Appendix B
Lighting Report

Harvard-Westlake River Park Project
Studio City, CA

Lighting

Technical Report

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DESIGNING LIGHT

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1. Introduction

This Lighting Technical Report (Report) evaluates the potential lighting impacts created by the Harvard-Westlake River Park Project (Project) which involves the redevelopment of the 16.1-acre (701,428 square foot) Weddington Golf & Tennis site (Property), and an adjacent 1.1-acre (47,916 square foot) portion of property along the Los Angeles River leased from Los Angeles County (Leased Property), collectively comprising 17.2-acres (749,344 square foot) (Project Site), for use as an athletic and recreational facility for the Harvard-Westlake School (School) and for shared public use. The Project would remove the existing golf course and tennis facility to develop two athletic fields with bleacher seating, a six-lane running track surrounding one of the aforementioned fields, an 80,249-square-foot, two-story multi-purpose gymnasium with a maximum height of 30 feet, a 52-meter swimming pool with seating, eight tennis courts with seating, one level of below-grade parking and a surface parking lot. The Project would include ancillary field buildings, a pool house, security kiosks, exterior light poles, fencing, and retention of the existing clubhouse structure, putting green, and golf ball-shaped light standards. The Project would remove 240 of the existing 345 trees and plant 393 new trees. The Project would include a 1 million-gallon stormwater capture and reuse system for water conservation and treatment purposes. The Project would also provide approximately 5.4 acres (235,224 square feet) of publicly-accessible open space and landscaped trails connecting to the adjacent Zev Yaroslavsky Los Angeles River Greenway (Zev Greenway) and would provide on-site landscaped areas, water features, and recreational facilities. The Project involves off-site improvements to the Valleyheart Drive public right-of-way, portions of the Zev Greenway adjacent to the Project Site, and an ADA compliant ramp to provide a pedestrian connection between the Zev Greenway and Coldwater Canyon Avenue northwest of the Project Site. Project development would require excavation and grading of the Project Site to a maximum depth of approximately 21 feet below grade and a net cut/fill volume of approximately 250,000 cubic yards.

The Project is located between Bellaire Avenue to the west, Valley Spring Lane to the north, the Los Angeles River and Valleyheart Drive to the south, Whitsett Avenue to the east, and Los Angeles Fire Department (LAFD) Fire Station 78 to the southeast in Studio City, California. This Report describes the existing environmental setting, identifies the applicable ordinances, regulations, and statutes, and evaluates potential lighting impacts on adjacent light sensitive receptors based on the applicable ordinances, regulations, and statutes. Light sensitive receptors include any space and/or use in which a user would be adversely affected by a significant increase in lighting levels. Such spaces include residential units or facilities where users may reside temporarily like hotels and nursing facilities.

2. Project Location

The Project Site is located at 4141 Whitsett Avenue, just to the north of the Los Angeles River, in the Studio City community, which is within the Sherman Oaks–Studio City–Toluca Lake–Cahuenga Pass Community Plan Area of the City of Los Angeles (City). The Project Site (collectively including the Property and Leased Property) is generally bounded by Bellaire Avenue to the west, Valley Spring Lane to the north, the Los Angeles River and Valleyheart Drive to the south, Whitsett Avenue to the east, and LAFD Fire Station 78 to the southeast. The Project Site is adjacent and connecting to the Zev Greenway that runs along the north side of the river for ½ mile, including along the southern border of the Project Site (see **Figure 1** – *Project Development Area Map*).

Figure 1- Project Development Area Map

3. Project Description

Harvard-Westlake School (School) is proposing to repurpose a site currently occupied by a nine-hole, 27-par golf course and tennis facility, for use as an athletic and recreational facility for its students and employees. The Project would also provide for access and recreational use by the public.

The Project would include two athletic fields, with Field A located in proximity to Whitsett Avenue in the southeast sector of the Project Site, and Field B, located in proximity to Valley Spring Lane and Bellaire Avenue, in the west sector of the Project Site. Field houses for maintenance and storage are proposed at each field.

The Project would include an 80,249-square-foot multi-purpose gymnasium, located in the south sector of the Project Site; a 52-meter swimming pool with 2,200-square-feet of locker and meeting room space in the north-central sector of the Project Site; and, eight tennis courts with seating located to the east of the pool area. Other new development would include a security kiosk to the south of the tennis courts, and a below-grade parking structure in the eastern sector of the Project Site with 503 automobile parking spaces and a second security kiosk. Access to the parking structure would be via a two-way driveway on Whitsett Avenue. A second driveway to access the parking structure would be via a drop-off and roundabout from Valleyheart Drive at the southeast corner of the Project Site, where a third security kiosk would be located. This vehicle entrance area would also accommodate 29 surface parking spaces.

The original, on-site Weddington Golf & Tennis facility clubhouse, including its café, which are located on the northeastern portion of the Project Site, would remain as part of the Project. An existing putting green to the northeast of the clubhouse, six existing golf ball-shaped light standards, and the low brick retaining wall along the northeast edge of the Property would also remain.

It is anticipated that School-related practices and game competition would occur in the afternoons and early evenings, with approximately 5.4 acres (235,224 square feet) of proposed water features, benches, wooded areas and natural spaces open and available to the public from 7:00 a.m. to 9:00 p.m., seven days a week. Landscaped, publicly-accessible trails, which would circumnavigate the Project Site, would allow dog walking, recreation, relaxation, and observation of the natural setting and biodiversity around the Project Site. A trail would connect to the existing Zev Greenway and a trail through the center of the Project Site starting at Whitsett Avenue would lead from the street to the tennis courts. Off-site from the Project, the Project would also provide improvements to the segment of Valleyheart Drive south of LAFD Fire Station 78, to portions of the Zev Greenway adjacent to the Project Site, and would install an Americans with Disabilities Act (ADA) compliant accessible offsite pedestrian ramp leading to the Zev Greenway at Coldwater Canyon Avenue.

Lighting and Signage

The Project would provide lighting for outdoor athletic events and activities during the evening hours and pedestrian scale lighting along pathways 16-feet or less in height, around the proposed gymnasium building, in the surface parking area, and in entrance areas for security and wayfinding purposes. The gymnasium will also feature architectural exterior lighting and the glass of the façade will be internally illuminated from the interior lighting. In addition, lighting to accent signage and landscaping elements would be installed throughout the Project Site. Locations of field lights for athletic activities and signs are illustrated in **Figure** 2 - *Light and Signage Plan for the Project*. Field lights shown in Figure 2 would utilize Light Emitting Diode (LED) technology, timer controls, and shields directed only to the use intended to be illuminated to prevent spillover and glare and, as

with all other exterior lighting, would be designed to comply with Los Angeles Municipal Code (LAMC) and the River Improvement Overlay District (RIO) requirements. As required by LAMC Section 93.0117(b), exterior light sources and building materials would be designed such that they would not cause more than two footcandles of lighting intensity or generate direct glare onto nearby sensitive uses (i.e., residential uses). The RIO Overlay Ordinance, set forth under LAMC Section 13.17.F.3(a), requires that all exterior lights be designed to not exceed a maximum initial illuminance value of 0.20 horizontal and vertical footcandles at the site boundary, and not exceed 0.01 horizontal footcandles 15 feet beyond the Project boundary.

As shown in Figure 2, Field A would utilize three 70-foot-tall field light poles along the east sideline and three, 70-foot-tall field light poles along the west sideline. A 25'x 8' LED scoreboard (that will not include a display video), reaching a maximum height of 18 feet when combined with approximately 10-foot support poles and 3-foot lettering and donor signage, would be installed along the south edge of the field. Field B would utilize three, 60-70-foot-tall field light poles along the south sideline; three, 80-foot-tall field light poles along the north sideline; and a single 60-foot-tall field light pole along the east edge of the field. The same type of scoreboard as used for Field A would be installed along the west edge of Field B (this scoreboard will also not include a display video). The LED scoreboards would comply with LAMC Section 14.4.4 requirements which limit light intensity from signage to no more than three footcandles above ambient lighting at residential property boundaries.

Lighting in the pool area would include two, 60-foot-tall sports light fixtures, one of which would be installed on the southeast side of the pool and one of which would be installed on the southwest side of the pool, and twelve pool lights would be mounted within the proposed canopy, under the northeast and northwest sides of the canopy and ranging in height from 21 feet to 28 feet. Lighting for the tennis courts would include three, new 40-foot-tall court lights along each of the four edges of the courts, for a total of 12 light poles. The six existing golf ball-shaped light standards between the existing Weddington Golf & Tennis facility, parking lot and the driving range would be relocated to the west and southwest sides of the clubhouse. The golf ball-shaped light standards would be retrofitted from driving range floodlights into pedestrian area lights using new LED sources with glare control (redirection) and reduction from 1,000 watts to less than 50 watts per fixture. The Project Site would include a total of 45 light poles, including the six relocated golf ball-shaped light standards. Of the 45 light poles, 33 would exceed the 30-foot maximum height applicable to the Project Site, per the Property's zoning.

With the exception of the proposed welcome sign at the vehicle entrance on Whitsett Avenue, other entrance and identification signs for the Project would not be illuminated. All proposed signage would be designed in conformance with applicable LAMC requirements.

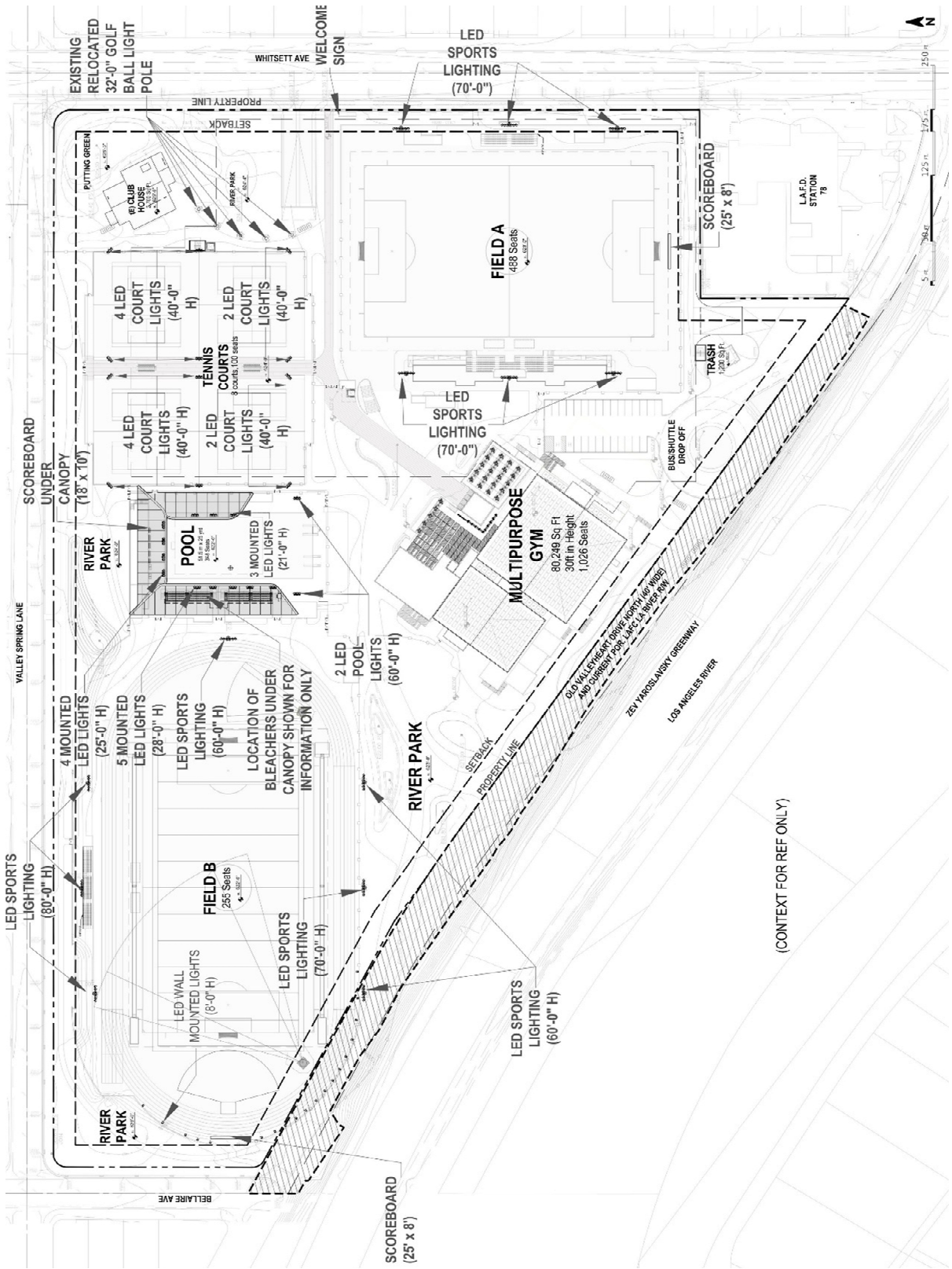


Figure 2 - Lighting and Signage Plan for the Project

4. Environmental Setting

Project Adjacent Existing Conditions

The Project Site is adjacent to residential neighborhoods to the north, east, and west. These include multi-family neighborhoods in the R3 zone along the east side of Whitsett Avenue directly east of the Project Site and along both the east and west sides of Whitsett Avenue to the north of Valley Spring Lane. Single-family residential neighborhoods in the R1 zone are located to the north of Valley Spring Lane. Along the north side of Valley Spring Lane, single-family homes are oriented along (facing) the streets intersecting with Valley Spring Lane, including Babcock Avenue, Beeman Avenue, Teesdale Avenue, and Bellaire Avenue, and therefore do not directly face the Project Site along Valley Spring Lane (though the Project Site may be visible from certain vantages). Two single-family homes in the R1 zone are located to the west of the Project Site on Bellaire Avenue, in which the residences face Bellaire Avenue and the Project Site. The surrounding residential neighborhoods are developed, with residential neighborhoods continuing north to the nearest commercial uses to the north along Moorpark Avenue, approximately 0.25 miles north of the Project Site. Adjoining the southeast corner of the Project Site, LAFD Fire Station 78 is located at the west side of Whitsett Avenue, where Whitsett Avenue and Valleyheart Drive intersect.

