

Cities of Brantford and Brampton

LED Street Lighting Assessment using the SEAD Street Lighting Tool

This paper summarizes the results of an analysis for locations being studied by the Cities of Brantford and Brampton for street lighting fixture upgrades, as part of the trial implementation of the SEAD Street Lighting Tool with LightSavers Canada.

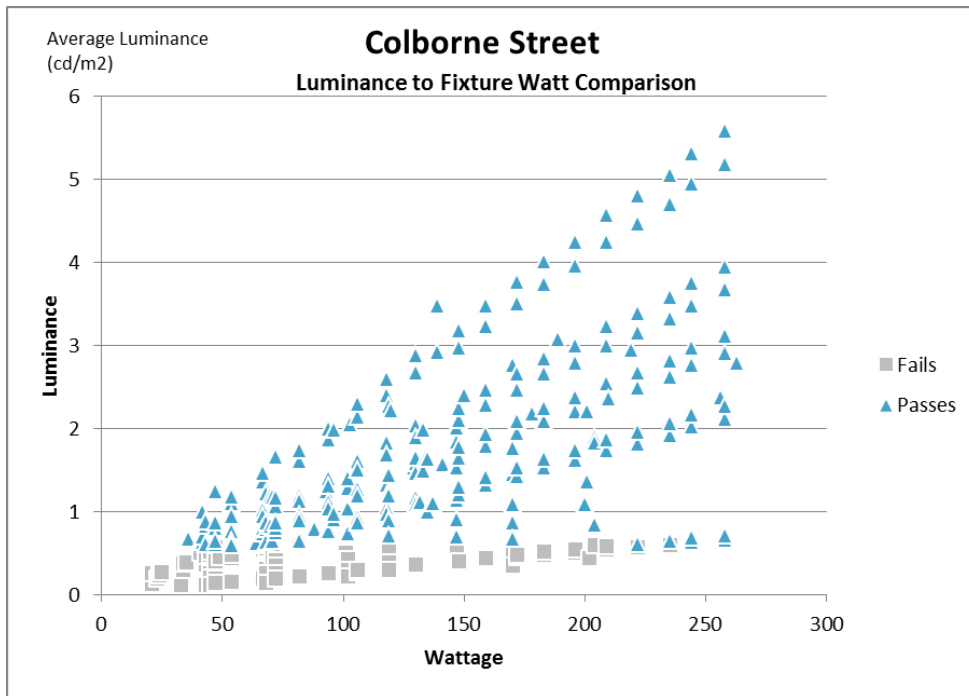
The [SEAD Street Lighting Tool](#) is set up to quickly analyze a large number of fixtures for basic road configurations, calculating photometric performance and energy consumption, as well as cost analysis. For this analysis, only photometric and energy considerations were considered. Basic characteristics about each of the sites – road width, pole height and spacing, etc. – were taken from the table of site parameters provided by Hamilton through LightSavers. For each location, 330 fixtures from three major manufacturers were analyzed, including GE Lighting, Philips Lumec, and Cree.

Results from the fixtures were reduced from the light output values provided in the relevant IES files to account for end-of-life performance. The two key factors in this are dirt depreciation and lumen depreciation, as noted below.

Dirt Depreciation Factor	Lumen Depreciation Factor	Total Depreciation Factor
0.88	0.70	0.616

Colborne Street, Brantford

The first graph, below, indicates the average luminance on the measurement grid of the as compared to the fixture wattage. The fixtures that passed the luminance criteria (both average luminance and average to minimum uniformity ratio) are indicated with blue, while those that fail at least one of the criteria are shown in gray.



Of the fixtures analyzed, the lowest energy consuming fixture that met the light performance criteria had an energy consumption of 36 watts. While some fixtures with lower energy consumption were able to provide this level of average luminance, they failed due to unacceptable uniformity.

