



City of Los Angeles

“Changing our Glow for
Efficiency”

Los Angeles, CA
June 2013



City of Los Angeles Facts

✓ **2nd largest City
in the USA**

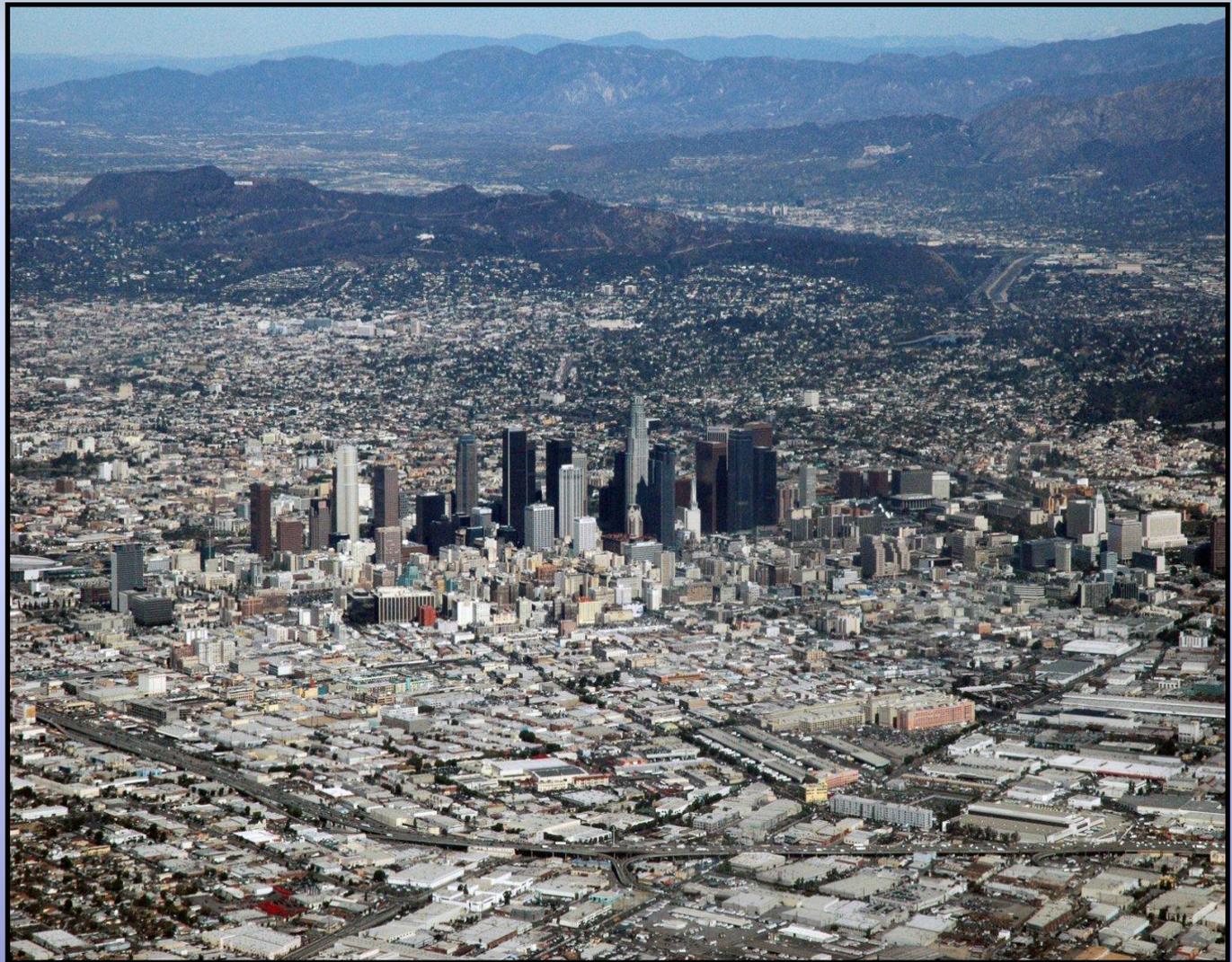
✓ **472 sq mi**

✓ **6500 miles of
streets**

✓ **Population of 4
Million**

✓ **\$7.2 Bi. City
Budget for 2012**

✓ **Power Utility
owned by the City**



Bureau of Street Lighting

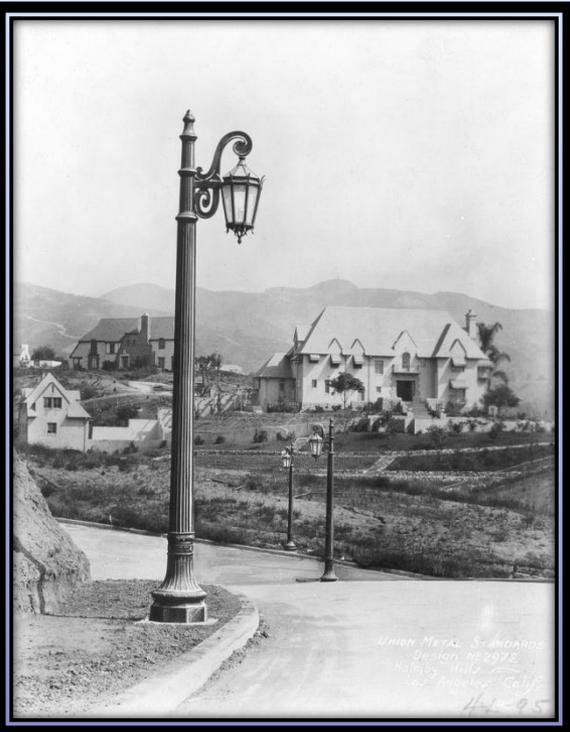
- One of five Bureaus in the Department of Public Works, Est. in 1925

- 210,000 streetlights with over 400 different styles

- 4500 miles of streets are illuminated



Union Metal Lamp Standard
Design No. 1931
cast First St. L.A. Calif.
18



UNION METAL STANDARDS
Design No. 1932
cast First St. L.A. Calif.
18



Bureau of Street Lighting Operations

- Street Lighting Maintenance Assessment Fund



- All maintenance and engineering work In-House
214 Employees

- \$25 Mil. Annual Budget –
Appropriation for FY 12/13



Operational Challenges for Bureau of Street Lighting

- **Energy Usage -190 million kWh/year (2008)**
- **Energy Cost - \$16 million/year (2008)**
- **No meters. Energy calculated from GIS system, nominal wattage, kWh price per time of use**
- **Proposition 218 & frozen Assessments**



City of Los Angeles – LED Program

“Mayor’s Green Initiative for City of Los Angeles”



PARTNERS



City of LA - LED Program



- **Convert 140,000 streetlights to LED**
- **Install Remote Monitoring System**
- **Timeline – 4 years**
- **Total Cost - \$57 million**
- **Loan \$40 million**
- **City crews**
- **Program payback – 7 years**
- **Launched – February 2009**

