Appendix 5.1 BIG-1

Methodology for Evaluating Aesthetic Impacts

Barstow International Gateway Methodology for Evaluating Aesthetic Impacts

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LIST OF ABBREVIATED TERMS

BIG	Barstow International Gateway
BNSF	BNSF Railway
CEQA	California Environmental Quality Act
EIR	Environmental Impact Report
FHWA	Federal Highway Administration
LOS	Line of Sight
VS	Visual Stimulation

1.0 INTRODUCTION

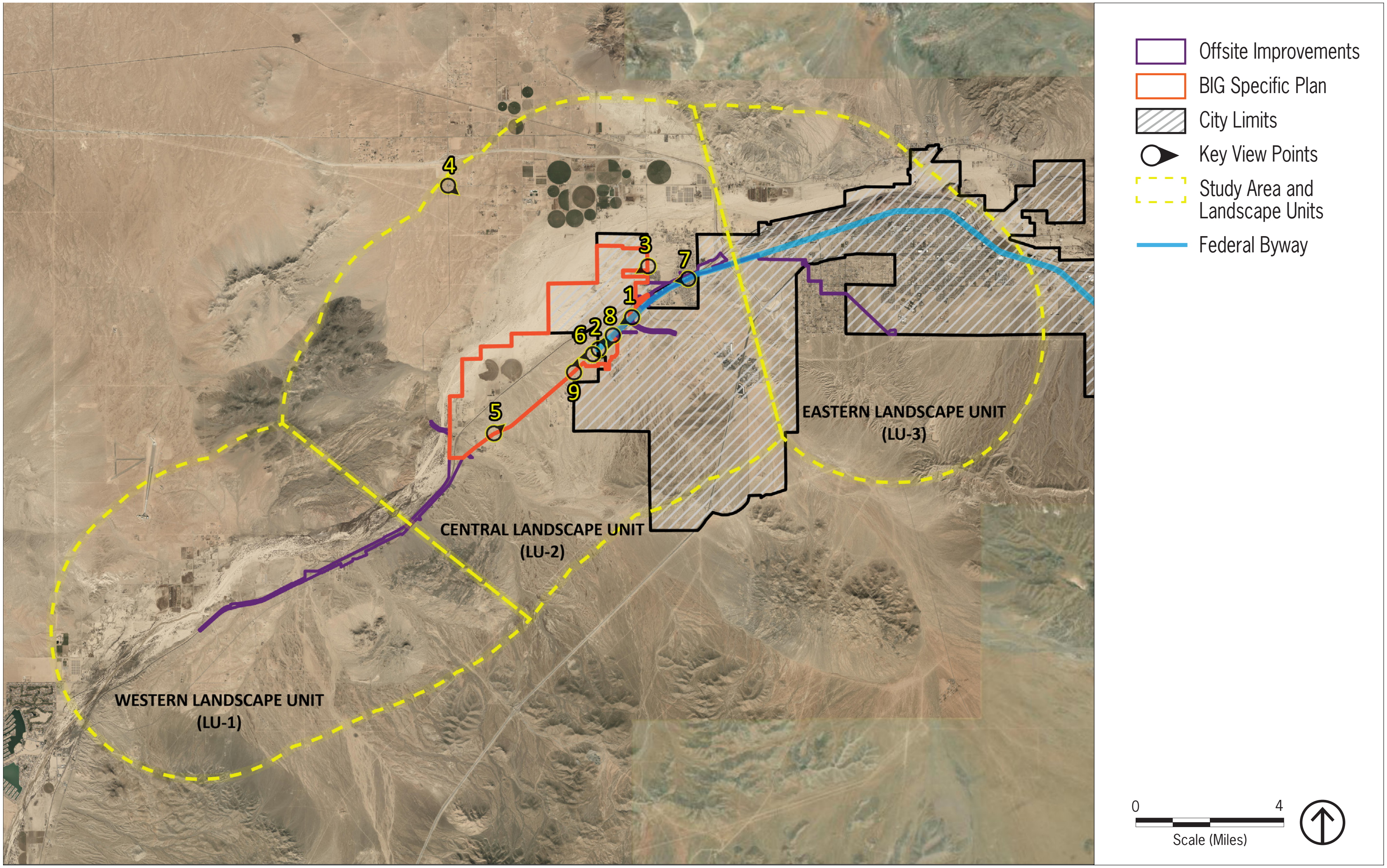
The purpose of this appendix is to provide detailed supplementary information to the Aesthetic Impacts section (Section 5.1) of the Environmental Impact Report (EIR) for the Barstow International Gateway (BIG) development. This appendix is intended to be read in conjunction with the main Aesthetic Impacts section of the EIR and to provide a more thorough and comprehensive understanding of the methodology used to evaluate impacts. While the EIR section provides a broad overview and summary of the findings, this appendix offers detailed data, methodologies, and any additional information that supports and expands on the main chapter’s analysis.

2.0 METHODOLOGY FOR EVALUATING IMPACTS

This section defines the study area (i.e., affected environment) and summarizes the methodology used to analyze potential impacts concerning aesthetics.

2.1 Definition of Study Area

In the BIG Aesthetics study area, BIG would be visible over a wide area due to the scarcity of buildings and tall vegetation that could block views. Due to the area's natural desert terrain, seasonal variations in vegetation would not alter the BIG Aesthetics study area. Beyond the foreground viewing distances of approximately 0.25-mile or even less, BIG's at-grade portions would have a limited visual presence. When considering BIG's visibility, a distance of 8.8 miles (the end of the middle-ground and start of the background BIG Aesthetics study area) would be the maximum viewing distance that BIG footprint changes would be perceptible. A viewing distance of 3.0 miles is considered the farthest boundary that probable BIG footprint impacts are likely to generate public concern since BIG would have limited visual presence at that distance. Therefore, the study areas used to assess BIG's impacts concerning aesthetics is the BIG Specific Plan area, off-site improvement areas, plus a fixed 3.0-mile buffer, accounting for the visibility of BIG's footprint components from adjacent vantage points, and considering the area's landforms (topography), land cover (vegetation and structures), and atmospheric conditions (dust, fog, precipitation) that can limit visibility. Most BIG off-site improvements would be at-grade or below-grade (e.g., Lenwood Channel) or would involve modifications to an existing facility (e.g., Tortilla substation) and would not result in a discernable visible change. Additionally, the BIG Aesthetics study area is comprised of three landscape units defined as Western Landscape Unit (LU-1), Central Landscape Unit (LU-2), and Eastern Landscape Unit (LU-3); see **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG** for additional details**.** A landscape unit is a defined area within the BIG Aesthetics study area that have similar visual features and visual character. LU-1 covers BIG's off-site rail improvements and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway), within the western portion of the BIG Aesthetics study area. LU-2 covers the central portion of the BIG Aesthetics study area, which includes the BIG Specific Plan area, the Lenwood Channel improvements and BIG off-site rail improvements and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway). LU-3 covers the eastern portion of the BIG Aesthetics study area which includes the Tortilla Substation improvements. **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG** depicts the BIG Aesthetics study area (i.e., the BIG Specific Plan area/landscape unit plus a fixed 3.0-mile buffer) and the off-site improvements landscape units.



Sources:
County of San Bernardino, Y2023_PUA_Cache [aerial imagery], 2023.; County of San Bernardino, Cities and Towns [Data set], 2022.; County of San Bernardino, City Spheres of Influence [Data set], 2022.; Caltrans, California State Scenic Highways [Data set], 2019.; Kimley-Horn, 2025.; U.S. Department of Transportation Federal Highway Administration, National Scenic Byways & All-American Roads, Route 66, 2025.

