



HPS to LED Conversion – A City of Phoenix Experience

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Phoenix: HPS to LED Street Lighting Conversion

The City of Phoenix currently maintains over 95,000 street lights along more than 4,800 miles of public streets.



The system is generally comprised of high pressure sodium (HPS) lighting fixtures with only around 750 units of light emitting diode (LED) fixtures installed.

Phoenix: HPS to LED Street Lighting Conversion

Clear direction from the City Manager's Office, the Mayor, and City Council to evaluate and implement "green" technologies and infrastructure where applicable and appropriate.

Evaluation efforts have determined that the technology has developed to the point where a conversion from HPS to LED is now appropriate.



Phoenix: HPS to LED Street Lighting Conversion

As the City of Phoenix has over 95,000 streetlights, the decision to convert the standard from high pressure sodium (standard for the last 25 years) to light emitting diode fixtures has taken some time.

This following arterial street analysis demonstrates the 10 year life cycle cost differentials and the maintenance issues that were considered as part of the conversion evaluation.



Phoenix: HPS to LED Conversion Analysis

CRITERIA	Major Street – High Pressure Sodium	Major Street – LED
Power Usage	280 Watts	139 Watts
Brightness	30,000 Lumens	9,900 Lumens
Energy Cost (per light per month)	\$6.03	\$2.74
Lamp Life (hrs)	20,000	50,000
Color Rendition (CRI)	25	70
Fixture Cost	\$250	\$475
Heat Management	130 F	122 F
Advantages	Low cost, Heat sensitivity is low, Bright light	Low energy consumption, Long service life, White light, Environmentally conscious
Disadvantages	High energy consumption, Low color rendition, Low service life	Expensive, Most are heat sensitive, Some low lumen output (dim)



Phoenix: HPS to LED Conversion Analysis

Data (Arterial street)	Units	HPS - 250 Watt	LED - 139 Watt
Lamp and Fixture (Mat. Only)	\$	\$230.00	\$475.00
Fixture Installation (Labor)	\$	\$29.00	\$29.00
Manufacturer's Lamp Life	Hours	20,000	50,000
Annual Energy Costs	\$	\$72.36	\$32.88
Lamp Replacement Cost	\$	\$1.20 per month	\$0.60 per month*
Calculations			
Years to Replace Lamp	Years	4	12
Manufacturer's Warranty	Years	1	10
10 year Lamp Replacements	#	2	0
Life Cycle Costs			
Initial Equipment & Install Costs	\$	\$259.00	\$504.00
10 Yr Energy Costs (w/o Infln)	\$	\$723.60	\$328.80
10 Yr Lamp Maintenance Costs	\$	\$144.00	\$72.00
Final Cost Totals			
10 Year Life Cycle Costs	\$	\$1,126.60	\$904.80
Annualized Costs	\$	\$112.66	\$90.48



10 Year Life Cycle Costing: Phoenix Arterial Streets

Cost Benefit Information	Units	
Annualized Savings per Streetlight	\$	\$22.18
Arterial Streetlights in the System	#	27,000
Annualized Total Savings for LED =		\$598,860
10 Year Life Cycle Savings for LED =		\$5,988,600



Phoenix: HPS to LED Street Lighting Conversion

What does this mean for the City?

- Higher capital costs for street lighting fixtures through new installations and replacement cycles.
- Annual savings of almost \$600,000 on arterial streets with a potential to save over \$2,800,000 system wide upon full conversion.

What does this mean to the private development community?

- New standard for LED street light fixtures.
- Higher capital costs for LED fixtures.

Pole and mast arm standards and street light spacing will remain unchanged.



So... what happened?

