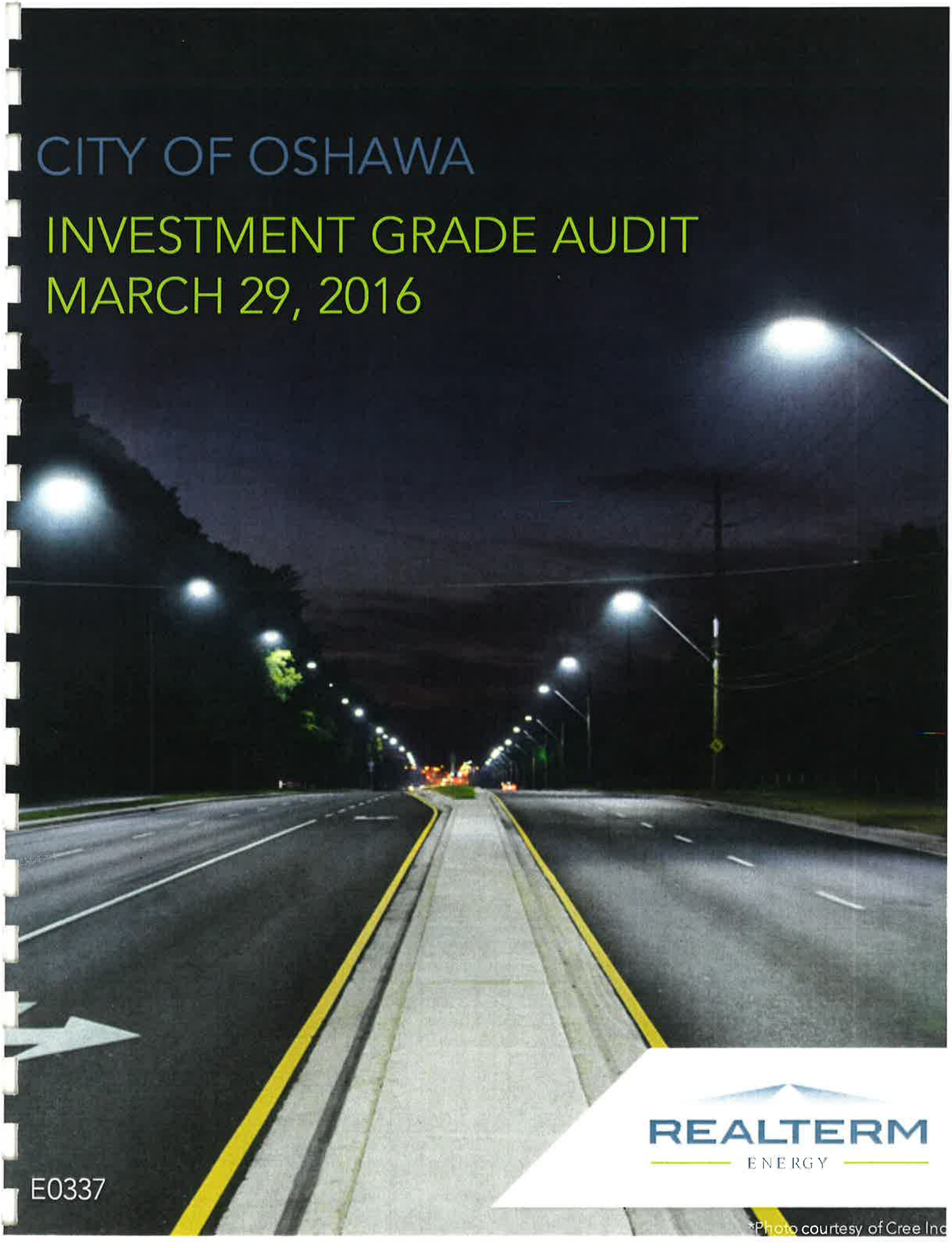
CITY OF OSHAWA

INVESTMENT GRADE AUDIT
MARCH 29, 2016



REALTERM
ENERGY

E0337

*Photo courtesy of Cree Inc

March 29, 2016

Mr. Michael Sluggett
Manager of Traffic, Street Lighting and Municipal Parking
City of Oshawa
50 Centre Street South
Oshawa, ON
L1H 3Z7

Dear Mr. Sluggett:

We are pleased to present to you this Investment Grade Audit of your streetlight network, which includes various decorative luminaire options for you to review in order to choose the optimal solution that will suit the City's budget and needs.

The main scope of work presented in the following IGA includes replacing all current High Intensity Discharge (HID) Cobra head luminaires to CREE LED luminaires, with options to replace the HID decorative fixtures by Acuity Brand LED decorative fixtures, or a mix of Acuity Brand and Cyclone Decorative fixtures (when Acuity Brand fixtures are not DLC listed).

Two different financing options are available to the City: RealTerm's Design, Upgrade and Transfer option where the City of Oshawa self-finances the project and the Energy Performance Contract where RealTerm Energy can fund up to 100% of the project costs, operate the system for 10 years and share the energy and maintenance savings with the City on a pre-determined basis. The EPC is viable if the City moves forward with replacing all cobrahead and decorative fixtures under the same contract, or if only the cobraheads are replaced. The option is uneconomic for the decorative fixtures in isolation.

We look forward to moving the project to the next phase. Please feel free to contact us should you have any questions.

Yours truly,

Sean Neely,
President

REALTERM ENERGY

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY for COBRAHEAD LED UPGRADE

OPTION 1: COBRA HEAD REPLACEMENT

The table below summarizes our findings based on the lighting Inventory obtained through a GIS/GPS audit of 10,372 fixtures and using up to date utility rates of OPUC to calculate current and projected electricity costs. The savings that will be achieved following the LED upgrade will be significant and will benefit the entire City.

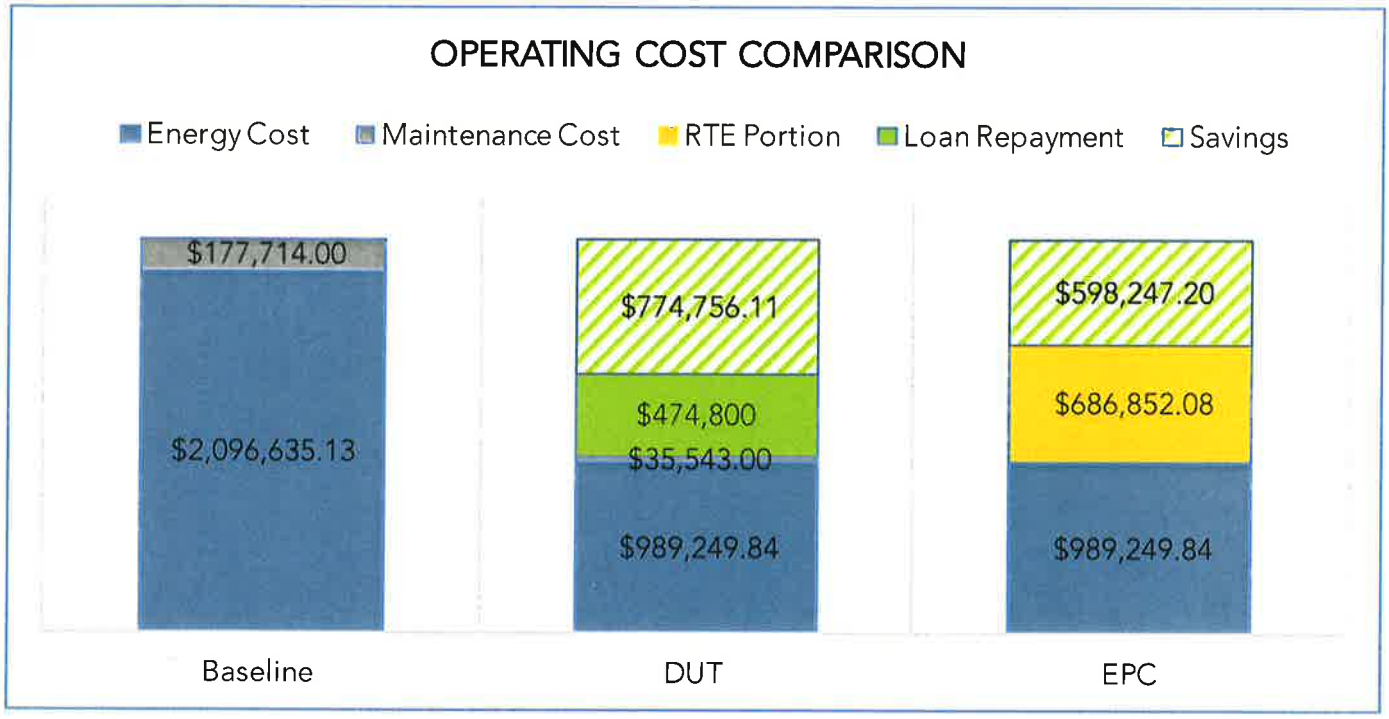
CURRENT STATUS	BEFORE UPGRADE	POST UPGRADE	VARIANCE	PERCENT
Number of Fixtures	10,372	10,372		
Annual Electricity Consumption (kWh)	8,572,849	3,493,115	5,079,734	59% ⇩
Annual Electricity Costs	$2,096,635	$989,250	$1,107,385	53% ⇩
Annual Maintenance Cost (5 yr. avg.)	$177,714	$35,543	$142,171	80% ⇩
Total Street Lights Expenditures	$2,274,349	$1,024,793	$1,249,556	55% ⇩
Average Annual Cost per Fixture	$219.28	$98.80	$120	55% ⇩

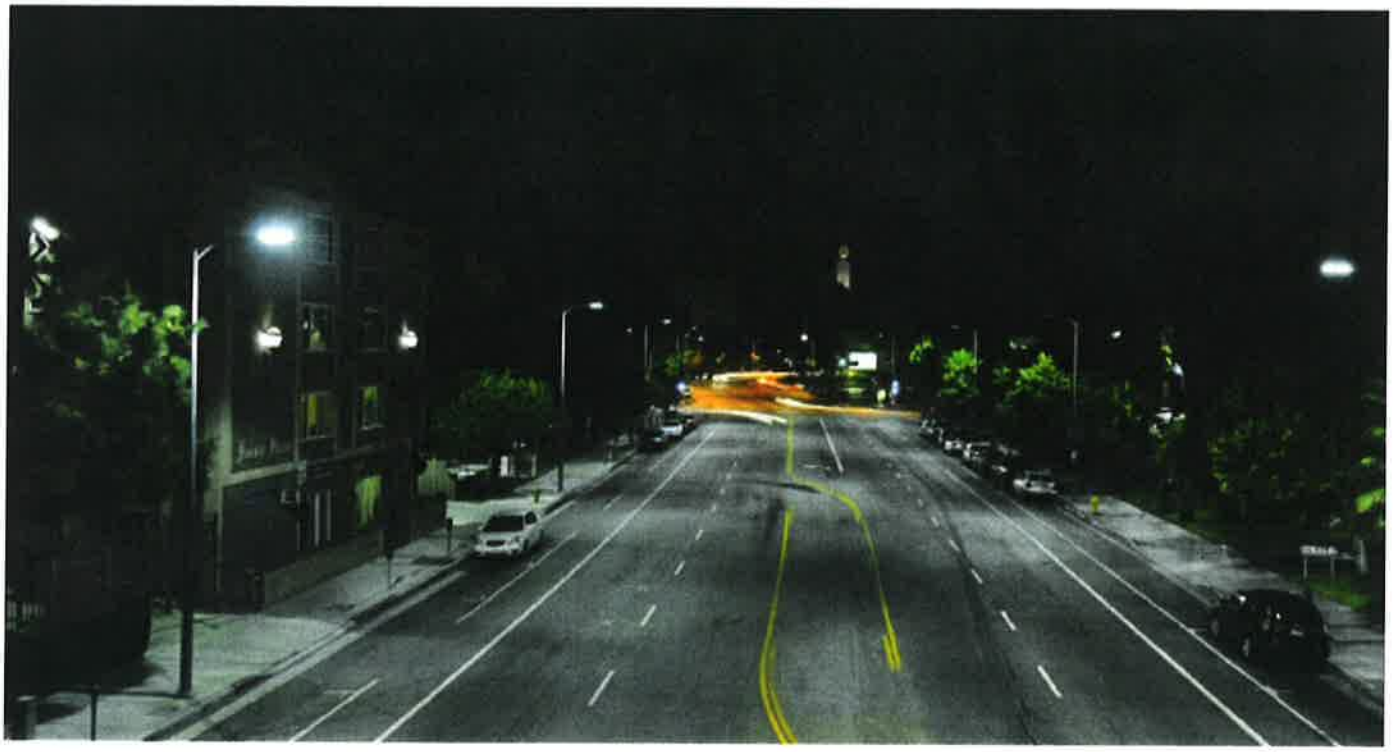
Whether the City chooses to proceed with the project under an Energy Performance Contract (EPC) or as a Design, Upgrade and Transfer (DUT), we have updated the financial results of both options.

	D.U.T.
Number of Fixtures	10,372
Total Project Costs	$5,398,068
IESO Incentive	-$1,184,208
Net Project Costs	$4,213,860
Price per Fixture	$406.27
Payback Period (Years)	3.3

	EPC
City's Portion	46.6%
RealTerm Energy's Portion	53.4%
Annual Share of Savings to Client (first year, increasing thereafter)	$598,247
Contract Period	10 years
10 Year Maintenance	Included

EXECUTIVE SUMMARY COBRAHEAD (CON'T)



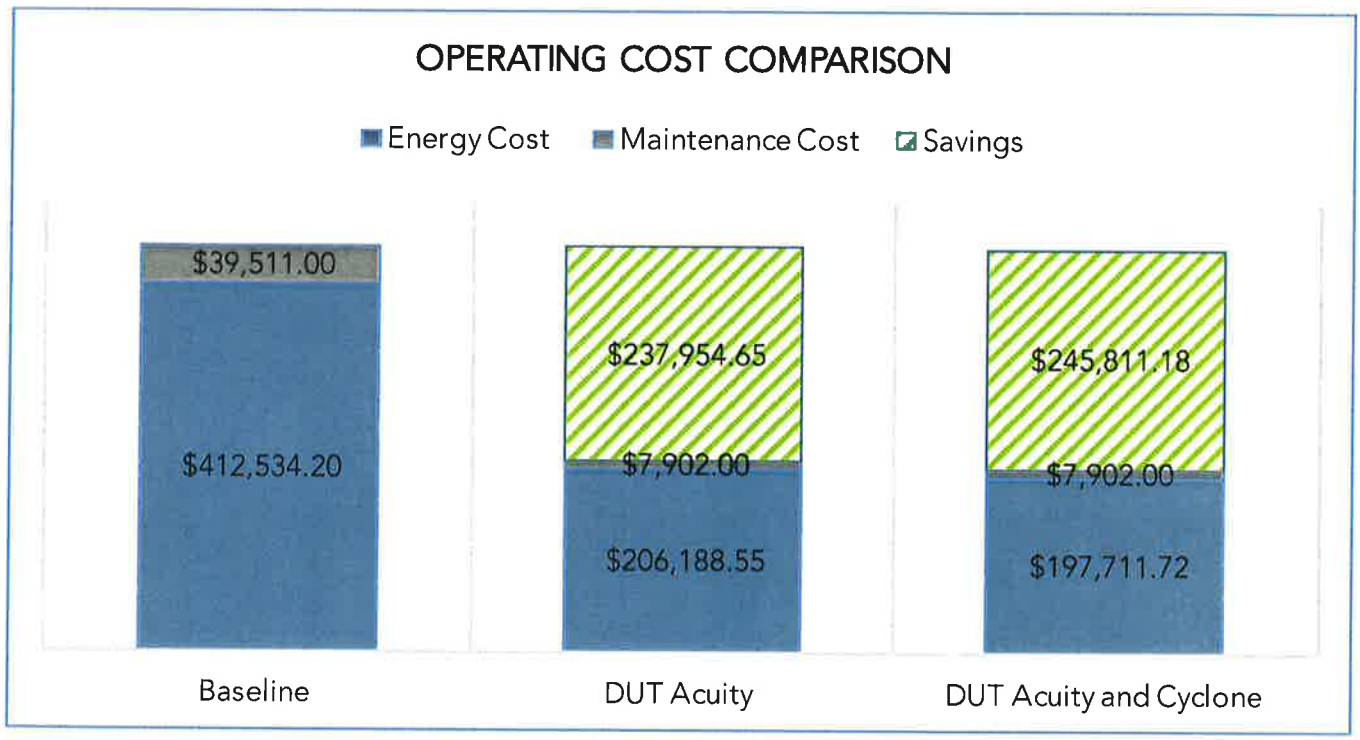


REALTERM ENERGY

EXECUTIVE SUMMARY for DECORATIVE LED UPGRADE

OPTION 2: DECORATIVE FIXTURE REPLACEMENT

	ACUITY BRAND	ACUITY BRAND AND CYCLONE
Number of Fixtures	2,306	2,306
Total Project Costs	$3,277,982	$3,261,337
IESO Incentive	-$43,188	-$179,324
Net Project Costs	$3,234,794	$3,082,013
Price per Fixture	$1,402.77	$1,336.52
Payback Period (Years)	11.6	10.9