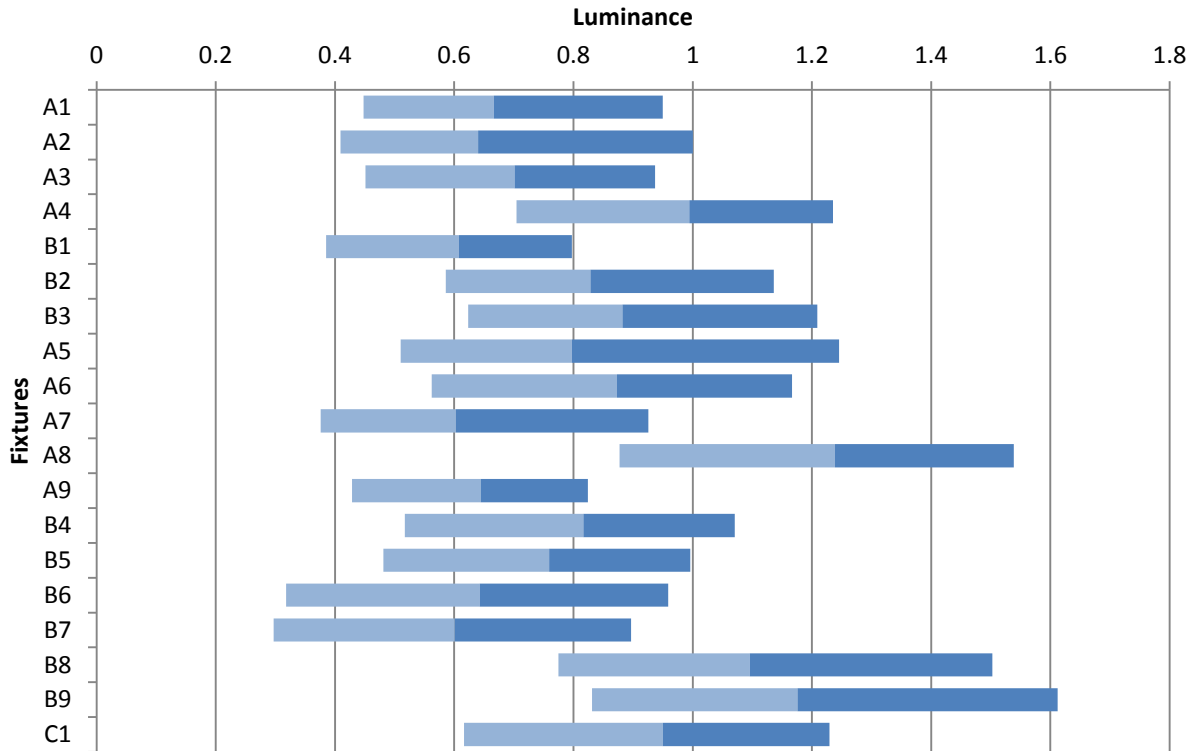
Existing Fixture	250 watts
Top Fixture	36 watts
Percent Savings	86%

The 19 fixtures with the lowest energy consumption that met the luminance criteria are shown below. The range of the two bars indicates the full range of luminance across the measurement grid, with the midpoint of the two bars being the average luminance across the grid. The full set of results for luminance for all 330 fixtures are available in the accompanying Excel file.

Colborne Street, Brantford -Luminance Range

Lowest energy fixtures meeting luminance criteria

Minimum Min to Avg Avg to Max



The table below provides a summary table of the inputs that were used to produce these results.

