

## **QL2.3 – Minimize light pollution.**

### Level of Achievement:

RESTORATIVE

### Summary:

All existing lighting was removed from the project site. The project team conducted an overall assessment of lighting needs for the project, which revealed that only security lighting is required. Accordingly, security lighting zones along the pedestrian walkways were established.

The project uses solar lights with cut-off lenses to reduce both lighting energy requirements and light spillage.

### Supporting documentation:

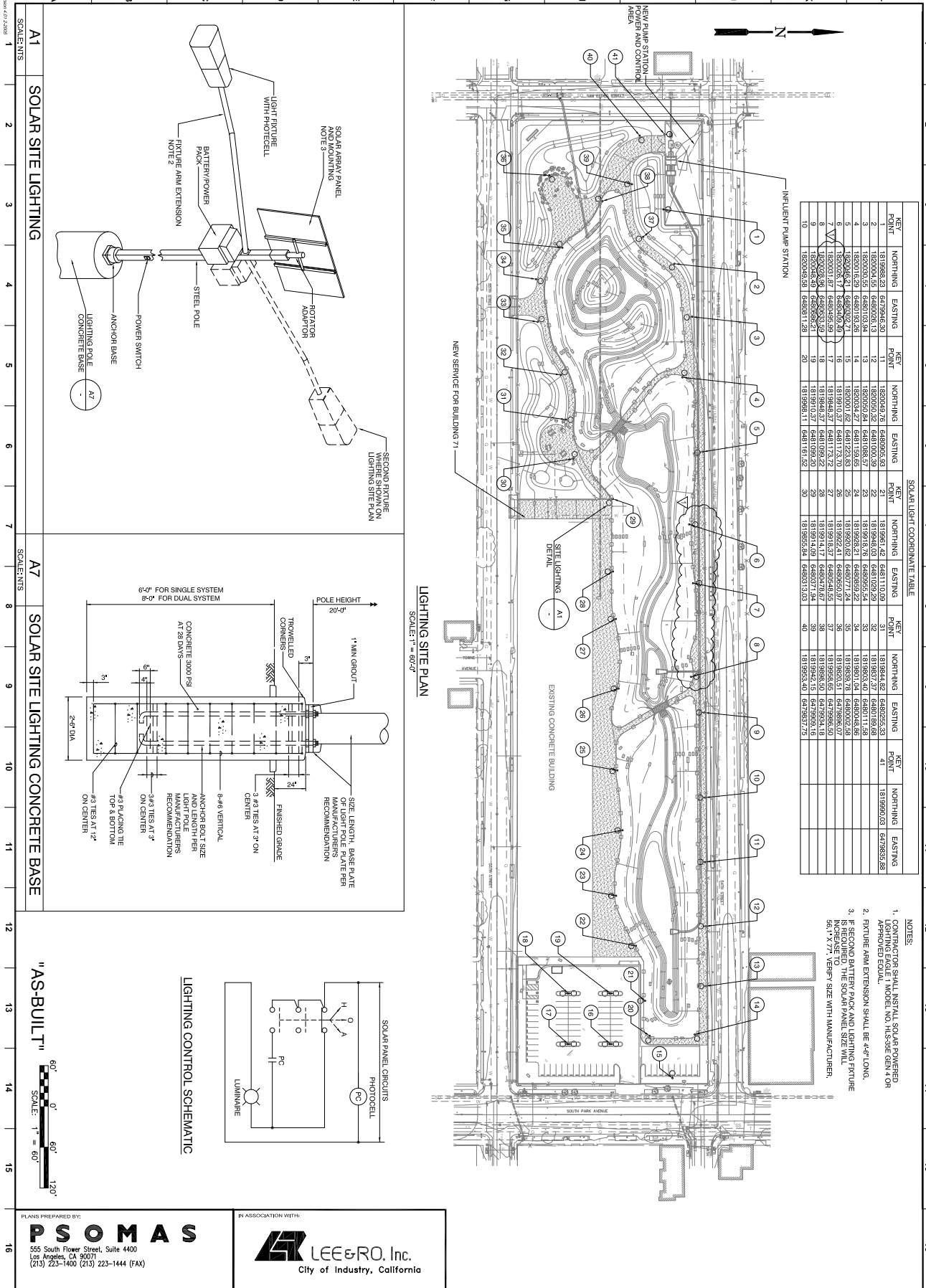
- Summary of Environmental Impacts and Mitigation Measures from EIR
- Lighting site plan
- Specifications Section 16501 – Solar Lighting