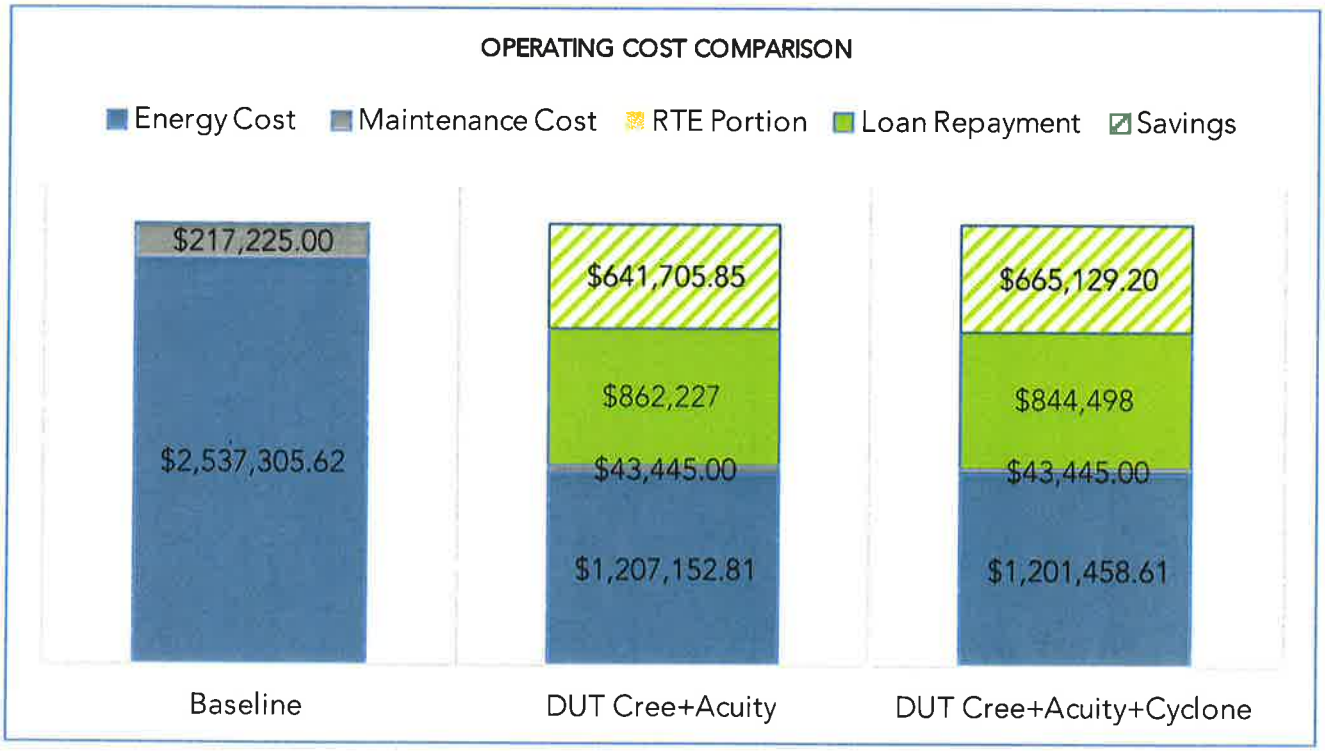
DECORATIVE-ACUITY BRAND AND CYCLONE

REALTERM ENERGY

EXECUTIVE SUMMARY (COMBINED COBRA AND DECO)

OPTION 3A: DUT CONTRACT COBRAHEAD AND DECORATIVE FIXTURES

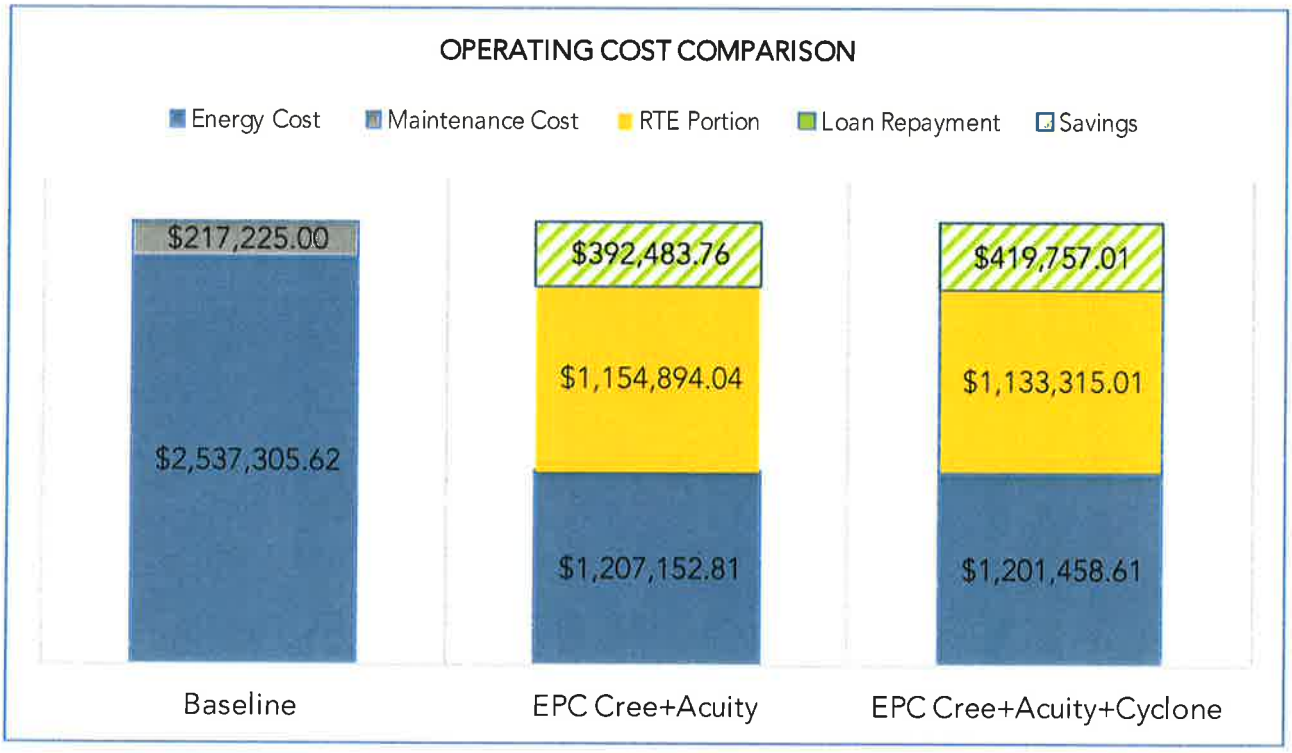
	D.U.T. COBRAS+ACUITY DECORATIVES	COBRAS + ACUITY + CYCLONE DECORATIVES
Number of Fixtures	12,678	12,678
Total Project Costs	$8,879,676	$8,858,465
IESO Incentive	-$1,227,396	-$1,363,532
Net Project Costs	$7,652,280	$7,494,933
Price per Fixture	$603.59	$591.18
Payback Period (Years)	4.8	4.7



EXECUTIVE SUMMARY – ENERGY PERFORMANCE CONTRACT

OPTION 3B: ENERGY PERFORMANCE CONTRACT COBRAHEAD AND DECORATIVE FIXTURES

	COBRAS+ACUITY DECORATIVES	COBRAS + ACUITY + CYCLONE DECORATIVES
City's Portion	25.4%	27.0%
RealTerm Energy's Portion	74.6%	73.0%
Annual Share of Savings to Client	$392,484	$419,757
Contract Period	10 years	10 years
10 Year Maintenance	Included	Included



COBRAHEAD REPLACEMENT

REALTERM ENERGY

INTRODUCTION

RealTerm Energy has examined in detail the City of Oshawa's existing streetlight network records to produce this Investment Grade Audit. Our analysis included the following stages:

- Evaluate existing GPS/GIS data of the entire street light inventory of the City
- Reconcile differences between the City's and the Utility's records if required
- Work with Cree Lighting to apply appropriate LED based lighting designs
- Update the replacement LED fixtures from the desktop review
- Examine in detail the City's utility bills
- Confer with utility to address any questions or ambiguities found
- Examine detailed maintenance records of the City
- Establish baseline results for energy usage and maintenance costs
- Project revised estimated costs and cost savings

A summary of our findings, compared to our Desktop Review presented in June 2015 is shown below:

	DESKTOP REVIEW	IGA RESULT	VARIANCE	PERCENT
Number of Cobrahead Fixtures	11,037	10,372	(665)	-6%
Type of Fixture	HPS/MV	HPS/MV	N/A	-
Energy Savings (%)	62.0%	59.3%	-2.7%	-
Energy Consumption (kWh)	8,021,061	8,572,849	551,788	7%
Energy Cost Savings (%)	38%	53%	15%	-
Projected Annual Electricity Costs	$1,538,239	$2,096,635	$558,396	36%
Annual Maintenance Cost (5 year avg)	$209,242	$177,714	-$31,528	-15%
Average Annual Cost per Fixture	$158	$219.28	$61	39%
Total Street Lights Expenditures	$1,747,481	$2,274,349	$526,868	30%
Total Project Costs	$4,880,696	$5,398,068	$517,372	11%
IESO Incentive	-$1,184,873	-$1,184,208	$665	0%
Net Project Costs *after IESO*	$3,695,823	$4,213,860	$518,037	14%

1. The energy consumption in kWh and projected electricity costs have increased since our initial review, as the distribution of the proposed fixtures varies upon following the recommended designs. For instance, based on a 1 for 1 replacement, in the proposal we had proposed the majority of the lights to be replaced by LEDs that are below 101W. However, after the designs, RTE determined that the required level of light at various locations had to be increased for a number of fixtures to a power level above 101W.
2. The project cost has also increased, mainly due to greater precision of the number of fixtures near high tension cables that will require additional security measures (approximately 15% of the total cobrahead Inventory).
3. Maintenance costs have been prorated to account for cobra head maintenance only.

GPS MAPPING

RealTerm Energy conducted a complete GIS inventory of the City of Oshawa's streetlights and used the information derived from this review to develop a detailed picture of the City's current streetlighting network including the following:

- Accurate count of all fixtures and fixture types
- Wattage of each existing fixtures
- Length of fixture arms, fixture heights, setbacks from roadway, pole spacing, etc.
- Exact GPS coordinates
- Road classifications
- Hydro pole ID numbers (when available)

From this database, we were able to assess the exact state of the City's streetlight inventory to enable us to dearly define the current street light inventory and energy demand, which we use to accurately estimate the energy savings obtained from the conversion of Oshawa's current street lights to LEDs.

A detailed breakdown of the revised lighting inventory, obtained from the GIS/GPS audit appears below:

GPS INVENTORY (Actual)

TYPE	SYSTEM WATTAGE	QTY	DEMAND (kW)
HPS 70	100	1	0.1
HPS 100	130	5,435	706.6
HPS 150	190	1,487	282.5
HPS 200	250	582	145.5
HPS 250	310	2,820	874.2
HPS 400	475	47	22.3
TOTAL		10,372	2,031.2

Compared to the desktop review, the net total number of fixtures has decreased. We discovered 299 current LED and other cobrahead lights that are not to be replaced, as well as 693 decoratives (not included in the Desktop review).

LED COBRA HEAD REPLACEMENT INVENTORY

The reduced demand after the implementation of the LED street light upgrade will directly impact the annual energy consumption, measured in kWh. Our findings show that the demand will be reduced by 1,204 kW. This will result in energy savings 59% over the current consumption, equivalent to 5,079,734 kWh annually. The table below illustrates the proposed changes to the City's inventory, based upon our examination of the GPS data and lighting design results (see next page for more details on our design methodology).

LED REPLACEMENTS (Actual, Post-Upgrade)

Design Light Consortium (DLC)	TYPE	WATTAGE	QTY	DEMAND (kW)
DLC	43W_XSPA01GC_USN	43	1,435	61.7
DLC	43W_XSPA02GC_USN	43	580	24.9
DLC	53W_XSPA01GA_USN	53	290	15.4
DLC	53W_XSPA02GA_USN	53	1,736	92.0
DLC	53W_XSPA03GA_USN	53	1,605	85.1
DLC	56W_XSPA02HF_USN	56	99	5.5
DLC	73W_XSPA01HD_USN	73	133	9.7
DLC	73W_XSPA02HD_USN	73	253	18.5
DLC	73W_XSPA03HD_USN	73	644	47.0
DLC	101W_XSPA01HA_USN	101	522	52.7
DLC	101W_XSPA02HA_USN	101	400	40.4
DLC	101W_XSPA03HA_USN	101	923	93.2
DLC	112W_XSPA02HO_USN	112	41	4.6
DLC	112W_XSPA03HO_USN	112	33	3.7
DLC	134W_XSPA01HN_USN	134	122	16.3
DLC	134W_XSPA03HN_USN	134	104	13.9
DLC	153W_XSPA02HM_USN	153	2	0.3
DLC	153W_XSPA03HM_USN	153	67	10.3
DLC	168W_XSPA02HL_USN	168	219	36.8
DLC	168W_XSPA03HL_USN	168	1,164	195.6
TOTAL			10,372	827.6

FORECASTED CHANGES IN ENERGY DEMAND

	Desktop Review	Investment Grade Audit	Difference
Energy Demand pre-upgrade (kW)	1,900.3	2,031.2	130.9
Energy Demand post upgrade (kW)	722.2	827.6	105.5
Difference (kW)	-1,178.1	-1,203.6	-25.5

LED LIGHTING DESIGN

RealTerm Energy's technical evaluation team reviewed the GPS information received and formulated a hybrid approach to completing roadway designs for The City of Oshawa. After evaluating the configuration of each light fixture for road classification, pole spacing, mounting height, arm length and curb setback, we were able to conclude that Oshawa can achieve the same or better light levels than those of its current incumbent street lights. The lighting design as suggested for the most part meets RP-8 lighting levels. (RP-8 is a recommended, though not required practice for roadway illumination).

Those portions of the City's lights points that do not meet RP-8 could be for a number of reasons, including:

- Inadequate Pole Spacing (poles are spaced too far apart),
- Insufficient Mounting Height, or
- Missing Light Fixtures

We concluded that in order to fully comply with RP-8 guidelines, the high costs of the required pole additions, replacements, rewiring and retrenching would render the project uneconomical.

Our analysis concludes that in all instances where RP-8 could not be achieved with a new LED fixture, this was also the case for the currently installed fixture. In those instances, photometric design has been utilized to select an LED luminaire in which the wattage and distribution pattern combine to meet or exceed the lighting levels of the currently installed fixtures.