To the south, the Project Site adjoins the Zev Greenway, the longest river greenway in the San Fernando Valley, which follows the north side of the Los Angeles River for approximately 0.5 miles between Whitsett Avenue on the east and Coldwater Canyon Avenue on the west. It is also part of the Los Angeles River Greenway, which connects various communities along the river edge, including Los Feliz, Silver Lake, Elysian Valley, and Downtown Los Angeles. The Los Angeles River Greenway trail is a publicly accessible paved/unpaved trail for pedestrians and bicyclists. There is an entry gate to the Zev Greenway south of Valleyheart Drive near the southeast corner of the Project Site.

The channelized Los Angeles River is located to the south of the Zev Greenway. The area along the south edge of the river is improved with a bicycle path. Commercial uses in the C1.5-IVL-RIO zone are located to the south of the river and oriented to (facing) Ventura Boulevard, approximately 0.1 miles south of the Project Site. The C1.5 zone (Limited Commercial) allows retail, theater, hotel, parks, playgrounds, and medium density multi-family residences. The Project vicinity is highly urbanized and generally built out. The north side of Ventura Boulevard directly to the south of the Project Site is developed with retail uses. These uses are served by large surface parking lots, including parking areas between the commercial buildings and the Los Angeles River. Retail and office uses are also located along the south side of Ventura Boulevard and, because Ventura Boulevard is located at the edge of the rising Santa Monica Mountains, residential neighborhoods in the hillside areas begin immediately to the south of this commercial strip.

The immediate area surrounding the Project Site is not subject to the same high levels of nighttime illumination as found within busy commercial areas nearby, however, there is ample existing lighting. Street lighting and residential building lighting comprises most of the lighting sources on the immediate bounding streets. Vehicle headlights and illuminated signage also contribute to the nighttime lighting conditions and environment. Street lighting was found to be comprised of primarily high-pressure sodium cobra-head style poles, though some areas have been updated with LED fixtures of a similar style. The street lighting fixtures illuminated the streets but also provided enough lighting on the adjacent sidewalks to be adequately traveled.

The Ventura Boulevard corridor to the south of the Project Site and beyond the Los Angeles River is highly activated at night. The Boulevard is heavily trafficked with vehicles using the road to access the many commercial uses or to traverse across the area along the busy connector. Ventura Boulevard is heavily lined with retail stores, a wide variety of restaurants, as well as other commercial uses. These building uses feature high levels of illumination from signage, building lighting, internal and external functional and display lighting, and occasionally parking lot lighting. This all contributes to a high level of nighttime illumination along the corridor.

As most of the Project Site's neighboring properties to the north, east and west are residential uses, they are considered sensitive receptors to glare and lighting trespass from new development, as outlined in the LAMC. For the purpose of this Report, six locations have been evaluated for lighting and glare impacts relative to the existing and new conditions (**Figure 3** – *Site Map and Nearby Sensitive Receptors*). These locations have been selected as their proximity and views makes them the likeliest to be affected by any increase in lighting levels from the Project Site. To the south of the Project is the Los Angeles River which is subject to a separate set of design guidelines (i.e., the RIO District Ordinance), however, the river and trail are not a sensitive receptor for nighttime illumination as they are not permitted for use after sunset. In addition to these locations, six other locations along Valley Spring Lane and Whitsett Avenue were included in the lighting analysis. While these locations are less likely to be affected by lighting levels from the Project Site, they were included to present a broad picture of the surrounding neighborhood based on public feedback during the Project's Scoping period.

Survey of Existing Conditions

On October 1, 2020 at 7:40 PM, a Project Site visit was conducted to gather data on the relative brightness of the existing lighting fixtures on the Property as well as document the surrounding conditions, including the balance of the Project Site and adjacent neighborhoods. The weather was clear, and the sun set at 6:37 PM.

The existing tennis court lighting is provided by eight 500-watt induction floodlights per court for a total of 128 fixtures. The existing 16 tennis courts are currently the brightest sources of light within the Project Site relative to the neighboring sites. The Neptune Light floodlight these courts utilize (cutsheet found in Appendix 2) has an adjustable knuckle at the top of the pole to allow fixtures to tilt up and cast lighting across the court instead of only directly below the fixture. The existing fixtures were tilted up from level an estimated 30-degrees to illuminate the courts more evenly. This upward tilt, however, makes the light source more visible from surrounding viewpoints which creates measurable glare as documented below in the findings.

The driving range at the Weddington Golf & Tennis facility is currently illuminated with six oversized golf ball-shaped light standards that each have five 1000-watt floodlights integrated into the golf ball-shaped head. There are four additional floodlights mounted to the north end of the driving range canopy bringing the total number of lamps to 34. These flood lights are all aimed at 90-degrees from the ground so that the lighting is cast horizontally down the range at night toward the west and Bellaire Avenue. The floodlights feature a conical reflector to direct the light from each lamp onto the range, but no additional control features are used to reduce the glare or uplight. The underside of the canopy has fluorescent striplights to provide illumination for golfers at the driving range stalls.

The existing parking lot has been upgraded from 400-watt metal halide fixtures to a pair of low wattage LED fixtures at each of the five locations along Whitsett Avenue. The LED fixtures have some optical control to provide illumination for the parking lot with minimal spill, and the fixtures are parallel to the ground, so off-site glare is nearly nonexistent.

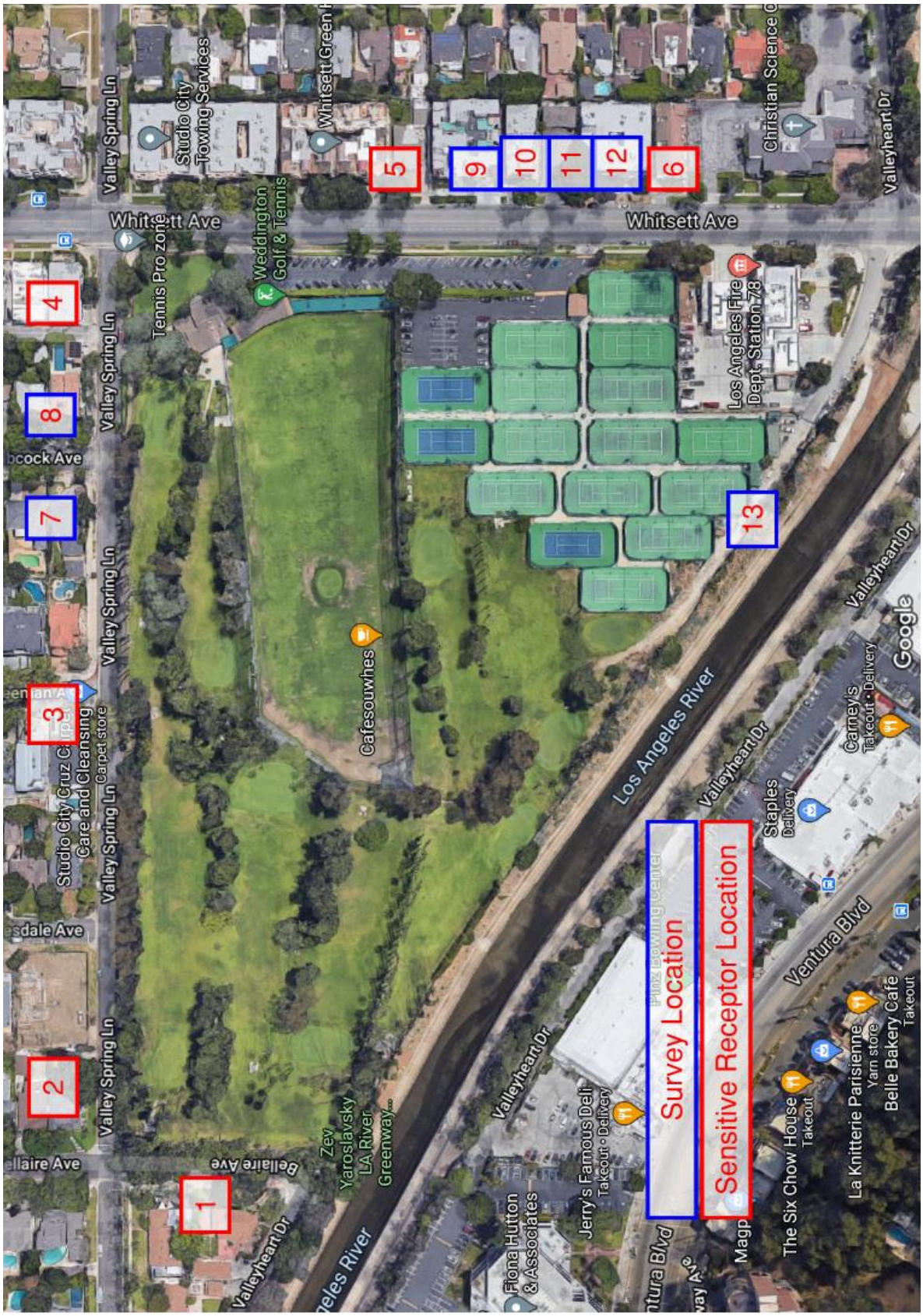


Figure 3 - Site Map and Nearby Sensitive Receptors

At the Clubhouse there are four wall sconces at building entries as well as eight aimable floodlights that are used to illuminate walks or service entries. Adjacent to the clubhouse is the putting green which also has two low level aimable floodlights to illuminate the turf. These fixtures all use incandescent sockets and traditional light sources, though some may have been upgraded to LED. Most of the aimable fixtures were aimed near 90-degree from straight down (i.e., horizontally) to cast light further out which results in noticeable glare both on- and off-site.

The Zev Greenway does not have dedicated lighting for nighttime use and is gated for closure after dusk. The Zev Greenway does have views to lighting emanating from the Project Site and receives filtered light through the trees between the trail and the existing Weddington Golf & Tennis facility.

The existing conditions were surveyed from many locations surrounding the Project Site to gather a Project baseline and document high luminance (i.e., glare) affected areas. As described earlier, 13 different locations were identified to create a broad picture of the existing conditions on the Project Site. These locations include the six sensitive receptors shown in Figure 3 as well as several additional locations that had good views of the Project Site. All survey locations have been documented in **Figure 4** – *Existing Conditions Map and Light Measurement Locations* and the readings are shown in **Table 1** – *Measured Existing Luminance*. All the measurements were taken after the sun had set in conformity with standard practice and regulations, and the twilight period following sunset had ended, eliminating the chance of additional sky glow affecting the readings. The measurements were taken using a Minolta luminance meter, which measures candelas/square meter (cd/m^2), and from the viewpoint of a pedestrian at ground level to the nearest light fixture on the Project Site.