Figure 1
Aesthetics Study Area and Key Viewpoint Location Map - BIG

2.2 Terminology and Concepts

Terminology and concepts utilized to discuss the aesthetic effects are based on the FHWA's 2015 Guidelines for the Visual Impact Assessment of Highway Projects (FHWA Guidelines; U.S. Department of Transportation Federal Highway Administration – Guidelines for the Visual Impact Assessment of Highway Projects Evaluation and Site Assessment [2015]).

Different people, when viewing the same landscape unit, may have various responses to that landscape and any proposed visual changes, based upon their values, familiarity, concern, or expectations for that landscape and its scenic quality. Because each person's attachment to and value for a landscape is unique, visual changes to that landscape inherently affect viewers differently. However, generalizations can be made about viewer sensitivity to scenic quality and visual changes. Recreational users (e.g., hikers, equestrians, tourists, and people driving for pleasure) are expected to have high concern for scenery and landscape character. People commuting daily through the same landscape generally have a moderate concern for scenery, and people working at industrial sites generally have a lower concern for scenic quality or changes to existing landscape character. A landscape's visual sensitivity is affected by the viewing distances from which it is seen, such as close-up or far away. A landscape's visual sensitivity is also affected by the travel speed of a person who is viewing the landscape (e.g., high speeds on a highway, low speeds on a hiking trail, or stationary at a residence). When collecting an inventory of visual resources, those that extend beyond the foreground and middle ground from a respective site should be considered, such as mountain ridgelines, large iconic structures, or water features, as these resources may be visible from a great distance.

The same project feature can be perceived differently depending on the distance between the observer and the viewed object. When a viewer is closer to a viewed object in the landscape, greater detail is visible, and there is greater potential influence of the object on visual quality because of its form or scale (the object's relative size in relation to the viewer). When the same object is viewed at background distances, details may be imperceptible but overall forms of terrain and vegetation are evident, and the horizon and skyline are dominant. In the middle ground, some detail is evident (e.g., the foreground), and landscape elements are seen in context with landforms and vegetation patterns (e.g., the background).

The methodology summarized below, employing the terms and concepts presented below, was used in this analysis for assessing visual resources and BIG's impacts on those resources.

Visual Resource. A visual resource is a site, object, or landscape feature that contributes to the visual character of the surrounding area or is important because of its visual characteristics or scenic qualities. Visual character is an impartial description of the defining features, landscape pattern, and distinctive qualities of the landscape. According to the FHWA Guidelines, visual resources, and the environments they dominate can be divided into three categories (i.e., natural, cultural, and project). Although these divisions are artificial, dividing the existing environment into natural, cultural, and project environments to determine their visual character ensures a thorough inventory of BIG Aesthetics study area's visual character.

- **Natural Visual Resources** include land, water, vegetation, animals, and atmospheric conditions that compose the natural environment.

- **Cultural Visual Resources** include buildings, infrastructure, structures, and artifacts and art that compose the cultural environment.
- **Project Visual Resources** include geometrics, grading, constructed elements, vegetation cover, and visual elements resulting from the project.

Scenic Vista. An area that is designated, signposted, and accessible to the public for the express purposes of viewing and sightseeing. This includes any such areas designated by a federal, state, or local agencies. Scenic vistas usually provide expansive, elevated views.

Scenic Highway. Any stretch of public roadway that is designated as a scenic corridor by a federal, state, or local agency.

Landscape Units. Defined areas within the study area that have similar visual features and homogeneous visual character and, frequently, a single viewshed. An "outdoor room." Typically, the spatial unit used for assessing visual impacts.

Viewshed. A project's viewshed is defined as the surrounding geographic area from which the project is likely to be seen, based on topography, atmospheric conditions, land use patterns, and roadway orientations. "Viewshed" is used to describe the area surrounding a project site where a person located on adjacent roadways and sidewalks or driving a vehicle can view the project site.

Visual Quality. Visual quality is what viewers like and dislike about visual resources that compose the visual character of a particular scene. Different viewers may evaluate specific visual resources differently based on their interests in natural harmony, cultural order, and project coherence. Visual quality is rated as low, moderate-low, moderate, moderate-high, or high. To determine overall visual quality, the natural harmony, cultural order, and project coherence are also rated, and the ratings of these three factors determine the overall visual quality. Therefore, the FHWA Guidelines recognize three types of visual perception corresponding to each of the three types of visual resources:

- **Natural Harmony.** Viewing the natural environment's visual resources can create a sense of natural harmony. People interpret the natural environment's visual resources as harmonious or inharmonious. The perception of natural harmony can be determined by viewing the character of the natural environment's visual resources through the lens of viewer preferences. Viewers have a concept of what constitutes natural harmony. The greater the degree to which the BIG Aesthetics study area's natural visual resources meet the viewer's preferred concept of natural harmony, the higher value the viewer places on those visual resources.
- **Cultural Order.** Viewing the cultural environment's visual resources can create a sense of cultural order. People interpret the cultural environment's visual resources as being orderly or disorderly. Similar to the evaluation of natural harmony, the perception of cultural order can be determined by viewing the character of the cultural environment's visual resources through the lens of viewer preferences. Viewers have a concept of what constitutes cultural order. The greater the degree that BIG Aesthetics study area's visual resources meet the viewer's preferred concept of cultural order, the higher value the viewer places on those visual resources.
- **Project Coherence.** Viewing the project environment's visual resources can create a sense of project coherence. People interpret the project environment's visual resources as being either

coherent or incoherent. Similar to the evaluation of natural harmony and cultural order, the perception of project coherence can be determined by viewing the character of the project environment's visual resources through the lens of the viewer preferences. Viewers have a concept of what constitutes project cohesion. The greater the degree that the project environment's visual resources meet the viewer's preferred concept of project coherence, the higher value the viewer places on those visual resources.

Visual Character. Visual character is the description of the visible attributes of a scene or object, typically using artistic terms such as form, line, color, and texture. Visual character is influenced by many different landscape attributes including color contrasts, landform prominence, repetition of geometric forms, and uniqueness of textures among other characteristics.

Viewers. The population affected by the project is referred to as viewers. FHWA Guidelines divide viewer groups into two distinct entities: neighbors (static viewers – from properties with views of the project, of the project) and travelers (dynamic viewers – from the road, of the project).

Viewer Sensitivity. Viewer sensitivity is the anticipated reaction from viewers based on their perception of change in visual resources. Viewer sensitivity is determined by establishing viewer preference, as well as viewer exposure and awareness to a project. The following definitions apply to viewer exposure:

- **Proximity.** Proximity is the distance from the viewing object. The farther away a scene or object is from a viewer (*background views*), the less exposure that viewer has. Conversely, the closer the viewer is to an object or scene (*foreground views*), the more exposure the viewer has.
- **Extent.** Extent refers to the number of people that will be viewing the scene or object. The greater this number, the higher the overall viewer exposure.
- **Duration.** Duration measures how long the scene or object is visible to viewers. With respect to a moving observation point (e.g., a vehicle on a scenic highway), the narrower the view and the faster one travels, the shorter the duration.

Viewer Awareness. The following definitions apply to viewer awareness:

- **Attention.** Attention correlates with routine. The more routine the scene is to a viewer, the less sensitive the viewer becomes. By contrast, the more unique a scene is to a viewer, the more sensitive the viewer will be to the scene.
- **Focus.** Focus refers to the ability to comprehend details. If a view has no specific visual element or point on which the viewer is focused, the viewer will be less sensitive to that scene's details.
- **Protection.** Protection is provided by restrictions that authorities and the community place on changes to a particular view or object being viewed. This protection can be legal or social.