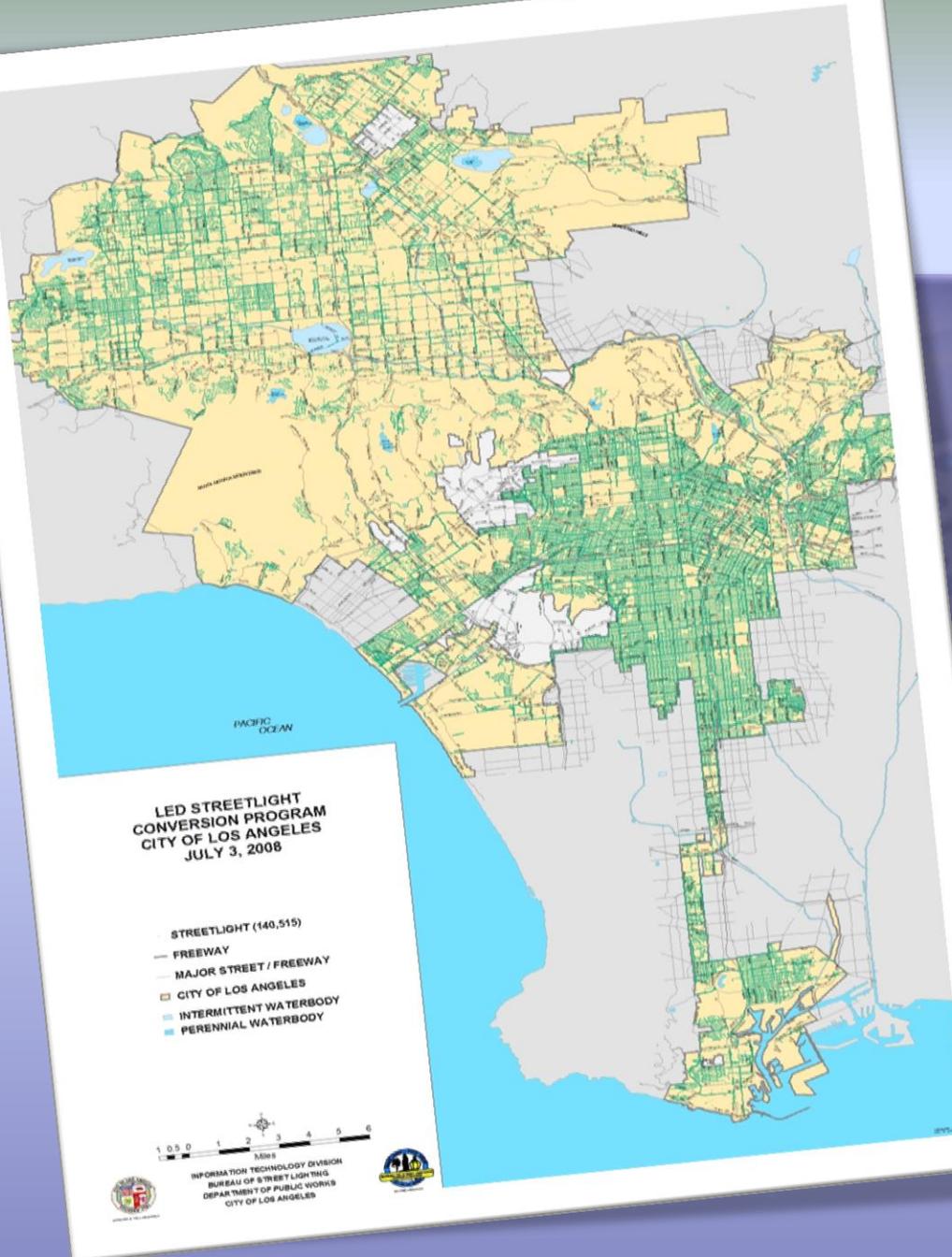
LED Program Goals & Benefits

- **Reduce energy consumption by 60%**
- **Energy Savings – 68,000 MWh/year, \$7.5 million/year**
- **Maintenance Savings - \$2.5 million/year;
Longer life of LED fixtures (10-15 yrs.)**
- **Environment - Reduce 40,500 tons of CO2/year**
- **White Light, perception of improved
lighting/visibility/dimming capability**

