

An architectural rendering of a modern, multi-story residential or commercial building. The building features a mix of white and dark grey panels, with several balconies and large windows. A prominent sign on the ground floor reads "12850 CRENSHAW" in orange, illuminated letters. The building is set against a clear blue sky. In the foreground, there is a street with a yellow curb, a palm tree on the left, and a few vehicles (a dark car, a motorcycle, and a silver car) on the road. The overall scene is brightly lit, suggesting a sunny day.

Appendix 9.2
Sign Lighting Technical Study



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SIGN LIGHTING TECHNICAL STUDY

**City of Gardena, California
TOD Specific Plan Project
12850 Crenshaw Boulevard
Gardena, California**

January 7, 2021

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This Lighting Study by Francis Krahe & Associate Inc. analyzes the new lighting associated with the proposed Project improvements at 12850 Crenshaw Boulevard in the City of Gardena, California, including new lighting for an outdoor sign (hereinafter referred to as Sign Lighting, and as described below in Appendix A) located at the north elevation of the Project Site, oriented to the north. The Project Site is bounded by the Dominguez Channel to the east, Crenshaw Boulevard to the west, an existing commercial use property to the north, and

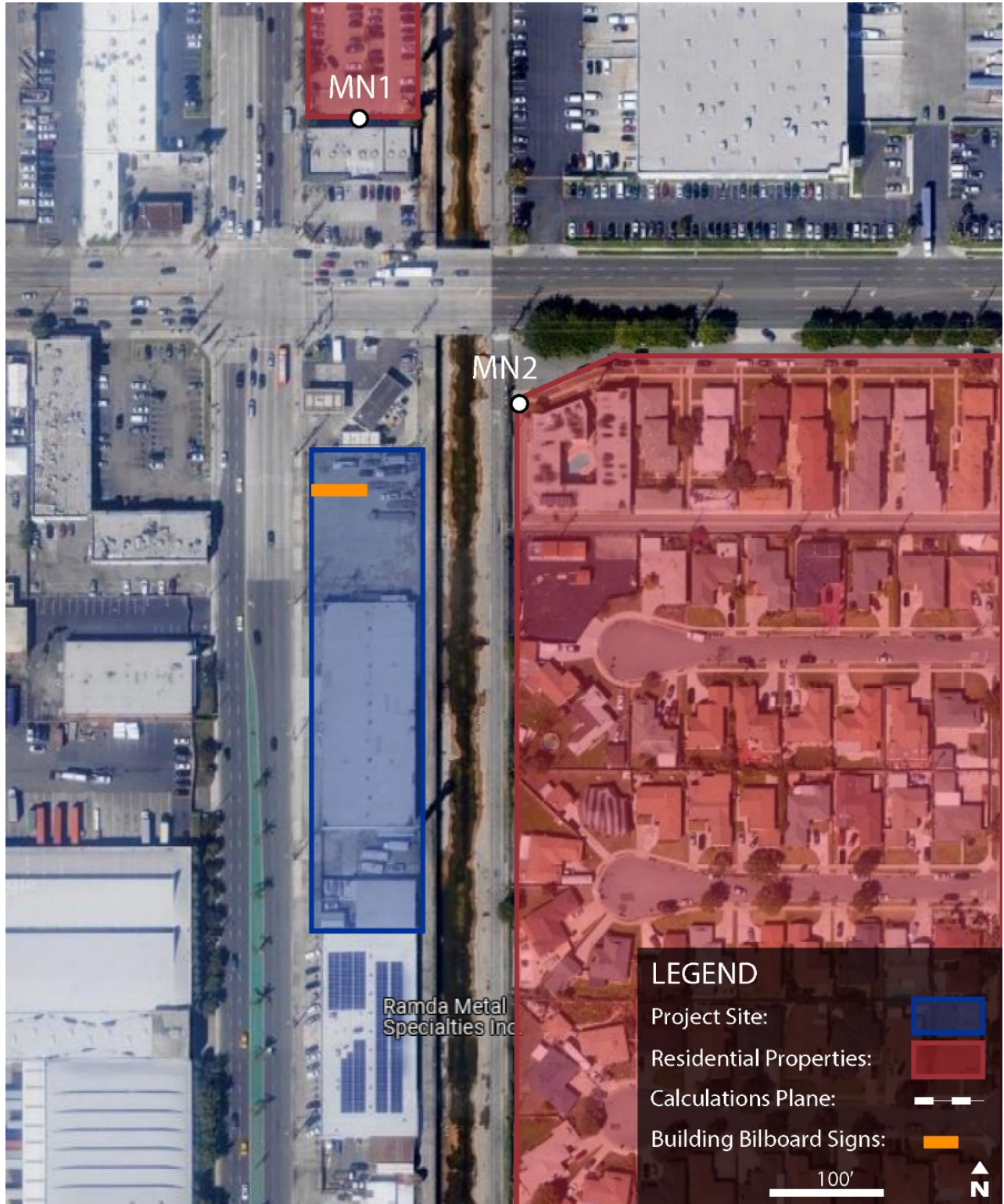


Figure 1: Project Site and Surrounding Properties

existing commercial use properties to the south. Surrounding sensitive use properties include existing residential use properties to the north and east of the Project Site. The nearest sensitive use properties are the residential uses north of West El Segundo Boulevard, north of the Project Site, and east of the Dominguez Channel, east of the Project Site.

This Study reviews the parameters that affect light trespass or glare (each as defined below) at properties in the Project vicinity, reviews the applicable lighting metrics and regulations pertaining to artificial lighting, examines the existing lighting conditions within and surrounding the Project Site, and evaluates the Project's proposed Sign Lighting to identify potential environmental impacts on surrounding sensitive use properties.

The methods of analysis utilized for this Study are based upon the recommended practices established by the Illuminating Engineering Society of North America (IESNA) for the practice of illumination engineering design and application, and the actual measurements of light sources and illuminated surfaces. The IESNA 10th Edition Handbook is the current reference published by IESNA, which supersedes the 9th Edition IESNA Handbook and various Recommended Practice (RP) References published by IESNA prior to 2011.

1. Executive Summary

This Study analyzes light trespass and glare at surrounding sensitive use properties surrounding the Project Site that could result from Sign Lighting on the Project Site. The Sign Lighting plan and the calculated illumination levels are intended to satisfy environmental review requirements and are considered adequate project-level details to permit implementation of the Sign Lighting subsequent to potential approval of the Project and its entitlements, and certification of the related Environmental Impact Report.

Residential properties are identified as the most sensitive use sites due to their close proximity to the Project Site and possible direct view of the Project Sign. Light intensity diminishes rapidly in relation to distance (see Inverse Square Law page 10). Therefore, more distant sensitive site locations will receive much lower Light Trespass illuminance and or luminance, and will therefore be less affected by the Project.

Light exposure within this Study is evaluated based on the following key subjects: Light Trespass; and Glare. These two technical terms are defined by the Illuminating Engineering Society of North America (IESNA) as follows:

- **Light Trespass¹** is the light that falls on a property but originates on an adjacent property. Light Trespass is measured in terms of illuminance (foot-candles or metric units lux), and can be measured at any point and in any direction. Where Light Trespass is evaluated the illuminance is measured perpendicular to the source of light, toward the source of light, at the property line, or the location where light is causing an issue, such as a residential window or balcony.
- **Glare²** 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 street light, 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. Glare is evaluated by measuring the luminance (footlamberts or metric units candelas per square meter (cd/m²)) at the source of light, such as a digital display, in comparison to the surrounding adjacent luminance. The term which describes the extent of Glare at an observer position for a view is referred to as contrast, and is determined by the variation of luminance within the field of view. The contrast ratio is the ratio of peak luminance to the average luminance within a field of view. "High," "Medium," and "Low" contrast are terms used to describe contrast ratios: contrast ratios greater than 30:1, between 10:1 and 30:1, and below 10:1, respectively. Contrast ratios above 30:1 are generally uncomfortable for the human eye to perceive. Any source luminance that is more than 50 times the adjacent background will be viewed as prominent, and may be viewed as distracting.

Light Trespass is evaluated at night. Glare may occur during day or night.

¹ IESNA Handbook, 10th Edition, 19.3: Light Pollution and Trespass, page 19.7

² IESNA Handbook, 10th Edition, 4.10: Glare, page 4.25

This Study analyzes the Project's potential environmental impacts relating to Light Trespass and Glare based on the Project Sign Lighting scope components, as described in Appendix A of this Study. This Study establishes the following illumination criteria for Sign Lighting:

- Light Trespass illuminance will not exceed 0.74 fc at the nearest residential use property.
- Project Sign will include design features which limit sign luminance to 400 cd/m² (all white) at night (from 20 minutes before sunset until 20 minutes after sunrise), and to 7000 cd/m² (all white) during the day (from 20 minutes after sunrise to 20 minutes before sunset).

Project Signs will transition smoothly from the maximum day luminance to maximum night luminance over a period no less than 20 minutes. This Study demonstrates the Light Trespass from the Sign Lighting at the adjacent sensitive use properties does not exceed the 0.74 footcandles (fc) threshold as defined by the California Green Building Code. There is no Light Trespass threshold for commercial use properties, which are not considered light or glare-sensitive receptors. Therefore, at commercial properties where the illuminance is calculated to exceed the 0.74 fc threshold, there is no significant Light Trespass impact from the Sign Lighting.

Furthermore, the Sign Lighting is evaluated with respect to Glare visible at adjacent residential properties or roadways. To present a conservative analysis, this Study evaluates the Sign Lighting with a maximum luminance of 7000 cd/m² during the day and 400 cd/m² for the north facing sign at night, operating at all white.

This Study analyzes the Glare from the Sign Lighting at sensitive use properties at night by calculating the contrast ratio, which compares the maximum Project Sign luminance to the existing average luminance measured at the residential properties. The calculated contrast ratios are less than 30:1, which indicates the Sign Lighting will not create a new Glare condition at adjacent sensitive use properties. The Glare at roadways is evaluated with respect to the California Vehicle Code standards, which define maximum sign luminance within drivers field of view for both day and night. This Study confirms the Sign Lighting will not exceed the maximum luminance defined by the California Vehicle Code during the day, at night, and during periods of low sun intensity.

Therefore, the results of this Study indicate the Project Sign Lighting will not create a new source of Light Trespass or Glare.

2. Project Description

The Project Site consists of one 1.33-acre (AC) parcel (APN # 4061-004-39) south of West El Segundo Boulevard, at 12850 Crenshaw Boulevard, in the City of Gardena (City), California (Project Site or Site). The Project Site is bounded on the west by Crenshaw Boulevard, on the north by an existing commercial use property to the south of West El Segundo Boulevard, on the east by the Dominguez Channel, and on the south by an existing commercial use property. There are existing residential use properties to the east of the Project Site, east of the Dominguez Drainage Channel, and to the north of West El Segundo Boulevard in the City of Hawthorne, California. The Project Site is immediately east of the Crenshaw Boulevard right of way, and to the south of West El Segundo Boulevard, and approximately 3250 feet south of Interstate 105 Freeway.

The Applicant proposes to develop an up to 265-dwelling unit (DU) multi-family residential building at a density of approximately 199 DU/AC. The Project is considered a TOD given its proposed density and proximity to employment and public transit. The eight-story building would total approximately 177,000 net square feet (NSF) (gross SF is presently unknown), and unit sizes would range from 493 SF to 1,272 SF. The Project would include 8,746 SF of private open space, with active and passive amenities, 255 off-street parking spaces, and 26 electric vehicle charging stations. Project construction is assumed to begin in 2021, although construction duration/completion are presently unknown. The Project Site is fully developed with an approximately 24,990-SF vacant industrial building (circa 1958) that appears to have been formerly used as an auto parts manufacturing (or similar). For analysis purposes, it is assumed all onsite improvements: would be removed and replaced with the proposed residential development; and would be 100 percent vacant in establishing the environmental baseline.

The Project includes a proposed illuminated sign as described below in Appendix A (Sign Lighting). The Project Sign is 59 feet 10-1/8" tall by 39 feet 10-3/4" wide, and will be installed on the north facing side of the Project

Building facing north. The Project Sign will operate at a maximum luminance of 7,000 candelas per meter squared (cd/m^2) during the day and a maximum of $400 \text{ cd}/\text{m}^2$ at night. The Project Sign will transition from day maximum luminance to night maximum luminance gradually, with the maximum night illuminance no later than 20 minutes after sunset.