## Summary of Environmental Impacts and Mitigation Measures from EIR

**Table 1-1  
Summary of Environmental Impacts and Mitigation Measures**

Environmental Impact	Mitigation Measures	Level of Significance After Mitigation
<b>Aesthetics</b>		
<p><b>Views</b></p> <p><i>Wetlands Park</i></p> <p>The proposed Wetlands Park site is an urbanized area with flat topography and there are no scenic vistas within or surrounding the site.</p> <p><i>Sign SUD</i></p> <p>The proposed billboards would be visible to pedestrians and motorists along 16<sup>th</sup> Street. There are partial views of the downtown skyline to the northeast of the site, but the billboards would not obstruct these views. The billboards are visible to motorists traveling eastbound and westbound on the I-10 Freeway. Westbound motorists have momentary views of the downtown skyline. The billboards would not obstruct these views. Additionally, the billboards are consistent with the industrial uses and variety of structures existing on the proposed Sign SUD site and in the vicinity.</p>	<p>None Required.</p> <p>None Required.</p>	<p>Less than Significant.</p> <p>Less than Significant.</p>
<p><b>Visual Character</b></p> <p><i>Wetlands Park</i></p> <p>Two potentially historical buildings would be demolished, however the buildings are in disrepair and overall the Project would improve the visual character as it would replace the existing Metro maintenance facility with a landscaped public space and result in minor physical improvements (such as painting) to an existing historical building currently in disrepair.</p> <p><i>Sign SUD</i></p> <p>The site is a bus yard in an urbanized area adjacent to uses that include manufacturing and warehousing, and elevated freeway and on-ramps. The billboards would not result in significant view blockages, alter or remove valued visual resources or affect open space areas.</p>	<p>None Required.</p> <p>None Required.</p>	<p>Less than Significant.</p> <p>Less than Significant.</p>
<p><b>Light or Glare</b></p> <p><i>Wetlands Park</i></p> <p>In general, the only lighting at the proposed Wetlands Park would be security lighting, which would be directed to minimize spillover. The proposed Project would not result in new sources of glare. Lighting and glare are anticipated to be less than currently generated by the existing Metro maintenance facility.</p>	<p>None Required.</p>	<p>Less than Significant.</p>

## Lighting site plan



## Specifications Section 16501 – Solar Lighting

**SECTION 16501**  
**SOLAR LIGHTING**

**PART 1 -- GENERAL**

**1.1 THE REQUIREMENT**

- A. The CONTRACTOR shall furnish and install lighting fixtures, and accessories for all lighting systems, complete and operable, all in accordance with the requirements of the Contract Documents.

**1.2 RELATED WORK SPECIFIED ELSEWHERE**

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 16010 Electrical General Provisions.
2. Section 16050 Basic Materials and Methods.
3. Section 16110 Raceways.

**1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

- A. Without limiting the generality of other requirements of these specifications, all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.

LAEC	City of Los Angeles Electrical Code, latest adopted edition.
UL	Underwriters Laboratories
ANSI C82.1	Specifications for Fluorescent Lamp Ballasts
ANSI C84.4	Specifications for High-Intensity-Discharge Lamp Ballasts (Multiple Supply Type).
ASHRAE/IES 90.1	High Efficiency Electrical Lighting Systems.
Standards of the Certified Ballast Manufacturer's Association	

**1.4 CONTRACTOR SUBMITTALS**

- A. The CONTRACTOR shall submit the following in accordance with Section 16010 Electrical General Provisions.
1. Shop drawings and catalog data.