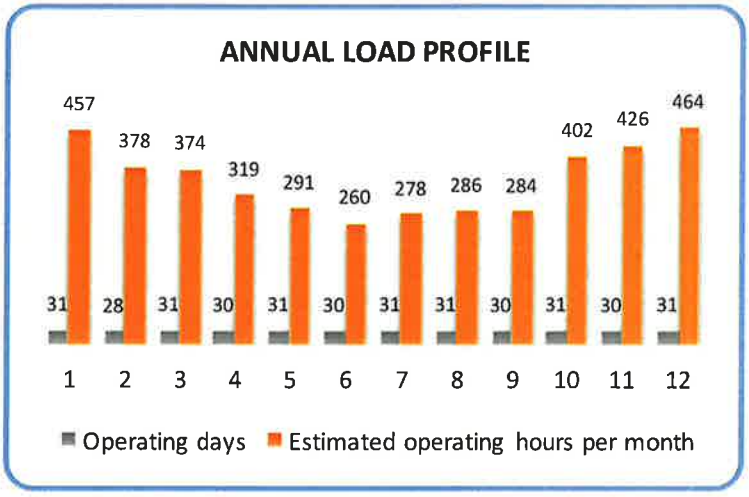
Based upon the replacement luminaires detailed in the following pages, we anticipate that the impact on the City's annual energy consumption will be as follows:

ENERGY CONSUMPTION	Desktop Review	%	IGA Results	%
Current Annual Energy Consumption (kWh)	8,021,061		8,572,849	
Projected LED Annual Energy Consumption (kWh)	3,048,301	-	3,493,115	-
Annual Savings (kWh)	4,972,760	62%	5,079,734	59%

ELECTRICAL COST ANALYSIS

Streetlights are not metered, but rather deemed to be 'on' and therefore billed based upon a Load Profile determined by the LDC. The annual load profile is a critical part of the Baseline calculation, used to project the actual energy consumption and future energy savings that will be realized after the upgrade. The load profile utilized by Oshawa PUC Network's Inc, Oshawa's LDC, appears at right.

OSHAWA PUC NETWORKS INC LOAD PROFILE



BASELINE ENERGY CALCULATIONS

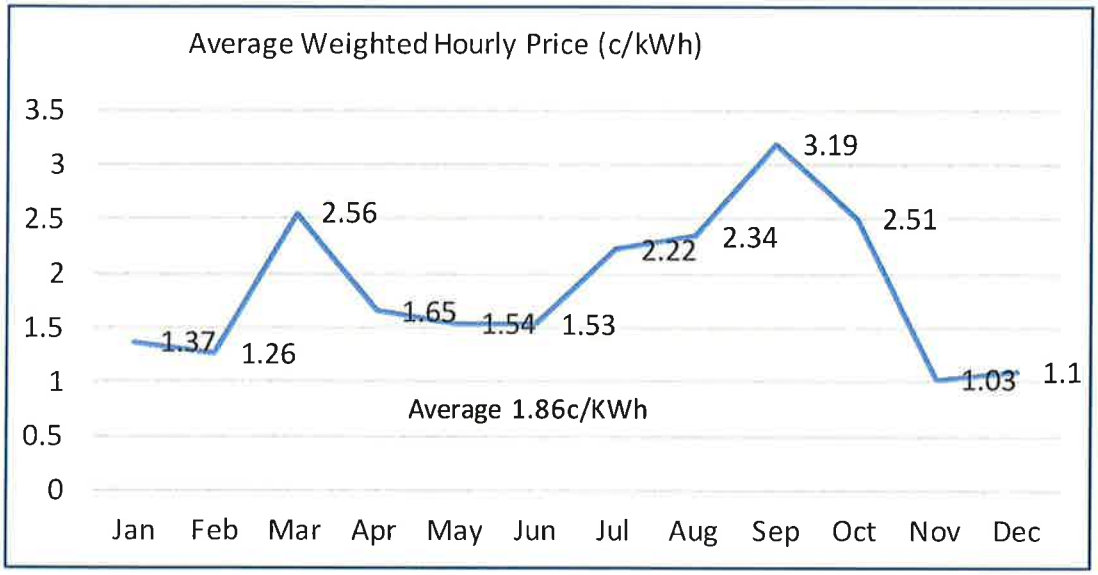
Utilities charge based upon both fixed and variable fees. The fixed fees usually remain unchanged before and after the upgrade because that rate is charged on a per connection basis, while the variable components of the bill vary depending on the actual consumption (kWh). Additionally, some components are *load dependent*, meaning that they are charged based on the demand (KW). Higher fixed fees, as a percentage of the total equate to lower dollar savings post-upgrade, due to the change in demand. **However, we note that Oshawa PUC Networks has already increased its streetlight rates as of January 1st 2016, the effect of which is to increase the overall fixed fees (Including the rates based per component and the rates based on the demand, see page 14).**

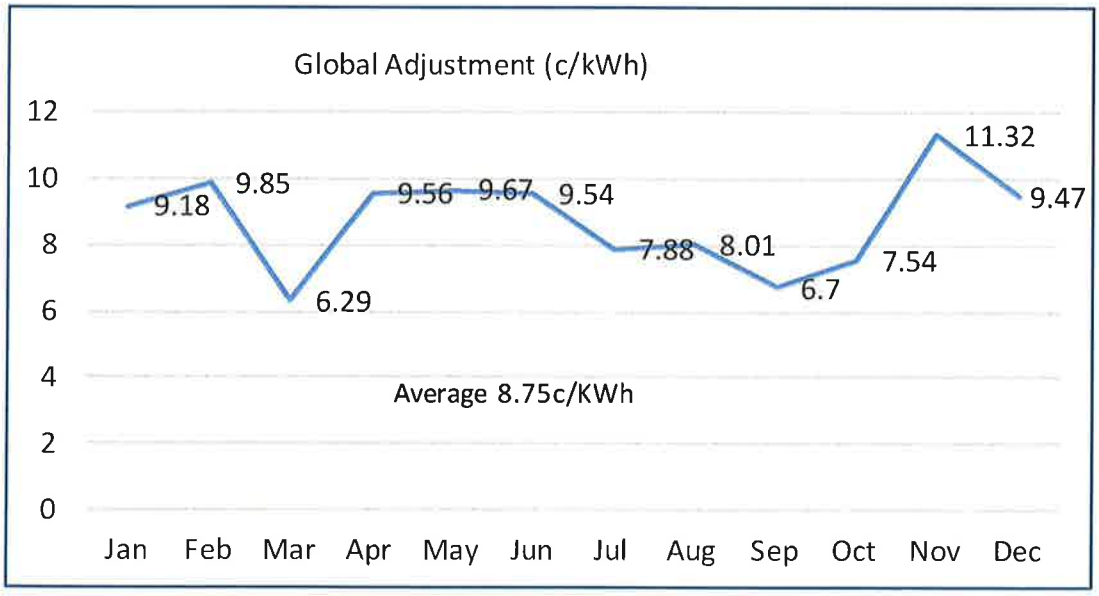
		Old Rate 2014/15	New Rate 2016	Variance
HPS	Fixed	$689,194.50	$1,034,359.50	50%
	Variable	$1,058,699.04	$1,062,275.63	0%
	Total Energy Cost	$1,747,893.54	$2,096,635.13	$348,741.59 (+20%)
LED	Fixed	$367,099.58	$556,412.34	52%
	Variable	$431,380.17	$432,837.50	0%
	Total Energy Cost	$798,479.76	$989,249.84	$190,770.09 (+24%)

ELECTRICAL COST ANALYSIS CON'T

BASELINE ENERGY CALCULATIONS CON'T

There is a charge included in the City of Oshawa's street light electricity bills in addition to the delivery and regulatory components that is dependent on the market rates, which we call the commodity electricity price. In order to evaluate the energy cost and energy cost savings, we have used the average weighted hourly price of the past 12 months as well as the global adjustment average rate for the past 12 months, from the IESO Price Overview Website, to determine the commodity electricity price.





ELECTRICAL COST ANALYSIS CON'T

The delivery and regulatory component charges of your electricity invoice are as follows:

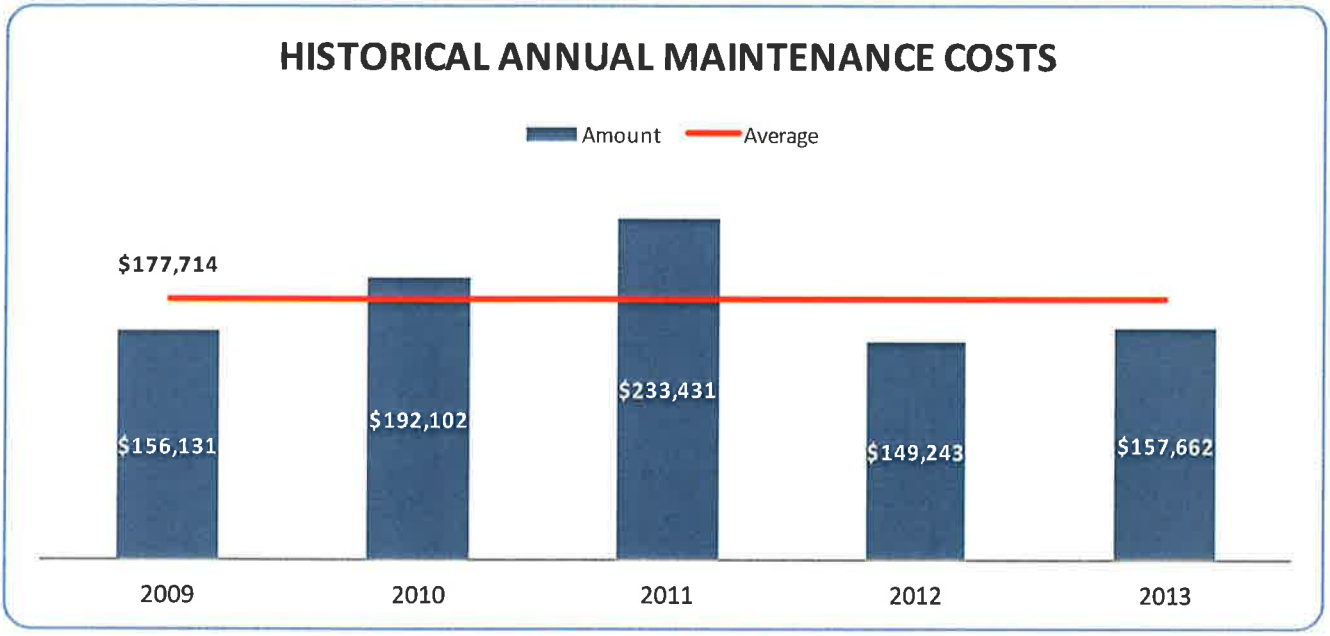
STREET LIGHTING SERVICE CLASSIFICATION		2014/15	2016	Variance
MONTHLY RATES AND CHARGES - Delivery Component				
Service Charge (per connection)	$	1.17	1.83	56%
Distribution Volumetric Rate	$/kW	18.1042	28.2590	56%
Rate Rider Oct-Dec 2015 revenue recovery - effective until December 31, 2016	$	0.00	0.16	
Rate Rider for Disposition of Deferral/Variance Accounts (2012) - effective until December 31, 2015	$/kW	0.3779		-100%
Rate Rider for Disposition of Deferral/Variance Accounts (2015) - effective until December 31, 2019	$/kW		0.2248	
Rate Rider for Disposition of Global Adjustment Sub-Account (2015) - effective until December 31, 2019 Applicable only for Non-RPP Customers	$/kW		0.4821	
Rate Rider for Disposition of Group 2 Deferral/Variance Accounts (2015) - effective until December 31, 2019	$/kW		0.0242	
Retail Transmission Rate - Network Service Rate	$/kW	1.6753	1.7724	6%
Retail Transmission Rate - Line and Transformation Connection Service Rate	$/kW	2.1434	2.3290	9%
MONTHLY RATES AND CHARGES - Regulatory Component				
Wholesale Market Service Rate	$/kWh	0.0044	0.0036	-18%
Rural Rate Protection Charge	$/kWh	0.0012	0.0013	8%
Ontario Electricity Support Program Charge (OESP)	$/kWh		0.0011	
Standard Supply Service - Administrative Charge (if applicable)	$	0.25	0.25	0%

Note the increase in the service charge and the Distribution Volumetric rate by 56% from the previous rates. These revised rates were provided by the OPUC and as yet are not uploaded on the Ontario Energy Board Website.

The majority of the rate increase comes from the service charge and the distribution volumetric Rate. The new rates are applicable since January 1, 2016 and you can see the impact of the energy cost by comparing the price of the HID lamps under the old rates versus the new rates increasing the overall cost by 20%. These are demonstrated on the table of the baseline energy calculation on page 10.

MAINTENANCE ANALYSIS

BASELINE MAINTENANCE



We have examined the maintenance costs for the past 5 years when data was provided by the City. The pro-rated cobrahead average is $177,174 per annum, which equates to roughly a cost per fixture of $17 per annum. This average is in line with, but slightly lower than the average expenditure we have compiled for Ontario communities of similar size. We conservatively estimate that ongoing LED maintenance will equate to 80% savings over current HPS expenditures, or approximately $142,171 in the first year.

(Note: if chosen by the City, Streetlight maintenance required during the 10 year Energy Performance Contract will be undertaken by RealTerm Energy, which will reduce the actual expenses incurred by the City to zero for warranty streetlight maintenance issues).

Energy & Maintenance Total Savings

	DUT CONTRACT			EPC CONTRACT		
	Before	After	Savings	Before	After	Savings
Energy	$2,096,635	$989,250	$1,107,385	$2,096,635	$989,250	$1,107,385
Maintenance	$177,714	$35,543	$142,171	$177,714	NIL	
Total	$2,274,349	$1,024,793	$1,249,556	2,274,349		

PROJECT COSTS & FINANCIAL OPTIONS

The following illustrates two options which are available to the City to finance its LED upgrade. First is our Design, Upgrade and Transfer option, where it is assumed that the City itself arranges the financing for the project. Typically, this would be from a source like Infrastructure Ontario, with its low-cost interest rates. For our Design, Upgrade & Transfer option, the City would finance the project on its own while for the Energy Performance Contract RealTerm Energy would fund 100% of the costs, operate the system for 10 years and share the energy and maintenance savings with the City on a pre-determined basis.

DESIGN, UPGRADE & TRANSFER (Self-financed)

PROJECT COSTS, SAVINGS AND INVESTMENT RETURN

PROJECT COSTS	
Number of Fixtures	10,372
Total Project Costs	$5,398,068
IESO Incentive	-$1,184,208
Net Project Costs	$4,213,860
Price per Fixture	$406.27

PROJECT SAVINGS	VALUE	VARIANCE
LED Energy Consumption	3,493,115 kWh	59% ⇩
Year 1 LED Energy Costs	$989,250	53% ⇩
Year 1 Maintenance Costs	$35,543	80% ⇩
Year 1 Operating Costs	$1,024,793	$1,249,556 ⇩
Year 1 Cost per Fixture	$99	$120 ⇩

Note regarding the IESO Incentive:
Calculated using the 2015 saveONenergy guidelines. This amount may vary in 2016 at the sole discretion of the LDC.

The above project costs include a provision for the following:

- 15% of the fixtures being near high tension cables (incurring greater than average installation costs)
- 35% of the fixtures being completely rewired
- 100% of the fixtures being refused, and
- 45% of the fuse holders to be replaced, and
- An allowance for 2% of the arms to be replaced.

This minimizes the likelihood of service calls over the life of the fixtures, greatly reduce maintenance costs. Should less than this amount require rewiring or arm replacement, the costs shall be reduced from the final billing on a time and materials basis. In the unlikely case that the Hydro Company insists on charging a fee for changing the connections to the secondary bus line when near high tension lines, RTE will not be responsible for these fees.

INVESTMENT RETURN

The simple payback period of the cobrahead project, before including any financing costs is **3.3 years.**

INFRASTRUCTURE ONTARIO LOAN

Infrastructure Ontario offers loans at favorable rates to most municipalities seeking to improve their civic infrastructure. Interest rates vary with market conditions and are set at the prevailing rate at the time the loan is advanced. The table below summarizes payment options which would be available to fund the project through Infrastructure Ontario. Please note these rates change daily and are submitted below for evaluative and budgeting purposes.

CAPITAL COST	TERM (YEARS)	INTEREST RATE	ANNUAL PAYMENT	COST OF BORROWING
$4,213,860*	5	1.74%	$880,436	$188,322
$4,213,860*	10	2.43%	$474,800	$534,142

* Net Project cost to Municipality (after IESO rebate)

NET SAVINGS AFTER FINANCING COSTS:

Year	1	2	3	4	5
Annual Savings	$1,249,556	$1,285,621	$1,322,740	$1,360,943	$1,400,262
Loan Repayment	$880,436	$880,436	$880,436	$880,436	$880,436
Net Savings	$369,120	$405,185	$442,304	$480,507	$519,826

Year	1	2	3	4	5	6	7	8	9	10
Annual Savings	$1,249,556	$1,285,621	$1,322,740	$1,360,943	$1,400,262	$1,440,731	$1,482,384	$1,525,254	$1,569,379	$1,614,794
Loan Repayment	$474,800	$474,800	$474,800	$474,800	$474,800	$474,800	$474,800	$474,800	$474,800	$474,800
Net Savings	$774,756	$810,821	$847,940	$886,143	$925,462	$965,931	$1,007,584	$1,050,454	$1,094,579	$1,139,994

We have assumed that an Infrastructure Ontario loan with an amortization term of 5 years would optimize the overall savings potential to the City however for comparative purposes we have also demonstrated an Infrastructure Ontario loan with an amortization term of 10 years at today's interest rate.

