shows that almost the entire SEZ south and west of the McCoy Mountains would be visible from the Anschutz Peak and Cultural Sites KOP. Within 25 mi (40 km) of the Anshutz Peak and Cultural Sites KOP, solar development on 31,699 acres (128.28 km^2) or 22% of the SEZ would potentially be visible.

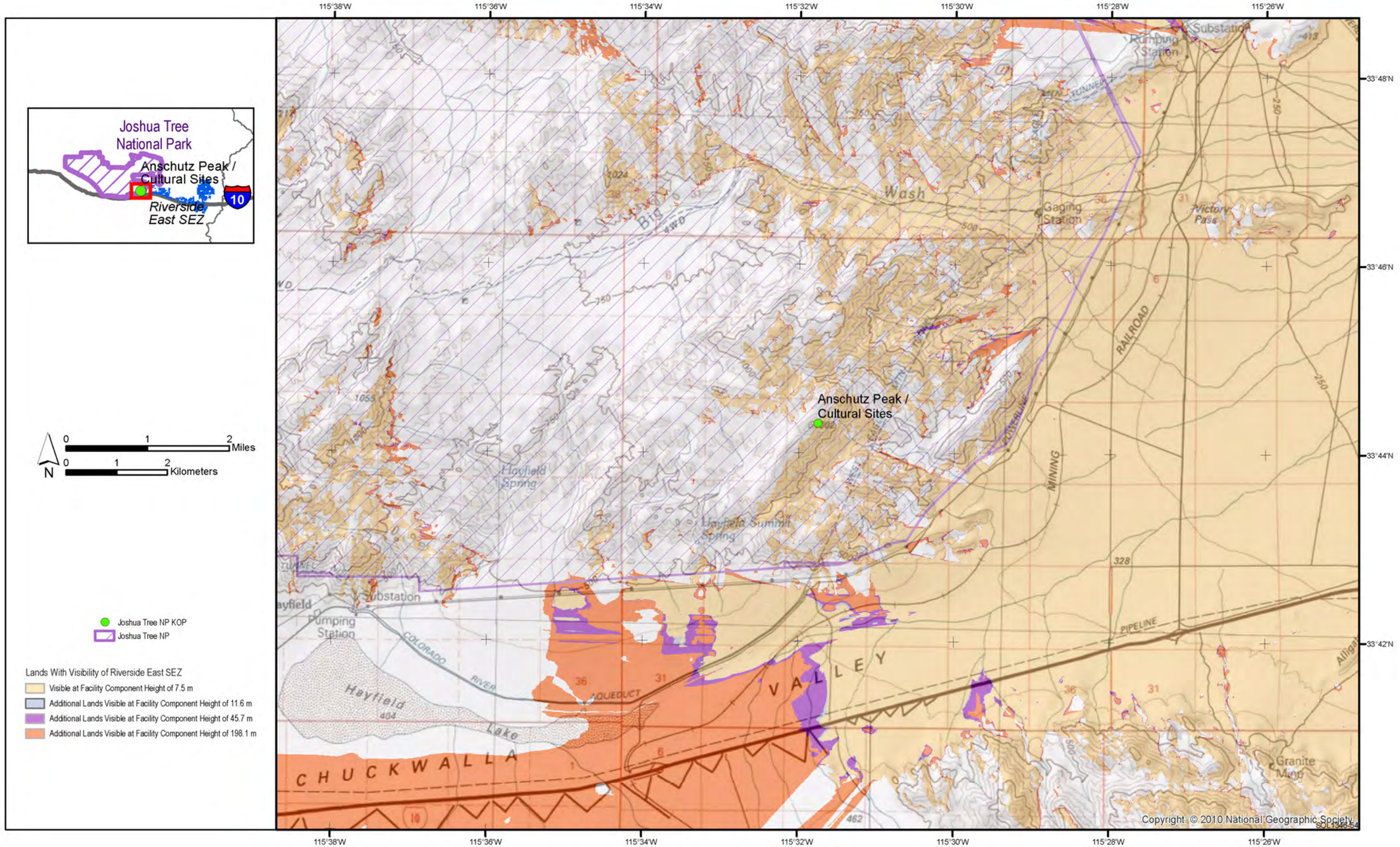

FIGURE 3.2-2 The Anshutz Peak and Cultural Sites KOP within the Riverside East Viewshed

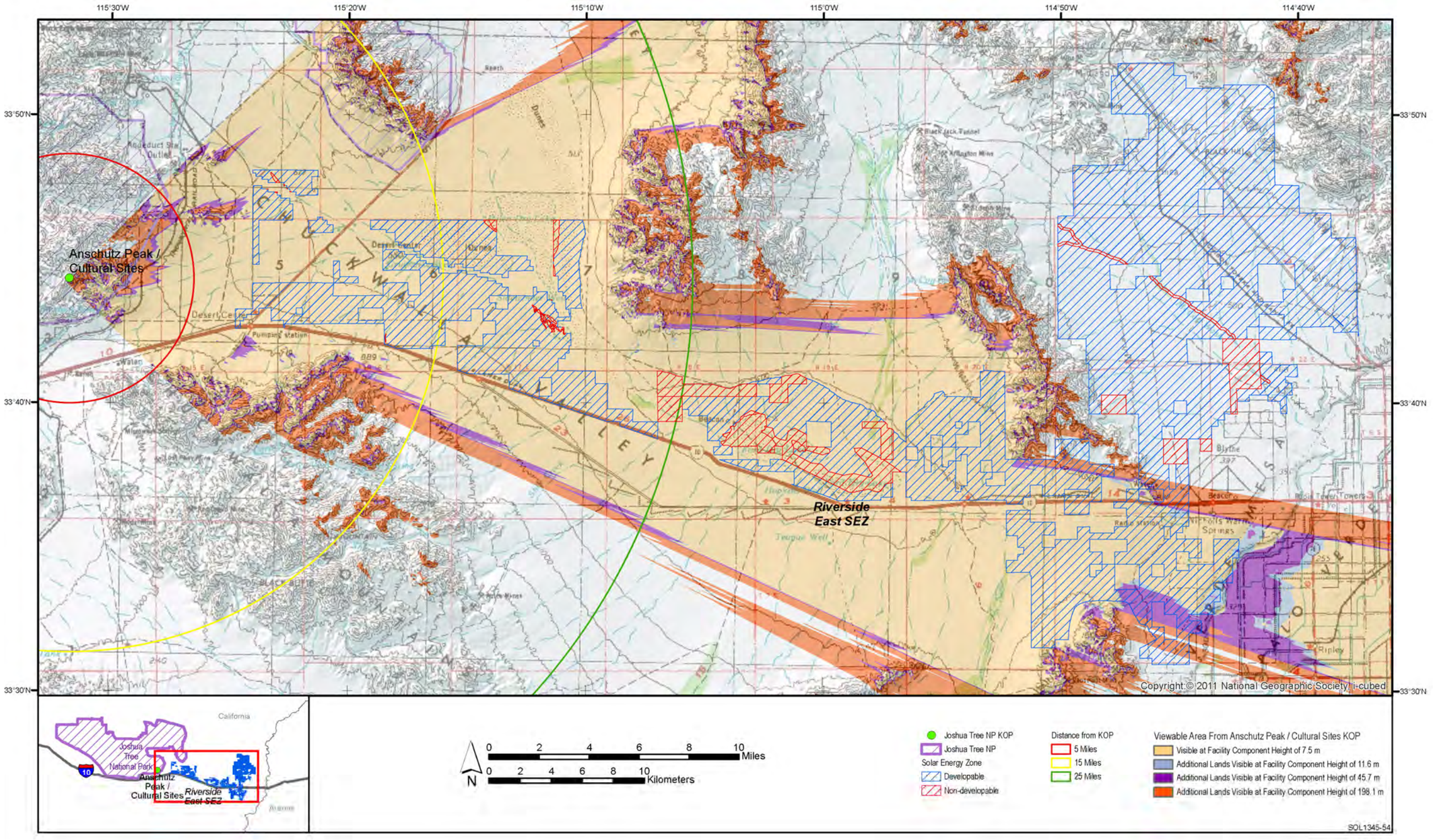

FIGURE 3.2-3 The Riverside East SEZ within the Anschutz Peak and Cultural Sites KOP Viewshed

This figure shows that the nearest visible point in the Riverside East SEZ is 6.8 mi (10.9 km) from the Anschutz Peak and Cultural Sites KOP. The farthest visible point in the SEZ is 48.2 mi (77.6 km) from the KOP. In almost the entire visible portion of the SEZ, solar facility components associated with PV, parabolic trough, and power tower facilities would potentially be visible from this KOP. In the far southeastern corner of the SEZ, only components with heights of 150 ft (45.7 m) or more, such as the upper portions of transmission towers, would be visible. In some slivers throughout the SEZ, only facility components measuring 650 ft (198.1 m) or taller, such as central receiving towers for power tower facilities, would potentially be visible.

Figure 3.2-4 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Anschutz Peak and Cultural Sites KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-5 is a Google Earth visualization of the Riverside East SEZ as seen from the Anschutz Peak and Cultural Sites KOP. This visualization suggests that looking east from the Anschutz Peak and Cultural Sites KOP, there is a clear view of the western end of the SEZ, which occupies approximately 47° of the viewer's horizontal field of view. Under the 80% development scenario, solar facilities would occupy a significant portion of the Chuckwalla Valley between the viewpoint and the Palen Mountains. South of the Palen Mountains, solar facilities could stretch almost to the eastern horizon, i.e., to as far as 48 mi (77 km) from the viewpoint.

The visualization shows that the angle of view is high enough that the tops and sides of solar collector/reflector arrays would be seen, making their large size and regular geometry more apparent and increasing the likelihood of glinting and glare at this viewpoint directly west of the SEZ. The arrays would appear to spread out across the valley floor, and the differing appearance and layouts of the facilities would be obvious, increasing the visual complexity of the view. Facilities closest to the SEZ would appear larger in size than those located further to the east, where foreshortening would tend to make the facilities appear as thin bands below the horizon line. Because of the lower angle of view to more distant facilities, the discontinuous shape of the SEZ would be less noticeable and development might appear to be denser further east in the SEZ.

Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers would protrude above the solar collector/reflector arrays, potentially creating form, line, and color contrasts in facilities located closer to the KOP. The complex forms and vertical lines of the collector array and power block components would contrast with the simple and strong horizontal form of the valley floor. The highly reflective metallic surfaces and deeply shadowed interstices of the solar array, array support structures, and other components would contrast with the dull grays, browns, tans, and greens of the sparse vegetation and bare soils of the valley floor. Texture contrasts might be visible for the facilities closest to the KOP, depending on the materials used in their construction. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other

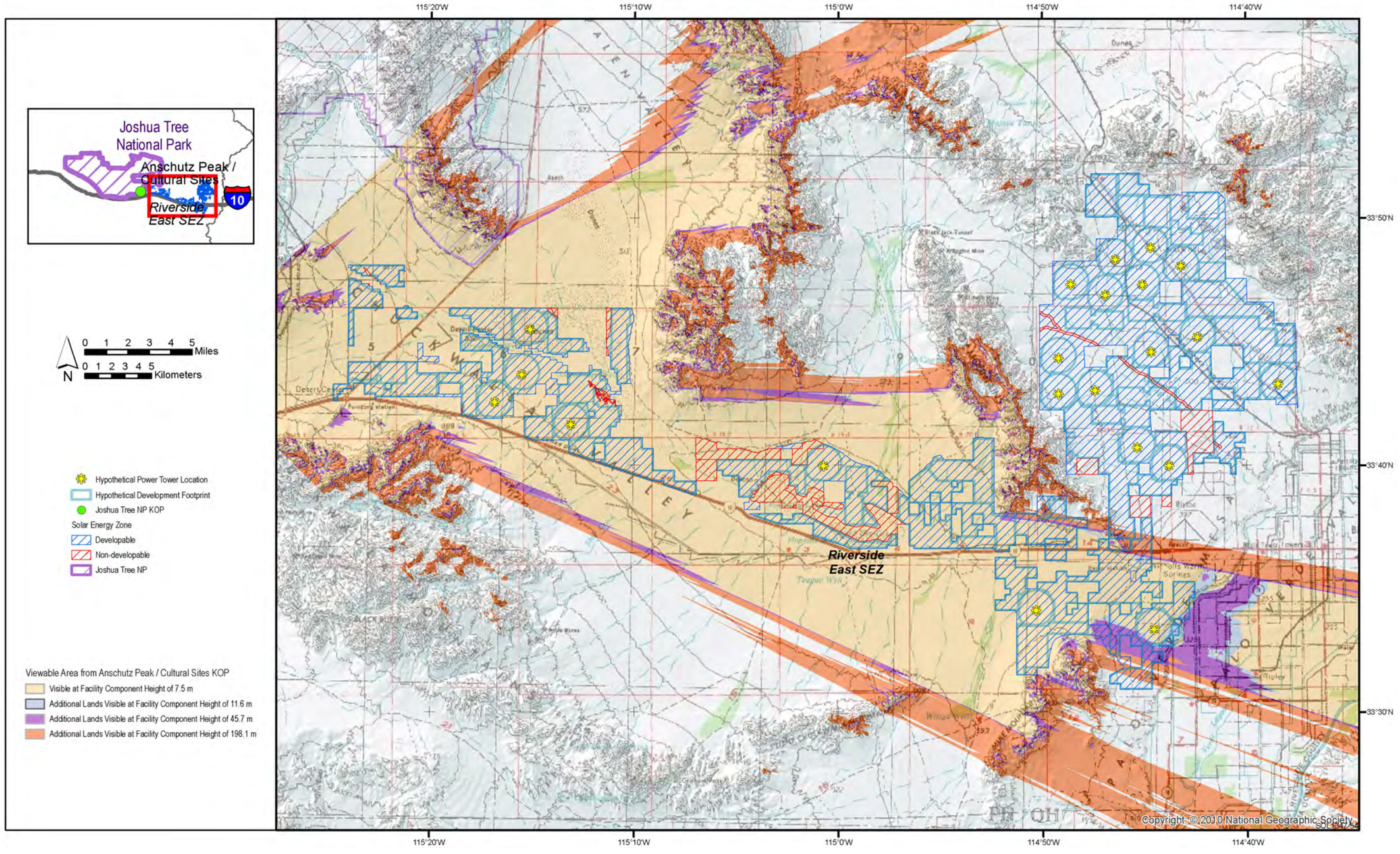

FIGURE 3.2-4 Close-up of Riverside East SEZ with Facility Footprints within the Anshutz Peak and Cultural Sites KOP Viewshed

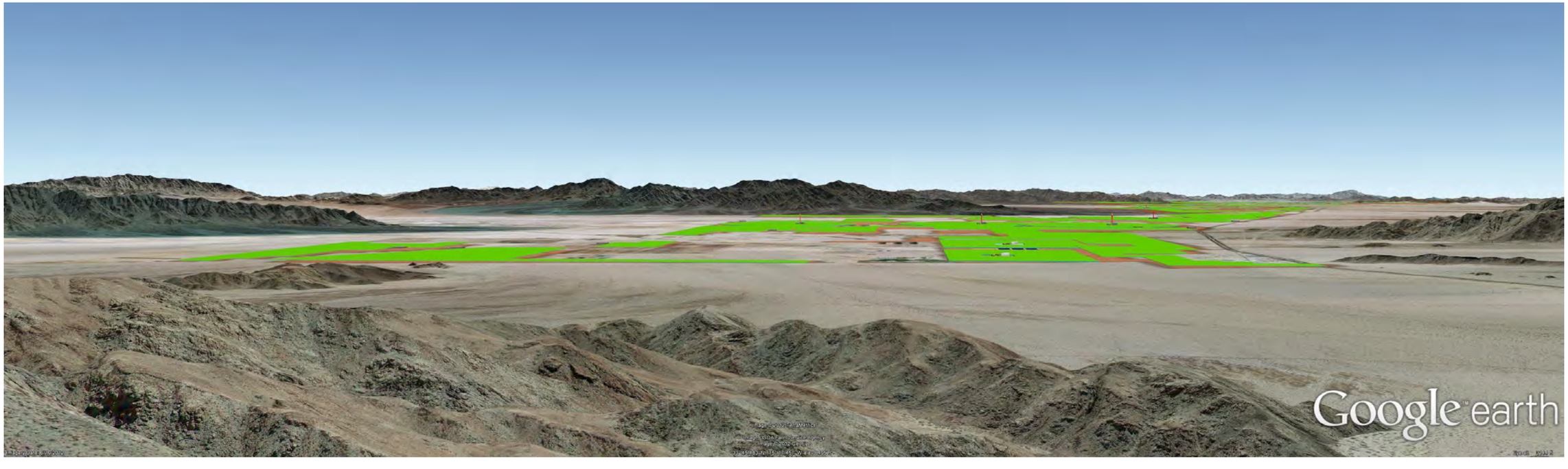

FIGURE 3.2-5 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Anschutz Peak and Cultural Sites KOP

plume sources could contribute substantially to visual contrasts from solar facilities in the SEZ, but the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

Central receiving towers located in the foreground would appear as brilliant non-point light sources on top of discernible towers, against the backdrop of the Chuckwalla Valley, Palen Mountains, or McCoy Mountains, depending on their placement within the SEZ. Central receiving towers located closest to the KOP would strongly attract and hold the viewer's attention, while those located further east would appear as distant, star-like points of light. Field observations of power tower facilities (Sullivan et al. 2012) have shown that reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012). If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would be visible at night from the Anschutz Peak and Cultural Sites KOP. Other lighting associated with the closer solar facilities would also likely be visible from this KOP; however, there are a variety of lights visible in the Chuckwalla Valley, such as from Desert Center and I-10.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to contrast strongly with the surrounding environment when viewed from the Anschutz Peak and Cultural Sites KOP. The broad expanse of facilities visible in the portion of the SEZ west of the Palen Mountains at distances ranging from 7 to 21 mi (11 to 34 km) would be a major visual disturbance that would be expected to dominate the view from the Anschutz Peak and Cultural Sites KOP. If power tower facilities were not located in the visible portions of the SEZ, contrasts would be lowered considerably, but would likely still be strong. Facility lighting could potentially cause substantial contrasts at night, but these contrasts could be reduced by implementing stringent lighting mitigation.

NPS did not provide information about visitors or visitation at the KOP; however, KOP use is likely to be very low. If it can be assumed that visitors to the KOP are interested in scenic views, those visitors would be subject to major visual impacts from solar development in the SEZ.

3.2.1.2 Aqua Peak

Aqua Peak, also known as Aqua Benchmark and Tensor Point, is located in the northeastern corner of Joshua Tree NP, in the Coxcomb Mountains. The highest peak of the northern Coxcomb Mountains, Aqua Peak is accessible only by foot, along a rough and rocky unmaintained wash/trail. Recorded trips to or near the peak can be found on hiking blogs and user-informed hiking websites such as Peakbagger.com (2012a) and SummitPost.org (2007). Guided day hikes to Aqua, Dyadic, and Spectre Peaks are occasionally offered by the Desert Peaks Section of the Angeles Sierra Club (Sierra Club 2010 and 2011). A trip record from 2007 indicates that the summit register found at the top of Aqua Peak dates to the 1960s (SummitPost.org 2007).

The Aqua Peak KOP is located at the summit of Aqua Peak, approximately 16.0 mi (26 km) north of the far western portion of the Riverside East SEZ. It is situated at an elevation of approximately 4,400 ft (1,341 m) above mean sea level and approximately 3,990 ft (1,216 m) above the center of the western portion of the Riverside East SEZ. Aqua Peak offers sweeping views of the surrounding valleys and mountain formations in all directions. From this KOP, one can see as far north as the Marble Mountains, as far west as the Pinto Mountains, as far south as the Chuckwalla Mountains and as far east as the Big Maria Mountains.

Cultural modifications potentially visible from the KOP include I-10 and several smaller roads, the community of Desert Center, the Lake Tamarisk housing development, a high-voltage transmission line, the Colorado River Aqueduct, and abandoned and actively farmed agricultural lands. These modifications detract slightly from the scenic qualities of the western portion of the SEZ, though some (e.g., I-10 and Desert Center) are very distant (20+ mi [32+ km]) from the KOP's location in the northern Coxcomb Mountains.

Figure 3.2-6 shows the Aqua Peak KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. The figure shows that there is somewhat scattered visibility of the SEZ in the vicinity of the KOP, with visibility limited primarily to the highest slopes and the summit of Aqua Peak. The peaks of the Coxcomb Mountains, located southeast of the KOP, screen views of much of the SEZ.

Figure 3.2-7 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Aqua Peak KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Aqua Peak KOP, solar development on 17,325 acres (70.112 km^2) or 12% of the SEZ would potentially be visible.

The figure shows that the nearest visible point in the Riverside East SEZ is 16 mi (26 km) from the Aqua Peak KOP. The farthest visible point in the SEZ is 49 mi (79 km) from the KOP. Much of the SEZ west of the Palen Mountains would be visible from the Aqua Peak KOP. In addition, a small section of the eastern portion of the SEZ could potentially be visible beyond the Palen Mountains.

In most of the visible portion of the SEZ, low-height solar facility components could potentially be seen from the KOP; however in some sections in the middle and far eastern section of the visible portion of the SEZ, only solar facility components measuring 150 ft (45.7 m) or taller, such as the upper portions of transmission towers and central receiving towers of power tower facilities, would be visible; and in other areas, only central receiving towers would be visible.

Figure 3.2-8 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Aqua Peak KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

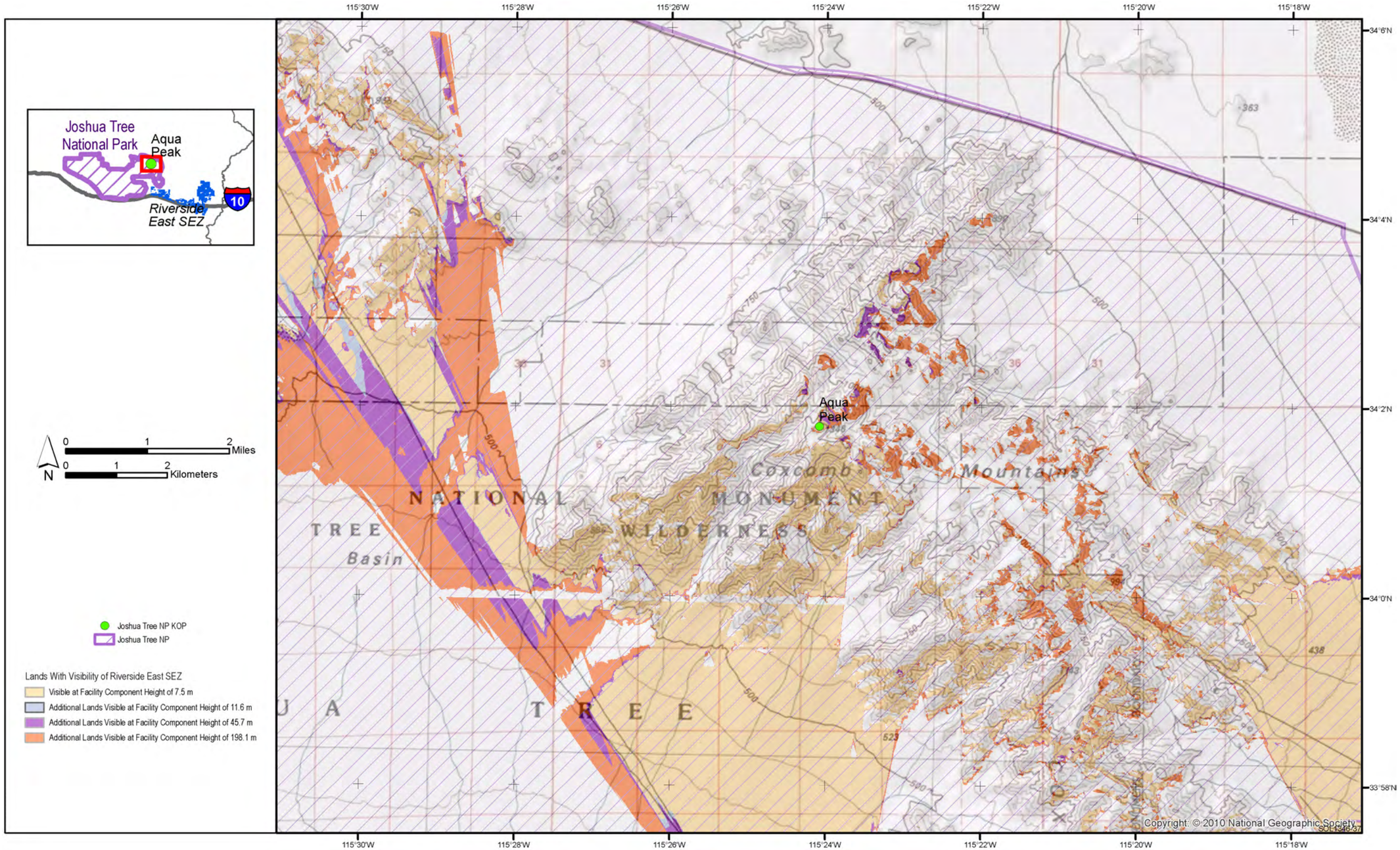

FIGURE 3.2-6 The Aqua Peak KOP within the Riverside East Viewshed

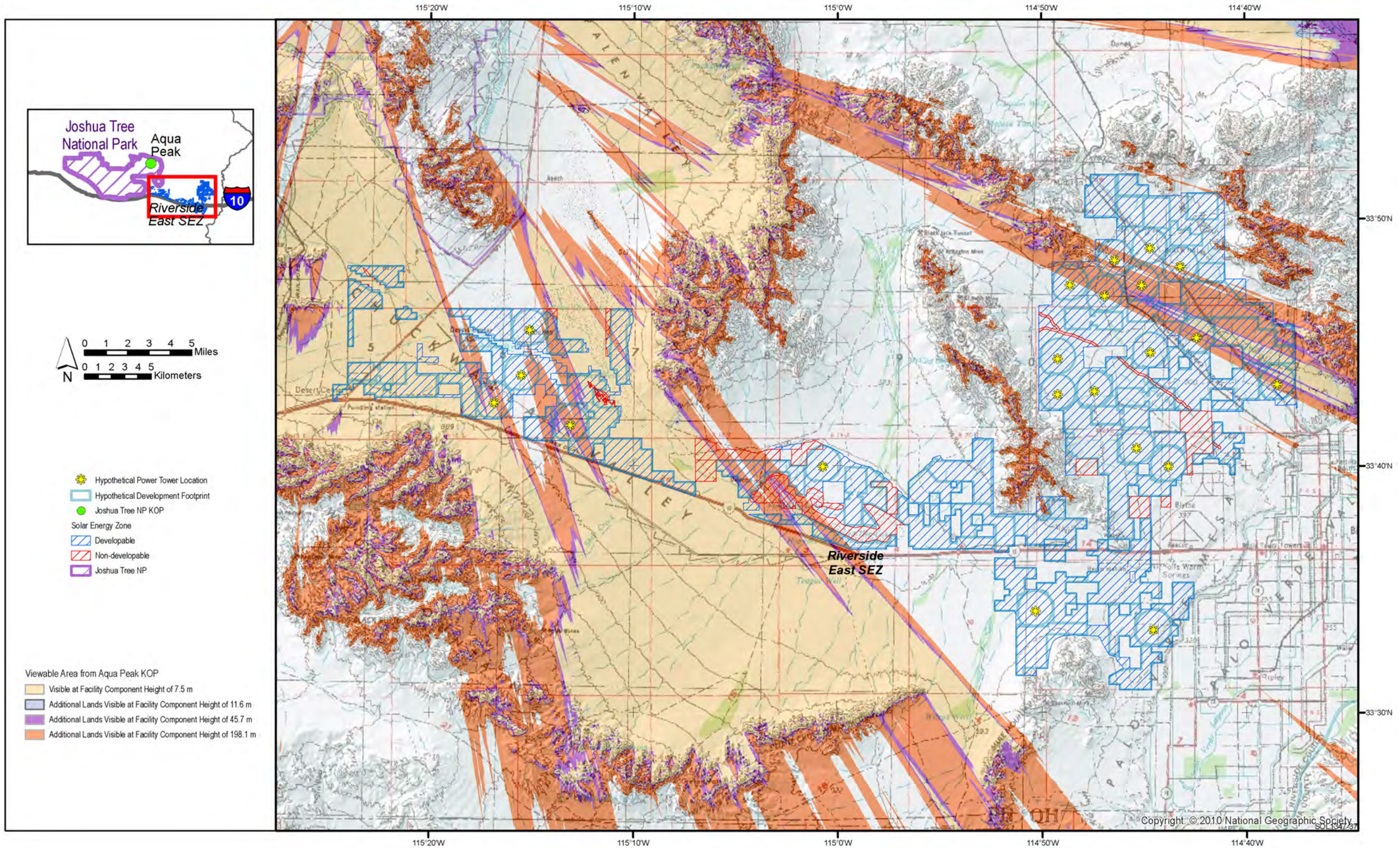

FIGURE 3.2-7 The Riverside East SEZ within the Aqua Peak KOP Viewshed

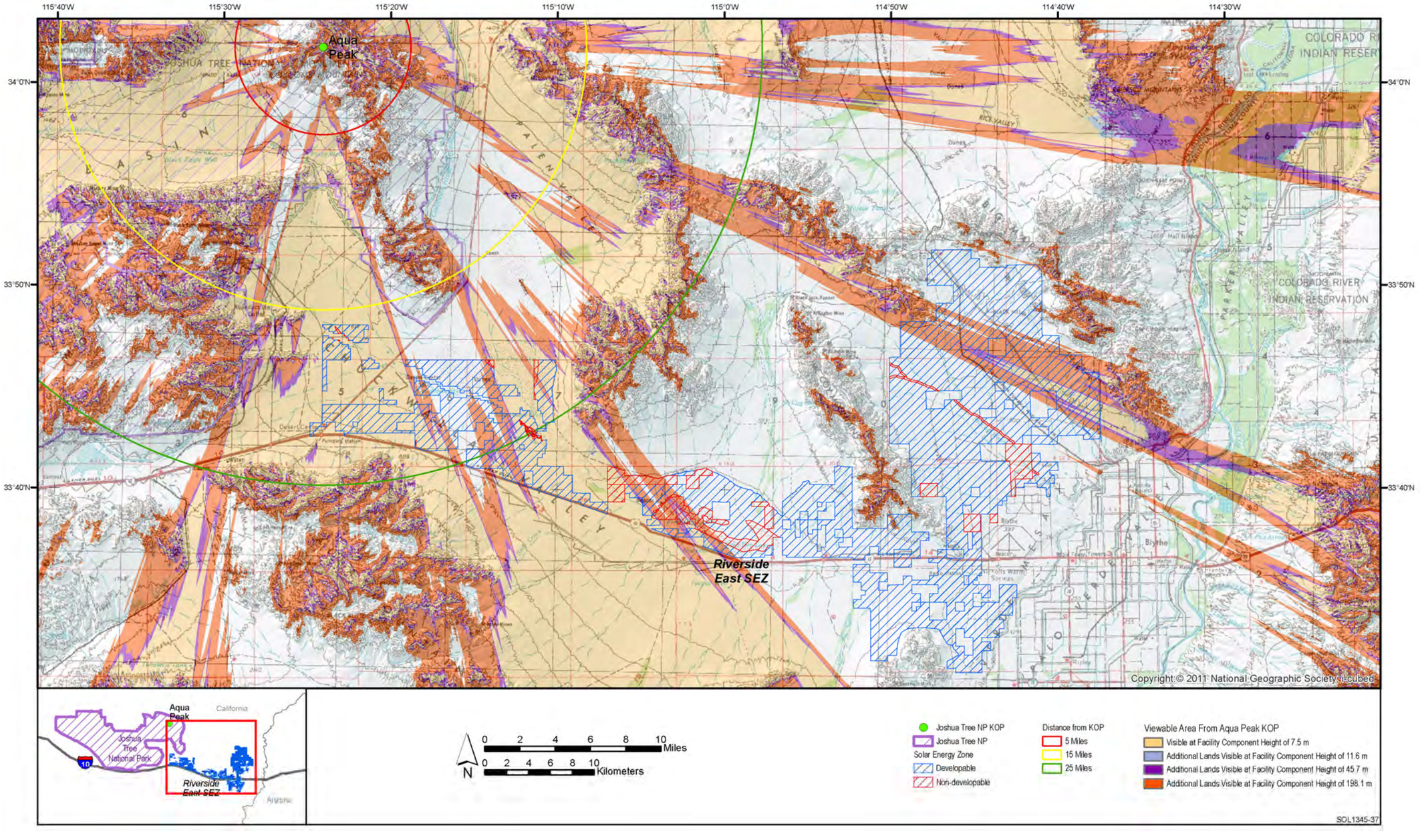

FIGURE 3.2-8 Close-up of the Riverside East SEZ with Facility Footprints within the Aqua Peak KOP

Figure 3.2-9 is a Google Earth visualization of the Riverside East SEZ (under the 80% development scenario) as seen from the Aqua Peak KOP. This visualization suggests that the western portion of the SEZ could be seen when facing south-southeast. A substantial portion of the SEZ is screened from view by Dyadic Peak and other mountains in the Coxcomb Range and, further east, by the Palen Mountains. Small areas in the eastern portion of the SEZ can be seen between gaps in the Palen Mountains when looking southeast.

The visualization shows that the KOP is sufficiently elevated that the tops and sides of solar collector/reflector arrays would be visible; however, given the 16-mi (26-km) distance to the SEZ, the vertical angle of view would be relatively low, and details of the facilities indistinct. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables. It is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

Because the KOP is north-northwest of the SEZ, the panels of non-tracking PV facilities would always face away from the KOP, and the likelihood of glinting from tracking PV panels or parabolic troughs would be very low. The long distance to the SEZ would probably reduce the brightness of reflections enough that they would not cause glare in any event.

The central receiving towers of power tower facilities in the SEZ would be visible and their tops would appear as bright, star-like points of light against the Chuckwalla Valley floor or the backdrop of the Chuckwalla Mountains, depending on their placement within the SEZ. Observed levels of contrast would vary depending on the mix of solar technologies sited in the SEZ. If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Aqua Peak KOP at night. Other lighting associated with the solar facility development could be visible from this KOP, but good mitigation practices could limit the associated visual contrasts considerably.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to contrast moderately with the surrounding environment when viewed from the Aqua Peak KOP. The broad expanse of facilities visible in the far western portion of the SEZ would be an obvious but not visually dominant visual disturbance that would extend across a significant portion of the observer's field of view. If power tower facilities were not located in the visible portions of the SEZ, contrasts would be lowered considerably, and might fall to weak levels depending on the facility types and layouts. Facility lighting could potentially cause some contrasts at night, but these contrasts could be reduced by implementing stringent lighting mitigation.

NPS did not provide information about visitors or visitation at the Aqua Peak KOP; however, KOP use is likely to be very low. Assuming that visitors to the KOP were interested in scenic views, they would be unlikely to miss the visual contrast of solar development with the surrounding landscape when looking towards the SEZ from this KOP. If only parabolic trough or PV facilities were located in the SEZ, overall contrasts would be reduced, but viewers would likely still see the solar facilities as unmistakable man-made elements, at least under some

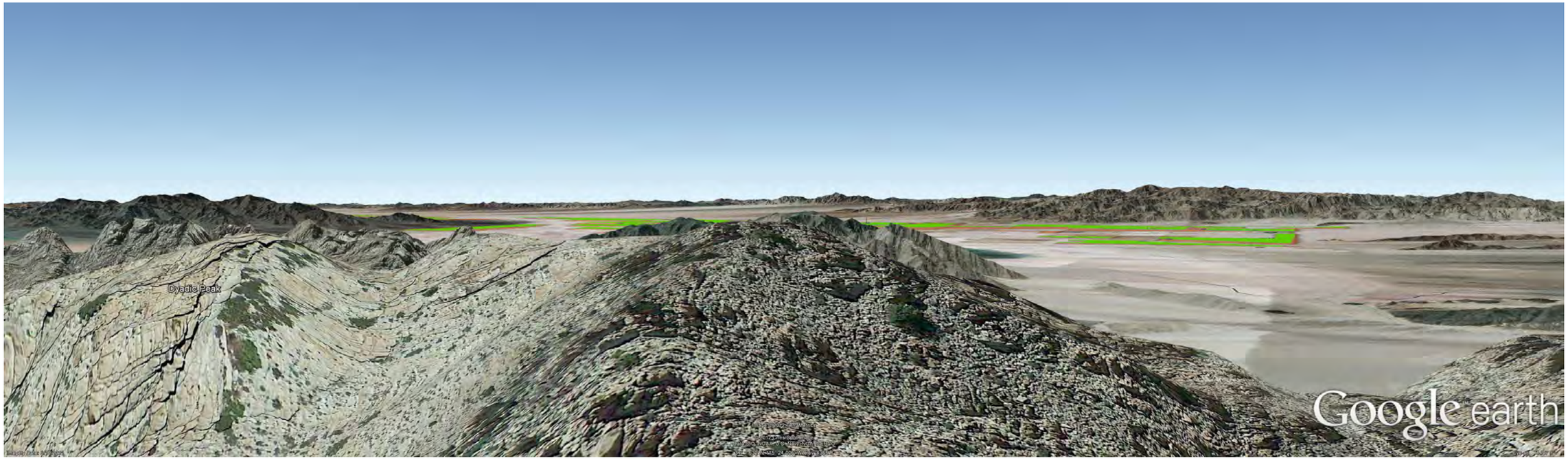

FIGURE 3.2-9 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Aqua Peak KOP

lighting conditions. If one or more power towers were in view, they would appear distinctly out of place in the daytime landscape and the bright lights would likely attract and hold the viewer's attention. Views of solar development from this KOP might negatively impact the viewer's perception of the generally natural-appearing landscape, and the KOP would likely be subjected to moderate visual impacts from solar development in the SEZ.

3.2.1.3 Big Wash Trail and Cultural Sites

Big Wash Trail, also known as Big Wash Corridor, is a hiking and 4-wheel-drive trail that links the Pinto Basin to the Chuckwalla Valley. The trail passes through the Eagle Mountains at the bottom of Big Wash and also connects to Black Eagle Mine Road Trail, which leads to Black Eagle Mine (a historic mining site), located just outside the park boundary. Big Wash Trail is located in the Joshua Tree Wilderness Area and is listed in the Joshua Tree Backcountry Management Plan (NPS 2000) as a trail for potential inclusion in a new trail system. It is also shown on the Joshua Tree Old Dale/Black Eagle Mine Roads backcountry map as Big Wash Hiking Corridor (NPS n.d.). The trail is also listed on the Trail Finder application of the outdoor adventure website GORP.com and is identified as a horse trail on the website of Joshua Tree Ranch, a nearby horse ranch which leads guided horseback tours (GORP.com 2012, Joshua Tree Ranch 2012).

The Big Wash Trail and Cultural Sites KOP is located near the terminus of Big Wash, on the eastern side of the Eagle Mountains, approximately 6 mi (9.7 km) west of the Riverside East SEZ. It is situated at an elevation of approximately 1,600 ft (487.7 m) above mean sea level and approximately1,190 feet (362.7 m) above the center of the western portion of the Riverside East SEZ. Facing east from the Big Wash Trail and Cultural Sites KOP, one can see across the Chuckwalla Valley to the Palen Mountains; however, this view is partially obstructed by the foothills of the Eagle Mountains. Big Wash stretches to the west as it winds its way along the base of the Eagle Mountains and the Eagle Mountain foothills dominate much of the view to the north and south.

Cultural modifications in the KOP viewshed include portions of I-10 and numerous other paved and dirt roads, the Lake Tamarisk housing development, a high-voltage transmission line, abandoned and actively-farmed agricultural lands, and at least three solar facilities currently under construction (Desert Sunlight, Desert Harvest, and Genesis). These modifications would likely detract noticeably from the scenic qualities of the western portion of the SEZ when viewed from this KOP, as some of the larger land modifications (Desert Sunlight, Desert Harvest, I-10) are located as close as 5.5 to 6 mi (9 to 9.7 km) away.

Figure 3.2-10 shows the Big Wash Trail and Cultural Sites KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could potentially be visible. The figure shows that the SEZ is clearly visible from the Big Wash Trail and Cultural Sites KOP and is visible for a little over 2 mi (3.2 km) west along the trail.

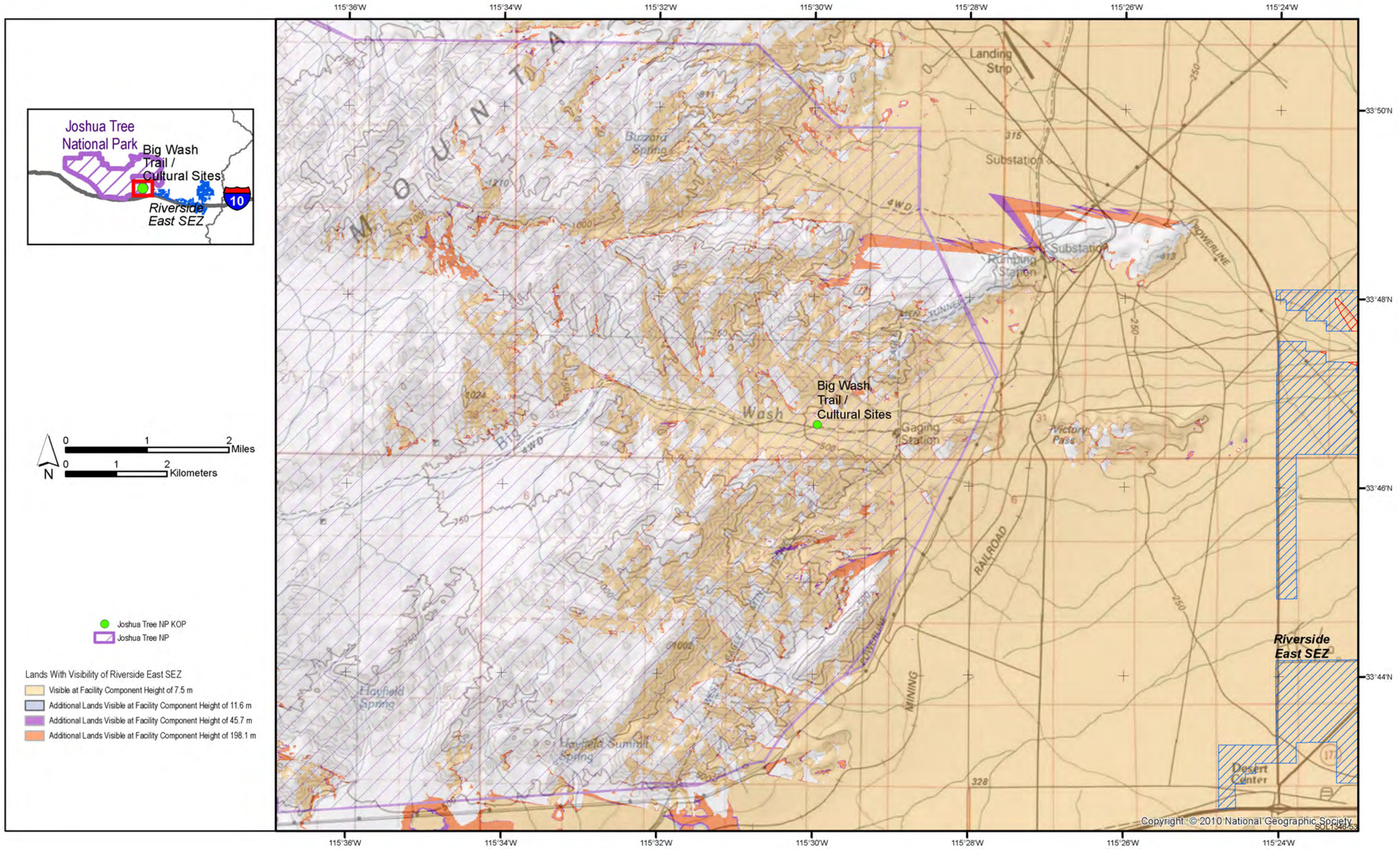

FIGURE 3.2-10 The Big Wash Trail and Cultural Sites KOP within the Riverside East Viewshed

Figure 3.2-11 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Big Wash Trail and Cultural Sites KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. This figure show that the majority of the western portion of the SEZ can be seen, from its western edge to its eastern terminus south of I-10 near the City of Blythe. A section of the SEZ that lies between the Eagle and Palen Mountains, as well as the far southwestern corner of the SEZ, is partially obstructed by the foothills of the Eagle Mountains. Within 25 mi (40 km) of the Big Wash Trail and Cultural Sites KOP, solar development on 22,277 acres (90.152 km^2) or 15% of the Riverside East SEZ is potentially visible.

The nearest visible point within the Riverside East SEZ is approximately 6 mi (9.7 km) from the Big Wash Trail and Cultural Sites KOP, and the farthest visible point in the SEZ is approximately 48 mi (77 km) from the KOP. In almost the entire visible portion of the SEZ, low-height solar facility components could potentially be seen from this KOP. In the far southeastern corner of the SEZ, only solar facility components measuring150 ft (45.7 m) or taller, such as the upper portions of transmission towers and central receiving towers, would be visible. In some slivers throughout the SEZ, only the upper portions of central receiving towers would be visible.

Figure 3.2-12 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Big Wash Trail and Cultural Sites KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-13 is a Google Earth visualization of the Riverside East SEZ as seen from the Big Wash Trail and Cultural Sites KOP. This visualization suggests that looking east from the Big Wash Trail and Cultural Sites KOP, the SEZ occupies approximately 43° of the viewer's field of view. Much of the Riverside East SEZ, from its western edge to the McCoy Mountains, can be seen, although the view is partially obstructed by the foothills of the Eagle Mountains.

The visualization shows that from this elevated viewpoint, the angle of view is high enough that the tops and sides of solar collector/reflector arrays would be visible from this KOP. In portions of the SEZ closest to the KOP, the shape and size of arrays would be discernible and their strong regular geometry more apparent. Foreshortening would cause the solar collector arrays in facilities located further east to blend together and appear as a thick band extending the length of the Chuckwalla Valley, repeating the flat line of the valley floor. Taller vertical components, such as support buildings, power blocks, cooling towers, and transmission towers, would be visible in facilities closest to the KOP extending above the collector/reflector arrays and creating form and line contrasts with the strong regular geometry of the array fields; but for facilities located in the distance, they would likely blend in with the surrounding development. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

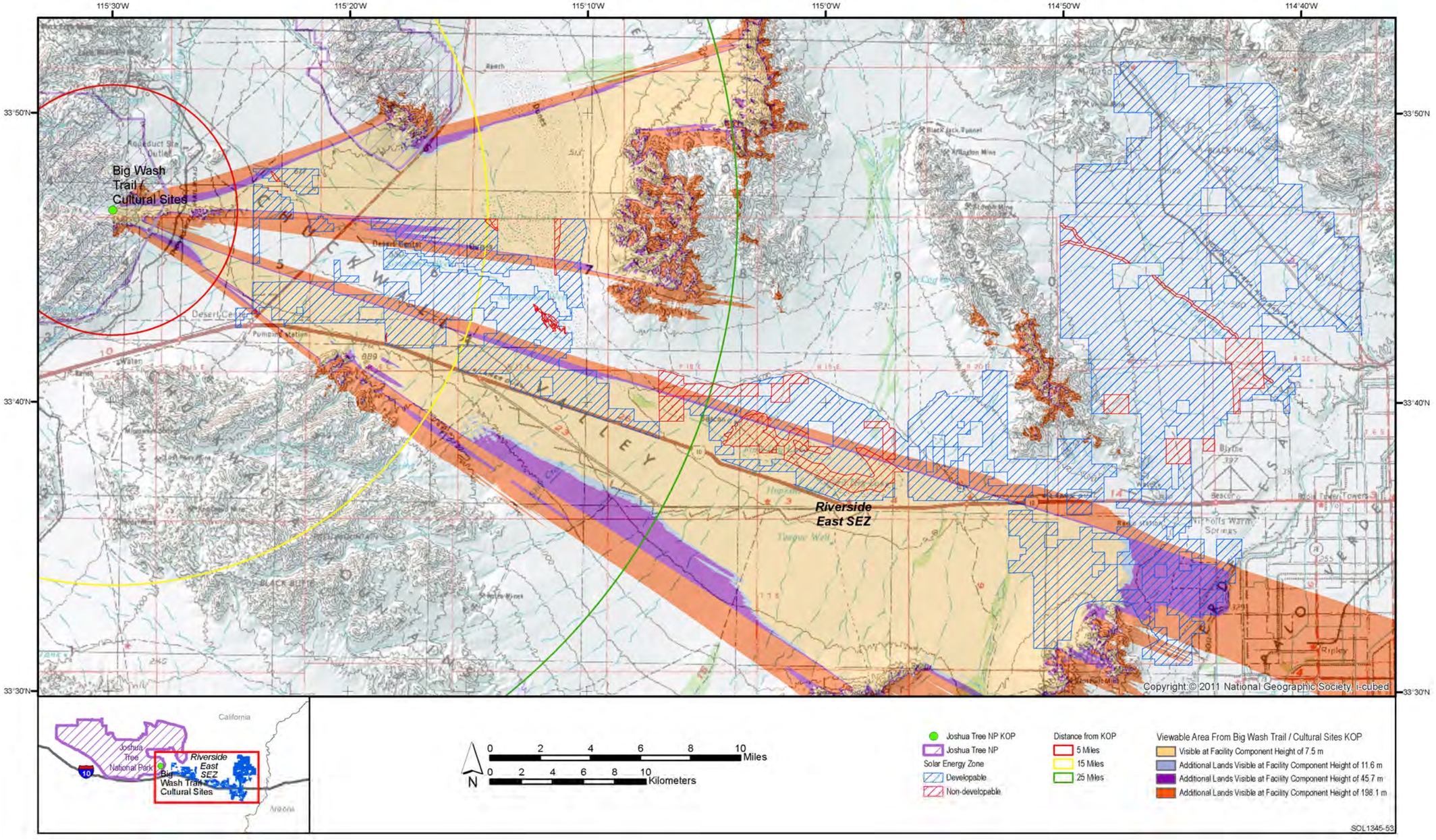

FIGURE 3.2-11 The Riverside East SEZ within the Big Wash Trail and Cultural Sites KOP Viewshed

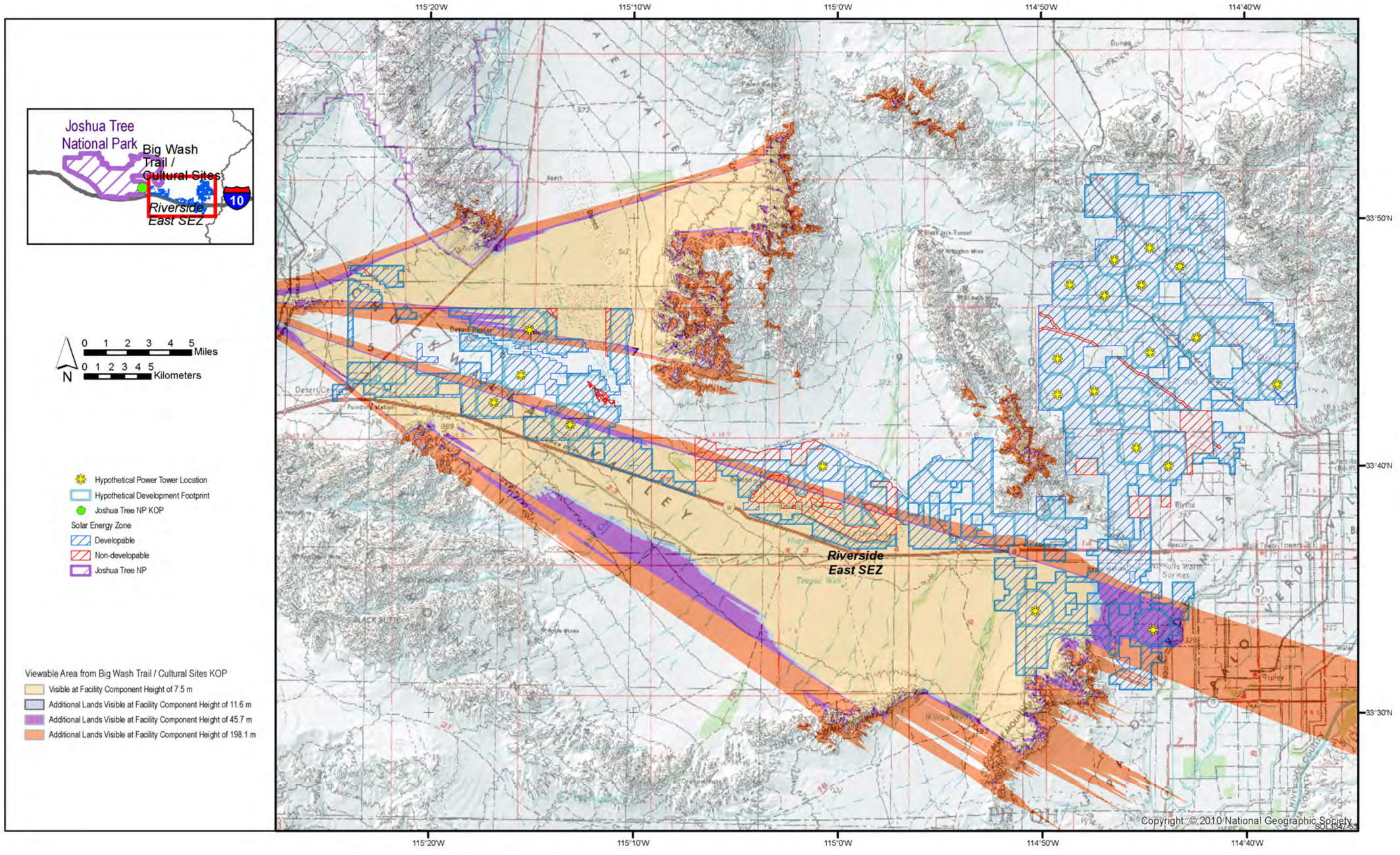

FIGURE 3.2-12 Close-up of the Riverside East SEZ with Facility Footprints within the Big Wash Trail and Cultural Sites KOP Viewshed

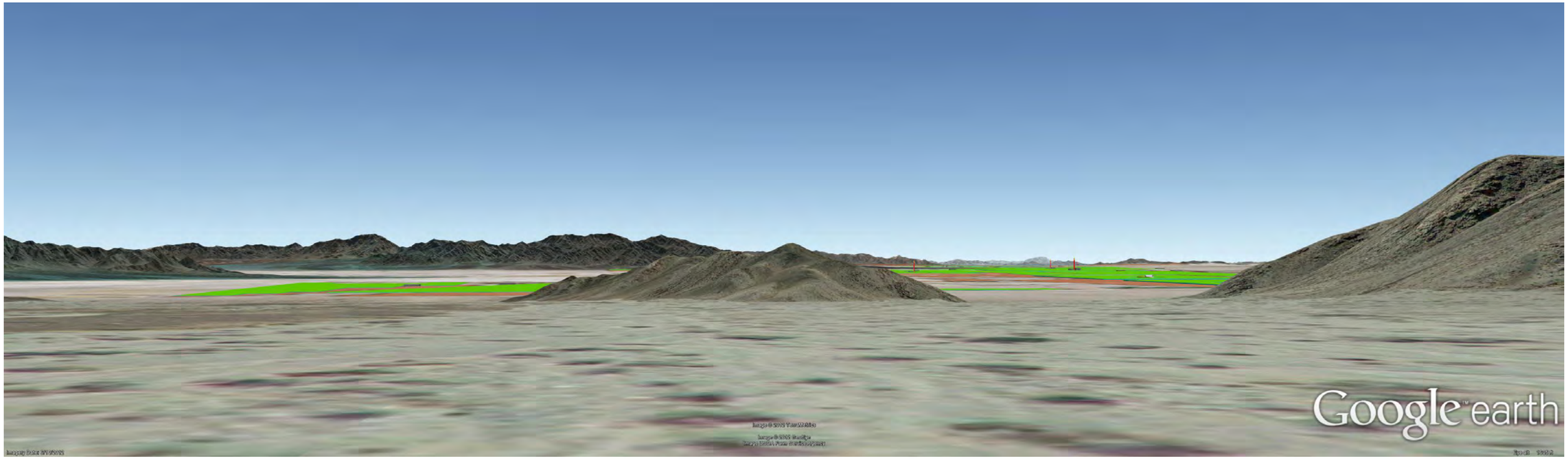

FIGURE 3.2-13 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Big Wash Trail and Cultural Sites KOP

Central receiving towers would be visible, and their tops would appear as bright points of light set against the backdrop of the sky, Chuckwalla Valley floor, or the McCoy Mountains, depending on their placement within the SEZ. Field observations of power tower facilities (Sullivan et al. 2012) have shown that reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012). If located further east within the SEZ, these towers would appear as distant star-like points of light. Central receiving towers located in the closest portion of the SEZ to this KOP would strongly attract and hold the viewer's attention when viewed from the KOP. Field observations of power tower facilities (Sullivan et al 2012) suggest that 100+-MW power towers would produce moderate to strong visual contrasts at viewing distances of 5 to 20 mi (8 to 32 km).

If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Big Wash Trail and Cultural Sites KOP at night; however, a variety of lights within the valley, including lighting from I-10 and the communities of Lake Tamarisk and Desert Center, may already be visible. Other lighting at surrounding solar facilities would likely be visible as well, with the amount of contrast dependent upon the mix of solar facilities and the degree to which lighting was mitigated to reduce night-sky impacts.

The discontinuous shape of the SEZ would be noticeable in areas closest to the KOP, where the angle of view from the KOP is higher, but would appear less noticeable further east. Development may also appear denser further east.