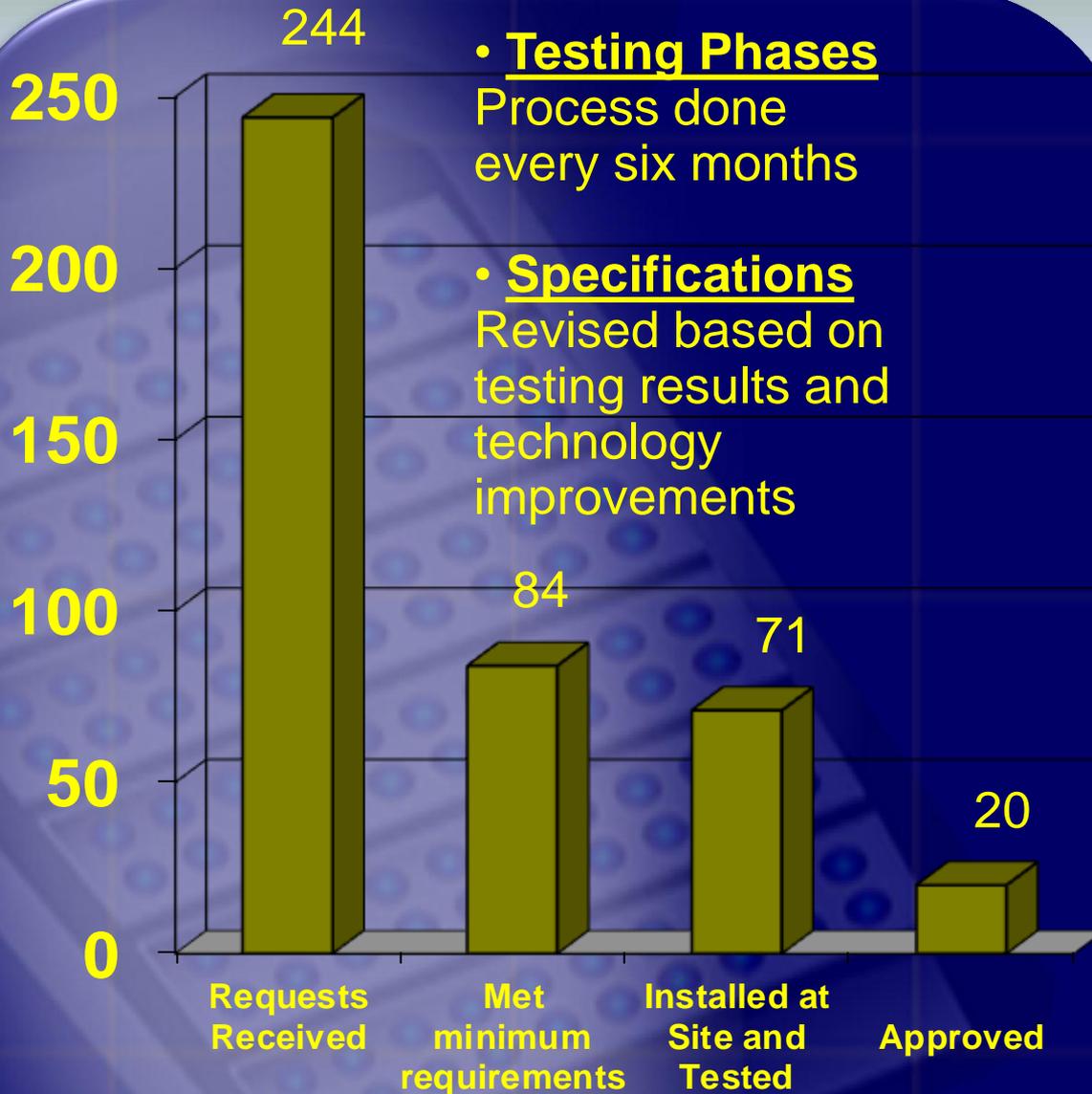


Program Geographic Area

LED Conversion of
140,000
streetlights in the
City of
Los Angeles



Testing and Evaluation



- Testing Phases

Process done every six months

- Specifications

Revised based on testing results and technology improvements

Lighting Evaluation

Illumination, Luminance, Uniformity Ratio, Color Temperature, Brightness.

Electrical Evaluation

Power consumption, Power Factor, Harmonic Distortion, Remote Monitoring Device compatibility, Remote Dimming/Controls.

Mechanical Evaluation

Disconnects, fixture assembly and ease of installation.

■ LED Units that requested Evaluation/Test

Summary of City of LA Specifications

- 4000 K
- Warranty 6 years
- 70% delivery of initial lumens at 50,000 hours
- Minimum of 45% energy savings
- 3-prong twist-lock PE receptacle
- House-side light control
- Size, Weight, Packaging, Initial Lumens, and Efficacy
- Bureau's Webpage: <http://bsl.lacity.org>



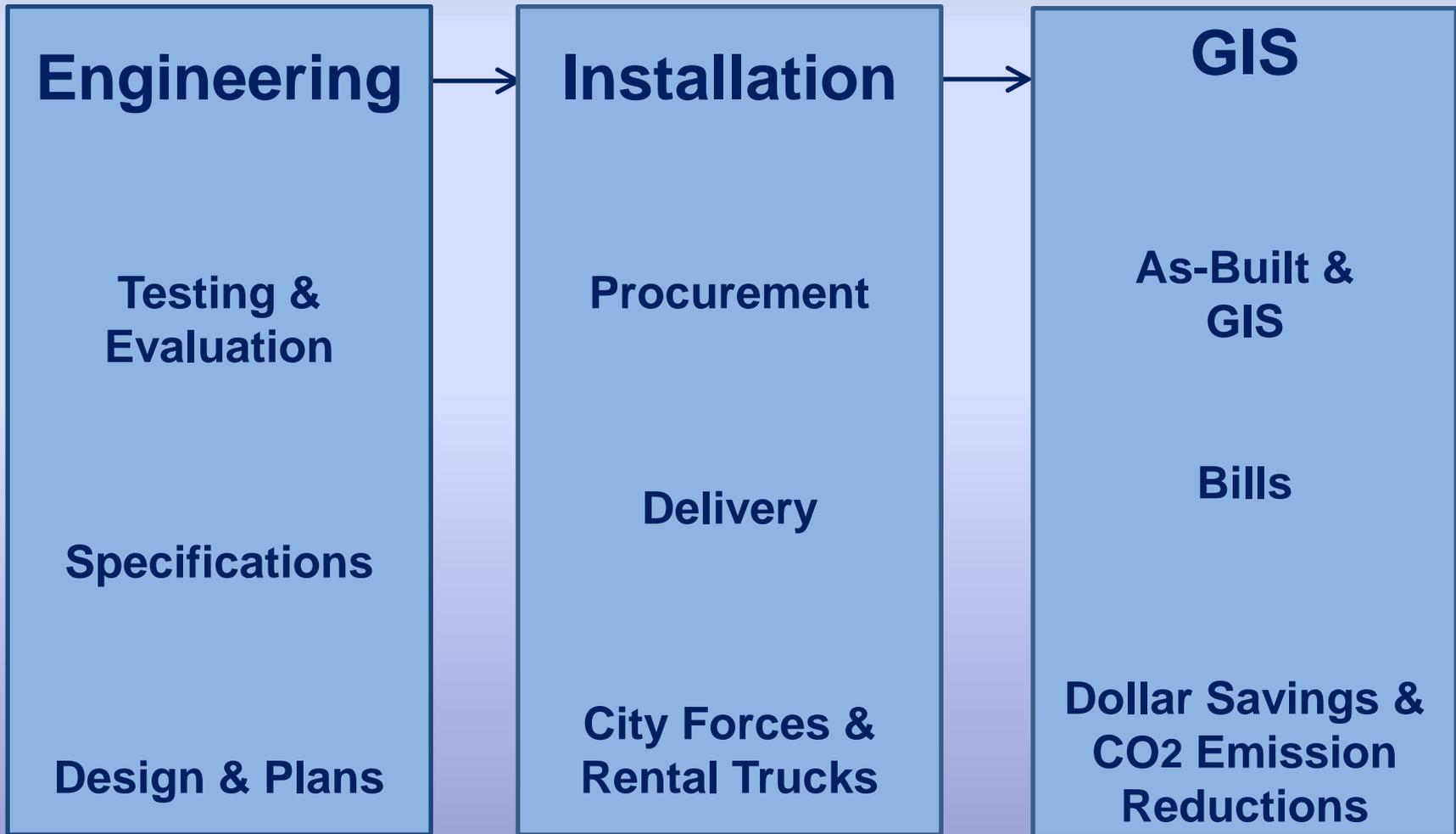
Public Outreach

- Improved Lighting
- No Cost
- No Negative Impact
- Surveys
- Dedicated telephone line
- Website
<http://bsl.lacity.org>



LED Conversion Project

Implementation Process



L.A. Lighting the Way



Statistics

- Jobs Created
Manufacturer: 227
City of LA: 15
- Truck rentals: 7
- No. of Crews: 7

