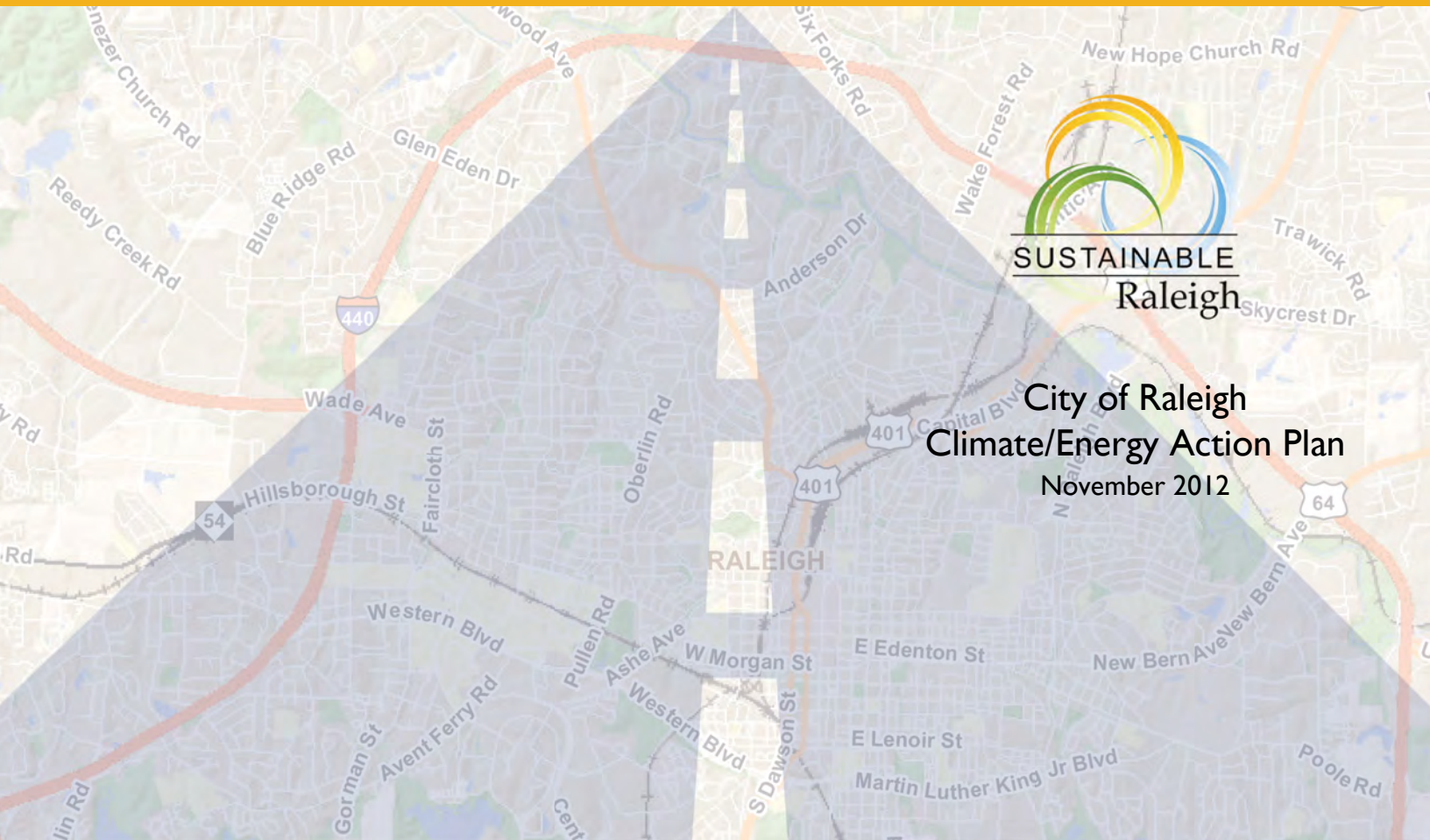
Technical Documentation – Volume Two

Business Case Evaluations



SUSTAINABLE Raleigh

City of Raleigh
Climate/Energy Action Plan
November 2012

City of Raleigh
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Volume Two contains the complete report of the two Business Case Evaluations (BCEs) performed by the Finance Team. The process used to develop the BCE is also described in this volume.

BCE #1: Existing Park Facility Outdoor Refuse and Recyclables Collection

BCE #2: Existing Parking Deck Facility Lighting

	City of Raleigh **Existing Park Facility Outdoor** **Refuse and Recyclables Collection** **Business Case Evaluation** **April 2012**	

Background

The City of Raleigh Parks Department's refuse collection crew and the Solid Waste Services (SWS) Department are responsible for the collection and removal of refuse and recyclables from the outdoor areas of City owned park facilities, respectively. The Parks Department currently makes 160 trips per week to 81 of the City's parks for refuse collection from the outdoor areas only (note that refuse from park building dumpsters is collected via a third party contract and is not part of this evaluation). In addition, SWS makes 38 trips per week for the collection of recyclables from outdoor areas and the buildings. A list of the subject park facilities, collection frequency, and recyclable collection locations can be found in Attachment A. The current collection strategy for outdoor refuse and recyclables at the City's park facilities represents an estimated total of approximately 50,000 miles driven and 5,700 gallons of fuel consumed each year to collect and deliver to the landfill, with a total operational expense to the City of approximately $0.27 million per year.

The requirement for City staff to physically walk the parks' outdoor areas will always be necessary, but there is potential to reduce the actual number of trips to each park facility. This reduction in trips represents an opportunity to increase efficiency in City resources such as staff time, fuel, and truck maintenance requirements. However, it would require a shift in strategy for current collection practices from these facilities. This business case evaluation will review and recommend a path forward for the City based on the evaluation of financial and non-financial factors for a range of potential options for the City's refuse and recyclables collection at existing park facilities.

Problem to be Addressed

A reduction in the number of trips required each week for recyclables collection at the City's existing park facilities presents an opportunity for improved efficiency with City resources: staff time, fuel, and truck maintenance requirements.

Options

The following options outline the range of potential options for the City's removal of recyclables from the City's park facilities:

1. **Status quo:** Continue current operations, including separate trips to park facilities for the collection of refuse and recyclables.
    - This option would continue the current level of service for refuse and recyclables collection.

2. **Carry in, Carry out Recyclables Policy:** The City would adopt a policy that in all outdoor areas of City owned park facilities visitors would be responsible to carry out all recyclables they have brought into the park with them.
    - This option would continue the current level of service for refuse collection, but shift the service objective to remove recyclables from outdoor park areas from the City to the park visitors. In addition, the removal of recyclables from park building facilities would require the shift toward a weekly pick-up coordinated with the local SWS recyclable collection route.

3. **Purchase a Split Body Truck:** Purchase a split body collection truck that has the capacity for the collection of refuse and recyclables in a single trip to park facilities to eliminate the additional trip by SWS for the collection of recyclables.
    - This option would continue the current level of service for refuse and recyclables collection, delivered using one split body truck and one standard refuse collection truck.

Financial Analysis

A financial analysis was completed to compare the net present value for the total cost of each option for the collection of refuse and recyclables at City park facilities. Table 1 presents the total future costs for each option and Table 2 presents the results of the net present value analysis. The evaluation period for the financial analysis is from 2012 through 2024, the current collection trucks are assumed to require replacement in 2015 at the end of their 10-year life cycle. Attachment B contains the primary financial assumptions used in the net present value analysis. Future year cash flow charts can be found in Attachment C.

TABLE 1
Summary of Total Future Year Costs (Calendar Year (CY) 2012 – CY2024)

Option	Capital Cost	Fuel Costs	Maintenance Costs	Labor Costs	Total Costs
1	$0.28M	$0.28M	$0.50M	$3.3M	$4.4M
2	$0.19M	$0.18M	$0.29M	$2.6M	$3.3M
3	$0.24M	$0.19M	$0.31M	$3.2M	$3.9M

Note: Costs in this table have not been discounted.

TABLE 2
Summary of Net Present Value Analysis (Discount Rate = 4%) (CY2012-CY2024)

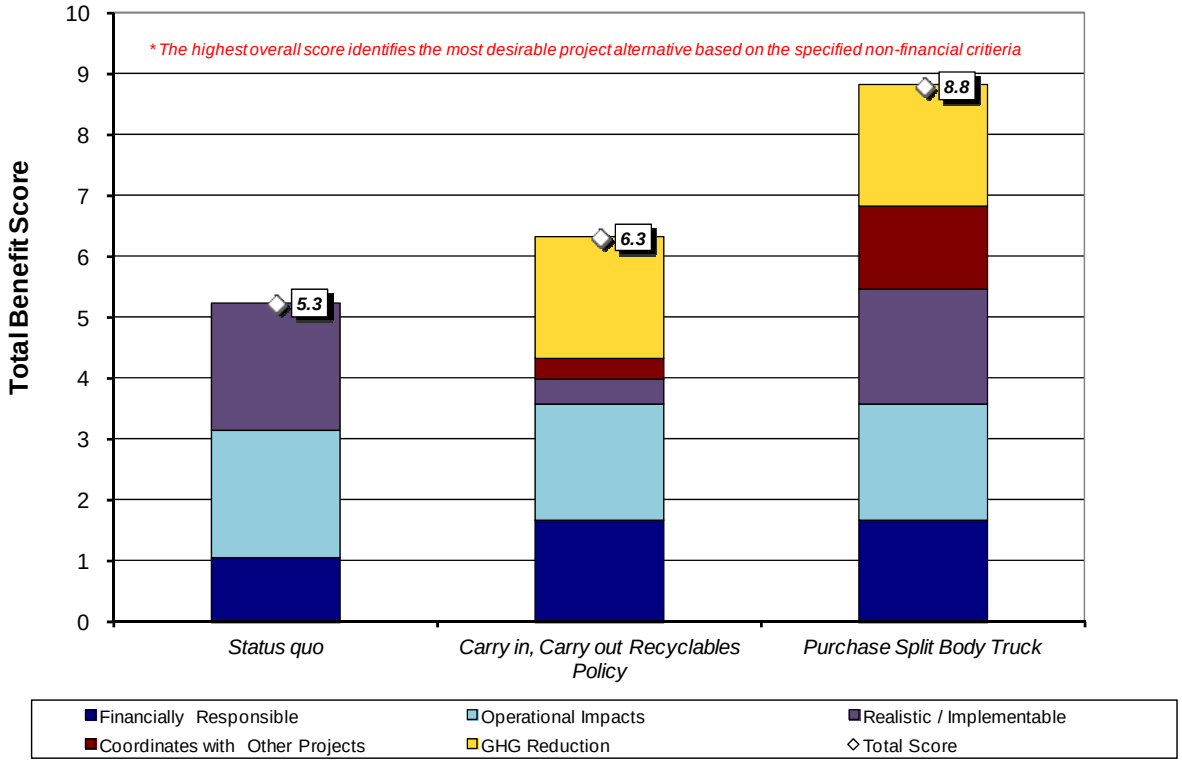
Option	Net Present Value Total Costs	Equivalent Annual Costs
1	$3.4M	$0.34M
2	$2.6M	$0.26M
3	$3.1M	$0.31M

Non-Financial Considerations

The financial analysis addressed the capital and operating costs of each option. These costs do not include the consideration of non-financial factors that represent potential benefits to the City that are not as easily monetized. To account for these non-financial considerations a value-based approach using a multi-criteria analysis (MCA) was utilized. The methodology used for the evaluation of non-financial considerations for this BCE is the same approach used for the strategy prioritization work completed as part for the City's Climate/Energy Action Plan (CEAP).