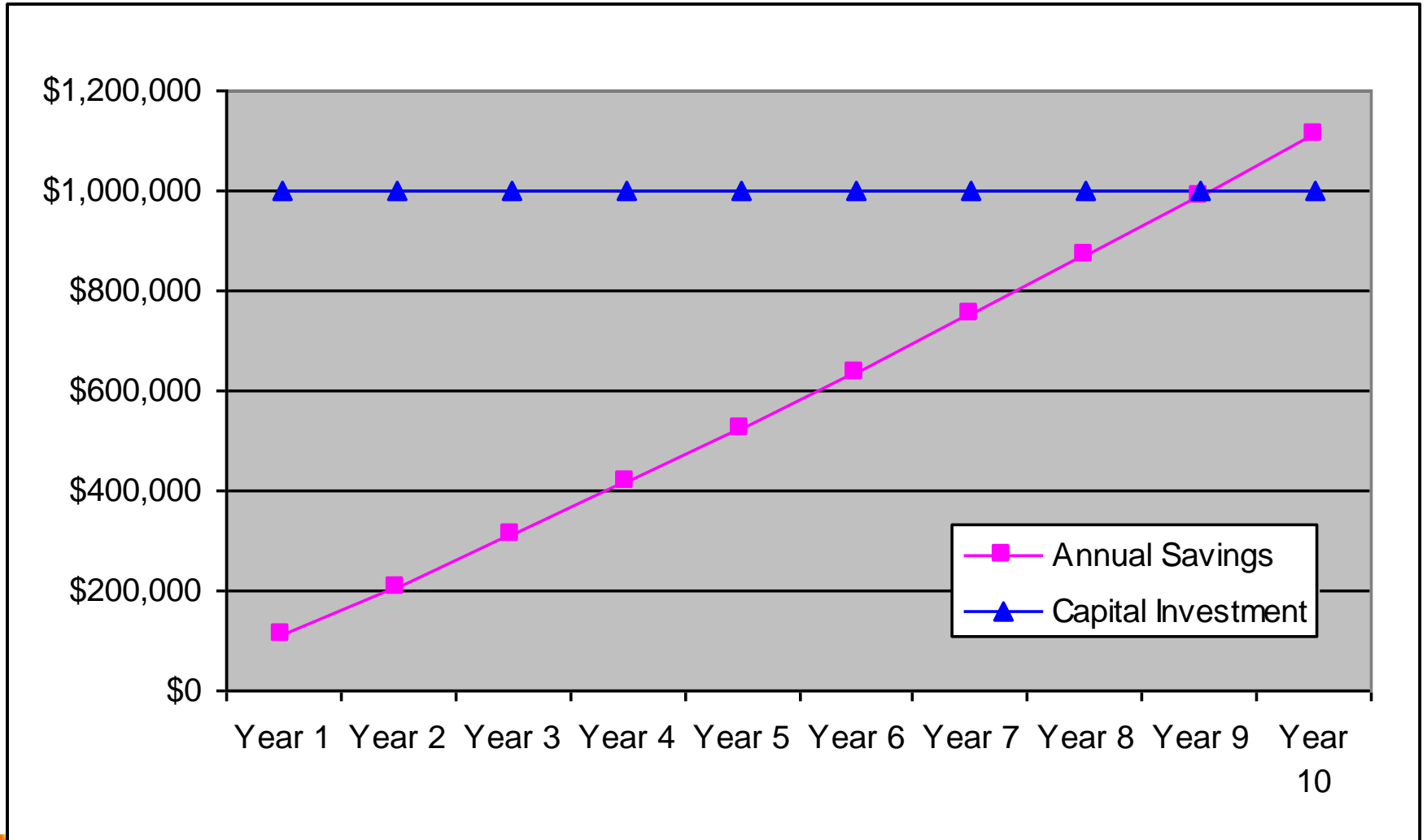
City staff presented this data to the Finance Department and the Budget & Research Department.

Staff also proposed an annual lump sum investment to accelerate the conversion time frame.

The following shows a 10 year time frame with a \$1 M lump sum budget increase plus the use of realized annual savings from the conversions.