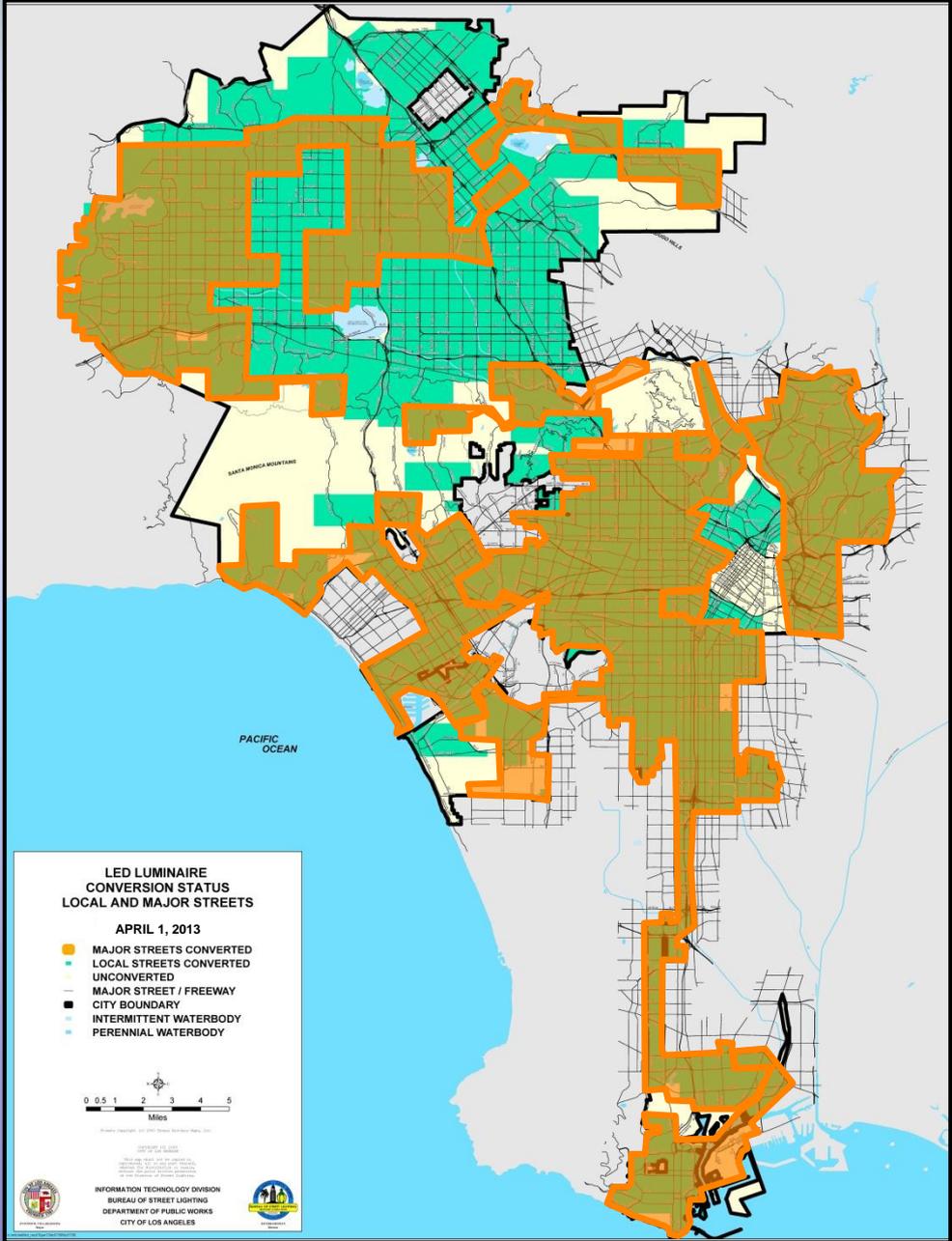


Workload

- Weekly Installations:
1,000



City of Los Angeles - LED Conversion Project

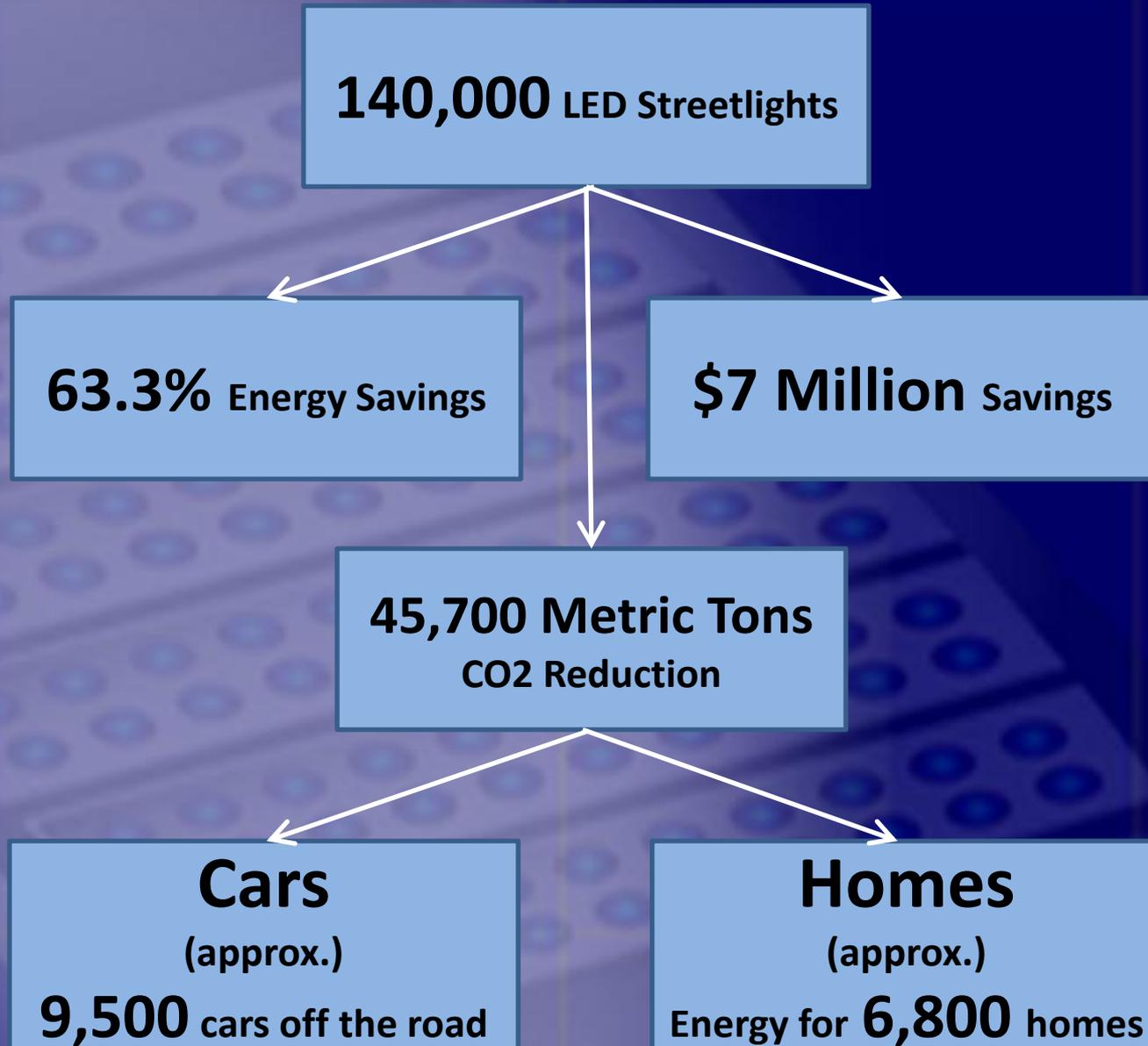


Local Streets

Major Streets



City of Los Angeles – Bureau of Street Lighting LED Conversion Project



Yearly Comparisons

Local Street LED Fixture

2009

- Avg. Price = \$ 432
- Efficacy = 42 Lm/W
- Life = 80,000 hrs
- Warranty = 5 yrs