Figure 1 presents the total benefit score for each option. The higher an option's total benefit score the greater the contribution to the non-financial decision criteria. Attachment D provides additional details on the non-financial evaluation; including the definition and weighting of the decision criteria and definition of the performance scales.

FIGURE 2
Non-Financial Evaluation - Comparison of Total Weighted Benefit Scores and Components by Criterion



Recommendation

Based on the financial evaluation the cost of the Carry in, Carry out recyclable policy option represents the lowest net present value. This option represents a reduction in level of service the City delivers to the visitors of the existing park facilities, which is reflected in the evaluation of the non-financial considerations. Therefore, **Option 3 - Purchase a Split Body Truck** is recommended because it presents an opportunity for the City to increase efficiency with City resources, has the second lowest net present value total cost, and presents a significant increase in benefit to the community over the status quo option, as evidenced in the non-financial evaluation. It is recommended that at the end of the life cycle of the existing Parks Department's collection trucks, estimated to be around 2015, the City shift its current collection strategy for existing park facilities to include a split body truck to combine one of the refuse and the recyclables collection routes.

Attachment A

Listing of City of Raleigh Park Facilities with Refuse and Recyclable Collection for outdoor areas.
Prepared by the City of Raleigh Parks Department

City of Raleigh

Park Facility Refuse and Recyclables Collection

Park Facility List - Park Classification, Service Days, Collection Frequency, Recyclable Collection

Park Name	Classification	Service	Days/wk	Outside
Anderson Point	Community	M	1	y
Baileywick	Community	MTWHFSaS	7	y
Barwell Rd	Community	MTH	3	y
Biltmore	Community	MWF	3	y
Brier Creek	Community	MHS	3	n
Carolina Pines& DP	Community	MWF	3	y
Chavis	Community	MWF	3	y
Green Road	Community	MWF	3	y
Halifax	Community	W	1	n
Jaycee	Community	MWF	3	y
Laurel Hills	Community	MWFSaS	5	y
Leesville	Community	T	1	n
Lions	Community	MWF	3	y
Marsh Creek	Community	MHSa	3	y
Millbrook & DP	Community	MWF	3	y
Optimist	Community	MWF	3	y
Worthdale	Community	MWF	3	y
Lake Johnson	Metro	TS	2	y
Lake Johnson Pool	Metro	T	1	n
Lake Lynn	Metro	MH	2	y
Shelly	Metro	MHS	3	y
Bragg Street Mini	Mini	T	1	n
Caraleigh Mini	Mini	T	1	n
Compenge	Mini	T	1	n
Davie St Mini	Mini	H	1	n
Fisher St Mini	Mini	T	1	n
Hertford Vil. Mini	Mini	T	1	n
Lane Street Mini	Mini	T	1	n
Lee Street Mini	Mini	T	1	n

City of Raleigh
Park Facility Refuse and Recyclables Collection
Park Facility List - Park Classification, Service Days, Collection Frequency, Recyclable Collection

Lenoir Street	Mini	T	1	n
Moredecai Mini	Mini	H	1	n
Quarry St Mini	Mini	T	1	n
Spring Mini	Mini	T	1	n
Brookhaven	Nature Perserve	H	1	n
Apollo Heights	Neighborhood	Sa	1	n
Beaver Dam	Neighborhood	H	1	n
Brentwood	Neighborhood	MH	2	y
Cedar Hills	Neighborhood	MWF	3	y
Chamberlain	Neighborhood	T	1	n
Eastgate	Neighborhood	MWF	3	y
Elisa Pool	Neighborhood	WS	2	n
Fallon	Neighborhood	MH	2	n
Fred Fletcher	Neighborhood	MWF	3	y
Glen Eden	Neighborhood	MH	2	n
Honeycutt	Neighborhood	THSa	3	y
Isabela Canon	Neighborhood	T	1	n
Kaplan Dr.	Neighborhood	T	1	n
Kentwood	Neighborhood	TS	2	y
Kingwood Forest	Neighborhood	T	1	n
Kiwanis	Neighborhood	MHS	3	y
Longview Pool	Neighborhood	H	1	n
Method	Neighborhood	T	1	y
North Hills	Neighborhood	H	1	n
Oakwood & DP	Neighborhood	MWHF	4	n
Peach Rd	Neighborhood	W	1	y
Powell Dr.	Neighborhood	T	1	n
Ridge Rd Pool	Neighborhood	MH	2	y
Roanoke	Neighborhood	H	1	n

City of Raleigh

Park Facility Refuse and Recyclables Collection

Park Facility List - Park Classification, Service Days, Collection Frequency, Recyclable Collection

Roberts	Neighborhood	H	1	y
Sanderford Rd	Neighborhood	MH	2	y
Southgate	Neighborhood	MH	3	y
Spring Forest	Neighborhood	MWF	3	y
Tarboro	Neighborhood	MWF	3	y
Williams	Neighborhood	MWFSa	4	y
Wooten Medows	Neighborhood	H	1	n
Culpepper Ext/Cir	Open Space	W	1	n
Forest/Edna Metz	Open Space	H	1	n
Frank/Norris	Open Space	W	1	n
Mayview	Open Space	T	1	n
Park Drive	Open Space	T	1	n
Poplar Marshall	Open Space	H	1	n
Varnell/Dade	Open Space	H	1	n
Marsh Creek Maint	Operation Fac	MHSa	3	y
Moore Square	Special	MTWHFSaS	7	y
Mordecai	Special	TS	2	y
Nash Square	Special	WSaS	3	y
Poole Road Canoe	Special	T	1	n
Tucker House	Special	SaS	2	n
W.C. Wetlands	Special	W	1	y
Edna Metz Wells		T	1	n
Umsted Camp		W	1	n
No. of Park Facilities		**81**		
Parks Refuse Collection Visits per week			**160**	
SWS Recyclables Colleciton Visits per week				**38**
Total Vists by Parks and SWS Dept.		**198**		

Attachment B

Primary Financial Assumptions
The assumptions used in developing the life cycle net present value cost financial analysis can be found on the following pages.

General Assumptions:

Assumptions:

			Note:
Discount Rate	4.0%		Based on available City borrowing rate (4%) similar to US OMB, 2012 rates
Escalation	1.8%		US OMB, 2012
No. of Park Facilities	81		Park Facilities with dedicated Park Refuse Collection Staff, per Ivan Dickey (see ParkFacilityList worksheet)
No. of Refuse Coll. Visits	160		Park Facilities with dedicated Park Refuse Collection Staff, per Ivan Dickey (see ParkFacilityList worksheet)
No. of Recycle. Coll. Visits	38		Park Facilities with recyclables collection, per Ivan Dickey (see ParkFacilityList worksheet)
Parks O&M Assumptions			
Staff/FTEs	4.4		Staff works 8 extra hours a week during the peak season and 4 holidays, per Ivan Dickey
Average Annual Staff Salary	$127,000		Total staff salaries (no OT), per Ivan Dickey
Average Annual Salary + Benefits	$158,000		Includes total staff salary plus benefits (no OT), per Ivan Dickey
No. of Collection Truck(s)	2.0		per Parks Dept.
Age of Truck(s)	7.0	years	per Parks Dept.
Miles driven per year	30,000	miles	estimated from 2005/2006, 2009/2010, 2010/2011 Parks Dept. truck data
Cost per mile driven - Maintenance (Yr 1)	$0.10	$ per mile	estimated from 2005/2006 Parks Dept. truck data, (Year when trucks were initially commissioned)
Cost per mile driven - Maintenance	$0.70	$ per mile	estimated from 2011/2012 Parks Dept. truck data
Cost per mile driven - Fuel	$0.32	$ per mile	estimated from 2011/2012 Parks Dept. truck data
Fuel consumed per year	3,800	gallons	estimated from 2010/2011 Parks Dept. truck data, combined total for both trucks
Fuel costs per year	$11,700		estimated from 2011/2012 Parks Dept. truck data
Fuel costs per gallon consumed	$3.08		estimated from 2011/2012 Parks Dept. truck data
Trip to the Landfill per day	1.0		per Ivan Dickey
SWSs O&M Assumptions			
Staff/FTEs	1.0		SWS has 1 staff collecting recyclables, per SWS - total staff workload 1.5 FTE, 1.0 FTE (70%) is spent on Park Facilities
Average Annual Staff Salary	$43,200		For current SWS recyclable collection position, per SWS
Average Annual Salary + Benefits	$54,000		For current SWS recyclable collection position, per SWS
No. of Collection Truck(s)	1.0		per SWS
Age of Truck(s)	7.0	years	assumed similar age as Parks Dept. trucks
Miles driven per year	20,800	miles	per SWS, see comment for details (70% of total mileage)
Cost per mile driven - Maintenance	$0.41	$ per mile	per SWS (total truck costs = $0.73/mile), Maintenance cost = Total costs per mile - fuel costs per mile
Cost per mile driven - Fuel	$0.32	$ per mile	assumed the same as the Parks Department
Gas consumed per year	1,912	gallons	per SWS, 70% of 2,731 gallons
Fuel costs per gallon consumed	$3.08		assumed the same as the Parks Department
Trip to the Landfill per day	1.0		per SWS staff
Existing Truck Assumptions			
Age Induced Increases Maintenance Costs	$0.10	per mile, per year	Annual rate of increase in maintenance costs from Parks data for existing trucks
Age Induced Reduction in Fuel Efficiency	0.17	gallons per mile per year	Annual rate of decrease in fuel efficiency from Parks data for existing trucks, 2005 to 2010
Fuel Efficiency			
For New Trucks	9.0	miles per gallon	estimated from 2005/2006 Parks Dept. truck data (Year when trucks were initially commissioned)

Debt Service Assumptions:

			Note:
Bond Rate	4.0%		conservative for near term years, per Fred Blackwood
Repayment Term	10	years	Life cycle of trucks
Debt Issuance Cost	2%		Raleigh range 2-4%, based on size of project

New Truck Assumptions:

			Note:
Ex. Truck Cap Cost	$88,500	6 yd. capacity	Vendor quotes from SWS, see comment for all cost quotes.
Split body. Truck Cap Cost	$142,500	16 yd. capacity	Vendor quotes from SWS, see comment for all cost quotes.
Life Cycle of Trucks	10	years	Life cycle of trucks, per Parks and SWSs
Increase in Maintenance Requirement for Split-Body	125%		Increase in maintenance requirement per mile due dual systems
Year of Replacement of Existing Trucks	2015		Based on current age of trucks (7 years) and a truck life cycle of 10 years.

