LED STREET LIGHTING

Pilot Project and Business Case

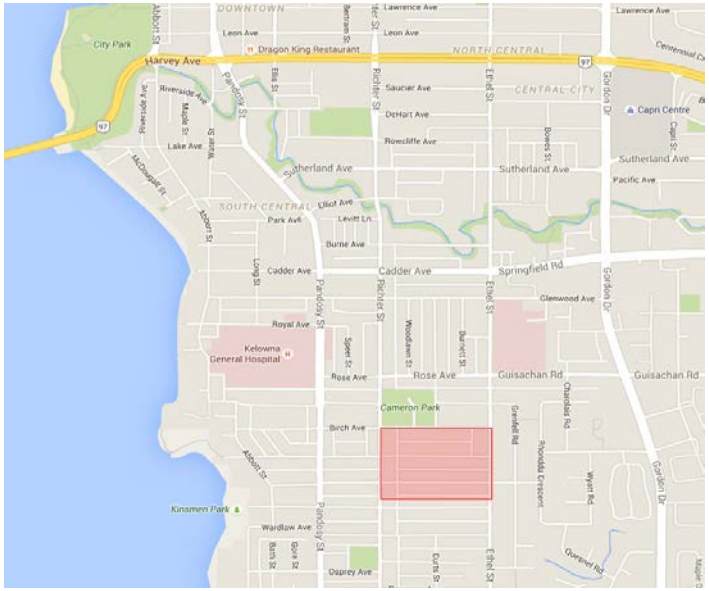
BACKGROUND

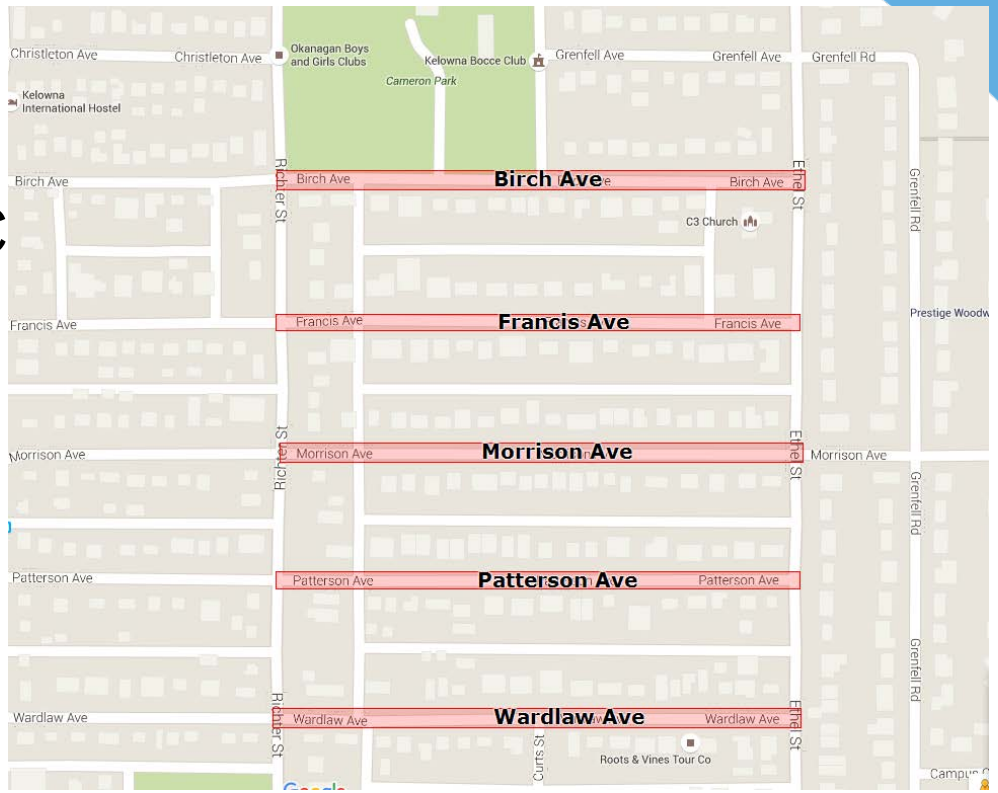
- **Current Technology**

- High Pressure Sodium Lighting
  - Inefficient
  - Short Life
  - High Energy Cost
  - Unpredictable and expensive maintenance

PILOT PROJECT

- Sept 2015 – Sept 2016
- Partnership with FortisBC





PILOT PROJECT

BC Government - Corporate Service Agreement (CSA)

- Performed the due diligence on behalf of municipalities in BC
- Shortlisted 5 manufacturers
- Mandatory 10 year warranty
- Competitive pricing for municipalities

PILOT PROJECT

- Does LED meet our standards?