2010

- Avg. Price = \$ 298
- Efficacy = 61 Lm/W
- Life = 111,000 hrs
- Warranty = 6 yrs

2011

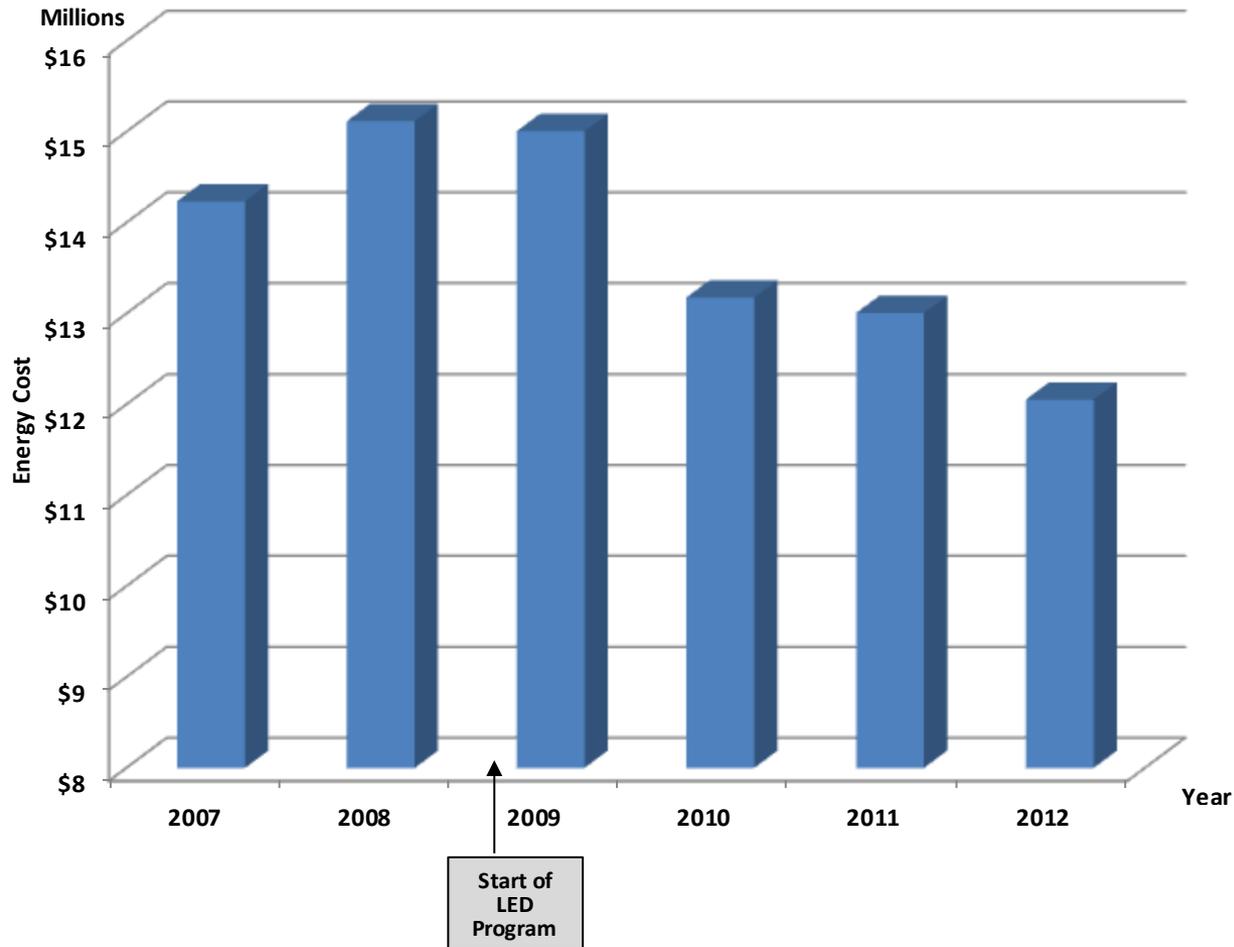
- Avg. Price = \$ 285
- Efficacy = 72 Lm/W
- Life >150,000 hrs
- Warranty = 6 yrs

2012

- Avg. Price = \$ 245
- Efficacy = 81 Lm/W
- Life >150,000 hrs
- Warranty = 7 yrs

LED Program

Street Lighting Energy Cost



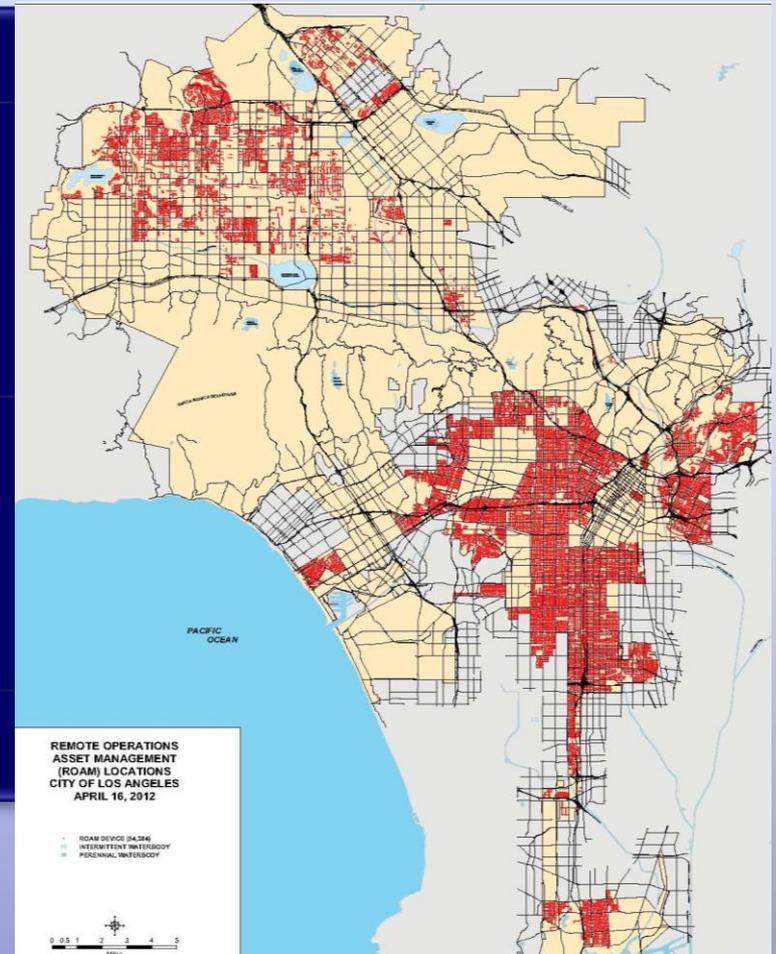
March 13,
2012



Remote Monitoring System

Street Lighting and Controls

- 210,000 streetlights in the City of Los Angeles
- 54,027 street lighting controls installed
- Majority installed over the last 3 years (with our LED program)