Because the KOP is located directly west of the SEZ, views in the late afternoon would be towards western-facing parabolic trough mirrors and other west-facing collectors (i.e., heliostats on the eastern side of power towers). Field observations of parabolic trough facilities (Sullivan et al. 2012) suggest that reflected light from the collectors might be visible from this KOP at certain times during the day, adding to the visual complexity of the surrounding development. Reflected light might be seen as a bright spot or as several bright spots in close proximity to each other in a horizontal row across the center of the trough. Given the viewing angle and location of the KOP in relation to the SEZ, reflections would likely be limited to short periods of time in mid-day and late afternoon. Similar but potentially less intense reflection might be seen from tracking PV panels, when they are facing west in the afternoon. It is possible that reflected light from west-facing heliostats at power tower facilities would be present; however, the potential impacts are uncertain. It is unlikely that fixed PV panels would contribute any reflected light, as they would be oriented south. Given the short distance to the SEZ, reflected light from parabolic trough facilities located closest to the KOP may be more intense and may cause more visual discomfort than light reflected from those further east. More definite knowledge of the occurrence of light reflection and glint/glare patterns could be obtained through a glint/glare analysis conducted during a project-specific environmental impact assessment.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to yield very strong contrasts with the surrounding landscape when viewed from the Big Wash Trail and Cultural Sites KOP. Facilities

visible throughout the Chuckwalla Valley are expected to dominate the view from this KOP and to be a significant visual disturbance. Contrasts would be somewhat lower if power tower facilities were not placed within the visible portion of the SEZ, but would still likely be strong. Facility lighting could cause considerable contrasts at night, but could be reduced through stringent mitigation measures.

NPS did not provide information about visitors or visitation to the Big Wash Trail and Cultural Sites KOP; however, KOP use is likely to be low. This KOP appears to be a point on a backcountry trail and it can be assumed that visitors to the KOP would be interested in solitude and scenic vistas. Viewers at this location would not miss the visual contrast of solar development with the surrounding landscape when looking east from this KOP. If only parabolic trough or PV facilities were located in the SEZ, overall contrasts might be reduced, but viewers would still see unmistakable man-made elements. If one or more power towers were in view, they would appear distinctly out of place in the daytime landscape and their bright lights would likely attract and hold the viewer's attention. Depending on the direction of travel, the SEZ would be the first or last thing seen when hiking along the Big Wash Trail. This view of solar development would be expected to constitute a major visual impact for viewers at the KOP.

3.2.1.4 Coxcomb Alluvial Fans

The Coxcomb Alluvial Fans KOP is located in the northeastern Coxcomb Mountains, in a remote wilderness area of Joshua Tree NP. It is situated approximately 15 mi (24 km) north of the Riverside East SEZ at its closest point. The KOP is at an elevation of 2,645 ft (806 m) above mean sea level and approximately 2,240 ft (683 m) above the center of the western portion of the Riverside East SEZ. From this KOP, one can see across the Palen Valley to the Granite and Palen Mountains to the east; across the Cadiz Valley to the Marble and Bristol Mountains to the north; the Iron Mountains to the northeast; and the rugged peaks of the Coxcomb Mountains to the west.

Cultural modifications in the KOP viewshed include portions of California State Highways 72 and 177, portions of dirt roads, and a small section of the Colorado River Aqueduct. I-10 is theoretically visible from this KOP, but it is located approximately 25 mi (40 km) away. These modifications are not a significant source of visual contrast and, at most, would detract only slightly from the scenic qualities of the western portion of the SEZ as seen from this KOP.

Figure 3.2-14 shows the Coxcomb Alluvial Fans KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. The figure shows that visibility of the SEZ from this KOP is limited to the crest of the alluvial fans.

Figure 3.2-15 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Coxcomb Alluvial Fans KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. The figure shows that only a portion of the Riverside East SEZ that lies within the Chuckwalla

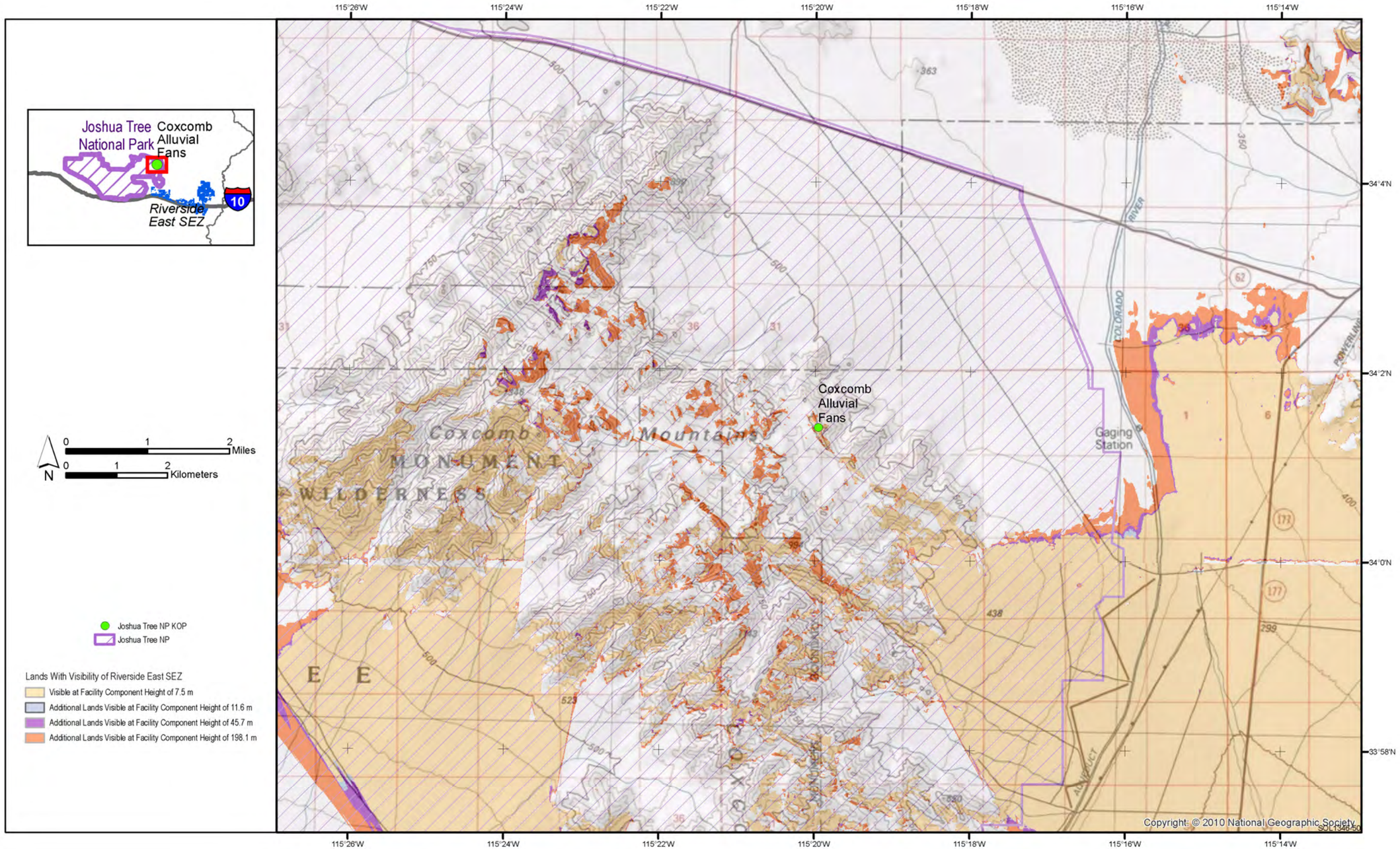

FIGURE 3.2-14 The Coxcomb Alluvial Fans KOP within the Riverside East Viewshed

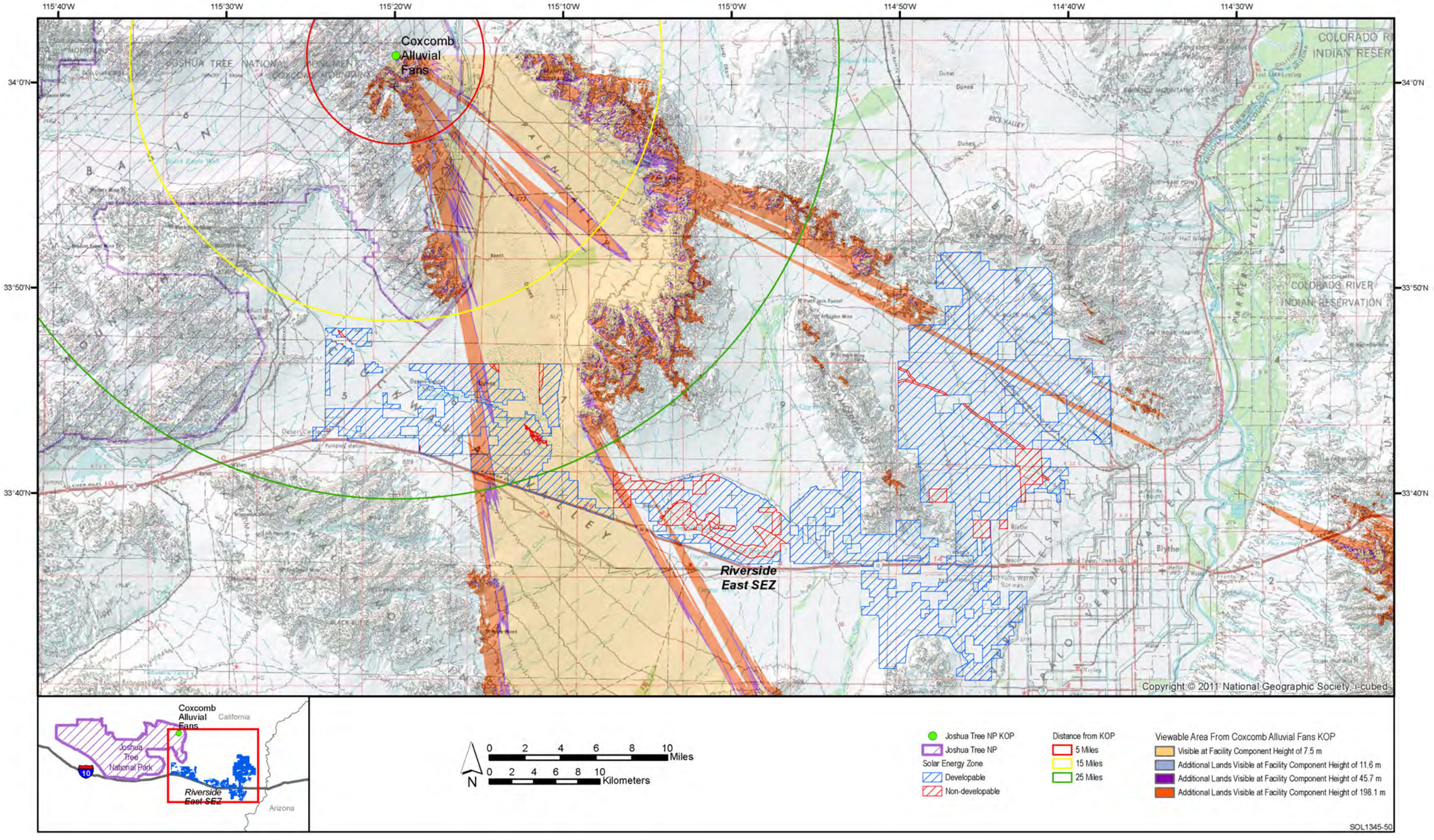

FIGURE 3.2-15 The Riverside East SEZ within the Coxcomb Alluvial Fans KOP Viewshed

Valley south of the Coxcomb Mountains and south and west of the Palen Mountains is visible. In addition, a very thin sliver of the portion of the SEZ located on the Palo Verde Mesa is potentially visible. Within 25 mi (40 km) of the KOP, solar development on 12,866 acres (52.067 km^2) or 9% of the SEZ would potentially be visible.

The nearest visible point within the Riverside East SEZ is approximately 15 mi (24 km) from the Coxcomb Alluvial Fans KOP, and the farthest visible point in the SEZ is approximately 45 mi (73 km) from the KOP. In almost the entire visible portion of the SEZ, low-height solar facility components could potentially be visible from this KOP; however, along the eastern and western edges of the visible area of the SEZ, only facility components of 150 ft (45.7 m) and taller, such as the upper portions of transmission lines and central receiving towers of power tower facilities, could potentially be seen.

Figure 3.2-16 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Coxcomb Alluvial Fans KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-17 is a Google Earth visualization of the Riverside East SEZ as seen from the Coxcomb Alluvial Fans KOP. The visualization suggests that looking south-southeast from this KOP, the SEZ occupies approximately 15° of the viewer's field of view. There is a clear view of the small portion of the SEZ that is located in the Chuckwalla Valley, south of the Coxcomb Mountains and south and west of the Palen Mountains; however, much of the SEZ is obstructed by the Coxcomb and Palen Mountains.

This visualization shows that from this elevated viewpoint in the Coxcomb Alluvial Fans KOP, the tops and sides of solar collector/reflector arrays of solar facilities in the SEZ would be seen. However, given the long distance of 15 mi (24 km) to the nearest point in the SEZ, the angle of view is relatively low, and arrays and heliostats would appear as a thin irregular band across the flat valley floor. Taller, vertical components such as support buildings, power blocks, cooling towers, and transmission towers might extend above the collector/reflector arrays, creating form and line contrasts with the strong horizontal line of the arrays, but because of the long distance to the SEZ, except for the central receiving towers of power tower facilities, solar facility components would not likely be noticed by the casual observer. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables. It is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

Field observations (Sullivan et al. 2012) suggest that central receiving towers of power tower facilities located in the visible portion of the SEZ would be perceived as star-like points of light when viewed from this KOP. If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would also be visible from the Coxcomb Alluvial Fans KOP at night. Other night lighting associated with solar facilities would also

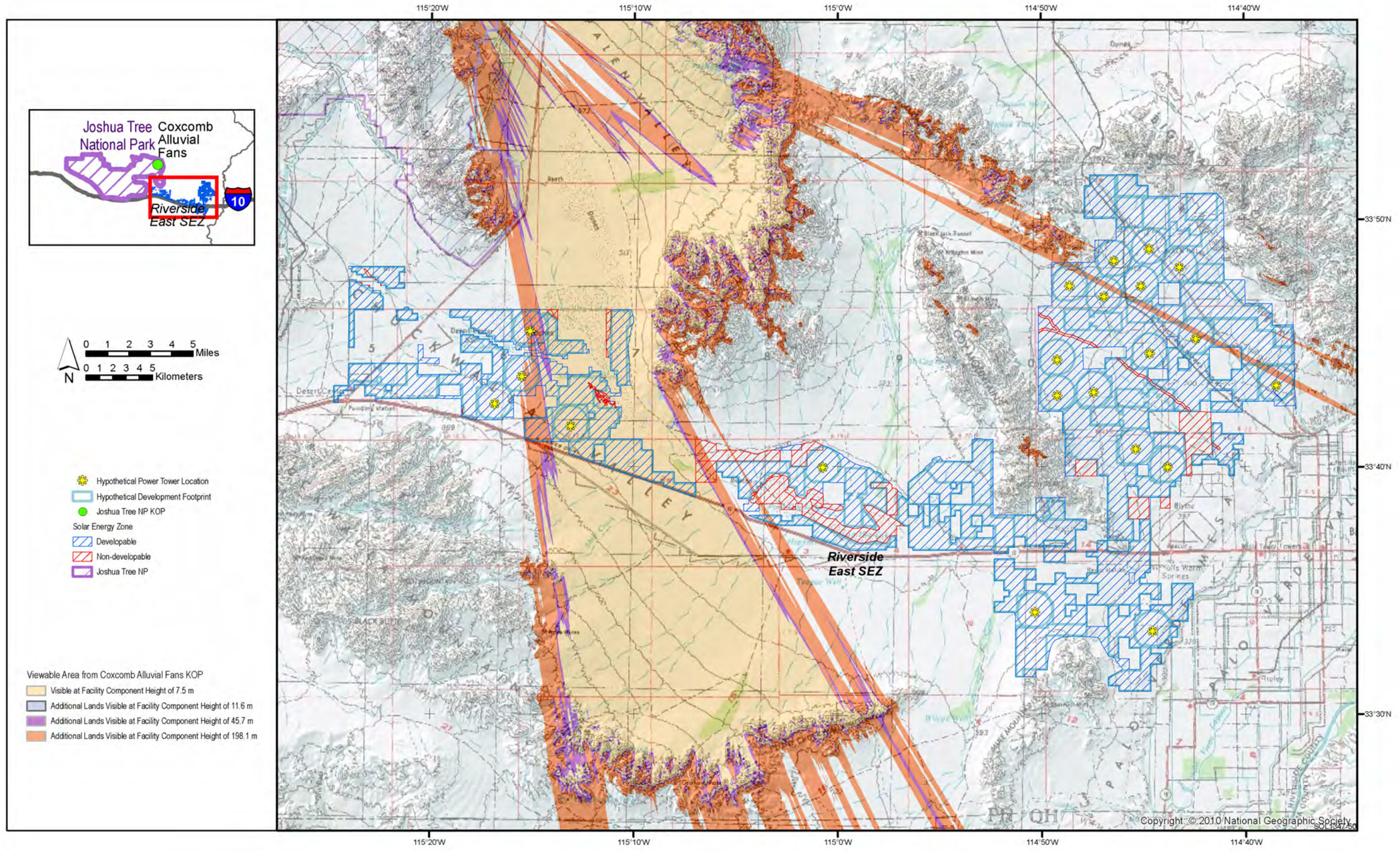

FIGURE 3.2-16 Close-up of the Riverside East SEZ with Facility Footprints within the Coxcomb Alluvial Fans KOP Viewshed

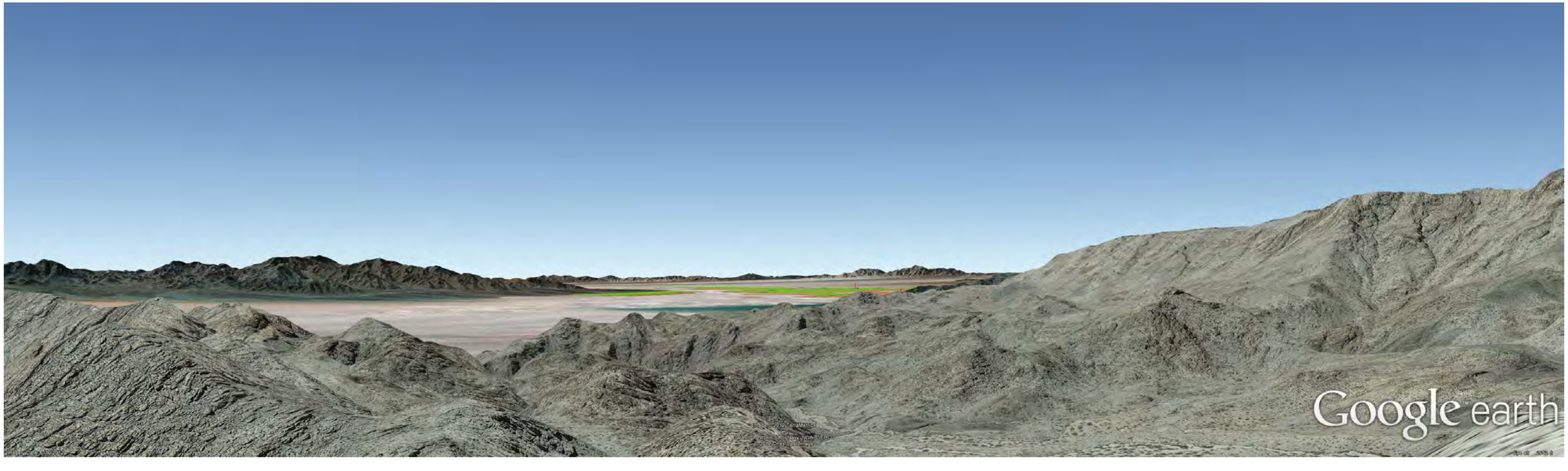

FIGURE 3.2-17 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Coxcomb Alluvial Fans KOP

potentially be visible, with the degree of contrast dependent on the mix of facilities and the type of mitigation measures employed. Lights associated with development in the valley would also likely be visible at night.

This KOP is located north of the SEZ, and views from the KOP would be towards the sides of parabolic trough arrays, the faces of north-facing heliostats on the south side of power towers, and the shaded side of PV facilities and other south-facing collector arrays such as tracking PV panels and south-facing heliostats. On the basis of field observations of parabolic trough and PV facilities (Sullivan et al. 2012), reflector/collector arrays might be visible from this KOP, depending on the time of day, lighting, weather, and atmospheric conditions. Given the viewing direction and distance, it is unlikely that glint/glare from PV facilities, parabolic trough facilities, or heliostats would be observed; however, a more complete glint/glare analysis would be conducted during project-specific analysis.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to yield weak to moderate contrasts with the surrounding landscape when viewed from the Coxcomb Alluvial Fans KOP, with contrast likely to be weak if development is limited to low-height technologies such as PV and parabolic trough facilities. Contrasts would be expected to be moderate if multiple central receiving towers were placed within the visible portion of the SEZ.

NPS did not provide information about visitors or visitation to the Coxcomb Alluvial Fans KOP; however, KOP use is likely to be very low. It can be assumed that visitors to the KOP would be interested in solitude and scenic vistas. If one or more power towers were in view, they would appear distinctly out of place in the daytime landscape and their bright lights could attract the viewer's attention, likely resulting in minor or moderate impacts for sensitive viewers. If only low-height facilities were located within the visible portion of the SEZ, minor visual impacts would be expected.

3.2.1.5 Coxcomb Peak

Coxcomb Peak is located in the southern Coxcomb Mountains, in a remote wilderness area of Joshua Tree NP. The Coxcomb Peak KOP is located at the summit of Coxcomb Peak. The Colorado River Aqueduct runs through the southern section of the Coxcomb Mountains, directly under the ridgeline that creates Coxcomb Peak. There is no maintained trail to Coxcomb Peak, and the peak is only accessible by foot. At its closest point, Coxcomb Peak is situated approximately 5 mi (8 km) north-northeast of the Riverside East SEZ, at an elevation of approximately 2,940 ft (896 m) above mean sea level and approximately 2,530 ft (771 m) above the center of the eastern portion of the Riverside East SEZ. Looking east and north from this KOP, the Palen and Granite Mountains can be seen across the extent of the Palen Valley. To the southeast, the view extends across the Chuckwalla Valley to the Mule Mountains, south of I-10. The peaks of the Coxcomb Mountains can be seen to the north and south. The Pinto Mountains are visible to the northwest, across the western extent of the Pinto Basin.

Cultural modifications in the KOP viewshed include portions of I-10, California State Highway 177, and numerous other paved and dirt roads; the Lake Tamarisk housing development; a high-voltage transmission line; abandoned and actively farmed agricultural lands; and at least three solar energy facilities currently under construction (Desert Sunlight, Genesis, and Desert Harvest). These modifications would detract from the scenic qualities of the western portion of the SEZ as seen from this KOP; some of the man-made facilities (e.g., the Desert Sunlight and Desert Harvest facilities) are as close as 4 mi (6 km) away.

Figure 3.2-18 shows the Coxcomb Peak KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. This figure shows that development within the SEZ is visible from the southeast-facing slopes of Coxcomb Peak, as well as from the surrounding higher-elevation peaks within the southern Coxcomb Mountains.

Figure 3.2-19 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Coxcomb Peak KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Coxcomb Peak KOP, solar development on 32,061 acres (129.75 km^2) or 22 % of the SEZ would potentially be visible.

This figure shows that most of the SEZ, from its western edge to the portion that falls just north of the intersection of I-10 and Wiley's Well Rest Area, would be visible; however a small portion south of the terminus of the Coxcomb Mountains and north of I-10 is obstructed by the Coxcomb Mountains. A small portion of the SEZ located south of I-10 and north of the Mule Mountains is also potentially visible, but very distant from the KOP. Portions of the SEZ located north of I-10 and east of Wiley's Well Rest Area would not be visible. The nearest visible point within the Riverside East SEZ is approximately 5 mi (8 km) from the SEZ, and the farthest visible point in the SEZ is approximately 42 mi (68 km) from the KOP.

Figure 3.2-20 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Coxcomb Peak KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figures 3.2-21 and 3.2-22 are Google Earth visualizations of the Riverside East SEZ as seen from the Coxcomb Peak KOP. Because the SEZ stretches across a very large portion of the horizontal field of view from the KOP, two images are needed to show all potentially visible portions of the SEZ. The images overlap slightly at the right side of Figure 3.2-21 and the left side of Figure 3.2-22, respectively. These visualizations show that looking south from the Coxcomb Peak KOP, the visible portion of the SEZ occupies approximately 105° of the viewer's field of view, although a small portion of the SEZ is obstructed by the southern Coxcomb Mountains.

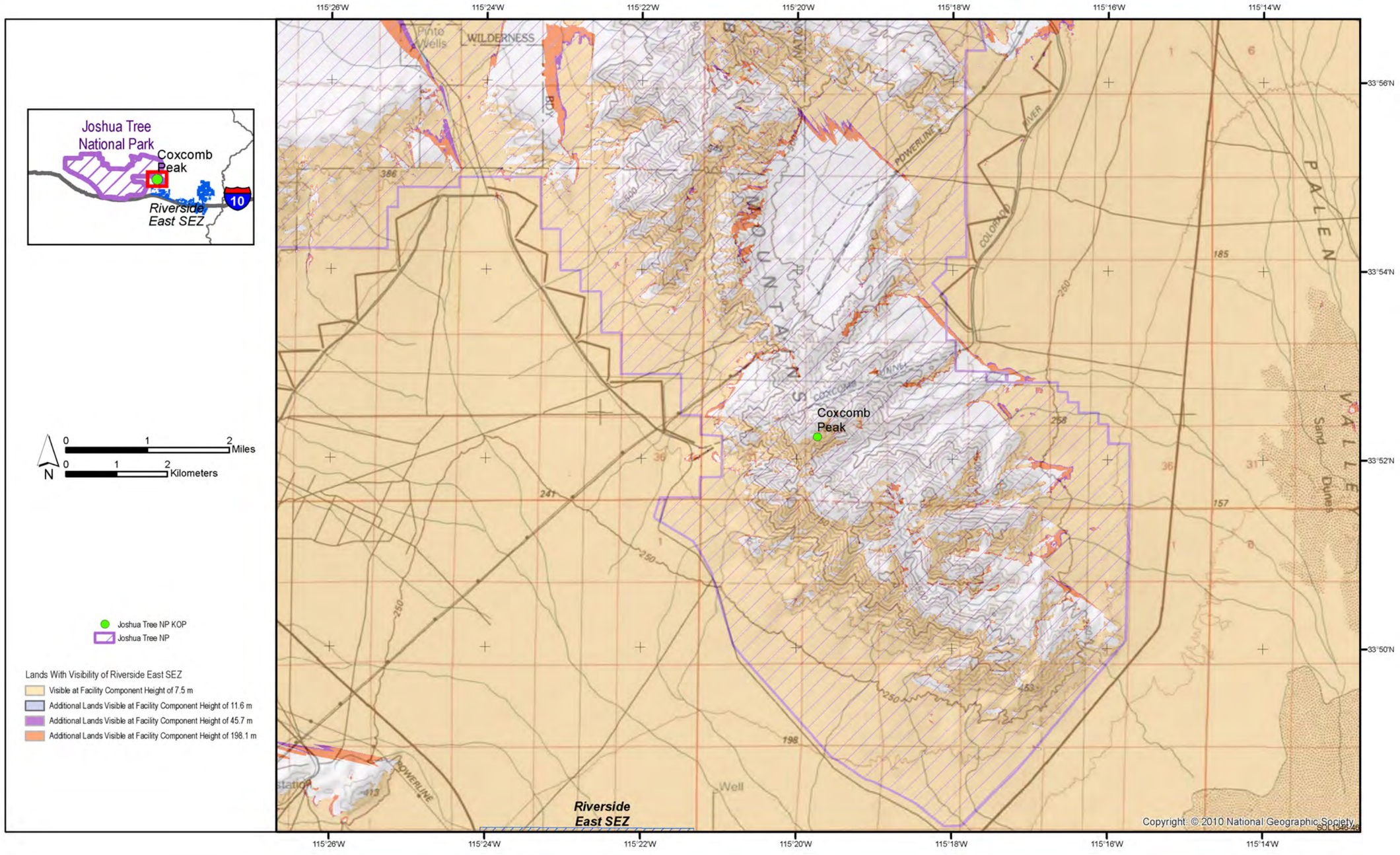

FIGURE 3.2-18 The Coxcomb Peak KOP within the Riverside East Viewshed

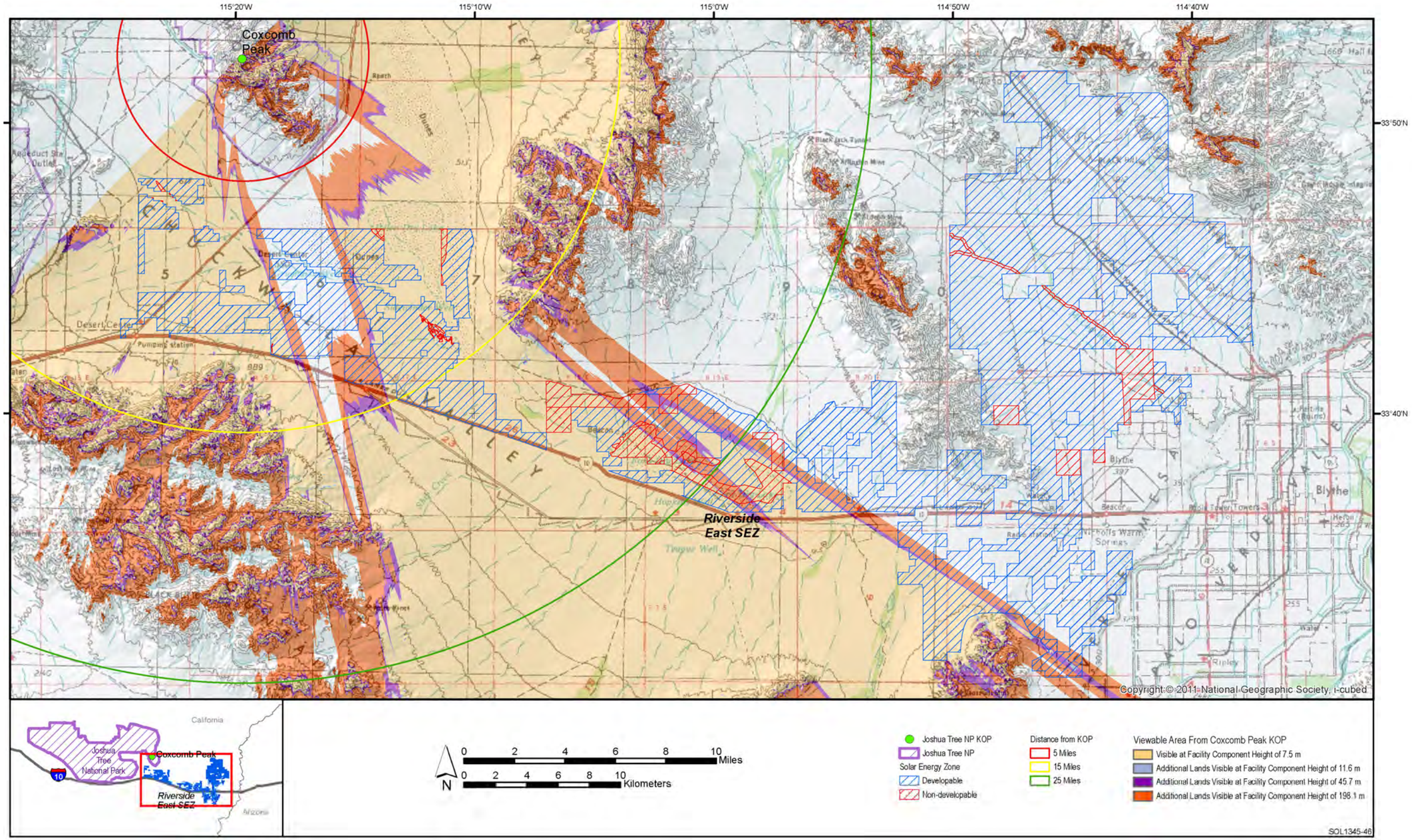

FIGURE 3.2-19 The Riverside East SEZ within the Coxcomb Peak KOP Viewshed

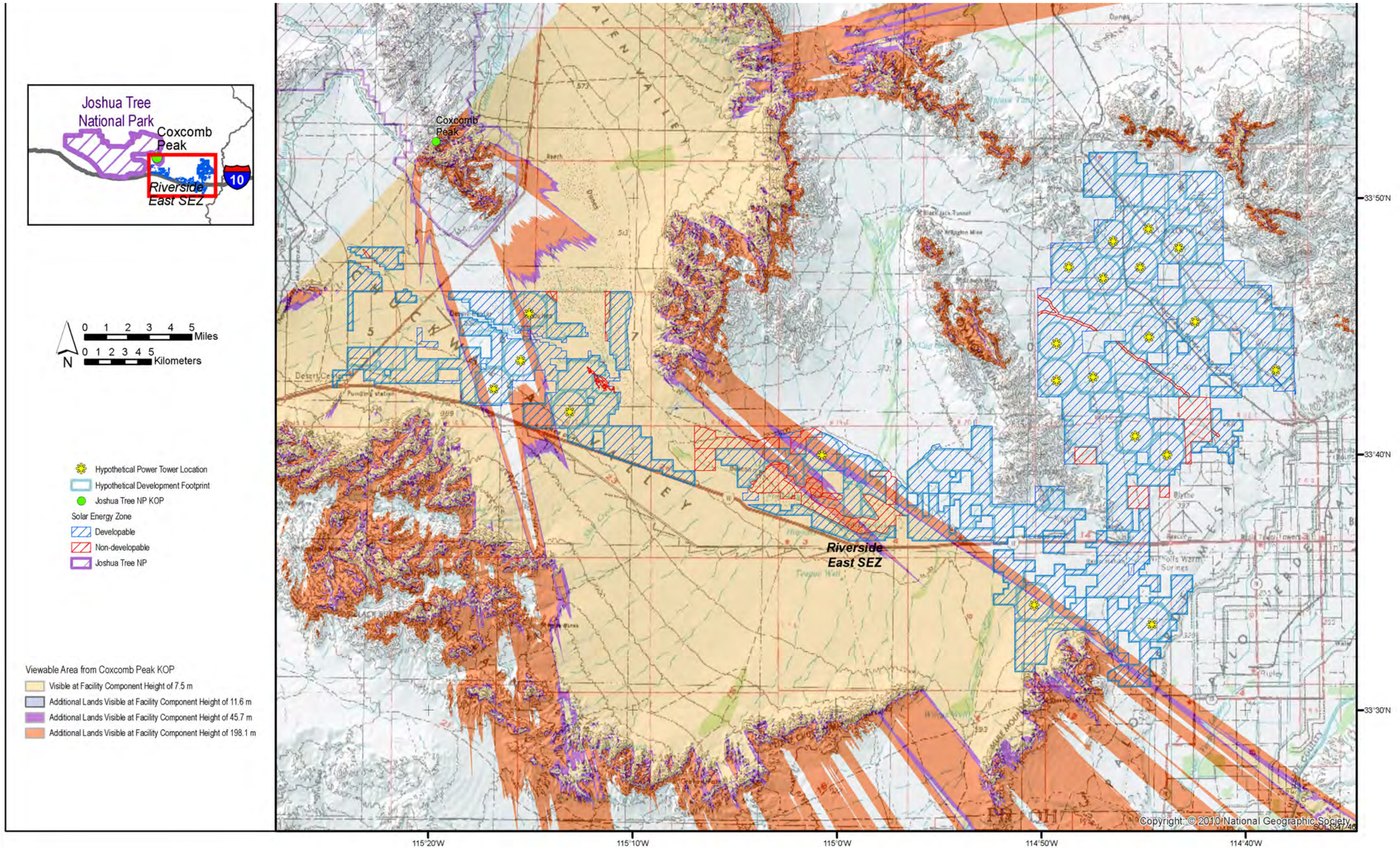

FIGURE 3.2-20 Close-up of the Riverside East SEZ with Facility Footprints within the Coxcomb Peak KOP Viewshed

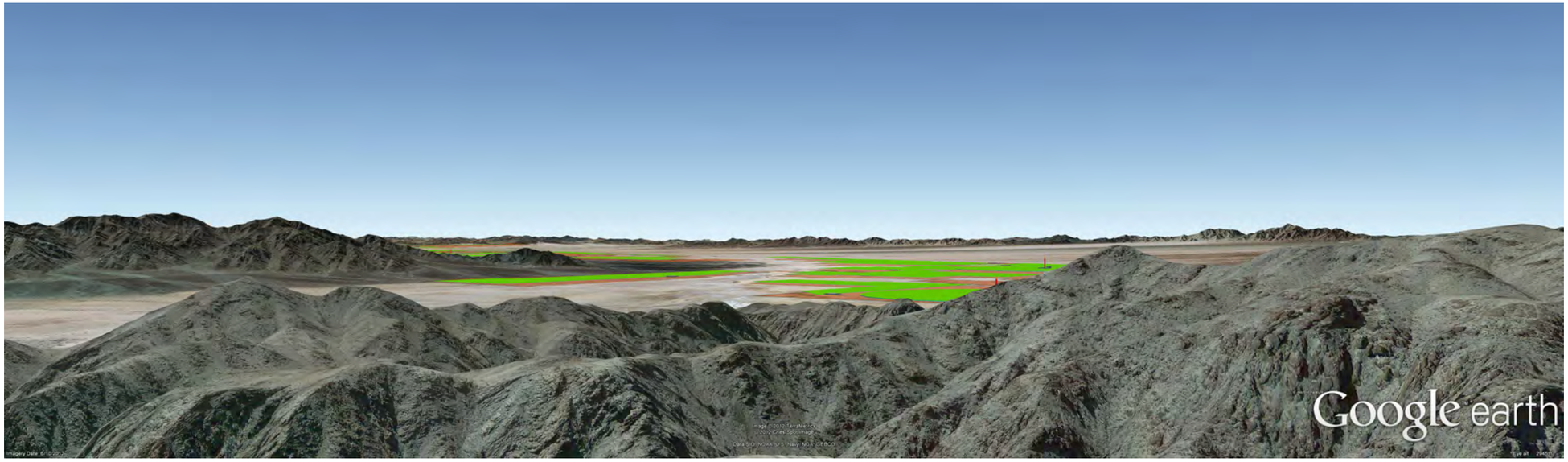

FIGURE 3.2-21 Google Earth Visualization of Partial View of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Coxcomb Peak KOP Looking Southeast

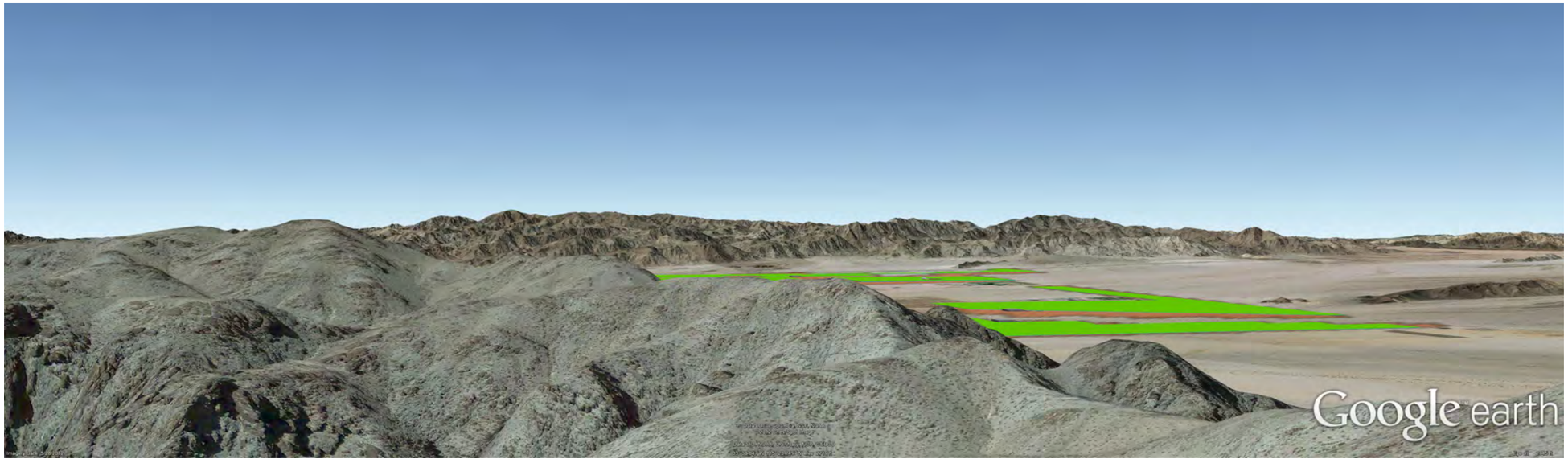

FIGURE 3.2-22 Google Earth Visualization of Partial View of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Coxcomb Peak KOP Looking South

These visualizations show that the angle of view is high enough that the tops and sides of solar collector/reflector arrays would be seen, making their strong regular geometry more apparent. In the foreground, facilities would appear spread out across the valley floor, accentuating the size of each facility and making the discontinuous shape of the SEZ more noticeable, such that development may appear dense in some areas and sparse in others. Nearby facilities may cause form and texture contrasts with the fine, even texture of the valley floor. For facilities located at greater distances, the angle of view is low and foreshortening would cause the facilities to appear edge-on, somewhat reducing visual contrasts.

Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers might be visible in the foreground, extending above the collector/reflector arrays and creating form and line contrasts with the strong regular geometry of the collector arrays, but they would be less noticeable to the casual observer in facilities located farther from the KOP. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

Central receiving towers of power tower facilities could potentially be seen throughout the visible portion of the SEZ, and towers located closer to the KOP would be especially noticeable. Field observations (Sullivan et al. 2012) suggest that towers located between 5 and 20 mi (8.0 and 32 km) away, and possibly further, would appear as brilliant to bright points of light against the backdrop of the Chuckwalla Valley or Palen Mountains, depending on their placement within the SEZ. Further east within the SEZ, these towers would appear as distant, diminished, star-like points of light against the backdrop of the Chuckwalla Valley and possibly the Mule Mountains. Reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012). If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Coxcomb Peak KOP at night. Additional night lighting associated with solar facilities would also be visible, but contrasts could be reduced with stringent mitigation measures.

Although the KOP is located north of the SEZ, the view directly south is obstructed by the high peaks of the southern Coxcomb Mountains. The view of the visible portion of the Riverside East SEZ from this KOP would generally be southeast or southwest, and views would generally be towards the sides of parabolic trough arrays; the north-facing heliostats on the south side of power towers; and the shaded side of PV facilities and other south-facing collector arrays such as tracking PV panels and south-facing heliostats on the north side of power towers.

Given the viewing direction, it is unlikely that glint/glare from PV panels or south-facing heliostats would be observed. Field observations of parabolic trough facilities (Sullivan et al. 2012) suggest that glint/glare might be possible at this KOP, given the high angle of view and short distance to the SEZ. It is unclear as to whether or not glint/glare from north-facing heliostats on the south side of power towers might be observed at this KOP. A more complete glint/glare analysis would be conducted during project-specific analysis.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to yield strong contrasts with the surrounding landscape when viewed from the Coxcomb Peak KOP, especially if multiple power tower facilities were built in the visible areas of the Chuckwalla Valley closest to the KOP. If development were limited to low-height technologies such as PV and parabolic trough facilities, contrasts would be reduced, but would still likely be strong.

NPS did not provide information about visitors or visitation to the Coxcomb Peak KOP; however, KOP use is likely to be very low. It can be assumed that visitors to the KOP would be interested in solitude and scenic vistas. Given the short distance between the KOP and the SEZ, if one or more power towers were in view in the nearby portions of the SEZ, they would appear distinctly out of place in the daytime landscape and their bright lights would likely strongly attract and hold the viewer's attention, resulting in major visual impacts for sensitive viewers. If only parabolic trough or PV facilities were located within the visible portion of the SEZ, impacts would be lower but still would be expected to be major.

3.2.1.6 Dyadic Peak

Dyadic Peak is the second highest peak in the northern Coxcomb Mountains. It is accessible only by foot, along a rough and rocky unmaintained wash/trail. Recorded trips to or near the peak can be found on hiking blogs and websites such as Peakbagger.com and SummitPost.org. Guided day hikes to Dyadic, Aqua, and Spectre Peaks are occasionally offered by the Desert Peaks Section of the Angeles Sierra Club (Sierra Club 2010 and 2011). A trip record from 2007 indicates that the summit register found at the top of Dyadic Peak dates to the 1960s (SummitPost.org 2007).

The Dyadic Peak KOP is located at the summit of Dyadic Peak, approximately 15 mi (24 km) north of the Riverside East SEZ at its closest point. It is situated at an elevation of approximately 4,160 ft (1268 m) above mean sea level and approximately 3,750 ft (1,143 m) above the center of the eastern portion of the Riverside East SEZ. Looking north from the Dyadic Peak KOP, one can see across Cadiz Valley all the way to Van Winkle Mountain. To the east, the Granite and Palen Mountains are visible across the Palen Valley. To the south and southeast, the eastern extents of the Little Chuckwalla Mountains are visible across the Chuckwalla Valley. To the southwest, the eastern portion of the Pinto Basin and the Eagle Mountains are visible. The view to the west and northwest is obscured by Spectre and Aqua Peak and the surrounding Coxcomb Mountains.

Cultural modifications in the KOP viewshed include portions of I-10, California State Highways 62 and 177, and numerous other paved and dirt roads; the Lake Tamarisk housing development; a high-voltage transmission line; abandoned and actively farmed agricultural lands; and at least two solar facilities currently under construction (Desert Sunlight and Desert Harvest). The largest of these man-made modifications (the Desert Sunlight and Desert Harvest facilities) would detract from the scenic qualities of the western portion of the SEZ as seen from this KOP, although they are located approximately 13 mi (21 km) away.

Figure 3.2-23 shows the Dyadic Peak KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. The figure shows that visibility of the SEZ from the areas around the KOP is intermittent, with the best visibility occurring at the summit of Dyadic Peak and along the southern and southwestern faces of the peak.

Figure 3.2-24 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Dyadic Peak KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Dyadic Peak KOP, solar development on 16,822 acres (68.076 km^2) or 11% of the SEZ would potentially be visible.

This figure shows that the nearest visible point within the Riverside East SEZ is approximately 15 mi (24 km) from the Dyadic Peak KOP. The farthest visible point in the SEZ is approximately 49 mi (79 km) from the KOP. Intermittent portions of the SEZ from its western edge to its point south of the Palen Mountains are potentially visible. In addition, a small portion of the SEZ that falls on the Palo Verde Mesa between the McCoy Mountains and the Big Maria Mountains is also potentially visible.

Throughout much of the visible portion of the western half of the SEZ, low-height facilities such as PV and parabolic trough facilities could potentially be visible. Only the upper portions of central receiving towers of power tower facilities in the eastern half of the SEZ, and a relatively small portion of the western part of the SEZ, would potentially be visible.

Figure 3.2-25 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Dyadic Peak viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-26 is a Google Earth visualization of the Riverside East SEZ as seen from the Dyadic Peak KOP. The visualization shows that looking south and east from the Dyadic Peak KOP, the visible portion of the SEZ occupies approximately 72° of the viewer's horizontal field of view; however, this view is partially obstructed by the rugged peaks of the surrounding Coxcomb Mountains and the Palen Mountains.

The visualization shows that the KOP is sufficiently elevated that the tops and sides of solar collector/reflector arrays would be visible; however, given the 15 mi (24 km) to the SEZ, the vertical angle of view would be relatively low, and details of the facilities indistinct. The form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables. It is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

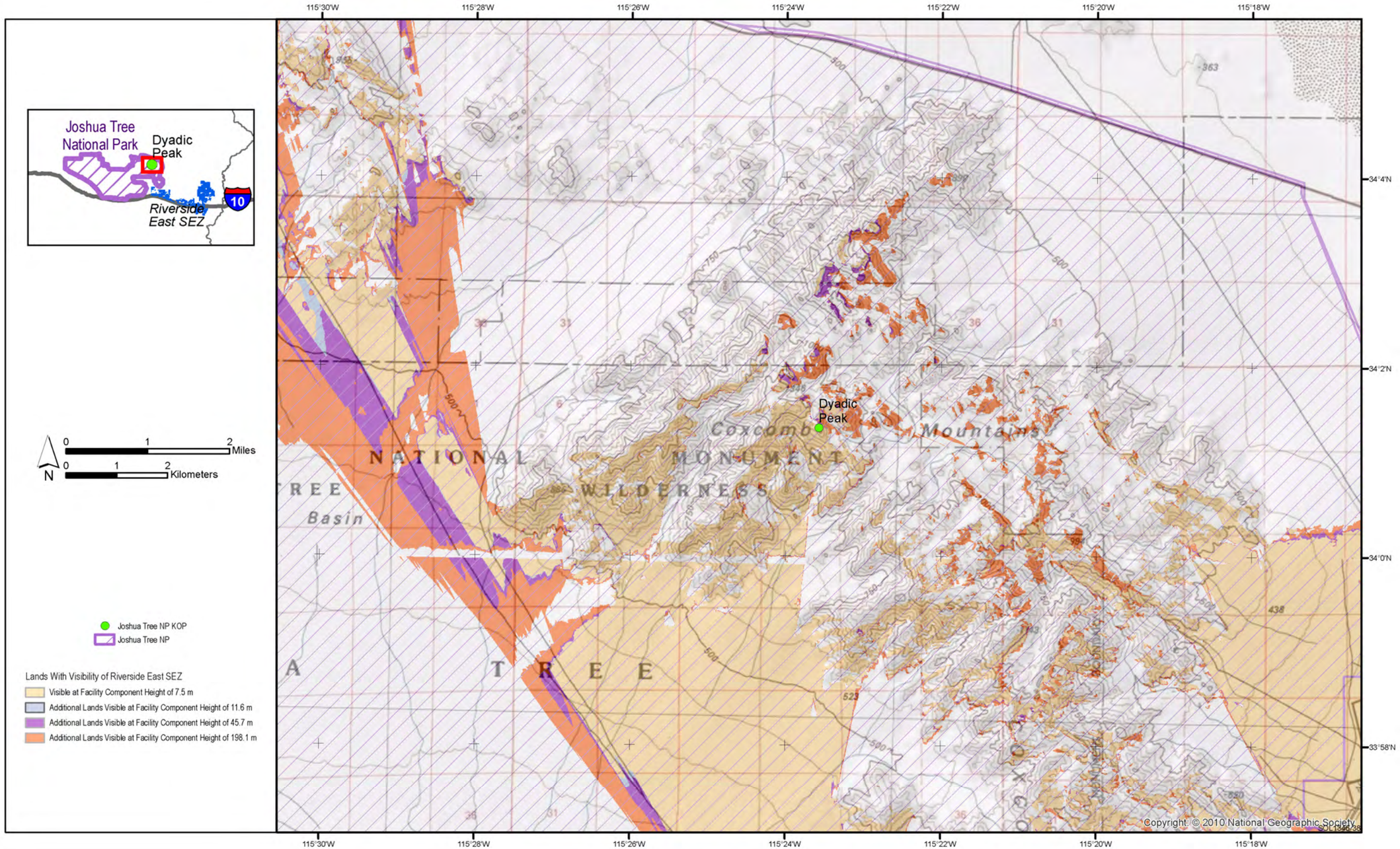

FIGURE 3.2-23 The Dyadic Peak KOP within the Riverside East Viewshed

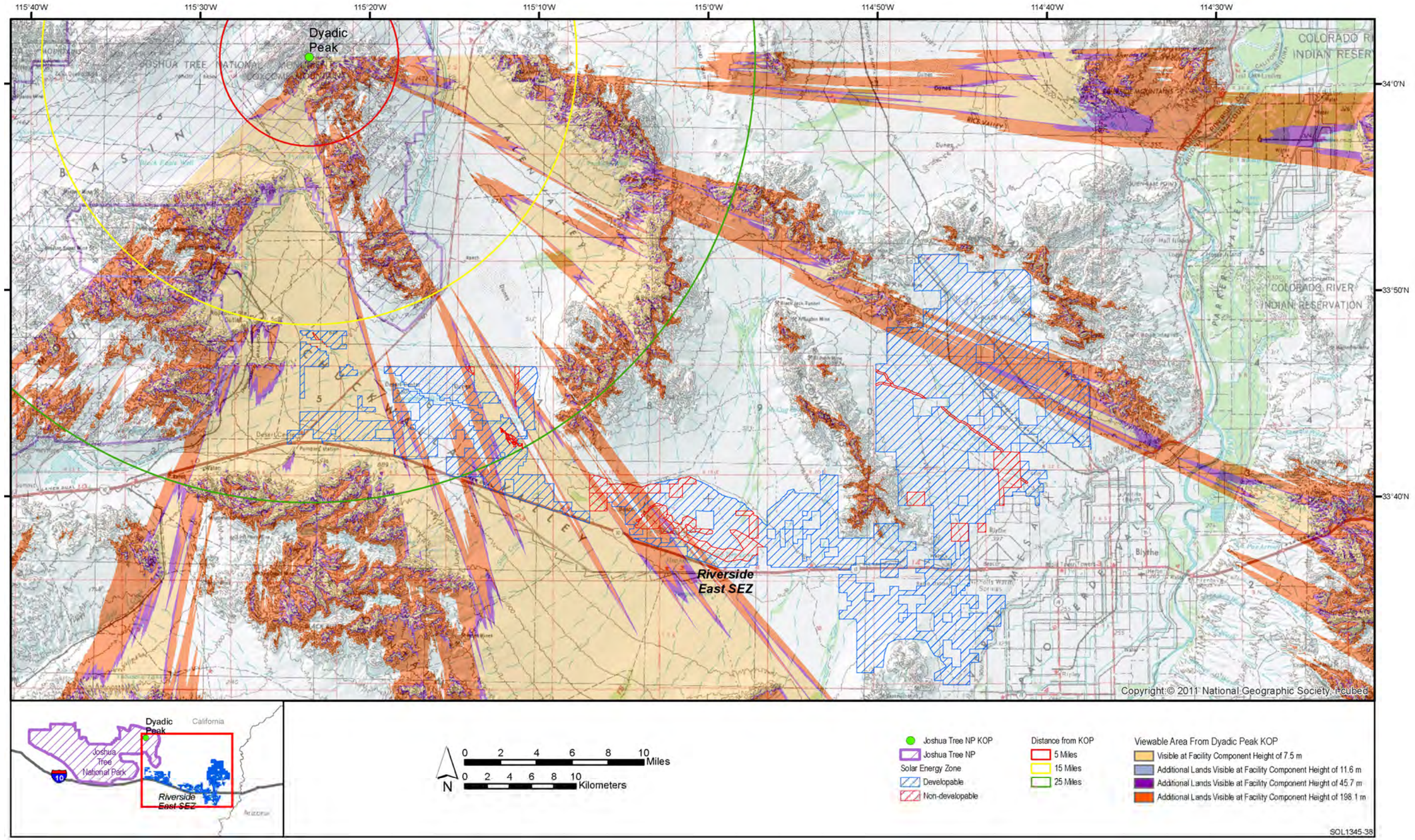

FIGURE 3.2-24 The Riverside East SEZ within the Dyadic Peak KOP Viewshed

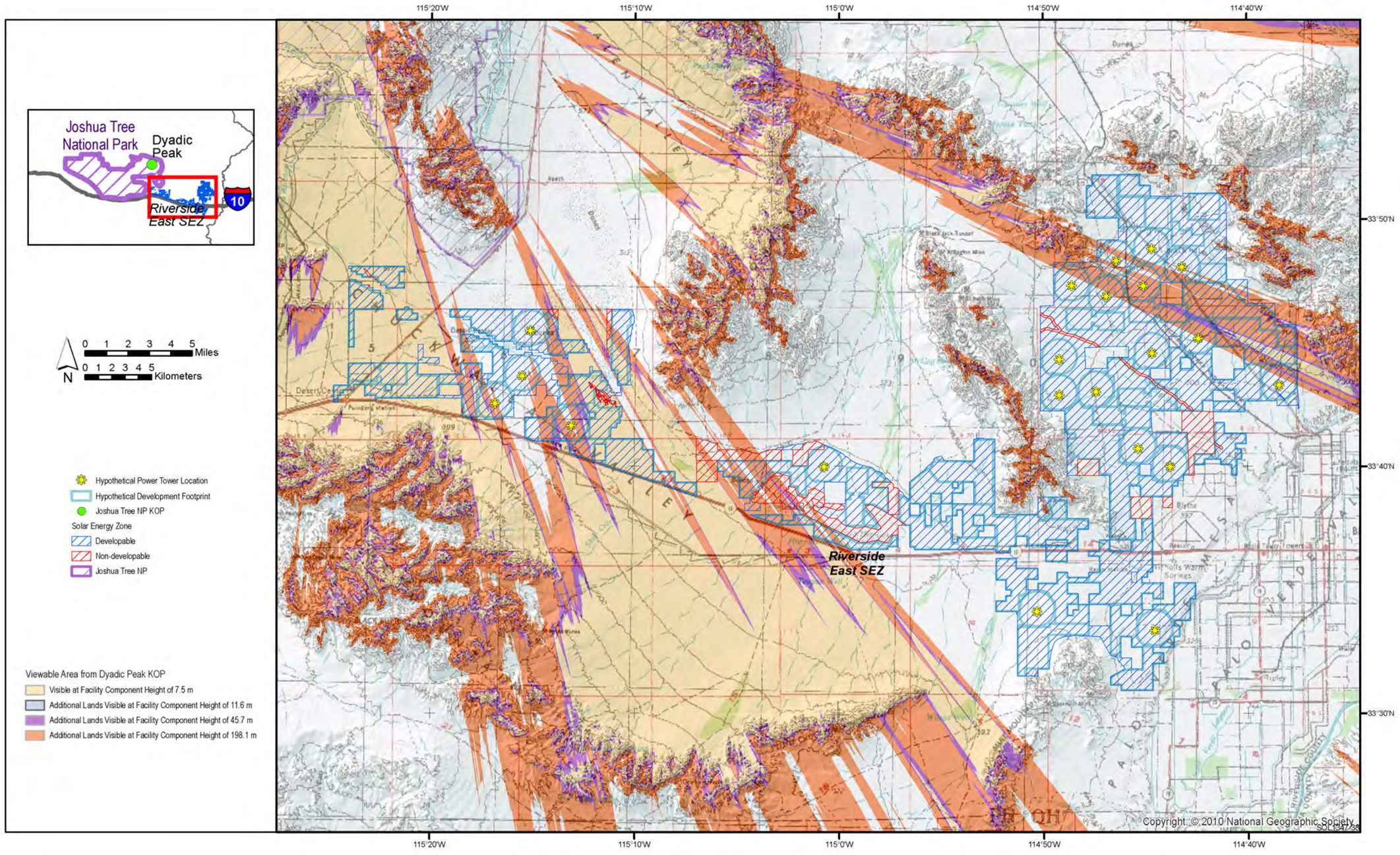

FIGURE 3.2-25 Close-up of the Riverside East SEZ with Facility Footprints within the Dyadic Peak KOP Viewshed

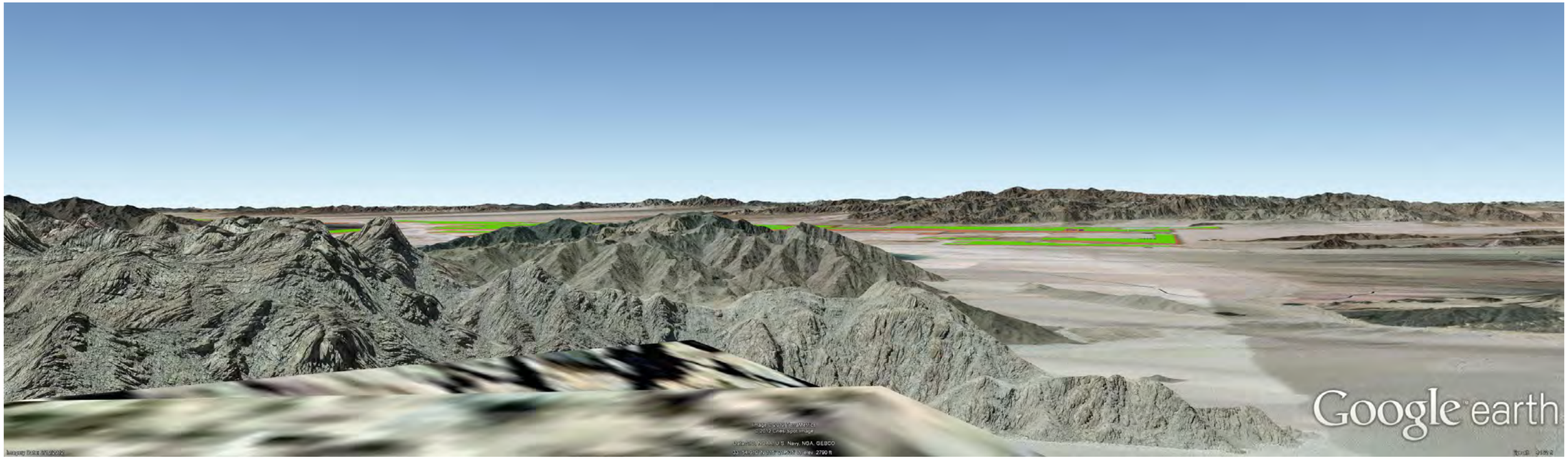

FIGURE 3.2-26 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Dyadic Peak KOP

Because the KOP is north-northwest of the SEZ, the panels of non-tracking PV facilities would always face away from the KOP, and the likelihood of glinting from tracking PV panels or parabolic troughs would be very low. The long distance to the SEZ would probably reduce the brightness of reflections enough that they would not cause glare in any event.