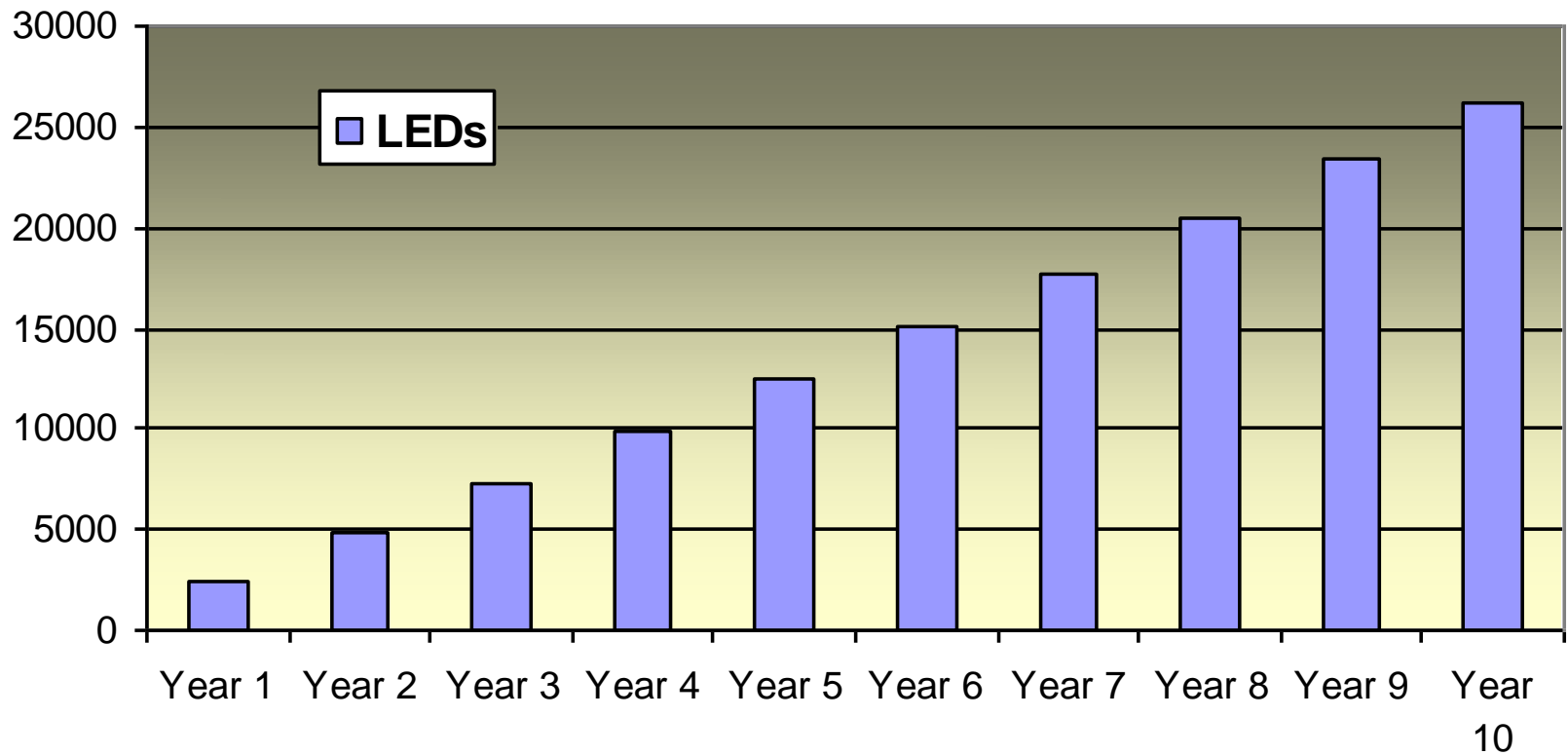


Arterial Street LED Conversion Analysis



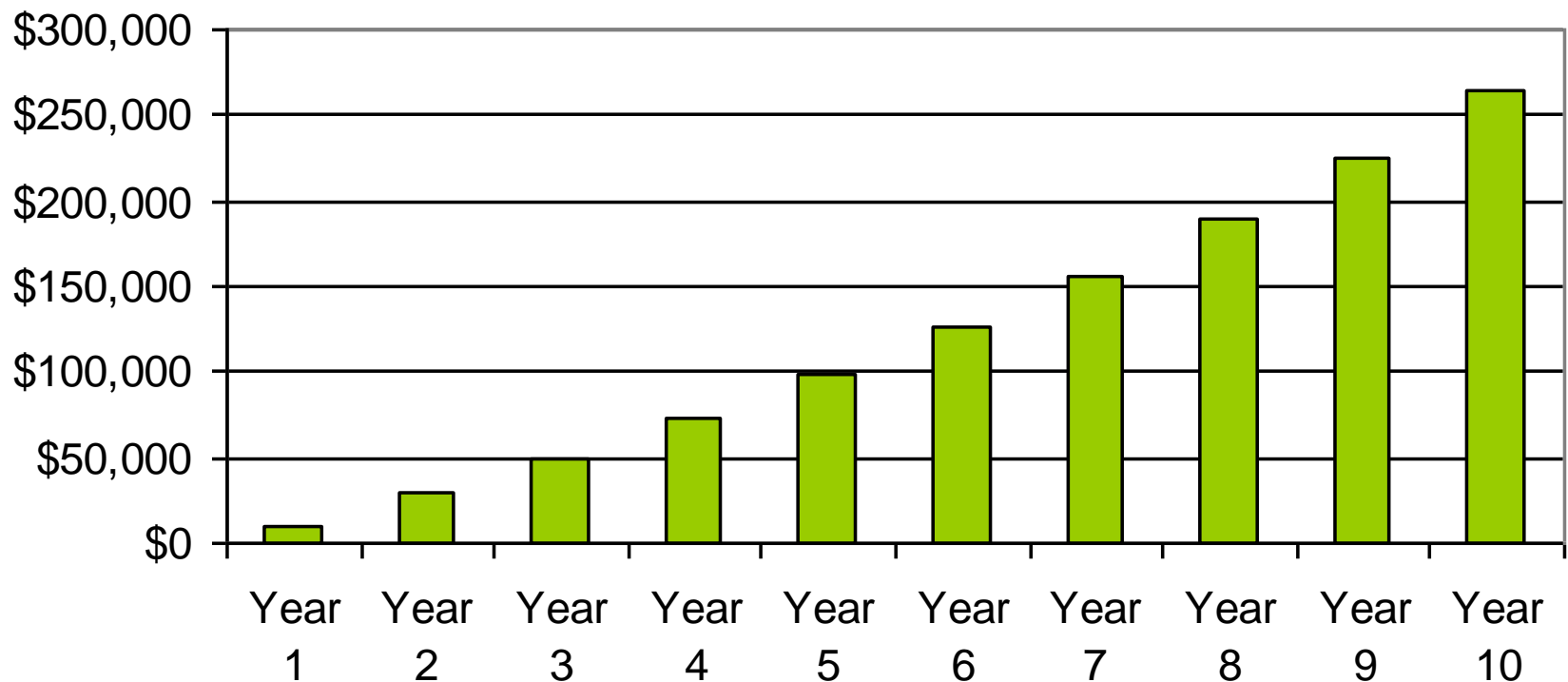
Arterial Street LED Conversion Analysis

Cumulative LEDs by Year



Arterial Street LED Conversion Analysis

Annual Savings from LED Street Lights



Capital Reinvestment Conversion Summary

Conversion plan:

- Use surplus operating funds at end of each fiscal year to fund ongoing conversions.
- Submit annual supplemental budget requests to obtain additional capital funds.

Main goals for conversion were to be sustainable and maintainable.

Upon system wide conversion, power costs will be reduced 50% from \$10M per year to \$5M per year.



So... (really)... what happened?

The Finance Department and the Budget & Research Department denied the request for additional lump sum budget increases.

However, the above departments and the City Council subsequently approved the establishment of a capital reinvestment fund to initiate the system wide conversion process.

Staff will continue to submit the request for additional lump sum budget increases through the annual citywide budget process and continue providing data about the success of the program.