Light Exposure. Light exposure is evaluated based on light trespass and glare. These two technical terms are defined by the Illuminating Engineering Society of North America (IESNA) as follows:

- **Light Trespass.** Light trespass is the light that falls on a property but originates on an adjacent property.
- **Glare.** Glare occurs when either the luminance is too high or the range of brightness in a visual field is too large. A bright light source, such as a flood light or streetlight, viewed against a dark

sky may be uncomfortable to look at, and may create a temporary sensation of blindness, which is referred to as disability glare.

Contrast. Contrast is the term which describes the extent of glare at an observer position for a view. Contrast is determined by the variation of luminance within the field of view.

2.3 Methodology for Impact Analysis

Scenic Vistas, Scenic Resources Within a State Designated Scenic Highway, and Light and Glare

This analysis considers the existing regulatory framework (i.e., laws, ordinances, regulations, and standards) that avoid or reduce the potentially significant environmental impact. Where significant impacts remain despite compliance with the regulatory framework, feasible mitigation measures are recommended, to avoid or reduce the Project's potentially significant environmental impacts.

This analysis of aesthetic impacts examines the temporary (i.e., construction) and permanent (i.e., operational) effects based on significance criteria/thresholds application outlined above. For each criterion, the analyses are generally divided into two main categories: (1) construction impacts and (2) operations impacts. Each criterion is discussed in the context of the study area and the surrounding characteristics and geography. The impact conclusions consider the potential for changes in environmental conditions, as well as compliance with the regulatory framework enacted to protect the environment.

The baseline conditions and impact analyses are from review of BIG plans, maps, and drawings; analysis of aerial and ground-level photographs; and review of various data available in public records, including regional and local planning documents. Detailed information is presented on visual quality or character changes as a result of BIG and its potential result in a substantial adverse effect on a scenic vista; substantially damage scenic resources (e.g., trees, rock outcroppings, and historic buildings within a State Scenic Highway); and or potential to create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. The determination that a project component would or would not result in "substantial" adverse aesthetic impacts considers the site's existing aesthetic resources and the severity of BIG's visual impact (e.g., the nature and duration of the impact) during construction and operation.

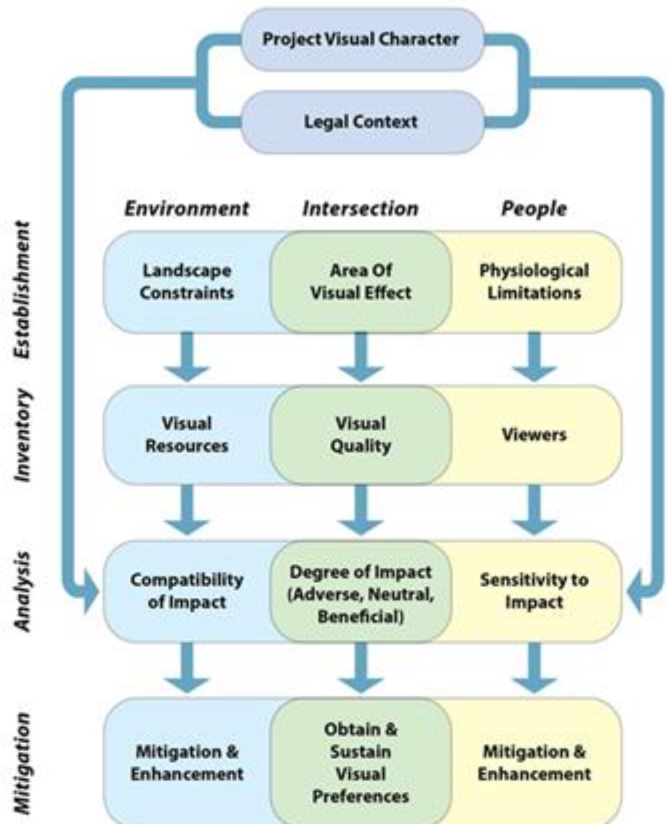
Visual Character of Public Views

The assessment of BIG's visual character and aesthetic effects are based on the FHWA Guidelines. As noted above, visual character is the description of the visible attributes of a scene or object. The FHWA Guidelines include four phases: Establishment, Inventory, Analysis, and Mitigation. **Figure 2: FHWA Visual Impact Assessment Process Flow Diagram – BIG** shows the visual effects assessment process and the intersection of the physical environment with people's perceptions of that environment, as presented in the FHWA Guidelines. This methodology qualitatively measures aesthetic effects by considering changes to visual resources, the capacity of the visual environment to absorb BIG (i.e., compatibility), the viewer sensitivity (i.e., viewer exposure and viewer awareness) to such change, and the change in overall visual character.

Visual Quality of Public Views

BIG's visual quality aesthetic effects are based on the FHWA Guidelines. As noted above, visual quality is what viewers like and dislike about visual resources that compose the visual character of a particular scene, such as BIG. Different viewers may evaluate specific visual resources differently based on their interests in natural harmony, cultural order, and project coherence. This section describes how existing and future viewer sensitivity and visual quality are qualitatively measured. Visual quality is rated as low, moderate-low, moderate, moderate-high, or high. To determine overall visual quality, the natural harmony, cultural order, and project coherence are also rated, and the ratings of these three factors determine the overall visual quality.

Figure 2: FHWA Visual Impact Assessment Process Flow Diagram – BIG



Source: FHWA, 2015.

The first step in the overall visual character impact assessment is to establish the BIG Aesthetics study area and its landscape unit(s) based on BIG characteristics and the physical environment limits on visibility (e.g., topography and land cover (vegetation and structures)). The BIG Aesthetics study area is defined in **Section 2.1**. The entire BIG Aesthetics study area is comprised of three landscape units (i.e., LU-1, LU-2, and LU-3) containing BIG's footprint plus the 3.0-mile buffer, which includes various off-site improvement landscape units. Nine key views were established within the BIG Aesthetics study area based on existing views and their visual resources, as seen by viewer groups. The nine key views were developed as visual simulations (VS) to provide representative examples of the existing LU-2 within the BIG Aesthetics study area. The BIG Aesthetics study area, visual resources, and seven VS locations are shown on **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG.**

The second step is to inventory the visual resources (including proposed General Plan-identified), viewer groups, and the viewers' perceptions and preferences of the BIG Aesthetics study area's visual character. The inventory of existing visual resources, viewer groups, viewer preferences, and existing visual character is provided in **Section 3**.

The third step is to analyze and objectively evaluate impacts on visual quality (natural harmony, cultural order, and project coherence) based on BIG's compatibility with its setting and the sensitivity of viewers. Visual simulations of the conditions that would exist upon BIG implementation are used to illustrate any changes BIG would have on these views. The impact analysis is provided in **Section 5.1: Aesthetics** of the EIR.

Inherent within the measure of the change in visual resources is the capacity of the visual environment to absorb BIG (i.e., compatibility). Visual landscapes have a capacity to seamlessly absorb a project that blends harmoniously with the existing scenic character of a landscape. For instance, the addition of a newly proposed skyscraper in a highly urbanized, dense city center is unlikely to significantly impact the existing visual character and quality of the environment that it is proposed because the existing visual conditions have the capacity to absorb this change without substantially affecting the character and quality of the visual environment. Conversely, if the same structure were proposed in a highly rural environment, this type of construction would not fit with the existing character and visual quality of the surrounding conditions. Thus, the existing condition, context, and visual character of the environment affect the degree of effects.