Option 3 Assumptions:

		Note:
Full Time CDL Driver (FTE)	1.0	at SWS current labor rate
Reduction in Recycle DT	20%	reduction in current recyclable collection drive time, due to combined crews

Attachment C

Cash Flows Analysis for each Park Facility Refuse and Recyclables Collection Option

FIGURE C-1
Cash Flow Analysis for Option 1

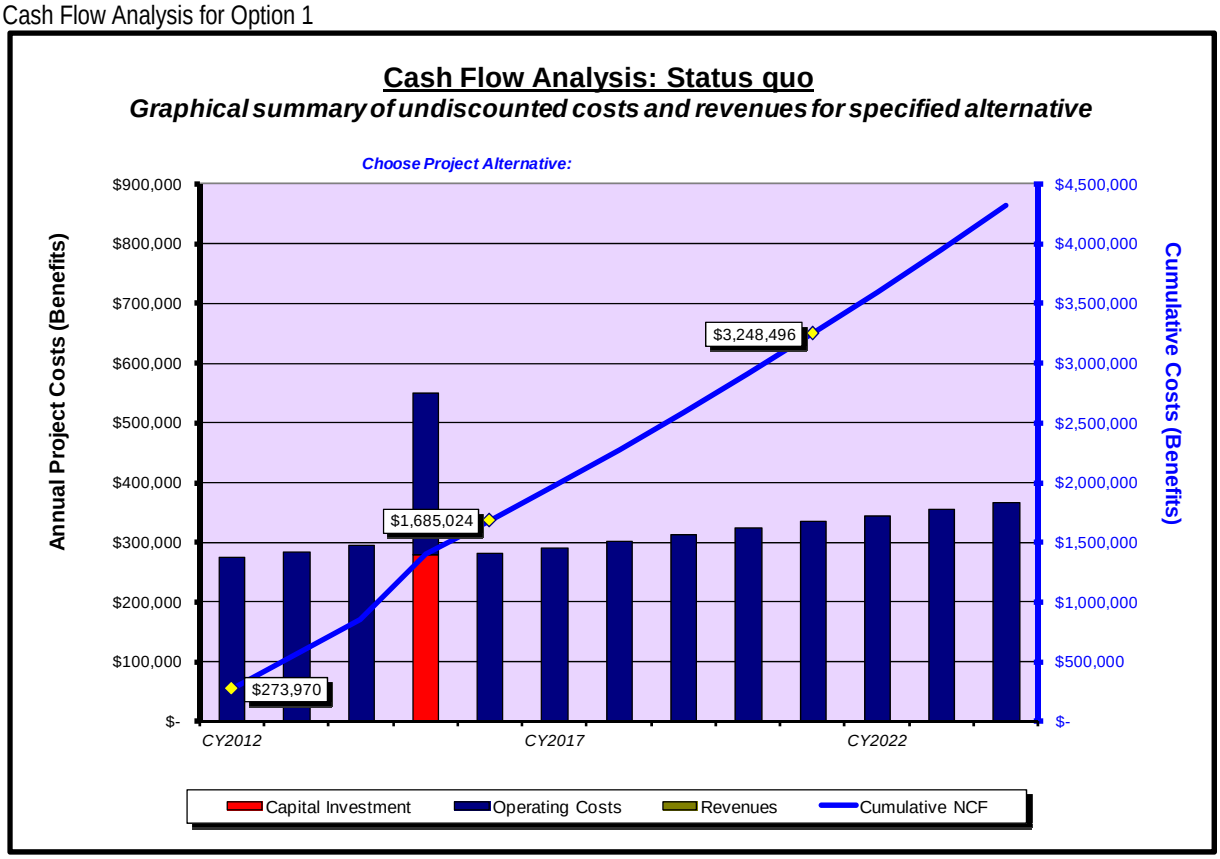


FIGURE C-2
Cash Flow Analysis for Option 2

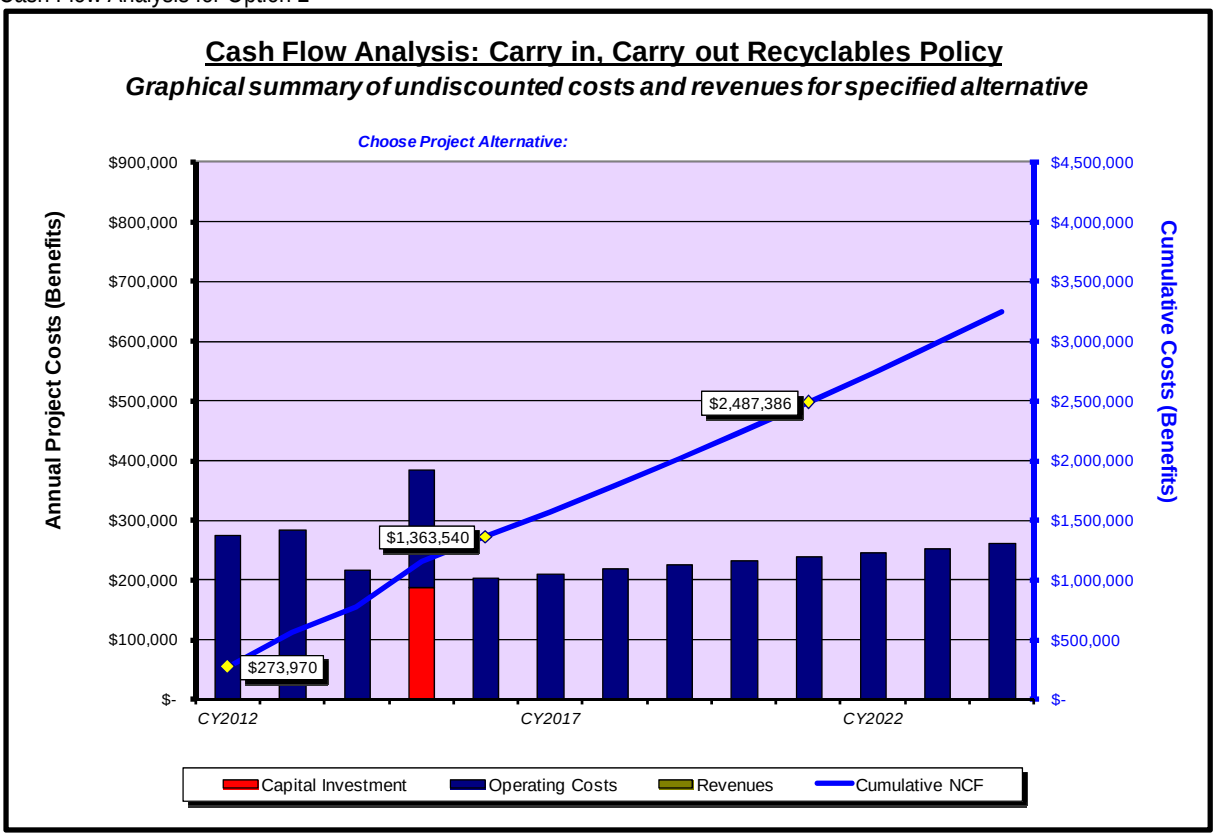
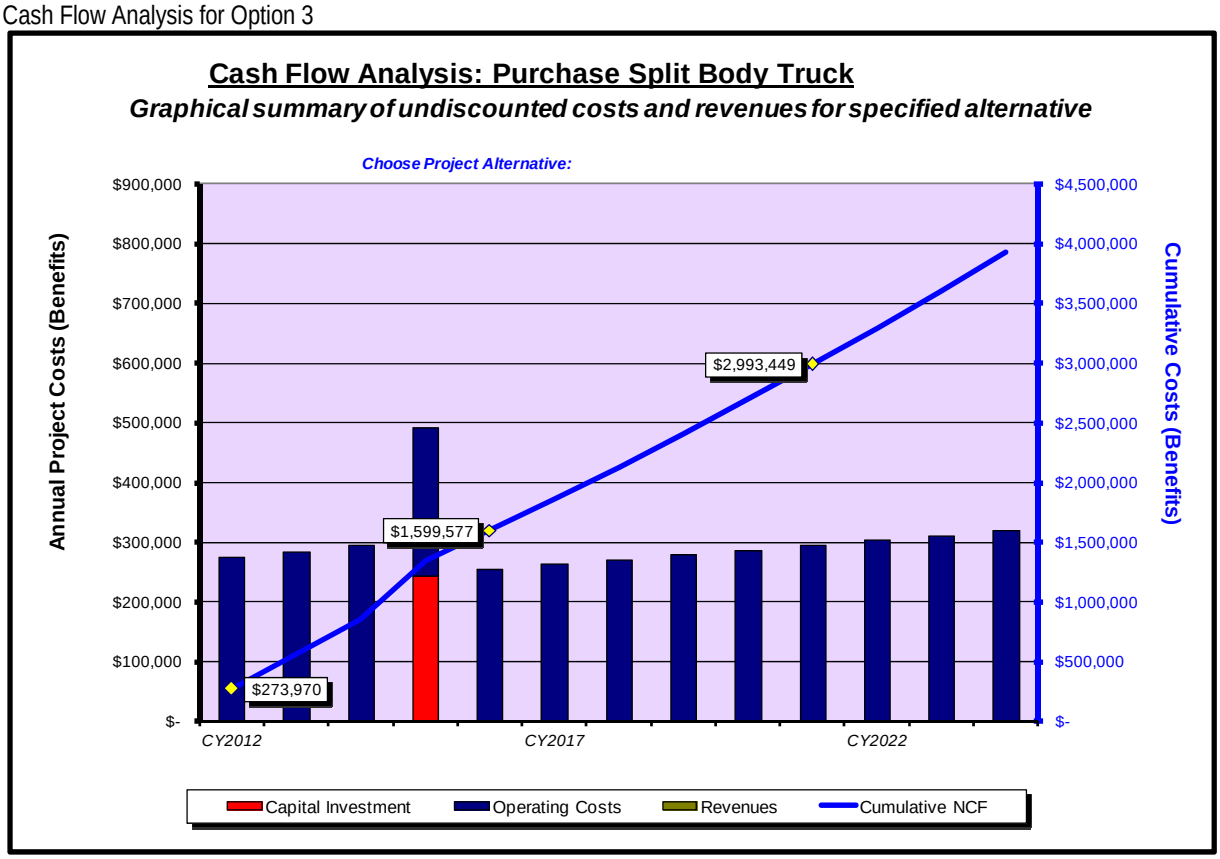


FIGURE C-3
Cash Flow Analysis for Option 3



Attachment D

Non-Financial Evaluation of Park Facility Refuse and Recyclables Collection Options

FIGURE D-1
Non-Financial Evaluation Criteria and Criteria Weightings

Non-Financial Project Evaluation Criteria

RESET

This worksheet allows the user to identify and define non-financial criteria for project evaluation.
For each criterion, the user assigns relative importance, chooses an appropriate performance scale, and determines the scoring mechanism for each scale.