Phoenix: HPS to LED Street Lighting Conversion

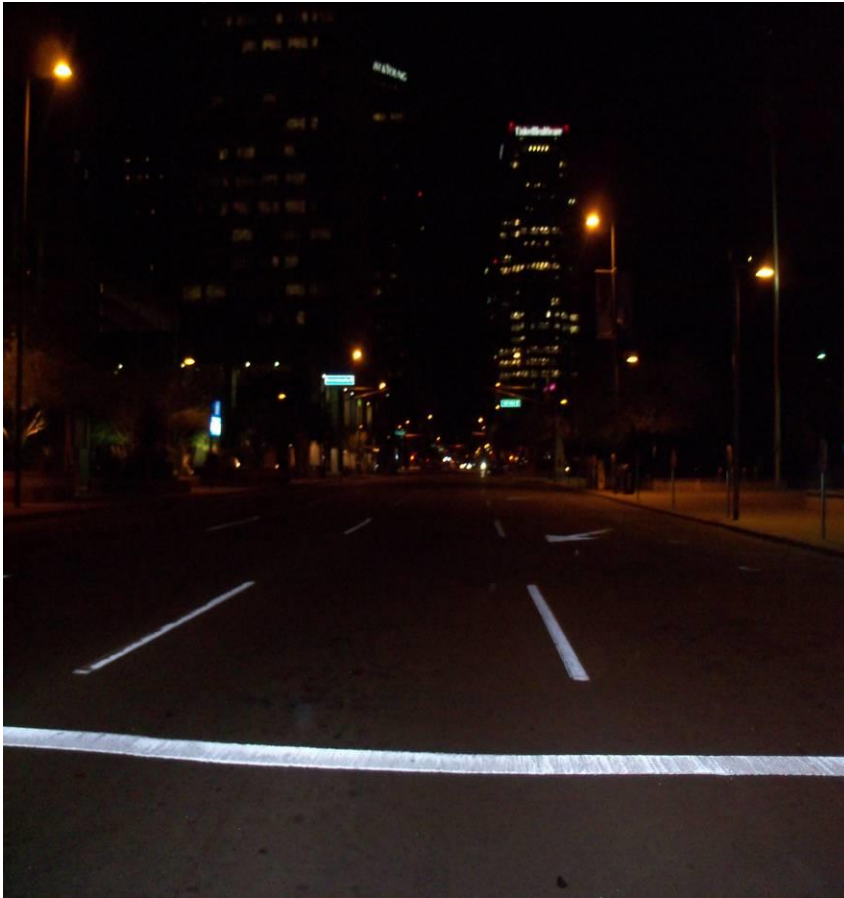
HPS
Fixture



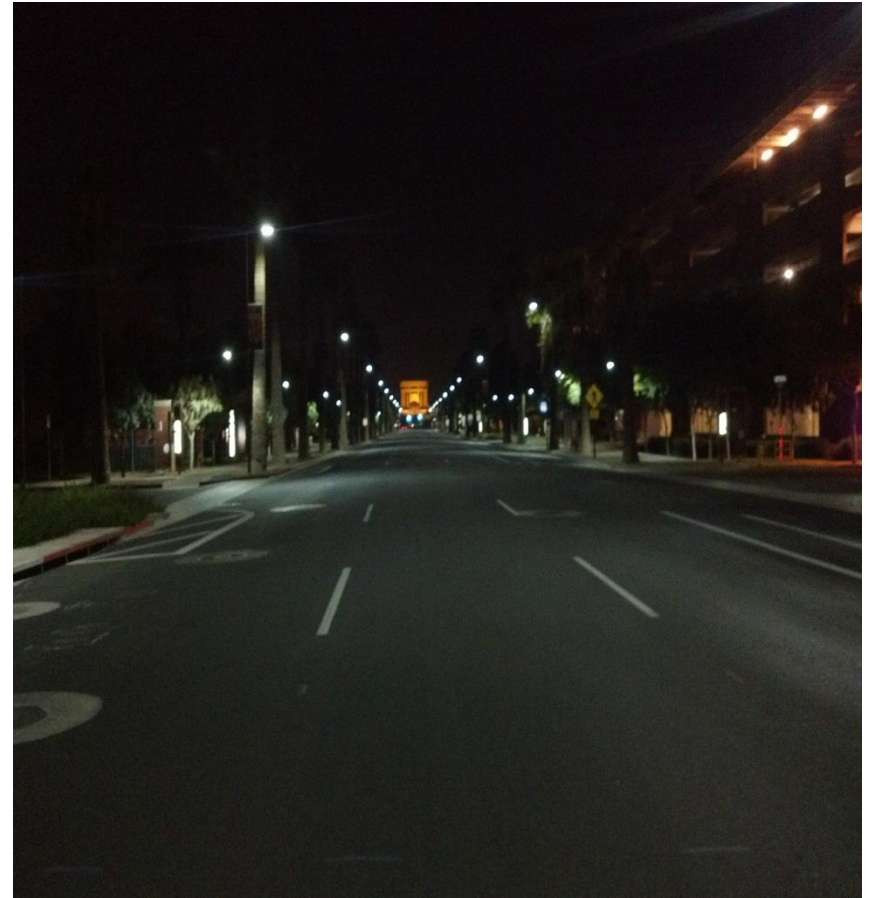