As defined above, visual character typically consists of landforms, vegetation, water features, and cultural modifications that impart an overall visual impression of an area's landscape. Viewer sensitivity is the anticipated reaction from viewers based on their perception of change in visual resources. Viewer sensitivity is determined by establishing viewer preference, as well as viewer exposure and awareness to the Project, through Proximity, Extent, Duration, Attention, Focus, and Protection.

The last step is to describe mitigation measures to avoid or reduce aesthetic effects, as appropriate. Any significant unavoidable aesthetic impacts remaining after mitigation is incorporated are discussed in **Section 5.1: Aesthetics** of the EIR**.**

2.4 Assessment Methodology

Viewers

The evaluation of viewer sensitivity to visual change was based primarily on viewer type and associated scenic expectations and was augmented with local priorities and values, particularly as expressed in adopted public policy (e.g., General Plans). For BIG, viewer sensitivity, exposure, and awareness were evaluated in terms of low, moderate-low, moderate, moderate-high, or high. Low viewer sensitivity was determined to exist when there were few viewers who experience a defined view or when potential views of BIG would be screened or filtered by intervening terrain, structures, or landscaping (low viewer exposure). Low viewer sensitivity was determined to also occur where viewers would not be particularly concerned about the quality of views because of their activity type (low viewer awareness), such as a commuter on the freeway. Moderate viewer sensitivity was determined to occur where views of BIG would be distant enough such that BIG would not dominate the view (moderate viewer exposure), or where viewer activity would not focus on visual quality and expectations would be moderate, such as office workers or shoppers (moderate viewer awareness). High viewer sensitivity was determined to occur where BIG would be highly prominent, open to public views, and seen by relatively high numbers of viewers (high viewer exposure) and where viewer concern and expectations of visual quality would also be high, as in a rural park where scenery is a primary focus, or in a residential neighborhood (high viewer awareness).

Types of viewers within the BIG Aesthetics study area are travelers (commuting, touring, shipping) and neighbors (residential, commercial, agricultural). Travelers have a generally low viewer sensitivity. Most travelers are visually engaged in operating their vehicles at high speeds along highways, concentrating on traffic and road conditions. Passengers in vehicles could be observing the passing scenery or be engaged in activities, like conversing or reading, that limit their sensitivity to the surrounding environment. Although a traveler’s sensitivity is typically low, it is often moderate or high in areas with enhanced scenery. Their exposure to views is primarily determined by the speeds that they are traveling. Exposure to any one view is low when passing at high speeds. Exposure is also limited by the time drivers have to experience views beyond those required for safe operation of their vehicles. Motorists and commuters were generally assumed to have low levels of sensitivity unless a noteworthy scenic vista would be affected, or the affected roadways have scenic designation (e.g., Main Street).

Typically, neighbor viewers were assumed to have higher levels of viewer sensitivity to BIG effects than people working in or passing through the viewshed. This is because neighbor viewers would experience long-term exposure to changes in their natural and cultural environments and therefore are generally concerned with those environments.

Standardized descriptions of viewer groups (encompassing viewer groups that could be affected by BIG) are provided in **Table 1: Summary of Affected Viewer Groups and Associated Viewer Preferences.**

Visual Quality

As stated above, visual quality is a result of the interactive experience between viewers and their environment. The FHWA Guidelines recognize three types of visual perception corresponding to each of the three types of visual resources as natural harmony, cultural order, and project coherence.

In this analysis, the characterization of existing visual quality served as the baseline for evaluating BIG’s potential effects. Natural harmony and cultural order were described as either low, moderate-low, moderate, moderate-high, or high, and project coherence was determined by compatibility to existing environment. High quality views were those with topographic relief, a variety of vegetation, rich colors, impressive scenery, and unique natural or built features. Moderate quality views were those with interesting but minor landforms, some variety in vegetation and color, or moderate scenery. Low quality views were those with no unique features, little variety in vegetation and color, no unique scenery, or common elements.

In accordance with the FHWA Guidelines, viewer sensitivity to the effects on visual resources influenced the degree of BIG's effect on visual quality. The degree of visual effect was determined by evaluating the compatibility of the effect and viewer sensitivity to the effect. Compatibility as defined above was determined as the ability of the environment to absorb BIG, with both BIG and the environment having harmonious or congruent visual character. BIG was analyzed to assess whether it would be compatible (not contrasting) or incompatible (contrasting) with the natural, cultural, and project environments.

Table 1: Summary of Affected Viewer Groups and Associated Viewer Preferences

Viewer Group	Viewer Group Preferences
Residential Neighbors	The residential neighbors viewer group is comprised of the residents within the BIG Aesthetics study area single-family homes and condominiums/apartments. They can be owners or renters and tend to be permanent rather than transitory. Residential neighbors' visual preferences tend toward a desire to maintain the existing landscape as it is—they settled where they are for a reason, including how their neighborhood looks. They are not very interested in change, even change that purports to improve the quality of their lives, unless they participated in defining the changes. Depending on their location, residential neighbors are often interested in cultural order and natural harmony, with less emphasis on project coherence unless it impacts their ability to appreciate the other two aspects of visual quality.
Commercial Neighbors	The commercial neighbors view group occupies the BIG Aesthetics study area commercial uses. They include persons who occupy or use office, retail, and other commercial uses. These persons/employees are often permanent, while visitors and patrons are transitory. The visual preferences of commercial neighbors vary depending on the business. Some commercial neighbors use natural harmony as a method for attracting and keeping tenants/patrons.
Agricultural Neighbors	The agricultural neighbor's viewer group is comprised of nearby farmers of crops or herd animals. They often work in fields and pastures. Some are permanent; many are migratory but may return to the same area again and again over the years. Agricultural neighbors regard cultural order and natural harmony as critical components of the landscape. They are generally less interested in project coherence.
Commuting Travelers	The commuting travelers viewer group are regular travelers of the same route. The frequency of the travel may vary, but there tend to be peaks—such as morning and evening rush hours and holidays. Most commuting occurs as short trips in urban areas between home and work. These commutes tend to be by single drivers. Other types of commuting involving longer distances, travel through rural or even wilderness settings, and involve passengers as well as drivers. Such trips may include commuting to a favorite or frequent destination, such as a campground, cabin, sports arena, or relative's home. Such trips are considered to be commuting because as they are repeated, the trips tend to become routine and not an adventure. Commuters, like all travelers, are particularly interested in project coherence. They are also interested in cultural order and natural harmony to the extent that it contributes to wayfinding.
Touring Travelers	The touring travelers viewing group is comprised of people who are traveling primarily for enjoyment, usually to a pre-determined destination. These types of trips tend to be more adventuresome, cover longer distances, and take more time than commuting trips. Touring travelers frequently are traveling in groups with both a driver and passengers. Touring travelers are equally interested in project coherence, cultural order, and natural harmony.
Shipping Travelers	The shipping travelers viewing group is comprised of persons who make a living using a highway primarily to move goods. The type of vehicle and the distance traveled vary. Nonetheless, shipping traveler views are routine. Frequently, shipping travelers are only drivers. The shipping travelers' primary interest is in project coherence, although they will use

Table 1: Summary of Affected Viewer Groups and Associated Viewer Preferences	
Viewer Group	**Viewer Group Preferences**
	the resources that create cultural order and natural harmony to help as wayfinding instruments.
Source: FHWA. 2015. *Guidelines for the Visual Impact Assessment of Highway Project*; pp. 5-7 – 5-10.	

Landscape Units

The BIG Aesthetics study area is made up of three landscape units (i.e., LU-1, LU-2, and LU-3), which are the geographic units in which project effects will be addressed.