Use this section to identify and describe relevant non-financial criteria

	Non-Financial Criteria	Detailed Description of Criteria
1	Financially Responsible	CAPEX, OPEX, Payback Period; Good use of public funds
2	Operational Impacts	Operational changes that lead to increased energy efficiency and/or operating efficiency; Departmental operating budget adjustments; Staff behavioral changes may be required
3	Realistic / Implementable	Can be incorporated into the way the City "does business" (organization, processes, procurement); Reasonable amount of staff time and effort; Technology and market maturity; Legal; Meets regulatory requirements
4	Coordinates with Other Projects	Can be a component of current or future projects; Common responsible parties and common internal or external partners
5	GHG Reduction	Greenhouse Gas (GHG) Reduction Potential
6		
7		

Use this section to assign relative importance and specify performance scales for each criterion

	Non-Financial Criteria	Weights	Relative Priority by Criterion	Choose Relevant Scale	Performance Scales
1	Financially Responsible	21.0%		Numerical Scale	Scale Descriptions
2	Operational Impacts	21.0%		Numerical Scale	
3	Realistic / Implementable	21.0%		Numerical Scale	Define Raw Scores Associated with Scales
4	Coordinates with Other Projects	17.0%		Numerical Scale	
5	GHG Reduction	20.0%		Numerical Scale	
6		0.0%			Create Custom Scale
7		0.0%			
		100.0%			

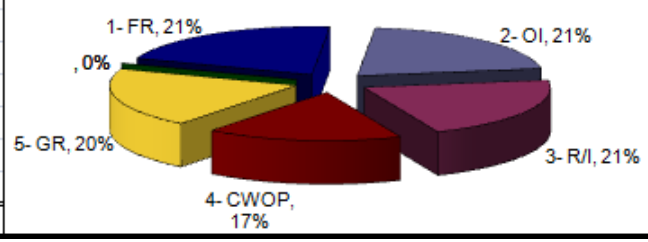


FIGURE D-2
Non-Financial Evaluation Criteria Performance Scale Description (Selection: Numeric Scale)

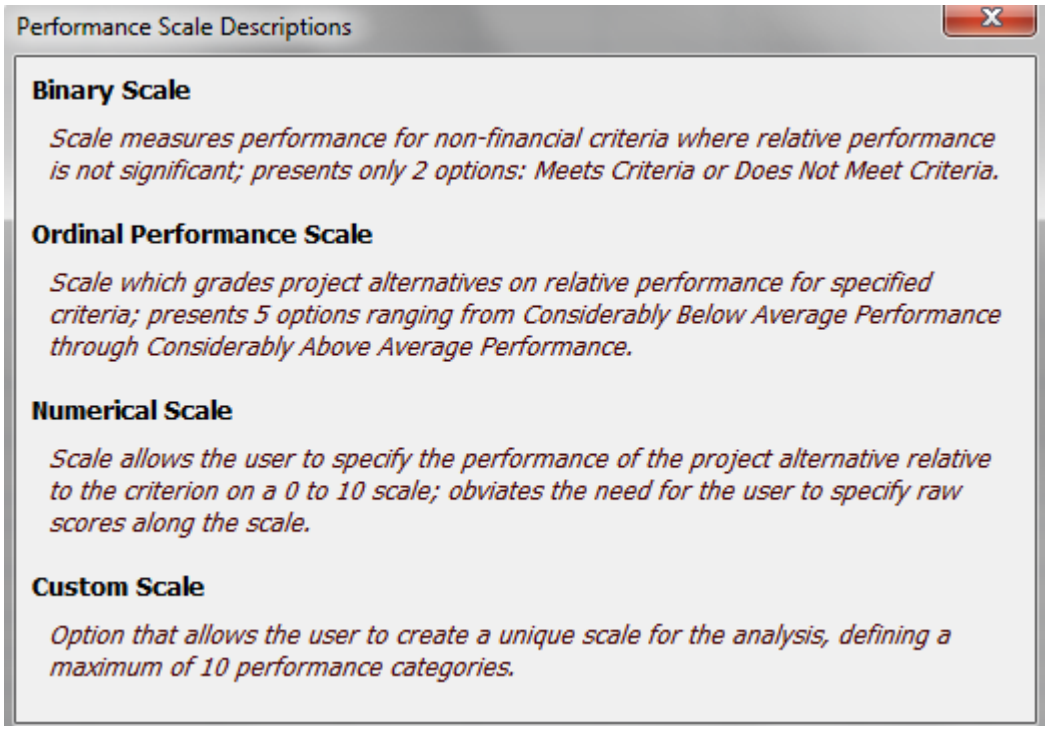


FIGURE D-3
Non-Financial Evaluation Scores and Results

Non-Financial: Project Alternative Evaluation, Scores, and Results

RESET Evaluation

This worksheet allows the user to evaluate each project alternative against the chosen performance scale, and displays the results of the analysis

Type of Performance Scale Specified:	Numerical	Numerical	Numerical	Numerical	Numerical				
	Financially Responsible	Operational Impacts	Realistic / Implementable	Coordinates with Other Projects	GHG Reduction				
Rate Performance: use this section to rate the performance of the project alternatives against specified non-financial criteria									
Status quo	5	10	10	0	0				
Carry in, Carry out Recyclables Policy	8	9	2	2	10				
Purchase Split Body Truck	8	9	9	8	10				
Calculate Raw Scores: this section determines the raw score for each non-financial criterion and project alternative based on previous input from user									
Status quo	5	10	10	0	0				
Carry in, Carry out Recyclables Policy	8	9	2	2	10				
Purchase Split Body Truck	8	9	9	8	10				
Weighted Score and Results: this section applies the user-specified weights and develops the overall Non-Financial Score for each project alternative									
Priority Weighting:	**21.0%**	**21.0%**	**21.0%**	**17.0%**	**20.0%**			**Total Score**	% of High
Status quo	1.05	2.10	2.10	0.00	0.00			**5.25**	60%
Carry in, Carry out Recyclables Policy	1.68	1.89	0.42	0.34	2.00			**6.33**	72%
Purchase Split Body Truck	1.68	1.89	1.89	1.36	2.00			***8.82***	NA

	City of Raleigh **Existing Parking Deck Facility Lighting** **Business Case Evaluation** **April 2012**	

Background

The City of Raleigh parking decks provide the community and its visitors with convenient parking facilities necessary for access to their places of employment, shopping, restaurants, entertainment venues, the Convention Center, and special events. The lighting of these facilities is a critical public safety function and can have an important impact on the quality of the experience of the City's citizens and visitors when they make use of these facilities.

Currently, the City operates ten parking decks, two of which were constructed with light emitting diode (LED) fixtures. The remaining parking decks are predominantly lighted by more than 3,900 light fixtures that include high pressure sodium fixtures, metal halide fixtures, fluorescent light fixtures, incandescent light fixtures or a mixture of these fixtures. These fixtures illuminate the parking areas, stair wells, elevators, mechanical rooms and exterior areas. Attachment A provides an itemized listing of lighting fixtures by parking deck.

The lighting of the eight City's non-LED parking decks is estimated to cost the City on average $300,000 annually in both power and maintenance costs. There are options for the City to improve efficiency related to energy savings through reduced energy consumption, and maintenance savings through increased fixture life cycles. These advances in efficiency can be gained along with the potential to improve upon the current level of service related to lighting the parking deck facilities.

In 2007, the City partnered with Cree to evaluate the efficacy of LED lighting through a pilot project at the Municipal Building parking deck, switching one level from the previous high pressure sodium fixtures to LEDs. This pilot project resulted in a number of favorable findings including power and maintenance cost savings, quality of light improvements and improvements in City customer perspectives on their parking deck experience (Cree, 2007). However, the pilot study did find that cost savings alone would not justify changing lighting fixtures to LED before the end of their useable life.

As part of the City's efforts to promote environmental and economic sustainability this business case evaluation will review and recommend a path forward for the City's parking deck lighting replacement strategy based on the evaluation of financial and non-financial factors for a range of potential options to transition the City's parking decks to LED lighting.

Problem to be Addressed

The City continues to evaluate means to be more efficient with its resources while maintaining or improving its service to customers. LED lighting presents an opportunity to improve operating efficiency, through increased energy efficiency and longer fixture life cycles, and the potential for enhanced parking deck customer experience.

Options

The range of potential options for the City's existing parking deck lighting replacement includes:

1. **Status quo:** Continue lighting replacement with current types of lighting fixtures.

2. **Phased LED lighting change-out:** The City replaces parking deck lighting with LED fixtures starting with the highest energy consuming parking deck and completing two decks per year.
3. **Phased LED lighting change-out triggered by LED cost:** The City replaces parking deck lighting with LED fixtures starting with the highest energy consuming parking deck and completing two decks per year, however, under this option the change out is delayed until such time as LED fixture costs are reduced, based on future LED cost projections (DOE, 2011a).
4. **One-time, full-scale LED lighting change-out:** The City replaces all parking deck lighting with LED light fixtures at one time.