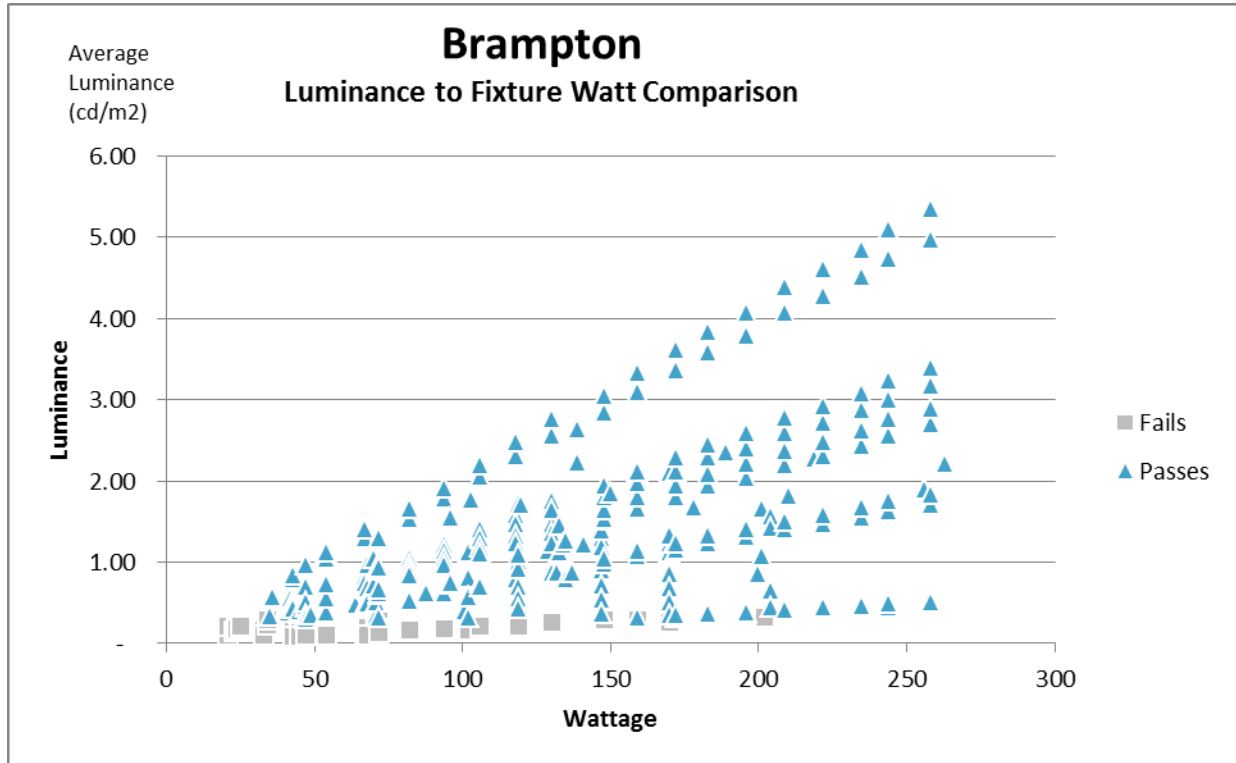
Table 1: Inputs for Colborne Street

Description	Baseline	Units
Road Geometry		
Number of Lanes	4	lanes
Lane Width	3	meters
Median Width	3	meters
Light Geometry		
Pole Placement	Staggered	
Pole Height	10.7	meters
Pole Spacing	50	meters
Pole Setback	1.5	meters
Arm Length	2.5	meters
Number of Points in Grid		
	10	
Lighting Standards		
Illuminance Method		
Average Illuminance Targe (lav)	9	Lux
Uniformity Ratio (Eavg/Emin)	4.0	unitless
or		
Luminance Method		
Road Surface Type	R3	Standard Surface
Average Luminance Targe (lav)	0.6	cd/m2
Overall Uniformity (U0 - avg/min)	3.5	unitless
	6.0	unitless
Lamp Lumen Depreciation		
	0.73	unitless
Luminaire Dirt Depreciation		
	0.9	unitless
Temperature Effects		
	1.0	unitless
Operation Hours		
	4380.0	hours

Brampton

The SEAD Tool was also used for a similar analysis for another roadway section in Brampton.

This graph indicates the average luminance on the measurement grid as compared to the fixture wattage. The fixtures that passed the luminance criteria (both average luminance and average to minimum uniformity ratio) are indicated with blue, while those that fail at least one of the criteria are shown in gray.



Of the fixtures analyzed, the lowest energy consuming fixture that met the light performance criteria had an energy consumption of 35 watts. While some fixtures with lower energy consumption were able to provide this level of average luminance, they failed due to unacceptable uniformity.

Existing Fixture	70 watts
Top Fixture	35 watts

Percent Savings 50%

The 19 fixtures with the lowest energy consumption that met the luminance criteria are shown below. The range of the two bars indicates the full range of luminance across the measurement grid, with the midpoint of the two bars being the average luminance across the grid. The full set of results for luminance for all 330 fixtures are available in the accompanying Excel file.

