

City of Los Angeles

“Changing our Glow for Efficiency”

Municipal Solid State Lighting Consortium - LED Workshop

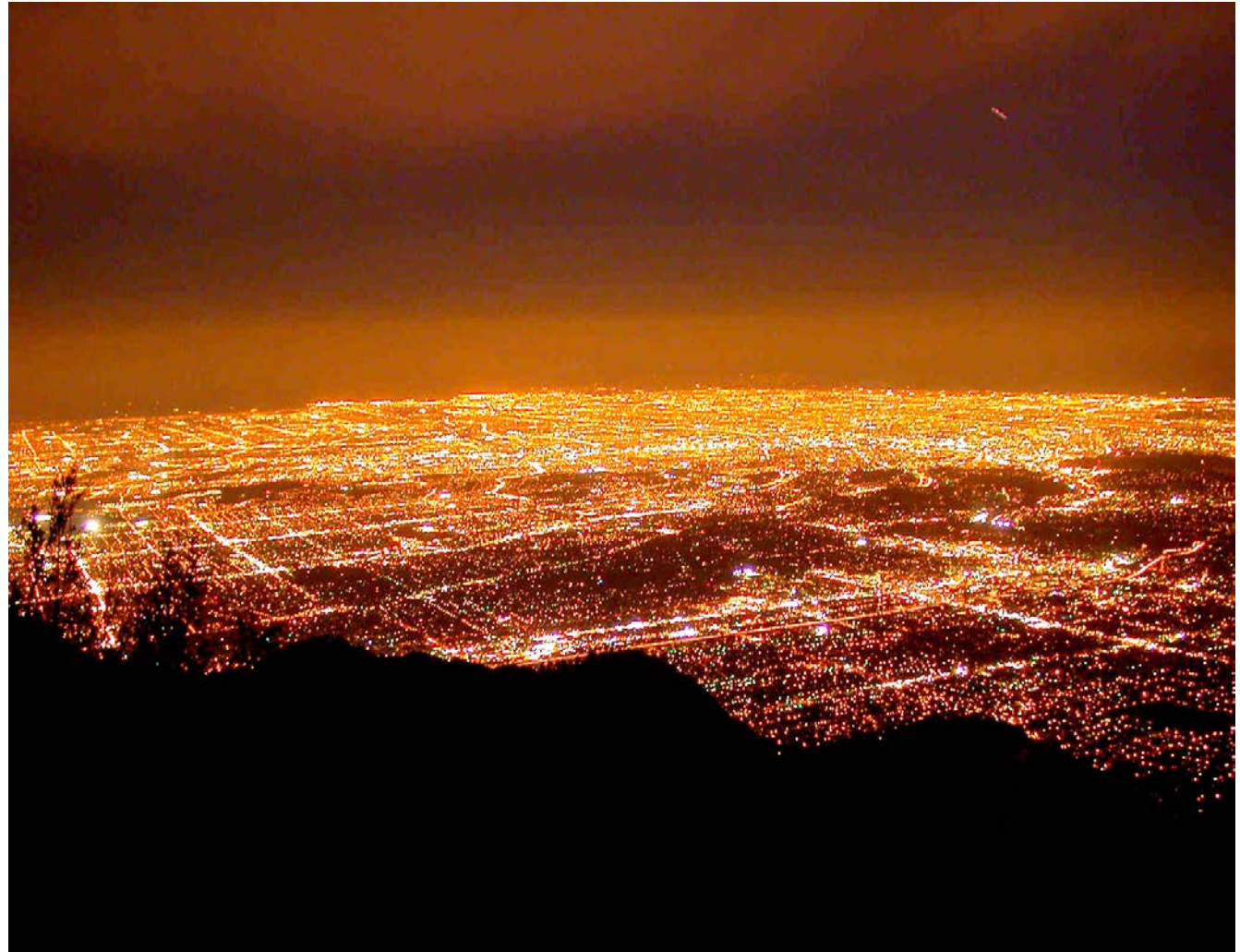


Los Angeles
April 2012



City of Los Angeles Facts

- 472 Sq. Mi.
- 6500 Miles of streets
- 22 Departments
- 2nd largest City in the USA
- \$6.7 Bi. City Budget for 2011
- Population of 4 Million
- Utility owned by the City



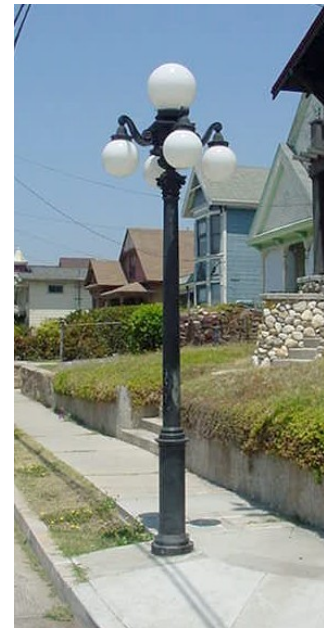
Bureau of Street Lighting Operations

- One of five Bureaus in the Dept. of Public Works, Est. in 1925
- 210,000 streetlights with over 400 different styles
- 4500 miles of streets are illuminated
- \$22 Mil. Annual Budget Appropriation for 2011



Bureau of Street Lighting Operations

- **Street Lighting Maintenance Assessment Fund**
- **All maintenance and engineering work in House/214 Employees**
- **More than 70,000 streetlight repairs per year**



Bureau of Street Lighting Streetlight Viewer Geographic Information System

- Complete geographic database (GIS) with over 210,000 streetlight poles.
- This database has all streetlight attributes including light source, and all plans associated with the location.
- Direct connection between the geographic database (GIS) and our Computer Aided Drafting (CAD) environment.
- This database is used for our maintenance and repair, billing purposes, planning and design including maps for our LED program.



Streetlight Report

Post information

Status:	AsBuilt
Streetlight ID:	87914
Post description:	CD913
Standard plan:	B2951
Installation plan:	D27532
Installation post no:	704
Material:	Steel
Arm style:	Two
Pole shape:	Octagonal
Circuit number:	092549
Circuit type:	Series
Burn schedule:	All Night
GASB category:	Custom



Lamp information

Lamp ID:	A (SLAF)
Lamp description:	200W HPS
lamp lumens:	22000
ANSI:	S66
Long description:	High Pressure Sodium 200W

Lamp ID:	B (SLAF)
Lamp description:	200W HPS
lamp lumens:	22000
ANSI:	S66
Long description:	High Pressure Sodium 200W

Plan information

[D27532](#) (AsBuilt)

Burn date: 1/1/1983 Asbuilt date: 6/27/1983

CENTRAL BUSINESS DISTRICT REDEVELOPMENT PROJECT
UNIT I



Bureau of Street Lighting Asset Maintenance System Intersection / Address Search

Streetlight Asset Maintenance System - Windows Internet Explorer

http://10.84.1.209/ams/index.htm

File Edit View Favorites Tools Help

★ Favorites ★ Suggested Sites Streetlight Viewer Free Hotmail Web Slice Gallery Streetlight Viewer (2)