Measured Existing Luminance				
Receptor (* = Sensitive)	**Location**	**Luminance (cd/m^2)**	**Light Source**	**Measurement Taken From**
1*	4155 Bellaire Ave.	550	Driving Range Floodlights	Pedestrian Entry
2*	4202 Bellaire Ave.	0	Obstructed by Trees	Edge of Property
3*	4202 Beeman Ave.	230	Driving Range Floodlights	Pedestrian Entry
		30	Tennis Court Lights	Side Pedestrian Entry
4*	12501-12509 Valley Spring Ln.	720	Clubhouse Floodlights	Pedestrian Entry
5*	4122 Whitsett Ave.	1500	Tennis Court Lights	Pedestrian Entry
6*	4068 Whitsett Ave.	950	Tennis Court Lights	Pedestrian Entry
		3500	Tennis Court Lights	Garage Entry
7	4203 Babcock Ave.	900	Driving Range Floodlights	Side Pedestrian Entry
8	4202 Babcock Ave.	3200	Putting Green Floodlights	Side Pedestrian Entry
9	4110 Whitsett Ave.	2500	Tennis Court Lights	Underground Parking Entry
10	4108 Whitsett Ave.	2350	Tennis Court Lights	Pedestrian Entry
11	4104 Whitsett Ave.	2400	Tennis Court Lights	Pedestrian Entry
12	4100 Whitsett Ave.	3700	Tennis Court Lights	Underground Parking Entry
		3800	Tennis Court Lights	Leasing Office Entry
13	Zev Greenway L.A. River	4375	Tennis Court Lights	Nearest Greenway Location

Table 1 - Measured Existing Luminance

The highest single value was recorded on the Zev Greenway at the Los Angeles River. This location had the nearest proximity to the tennis court lights, but also a lower elevation, providing a very direct view into the lighting fixtures. The distance and clear view returned the highest luminance values of any location surveyed.

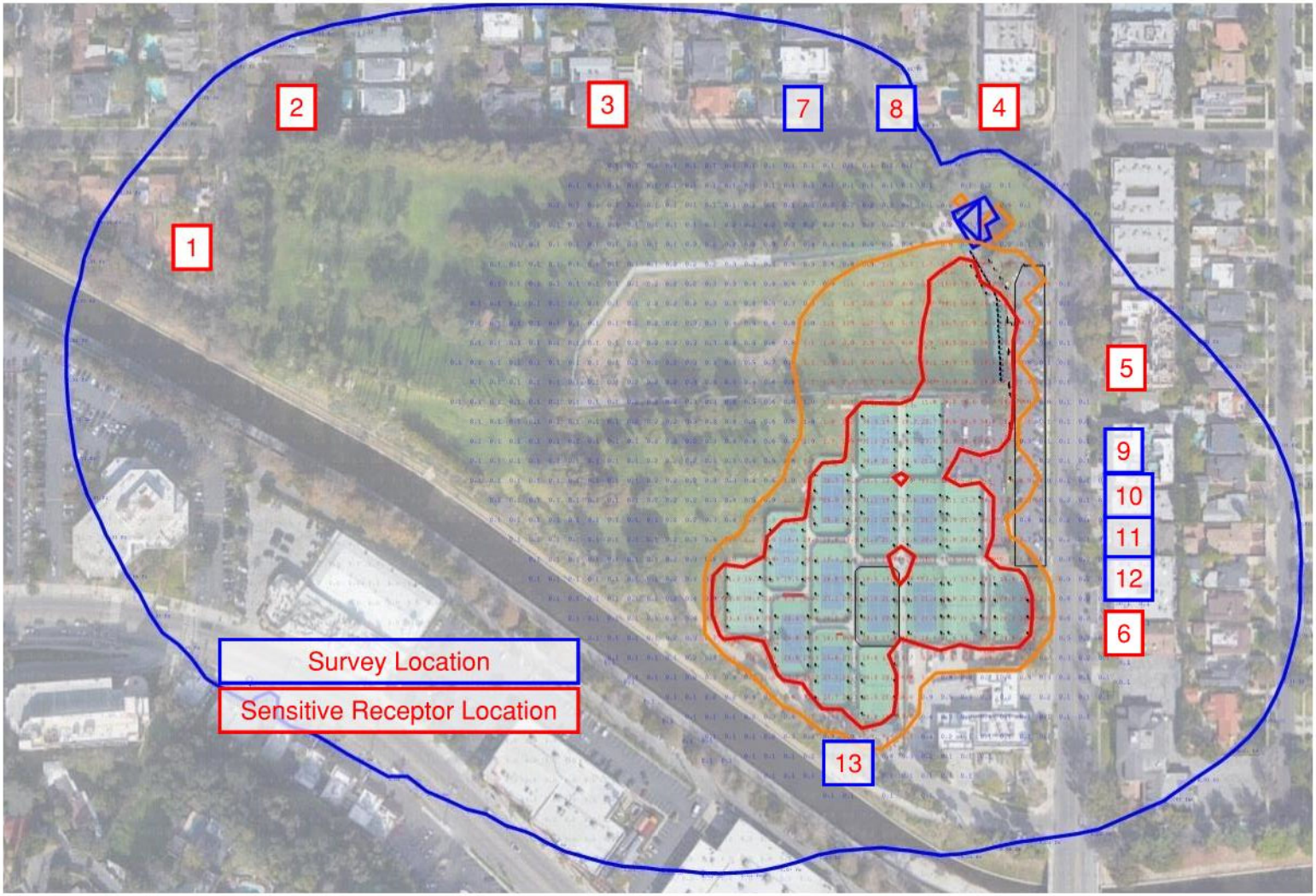
Figure 4 - Existing Conditions Map and Light Measurement Locations

Reference Approximate Luminance Values of common sources in cd/m^2:

Lightning flash	68,000,000,000	Cloud (sunny day)	35,000
Sun	1,600,000,000	Fluorescent lamp	12,000-14,000
Arc lamp	150,000,000	White illuminated cloud	10,000
Metal halide lamp	5,300,000	60 watt soft-white bulb	10,000
Clear incandescent lamp	2,000,000	Convenience store sign	150
Frosted incandescent lamp	50,000-400,000	Candle	7.5
Maximum visual tolerance	50,000	Moon	2.5

The existing lighting fixtures were also surveyed for quantity, wattage, and fixture type to create a photometric calculation simulation of the existing conditions. Using the lighting fixture data collected from the facility, a calculation model was created to best approximate the conditions and allow for off-site lighting effects to be demonstrated graphically to support the on-site reading taken during the survey. Figure 5 – Existing Off-Site Illuminance demonstrates the illuminance impacts that the existing Weddington Golf & Tennis facility lighting creates on the surrounding areas. The blue isoline represents the extent of measurable lighting that is produced by lighting sources on the existing Project Site. As demonstrated, the existing lighting extends well beyond the Project Site boundary into the neighboring sites. This simulation does not account for landscape, changes in elevation, intervening structures, or geography of the Project Site that might reduce lighting views to some areas. While conservative in nature, this methodology was selected since it matches the study methodology of the Project's proposed lighting, which will be discussed later in this Report.

Figure 5 – Existing Off-Site Illuminance



SCALE: 1" = 200'-0"

ISOLINE COLOR LEGEND

BLUE - 0 FOOTCANDLES

ORANGE - 1 FOOTCANDLES

RED - 10 FOOTCANDLES

HARVARD-WESTLAKE EXISTING SITE
PHOTOMETRICS - ILLUMINANCE

5. Existing Regulatory Framework

Los Angeles Municipal Code

SECTION 14.4.4 E

No sign shall be illuminated in such a manner as to produce a light intensity of greater than three footcandles above ambient lighting, as measured at the property line of the nearest residentially zoned property.

SECTION 93.0117

No exterior light source may cause more than two footcandles of lighting intensity or generate direct glare onto exterior glazed windows or glass doors; elevated habitable porch, deck, or balcony; or any ground surface intended for uses such as recreation, barbecue or lawn areas or any other property containing a residential unit or units.

SECTION 13.17.F.3 (Specific to River Improvement Overlay District/Zev Greenway)

(a) All site and building mounted lighting shall be designed such that it produces a maximum initial luminance value no greater than 0.20 horizontal and vertical footcandles at the site boundary, and no greater than 0.01 horizontal footcandles 15 feet beyond the site. No more than 5.0 percent of the total initial designed lumens shall be emitted at an angle of 90 degrees or higher from nadir (straight down).

(b) All low pressure sodium, high pressure sodium, metal halide, fluorescent, quartz, incandescent greater than 60 watts, mercury vapor, and halogen fixtures shall be fully shielded in such a manner as to not exceed the limitation of Subdivision 3(a) above.

California Code of Regulations, Title 24, Part 6 – California Energy Code

Refer to full code sections for all exceptions not listed below or not applicable to the Project.

SECTION 130.2 – OUTDOOR LIGHTING CONTROLS AND EQUIPMENT

Nonresidential, high-rise residential and hotel/motel buildings shall comply with the applicable requirements of Sections 130.2(a) through 130.2(c).

(a) RESERVED

(b) Luminaire Cutoff Requirements.

All outdoor luminaires of 6,200 initial luminaire lumens or greater shall comply with Backlight, Uplight, and Glare (collectively referred to as "BUG" in accordance with IES TM-15-11, Addendum A) requirements as follows:

1. Maximum zonal lumens for Backlight, Uplight, and Glare shall be in accordance with Title 24, Part 11, Section 5.106.8. (See below for IES TM-15-11)

(c) Controls for Outdoor Lighting.

Outdoor lighting shall be independently controlled from other electrical loads, and the controls for outdoor lighting shall meet the following functional requirements:

1. Daylight Availability. All installed outdoor lighting shall be controlled by a photo control, astronomical time-switch control, or other control capable of automatically shutting OFF the outdoor lighting when daylight is available.

2. Automatic Scheduling Controls.

    a. Automatic scheduling controls shall be capable of reducing the outdoor lighting power by at least 50 percent and no more than 90 percent, and separately capable of turning the lighting OFF, during scheduled unoccupied periods.

    b. Automatic scheduling controls shall allow scheduling of a minimum of two nighttime periods with independent lighting levels, and may include an override function that turns lighting ON during its scheduled dim or OFF state for no more than two hours when an override is initiated.

    c. Acceptance tests of outdoor lighting controls shall verify the scheduled occupied and unoccupied periods, as specified in Section 130.4(a)6.

    d. Automatic scheduling controls shall be installed for all outdoor lighting, and may be installed in combination with motion sensing controls or other outdoor lighting controls.

3. Motion Sensing Controls.

    a. Motion sensing controls shall be capable of reducing the outdoor lighting power of each controlled luminaire by at least 50 percent and no more than 90 percent, and separately capable of turning the luminaire OFF, during unoccupied periods.

    b. Motion sensing controls shall be capable of reducing the lighting to its dim or OFF state no longer than 15 minutes after the area has been vacated, and of returning the lighting to its ON state when the area becomes occupied.

    c. No more than 1,500 watts of lighting power shall be controlled by a single sensor.

    d. Motion sensing controls shall be installed for the following luminaires, and may be installed for other outdoor lighting and in combination with other outdoor lighting controls:

        i. Outdoor luminaires other than Building Façade, Ornamental Hardscape, Outdoor Dining, or Outdoor Sales Frontage lighting, where the bottom of luminaire is mounted 24 feet or less above grade; and,

        ii. Outdoor wall mounted luminaires installed for Building Façade, Ornamental Hardscape or Outdoor Dining lighting that have a bilaterally symmetric distribution as described in the IES Handbook (typically referred to as “wall packs”) mounted 24 feet above grade or lower.

SECTION 130.3 – SIGN LIGHTING CONTROLS

Nonresidential, high-rise residential and hotel/motel buildings shall comply with the applicable requirements of Section 130.3(a)1 through 130.3(a)3.

1) Controls for Sign Lighting. All sign lighting shall meet the requirements below as applicable:

   a) Indoor Signs. All indoor sign lighting shall be controlled with an automatic time-switch control or astronomical time-switch control.

   b) Outdoor Signs. Outdoor sign lighting shall meet the following requirements as applicable:

      i) All outdoor sign lighting shall be controlled with a photocontrol in addition to an automatic time-switch control, or an astronomical time-switch control.

      ii) All outdoor sign lighting that is ON both day and night shall be controlled with a dimmer that provides the ability to automatically reduce sign lighting power by a minimum of 65 percent during nighttime hours. Signs that are illuminated at night and for more than 1 hour during daylight hours shall be considered ON both day and night.

2) Demand Responsive Electronic Message Center Control. An Electronic Message Center (EMC) having a new connected lighting power load greater than 15 kW shall have a control installed that is capable of reducing the lighting power by a minimum of 30 percent when receiving a demand response signal.

SECTION 140.7 – PRESCRIPTIVE REQUIREMENTS FOR OUTDOOR LIGHTING

a) An outdoor lighting installation complies with this section if it meets the requirements in Subsections (b) and (c), and the actual outdoor lighting power installed is no greater than the allowed outdoor lighting power calculated under Subsection (d). The allowed outdoor lighting shall be calculated according to Outdoor Lighting Zone in Title 24, Part 1, Section 10-114.

   EXCEPTIONS to Section 140.7(a): When more than 50 percent of the light from a luminaire falls within one or more of the following applications, the lighting power for that luminaire shall be exempt from Section 140.7

   1. Temporary outdoor lighting.

   2. Lighting required and regulated by the Federal Aviation Administration, and the Coast Guard.

   3. Lighting for public streets, roadways, highways and traffic signage lighting, including lighting for driveway entrances occurring in the public right-of-way.

   4. Lighting for sports and athletic fields, and children’s playgrounds.

   5. Lighting for industrial sites, including but not limited to, rail yards, maritime shipyards and docks, piers and marinas, chemical and petroleum processing plants, and aviation facilities.