Financial Analysis

A financial analysis was completed to compare the life cycle net present value of the total cost for each parking deck lighting option, focusing on the capital and operating costs. The typical industry standard definition for the life cycle of LED lights is defined as a 70 percent reduction in light output which equates to approximately 50,000 hours of operation as a minimum life cycle. Some LED vendors quote life cycles up to 100,000 hours of operation but 50,000 hours continues to be the standard currently used for the evaluation of LED lights. If operated for 12 hours per day, 50,000 hours equates to a life of approximately 12 years. In this analysis, a 24-year period was assumed (approximately 2 life cycles for LED lights) to account for the options which involve phasing of the LED fixture installation.

Table 1 presents the total future costs for each option and Table 2 presents the results of the net present value analysis. Both Tables 1 and 2 present data for two life cycle scenarios that bound the current perceptions of the minimum and maximum service life for the current LED technology. Figures 1 and 2 present a comparison of net cash flows from 2012 through 2035, for the 50,000 and 100,000 hour life cycle scenarios, respectively. These two figures present cash flows with capital costs converted to annual debt service payments, which includes the cost of capital. Attachment A contains the parking deck facility light fixture inventory and LED equivalency determination. Attachment B contains the primary financial assumptions used in the net present value analysis. Future year cash flow charts for each individual option and life cycle scenario can be found in Attachment C.

TABLE 1
Summary of Total Future Costs (Calendar Year (CY) 2012 – CY2035)

	Option	Capital Cost	Power Costs	Maintenance Costs	Total Costs
Life Cycle = 50,000 hours	1	$0.2M	$8.3M	$1.8M	$10.2M
	2	$5.1M	$3.3M	$0.2M	$8.6M
	3	$5.1M	$3.8M	$0.3M	$9.2M
	4	$5.9M	$3.1M	$0.1M	$9.1M
Life Cycle = 100,000 hours	1	$0.1M	$8.3M	$1.8M	$10.2M
	2	$3.0M	$3.3M	$0.2M	$6.5M
	3	$3.3M	$3.8M	$0.3M	$7.4M
	4	$3.5M	$3.1M	$0.1M	$6.7M

Note: There was no consideration included in analysis for the decay in energy efficiency towards the end of a fixture life cycle.
Note: Costs in this table have not been discounted.

TABLE 2
Summary of Net Present Value (NPV) Analysis (Discount Rate = 4%) (CY2012-CY2035)

	Life Cycle = 50,000 hours		Life Cycle = 100,000 hours	
Option	**Net Present Value Total Costs**	**Equivalent Annual Costs (EAC)**	**Net Present Value Total Costs**	**Equivalent Annual Costs (EAC)**
1	$6.4M	$0.42M	$6.4M	$0.42M
2	$6.1M	$0.41M	$4.8M	$0.32M
3	$6.3M	$0.42M	$5.2M	$0.36M
4	$6.7M	$0.44M	$5.2M	$0.34M

Note: NPV analysis includes salvage value; EACs do not. Salvage value is the remaining value of an asset at the end of an evaluation period based on its useful life. Straight-line depreciation was used to determine salvage values.

FIGURE 1
Comparison of Net Cash Flow, Future Year Costs, 50,000 hour Life Cycle Scenario (CY2012 – CY2035)
Capital Costs have been converted to Annual Debt Service Payments

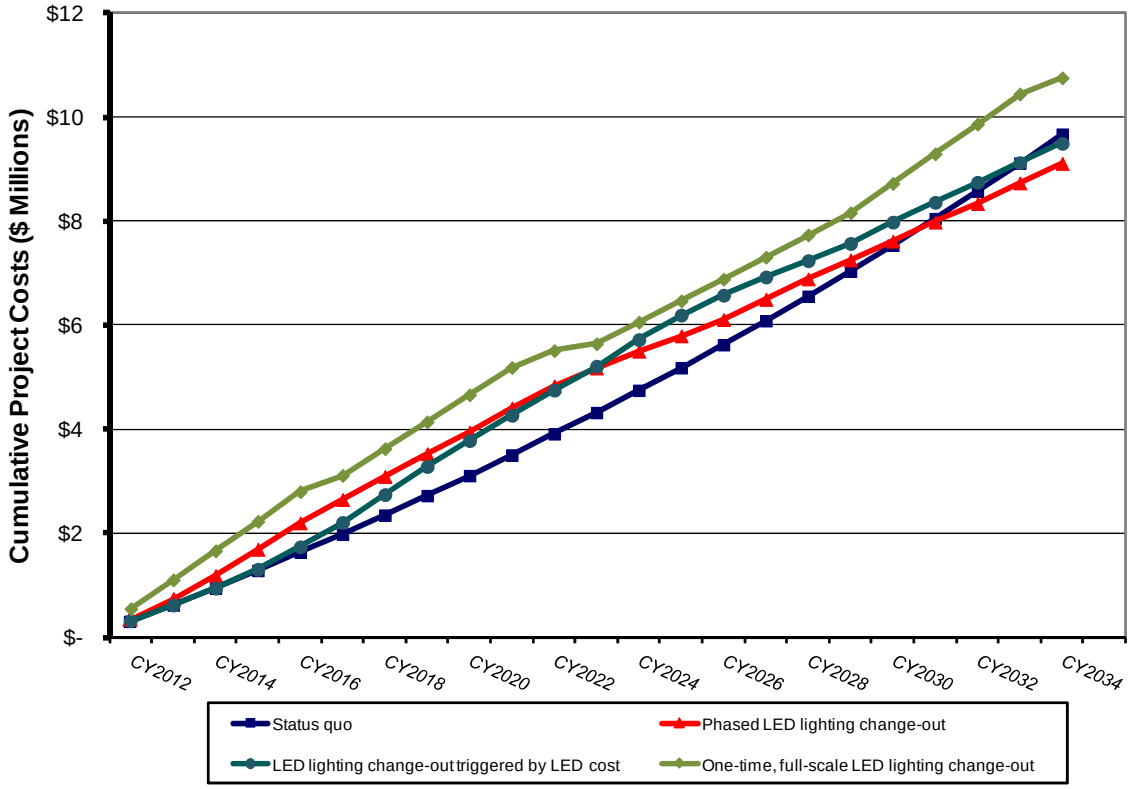
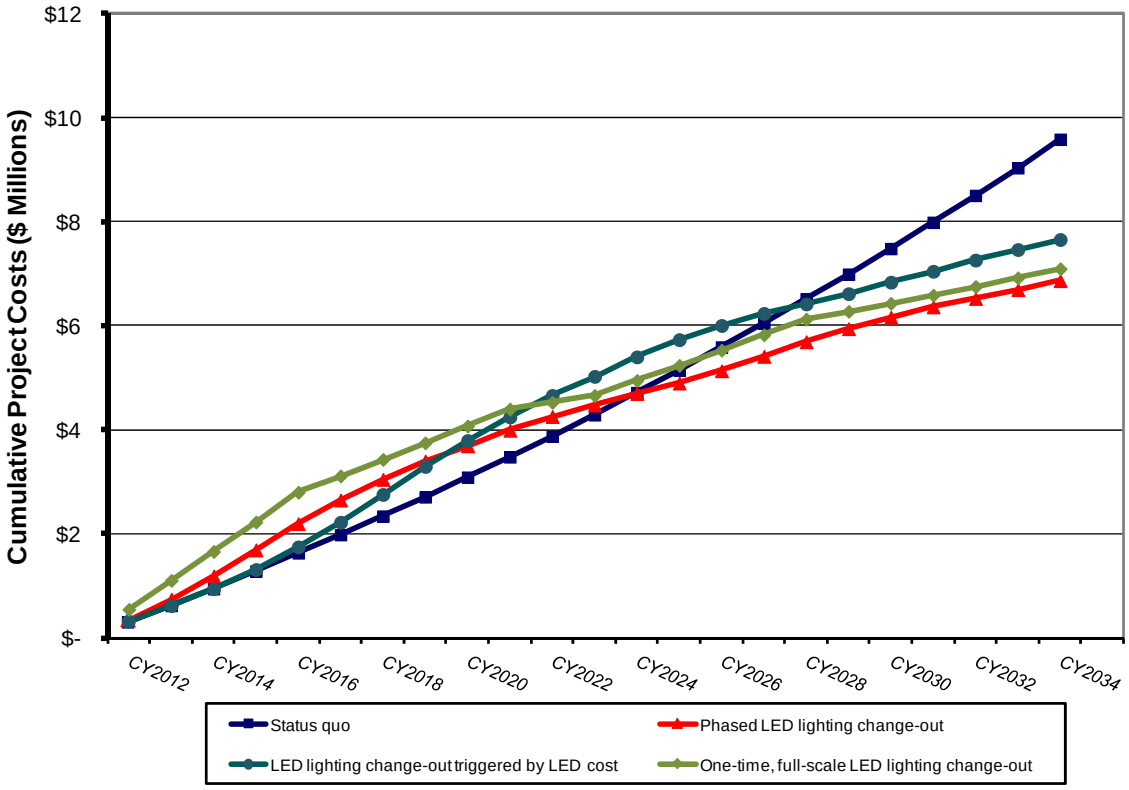


FIGURE 2
Comparison of Net Cash Flow, Future Year Costs, 100,000 hour Life Cycle Scenario (CY2012 – CY2035)
Capital Costs have been converted to Annual Debt Service Payments



The summary data presented in Tables 1 and 2 provide a different picture than the data presented in Figures 1 and 2. Tables 1 and 2 provide an indication of the long-term financial viability of an LED conversion strategy for the existing parking deck facilities. A majority of the options have an identified potential to cumulatively save the City between $0.3 and $1.6 million, present value savings, over the status quo option. Figures 1 and 2 provide the time-series data that shows what it will take to achieve these total savings with the expenditure of new capital (including the cost of capital) necessary for the conversion to LED. Debt service obligations for the procurement and installation of LED fixtures have the potential to range up to $460,000 per year. This amount of debt service is greater than the potential annual savings from the LED fixtures, both in terms of power and maintenance costs, which is the reason for the slow progression of each option's cumulative cash flow curve to meet the status quo curve in Figures 1 and 2. As shown in Figure 1, savings are not realized until late in the evaluation period primarily related to the continual cycle of replacement of the LED fixtures once they have reached the end of their life cycle and the concurrent retirement of the debt for those fixtures. In other words, once the City pays off the debt for the LED fixtures with a 50,000 hour life cycle it is time to acquire more capital to replace them.