Dividing the landscape into natural, cultural, and project visual resources is an artificial but useful analytical tool. However, this analytical approach does not precisely replicate how people view and interpret the landscape; people typically do not dissect the landscape when viewing it but experience it as an overall composition with an interplay between nature, culture, and a project. Therefore, after describing the natural, cultural, and project environments as independent components, the overall composition for the landscape units is evaluated. Because of the similarity of existing views and viewer sensitivity throughout the BIG Aesthetics study area, landscape units are generally defined by geographic region. Each of BIG's landscape units (i.e., LU-1, LU-2, and LU-3) represents a spatially closed or visually bounded area, having distinct landscape character, interrelated visual elements, or specific viewer groups.

As discussed previously in **Section 2.1**, LU-1 covers BIG off-site rail improvements and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway), within the BIG Aesthetics study area's western portion. LU-2 covers the BIG Aesthetics study area's central portion, which includes the BIG Specific Plan area, the Lenwood Channel improvements, and BIG off-site rail improvements and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway). LU-3 covers the BIG Aesthetics study area's eastern portion, which includes the Tortilla Substation improvements.

Within LU-2, key viewpoints have been identified. These key viewpoints are illustrated as visual simulations to show whether BIG would be compatible or incompatible with the existing viewshed from particular views. Key viewpoints represent specific locations in the landscape unit from which a proposed project would be visible to viewers. Key viewpoints are very useful for depicting the range of visual character and visual quality found in a landscape unit. These locations are typically selected to represent either (1) typical views from common types of viewing areas, such as certain highways or residential areas with exposure to BIG, or (2) specific high-sensitivity areas such as parks, scenic viewpoints, and historic districts that may be affected by BIG. The effects determination for an individual key viewpoint may not be the same as the effects determination for the entire landscape unit in which the key viewpoint is located. This is because when determining effects, the entire landscape unit is considered, not just one specific location, and the condition of the viewed landscape as seen from a sensitive or unique key viewpoint may be different than that of the entire landscape unit.

Visual simulations were prepared to depict the view from each selected key viewpoint as it would appear upon BIG's implementation. Computer modeling and rendering techniques produced the simulated images. Existing topographic and site data provided the basis for developing an initial digital model. Plan and profile drawings of the proposed BIG facilities were provided. These were used to overlay a threedimensional rendering of the proposed BIG facilities onto a digital image of the existing conditions. Comparison of the visual simulation photographs with the simulations with-BIG conditions provided the basis for determining potential effects on views and visual quality.

As previously discussed and shown in **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG**, seven VS locations were established to assess visual effects. The locations and directions of the selected views, their corresponding viewer groups and those viewer groups' visual preferences, and the visual resources considered at each visual simulation are presented (see **Table 2: Visual Simulations Viewer Groups and Visual Resources** in **Section 3.0**).

Light and Glare

The existing conditions surrounding BIG are best described as having low ambient lighting. Light exposure was evaluated for light trespass and glare at light-sensitive receptors surrounding BIG's footprint that could result from BIG's construction and operational activities. Light trespass was evaluated at night, while glare was evaluated for both day and night.

Lighting levels are presented in terms of illuminance (footcandles or metric units lux), as measured at any point and in any direction. Light trespass (the light that falls on a property but originates on an adjacent property) was not measured, as BIG lighting would be contained on the site.

A Glare Analysis was performed for BIG's approximately 140-acre solar farm proposed south of the rail yard, at the southwest corner of the Main Street at Country Club Drive intersection. The analysis, which includes modeling the site in ForgeSolar utilizing the Solar Glare Hazard Analysis Tool, was performed to determine if a new source of glare would be created that would adversely affect daytime glare on any abutting residential land use zoning district, residential parcel, or public right-of-way; see **Appendix 5.1 BIG-1: Solar Farm Glare Study**.

The glare determined by the Solar Glare Hazard Analysis Tool is assigned a color value of "green," "yellow," or "red" based on the intensity of the light that reaches an observer's retina and the size of the glare in the observer's field of view in increasing severity. "Green" glare is glare that is bright and large enough to affect some observers in ideal conditions, "yellow" glare is glare bright and large enough to affect most observers when occurring, and "red" glare is bright and large enough to cause retinal burn in most observers.

The instances of glare identified by ForgeSolar were further reviewed for potential visual obstructions. A Line of Sight (LOS) analysis was performed for ground-level observers that were noted to have the potential to experience glare in areas where only partial visual obstructions exist or are proposed. The LOS from the observers to the arrays was categorized as "Visible," "Marginally Visible," and "Not Visible" due to geography, vegetation, structures, or other existing objects. The results were then combined with the Solar Glare Hazard Analysis Tool output to determine if glare could affect an observer with an unobstructed LOS. If no potential for glare was determined from the Solar Glare Hazard Analysis Tool, then the LOS was not evaluated as there was no potential for adverse effects from glare.

Any visual obstructions between the source of glare and the observer such as geography, vegetation, or structures would serve to reduce the intensity of the light that reaches an observer's retina and the size of the glare in the observer's field of view by blocking the light. Accordingly, the instances of glare identified in this analysis may over-represent actual glare experienced by an observer during solar farm operations. Any added visual screening such as fencing, vegetation buffers, or berms required to meet other permitting requirements would reduce or eliminate the potential for an observer to experience glare when the screening is acting as a visual obstruction to the LOS. The Glare Study (**Appendix 5.1 BIG-1**) also contained several assumptions to address uncertainties in the information provided, including but not limited to: (1) sunny conditions year-round, (2) a completely free horizon that does not affect localized sunset and sunrise times, and (3) complete coverage of modules in the modeled regions with no full or partial visual obstructions from the site equipment itself. As such, the modeling tools likely overestimate the instances of glare reported.

2.5 Determining Significance Criteria under CEQA

California Environmental Quality Act (CEQA) significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as aesthetics. According to State CEQA Guidelines Appendix G, a project would normally result in a significant effect on the environment if it would impact the aesthetics thresholds listed below:

- Have a substantial adverse effect on a scenic vista.
- Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.
- In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings. (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality.
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

Visual changes and the sensitivity of people who view the affected landscape determine the level and degree of impact of a proposed project. For BIG, level of impact was determined by evaluating visual character changes, as represented by the visual simulations at the key viewports, according to the following:

- If visual character would change from one qualitative category to another (for example, from low sensitivity to moderate or high sensitivity) in an area with viewers of high or moderate-high sensitivity, the visual character change would be considered a significant impact.
- If visual character would change from one qualitative category to another in an area with viewers of moderate, moderate-low, or low sensitivity, the visual character change would be considered a less than significant impact.
- If visual character would not change from one category to another, there would be no impact.

The impact analysis is provided in **Section 5.1: Aesthetics** of the EIR.

3.0 ENVIRONMENTAL SETTING

3.1 Study Area and Landscape Units

As discussed above, the first step in the visual impact assessment process is to establish the BIG Aesthetics study area and its landscape unit(s) based on BIG's characteristics and the physical environment limits on visibility (e.g., topography and land cover (vegetation and structures). The BIG Aesthetics study area (defined in **Section 2.1**) comprises a 3.0-mile buffer separated into three landscape units: a western landscape unit (LU-1) covering BIG off-site rail and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway), a central landscape unit (LU-2) covering the BIG Specific Plan area, Lenwood Channel, and BIG off-site rail and non-rail improvements, and an eastern landscape unit (LU-3) covering the Tortilla Substation; see **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG**.