2. Catalog literature for each fixture specified. Each submittal shall clearly describe materials, type of diffuser, hardware, gasketing, reflector and chassis, finish, and ballast. Each submittal shall also show evidence of acceptance of all proposed material and equipment by UL or other testing laboratory recognized by the City of Los Angeles, Department of Building and Safety.
  3. Complete literature for each fixture substitutions with incandescent lamps in excess of 200 watts or HPS Sodium sources in excess of 75 watts. Submittals for other fixtures shall be sufficient for competent comparison of the proposed fixture to the originally specified fixture. Photometric data shall include coefficients of utilization, average brightness, candle power distribution curves, and lumen output chart.
  4. Pole-mounted fixtures, including complete data on the pole material, finish, handpoles, anchoring, and fixture attachment. Support method shall be submitted for interior fixtures weighing more than 50 pounds.
  5. Ballast catalog data indicating lamp wattage, input watts, sound rating, power factor, and type of ballast. Data for outdoor ballast shall include low temperature starting characteristics.
  6. Photocell data submittal shall indicate switching capacity, the means of adjusting the lighting pickup level, and enclosure.
- B. Substitutions for specified fixtures shall be based upon quality of construction, light distribution, appearance, and maintenance.

## 1.5 QUALITY ASSURANCE

- A. Quality assurance shall be in accordance with all applicable requirements of Section 16010 Electrical General Provisions.
  - B. Exterior lighting system operation shall be demonstrated during the hours of darkness to indicate that fixtures are properly focused, photo-cell operation is correct, and that fixture switching functions as intended. Similar requirements shall apply to interior lighting. Through demonstration, the CONTRACTOR shall also verify that panel schedules properly indicate the lighting outlets connected to each circuit.
  - C. Lighting demonstration shall occur within 2 weeks prior to project acceptance.
  - D. Lighting fixtures shall be stored in their original cartons from the manufacturers until the time of installation. Fixtures poles shall be stored on blocks above grade until the time of installation.
- E. CLEANUP
1. Fixture lenses, diffusers, and reflectors shall be cleaned just prior to the time specified for the system demonstrations.



2. Fixture trim, including poles and support brackets, where finish has been damaged, shall be refinished.

## **PART 2 -- PRODUCTS**

### **2.1 LIGHTING SYSTEMS GENERAL**

- A. Lighting systems shall be in conformance with ASHRAE/IES 90.1 - 1989 Standards for High Efficiency Electrical Lighting Systems.
- B. All components to meet or exceed UL Listing and are of either UL and/or CE listed and all wires to be USCG approved in addition to UL listing. Power supply to be circuit breaker protected (instead of a fuse) with 100,000 hours RED lamp to indicate the system is energized. Switches shall be waterproof type and protected in a rubber boot and all wires and connectors must meet or exceed USCG (US Coast Guard) requirements for use in a marine (harsh environments) to prevent failure due to age, UV, electrolysis, water, flame retardant and ruggedness. Under no circumstances shall automotive or UL listed household wires be used.
- C. All components shall be mounted on top of the lamp pole and should not be accessible from the ground without mechanical means. The design shall be such that the weight of its components should be over the CG (center of gravity) of the pole so as not to add unnecessary (nor accentuate) side wing loading to the pole in storms.
- D. Solar array shall be able to "feather automatically" (tilt flat to face the wind horizontally) at high winds to reduce side wind loading in wind storms.
- E. The design shall incorporate a means to pad-lock the batteries from theft as well as make it difficult to steal the solar array without resorting to cutting, blow torching, or other time consuming methods to remove it from the site.

### **2.2 SOLAR ELECTRIC PANELS**

- A. The solar electric panel shall contain state of the art 6"x6" multi crystalline (not amorphous silicon) solar cells with a conversion efficiency of over 18%. The modules shall contain EVA pottant with PVF backing laminated to non reflective tempered glass, assembled in an anodized and clear coating aluminum frame equipped with a weather proof junction box installed with bypass diodes across every eighteen series solar cells. The solar panel shall be UL 1703 certified for hazardous location class I, Div 2 Groups A through D carrying a 25 year warranty.
- B. Electrical characteristics;
  1. Maximum Power Voltage: 17.6 V
  2. Open Circuit Voltage: 21.9 V
  3. Short Circuit Current: 8.02 A (Benchmark configuration of 4 hour insulation at

irradiance level of 1 Kw/m2, spectrum of 1.5 air mass and cell temp of 25 degrees Celsius)