Surrounding land uses include industrial to the immediate north, south, and west, and residential to the east. The Project Site is designated General Commercial and zoned Commercial (C- 3). The requested entitlements include a General Plan Amendment, adoption of a Specific Plan and corresponding Zone Change (to TOD Specific Plan), Lot Merger, and Site Plan Review.

3. Glossary of Lighting Terminology

Discussions of lighting issues include precise definitions, descriptions or terminology of the specific lighting technical parameters. The following glossary summarizes explanations of the technical lighting terms utilized in this Study and the related practice standards to facilitate discussion of these issues. The following technical terms are used in this Study.

Brightness:	The magnitude of sensation that results from viewing surfaces from which light comes to the eye. This sensation is determined partly by the measurable luminance of the source and partly by the conditions of observation (Context), such as the state of adaptation of the eye. For example, very bright lamps at night appear dim during the day, because the eye adapts to the higher brightness of daylight.
BUG Rating:	A luminaire classification system established in <i>IES TM15-11</i> , BUG Ratings Addendum that provides for uniform assessment of the directional characteristics of illumination for exterior area lighting. BUG is an acronym composed of Backlight, Uplight, and Glare. BUG ratings are based on a zonal lumen calculations for secondary solid angles defined in <i>IES TM15-11</i> .
Candela:	Measure of light energy from a source at a specific standard angle and distance. Candela (cd) is a convenient measure to evaluate output of light from a lamp or light fixture in terms of both the intensity of light and the direction of travel of the light energy away from the source.
Contrast:	Calculated evaluation of high, medium and low contrast of visible light sources or surfaces within the Property by a ratio of luminance. Contrast is the ratio of one surface luminance to a second surface luminance or to the field of view. Contrast exceeding 30 to 1 are usually deemed uncomfortable; 10 to 1 are clearly visible; and less than 3 to 1 appear to be equal.
Fully Shielded:	A lighting fixture constructed in such a manner that all light emitted by the fixture, either directly from the lamp or a diffusing element, or indirectly by reflection or refraction from any part of the Luminaire, is projected below the horizontal as determined by photometric test or certified by the manufacturer. Any structural part of the light fixture providing this shielding must be permanently affixed. In other words, no light shines above the horizontal from any part of the fixture.
Glare:	Glare is visual discomfort experienced from high luminance or high range of luminance. For exterior environments at night, glare occurs when the range of luminance in a visual field is too large. The light energy incident at a point is measured by a scale of footcandles or lux, and is described in the technical term Illuminance. This incident light is not visible to the eye until it is reflected from a surface, such as pavement, wall, dust in the atmosphere or the surface of a light bulb. The visible brightness of a surface is measured in footlamberts

(or metric equivalent candelas per square meter) and is described by the term Luminance.

The human eye processes brightness variations across a very broad spectrum of intensities. The range of brightness generated by direct noon sun versus a moonlight evening is over 5000 to 1. Human eyes are capable of accommodating to this range of intensities given adequate time to adjust. However, the eye cannot process brightness ratios of more than 30 to 1 within a view without discomfort. See IESNA 10th Edition Handbook, Section 4.10.1, Discomfort Glare and Section 10.9.2 Calculating Glare.

For the purpose of this analysis, brightness of light sources may be described subjectively by the following criteria:

High Contrast Conditions: View of light fixture emitting surface, such as a lens, reflector, or lamp, where brightness contrast ratio exceeds 30 to 1 (source Luminance to background Luminance ratio in footlamberts).

Medium Contrast Conditions: Brightly lighted surfaces where contrast ratio exceeds 10 to 1, but is less than 30 to 1 (lighted surface Luminance to background Luminance ratio in footlamberts).

Low Contrast Conditions: Illuminated surfaces where contrast ratio exceeds 3 to 1, but less than 10 to 1 (source Luminance to background Luminance ratio in footlamberts).

Illuminance:

Illuminance is the means of evaluating the density of Luminous Flux. Illuminance indicates the amount of Luminous Flux from a light source falling on a given area. Illuminance is measured in footcandles (fc) which is the lumens per square foot, or Lux (lumens per square meter). Illuminance need not necessarily be related to a real surface since it may be measured at any point within a space. Illuminance is determined from the Luminous intensity of the light source. Illuminance of a point source decreases with the square of the distance from the light source (see Inverse Square Law definition).

Horizontal Illuminance:

Illuminance incident upon a horizontal plane. The orientation of the illuminance meter or calculation point will be 180° from Nadir.

Vertical Illuminance:

Illuminance incident upon a vertical plane. The orientation of the illuminance meter or calculation point will be 90° from Nadir.

Inverse Square Law:

In physics, an inverse-square law is any physical law stating that a specified physical quantity or intensity is inversely proportional to the square of the distance from the source of that physical quantity. The fundamental cause for this relationship can be understood as geometric dilution corresponding to point-source radiation into three-dimensional space (see Figure 2). The divergence of a vector field which is the resultant of radial inverse-square law fields with respect to one or more sources is everywhere proportional to the strength of the local sources, and hence zero outside sources. Newton's law of universal gravitation follows an inverse-square law, as do the effects of electric, magnetic, light, sound, and radiation phenomena. Thus, Illuminance decreases with the square of the distance from the light source.

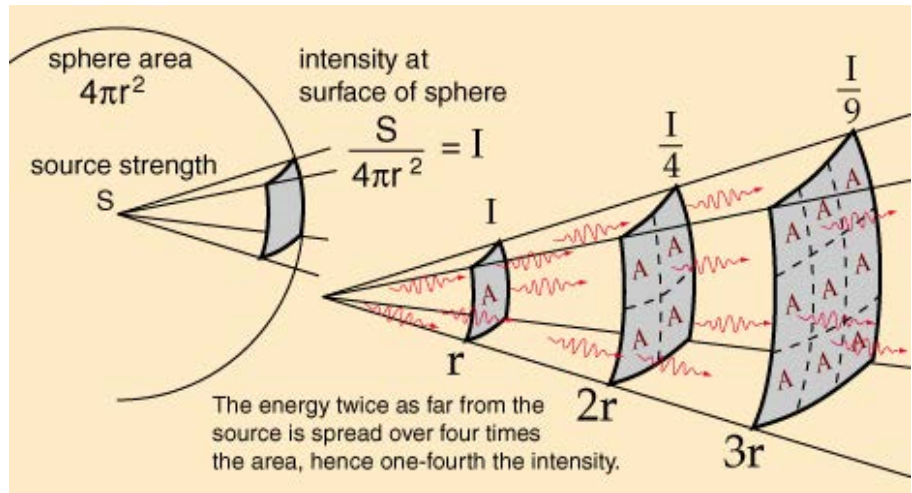


Figure 2: Inverse square law diagram (hyperphysics.phy-astr.gsu.edu)

Output Direction:

Luminaires for general lighting are classified in accordance with the percentages of total luminaire output emitted above and below horizontal. The light distribution curves may take many forms within the limits of upward and downward distribution, depending upon the type of light and the design of the luminaire.

Lighting Array:

An installation of multiple light sources or lamps where the distance between each lamp or light source within the Lighting Array is less than 5 feet on center in any direction from any other source.

Light Source:

Device which emits light energy from an electric power source.

Light Trespass:

Electric light from subject property incident onto adjacent properties, measured in footcandles or lux, usually analyzed by measurement at or near the adjacent property line.

Lighting Zone (LZ):

Defined by IESNA and summarized in Table 26.4 in the Handbook and adopted by CALGreen.

Lighting Zone LZ2:

Outdoor areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting is not uniform or consistent. Lighting is generally desired for safety, security and/or convenience.

Lighting Zone LZ3:

Outdoor areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience.

Lighting Zone LZ4:

Outdoor areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally desired for safety, security and/or convenience.

Luminaire:

A complete lighting unit consisting of a light source together with the parts designed to distribute the light, to position and protect the light source, and to connect the light source to the power supply. Also referred to as a Light Fixture.

Luminance:	<p>Luminance is a measure of emissive or reflected light from a specific surface in a specific direction over a standard area. Luminance is measured in footlamberts (fL) ($1/\pi$ Candela per square foot) or cd/m^2 (Candela per square meter). $1\text{fL} = 3.43 \text{cd}/\text{m}^2$.</p> <p>Whereas Illuminance indicates the amount of Luminous Flux falling on a given surface, Luminance describes the brightness of an illuminated or luminous surface. Luminance is defined as the ratio of luminous intensity of a surface (Candela) to the projected area of this surface (m^2 or ft^2).</p>
Luminous Flux:	<p>Mean value of total Candelas produced by a light source. Luminous Flux describes the total amount of light emitted by a light source. The unit for measuring Luminous Flux is Lumen (lm).</p> <p>This radiation could basically be measured or expressed in watts. This does not, however, describe the optical effect of a light source adequately, since the varying spectral sensitivity of the eye is not taken into account. To include the spectral sensitivity of the eye the Luminous Flux is measured in lumen. Radiant Flux or 1 W emitted at the peak of the spectral sensitivity (in the photopic range at 555 nanometers produces a Luminous Flux of 683 lumen). The unit of lumen does not define direction.</p>
Monitoring Sites:	<p>Monitoring Sites are locations selected for observation and field lighting measurements to evaluate the views to the Project from adjacent sensitive use properties and to determine the extent and intensity of existing light sources within and surrounding the Project. The Monitoring Sites are within the public right of way, and may be adjacent to sensitive use sites. These locations are representative of the view to the Project from the vicinity of the sensitive sites surrounding the Project to the north, south, east and west. Figure 5 below illustrates the Monitoring Site locations.</p>
Skyglow:	<p>Skyglow is the description of luminous atmospheric background and results from both natural and human made conditions. Natural causes of skyglow include sunlight reflected from the surface of the earth and moon, sunlight illuminating the upper atmosphere, and visible illumination from other interplanetary sources. Human made causes of skyglow include electric light that is emitted directly upward into the sky (Uplight), or reflected off of the ground.</p>

4. Review of Lighting Regulations & Reference Standards

Exterior lighting is regulated throughout California by the local municipal code and the state energy and building codes. Pertinent lighting sections are summarized and discussed for the City of Gardena Municipal Code (GMC), the California Vehicle Code, the State of California Green Building Code, and the California Energy Code (CalGreen). Reference standards include model lighting ordinances provided by the Illuminating Engineering Society of North America (IESNA) and the International Dark Sky Organization, ASHRAE 90-75, and the U.S. Green Building Council. Various aspects of these reference standards are included in local regulations to improve the outcomes of any approved project and avoid future disputes or legal challenges to proposed lighted signs. The lighting regulations and standards summarized below balance the requirements of property owners for sufficient brightness and flexibility for the use of the signs, with minimizing the off-site negative effects of Light Trespass and Glare.

4.1 Gardena Municipal Code

The GMC regulates lighting with respect to light trespass (i.e., the spillover of light onto adjacent light-sensitive properties). The City also enforces the building code requirements of the the California Building Code, the

California Green Building Standards Code (CALGreen), and the California Electrical Code, as adopted by the City of Gardena.

The regulations applicable to the Project include the GMC, CALGreen, and the California Vehicle Code.

The GMC includes the following sections pertaining to illumination:

GMC Section 18.58.060 - Design Standards.

D. Lighting. All lighting and illumination of signs, when allowed, shall comply with all applicable safety codes. All external lighting shall be hooded and directed to the sign face and away from adjacent properties. On uses where the sign is visible from a residential zone, the illumination shall be shielded to minimize the flow of light into the residential zone.

GMC Section 18.58.070 - Design Permit Requirements and Procedures.

A. Any person seeking a permit for a sign, for which a permit is required under this Chapter, shall submit to the Director a written application for such sign permit. A sign permit application is complete only when it is accompanied by the appropriate application fee, in an amount set by resolution of the City Council, and provides the following information: ...

12. A statement or graphical description as to whether the proposed sign, or any part of it, is proposed to utilize any of the following physical methods of message presentation: ... rotating or moving elements; ... neon or other fluorescing gases; flashing or strobing lighting; liquid crystal displays or other video-like methods;

In this Study, the above standards apply to Sign Lighting where the Project Sign is adjacent to sensitive use properties.