The western landscape unit (LU-1) off-site rail improvements include lead track extensions to the west of approximately seven miles. These improvements would include clearing and grubbing, bridge crossing construction, ballast placement, track laying, and connection to the mainline. Off-site rail improvements would parallel the existing BNSF Railway (BNSF) mainline and primarily be within BNSF right-of-way. These improvements would enable trains to safely enter and exit the mainline at mainline speeds, rather than slower yard speeds and risk fouling the track. Additionally, non-rail improvements for LU-1 would include ancillary and related stormwater drainage, utility (i.e., water, sewer, electric power, natural gas, and telecommunications), and circulation/roadway improvements and modifications.

The central landscape unit (LU-2) covers the BIG Aesthetics study area's central portion, which includes the BIG Specific Plan area, the Lenwood Channel improvements and BIG off-site rail improvements and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway). The approximately 4,354-acre BIG Specific Plan area which is in the County's western portion, at Barstow's western extent. The BIG Specific Plan landscape unit is surrounded by primarily vacant undeveloped land with sparse rural residential uses.

The eastern landscape unit (LU-3) off-site rail and non-rail improvements are similar to that of the western landscape unit. Off-site rail improvements include lead track extensions to the east of approximately two miles. Non-rail improvements for LU-3 would include ancillary and related stormwater drainage, utility (i.e., water, sewer, electric power, natural gas, and telecommunications), and circulation/roadway improvements and modifications. Lastly, LU-3 would include the Tortilla Substation improvements. Underground duct banks with electrical conductors would connect BIG to the Tortilla Substation utilizing existing franchise agreements with the City and County on a route following Main Street, L Street, and Bonanza Road before utilizing existing easements between Bonanza Road and the substation.

CWP Policy Map NR-3: Scenic Routes & Highways depicts the County's scenic routes and state scenic highways and identifies County Scenic Route and Eligible State Scenic Highways near and within the BIG Aesthetics study area (County of San Bernardino, 2020). However, the 2015 General Plan does not identify any scenic vistas or state-designated scenic highways within the City (City of Barstow, 2015, p. I-44).

Nine key viewpoints were established based on examples of existing views and their visual resources, within the BIG Specific Plan landscape unit. The nine key viewpoints were developed as visual simulations to provide representative examples of the existing viewshed within the BIG Aesthetics Study area (see **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG**).

Visual Resources

Visual resources are organized in accordance with the methodology outlined above. Inherent within the measure of change in visual resources is the capacity of the visual environment to absorb BIG. Prominent visual resources within BIG include the natural desert terrain of the Mojave Desert, the Mojave River, and existing development and vegetation which can be viewed from Main Street, located in the central landscape unit (LU-2) and the eastern landscape unit (LU-3). This segment of Main Street, stretching across the central and eastern landscape units, is approximately 8.8 miles in length and is identified as a "Designated Scenic Resource," for its National Scenic Byway designation under the National Scenic Byways Program and Route 66 Byway designation under the State Scenic Highways Program; see **Figure 1: Aesthetics Study Area and Key Viewpoint Location Map - BIG**. Additionally, some BIG off-site improvements include or are adjacent to a designated portion of Main Street. The proposed solar farm area, located within the central landscape unit, is just south of Main Street at the Country Club intersection. The Lenwood Channel improvement located within the central landscape unit, would include construction of a bridge over Lenwood Channel for Main Street, to replace the existing low water crossing and accommodate widening of Main Street in that immediate area, as well as installation of traffic signals and other roadway improvements in the immediate area. Finally, BIG would require various utility relocations, expansions, and construction. See **Section 2.1** for additional detail on the rail and non-rail improvements. The central landscape unit (LU-2) which includes the BIG Specific Plan area, solar farm, the Lenwood Channel improvements and certain BIG off-site rail and non-rail improvements (i.e., stormwater drainage, utility, and circulation and roadway improvements), is generally flat and gradually slopes north to the Mojave River. The central landscape unit can be visually characterized as mostly vacant with scrub-like desert vegetation (e.g., allscale scrub, creosote bush scrub, desert dunes, disturbed habitat), little to no improvements, and sparse rural residential uses, except the commercial and industrial uses north of Main Street on the eastern portion of the central landscape unit. This area is mostly devoid of tall vegetation and trees, with structures and other elements of the built environment scattered throughout. There are no hillsides, ridgelines, or dominant landforms within the central landscape unit. BIG's footprint includes BNSF's existing mainline corridor, which traverses the area in an east-west orientation. BIG's footprint is approximately 0.5-miles west of the existing BNSF Barstow Classification Yard.

Public views of the central landscape unit are experienced primarily by touring travelers along Main Street, commuting travelers along Hinkley Road, and Lenwood Road, and to a lesser degree, commuting travelers along I-58, located north and east of the central landscape unit. Additionally, the residential neighbors who reside in the rural residential communities located south of Main Street (primarily between Prairie Avenue and Country Club Drive) experience views of the central landscape unit.

The western landscape unit (LU-1) does not contain any identified visual resource.

Natural Harmony

Viewing the visual resources of the natural environment can create a sense of natural harmony. Within this portion of the County, natural visual resource views of features with scenic quality are generally comprised of large open expanses of the Mojave Desert. The Mojave Desert is an arid rain-shadow desert of the southwest United States. It is generally a sparsely populated area, comprising 47,877 square miles. Within this portion of the Mojave Desert, views of features with scenic quality include vast stretches of undeveloped desert landscapes that, due to a general lack of development, trees, and other visual obstructions, feature panoramic views (County of San Bernardino, 2019, p. 5.1-14). The CWP and the 2015 General Plan do not officially designate any scenic vistas among this desert terrain. While there are no designated scenic vistas, or notable trees or rock outcroppings within or near the BIG landscape unit, the surrounding Mojave Desert provides panoramic views of vast stretches of undeveloped desert landscapes and distant mountains that provide for scenic quality. Views of the Mojave Desert as visual resource aids in creating a sense of natural harmony for the surrounding population.

Cultural Order

Viewing the visual resources of the cultural environment can create a sense of cultural order. Based on the Cultural Resources Assessment, 199 cultural resources were identified within the BIG footprint, and a total of 20 cultural resources are noted as significant and require additional consideration related to potential adverse effects and appropriate treatment and or mitigation; see **Appendix 5.5 BIG-1: Phase I Cultural Resources Assessment**.

Additionally, approximately 9.75 miles of National Trails Highway/Route 66 within the BIG Aesthetics study area is listed on by the National Register of Historic Places and California Register of Historical Resources and, therefore, is considered a “historical resource” under State CEQA Guidelines and “historic property” under the National Historic Preservation Act (Section 106. However, there are segments within the greater Route 66 alignment that lack integrity sufficient to convey the resource's significance due to modern development and disturbances. While the segment of Route 66 (Main Street) that resides within the BIG Aesthetics study area has retained its original alignment location, the portion within the easternmost part of the BIG Aesthetics study area has been heavily modified with infrastructure development. While the central and westernmost portions of the segment within the BIG Aesthetics study area have retained much of its locational integrity, it has undergone physical upgrades over time and is not particularly recognizable as Route 66 due to lack of period-significant businesses, landmarks, or badging that connect the segment to the important events in history that make Route 66 significant.

Project Coherence

Viewing the visual resources of a project environment can create a sense of project coherence. People interpret the visual resources of a project environment as being either coherent or incoherent. Similar to the evaluation of natural harmony and cultural order, the perception of project coherence can be determined by viewing the character of the visual resources of BIG environment through the lens of the viewer preferences.