The central receiving towers of power tower facilities in the SEZ would be visible and their tops would appear as bright, star-like points of light against the Chuckwalla Valley floor or the backdrop of the Chuckwalla Mountains, depending on their placement within the SEZ. Observed levels of contrast would vary depending on the mix of solar technologies sited in the SEZ. If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Dyadic Peak KOP at night. Other lighting associated with the solar facility development could be visible from this KOP, but good mitigation practices could limit the associated visual contrasts considerably.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to contrast moderately with the surrounding environment when viewed from the Dyadic Peak KOP. The broad expanse of facilities visible in the far western portion of the SEZ would be an obvious but not visually dominant visual disturbance that would extend across a significant portion of the observer's field of view. If power tower facilities were not located in the visible portions of the SEZ, contrasts would be lowered considerably and might fall to weak levels under some lighting conditions, depending on the facility types and layouts. Facility lighting could potentially cause some contrasts at night, but these contrasts could be reduced by implementing stringent lighting mitigation.

NPS did not provide information about visitors or visitation to the Dyadic Peak KOP; however, according to the summit register (Summitpost.org 2007), it has been a hiking destination since 1960 and it can be assumed that visitors to the KOP would be interested in solitude and scenic vistas. KOP use is likely to be very low. Visitors to this KOP would be unlikely to miss the visual contrast of solar development with the surrounding landscape when looking towards the SEZ from this KOP. If only parabolic trough or PV facilities were located in the SEZ, overall contrasts would be reduced, but viewers would still see the facilities as unmistakable man-made elements, at least under some lighting conditions. If one or more power towers were in view, they would appear distinctly out of place in the daytime landscape and their bright lights would likely attract the viewers' attention. As a result, the KOP would likely be subjected to moderate visual impacts from solar development in the SEZ.

3.2.1.7 Eagle Mountain

Eagle Mountain is located in the western portion of the Eagle Mountain Range, in a section of Joshua Tree NP designated as wilderness. Eagle Mountain is the highest peak in the Eagle Mountain Range and is listed on the Sierra Club's Desert Peaks List (Sierra Club 2003) and Peakbagger.com's (2012b) "California Peaks with 2,000 feet of prominence" list. It is accessible only by foot along a rocky, unmaintained trail. Guided day hikes to Eagle Mountain are occasionally offered by the Desert Peaks Section of the Angeles Sierra Club (Sierra Club 2012), and recorded trips to the peak can be found on hiking blogs and user-informed

hiking websites such as Peakbagger.com (2012c). A trip report from 2009 indicates that the summit register holds signatures dating from 2000, with 10 to 20 individuals signing the register each year (Surgent 2009).

The Eagle Mountain KOP is located at the summit of Eagle Mountain, approximately 19 mi (31 km) west of the Riverside East SEZ at its closest point. It is situated at an elevation of approximately 5,340 ft (1628 m) above mean sea level and approximately 4,940 ft (1,506 m) above the center of the western portion of the Riverside East SEZ. Looking east from this KOP, the Palen and McCoy Mountains are visible across the Palen and Chuckwalla Valley. To the south, the Salton Sea and much of the Imperial Valley are visible. To the west, Mount San Jacinto in the San Jacinto Mountains and Mount San Gorgonio in the San Bernardino Mountains can be seen. The Pinto Mountains are visible across the Pinto Basin to the north.

Cultural modifications in the KOP viewshed include portions of I-10, numerous other paved and dirt roads, the cities of Indio and Mecca, California, a segment of the Colorado River Aqueduct, abandoned and actively farmed agricultural lands, and at least three solar facilities at this time (Desert Solar, Desert Harvest, and Genesis). These modifications would detract somewhat from the natural scenic quality of the area as viewed from this KOP.

Figure 3.2-27 shows the Eagle Mountain KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. The figure shows that in the vicinity of this KOP, the SEZ is only visible from the summit of Eagle Mountain, from some higher areas immediately surrounding the summit, and from the peaks of other mountains within the Eagle Mountain Range.

Figure 3.2-28 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Eagle Mountain KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Eagle Mountain KOP, solar development on 2,224 acres (9 km^2) or 2% of the SEZ would potentially be visible; although much of the SEZ is visible from the Eagle Mountain KOP, the vast majority of it is beyond 25 mi (40 km) away.

The figure shows that almost the entire length of the SEZ through the Chuckwalla Valley can be seen. The nearest visible point within the Riverside East SEZ is approximately 1 mi (31 km) from the KOP and the farthest visible point in the SEZ is approximately 60 mi (96.6 km) from the KOP. A small portion of the SEZ within the upper Chuckwalla Valley between the Eagle and Palen Mountains is obstructed by the foothills of the Eagle Mountain Range. The eastern portion of the SEZ that is located east of the McCoy Mountains, on the Palo Verde Mesa, is obstructed from view by the McCoy Mountains. Throughout much of the visible portion of the SEZ, facility components with lower heights such as PV and parabolic trough solar facilities would potentially be seen. In some areas, only solar components measuring 150 ft (45.7 m) or taller would be visible, while in other areas only components with a height of 650 ft (198.1 m) or more would be visible.

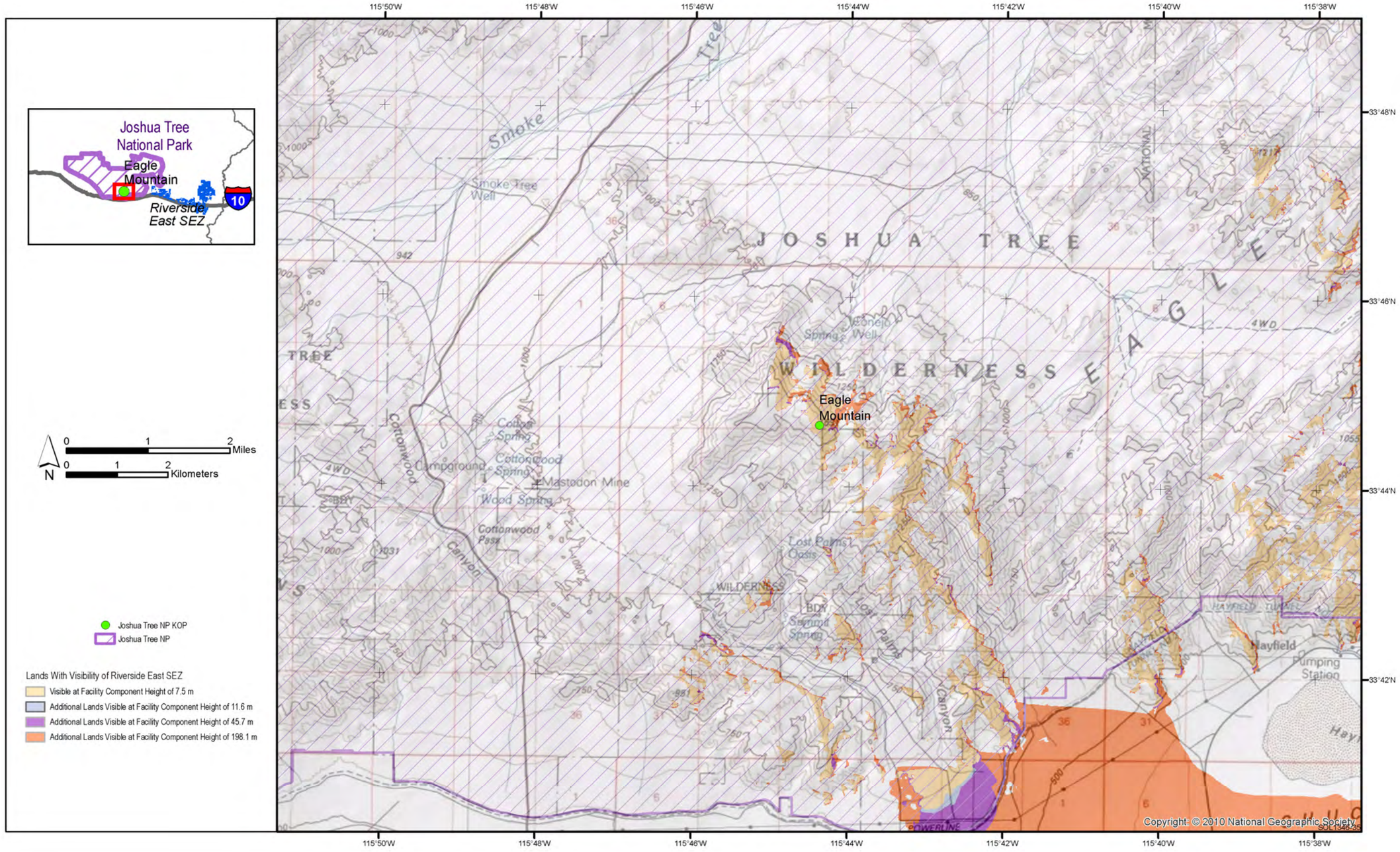

FIGURE 3.2-27 The Eagle Mountain KOP within the Riverside East SEZ Viewshed

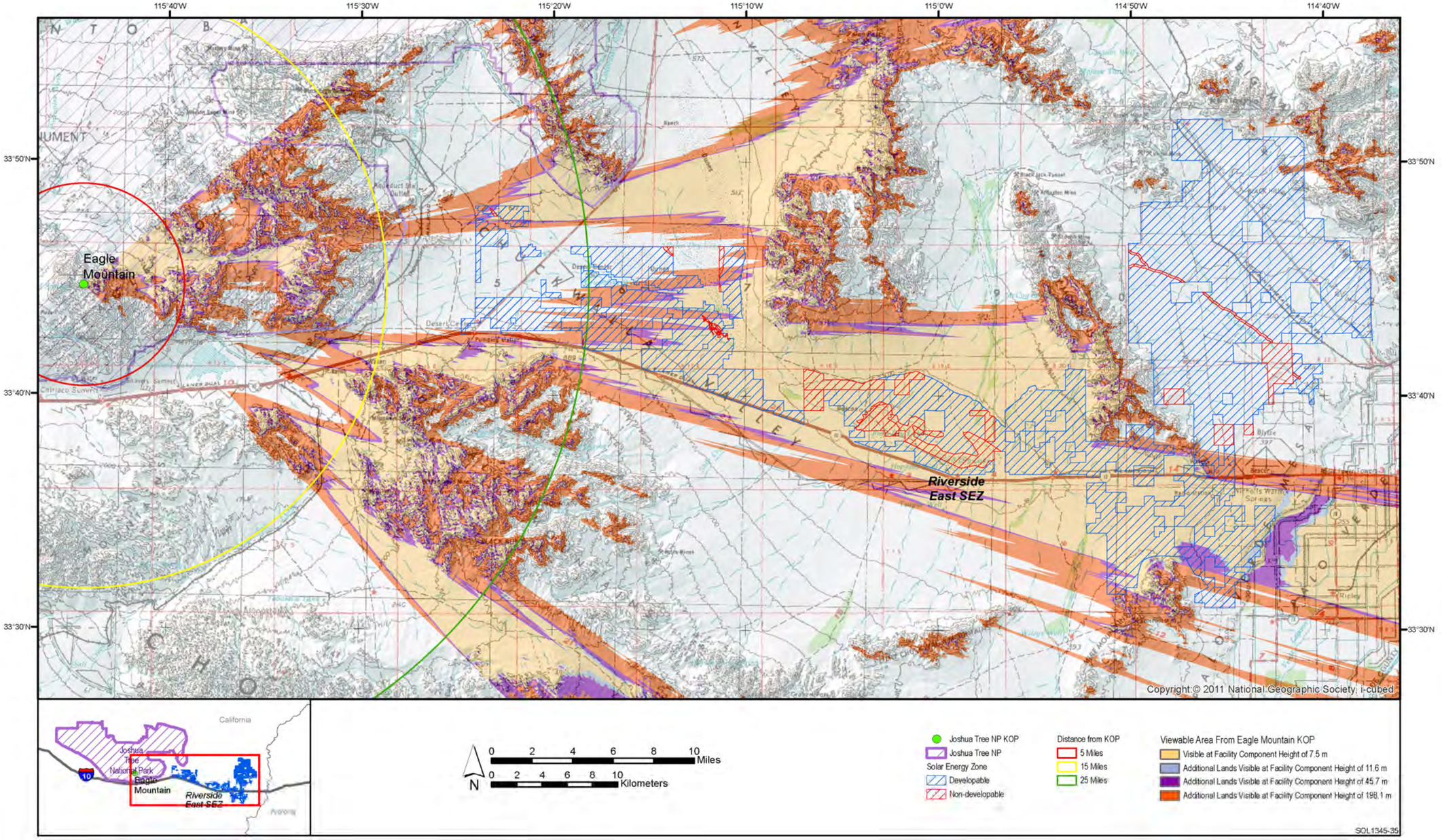

FIGURE 3.2-28 The Riverside East SEZ within the Eagle Mountain KOP Viewshed

Figure 3.2-29 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Eagle Mountain KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-30 is a Google Earth visualization of the Riverside East SEZ as seen from the Eagle Mountain KOP. This visualization suggests that looking east from the Eagle Mountain KOP, there is a clear view of almost the entire western end of the SEZ, which occupies approximately 27° of the viewer's field of view. Under the 80% development scenario, solar facilities would occupy much of the Chuckwalla Valley and views of solar development could stretch for 60 mi (97 km) from the Eagle Mountain KOP.

The visualization suggests that the tops and sides of collector/reflector arrays would be seen; however, given the long distance between the KOP and the SEZ, the angle is relatively low, which reduces the strong regular geometry of the facilities and decreases the apparent size of the solar facilities within the SEZ. From this distant viewpoint, foreshortening could cause the development to appear dense throughout the length of the Chuckwalla Valley. Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers might be visible extending above the collector/reflector arrays; but given the long distance and low angle of view, except for the central receiver towers of power tower facilities, they would not likely create a significant contrast. The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables. It is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

Field observations (Sullivan et al. 2012) suggest that central receiving towers for power tower facilities would appear as bright star-like points of light at distances of up to 20 mi (32 km) and likely further. Central receiving towers located further east in the SEZ would likely be visible, appearing as distant, faint points of light. If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Eagle Mountain KOP. Additional night lighting from solar facilities could potentially cause contrasts against the dark night sky; however, there are already a variety of lights visible within the Chuckwalla Valley from the communities of Lake Tamarisk and Desert Center and from I-10, and night-sky impacts from solar development could be reduced through stringent lighting mitigation measures.

The KOP is located due west of the SEZ, and views throughout the day would generally include the sides of PV and tracking PV arrays and west-facing heliostats on the east side of power tower facilities. Reflected light, such as small bright spots, from trough arrays and power tower heliostats might be visible under certain lighting conditions, but the long distance would likely prevent them from causing strong contrasts if they occurred at all. A more complete glint/glare analysis would be conducted during a project-specific environmental impact assessment.

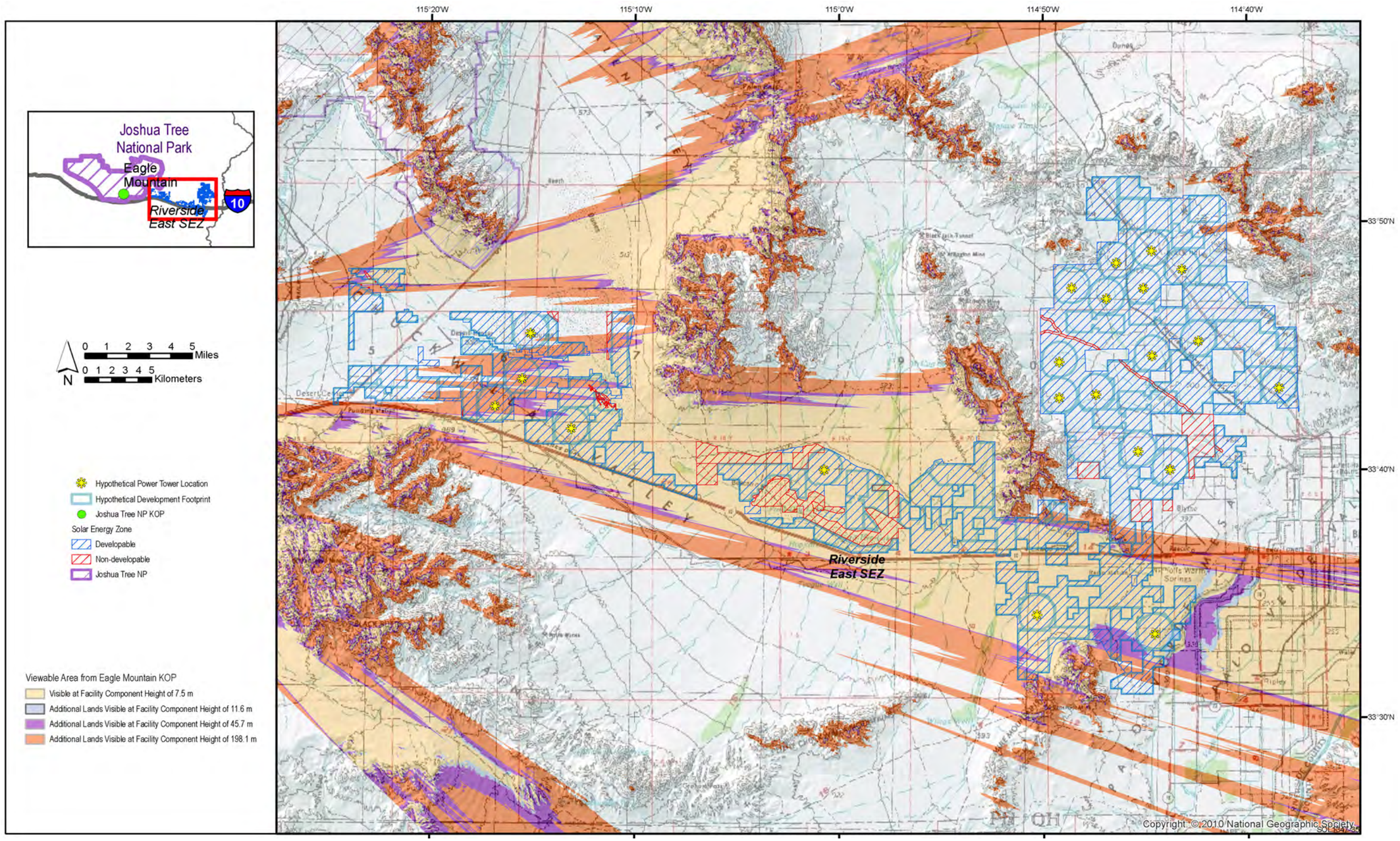

FIGURE 3.2-29 Close-up of the Riverside East SEZ with Facility Footprints within the Eagle Mountain KOP Viewshed

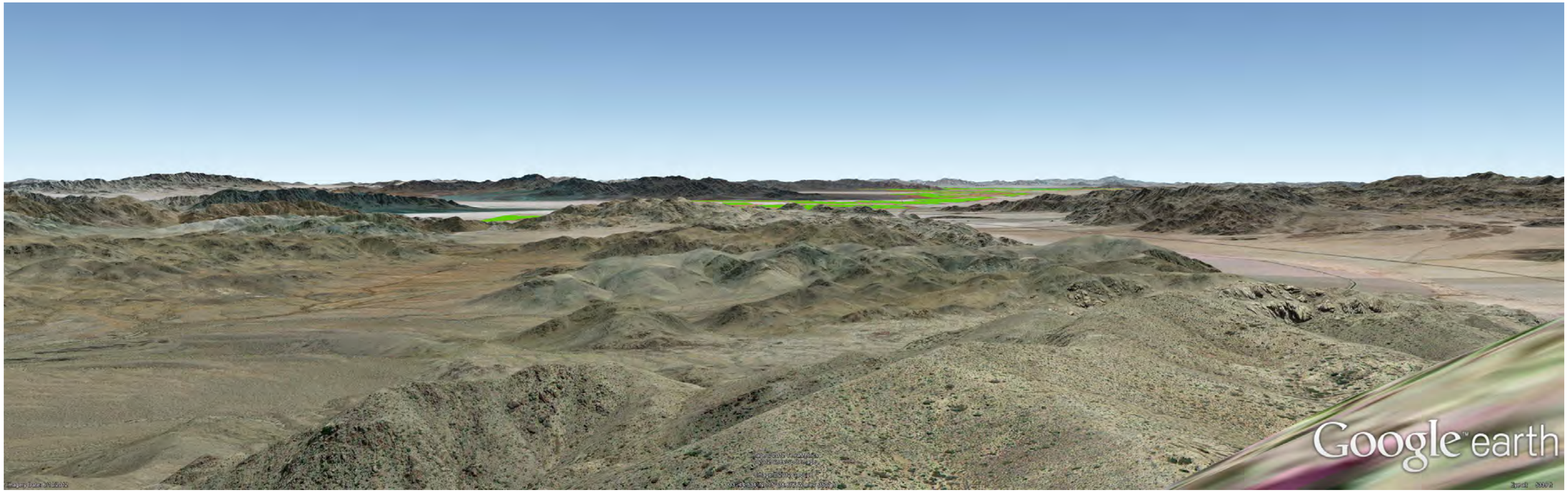

FIGURE 3.2-30 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Eagle Mountain KOP

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to create weak to moderate contrasts with the surrounding landscape when viewed from the Eagle Mountain KOP, especially if multiple power tower facilities were built in the visible areas of the Chuckwalla Valley. If development were limited to low-height technologies such as PV and parabolic trough facilities, arrays would tend to repeat the line and form of the flat valley floor, and visual contrasts would likely be weak.

NPS did not provide information about visitors or visitation to the Eagle Mountain KOP; however, it can be assumed that it is a remote hiking destination for visitors interested in solitude and scenic vistas, and thus KOP use is likely to be very low. Visitors to this location would be unlikely to miss the visual contrasts from solar development in the SEZ. If multiple power tower facilities were visible in the western portions of the SEZ, their reflected light, visible during the day, would add obvious man-made elements to the view. In a worst-case scenario, the Eagle Mountain KOP could be subjected to moderate visual impacts from solar development in the SEZ.

3.2.1.8 Eagle Mountain/Basalt

The Eagle Mountain/Basalt KOP is located at the far northeastern end of the Eagle Mountains, near a large outcrop of basalt rock, in the remote wilderness area of Joshua Tree NP. The KOP is situated approximately 9 mi (14 km) north-northwest of the Riverside East SEZ at its closest point. It is situated at an elevation of approximately 1,330 ft (405 m) above mean sea level and approximately 920 ft (280 m) above the center of the western portion of the Riverside East SEZ. Looking north and northeast from the Eagle Mountain/Basalt KOP, the Palen Valley and the western portion of the Coxcomb Mountains are visible. To the east, the southern Coxcomb Mountains dominate the view. The Chuckwalla Mountains can be seen across the Chuckwalla Valley to the south, and to the west, the foothills of the Eagle Mountains dominate the view.

Cultural modifications in the KOP viewshed include portions of I-10 and numerous other paved and dirt roads, portions of the Colorado River Aqueduct, a very small section of Eagle Mountain Mine, and at least two solar facilities currently under construction (Desert Solar and Desert Harvest). The large-scale land modifications and built facilities, such as the Eagle Mountain Mine and solar facilities, detract from the scenic qualities of the western portion of the SEZ as seen from this KOP; however, the elevation of this KOP is low enough that views of the aqueduct, roads, and agricultural land are at a very low vertical angle and are not a significant visual contrast.

Figure 3.2-31 shows the Eagle Mountain/Basalt KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development in the Riverside East SEZ could potentially be visible. The figure shows that visibility of the SEZ from this KOP is limited to the immediate area surrounding the KOP, as well as the eastern side of the Eagle Mountain foothills.

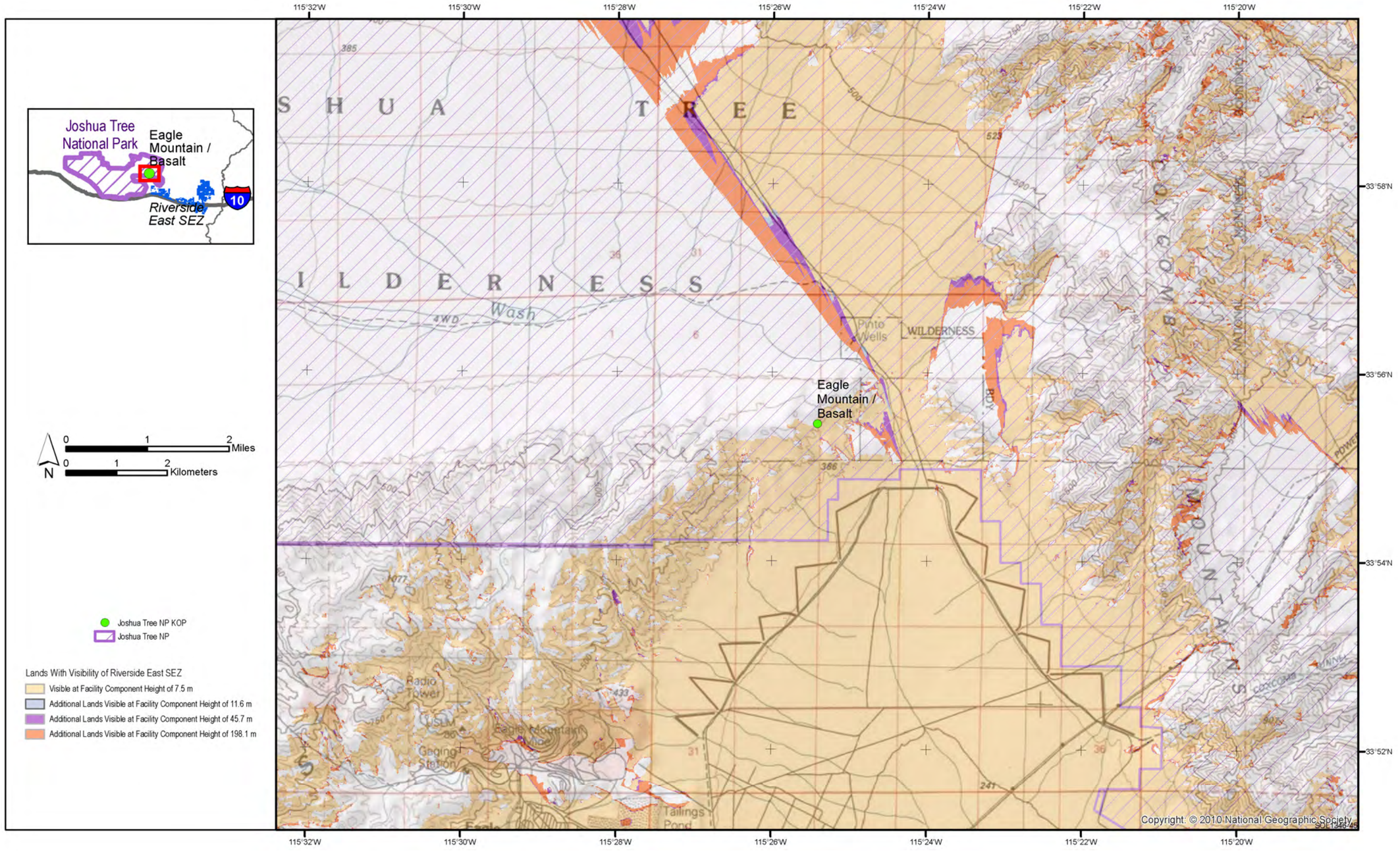

FIGURE 3.2-31 The Eagle Mountain/Basalt KOP within the Riverside East Viewshed

Figure 3.2-32 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Eagle Mountain/Basalt KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Eagle Mountain/Basalt KOP, solar development on 26,085 acres (105.56 km^2) or 18% of the SEZ would potentially be visible. This figure shows that the nearest visible point within the Riverside East SEZ is approximately 9 mi (14 km) from the KOP, and the farthest visible point in the SEZ is approximately 26 mi (42 km) from the KOP. Much of the western portion of the SEZ within the Chuckwalla Valley, east of the Eagle Mountains and southwest of the Coxcomb Mountains, would potentially be visible, with the exception of portions of the SEZ that fall within Palen Dry Lake. Throughout most of this area, facilities with low-height components such as PV or parabolic trough facilities could potentially be seen. On the easternmost side of the visible portion of the SEZ, only components measuring 150 ft (45.7 m) and taller, such as the upper portions of transmission lines and the central receiving towers of power tower facilities, would be visible.

Figure 3.2-33 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Eagle Mountain/Basalt viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-34 is a Google Earth visualization of the Riverside East SEZ as seen from the Eagle Mountain/Basalt KOP, looking south-southeast. This visualization suggests that the SEZ occupies approximately 36° of the viewer's field of view, although the view is partially obstructed by the foothills of the Eagle Mountains.

The visualization suggests that for facilities closest to the Eagle Mountain/Basalt KOP, the tops and sides of collector/reflector arrays would be seen; however, the angle of view is low and the arrays and heliostats would appear almost edge-on, as a thick band across the valley floor, greatly reducing the apparent size of the facilities. Facilities located further south and southeast may appear as a somewhat thinner band just below the horizon line. For facilities closest to the KOP, taller vertical facility components including support buildings, power blocks, cooling towers, and transmission towers would likely be visible extending above the collector/reflector and heliostat arrays, creating contrasts in form, line and texture. In facilities further south, taller components, with the exception of central receiving towers, might be difficult to see. The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

The central receiving towers of power tower facilities within the SEZ would appear as bright points of light at distances of up to 20 mi and possibly further (Sullivan et al. 2012). They would be viewed primarily against dark mountain backdrops. Central receiver towers in the closest portions of the SEZ could be very bright, and would likely attract and hold visual attention. Field observations of power tower facilities (Sullivan et al. 2012) have shown that reflected light from dust particles in the air around the receivers could appear as faint light

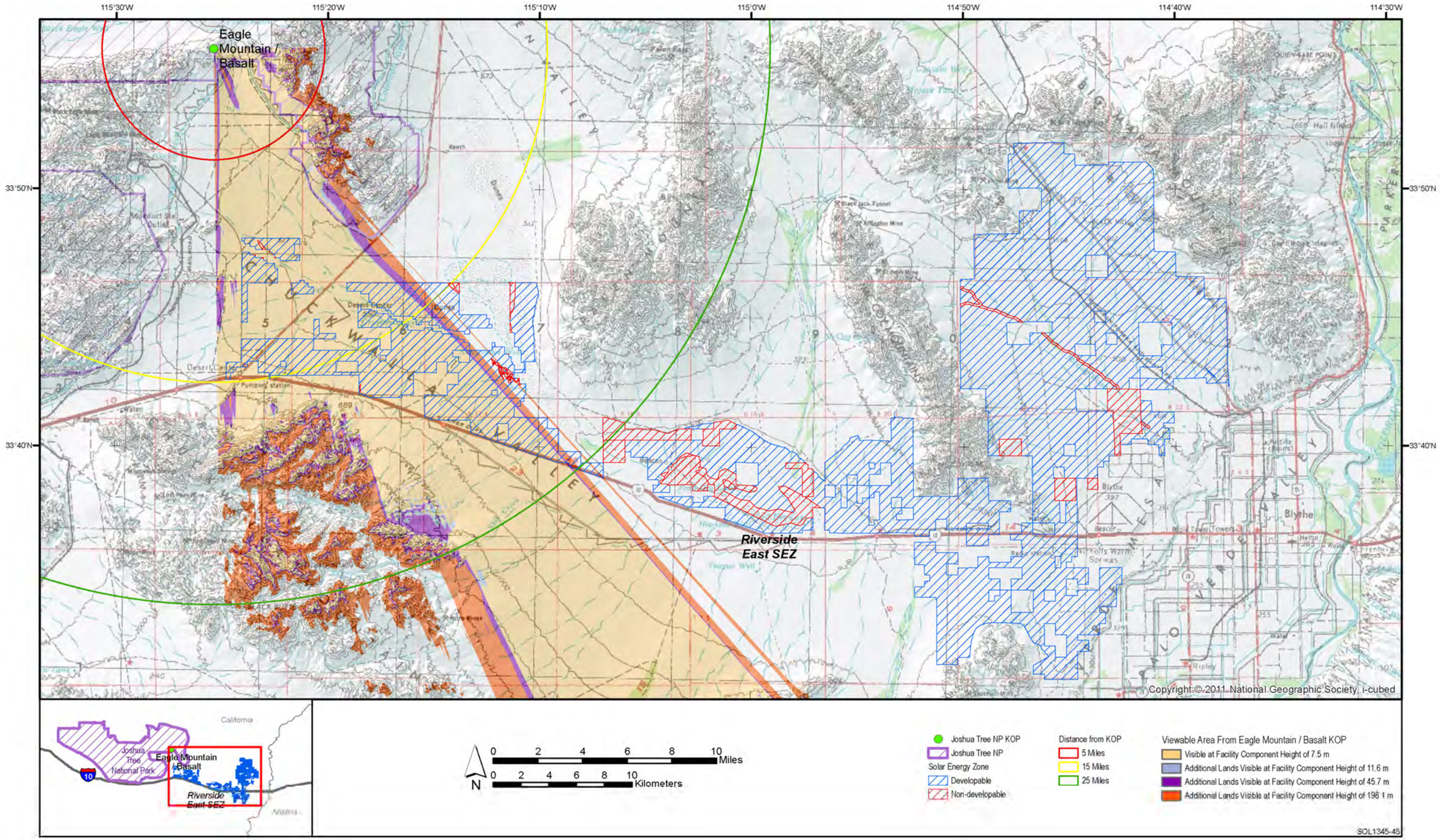

FIGURE 3.2-32 The Riverside East SEZ within the Eagle Mountain/Basalt KOP Viewshed

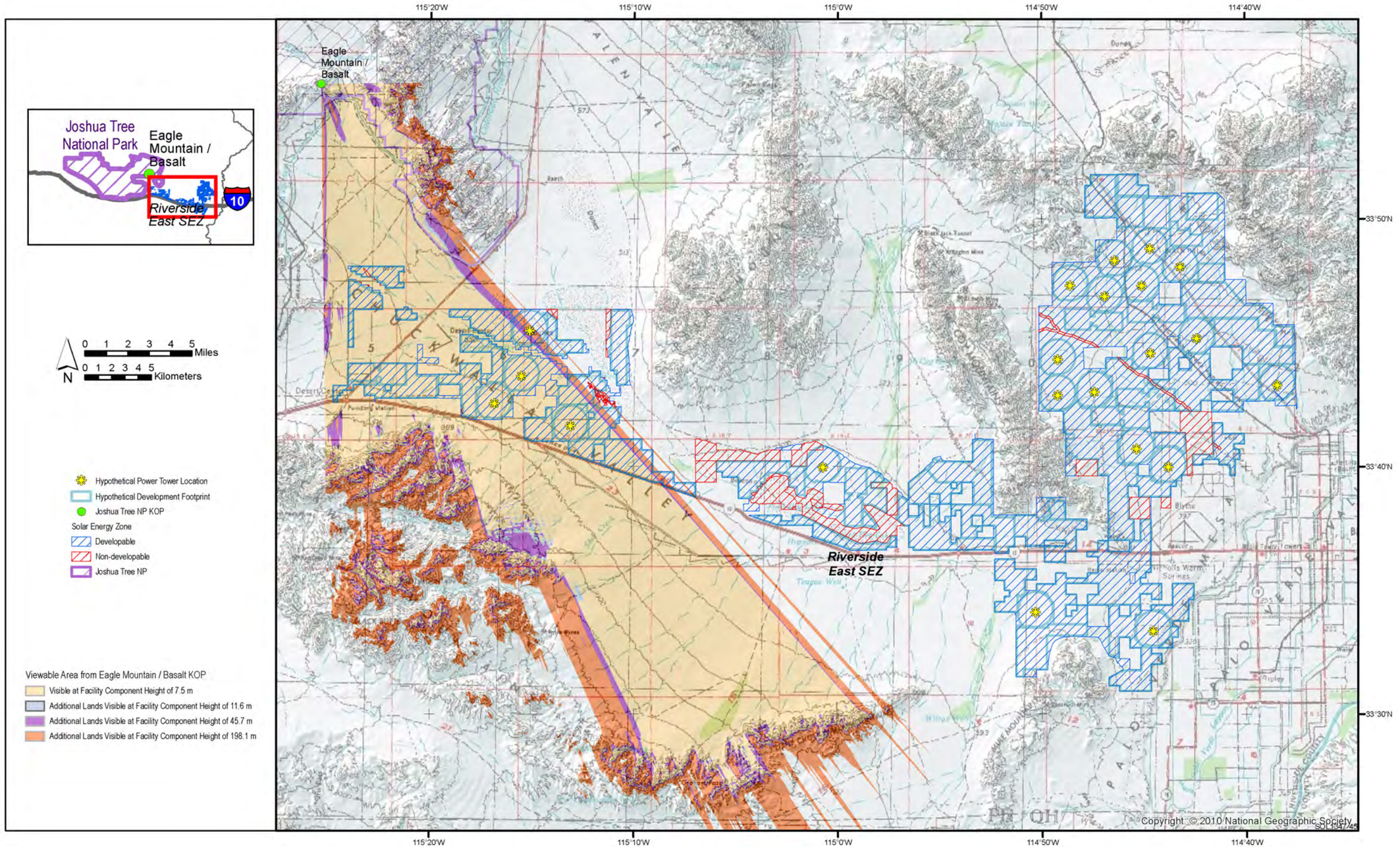

FIGURE 3.2-33 Close-up of the Riverside East SEZ with Facility Footprints within the Eagle Mountain/Basalt KOP Viewshed

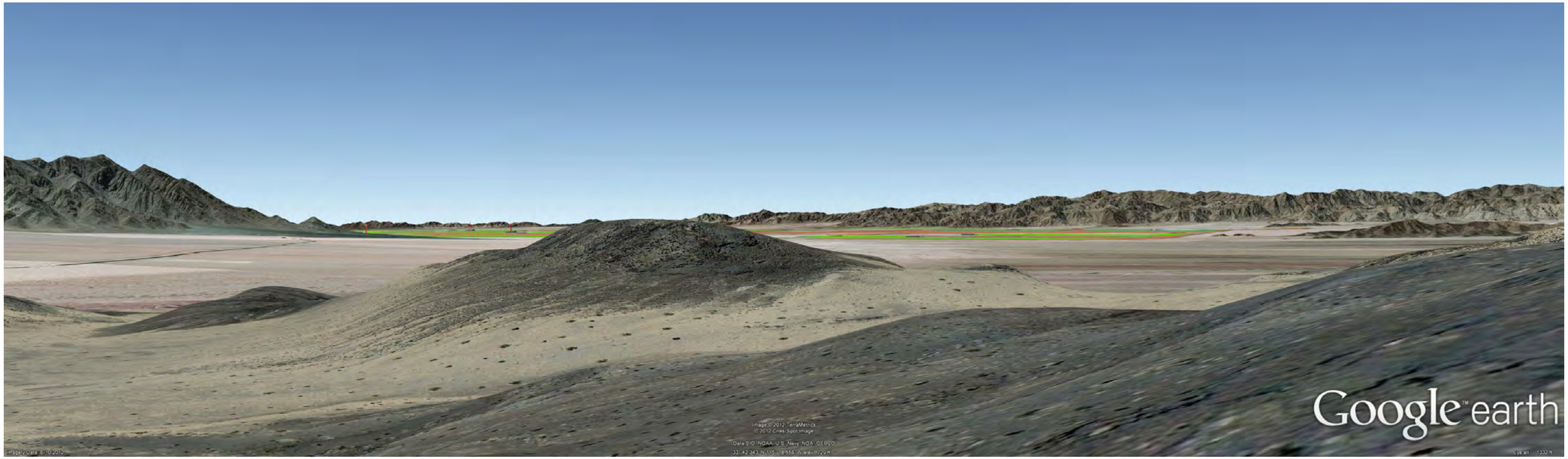

FIGURE 3.2-34 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Eagle Mountain/Basalt KOP

streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012). It is not known if this reflected light would be visible at the distance between the Eagle Mountain/Basalt KOP and the SEZ.

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Eagle Mountain/Basalt KOP at night. Additional night lighting from solar facilities within the SEZ would also likely be visible; however, there are other lights visible within the Chuckwalla Valley, such as lights from the communities of Lake Tamarisk and Desert Center and from I-10. Stringent lighting mitigation could substantially reduce night-sky impacts from the facilities.

The KOP is located north-northwest of the SEZ. Views toward the SEZ would be directed at the sides of parabolic trough arrays; the north-facing heliostats on the south side of power towers; and the back side of PV panels and other south-facing collector arrays. It is very unlikely that light reflection or glint/glare from south-facing panels would occur. Field observations (Sullivan et al. 2012) of parabolic trough facilities suggest that reflections might be visible from this KOP, depending on the lighting angle, but it is unlikely given the direction and low angle of view. A more complete glint/glare analysis would be conducted during project-specific analysis.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ could cause moderate to strong contrasts with the surrounding landscape as viewed from the Eagle Mountain/Basalt KOP, especially if multiple power tower facilities are built in the visible areas of the SEZ. If one or more power towers were in view, they would appear as obvious man-made elements in an otherwise natural-appearing landscape, and if they were sufficiently close to the KOP, the bright lights might attract and hold viewers' attention. If development were limited to low-height technologies such as PV and parabolic trough facilities, visual contrasts would be substantially reduced.

NPS did not provide information about visitors or visitation to the Eagle Mountain/Basalt KOP; however, KOP use is likely to be very low. It can be assumed that it is a remote hiking destination for visitors interested in solitude and scenic vistas. Visitors to the KOP would be very unlikely to miss the visual contrasts from solar development in the SEZ, especially if multiple power tower facilities were built in the western portions of the SEZ. Their reflected light, visible during the day, would add obvious man-made elements to the view. In a worst-case scenario, the Eagle Mountain/Basalt KOP could be subjected to major visual impacts from solar development in the SEZ. If solar development in the SEZ were limited to low-height solar facilities, impacts would likely be moderate.

3.2.1.9 Eagle Mountain/Big Wash

Eagle Mountain/Big Wash KOP is located at the eastern end of the Eagle Mountains, in a section of Joshua Tree NP that is designated wilderness. The KOP is located approximately 7 mi (11 km) west of the Riverside East SEZ at its closest point. It is situated at an elevation of approximately 3,300 ft (1,006 m) above mean sea level and approximately 2,890 ft (881 m)

above the center of the eastern portion of the Riverside East SEZ. From this KOP, the Eagle Mountains dominate the view to the north and west. To the south, the Chuckwalla Mountains can be seen across the western end of the Chuckwalla Valley. Looking southeast from the KOP, one can see across the entire expanse of the Chuckwalla Valley, as far as the City of Blythe, California.

Cultural modifications in the KOP viewshed include portions of I-10 and numerous other paved and dirt roads; the Lake Tamarisk housing development; a high-voltage transmission line, abandoned and actively farmed agricultural lands; and at least three solar facilities currently under construction (Desert Solar, Desert Harvest and Genesis.) These land modifications and built facilities would likely detract noticeably from the scenic qualities of the western portion of the SEZ as seen from this KOP, as some (Desert Solar and Desert Harvest) are located as close as 5 mi (8 km) away.

Figure 3.2-35 shows the Eagle Mountain/Big Wash KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could be seen. The figure shows that visibility surrounding the KOP is limited to the higher elevations of the foothills of the Eagle Mountains, as well as areas along the eastern side of the foothills.

Figure 3.2-36 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Eagle Mountain/Big Wash KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Eagle Mountain/Big Wash KOP, solar development on 31,698 acres (128.28 km^2) or 22% of the SEZ would potentially be visible. The figure shows that the entire east-west length of the SEZ, from its western edge to its eastern terminus on the Palo Verde Mesa south of I-10, can be seen from the Eagle Mountain/Big Wash KOP, with the exception of two small sections obscured by the McCoy and Mule Mountains. The nearest visible point within the Riverside East SEZ is approximately 7 mi (11 km) from the KOP, and the farthest visible point in the SEZ is approximately 48 mi (77 km) from the KOP. In almost this entire area, low-height solar technologies would potentially be visible, except in the extreme southeastern end of the SEZ, where only components of 150 ft (45.7 m) or taller, such as the upper portions of transmission lines or central receiving towers of power tower facilities, could be visible.

Figure 3.2-37 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Eagle Mountain/Big Wash KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-38 is a Google Earth visualization of the Riverside East SEZ as seen from the Eagle Mountain/Big Wash KOP, looking east. The visualization confirms that the Eagle Mountain/Big Wash KOP provides a clear view of almost the entire western portion of the SEZ, which occupies approximately 49° of the viewer's field of view.

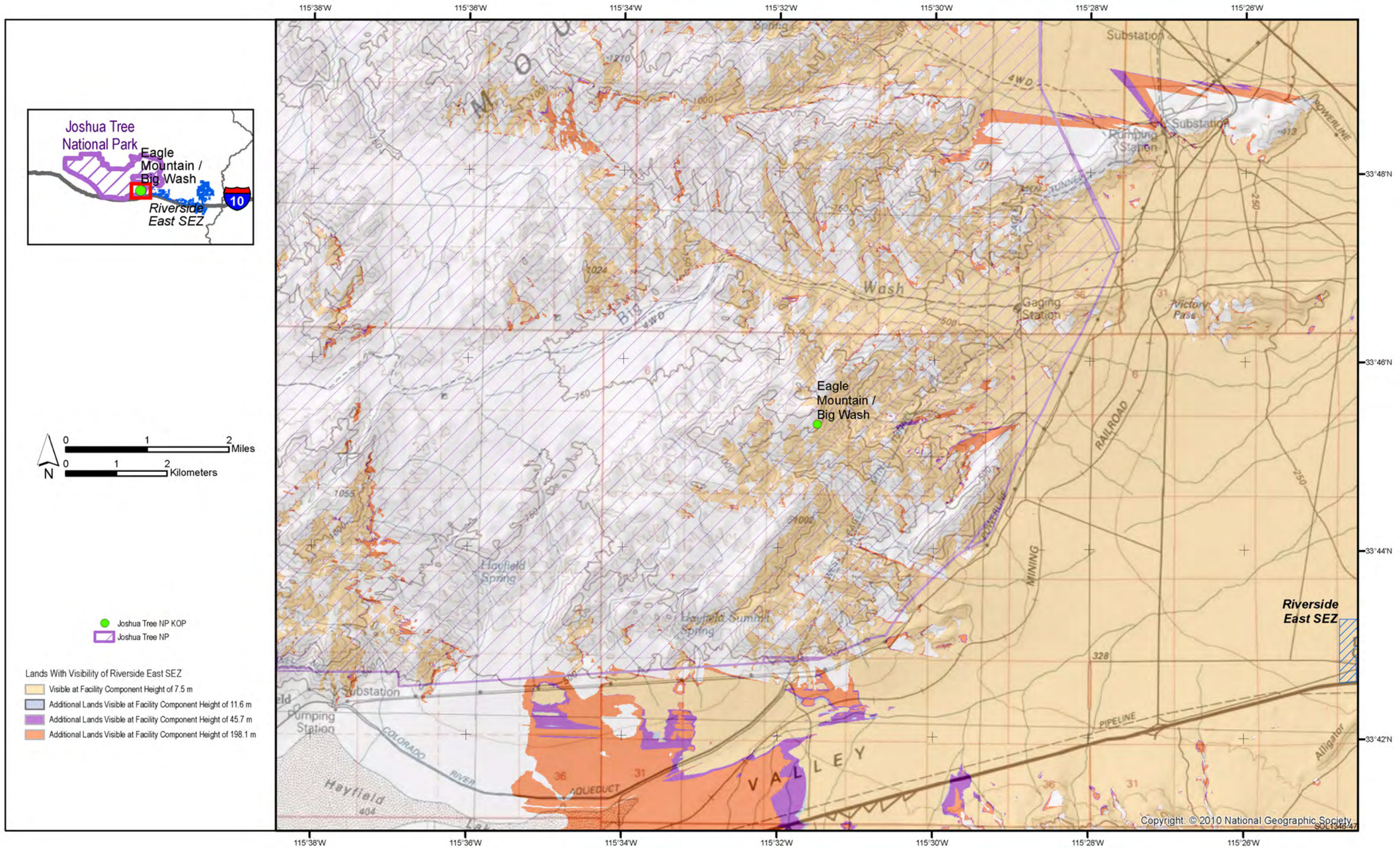

FIGURE 3.2-35 The Eagle Mountain/Big Wash KOP within the Riverside East SEZ Viewshed

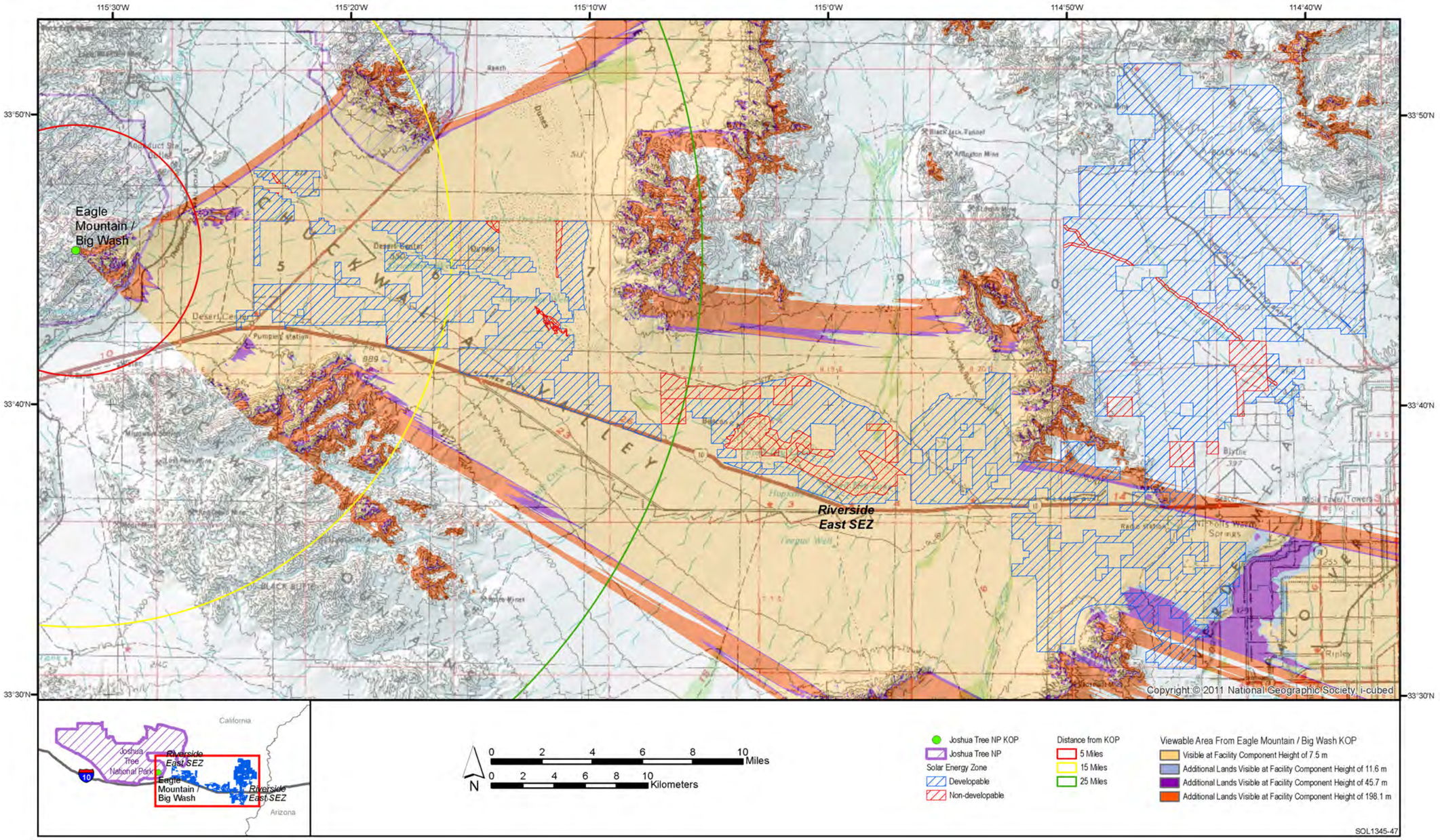

FIGURE 3.2-36 The Riverside East SEZ within the Eagle Mountain/Big Wash KOP Viewshed

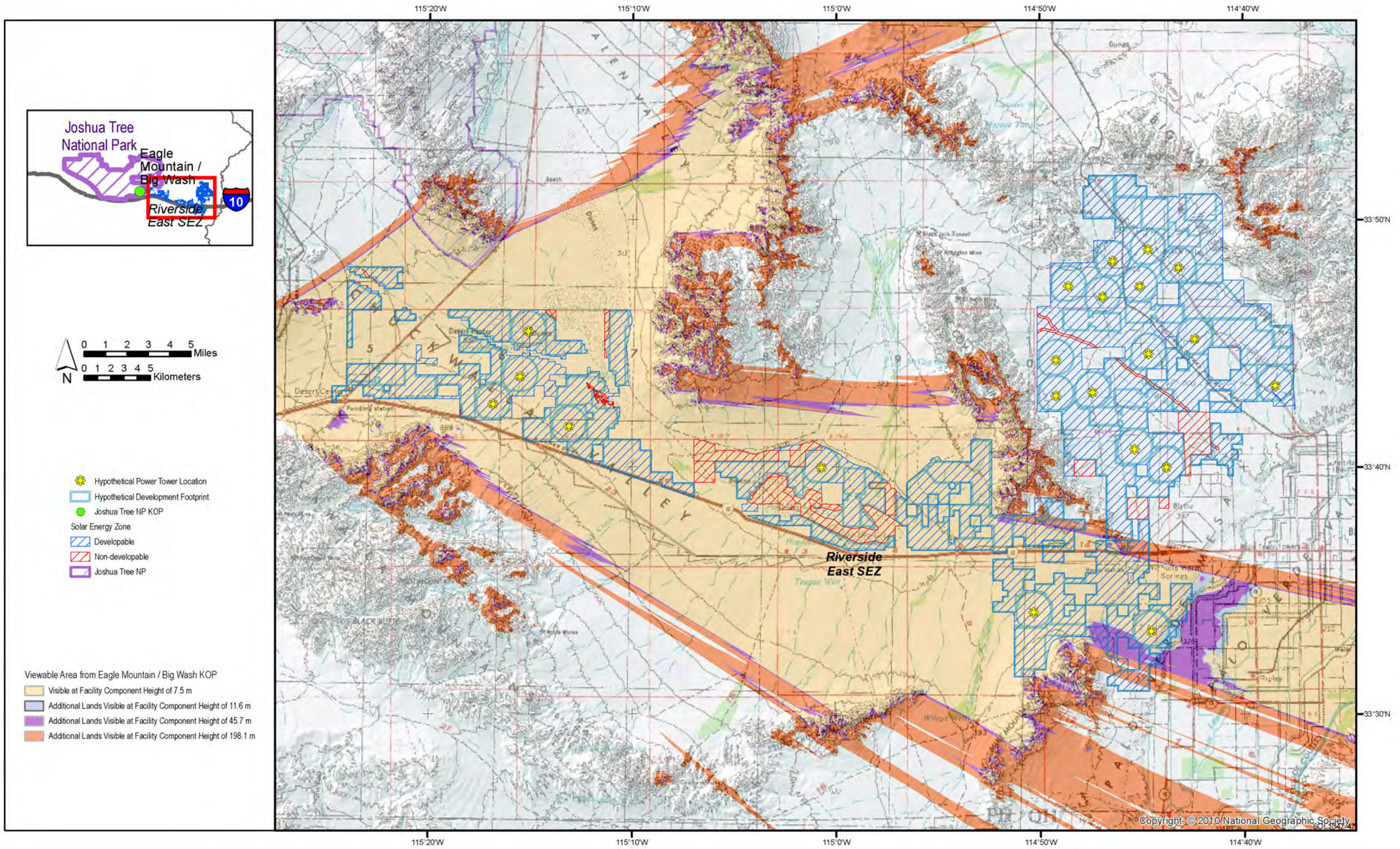

FIGURE 3.2-37 Close-up of the Riverside East SEZ with Facility Footprints within the Eagle Mountain/Big Wash KOP Viewshed

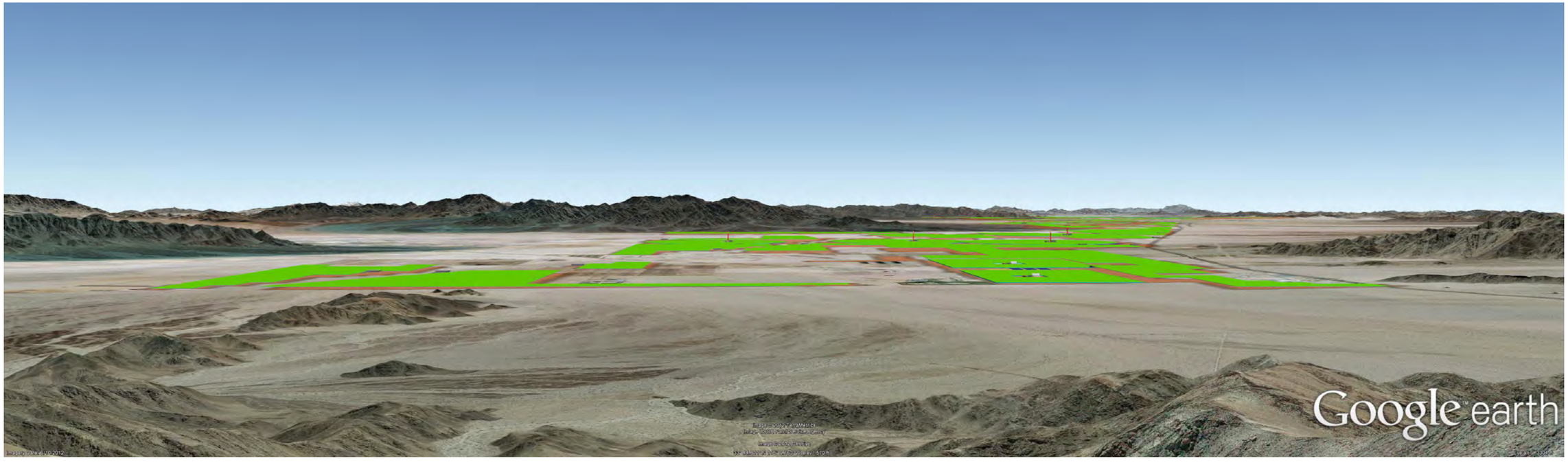

FIGURE 3.2-38 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Eagle Mountain/Big Wash KOP

The visualization shows that similarly to the Big Wash Trail and Cultural Sites KOP, the vertical angle of view from the Eagle Mountain/Big Wash KOP is high enough that the tops and sides of solar collector/reflector arrays would be visible from this KOP. However, the Eagle Mountain/Big Wash KOP is 1,293 ft (394.1 m) higher in elevation than the Big Wash Trail and Cultural Sites KOP, creating a higher angle of view. A visitor to this KOP would likely be able to distinguish individual components of solar facilities, including individual panels and heliostats, in the closest part of the SEZ. In the foreground, solar facilities would appear to spread out across the valley floor, emphasizing the strong, regular, repeated geometry of collector arrays. The discontinuous nature of the SEZ could clearly be seen in the foreground, and individual facilities could be distinguished. For views further east and southeast, as the angle of view becomes lower and the floor of the SEZ less visible, foreshortening would cause the facilities to blend together visually, resulting in a loss of detail.

Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers in facilities closest to the KOP would be quite noticeable. These components would appear to extend above the collector/reflector arrays, creating form and line contrasts with the strong regular geometry of the array and heliostat fields; these contrasts would be less noticeable for facilities located further east in the SEZ. The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

Field observations of power tower facilities (Sullivan et al. 2012) suggest that 100+-MW central receiving towers in the nearer portions of the SEZ could appear as brilliant white lights atop discernible tower structures set against the backdrop of the Chuckwalla Valley floor or the Palen Mountains, depending on the receivers' placement within the SEZ. They would likely be bright enough to attract and hold viewers' attention. Reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012), and this phenomenon might be visible from this KOP. For facilities located in the far eastern visible portions of the SEZ, the receivers would appear as distant star-like points of light, and reflected light from dust particles would be unlikely to be visible. If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Eagle Mountain/Big Wash KOP at night; however, a variety of lights within the valley are already visible, including lighting from I-10 and the communities of Lake Tamarisk and Desert Center. Other lighting at surrounding solar facilities would likely be visible as well, with the amount of contrast dependent upon the degree to which lighting was mitigated to reduce night-sky impacts.

Because the KOP is located directly west of the SEZ, views in the late afternoon would be towards western-facing parabolic trough mirrors and other western-facing collectors (i.e., heliostats on the eastern side of power towers). Field observations of parabolic trough facilities (Sullivan et al. 2012) suggest that reflected light and glint/glare from the collectors might be visible from this KOP at certain times during the day. Given the higher angle of view and short distance from the KOP to the SEZ, reflections would likely occur between mid-day and

late afternoon. Similar but potentially less intense reflections might be seen from tracking PV panels, when PV panels would be facing west in the afternoon, but given the higher angle of view, it is possible that reflected light from west-facing heliostats on the east side of power tower facilities would be observed; however, the potential for glare in this case is unknown. Reflected light from non-tracking PV panels is very unlikely, given their southern orientation. More definite knowledge of the occurrence of light reflection and glint/glare patterns could be obtained through a glint/glare analysis conducted during a project-specific environmental analysis.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to yield strong contrasts with the surrounding landscape when viewed from the Eagle Mountain/Big Wash KOP. Facilities visible throughout the Chuckwalla Valley would be expected to strongly attract visual attention and dominate the view from this KOP. If one or more power towers were in view, they would appear as obvious man-made elements in a generally natural-appearing landscape. Contrasts would be somewhat lower if only low-height technologies such as PV and parabolic trough facilities were placed within the visible portion of the SEZ, but contrasts would still be considered strong and development would still appear extremely dense throughout the valley. Facility lighting could cause considerable contrasts at night, but these could be reduced through stringent mitigation measures.

NPS did not provide information about visitors or visitation to the KOP; however, KOP use is likely to be very low. It can be assumed that visitors to the KOP would be interested in solitude and scenic vistas. Viewers at this location would see unmistakable man-made elements across much of the field of view, regardless of the types of facilities constructed within the SEZ, and overall visual impacts are expected to be major.

3.2.1.10 Historic Feature North

The Historic Feature North KOP is a point on an east/west-trending dirt road that extends west towards the eastern foothills of the northern Coxcomb Mountains from an unnamed dirt road that zigzags north-south across the floor of the Palen Valley, loosely following the path of the Colorado River Aqueduct. It appears that this road extends through the foothills of the eastern side of the Coxcomb Mountains, potentially passing abandoned homesteads and/or mine sites. It is located approximately 13.5 mi (22 km) north of the Riverside East SEZ at its closest point, at an elevation of approximately 1,090 ft (332 m) above mean sea level and approximately 683 ft (208 m) above the center of the western portion of the Riverside East SEZ. The Historic Feature North KOP is located at the eastern edge of Joshua Tree NP, in a remote wilderness area. From this KOP, the Coxcomb Mountains are visible to the west. To the south, the Chuckwalla Mountains can be seen across the Palen and Chuckwalla Valleys. To the east, the Palen and Granite Mountains are visible across the Palen Valley, which stretches out to the north.

Cultural modifications in the KOP viewshed include portions of I-10, California State Highways 177 and 62, and numerous dirt roads; a high-voltage transmission line; portions of the Colorado River Aqueduct; and abandoned and actively farmed agricultural lands. Because of the low vertical angle of view, these modifications detract only slightly from the scenic qualities of

the western portion of the SEZ as seen from this KOP, even though some (CA-177 and the Colorado River Aqueduct) are located within 6 mi (9.7 km).

Figure 3.2-39 shows the Historic Feature North KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could be seen. The figure shows that the SEZ is clearly visible from all locations in the KOP vicinity, with visibility becoming limited to the peaks of the Coxcomb Mountain further west.

Figure 3.2-40 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Historic Feature North KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Historic Feature North KOP, solar development within 18,109 acres (73.285 km^2) or 12% of the SEZ would potentially be visible. The figure shows that only a small portion of the Riverside East SEZ that lies south and west of the Palen Mountains and south and east of the Coxcomb Mountains is visible from this KOP. The nearest visible point within the Riverside East SEZ is approximately 13.5 mi (22 km) from the KOP, and the farthest visible point in the SEZ is approximately 24 mi (39 km) from the KOP. Throughout most of this area, low-height solar facilities could potentially be visible; however, along the very western edge and southeastern edge of the visible area of the SEZ, only facility components of 150 ft (45.7 m) and taller, such as the upper portions of transmission towers and central receiving towers of power facilities, would potentially be visible.

Figure 3.2-41 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Historic Feature North KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-42 is a Google Earth visualization of the Riverside East SEZ as seen from the Historic Feature North KOP, looking south-southeast. The visible portion of the SEZ occupies approximately 21° of the viewer's field of view.

The visualization shows that solar facilities within the Riverside East SEZ, as viewed from this KOP, would appear nearly edge-on because of the low angle of view. Foreshortening would cause solar collector/reflector arrays to appear as an extremely thin band just under the horizon, significantly reducing their strong regular geometry and their apparent size. Taller facility components such as support buildings, power blocks, cooling towers, and transmission towers located in the visible portions of the SEZ closest to the KOP would extend above the collector/reflector arrays; however, except for the central receiving towers of power tower facilities, because of the distance and low angle of view, this would not cause significant contrasts.

The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their

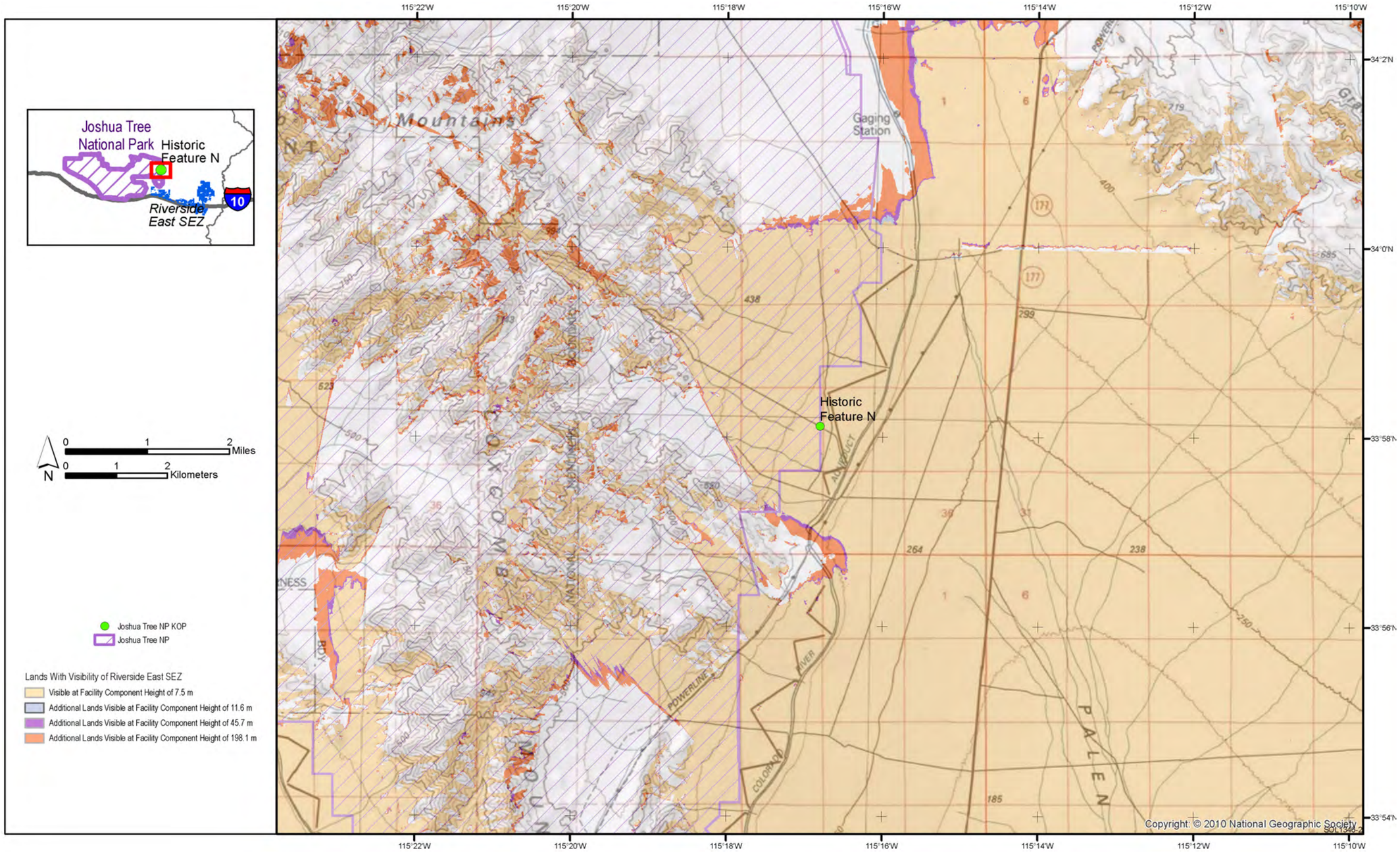

FIGURE 3.2-39 The Historic Feature North KOP within the Riverside East Viewshed

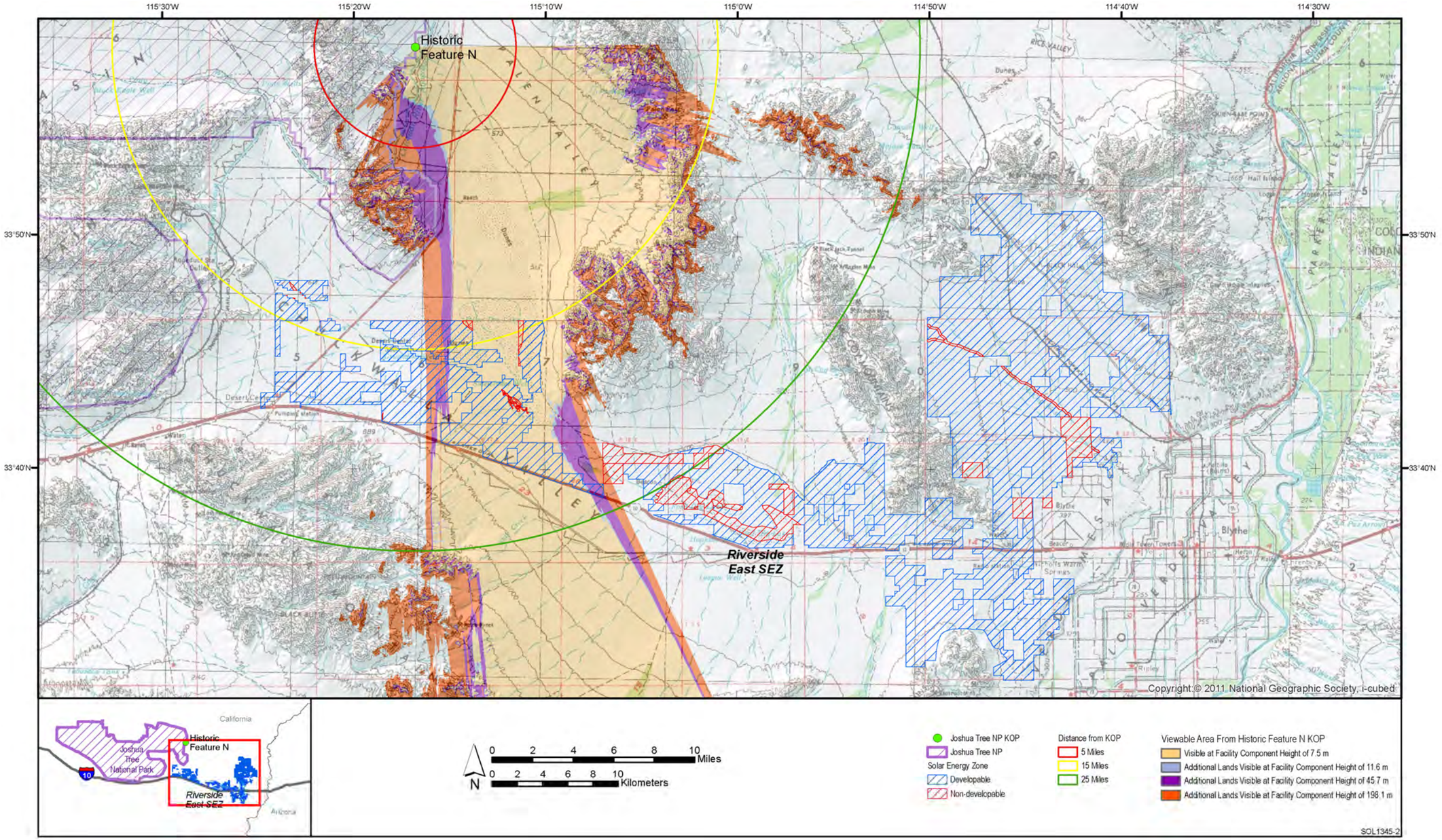

FIGURE 3.2-40 The Riverside East SEZ within the Historic Feature North KOP Viewshed

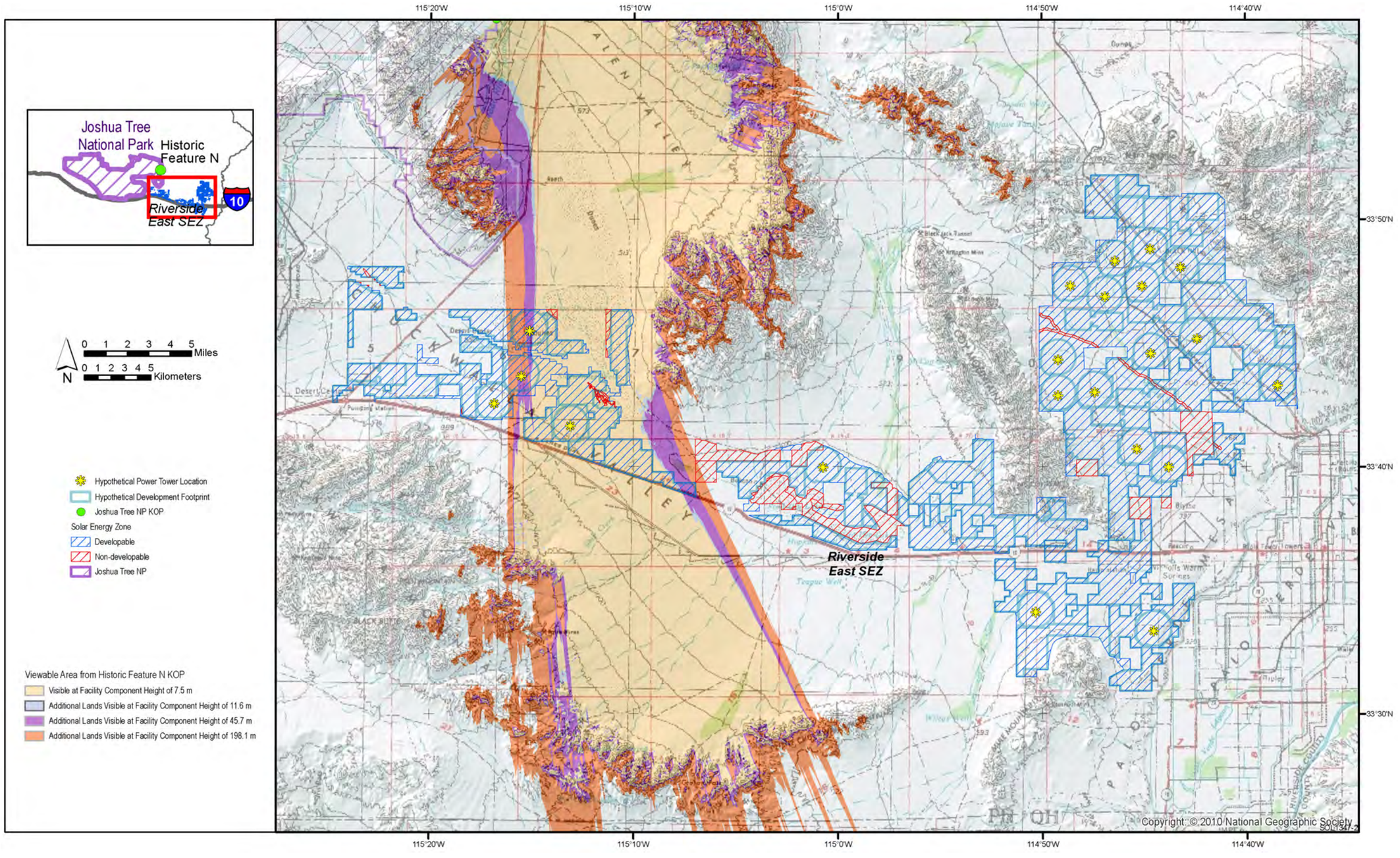

FIGURE 3.2-41 Close-up of Riverside East SEZ with Facility Footprints within the Historic Feature North Viewshed

FIGURE 3.2-42 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Historic Feature North KOP

height and optical density are highly dependent on atmospheric and other variables. It is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

Field observations of power tower facilities (Sullivan et al. 2012) suggest that 100+-MW central receiving towers located throughout the visible portion of the SEZ would appear as bright points of light against the backdrop of the Chuckwalla Valley or the Chuckwalla Mountains. If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Historic Feature North KOP at night. Other lighting at surrounding solar facilities would likely be visible as well, with the amount of contrast dependent upon the degree to which lighting was mitigated to reduce night-sky impacts. The nearest lights directly visible south of the SEZ would be associated with I-10, about 20 mi (32 km) from the SEZ, so lighting from multiple solar facilities, if not stringently mitigated, could contribute substantially to night-sky impacts.

Because this KOP is located north of the SEZ, views from the KOP would be towards the sides of parabolic trough arrays; north-facing heliostats on the south side of power towers; and the shaded side of PV panels and other south-facing collector arrays, like tracking PV panels and south-facing heliostats on the north side of power towers. On the basis of field observations of parabolic trough and PV facilities (Sullivan et al. 2012), reflector/collector arrays would potentially be visible from this KOP. Although visibility would depend on the time of day, lighting, and atmospheric conditions, visibility would likely be greatly reduced owing to the low angle of view and relatively long distance between the KOP and SEZ. Given the viewing direction and low angle of view, it is unlikely that glint/glare from any solar development would be observed from the KOP. A more complete glint/glare analysis would be conducted during project-specific analysis.

Historic Feature North is an east/west-oriented dirt road, accessible by adjacent dirt roads extending from CA-177. The road appears to be an off-roading trail potentially leading to historic home and mine sites in the foothills on the east side of the Coxcomb Mountains, and it is unlikely that visitors will stop at this KOP to look around. Viewers planning to enter park boundaries using this road would pass the Riverside East SEZ for approximately 7 mi (11 km) as they travel north on CA-177. If approaching this road travelling south on CA-177, viewers may see solar development within the SEZ before turning west towards the KOP.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to yield weak contrasts with the surrounding landscape when viewed from the Historic Feature North KOP. If only PV or parabolic trough facilities were located in the visible area of the SEZ, viewers might not notice solar development in the SEZ because of the low angle of view and relatively long distance to the SEZ. Power tower facilities would draw more attention, as the central receiving towers would project above the valley floor and appear as obvious man-made elements in an otherwise mostly natural-appearing landscape.

NPS did not provide information about visitors or visitation to the KOP; however, KOP use is likely to be very low. It is assumed that visitors to the KOP would be interested in scenic

vistas. Because of the long distance to the SEZ and the low vertical angle of view, overall impacts would likely be minor.

3.2.1.11 Historic Feature South

The Historic Feature South KOP is a historic road located in the western foothills of the southern Coxcomb Mountains, a remote wilderness area of Joshua Tree NP. It is situated approximately 3 mi (5 km) northeast of the Riverside East SEZ at its closest point, at an elevation of approximately 830 ft (253 m) above mean sea level and approximately 430 ft (131 m) above the center of the western portion of the Riverside East SEZ. The steep faces of the southern Coxcomb Mountains rise immediately to the north and northeast. The Palen, Chuckwalla, and Eagle Mountains are visible to the southeast, south, and west across the vast expanse of the Chuckwalla Valley.

Cultural modifications in the KOP viewshed include portions of California State Highway 177, I-10, and numerous other paved and dirt roads; the Lake Tamarisk housing development; a high-voltage transmission line; abandoned and actively farmed agricultural lands; and at least two solar facilities currently under construction (Desert Solar and Desert Harvest). The historic Eagle Mountain mine is also visible from this location. The larger of these modifications (Desert Solar, Desert Harvest, and Eagle Mountain Mine) detract noticeably from the scenic qualities of the western portion of the SEZ as seen from this KOP and are located between 3 and 8 mi (5 km and 13 km) away.

Figure 3.2-43 shows the Historic Feature South KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could be seen. The figure shows that there would be unobstructed views of low-height solar facilities in the SEZ from the KOP and nearby lands.

Figure 3.2-44 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Historic Feature South KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Historic Feature South KOP, solar development within 36,427 acres (147.41 km^2) or 25 % of the SEZ would potentially be visible. The figure shows that much of the Riverside East SEZ between its western terminus and its point just north of I-10 in Ford Dry Lake is visible from this KOP. The nearest visible point in the Riverside East SEZ is approximately 3 mi (5 km) from the Historic Feature South KOP, and the farthest visible point in the SEZ is approximately 30 mi (48 km) from the KOP. In almost all of this area, low-height facilities could potentially be visible; however, along the southeastern edge of the visible area of the SEZ there are small sections where only facility components 150 ft (45.7 m) high or higher, such as the upper portions of transmission towers and central receiving towers of power tower facilities, would potentially be visible, and adjacent to these areas, there is an area roughly equivalent in size where only the upper portions of central receiving towers would potentially be visible.

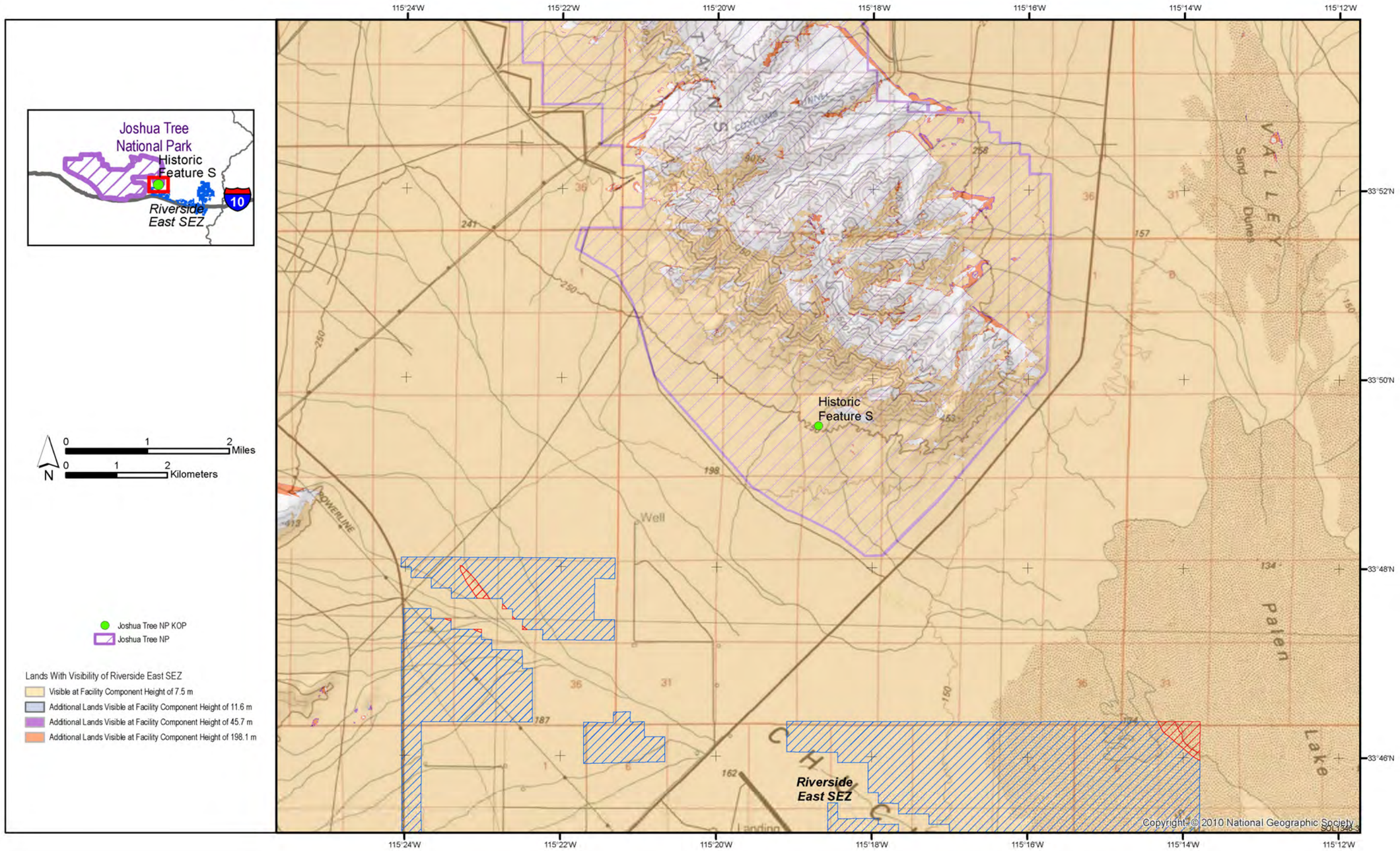

FIGURE 3.2-43 The Historic Feature South KOP within the Riverside East Viewshed

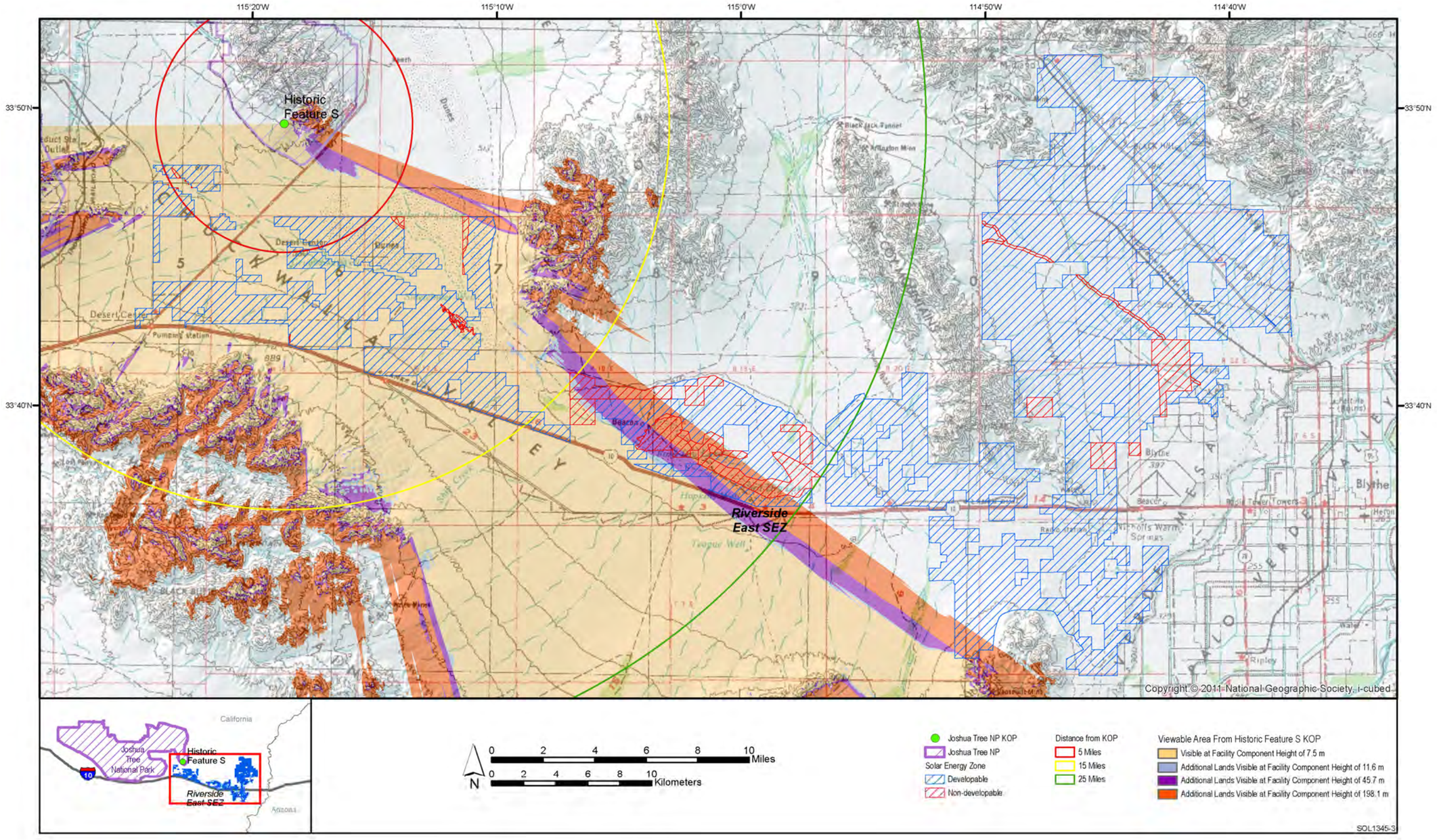

FIGURE 3.2-44 The Riverside East SEZ within the Historic Feature South KOP Viewshed

Figure 3.2-45 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Historic Feature South KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figures 3.2-46, 3.2-47, and 3.2-48 are Google Earth visualizations of the Riverside East SEZ as seen from the Historic Feature South KOP. Because the SEZ stretches across a very large portion of the horizontal field of view from the KOP, three images are needed to show all potentially visible portions of the SEZ. The images overlap slightly at the right side of Figure 3.2-46, both the left and right sides of Figure 3.2-47, and the left side of Figure 3.2-48, respectively. These visualizations show that looking southwest to southeast from the Historic Feature South KOP, the visible portion of the SEZ occupies approximately 138° of the viewer's field of view.

These visualizations show that the vertical angle of view from the Historic Feature South KOP is high enough that the tops and sides of solar collector/reflector arrays would be visible. Solar development in the SEZ would spread across so much of the view that KOP visitors would have to turn their heads in order to see it all. A visitor to this KOP would likely be able to distinguish individual components of solar facilities, including individual panels and heliostats, in the closest part of the SEZ. In the foreground, solar facilities would appear to spread out across the valley floor, emphasizing the strong, regular, repeated geometry of the collector arrays. The discontinuous nature of the SEZ could clearly be seen in the foreground and individual facilities could be distinguished, and the lack of consistency in the visual appearance of different facilities would likely be evident, potentially creating a visually cluttered landscape. For views further east and southeast, as the angle of view becomes lower and the floor of the SEZ less visible, foreshortening would cause the facilities to blend together visually, resulting in a loss of detail.

Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers in facilities closest to the KOP would be quite noticeable. These components would appear to extend above the collector/reflector arrays, creating form and line contrasts with the strong regular geometry of the array and heliostat fields; this effect would be less noticeable for facilities located further east and southeast in the SEZ. The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute substantially to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

Field observations of power tower facilities (Sullivan et al. 2012) suggest that 100+-MW central receiving towers in the nearer portions of the SEZ could appear as brilliant white lights atop discernible tower structures, set against the backdrop of the Chuckwalla Valley floor or the Palen Mountains, depending on their placement within the SEZ. They would likely be bright enough to attract and hold viewers' attention. Reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012), and this phenomenon

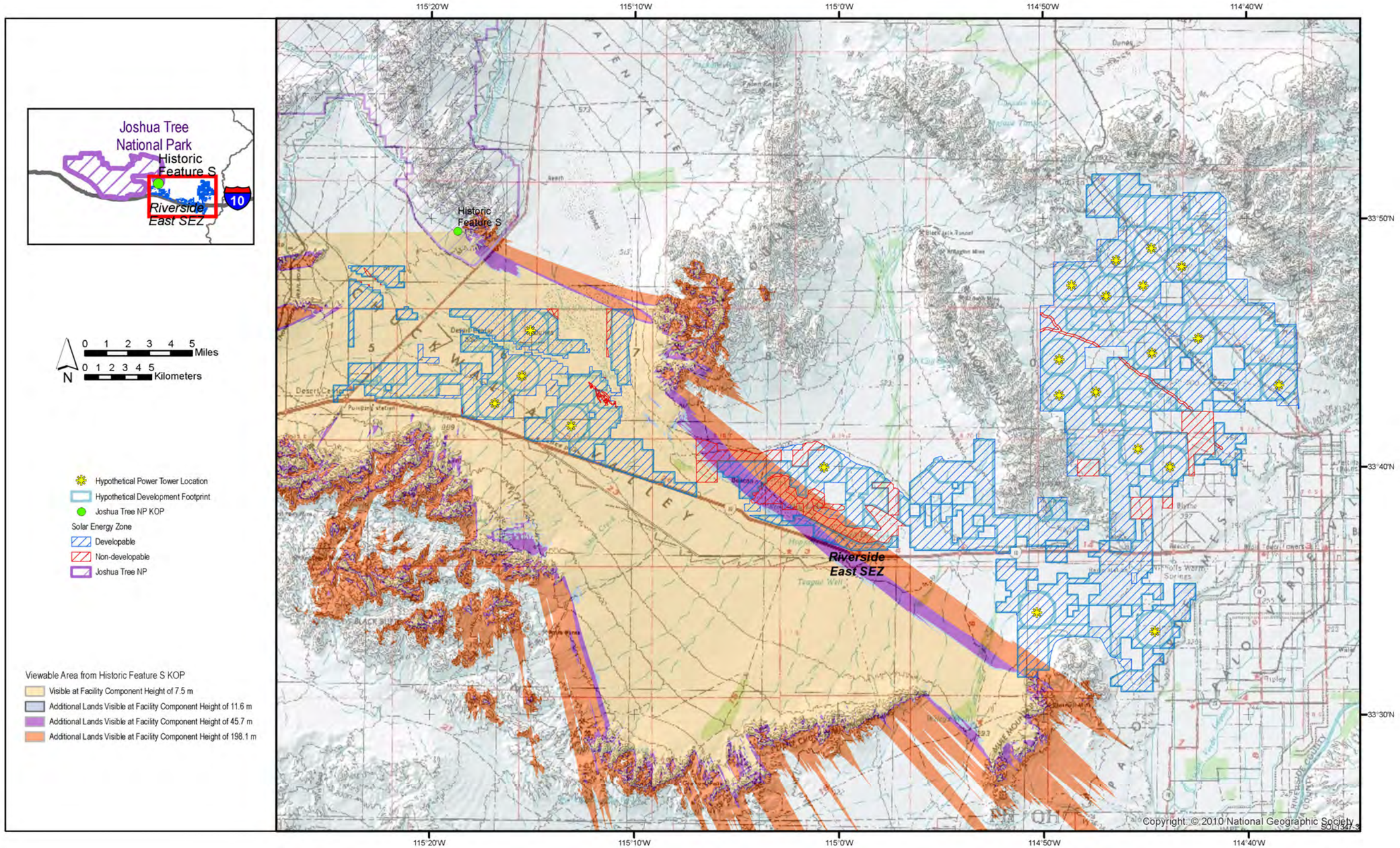

FIGURE 3.2-45 Close-up of Riverside East SEZ with Facility Footprints within the Historic Feature South KOP Viewshed

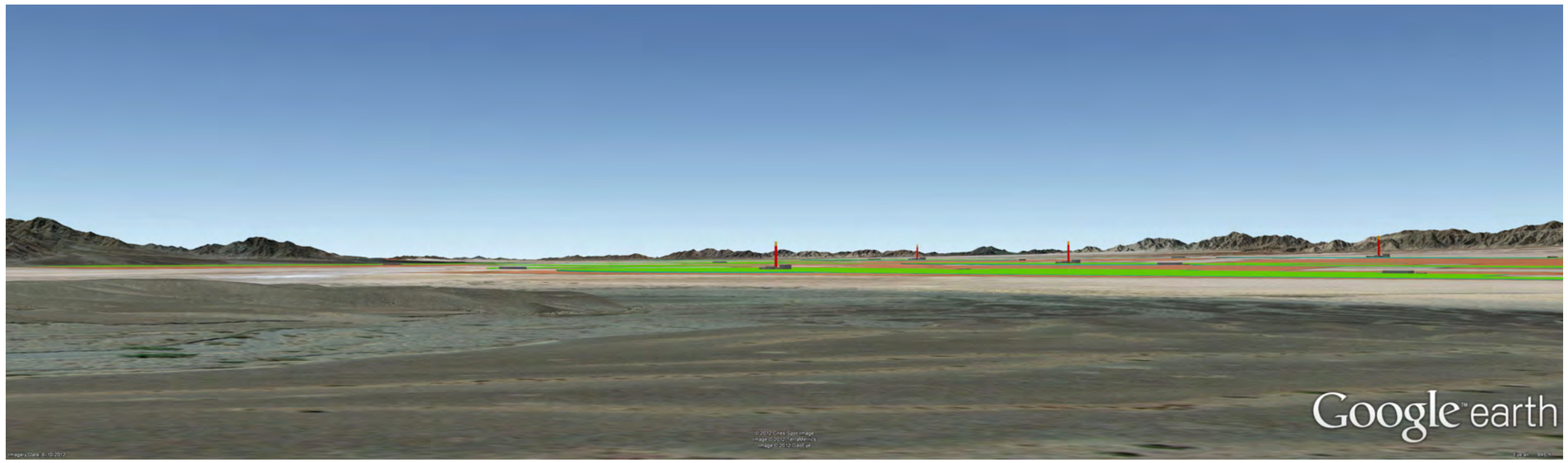

FIGURE 3.2-46 Google Earth Visualization of Partial View of Left-hand Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Historic Feature South KOP

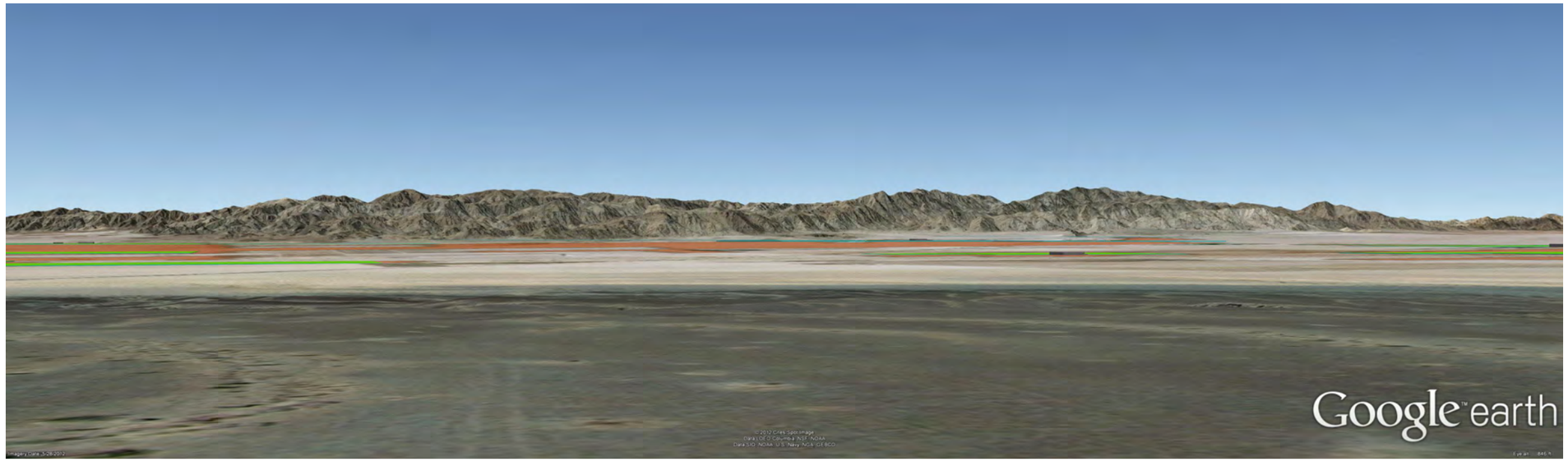

FIGURE 3.2-47 Google Earth Visualization of Partial View of Central Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Historic Feature South KOP

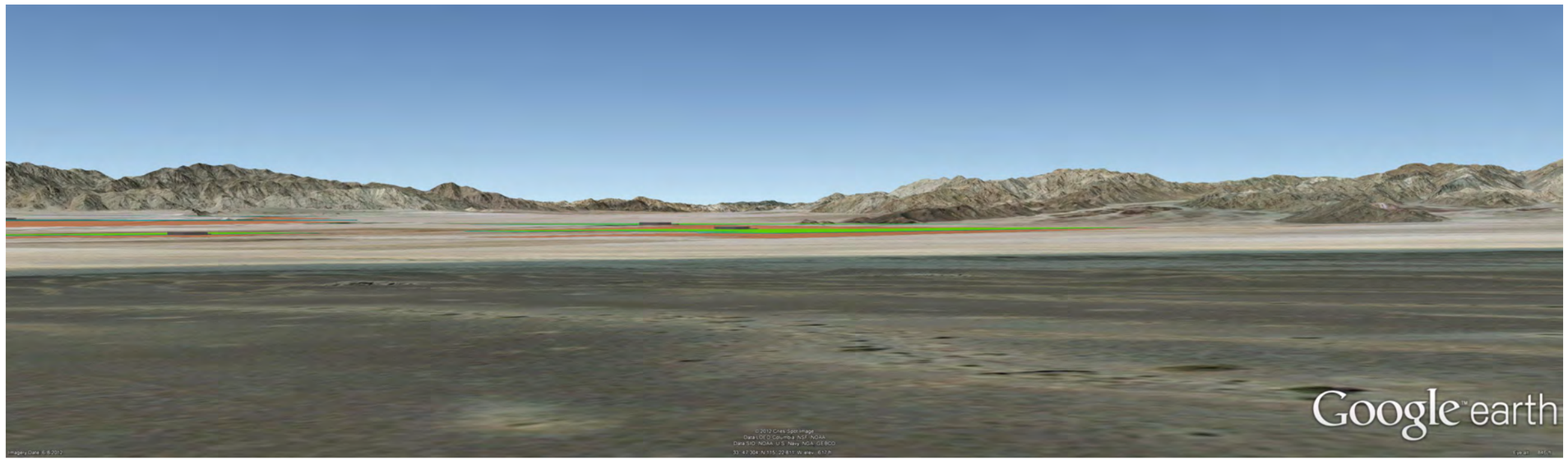

FIGURE 3.2-48 Google Earth Visualization of Partial View of Right-hand Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Historic Feature South KOP

would likely be visible from this KOP if power towers were located close to the KOP. For facilities located in the far eastern visible portions of the SEZ, the receivers would appear as distant star-like points of light, and reflected light from dust particles would be unlikely to be visible. If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Historic Feature South KOP at night; however, a variety of lights within the valley would already be visible, including lighting from I-10 and the communities of Lake Tamarisk and Desert Center. Other lighting at surrounding solar facilities would likely be visible as well, with the amount of contrast dependent upon the degree to which lighting was mitigated to reduce night-sky impacts.

The KOP is north of the nearest portion of the SEZ and southward views from this KOP would consist of the sides of parabolic trough arrays; the north-facing heliostats on the south side of power towers; and the shaded side of PV panels and other south-facing collector arrays, such as south-facing heliostats on the north side of power towers. Because the SEZ extends eastward and the KOP is relatively close to the SEZ, views of solar development in the KOP include southeastern views toward Ford Dry Lake. If parabolic troughs and power tower facilities were located southeast of the KOP, it is possible that glinting or glare could result, and because the distance is relatively short, if glare occurred, it could be bright; however, a more complete glint/glare analysis would be needed to determine if glinting or glare would be observed. Such an analysis would be conducted during a project-specific environmental assessment.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to create strong contrasts with the surrounding landscape when viewed from the Historic Feature South KOP, with particularly strong contrasts resulting if multiple power tower facilities were built in the visible areas of the Chuckwalla Valley closest to the KOP. If development were limited to low-height technologies such as PV and parabolic trough facilities, contrasts would likely be less strong, but solar facilities in the SEZ would still dominate views of the Chuckwalla Valley.

NPS did not provide information about visitors or visitation to the Historic Feature South KOP; however, KOP use is likely to be very low. If it can be assumed that visitors to the KOP would be interested in scenic views, given the short distance from the KOP to the SEZ, under the 80% development scenario, solar development in the SEZ would create a potentially overwhelming visual presence and would dominate the view. Sensitive viewers at the KOP would likely be subject to major visual impacts from solar development within the SEZ.

3.2.1.12 Rock Cairn

Rock Cairn KOP is located in the western foothills of the southern Coxcomb Mountains, in a remote wilderness area of Joshua Tree NP. The KOP is situated approximately 3.5 mi (5.6 km) north-northeast of the Riverside East SEZ at its closest point, at an elevation of approximately 1,120 ft (341 m) above mean sea level and approximately 710 ft (216 m) above the center of the western portion of the Riverside East SEZ. The steep faces of the southern Coxcomb Mountains rise immediately to the north and east. The Eagle Mountains are visible to

the west across the northwestern extent of the Chuckwalla Valley. The Mule Mountains are visible to the southeast, across the Chuckwalla Valley.

Cultural modifications in the KOP viewshed include portions of I-10, CA-177, and numerous other paved and dirt roads; the Lake Tamarisk housing development; a high-voltage transmission line; abandoned and actively farmed agricultural lands; and at least two solar facilities currently under construction (Desert Solar and Desert Harvest). The historic Eagle Mountain mine is also visible from this KOP. These man-made modifications and built facilities would likely detract noticeably from the scenic qualities of the western portion of the SEZ as seen from this KOP, as the KOP provides an open, unobstructed view of much of the Chuckwalla Valley.

Figure 3.2-49 shows the Rock Cairn KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could be seen. The figure shows that parts of the SEZ surrounding the Rock Cairn KOP are clearly visible from the KOP, with the exception of some locations just north of the KOP, where undulating topography obstructs the view.

Figure 3.2-50 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Rock Cairn KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. The viewshed is very similar to that of the Historic Feature South KOP. The figure shows that much of the Riverside East SEZ between its western terminus and its point just north of I-10 in Ford Dry Lake is visible from this KOP. Within 25 mi (40 km) of the Rock Cairn KOP, solar development within 35,213 acres (142.50 km^2) or 24% of the SEZ would potentially be visible.

The nearest visible point in the Riverside East SEZ is approximately 3.5 mi (5.6 km) from the Rock Cairn KOP, and the farthest visible point in the SEZ is approximately 27.5 mi (44 km) from the KOP. In almost all of this area, low-height solar facilities could potentially be seen. However, along the northeastern edge of the visible area of the SEZ, there are small portions of the SEZ where only components with heights of 150 ft (45.7 m) or more could potentially be seen, and additional areas where only components with heights of 650 ft (198.1 m) or more, such as the upper portions of central receiving towers for power tower facilities, could potentially be seen.