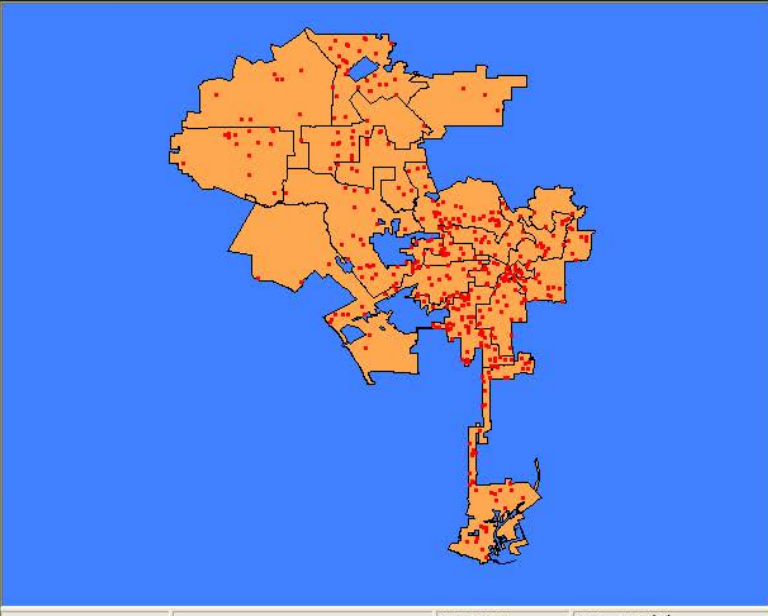
Streetlight Asset Maintenance System

Streetlight Asset Maintenance System

Select an option: Closed incidents - show: [All](#) [Last 6 months](#) [Last 12 months](#) [None](#) [Log in / out](#)

Find location [Go](#) [Help](#) [SRS](#)

Double-click on a streetlight, incident or parcel for more information.



1: 642,181 63.8 x 49.2 (mi)

User ID: read (read)

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Intersection / Address Search

Search for an **intersection** by entering a primary and cross street name.

Example: Spring and Temple

Primary street:

Cross street:


Search for an **address** by entering a number and street name *.

Example: 200 Spring

* UPDATE: Entering the street direction is no longer required.

All matching addresses will be shown (e.g., 200 N Spring St, 200 S Spring St, etc.) and the desired address can be selected from the list.

Local intranet 100%



Bureau of Street Lighting Asset Maintenance System Address Search Result

Streetlight Asset Maintenance System - Windows Internet Explorer

http://10.84.1.209/ams/index.htm

File Edit View Favorites Tools Help

★ Favorites ★ Suggested Sites Streetlight Viewer Free Hotmail Web Slice Gallery Streetlight Viewer (2)

Streetlight Asset Maintenance System

Streetlight Asset Maintenance System

Select an option: Find location Go

Closed incidents - show: All Last 6 months Last 12 months None

Log in / out

Help

SRS

Double-click on a streetlight, incident or parcel for more information.

1 'parcel' selected 1 : 3,500 1,835 x 1,416 (ft)

User ID: read (read)

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Address Search

The value you entered was: 1149 Broadway

Address Search Results:

1149 S BROADWAY

zoom to location

[Google Street View](#)

Return

Local intranet 100%

Bureau of Street Lighting Asset Maintenance System Incident Report

Streetlight Asset Maintenance System - Windows Internet Explorer

<http://10.84.1.209/ams/index.htm>

File Edit View Favorites Tools Help

Streetlight Asset Maintenance System

Streetlight Asset Maintenance System

Select an option: [Go](#)

Closed incidents - show: [All](#) [Last 6 months](#) [Last 12 months](#) [None](#)

[Log in / out](#)

[Help](#)

[SRS](#)

Double-click on a streetlight, incident or parcel for more information.

FOD district : CENTRAL DIS 1 'incident open' selected 1 : 3,500 1,835 x 1,416 (ft)

User ID: admin (admin)

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Incident Report

The following incidents are at this location:
Incident 185523 (open)

[View damage claim\(s\)](#)

[View streetlight information](#)

[View job\(s\)](#)

[Print crew sheet for a new job](#)

Incident:	185523
Reported problem:	post hit
Funding:	SLAF
Incident status:	open
Location description:	E/S OLIVE 3/N/O 12TH
Incident description:	POST HIT, S/S NEEDS GLASSWARE
Work order:	L0388999
Task:	024
Sub task:	051
Reported by name:	DOT OP #1117
Reported by phone:	
Reported on date:	4/16/2009
Repair completion date:	
Multiple calls:	No
Post attributes:	
Circuit no:	092557
USA number:	
Assigned to:	35
Repaired by:	BSL
Concrete pending:	No
Patrol map no:	262SE
Thomas guide:	634 5E
FOD district:	CENTRAL
APC district:	Central
Council district:	9
Streetlight ID:	65676
Date entered:	4/16/2009 9:36:37 AM

Internet 100%

Bureau of Street Lighting Asset Maintenance System Job Report

Streetlight Asset Maintenance System - Windows Internet Explorer
http://10.84.1.209/ams/index.htm
File Edit View Favorites Tools Help
Streetlight Asset Maintenance System

Streetlight Asset Maintenance System

Select an option: Closed incidents - show: [All](#) [Last 6 months](#) [Last 12 months](#) [None](#) [Log in / out](#)

Find location [Go](#) [Help](#) [SRS](#)

Double-click on a streetlight, incident or parcel for more information.

FOD district : CENTRAL DIS | 1 'incident open' selected | 1 : 3,500 | 1,835 x 1,416 (ft)

User ID: admin (admin)

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Job Report

The incident you selected has the following job(s):

[Return](#)

Incident:	185523
Job number:	1
Crew leader:	V. HERNANDEZ
Actual repair hours:	1
Job status:	complete
Job date:	4/13/2009
Resolution:	None specified
Resolution description:	ISA; POST S/S; GLASSAWRE MISSING; LUM TILTED; ORDERED PARTS.
Overtime:	No
Date entered:	4/16/2009 9:38:02 AM
Last update:	
Last update by:	rlangda

Crew usage information

Job	Class	Quantity
1	St. Lgt. Electrician	1
1	Electrical Craft Helper	1
1	Assistant St. Lgt. Electrician	1

Equipment usage information

Job	Equipment	Hours
1	DIGGER DERRICK TRUCK (39798)	1
1	COMPRESSOR DUMP TRUCK (39499)	1

[Return](#)

Internet 100%

Bureau of Street Lighting Asset Maintenance System Open Incident Summary

Streetlight Asset Maintenance System - Windows Internet Explorer

<http://10.84.1.209/ams/index.htm>

File Edit View Favorites Tools Help

Streetlight Asset Maintenance System

Streetlight Asset Maintenance System

Select an option: Closed incidents - show: [All](#) [Last 6 months](#) [Last 12 months](#) [None](#) [Log in / out](#)

Reports [Go](#) [Help](#) [SRS](#)

Double-click on a streetlight, incident or parcel for more information.

parcel : 955 S BROADWAY: 0 feature(s) selected 1 : 3,500 1,835 x 1,416 (ft)

User ID: admin (admin)

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Open Incidents Summary Report

[Return](#)

Type	Count
conduit hit	3
construction	19
inspect	1
LED installation	46
multiple lights out	53
other damage	14
other failure	16
post hit	99
single light out	202
vandalism	16
Total:	469

Run date 6/23/2010 10:30:05 AM

[Return](#)

Bureau of Street Lighting Asset Maintenance System Repair Equipment

Streetlight Asset Maintenance System

Select an option: Table maintenance [Go](#)

Closed incidents - show: [All](#) [Last 6 months](#) [Last 12 months](#) [None](#)

[Log in / out](#)

[Help](#)

[SRS](#)

Double-click on a streetlight, incident or parcel for more information.

parcel : 958 S HILL ST-APN: 0 Feature(s) selected 1 : 3,500 1,835 x 1,416 (ft)