BIG’s footprint is surrounded by primarily vacant undeveloped land with sparse rural residential uses to the south, east, and west. Surrounding uses include:

- **North**—Vacant undeveloped land, including the Mojave River, is to the north. There are residential and commercial uses north of the existing BNSF tracks.
- **South**—Primarily vacant undeveloped land is to the south. Some low-density residential uses are south of Main Street and west of Lenwood Road. Low- and medium-density residential uses are east of Lenwood Road.
- **East**—Residential and commercial uses are to the east, north and south of the existing tracks, including along Main Street. SR-58 and the existing Barstow classification yard are also to the east.
- **West**—Vacant undeveloped land, including the Mojave River is to the west.

3.2 Existing Viewers

As stated previously, types of viewers within the BIG Aesthetics study area are travelers (commuting, touring, shipping) and neighbors (residential, commercial, agricultural). Travelers have a generally low viewer sensitivity due to their engagement in operating their vehicles at typically high speeds. Roads within the BIG Aesthetic study area travelers may take are Main Street, Lenwood Road, and Hinkley Road. However, travelers on these roadways have a generally low viewer sensitivity as they are visually engaged in operating their vehicles at high speeds along highways, concentrating on traffic and road conditions. Although a traveler’s sensitivity is typically low, it is often moderate or high in areas with enhanced scenery, such as Main Street that borders BIG Aesthetics study area.

The BIG Aesthetics study area is surrounded by primarily vacant undeveloped land with sparse rural residential and commercial uses to the south, east, and west. The viewers with the greatest sensitivity in the BIG Aesthetics study area are the residential neighbors surrounding BIG’s footprint. Residential neighbor viewers have a high familiarity with their visual surroundings and often have a sense of ownership of their views because of this familiarity and the investment they have made in their residence. These viewers were assumed to have higher levels of viewer sensitivity to BIG effects than people working in or passing through the viewshed. This is because these viewers would experience long-term exposure to changes in their natural and cultural environments and therefore are generally concerned with those environments. Their exposure is also the greatest, as residents spend so much of their lives in and around their residences. **Table 2: Visual Simulations Viewer Groups and Visual Resources** presents the existing viewer groups and their visual preferences.

Table 2: Visual Simulations Viewer Groups and Visual Resources				
VS	**Location and Direction of View**	**Viewer Group**	**Viewer Sensitivity**	**Visual Resources**
1	View of southwestern Mojave Desert from Main Street; Facing west	Neighbors: Residential and Commercial Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate Travelers: Moderate OVERALL: Moderate Viewer Sensitivity	Distant Mountains; Mojave Desert; Main Street
2	View of southwestern Mojave Desert from Main Street; Facing east	Neighbors: Residential and Commercial Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate-Low Travelers: Moderate OVERALL: Moderate-Low Viewer Sensitivity	Mojave Desert; Main Street
3	View of southwestern Mojave Desert from Lenwood Road; Facing southwest toward mountains	Neighbors: Residential, Commercial, and Agricultural Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate-High Travelers: Low OVERALL: Moderate Viewer Sensitivity	Distant Mountains; Mojave Desert; Main Street
4	View of southwestern Mojave Desert from Hinkley Road; Facing south-southeast toward Project	Neighbors: Residential, Commercial, and Agricultural Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate-Low Travelers: Low OVERALL: Low Viewer Sensitivity	Distant Mountains; Mojave Desert, Main Street
5	View of southwestern Mojave Desert from Main Street; Facing north-northeast toward Project	Neighbors: Residential, Commercial, and Agricultural Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate Travelers: Moderate-Low OVERALL: Moderate Viewer Sensitivity	Distant Mountains; Mojave Desert, Main Street
6	View of southwestern Mojave Desert from Main Street; Facing west toward mountains	Neighbors: Residential and Commercial Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate Travelers: Moderate-Low OVERALL: Moderate Viewer Sensitivity	Distant Mountains; Mojave Desert, Main Street
7	View of southwestern Mojave Desert from Main Street; Facing west	Neighbors: Residential and Commercial Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: High Travelers: Moderate OVERALL: Moderate-High Viewer Sensitivity	Distant Mountains; Mojave Desert, Main Street
8	View of southwestern Mojave Desert from Main Street; Facing southwest toward mountains	Neighbors: Residential and Commercial Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate Travelers: Moderate-Low OVERALL: Moderate Viewer Sensitivity	Distant Mountains; Mojave Desert, Main Street
9	View of southwestern Mojave Desert from Main Street; Facing northwest toward mountains	Neighbors: Residential and Commercial Travelers: Commuting, Touring, Shipping, Motoring	Neighbors: Moderate Travelers: Moderate-Low OVERALL: Moderate Viewer Sensitivity	Distant Mountains; Mojave Desert, Main Street
Notes: VS = visual simulation.				
Source: FHWA. 2015. Guidelines for the Visual Impact Assessment of Highway Project; pp. 5-6 – 5-10.				

Existing Visual Quality

Residential, commercial, and industrial land uses are sporadically present within BIG's viewshed, with generally unobstructed views of the desert. These views provide natural harmony, while there is a lack of cultural order and coherence in the area. **Table 3: Existing Visual Quality for Viewshed and Visual Simulations** measures the existing visual quality of the affected environment by qualitatively rating the natural harmony, cultural order, and project coherence to determine the existing visual quality of Visual Simulation 1 through 9. As stated previously, visual quality is rated as low, moderate-low, moderate, moderate-high, or high. To determine overall visual quality, the natural harmony, cultural order, and project coherence are also rated, and the ratings of these three factors determine the overall visual quality. Viewer groups and viewer preference are taken into account when determining existing visual quality.

Table 3: Existing Visual Quality for Viewshed and Visual Simulations

Visual Simulation	Natural Harmony	Cultural Order	Coherence
1	High	Low	Low
2	High	Low	Low
3	Moderate	Moderate-Low	Moderate-Low
4	Moderate-Low	Moderate-Low	Moderate-Low
5	High	Low	Low
6	High	Low	Low
7	Low	High	High
8	High	Low	Low
9	High	Low	Low
Overall	**Moderate-High**	**Moderate-Low**	**Moderate-Low**

Source: FHWA. (2015). *Guidelines for the Visual Impact Assessment of Highway Project*. Pages 5-6 – 5-10.

Light and Glare

Light and glare in BIG's footprint are typical of that found in rural environments. Sources of light and glare are minimal and include sparse commercial and residential development located north of Main Street and rural residential communities located south of Main Street, as well as scattered rural residential uses, and vehicle headlights and streetlights that are present throughout the area. Main Street separates BIG and rural development to the south, and Main Street itself is a source of light/glare from the automobiles and associated headlights/taillights. Light and glare from Main Street already influence the environment for viewers south of Main Street.

3.3 Lighting

A rural environment such as the BIG Specific Plan area's setting has low ambient nighttime light levels. BIG would introduce new light sources required for operations, maintenance, public safety, and security. BIG would generate lighting that could result in light exposure (i.e., light trespass and glare), including lighting from building interiors that would pass through windows and lighting from various exterior sources (e.g., rail yard lighting/light masts, equipment, street lighting, parking lot lighting, building illumination, security lighting, illuminated signs, landscape lighting, and automobile lighting (i.e., headlights). No lighting is proposed within BIG's off-site rail and non-rail improvements.