Figure 3.2-51 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Rock Cairn KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figures 3.2-52 and 3.2-53 are Google Earth visualizations of the Riverside East SEZ as seen from the Rock Cairn KOP. Because the SEZ stretches across a very large portion of the horizontal field of view from the KOP, two images are needed to show all potentially visible portions of the SEZ. The images overlap slightly at the right side of Figure 3.2-52 and the left side of Figure 3.2-53, respectively. The visualizations confirm that under the 80% development

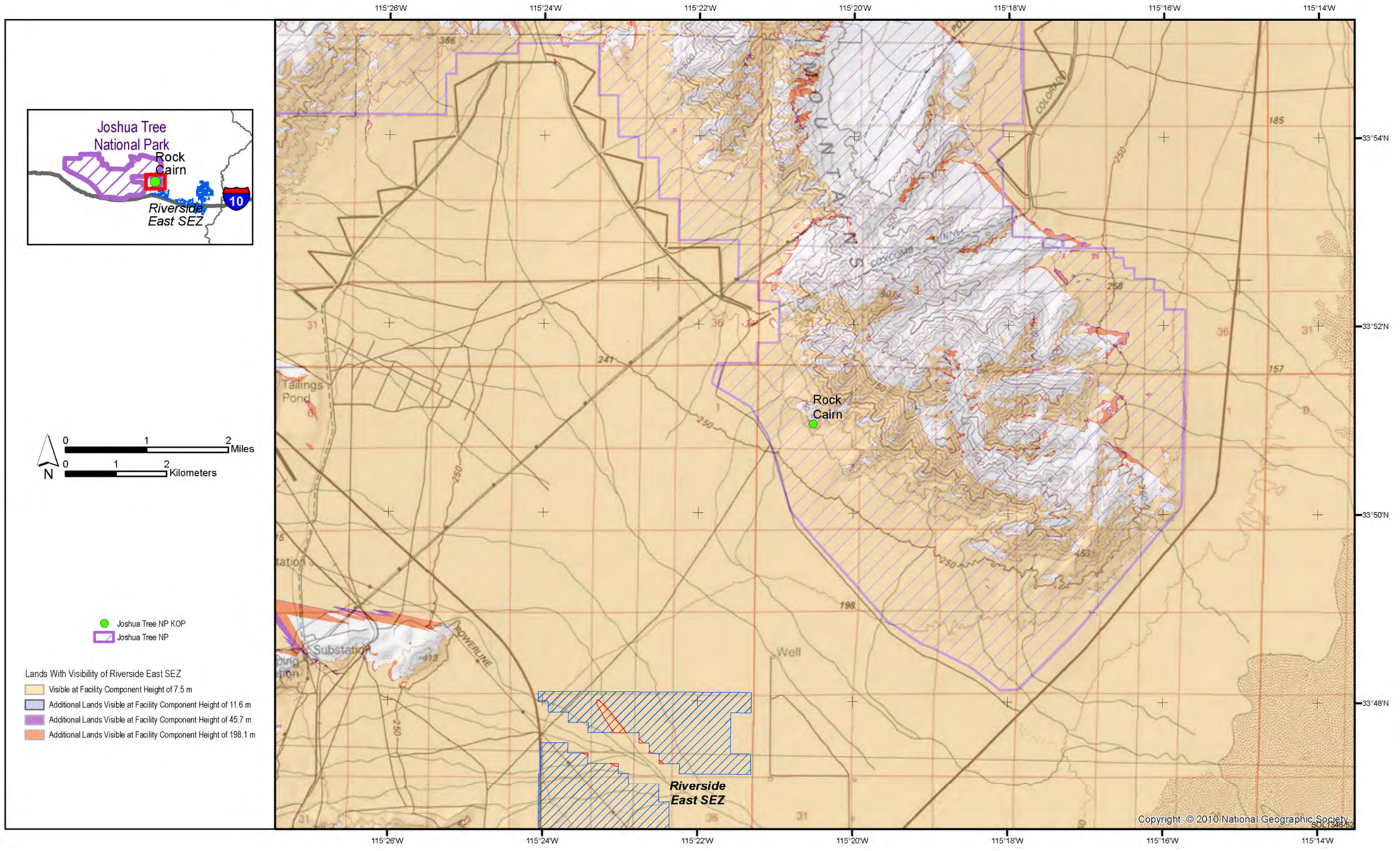

FIGURE 3.2-49 The Rock Cairn KOP within the Riverside East Viewshed

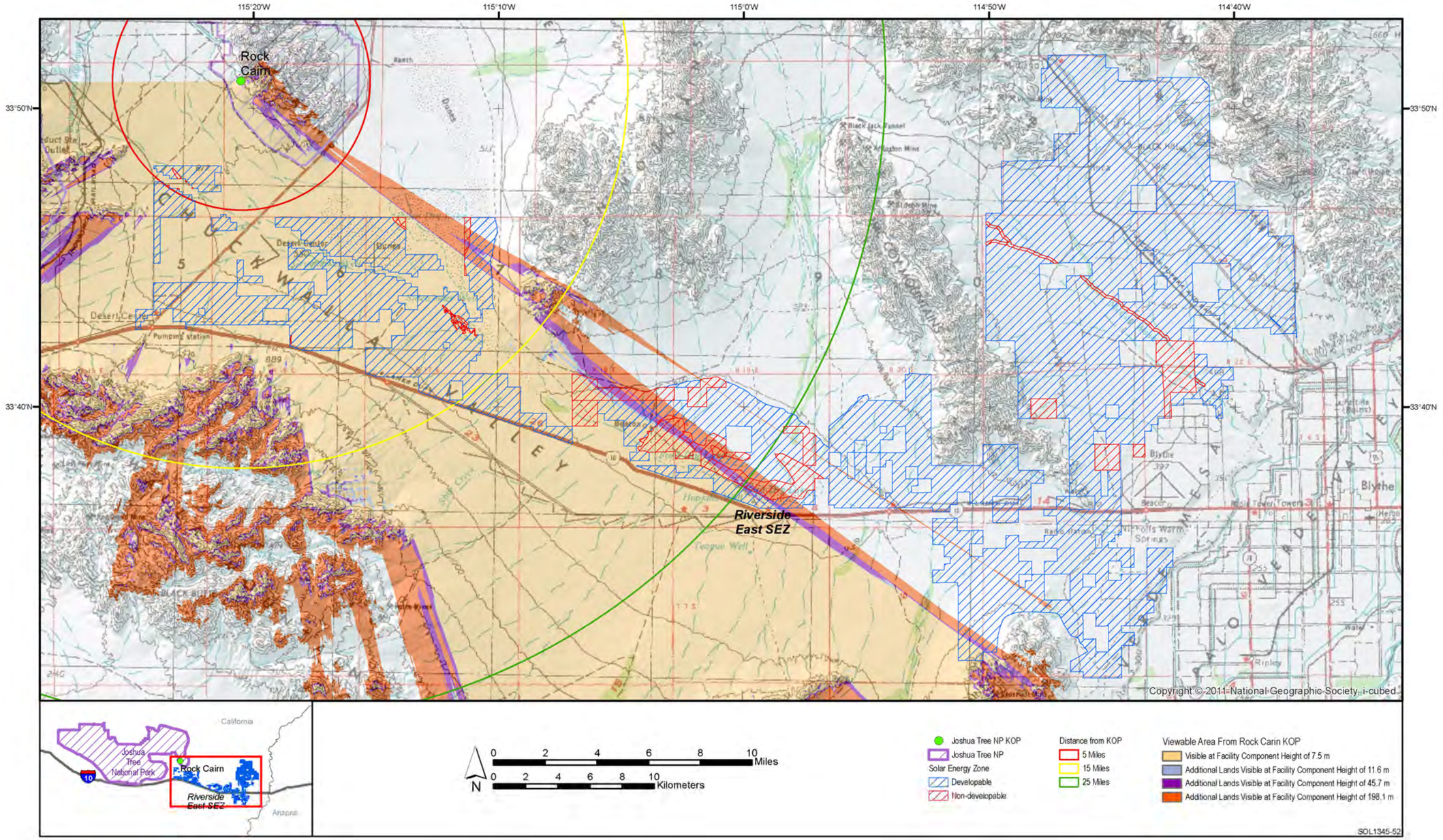

FIGURE 3.2-50 The Riverside East SEZ within the Rock Cairn KOP Viewshed

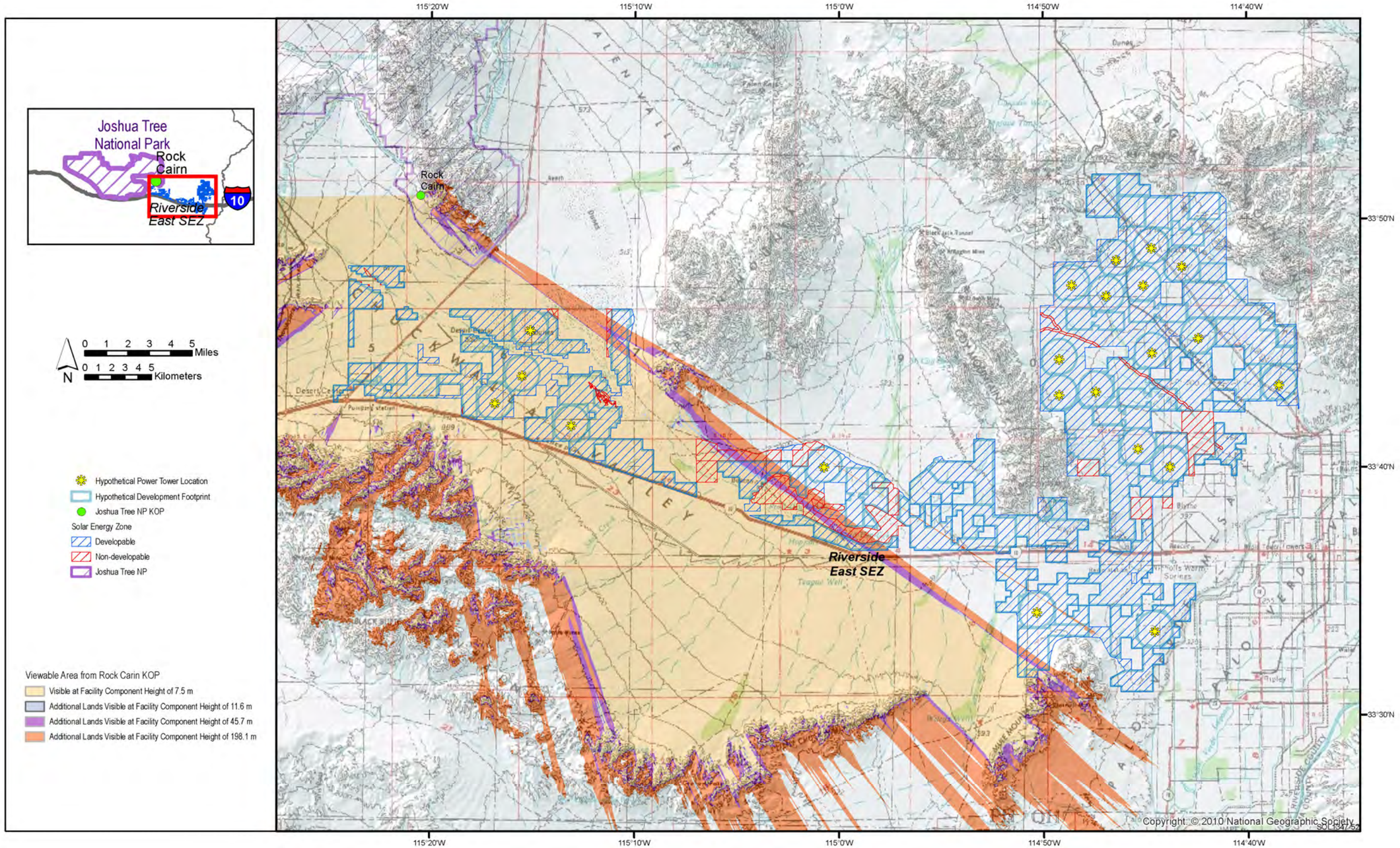

FIGURE 3.2-51 Close-up of the Riverside East SEZ with Facility Footprints within the Rock Cairn KOP Viewshed

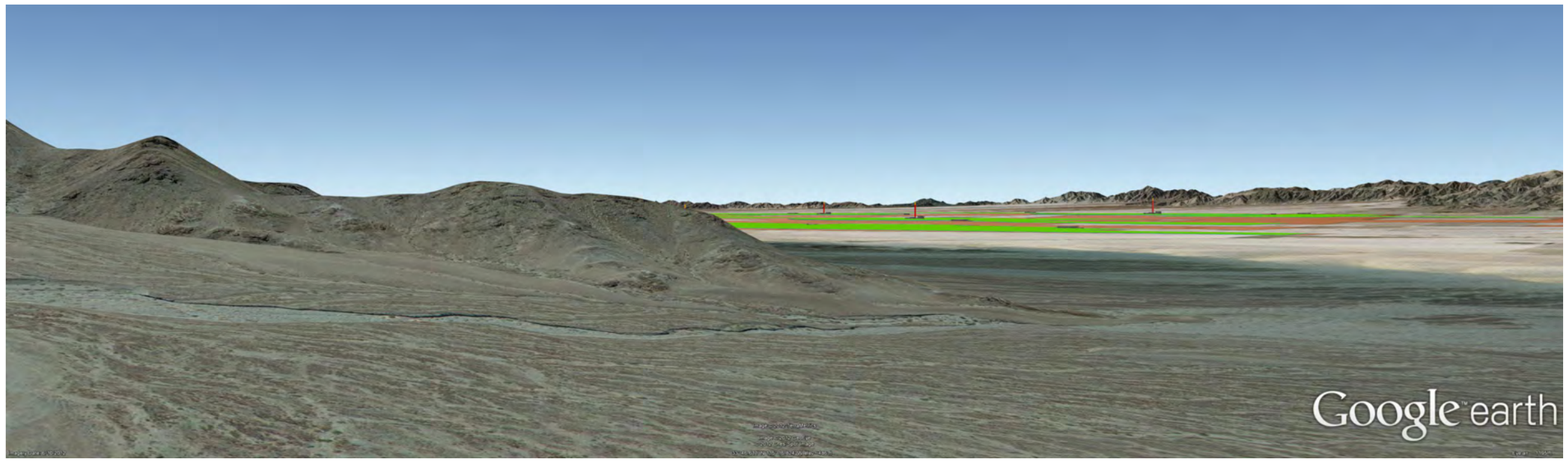

FIGURE 3.2-52 Google Earth Visualization of the Left-hand Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Rock Cairn KOP

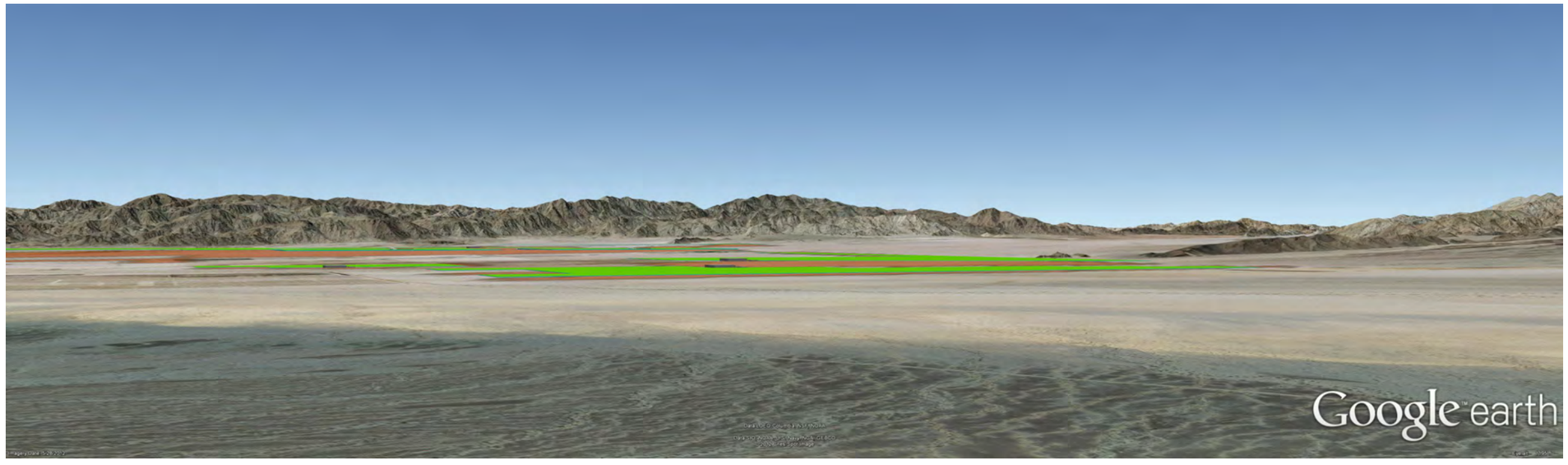

FIGURE 3.2-53 Google Earth Visualization of the Right-hand Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Rock Cairn KOP

scenario presented here, much of the Riverside East SEZ between its western terminus and its point just north of I-10 in Ford Dry Lake is potentially visible from the KOP. The visible portion of this KOP occupies approximately 106° of the viewer's horizontal field of view.

These visualizations show that the view of the SEZ from the Rock Cairn KOP is generally similar to that from the Historic Feature South KOP. Like the Historic Feature South KOP, the tops and sides of solar collector/reflector arrays in the SEZ would be visible; however the angle of view is slightly higher, and is high enough that the strong regular geometry of solar collector/reflector arrays in the closest parts of the SEZ would be apparent.

Similarly to the view from the Historic Feature South KOP, solar development in the SEZ would spread across so much of the Rock Cairn KOP view that KOP visitors would have to turn their heads in order to see it all. A visitor to this KOP would likely be able to distinguish individual components of solar facilities in the closest part of the SEZ. In the foreground, solar facilities would appear to spread out across the valley floor, emphasizing the strong, regular, repeated geometry of collector arrays. The discontinuous nature of the SEZ could clearly be seen in the foreground and individual facilities could be distinguished, and the lack of consistency in the visual appearance of different facilities would likely be evident, potentially creating a visually cluttered landscape. For views further east and southeast, as the angle of view becomes lower and the floor of the SEZ less visible, foreshortening would cause the facilities to blend together visually, resulting in a loss of detail.

Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers in facilities closest to the KOP would be quite noticeable. These components would appear to extend above the collector/reflector arrays, creating form and line contrasts with the strong regular geometry of the array and heliostat fields; this effect would be less noticeable for facilities located further east and southeast in the SEZ.

The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute substantially to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables.

Field observations of power tower facilities (Sullivan et al. 2012) suggest that 100+-MW central receiving towers in the nearer portions of the SEZ could appear as brilliant white lights atop discernible tower structures set against the backdrop of the Chuckwalla Valley floor, the Chuckwalla Mountains, or the Little Chuckwalla Mountains, depending on their placement within the SEZ. Central receivers in the closer portions of the SEZ would likely be bright enough to attract and hold viewers' attention. Reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012), and this phenomenon would likely be visible from this KOP. For facilities located in the far eastern visible portions of the SEZ, the receivers would appear as distant star-like points of light, and reflected light from dust particles would be unlikely to be visible. If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Rock Cairn KOP at night; however, a variety of lights within the valley would already be visible,

including lighting from I-10 and the communities of Lake Tamarisk and Desert Center. Other lighting at surrounding solar facilities would likely be visible as well, with the amount of contrast dependent upon the degree to which lighting was mitigated to reduce night-sky impacts.

The KOP is north of the nearest portion of the SEZ, and southward views from this KOP would include the sides of parabolic trough arrays; the north-facing heliostats on the south side of power towers; and the shaded side of PV panels and other south-facing collector arrays, such as south-facing heliostats on the north side of power towers. Because the SEZ extends eastward and the KOP is close to the SEZ, views of solar development in the KOP include southeastern views toward Ford Dry Lake. If parabolic troughs and power tower facilities were located southeast of the KOP, it is possible that glinting or glare could result, and because the distance is relatively short, if glare occurred, it could be bright; however, a more complete glint/glare analysis would be needed to determine if glinting or glare would be observed. Such an analysis would be conducted during a project-specific environmental assessment.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to create strong contrasts with the surrounding landscape when viewed from the Rock Cairn KOP, with particularly strong contrasts resulting if multiple power tower facilities were built in the visible areas of the Chuckwalla Valley closest to the KOP. If development were limited to low-height technologies such as PV and parabolic trough facilities, contrasts would likely be less strong, but solar facilities in the SEZ would still dominate views of the Chuckwalla Valley.

NPS did not provide information about visitors or visitation to the Rock Cairn KOP; however, KOP use is likely to be very low. If it can be assumed that visitors to the KOP would be interested in scenic views, given the short distance from the KOP to the SEZ, under the 80% development scenario, solar development in the SEZ would create a potentially overwhelming visual presence and would dominate the view. Sensitive viewers at the KOP would likely be subject to major visual impacts from solar development within the SEZ.

3.2.1.13 South Coxcomb Peak

The South Coxcomb Peak KOP is located in the very southern tip of the Coxcomb Mountains, in a remote wilderness area of Joshua Tree NP. There is no trail to South Coxcomb Peak, but it appears to be accessible by foot from surrounding washes. It is situated approximately 4 mi (6 km) north of the Riverside East SEZ at its closest point. The KOP is located at an approximate elevation of 1,6010 ft (491 m) above mean sea level and approximately 1,200 ft (366 m) above the center of the western portion of the Riverside East SEZ. Looking north from this KOP, the northern extent of the Palen Valley can be seen, framed by the cragged terrain of the Coxcomb Mountains and the Granite Mountains. The Palen Mountains are visible to the east. To the southeast, the view extends across the Chuckwalla Valley to the Mule Mountains. The peaks of the southern Coxcombs obstruct views to the west.

Cultural modifications in the KOP viewshed include portions of I-10, CA-177, and numerous other paved and dirt roads; the Lake Tamarisk housing development; the community

of Desert Center; a high-voltage transmission line; abandoned and actively farmed agricultural lands; and at least two solar facilities currently under construction (Desert Solar and Desert Harvest). The historic Eagle Mountain mine is also visible from this KOP. These modifications would likely detract noticeably from the scenic qualities of the western portion of the SEZ as seen from this KOP, as much of the Chuckwalla Valley is visible from this location.

Figure 3.2-54 shows the South Coxcomb Peak KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could be seen. The figure shows that the SEZ is clearly visible from the area immediately surrounding the KOP, with visibility at its greatest along the southern face of the peak. In some locations just north of the KOP, visibility appears restricted because of undulating topography; but it becomes clearer at higher elevations.

Figure 3.2-55 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the South Coxcomb Peak KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the South Coxcomb Peak KOP, solar development within 37,412 acres (151.40 km^2) or 26% of the SEZ would potentially be visible.

As is the case for other KOPs within the Southern Coxcomb Mountains, the figure shows that much of the Riverside East SEZ between its western terminus and its point just north of I-10 at Ford Dry Lake is visible from this KOP. The nearest visible point in the Riverside East SEZ is approximately 4 mi (6 km) from the South Coxcomb Peak KOP, and the farthest visible point in the SEZ is approximately 37 mi (60 km) from the KOP. In almost all of this area, low-height solar facilities could potentially be seen; however, along the southeastern edge of the visible area of the SEZ, there are small sections where only components with heights of 150 ft (45.7 m) or greater (e.g., the upper portions of tall transmission towers and central receiving towers of power tower facilities) would potentially be seen, and also some areas where only central receiving towers [650 ft (198.1 km) or higher] would potentially be visible.

Figure 3.2-56 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the South Coxcomb Peak KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figures 3.2-57, 3.2-58, and 3.2-59 are Google Earth visualizations of the Riverside East SEZ as seen from the South Coxcomb Peak KOP. Because the SEZ stretches across a very large portion of the horizontal field of view from the KOP, three images are needed to show all potentially visible portions of the SEZ. The images overlap slightly at the right side of Figure 3.2-53, both the left and right sides of Figure 3.2-54, and the left side of Figure 3.2-55, respectively. These visualizations confirm that solar development within the Riverside East SEZ, from near the SEZ's western terminus to a point near the Palen Dunes Dr. exit of I-10, could potentially be visible. The visible portion of the SEZ occupies approximately 116° of the horizontal field of view.

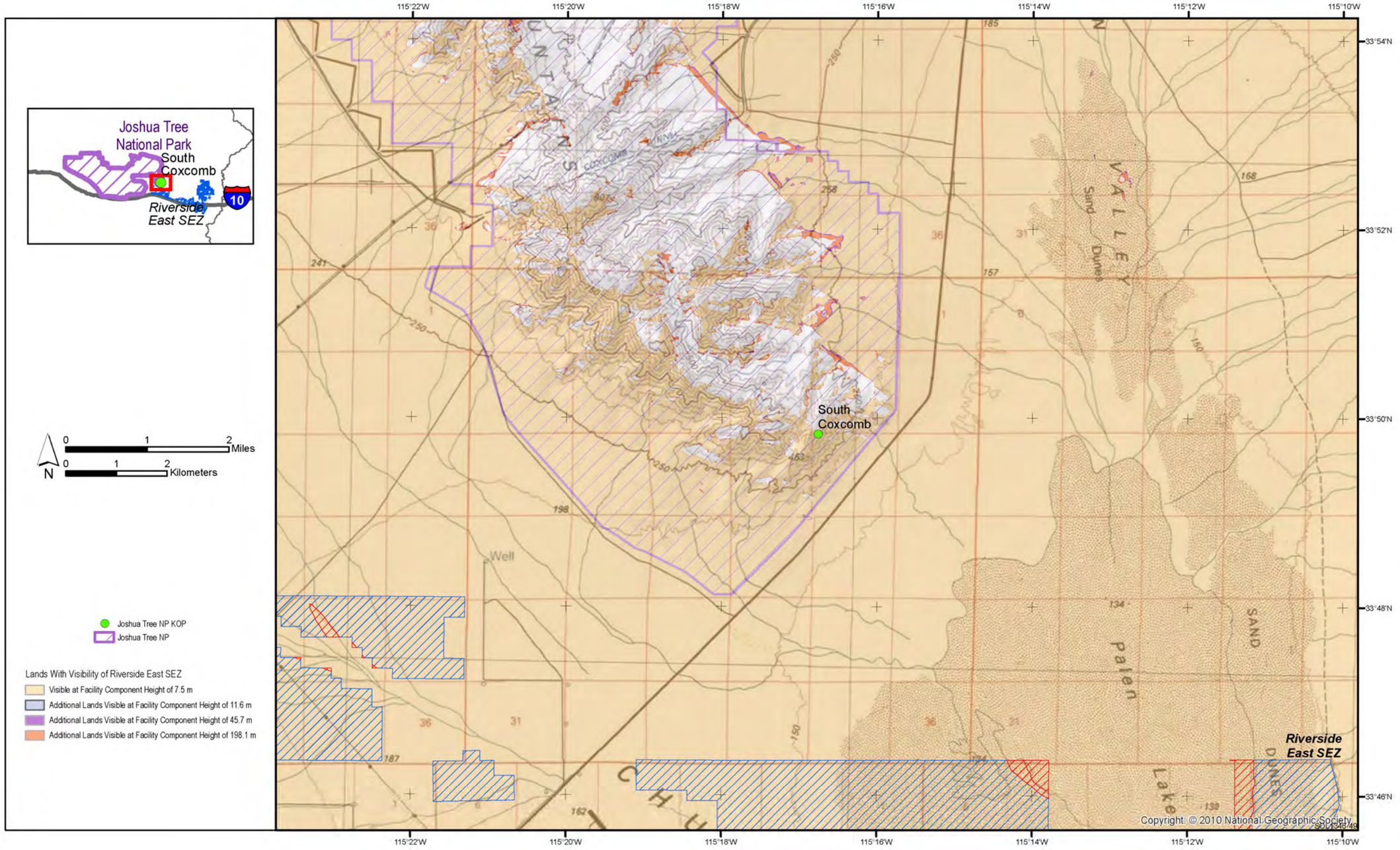

FIGURE 3.2-54 The South Coxcomb Peak KOP within the Riverside East SEZ Viewshed

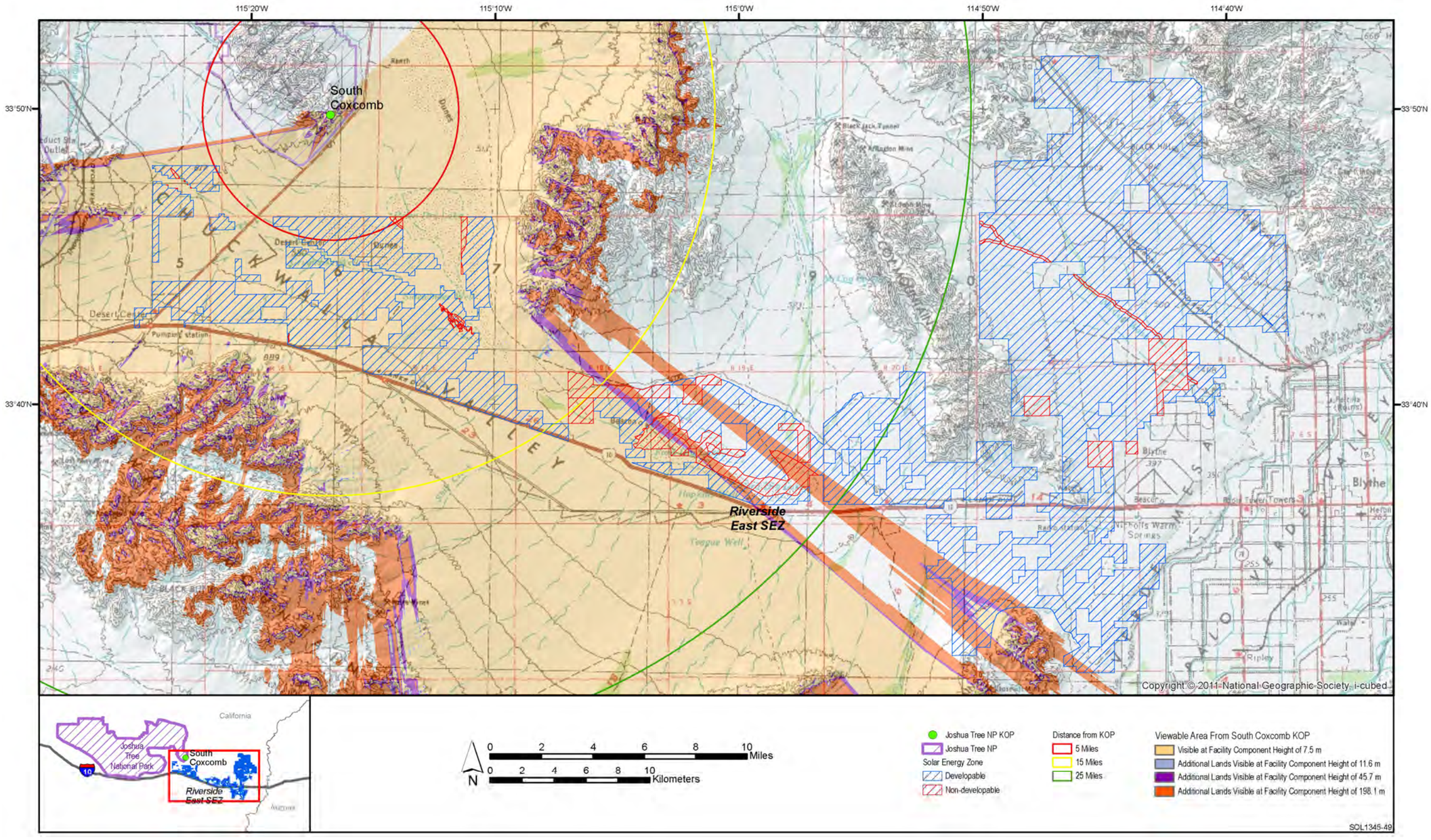

FIGURE 3.2-55 The Riverside East SEZ within the South Coxcomb Peak KOP Viewshed

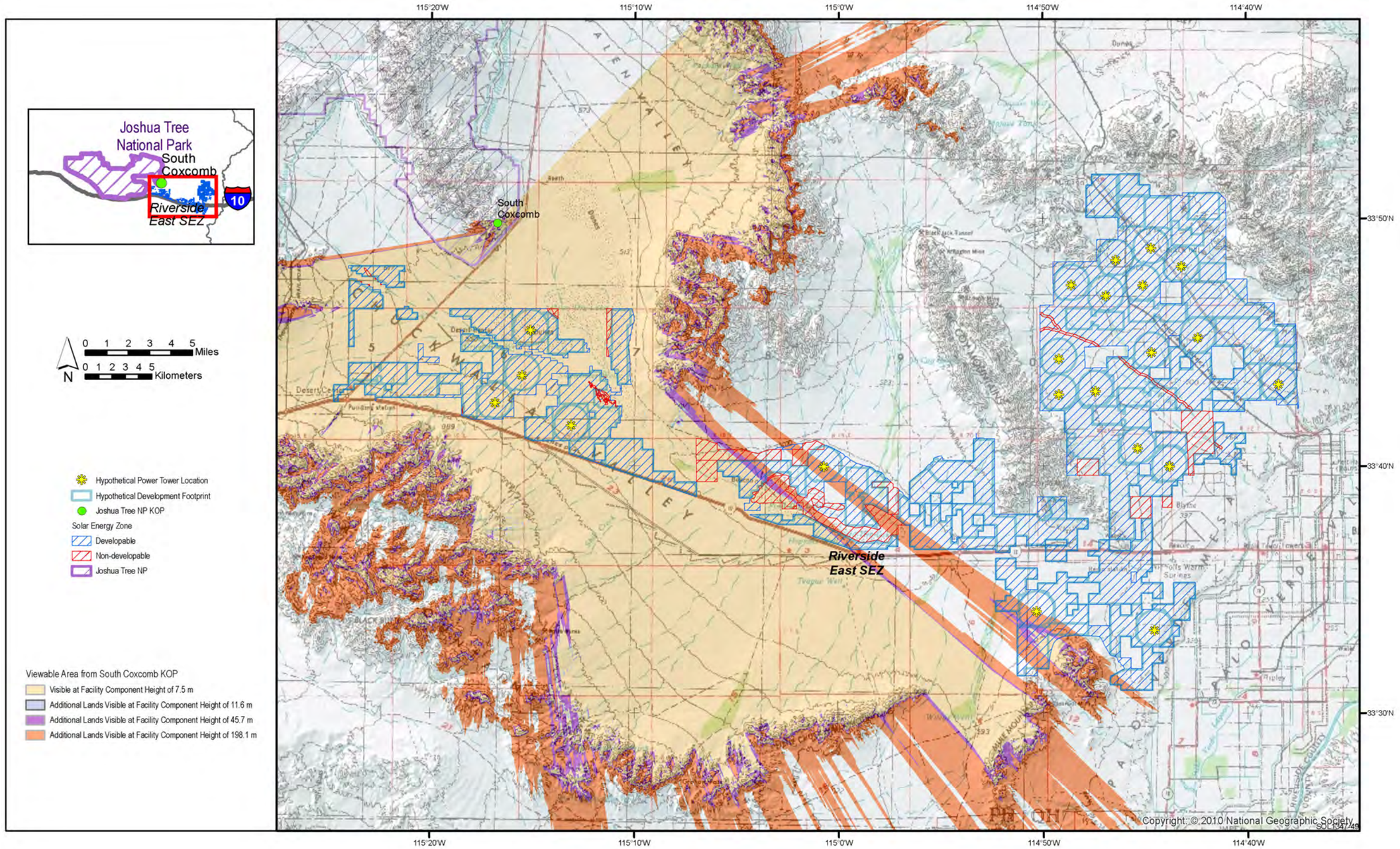

FIGURE 3.2-56 Close-up of the Riverside East SEZ with Facility Footprints within the South Coxcomb Peak KOP Viewshed

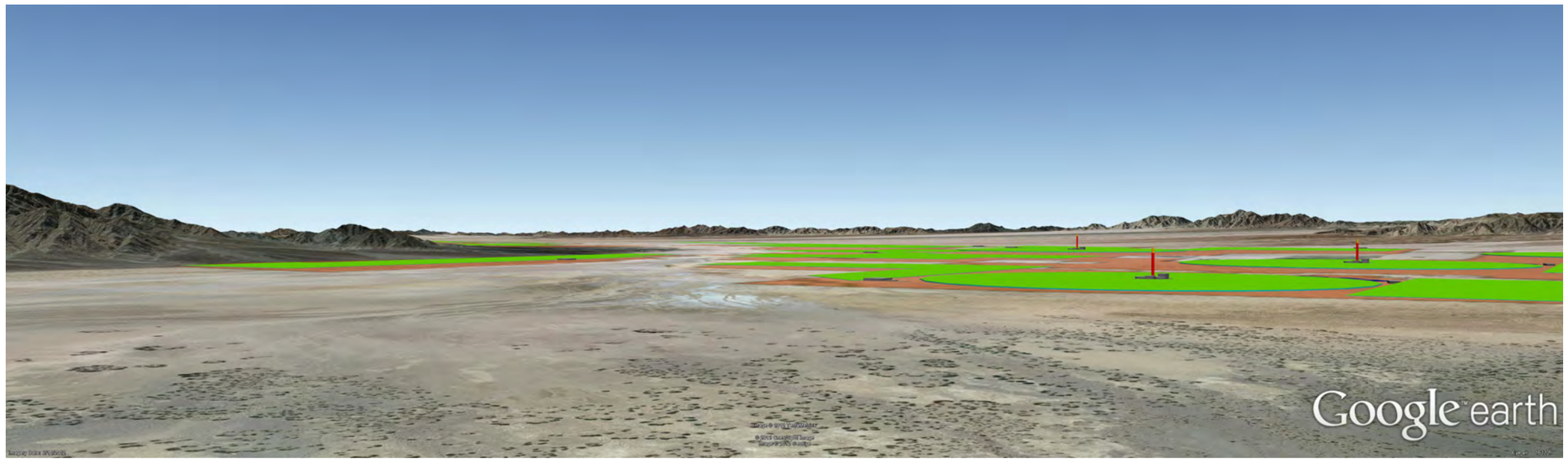

FIGURE 3.2-57 Google Earth Visualization of the Left-hand Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the South Coxcomb Peak KOP

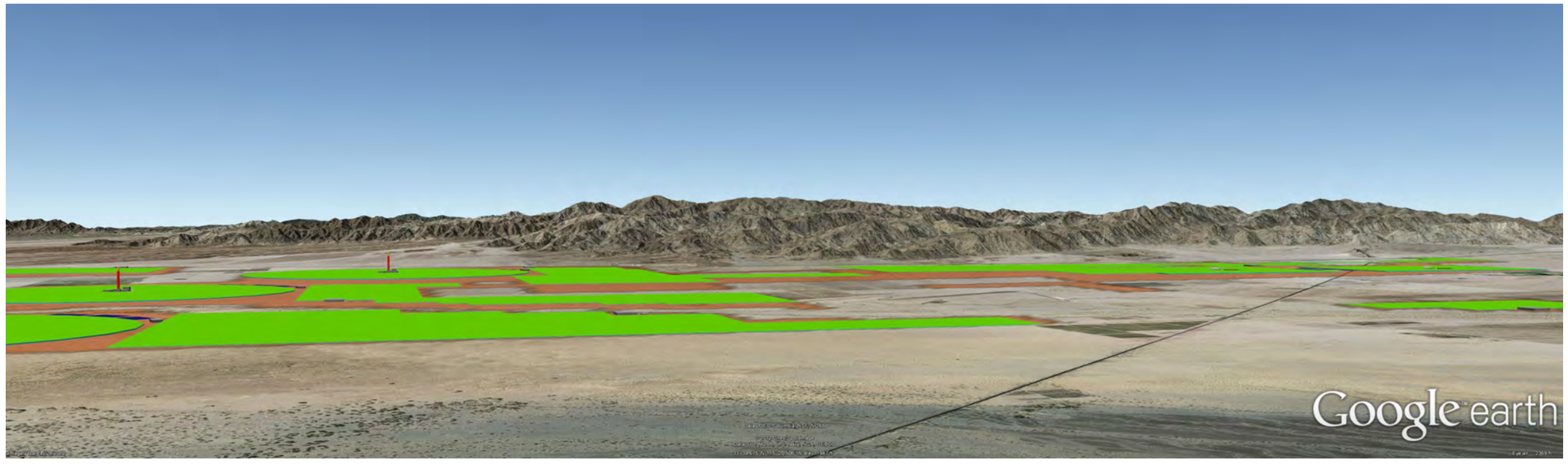

FIGURE 3.2-58 Google Earth Visualization of the Central Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the South Coxcomb Peak KOP

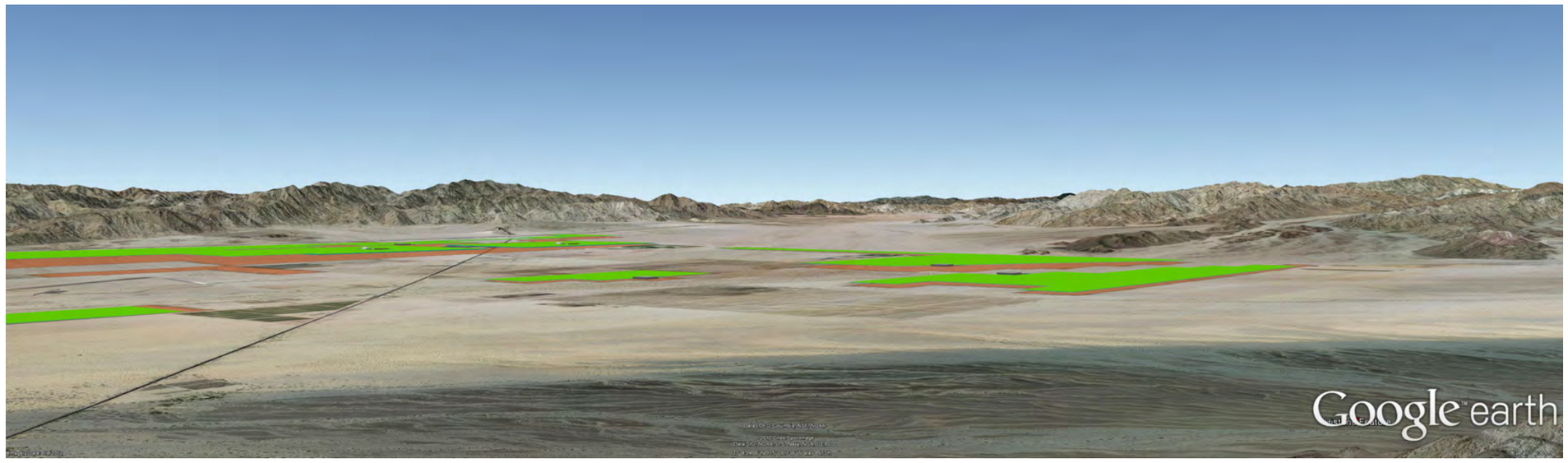

FIGURE 3.2-59 Google Earth Visualization of the Right-hand Portion of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the South Coxcomb Peak KOP

These visualizations show that the view of the SEZ from the South Coxcomb Peak KOP is generally similar to that from the Rock Cairn and Historic Feature South KOPs; however the South Coxcomb Peak KOP is several hundred feet higher in elevation than the other KOPs, so the vertical angle of view is greater, and thus the strong regular geometry of solar collector/reflector arrays in the closest parts of the SEZ would be more apparent. This will likely lead to higher contrast levels.

As is the case for the Rock Cairn and Historic Feature South KOPs, solar development in the SEZ would spread across so much of the view that South Coxcomb Peak KOP visitors would have to turn their heads in order to see it all. A visitor to this KOP would likely be able to distinguish individual components of solar facilities in the closest part of the SEZ. In the foreground, solar facilities would appear to spread out across the valley floor, emphasizing the strong, regular, repeated geometry of collector arrays. The discontinuous nature of the SEZ could clearly be seen in the foreground and individual facilities could be distinguished. The lack of consistency in the visual appearance of different facilities would likely be evident, potentially creating a visually cluttered landscape. For views further east and southeast, as the angle of view becomes lower and the floor of the SEZ less visible, foreshortening would cause the facilities to blend together visually, resulting in a loss of detail.

Taller vertical components such as support buildings, power blocks, cooling towers, and transmission towers in facilities closest to the KOP would be quite noticeable. These components would appear to extend above the collector/reflector arrays, creating form and line contrasts with the strong regular geometry of the array and heliostat fields. These contrasts would be less noticeable for facilities located further east and southeast in the SEZ. Depending on atmospheric and lighting conditions, the irregular form, color contrast, and movement of plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could add substantially to observed contrasts from facilities where they were present.

Field observations of power tower facilities (Sullivan et al. 2012) suggest that 100+-MW central receiving towers in the nearer portions of the SEZ could appear as brilliant white lights atop discernible tower structures, set against the backdrop of the Chuckwalla Valley floor, the Chuckwalla Mountains, or the Little Chuckwalla Mountains, depending on their placement within the SEZ. Central receivers in the closer portions of the SEZ would likely be bright enough to attract and hold viewers' attention. Reflected light from dust particles in the air around the receivers could appear as faint light streaming downward or upward from the receivers at distances of at least 5 mi (8 km) and possibly longer (Sullivan et al. 2012), and this phenomenon would likely be visible from this KOP. For facilities located in the far eastern visible portions of the SEZ, the receivers would appear as distant star-like points of light, and reflected light from dust particles would be unlikely to be visible. If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the South Coxcomb Peak KOP at night; however, a variety of lights within the valley, including lighting from I-10 and the communities of Lake Tamarisk and Desert Center, would already be visible. Other lighting at surrounding solar facilities would likely be visible as well, with the amount of contrast dependent upon the degree to which lighting was mitigated to reduce night-sky impacts.

The South Coxcomb Peak KOP is north of the nearest portion of the Riverside East SEZ, and southward views from this KOP would consist of the sides of parabolic trough arrays; the north-facing heliostats on the south side of power towers; and the shaded side of PV panels and other south-facing collector arrays, such as south-facing heliostats on the north side of power towers. Because the SEZ extends eastward and the KOP is close to the SEZ, views of solar development in the SEZ include southeastern views toward Ford Dry Lake. If parabolic troughs and power tower facilities were located southeast of the KOP, it is possible that glinting or glare could result, and because the distance is relatively short, if glare occurred, it could be bright; however, a more complete glint/glare analysis would be needed to determine if glinting or glare would be observed. Such an analysis would be conducted during a project-specific environmental assessment.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to create strong contrasts with the surrounding landscape when viewed from the South Coxcomb Peak KOP, with particularly strong contrasts resulting if multiple power tower facilities were built in the visible areas of the Chuckwalla Valley closest to the KOP. If development were limited to low-height technologies such as PV and parabolic trough facilities, contrasts would likely be less strong, but solar facilities in the SEZ would still dominate views of the Chuckwalla Valley.

NPS did not provide information about visitors or visitation to the South Coxcomb Peak KOP; however, KOP use is likely to be very low. If it can be assumed that visitors to the KOP would be interested in scenic views, given the short distance from the KOP to the Riverside East SEZ, under the 80% development scenario, solar development in the SEZ would create a potentially overwhelming visual presence and would dominate the view. Sensitive viewers at the KOP would likely be subject to major visual impacts from solar development within the SEZ.

3.2.1.14 Spectre Peak

Spectre Peak is the third highest peak of the northern Coxcomb Mountains. It is listed on the Sierra Club's Desert Peaks List (Sierra Club 2003) and on the "California Peaks with 2,000 feet of prominence" list found on Peakbagger.com (2012b). It is accessible only by foot, by ridge-top scrambling and bouldering from Aqua Peak to the west. Recorded trips to or near the peak can be found on hiking blogs and user-informed hiking websites such as Peakbagger.com (2012d) and SummitPost.org (2007). Guided day hikes to Spectre, Aqua, and Dyadic Peaks are occasionally offered by the Desert Peaks Section of the Angeles Sierra Club (Sierra Club 2010 and 2011). A trip record for Spectre Peak indicates that its summit register is the most recent of the three peaks' registers (Summitpost.org 2007); but Spectre Peak has likely been visited for as long as Dyadic and Aqua Peaks.

The Spectre Peak KOP is located at the summit of Spectre Peak, approximately 16 mi (26 km) north of the Riverside East SEZ at its closest point. It is situated at an elevation of approximately 3,720 ft (1,134m) above mean sea level and approximately 3,315 ft (1,010 m) above the center of the western portion of the Riverside East SEZ. Looking north from the Spectre Peak KOP, one can see across Cadiz Valley all the way to Van Winkle Mountain. The

view to the west offers a vista of the Pinto Basin and much of Joshua Tree NP. The visual mass of Aqua Peak blocks views directly east. To the south and southeast, the east-west line of the Chuckwalla Mountains is visible across the Chuckwalla Valley Floor beyond the tops of the Coxcomb Mountains in the foreground.

Cultural modifications within the KOP viewshed include portions of I-10, CA-177, and numerous other paved and dirt roads; the Lake Tamarisk housing development; a high-voltage transmission line; abandoned and actively farmed agricultural lands; the Colorado River Aqueduct; and at least two solar facilities currently under construction (Desert Solar and Desert Harvest). Some of the larger and closer built facilities, like the Desert Solar and Desert Harvest solar facilities (13.5 mi [21.7 km] away), might detract noticeably from the scenic qualities of the view toward the western portion of the SEZ as seen from this KOP, while others such as I-10 are too far away to have non-negligible visual impacts.

Figure 3.2-60 shows the Spectre Peak KOP within the Riverside East SEZ viewshed. The colored portions indicate areas in the vicinity of the KOP from which solar development within the Riverside East SEZ could be seen. The figure shows that there is intermittent visibility of the SEZ from the area surrounding the Spectre Peak KOP. Visibility appears limited to the highest point of the peak and south- and southeastern slopes of the mountain.

Figure 3.2-61 depicts the area within the Riverside East SEZ where solar facilities would be expected to be visible from the Spectre Peak KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that may cause reduced visibility. Within 25 mi (40 km) of the Spectre Peak KOP, solar development within 13,748 acres (55.636 km^2) or 9% of the SEZ would potentially be visible. The figure shows that portions of the Riverside East SEZ between its western terminus and its point just north of the intersection of I-10 at Ford Dry Lake is potentially visible from this KOP, although a fairly substantial section is obscured by the southern end of the Coxcomb Mountain Range. The nearest visible point in the Riverside East SEZ is approximately 16 mi (26 km) from the Spectre Peak KOP, and the farthest visible point in the SEZ is approximately 38.5 mi (62 km) from the KOP. In the western section of the visible portion of the SEZ, low-height solar facility components, 24.6 ft (7.5 m) tall or taller, could potentially be visible. In the eastern section of the visible area of the SEZ, visibility of solar facilities is more varied. Low-height solar facilities would potentially be visible in some areas, while in others, only the upper portions of central receiving towers for power tower facilities would potentially be visible.

Figure 3.2-62 shows schematic 3-D models of solar energy facilities within the Riverside East SEZ under the 80% development scenario used in this analysis, overlaid with the Spectre Peak KOP viewshed. The number, mix, and arrangement of facilities are hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.2-63 is a Google Earth visualization of the Riverside East SEZ as seen from the Spectre Peak KOP. The visualization suggests that looking southeast from the Spectre Peak KOP, the SEZ occupies approximately 36° of the viewer's field of view, although this view is partially obstructed by the jagged peaks of the Coxcomb Mountains.

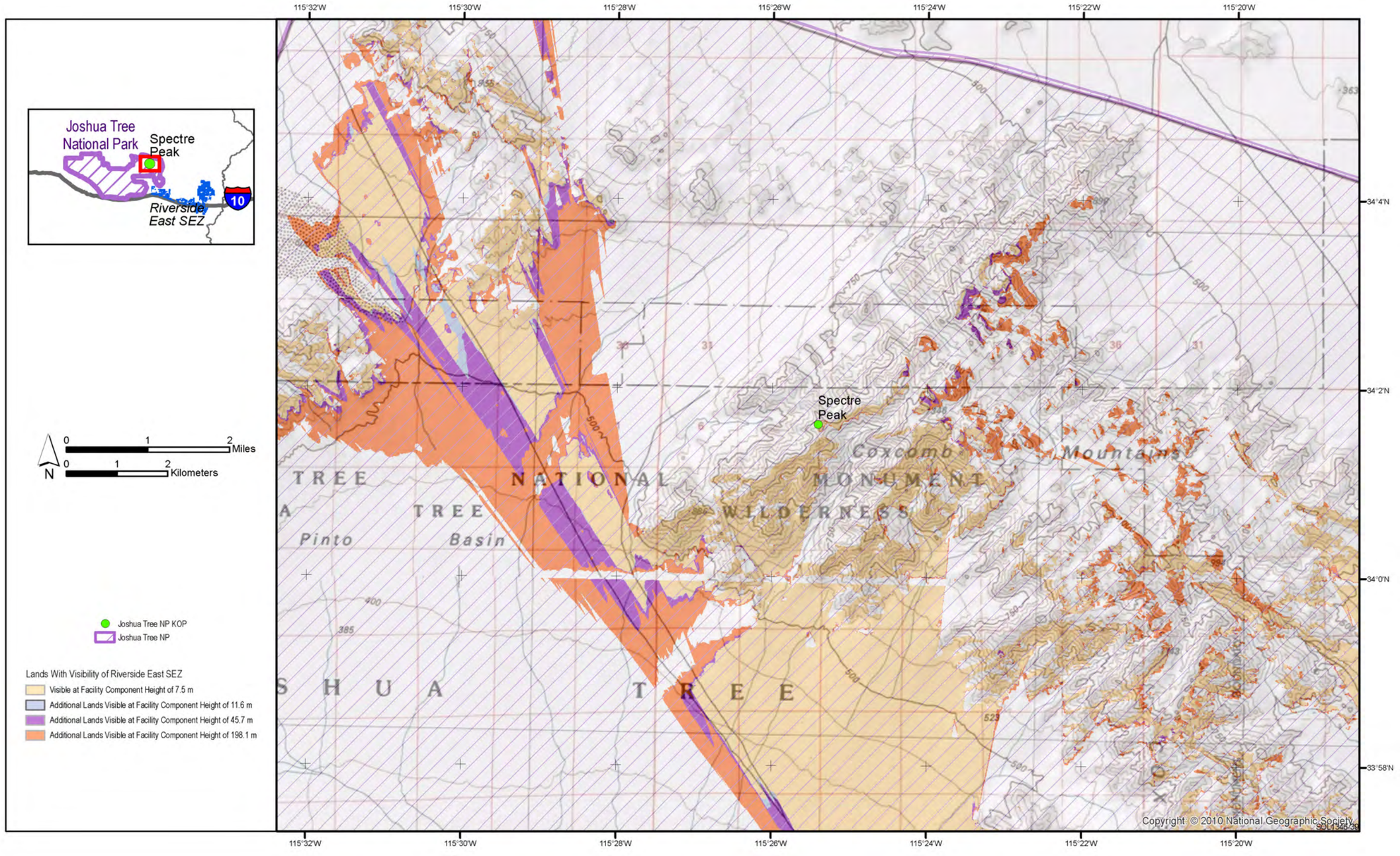

FIGURE 3.2-60 The Spectre Peak KOP within the Riverside East Viewshed

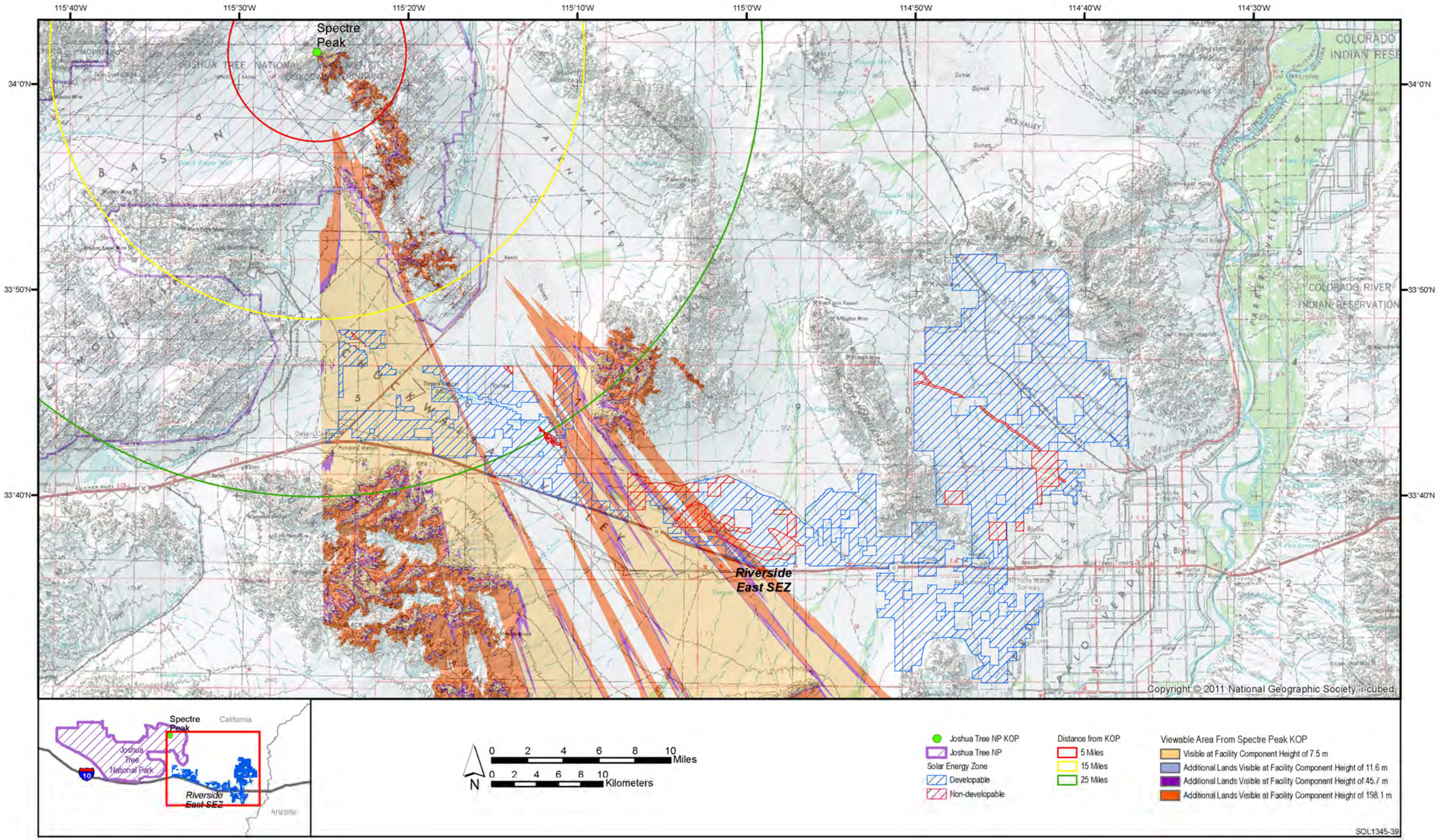

FIGURE 3.2-61 The Riverside East SEZ within the Spectre Peak KOP Viewshed

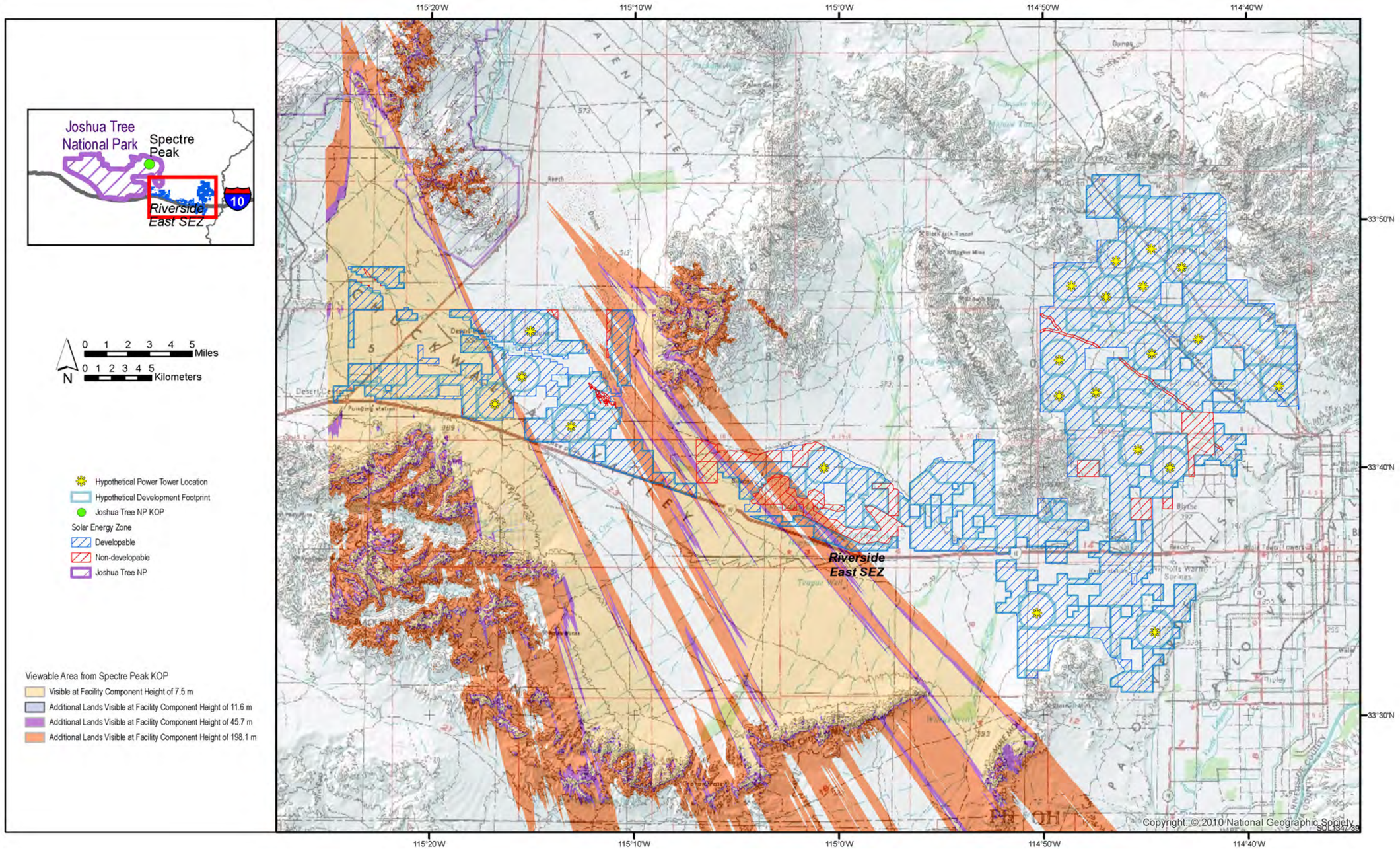

FIGURE 3.2-62 Close-up of the Riverside East SEZ with Facility Footprints within the Spectre Peak KOP Viewshed

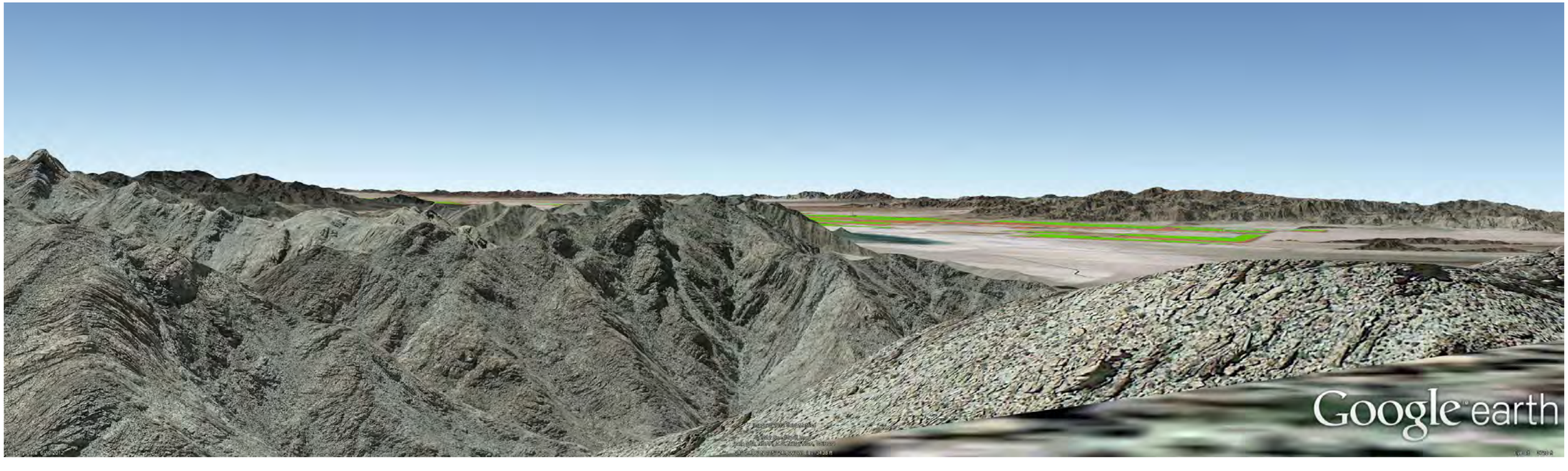

FIGURE 3.2-63 Google Earth Visualization of the Riverside East SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Spectre Peak KOP

The visualization shows that potential visual contrasts are similar to those expected for the views from the nearby Aqua Peak KOP (see Section 3.2.1.2). From the Spectre Peak KOP, 3,300 ft (1,000 m) above the center of the western portion of the SEZ, the tops and sides of solar collector/reflector arrays would be visible; however, given the 15.6-mi (21.1-km) distance to the nearest point in the SEZ, the angle of view would be relatively low and details of the facilities indistinct.