Remote Monitoring System

Existing Street Lighting Controls

- System utilizes mesh network and gateway
- Server hosted by manufacturer
- Provide streetlight diagnostics (operations, power consumption etc.)
- On/Off ability
- Lighting Control integrated in PE cell
- No GPS self activation. Manually activated with a Bar Code scanner



Remote Monitoring System

Street Lighting Control - Challenges

- Deployment Challenges
 - Stickers and bar coding
 - Cumbersome Process
 - Too much inputting
 - Too many devices
 - Too much time for activation
 - Field crew vs. contractor
- Interference – 3G, 4G to what's next.
- Ornamental Systems



Remote Monitoring System

Street Lighting Control - Future Needs

- Better commissioning deployment
 - GPS built-in option
 - Remote activation
- Meter grade accuracy (2% or less)
- Flexibility for use with decorative systems
- Power back-up system on devices
- No monitoring fees
- Cost Reduction – more affordable
- Systems Compatibility – Standardization



Before and After Pictures of Program

Fc.: 4.31

Ave./Min.:2.40

Max./Min.: 5.4



BEFORE – 200 W HPS (240 W)
6th Street Bridge over Los Angeles River



Before and After Pictures of Program

Fc.: 3.48

Ave./Min.: 1.63

Max./Min.: 2.67



AFTER – 180 W LED (180 W)
6th Street Bridge over Los Angeles River



Before and After Pictures of Program

Fc.: 1.59

Ave./Min.: 2.3

Max./Min.: 5.23

BEFORE
200 W HPS
(240 W)



La Brea Avenue – HPS

Before and After Pictures of Program

Fc.: 1.08

Ave./Min.: 1.71

Max./Min.: 2.52

AFTER

64 W LED

(64 W)



La Brea Avenue – LED



Before and After Pictures of Program

Fc.: 2.99

Ave./Min.: 1.83

Max./Min.: 3.15

BEFORE
400 W HPS
(465 W)



Ventura Blvd. – HPS



Before and After Pictures of Program

Fc.: 1.76

Ave./Min.: 1.52

Max./Min.: 2.22

After
168 W LED
(168 W)



Ventura Blvd. – LED



Before and After Pictures

Fc.: 0.68

Ave./Min.: 13.60

Max./Min.: 54.80



Fc.: 0.46

Ave./Min.: 2.42

Max./Min.: 4.32



BEFORE – 100 W HPS (138 W)

AFTER – 70 W LED (70 W)



Before and After Pictures of Program

Fc.: 1.46

Ave./Min.: 6.63

Max./Min.: 18.32

BEFORE

150 W HPS

(190 W)



Ocean Front Walkway, Venice – HPS

Before and After Pictures of Program

Fc.: 1.90

Ave./Min.: 3.29

Max./Min.: 7.44

AFTER
72 W LED
(72 W)



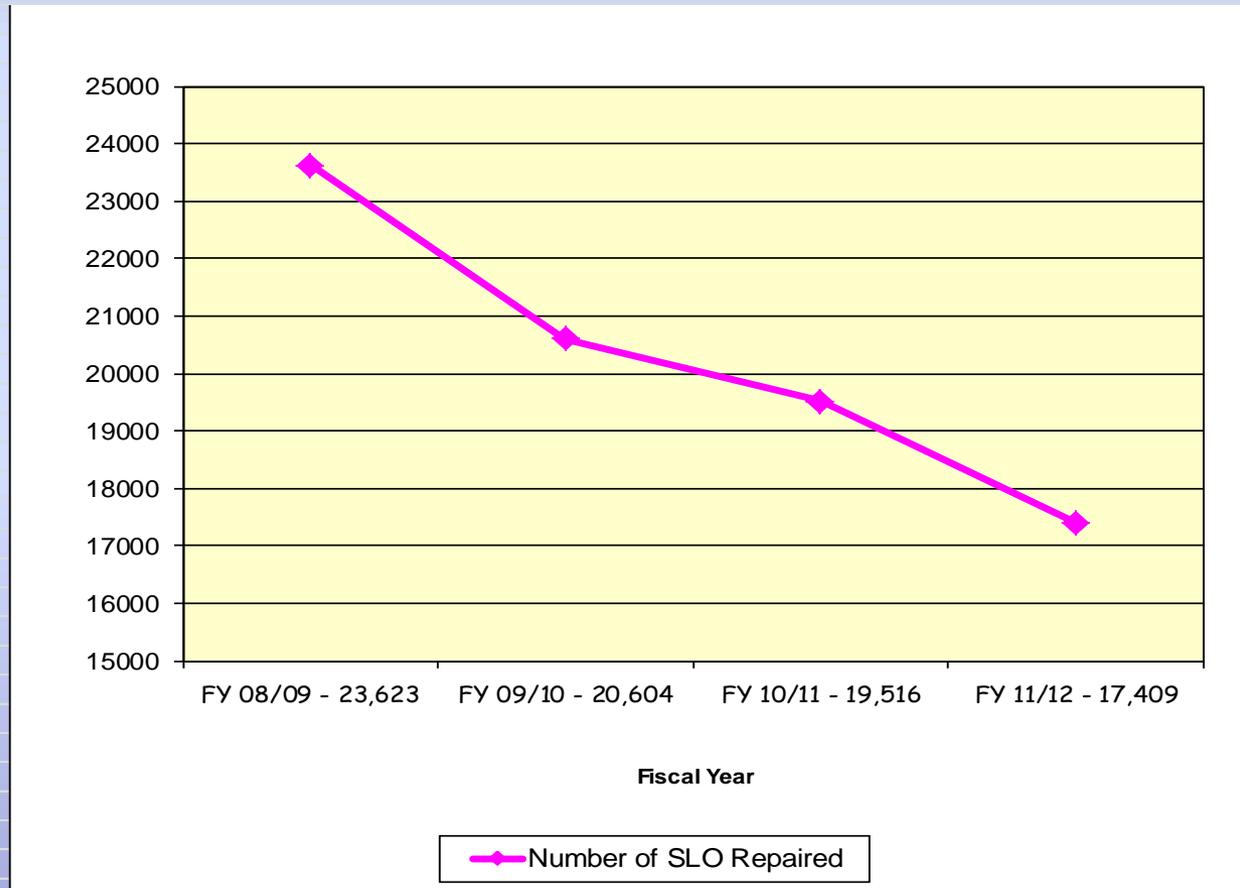
Ocean Front Walkway, Venice – LED

“Lessons Learned”

- **“TRUST BUT VERIFY”** – Not all claims manufacturers make are true.
- **“REALITY VERSUS THEORY”** – The change from HPS to white light with the LEDs is being perceived as a significant increase in lighting levels.
- **“ENERGY SAVINGS ARE REAL”** – As the LEDs improve, and the manufacturers develop the technology, the energy savings are being realized and continue to increase.
- **“IMPROVED VISIBILITY”** – The change from HPS to white light have improved visibility as noticed by residents and encouraged by the Police Department.