4.2 California Code of Regulations, Title 24

California Code of Regulations (CCR) Title 24, also known as the California Building Standards Code, consists of regulations to control building standards throughout the State. The following Title 24 components include standards related to sign lighting:

The California Green Building Standards Code, which is Part 11 of Title 24, is commonly referred to as the CALGreen Code. Paragraph 5.1106.8, Light Pollution Reduction, requires that all non-residential outdoor lighting comply with the following:

- The minimum requirements in the California Energy Code (CEC) for Lighting Zones 1–4, as defined in California Administrative Code Chapter 10, as noted above; and
- Comply with a local ordinance lawfully enacted pursuant to Section 101.7, whichever is more stringent.

4.3 Lighting Zone Designation LZ3

The Project Site and surrounding properties are urban, mixed use, commercial, and residential zones with nighttime uses. Current best practices for lighting standards recognize the unique issues related to night time use adjacent to residences. The CEC includes designations for Lighting Zones (LZ) 1 through 4, included in Appendix B, which correspond to the IESNA 10th Edition Handbook, Table 26.4 Light Trespass recommendations; see Appendices C and D.

All California urban areas are designated Lighting Zone 3, as default under the CEC, which limits the Light Trespass to 8 lux (0.74 footcandles). Per the CEC, California Building Energy Efficiency Standards, Section 10-114, pages 40, 41, the designations for outdoor lighting zones in urban areas are as follows:

“The default for urban areas, as defined by the U.S. Census Bureau, is Lighting Zone 3. Local AHJs (Authorities Having Jurisdiction) may designate areas to Lighting Zone 4 for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.”

The existing conditions within and surrounding the Project Site and along Crenshaw Boulevard and El Segundo Boulevard are consistent with the definition of Lighting Zone 3 noted above. In addition, the IESNA defines Lighting Zone 3 as:

“areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience and it is mostly uniform or continuous.”

IESNA Table 26.5, lists a Pre-curfew 8 Lux (0.74 footcandles) maximum at the location where trespass is under review for Zone 3. The CEC standard is well defined and supported by the IESNA and ASHRAE, and other independent lighting organizations such as the International Dark Sky Organization and U.S. Green Building Council.

4.4 California Vehicle Code, Division 11. Rules of the Road

California Vehicle Code Chapter 2, Article 3 stipulates limits to the location of light sources that may cause glare and impair driver’s vision.

ARTICLE 3. Offenses Relating to Traffic Devices [21450 - 21468] (Article 3 enacted by Stats. 1959, Ch. 3.), Section 21466.5. No person shall place or maintain or display, upon or in view of any highway, any light of any color of such brilliance as to impair the vision of drivers upon the highway. A light source shall be considered vision impairing when its brilliance exceeds the values listed below.

The brightness reading of an objectionable light source shall be measured with a 1.5 degree photoelectric brightness meter placed at the driver’s point of view. The maximum measured brightness of the light source within 10 degrees from the driver’s normal field of view shall not be more than 1,000 times the minimum measured brightness in the driver’s field of view, except that when the minimum measured brightness in the field of view is 10 footlamberts or less, the measured brightness of the light source in footlambert shall not exceed 500 plus 100 times the angle, in degrees, between the driver’s field of view and the light source.

4.5 California Outdoor Advertising Act

The California Outdoor Advertising Act (Business & Professions Code Section 5200 et seq.) stipulates limits to the location of outdoor advertising displays administered by the California Department of Transportation (CALTRANS), which provides the following regulations to limit outdoor illuminated signs within 1000 feet of a Freeway that may cause glare and impair the vision of drivers.

ARTICLE 7. Regulations [5400-5419], Section 5408(d).

- (a) Advertising displays may not be placed that exceed 1,200 square feet in area with a maximum height of 25 feet and a maximum length of 60 feet, including border and trim, and excluding base or apron supports and other structural members. This subdivision shall apply to each facing of an advertising display. The area shall be measured by the smallest square, rectangle, triangle, circle, or combination thereof, which will encompass the entire advertisement. Two advertising displays not exceeding 350 square feet each may be erected in a facing.
- (d) No advertising display shall be placed within 500 feet from another advertising display on the same side of any portion of an interstate highway or a primary highway that is a freeway. No advertising display shall be placed within 500 feet of an interchange, or an intersection at grade, or a safety roadside rest area on any portion of an interstate highway or a primary highway that is a freeway and if the interstate or primary highway is located outside the limits of an incorporated city and outside the limits of an urban area. ... No advertising display shall be placed within 100 feet from another advertising display on the same side of any portion of a primary highway that is not a freeway if that portion of the primary highway is located inside the limits of an incorporated city or inside the limits of an urban area.

The Project Sign is located more than 1000 feet from the nearest Freeway. Therefore the California Outdoor Advertising Act requirements do not apply to this Study.

4.6 IESNA Recommended Practices

The Illuminating Engineering Society of North America (IESNA) recommends illumination standards for a wide range of building and development types. These recommendations are widely recognized and accepted as best practices and are therefore a consistent predictor of the type and direction of illumination for any given building type. For all areas not stipulated by the regulatory building code, municipal code or specifically defined requirements, the IESNA standards are used as the basis for establishing the amount and direction of light for the Project.

The IESNA 10th Edition Lighting Handbook defines Outdoor Lighting Zones relative to a range of human activity versus natural habitat. Table 26.4, Nighttime Outdoor Lighting Zone Definitions, included in Appendix C of this Study, establishes the Zone designation for a range of existing lighting conditions, from low or no existing lighting to high light levels in urban areas. Table 26.4 is referenced by the CEC as noted above in relation to allowable energy use for outdoor lighting. In addition, the IESNA 10th Edition Lighting Handbook defines Recommended Light Trespass Limits in Table 26.5, included in Appendix D hereto, relative to the Outdoor Lighting Zones. The Recommended Light Trespass Illuminance Limits describe the maximum Light Trespass values in Lux at the location where trespass is under review.

The existing conditions surrounding the Project Site are best described as Lighting Zone 3. IESNA Table 26.5, lists a Pre-curfew 8 Lux (0.74 footcandles) maximum at the location where trespass is under review for Zone 3.

5. Significance Threshold

Appendix G of the State California Environmental Quality Act (CEQA) Guidelines (14 California Code of Regulations, Sections 15000–15387) provides thresholds to evaluate impacts concerning aesthetics, including light and glare. The City of Gardena uses Appendix G as its significance thresholds. The thresholds that pertain to Light Trespass and Glare is as follows:

Would the project:

- Create a new source of substantial light and glare which would adversely affect day or nighttime views in the area?

In the context of this question from State CEQA Guidelines Appendix G, the determination of significance in this Study takes into account the following factors:

- The change in ambient nighttime levels as a result of project sources; and
- The extent to which project lighting would trespass/spill off the Project Site and affect nearby residential zoned properties here.....

Specifically, the Project Sign Lighting would create a significant impact concerning light or glare if:

- The Project Sign Lighting Trespass Illuminance would exceed 0.74 foot-candles at the property line of a residential zoned property and therefore adversely change the ambient light level at residential properties.
- The Project Sign Lighting creates Glare with new high contrast conditions, with luminance greater than 400 cd/m² or contrast ratio greater than 30:1, visible from a field of view from a residentially zoned property.

In addition, based on the California Vehicle Code requirements identified above, the Project Sign Lighting would create a significant impact with regard to artificial light or glare effects on drivers of motor vehicles if:

- The maximum measured brightness of the light source within 10 degrees from the driver's normal field of view is greater than 1,000 times the minimum measured brightness in the driver's field of view, except that when the minimum measured brightness in the field of view is 10

footlamberts or less, the measured brightness of the light source in footlambert is greater than 500 plus 100 times the angle, in degrees, between the driver's field of view and the light source.³

6. Methodology

6.1 Existing Conditions Procedures

Existing conditions lighting observations were conducted following recommended practice procedures defined by the IESNA in RP-33-00 Lighting for Outdoor Environments, TM10-00 Addressing Obtrusive Light (Urban Sky Glow and Light Trespass) in Conjunction with Roadway Lighting, and TM11-00 Light Trespass: Research, Results and Recommendations. Field illuminance and luminance measurements were conducted to accurately document all existing incident and visible light at each Monitoring Site location. Incident light can be understood as a vector of luminous flux moving through space. As the vector (light) is incident upon a surface, the intensity of the resulting illuminance will vary depending upon the relative orientation of the vector to the surface. The greatest illuminance will result when the surface and vector are perpendicular. The least illuminance will result when the surface and vector are parallel. In the field conditions, where there are multiple sources of light originating from varied positions, illuminance measurements are recorded horizontally with the photosensor facing up at 3 feet above grade, and vertically with the photosensor facing the Project as per as per IESNA standards. These measurements document the total horizontal illuminance received at a Monitoring Site as well as the direction and intensity of light converging on the Monitoring Site from the direction of the Property. Since most of the Monitoring Sites are located at a long distance away from the Property, greater than 130 feet as noted in Section 7 below, the vertical illuminance represents a plane perpendicular to the light sources. Under these conditions, there is little difference between the vertical and perpendicular plane, and the vertical plane analysis that is conducted in this Study would be equal to or greater than the measured luminance from a precisely perpendicular plane analysis. Therefore, this study utilizes a vertical illuminance analysis. The existing Illuminance is measured with a Minolta

illuminance meter. Figure 3: Minolta LS-100 meter



Figure 3: Minolta LS-100 meter

illuminance meter. The existing luminance is measured from a Monitoring Site to light sources and surfaces within the field of view toward the Property from that Monitoring Site. This existing conditions luminance data is measured with a Minolta LS-100 Luminance meter with procedures consistent with best practices for field measurement of luminance as per IESNA standards. The LS-100 meter utilized by Francis Krahe & Associates, Inc. reports luminance data in either candelas per square meter or footlamberts (fL). All existing luminance data measured and reported in this Study are recorded as cd/m^2 .

³ The driver's field of view from the center of the roadway plus 10 degrees."

6.2 Project Analysis

The Project analysis includes evaluation of the illuminance Light Trespass from the Project at the nearest adjacent residential property line, and an evaluation of Glare from the Project visible at residential properties or at adjacent roadway locations. This Study presents a conservative analysis with respect to Light Trespass and Glare. The Project Sign Lighting is evaluated with a configuration of the maximum permissible lights that are within the limits of the California Building Code. This Study evaluates the proposed Project Sign Lighting identified in Appendix A.

a. Project Light Trespass Analysis

Light Trespass illuminance is calculated at the location where lighting is under review through the illumination modeling software program AGI32. This software utilizes the 3-dimensional architectural computer model, including Project Sign Lighting locations, dimensions, and luminous specifications to generate an accurate prediction of future illuminance. Light Trespass illuminance is evaluated with respect to horizontal and vertical illuminance at the locations where lighting is under review.⁴

To evaluate Light Trespass at the nearest sensitive use properties, the Project’s illuminance is calculated at the review location within a vertical plane at the sensitive use property line, extending from grade to a maximum viewing elevation above grade. For the Project, the maximum height is 80 feet above grade at the adjacent sensitive use properties to the north of El Segundo Boulevard and to the east of the Dominguez Drainage Channel. The calculated illuminance data is presented at 10 feet on center. The calculation plane simulates the illumination (fc) captured by light meters. Figure 4 illustrates the locations where the lighting is under review and where the vertical illuminance is calculated to evaluate Light Trespass.