LED
Fixture



Phoenix: HPS to LED Street Lighting Conversion

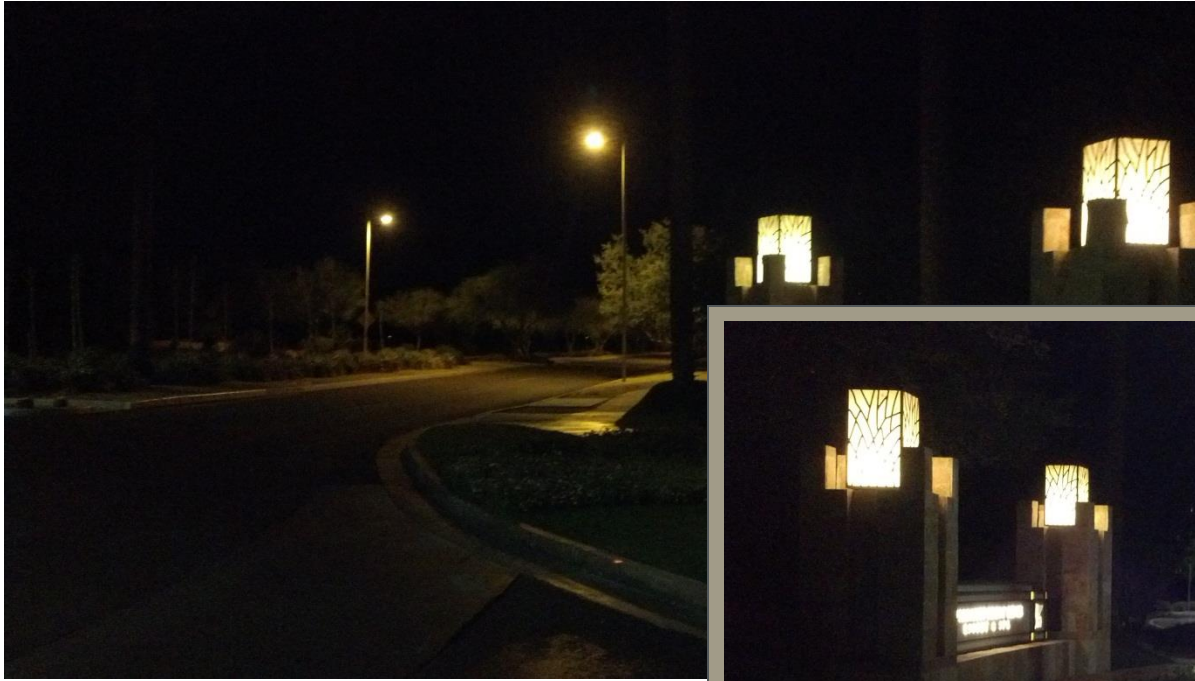


Before (yellow)