The irregular form, color, and movement of vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ; however, the occurrence of visible plumes and their height and optical density are highly dependent on atmospheric and other variables. It is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

Because the KOP is north-northwest of the SEZ, the panels of non-tracking PV facilities would always face away from the KOP, and the likelihood of glinting from tracking PV panels or parabolic troughs would be very low. The long distance to the SEZ would probably reduce the brightness of reflections enough that they would not cause glare in any event.

The central receiving towers of power tower facilities in the SEZ would be visible and their tops would appear as bright, star-like points of light against the Chuckwalla Valley floor or the backdrop of the Chuckwalla Mountains, depending on their placement within the SEZ. Observed levels of contrast would vary depending on the mix of solar technologies sited in the SEZ. If over 200 ft (61 m) tall, central receiving towers would be equipped with red or white navigation lights which would likely be visible from the Spectre Peak KOP at night. Other lighting associated with the solar facility development could be visible from this KOP, but good mitigation practices could limit the associated visible contrasts considerably.

Under the 80% development scenario used for the analysis, solar energy development within the Riverside East SEZ would be expected to contrast moderately with the surrounding environment when viewed from the Spectre Peak KOP. The broad expanse of facilities visible in the far western portion of the SEZ would be an obvious but not visually dominant visual disturbance that would extend across a significant portion of the observer's field of view. If power tower facilities were not located in the visible portions of the SEZ, contrasts would be lowered considerably, and might fall to weak levels depending on the facility types and layouts. Facility lighting could potentially cause some contrasts at night, but these contrasts could be reduced by implementing stringent lighting mitigation.

NPS did not provide information about visitors or visitation at the Spectre Peak KOP; however, it is a known hiking destination (Peakbagger.com 2012d, Summitpost.org 2007, Sierra Club 2010 and 2011). KOP use is likely to be very low. It can be assumed that visitors to the KOP are likely interested in solitude and scenic views. They would be unlikely to miss the visual contrast of solar development with the surrounding landscape when looking towards the SEZ from this KOP. If only parabolic trough or PV facilities were located in the SEZ, overall contrasts would be reduced, but viewers would likely still see the solar facilities as unmistakable man-made elements, at least under some lighting conditions. If one or more power towers were in view, they would appear distinctly out of place in the daytime landscape and the lights would

likely attract the viewer's attention. Views of solar development from this KOP might negatively impact the viewer's perception of the generally natural-appearing landscape, and the KOP would likely be subjected to moderate visual impacts from solar development in the SEZ.

3.2.3 Summary of Visual Impacts to Joshua Tree NP KOPs

Joshua Tree NP staff provided Argonne with 54 KOPs throughout Joshua Tree NP. Fourteen of these KOPs would potentially have views of solar facilities in the Riverside East SEZ, within 25 mi (40 km) of the KOP. All of the Joshua Tree NP KOPs are located in relatively remote and rugged areas of Joshua Tree NP. Few have road or even trail access. NPS did not provide information about KOP user types or numbers; however, available evidence suggests low or very low usage of the KOPs, but likely by sensitive viewers, primarily backcountry hikers.

These KOPs can be divided into two groups: the first group consists of eight KOPs in the southern Coxcomb Mountains and the eastern Eagle Mountains, all within 10 mi (16 km) of the Riverside East SEZ; and the second group consists of six KOPs—Eagle Mountain KOP and five KOPs on more distant mountain peaks in the northern Coxcomb Mountains each between 15 and 19 mi (24 and 31 km) from the SEZ.

The first group includes the following KOPs:

- Anschutz Peak and Cultural Sites
- Big Wash Trail and Cultural Sites
- Coxcomb Peak
- Eagle Mountain/Basalt
- Eagle Mountain/Big Wash
- Historic Feature South
- Rock Cairn
- South Coxcomb Peak

All of these KOPs would be potentially subject to major visual impacts from solar development in the SEZ, primarily because they are relatively close to the SEZ and have generally unobstructed views from elevated positions such that solar development in the SEZ (under the 80% development scenario) would occupy much of the horizontal field of view from these KOPs. The Eagle Mountain/Basalt KOP would be subject to somewhat lower contrasts than the other KOPs in this group because it is the farthest from the SEZ, has a relatively low vertical angle of view, and has a more restricted view of the SEZ. If solar development in the

Western portion of the SEZ were limited to low-height solar technologies, the Eagle Mountain/ Basalt KOP might be subject to only moderate contrast from solar development in the SEZ.

The second group includes the following KOPs, listed along with impact characterizations:

- Aqua Peak – Moderate
- Coxcomb Alluvial Fans – Minor to moderate
- Dyadic Peak – Moderate
- Eagle Mountain – Minor to moderate
- Historic Feature North – Minor
- Spectre Peak – Moderate

These KOPs would be subject to minor to moderate impacts from solar development in the SEZ. Despite being relatively far from the SEZ, the Aqua, Dyadic, and Spectre Peak KOPs are potentially subject to substantial contrasts because they have commanding views of much of the western side of the SEZ, and though distant, it would still occupy much of the horizontal field of view. The Coxcomb Alluvial Fans and Eagle Mountain KOPs would be subject to lower contrast from solar development in the SEZ because intervening mountains substantially restrict views of the SEZ, and because of increased distance in the case of the Eagle Mountain KOP. The Historic Feature North KOP would likely be subject to the lowest impacts within this group; it is moderately far from the SEZ, has a partially unobstructed view, and a low viewing angle that would decrease the total visible surface area of solar development within the SEZ.

3.3 EL CAMINO REAL NATIONAL HISTORIC TRAIL (NHT)

The El Camino Real de Tierra Adentro National Historic Trail (El Camino NHT) is a historic route of travel, trade, and interaction that connected the lives of early Spaniards, other Europeans, American Indians, Mexicans, and Americans (NPS 2012b,c). Use of the 1,400-mi trail from Mexico City, Mexico, to San Gabriel de Yunque-ouinge (the present-day San Juan Pueblo, New Mexico) began in 1598 and continued until the arrival of the railroad in 1880 (NPS 2012b). In 2000, El Camino Real de Tierra Adentro (The Royal Road of the Interior) was recognized for its national and international significance in the shaping of the southwest, and its section from El Paso, Texas, to San Juan Pueblo, New Mexico, was added to the National Trails System through Public Law 106-307 (NPS and BLM 2004). The El Camino Real de Tierra Adentro Corridor has also been designated as a state scenic and historic byway, a national scenic byway, and a Millennium Legacy Trail (NPS and BLM 2004). In 2010, the segment of the trail that resides in Mexico was designated as a World Heritage Site (NPS 2012b, UNESCO 2012).

A stated goal of the El Camino Real de Tierra Adentro management plan (NPS and BLM 2004) is to "protect scenic values related to historical resources." In addition, the National Trails Act (PL 90–543, 1968) and Scenic Byways Legislation (Title 23, Section 163 U.S. Code) provide mandates, general policy and monetary assistance programs for the study and protection of cultural, natural, and visual resources within a trail or byway corridor.

The El Camino NHT is approximately 404 mi in length and passes through approximately 60 mi (97 km) of BLM-administered land, 33 mi (53 km) of the U.S. Fish and Wildlife Service (USFWS) Sevilleta National Wildlife Refuge (NWR), and 57 mi (92 km) of the USFWS Bosque del Apache NWR. In addition, approximately 8 mi (13 km) of the NHT passes through the Santa Fe National Forest, which is administered by the United States Department of Agriculture Forest Service (USFS), and approximately 5 mi (8 km) crosses lands administered by the U.S. Army Corp of Engineers (USACE). The remainder of the trail passes through 377 mi (607 km) of private lands; 25 mi (40 km) of state-administered lands; and 90 mi (145 km) of tribal lands (NPS and BLM 2004). The NHT is administered by both the BLM and the NPS.

The Afton SEZ encompasses 29,964 acres (121.26 km^2) in Doña Ana County. It is located approximately 7.3 mi (11.8 km) west of the town of Vado, New Mexico, and approximately 12.5 mi (20.1 km) south-southwest of the town of Las Cruces, New Mexico, at its closest point. It lies approximately 5.8 mi (9.3 km) west of the El Camino NHT, at its closest point, at the Bracito KOP. Afton SEZ is managed as VRM Class III.

Approximately 42 mi (67.6 km) of the El Camino NHT has potential visibility of facilities within the Afton SEZ. Seven KOPs along the El Camino NHT are located within 25 mi and could potentially have views of solar development within the SEZ.

The Afton SEZ is located on West Mesa, immediately west of the Mesilla Valley and the Rio Grande River. West Mesa is several hundred feet higher in elevation than the Mesilla Valley, through which the El Camino NHT runs, generally north-south. The eastern edge of the SEZ is set back approximately 1–8 mi (2–13 km) from the eastern edge of West Mesa. As a consequence of the SEZ's elevation and position atop West Mesa, the ground surface of the SEZ itself is not visible from the Mesilla Valley floor, and thus is not visible from six of the seven KOPs analyzed here. In fact, PV, parabolic trough, and solar dish facilities in the SEZ could not be seen from any of these six KOPs, greatly reducing the potential visual contrast and associated impacts from solar development in the SEZ for these KOPs. However, because of the height of power towers and some other associated infrastructure, such as transmission towers, the upper portions of power towers (and in some cases the upper portions of transmission towers) in the eastern portions of the SEZ could potentially be visible from the six KOPs in the Mesilla Valley. In the following analysis, when the SEZ is said to be "visible" from a KOP, this actually means that solar facilities of sufficient height within the SEZ, rather than the ground surface, could potentially be visible from the KOP.

The seventh KOP (Robledo Peak) is substantially elevated with respect to the SEZ, has unobstructed visibility of the ground surface of the entire SEZ, and thus would potentially afford visibility of low-height solar technologies within the SEZ.

3.3.1 Key Observation Points

El Camino NHT staff provided Argonne with 95 KOPs spanning the length of the trail. Eight of these KOPs have views of and fall within 25 mi (40 km) of the Afton SEZ. These eight KOPs were used to identify potential visual impacts to the El Camino NHT from solar development within the Afton SEZ. Six of these eight KOPS are considered "high-potential historic sites," as defined in the National Historic Trails Act (PL 90–543, 1968, as amended). High-potential historic sites as defined in the act are "historic sites related to the route, or sites in close proximity thereto, which provide opportunity to interpret the historic significance of the trail during the period of its major use." Scenic quality and relative freedom from intrusion are two criteria used in considering high-potential sites.

The following KOPs along the El Camino NHT fall within the 25-mi (40.2-km) viewshed of the Afton SEZ (Figure 3.3-1), and were included in this analysis:

- Punta del Estero Largo/ Paraje de Los Cacaxitos
- Bracito (high-potential historic site)
- Fort Fillmore (high-potential historic site)
- Mesilla (high-potential historic site)
- La Ranchería (high-potential historic site)
- Doña Ana (high-potential historic site)
- Robledo Peak

3.3.1.1 Punta del Estero Largo/Paraje de Los Cacaxitos

Punta del Estero Largo (Point of the Long Swamp) was a paraje along the El Camino Real de Tierra Adentro. A paraje is a camping place such as a small town or village, or simply a good place to camp along a long-distance trail such as the El Camino Real. The term Estero Largo is a generic term used for the New Mexico Rio Grande region, and is especially associated with the founding of the town of Las Cruces, New Mexico. Early sources generally place it somewhere south of La Rancheria; however, there may have been several more parajes associated with Estero Largo, such as Paraje de Los Cacaxitos (Elliott 2012). Parajes usually contained water and food sources for animals and people. Although only the general location of the site is known, Punta del Estero Largo/Paraje de Los Cacaxitos plays an important role in the interpretation of the NHT (NPS 2012b).

The Punta del Estero Largo/Paraje de Los Cacaxitos KOP is an approximate location of the Paraje de Los Cacaxitos associated with Estero Largo. It is located east-southeast of the Afton SEZ at an elevation of approximately 3,820 feet (1,164 m) above mean sea level and

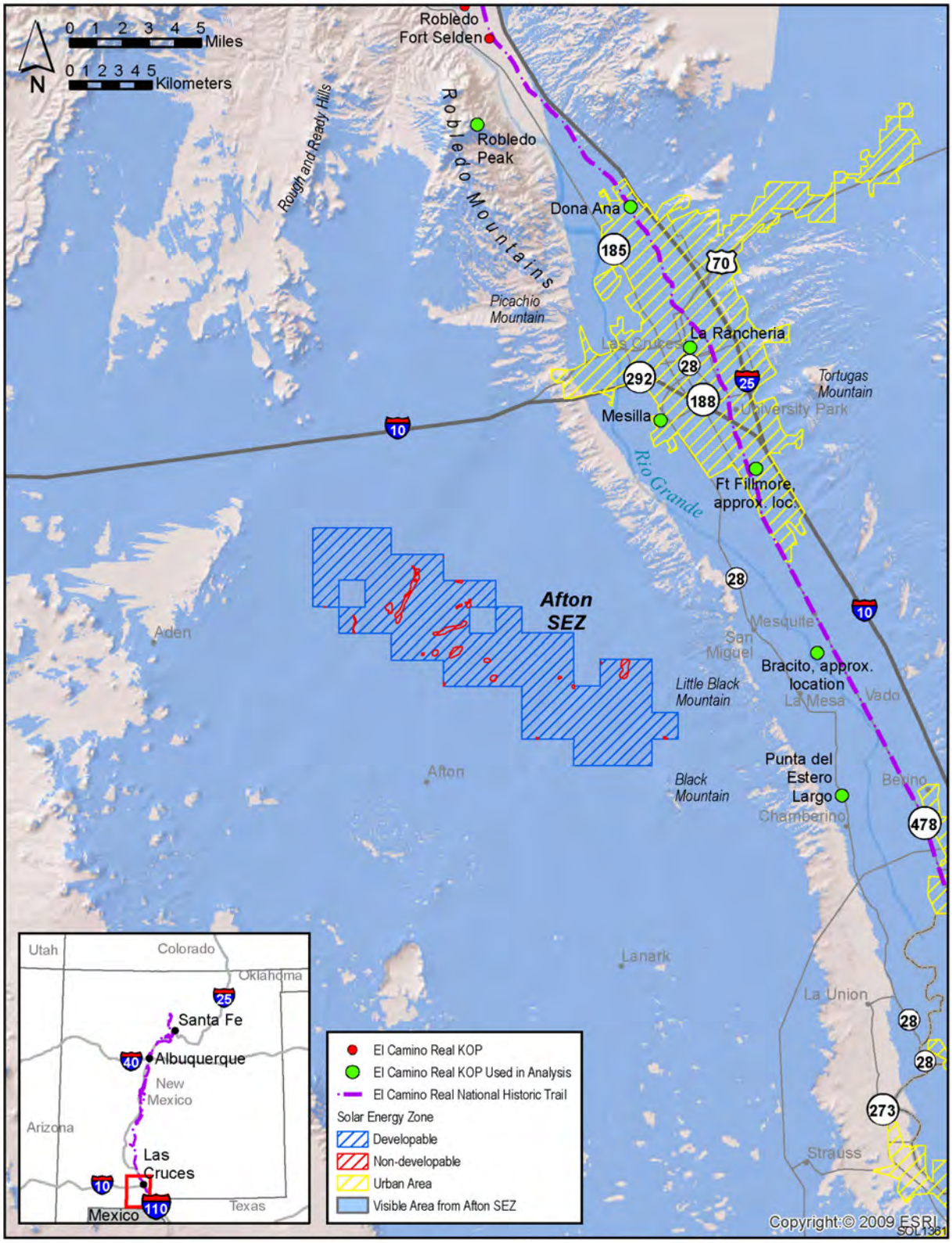

FIGURE 3.3-1 El Camino Real de Tierra Adentro KOPs within the 25-mi (40-km) Viewshed of the Afton SEZ

approximately 403 feet (122.9 m) below the center of the Afton SEZ. The nearest visible point in the Afton SEZ is approximately 6.5 mi (10 km) from the Punta del Estero Largo/Paraje de Los Cacaxitos KOP, and the farthest visible point in the SEZ is approximately 16 mi (26 km) from the KOP. The KOP is surrounded by farmland on all sides.

Figure 3.3-2 shows the Punta del Estero Largo/Paraje de Los Cacaxitos KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the Punta del Estero Largo/Paraje de Los Cacaxitos KOP from which solar development in the Afton SEZ could potentially be visible. The figure shows that just west of the KOP, facility visibility would be entirely limited to the upper portions of power towers, while just east of the KOP, solar facility components of 150 ft (45.7 m) or taller, such as the tops of transmission towers (if they were sufficiently close), would be visible within the SEZ.

Figure 3.3-3 depicts the area within the Afton SEZ where solar facilities would be expected to be visible from the Punta del Estero Largo/Paraje de Los Cacaxitos KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that cause reduced visibility. The figure shows that from the Punta del Estero Largo/Paraje de Los Cacaxitos KOP, solar facilities could only be potentially visible in the eastern 35% of the SEZ (10,679 acres [43.216 km^2]), and in almost this entire area, only the upper portions of power towers could potentially be visible, while in a very small portion of the SEZ, solar facility components of 150 ft (45.7 m) or taller would be visible within the SEZ.

Figure 3.3-4 shows hypothetical solar energy facilities within the Afton Valley SEZ under the 80% development scenario used in this analysis, overlaid with the Punta del Estero Largo/Paraje de Los Cacaxitos KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.3-5 is a Google Earth visualization of the Afton SEZ as seen from the Punta del Estero Largo/Paraje de Los Cacaxitos KOP, looking west-northwest. The visible portion of potential solar development within the SEZ occupies approximately 10° of the viewer's field of view.

The visualization confirms that looking west-northwest from the KOP, the SEZ ground surface is obstructed by the slope of West Mesa. The KOP is close enough to the SEZ, and the angle of view is low enough, that the majority of components associated with solar facilities, such as parabolic trough arrays, PV panels, heliostats of power tower facilities, power blocks, and ancillary buildings would not be visible. Only central receiving towers for power tower facilities located within the eastern one-third of the SEZ would be visible. The towers would appear to extend above the mesa, contrasting with the strong horizontal line of the mesa rim. On sunny days, the reflected sunlight from the receivers would appear as very bright points of light atop discernible tower structures, set against the backdrop of the sky. On the basis of field observations of a 20-MW power tower facility (Sullivan et al. 2012), it is likely that 100+-MW power tower facilities in the easternmost portion of the SEZ would produce strong visual contrasts when viewed from this KOP, given the short distance of 6.5 mi (10 km) to the nearest portion of the SEZ. The same field observations suggest that reflected light from dust

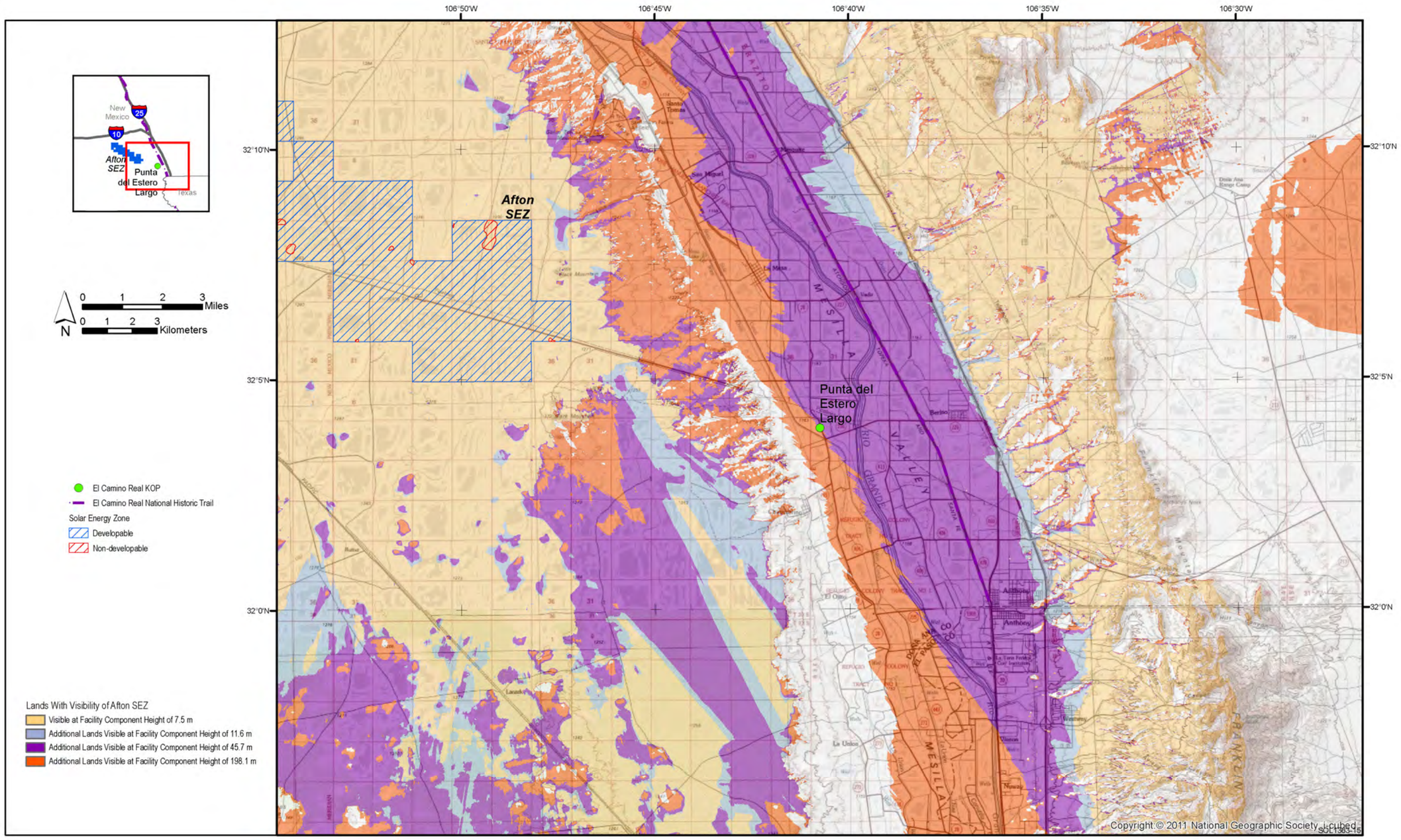

FIGURE 3.3-2 The Punta del Estero Largo/Paraje de Los Cacaxitos KOP within the Afton SEZ Viewshed

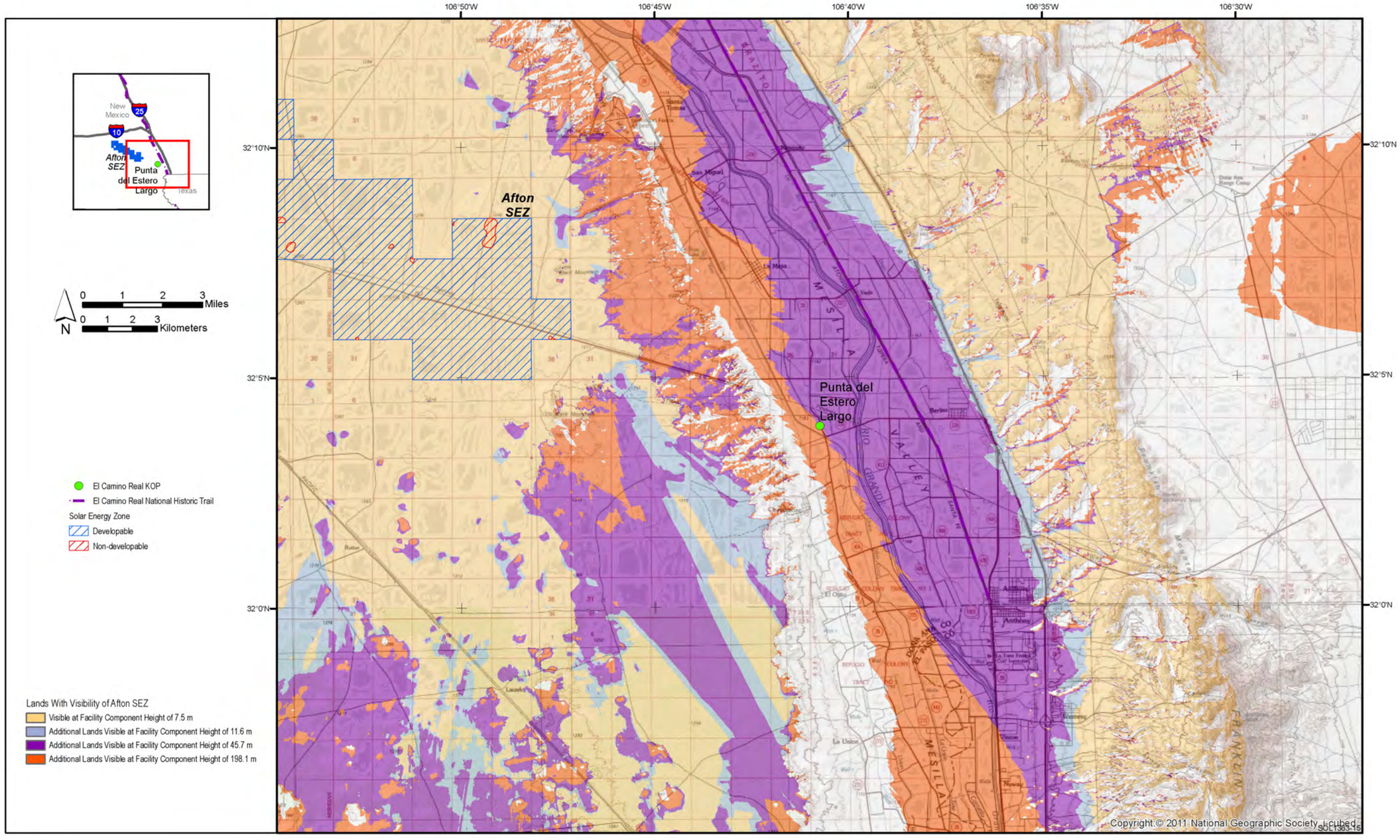

FIGURE 3.3-3 Portion of the Punta del Estero Largo/Paraje de Los Cacaxitos KOP Viewshed, Including the Afton SEZ

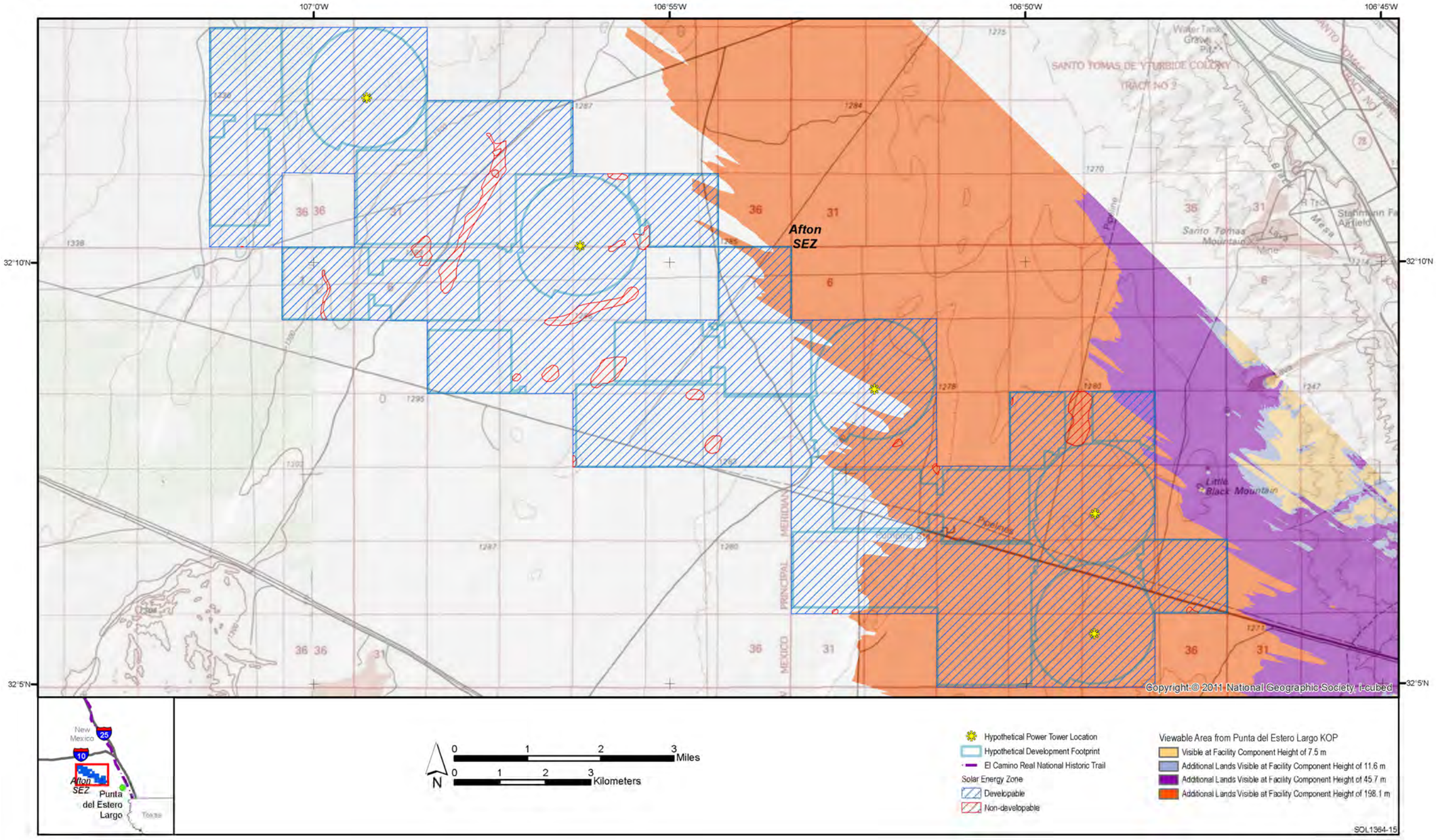

FIGURE 3.3-4 Close-up View of the Afton SEZ with Facility Footprints within the Punta del Estero Largo/Paraje de Los Cacaxitos KOP Viewshed

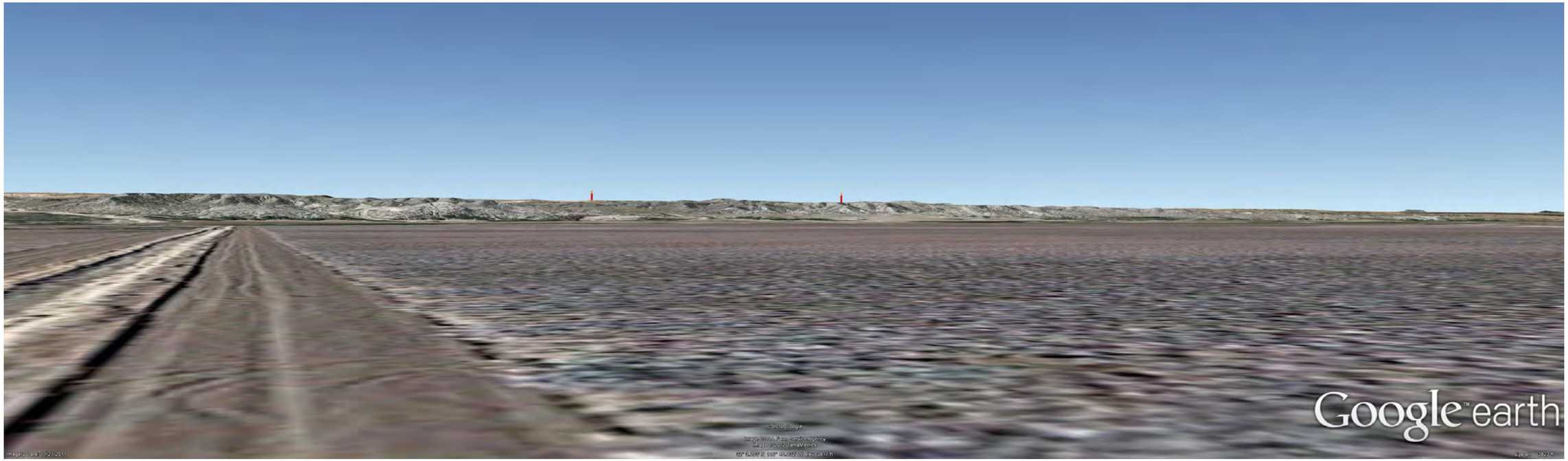

FIGURE 3.3-5 Google Earth Visualization of the Afton SEZ (Power Towers Visible in Red), as Seen from the Punta del Estero Largo/Paraje de Los Cacaxitos KOP

particles in the air around the receivers might be observed as well, and could appear as faint light streaming downward and/or upward from the receivers. The apparent height of the towers and the brightness of the reflected light from the receivers and dust particles would be less for power towers farther from the KOP, and there would be substantial differences in visual contrast levels between power towers in the farthest visible portions of the SEZ (about 16 mi [26 km] away) and those in the closest portions of the SEZ (about 6.5 mi [10 km] away).

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that would be visible for long distances at night and would likely be visible from this KOP. Additional lighting from other solar facilities would not be visible directly, but if there were a sufficient density of facilities, there would be the potential for sky glow to result; however, this glow could be greatly diminished through good lighting mitigation, and in any event, because the Mesilla Valley in this area is relatively densely populated, there are numerous bright lights visible, and the additional sky-glow impacts from solar development in the SEZ are unlikely to be significant.

Under the 80% development scenario presented here, if there were no power towers in the SEZ or if they were limited to the western portions of the SEZ, solar energy development within the Afton SEZ would be expected to yield very weak visual contrasts with the surrounding environment when viewed from Punta del Estero Largo/Paraje de Los Cacaxitos KOP. If development were to include power tower facilities in the eastern end of the SEZ, visual contrasts would be expected to be weak to moderate, but possibly strong in a worst-case scenario of multiple power towers located in the far eastern portion of the SEZ. The observed levels of contrast could vary substantially, depending on the number of power towers that were visible, and their distance from the KOP.

Visitors traveling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. The Punta del Estero Largo/Paraje de Los Cacaxitos KOP has a role to play in the interpretation of the trail even though it is not considered a high-potential site. Additional man-made elements intruding on the landscape may interfere with a visitor's perceived value of the KOP, both historic and scenic.

If solar development within the SEZ consisted only of low-height facilities within the visible area of the SEZ, viewers at this KOP would not see evidence of solar development except possibly a slight increase in night-sky impacts, and as a result, expected visual impacts would be negligible. However, if power towers were present within the eastern portion of the SEZ, their very bright, steady lights atop discernible tower structures would be unmistakable man-made visual intrusions. The KOP appears to be located within a farm field, with little vegetation, offering a sweeping view of the landscape in all directions. If one or more power towers were in view in the far eastern portion of the SEZ, the very bright lights would seem out of place in the daytime landscape and would likely attract and hold the viewer's attention. Towers with navigation lighting at night might be a source of negative impact for some observers, especially if there were only a few visible lights on the horizon. In general, visual impacts would be expected to be low to moderate, but possibly high in the worst-case scenario of multiple power towers near the eastern edge of the SEZ. A more precise determination of impacts would be

made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.1.2 Bracito

Bracito (also known as Brazito, Bracito Battlefield, and Bracito Paraje) was a long-time paraje along El Camino Real de Tierra Adentro in the 18th and 19th centuries. The paraje was settled in 1805 by Juan Antonio Garcia, a retired lieutenant with the Dragoons of the Provincial Militia of El Paso Norte, who petitioned the Governor of New Mexico for a land grant, which included the Bracito area. In his petition, Garcia agreed to improve the land and retain a group of armed men for the protection of the settlement, the miners working in the surrounding mountains, and individuals traveling the El Camino Real. In 1820, the "Bracito Land Grant" was finally granted to Garcia, and Rancho del Bracito served as a mail exchange point for mail runs between Santa Fe, New Mexico, and Chihuahua, Mexico, in the 1820s (Bowden 2012a; BLM and NPS 2004). Bracito is perhaps best known for the Battle of Bracitos, which occurred on Christmas Day in 1846, when Mexican troops were defeated and the U.S. Army went on to invade Chihuahua, Mexico (NPS 2012b; Bowden n.d.). The exact location of Bracito is difficult to pinpoint because of natural and man-made modifications to the land, and the KOP discussed here is an approximate location. However, Bracito is considered a high-potential site along the El Camino NHT (NPS and BLM 2004) and represents an excellent interpretive opportunity (NPS 2012b).

Bracito KOP is located in a privately owned orchard along the east bank of the Rio Grande River, in the unincorporated town of La Mesa, New Mexico. It is situated in the Mesilla Valley, approximately 6 mi (9.7 km) east of the Afton SEZ at its closest point. It lies at an elevation of 3,837 ft (1,170 m) above mean sea level and approximately 383 ft (117 m) below the center of the SEZ. The nearest visible point in the Afton SEZ is approximately 6 mi (9.7 km) from the Bracito KOP, and the farthest visible point in the SEZ is approximately 18 mi (29 km) from the KOP. Bracito KOP is immediately surrounded by an orchard in all directions. From Bracito KOP, the Organ Mountains are visible to the northeast, the Robledo Mountains are visible to the northwest, and the Franklin Mountains are visible to the southeast.

Figure 3.3-6 shows the Bracito KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the Bracito KOP from which solar development could potentially be visible. The figure shows that from the area immediately surrounding the KOP, the visibility of facilities inside the SEZ would be limited to facility components taller than 150 ft (45.7 m), such as the upper portions of power towers and the tops of transmission towers (if they were sufficiently close).

Figure 3.3-7 depicts the area within the Afton SEZ where solar facilities would be expected to be visible from the Bracito KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that cause reduced visibility The figure shows that from the Bracito KOP, solar facilities of sufficient height in the eastern 70% of the SEZ (encompassing 21,050 acres [85.186 km^2]) could potentially be visible. In almost this entire area, only the upper portions of power towers could potentially be visible; however, in a small area (encompassing

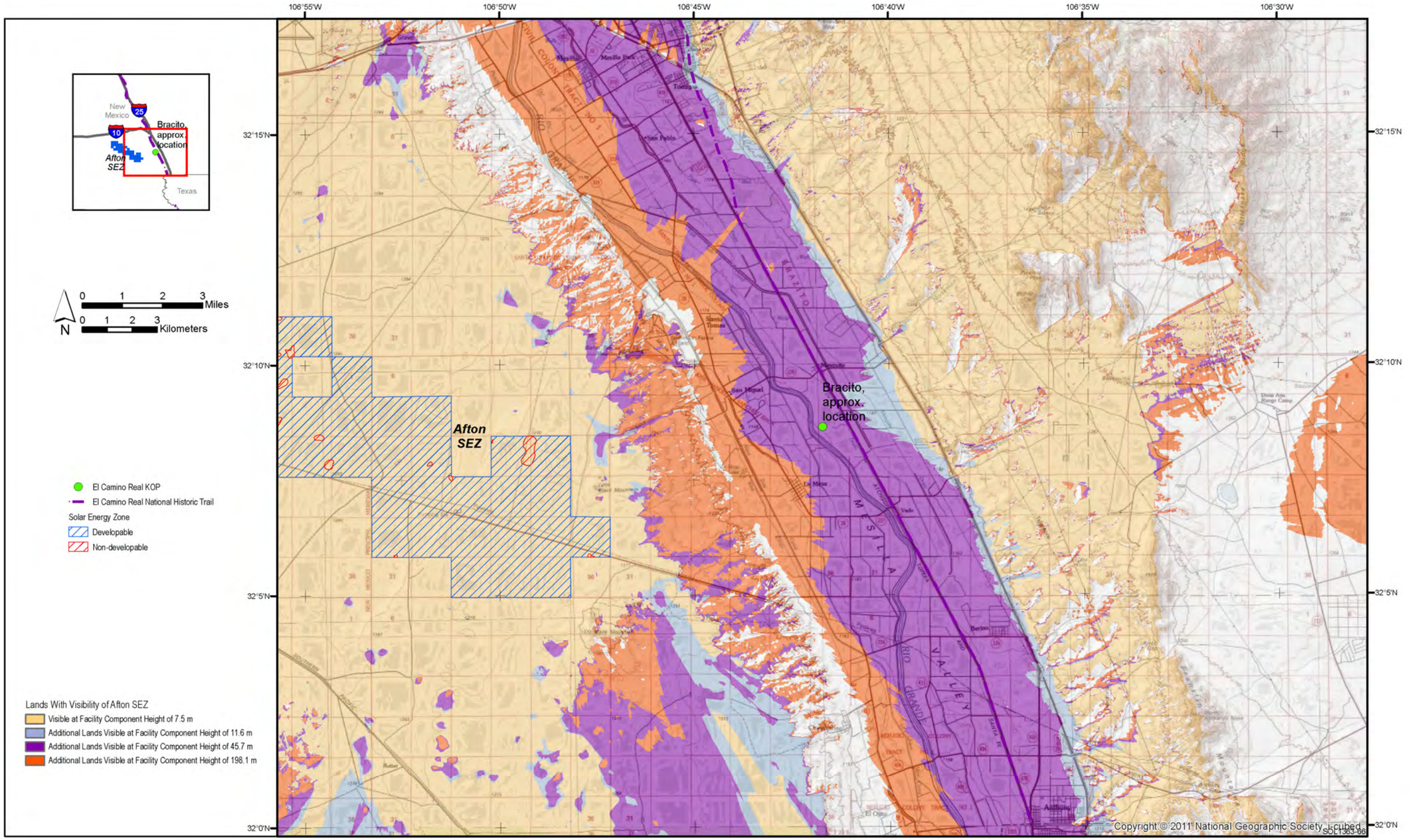

FIGURE 3.3-6 The Bracito KOP within the Afton SEZ Viewshed

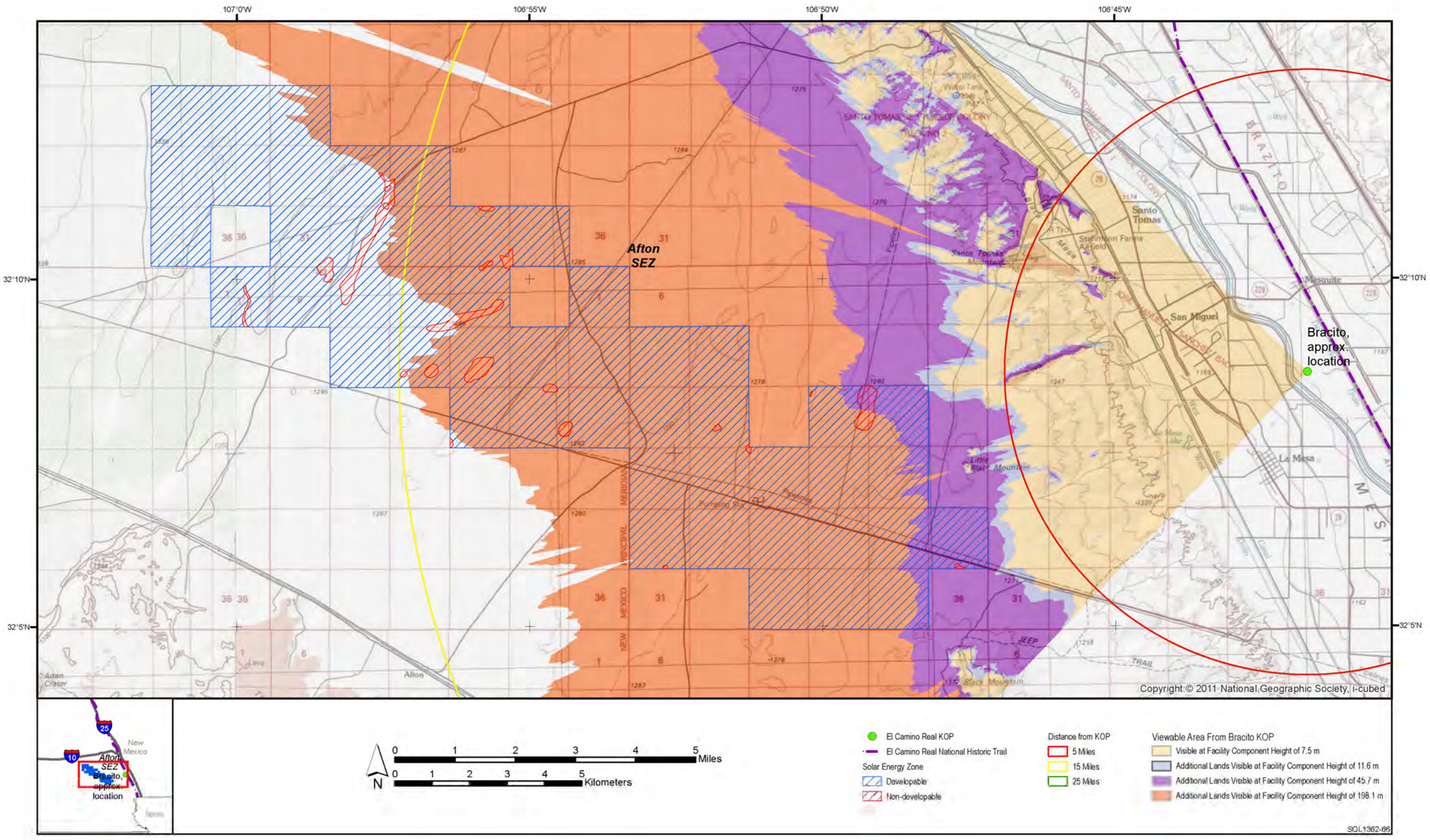

FIGURE 3.3-7 Portion of the Bracito KOP Viewshed, Including the Afton SEZ

1,659 acres [6.714 km^2]) in the far eastern portion of the SEZ, facility components of 150 ft (45.7 m) or taller, such as the tops of transmission towers, could be visible.

Figure 3.3-8 shows hypothetical solar energy facilities within the Afton SEZ under the 80% development scenario used in this analysis, overlaid with the Bracito KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.3-9 is a Google Earth visualization of the Afton SEZ as seen from the Bracito KOP, looking west-southwest. The visible portion of potential solar development within the SEZ occupies approximately 25° of the viewer's field of view.

This visualization confirms that looking west from the KOP, the view of the SEZ ground surface is obstructed by the slope of West Mesa. The KOP is close enough to the SEZ, and the angle of view is low enough, that the majority of components associated with solar facilities, such as parabolic trough arrays, PV panels, heliostats of power tower facilities, power blocks, and ancillary buildings would not be visible. Only the upper portions of central receiving towers for power tower facilities located within the eastern two-thirds of the SEZ would be visible. Similarly to the view from other KOPs located within the Mesilla Valley, the towers would appear to extend above the mesa, breaking the strong horizontal line of the mesa rim. On sunny days, for central receiving towers of power tower facilities closest to the KOP, the receivers would appear as brilliant non-point (possibly cylindrical- or rectangular-shaped) light sources atop distinct tower structures, set against the backdrop of the sky. The receivers located in more distant parts of the SEZ would appear as very bright points of light atop shorter and less distinct tower structures, set against the backdrop of the sky. On the basis of field observations of a 20-MW power tower facility (Sullivan et al. 2012), it is likely that a 100+-MW power tower facility in the easternmost portion of the SEZ would produce strong visual contrasts when viewed from this KOP, given the short distance of 6 mi (9.7 km) from the KOP to the SEZ. The same field observations suggest that reflected light from dust particles in the air around the receivers might be observed and could appear as faint light streaming downward and/or upward from the receivers. For power towers farthest from the KOP, the apparent height of the towers and the brightness of the reflected light from the receivers and dust particles would be diminished. There would be substantial differences in visual contrast levels between power towers in the farthest visible portions of the SEZ (about 16 mi [26 km] away) and those in the closest portions of the SEZ (about 6 mi 9.7 km] away).

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that would be visible for long distances at night and would likely be visible from this KOP. Additional lighting from other solar facilities would not be directly visible, but if there were a sufficient density of facilities, there would be the potential for sky glow to result. However, this glow could be substantially reduced through good lighting mitigation. In any event, because this area of the Mesilla Valley is in a relatively densely populated area, numerous bright lights are visible and the additional sky-glow impacts from solar development in the SEZ are likely to be insignificant.

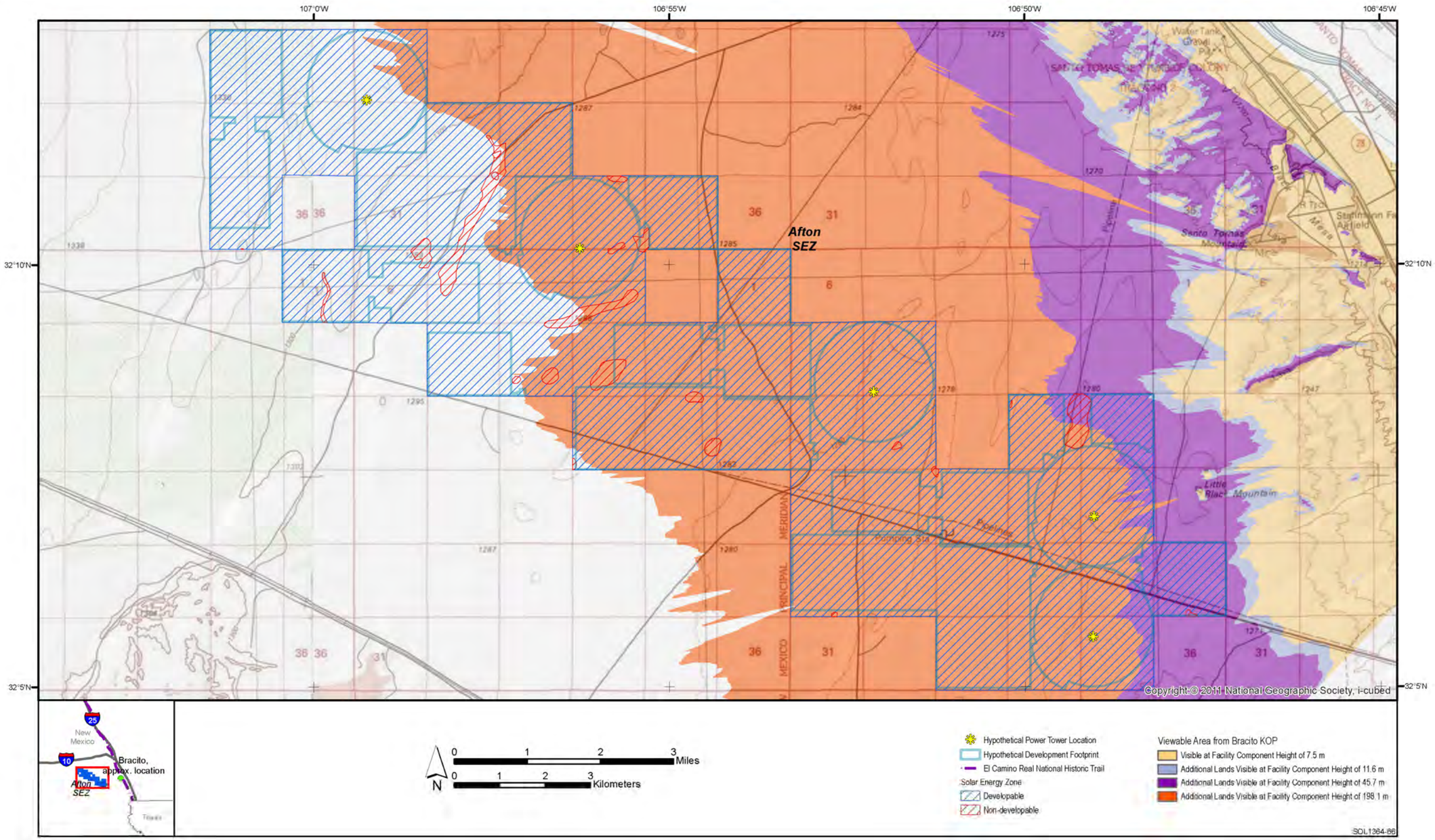

FIGURE 3.3-8 Close-up View of the Afton SEZ with Facility Footprints within the Bracito KOP Viewshed

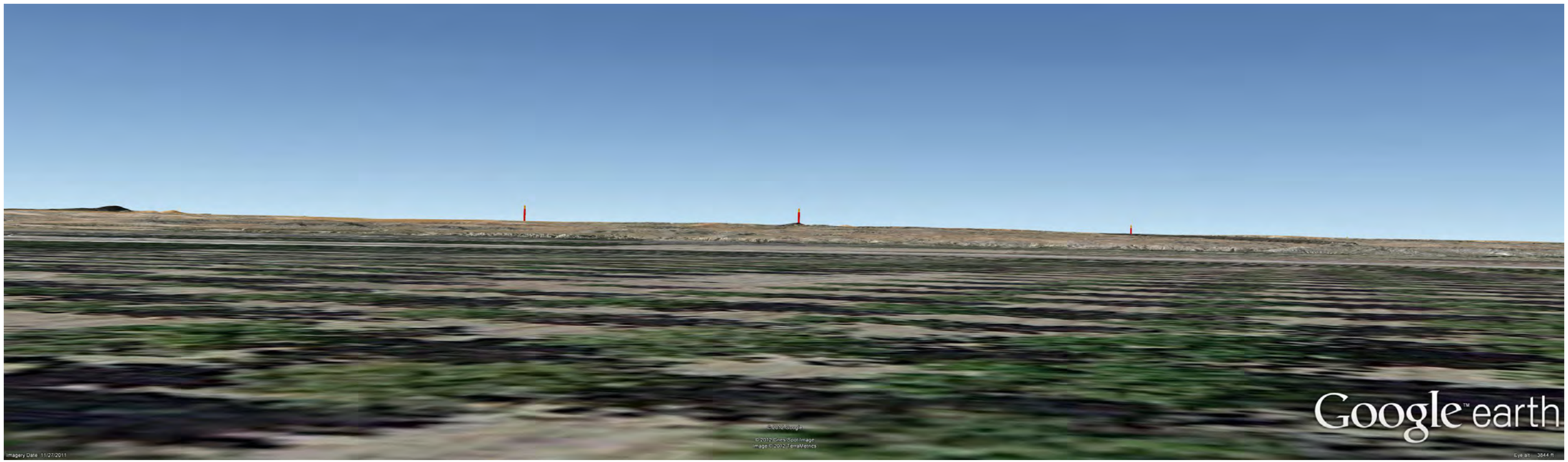

FIGURE 3.3-9 Google Earth Visualization of the Afton SEZ with Solar Facility Models (Power Towers Shown in Red), as Seen from the Bracito KOP

Under the 80% development scenario presented here, if there were no power towers in the SEZ or if they were limited to the western third of the SEZ, solar energy development within the Afton SEZ would be expected to yield very weak visual contrasts with the surrounding environment when viewed from the Bracito KOP. If development were to include power tower facilities in the eastern two-thirds of the SEZ, visual contrasts would be expected to be weak to moderate, but possibly strong in a worst-case scenario of multiple power towers located in the far eastern portion of the SEZ. The observed levels of contrast could vary substantially, depending on the number of power towers visible and their distance from the KOP.