User ID: admin (admin)

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Repair Equipment

[Add repair equipment](#) [Return](#)

Equip. no.	Equipment description (Type)	Cost per hour	In-service?	
00000	NO EQUIPMENT UTILIZED (N/A)	\$0.00	yes	Edit Delete
02520	SEDAN - SUPV II (SEDAN)	\$0.00	yes	Edit Delete
10051	HERTZ RENTAL AERIAL LIFT (487-38-6001) 38' (AERIAL LIFT)	\$56.59	yes	Edit Delete
10055	HERTZ RENTAL AERIAL LIFT (487-31-5001) (AERIAL LIFT)	\$56.59	yes	Edit Delete
10057	ALTEC LOANER AERIAL (Indiana 1034092) (AERIAL LIFT)	\$56.59	yes	Edit Delete
10058	HERTZ RENTAL AERIAL LIFT (487-0310;Lic# 7J66512) (AERIAL LIFT)	\$56.59	yes	Edit Delete
10059	HERTZ RENTAL PORTABLE COMPRESSOR (Lic # SE 584123) (PORT COMPRESSOR)	\$16.31	yes	Edit Delete
10062	HERTZ RENTAL PORTABLE COMPRESSOR (Lic # SE584126) (PORT COMPRESSOR)	\$16.31	yes	Edit Delete



Bureau of Street Lighting Asset Maintenance System History of Repairs

Streetlight Asset Maintenance System - Windows Internet Explorer

http://10.84.1.209/ams/index.htm

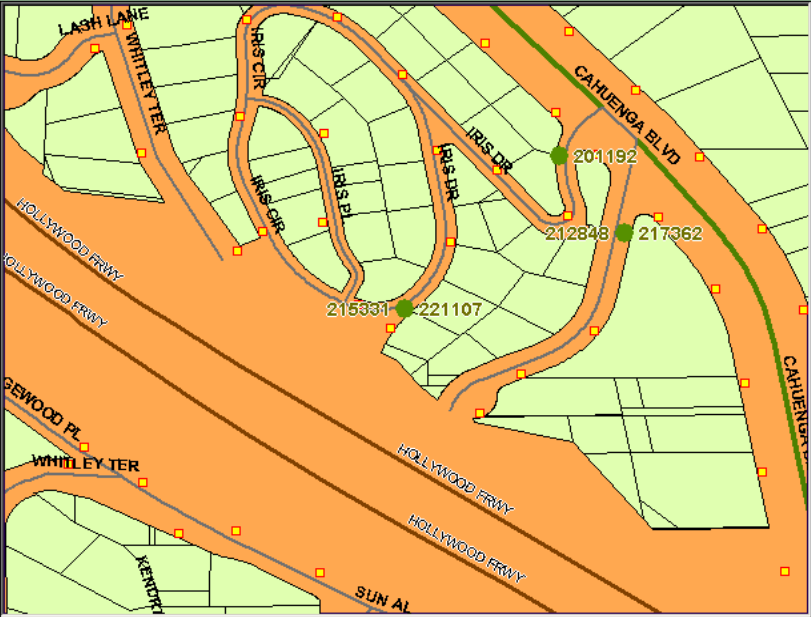
File Edit View Favorites Tools Help

Streetlight Asset Maintenance System

Select an option: Closed incidents - show: [All](#) [Last 6 months](#) [Last 12 months](#) [None](#) [Log in / out](#)

Find incident [Go](#) [Help](#) [SRS](#)

Double-click on a streetlight, incident or parcel for more information.



parcel : 2213 N HOLLY DR-4 1 : 2,000 1,049 x 809 (ft)

User ID: read (read)

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Incidents for Select Streetlight ID

[Return](#)

Streetlight ID 106970

- Incident 221107 was closed on 7/29/2010. [Details](#)
- Incident 215331 was closed on 3/30/2010. [Details](#)
- Incident 196736 was closed on 8/26/2009. [Details](#)
- Incident 196130 was closed on 8/17/2009. [Details](#)
- Incident 175970 was closed on 1/12/2009. [Details](#)
- Incident 156675 was closed on 5/23/2008. [Details](#)
- Incident 94577 was closed on 5/1/2006. [Details](#)
- Incident 76530 was closed on 11/4/2005. [Details](#)
- Incident 68170 was closed on 8/10/2005. [Details](#)
- Incident 66188 was closed on 7/20/2005. [Details](#)

[Return](#)

Done Internet 100%

Operational Challenges for Bureau of Street Lighting

- **Energy Usage -190 million KWH/year**
- **Energy Cost - \$16 million/year**
- **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