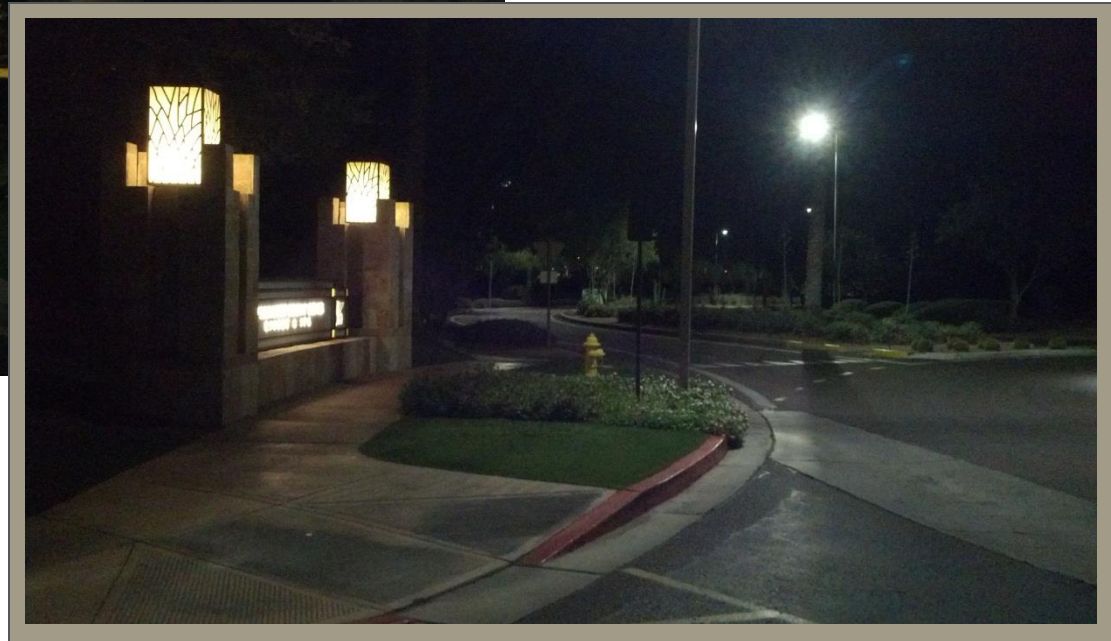


After (white)