Visitors traveling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. Although the exact location of Bracito is not known and the Bracito KOP lies within a substantially altered landscape, it is considered a high-potential historic site and additional man-made elements intruding on the landscape may interfere with a visitor's perceived value of the KOP, both historic and scenic.

If solar development within the visible area of the SEZ consisted only of low-height facilities, viewers from this KOP would not see evidence of solar development except possibly a slight increase in night-sky impacts, and as a result, expected visual impacts would be negligible. However, if power towers were present within the eastern two-thirds of the SEZ, their very bright, steady lights atop discernible tower structures would be unmistakable man-made visual intrusions. Because this KOP is located within an orchard, the surrounding trees may obstruct the view of the central receiving towers, depending on the viewer's position within the Bracito KOP. However, if one or more power towers were visible in the SEZ, the very bright lights would seem out of place in the daytime landscape and would likely attract and hold the viewer's attention. Towers with navigation lighting at night might be a source of negative impact for some observers, especially if there were only a few visible lights on the horizon. In general, visual impacts would be expected to be low to moderate, but possibly high in the worst-case scenario of multiple power towers near the eastern edge of the SEZ. A more precise determination of impacts would be made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.1.3 Fort Fillmore

Fort Fillmore was an adobe fort established by the U.S. Government in 1851. Located a few mi south of Mesilla, New Mexico, the fort was intended to protect travelers and traders along El Camino Real de Tierra Adentro, and several other trade and travel routes, from Apache raids. By the end of the late 1850s, the Fort had fallen into disrepair. Prompted by rumors of a confederate invasion of New Mexico, the Union Army reinforced the fort shortly after the start of the Civil War. In July of 1861, the Confederate Army invaded Mesilla. The Union forces failed to protect the town, abandoned the fort, and marched towards Fort Stanton, only to be captured east of Las Cruces. Fort Fillmore was officially closed by the Union in October 1862, although it continued to be a waypoint along several major travel routes through the period of western expansion (NPS 2012b)

Fort Fillmore was listed on the National Register of Historic Places in 1974 (National Register 2012) and is considered a high-potential site along the El Camino NHT (NPS and BLM 2004). Similarly to the Bracito KOP, the exact location of Fort Fillmore is difficult to pinpoint because of man-made modifications to the land, and the KOP discussed here is an approximate location.

The Fort Fillmore KOP is located on the east bank of the Rio Grande River in the approximate location where Fort Fillmore once stood. It is located in a privately owned orchard, approximately 4.2 mi (6.8 km) southwest of the town of Mesilla and 5.5 mi (9 km) south-southeast of the Town of Las Cruces. It is situated in the Mesilla Valley, approximately 8 mi (13 km) northeast of the Afton SEZ at its closest point. It lies at an elevation of approximately 3,910 ft (1,192 m) above mean sea level and approximately 310 ft (94 m) below the center of the SEZ. The nearest potentially visible point in the Afton SEZ is approximately 8 mi (13 km), and the farthest potentially visible point in the SEZ is approximately 17.5 mi (28 km), from the KOP.

Figure 3.3-10 shows the Fort Fillmore KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the Fort Fillmore KOP from which solar development in the Afton SEZ could potentially be visible. The figure shows that absent screening by vegetation or structures, from the Fort Fillmore KOP, visibility of facilities within the Afton SEZ would be limited to facility components 150 ft (45.7 m) tall or taller, such as the upper portions of transmission towers (if they were sufficiently close) or the upper portions of central receiving towers for power tower facilities. Just east of the KOP, components 38.1 ft (11.6 m) tall or taller could potentially be visible, including parabolic trough reflector arrays.

Figure 3.3-11 depicts the area within the Afton SEZ where solar facilities would be expected to be visible from the Fort Fillmore KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that cause reduced visibility. Because the rim of West Mesa obstructs views from the east, the ground surface of the Afton SEZ is not visible from the Fort Fillmore KOP, and for 89% (26,720 acres [108.132 km^2]) of the SEZ, only the upper portions of the central receiver towers of power tower facilities would be visible from the KOP; for 11% of the SEZ, i.e., a small area (3,221 acres [13.035 km^2]) on the eastern edge of the southeast corner of the SEZ, solar facility components greater than 150 ft (45.7 m) in height could potentially be visible from the KOP.

Figure 3.3-12 shows hypothetical solar energy facilities within the Afton SEZ under the 80% development scenario used in this analysis, overlaid with the Fort Fillmore KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.3-13 is a Google Earth visualization of the Afton SEZ as seen from the Fort Fillmore KOP, looking southeast. The visible portion of potential solar development within the SEZ occupies approximately 53° of the horizontal field of view.

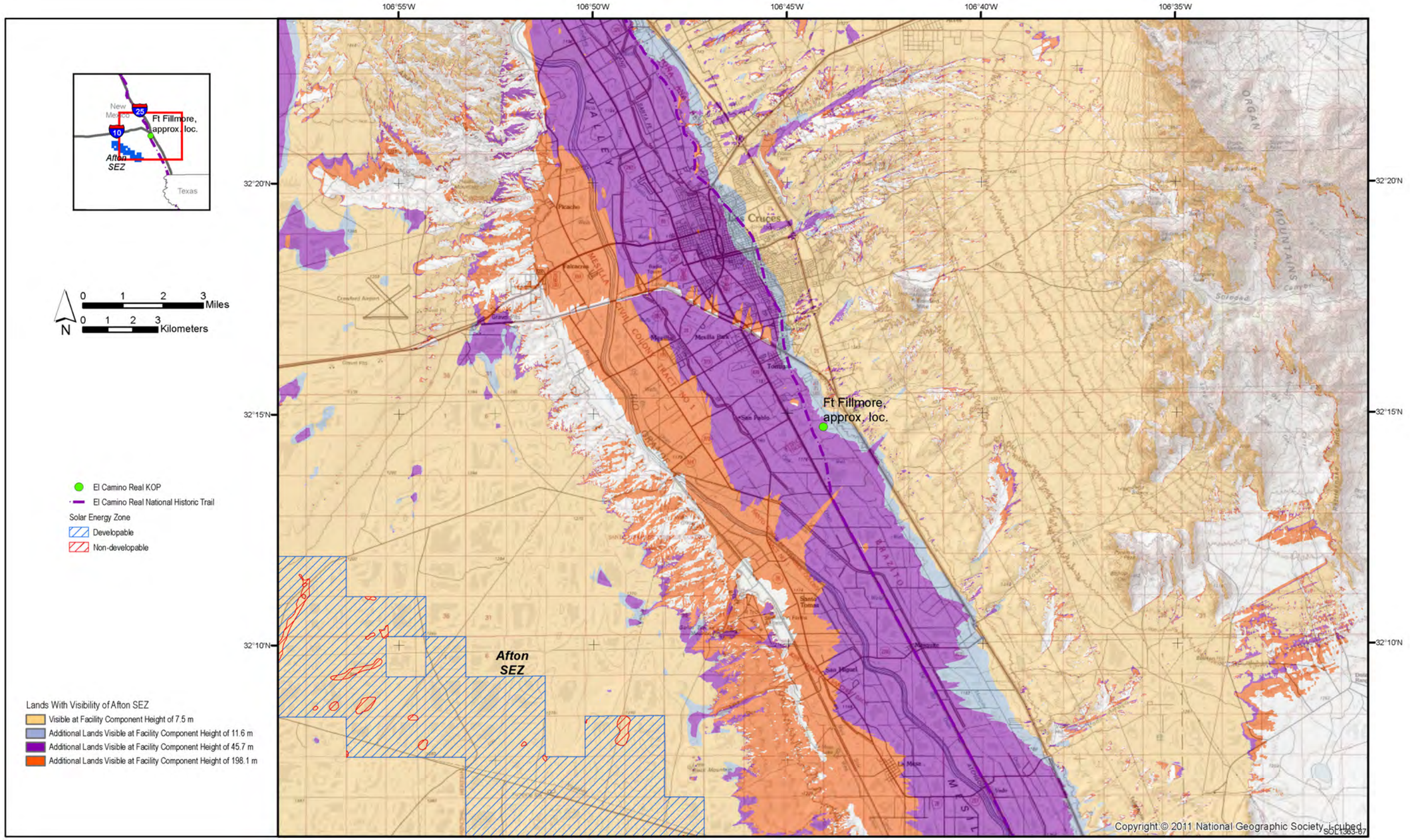

FIGURE 3.3-10 The Fort Fillmore KOP within the Afton SEZ Viewshed

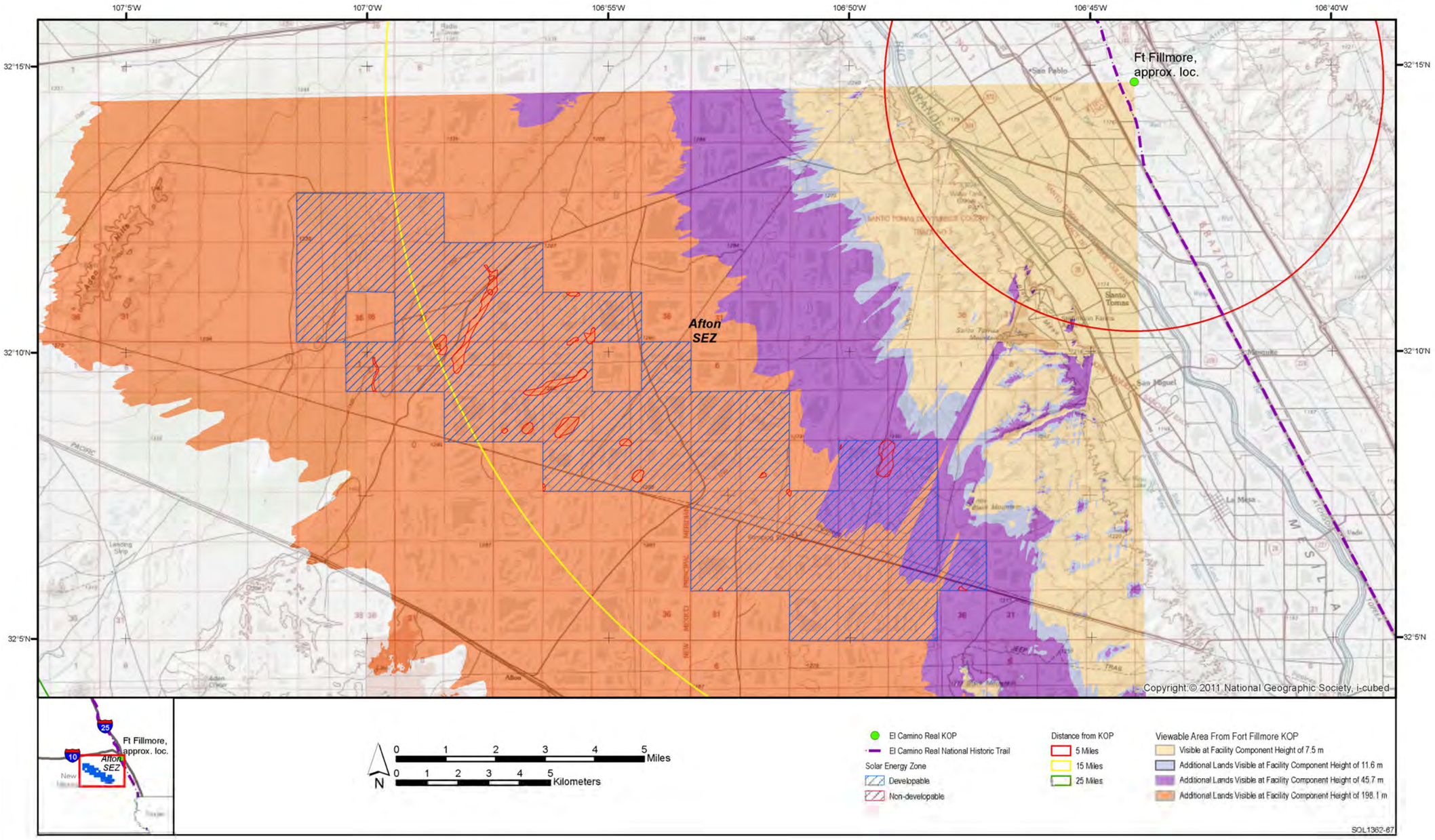

FIGURE 3.3-11 Portion of the Fort Fillmore KOP Viewshed Including the Afton SEZ

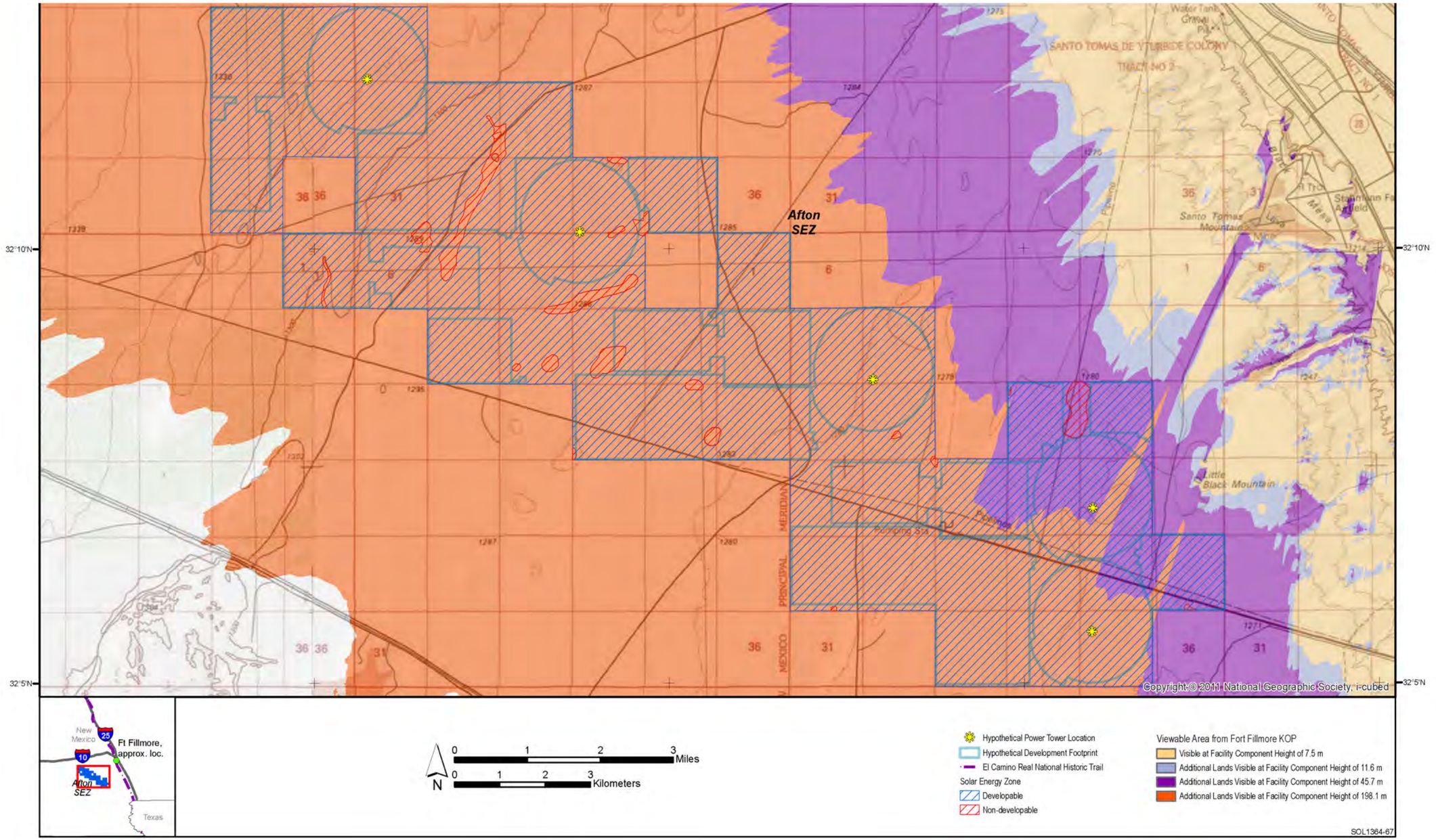

FIGURE 3.3-12 Close-up View of the Afton SEZ with Facility Footprints within the Fort Fillmore KOP Viewshed

FIGURE 3.3-13 Google Earth Visualization of the Afton SEZ with Solar Facility Models (Power Towers Shown in Red), as Seen from the Fort Fillmore KOP

The visualization confirms that looking southeast from the KOP, the SEZ ground surface is obstructed by the slope of West Mesa. The KOP is close enough and the angle of view is low enough that most components associated with solar facilities, such as parabolic trough arrays, PV panels, heliostats of power tower facilities, power blocks, and ancillary buildings would not be visible. However, the upper portions of central receiving towers for power tower facilities throughout the entire SEZ would be visible. Similarly to the view from other KOPs located within the Mesilla Valley, the towers would appear to extend above the mesa, contrasting strongly with the horizontal line of the mesa rim. On sunny days, the central receiving towers of power tower facilities closest to the KOP would appear as very bright non-point (possibly cylindrical- or rectangular-shaped) light sources atop distinct tower structures, set against the backdrop of the sky. The receivers located in more distant parts of the SEZ would appear as bright points of light atop shorter and less distinct tower structures, set against the backdrop of the sky. On the basis of field observations of a 20-MW power tower facility (Sullivan et al. 2012), it is likely that a 100+-MW power tower facility in the easternmost portion of the SEZ would produce strong visual contrasts when viewed from this KOP, given the viewing distance of 8 mi (13 km) from the KOP to the SEZ. The same field observations suggest that reflected light from dust particles in the air around the receivers might be observed at that distance and could appear as faint light streaming downward and/or upward from the receivers. For power towers farthest from the KOP, the apparent height of the towers and the brightness of the reflected light from the receivers would be substantially diminished, and reflections from dust particles would not likely be visible at all. There would be substantial differences in visual contrast levels between power towers in the farthest visible portions of the SEZ (about 17.6 mi [28.3 km] away) and those in the closest portions of the SEZ (approximately 8 mi [13 km] away).

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that would be visible for long distances at night and would likely be visible from this KOP. Additional lighting from other solar facilities would not be visible directly, but if there were a sufficient density of facilities, there would be the potential for sky glow to result; however, this glow could be greatly diminished through good lighting mitigation. In any event, because this area of the Mesilla Valley is in a relatively densely populated area, numerous bright lights are visible and the additional sky-glow impacts from solar development in the SEZ are unlikely to be significant.

In the easternmost portion of the SEZ, the tops of transmission towers would potentially be visible, and for viewers at the KOP, they might be visible over the edge of the mesa, especially if they were white or galvanized metal monopoles. They would also likely be visible from the KOP when silhouetted against the setting sun; however, the resulting visual contrasts would depend on the size and design of the transmission towers, their precise locations, and other site- and project-specific factors. At most, visibility of the tops of transmission towers in the SEZ would be likely to create weak visual contrasts. The form, color, and movement of sufficiently tall vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ, but the occurrence of visible plumes and their height and optical density of plumes is highly dependent on atmospheric and other variables.

If solar development within the visible area of the SEZ consisted only of low-height facilities, unless there were transmission facilities very close to the eastern edge of the SEZ, viewers at the KOP would be unlikely to see any evidence of solar development in the SEZ, and as a result, expected visual impacts would be negligible. Contrast levels might rise to weak if multiple transmission towers were located at the far eastern portion of the SEZ.

If power tower facilities were located in the SEZ, the observed levels of contrast could vary substantially, depending on the number of power towers visible and their distance from the KOP. Visual contrasts would be expected to be weak to moderate if power tower facilities were located in the western portion of the SEZ, but in a worst-case scenario of multiple power towers located in the far eastern portion of the SEZ, visual contrasts would likely be strong.

As previously noted, visitors traveling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. Fort Fillmore is considered a high-potential historic site and man-made elements intruding on the landscape may interfere with a visitor's perceived value of the KOP, both historic and scenic.

If solar development within the SEZ consisted only of low-height solar facilities, viewers from this KOP would not see evidence of solar development except possibly a slight increase in night-sky impacts. As a result, expected visual impacts would be negligible. However, if power towers were present anywhere within the SEZ, their very bright, steady lights atop discernible tower structures would be unmistakable man-made visual intrusions. If one or more power towers were visible in the far eastern portion of the SEZ, the very bright lights would seem out of place in the daytime landscape and would likely attract and hold the viewer's attention. Towers with navigation lighting at night might be a source of negative impact for some observers, especially if there were only a few visible lights on the horizon. Power towers located further west in the SEZ would still appear as bright, steady lights; however, their intensity would be diminished and the impact would not be as great.

In general, under the 80% development scenario, visual impacts from power tower facilities in the SEZ would be expected to be low to moderate, but possibly high in the worst-case scenario of multiple power towers near the eastern edge of the SEZ. A more precise determination of impacts would be made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.1.4 Mesilla

In 1848, The Treaty of Guadalupe Hidalgo established the area west of the Rio Grande River occupied by present-day Mesilla as part of Mexico. Towns on the east side of the river were considered part of the United States. As Euro-Americans began to settle U.S. territory, many Mexican natives wishing to be on Mexican soil moved to the west side of the river, settling on a small rise in the valley. This settlement became known as Mesilla. Mesilla officially became a town in 1853 when the Mexican government issued the Mesilla Civil Colony Land Grant; however, the citizens of Mesilla soon found themselves back in American territory, when the

United States acquired land containing the town of Mesilla during the Gadsden Purchase in 1864. Mesilla became a stop on the Overland Mail route in 1858. In 1861, at the beginning of the Civil War, Mesilla was invaded by Confederate soldiers who claimed the territory for the "Confederate States of America," but the Union Army regained control of the territory in 1862. Mesilla became a bustling community and remained so through 1881, when the Santa Fe Railroad was routed through Las Cruces, New Mexico (NPS and BLM 2004).

Mesilla Plaza was designated as a National Historic Landmark in 1980 (National Register 1980) for its significance in military, government, and transportation history. In 1982, the Mesilla Historic District was added to the National Registry for its historic architecture and its role in early exploration, commerce, government, and transportation (National Register 1982). Mesilla is considered a high-potential site along El Camino NHT and is a potential interpretive site (NPS 2012b).

Mesilla KOP is located on the west bank of the Rio Grande River, on the street of Calle de Parian, in the present-day town of Mesilla. The KOP is situated in the Mesilla Valley, approximately 9 mi (14 km) northeast of the Afton SEZ at its closest point. It lies at an elevation of approximately 3,890 ft (1,186 m) above mean sea level and approximately 330 ft (101 m) below the center of the SEZ. The nearest visible point in the Afton SEZ is approximately 9 mi (14 km) from the Mesilla KOP, and the farthest visible point in the SEZ is approximately 13 mi (21 km) from the KOP. The Mesilla KOP is located in a residential neighborhood and is surrounded by modern development in all directions, which could partially or completely screen views toward the SEZ.

Figure 3.3-14 shows the Mesilla KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the Mesilla KOP from which solar development within the SEZ could potentially be visible. The figure shows that just west of the KOP, visibility of solar development within the SEZ would be entirely limited to the upper portions of power towers, while just east of the KOP, solar facility components 150 ft (45.7 m) tall or taller, such as the tops of transmission towers (if they were sufficiently close to the edge of West Mesa), would be visible.

Figure 3.3-15 depicts the area within the Afton SEZ where solar facilities would be expected to be visible from the Mesilla KOP, assuming the absence of vegetation, structures, or lighting and of atmospheric conditions that cause reduced visibility. The figure shows that the majority of the eastern half of the SEZ (17,080 acres [69.120 km^2]) could potentially be visible from the Mesilla KOP, while only small portions of the western half could potentially be visible. In almost this entire area, only the upper portions of power towers could potentially be visible, except for 122 acres (0.494 km^2) in the northeasternmost corner, where facility components 150 ft (45.7 m) tall or taller would be visible from the KOP.

Figure 3.3-16 shows hypothetical solar energy facilities within the Afton SEZ under the 80% development scenario used in this analysis, overlaid with the Mesilla KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

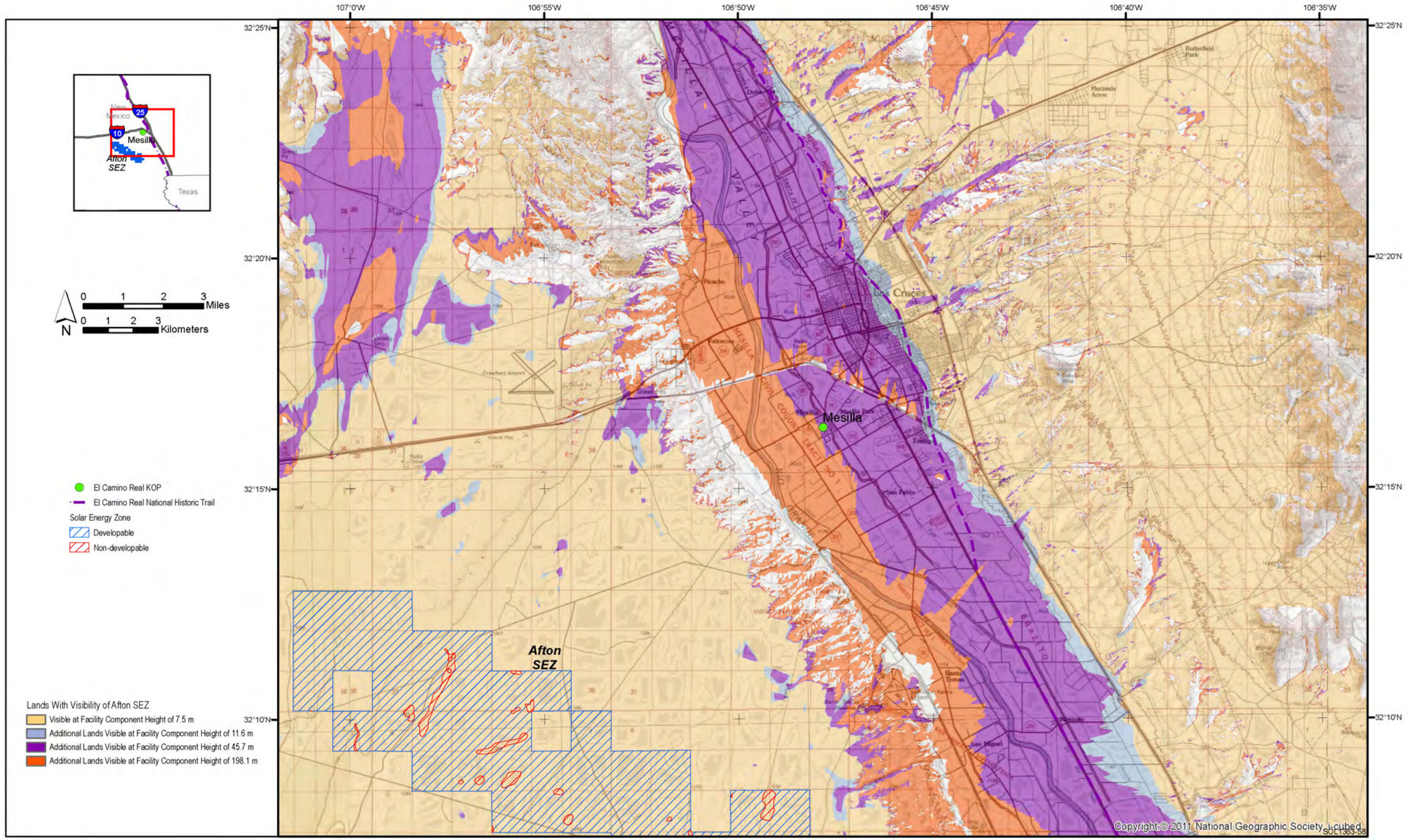

FIGURE 3.3-14 The Mesilla KOP within the Afton SEZ Viewshed

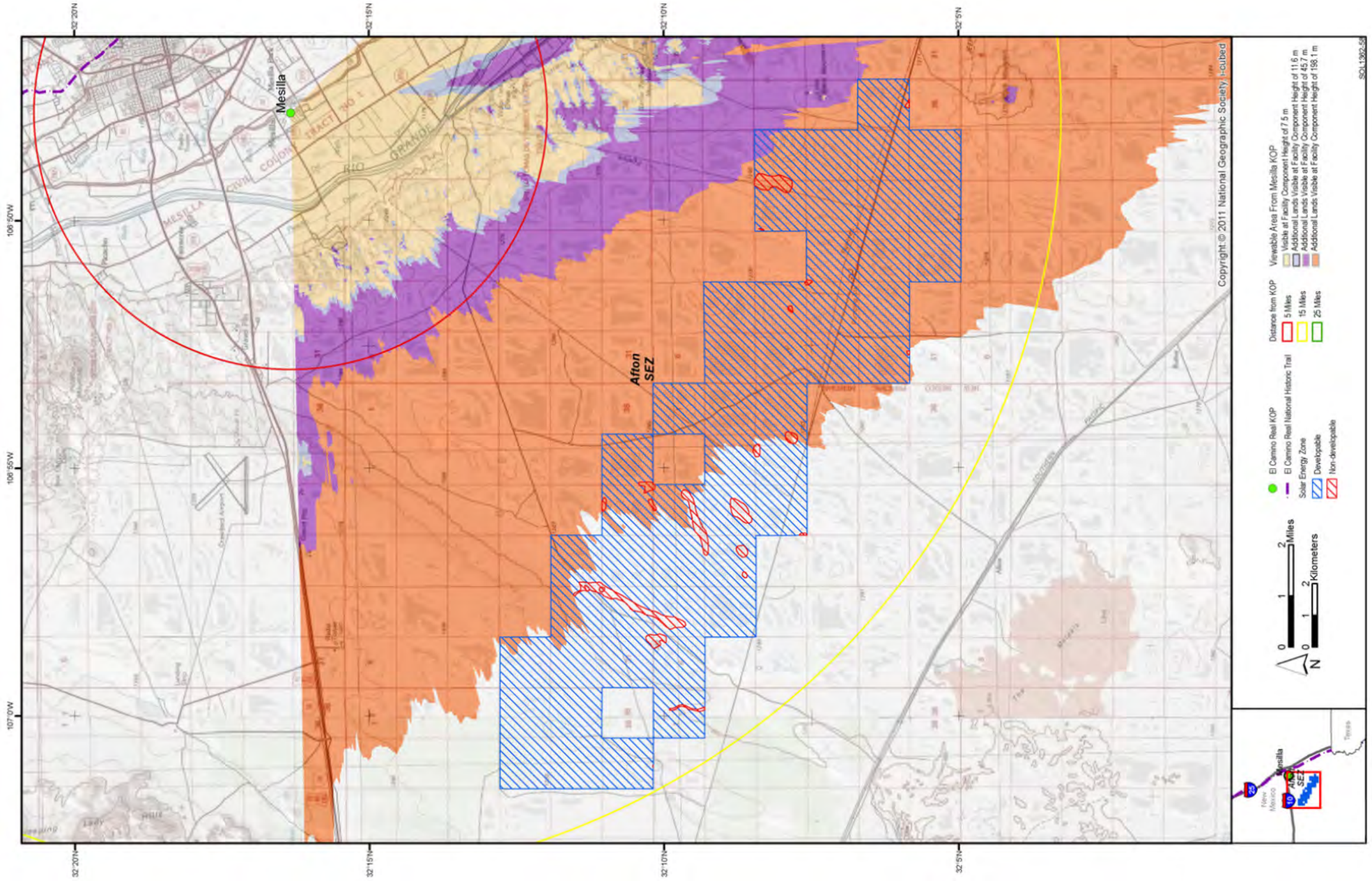

FIGURE 3.3-15 Portion of the Mesilla KOP Viewshed Including the Afton SEZ

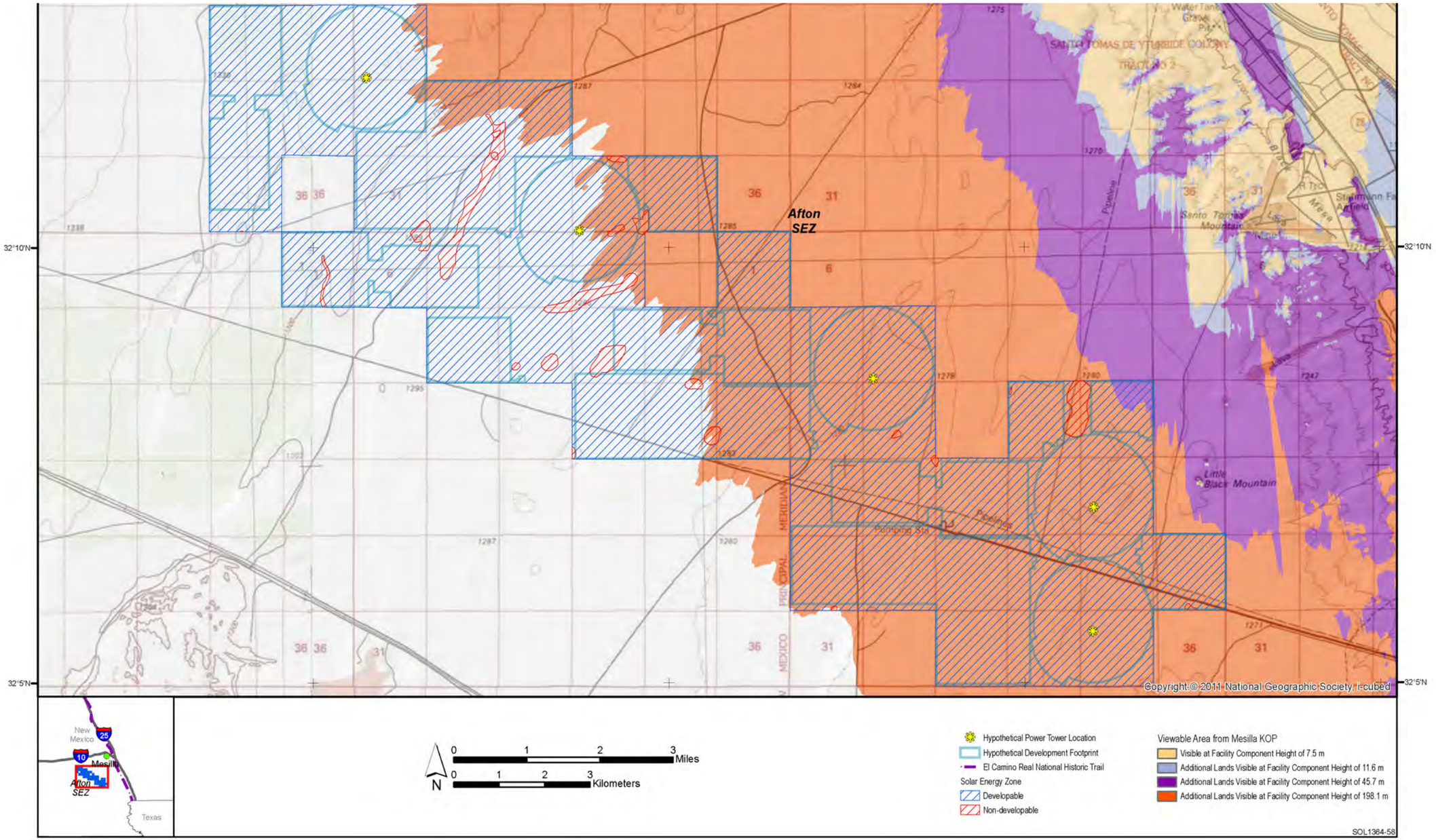

FIGURE 3.3-16 Close-up View of the Afton SEZ with Facility Footprints within the Mesilla KOP Viewshed

Figure 3.3-17 is a Google Earth visualization of the Afton SEZ as seen from the Mesilla KOP, looking west-southwest. The visible portion of potential solar development within the SEZ occupies approximately 19° of the viewer's field of view.

The visualization confirms that when for an observer looking southeast from the Mesilla KOP, the SEZ ground surface would be obstructed by the slope of West Mesa. As with the other KOPs located in the Mesilla Valley, the KOP is close enough to the SEZ, and the angle of view is low enough, that the majority of components associated with solar facilities, such as parabolic trough arrays, PV panels, heliostats of power tower facilities, power blocks, and ancillary buildings would not be visible. As noted above, the Mesilla KOP is located in an urbanized are and surrounding structures and vegetation may obstruct the view. Assuming that there were unobstructed views toward the SEZ form the Mesilla KOP, only central receiving towers for power tower facilities in the SEZ would be visible.

Similarly to the other KOPs located in Mesilla Valley, when viewed from this KOP, the towers would appear to extend above the mesa, causing vertical line contrasts with the strong horizontal line of the mesa rim. On sunny days, the reflected sunlight from the receivers would appear as very bright points of light atop discernible tower structures, set against the backdrop of the sky. On the basis of field observations of a 20-MW power tower facility (Sullivan et al. 2012), it is likely that 100+-MW power tower facilities in the easternmost portion of the SEZ would produce strong visual contrasts when viewed from this KOP, given the short distance of 9 mi (14 km) to the SEZ. The same field observations suggest that reflected light from dust particles in the air around the receivers might be observed as well, and could appear as faint light streaming downward and/or upward from the receivers. The apparent height of the towers and the brightness of the reflected light from the receivers and dust particles would decrease for power towers farther from the KOP, and there would be some differences in visual contrast levels between power towers in the farthest visible portions of the SEZ (approximately 13 mi [21 km] away) and those in the closest visible portions of the SEZ (approximately 9 mi [14 km] away).

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that would be visible for long distances at night and would likely be visible from this KOP. Additional lighting from other solar facilities would not be visible directly, but if there were a sufficient density of facilities, there would be the potential for sky glow to result; however, this glow could be greatly diminished through good lighting mitigation. The Mesilla KOP is located in a relatively densely populated area and surrounded by urban development. Numerous bright lights are visible, and the additional sky-glow impacts from solar development in the SEZ are likely to be negligible.

It is likely that many if not most views toward the SEZ from the immediate vicinity of the Mesilla KOP are screened by vegetation or structures. At these locations, visual contrast from solar development would not be expected, even at night, because there are numerous lights in the immediate area of the KOP that would very likely make any additional sky glow from solar facilities in the SEZ unnoticeable.

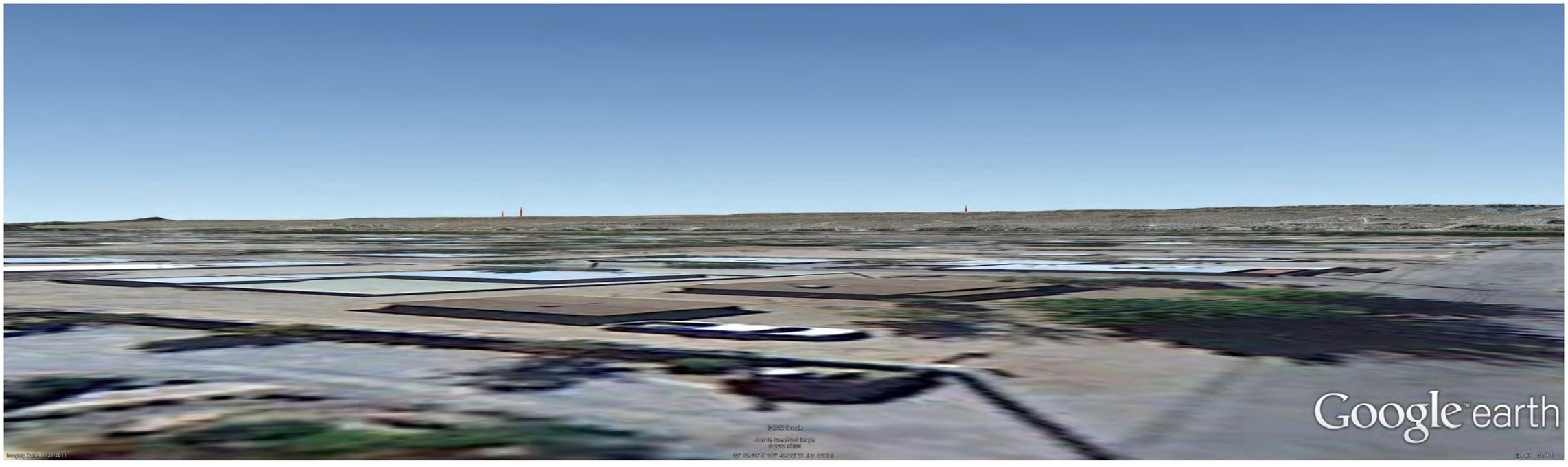

FIGURE 3.3-17 Google Earth Visualization of the Afton SEZ with Solar Facility Models (Power Towers Shown in Red), as Seen from the Mesilla KOP

For locations in the immediate vicinity of the Mesilla KOP, assuming unobstructed views toward the SEZ, under the 80% development scenario used in this analysis, if there were no power towers constructed within the eastern half of the SEZ, visual contrast from solar energy development in the SEZ would likely be negligible. Visual contrasts would be expected to be weak if power tower facilities were positioned in the western portions of the eastern half of the SEZ, where they are unlikely to be seen from this KOP. In a worst-case scenario of multiple power towers located in the far eastern portion of the SEZ, visual contrasts would likely be moderate. The observed levels of contrast could vary substantially, depending on the number of power towers visible and their distance from the KOP.

As previously noted, visitors traveling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. Although Mesilla is considered a high-potential historic site, given the numerous modern man-made elements visible in the immediate vicinity of the KOP and the prevalence of screening elements, there would likely be minimal impacts from the addition of solar facilities in the SEZ, unless multiple power towers were located in the closest portions of the SEZ and they were not screened from view. In this unlikely scenario, impacts could be weak to moderate. A more precise determination of impacts would be made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.1.5 Doña Ana

Doña Ana is the oldest and most continually inhabited community in southern New Mexico (Doña Ana County Historical Society 2010). The town, once a frequently visited paraje along the El Camino Real de Tierra Adentro, was founded under the Doña Ana Land Grant in 1840 (Bowden 2012b). The Doña Ana Village Historic District was listed on the National Register of Historic Places in 1996 for its significance in exploration, settlement, and architecture (National Register 1996), and is considered a high-potential site in the El Camino de Real Tierra Adentro management plan (NPS and BLM 2004). The district is roughly bounded by the Doña Ana lateral irrigation ditch, I-25, New Mexico State Highway 320, and Doña Ana School Road (National Register 1996). The Doña Ana Plaza presents an excellent interpretive opportunity for interpretation of the El Camino NHT.

The Doña Ana KOP is located at the intersection of East Thorpe Road and Abeyta Street, in the town of Doña Ana, New Mexico, approximately 15 mi (24 km) northeast of the Afton SEZ at its closet point. The KOP is less than 0.5 mi (0.8 km) west of I-25. It is situated at an elevation of approximately 3,945 ft (1,202 m) above mean sea level and approximately 275 ft (84 m) below the center of the Afton SEZ. The Doña Ana KOP is located in a residential community and is surrounded by modern homes on all sides.

Figure 3.3-18 shows the Doña Ana KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the Doña Ana KOP from which solar development in the Afton SEZ could potentially be visible. The figure shows that from the Doña Ana KOP, visibility of facilities within the Afton SEZ would be limited to facility components 150 ft (45.7 m) tall or

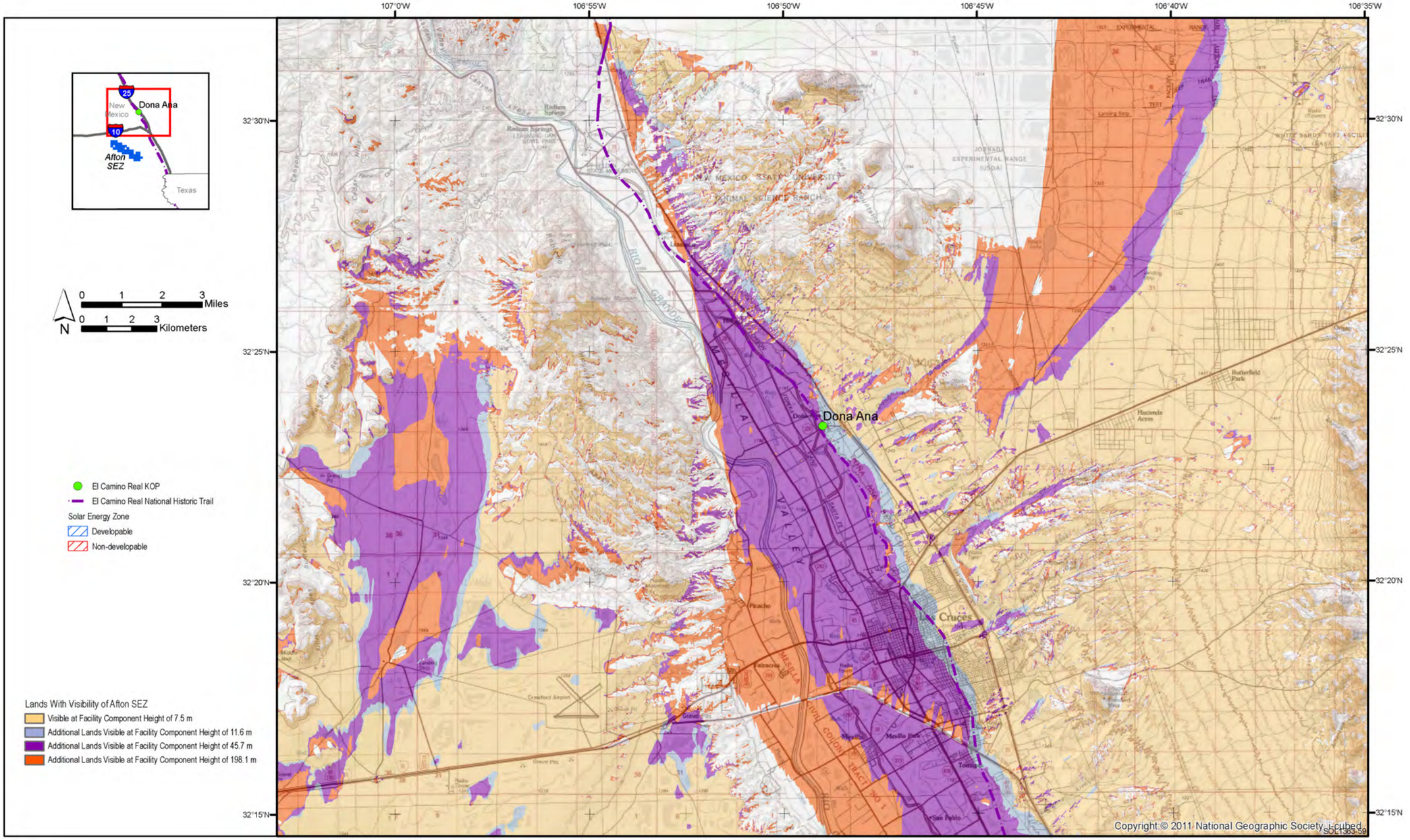

FIGURE 3.3-18 The Doña Ana KOP within the Afton SEZ Viewshed

taller, such as transmission towers (if they were sufficiently close) or the upper portions of central receiving towers for power tower facilities. Just east of the KOP, components 38.1 ft (11.6 m) tall or taller, including parabolic trough reflector arrays, could potentially be visible.

Figure 3.3-19 depicts the area within the Afton SEZ where solar facilities could be visible from the Doña Ana KOP, assuming the absence of vegetation, structures, or lighting and of atmospheric conditions that cause reduced visibility. The figure shows that from the Doña Ana KOP, solar facilities throughout nearly all of the SEZ (26,429 acres [106.954 km^2] or 88% of the SEZ), except the section of the SEZ located furthest west, would potentially be visible. The nearest point in the Afton SEZ where solar facilities could be visible is approximately 15.1 mi (24.3 km) from the Doña Ana KOP. The farthest point in the SEZ where solar facilities could be visible is approximately 21.5 mi (35 km) from the KOP. Throughout the majority of the SEZ, only the upper portions of central receiving towers would be visible from the KOP; however, on 2,205 acres (10.137 km^2) within the far southeastern portion of the SEZ, solar facility components 150 ft (45.7 m) tall or taller could potentially be visible from the KOP.

Figure 3.3-20 shows hypothetical solar energy facilities within the Afton SEZ under the 80% development scenario used in this analysis, overlaid with the Doña Ana KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.3-21 is a Google Earth visualization of the Afton SEZ as seen from the Doña Ana KOP, looking south-southwest. The visible portion of potential solar development within the SEZ occupies approximately 25° of the viewer's field of view.

The visualization confirms that looking south-southwest from the KOP, the SEZ ground surface is obstructed by the slope of West Mesa. The angle of view from the KOP is low enough that the majority of components associated with solar facilities, such as parabolic trough arrays, PV panels, heliostats of power tower facilities, power blocks, and ancillary buildings would not be visible. However, central receiving towers for power tower facilities would be visible throughout almost the entire SEZ, except for the portion of the SEZ located furthest west. Similarly to surrounding KOPs, the towers would appear to extend above the mesa, creating vertical line contrasts with the mesa rim. On sunny days, the reflected sunlight from the receivers would likely appear as bright points of light atop distinct tower structures, set against the backdrop of the sky. On the basis of field observations of a 20-MW power tower facility (Sullivan et al. 2012), it is likely that a 100+-MW power tower facility in the easternmost portion of the SEZ would produce weak visual contrasts when viewed at distances of 15 to 21 mi (24 to 34 km) from the KOP to the SEZ. It is uncertain but unlikely that reflected light from dust particles in the air around the receivers would be observed, but if it were, it could appear as faint light streaming downward and/or upward from the receivers. For power towers farthest from the KOP, the apparent height of the towers and the brightness of the reflected light from the receivers would be diminished slightly, and there would be some differences in visual contrast levels between power towers in the more distant portion of the SEZ (as far as 21.5 mi [35 km] away) and those in the closer, eastern portion of the SEZ (as close as 15 mi [24 km] away). Similarly to the Mesilla KOP, the Doña Ana KOP is located in a residential neighborhood and

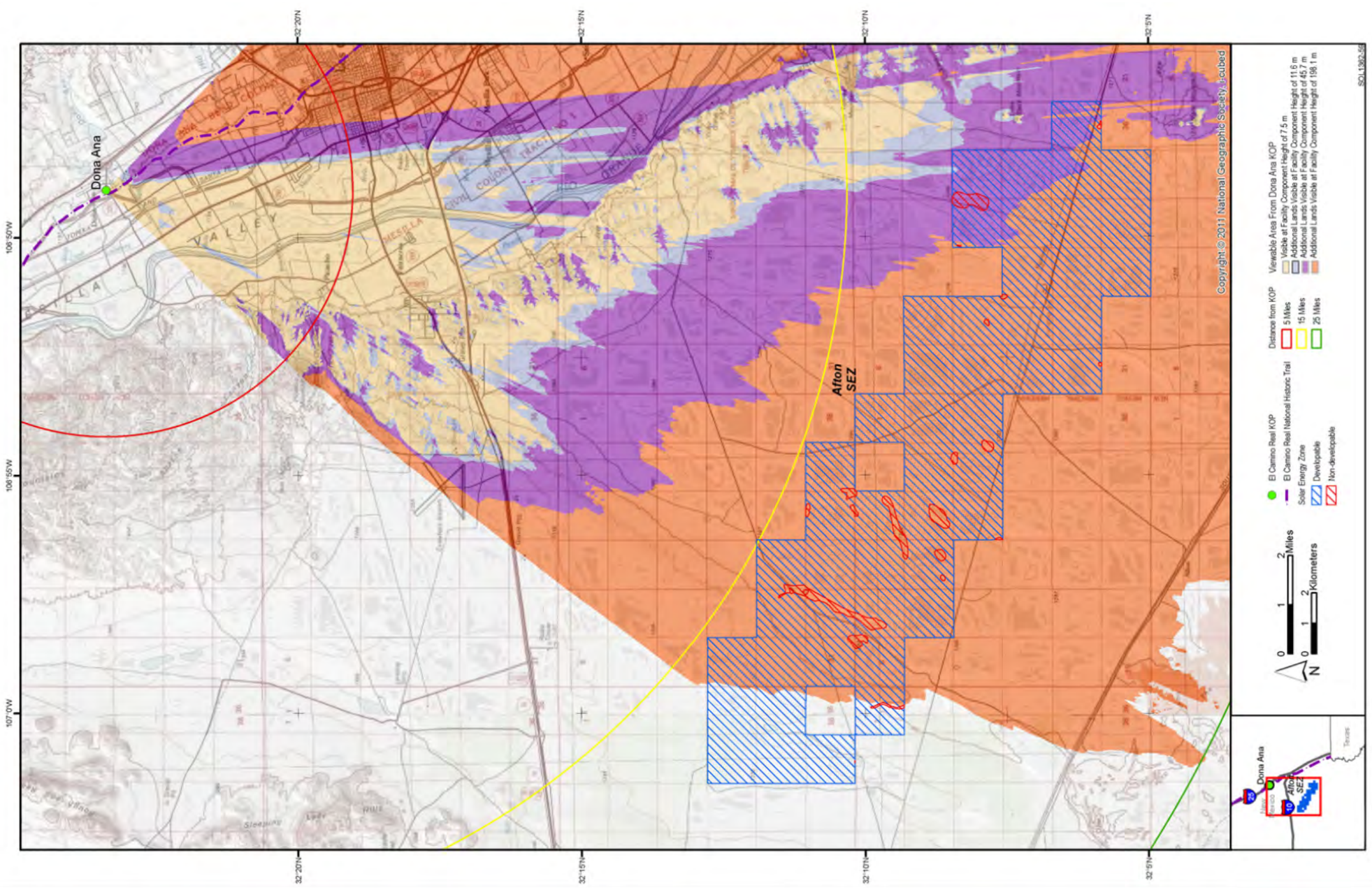

FIGURE 3.3-19 Portion of the Doña Ana KOP Viewshed, Including the Afton SEZ

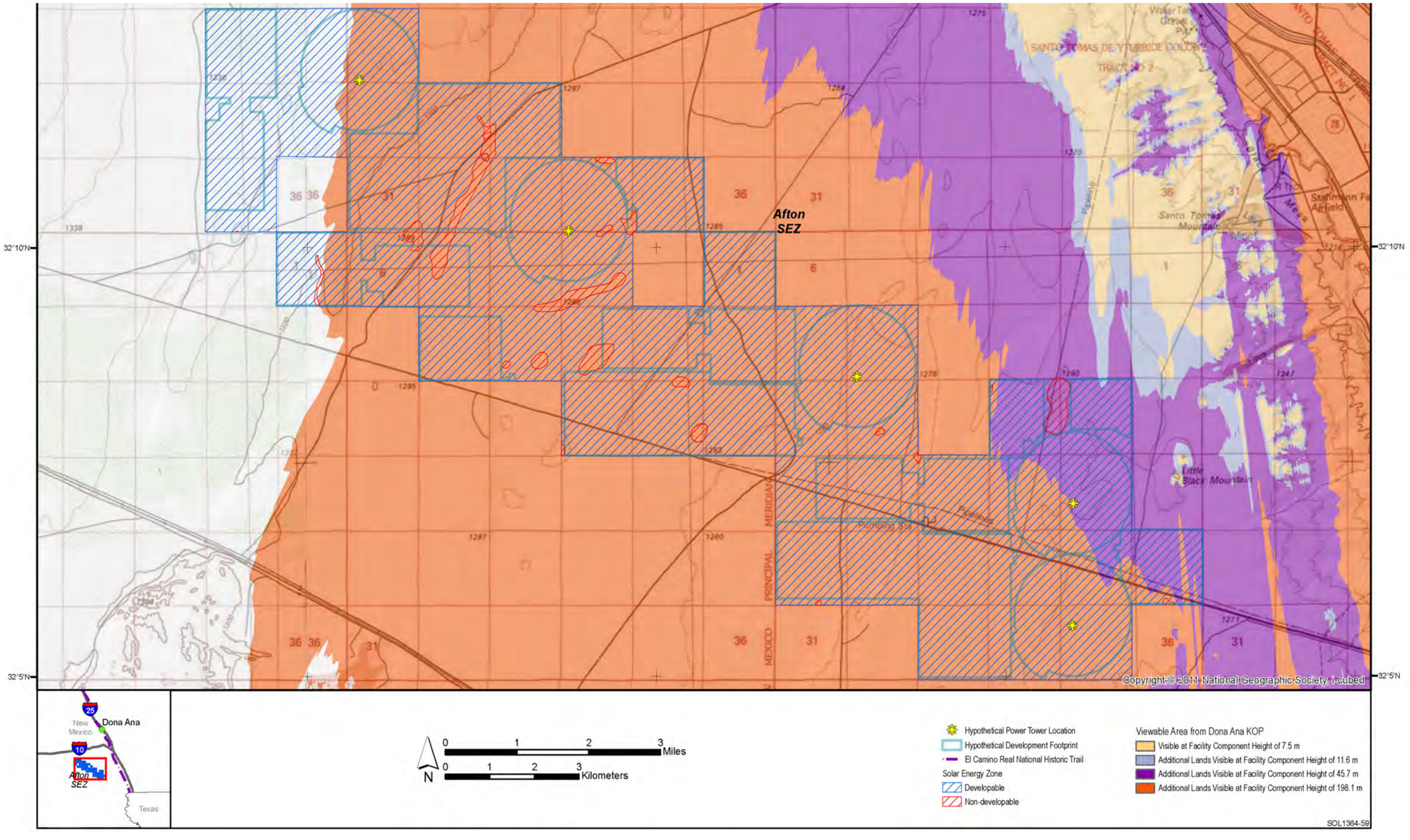

FIGURE 3.3-20 Close-up View of the Afton SEZ with Facility Footprints within the Doña Ana KOP Viewshed

FIGURE 3.3-21 Google Earth Visualization of the Afton SEZ with Solar Facility Models (Power Towers Shown in Red), as Seen from the Doña Ana KOP

the potential view of central receiving towers could be partially or completely obstructed by the surrounding urban development.