   6. Lighting of public monuments.

7. Lighting of signs complying with the requirements of Sections 130.3 and 140.8.

8. Lighting of tunnels, bridges, stairs, wheelchair elevator lifts for American with Disabilities Act (ADA) compliance, and ramps that are other than parking garage ramps.

9. Landscape lighting.

10. In theme parks: outdoor lighting only for themes and special effects.

11. Lighting for outdoor theatrical and other outdoor live performances, provided that these lighting systems are additions to area lighting systems and are controlled by a multiscene or theatrical cross-fade control station accessible only to authorized operators.

12. Outdoor lighting systems for qualified historic buildings, as defined in the California Historic Building Code (Title 24, Part 8), if they consist solely of historic lighting components or replicas of historic lighting components. If lighting systems for qualified historic buildings contain some historic lighting components or replicas of historic components, combined with other lighting components, only those historic or historic replica components are exempt. All other outdoor lighting systems for qualified historic buildings shall comply with Section 140.7.

b) Outdoor Lighting Power Trade-offs. Outdoor lighting power trade-offs shall be determined as follows:

1. Allowed lighting power determined according to Section 140.7(d)1 for general hardscape lighting allowance may be traded to specific applications in Section 140.7(d)2, provided the hardscape area from which the lighting power is traded continues to be illuminated in accordance with Section 140.7(d)1A.

2. Allowed lighting power determined according to Section 140.7(d)2 for additional lighting power allowances for specific applications shall not be traded between specific applications, or to hardscape lighting in Section 140.7(d)1.

3. Trading of lighting power allowances between outdoor and indoor areas shall not be permitted.

c) Calculation of Actual Lighting Power. The wattage of outdoor luminaires shall be determined in accordance with Section 130.0(c).

d) Calculation of Allowed Lighting Power. The allowed lighting power shall be the combined total of the sum of the general hardscape lighting allowance determined in accordance with Section 140.7(d)1, and the sum of the additional lighting power allowance for specific applications determined in accordance with Section 140.7(d)2.

1. General Hardscape Lighting Allowance. Determine the general hardscape lighting power allowances as follows:

a. The general hardscape area of a site shall include parking lot(s), roadway(s), driveway(s), sidewalk(s), walkway(s), bikeway(s), plaza(s), bridge(s), tunnel(s), and other improved area(s) that are illuminated. In plan view of the site, determine the illuminated hardscape area, which is defined as any hardscape area that is within a square pattern around each luminaire or pole that is ten times the luminaire mounting height with the luminaire in the

middle of the pattern, less any areas that are within a building, beyond the hardscape area, beyond property lines or obstructed by a structure. The illuminated hardscape area shall include portions of planters and landscaped areas that are within the lighting application and are less than or equal to 10 feet wide in the short dimensions and are enclosed by hardscape or other improvement on at least three sides. Multiply the illuminated hardscape area by the Area Wattage Allowance (AWA) from Table 140.7-A for the appropriate Lighting Zone.

b. Determine the perimeter length of the general hardscape area. The total perimeter shall not include portions of hardscape that are not illuminated according to Section 140.7(d)1A. Multiply the hardscape perimeter by the Linear Wattage Allowance (LWA) for hardscape from Table 140.7-A for the appropriate lighting zone. The perimeter length for hardscape around landscaped areas and permanent planters shall be determined as follows:

    i. Landscaped areas completely enclosed within the hardscape area, and which have a width or length less than 10 feet wide, shall not be added to the hardscape perimeter length.

    ii. Landscaped areas completely enclosed within the hardscape area, and which width or length is a minimum of 10 feet wide, the perimeter of the landscaped areas or permanent planter shall be added to the hardscape perimeter length.

    iii. Landscaped edges that are not abutting the hardscape shall not be added to the hardscape perimeter length.

c. Determine the Initial Wattage Allowance (IWA) for general hardscape lighting from Table 140.7-A for the appropriate lighting zone. The hardscape area shall be permitted one IWA per site.

d. The general hardscape lighting allowance shall be the sum of the allowed watts determined from (A), (B) and (C) above.

2. Additional Lighting Power Allowance for Specific Applications. Additional lighting power for specific applications shall be the smaller of the additional lighting allowances for specific applications determined in accordance with TABLE 140.7-B for the appropriate lighting zone, or the actual installed lighting power meeting the requirements for the allowance.

SECTION 140.8 – REQUIREMENTS FOR SIGNS

This section applies to all internally illuminated and externally illuminated signs, unfiltered light emitting diodes (LEDs), and unfiltered neon, both indoor and outdoor. Each sign shall comply with either Subsection (a) or (b), as applicable.

a) Maximum Allowed Lighting Power.

1) For internally illuminated signs, the maximum allowed lighting power shall not exceed the product of the illuminated sign area and 12 watts per square foot. For double-faced signs, only the area of a single face shall be used to determine the allowed lighting power.

2) For externally illuminated signs, the maximum allowed lighting power shall not exceed the product of the illuminated sign area and 2.3 watts per square foot. Only areas of an externally lighted sign that are illuminated without obstruction or interference, by one or more luminaires, shall be used.

3) Lighting for unfiltered light emitting diodes (LEDs) and unfiltered neon shall comply with Section 140.8(b).

b) Alternate Lighting Sources. The sign shall comply if it is equipped only with one or more of the following light sources:

1) High pressure sodium lamps; or

2) Metal halide lamps that are:

i) Pulse start or ceramic served by a ballast that has a minimum efficiency of 88 percent or greater; or

ii) Pulse start that are 320 watts or smaller, are not 250 watt or 175-watt lamps, and are served by a ballast that has a minimum efficiency of 80 percent.

Ballast efficiency is the measured output wattage to the lamp divided by the measured operating input wattage when tested according to ANSI C82.6-2005.

3) Neon or cold cathode lamps with transformer or power supply efficiency greater than or equal to Following:

i) A minimum efficiency of 75 percent when the transformer or power supply rated output current is less than 50 mA; or

ii) A minimum efficiency of 68 percent when the transformer or power supply rated output current is 50mA or greater.

The ratio of the output wattage to the input wattage is at 100 percent tubing load.

4) Fluorescent lighting systems meeting one of the following requirements:

i) Use only lamps with a minimum color rendering index (CRI) of 80; or

ii) Use only electronic ballasts with a fundamental output frequency not less than 20 kHz.

5) Light emitting diodes (LEDs) with a power supply having an efficiency of 80 percent or greater; or

6) Compact fluorescent lamps that do not contain a medium screw base sockets (E24/E26).

ILLUMINATING ENGINEERING SOCIETY (IES) TECHNICAL MEMORANDUM 15-11

Luminaire Classification System for Outdoor Luminaires

1.0 FOREWORD

This Technical Memorandum defines a classification system for outdoor luminaires that provides information to lighting professionals regarding the lumen distribution within solid angles of specific interest. The lumens within these solid angles are intended to be one of the metrics used to evaluate luminaire optical distribution including the potential for light pollution and obtrusive light, but not as the only metric that should be evaluated. Light pollution and obtrusive light result not only from the optical characteristics of the luminaires, but also from the application of those luminaires within an outdoor site or roadway. A detailed evaluation of the lighting performance for the outdoor site should be based not only on the luminaire optics, but also on overall system design, including luminaire locations, utilization of light where it is needed, lighting quality, visual tasks, aesthetics, safety requirements, and security issues.

2.0 INTRODUCTION

Outdoor lighting serves a variety of purposes that include providing light for nighttime visual activities, contributing to safety/security, and enhancing the beauty of architecture, monuments, sculpture, or landscape. Outdoor lighting also serves to improve driving visibility on roadways. Nighttime lighting can enhance social experiences and revitalize the economy of a municipal district. However, a careful selection of lighting equipment is critical to ensure that the positive aspects of outdoor lighting do not simultaneously create a nuisance for local residents. The issues of light pollution, glare, natural habitat, and the nighttime environment are best addressed when meaningful data regarding luminaire optics can be considered as the lighting application is designed.

3.0 BACKGROUND ON OUTDOOR LUMINAIRE CLASSIFICATIONS

Historically, the primary outdoor lighting considerations have related to meeting or exceeding recommended illuminance levels, providing uniform lighting, and minimizing glare. The IES cutoff classification system was redefined in 1963 and published in a revision to the *American Standard Practice for Roadway Lighting* as a method for defining luminaire light distributions. At that time, luminaire light distribution was defined in three ways: (1) the lateral beam width continued to be defined as Types I through V, but the method of determination was redefined; (2) the vertical angle of maximum candlepower (short, medium or long); and, (3) to a limited extent, the degree of "glare" control defined by high angle intensity (cutoff, semicutoff, and noncutoff). The classification "full cutoff" was added in the late 1990s to describe a luminaire with intensity limits meeting the "cutoff" classification, but limiting the optics to only those with no intensity distribution at or above 90 degrees (i.e., – no uplight). All four cutoff classifications (full cutoff, cutoff, semicutoff, and noncutoff) are defined and illustrated in RP-8-00, *American National Standard Practice for Roadway Lighting*[1].

The current IES cutoff classifications are based only on intensities at or above 80 degrees, rather than on luminaire lumens. The system has served a valuable purpose to identify products with high angle brightness. However, in recent years the system has been used for purposes well beyond the technical intent. Full cutoff lighting is often cited as the best system to control light pollution. However there has been limited consideration related to the ability for full cutoff optics to distribute light at angles necessary to illuminate vertical objects. In addition, the range of performance within each IES cutoff category can result in drastically different percentages of uplight, potentially contributing to sky glow. For example, the analysis of commercial luminaires shown in **Table 1** illustrates that within three of the current classifications, the luminaire can have very little or a significant amount of uplight. A common misconception is that only luminaires with a higher degree of cutoff (full cutoff) will have minimal uplight, but this is not always the case. Some cutoff, semi-cutoff or even non-cutoff luminaires can have minimal uplight, but do not meet the intensity restrictions at 80 degrees resulting in a lower cutoff classification.

Table 1: Current Analysis of Commercial Luminaires

IES Cutoff Classification	Typical Range of Upward Distribution (% of luminaire lumens)
Full cutoff	0%
Cutoff	0% - 20%
Semicutoff	0% - 40%
Noncutoff	2% - 100%

With increasing concerns among municipalities regarding nuisance light, the IES determined there was a clear need for a system that will provide more comprehensive data to evaluate the overall distribution of light from a luminaire.

4.0 LUMINAIRE CLASSIFICATION SYSTEM (LCS)

The Luminaire Classification System (LCS) defines the distribution of light from a luminaire within three primary solid angles. These are further divided into 10 secondary solid angles. LCS can be described as either percent bare lamp lumens or luminaire lumens for each primary and secondary solid angle. It is based in part on IES-funded research (*LESS: Luminaire Evaluation and Selection System*)* conducted at the Lighting Research Center, Troy, NY by Michele W, McColgan Ph.D., John D. Bullough Ph.D., John Van Derlofske Ph.D., and Mark S. Rea Ph.D.. The LCS quantifies light distribution in front of the luminaire, behind the luminaire, and above the luminaire. The system offers the following benefits:

- LCS defines the standard solid angles for evaluation and comparison of outdoor luminaires. It does not provide quantitative lumen limits within each solid angle. It does provide the basic model from which limits for lumens within the solid angles by lighting zone and application type will be defined.
- LCS utilizes existing photometric test data and can be easily reported by manufacturers or incorporated into software tools.
- LCS enables designers to evaluate and compare the distribution of lumens for various types of luminaire optics, thus assisting in the selection of the luminaire most appropriate for the application.

As illustrated in **Figure 1**, the primary solid angles defined by the LCS are:

- Forward Light
- Back Light
- Uplight

The sum of percentages of lamp lumens within these three primary solid angles is equal to the photometric luminaire efficiency.

* available through the IES

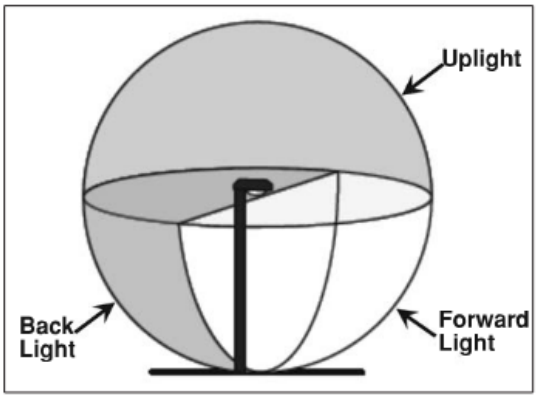


Figure 1. The three primary solid angles of the Luminaire Classification System (LCS).

$$\text{Photometric Luminaire Efficiency (\%)} = 100 \times \frac{(\text{Forward Light}^{\dagger} + \text{Back Light}^{\dagger} + \text{Uplight}^{\dagger})}{(\text{total bare lamp output}^{\dagger})}$$

†all values are in lumens

Photometric Luminaire Efficiency (%) = Forward Light (%) + Back Light (%) + Uplight (%)

Trapped Light (%) = 100% – Photometric Luminaire Efficiency (%)

4.1 Intended Use

The LCS metrics are indicators of optical distribution and are intended to be used in conjunction with the IES distribution classifications (Type I, II, III, IV, V and Short, Medium, Long)[2] for a more complete analysis of where the light is distributed.