PARTNERS

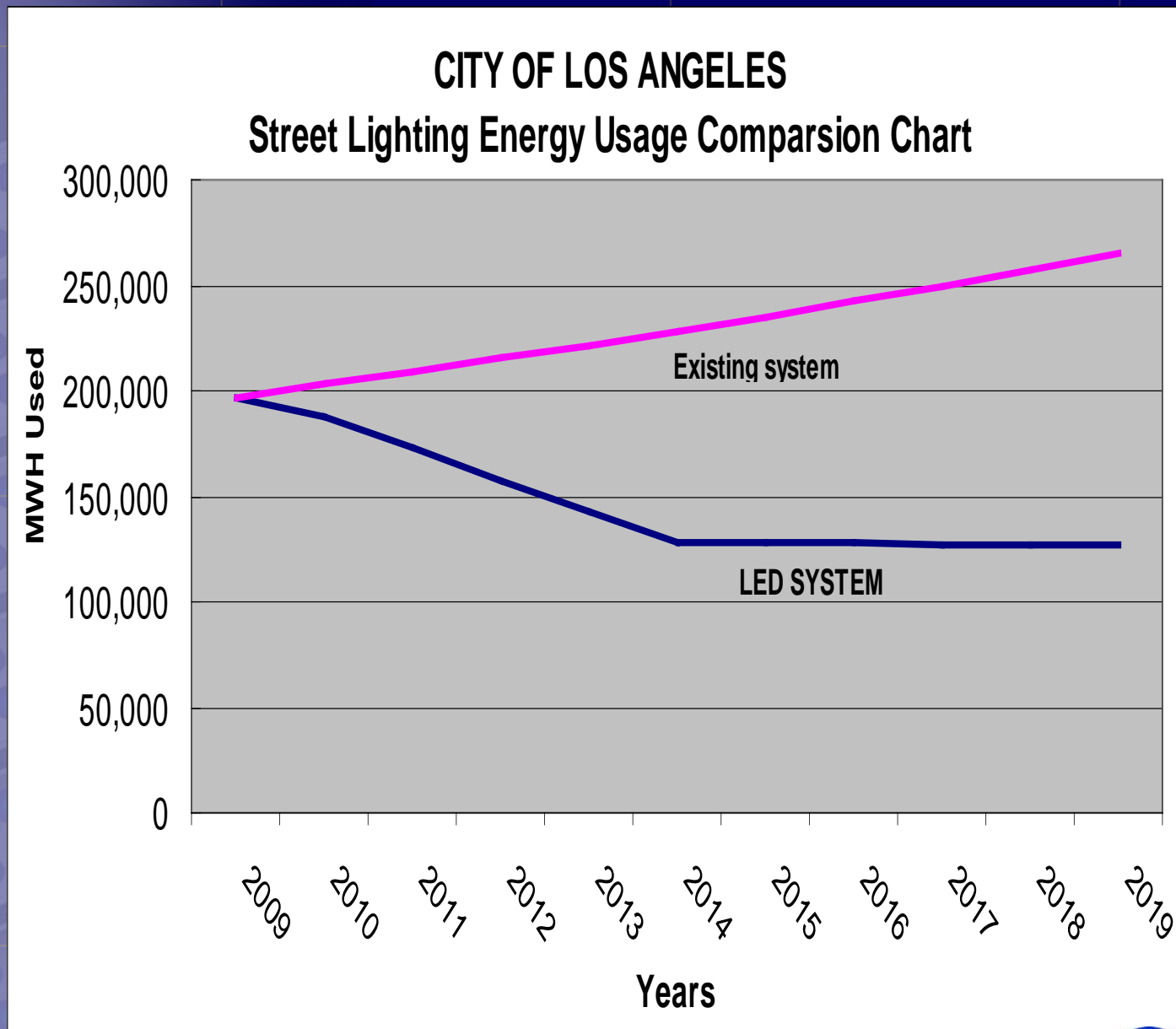


2008



WHY Program was Developed

- Contribute to Mayor's Green Initiative for City of Los Angeles
- To reduce energy consumption by 40%
- To reduce maintenance costs - Longer life of fixtures
- Reduction in carbon emissions



City of LA - LED PROGRAM



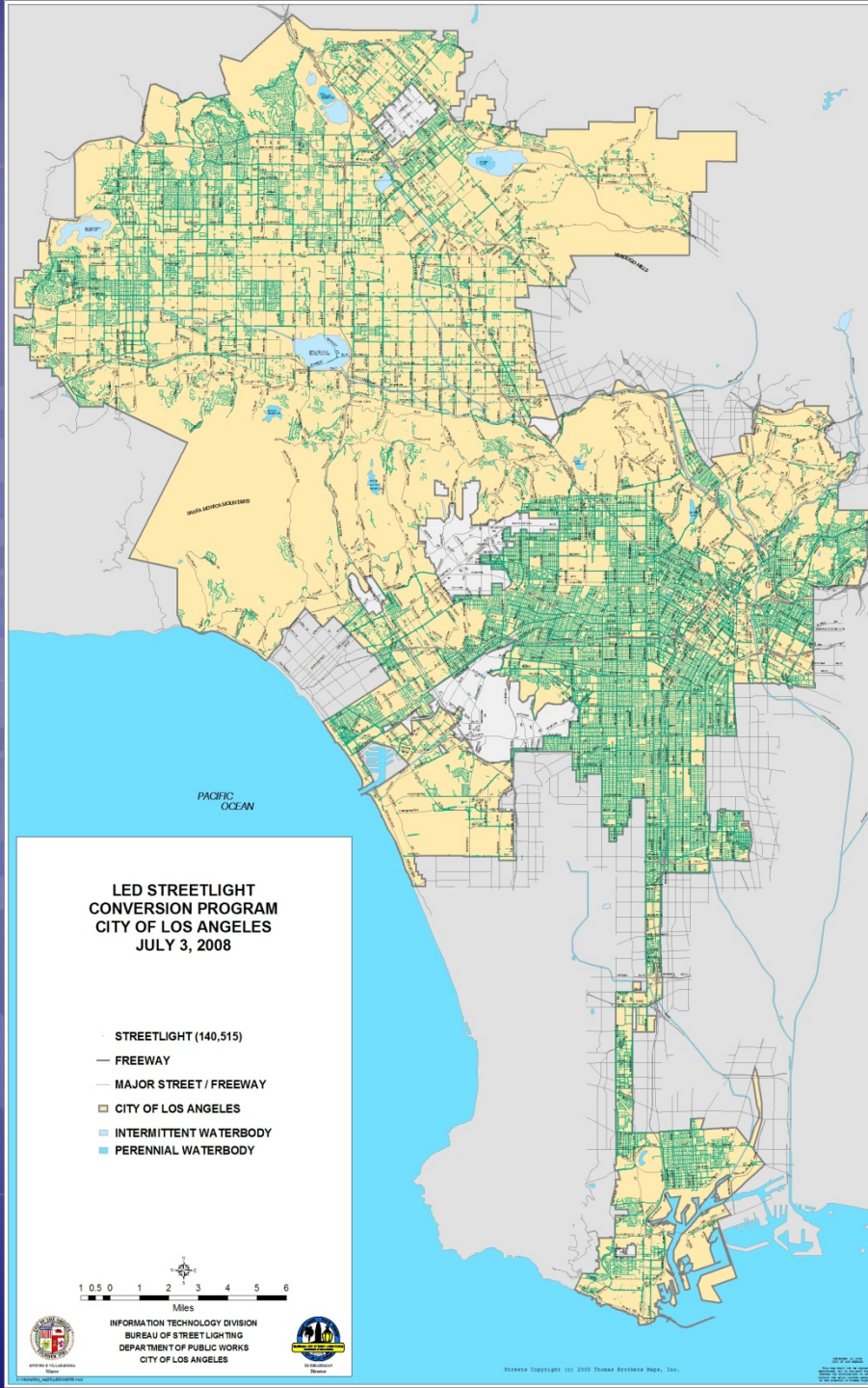
- **Convert 140,000 streetlights to LED**
- **Install Remote Monitoring System**
- **Timeline – 5 years**
- **20,000 in first year; 30,000 2nd to 5th**
- **Total Cost - \$57 million**
- **Loan \$40 million**
- **City crews**
- **Program payback – 7 years**
- **Launched – February 2009**



LED Program Benefits

- **Energy Savings – 68,000,000 KWH/year, \$7.5 million/year**
- **Maintenance Savings - \$2.5 million/year**
- **Environment - Reduce 40,500 tons of CO2/year**
- **White Light, perception of improved lighting/visibility/dimming capability**
- **Installation of remote monitoring units**