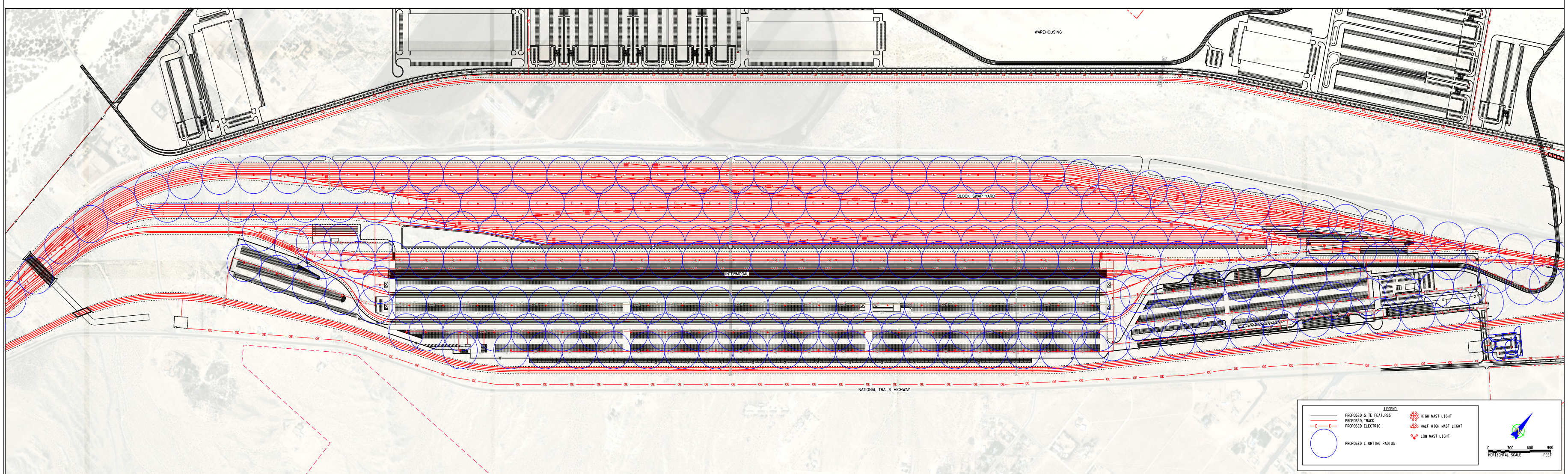
Additionally, the solar farm proposed south of Main Street and the solar panels proposed on top of industrial and rail yard buildings could generate glare. BIG's design does not include buildings with large facades constructed of reflective surfaces (e.g., brightly colored building facades, metal surfaces, and reflective glass), which typically generate daytime glare.

Light Trespass

The locations of the proposed rail yard's lighting and the respective lighting levels from each lighting unit (i.e., luminaire) are shown on **Figure 3: Rail Yard Lighting Plan** and the lighting levels are depicted on **Figure 4: Light Spill Heat Map**.

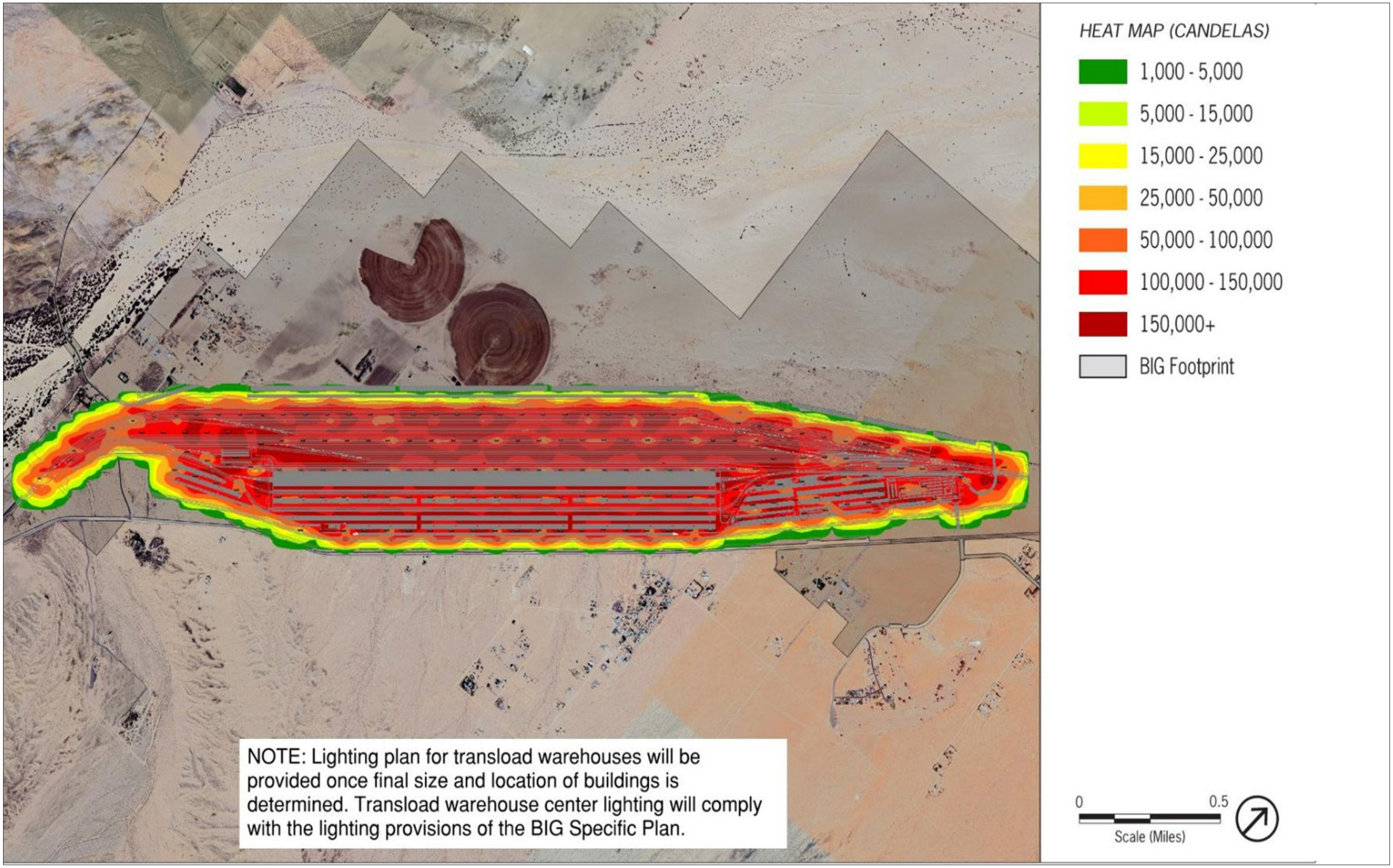
Light Pollution and Sky Glow

Light pollution, also known as "sky glow," is an adverse effect of man-made light. The term is often used to denote urban sky glow (brightening of the night sky due to man-made lighting) but also includes glare (intense and blinding light) and light trespass (light falling where it is not wanted or needed; spill light). In many cases, sky glow is visible from great distances, particularly in evenings when there is moisture in the air. Minute water droplets in the evening air reflect and scatter light into the atmosphere. BIG would operate 24 hours a day, 7 days a week, 365 days a year and would introduce illumination/glow to an area with nearby sensitive receptors and a minimally illuminated environment**.**



Source: *Kimley-Horn,* 2025.

Figure 3
Rail Yard Lighting Plan



Sources: County of San Bernardino, 2023; City of Barstow, 2022. Musco 2024.

Figure 4
Rail Yard Lighting Plan

4.0 REFERENCES

4.1 References Cited

U.S. Department of Transportation Federal Highway Administration. 2015. *Guidelines for the Visual Impact Assessment of Highway Projects*. Retrieved from: https://www.environment.fhwa.dot.gov/env_topics/other_topics/VIA_Guidelines_for_Highway_Projects.aspx.