As previously noted, the LCS is designed to describe the lumen distribution of an individual luminaire. It also provides a convenient method to compare the utilization of available lamp lumens in the three LCS solid angles among similar non-aimable outdoor luminaires.

The lumens within each LCS solid angle provide data that can relate to an evaluation of light trespass and sky glow. However these issues relate also to the optical distribution of light as a function of the installed characteristics including location of the luminaires with respect to the property line, installed height, spacing and uniformity of light and reflective characteristics of the ground materials that may contribute to light reflected into the sky.

The previous IES cutoff classifications (full cutoff, cutoff, semi-cutoff, and non-cutoff) are superseded by the Luminaire Classification System (LCS).

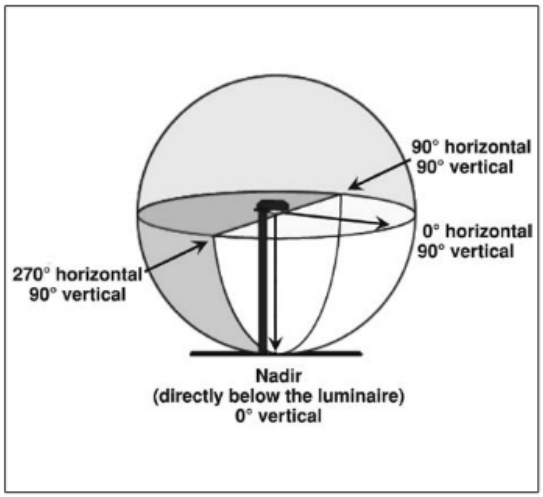
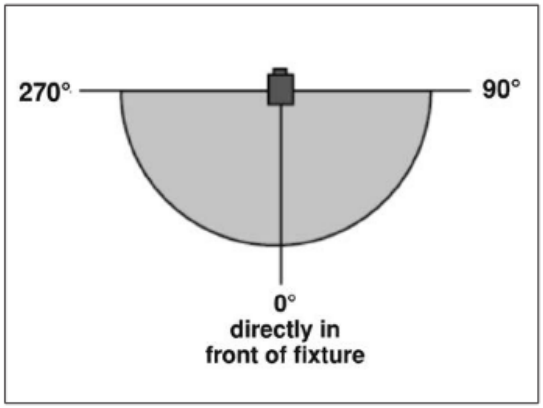


Figure 2. Solid angle references are based on a sphere of data points around a luminaire.



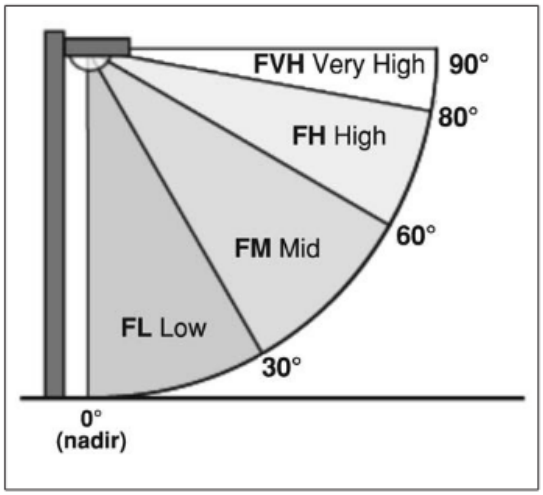


Figure 3. (top) Plan view for forward solid angle, (bottom) Section view for forward solid angle.

4.2 Solid Angle References

The LCS is based on IES photometric testing procedures. Using these procedures, a web of intensity values is measured around a luminaire, creating a sphere of data points (see **Figure 2**). Luminaire lumens are calculated based on the measured intensities in specific solid angles. The term nadir refers to the point directly below the luminaire. This IES publication references LCS solid angles based on vertical angles referenced from nadir and lateral angles referenced in a counter-clockwise direction.

Consult the *IES Lighting Handbook*[2] for further information regarding photometry and luminaire zonal lumens.

4.3 Forward Light

Forward light describes the lumen distribution in front of the luminaire. The forward light solid angle is defined between 0 and 90 degrees vertical, and 270 to 90 degrees horizontal in front of the luminaire. The forward light solid angle is further refined into four vertical secondary solid angles to evaluate the distribution of light in front of the luminaire. The forward light secondary solid angles (see **Figure 3**) are defined as follows:

- Forward light low secondary solid angle (FL) - Percent lamp lumens between 0 and 30 degrees vertical (or luminaire lumens within that solid angle) in front of the luminaire. This is the light emitted from directly below the luminaire to 0.6 mounting heights away from luminaire.

- Forward light mid secondary solid angle (FM) - Percent lamp lumens between 30 and 60 degrees vertical (or luminaire lumens within that solid angle) in front of the luminaire. This is the light emitted from 0.6 to 1.7 mounting heights away from the luminaire.

- Forward light high secondary solid angle (FH) - Percent lamp lumens between 60 and 80 degrees vertical (or luminaire lumens within that solid angle) in front of the luminaire. This is the light emitted from 1.7 to 5.7 mounting heights away from the luminaire.

- Forward light very high secondary solid angle (FVH) - Percent lamp lumens between 80 and 90 degrees vertical (or luminaire lumens within that solid angle) in front of the luminaire. This is the light emitted beyond 5.7 mounting heights away from the luminaire.

4.4 Back Light

Back light describes the lumen distribution in back of the luminaire. The back light solid angle is defined between 0 and 90 degrees vertical, and 90 to 270 degrees horizontal in back of the luminaire. This solid angle can be used to evaluate light trespass when luminaires are located near the property line. When luminaires are located on the interior of a site, the evaluation of a luminaire distribution may or may not consider the back light relative to offensive light. The back light solid angle is further refined into four vertical secondary solid angles to evaluate the distribution of light behind the luminaire. The back light secondary solid angles (see **Figure 4**) are defined as follows:

- Back light low secondary solid angle (BL) - Percent lamp lumens between 0 and 30 degrees vertical (or luminaire lumens within that solid angle) behind the luminaire. This is the light emitted from directly below the luminaire to 0.6 mounting heights away from luminaire.

- Back light mid secondary solid angle (BM) - Percent lamp lumens between 30 and 60 degrees vertical (or luminaire lumens within that solid angle) behind the luminaire. This is the light emitted from 0.6 to 1.7 mounting heights away from the luminaire.

- Back light high secondary solid angle (BH) - Percent lamp lumens between 60 and 80 degrees vertical (or luminaire lumens within that solid angle) behind the luminaire. This is the light emitted from 1.7 to 5.7 mounting heights away from the luminaire.

- Back light very high secondary solid angle (BVH) - Percent lamp lumens between 80 and 90 degrees vertical (or luminaire lumens within that solid angle) behind the luminaire. This is the light emitted beyond 5.7 mounting heights away from the luminaire.

4.5 Uplight

Uplight describes the lumen distribution above the luminaire. The uplight solid angle is defined between 90 and 180 degrees vertical, and 0 to 360 degrees horizontal around the entire luminaire. Uplight is a component of sky glow. The overall impact on sky glow is a function of the angle of light above the horizontal, atmospheric scattering of the light, and geographic location[3]. The uplight solid angle does not account for the directional impact on sky glow nor does it quantify the impact from light reflected from ground surfaces and adjacent structures.

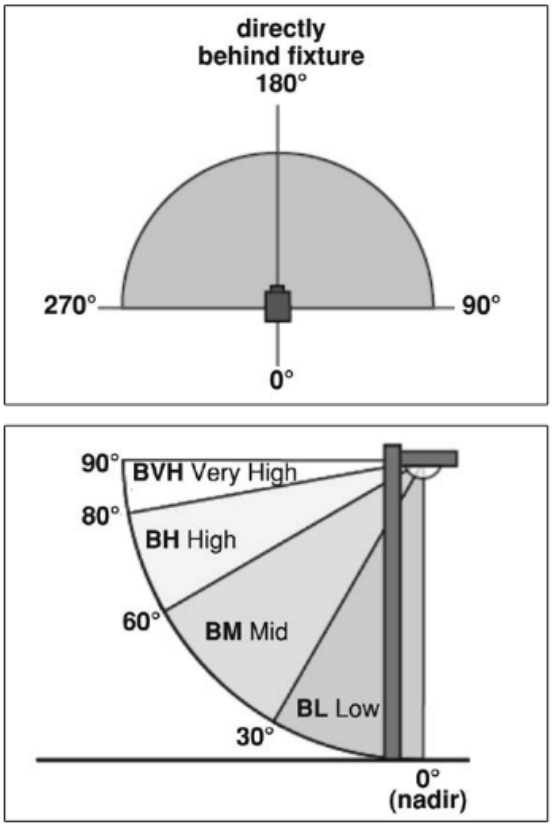


Figure 4. (top) Plan view for back light solid angle, (bottom) Section view for back light solid angle.

The uplight solid angle is further refined into two vertical secondary solid angles to evaluate the distribution of light at or near horizontal and that directly above the luminaire. The uplight secondary solid angles (see **Figure 5**) are defined as follows:

- Uplight low secondary solid angle (UL) - Percent lamp lumens between 90 and 100 degrees vertical (or luminaire lumens within that solid angle) 360 degrees around the luminaire. Light emitted at or slightly above 90 degrees will impact the sky glow when observing far from a city[3].

- Uplight high secondary solid angle (UH) - Percent lamp lumens between 100 and 180 degrees vertical (or luminaire lumens within that solid angle) 360 degrees around the luminaire. Light emitted at angles above 100 degrees will impact sky glow directly over the city[3].

Backlight Ratings (maximum zonal lumens)

Backlight / Trespass	Secondary Solid Angle	BO	B1	B2	B3	B4	B5
	BH	110	500	1000	2500	5000	>5000
	BM	220	1000	2500	5000	8500	>8500
	BL	110	500	1000	2500	5000	>5000

Uplight Ratings (maximum zonal lumens)

Uplight / Skyglow	Secondary Solid Angle	UO	U1	U2	U3	U4	U5
	UH	0	10	50	500	1000	>1000
	UL	0	10	50	500	1000	>1000

Glare Rating for Asymmetrical Luminaire Types (Types I, II, III, and IV), maximum zonal lumens

Glare / Offensive Light	Secondary Solid Angle	G0	G1	G2	G3	G4	G5
	FVH	10	100	225	500	750	>750
	BVH	10	100	225	500	750	>750
	FH	660	1800	5000	7500	12000	>12000
	BH	110	500	1000	2500	5000	>5000

Glare Rating for Symmetrical Luminaire Types (Types V and V Square), maximum zonal lumens

Glare / Offensive Light	Secondary Solid Angle	G0	G1	G2	G3	G4	G5
	FVH	10	100	225	500	750	>750
	BVH	10	100	225	500	750	>750
	FH	660	1800	5000	7500	12000	>12000
	BH	660	1800	5000	7500	12000	>12000

6. Environmental Thresholds of Significance and Lighting Standards

Appendix G of the California Environmental Quality Act (CEQA) Guidelines includes a question to assist in determining whether increased illuminance or luminance due to the Project might constitute a significant impact. The City uses this question as its threshold of significance for evaluating impacts under CEQA. The threshold of significance indicates that a project would have a significant impact related to lighting if it would ***"Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area."*** As this threshold derived from Appendix G of the CEQA Guidelines does not provide a specific value or standard for determining significance, the following standards from the LAMC are used to inform the determination of impact significance:

- Per LAMC Section 93.0117, no exterior light source may cause more than two footcandles of lighting intensity or generate direct glare onto exterior glazed windows or glass doors; elevated habitable porch, desk, or balcony; or any ground surface intended for uses such as recreation, barbecue or lawn areas or any other property containing a residential unit or units. This shall apply to all lighting on the Project Site.

- Per LAMC Section 14.4.4 E, no sign shall be illuminated in such a manner as to produce a light intensity of great than three footcandles above ambient lighting, as measured at the property line of the nearest residentially zoned property. This shall apply to all signs on the Project Site.

- Per LAMC Section 13.17.F.3, all site and building mounted lighting shall be designed such that it produces a maximum initial luminance value no greater than 0.20 horizontal and vertical footcandles at the site boundary, and no greater than 0.01 horizontal footcandles 15 feet beyond the site. No more than 5.0 percent of the total initial designed lumens shall be emitted at an angle of 90 degrees or higher from nadir (straight down). All low pressure sodium, high pressure sodium, metal halide, fluorescent, quartz, incandescent greater than 60 watts, mercury vapor, and halogen fixtures shall be fully shielded in such a manner as to not exceed the above limitation. This shall apply to the Zev Greenway as part of the River Improvement Overlay District.