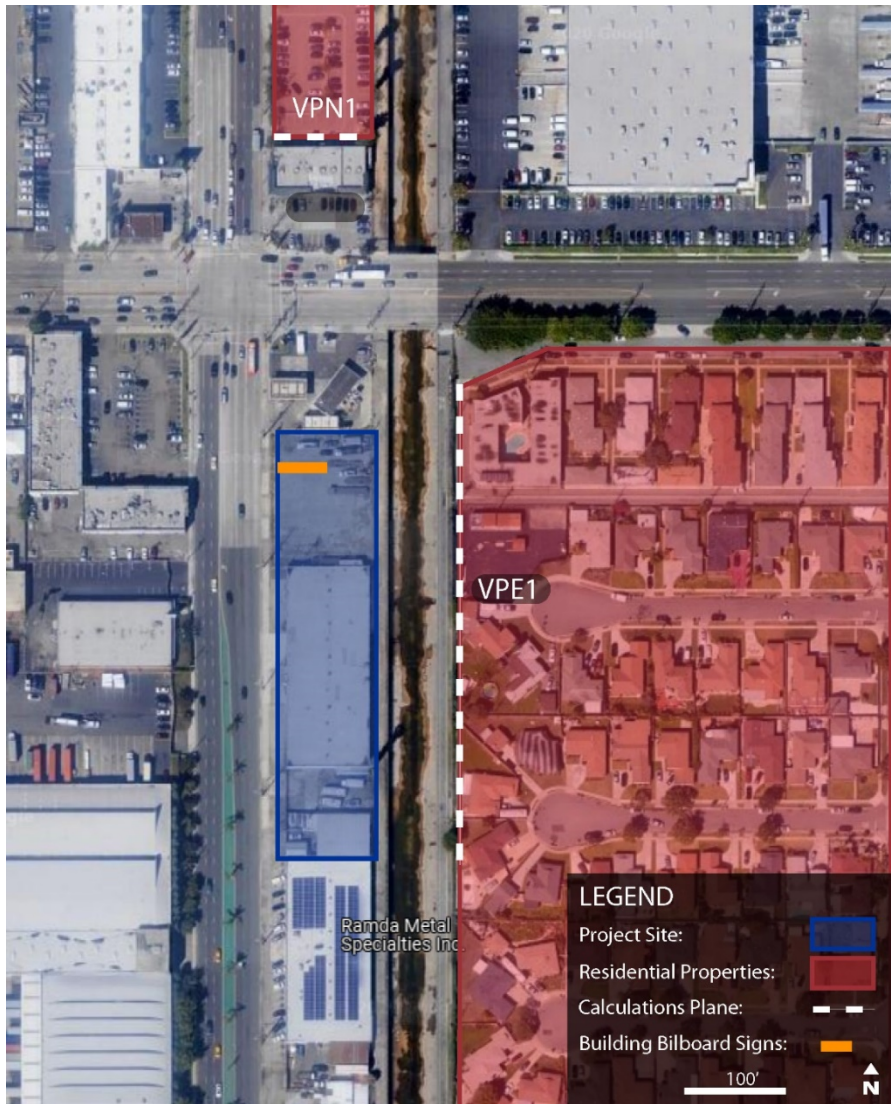


Figure 4: Project Site and Vertical Calculation Plane Locations

⁴ See Note 2, above.

Vertical Plane VPN1 is located to the north of West El Segundo Boulevard at the south property line of the residential property located at 12540 Crenshaw Boulevard in the City of Hawthorne, California. The property south elevation at Vertical Plane VPN1 includes residential use properties with windows facing south.

Vertical Plane VPE1 is located at the east property line of the residential properties located 2936 W El Segundo Blvd at the west elevation facing the Laguna Dominguez Trail. Vertical plane VPE1 extends from grade to 80 feet above grade. Light Trespass illuminance data is presented from grade to 30 feet above grade, and from 30 feet above grade to 80 feet above grade. The area from 30 feet above grade to 80 feet above grade is not occupied, therefore light trespass illuminance within the portion of the elevation will be less than significant.

The vertical calculation planes analyze the lighting at the locations adjacent to the Project property line, which will be greater than the illuminance at any location more distant from the Project. Incident light (f_c) from a source degrades in proportion to the inverse square of the distance from the source to the location where lighting is under review. The illuminance E_v (f_c) incident at any given distance D (ft) from an illuminated surface S (f_t^2) with uniform surface luminance of L (cd/m^2) is calculated by the following formula:

$$E_v = \frac{L \times S}{10.76 \times D^2}$$

This formula illustrates the reduction in illuminance at any location as the distance increases from a light source. More distant sensitive use properties will receive less light from the Project due to the increased distance. Therefore, the Project will produce a less significant Light Trespass impact on sensitive use properties located at a greater distance than the nearest adjacent residential property line.

b. Project Glare Analysis

Glare from the Project is evaluated at nearby sensitive night use properties and for drivers on adjacent streets. Project luminance is evaluated by the contrast ratio, which equals the maximum Project Sign luminance divided by the measured average existing luminance within the field of view at the Monitoring Sites identified in the field survey of existing conditions (see Section 7 below). Contrast ratios greater than 30:1 are considered potential glare conditions.

The potential roadway glare impacts are analyzed with respect to the Project Sign luminance compliance with the California Vehicle Code requirements for both day and night conditions at the Freeway Receptor Site locations identified in Figure 5 below. According to California Vehicle Code Section 21466.5, the Project Signs would have a significant impact with regard to artificial light or glare if:

- The maximum measured brightness of a light source within 10 degrees from a driver's normal line of sight exceed 1,000 times the minimum measured brightness in the driver's field of view, except when the minimum values are less than 10 footlamberts (fL).
- At minimum luminance less than 10 footlamberts (fL) the source brightness shall not exceed 500 fL plus 100 times the angle, in degrees, between the driver's line of sight and the light source.

The roadway glare analysis includes evaluation of the view angle at each Freeway Receptor Site location from the driver's line of sight to the Project Sign Lighting to determine the visibility of the Project Sign Lighting, and evaluates the luminance of the Project Sign Lighting at that location.

7. Existing Site Analysis

The Project Site is south of West El Segundo Boulevard, at 12850 Crenshaw Boulevard (Project Site or Site), in the City of Gardena (City).

The Site is bounded on the west by Crenshaw Boulevard, on the north by an existing commercial use property to the south of West El Segundo Boulevard, on the east by the Dominguez Channel, and on the south by an existing commercial use property. There are existing residential use properties north of West El Segundo Boulevard and east of the Dominguez Drainage Channel. The Site is immediately east of the Crenshaw

Boulevard right of way, south of West El Segundo Boulevard, and approximately 3250 feet south of Interstate 105 Freeway.

The Project includes lighting for outdoor signs (Sign Lighting) as described in Appendix A. This analysis represents a conservative evaluation of the potential for offsite Light Trespass Illuminance and Glare from the Project Sign Lighting.

Existing lighting conditions within and surrounding the Project Site consist of exterior parking lot light, exterior lighting utilized for security and safety, roadway lighting, and lighting at adjacent residential and commercial properties.

The distance to adjacent sensitive use properties varies considerably. The distance from the Project Site's north property line to the nearest adjacent sensitive use property is 320 feet. The distance from the Project Site's east property line to the nearest sensitive use property line is 96 feet.

7.1 Existing Conditions Monitoring Sites

Monitoring Sites are utilized to describe and evaluate the existing lighting conditions at and surrounding the Project Site to determine the maximum potential impacts that may result from light or glare onto sensitive sites surrounding the Project Site. All Monitoring Site locations are near the Project Site and would have views of the Project. Monitoring Sites may also be considered existing residential use properties, or may be located adjacent to existing residential properties. The following criteria are used to select potential Monitoring Site locations:

Project Light Visibility – Monitoring Sites are analyzed that provide direct view of the areas of greatest light intensity from the Project.

Proximity – Monitoring Sites at the least distance to the Project are analyzed. These locations are selected because light intensity decreases exponentially with distance. Locations at a greater distance will experience less light intensity than nearby locations.

Figure 5 shows the Project Site's location, the Monitoring Site locations, and the properties surrounding the Project Site. Monitoring Site locations were selected for observation and field lighting measurements to evaluate the views to the Project from adjacent residential properties to determine the extent and intensity of existing light sources within and surrounding the Project. The Monitoring Sites are within the public right of way, adjacent to residential use properties, or at the Project property line. These locations are representative of the view to the Project from residential use properties surrounding the Project Site to the north, south, east, and west.



Figure 5: Project Site and Monitoring Site Locations

Figure 5 illustrates the following Monitoring Site locations:

Monitoring Site MN1: Monitoring Site MN1 is located from the southeast roof the Green Line Apartments located at 12540 Crenshaw Boulevard, north of the West El Segundo Boulevard intersection, at the east side of the Crenshaw Boulevard right of way. This location is used to evaluate sensitive use properties north of the Project. The distance to the Project Site’s north property line is approximately 367 feet. The dominant light sources for this area are streetlights and parking lot lights from the Project Site along with night glow from the surrounding city.

Monitoring Site MN2: Monitoring Site MN2 is located east of the Dominguez Drainage Channel at 2936 West El Segundo Boulevard. This location is used to evaluate the sensitive use properties northeast of the Project Site. The distance to the Project Site northeast property line is approximately 132 feet. The dominant light source in this area is city night glow and street light poles.

7.2 Monitoring Site Criteria

As established in Section 1.3, the following factors were used to assess the existing conditions at each Monitoring Site:

Table 1: Existing Conditions Lighting Criteria at Monitoring Sites

Criteria	Metric	Procedure
Light Trespass - Illuminance	Measured illuminance (footcandle) at each Monitoring Site	Horizontal and vertical illuminance measurements at each Monitoring Site with Minolta illuminance meter.
Glare – Luminance Contrast Ratio	Measured luminance (cd/m ²) at each Monitoring Site within field of view to the Project Site from the Monitoring Site; Observed existing conditions	Luminance measurements at each Monitoring Site with Minolta luminance meter. Observed conditions with respect to the view to the Property from the Monitoring Site in terms of visibility of the Project, light sources, lighted surfaces, and illuminated signs.

7.3 Monitoring Site Survey Data

The observations and measurement of existing lighting conditions within and surrounding the Property are summarized below in relation to the evaluation factors established in Section 5, Significance Threshold:

Illuminance: The Illuminance listed in Table 2, below, summarize the measured Illuminance at the Monitoring Sites. Measured illuminance greater than 3.0 fc is evaluated as high illuminance, from 1.0 fc to 3.0 fc is evaluated as medium illuminance, and from 1.0 fc or less as low illuminance.

Table 2: Measured Illuminance (fc) at Monitoring Sites

Monitoring Site	Illuminance (fc)		Evaluation
	Horizontal	Vertical	
MN1	0.015	0.203	Low Ambient Illuminance
MN2	0.194	0.176	Low Ambient Illuminance

The measured illuminance is relatively low for an urban lighting condition, with low measured illuminance at both Monitoring Sites MN1 and MN2. The existing Project Site includes very limited existing lighting for safety

and security within the Project Site property. Adjacent commercial properties to the north and roadway lighting on the adjacent Crenshaw Boulevard right of way contribute to brightness visible in the distance.

The highest existing horizontal illuminance level was recorded at Monitoring Site MN2 at 0.194 fc, while the lowest horizontal illuminance was recorded at Monitoring Site MN1 at 0.015 fc. The highest existing vertical illuminance level was recorded at Monitoring Site MN2 at 0.176 fc, while the lowest vertical illuminance was recorded at Monitoring Site MN1 at 0.203 fc.

Contrast/Glare: The evaluation of High, Medium, and Low Contrast describes the perception of how bright a visible object appears in comparison to the surrounding objects within any given field of view. The “luminance ratio” is the ratio of the highest Measured Luminance as compared to the Luminance within the field of view visible at an observer position. This ratio is referred to as “contrast,” and is determined by the variation of luminance. “High,” “Medium,” and “Low” contrast are terms used to describe effect of the contrast ratios (the ratio of peak measured luminance to the average within a field of view) of greater than 30:1, between 10:1 and 30:1, and below 10:1, respectively. Luminance contrast ratios above 30:1 are generally uncomfortable for the human eye to perceive. High Contrast indicates a potential Glare condition.

Table 3 summarizes the measured luminance at each Monitoring Site along with qualitative evaluation of the existing luminance. The notes below for each Monitoring Site include observations of the brightness of visible light sources and surrounding illuminated surfaces within the field of view to the Project Site from the Monitoring Sites, and the visibility of the Project Site within the field of view.

The measured luminance recorded at the Monitoring Sites within the view to the Project Site includes prominent, high brightness light sources and illuminated surfaces, such as street lights, illuminated signs, and flood lighted buildings, as well as lower brightness surfaces such as sidewalks, parking lots, and un-illuminated walls or landscape areas. The existing Project Site is a surface parking lot with existing exterior light poles. The Monitoring Sites survey a wide range of light conditions from areas with minimal lighting to well illuminated areas with many bright surfaces visible

Table 3: Measured Luminance, (cd/m²) at Monitoring Sites

Monitoring Site	Luminance (cd/m ²)		Contrast Ratio (Max / Average)	Evaluation
	Maximum	Average		
MN1	931	68.1	15.1	Medium contrast ratio
MN2	4173	208.1	20.1	Medium contrast ratio

The highest maximum luminance was recorded at Monitoring Site MN2 with 4173 cd/m², while the lowest maximum luminance was recorded at Monitoring Site MN1 at 931 cd/m². The highest average luminance was recorded at Monitoring Site MN2 at 208.1 cd/m², while the lowest average luminance was recorded at Monitoring Site MN1 at 68.1 cd/m².