The tops of transmission towers in the easternmost portion of the SEZ would potentially be visible, and for viewers at the KOP, they might be visible over the edge of the mesa, especially if they were white or galvanized metal monopoles. They could potentially be visible from the KOP when silhouetted against the setting sun; however, the resulting visual contrasts would depend on the size and design of the transmission towers, their precise locations, and other site- and project-specific factors. Give the 17- to 20-mi (27- to 32-km) distance to the portion of the SEZ where objects of this height could be visible, visibility would be very limited and would be likely to create negligible visual contrasts. The form, color, and movement of sufficiently tall vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume sources could contribute to visual contrasts from solar facilities in the SEZ, but the occurrence of visible plumes and their height and optical density of plumes is highly dependent on atmospheric and other variables, and it is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that would be visible for long distances at night and would likely be visible from this KOP. Additional lighting from other solar facilities would not be visible directly, but if there were a sufficient density of facilities, there would be the potential for sky glow to result; however, this glow could be greatly diminished through good lighting mitigation. The Doña Ana KOP is located in a relatively densely populated area and is surrounded by residential development. Numerous bright lights are already visible, and the additional sky-glow impacts from solar development in the SEZ would likely be negligible.

If power towers were present within the majority of the SEZ, their bright, steady lights atop discernible tower structures would be unmistakable man-made visual intrusions. If one or more power towers were visible in the far eastern portion of the SEZ, the bright lights would seem out of place in the daytime landscape and would likely attract viewers' attention. Power towers located further west in the SEZ would still appear as bright, steady lights; however, their intensity would be diminished and the impact to the surrounding landscape would not be as great. Towers with navigation lighting at night might be a source of negative impact for some observers, especially if there were only a few visible lights on the horizon.

Under the 80% development scenario presented here, if there were no power towers constructed within the SEZ, solar energy development within the Afton SEZ would be expected to yield negligible visual contrasts with the surrounding environment when viewed from the Doña Ana KOP. Assuming no screening of views by vegetation or structures, visual contrasts would be expected to be weak if power tower facilities were positioned in the western portion of the SEZ. In a worst-case scenario of multiple power towers located in the far eastern portion of the SEZ, visual contrasts would be expected to be moderate. The observed levels of contrast could vary substantially, depending on the number of power towers visible and their distance from the KOP.

If solar development within the SEZ consisted only of parabolic trough or PV facilities and/or central receiving towers only in the farthest western portion of the SEZ, viewers from this KOP would not see evidence of solar development except possibly a slight increase in night-sky impacts. As a result, expected visual impacts would be negligible.

As previously noted, visitors travelling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. Although Doña Ana is considered a high-potential historic site, given the numerous modern man-made elements visible in the immediate vicinity of the KOP, there would likely be minimal impacts from the addition of solar facilities in the SEZ, unless multiple power towers were located in the closest portions of the SEZ and they were not screened from view. In this unlikely scenario, impacts would likely be weak. A more precise determination of impacts would be made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.1.6 La Rancheria

La Rancheria was once a paraje along the El Camino Real de Tierra Adentro. La Rancheria was frequently inhabited by the Mansos Indians before they were converted to Mission life in the 17th century (NPS 2012b; University of Texas, Austin 2008). The site now lies somewhere underneath the town of Las Cruces, New Mexico, its exact whereabouts unknown.

The La Rancheria KOP is located on North Church Street, in Las Cruces, New Mexico, on the eastern side of the Mesilla Valley, and approximately 11.5 mi (18.5 km) northeast of the Afton SEZ at its closest point. It lies at an elevation of approximately 3,915 ft (1,193 m) above mean sea level and approximately 305 ft (93 m) below the center of the SEZ. The nearest point where solar facility components in the Afton SEZ would be visible is approximately 11.5 mi (18.5 km) from the La Rancheria KOP; the farthest point where solar facility components in the Afton SEZ would be visible is approximately 17.5 mi (28.2 km) from the KOP. The La Rancheria KOP is located in a heavily urbanized area, on a main thoroughfare, and is surrounded by businesses in all directions.

Figure 3.3-22 shows the La Rancheria KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the La Rancheria KOP from which solar development in the Afton SEZ could potentially be visible. The figure shows that from the La Rancheria KOP, facility visibility within the Afton SEZ would be limited to facility components 150 ft (45.7 m) or taller, such as transmission towers (if they were sufficiently close) or the upper portions of central receiving towers for power tower facilities. A short distance east of the KOP, components 38.1 ft (11.6 m) or taller could potentially be visible, including the tops of solar dish engines.

Figure 3.3-23 depicts the area within the Afton SEZ where solar facilities would be expected to be visible from the La Rancheria KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that cause reduced visibility. The figure shows that from the La Rancheria KOP, solar facilities throughout all of the SEZ would potentially be

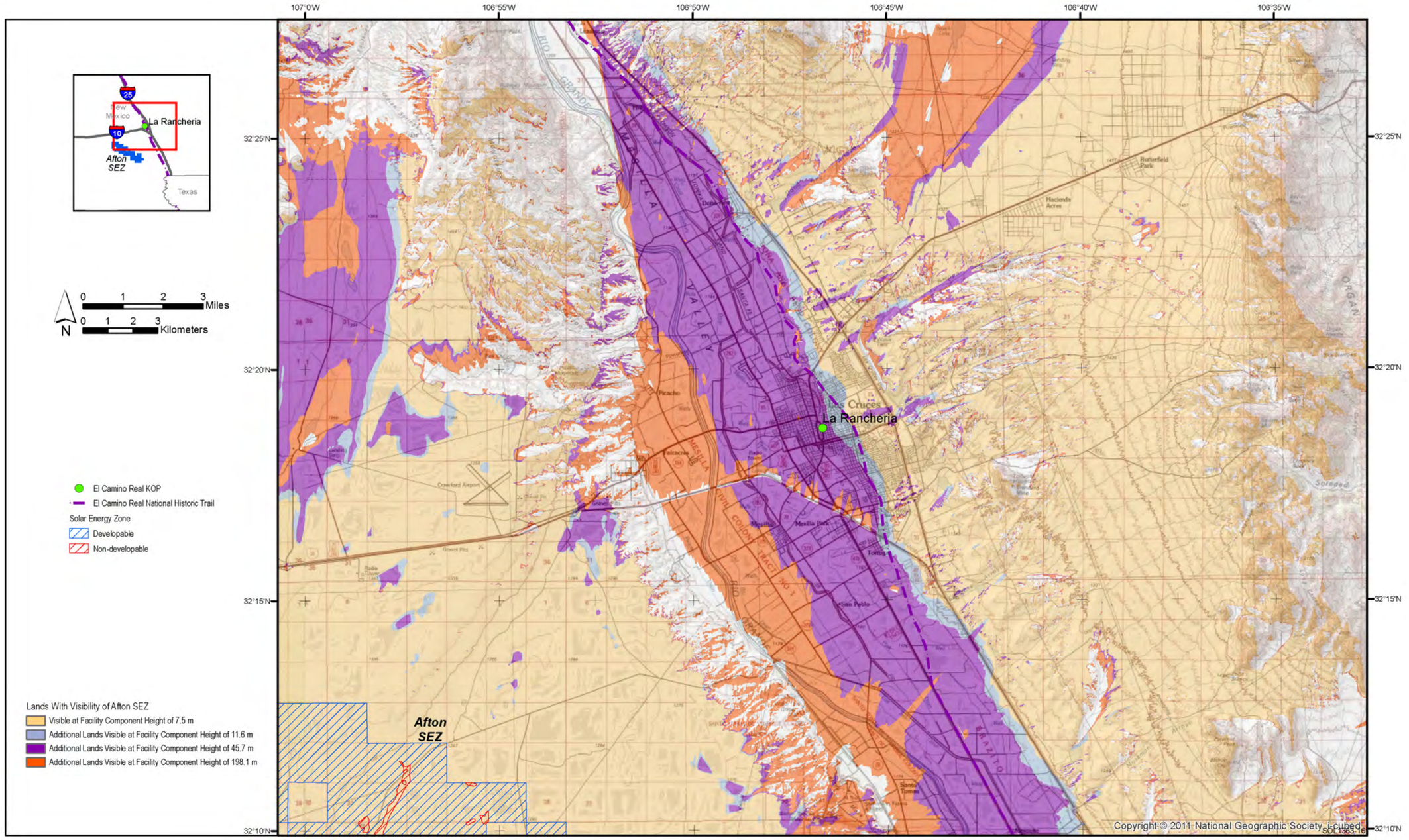

FIGURE 3.3-22 La Rancheria KOP within the Afton SEZ Viewshed

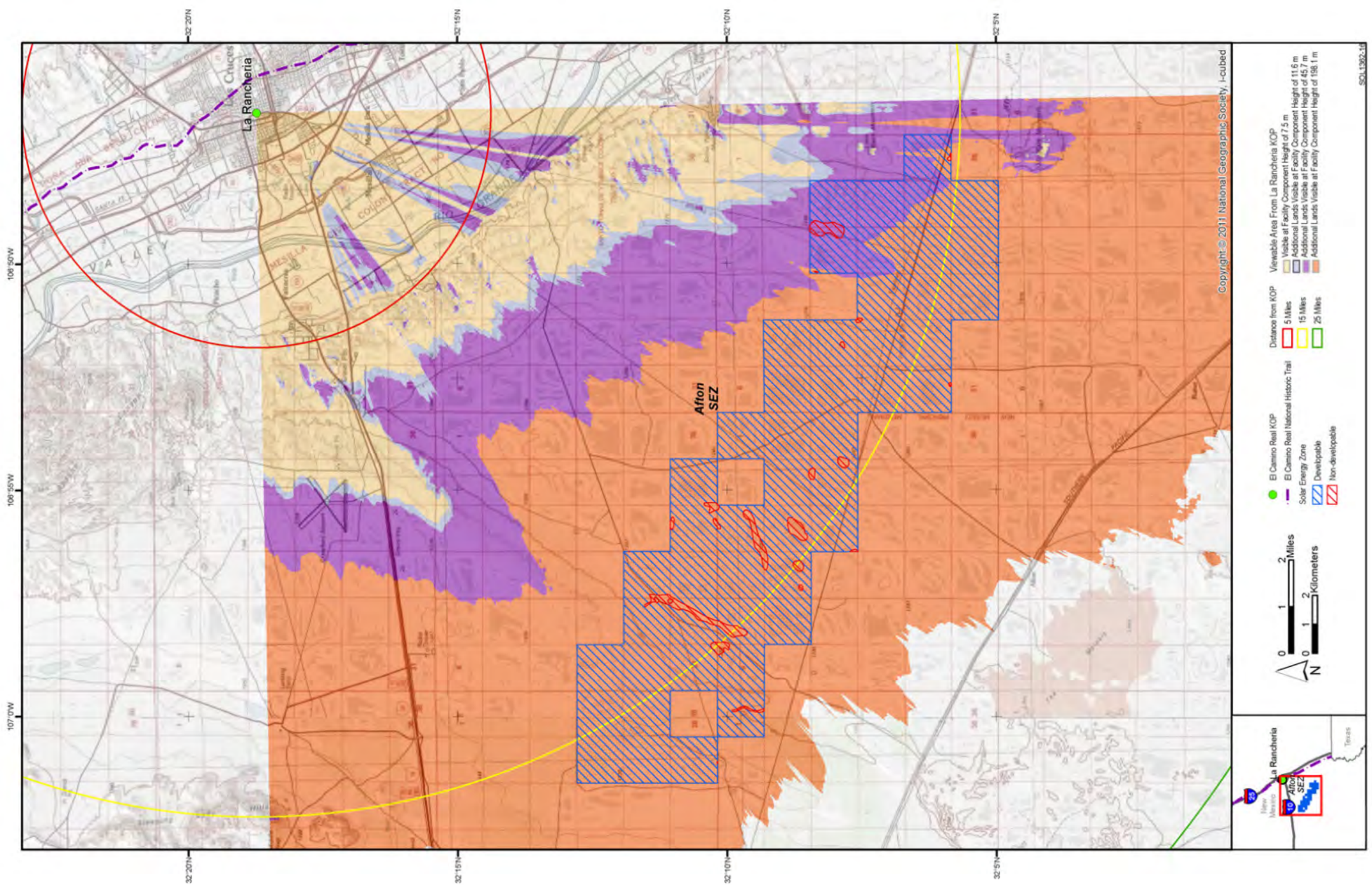

FIGURE 3.3-23 Portion of the La Rancheria KOP Viewshed, Including the Afton SEZ

visible. Throughout the majority of the SEZ (27,090 acres [109.629 km^2] or 90% of the SEZ), only the upper portions of central receiving towers would be visible from the KOP; however, solar facility components of 150 ft (45.7 m) or taller on 2,851 acres (11.538 km^2) within the southeastern portion of the SEZ could potentially be visible from the KOP.

Figure 3.3-24 shows hypothetical solar energy facilities within the Afton SEZ under the 80% development scenario used in this analysis, overlaid with the La Rancheria KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figures 3.3-25 is a Google Earth visualization of the Afton SEZ as seen from the La Rancheria KOP, looking south-southwest. The visible portion of potential solar development within the SEZ occupies approximately 49° of the viewer's field of view.

The visualization confirms that looking southwest from the KOP, the SEZ ground surface is obstructed by the slope of West Mesa. The KOP is close enough to the SEZ and the vertical angle of view from the KOP is low enough that the majority of components associated with solar facilities, such as parabolic trough arrays, PV panels, heliostats of power tower facilities, power blocks, and ancillary buildings would not be visible. However, central receiving towers for power tower facilities would be visible throughout the entire SEZ. The towers would appear to extend above the mesa, and the vertical lines of the towers would contrast with the strong horizontal line of the mesa rim. On sunny days, the reflected sunlight from the receivers in the closest parts of the SEZ would appear as very bright points of light atop distinct tower structures, set against the backdrop of the sky. Field observations of 5- to 20-MW power towers (Sullivan et al. 2012) suggest that reflected light from the central receiving towers at 100+-MW facilities would likely produce moderate to weak contrasts at viewing distances of 11.5–17.5 mi (18.5–28.2 km), with lower contrasts at longer distances. At these distances, it is uncertain but unlikely that reflected light from dust particles in the air around the receivers would be observed, but if it were, it could appear as faint light streaming downward and/or upward from the receivers. For power towers farthest from the KOP, the apparent height of the towers and the brightness of the reflected light from the receivers would be diminished, and there would likely be substantial differences in visual contrast levels between power towers in the nearer and more distant portions of the SEZ. Like the Mesilla and Doña Ana KOPs, La Rancheria is located on a road and is surrounded by urban development that could potentially obstruct the view of any facilities in the SEZ.

In the easternmost portion of the SEZ, the tops of transmission towers would potentially be visible, and for viewers at the KOP, they might be visible over the edge of the mesa, especially if they were white or galvanized metal monopoles. They could potentially be visible from the KOP when silhouetted against the setting sun; however, the resulting visual contrasts would depend on the size and design of the transmission tower, the precise location, and other site- and project-specific factors. Give the 12- to 15-mi (19- to 24-km) distance to the portion of the SEZ where objects of this height could be visible, visibility would be very limited and would be likely to create negligible visual contrasts. The form, color, and movement of sufficiently tall vapor plumes from cooling towers (for parabolic trough or power tower facilities) or other plume

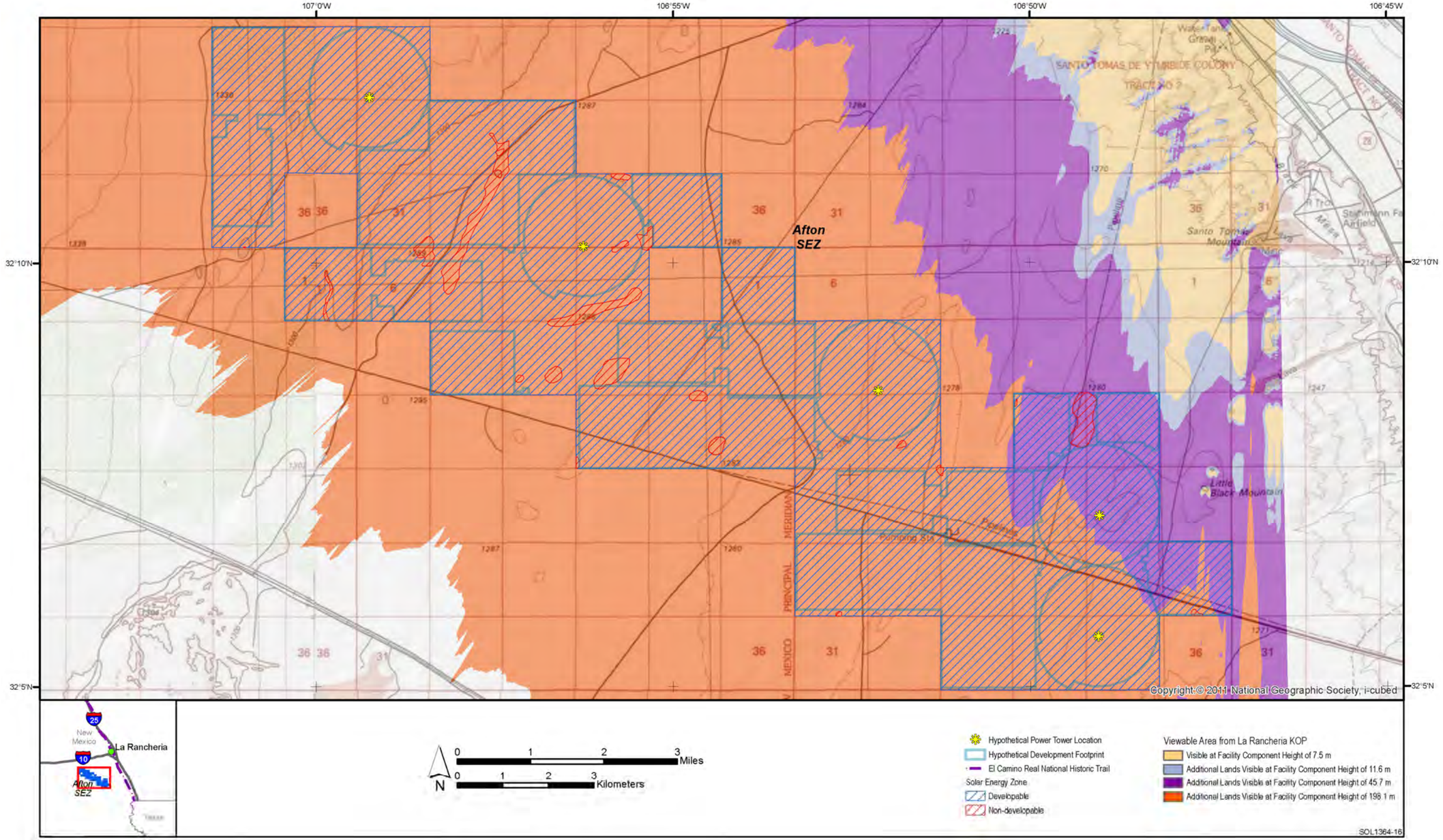

FIGURE 3.3-24 Close-up View of the Afton SEZ with Facility Footprints within the La Rancheria KOP Viewshed

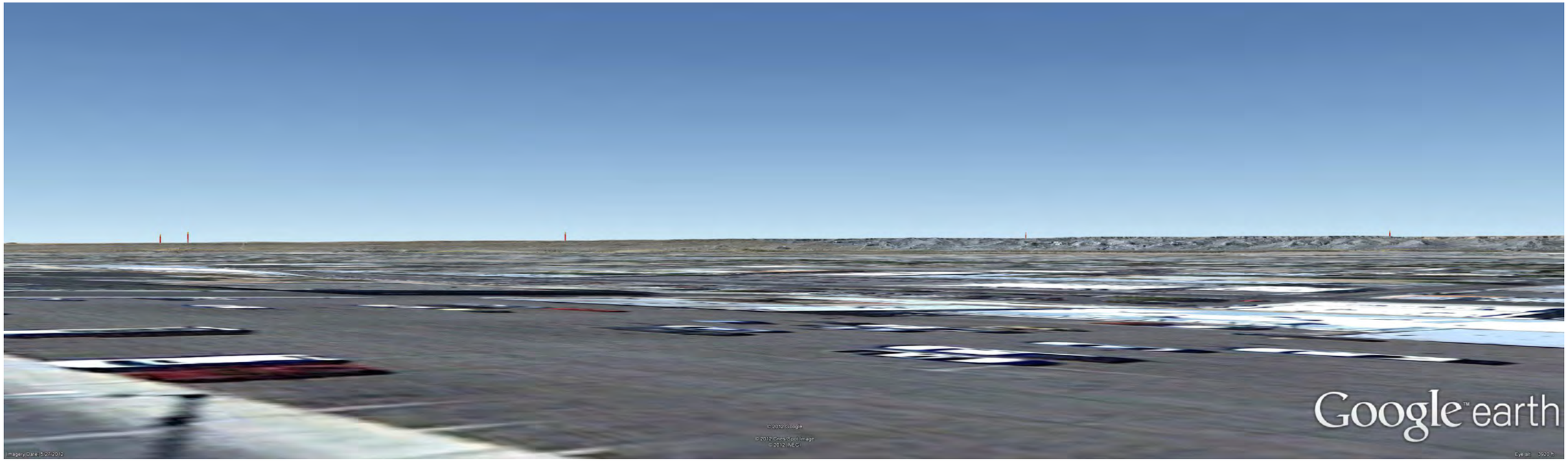

FIGURE 3.3-25 Google Earth Visualization of the Afton SEZ with Solar Facility Models (Power Towers Shown in Red), as Seen from the La Rancheria KOP

sources could contribute to visual contrasts from solar facilities in the SEZ, but the occurrence of visible plumes and their height and optical density of plumes is highly dependent on atmospheric and other variables, and it is not certain that plumes would be visible at the relatively long distance of the SEZ from the KOP.

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation warning lights that would be visible for long distances at night and would likely be visible from this KOP. Additional lighting from other solar facilities would not be visible directly, but if there were a sufficient density of facilities, there would be the potential for sky glow to result; however, this glow could be greatly diminished through good lighting mitigation. The La Rancheria KOP is located in a relatively densely populated area and is surrounded by urban development. Numerous bright lights are already visible and the additional sky-glow impacts from solar development in the SEZ are likely to be negligible.

Under the 80% development scenario presented here, if no power towers were constructed within the Afton SEZ, solar energy development within the SEZ would be expected to create negligible visual contrasts with the surrounding environment when viewed from the La Rancheria KOP. Assuming there were no screening of the views toward the SEZ by structures or vegetation, visual contrasts would be expected to be weak to moderate if power tower facilities were positioned in the far southwestern portions of the SEZ. In a worst-case scenario of multiple power towers located in the northeastern and far eastern portions of the SEZ, visual contrasts could be strong. The observed levels of contrast could vary substantially, depending on the number of power towers visible and their distance from the KOP.

As previously noted, visitors traveling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. Although La Rancheria is considered a high-potential historic site, given the numerous modern man-made elements visible in the immediate vicinity of the KOP, there would likely be minimal impacts from the addition of solar facilities in the SEZ, unless multiple power towers were located in the closest portions of the SEZ and they were not screened from view. In this unlikely scenario, impacts would likely be moderate.

If solar development within the SEZ consisted only of parabolic trough or PV facilities, viewers from this KOP would not see evidence of solar development except possibly a slight increase in night-sky impacts. As a result, expected visual impacts would be negligible. However, if power towers were present within any part of the SEZ, their bright, steady lights atop discernible tower structures would be unmistakable man-made visual intrusions. If one or more power towers were visible in the northeastern and especially in the far eastern portions of the SEZ, the bright lights would seem out of place in the daytime landscape and would likely attract and hold the viewer’s attention. Power towers located further from the KOP would still appear as bright, steady lights; however, their intensity would be diminished and the impact to the surrounding landscape would not be as great. In general, under this scenario, visual impacts would be expected to be weak, but possibly moderate in the worst case of multiple power towers located along the northeastern edge or in the far eastern portion of the SEZ. A more precise determination of impacts would be made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.1.7 Robledo Peak

Robledo Peak is a tall prominence in the Robledo Mountains, overlooking the Robledo Paraje to the north. Northbound travelers on the El Camino Real de Tierra Adentro would stop at Robledo Paraje for several days to collect water and supplies before they began their 3-day journey across the Jornada del Muerto, one of the most dangerous stretches of the trail (El Camino Real International Heritage Center 2012, NPS 2012b). The area was named for Pedro Robledo, a member of Juan de Oñate's expedition, who died and was buried in the area in 1598. Both Robledo Peak and Robledo Paraje have the opportunity to provide significant interpretation opportunities.

The Robledo Peak KOP is located at the summit of Robledo Mountain, approximately 16 mi (26 km) north of the Afton SEZ at its closest point. It is situated at an elevation of 5,894 ft (1,796 m) above mean sea level and 1,674 ft (510 m) above the center of the Afton SEZ. The nearest visible point in the Afton SEZ is approximately 16 mi (26 km) from the Robledo Peak KOP, and the farthest visible point in the SEZ is approximately 25 mi (40 km) from the KOP. Because of its relatively high elevation, the Robledo Peak KOP provides clear views of the surrounding landscape in all directions, including Aden Crater and the Malpais to the southwest; Las Cruces, New Mexico, and the Organ Mountains to the east and southeast; the Franklin Mountains to the south-southeast; the Doña Ana Mountains to the northeast; and Point of Rocks and the town of Radium Springs to the north.

A number of major cultural modifications are visible from the KOP in the lands between the KOP and the SEZ. These modifications include the Las Cruces International Airport and I-10. The airport is located approximately 9–11 mi (14–18 km) south of the KOP, while I-10 runs east-west across a field of view that includes the SEZ at a distance of approximately 11 mi (14 km). To the east of the SEZ and West Mesa, urban development within the Mesilla Valley would also be visible from the KOP.

Figure 3.3-26 shows the Robledo Peak KOP within the Afton SEZ viewshed. The colored portions indicate areas in the vicinity of the Robledo Peak KOP from which solar development in the Afton SEZ could potentially be visible. The figure shows that visibility is spotty near Robledo Peak, with views of the SEZ from just north of the KOP completely screened and with SEZ visibility limited primarily to the highest ridges west-southwest to east-southeast of the KOP.

Figure 3.3-27 depicts the area (29,964 acres [121.26 km^2]) within the Afton SEZ where solar facilities would be expected to be visible from the Robledo Peak KOP, assuming the absence of vegetation, structures, or lighting and atmospheric conditions that cause reduced visibility. The figure shows that from the Robledo Peak KOP, solar facilities of any height throughout the SEZ would potentially be visible.

Figure 3.3-28 shows hypothetical solar energy facilities within the Afton SEZ under the 80% development scenario used in this analysis, overlaid with the Robledo Peak KOP viewshed. The arrangement of facilities is hypothetical, as is the 80% development scenario. In reality, the

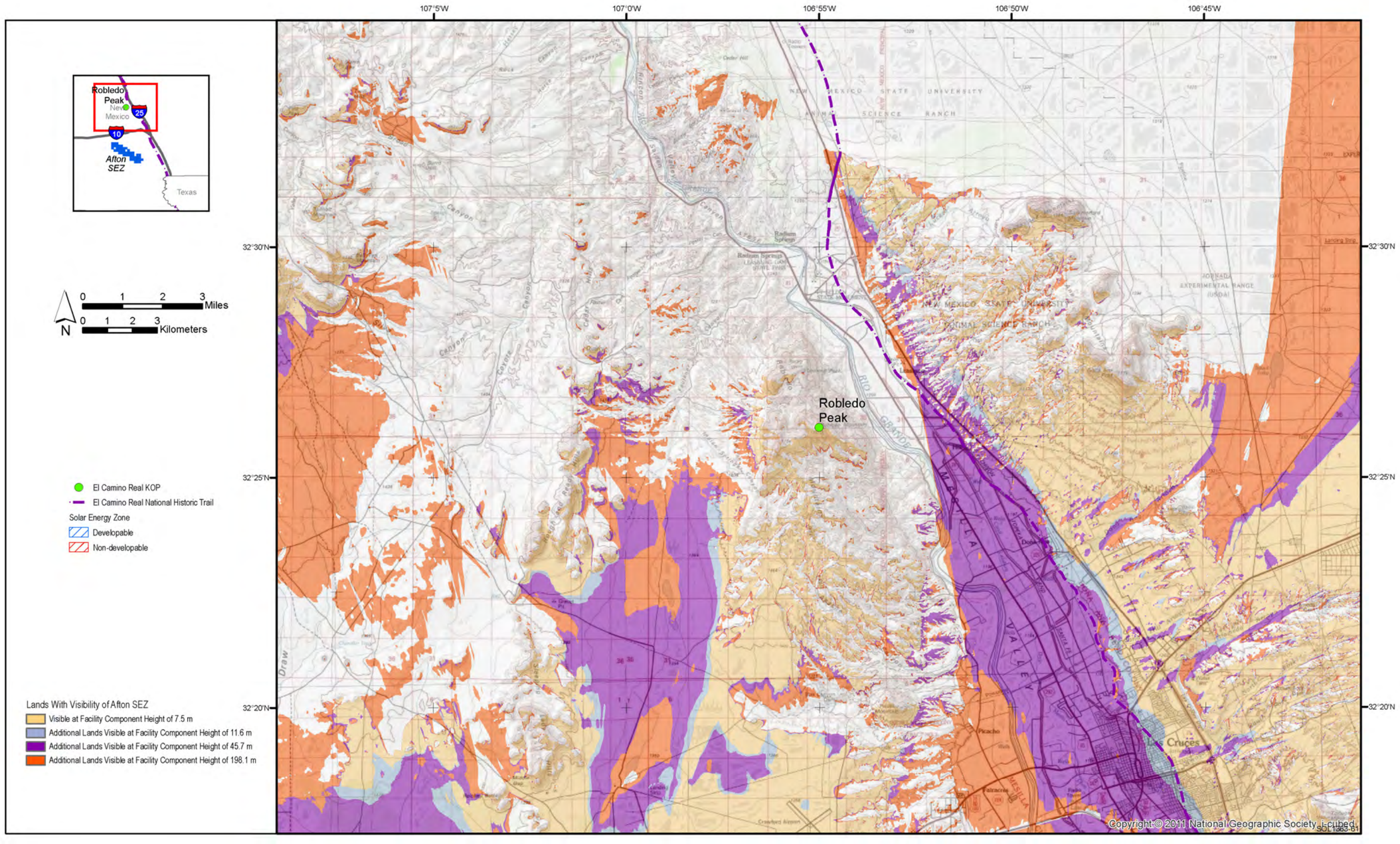

FIGURE 3.3-26 Robledo Peak KOP within the Afton SEZ Viewshed

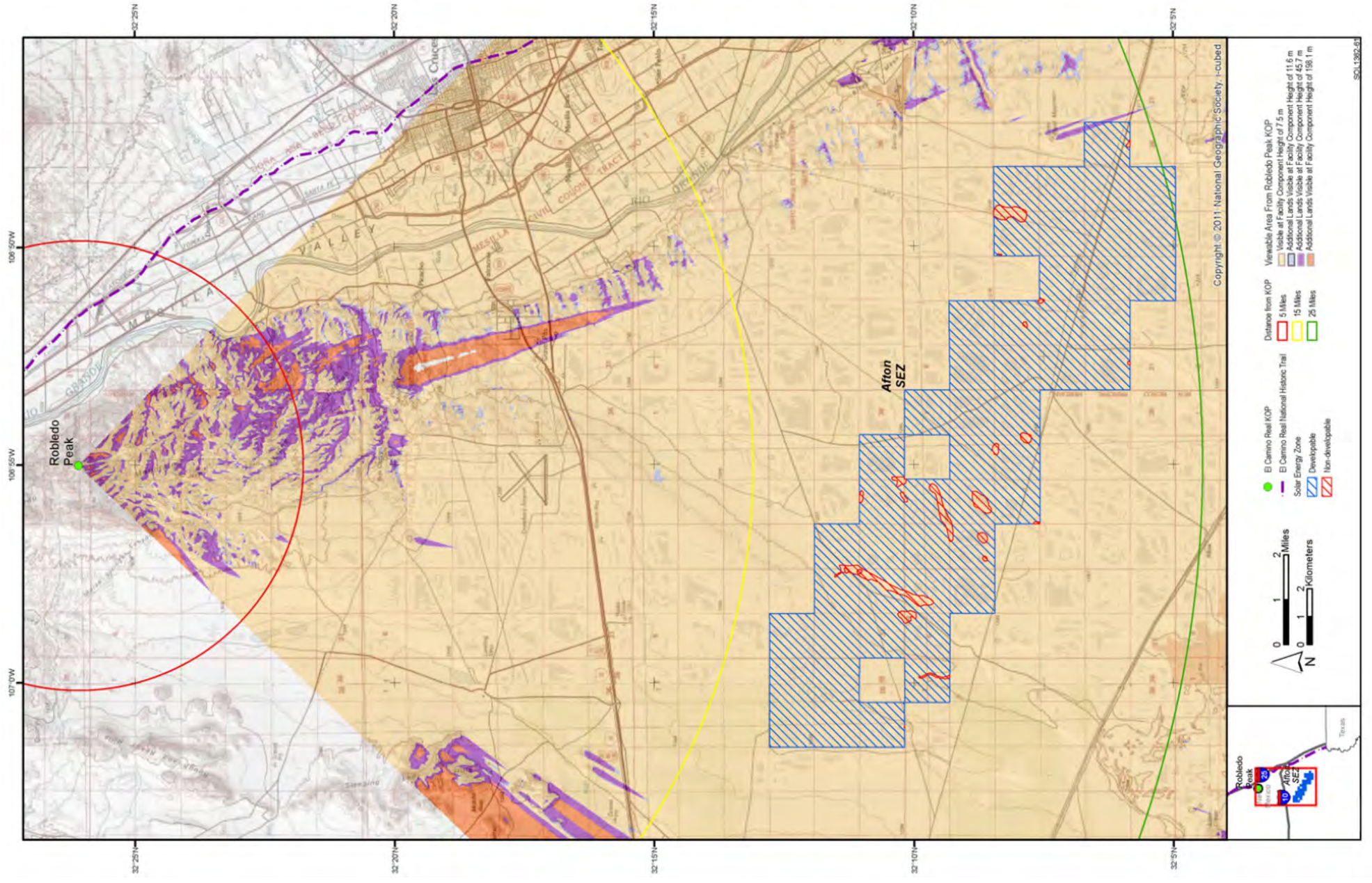

FIGURE 3.3-27 Portion of the Robledo Peak KOP Viewshed, Including the Afton SEZ

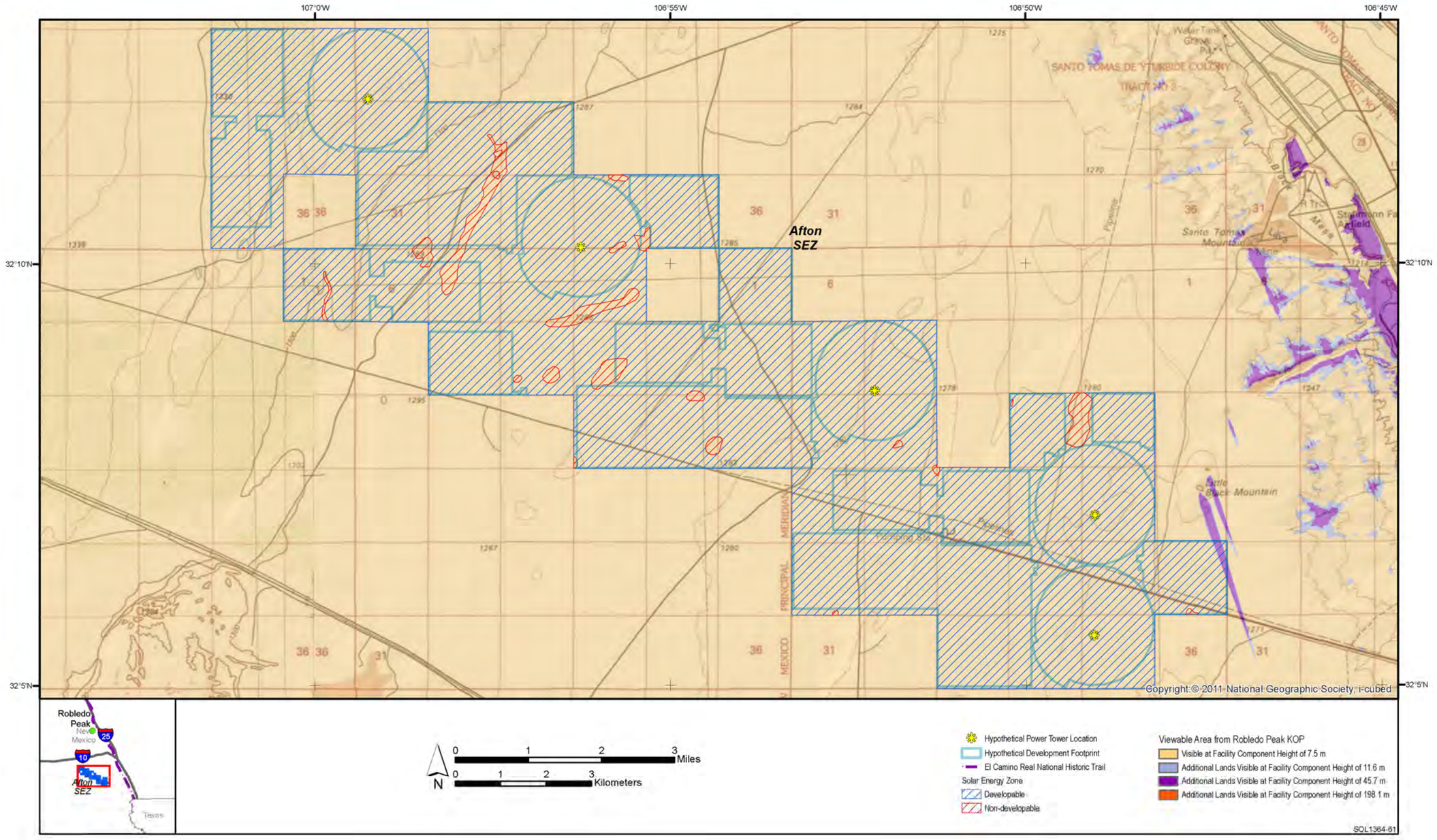

FIGURE 3.3-28 Close-up View of the Afton SEZ with Facility Footprints within the Robledo Peak KOP Viewshed

types of facilities, their sizes and layouts, and their density within the SEZ would differ from what is depicted here.

Figure 3.3-29 is a Google Earth visualization of the Afton SEZ as seen from the Robledo KOP, looking west-northwest. The entire SEZ is visible from the Robledo Peak KOP, and the SEZ occupies approximately 42° of the viewer's field of view.

The visualization confirms that looking south from the Robledo Peak KOP, the entire SEZ is visible. The visualization shows that although the tops of solar collectors arrays within the SEZ would be seen, given the long distance between the KOP and the SEZ, the viewing angle would be low and collector/reflector arrays would appear nearly edge-on, making the strong regular geometry of the solar arrays less apparent and reducing the apparent size of the facilities. The facilities in the SEZ would likely appear as a thin, somewhat indistinct horizontal band, repeating the line of the flat valley floor. Taller components with vertical geometries and irregular forms, such as cooling towers, thermal storage tanks, and plumes, would project above the solar collector arrays, but might be indistinct under many viewing conditions because of the long distance between the KOP and the SEZ. Under the 80% development scenario, development within the SEZ could potentially occupy up to 42° of the viewer's field of view.

Because the Robledo Peak KOP is directly north of the SEZ, the distance between the KOP and the SEZ exceeds 15 mi (24 km), and the angle of view is low, glinting and glare from the solar facilities within the SEZ is unlikely. There could potentially be bright reflections from the sun when it was directly south of the facility, but the angle of view is probably too low for this to be significant if it occurred at all, and in any event, the reflections would be diminished because of the long distance to the SEZ from the KOP. More definite knowledge of possible glint/glare occurrence would be obtained through a glint/glare analysis that would be conducted during a project-specific environmental impact assessment. The collector arrays from PV facilities would be oriented to the south, and thus views from the KOP would be of the shaded north side of the array and the ground beneath it, reducing visual contrast.

Central receiving towers would be visible within the SEZ, and on sunny days their tops would appear as bright points of light against the southern sky or against the backdrop of the desert floor. Field observations of 5- to 20-MW power towers suggest that reflected light from the central receiving towers at 100+-MW facilities would produce weak or moderate contrasts at viewing distances of 16–20 mi (26–32 km) (Sullivan et al. 2012), with contrasts diminishing at longer distances. At these distances, it is uncertain but unlikely that reflected light from dust particles in the air around the receivers would be observed, but if it were, it could appear as faint light streaming downward and/or upward from the receivers.

If over 200 feet (61 m) tall, central receiving towers would be equipped with red or white navigation lights that would likely be visible from the Robledo Peak KOP, though it would be unusual for people to be at Robledo KOP at night. At a distance of 16–25 mi (26–40 km), hazard navigation lights would not be bright, but they might be noticed by casual observers. Additional lighting from other solar facilities could potentially be visible as well, with the amount of contrast dependent on the degree of lighting mitigation; however, there would be lighting associated with both the Las Cruces Airport and I-10 in the direct line of sight to the SEZ, and

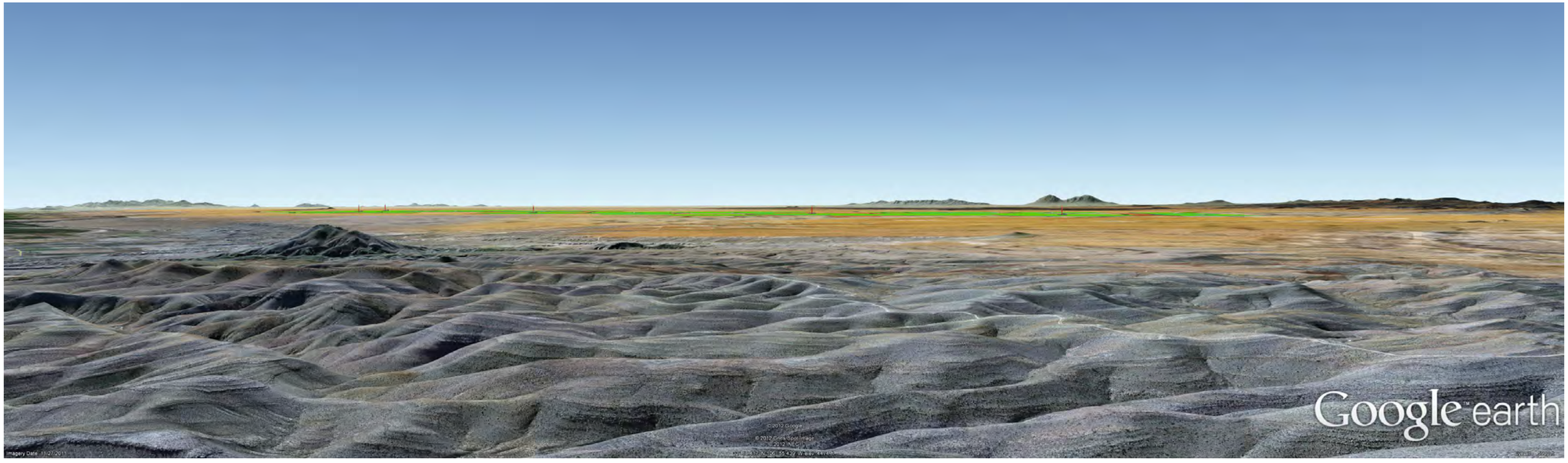

FIGURE 3.3-29 Google Earth Visualization of the Afton SEZ (Shown in Orange) with Solar Facility Models (Shown in Green), as Seen from the Robledo Peak KOP

there would be numerous lights and sky glow associated with the urban development in the Mesilla Valley. Any additional night-sky impacts from solar development within the SEZ would likely be insignificant.

Under the 80% development scenario presented here, if solar development in the SEZ were limited to PV or parabolic trough facilities, some casual observers might miss the development because of the relatively low angle of view. Solar energy development within the Afton SEZ would be expected to yield weak visual contrasts with the surrounding environment when viewed from the Robledo Peak KOP. Visitors to this KOP would be unlikely to miss the visual contrast of power towers within the SEZ. At a distance of 16–25 mi (25–40 km), however, observers are unlikely to distinguish individual components within the SEZ, with the exception of central receiving towers.

Visitors traveling the El Camino NHT are usually seeking to re-create, to the extent possible, the location, feeling, and associations related to historic activities that took place along the trail. Although Robledo Peak is not considered a high-potential historic site, it does overlook Robledo Paraje to the north and offers scenic views of the rugged and barren landscape once traversed by many individuals throughout history as they traveled on El Camino Real. Although much of the Mesilla Valley is densely populated, and views to the south include the airport, I-10 and some additional man-made elements, solar development in the SEZ would add additional visual intrusions to the landscape that could detract from viewers' experience at the KOP.

If solar development in the SEZ were limited to PV or parabolic trough facilities, viewers at the KOP would see man-made development in the SEZ stretching across a significant portion of the horizontal field of view, but contrasts would likely be low, given the distance and the low angle of view from this KOP. Because of the low expected contrast and the existing level of visual intrusions, expected impacts for sensitive viewers at the KOP would likely be low. However, if power towers were present within any part of the SEZ, their bright, steady lights atop discernible tower structures would be unmistakable man-made visual intrusions. Their lights would seem out of place in the daytime landscape and would likely attract the viewer's attention. Towers with hazard navigation lighting at night might be a source of negative impact for some observers, especially if there were only a few visible lights on the southern horizon; however, the effect would likely be small. With multiple power tower facilities in the SEZ, expected visual impacts would be expected to be moderate for sensitive viewers. A more precise determination of impacts would be made in the course of project-specific environmental assessments, when the location, type, and size of proposed facilities would be known.

3.3.2 Summary of Visual Impacts to El Camino NHT KOPs

El Camino NHT staff provided Argonne with 95 KOPs spanning the length of the trail. Solar facilities within the Afton SEZ could potentially be visible from seven of these KOPs within 25 mi (40 km) of the SEZ.

Six of the seven KOPs are located in the Mesilla Valley at a substantially lower elevation than the SEZ, which is located west of the valley on West Mesa. For these KOPs, views of the ground surface of the SEZ are completely screened by the rim of West Mesa. If solar development in the SEZ were limited to low-height technologies, such as PV or parabolic trough, solar dish, or compact linear Fresnel lens reflector technology, the facilities would not be visible from these KOPs, although the tops of transmission towers more than 150 ft (45.7 m) in height that were located in the far southeastern portion of the SEZ might be visible from some of the KOPs. As a result, if solar development in the SEZ were limited to low-height technologies, visual contrasts and associated impacts for the six KOPs in the Mesilla Valley would be negligible or weak, with contrasts limited to a possible increase in sky glow if there were sufficient numbers of CSP facilities in the SEZ. Even these very slight contrasts could be substantially reduced through proper mitigation, and there are so many other light sources in the Mesilla Valley already that it is doubtful that any increase from solar development in the SEZ would be noticeable in any event.

If solar development in the SEZ included power tower facilities, central receiver towers within any part of the SEZ would be visible from all of these KOPs, and the reflected sunlight from the receivers would create visual contrasts and impacts for viewers at these KOPs. In addition, hazard navigation lighting would create visual contrasts at night. The magnitude of potential visual contrasts would be highly dependent on the number, size, and location of central receiver towers within the SEZ, with contrasts strongest for multiple large towers located in the eastern or northeastern portions of the SEZ and weakest for fewer, smaller towers in the western or southwestern portions of the SEZ. Depending on where power towers were located within the SEZ, observed contrasts could range from weak to strong for the following KOPs:

- Punta del Estero Largo/ Paraje de Los Cacaxitos;
- Bracito;
- Fort Fillmore; and
- La Ranchería.

Depending on where power towers were located within the SEZ, observed contrasts could range from weak to moderate for the following KOPs:

- Mesilla
- Doña Ana

It should be noted that the KOPs in the Mesilla Valley are subject to screening from vegetation and/or structures, and views toward the SEZ could be partially or even completely screened from the KOPs, substantially reducing or even eliminating contrasts and impacts.

The seventh KOP, Robledo Peak, is a mountain peak 15.5 mi (25.0 km) north of the SEZ with an unobstructed view of the ground surface of the entire SEZ. Solar facilities of any height would be visible from this KOP, and the SEZ would spread across much of the horizontal field of view for observers looking south from the KOP; however, because the distance is great and the vertical angle of view is low, contrasts would likely be limited to moderate levels if multiple power tower facilities were located in the SEZ, and would likely be weak if solar development in the SEZ were limited to PV technologies.

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4 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

The analysis reported here is an extension of the Solar PEIS visual impact analysis that assessed potential visual contrasts associated with solar energy facilities within SEZs that might be observed from specific KOPs within 25 mi (40 km) of the SEZs, and located in Death Valley NP, in Joshua Tree NP, or on the El Camino NHT. The analysis showed that certain KOPs in each of these NPS units could potentially be subject to major visual contrast and impacts from solar development within the SEZs, but many of the KOPs would likely be subject to moderate, minor, or negligible contrasts and impacts, generally because they are relatively distant from the relevant SEZ, have views of the SEZ partially blocked by intervening terrain, and/or have very low vertical angles of view toward the SEZ. All of these conditions would tend to reduce the visible extent of solar facilities in the SEZ, which would reduce the associated contrasts and impacts. The results of the analysis are summarized in Table 4.1-1.

For all three NPS units, power tower facilities were found to be major contributors to potential visual contrasts, primarily because of the long-distance visibility of intensely bright reflection of light from the receivers on the central towers, but also because of the height and strong vertical line of the tower structures and the potential for night-sky impacts from FAA-mandated hazard navigation lighting. Power towers could be especially large contributors to contrasts for the El Camino NHT, because almost all other structures associated with solar development would be screened from view from all but one of the El Camino NHT KOPs.

4.2 RECOMMENDATIONS

The Solar PEIS contains a number of visual impact mitigation measures that could be used to avoid or reduce potential visual impacts from solar energy development in the SEZs. While all of these mitigation measures would have positive effects on impact reduction, certain mitigation measures stand out as being particularly effective, and are discussed below.

As noted in the PEIS, careful siting of facilities has the greatest potential to reduce associated impacts, and siting solar facilities farther from the most potentially affected KOPs or siting facilities so that they are screened from view of KOPs by topography is likely the single most effective means to limit visual impacts to the NPS KOPs from solar development in the SEZs.

Restrictions on the use of power tower technology in all or portions of the SEZs would also greatly reduce overall contrasts from solar development in the SEZs. This strategy would be particularly effective for the El Camino NHT; if power tower facilities were not allowed in the eastern portions of the SEZ, expected impact levels would drop from “major” to “negligible” for many of the KOPs because lower-height solar technology components would be almost completely screened from view from the KOPs. This would be true for both day- and nighttime visual contrasts. If only PV facilities were allowed in all or selected parts of the SEZs, the

TABLE 4.1-1 Summary of Contrasts by KOP

Park Unit	KOP	Page No.	SEZ Name	Distance from KOP to SEZ (at its closest point)	Degree of Contrast Depending on Development
Death Valley National Park	Pyramid Peak	17	Amargosa Valley	20 mi (32 km)	Weak
	Chloride Cliff #1	23	Amargosa Valley	9 mi (14 km)	Weak, if development is limited to PV facilities throughout the SEZ and good mitigation measures are followed. Moderate to strong, if parabolic trough or power tower facilities are constructed within the SEZ.
	Chloride Cliff #2	30	Amargosa Valley	2 mi (18 km)	Weak, if development is limited to PV facilities within the SEZ. Moderate, if multiple power tower facilities are constructed within the SEZ.
	Daylight Pass Road	37	Amargosa Valley	11 mi (18 km)	Weak, if development is limited to PV facilities throughout the SEZ and good mitigation measures are followed. Moderate to strong, if multiple power towers are constructed in the northern portion of the SEZ.
	Titus Canyon Road #2	44	Amargosa Valley	27 mi (43 km)	Negligible to very weak.
	Last Chance Mountain	50	Gold Point	18 mi (29 km)	Weak.
	Auguereberry Point	56	Amargosa Valley	31 mi (50 km)	Weak.
	Telescope Peak	57	Amargosa Valley	43 mi (69 km)	Negligible.

TABLE 4.1-1 (Cont.)

Park Unit	KOP	Page No.	SEZ Name	Distance from KOP to SEZ (at its closest point)	Degree of Contrast Depending on Development
Joshua Tree National Park and Wilderness Area	Anshutz Peak	61	Riverside East	6.8 (10.9 km)	Strong.
	Aqua Peak	69	Riverside East	16 mi (26 km)	Moderate, but possibly weak if development is limited to PV and parabolic trough facilities within the visible portions of the SEZ.
	Big Wash and Cultural Sites	75	Riverside East	6 mi (9.7 km)	Strong.
	Coxcomb Alluvial Fans	83	Riverside East	15 mi (24 km)	Weak, if development is limited to PV and parabolic trough facilities within the visible portions of the SEZ. Moderate, if multiple power towers are constructed within the visible portions of the SEZ.
	Coxcomb Peak	89	Riverside East	5 mi (8 km)	Strong.
	Dyadic Peak	95	Riverside East	15 mi (24 km)	Moderate, but possibly weak if development is limited to PV and parabolic trough facilities within the visible portions of the SEZ.
	Eagle Mountain	117	Riverside East	19 mi (31 km)	Weak, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Moderate, if multiple power towers are constructed within the visible portions of the SEZ.
	Eagle Mountain/Basalt	124	Riverside East	9 mi (14 km)	Moderate to strong.

TABLE 4.1-1 (Cont.)

Park Unit	KOP	Page No.	SEZ Name	Distance from KOP to SEZ (at its closest point)	Degree of Contrast Depending on Development
Joshua Tree National Park and Wilderness Area (Cont.)	Eagle Mountain/Big Wash	131	Riverside East	7 mi (11 km)	Strong.
	Historic Feature North	138	Riverside East	13.5 mi (22 km)	Weak.
	Historic Feature South	128	Riverside East	3 mi (5 km)	Strong.
	Rock Cairn	136	Riverside East	3.5 mi (5.6 km)	Strong.
	South Coxcomb Peak	144	Riverside East	4 mi (6 km)	Strong.
	Spectre Peak	152	Riverside East	16 mi (26 km)	Moderate, but possibly weak if development is limited to PV and parabolic trough facilities within the visible portions of the SEZ.
El Camino Real National Historic Trail	Punta de Estero Largo/Paraje de Los Cacaxitos	163	Afton	6.5 mi (10 km)	Weak, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Moderate to strong, if power towers are constructed in the easternmost portion of the SEZ.
	Bractio	169	Afton	6 mi (9.7 km)	Weak, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Moderate to strong, if power towers are constructed in the easternmost portion of the SEZ.

TABLE 4.1-1 (Cont.)

Park Unit	KOP	Page No.	SEZ Name	Distance from KOP to SEZ (at its closest point)	Degree of Contrast Depending on Development
El Camino Real National Historic Trail (Cont.)	Fort Fillmore	176	Afton	4.2 mi (6.8 km)	Negligible to weak, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Weak to moderate, if multiple power towers are constructed in the western portion of the SEZ. Strong, if multiple power towers are constructed in the easternmost portion of the SEZ.
	Mesilla	183	Afton	9 mi (14 km)	Negligible, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Weak, if multiple power towers are constructed in the western portion of the SEZ. Moderate, if multiple power towers are constructed in the easternmost portion of the SEZ.
	Dona Ana	190	Afton	15 mi (24 km)	Negligible, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Weak, if multiple power towers are constructed in the western portion of the SEZ. Moderate, if multiple power towers are constructed in the easternmost portion of the SEZ.

TABLE 4.1-1 (Cont.)

Park Unit	KOP	Page No.	SEZ Name	Distance from KOP to SEZ (at its closest point)	Degree of Contrast Depending on Development
El Camino Real National Historic Trail (Cont.)	La Rancheria	196	Afton	11.5 mi (18.5 km)	Negligible, if development is limited to PV and parabolic trough facilities throughout the visible portions of the SEZ. Weak to moderate, if multiple power towers are constructed in the southwestern portion of the SEZ. Strong, if multiple power towers are constructed in the far eastern and northeastern portions of the SEZ.
	Robledo Peak	203	Afton	16 mi (26 km)	Weak, if development is limited to PV or parabolic trough facilities throughout the visible portions of the SEZ. Moderate, if multiple power tower facilities are present within the visible portions of the SEZ.

vertical profile, visual complexity, and reflectivity of the solar facilities would be significantly reduced, and night-sky impacts would be reduced as well, while if parabolic trough facilities were allowed, lesser but still important reductions in contrast would occur.

The use of dry cooling or hybrid cooling technology would reduce or eliminate the occurrence of plumes that can contribute substantially to visual contrast from solar facilities, and the use of low-reflectance materials painted to match their surroundings (as per BLM visual resource management guidance) wherever possible on facility structures would also substantially reduce potential contrasts. Finally, the use of stringent lighting mitigation is recommended to reduce potential night-sky impacts from solar facilities in the SEZs; this would be particularly important for both Joshua Tree and Death Valley NPs, which have high-quality dark skies that are valued by NP visitors.

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