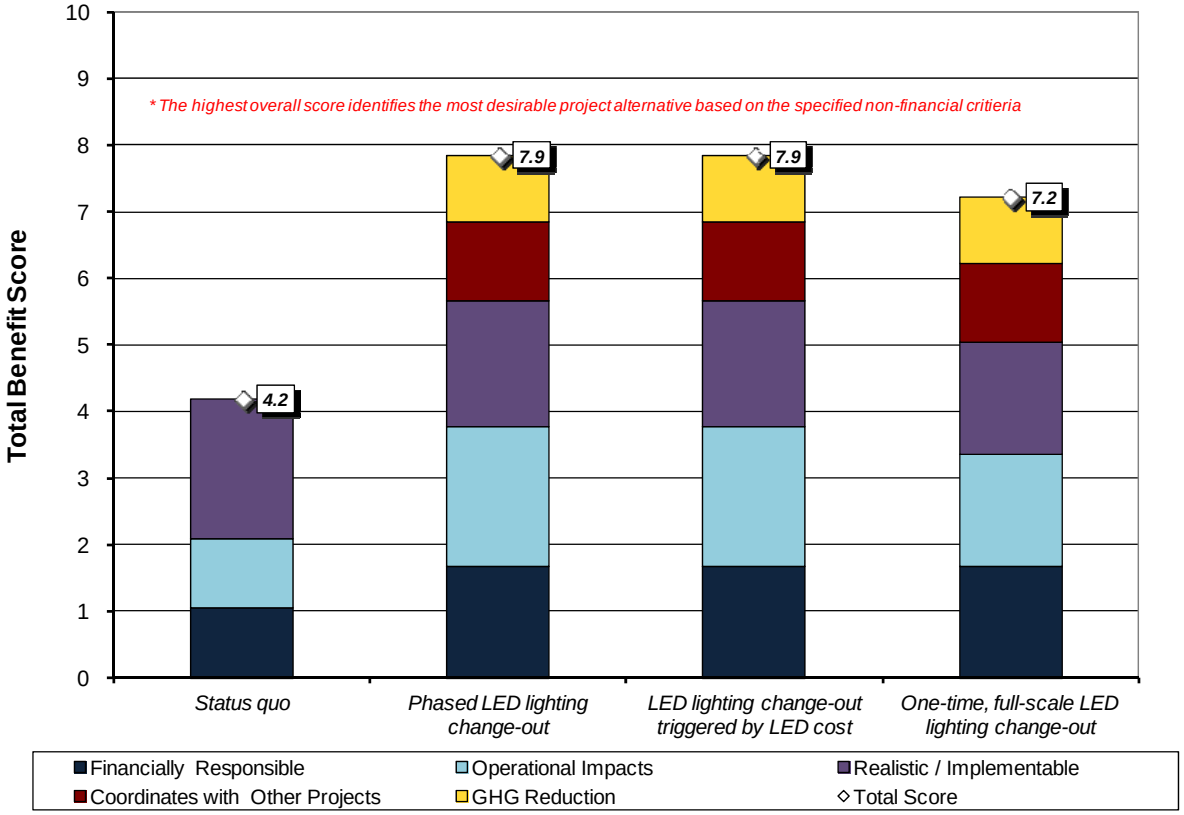
Non-Financial Considerations

The financial analysis addressed capital and operating costs of each option, and does not include the consideration of non-financial factors that represent potential benefits to the City that are not as easily monetized. To account for these non-financial considerations a value-based approach using a multi-criteria analysis (MCA) was utilized. The methodology used for the evaluation of non-financial considerations for this BCE is based on the same decision criteria used to prioritize the City's Climate/Energy Action Plan (CEAP) strategies.

Figure 3 presents the total benefit score for each option. The higher an option's total benefit score the greater the option supports the non-financial decision criteria. Attachment D provides additional details on the non-financial evaluation including the definition and weighting of the decision criteria, and definition of the performance scales.

In addition to the non-financial evaluation completed for this BCE, there are a number of other factors that were evaluated as part of the Municipal Deck LED lighting pilot project (Cree, 2007) that are worthy of note. These include the LED's improvement of lighting distribution and brightness, without glare, which was identified as more effective lighting in regard to public safety and security than the replaced light fixtures. In addition, a parking garage user survey provided findings that indicated that the LED lighting provided a significant improvement in customer feelings on safety, light quality, garage cleanliness, maneuverability and parking spaces; resulting in a overall improvement in the parking garage customer experience.

FIGURE 3
Non-Financial Evaluation - Comparison of Total Weighted Benefit Scores and Components by Criterion



Recommendation

It is important to recognize that all of the LED lighting replacement options are more expensive on a cash flow basis in the short-term than the status quo option, primarily due to the cost of the LED fixtures. Of the options evaluated, **Option 2 – Phased LED Lighting Change-out**, is the recommended strategy to transition lighting in the City's existing parking deck facilities to LED lighting, via a phased implementation that targets the highest consuming decks first. This option provides the City with the greatest savings and lowest net present value over the 24-year evaluation period for both of the life cycle scenarios. In addition to the identified long-term savings, this option contributes greatly to the non-financial decision criteria, as well as the potential to increase the level of service to parking deck customers through improved light quality and public safety.

It is recommended that the City commit to this lighting strategy for the existing parking deck facilities, and plan on initiating implementation in the next 2 to 3 years. See the following section for a discussion on timing for implementation of this option.

Recommendation Discussion

As power rates increase in the future and LED technology improves (greater energy efficiency, lower costs and longer life cycles), the City should transition from its current parking deck lighting to LEDs to increase efficiency. Both the financial and non-financial evaluations demonstrate the benefits of moving towards LED fixtures over the long-term, with the best implementation strategy of phasing by parking deck. The question of "what should the City do" is answered through this analysis; the question of "when should the City start to systematically transition to LEDs" is a separate question.

It is widely published that initial capital costs are the largest barrier to the conversion to LED fixtures. For a simple comparison, the City's current light bulb replacement costs, including the ballast which is only changed every 3 to 4 bulb replacement cycles, are approximately between $20 and $100 per fixture. The cost to convert to an LED fixture is approximately $550, based on a current estimate provided to the City. However, the savings that can be realized from a conversion to LED lighting are not insignificant in relation to power and maintenance cost reductions – up to approximately $1.6 million, as identified in Table 1. With the current cost differential between the current fixtures and LED fixtures it will take the City a number of years to overcome that initial capital expenditure.

The US Department of Energy (DOE) is currently making significant investments into the research and development of LED technology. The DOE has projected significant advances in LED fixture energy efficiency (more lumens per watt equating to less power consumption) and the manufacturing process (more cost effective means of producing LED fixtures in larger quantities) by 2015 and 2020 (DOE, 2011b). While the pace and level of improvements that will actually be realized is uncertain, it is fairly certain that in the near future LED light fixtures will be more efficient and cost less. A sensitivity analysis on the initial capital cost identified that for every $100 reduction in the LED fixture cost, the simple payback improved by 1 to 2 years from the 11-year payback at the current fixture cost. If the availability of capital limits implementation, the City could wait for LED fixture prices to fall; as a benchmark, a unit cost between $200 and $250 per fixture appears to be the price range at which the annual cost savings for the City has the greatest potential to cover the debt service for the conversion to LED. As the price of LED fixtures approaches this unit cost range the timing to payback and the cash flow improves. The primary implication of waiting to implement an LED fixture lighting strategy is the lost opportunity for the accumulation of power and maintenance cost savings; the LED technology is only going to get more efficient and more cost effective with time.

References

Cree. 2007. City of Raleigh Municipal Garage LED Lighting Pilot Project.

Department of Energy (DOE). 2011a. Cost Trends for Solid State Lighting. Presented at the DOE SSL Market Introduction Workshop. July 11, 2011.

Department of Energy (DOE). 2011b. Solid-State Lighting Research and Development: Multi Year Program Plan.

This BCE was completed by CH2M HILL in direct cooperation with City staff as part of the City Operations Climate/Energy Action Plan.

Attachment A

City of Raleigh Parking Deck Lighting Inventory and LED Equivalency Determination,
Prepared by the City of Raleigh Public Works Department, Transportation Operations Division

Lighting Inventory and LED Equivalency

Individual Parking Decks

Blount St. Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck	175w MH	1	277V	175	299		185	55315	50	14950
Pole Lights	250w MH	1	277V	440	10		292	2920	155	1550
Elevator Pit	100w INC	1	120V	n/a	4		100	400	14	56
Exit Lights	4.7w LED	1	277V	0	80		4.7	376	4.7	376
Walkways	42w FL	1	277V		50		42	2100	36	1800
Exterior	17w	2	277V		12		0	0	0	0
Mechanical	32w FL	2	277V		27		64	1728		1728
Storage/Restroom	32w FL	3	277V		5		96	480		480
Stairwells	40w FL	2	277V	100	38		80	3040	36	1368
Totals		**612**			**525**		**864**	**66,359**	**296**	**22,308**
Totals (LED conv eligible)		**532**			**513**		**822**	**64,259**	**296**	**20,508**

Note: It was assumed that at time of procurement of LED fixtures, the LED would be jus as efficient as T8 32W fluorescent lights (at a minimum).

Cabarrus St. Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck	150w HPS	1	277V	175	165		185	30525	50	8250
Pole Lights	400w HPS	1	"	440	4		464	1856	155	620
Elevator Pit	75 INC	1	120V	n/a	1		75	75	14	14
Emergency Lights	12V	1	"	12V	27					0
Exit Lights	7w FL	2	"	20	32		14	448	5	160
Stairwells	40w FL	2	277V	100	59		80	4720	36	2124
Totals		**379**			**288**		**818**	**37,624**	**260**	**11,168**
Totals (LED conv eligible)		**352**			**261**		**818**	**37,624**	**260**	**11,168**

City Center Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck L1	150w HPS	1	277V	150	36		185	6660	50	1800
L2 thru L6	100w HPS	1	277 V	100	252		129	32508	29	7308
Walkways	100w HPS	1	277V	100	9		129	1161	29	261
	100w HPS	1	277V	100	6		129	774	29	174
Pole Lights	100 HPS	1	277V	100	5		129	645	29	145
Pole Lights	150w HPS	1	277 V	150	43		185	7955	50	2150
Exit Lights	15w FL	2	277V	15	27		30	810	25	675
Stairs	150w HPS	1	277V	150	25		185	4625	50	1250
Elevator Pit	100w HPS	1	277V	100	4		129	516	29	116
Storage	86w FL	2	277V	86	16		172	2752		2752
Exterior	100w HPS	1	277V	100	15		129	1935	29	435
Maint/Office	38w FL	3	120V	38	16		114	1824	50	800
	17w FL	2	120V	17	1		34	34	18	18
Emergency	12w INC	2	277V	n/a	9		24	216	2	18
Totals		**549**			**464**		**1,703**	**62,415**	**419**	**17,902**
Totals (LED conv eligible)		**549**			**464**		**1,703**	**62,415**	**419**	**17,902**

Note: It was assumed that at time of procurement of LED fixtures, the LED would be jus as efficient as T8 32W fluorescent lights (at a minimum).