The measured luminance indicates relatively bright existing light conditions within and surrounding the Project Site, with areas of very little lighting along the Dominguez Drainage Channel and much higher luminance within the commercial properties with extensive outdoor lighting.

a. Monitoring Site MN1:

Monitoring Site MN1 is located to the north of the Project Site at 12540 Crenshaw Boulevard, north of the West El Segundo Boulevard intersection, at the east side of the Crenshaw Boulevard right of way at the south roof terrace of the Green Line Apartments. This location is used to evaluate sensitive use properties north of the Project Site. The distance to the Project Site's north property line is approximately 367 feet. Prominent light sources visible within the field of view from MN1 to the Project Site include city street lights, parking lot lights at the commercial properties to the south of MN1 and sky glow from the surrounding city.



Figure 6: MN1 day view November 3, 2020, 1:11 PM



Figure 7: MN1 night view November 10, 2020, 5:35 PM

b. Monitoring Site MN2:

Monitoring Site MN2 is located east of the Dominguez Drainage Channel at 2936 West El Segundo Boulevard. This location is used to evaluate the sensitive use properties northeast of the Project Site. The distance to the Project Site's northeast property line is approximately 132 feet. Prominent light sources visible in the field of view from MN2 to the Project Site include city street light poles and skyglow from adjacent commercial properties.



Figure 8: MN2 day view November 3, 2020, 1:29 PM



Figure 9: MN2 night view November 10, 2020, 6:00 PM

8. Project Analysis

The Project would introduce new Lighting as described in Section 2 and depicted in Appendix A.

8.1 Project Sign Analysis

The Project would introduce new Sign Lighting as described in Section 2 and depicted in Appendix A. Future proposed Project Sign Lighting may cause Light Trespass or Glare with respect to the following variables:

- The Project Lighting projects light toward an adjacent residential use property, and is close enough (immediately adjacent to or less than 1,000 feet away) to create substantial Light Trespass illuminance at a sensitive use property line.
- The light source surface area is large enough to create substantial Light Trespass illuminance at an adjacent sensitive use property line.
- The light source surface is bright enough to create Glare, or high contrast conditions, when the light source surface luminance is compared to the surrounding surface luminance.

The following criteria are used to evaluate the Project's Light Trespass and Glare impacts:

- Light Trespass illuminance must not exceed 0.74 fc at adjacent residentially zoned property lines.
- Light source luminance visible from the sensitive use properties must not create high contrast conditions, greater than 30 to 1 contrast ratios.

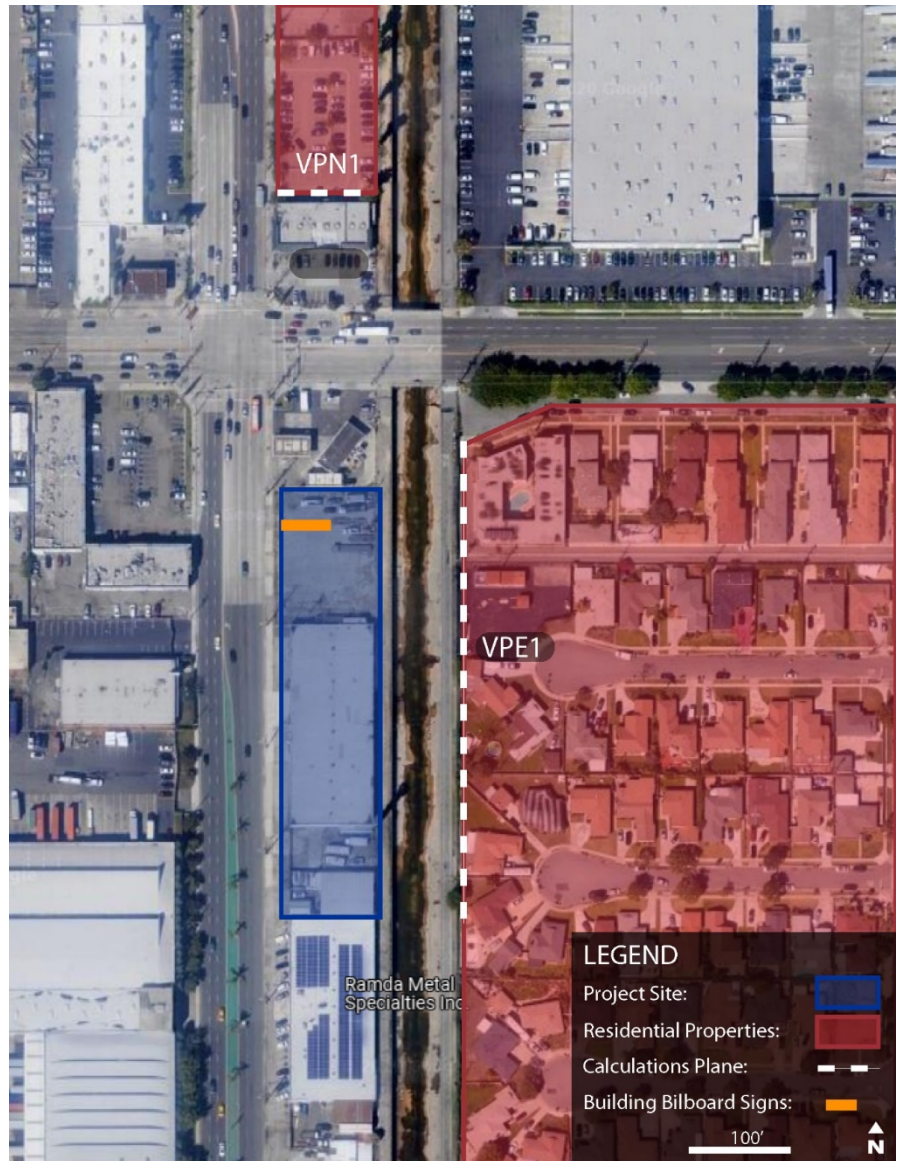


Figure 10: Project and Digital Sign Location

8.2 Sign Lighting - Light Trespass Illuminance Analysis

The Light Trespass analysis evaluates the illuminance (fc) at the locations where lighting is under review with respect to light leaving the Project toward adjacent properties from the Project Sign Lighting. The Project Sign Lighting includes the light sources as defined in and as illustrated in the Project Sign Concept Plan in Appendix A. Table 4 summarizes the Project Sign Light Trespass illuminance at the Vertical Planes, which varies from a minimum of 0.00 fc to a maximum of 0.71 fc. Complete calculated data is presented in Appendix F.

Table 4: Project Sign Light Trespass Illuminance (fc) at Vertical Planes- Sign Illuminance of 400 cd/m²

Vertical Calculation Planes		Description	Illuminance (fc)			Analysis
			Max	Min	Average	
VPN1	0 - 30 ft above grade	North Residential Property Line	0.69	0.53	0.63	Below Threshold of 0.74 fc, no Light Trespass Impact
	30 - 80 ft above grade	North Residential Property Line	0.71	0.57	0.66	Below Threshold of 0.74 fc, no Light Trespass Impact
VPE1	0 -30 ft above grade	East Residential Property Line	0.57	0.00	0.04	Below Threshold of 0.74 fc, no Light Trespass Impact
	30 - 80 ft above grade	East Residential Property Line	0.61	0.00	0.05	Below Threshold of 0.74 fc, no Light Trespass Impact

Vertical Plane VPN1 is located at the south property line of the sensitive use properties north of the Project Site. The Project design features stipulate a maximum Sign Luminance of 400 cd/m² all white for the Project Sign. The maximum light trespass occurs at Vertical Plane VPN1 at 0.71 fc, which is less than the 0.74 fc maximum permissible light trespass illuminance established above in Section 5. Therefore the Project Sign would not create a significant light trespass impact with the maximum Sign Luminance of 400 cd/m² all white at vertical plane VPN1.



Figure 13: Light Trespass Illuminance at VPE1 Figure 14: Light Trespass Illuminance at VPN1

The Project Light Trespass illuminance calculation data is presented in rendered view within Figure 10. The calculated data is presented as a grid on the Vertical Plane surface to the north of the Project Site. In this rendered view calculated illuminance less than 0.74 fc are shown as white text, and calculated illuminance at 0.74 fc or greater are presented as red text. There is no red text within Figure 10, which indicates there is no light trespass impact from the Project Sign at Vertical Plane VPN1.

Vertical Plane VPE1 is located adjacent to the property line of the residential properties to the east, which are sensitive use locations. The maximum Project Light Trespass at vertical plane VPE1 is 0.61 fc which is less than the 0.74 fc maximum permissible light trespass illuminance established above in Section 5. Therefore the Project Sign will not create a significant light trespass illuminance impact with the maximum Sign Luminance of 400 cd/m² all white at vertical plane VPE1.

The Project Light Trespass illuminance calculation data is presented in rendered view within Figure 11. The calculated data is presented as a grid on the Vertical Plane surface to the east of the Project Site. In this rendered view calculated illuminance less than 0.74 fc are shown as white text, and calculated illuminance at 0.74 fc or greater are presented as red text. There is no red text within Figure 11, which indicates there is no light trespass impact from the Project Sign at Vertical Plane VPE1.

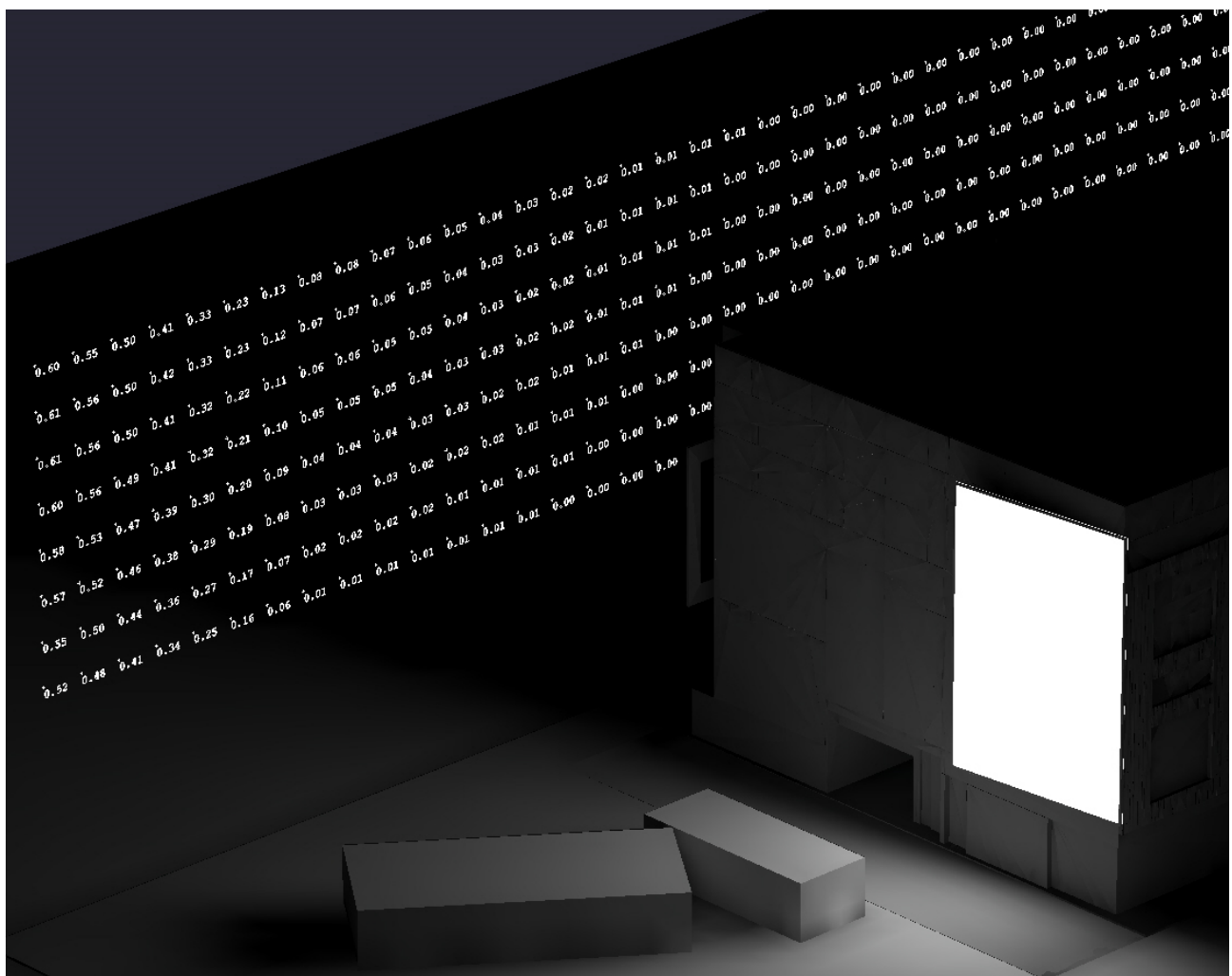


Figure 15: Light Trespass Illuminance at VPE1

8.3 Sign Lighting - Glare Analysis

Glare from Project Sign Lighting occurs when the Project Sign is visible against a dark background, such as a dark sky, or when a high brightness source is aimed at a low angle within the field of view. The maximum Sign Lighting source brightness is determined by the rated source luminance. For this Study, the maximum night time Sign Lighting luminance is 400 cd/m². The measured existing luminance is summarized in Table 3 in Section 7 above. Table 5 below summarizes the contrast ratio calculated for the maximum Sign Lighting luminance in comparison to the existing Average Measured luminance.