As can be seen, there are significant net savings from the outset of the project, net of financing costs.

ENERGY PERFORMANCE CONTRACT (COBRA HEADS)

With an accurate inventory, as well as a breakdown of the energy bills and utility rate structure, we have established the Baseline, which gives an accurate statement of what the City would be spending on the existing streetlight network prior to commencing the upgrade (subject to rate changes by the utility). The establishment of the Baseline is critical in computing the future energy and cost savings that will accrue from upgrading the system to LED and determining the split of the shared savings between the City and RTE.

ENERGY PERFORMANCE CONTRACT OPTION DETAILS	IGA Results
Up-front Capital Requirement	Nil
City's Savings Portion	46.6%
RTE's Savings Portion**	53.4%
Annual Share of Savings to Client*	$598,247
Estimated Value of Energy Savings (Over 10 years)	$5,909,821
Contract Period	10 years
Annual Maintenance	Included

**Year One Combined Electricity and Maintenance Savings*

**** Important notice:** The split of the cost savings between the City and RTE was calculated based on a IESO incentive of $1,184,208 which will be paid to RTE and applied directly to reduce the initial project costs. In the event that the actual IESO approved amount paid by the LDC changes, RTE will be required to recalculate (increase or decrease) the split of the cost savings in order to conserve the commercial viability of the contract.

What is Included in the Energy Performance Contract Option

The same deliverables included in the Design, Upgrade and Transfer Option PLUS

- Guaranteed energy savings throughout the Term
- RealTerm ensures that the network operates to established parameters
- RealTerm is responsible for all luminaire maintenance over the Term
- At end of Term, operations revert back to City who then enjoys 100% of the savings
- Asset ownership rests with City throughout

GREENHOUSE GAS REDUCTION

ESTIMATED GREENHOUSE GAS REDUCTION	Desktop Review	IGA Results
Current Annual Energy Consumption (kWh)	8,021,061	8,572,849
Projected LED Annual Energy Consumption (kWh)	3,048,301	3,493,115
Annual kWh Savings	4,972,760	5,079,734
Estimated Annual GHG Reduction (metric tonnes)	497	386
GHG Reduction over Luminaire Life (metric tonnes)	11,437	8,881

CALCULATION ASSUMPTIONS

1. The electricity cost savings were calculated based on Oshawa PUC hydro Inc's current rates valid at the date of the preparation of this IGA. This information can be obtained online on the Ontario Energy Board website[1]. The annual energy savings and the new LED street lighting system were calculated based on the data collected by the GIS/GPS mapping. Any changes in the below data will have as an effect changes in the energy consumption savings and in the energy cost savings.

Type of Light	# of Lights	Total Demand Before (kW)	Total Demand After (kW)	Annual Operating Hours
Cobra Head	10,372	2031.2	827.6	4,221

2. We have assumed that the saveONenergy program continues to be in effect as promised, using the currently published rates, and that there will be no unexpected delays on the part of our partners which would prevent us from meeting the deadline for the City to receive this incentive. While we will do everything we can to meet the requirements of this program and to gain this incentive for the City, RealTerm Energy cannot take responsibility for those aspects which are outside of its control.

3. HST was not included thorough our calculations.

CONCLUSION AND RECOMMENDATION

- We have implemented a designed solution of selected LED luminaires that conform to RP-8 guidelines for the majority of the applications.

- This combination of LED luminaires will result in energy consumption savings of 5,079,734 kWh per year over the incumbent HPS fixtures, which is equivalent to **59% energy savings**.

- If the City of Oshawa chooses to move forward with the Design, Upgrade and Transfer option, the total project cost will be $5,398,068 which includes 2% arm replacement and 35% re-wiring and re-fusing of all fixtures. The cost includes also an additional 15% for the fixtures near high tension cables which require specific safety measures. The City should expect a payback period of 3.3 years with an IESO incentive of $1,184,208.

- If the City of Oshawa elects to proceed with an Energy Performance Contract, we propose that the portion of the combined energy and maintenance savings accruing to the City be **46.6%**, with RealTerm Energy receiving the remainder of the savings over the 10 year term of the Energy Services Agreement. The share to the City of Oshawa would result in $598,247 savings for the first year, escalating over the term for inflation.

The next steps to start the implementation of this new technology and start seeing energy and maintenance savings are as follows:

1. Meeting to review IGA with staff and RealTerm energy team
2. Approval of the IGA
3. Submit IESO rebate (prepared by RealTerm, but municipal staff must submit)
4. Review contract to proceed with project
5. Sign contract

TERMS & CONDITIONS

The total project cost includes the following scope of work:

1. Data collection including GIS/GPS mapping of the existing and proposed luminaires,
2. Lighting designs for each unique street,
3. Removing Oshawa's existing HID cobra head luminaires and the supply and installation of Oshawa's cobra head LED luminaires with photocell controllers as shown in the table on the page 8.
4. A provision for the cost of rewiring 35% of the luminaires,
5. Fuse and fuse holder replacements for 100% of the luminaires,
6. A provision for the replacement of 2% of the cobra head luminaires davit arms,
7. ESA permits and inspection of work
8. Recycling of the removed HID luminaires.
9. Project management,
10. Commissioning,
11. Changing the utility bills on your behalf based on the new LED lighting system installed by RTE and based on the information provided by the Municipality and LDC regarding the metered and unmetered lights. RTE assumes that the information provided by both parties are accurate and reflects the current state of the actual inventory.
12. Applying on your behalf for the available IESO incentives. The final calculation of the actual dollar amount of the incentive will be determined by the LDC and is not guaranteed by RTE.
13. RealTerm Energy and our Installation Contractor warrant all workmanship completed within the work area for a period of one (1) year following the completion date of the installation. Fuses are not covered under this warranty, however fuse failures within 30 days will be replaced at no cost.
14. The Luminaire and Photocell are covered by their manufacturer's warranties for 10 and 12 years, respectively.

TERMS & CONDITIONS

For greater clarity, the scope of work set forth herein shall constitute the sole and entire scope of work for the Project and supersedes all prior and contemporaneous understandings, agreements, representations and warranties, both written and oral, with respect to the Project. The Parties have not relied on any statement, representation, warranty or agreement of the other Party or of any other person acting on such Party's behalf, including any representations, warranties, or agreements arising from statute or otherwise in law, except for the representations, warranties, or agreements expressly contained in this Agreement. Without limitation of the foregoing, the parties acknowledge and agree that the following items are not included in the scope of work and nor the total project cost:

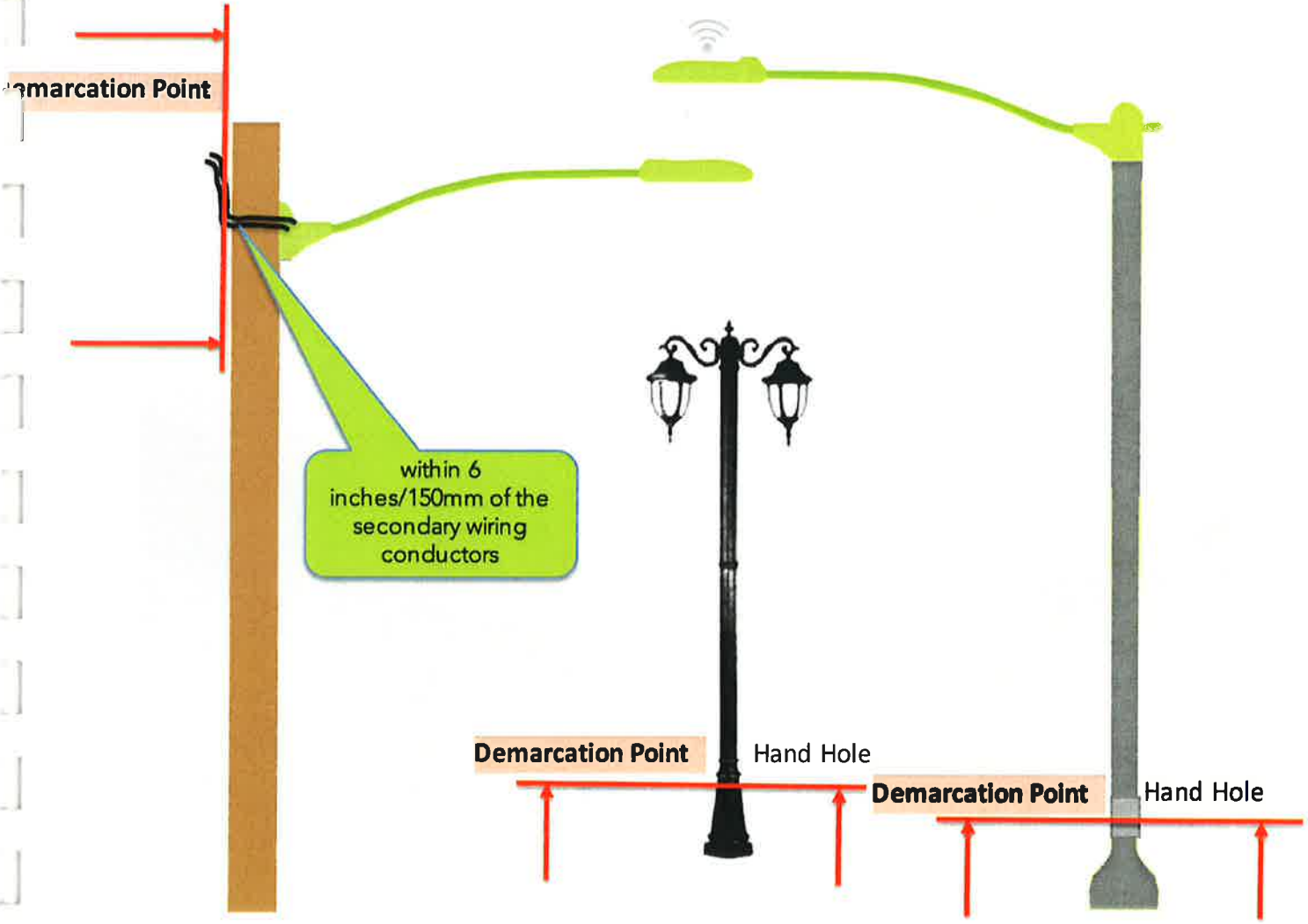
1. Any cost related to upgrading your existing lighting/electrical systems to provincial and or federal standards;
2. Any cost related with the replacement of the existing relays for the group-controlled streetlights (controller box)
3. Any fees related to the connections to the secondary bus in the unlikely case that your LDC insists on charging a fee.
4. Any other fees which may be charged by a third party.
5. Any costs related to works beyond the Demarcation Point, described as follows:

Work performed on the electrical system by RealTerm Energy will be confined to the Luminaire and an area between the agreed upon "*Demarcation Point*" (in the majority of cases a point within 6 inches/150mm of the secondary wiring conductors) on what is referred to as the "Tail". This is the location at which a Fuse Holder and Fuse should exist and acts as a disconnect to allow easy service, protect the new luminaire and wiring from voltage surges and provide a safe working environment. In the event that a Fuse and Holder do not exist, they will be installed.

For Decorative Poles and Stand-Alone underground fed units the "*Demarcation Point*" is located at the base of the pole in the "Hand Hole". Where Overhead feeds are in use, the "Demarcation Point" is located at the base of the arm holding the fixture, where the connection is made to the secondary wires.

If RealTerm Energy dispatches a maintenance contractor and the required repairs are outside of the work areas, we will recommend a solution and communicate this information to the Client for approval before proceeding.

TERMS & CONDITIONS



The foregoing excluded items and any other items not included within the scope of work may be provided by RealTerm Energy at an additional cost pursuant to a separate written agreement or amendment between the parties only. The above list of exclusions is not meant to be an exhaustive, as network site conditions vary, and shall not operate in any way to limit the exclusions of this paragraph or imply any obligation or duty on the party of RealTerm Energy to complete any work other than the specifically defined scope of work set forth herein.

This IGA is valid until April 30, 2016.

The total project cost is in Canadian dollars and does not include HST.

City of Oshawa
50 Centre Street South
Oshawa, ON
L1H 3Z7

The information contained herein will form part of the Installation contract documents as well as the Scope of Work for the LED Street Lighting conversion project. The undersigned is authorized to sign on behalf of the municipality and accepts the terms and conditions of this Investment Grade Audit (IGA) E0295 - 02-02-2016.

_____
Authorized Signature

_____
Name (please print)

_____
Title (please print)

_____
Date

DECORATIVE FIXTURE REPLACEMENTS

With Acuity Brand Fixtures

REALTERM ENERGY

CURRENT DECORATIVE INVENTORY

GPS DECORATIVE INVENTORY (Actual)

TYPE	SYSTEM WATTAGE	QTY	DEMAND (kW)
Acorn Post Top 150W	190	38	7.2
Bollard 150W	190	10	1.9
Box Top 150W	190	52	9.9
Box Top 250W	310	39	12.1
Box Top (Circular) 250W	310	7	2.2
Cube Post Top 150W	190	7	1.3
Cylinder Post Top 150W	190	59	11.2
Other Downlighting 100W	130	10	1.3
Other Downlighting 150W	190	139	26.4
Other Downlighting 200W	250	231	57.8
Post Top Metal Halide 175W	210	8	1.7
Top Hat 100W	130	144	18.7
Top Hat 150W	190	22	4.2
Top Hat 200W	250	1	0.3
Victorian Lantern Post Top 100W	130	6	0.8
Victorian Lantern Post Top 150W	190	18	3.4
Victorian Lantern Side Mount 100W	130	994	129.2
Victorian Lantern Side Mount 150W	190	491	93.3
WallPack 100W	130	30	3.9
TOTAL		2,306	386.7

PROPOSED DECORATIVE INVENTORY – ACUITY BRAND

PROPOSED LED REPLACEMENT-DECORATIVE INVENTORY- ACUITY

DLC/NOT DLC	TYPE	SYSTEM WATTAGE	QTY	DEMAND (kW)
DLC	KAD LED 20C 530 40K R3 MVOLT PUMBAK PER7	38	3	0.1
DLC	OSQ A AA 3ME A 40K * SV DIM Q9 R	112	4	0.4
DLC	XSPW A O 3 F C * U Z Y	42	30	1.3
DLC	AVPCL2 30LEDE10 MVOLT 5K R5 P7 PCLL NL	106	15	1.6
DLC	KAD LED 30C 700 50K R5 MVOLT SPUMBAK06 PER7 DBLXD	69	81	5.6
NOT DLC	GRPCL 30LEDE70 MVOLT 5K R3 P7 PCLL NL (Post Top)	66	24	1.6
DLC	MR1 LED 42C 700 40K SR3 MVOLT RPA PER7 DBAXD + AST25-190 DNAXD	98	23	2.3
DLC	MR1 LED 42C 700 50K SR5 MVOLT RPA PER7 DNAXD + AST20-190 DNAXD	98	51	5.0
DLC	KBR8 LED 16C 700 50K SYM MVOLT DBLXD	39	10	0.4
DLC	MRP LED 42C 1000 40K SR5 MVOLT MRPF5 PER7 DNAXD	151	8	1.2
NOT DLC	PHL1105KASP(1.25)RAL30043PCSR RFD174272	110	352	38.7
NOT DLC	AWDE 60 4K AS M B 3 N C U P7 NL1X1 PCS	60	38	2.3
NOT DLC	GRSCL 30LEDE70 MVOLT 5K R3 PCLL NL	66	1,485	98.0
YES	245L 20LEDE70 MVOLT 5K R5 RNA P7 PCLL NL (Need adaptor)	44	175	7.7
YES	MR1 LED 42C 350 40K SR3 MVOLT RPA PER7 + AST20-190 DNAXD	49	7	0.3
	TOTAL		601	58.2

DECORATIVE-ACUITY BRAND

*DLC listed products are LED products that have been tested at a DLC approved laboratory and that comply with specified performance and energy efficiency criteria. These products are eligible for IESO incentive. For further information please visit the Design Lights Consortium website at www.designlights.org. The 'Not DLC listed' products are not eligible for the IESO incentive. Please note that in the table above, 4 different types of decorative lights are not eligible for IESO incentives as they are not DLC listed.