7. Methodology

The Project's lighting plan allows the use of the outdoor recreational, athletic, and passive recreational spaces beyond sunset, extending the usable hours of the facility especially during the winter months. This provides a greater opportunity for more users to be able to access the facilities which in turn provides more accessibility for the community. This Report identifies the requirements governing the types, locations, maximum brightness, hours of operation, optical control, and visibility of the lighting designed as part of the Project. Please refer to Appendix 2 for additional information regarding the lighting designs including photometric calculation reports, plot maps, and cutsheets.

The analysis of light and glare describes the existing lighting environments in the Project area, identifies the light- and glare-sensitive land uses in the area, describes the light and glare sources under the Project, and evaluates whether the Project would result in a substantial increase in nighttime lighting and daytime glare as seen from the area's sensitive uses. A quantitative analysis of luminance, or glare (expressed in cd/m^2), is also provided below, as well as a quantitative discussion of illuminance (light levels seen on an object or sidewalk) (expressed in footcandles) compared to the limitation on footcandle levels set forth in the RIO District Ordinance and LAMC. The analysis of lighting impacts focuses on whether the Project would cause or substantially increase adverse nighttime lighting effects on light sensitive uses.

The existing conditions were surveyed from several study locations surrounding the Project Site to gather a baseline and document any off-site areas currently affected by light or glare from the existing Project Site. The study locations include twelve residential points along Whitsett Avenue, Valley Spring Lane, and Bellaire Avenue, as well as a thirteenth location on the Zev Greenway. The location on the Zev Greenway was selected because of its proximity to the existing tennis courts and associated lighting. All the measurements were taken after the sun had set in conformity with standard practice and regulations, and the twilight period had ended, eliminating the chance of additional sky glow which could affect the readings. All existing measurements were taken using a Minolta luminance meter, which measures candelas/square meter (cd/m^2), and from the viewpoint of a pedestrian at ground level to the nearest light fixture on the Project Site. The increases in illumination levels are not based on incremental changes to existing conditions, but on modeled calculations of illuminance levels from Project lighting (expressed in footcandles) at the sensitive receptor locations compared to regulatory standards. Lighting in both expressions, luminance and illuminance, are additive quantities, meaning that any of the existing remaining lighting conditions that surround the Project Site will be in addition to the values documented in the calculations discussed later in this section. As such, and for the purpose of analyzing Project lighting in relation to applicable regulatory thresholds, this aspect of the Report does not evaluate the effects created by lighting not associated with the Project Site as it exists now or as it is being proposed. The lighting effects created in the areas surrounding the Project Site are assumed to be remaining, thus their values of contribution will not change and can be removed from the evaluation. Further, the thresholds outlined in the regulatory framework pertain to only the lighting effects created by the Project Site and do not account for changes unrelated to the reference Project. The values in this section of the Report demonstrate only the additional lighting contributions that are created by the Project. Please refer to section 9 of this Report for consideration of the cumulative impact of the Project and related projects located in the vicinity of the Project Site.

Using the photometry data for the proposed lighting solutions, a computer calculation model was created to evaluate each of the athletic facilities proposed for the Project Site. The model and calculations were created by Musco Lighting, the manufacturer and installer of the sports lighting systems proposed for the Project Site. Musco utilizes advanced photometric software to design the lighting system to meet the recommendations for athletic field/court illumination. The software uses a laboratory generated lighting fixture data file to simulate

each fixture which are placed and aimed in the model as they would be installed on the Project Site. The software then calculates the illumination created by the array of lighting fixtures designed into the model.

Three analyses were prepared for the Project's lighting evaluation, the first two of which are based off the computer calculations that were generated by Musco Lighting of the proposed sports lighting fixtures. The third analyses examined compliance of other light sources, such as for general hardscaping and signage, with the California Energy Code ("Energy Code") and RIO District Ordinance. Musco Lighting uses a proprietary calculation engine that calculates luminance or illuminance at a specified task surface. The engine utilizes photometry files which define the amount of candela (light) emitted at any angle in a sphere around the fixture.

First, the proposed sports lighting fixtures were evaluated for off-site spill lighting illuminance at all surrounding properties to determine if the Project would produce two or more footcandles of light at any sensitive receptor, per LAMC Section 93.0117.

Second, the proposed sports lighting fixtures were evaluated for glare impacts from the nearest, most impactful light fixture at all surrounding sensitive receptors outside of the property line of the Project Site per the requirements set forth in LAMC Section 93.0117. The luminance readings of the proposed design were compared to the survey of existing conditions to evaluate the change in brightness at the receptor locations.

Finally, general hardscape lighting, building lighting, and sign lighting were evaluated using the Energy Code and the RIO District Ordinance. The RIO District Ordinance determines the type of lighting, the intensity, and the size that may be used on the Project Site between the athletic facilities as well as surface parking in order avoid impacting neighboring properties and the Zev Greenway. Compliance with the Energy Code will limit the wattage, the spill lighting, and the operation of the lighting fixtures for pedestrian and vehicular circulation of the Project Site. These factors are all designed to provide neighbor friendly lighting environments as well as reduce unnecessary energy use when sites are unoccupied or nonoperational. By also following the requirements of the RIO District Ordinance, the Project's sports lighting designs would essentially eliminate the spill lighting that currently crosses the Project's property line into the Zev Greenway and Los Angeles River.

8. Impact Analysis

Evaluation of Fixture Glare Control

The Musco Lighting fixtures for the Project are specifically designed with precise optics and integral shields to aid in controlling the light and preventing unwanted spill light, uplight, or glare. This shield is demonstrated in the two views below as **Figure 6** – *Exploded Fixture View*. The Light Control Visor is specifically engineered such that the light from the fixture can reach the destination surface, in this case a sports field, pool, or tennis court, while the edges of the visor block any high angles which would impact neighboring sites. This level of control can be seen in Figures 5 and 8 by comparing the contour lines close to the athletic facilities and those points outside the facilities. The significant drop in footcandles and candela in Tables 2 and 3 is indicative of tight beam control and limited spill lighting. Additionally, the Musco lighting fixtures are designed to be tilted downward toward the target which further enhances effectiveness of the Control Visor.

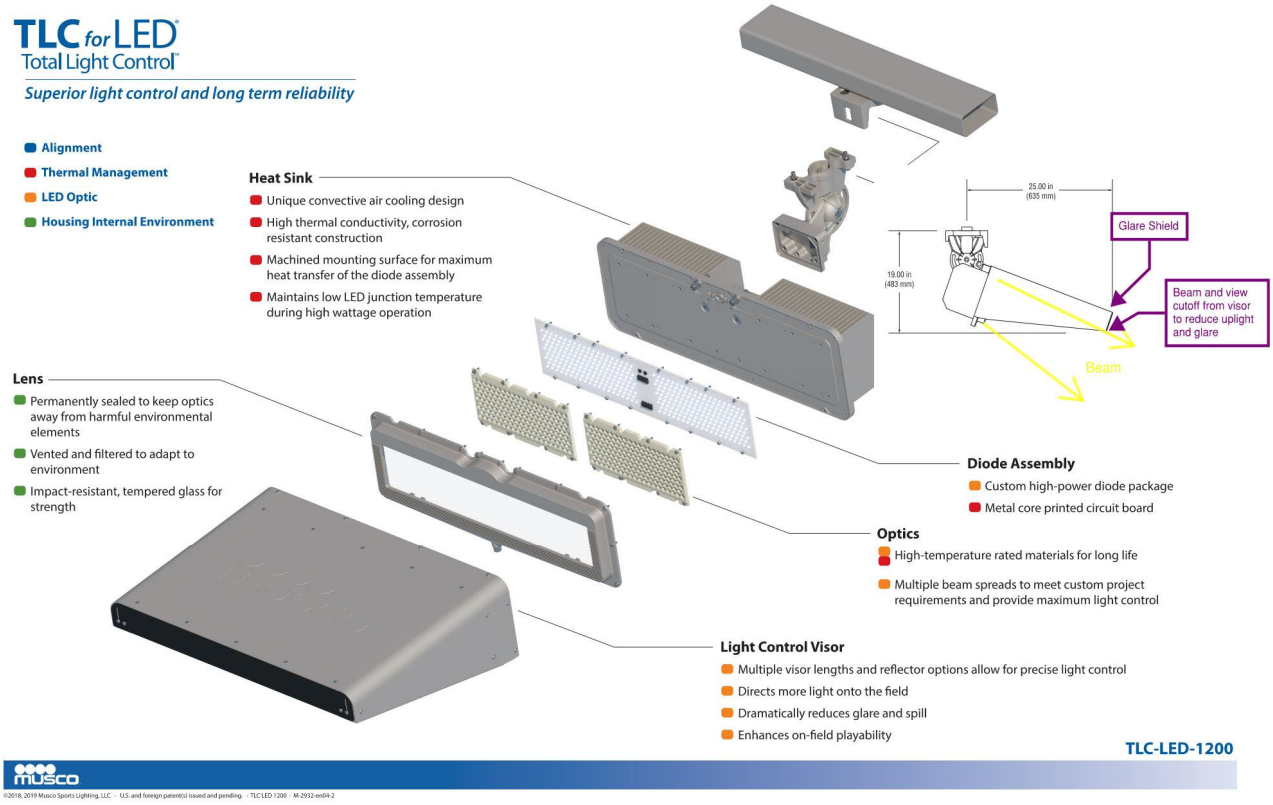


Figure 6 - Exploded Fixture View

By contrast, the existing fixtures on the Project Site have no integral shielding and a more generic optical pattern common to floodlighting. The existing fixtures use legacy lamp sources, induction and metal halide, with internal fixture optics around the lamp to control the beam pattern. Due to the size of the lamps in the fixtures, controlling the light is less precise than when a small point source, such as LED, is used. Additionally, the lamp itself is directly visible with no optical control which contributes to the perceived glare. Finally, these fixtures are tilted upward to cast the lighting across the intended area to maximize their effectiveness, but this further exposes the lights to the surrounding receptors and is the primary source of glare found during the survey. **Figure 7** – *Existing Tennis Floodlights* shows the existing tennis court floodlights currently on the Property.

Figure 7 - Existing Tennis Floodlights

Evaluation of Off-Site Illuminance

For this study, Musco Lighting provided the calculations for each of the light uses for athletic purposes on the Project Site. Musco Lighting also provided an expanded site map which shows the spill light from the sports lighting within the Project Site and beyond to all the neighboring properties. The light sensitive receptors near the Project Site, as shown previously in Figure 3, are all residential properties along Whitsett Avenue, Valley Spring Lane, and Bellaire Avenue. **Figure 8** – *Off-Site Illuminance* shows the footcandle intensity, delineated by contour lines, produced by the cumulative output of all the sports lighting on the Project Site and **Figure 9** – *Off-Site Luminance* shows the specific footcandle values throughout the Project Site and adjacent neighborhood. The results of this calculation indicate that there would be little or no spill lighting leaving the Project Site, with the only noticeable spill found on Whitsett Avenue from Field A lights, ranging from two to four footcandles along the western curbline and less than one footcandle from the center of Whitsett Avenue east. This spill light is limited to only Whitsett Avenue and at the property line of all the residential properties surrounding the Project Site there is next to no lighting being created from the sports lighting fixtures. With a maximum 0.05 footcandles being contributed at any property line, the Project lighting falls well under the LAMC maximum of 2.0 footcandles of additional light at any sensitive receptor.