Contrast Ratios less than or equal to 30:1 are considered medium contrast, and will not introduce a new source of Glare. Contrast Ratios less than 10:1 are considered low contrast, and will not introduce a new source of Glare.

The calculated contrast ratio at all Monitoring Sites range from 1 to 6, and are all less than 10:1; therefore, are low contrast. At Monitoring Sites MN1 and MN2 Project Lighting will not create a new source of Glare.

Table 5: Contrast Ratio: Comparison of Existing Luminance to Project Sign @ 400 cd/m²

Monitoring Site	Existing Measured Luminance		Project Sign Luminance		
	Maximum	Average	Max	Contrast Ratio	Evaluation
				Max to Average	
MN1	931	68.1	400	5.9	Low Contrast, at 30:1 Contrast Ratio, No Glare Impact
MN2	4173	208.1	400	1.9	Low Contrast, at 30:1 Contrast Ratio, No Glare Impact

8.4 Sign Lighting - Glare Analysis for Roadways

The lighting impact to driver's visibility from Sign Lighting is evaluated by way of the methodology defined above at the locations where lighting is under review. As summarized below, the results of this evaluation demonstrate the light impacts resulting from the Sign Lighting at the locations where light is under review are below the significance threshold for excessive luminance, or glare, during night, twilight (sunrise/sunset), and day. The Project meets the California Vehicle Code standard for roadways approaching the Project from all directions.

The Glare analysis of the Sign Lighting during night assumes the simultaneous use of all Sign Lighting at the maximum luminance stipulated above, and compares the resulting luminance to the most stringent California Vehicle Code requirements to determine if the Sign Lighting will introduce a source of distracting glare to drivers. The most stringent condition identified within California Vehicle Code Section 21466.5, states: "except that when the minimum measured brightness in the field of view is 10 footlamberts or less, the measured brightness of the light source in footlamberts (fL) shall not exceed 500 plus 100 times the angle, in roadway degrees, between the driver's field of view and the light source." Thus, a conservative evaluation, occurs where the Sign Lighting is visible within the centerline of the driver's field of view, the angle noted above within the field of view is 0, the surrounding surface luminance is less than 10 fL, and therefore the maximum allowable luminance is 500 fL. Therefore, the most conservative condition at night evaluates Sign Lighting against a threshold for luminance of a maximum 500 fL.

A measured brightness within the driver's field of view of less than 10 fL may occur at night. The Sign Lighting is evaluated with a maximum luminance of 400 cd/m². Calculating the equivalent Sign Lighting luminance by converting to English units from metric units: 400 cd/m² equals 116.7 fL. The Sign Lighting will not exceed 116.7 fL, which is 77% less than the 500 fL maximum, the most conservative limit stipulated by the California Vehicle Code for conditions where the minimum brightness in the driver's field of view is less than 10 fL.

For Signs located beyond the driver's 10 degree field of view the maximum luminance is permitted to increase under the California Vehicle Code. For example, light sources located 15 degrees from the centerline of the driver's field of view would be limited to a maximum of 1,000 fL (500 fL plus 100 times the angle (5 degrees) = 1,000 fL). All Sign Lighting will operate at maximum of 116.7 fL at night, or less than approximately 12% of the maximum allowed by the California Vehicle code for those locations at 15 degrees from the center of the driver's field of view. Therefore, at night the Sign Lighting will not exceed the 1,000 fL threshold and will not introduce a new source of Glare as defined by California Vehicle Code Section 21466.5.

The Sign Lighting is also evaluated during twilight, which is the transition period from day to night, from 20 minutes before sunset to sunset, and the transition from night to day, from 20 minutes before sunrise to sunrise. Sunlight increases gradually from the minimum brightness at sunrise to maximum brightness at mid-day, and then decreases gradually to the minimum brightness at sunset. Therefore, the minimum ambient luminance occurs at sunset or sunrise. However, in order to analyze the most conservative, low level sunlight conditions, this analysis adjusts the time frame for the minimum ambient luminance condition of 10 fL to 20 minutes prior to sunset and 20 minutes after sunrise, extending the duration of night. At 20 minutes prior to sunset the ambient sunlight will be greater than the minimum values at sunset, and at 20 minutes after sunrise the luminance will be greater than the minimum at sunrise. At 20 minutes prior to sunset, the minimum luminance values within the driver's field of view will be above the minimum night time values (10fL) due to the light from the setting or rising sun. However, to maintain a conservative analysis, this evaluation assumes the minimum luminance within the driver's field of view will be less than 10 fL from 20 minutes prior to sunset until 20 minutes after sunrise. Therefore, the maximum luminance threshold during this time will remain at 500 fL as noted above in the evaluation of the night threshold. The maximum light source luminance of 500 fL converting to metric units equals 1719 cd/m².

The proposed Project Lighting is designed to limit maximum luminance to less than 400 cd/m² (116.7fL) maximum luminance, from 20 minutes before sunset to 20 minutes after sunrise. The Sign Lighting will not exceed 400 cd/m² for the period beginning 20 minutes prior to sunset until 20 minutes after sunrise. Therefore, at 20 minutes before and including sunset and at sunrise and 20 minutes after, the Sign Lighting will not exceed the threshold of 500 fL, and will therefore not introduce a new source of Glare.

Sign Lighting is designed to not exceed 400 candelas/m² (116.7fL) luminance at night. The maximum Sign Lighting luminance at night is less than the California Vehicle Code standard, including less than 20% of the maximum allowable luminance identified as the threshold for Glare, therefore Sign Lighting will not create a new source of Glare.

The evaluation of the Project Signs during the day (20 minutes after sunrise until 20 minutes before sunset) compares the daytime, ambient brightness to the maximum sign brightness stipulated by the California Vehicle Code during full sun conditions and overcast sky conditions. California Vehicle Code Section 21466.5 above permits the project signs to "generate light intensity levels greater than 1,000 times the minimum measured brightness in the driver's field of view, except when the minimum values are less than 10 (fL)."

During the day (20 minutes after sunrise until 20 minutes before sunset) sunlight with clear sky conditions or light overcast conditions provides sufficient illuminance to generate surface brightness greater than 10 fL and up to 1200 fL on the least reflective surfaces, such as roadway pavement. Utilizing the value of 10fL as the minimum within the driver's field of view, the maximum allowable brightness would be 1,000 times 10 fL, or 10,000 fL. The Project Sign will not exceed 7,000 cd/m² (2,043fL) during the daytime hours of operation, and would operate at less than 18% of the maximum luminance stipulated by the California Vehicle Code. Therefore, the Sign Lighting would not create a new source of glare during day time hours of operation with clear sky or light overcast conditions.

Severe storms, heavy cloud cover, or other atmospheric conditions could occur during the day, which could cause the minimum brightness within the driver's field of view to be less than 10 fL. The Project Signs will include an electronic control system to reduce the sign luminance from 7,000 cd/m² (2,043 fL) to 400 cd/m² (116.7fL) maximum when the ambient sun light falls to illuminance values similar to night, less than 100 fc. During the day, when storms, cloud cover, or other low ambient sunlight conditions occur and when the ambient sunlight is less than 100 fc, the Project Signs would transition from the daytime 7,000 cd/m² (2,043 fL) to 400 cd/m² (116.7fL) maximum, and thereby ensure that the sign luminance remains less than 20% of the maximum stipulated by the California Vehicle Code. Therefore, the Sign Lighting would not create a new source of glare during day time periods with storm or severe overcast weather conditions.

a. Sign Lighting Cumulative Glare Analysis for Roadways

The analysis of the Project Signs glare impact on the drivers within the adjacent roadways includes review of the the new proposed Project Sign with respect to the Outdoor Advertising Act requirements. The Project Site is located east of Crenshaw Boulevard, south of West El Segundo Boulevard, and approximately 3,250 feet south of the I-105 Freeway.

The CALTRANS requirements for Displays located adjacent to interstate highways are listed above in Section 4.5.

The Project Sign is not within 1,000 feet of the 105 Freeway right of way, and is therefore not subject to the Outdoor Advertising Act requirements concerning the 105 Freeway. There are no adjacent existing signs within 1,000 feet of the Project Site. Therefore there is no cumulative Glare impact from the Project Sign on any of the adjacent roadways.

8.5 Sign Lighting Conclusions

The Project proposes to install a new illuminated Sign while minimizing Light Trespass and Glare to neighboring sensitive use properties through design features that comply with the following design standards:

- Sign Light Trespass illuminance at night will not exceed 0.74 fc at all adjacent residential use properties as stipulated by CALGreen Code, Paragraph 5.1106.8, Light Pollution Reduction.
- At night and during sunset, sunrise, glare at sensitive residential or roadway sites will be less than high contrast conditions with a maximum sign luminance of 400 cd/m².
- During the day, glare at sensitive residential or roadway sites will be less than high contrast conditions with a maximum sign luminance of 7000 cd/m².
- Project Lighting will be controlled by a photocell on and timeclock off to transition smoothly from the daytime conditions to the maximum nighttime luminance.
- This analysis accurately evaluates the potential for Project Signs to create a new source of Light Trespass and or Glare at adjacent sensitive use properties. The Project Sign location, type, dimensions, and maximum luminance are as described by the Concept Plan in Appendix A, and are evaluated at night with the Project Sign operating at maximum luminance, all white, of 400 cd/m².

Therefore, the Project Sign will not create a new source of Light Trespass or Glare that would exceed established standards.

As such, this analysis represents a conservative evaluation of the proposed Project Sign Lighting potential for off-site Light Trespass and Glare.

APPENDIX A: Sign Concept Plan**Gardena TOD Specific Plan Digital Display Operation**

Location: The Digital Display shall be located or screened to minimize to the greatest reasonable extent possible direct light sources onto any exterior wall of a residential unit in the City of Gardena.

Materials: The Digital Display shall not use highly reflective materials such as mirrored glass.

Title 24: All light sources, including illuminated signage, shall comply with CALGreen (Part II of Title 24, California Code of Regulations).

Dimming: The Digital Display shall be fully dimmable and shall be controlled by a programmable timer so that luminance levels may be adjusted according to the time of day and ambient light conditions.