Luminance Range - Brampton

Lowest energy fixtures meeting luminance criteria

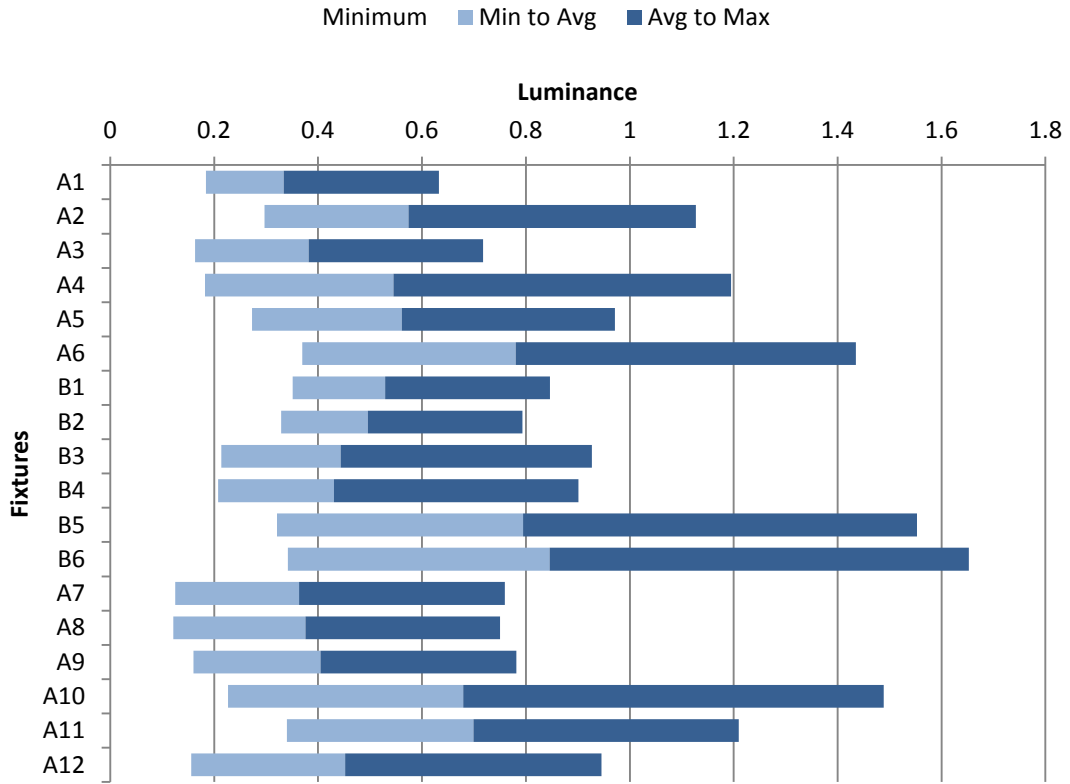


Table 2: Tool Inputs for Brampton

Description:	Baseline	Units
Road Geometry		
Number of Lanes	2	lanes
Lane Width	4	meters
Median Width	0	meters
Light Geometry:		
Pole Placement	Single-side	
Pole Height	9.2	meters
Pole Spacing	40	meters
Pole Setback	1.5	meters
Arm length	2.4	meters
Number of Points in Grid	10	
Lighting Standards		
Illuminance Method		
Average Illuminance Target (Iavg)	4	Lux
Uniformity Ratio (Eavg/Emin)	6	unitless
Luminance Method		
Road Surface Type	R3	Standard Surface
Average Luminance Target (Lav)	0.3	cd/m2
Overall Uniformity (U0 - avg/min)	6	unitless
Lamp Lumen Depreciation	0.73	unitless
Luminaire Dirt Depreciation	0.88	unitless
Temperature Effects	1	unitless
Operating hours	4380	hours

Conclusions

This analysis shows that there are many LED fixtures available on the market that meet the luminance requirements for these two locations. The fixtures identified by the tool can cut energy use by 86% in Brantford and 50% in Brampton. These municipalities can use the results from the SEAD Street Lighting Tool to pre-screen fixtures and complete simple payback calculations before initiating the street lighting upgrades process. The tool can also validate data submitted by manufacturers during the RFQ process.

SEAD will continue to work with LightSavers, NRCan, and interested municipalities in deploying the tool and accelerating the transition to efficient street lighting in Canada.