Figure 8 – Off-Site Illuminance

SCALE: 1" = 200'-0"

ISOLINE COLOR LEGEND

BLUE - 0 FOOTCANDLES

ORANGE - 1 FOOTCANDLES

RED - 10 FOOTCANDLES

HARVARD-WESTLAKE EXISTING SITE
PHOTOMETRICS - ILLUMINANCE

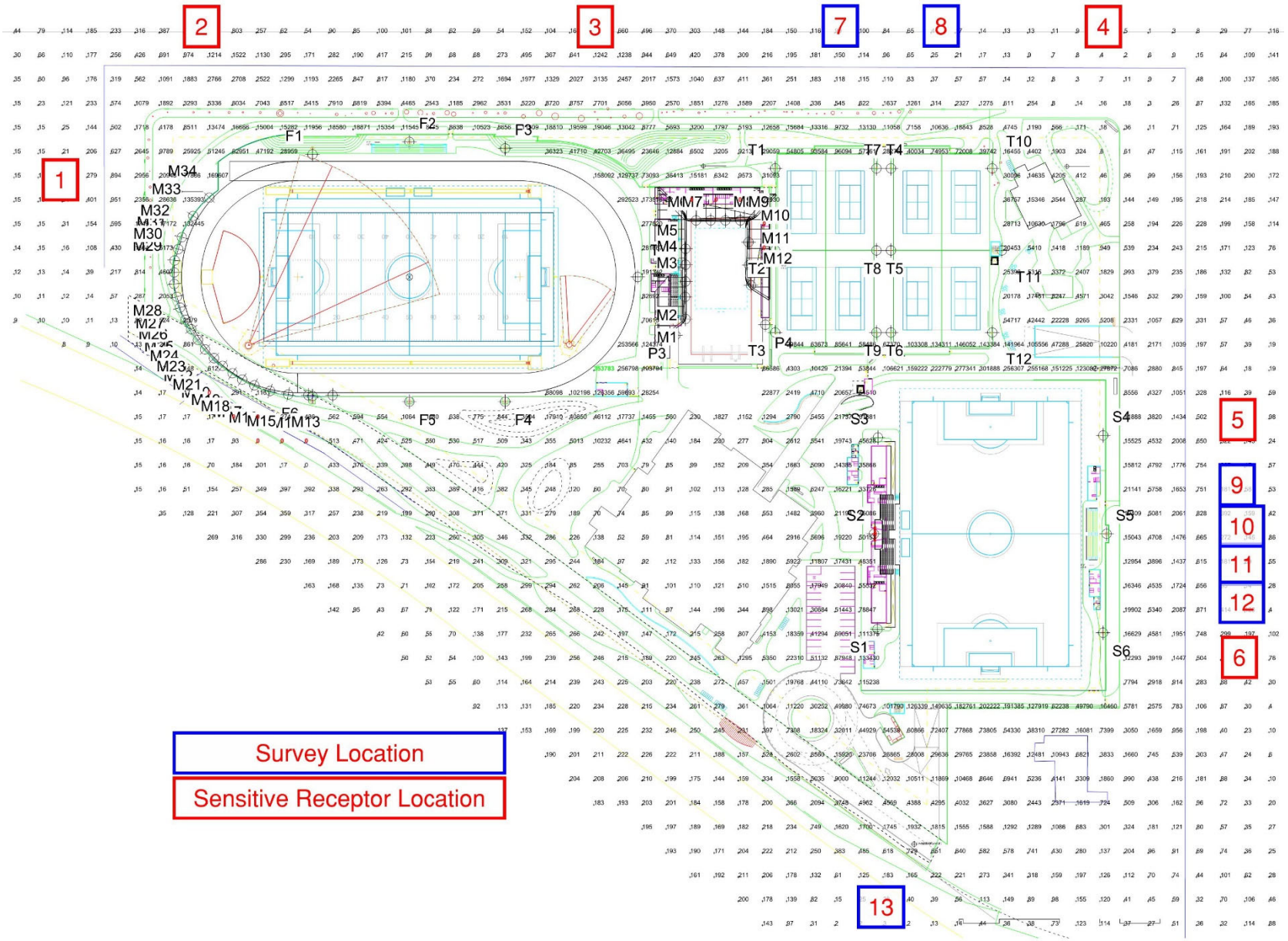


Figure 9 – Off Site Luminance

When comparing Figure 8 (Project Off-Site Illuminance) to Figure 5 (Existing Off-Site Illuminance), there is a discernible decrease in the radius and intensity of illuminance from the Project Site. The existing conditions have light spilling well beyond the Project Site boundary and even several lots deep into the adjacent residential areas. The proposed Project lighting shows far more control with only minimal spill beyond the Project Site boundary in a few areas. This comparison demonstrates the new lighting system will provide less intrusion into neighboring sites than the existing Project Site lighting. The illumination of the new Project Site would produce more footcandles on the athletic facilities than the lighting of the existing Weddington Golf & Tennis facility. This would make the Project Site's surfaces more prominent at night than the previous facility, as the athletic fields will be brighter. However, the target plane for these areas is at ground level which is perpendicular to the views from the receptor locations, and the receptors are at or below the playing surfaces which makes their visibility low. With the extremely oblique viewing angle, the existing and proposed landscape on the Project Site, as well as the new architecture on the Project Site, the views of the illuminated surfaces would be limited. The residential neighborhood on the hill above Ventura Boulevard has a more direct view of the facilities, unobstructed by landscape or architecture, from which to observe the "glow" of the Project Site. Glow, like brightness, is a perceived lighting quantity and varies person to person. Despite the view of the Project Site from above, the lighting impacts that could affect this area are negated by the distance from the Project Site as well as the control of the new lighting system which prevents views of any light source from above. The lighting of the Project Site is controlled to the athletic fields such that the impacts for the surrounding neighborhoods would be less than existing conditions (**Table 2** – *Summary of Calculated Off-Site Illuminance)*.

Summary of Calculated Off-Site Lighting						
Receptor (* = Sensitive)	**Location**	**Project Illuminance (footcandles)**		**LAMC/RIO Threshold (footcandles)**		**LAMC Compliant**
		Horizontal	**Vertical**	**Horizontal**	**Vertical**	
1*	4155 Bellaire Ave.	0.00	0.02	2.00	2.00	YES
2*	4202 Bellaire Ave.	0.04	0.09	2.00	2.00	YES
3*	4202 Beeman Ave.	0.03	0.07	2.00	2.00	YES
4*	12501-12509 Valley Spring Ln.	0.00	0.00	2.00	2.00	YES
5*	4122 Whitsett Ave.	0.05	0.09	2.00	2.00	YES
6*	4068 Whitsett Ave.	0.02	0.06	2.00	2.00	YES
7	4203 Babcock Ave.	0.00	0.00	2.00	2.00	YES
8	4202 Babcock Ave.	0.00	0.00	2.00	2.00	YES
9	4110 Whitsett Ave.	0.02	0.04	2.00	2.00	YES
10	4108 Whitsett Ave.	0.04	0.08	2.00	2.00	YES
11	4104 Whitsett Ave.	0.01	0.04	2.00	2.00	YES
12	4100 Whitsett Ave.	0.01	0.02	2.00	2.00	YES
RIO	Property Line	0.06	0.07	0.20	0.20	YES
	15-feet Beyond Property	0.01	0.02	0.01	n/a	YES

Table 2 - Summary of Calculated Off-Site Illuminance

As indicated above, per LAMC Section 13.17 Subsection F, the RIO District Ordinance requires all site and building mounted lighting to be designed such that it produces a maximum initial luminance value no greater than 0.20 horizontal and vertical footcandles at the site boundary, and no greater than 0.01 horizontal footcandles 15 feet beyond the site. Lighting from the Project would be at maximum of 0.06 horizontal and 0.07 vertical footcandles at the Project Site boundary, and 0.01 horizontal footcandles 15 feet beyond the Project Site. Thus, the Project would comply with the lighting requirements of the RIO District Ordinance. Furthermore, the modeled light levels included in this Report did not account for the landscape conditions occurring between the Project Site and the Zev Greenway or the change in elevation. With numerous trees and dense landscaping along the Project Site's property line in the proximity of the Zev Greenway, it is likely that landscaping would block the line of sight between the light source and the Zev Greenway. As such, these conditions would shield the lighting and lower the footcandle levels at the property line beyond those included in this Report.

The Project Site and building mounted lighting that will be used for circulation around the facilities, as well as the architectural accenting, will be subject to compliance with the Energy Code, Outdoor Lighting Controls and Equipment. Section 130.2 of the Energy Code provides restrictions on all outdoor lighting equipment and fixtures over 6,200 lumens, requiring that fixtures comply with IES TM-15-11 for lighting pollution reduction. This technical memorandum defines limits to the Backlight, Uplight, and Glare of a fixture relative to mounting height and distance from the property line. These requirements are designed to prevent lighting fixtures from producing any unwanted skyglow, lighting trespass, or glare beyond the property line, effectively reducing the impact on neighboring sites. The Energy Code also provides controls requirements in Section 130.3 for outdoor lighting which requires daily scheduling, dimming capabilities, and motion sensing to reduce lighting when a space is unoccupied, not scheduled for use, or outside of operating hours. Finally, in Section 140.7, all outdoor lighting is subject to a maximum allowable wattage by area and use. By limiting the maximum watts per square foot, a lighting design cannot be permitted with excessive use of power or fixture quantity creating another limiting factor on the total amount of light allowable on the Project Site. The combination of lighting pollution reduction, lighting controls, and power density allowances provide a prescriptive path to compliance which cumulatively prevents new on-site lighting from affecting neighboring properties with excessive light or glare.

The golf ball-shaped light standards currently used to illuminate the driving range are to be repurposed as area lighting for the courtyard adjacent to the clubhouse and tennis courts. The retrofit design of these golf ball-shaped light standards will be required to take the same prescriptive path as all other outdoor lighting referenced above. The new design for these fixtures will utilize luminaires that can be accommodated within the existing shell of the golf ball, but offer optic control, glare shielding, and power consumption that is consistent with California Title 24 Part 6. The existing 1000-watt fixtures will be reduced to approximately 50 watts per fixture. By carefully selecting the retrofit lighting solutions for these existing golf ball-shaped light standards, the Project can repurpose and utilize the iconic lights for modern area lighting on the Project Site.

Signs and sign lighting will be restricted by the Energy Code limiting the allowable wattage for internally and externally illuminated signs. This applies to directional signs as well as scoreboards on the Project Site. Per Section 140.8 of Title 24, internally illuminated signs are allowed up to 12 watts per square foot while externally illuminated signs can use 2.3 watts per square foot of illuminated sign area. Signs must also comply with Section 130.3 which requires photosensor control to switch off signs during daylit conditions or at least 65% dimming capabilities for signs illuminated both at night and day, and any Electronic Message Center greater than 15kW will be required to reduce power by 30% in an energy event. These maximum allowable power restrictions for signs keep the illumination to a minimum while maintaining functional viewing. The layout of the scoreboards for the Project is strategic so that no scoreboard directly faces an adjacent sensitive receptor. This layout of the scoreboards creates very long distances to any directly facing receptor and steep oblique viewing angles to closer receptors adjacent to the fields. Due to either the long distance or steep viewing angle, the illumination

effects of these signs would be nearly nonexistent at the sensitive receptors resulting in no exceedance of LAMC Section 14.4.4 E, which limits light intensity from signage to no more than three footcandles above ambient lighting at residential property boundaries.

Evaluation of Off-Site Luminance/Glare

Musco Lighting provided a second calculation set that evaluated the candela produced by fixtures in the direction of any given point on and off the Project Site, including at the sensitive receptors. Figure 9 below shows the values in candela across the Project Site and surrounding vicinity. Each point on this grid reflects the maximum candela value for the fixture with the highest potential for glare on any given pole on the Project Site. This represents the fixture intensity at the given angle that correlates directly to the view from the receptor, and will determine what a user might perceive as the brightness, or point intensity, of a lighting fixture when directly viewed from the respective location. Consistent with the analysis of illuminance in the prior section, the calculation of off-site luminance does not take into consideration existing or proposed landscaping, changes in elevation, and the Project's architectural and hardscaping features. Thus, the calculation and comparisons are considered conservative.

The candela values provided by Musco are representative of the intensity at the fixture itself and need to be adjusted to account for distance and viewing angle in order to represent glare at the sensitive receptors and other survey locations. To relate the candela values at the fixture to the luminance (glare) received by each receptor location, the relationship between distance and solid angle was utilized to calculate the candelas per square meter (cd/m^2). This method is outlined by The Illuminating Engineering Society "The Lighting Handbook" 10^{th} Edition, section 9.11: Measuring Intensity. The equation relates illuminance, luminance, and solid angle as shown below, where solid angle is the spacial quantity representing a cone in which the fixture is viewed.

$E = L\ \Delta\omega \cos(\xi)$

L = object luminance
$\Delta\omega$ = solid angle subtended by the source to the illumination measurement point.
$\cos(\xi)$ = cosine of the angle between the solid angle and perpendicular of the illuminance plane.
E = illuminance produced by object.

Since the candela value provided is directed at the receiving points, the measurement is perpendicular to the source which simplifies the equation to:

$$L = \frac{E}{\Delta\omega}$$

The final equation substitution in the formula is to replace illuminance for the light intensity divided by the square of the distance between the source and the receptor. By following this equation, the luminance at each point is calculated using the candela intensity (I), distance (d), and solid angle ($\Delta\omega$) of the view of the light source. This method is the consistent with the mathematics used by the luminance meter in the initial survey.

$$L = \frac{I/d^2}{\Delta\omega}$$

Table 3 – *Summary of Calculated Off-Site Luminance* shows the values that were recorded during the survey as well as the calculated Project values of the designed system by Musco. As shown in in the table, the Project would result in dramatic reductions in glare at most of the sensitive receptor sites. For example, the values at 4068 Whitsett Avenue will be reduced from 3,500cd/m^2 to approximately 5.8cd/m^2 following Project construction. In other words, the new lighting system should generally provide a significant reduction in

nighttime glare from the existing tennis court lighting. In the instance of 4202 Bellaire Avenue, the existing lighting was heavily obstructed or not visible due to the heavy landscaping along the Project Site. The Project would produce 7.7cd/m^2 at this location, which corresponds to approximately the brightness of a single candle flame in front of the property.