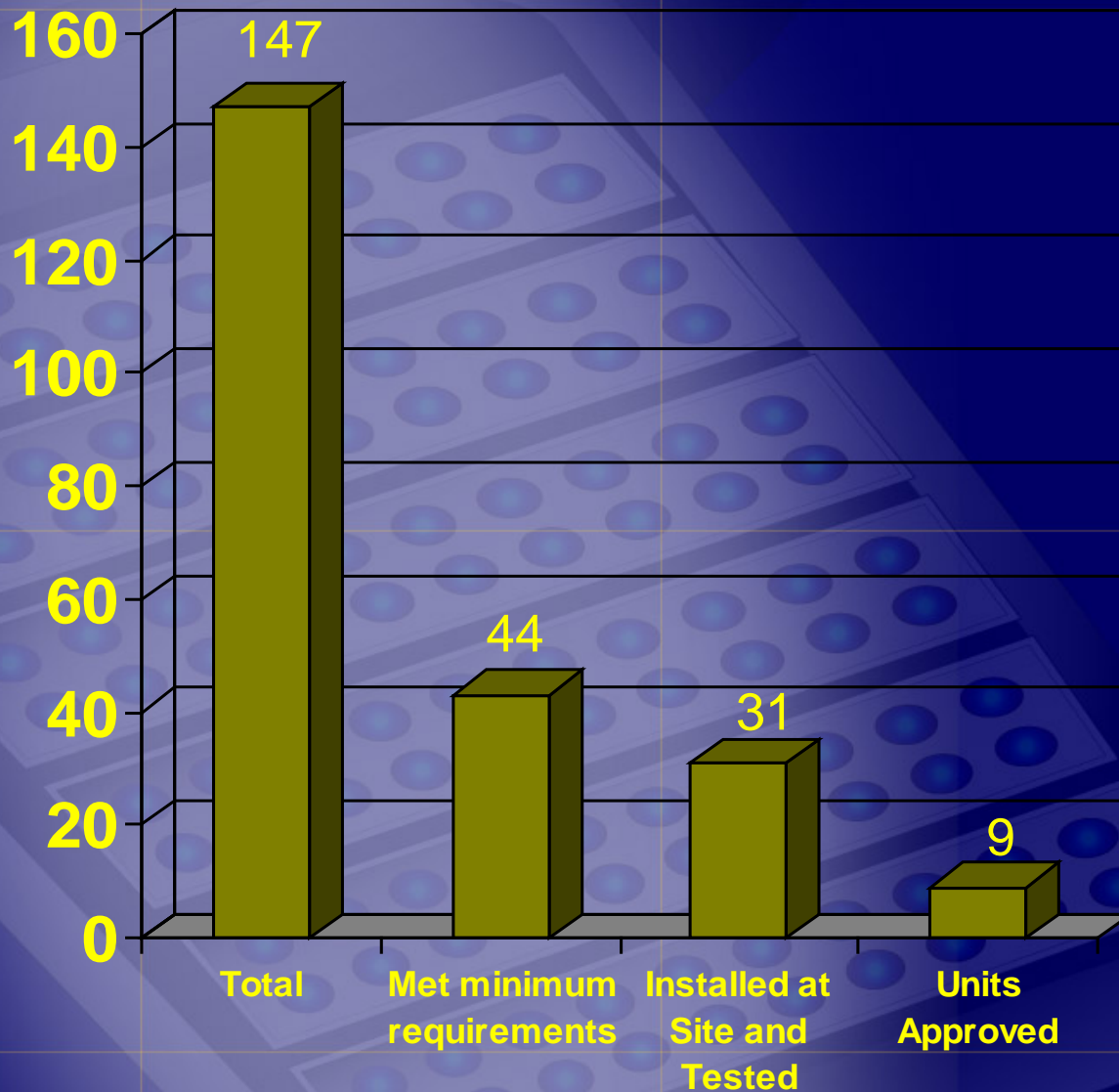




LED CONVERSION OF 140,000 STREETLIGHTS IN THE CITY OF LOS ANGELES



TESTING AND EVALUATION



- Testing Phases

Process done every six months

- Specifications

Revised based on testing results and technology improvements

■ LED Units that requested Evaluation/Test



TESTING AND EVALUATION

Lighting Evaluation

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

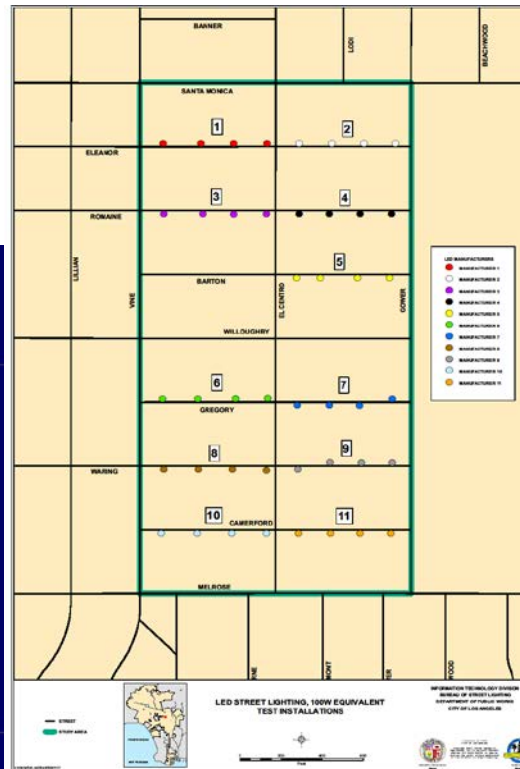
Electrical Evaluation Power consumption, Power Factor, Harmonic Distortion, Remote Monitoring Device compatibility, Remote Dimming/Controls.

Mechanical Evaluation

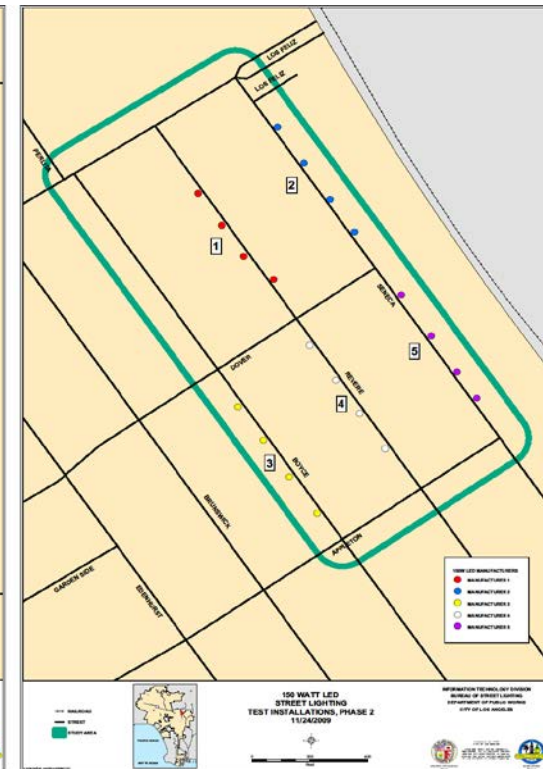
Disconnects, fixture assembly and ease of installation.



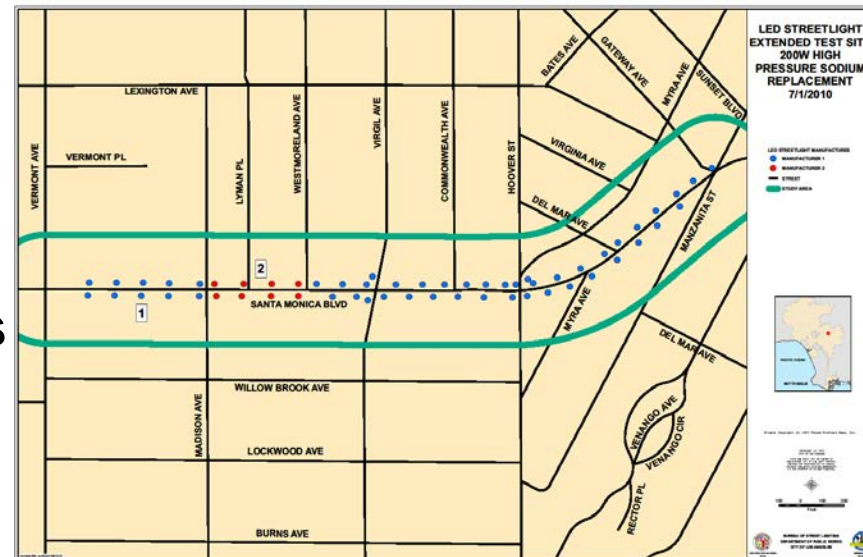
Local Streets



Collector Streets



Major Streets



Summary of City of LA Specifications

- **4000° K TEMPERATURE**
- **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 – www.bsl.lacity.org



How Will This Affect Me?

• Improved Lighting

The streetlights will be changed from HPS (yellowish) to LED (white light).

• No Cost

There will be no additional charge or fee for this conversion. The cost will be paid through the savings in energy and maintenance.

• Impact

The program will change the existing fixtures at the top of the pole to an LED unit. This will take approximately 30 minutes at each pole and there will be no impact to your property.