Maintenance Savings

- **Single Streetlight Repairs**
FY 2009: 23,500
FY 2012: 17,400
- **Total Streetlight Repairs**
FY 2010: 70,000
FY 2012: 46,300



Handling and Installation

- Smaller/lighter units, easy to install and transport
- No need to carry components in trucks for maintenance
- Reduction in warehousing space
- Packaging – 50% reduction compared to HID units

LED Advantages

- Improved uniformity ratios – “Carpeted Effect”
- Allows for designs with smaller wire and conduit sizing
- Compatible with Remote Monitoring Systems
- Option of dimmable driver
- Instant ON and OFF operation

LED Performance

- Availability of house-side shield
- Improved visibility and reduction of hot-spots
- Ratio of Maximum/Minimum has become more relevant than ratio of Average/Minimum
- The cooler the color temperature, the more glare complaints we received from people

LED Performance

➤ Lumen Depreciation

	LUMEN
3 YEARS	13%
5 YEARS	15%

➤ Annual Dirt Depreciation 4%

➤ Failure Comparison (average)

HID – 10% (based on past installation history)

LED – 0.2% (based on 189 units from 98,000 installed)

Results

Program vs. Actual

	<u>PROGRAM GOALS</u>	<u>ACTUAL</u>
TOTAL UNITS INSTALLED	110,000	140,000
ENERGY SAVINGS	40%	63%
PERFORMANCE	Uniformity a Concern	Good Uniformity, better than HPS
COMMUNITY FEEDBACK	Anticipated Negative	Mostly Positive
CITY CREWS AND UNION HALL	20 units/day/crew	30 units/day/crew
REMOVED HID UNITS	Recycle old units	Auction and Recycle \$1,088,734 in revenue

Citywide Crime Statistics

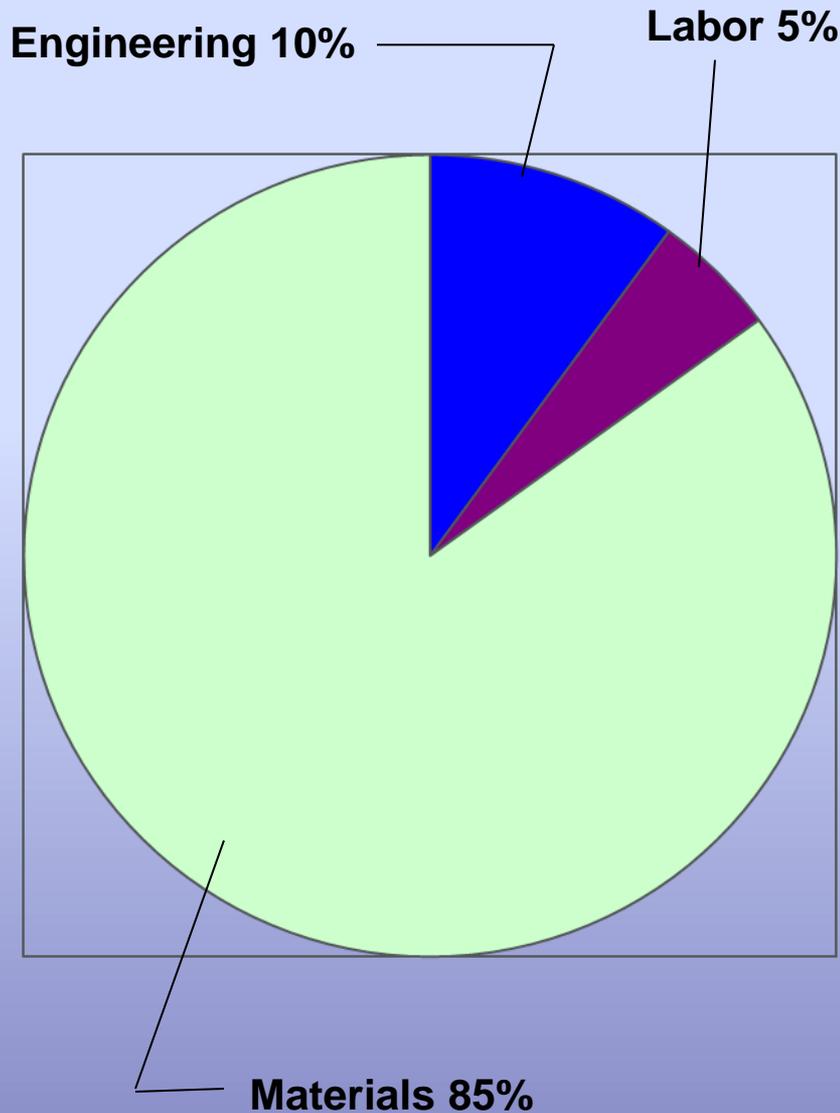
Incidents between hours of 7 PM to 7 AM

CRIME TYPES	YEAR		REDUCTION
	2009	2011	
Vehicle Theft	15,778	13,632	13.60 %
Burglary-Robbery-Theft	19,967	18,406	7.82 %
Vandalism	11,115	9,906	10.90 %
Total	46,860	41,944	10.5 %

- Most units installed in residential, local streets



Cost Breakdown



Unit Cost Breakdown for 2011/12 Fiscal Year - LED Program

■ Engineering	- \$31.66
■ Labor	- \$15.42
■ Material	- \$261.92

**TOTAL COST PER UNIT
= \$309**

Sepulveda Tunnel under LAX LED Lighting Project



- 2080 foot-long divided tunnel under LAX
- Built in 1953 as part of State Highway 1
- Old Lighting System – High Pressure Sodium
- **New Lighting System – 572 LED fixtures, Range: 30-120 LED's**
- **Energy Savings: 64%**
- **Wireless Remote Controls System**