Summary of Calculated Off-Site Luminance			
Receptor (* = Sensitive)	Location	Glare Intensity (cd/m^2)	
		Existing	Project
1*	4155 Bellaire Ave.	550	3.3
2*	4202 Bellaire Ave.	0	7.7
3*	4202 Beeman Ave.	230	7.4
4*	12501-12509 Valley Spring Ln.	720	0.1
5*	4122 Whitsett Ave.	1500	5.0
6*	4068 Whitsett Ave.	3500	5.8
7	4203 Babcock Ave.	900	1.1
8	4202 Babcock Ave.	3200	0.5
9	4110 Whitsett Ave.	2500	5.4
10	4108 Whitsett Ave.	2350	5.2
11	4104 Whitsett Ave.	2400	5.8
12	4100 Whitsett Ave.	3700	2.5
RIO	Property Line	4375	13.6
	15-feet Beyond Property	4375	4.0

Table 3 - Summary of Calculated Off-Site Luminance

*Views obstructed/limited by landscape between receptor and Project Site
**Calculated values do not account for landscape (new or proposed)

As noted earlier, the Project would retain and preserve most of the trees located along the property lines, and supplement that existing condition with substantial new tree plantings. The lighting model does not take either of these Project conditions into consideration. In other words, the measurement of existing lighting benefitted from the existing landscape, however, the modeled levels of Project lighting do not. Therefore, it is likely that the Project landscaping would again shield these receptors and result in no visible glare. In either case, this level of luminance is not considered significant glare and would not impact the receptors. Evaluation of Table 3 shows that nearly all of the sensitive receptors would see less glare than is currently being experienced. This reduction in candela per square meter indicates that the Project would actually improve the nighttime conditions in this area relating to light and glare. Further, the reduction in candela per square meter also indicates that the illuminance produced by the Project Site would also generally be less than what is currently experienced. As previously noted, baseline footcandle readings could not be documented due to the inability to separate existing Project Site lighting sources from off-site sources when taking readings. Understanding that lighting is additive, if the off-site lighting remains the same and the candela from the on-site lighting is less with the Project, the footcandles of lighting spillover would also be less.

Based on this analysis, the Project design ensures that there will not be any significant lighting impacts to the sensitive residential receptors or to nighttime conditions along the Zev Greenway. As such, the Project complies with all applicable lighting regulations. The Project will create a fraction of a footcandle of illumination at any adjacent residential property, well below the LAMC threshold of two footcandles. The Project's proposed lighting fixtures will also create dramatically less glare than the existing lighting fixtures used for the existing tennis and golf uses, except for one receptor that would experience a minimal increase in glare equivalent to a single candle flame (and without taking into consideration existing and proposed landscaping).

9. Related Projects and Cumulative Impacts

The draft environmental impact report for the Project identifies five related projects in the vicinity of the Project Site, for which cumulative impacts are considered. All five of the related projects are located along Ventura Boulevard which, as described earlier in this Report, is already subject to high levels of nighttime illumination from signage, vehicle headlights, building lighting, internal and external functional and display lighting, and occasionally parking lot lighting. Relevant to the assessment of cumulative lighting impacts, the related projects entail outdoor lighting uses consistent with building signage, parking lot, and sidewalk illumination.

The LAMC and RIO District Ordinance illumination thresholds outlined in the regulatory framework only pertain to the Project's incremental lighting effects and do not account for changes resulting from related projects. Nonetheless, applying the regulatory framework to the cumulative impact of the Project and the related projects would similarly yield the conclusion that illumination at the receptor locations would be below the thresholds. The related projects are located on Ventura Boulevard, south of the Los Angeles River, with numerous intervening buildings and structures that block the line of sight between the receptors and related project lighting. Further, the related projects would also be individually subject to the LAMC requirement that offsite illumination be less than two footcandles at nearby residential uses. Even without intervening structures, given the significant distance between the related projects and the receptors evaluated for Project-specific impacts, any light produced by the related projects would be diminished at each of the receptor locations.

Cumulative impacts from glare would also be less than significant. Unlike multiple light sources having the potential to create overlapping areas of offsite illumination, glare is the result of a direct view from a receptor to a single light source (or light sources within the exact same field of vision). The location of the related projects, the Project's light sources, and the Project's adjacent receptors are such that no incremental glare would be produced.

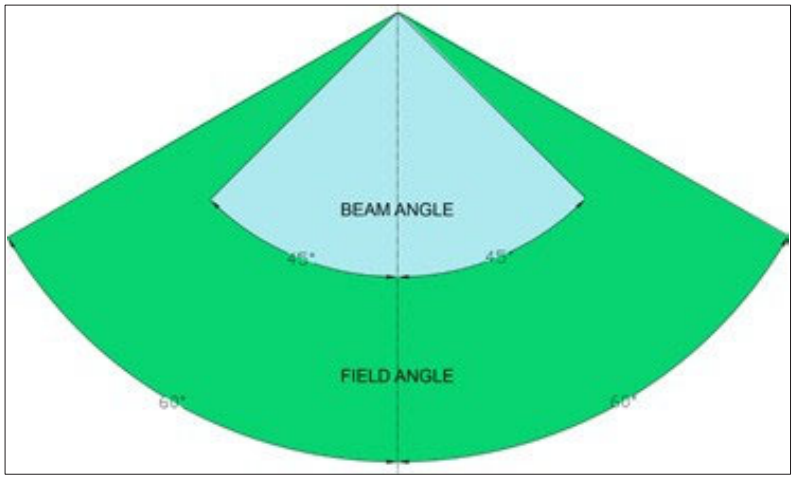
10. Conclusion

The Project would reduce the lighting effects currently being experienced at the adjacent properties. Further, implementation of the state-of-art lighting installation, including highly specialized optics and physical glare control, would ensure that the lighting of the Project is tailored to adhere to all applicable regulations and guidelines. Because the Project would meet and not exceed the lighting standards established under the LAMC, it would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. Therefore, impacts related to light and glare would be less than significant.

11. Appendix 1

Definitions

Beam Angle: The angle between the two planes of light where the intensity is at least 50% of the maximum intensity at center beam.



Candela: Basic unit for measuring luminous intensity from a light source in a given direction. A common candle emits light with a luminous intensity of roughly one candela.

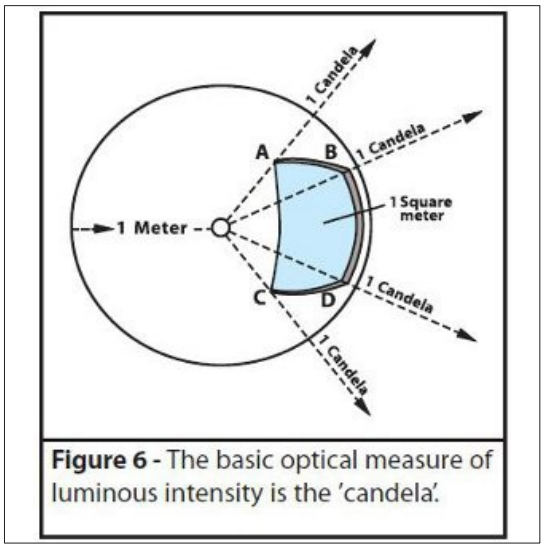


Figure 6 - The basic optical measure of luminous intensity is the 'candela'.

Field Angle: The angle between the two planes of light where the intensity is 10% (or less) of the maximum intensity at center beam.

Footcandle (fc): An imperial unit of measurement for illuminance, abbreviated as fc. The unit is defined as the amount of illumination the inside surface of an imaginary 1-foot radius sphere would be receiving if there were a uniform point source of one candela in the exact center of the sphere.

Footlambert: A Lambertian unit of luminance equal to (1/π) candelas per square foot. Equal to 3.426 candela/sq.m.

Glare: The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance or visibility.

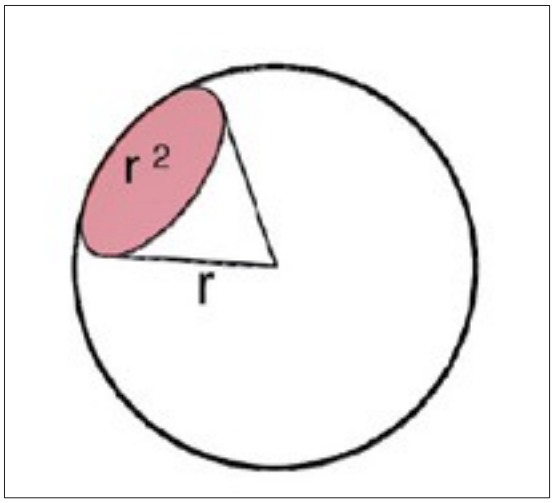
Illuminance: The intensity of light falling at a given place on a lighted surface; the luminous flux incident per unit area, expressed in lumens per unit of area.

Intensity: This is the candlepower, or concentration, of light emitted in a given direction. Measured in Candelas / sq. meter.

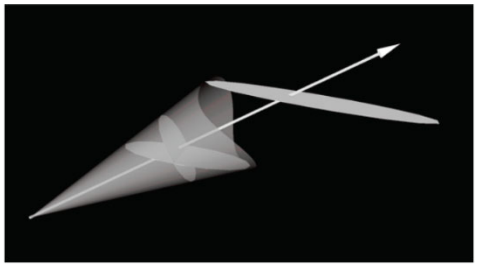
Lumen: A lumen is the basic unit of light, a measure of the perceived power of light. The lumen is defined in relation to the candela by 1 Lumen = 1 candela x 1 steradian.

Luminance: The quantitative measure of brightness of a light source or an illuminated surface, equal to lumen per unit solid angle emitted per unit projected area of the source or surface, measured in candela/sq. meter. This is the brightness measured from a particular angle of view.

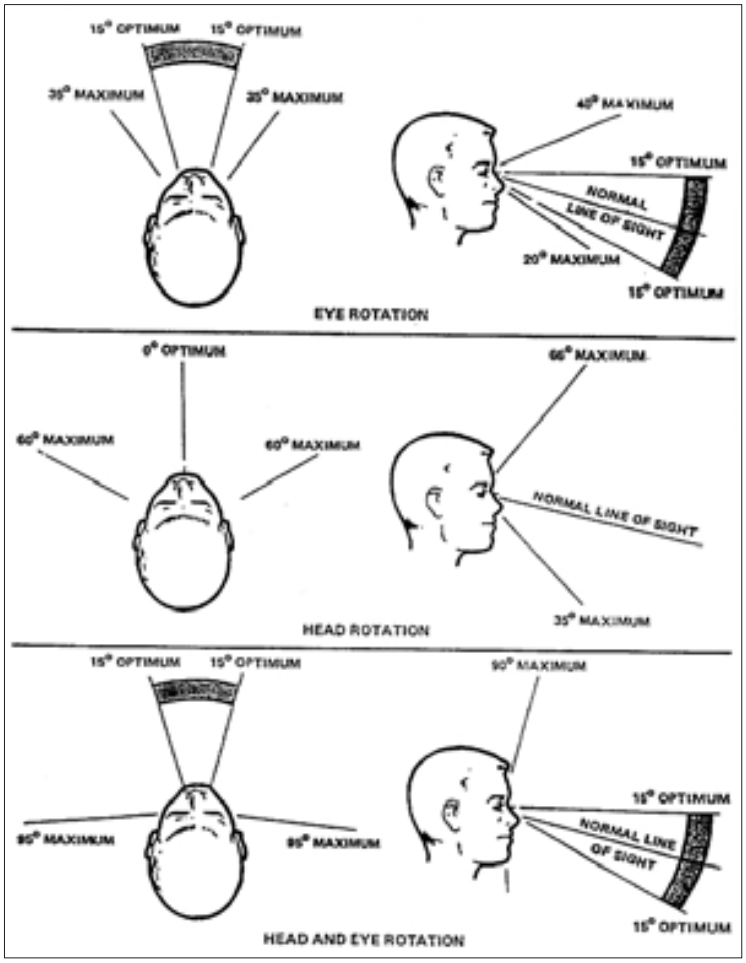
Steradian: A description of two-dimensional angular spans in three-dimensional space, analogous to the way in which the radian describes angles in a plane.



Solid Angle: a measure of the amount of the field of view from some particular point that a given object covers. That is, it is a measure of how large the object appears to an observer looking from that point. The point from which the object is viewed is called the *apex* of the solid angle, and the object is said to *subtend* its solid angle from that point.



Visual Field: The space or range within which objects are visible to the immobile eyes at a given time. Also called field of vision.



Visual Angle: The angle formed by two rays of light, or two straight lines drawn from the extreme points of an object to the center of the eye.

12. References

Illuminating Engineering Society – The Lighting Handbook 10th Edition

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