4. Maximum Power Current: 7.39 A at benchmark configuration
  5. Nominal Cell operating Temperature: 47 degree Celsius.
  6. Connections to be finger tight (no tools required), color coded wire with strain resistant "posi-loc" wire connectors.
  7. The power supply wires shall be tin coated heavy duty copper wires and shall exceed rated current by 100% to meet or exceed UL, CE, USCG, NFPE. All wires exposed to the elements and the output leads from the solar panel shall be protected from weathering by heavy duty water proof UV resistant flexible conduits.
- C The tilt angle shall be minimum 320 degrees (azimuth) for optimum solar absorption in winter or high latitude installations. No fixed (or non adjustable) solar array designs shall be accepted due to the need to align the solar panels to face the Sun in its winter azimuth.
- D. The horizontal rotation shall be minimum 360 degrees (to face direct the Sun directly regardless of roadway direction/orientation). No fixed (non adjustable) designs shall be acceptable.

## 2.3 LUMINAIRES

- A. General: Provide luminaire Type Roadway Cobrahead with a type II or type III distribution with adjustable photometric to accommodate lampsite in relation to the roadway.
- B. Housing: white powder coated high pressure die cast aluminum with single action latch opening.
- C. Lens: cut-off optics (shielded light) with glass lens (under no circumstances shall plastic or polycarbonate lens be substituted.). Protection against vandalism.
- D. Reflector: Anodized specula aluminum hydro formed with minimum 94% reflectivity coupled protected by totally acid resistant foam and Dacron polyester filter sealed enclosure to prevent migration of dust, particulate road grime, vehicular exhaust fumes, oil, etc over time to degrade reflectivity.
- E. Bulb/lumens: Full color spectrum high intensity gas discharge "arc lamp" system producing a min. 3,600 lumens at a color temperature of 4,700 degrees Kelvin or equivalent to 150-200 HPS color temperature corrected. Under no circumstances shall fluorescent lamps (cold cathodes or compact fluorescent residential lighting be utilized).
- F. Ballast/lamp: Ballast to be fully potted water resistant electronic ballast to be able to withstand temperature extremes from -30 to +85 degree Celsius.

- G. Mounting: Two bolt single bracket slip fitter with cast-in pipe stop and adjustable leveling steps

## 2.4 BATTERY

- A. General: Provide 3 light weight batteries connected in parallel (instead of a single large heavy battery) to facilitate safe operation during installation/replacement. Batteries shall be 100% maintenance free, sealed, FAA approved gel (no wet type acceptable). Batteries shall not produce corrosive acid or explosive fumes. Batteries shall be suitable for a wide temperature range -22F(-30C) to +122F (+50C). Batteries shall have the Nominal Primary Voltage of 12 VDC.
- B. Batteries enclosure shall be of steel or aluminum exhibiting natural flow through ventilation to maintain stable internal temperature for the batteries regardless of external temperature extremes by allowing convectional air to enter and exit from the top rear of the enclosure. It shall also be pad- lockable to prevent unauthorized tampering with the control panel or theft of batteries.
- C. Control panel shall be located in the PowerPac protected from the elements. A lamp test switch shall also be available to temporarily activate the light when re-lamping. All controls shall be clearly marked with lexan labels and made to endure 30 years of weathering .
- D. Location: Weight of batteries to center lever the 4'-6" lamp arm extension and mounted directly under the shade of solar array. Batteries and control panel to be located at top of pole with no attachments to the ground to prevent vandalism.

## 2.5 POWERPAC AND ARM

- A. 4'-6" arm to be constructed of round aircraft aluminum powder coated white and aluminum welding shall be to aviation quality and standards. The PowerPac enclosing the battery shall be constructed of powder coated steel or aluminum capable of taking the weight of batteries and components. Total weight of the system for the benchmark 4 hour insulation model shall not exceed 300 lb. with an EPA of less than 5 sq. feet
- B. The arm shall be designed to flex in the wind to minimize stress on the welded joints and stress points shall be extended away from the welds or points of attachments to further help reduce metal fatigue caused by constant flexing of the 4'-6" arm in winds and to endure 30 years.
- C. Manufacturer:
  - 1. Eagle-1 Mfg. USA., Model HLS-35E GEN 4.
  - 2. SOL Inc.
  - 3. Se'lux Corp
  - 4. Or Approved Equal.