The Bureau of Street Lighting has started to replace existing modern streetlight fixtures (see inset picture) in the City with Light Emitting Diode (LED) units. This program will save energy by 40%, approximately 40,500 tons of carbon emissions per year, and reduce maintenance of the City's street lighting system. The replacement will be completed through City forces.



Presented by the
CITY OF LOS ANGELES - DEPARTMENT OF PUBLIC WORKS

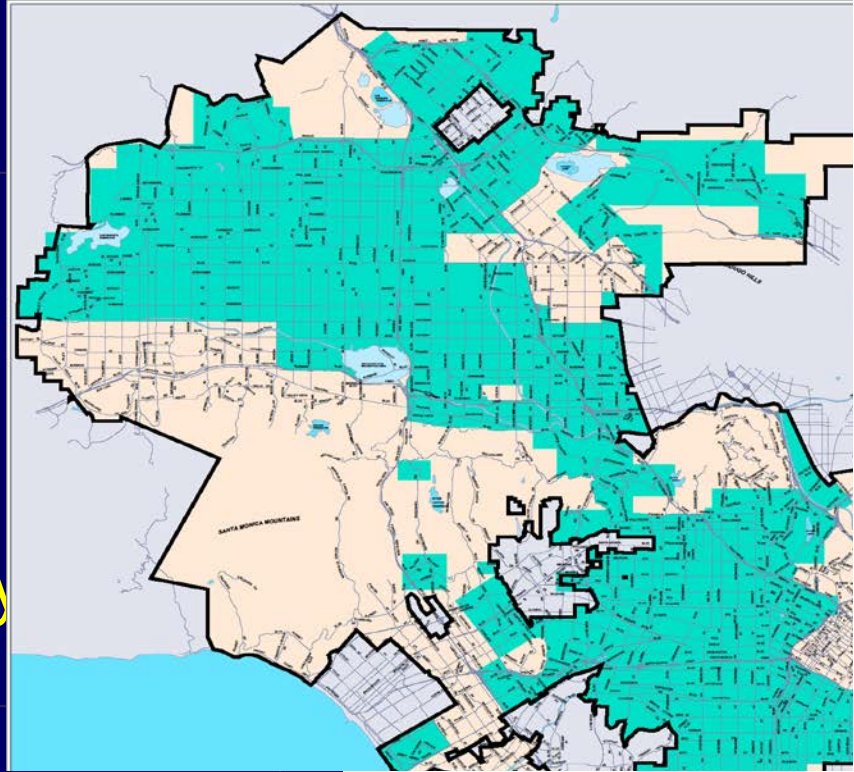
BUREAU OF STREET LIGHTING

If you have questions, please visit our website at <http://bsl.lacity.org> or call (213) 847-1891

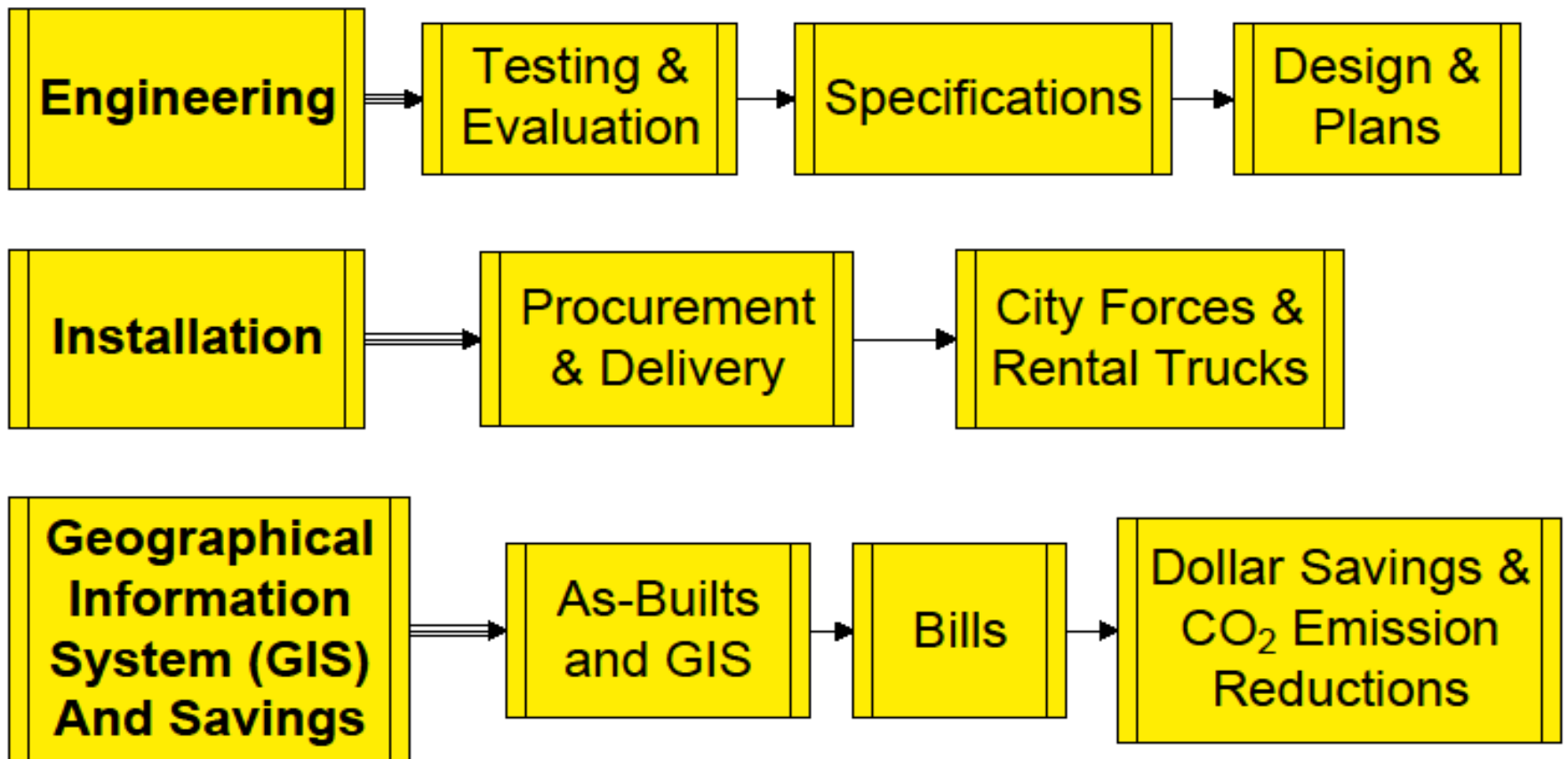


Current Status of LED Program

- **73,114** fixtures installed up to date
- **7,946 KW TOTAL** Energy savings
- **19,169 MT** of CO2 reduced annually
- Mostly on residential, local streets
- **\$2,866,224** Annual Energy Savings