Business Case Evaluation – Parking Deck Lighting

Municipal Building Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck	100w HPS	1	277 V	100	354		129	45666	29	10266
	175 MH	1	277 V	175	8		210	1680	89	712
	110 LED	1	110 W		153		110	16830	110	16830
Pole Lights	250w HPS	1	480 V	250	24		295	7080	93	2232
Pole Lights	250w HPS	1	480 V	250	4		295	1180	93	372
emergency lights	6v	1	277 V	6V	33			0		0
exit lights	"	2		6V	19			0		0
stairwell lights	70w HPS	1	277V	70	29		91	2639	18	522
storage	40w FL	2	277V	40	47		80	3760	36	1692
bridge	70w HPS	1	120V	70	13		91	1183	18	234
Totals		**750**			**684**		**1,301**	**80,018**	**486**	**32,860**
Totals (LED conv eligible)		**679**			**479**		**1,191**	**63,188**	**376**	**16,030**

Moore Square Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck	150w HPS	1	277V	150	322		185	59570	50	16100
Clock	250w HPS	1	277V	250	4		295	1180	93	372
Pole Lights	250w HPS	1	480V	250	12		295	3540	93	1116
Stairwell	70w HPS	1	277V	70	22		91	2002	18	396
Exit Lights	8w FL	2	12V		7		16	112	11	77
	12w HAL	1	12V		7		12	84	3	21
Elec/Storage	40w FL	2	240V	40	6		80	480	36	216
	40w FL	2	277V	40	4		80	320	36	144
elevator pit	200 INC	1			2		200	400	46	92
Totals		**403**			**386**		**1,254**	**67,688**	**386**	**18,534**
Totals (LED conv eligible)		**403**			**386**		**1,254**	**67,688**	**386**	**18,534**

Performing Arts Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck	100 watt MH	1	277V	100	410		129	52890	48	19680
	175 watt MH	1	277V	175	55		210	11550	89	4895
	70 watt MH	1	277V	70	4		85	340	36	144
Pole Lights	250 watts MH	1	277V	250	18		292	5256	141	2538
Pole Lights	100 watt MH	1	277V	100	14		129	1806	48	672
Stairwell lights/wall	150 watt MH	1	277V	150	74		186	13764	83	6142
Elevator/Storage/Mech	75 watt INC	1		N/A	6		75	450	13	78
	32 watt FL	2	277V	32	17		64	1088		1088
exterior lights	26 watt FL	2	277V	26	13		52	676	40	520
	40 watt FL	2	277V	40	6		80	480	36	216
	100 watt MH	1	277V	100	10		129	1290	48	480
emergency lights	12w HAL	2	277V		39		24	936	3	117
exit lights	3.0 v LED	1	120/277		30		0	0	0	0
Totals		**771**			**696**		**1,455**	**90,526**	**585**	**36,570**
Totals (LED conv eligible)		**741**			**666**		**1,455**	**90,526**	**585**	**36,570**

Note: It was assumed that at time of procurement of LED fixtures, the LED would be jus as efficient as T8 32W fluorescent lights (at a minimum).

Progress Energy Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck 2-6	175w MH	1	277V	175w	364		210	76440	89	32396
L7	32w FL	3	277V	90w	176		96	16896		16896
Pole Lights	400w MH	1	277V	455w	1		460	460	194	194
Pole Lights	400w MH	1	277V	910w	4		460	1840	194	776
Elevator Pit	150w IN	1	277V	n/a	2		150	300	18	36
Exterior	100w MH	1	277V	100w	9		129	1161	48	432
exit lights	4w LED	1	277V		75		4	300	4	300
stairwell	32w FL	2	277V	60w	78		64	4992		4992
landings	26w FL	1	277V	30w	24		26	624	20	480
	70w MH	1	277V	70w	2		85	170	36	72
Totals		**1165**			**735**		**1,684**	**103,183**	**603**	**56,574**
Totals (LED conv eligible)		**1165**			**735**		**1,684**	**103,183**	**603**	**56,574**

Note: It was assumed that at time of procurement of LED fixtures, the LED would be jus as efficient as T8 32W fluorescent lights (at a minimum).

Wilmington St. Parking Deck

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Deck	150w HPS	1	277 V	150	288		185	53280	50	14400
Exterior	150w HPS	1	"	150	3		185	555	50	150
	100w HPS	1	"	100	6		129	774	29	174
	250w HPS	1	"	250	2		295	590	93	186
electric/storage	40w Fl	2	"	40	10		80	800	36	360
	40w Fl	4			6		160	960	83	498
pole lights\25and30 ft	250w HPS	1	"	250	8		295	2360	93	744
stairwell lights\wall	100w HPS	1	"	100	52		129	6708	29	1508
walkway lights	70w HPS	1	"	70	20		91	1820	18	360
	250w HPS	1	"	250	4		295	1180	93	372
	100w HPS	1	"	100	15		129	1935	29	435
	150w HPS	1	"	150	30		185	5550	50	1500
canopy	100w HPS	1	120V	100	6		129	774	29	174
emergency lights	12w HAL	1	12V		21		12	252	3	63
elevator-pit	200w INC	1		n/a	3		200	600	46	138
exit lights	Ukwn		12V		26		0	0		0
Totals		**502**			**500**		**2,499**	**78,138**	**731**	**21,062**
Totals (LED conv eligible)		**476**			**474**		**2,499**	**78,138**	**731**	**21,062**

Parking Decks Summary

Current Lighting Inventory & LED Equivalency

AREA USED	BULB TYPE	BULB(S)/ FIXTURE	VOLTAGE	BALLAST	TOTAL FIXTURES		Est. Watt/Fixture	Total Current Fixture Watts per Hour	LED Watt/Fixture	Total LED Fixture Watts per Hour
Cumulative Total		**5,131**			**4,278**		**11,578**	**585,951**	**3,766**	**216,978**
Cumulative Total (minus current LED)		**4,897**			**3,978**		**11,426**	**567,021**	**3,656**	**198,348**

Attachment B

Primary Financial Assumptions
The assumptions used in developing the life-cycle net present value cost financial analysis can be found on the following pages.

General Assumptions:

Assumptions:

Energy Cost Assumptions			**Note:**
Power Rate	$0.067	per kWh	2012 average annual rate (includes taxes and peak cap. charges)
Annual Power Rate Increase	3.0%		Used in budget forecasts, per Suzanne Walker.
Operational Duration			
60% of fixtures	4,368	hours per year	12-hours per day, 7 days per week, 52 weeks per year; assumption per Mike Kennon
40% of fixtures	8,736	hours per year	24-hours per day, 7 days per week, 52 weeks per year; assumption per Mike Kennon
Current Fixture Efficiency Loss Factor			
Efficiency Loss Factor	0%		
Maintenance Cost Assumptions:			**Note:**
Labor/Material Escalation	1.8%		US OMB, 2012
Current Light Bulb Replacement			
Labor	15	minutes	assumption per Mike Kennon
Labor Cost/hour	$25.00	per hour	fully burdened rate, assumption per John Wynn
Light Replacement with Ballast			
Labor	30	minutes	assumption per Mike Kennon
Labor Cost/hour	$25.00	per hour	fully burdened rate
Current Light Bulb Replacement Materials			
Bulb Cost	$18.00	per bulb	assumption per John Wynn
Ballast Cost	$60.00	per ballast	assumption per John Wynn
Disposal Cost	$0.00	per bulb	assumption per Mike Kennon & Billy Jackson
Annual Light Cleaning			
Current Lights %	0%	% of all fixtures	assumption per Mike Kennon
Cleaning Length	5.00	minutes	
LED Lights %	20%	% of all fixtures	per year
Cleaning Length	5.00	minutes	
LED Conversion Assumptions:			**Note:**
LED Conversion			
Turnkey Replacement	$625	per fixture	assumption per John Wynn, future end of life cycle replacements are complete fixture replacements
Lamp Post	$1,000	per lamp post	for top level of parking decks, where appropriate, 20' to 30' foot poles - material + labor (average)
Cost increase for Program Mgmt.	10%		anything beyond the conversion of 2 decks per year the City will need staff augmentation to manage the program, per M. Kennon
Conversion Ratio			
Current fixture to LED fixture	1:1		assumption per Mike Kennon
LED Equivalency	---------->		LED lumen comparison based on manufacturer recommendation for comparable fixture, or 67.2 lumen/watt per Cree estimate.
Life Cycle Assumptions:			**Note:**
Current Fixtures - Bulb	4	years	average for system (defined by failure, 3-4 years), assumption per Mike Kennon and Billy Jackson
Current Fixtures - Ballast	9	years	average for system (defined by replacement every 2-3 cycles), assumption per Mike Kennon and Billy Jackson
LED Fixtures	50,000	hours	70% light reduction, Industry Standard determination of Life Cycle for LEDs

Debt Service Assumptions:

			Note:
Bond Rate	4.0%		conservative for near term years, per Fred Blackwood
Repayment Term	10	years	Life cycle of LED lights - 12 hour run time
Repayment Term	5	years	Life cycle of LED lights - 24 hour run time
Debt Issuance Cost	2%		Raleigh range 2-4%, based on size of project

Rebate Assumptions:

			Note:
Progress Energy Rebate	$0.08	per kWh saved per year	applied against total capital cost required for LEDs, Year 1 of conversion

Parking Deck	kWh saved	Rebate Total	Parking Deck	kWh saved	Rebate Total
Blount St.	268,281	$21,462	Performing Arts	330,858	$26,469
Cabarrus St.	162,228	$12,978	Progress Energy	285,806	$22,865
City Center	272,954	$21,836	Wilmington St.	349,990	$27,999
Municipal	289,173	$23,134			
Moore Sq.	301,412	$24,113	**Total Rebate:**	**2,260,703**	**$180,856**

Annual Rate of Cost Decrease for LEDs Assumption:

Cost decline %		
For reduction	2012	0.0%
assumption used half	2013	4.5%
of the DOE projected	2014	9.0%
target curve (4.5%)	2015	13.5%
End of eval. period	2016	19.0%
75% reduction	2017	24.0%
	2018	29.0%
	2019	34.0%
	2020	40.5%
	…	…
	2034	75.0%