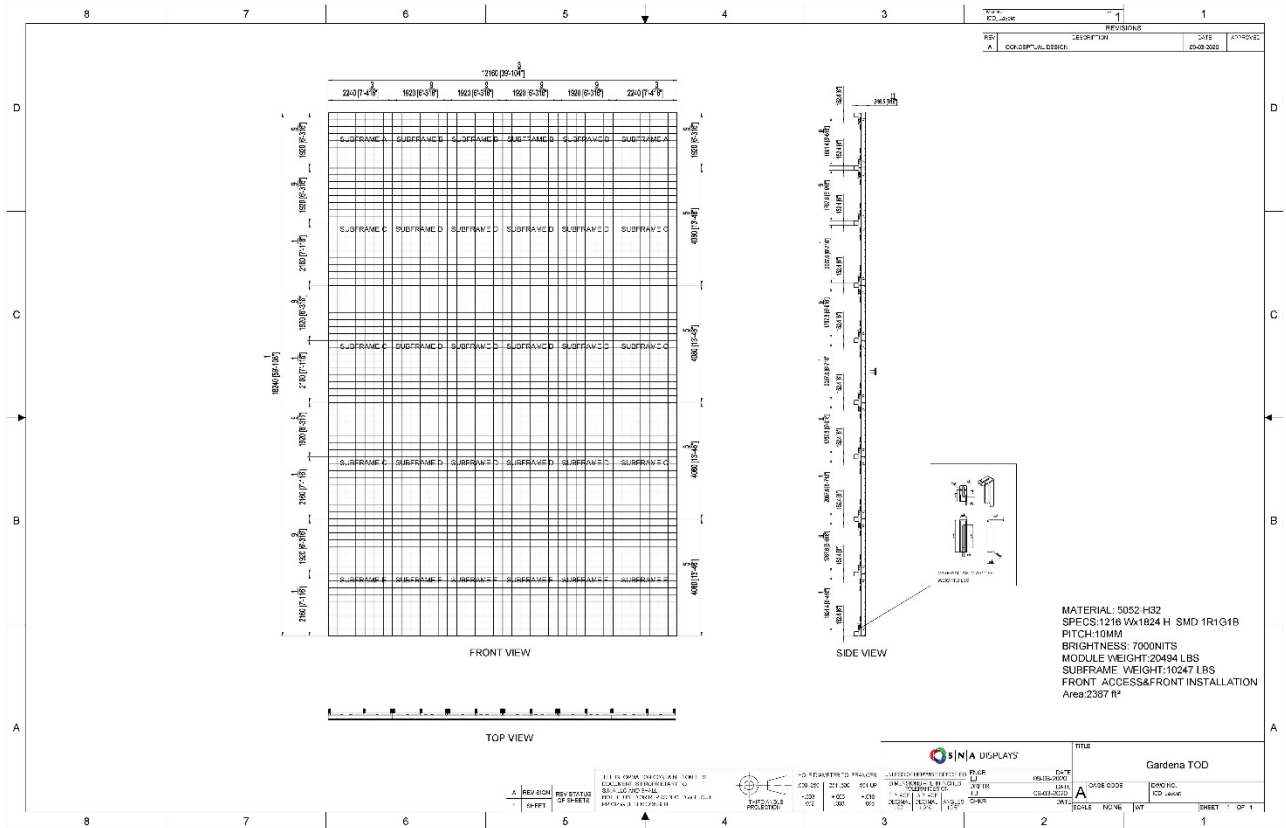
Brightness: The Digital Display shall have a nighttime brightness no greater than 400 candelas per square meter and a daytime brightness no greater than 7,000 candelas per square meter. The displays shall transition smoothly at a consistent rate from the permitted daytime brightness to the permitted nighttime brightness levels, beginning 45 minutes prior to sunset and concluding 20 minutes after sunset, and at all times when the ambient light is less than 100 footcandles.

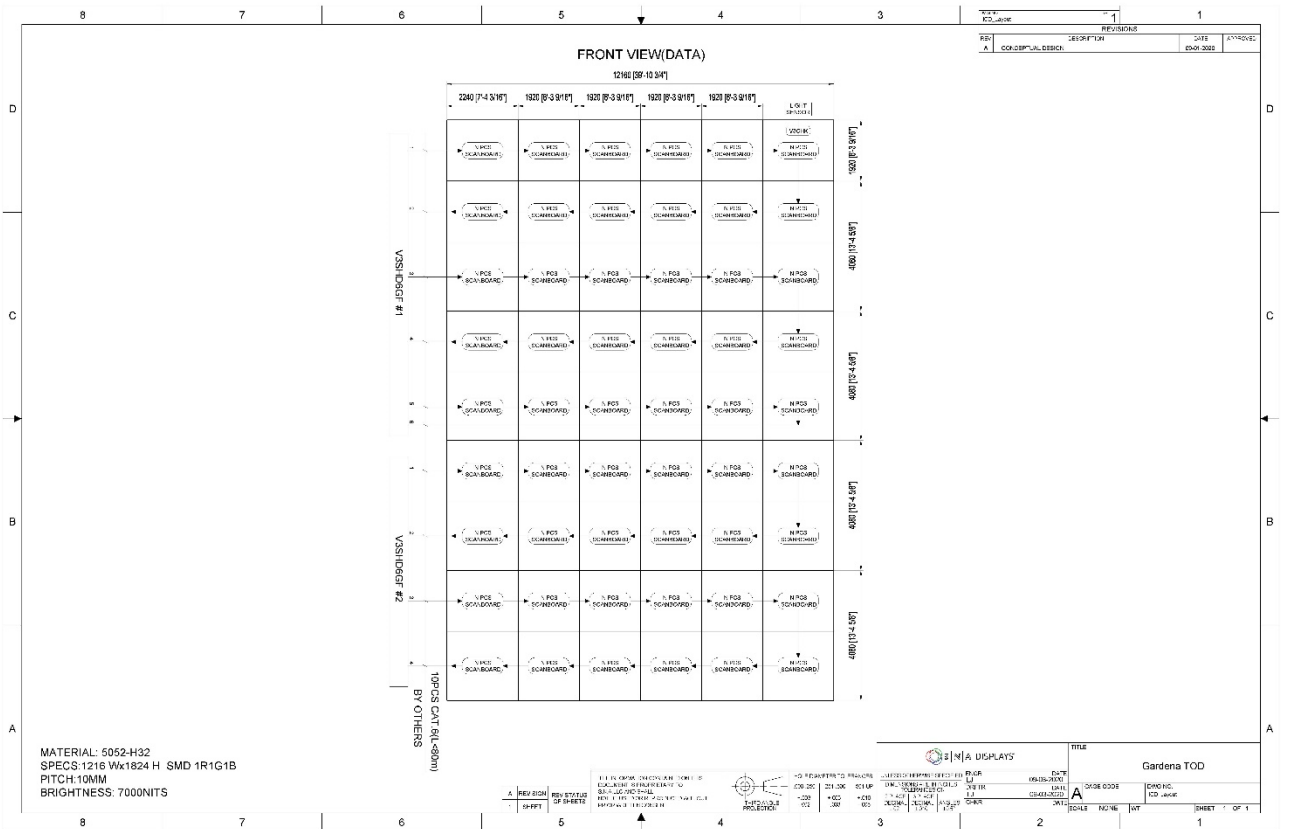
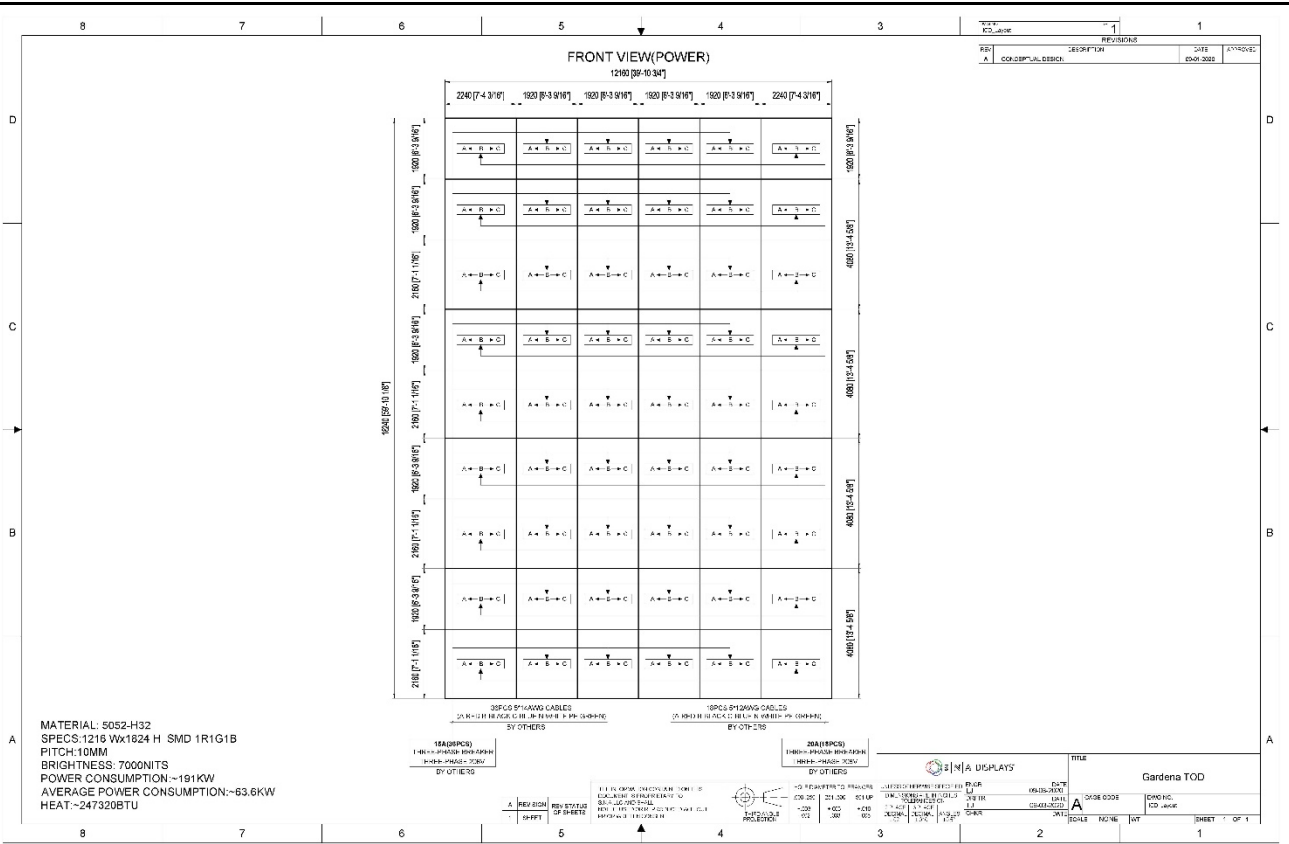
Ground Spillage: When measured at ground level from any residential property other than the property on which the Digital Display is located, the Digital Display shall not under any circumstance increase the total amount of measurable light more than 8 LUX above the ambient-light level that exists when the Digital Display is extinguished.

Interior Spillage: When measured from any location within the building, the Digital Display shall not increase the total amount of measurable light more than 5 LUX above the ambient-light level that exists when the Digital Display is extinguished.

Refresh Rate: The Digital Display will operate under unrestricted refresh rates and shall permit images, videos, animation, parts and/or illumination that flash, change, move, stream, scroll, blink or otherwise incorporate motion to change at an unrestricted rate.

Hours of Operation: The Digital Display may be illuminated between the hours of 6:00 a.m. to 2:00 a.m.





APPENDIX B: CalGreen 2019 Building Energy Efficiency Standards, pages 40,41

ADMINISTRATIVE REGULATIONS FOR THE CALIFORNIA ENERGY COMMISSION (CEC)

- certifying organizations that ensures uniform application of the CRRC testing and rating procedures, labeling and rating, and such other rating procedures for other factors that improves the accuracy of properties of roofing products affecting energy performance as the CRRC and the Commission may adopt.
4. The entity shall require manufacturers and independent certifying organizations within its program to use only laboratories accredited by the supervisory entity to perform tests in accordance with CRRC-1.
 5. The entity shall maintain appropriate guidelines for testing laboratories and manufacturers, including requirements for adequate:
 - A. Possession and calibration of equipment;
 - B. Education, competence, and training of personnel;
 - C. Quality control;
 - D. Record keeping and reporting;
 - E. Periodic review including, but not limited to, blind testing by laboratories; inspections of products; and inspections of laboratories, and manufacturing facilities;
 - F. Challenges to ratings; and
 - G. Guidelines to maintain the integrity of the program, including, but not limited to, provisions to avoid conflicts of interest within the rating process.
 6. The entity shall be a nonprofit organization and shall maintain reasonable, nondiscriminatory fee schedules for the services it provides, and shall make its fee schedules, the financial information on which fees are based, and financial statements available to its members for inspection.
 7. The entity shall provide hearing processes that give laboratories, manufacturers and certifying agencies a fair review of decisions that adversely affect them.
 8. The entity shall maintain a policy committee or similar body whose procedures are designed to avoid conflicts of interest in deciding appeals, resolving disputes and setting policy for the certifying organizations in its program.
 9. The entity shall publish at least annually a directory of rated products and products that are no longer rated by the CRRC.
 10. The entity itself shall be free from conflict-of-interest ties or to undue influence from any particular roofing product manufacturing interest(s), testing or independent certifying organization(s).
 11. The entity shall provide or authorize the use of labels that can be used to meet the requirements for showing compliance with the requirements of Sections 140.1, 140.2, 140.3(a)1, 141.0(b)2B, 150.1(c)11, 150.2(b)1H and 150.2(b)2, and this section.
 12. The entity's rating program shall allow for multiple participants in each aspect of the program to provide

for competition between manufacturers and between testing labs.