We have chosen these lights and are recommending them to you because in our professional opinion they are equivalent quality and energy efficiency, and have the same type of independent testing as that done for DLC-listed lights, however because they are made in smaller quantities the manufacturer has not paid to submit them to the DLC list.

In the case you wish to have all your fixtures decorative fixtures DLC approved, please refer to the next option

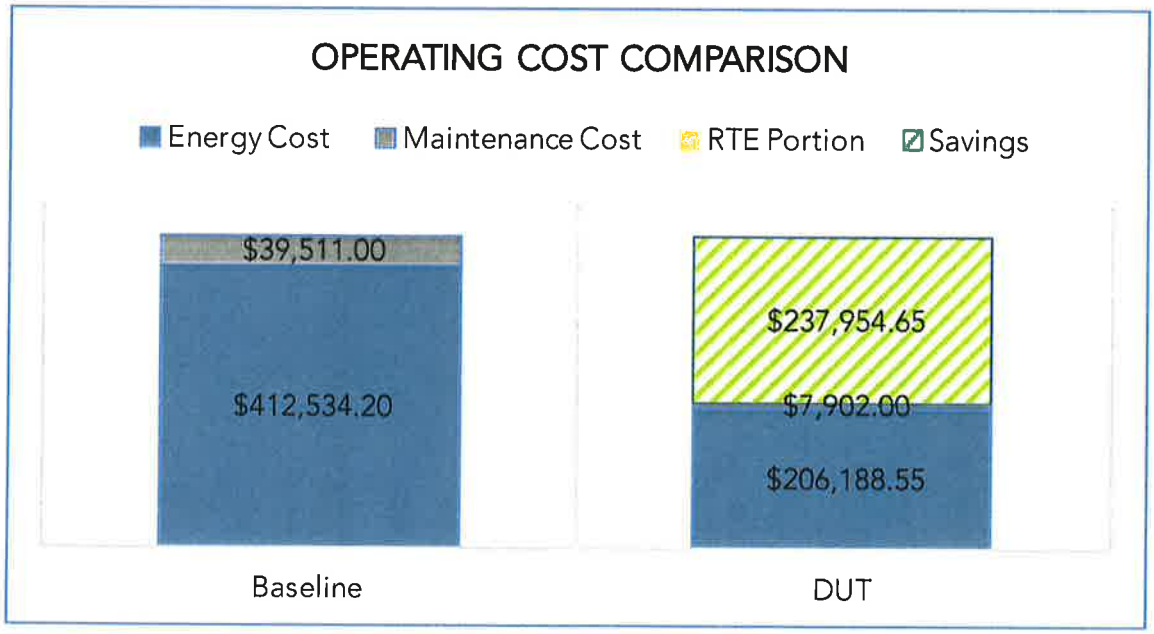
ENERGY AND FINANCIAL ANALYSIS

CURRENT DECORATIVE FIXTURES REPLACED BY ACUITY BRAND LED FIXTURES

CURRENT STATUS	BEFORE UPGRADE	POST UPGRADE	VARIANCE	PERCENT
Number of Fixtures	2,306	2,306		
Annual Electricity Consumption (kWh)	1,632,096	702,675	929,421	57% ⇩
Annual Electricity Costs	$412,534	$206,189	$206,346	50% ⇩
Annual Maintenance Cost (5 yr. avg.)	$39,511	$7,902	$31,609	80% ⇩
Total Street Lights Expenditures	$452,045	$214,091	$237,954	53% ⇩
Average Annual Cost per Fixture	$196.03	$92.84	$103	53% ⇩

Design, Upgrade and Transfer (DUT).

	D.U.T.
Number of Fixtures	2,306
Total Project Costs	$3,277,982
IESO Incentive	-$43,188
Net Project Costs	$3,234,794
Price per Fixture	$1,402.77
Payback Period (Years)	11.6



DECORATIVE-ACUITY BRAND

REALTERM ENERGY

DECORATIVE FIXTURE REPLACEMENTS

With Acuity Brand and Cyclone Fixtures

REALTERM ENERGY

CURRENT DECORATIVE INVENTORY

GPS DECORATIVE INVENTORY (Actual)

TYPE	SYSTEM WATTAGE	QTY	DEMAND (kW)
Acorn Post Top 150W	190	38	7.2
Bollard 150W	190	10	1.9
Box Top 150W	190	52	9.9
Box Top 250W	310	39	12.1
Box Top (Circular) 250W	310	7	2.2
Cube Post Top 150W	190	7	1.3
Cylinder Post Top 150W	190	59	11.2
Other Downlighting 100W	130	10	1.3
Other Downlighting 150W	190	139	26.4
Other Downlighting 200W	250	231	57.8
Post Top Metal Halide 175W	210	8	1.7
Top Hat 100W	130	144	18.7
Top Hat 150W	190	22	4.2
Top Hat 200W	250	1	0.3
Victorian Lantern Post Top 100W	130	6	0.8
Victorian Lantern Post Top 150W	190	18	3.4
Victorian Lantern Side Mount 100W	130	994	129.2
Victorian Lantern Side Mount 150W	190	491	93.3
WallPack 100W	130	30	3.9
TOTAL		2,306	386.7

PROPOSED DECORATIVE INVENTORY - ACUITY BRAND AND CYCLONE

PROPOSED LED REPLACEMENT- DECORATIVE INVENTORY- ACUITY AND CYCLONE

DLC	TYPE	SYSTEM WATTAGE	QTY	DEMAND (kW)
DLC	KAD LED 20C 530 40K R3 MVOLT PUMBAK PER7	38	3	0.1
DLC	OSQ A AA 3ME A 40K * SV DIM Q9 R	112	4	0.4
DLC	XSPW A O 3 F C * U Z Y	42	30	1.3
DLC	AVPCL2 30LEDE10 MVOLT 5K R5 P7 PCLL NL	106	15	1.6
DLC	KAD LED 30C 700 50K R5 MVOLT SPUMBAK06 PER7 DBLXD	69	81	5.6
DLC	CL41T4-FLAC-GAL-3-60W-4K-120-EA1-DEP-DIM-PTFS-PTDR-CP4145-RAL9005TX	60	24	1.4
DLC	MR1 LED 42C 700 40K SR3 MVOLT RPA PER7 DBAXD + AST25-190 DNAXD	98	23	2.3
DLC	MR1 LED 42C 700 50K SR5 MVOLT RPA PER7 DNAXD + AST20-190 DNAXD	98	51	5.0
DLC	KBR8 LED 16C 700 50K SYM MVOLT DBLXD	39	10	0.4
DLC	MRP LED 42C 1000 40K SR5 MVOLT MRPF5 PER7 DNAXD	151	8	1.2
NOT DLC	PHL1105KASP(1.25)RAL30043PCSR RFD174272	110	352	38.7
DLC	CA23T4-GAL-3-VS3AR-60W-4K-120V	60	38	2.3
DLC	CL41P1-FLAC-GAL-3-60W-4K-120-DIM-PTFS-PTDR-CP4159-RAL9005TX	60	1,485	89.1
DLC	245L 20LEDE70 MVOLT 5K R5 RNA P7 PCLL NL (Need adaptor)	44	175	7.7
DLC	MR1 LED 42C 350 40K SR3 MVOLT RPA PER7 + AST20-190 DNAXD	49	7	0.3
TOTAL			601	58.2

For the purpose of optimizing the possible incentive amount, we proposed to replace the Non DLC fixtures from Acuity by DLC fixture from Cyclone (see rows highlighted orange). Only one model did not have a similar type of fixture replacement which remained non DLC and it's proposed replacement is the PHL from Acuity.

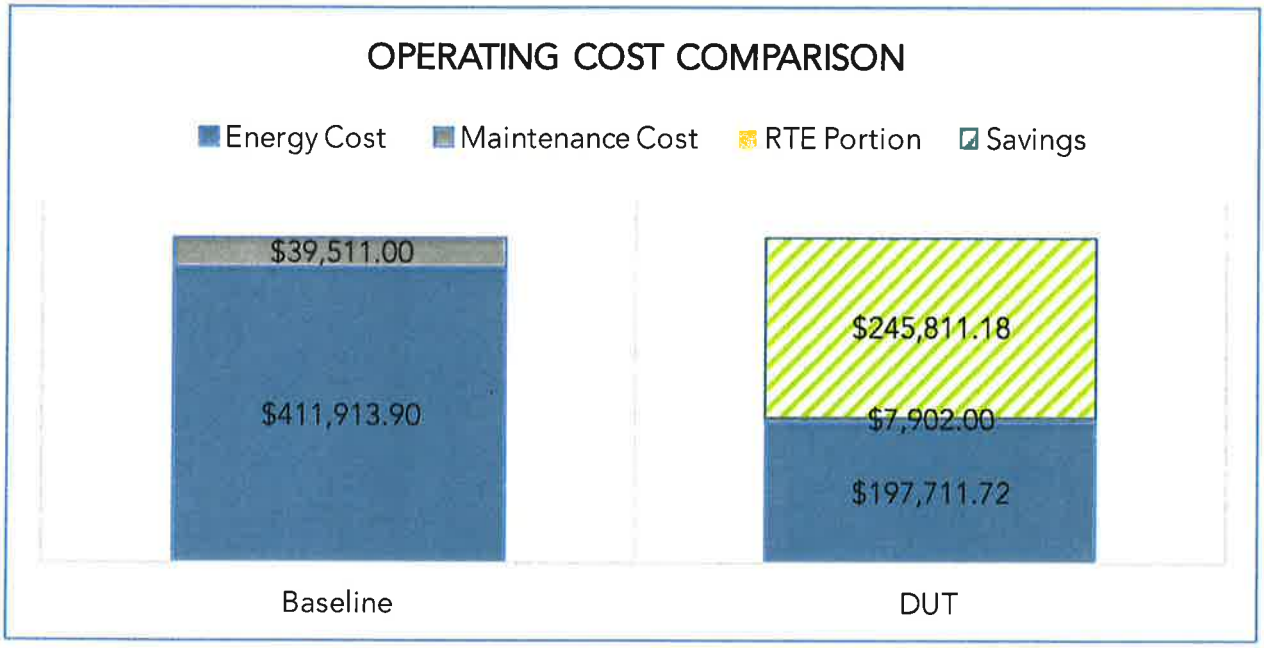
ENERGY AND FINANCIAL ANALYSIS

CURRENT DECORATIVE FIXTURES REPLACED BY ACUITY BRAND LED FIXTURES AND CYCLONE FIXTURES WHEN DECORATIVES ARE NOT DLC

CURRENT STATUS	BEFORE UPGRADE	POST UPGRADE	VARIANCE	PERCENT
Number of Fixtures	2,306	2,306		
Annual Electricity Consumption (kWh)	1,632,096	664,462	967,634	59% ⇩
Annual Electricity Costs	$411,914	$197,712	$214,202	52% ⇩
Annual Maintenance Cost (5 yr. avg.)	$39,511	$7,902	$31,609	80% ⇩
Total Street Lights Expenditures	$451,425	$205,614	$245,811	54% ⇩
Average Annual Cost per Fixture	$195.76	$89.16	$107	54% ⇩

Design, Upgrade and Transfer (DUT).

	DESIGN, UPGRADE & TRANSFER
Number of Fixtures	2,306
Total Project Costs	$3,261,337
IESO Incentive	-$179,324
Net Project Costs	$3,082,013
Price per Fixture	$1,336.52
Payback Period (Years)	10.9



DECORATIVE-ACUITY BRAND AND CYCLONE

REALTERM ENERGY

COMBINED: COBRAHEAD AND DECORATIVE FIXTURE REPLACEMENTS

With Acuity Brand and (Acuity Brand and Cyclone)

REALTERM ENERGY

ENERGY AND FINANCIAL ANALYSIS

THE REPLACEMENT OF ALL FIXTURES: COMBINED COBRAHEAD AND DECORATIVES

CURRENT STATUS	BEFORE UPGRADE	POST UPGRADE	VARIANCE	PERCENT
Number of Fixtures	12,678	12,678		
Annual Electricity Consumption (kWh)	10,204,945	4,195,790	6,009,155	59% ⇩
Annual Electricity Costs	$2,537,306	$1,207,153	$1,330,153	52% ⇩
Annual Maintenance Cost (5 yr. avg.)	$217,225	$43,445	$173,780	80% ⇩
Total Street Lights Expenditures	$2,754,531	$1,250,598	$1,503,933	55% ⇩
Average Annual Cost per Fixture	$217.27	$98.64	$119	55% ⇩

Design, Upgrade and Transfer (DUT).

	D.U.T. Cobras+Acuity Decoratives	Cobras + Acuity + Cyclone Decoratives
Number of Fixtures	12,678	12,678
Total Project Costs	$8,879,676	$8,858,465
IESO Incentive	-$1,227,396	-$1,363,532
Net Project Costs	$7,652,280	$7,494,933
Price per Fixture	$603.59	$591.18
Payback Period (Years)	4.8	4.7

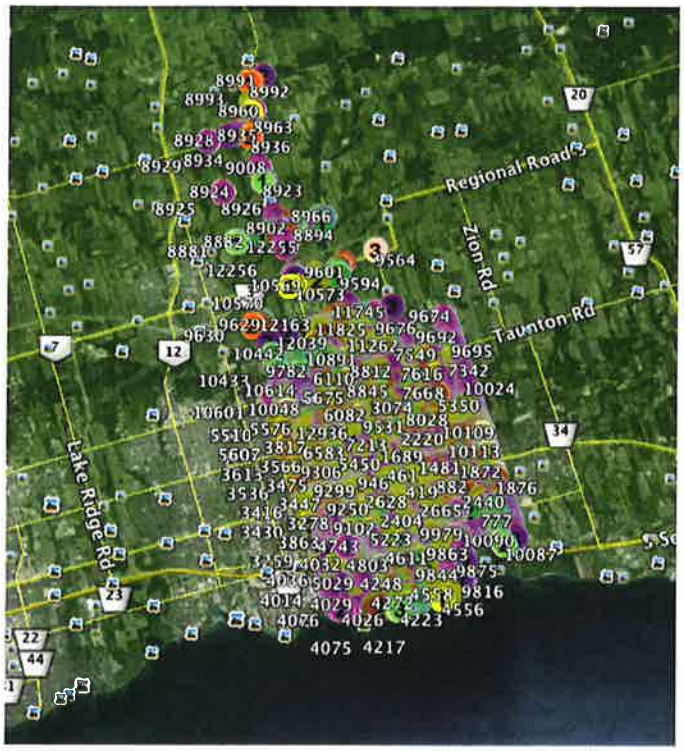
Energy Performance Contract (EPC).

	Cobras+Acuity Decoratives	Cobras + Acuity + Cyclone Decoratives
City's Portion	25.4%	27.0%
RealTerm Energy's Portion	74.6%	73.0%
Annual Share of Savings to Client	$392,484	$419,757
Contract Period	10 years	10 years
10 Year Maintenance	Included	Included

SITE SPECIFIC FIXTURE REPLACEMENTS

LED DESIGNS FOR COBRA HEAD LIGHTS

Sample Fixture Locations



Replacement Details*

3433

3433	
FID	6433
RTE_ID	3433
FixtQty	1
FixtType	Cobrahead - HPS
FixtHeight	35
ArmLength	8
FixtWattag	100
WireLocati	Underground
Setback	5
RdWidth	27
NbLanes	2
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	Tree trimming required
Comments	
SurvDate	42678.868576
Surveyor	Dan
LDC	
POINT_X	-78.89414
POINT_Y	43.884624
WithBallas	130
Design_ID	10
LEDDesigne	53W_XSPA02GA_USN
PowerLevel	A
LEDWattage	53
DesignName	
Performanc	0.407692
MountRatio	0.885714
Replacemen	FROM 130W Cobrahead - HPS TO 53W_XSPA02GA_USN
PO	
Name	3433
FolderPath	Oshawa_Lighting_Design_March14\53W_XSPA02GA_USN

HPS 100 W

LED 53W

***Sample Data:** Please note that while this map displays some of the 53W LEDs, not all of them will necessarily have been 100W HPS originally. Other sizes of lights may also have been converted to 53W LEDs.

REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations

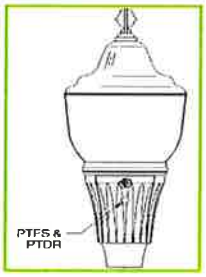
Replacement Details

13444

FID	13519
RTE_ID	13444
FixtQty	1
FixtType	Decorative - Acorn Post Top
FixtHeight	25
ArmLength	0
FixtWattag	150
WireLocati	Underground
Setback	1
RdWidth	58
NbLanes	2
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	
SurvDate	42616.59853
Surveyor	Dan
LDC	
POINT_X	-78.869429
POINT_Y	43.906104
WithBallas	190
Design_ID	97
LEDDesigne	WAUE_WSE_STLE 60 4K XX X 3XXX
PowerLevel	0
LEDWattage	60
DesignName	
Performanc	0.315789
MountRatio	2.36
Replacemen	FROM 190W Decorative - Acorn Post Top TO WAUE_WSE_STLE 60 4K XX X 3XXX
PO	
Name	13444
FolderPath	Oshawa_Lighting_Design_March14/60W_WAUE_WSE_STLE 60 4K XX X 3XXX

Decorative Acorn Post Top HPS 150 W

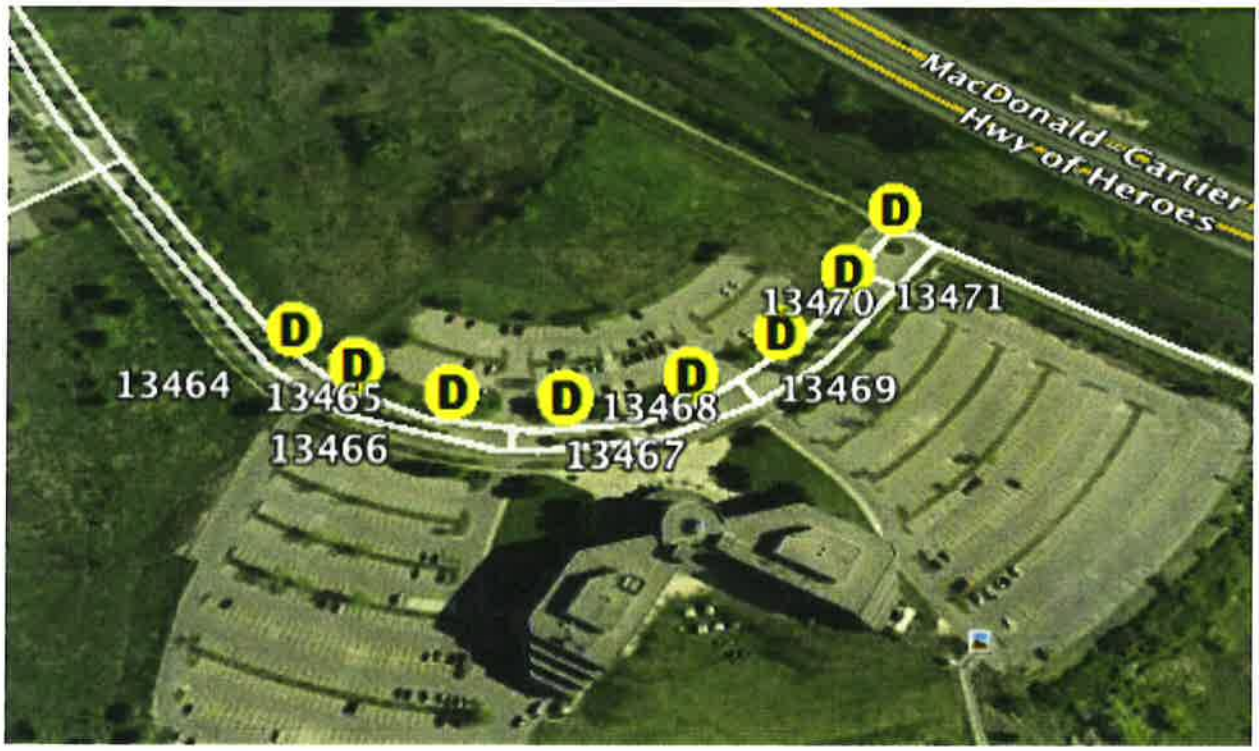
AWDE or CA23T4



REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations



Replacement Details

13467

	13467
FID	13477
RTE_ID	13467
FixtQty	1
FixtType	Decorative - Post Top Metal Halide
FixtHeight	25
ArmLength	0
FixtWattag	175
WireLocati	Underground
Setback	0
RdWidth	26
NbLanes	0
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	Colonel Sam Dr
SurvDate	42677
Surveyor	Dan
LDC	
POINT_X	-78.804799
POINT_Y	43.87857
WithBallas	210
Design_ID	96
LEDDesigne	MRP LED 42C 1000 40K SR5 MVOLT
PowerLevel	0
LEDWattage	151
DesignName	
Performanc	0.719048
MountRatio	1
Replacemen	FROM 210W Decorative - Post Top Metal Halide TO MRP LED 42C 1000 40K SR5 MVOLT
PO	
Name	13467
FolderPath	Oshawa_Lighting_Design_March14/151W_MRP LED 42C 1000 40K SR5 MVOLT

Decorative Post Top MH 175W

MRP 151W

REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations

Replacement Details

10660

FID	13437
RTE_ID	10660
FixtQty	1
FixtType	Decorative - Cylinder Post Top
FixtHeight	26
ArmLength	2
FixtWattag	150
WireLocati	Underground
Setback	4
RdWidth	32
NbLanes	2
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	
SurvDate	42645.605937
Surveyor	Cedric
LDC	
POINT_X	-78.898029
POINT_Y	43.927221
WithBallas	190
Design_ID	119
LEDDesigne	MR1 LED 42C 530 40K SR3 MVOLT
PowerLevel	0
LEDWattage	75
DesignName	
Performanc	0.394737
MountRatio	1.307692
Replacemen	FROM 190W Decorative - Cylinder Post Top TO MR1 LED 42C 530 40K SR3 MVOLT
PO	
Name	10660
FolderPath	Oshawa_Lighting_Design_March14/75W_MR1 LED 42C 530 40K SR3 MVOLT

Decorative Cylinder Post Top 150W

MR1 LED 75W

REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations

Replacement Details

13544

13544	
FID	13418
RTE_ID	13544
FixtQty	1
FixtType	Decorative - Box Top (Circular)
FixtHeight	25
ArmLength	1
FixtWattag	250
WireLocati	
Setback	0
RdWidth	0
NbLanes	0
RdClass	Pathway
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	City Hall
SurvDate	0
Surveyor	Dan
LDC	
POINT_X	-78.86574
POINT_Y	43.895342
WithBallas	310
Design_ID	94
LEDDesigne	MR1 LED 42C 350 40K SR3 MVOLT
PowerLevel	0
LEDWattage	49
DesignName	
Performanc	0.158065
MountRatio	-0.04
Replacemen	FROM 310W Decorative - Box Top (Circular) TO MR1 LED 42C 350 40K SR3 MVOLT
PO	
Name	13544
FolderPath	Oshawa_Lighting_Design_March14\49W_MR1 LED 42C 350 40K SR3 MVOLT

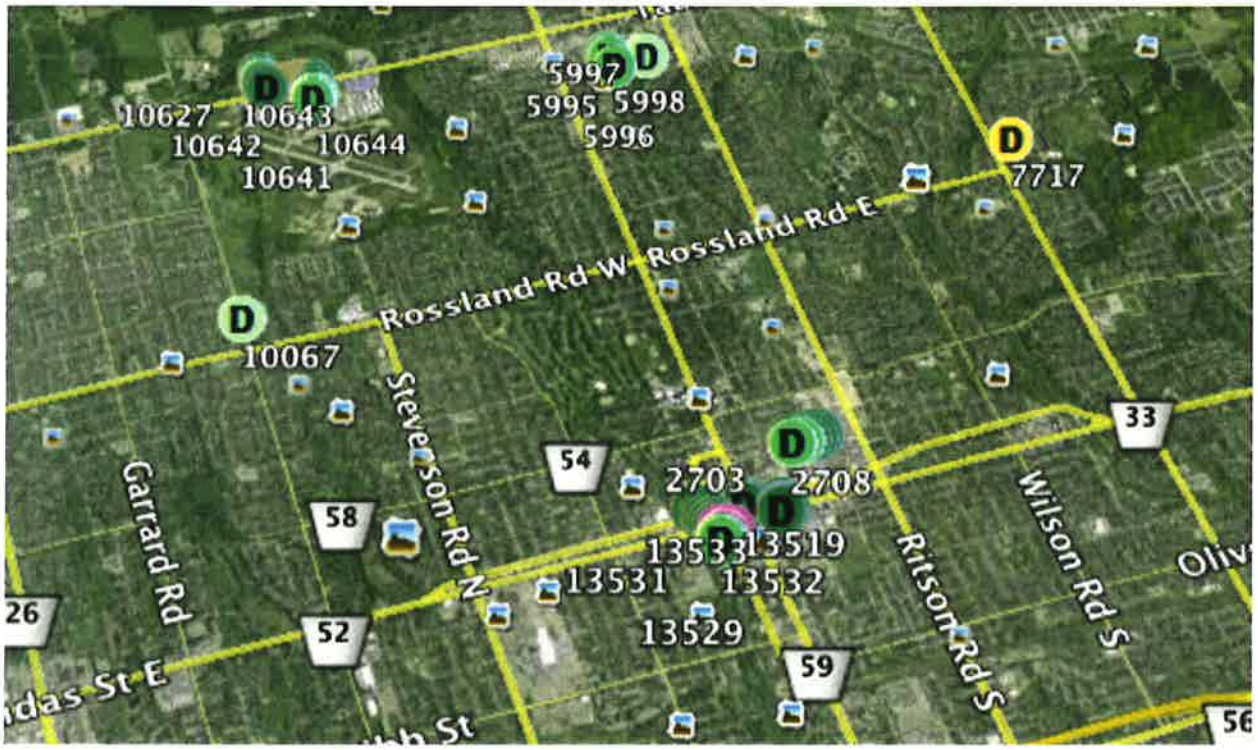
Decorative Box Top (Circular) HPS 250W

MR1 LED 49W

REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations



Replacement Details

10640

10640	
FID	13362
RTE_ID	10640
FixtQty	1
FixtType	Decorative - Cylinder Post Top
FixtHeight	26
ArmLength	2
FixtWattag	150
WireLocati	Underground
Setback	4
RdWidth	32
NbLanes	2
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	
SurvDate	42845.605937
Surveyor	Cedric
LDC	
POINT_X	-78.89783
POINT_Y	43.926039
WithBallas	190
Design_ID	91
LEDDesigns	KAD LED 20C 700 40K R3 MVOLT PUMBAK PER7
PowerLeval	0
LEDWattage	46
DesignName	
Performanc	0.242105
MountRatio	1.307692
Replacemen	FROM 190W Decorative - Cylinder Post Top TO KAD LED 20C 700 40K R3 MVOLT PUMBAK PER7
PO	
Name	10640
FolderPath	Oshawa_Lighting_Design_March14\46W_KAD LED 20C 700 40K R3 MVOLT PUMBAK PER7

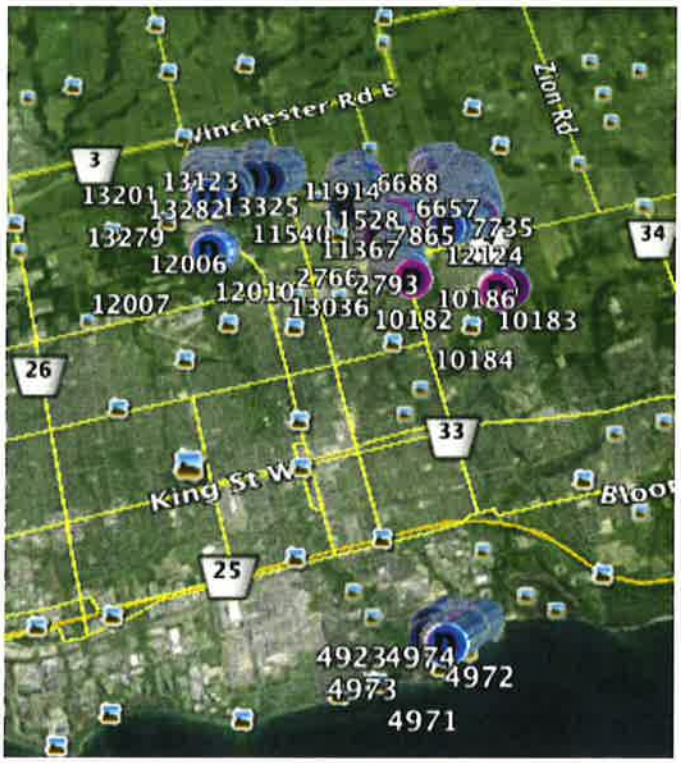
Decorative Cylinder Post Top HPS 150W

KAD 69W

REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations



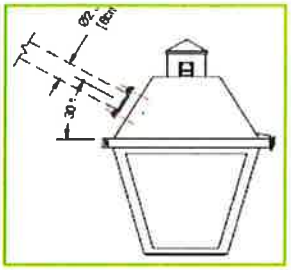
Replacement Details

7922

7922	
FID	12542
RTE_ID	7922
FixtQty	1
FixtType	Decorative - Victorian Lantern Side Mount
FixtHeight	26
ArmLength	6
FixtWattag	100
WireLocati	Underground
Setback	6
RdWidth	26
NbLanes	2
RdClass	Collector
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	
SurvDate	0
Surveyor	Adaski
LDC	
POINT_X	-78.84628
POINT_Y	43.945783
WithBallas	130
Design_ID	93
LEDDesigne	GRSL 30LEDE53 XXXX 4K R3 GL
PowerLevel	0
LEDWattage	50
DesignName	
Performanc	0.384815
MountRatio	1.04
Replacemen	FROM 130W Decorative - Victorian Lantern Side Mount TO GRSL 30LEDE53 XXXX 4K R3 GL
PO	
Name	7922
FolderPath	Oshawa_Lighting_Design_March14/50W_GRSL 30LEDE53 XXXX 4K R3 GL

Decorative Vitorian Lantern HPS 100W

GRSL or CL41P1



LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations

Replacement Details

13453

	13453
FID	11889
RTE_ID	13453
FixtQty	1
FixtType	Decorative - Bollard
FixtHeight	4
ArmLength	0
FixtWattag	150
WiresLocati	Underground
Setback	0
RdWidth	0
NbLanes	0
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	King Luminaire
SurvDate	42554
Surveyor	Jim
LDC	
POINT_X	-78.823333
POINT_Y	43.8654
WithBallas	190
Design_ID	101
LEDDesigne	DSXB LED 16C 700 40K SYM MVOLT PE SF DDBXD
PowerLevel	0
LEDWattage	39
DesignName	
Performanc	0.205263
MountRatio	0
Replacemen	FROM 199W Decorative - Bollard TO DSXB LED 16C 700 40K SYM MVOLT PE SF DDBXD
PO	
Name	13453
FolderPath	Oshawa_Lighting_Design_March14/39W_DSXB LED 16C 700 40K SYM MVOLT PE SF DDBXD