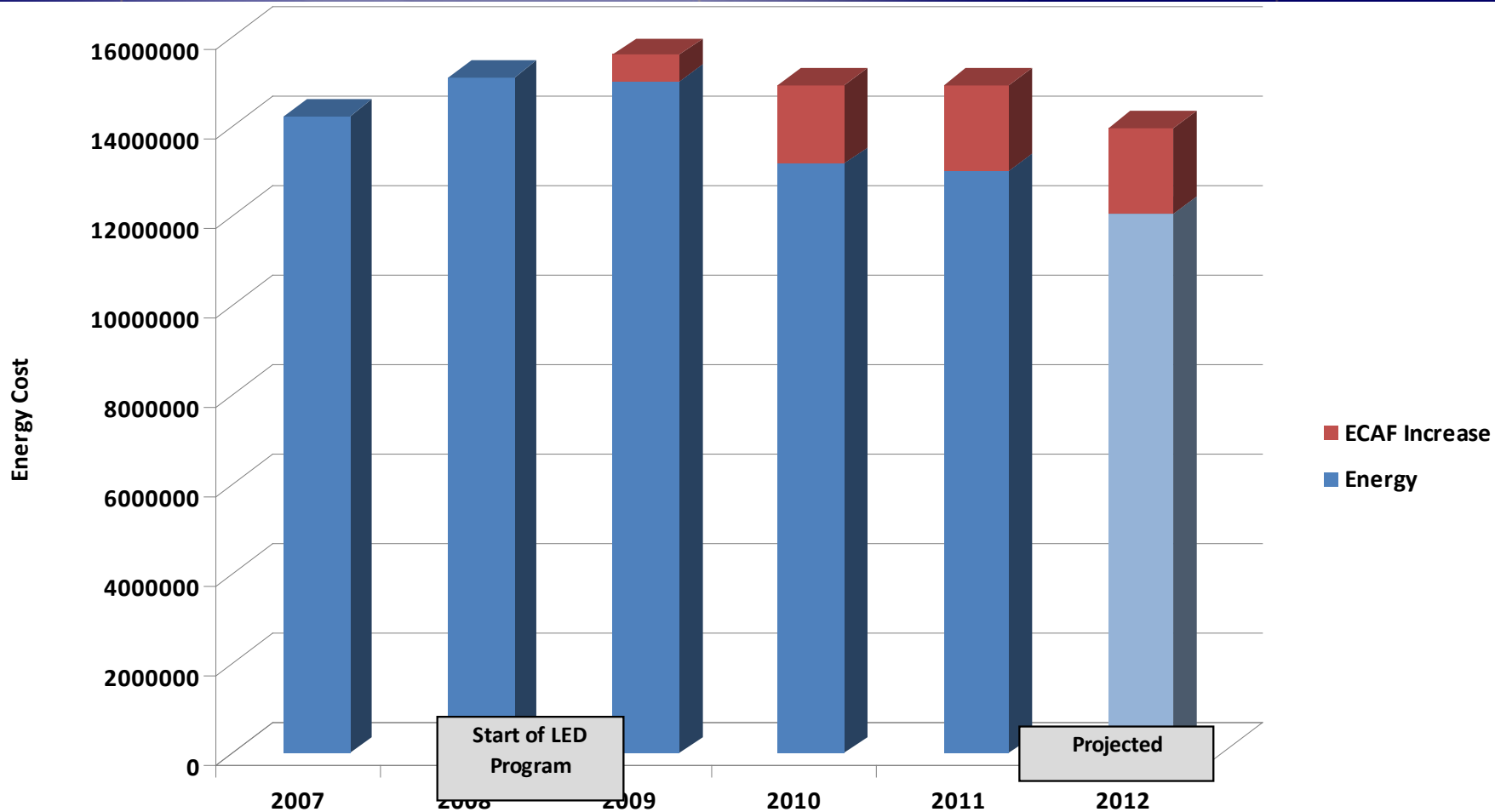


City of Los Angeles Bureau of Street Lighting LED Conversion Program



LED Program

Street Lighting Energy Cost



March 13,
2012



Before and After Pictures of Program

Fc.: 4.31

Ave./Min.: 2.40

Max./Min.: 5.4



BEFORE (200 W HPS)
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 (LED)

6th Street Bridge over Los Angeles River



Before and After Pictures



BEFORE (100 W HPS)

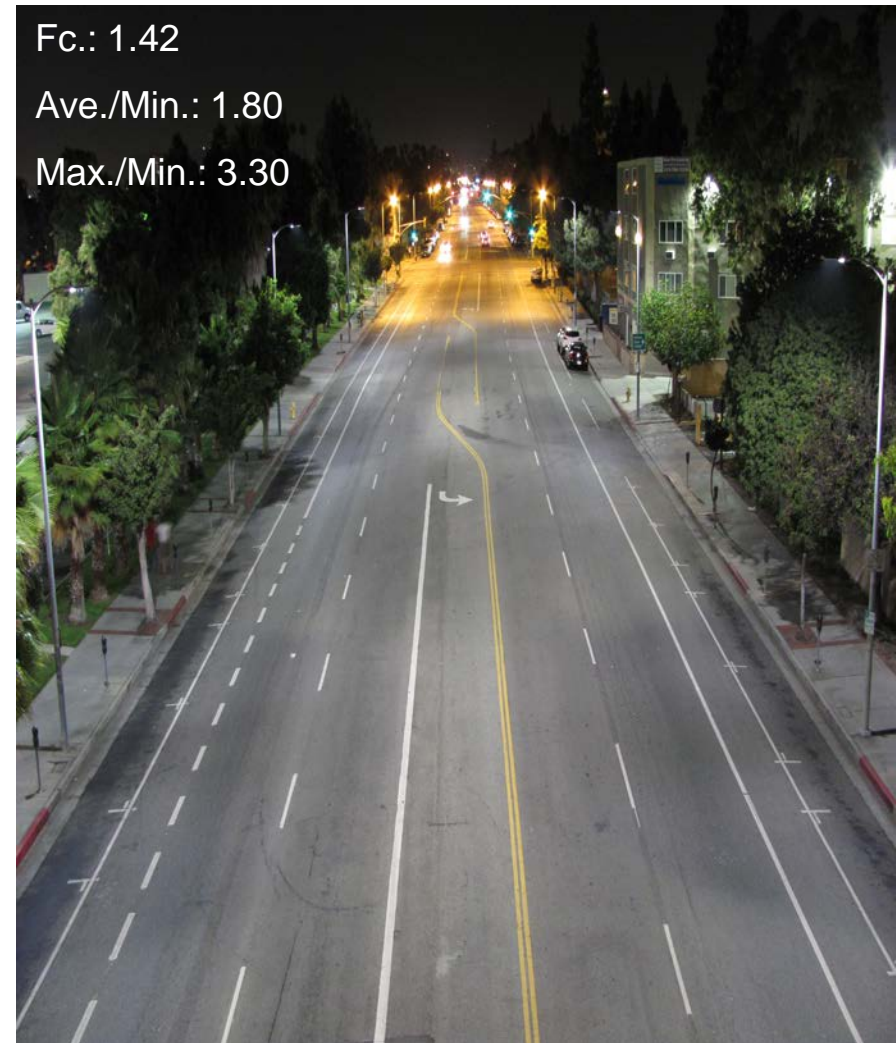
La Mirada Ave. – Seward St. to Wilcox Ave.

AFTER (LED)

Before and After Pictures of Program



BEFORE (310 W HPS)



AFTER (LED)

Hoover St. – 32nd St. to 30th St.