Authority: Sections 25402 and 25402.1, Public Resources Code.
Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

10-114. Determination of outdoor lighting zones and administrative rules for use. This section establishes rules for implementing outdoor lighting zones to show compliance with Section 140.7 of Title 24, California Code of Regulations, Part 6.

(a) **Lighting zones.** Exterior lighting allowances in California vary by Lighting Zones (LZ).

(b) **Lighting zone characteristics.** Table 10-114-A specifies the relative ambient illumination level and the statewide default location for each lighting zone.

(c) **Amending the lighting zone designation.** A local jurisdiction may officially adopt changes to the lighting zone designation of an area by following a public process that allows for formal public notification, review and comment about the proposed change. The local jurisdiction may determine areas where Lighting Zone 4 is applicable and may increase or decrease the lighting zones for areas that are in State Default Lighting Zones 1, 2 and 3, as specified in Table 10-114-A.

(d) **Commission notification, amended outdoor lighting zone designation.** Local jurisdictions who adopt changes to the State Default Lighting Zones shall notify the Commission by providing the following materials to the Executive Director:

1. A detailed specification of the boundaries of the adopted lighting zones, consisting of the county name, the city name if any, the zip code(s) of the redesignated areas, and a description of the physical boundaries within each zip code;
2. A description of the public process that was conducted in adopting the lighting zone changes; and
3. An explanation of how the adopted lighting zone changes are consistent with the specifications of Section 10-114.

(e) The Commission shall have the authority to not allow Lighting Zone changes which the Commission finds to be inconsistent with the specifications of Section 10-114.

Authority: Sections 25402 and 25402.1, Public Resources Code.
Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8 and 25943, Public Resources Code.

10-115 – Community shared solar electric generation system or community shared battery storage system compliance option for onsite solar electric generation or battery storage requirements.

(a) **Community shared solar electric generation system or battery storage system offset.** A community shared solar system, other community shared renewable system, community shared battery storage system, or combination of the aforementioned systems (hereinafter referred to as a community shared solar or battery stor-

ADMINISTRATIVE REGULATIONS FOR THE CALIFORNIA ENERGY COMMISSION (CEC)

age system) may be approved by the Commission as a compliance option to partially or totally meet the on-site solar electric generation system and/or battery storage system that is otherwise required by Section 150.1(b)1 of Title 24, California Code of Regulations, Part 6. To be approved, the community shared solar electric generation or community shared battery storage system shall meet the following requirements.

1. **Enforcement agency.** The community shared solar electric generation system and/or community shared battery storage system shall be installed and available for enforcement agency site inspection, no later than the point in time the enforcement agency must physically verify compliance of the building, which would otherwise be required to have an on-site solar electric generation and/or battery storage system, and shall not cause delay in the process of enforcement agency review and approval of that building. The enforcement agency shall have jurisdiction and facilitated access to make site inspections. All documentation for the community solar electric generation system and/or community solar battery storage system that is required to demonstrate compliance for the

building shall be completed prior to building permit application.

2. **Energy performance.** The community shared solar electric generation system and/or community shared battery storage system shall be demonstrated to provide the same or better energy performance equal to the partial or total compliance with the energy performance of the on-site solar electric generation and/or battery storage system that would otherwise have been required for the building, computed by compliance software certified for use by the Commission.
3. **Dedicated building energy savings benefits.** The community shared solar electric generation system and/or community shared battery storage system shall provide energy saving benefits directly to the building that would otherwise have been required to have an on-site solar electric generation system and/or battery storage system. The energy savings benefits shall be allocated from the total resource of the community shared solar electric generation system and/or community shared battery storage system in a manner demonstrated to be equivalent to the reductions in

TABLE 10-114-A
LIGHTING ZONE CHARACTERISTICS AND RULES FOR AMENDMENTS BY LOCAL JURISDICTIONS

ZONE	AMBIENT ILLUMINATION	STATEWIDE DEFAULT LOCATION	MOVING UP TO HIGHER ZONES	MOVING DOWN TO LOWER ZONES
LZ0	Very Low	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves.	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves can be designated as LZ1 or LZ2 if they are contained within such a zone.	Not applicable.
LZ1	Low	Developed portion of government designated parks, recreation areas and wildlife preserves. Those that are wholly contained within a higher lighting zone may be considered by the local government as part of that lighting zone.	Developed portion of a government designated park, recreation area, or wildlife preserve, can be designated as LZ2 or LZ3 if they are contained within such a zone.	Not applicable.
LZ2	Moderate	Rural areas, as defined by the 2000 U.S. Census.	Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction. Examples include special commercial districts or areas with special security considerations located within a rural area.	Special districts and government designated parks within a default LZ2 zone may be designated as LZ1 by the local jurisdiction for lower illumination standards, without any size limits.
LZ3	Moderately High	Urban areas, as defined by the 2000 U.S. Census.	Special districts within a default LZ3 may be designated as LZ4 by local jurisdiction for high-intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.	Special districts and government designated parks within a default LZ3 zone may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.
LZ4	High	None.	Not applicable.	Not applicable.

APPENDIX C: IESNA 10th Edition Lighting Handbook, Table 26.4, Nighttime Outdoor Lighting Zone Definitions

Table 26.4 | Nighttime Outdoor Lighting Zone Definitions

Zone	Outdoor Lighting Situation	Definition
LZ4	High Ambient Lighting	Areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience and it is mostly uniform and/or continuous. After curfew, lighting may be extinguished or reduced in some areas as activity levels decline.
LZ3	Moderately High Ambient Lighting	Areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous. After curfew, lighting may be extinguished or reduced in most areas as activity levels decline.
LZ2	Moderate Ambient Lighting	Areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, lighting may be extinguished or reduced as activity levels decline.
LZ1	Low Ambient Lighting	Areas where lighting might adversely affect flora and fauna or disturb the character of the area. The vision of human residents and users is adapted to low light levels. Lighting may be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, most lighting should be extinguished or reduced as activity levels decline.
LZ0	No Ambient Lighting	Areas where the natural environment will be seriously and adversely affected by lighting. Impacts include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. Human activity is subordinate in importance to nature. The vision of human residents and users is adapted to the darkness, and they expect to see little or no lighting. When not needed, lighting should be extinguished.

APPENDIX D: IESNA 10th Edition Lighting Handbook, Table 26.5, Recommended Light Trespass Illuminance Limits

Table 26.5 | Recommended Light Trespass Illuminance Limits

Lighting Zone	Limit in lux ^a	
	Pre-curfew	Post-curfew
LZ4	15	6
LZ3	8	3
LZ2	3	1
LZ1	1	0
LZ0	0.1	0

a. Maximum initial illuminance on a plane perpendicular to the line of sight to the luminaire(s). Plane located at observer position where light trespass is under review. [7]

APPENDIX E: California Outdoor Advertising Act, CALTRANS Permit Requirements**Outdoor Advertising Permit Requirements**

In order for an outdoor advertising display application to be considered for a permit adjacent to an Interstate or primary highway the following criterion must be met:

1. Display Location

- Must be outside the right of way of any highway.
- Must be outside of any stream, or drainage channel.
- There must be an existing business activity within 1000 feet of proposed display location on either side of the highway.
- Location of property where display is to be placed must be zoned industrial or commercial.
- Must have current property owner consent, in writing, to place the display at desired location.
- Must have written permission (building permit) from the local government having jurisdiction where the display is to be located.
- Location may not be adjacent to a landscaped freeway. (*Requirement notes at bottom of page)
- Location may not be adjacent to a scenic highway. (**Requirement notes at bottom of page)
- If adjacent to a bonus segment (***)Requirement notes at bottom of page) of an Interstate freeway, copy, size, and spacing is more restrictive.

2. Display

- Display must be 500 feet from any other permitted display on same side of any highway that is a freeway.
- Display must be 300 feet from any other permitted display on same side of any primary highway that is not a freeway in an unincorporated area.
- Display must be 100 feet from any other permitted display on same side of any primary highway that is not a freeway and is within the limits of an incorporated city.
- Display must be 500 feet from an interchange; intersection at grade or safety roadside rest if the highway is a freeway and the location is outside the limits of an incorporated city and outside the limits of an urban area.
- An electronic changeable message center display must meet the above spacing requirements and be 1000 feet from another electronic message center display.
- Maximum height for the advertising display area is, 25 feet in height and 60 feet in length, not to exceed an overall maximum of 1200 square feet.

APPENDIX F: Project Sign Light Trespass Illuminance Calculation (fc)

Sign Lighting illuminance data presented below is derived from the lighting illuminance calculations prepared as per the methods described in Section 6.2 above. Illuminance data is presented in the following tables with location coordinates defined relative to the elevation and horizontal distance from lower left, viewing from the Project to the vertical plane where Light Trespass illuminance is under review. Grid data is displayed at ten feet on center, vertical and horizontal.

Table 6: Project Sign Light Trespass Illuminance (fc) at Vertical Plane VPN1- Sign Luminance 400 cd/m²

Vertical Plane VPN1													
HORIZONTAL (ft)		0	10	20	30	40	50	60	70	80	90	100	110
VERTICAL (ft)	75	0.70	0.70	0.70	0.70	0.69	0.69	0.65	0.64	0.64	0.62	0.59	0.58
	65	0.70	0.70	0.70	0.69	0.69	0.68	0.67	0.66	0.64	0.62	0.62	0.58
	55	0.71	0.71	0.70	0.69	0.69	0.68	0.67	0.65	0.64	0.63	0.61	0.58
	45	0.71	0.70	0.71	0.69	0.69	0.68	0.66	0.65	0.64	0.62	0.61	0.57
	35	0.70	0.69	0.69	0.68	0.68	0.67	0.67	0.65	0.63	0.61	0.59	0.57
	25	0.69	0.69	0.69	0.67	0.69	0.67	0.66	0.64	0.62	0.60	0.57	0.56
	15	0.67	0.67	0.68	0.67	0.67	0.66	0.63	0.63	0.60	0.59	0.56	0.54
	5	0.66	0.66	0.67	0.65	0.65	0.64	0.62	0.61	0.59	0.58	0.54	0.53

Table 7: Project Sign Light Trespass Illuminance (fc) at Vertical Plane VPE1, Sign Luminance 400 cd/m²

Vertical Plane VPE1												
HORIZONTAL (ft)		0	10	20	30	40	50	60	70	80	90	100
VERTICAL (ft)	75	0.60	0.55	0.50	0.41	0.33	0.23	0.13	0.08	0.08	0.07	0.06
	65	0.61	0.56	0.50	0.42	0.33	0.23	0.12	0.07	0.07	0.06	0.05
	55	0.61	0.56	0.50	0.41	0.32	0.22	0.11	0.06	0.06	0.05	0.05
	45	0.60	0.56	0.49	0.41	0.32	0.21	0.10	0.05	0.05	0.05	0.04
	35	0.58	0.53	0.47	0.39	0.30	0.20	0.09	0.04	0.04	0.04	0.03
	25	0.57	0.52	0.46	0.38	0.29	0.19	0.08	0.03	0.03	0.03	0.02
	15	0.55	0.50	0.44	0.36	0.27	0.17	0.07	0.02	0.02	0.02	0.02
	5	0.52	0.48	0.41	0.34	0.25	0.16	0.06	0.01	0.01	0.01	0.01

HORIZONTAL (ft)		110	120	130	140	150	160	170	180	190	200	210
VERTICAL (ft)	75	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00
	65	0.04	0.03	0.03	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
	55	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00
	45	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
	35	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	25	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HORIZONTAL (ft)		220	230	240	250	260	270	280	290	300	310	320
VERTICAL	75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HORIZONTAL (ft)		330	340	350	360	370	380	390	400	410	420	430
VERTICAL	75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HORIZONTAL (ft)		440	450	460	470	480	490	500	510	520	530	540	550	560	570
VERTICAL	75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00