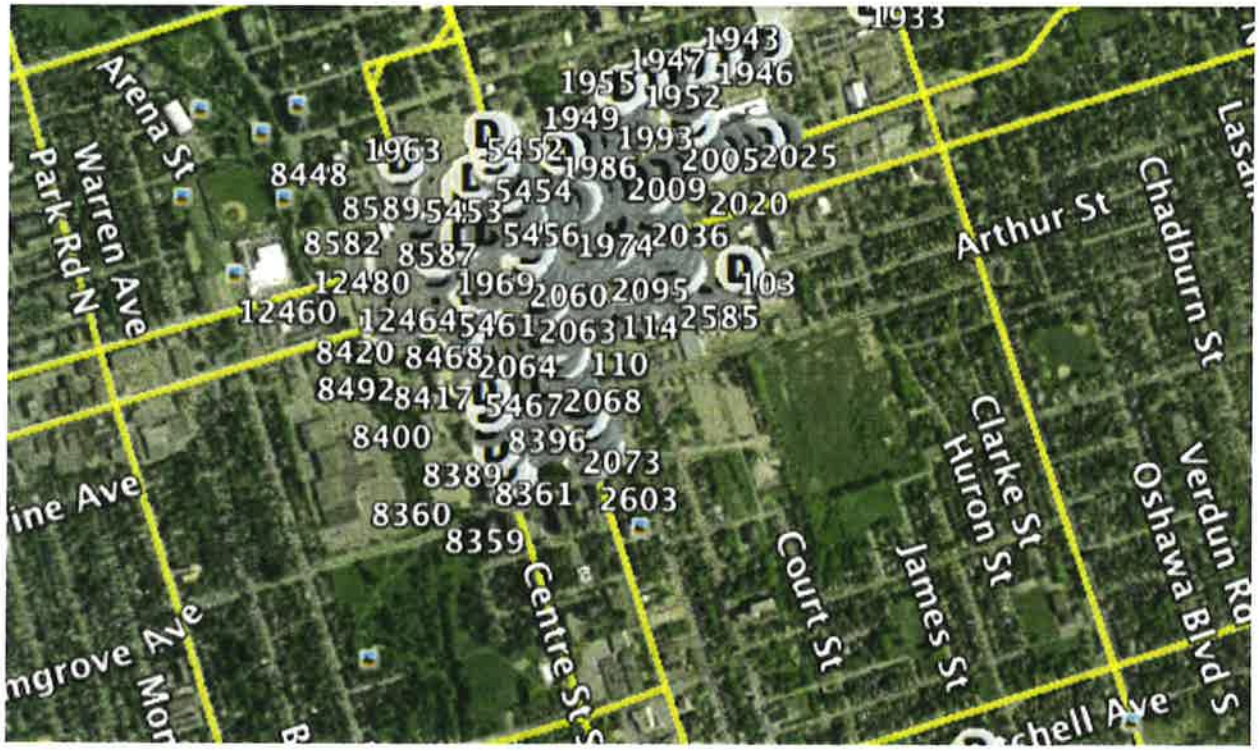
Decorative Bollard HPS 150W

KBR8 LED 39W

REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations



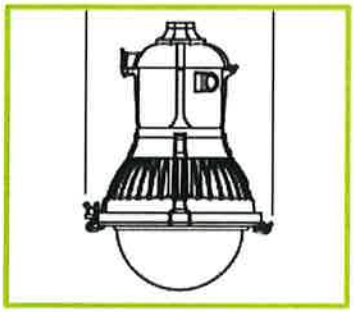
Replacement Details

2077

	2077
FID	10659
RTE_ID	2077
FixtQty	1
FixtType	Decorative - Other Downlighting
FixtHeight	17
ArmLength	4
FixtWattag	200
WireLocati	Underground
Setback	2
RdWidth	42
NbLanes	2
RdClass	Local
DecoWithPC	
DecoColour	Burgandy
UtilPoleID	0
Problems	
Comments	
SurvData	0
Surveyor	Aaron
LDC	
POINT_X	-78.862454
POINT_Y	43.896792
WithBallas	250
Design_ID	100
LEDDesigne	BWL 110 4K AS X 3
PowerLevel	0
LEDWattage	110
DesignName	
Performanc	0.44
MountRatio	2.352941
Replacemen	FROM 250W Decorative - Other Downlighting TO BWL 110 4K AS X 3
PO	
Name	2077
FolderPath	Oshawa_Lighting_Design_March14/110W_BWL 110 4K AS X 3

Decorative Downlighting HPS 200W

PHL1105KASP



REALTERM ENERGY

LED DESIGNS FOR DECORATIVE FIXTURES

Sample Fixture Locations

Replacement Details

5666

	5666
FID	3693
RTE_ID	5666
FixtQty	1
FixtType	Decorative - Top Hat
FixtHeight	16
ArmLength	0
FixtWattag	100
WireLocati	Underground
Setback	16
RdWidth	102
NbLanes	1
RdClass	Local
DecoWithPC	
DecoColour	
UtilPoleID	0
Problems	
Comments	
SurvDate	42645.788356
Surveyor	Kevin
LDC	
POINT_X	-78.882365
POINT_Y	43.925577
WithBallas	130
Design_ID	116
LEDDesigne	245L 20LED10 MVOLT 4K R5 RNA P7 PCLL (Need adaptor)
PowerLevel	0
LEDWattage	71
DesignName	
Performanc	0.646154
MountRatio	7.8
Replacemen	FROM 130W Decorative - Top Hat TO 245L 20LED10 MVOLT 4K R5 RNA P7 PCLL (Need adaptor)
PO	
Name	5666
FolderPath	Oshawa_Lighting_Design_March14/71W_245L 20LED10 MVOLT 4K R5 RNA P7 PCLL (Need adaptor)

Decorative Top Hat HPS 100W

245L LED 71W

REALTERM ENERGY

APPENDIX A

CREE PRODUCT WARRANTY

CANADIAN LIMITED WARRANTY FOR CREE® LED LIGHTING FIXTURES
(INCLUDING BETALED® TECHNOLOGY; TRUEWHITE® TECHNOLOGY; AND ESSENTIA® FIXTURES)

This limited warranty is provided by the Cree company described below ("Seller") to the original purchaser of the LED lighting product that is identified on Seller's invoice ("you") reflecting its original purchase (the "Product") in Canada. The Seller is the Cree company identified as such on the invoice. This limited warranty may be transferred to subsequent purchasers of the Product, provided that such Product is resold in new condition and in its original packaging. Seller warrants that the Product, when delivered in new condition and in its original packaging, will be free of defects in material and workmanship for a period of **TEN (10) YEARS** from the date of original purchase. The determination of whether the Product is defective shall be made by Seller in its sole discretion with consideration given to the overall performance of the Product. A Product shall not be considered defective solely as a result of the failure of individual LED components to emit light if the number of inoperable components is less than 10% of the total number of LED components in the Product.

If Seller determines the Product is defective, Seller will elect, in its sole discretion, to refund you the purchase price of the Product, repair the Product or replace the Product.

Exclusions:

1. This limited warranty will not apply to loss or damage to the Product caused by: negligence; abuse; misuse; mishandling; improper installation, storage or maintenance; damage due to fire or acts of God; vandalism; civil disturbances; power surges; improper power supply; electrical current fluctuations; corrosive environment installations; induced vibration; harmonic oscillation or resonance associated with movement of air currents around the Product; alteration; accident; failure to follow installation, operating, maintenance or environmental instructions prescribed by Seller or applicable electrical codes; or improper service of the Product performed by someone other than Seller or its authorized service provider.

2. This limited warranty excludes field labour and service charges related to the repair or replacement of the Product.

3. **THIS LIMITED WARRANTY IS VOID IF THE PRODUCT IS NOT USED FOR THE PURPOSE FOR WHICH IT IS DESIGNED.**

4. **THERE ARE NO REPRESENTATIONS, WARRANTIES OR CONDITIONS, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OR CONDITIONS AGAINST INFRINGEMENT OR OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR DURABILITY FOR A REASONABLE PERIOD OF TIME, OTHER THAN OTHER THAN THOSE EXPRESSLY CONTAINED IN THIS LIMITED WARRANTY AND THOSE LEGAL WARRANTIES PROVIDED UNDER PROVINCIAL LAW WHICH CANNOT BE WAIVED.**

5. IN NO EVENT SHALL SELLER BE LIABLE FOR INCIDENTAL, COMPENSATORY, CONSEQUENTIAL, INDIRECT, SPECIAL OR OTHER DAMAGES. SELLER'S AGGREGATE LIABILITY WITH RESPECT TO A DEFECTIVE PRODUCT SHALL IN ANY EVENT BE LIMITED TO THE MONIES PAID TO SELLER FOR THAT DEFECTIVE PRODUCT. THE LIMITATIONS CONTAINED IN THIS SECTION APPLY REGARDLESS OF THE BASIS OF THE CLAIM OR THE FORM OF ACTION INCLUDING, WITHOUT LIMITATION, NEGLIGENCE OR OTHER TORT, OR BREACH OF CONTRACT.

Seller reserves the right to utilize new, reconditioned, refurbished, repaired or remanufactured products or parts in the warranty repair or replacement process. Such products and parts shall be comparable in function and performance to an original product or part, as determined by Seller in its sole discretion, and warranted as set out in this limited warranty for the remainder of the original warranty period.

In order to make a warranty claim, you must notify Seller in writing within sixty (60) days after your discovery of the defect, provide proof of purchase such as the invoice and comply with Seller's other warranty requirements as set out in this limited warranty. Upon receiving that notice, Seller may require you to promptly return the Product to Seller, or its authorized service provider, freight prepaid. Your warranty claim should be addressed to Cree Canada Corp., 3-6889 Rexwood Road, Mississauga, ON L4V 1R2.

This limited warranty only applies to specified LED fixtures set out above. Any warranties applicable to finish, poles, lamps, CR Series downlights, LR24™ troffers, certain BetaLED® Technology outdoor fixtures (specifically Class II as defined per IEC/EN60598), backup batteries, controls, occupancy sensors, photocells and other fixture accessories can be found at www.cree.com/canada/warranty.

This limited warranty is effective for purchases of Product on or after the effective date set forth below. Seller reserves the right to modify this warranty from time to time. Any modification of this warranty shall be effective for all orders placed with Seller on or after the effective date of such revised warranty.

The parties acknowledge that they have required that this document be prepared in English. Les parties reconnaissent avoir exigé que les présents soient rédigés en anglais.

Effective Date: September 24, 2012

APPENDIX B

PROPOSED MAINTENANCE SCHEDULE

PROPOSED MAINTENANCE SCHEDULE

OUR OEM PARTNER, CREE LIGHTING GUARANTEES ALL OF ITS LUMINAIRES FOR A PERIOD OF 10 YEARS FROM THE DATE OF INSTALLATION.

A detailed Maintenance schedule for the Energy Performance Contract proposed in Option 2, will be included as an integral part of the EPC. However, prior to the finalization of network design parameters, RealTerm Energy's proactive maintenance obligations are generally inclusive of the following items:

- Annual reporting
- Periodic technical diagnostics to determine network effectiveness
- Defective photocell replacement
- System troubleshooting
- Prompt system repairs
- Cleaning as required

APPENDIX C

LIGHTING DESIGNS LAYOUT

We are sending the details of the proposed CREE luminaires in a separate file, as well as copies of the lighting design layouts performed for various applications in the City. They will be sent electronically.

APPENDIX D

SPEC SHEETS

Field Adjustable Output

For use with XSP1™, XSP2™, XSP2L™, LEDway® High Output and OSQ™ LED Street and Area Luminaires

Description:
The Field Adjustable Output option enables the XSP Series, LEDway® High Output and OSQ™ street and area luminaires to be tuned to the exact needs of a particular application. With multiple levels of adjustment, the XSP Series, LEDway® High Output and OSQ Series luminaires offer maximum flexibility to best meet a variety of applications using a single luminaire. When N or U options are ordered (XSP Series, LEDway® High Output), the luminaires will have the field adjustable option as well as a wattage label that indicates the maximum available wattage of the luminaire.

XSP1™ Street/Area Luminaires

Input Power Designator	System Watts		Lumen Multipliers		Optics Qualified on the DesignLights Consortium Qualified Products List	
	120-277V	347-480V	Types II, II Short, II Long and III Including BLS	Types V and V Short	4000K	5700K
A	53	59	1.00	1.00	2, G, 3, H	2, G, 3, H
B	48	54	0.91	0.92	2, G, 3, H	2, G, 3, H
C	43	50	0.86	0.85	2, G, 3, H	2, G, 3, H
D	38	46	0.77	0.78	2, G, 3, H	2, G, 3, H
E	34	41	0.70	0.70	2, G, 3, H	2, G, 3, H
F	29	36	0.61	0.59	2, G, 3, H	2, G, 3, H
G	27	34	0.52	0.49	N/A	N/A
H	19	26	0.40	0.37	N/A	N/A
I	15	21	0.29	0.27	N/A	N/A

XSP2™ Street/Area Luminaires

Input Power Designator	System Watts		Lumen Multipliers		Optics Qualified on the DesignLights Consortium Qualified Products List	
	120-277V	347-480V	Types II, II Short, II Long and III Including BLS	Types V and V Short	4000K	5700K
A	101	106	1.00	1.00	2, G, 3, H	2, G, 3, H
B	91	99	0.91	0.95	2, G, 3, H	2, G, 3, H
C	83	90	0.86	0.88	2, G, 3, H	2, G, 3, H
D	73	79	0.77	0.80	2, G, 3, H	2, G, 3, H
E	65	71	0.70	0.73	2, G, 3, H	2, G, 3, H
F	56	62	0.61	0.63	2, G, 3, H	2, G, 3, H
G	53	59	0.52	0.52	N/A	N/A
H	37	43	0.40	0.40	N/A	N/A
I	29	34	0.29	0.29	N/A	N/A

XSP2L™ Street/Area Luminaires

Input Power Designator	System Watts		Lumen Multipliers		Optics Qualified on the DesignLights Consortium Qualified Products List	
	120–277V	347–480V	Types II, II Short, II Long and III Including BLS	Types V and V Short	4000K	5700K
L*	168	N/A	1.00	N/A	2, 3	2, G, 3, H
M	153	N/A	0.91	1.00	2, 3	2, G, 3, H
N	134	N/A	0.85	0.91	2, G, 3, H	2, G, 3, H
O	112	N/A	0.75	0.81	2, G, 3, H	2, G, 3, H
P	94	N/A	0.64	0.70	N/A	N/A
Q	76	N/A	0.51	0.57	N/A	N/A
R	56	N/A	0.37	0.42	N/A	N/A

* Input power designator L not available on XSP Series Area Luminaires

For use with XSP1™, XSP2™, XSP2L™, LEDway® High Output and OSQ™ LED Street and Area Luminaires

LEDway® High Output Luminaires – Single Module

Input Power Designator	System Watts		Lumen Multipliers	Optics Qualified on the DesignLights Consortium Qualified Products List	
	120-277V	347-480V	Types II Medium and III Medium	4000K	5700K
A	136	140	1.00	2ME, 3ME	2ME, 3ME
B	130	133	0.97	2ME, 3ME	2ME, 3ME
C	123	126	0.94	2ME, 3ME	2ME, 3ME
D	117	119	0.91	2ME, 3ME	2ME, 3ME
E	107	109	0.86	2ME, 3ME	2ME, 3ME
F	97	99	0.81	2ME, 3ME	2ME, 3ME
G	87	89	0.76	2ME, 3ME	2ME, 3ME
H	78	79	0.67	2ME, 3ME	2ME, 3ME
I	68	69	0.61	2ME, 3ME	2ME, 3ME

LEDway® High Output Luminaires – Double Module

Input Power Designator	System Watts		Lumen Multipliers	Optics Qualified on the DesignLights Consortium Qualified Products List	
	120-277V	347-480V	Types II Medium and III Medium	4000K	5700K
A	274	279	1.00	2ME, 3ME	2ME, 3ME
B	265	265	0.97	2ME, 3ME	2ME, 3ME
C	252	251	0.94	2ME, 3ME	2ME, 3ME
D	238	237	0.91	2ME, 3ME	2ME, 3ME
E	214	217	0.86	2ME, 3ME	2ME, 3ME
F	198	198	0.81	2ME, 3ME	2ME, 3ME
G	172	177	0.76	2ME, 3ME	2ME, 3ME
H	153	157	0.67	2ME, 3ME	2ME, 3ME
I	136	137	0.61	2ME, 3ME	2ME, 3ME

BetaLED TECHNOLOGY

US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

CREE

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

For use with XSP1™, XSP2™, XSP2L™, LEDway® High Output and OSQ™ LED Street and Area Luminaires