Evaluation Criteria

- Physical Attributes and ease of installation
- Energy Conservation and Energy Cost Savings
- Light output and Glare
- Light Trespass (Cutoff)
- Life expectancy
- Dimming and Color options

PILOT PROJECT

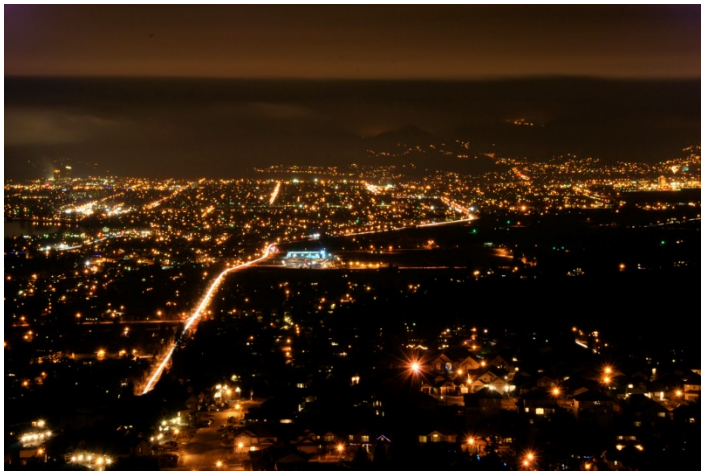
- Key outcomes
  - Energy Savings ≈ 55%
  - Maintenance Savings → HPS Life = 5 - 7 years; LED life = 15 - 20 years
  - Design optimization
    - LED's are dimmable, HPS are not
    - Improved optics and shielding
    - Color Options

PILOT PROJECT

BUSINESS CASE

13,000 Fixtures in the City of Kelowna

LED compatible ≈ 10,000



Current HPS Annual Costs

Electrical ≈ $1.35 M

Maintenance ≈ $250,000

Total = $1.6 M

BUSINESS CASE

LED Retrofit

Capital Cost ≈ $3.95M

Simple Payback ≈ 4.3 Years

15 Year ROI ≈ $13 Million

Estimated LED Annual Savings

Electrical ≈ $741,000

Maintenance ≈ $177,000

Total ≈ $918,000

BUSINESS CASE

- FortisBC Custom Business Efficiency Program

Financing	
Total Project Cost	$ 3,952,975
FortisBC Incentive	$ 555,118
New Project Cost	$ 3,397,857

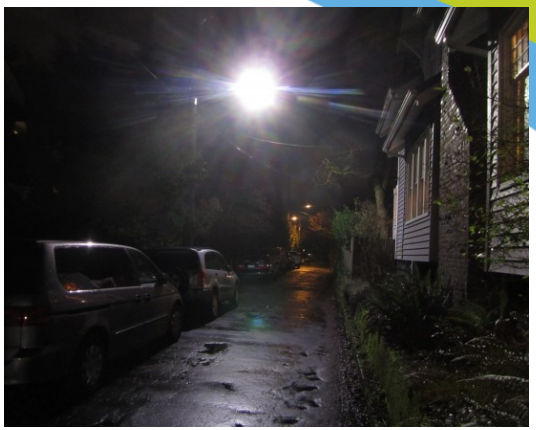
Simple Payback ≈ 3.7 Years

LESSONS LEARNED

Proper design is Critical to Success

1. Take into account recommendations from relevant organizations:
   - U.S. Department of Energy (DOE)
   - National Electrical Manufacturer's Association (NEMA)
   - American Medical Association (AMA)
     - Use of 3000K in residential areas
   - International Dark Sky Association (IDA)
   - Illumination Engineering Society (IES)
     - Responsible for setting the standards we currently follow in bylaw No. 7900 for HPS

LESSONS LEARNED



Proper Design is Critical to Success

2. Hire a Design Consultant
   - Pole spacing and street widths vary across the City
   - Residential vs non residential considerations
   - Public education
   - Ensure minimum light levels are met
   - Minimize the amount of blue light in residential areas
   - Optimize the “BUG” rating by minimizing
     - **B**acklight
     - **U**plight
     - **G**lare

LESSONS LEARNED

Proper Design is Critical to Success

3. Manufacturer Selection
   - Wide range of fixture options including
     - Wattage
     - Optimized “BUG” rating
     - Optics and shielding
     - Color (3000K, 4000K)
     - Dimming capabilities (allowing the design to be customized)

LESSONS LEARNED

Proper Design is Critical to Success

4. Other Municipalities
   - Many have successfully converted, without issue
   - Successful Installations include:
     - Mississauga, Ontario – 49,000
     - Hamilton, Ontario – 10,000
     - London, Ontario – 10,000
     - Penticton, BC – 2,727
     - Castlegar, BC – 819
     - Surrey, BC – 2,900 of 28,000
     - Calgary, AB – 45,000 of 80,000
   - Those with issues resulted mainly from improper design and over sizing the fixtures
     - Davis, California – 650 of 1,400 fixtures were replaced because of over lighting

SUMMARY

1. Design is critical to success

2. Significant Energy, Cost and Operational Savings

3. Improved life and reliability of City owned assets

4. Ongoing public education will be a key for success throughout the project

LED STREET LIGHTING

Pilot Project and Business Case

AMERICAN MEDICAL ASSOCIATION

- Recommendations

1. "The AMA supports the proper conversion to community-based LED lighting.."
2. "The AMA encourages minimizing the controlling blue-rich environmental lighting by using the lowest emission of blue light possible to reduce glare."
3. "The AMA encourages the use of 3000K or lower lighting for outdoor installations such as roadways. All LED lighting should be properly shielded to minimize glare and detrimental human and environmental effects, and consideration should be given to utilize the ability of LED lighting to be dimmed for off-peak time periods."