## **PART 3 -- EXECUTION**

### **3.1 LUMINAIRES**

#### **A. General**

1. Install each luminaire in a manner recommended by the luminaire manufacturer and accepted by the ENGINEER.
2. Furnish and install all additional ceiling bracing, hanger supports, and other structural reinforcements to the building and to concrete pole bases required to properly and safely mount luminaires, all acceptable to the ENGINEER and the INSPECTOR.
3. Be responsible for handling the luminaires, installing plumb and level, and keeping luminaires clean.
4. Where luminaires are wall mounted and a mounting height is indicated in the Luminaire Schedule or on the Drawings, the height is from the bottom of the luminaire to finished floor or finished grade, whichever is applicable.
5. Where luminaires are pendant-mounted and a mounting height is indicated in the Luminaire Schedule or on the Drawings, the height is from the bottom of the luminaire to finished floor.
6. Provide each luminaire outlet box with a galvanized luminaire stud to fit the luminaire selected.
7. Provide pendant-mounted luminaires with swivel type hangers and canopies as approved by the ENGINEER. Finish hangers and canopies to match luminaires, unless otherwise noted. Space single-stem hangers on continuous-row fluorescent luminaires nominally 48-inches apart. Use twin stem hangers on single luminaires.
8. After construction of total project is completed, remove all labels and other markings, wash dirty luminaires inside and out with a nonabrasive mild soap or cleaner. Clean luminaire plastic lenses with antistatic cleaners only. Touch up all painted surfaces of luminaires with high-grade exterior enamel, and poles with paint supplied by manufacturer. Replace all permanent lamps used for lighting purposes during construction.

#### **B. Finished Areas:**

1. Locate luminaires where shown on the Facility Plans.
2. Install all luminaires straight and true with reference to adjacent walls and where mounted on tiled ceilings; locate luminaires symmetrically with the tile pattern as shown on the Drawings. In all cases, locate centerlines of luminaires either on centerline of tile or on joint between adjacent tile

runs, as best suits luminaire spacing shown.

3. Provide surface-mounted luminaires, acceptable for installation on combustible low-density cellulose fiberboard.
4. Provide flush and recessed luminaires installed in ceilings with junction boxes located at least 1-foot from luminaires. Provide wiring from junction box to luminaire of temperature rating as required by the luminaire in not less than 4-feet, but no more than 6-feet of flexible steel conduit. In concealed locations, install junction boxes to be accessible by removing luminaire.
5. Install all recessed luminaires tight with the finished surface so that no spill light will show between the ceilings and the sealing rings, and furnish plaster frames when required by ceiling construction.
6. Provide each fluorescent recessed luminaire with two safety chains or two No. 12 soft-annealed galvanized steel wire of length needed to secure luminaire to building structure independent of ceiling structure. Tensile strength of chain or wires and fastening to structure shall be adequate to support weight of luminaire. Fasten a chain or wires to each end of luminaire.

C. Unfinished Areas:

1. Install all luminaires straight and true with reference to adjacent walls and structural members. Locate luminaires symmetrically in the pattern shown on the Drawings.
2. Coordinate luminaire locations with other utility systems. Relocate luminaires to avoid conflict with these other systems and to avoid blockage of luminaire light output.

### 3.2 BALLASTS

- A. Install in strict accordance with manufacturer's recommendations. Utilize all ballast mounting holes to fasten the ballast securely within the luminaire.

### 3.3 LIGHTING CONTROL

- A. Photo-Time Control: Install photo control as shown on Drawings.
- B. Dimming Systems: Mount dimmers in strict compliance with manufacturer's recommendations. Do not connect any ballasts or equipment to dimming system unless it is acceptable to dimming system manufacturer.

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