Sepulveda Tunnel under LAX



400W HPS Light pipe

Sepulveda Tunnel under LAX

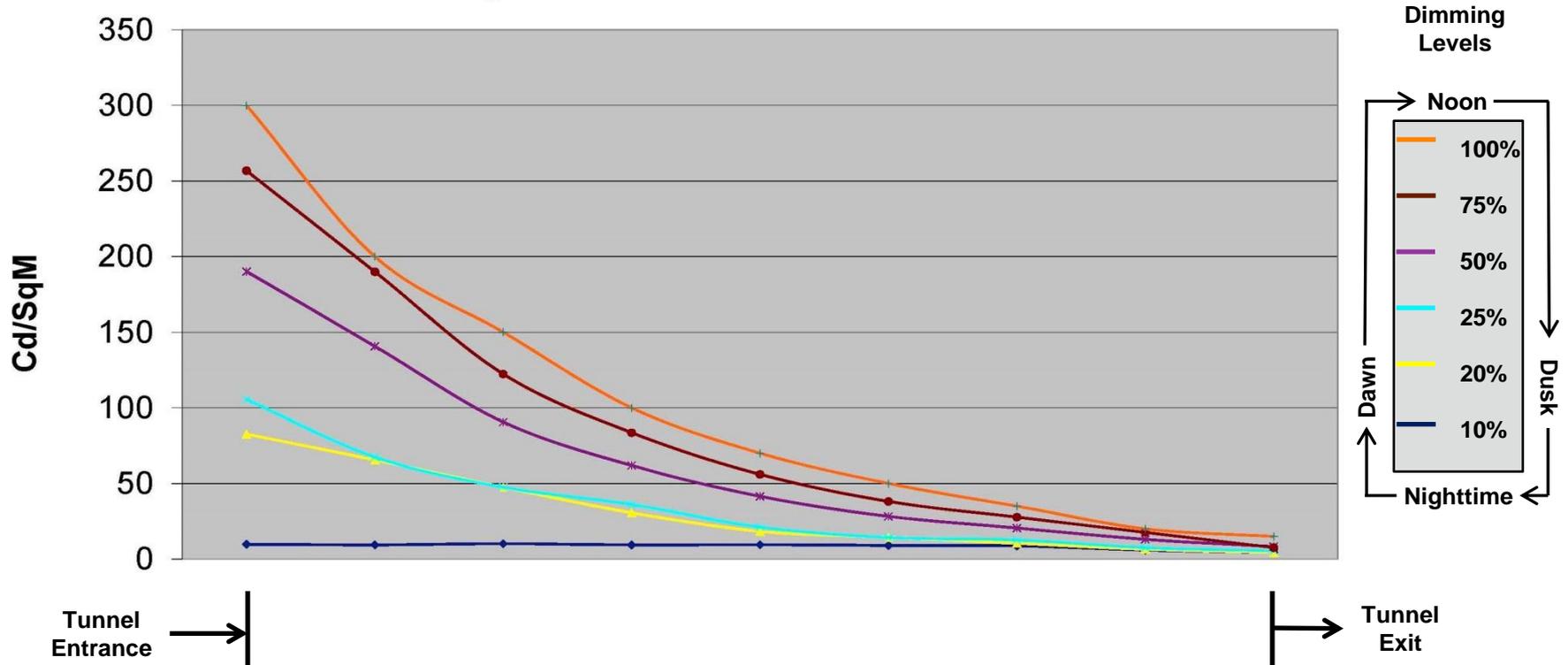


Sepulveda Tunnel under LAX



Sepulveda Tunnel under LAX

Light Transition within Tunnel



“Moving Forward” LED Decorative Fixtures

48 LEDs; 54 W



4100 K

48 LEDs; 80 W



3000 K

32 LEDs; 48 W



2900 K

42 LEDs; 55 W



2800 K

- More than 70,000 existing decorative fixtures
- About 400 different styles
- Color Temperature range – 3000 Kelvin
- Presently testing and evaluating LED and Induction units



Typical post-top fixture

“Moving Forward” LED Decorative Fixtures



“Moving Forward”

LED Lamps for Decorative Fixtures

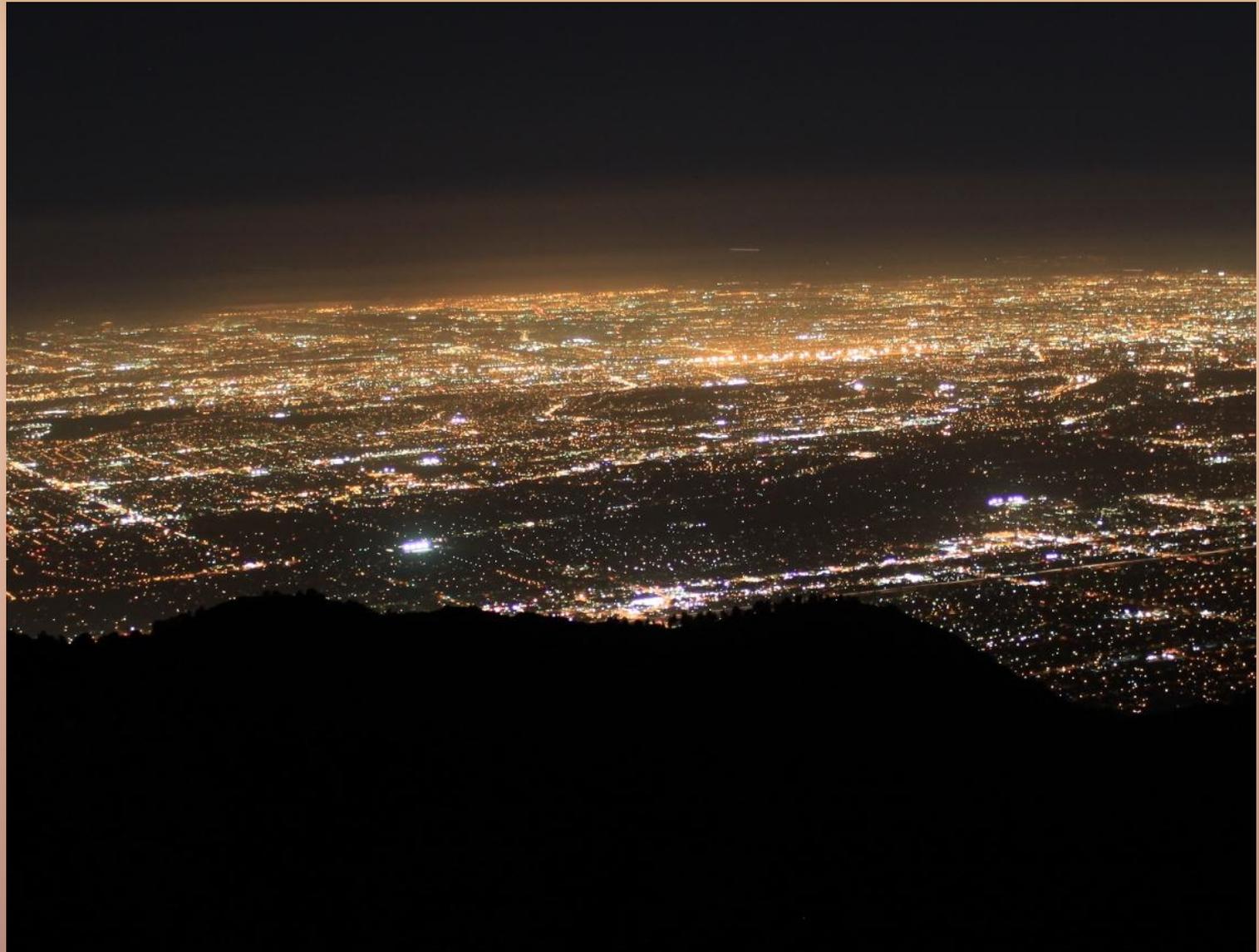


800 – 1780 lumens
2700 K

Los Angeles Basin – View from Mt. Wilson Before LED Retrofit Project – 2008



Los Angeles Basin – View from Mt. Wilson After LED Retrofit Project – 2012





THANK YOU

City of Los Angeles Bureau of Street Lighting



<http://bsl.lacity.org>



BUREAU OF STREET LIGHTING
DEPARTMENT OF PUBLIC WORKS