City of Los Angeles
Department of Public Works
Bureau of Street Lighting

April 12, 2012



LED Energy Efficiency Program

Total Savings By Council District - LED Conversion Program

Council District	Total Number of Units	Total Nominal Wattage Before (kW)	Total Nominal Wattage After (kW)	% Energy Savings	Annual CO2 Reduction (Metric Tons)	Annual Energy Savings (MWh)	Annual Energy Savings (\$)
1	2980	577.5	219.6	62.0%	863.5	1,460.3	\$129,090.28
2	2284	377.3	102.2	72.9%	663.7	1,122.4	\$99,364.60
3	4289	687.2	235.0	65.8%	1,090.9	1,844.9	\$163,087.58
4	3150	550.6	188.5	65.8%	873.5	1,477.3	\$130,592.12
5	4347	718.6	219.8	69.4%	1,203.4	2,035.2	\$179,912.93
6	1509	255.6	113.9	55.5%	342.0	578.3	\$51,123.81
7	4685	816.1	312.1	61.8%	1,216.1	2,056.6	\$181,806.46
8	9778	1,596.8	621.0	61.1%	2,354.2	3,981.4	\$352,295.20
9	5644	1,026.1	395.3	61.5%	1,521.9	2,573.8	\$227,520.19
10	7100	1,236.8	441.1	64.3%	1,919.8	3,246.7	\$287,007.99
11	1090	172.2	72.8	57.7%	239.8	405.5	\$35,843.22
12	9268	1,544.8	663.9	57.0%	2,125.2	3,594.2	\$317,725.70
13	3841	737.1	260.4	64.7%	1,150.2	1,945.2	\$171,956.87
14	4963	944.2	339.5	64.0%	1,458.8	2,467.1	\$218,088.98
15	8186	1,400.8	511.3	63.5%	2,145.9	3,629.1	\$320,808.37
Total	73114	12,642 kW	4,696 kW	62.9%	19,169 MT	32,418 MWh	\$2,866,224

“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.



“Lessons Learned”

- **“HANDLING AND INSTALLATION”**

- Smaller/lighter units, easy to install and transport. Weight reduction between 15% and 55% depending on the wattage size
- No need to carry components in trucks for maintenance
- Reduction in warehousing space - No need to storage components
- Packaging – Volume of LED units has been reduced by at least 50% from the 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



“Lessons Learned”

- “PERFORMANCE”

- Use of Type II light distribution on local streets instead of the historically Type III
- House-side shield available
- 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 of the LEDs, the more glare complaints we received from people



“Lessons Learned”

- “PERFORMANCE”

- Lumen and Dirt Depreciation Study Results

	LUMEN	DIRT	TOTAL (LED)	TOTAL (HID)
2 YEARS	13%	4%	17%	20%
4 YEARS	8%	9%	17%	28%

- Comparison of failures of new roadway lighting equipment installed after 24 months of initial operation:

Average failure of HID - 10% (based on past installation history)

Average failure of LED - 0.2% (based on retrofit LED program)

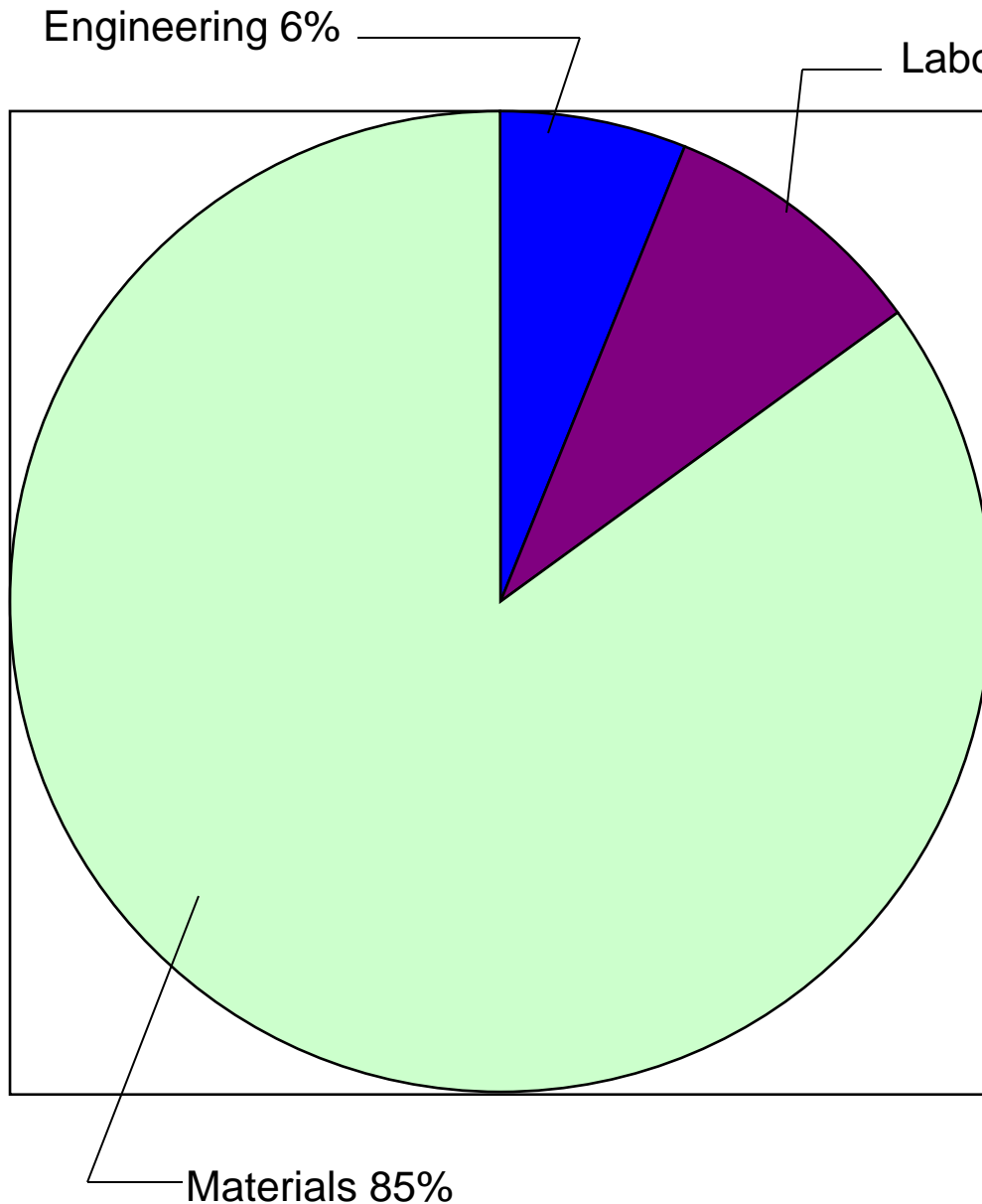


“Lessons Learned” Program Vs. Actual

	<u>PROGRAM GOALS</u>	<u>ACTUAL</u>
TOTAL UNITS INSTALLED	70,000	73,114
ENERGY SAVINGS	40%	63%
PERFORMANCE	Uniformity a Concern	Good Uniformity, better than HPS
COMUNITY 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 - \$513,858 in revenue



“Lessons Learned”



Unit Cost Breakdown for the first year LED Program

■ Engineering - \$30.13

■ Labor - \$42.58

■ Material - \$422.62

TOTAL COST PER UNIT = \$495.33

“Lessons Learned”

Citywide Crime Statistics

Incidents between hours of 7 PM to 7 AM

CRIME TYPES	YEAR		%REDUCTION
	2009	2011	
Total	46,869	41,944	10.50
Vehicle Theft	15,778	13,632	13.60
Burglary-Robbery-Theft	19,967	18,406	7.82
Vandalism	11,115	9,906	10.90

- Most units installed in residential, local streets



Municipal Solid-State
STREET LIGHTING
CONSORTIUM

Sponsored by the U.S. Department of Energy

THANK YOU

**City of Los Angeles
Bureau of Street Lighting
Ed Ebrahimian, Director**

<http://bsl.lacity.org/>