OSQ™ LED Area Luminaires – Input Power Designators A & J

Q Option Setting	System Watts 120-480V		Lumen Multipliers	Optics Qualified on the DesignLights Consortium Qualified Products List		
	Input Power Designator A	Input Power Designator J		3000K	4000K	5700K
Q9 (Standard)	112	168	1.00	N/A	N/A	N/A
Q8	107	160	0.98	N/A	N/A	N/A
Q7	101	152	0.94	N/A	N/A	N/A
Q6	96	143	0.91	N/A	N/A	N/A
Q5	87	131	0.85	N/A	N/A	N/A
Q4	79	120	0.80	N/A	N/A	N/A
Q3	71	108	0.73	N/A	N/A	N/A
Q2	64	96	0.68	N/A	N/A	N/A
Q1	56	84	0.61	N/A	N/A	N/A

OSQ™ LED Area Luminaires – Input Power Designator S

Q Option Setting	System Watts 120-277V	Lumen Multipliers	Optics Qualified on the DesignLights Consortium Qualified Products List		
	Input Power Designator S		3000K	4000K	5700K
Q9 (Standard)	223	1.00	N/A	N/A	N/A
Q8	213	0.98	N/A	N/A	N/A
Q7	202	0.94	N/A	N/A	N/A
Q6	191	0.91	N/A	N/A	N/A
Q5	175	0.85	N/A	N/A	N/A
Q4	160	0.80	N/A	N/A	N/A
Q3	144	0.73	N/A	N/A	N/A
Q2	128	0.68	N/A	N/A	N/A
Q1	112	0.61	N/A	N/A	N/A

US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

CREE

XSP1™ — XSPA02/G

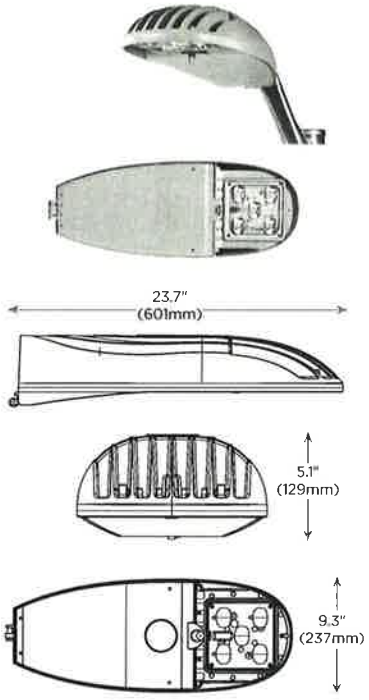
Cree® LED Street/Area Light – Single Module – Horizontal Tenon Mount – Type II and Type II w/Backlight Control

Product Description

Designed from the ground up as totally optimized LED street and area lighting system, the XSP Series delivers incredible efficiency without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves better optical control with our NanoOptic® Precision Delivery Grid™ optic than a traditional cobra head luminaire. The Cree® XSP Series LED luminaires are the better alternative for traditional street and area lighting with better payback and better performance.

Performance Summary

- Utilizes BetaLED® Technology
- NanoOptic® Precision Delivery Grid™ optic
- Made in the U.S.A. of U.S. and imported parts
- **CRI:** Minimum 70 CRI
- **CCT:** 4000K (+/- 300K), 5700K (+/- 500K)
- **Limited Warranty[1]:** 10 years on luminaire/10 years on Colorfast DeltaGuard® finish



Accessories

Field Installed Accessories

XA-SP1BLS Backlight Control Shield - Provides 1/2 Mounting Height Cutoff **XA-SP1BRDSPK** Bird Spikes	**XA-XSP4PTMNT** Four Point Mounting Kit - Includes Large Bracket for mounting to 2" (51mm) IP, 2.375" (60mm) O.D., Small Bracket for mounting to 1.25" (32mm) IP, 1.66" (42mm) O.D. tenon, and mounting bolts

Tenons (must specify color)

Square Internal Mount Tenons - Mounts to 4" (102mm) square aluminum or steel poles PD-1H4 – Single PD-2H4(90) – 90° Twin PD-2H4(180) – 180° Twin PD-3H4(90) – 90° Triple PD-4H4(90) – 90° Quad **Wall Mount Tenon** WM-2L	**Round External Mount Tenons** - Mounts to 2-3/8 – 3" (60 – 76mm) round aluminum or steel poles or tenons PT-1H – Single PT-2H(90) – 90° Twin PT-2H(180) – 180° Twin PT-3H(90) – 90° Triple PT-4H(90) – 90° Quad **Direct Arm Pole Adaptor Bracket** - Mounts to 3 – 6" (76 – 152mm) round or square aluminum or steel poles XA-TMDAB

Ordering Information

Example: XSPA02GA-US

XSP	A	0			A	-			
Product	Version	Mounting	Optic	Modules	Input Power Designator	-	Voltage	Color Options	Options
XSP	A	0 Horizontal Tenon	2 Type II G Type II w/BLS	G 4000K N 5700K	A 53W	-	U Universal 120–277V V 347–480V*	S Silver T Black Z Bronze B Platinum Bronze W White	F Fuse - When code dictates fusing, use time delay fuse - Not available with V voltage G Small Four Point Mounting - Mounts to 1.25" (32mm) IP, 1.66" (42mm) O.D. horizontal tenon J Large Four Point Mounting - Mounts to 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon K Occupancy Control - Refer to Occupancy Control spec sheet for details N Utility Label and NEMA Photocell Receptacle - Includes Q option - Refer to Field Adjustible Output spec sheet for details Q Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details R NEMA Photocell Receptacle - Photocell by others U Utility - Label per ANSI C136.15 - Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q option - Refer to Field Adjustable Output spec sheet for details

[1] See www.cree.com/canada/warranty for warranty terms

* 347–480V utilizes magnetic step-down transformer. For input power for 347–480V, refer to the Lumen Output, Electrical, and Lumen Maintenance data table

BetaLED TECHNOLOGY

Rev. Date: 03/03/14

CREE

www.cree.com/canada T (800) 473-1234 F (800) 890-7507

XSP1™ — XSPA02/G
LED Street/Area Light

Product Specifications

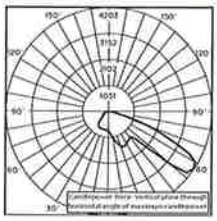
CONSTRUCTION & MATERIALS
- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" (32mm) IP, 1.66" (42mm) O.D. or 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Luminaire secured with two mounting bolts standard; optional four point mounting available
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, black, bronze, platinum bronze and white are available

ELECTRICAL SYSTEM
- **Input Voltage:** 120-277V or 347-480V, 50/60Hz
- Class 2 output
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- Compatible with control systems; consult factory for details

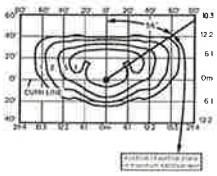
REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL") when ordered with 2, G, 3 or H optics. Exceptions apply when N, U, or Q options are ordered - see Field Adjustable Output spec sheet for details
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- Meets CALTrans 611 Vibration testing
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- Dark Sky Friendly, IDA Approved when ordered with the Type II and Type III optics

Photometry

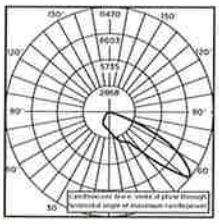
All published luminaire photometric testing performed to IESNA LM-79-08 standards by a NVLAP certified laboratory.



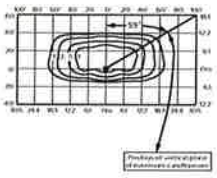
ITL Test Report #: 76664
BXSPA*2GA-U
Initial Delivered Lumens: 4,891



BXSPA*2GA-U
Mounting Height: 25' (7.6m)
Initial Delivered Lumens: 4,806
Initial FC at grade



ITL Test Report #: 76042
BXSPA*GHL-U
Initial Delivered Lumens: 11,092



BXSPA*GGA-U
Mounting Height: 25' (7.6m) A,F,G,
Initial Delivered Lumens: 4,209
Initial FC at grade

EPA and Weight

Weight 120-277V	Weight 347-480V	EPA				
		1@90°	2@90°	2@180°	3@90°	4@90°
18.0 lbs (8kg)	22.0 lbs (9kg)	0.71	1.02	1.43	1.74	2.04

Lumen Output, Electrical, and Lumen Maintenance Data

Input Power Designator	4000K		5700K		System Watts 120-277V	System Watts 347-480V	Total Current						50K Hours Projected Lumen Maintenance Factor @ 15°C (59°F)***
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11			120V	208V	240V	277V	347V	480V	
XSP1™ Series/Area Lights													
Type II Distribution													
A	4,806	B1 U0 G1	5,340	B1 U0 G1	53	59	0.44	0.25	0.22	0.20	0.17	0.15	99%
Type II Distribution w/BLS													
A	4,209	B1 U0 G1	4,674	B1 U0 G1	53	59	0.44	0.25	0.22	0.20	0.17	0.15	99%

*Actual production yield may vary between -4 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratas/TM-15-11BugRatingsAddendum.pdf
*** For recommended lumen maintenance factor data see TD-13. Projected L_{70} based on 11,088 hours LM-80-08 testing: > 150,000 hours

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CREE®

REALTERM ENERGY

XSP2™ — XSPA02/G

Cree® LED Street/Area Light – Double Module – Horizontal Tenon Mount – Type II and Type II w/Backlight Control

Product Description

Designed from the ground up as totally optimized LED street and area lighting system, the XSP Series delivers incredible efficiency without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves better optical control with our NanoOptic® Precision Delivery Grid™ optic than a traditional cobra head luminaire. The Cree® XSP Series LED luminaires are the better alternative for traditional street and area lighting with better payback and better performance.

Performance Summary

Utilizes BetaLED® Technology

NanoOptic® Precision Delivery Grid™ optic

Made in the U.S.A. of U.S. and imported parts

CRI: Minimum 70 CRI

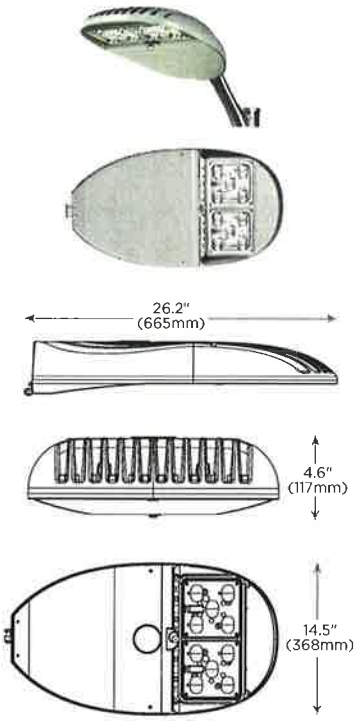
CCT: 4000K (+/- 300K), 5700K (+/- 500K)

Limited Warranty†: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

Accessories

Field Installed Accessories	
XA-SP2BLS Backlight Control Shield - Provides 1/2 Mounting Height Cutoff **XA-SP2RDSPK** Bird Spikes	**XA-XSP4PTMNT** Four Point Mounting Kit - Includes Large Bracket for mounting to 2" (51mm) IP, 2.375" (60mm) O.D., Small Bracket for mounting to 1.25" (32mm) IP, 1.66" (42mm) O.D. tenon, and mounting bolts

Tenons (must specify color)	
Square Internal Mount Tenons - Mounts to 4" (102mm) square aluminum or steel poles PD-1H4 – Single PD-2H4(90) – 90° Twin PD-2H4(180) – 180° Twin PD-3H4(90) – 90° Triple PD-4H4(90) – 90° Quad	**Round External Mount Tenons** - Mounts to 2-3/8 – 3" (60 – 76mm) round aluminum or steel poles or tenons PT-1H – Single PT-2H(90) – 90° Twin PT-2H(180) – 180° Twin PT-3H(90) – 90° Triple PT-4H(90) – 90° Quad
Wall Mount Tenon WM-2L	**Direct Arm Pole Adaptor Bracket** - Mounts to 3 – 6" (76 – 152mm) round or square aluminum or steel poles XA-TMDA8



Ordering Information

Example: XSPA02HA-US

XSP	A	0			A	–			
Product	Version	Mounting	Optic	Modules	Input Power Designator	–	Voltage	Color Options	Options
XSP	A	0 Horizontal Tenon	2 Type II G Type II w/BLS	H 4000K P 5700K	A 101W	–	U Universal 120–277V V 347–480V*	S Silver T Black Z Bronze B Platinum Bronze W White	F Fuse - When code dictates fusing, use time delay fuse - Not available with V voltage G Small Four Point Mounting - Mounts to 1.25" (32mm) IP, 1.66" (42mm) O.D. horizontal tenon J Large Four Point Mounting - Mounts to 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon K Occupancy Control - Refer to Occupancy Control spec sheet for details N Utility Label and NEMA Photocell Receptacle - Includes Q option - Refer to Field Adjustble Output spec sheet for details Q Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details R NEMA Photocell Receptacle - Photocell by others U Utility - Label per ANSI C136.15 - Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q option - Refer to Field Adjustable Output spec sheet for details

† See www.cree.com/canada/warranty for warranty terms

* 347–480V utilizes magnetic step-down transformer. For input power for 347–480V, refer to the Lumen Output, Electrical, and Lumen Maintenance data table

BetaLED TECHNOLOGY

Rev. Date: 03/03/14

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XSP2™ — XSPA02/G
LED Street/Area Light

Product Specifications

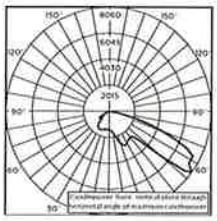
CONSTRUCTION & MATERIALS
- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" (32mm) IP, 1.66" (42mm) O.D. or 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5° to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Luminaire secured with two mounting bolts standard; optional four point mounting available
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, black, bronze, platinum bronze and white are available

ELECTRICAL SYSTEM
- **Input Voltage:** 120-277V or 347-480V, 50/60Hz
- Class 2 output
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- Compatible with control systems; consult factory for details

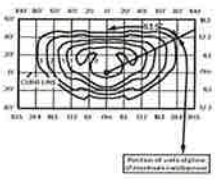
REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL") when ordered with 2, G, 3 or H optics. Exceptions apply when N, U, or Q options are ordered - see Field Adjustable Output spec sheet for details
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- Meets CALTrans 611 Vibration testing
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- Dark Sky Friendly, IDA Approved when ordered with the Type II and Type III optics

Photometry

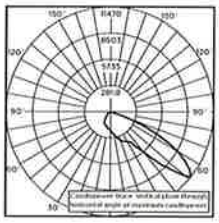
All published luminaire photometric testing performed to IESNA LM-79-08 standards by a NVLAP certified laboratory.



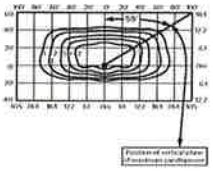
ITL Test Report #: 76663
BXSPA*2HA-U
Initial Delivered Lumens: 9,532



BXSPA*2HA-U
Mounting Height: 25' (7.6m)
Initial Delivered Lumens: 9,612
Initial FC at grade



ITL Test Report #: 76042
BXSPA*GHL-U
Initial Delivered Lumens: 11,092



BXSPA*GHA-U
Mounting Height: 25' (7.6m) A.F.G.
Initial Delivered Lumens: 8,417
Initial FC at grade

EPA and Weight

Weight 120-277V	Weight 347-480V	EPA				
		1@90°	2@90°	2@180°	3@90°	4@90°
26.0 lbs (12kg)	29.0 lbs (13.2kg)	0.69	1.14	1.38	1.83	2.28

Lumen Output, Electrical, and Lumen Maintenance Data

XSP2™ Street/Area Lights													
Input Power Designator	4000K		5700K		System Watts 120-277V	System Watts 347-480V	Total Current						50K Hours Projected Lumen Maintenance Factor @ 15°C (59°F)***
	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11	Initial Delivered Lumens*	BUG Ratings** Per TM-15-11			120V	208V	240V	277V	347V	480V	
Type II Distribution													
A	9,612	B2 U0 G2	10,680	B2 U0 G2	101	106	0.86	0.49	0.43	0.38	0.30	0.23	99%
Type II Distribution w/BLS													
A	8,417	B1 U0 G1	9,352	B1 U0 G1	101	106	0.86	0.49	0.43	0.38	0.30	0.23	99%

*Actual production yield may vary between -4 and +10% of initial delivered lumens
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Errata/TM-15-11BugRatingsAddendum.pdf
*** For recommended lumen maintenance factor data see TD-13. Projected L_{70} based on 11,088 hours LM-80-08 testing: > 150,000 hours

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