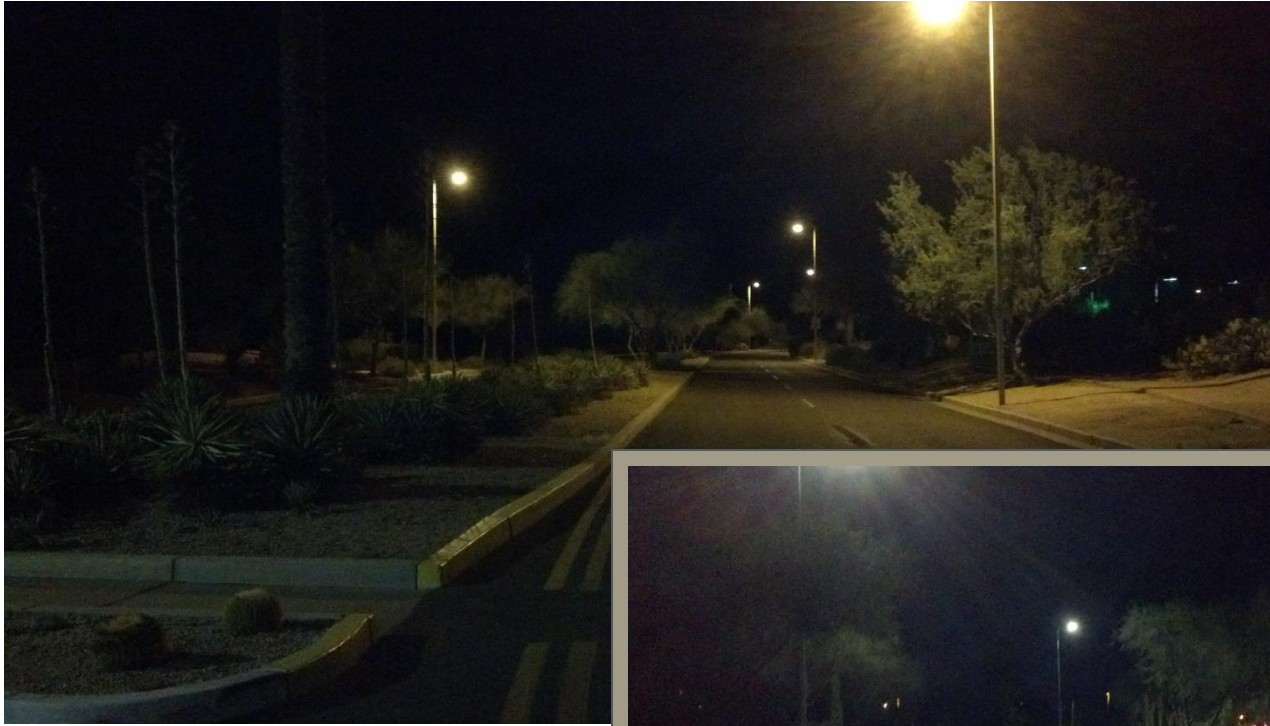
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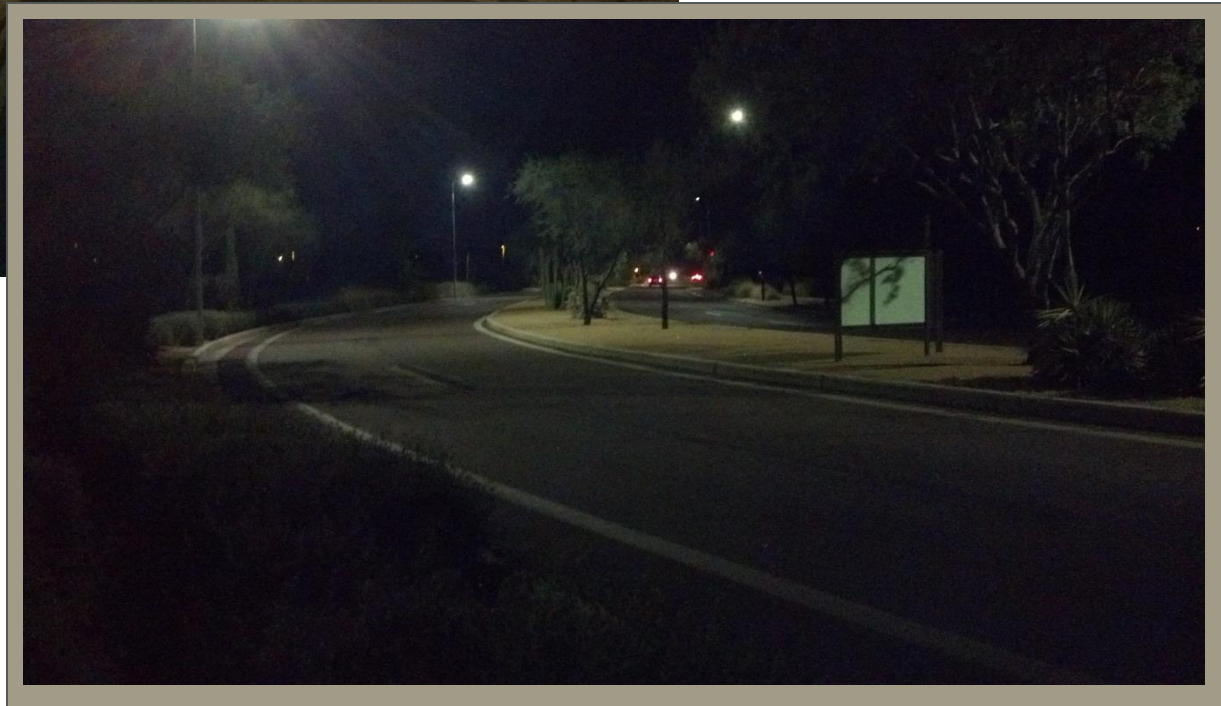
Marriott Drive



Phoenix: HPS to LED Street Lighting Conversion



Marriott Drive



Phoenix: HPS to LED Street Lighting Conversion



Side by Side Comparison

HPS to LED Conversions – “Lessons Learned”

1. Work hard on the data and applicable sustainability / maintainability scenarios.
2. Meet with Finance / Budget staff as well as Council members during the initial and final phases of the conversion plan proposal process.
3. Keep at it... as technology and prices are always changing.
4. Take what you can get to develop successful case studies or actual savings data.
5. Use the LED conversions as a way to upgrade transportation corridors to give business areas a feeling of “enhancement.”



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More information available on the
Phoenix Street Transportation
Department website:

<http://phoenix.gov/streets/index.html>

Questions?

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