Data Source: DOE, 2011

Average annual target decrease in DOE curve = 9%

Attachment C

Cash Flows Analysis for Parking Deck Lighting Options, by Life Cycle Scenario

FIGURE C-1
Cash Flow Analysis for Option 1; 50,000-hr Life Cycle

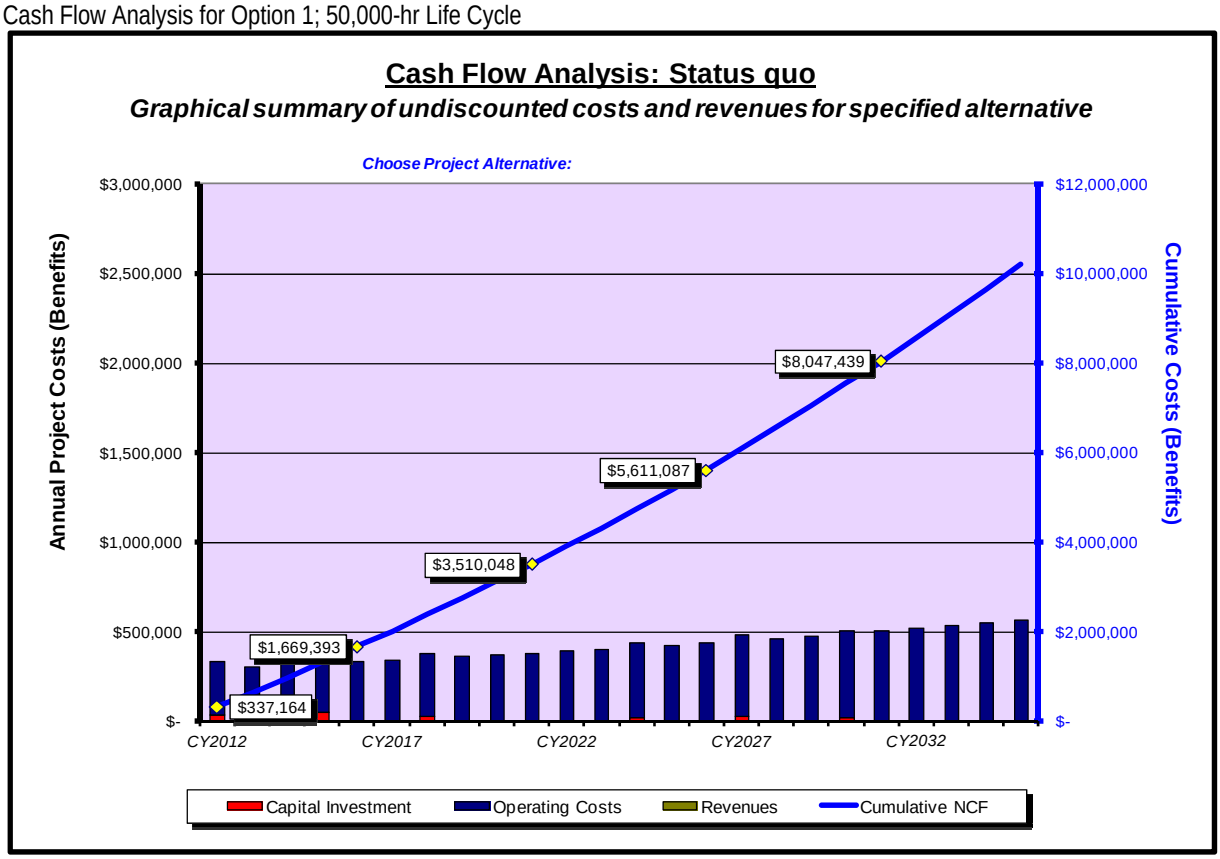


FIGURE C-2
Cash Flow Analysis for Option 1; 100,000-hr Life Cycle

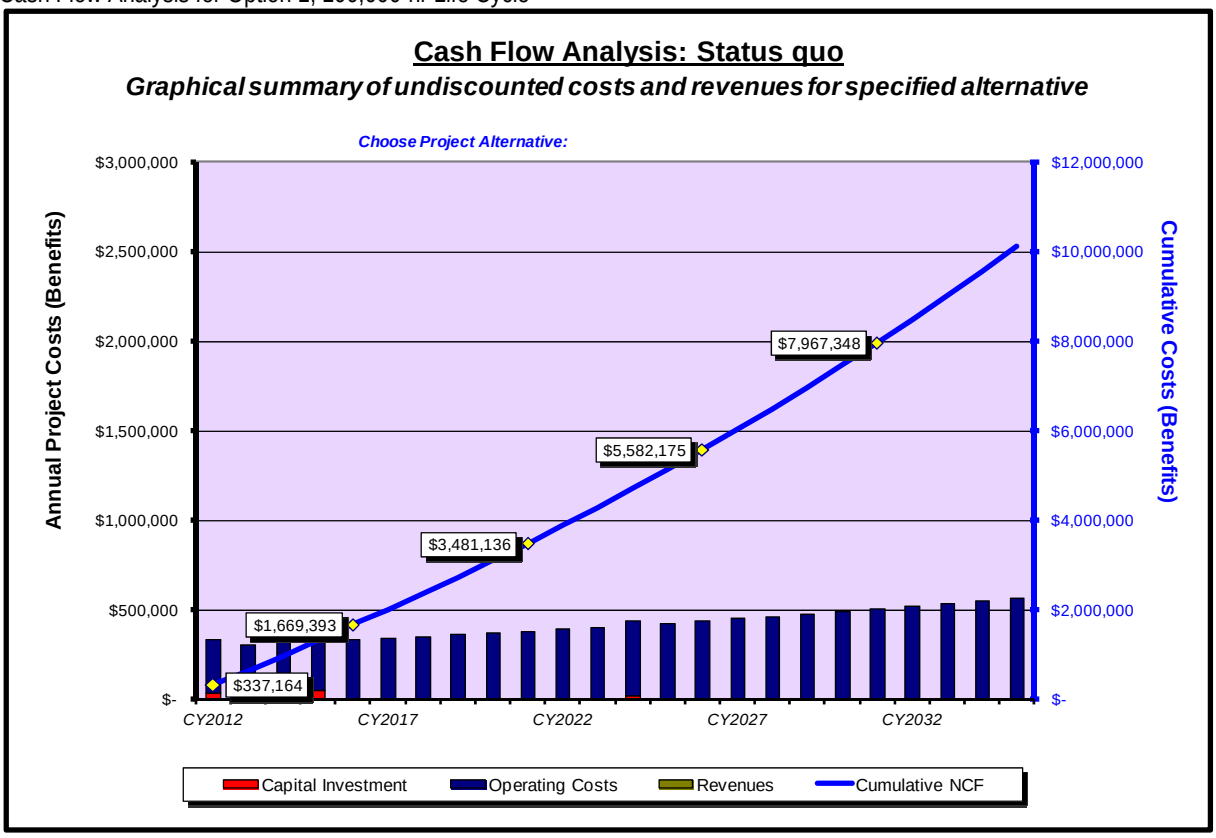


FIGURE C-3
Cash Flow Analysis for Option 2; 50,000-hr Life Cycle

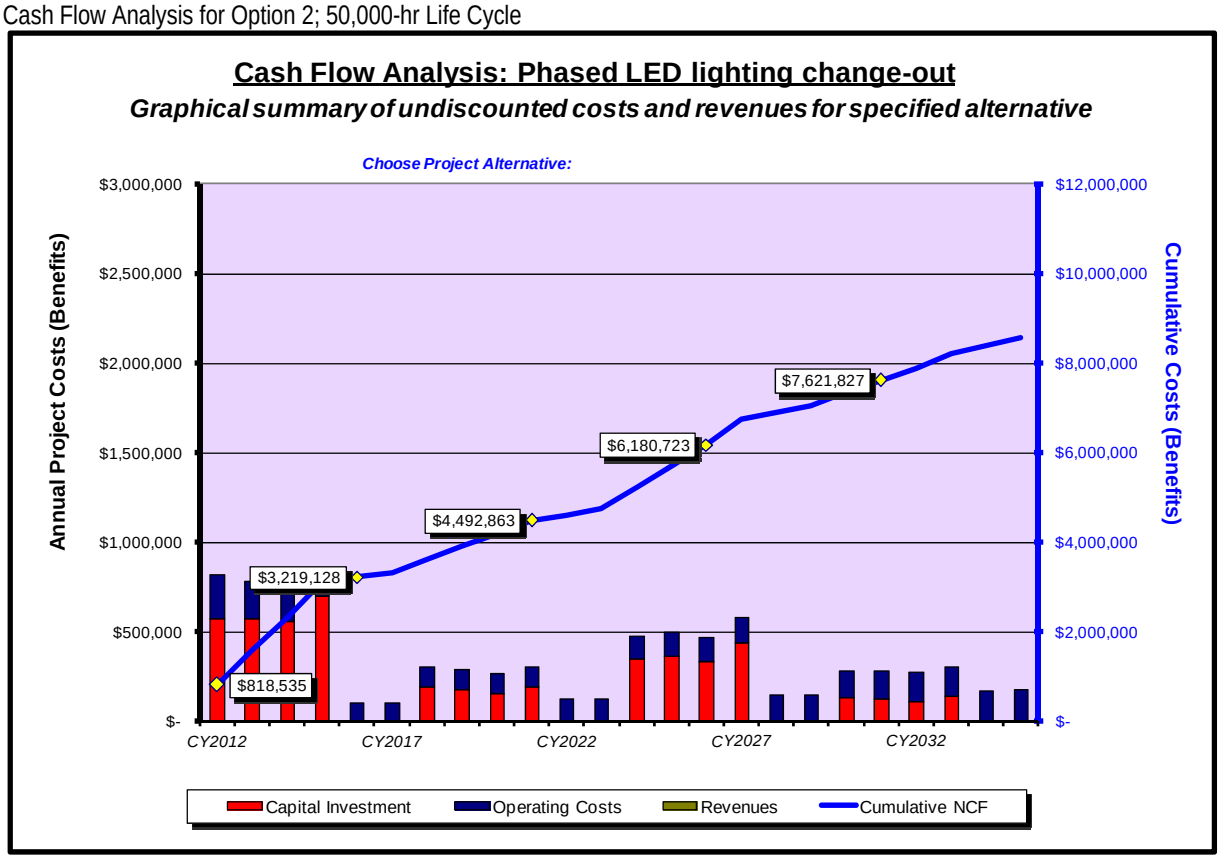


FIGURE C-4
Cash Flow Analysis for Option 2; 100,000-hr Life Cycle

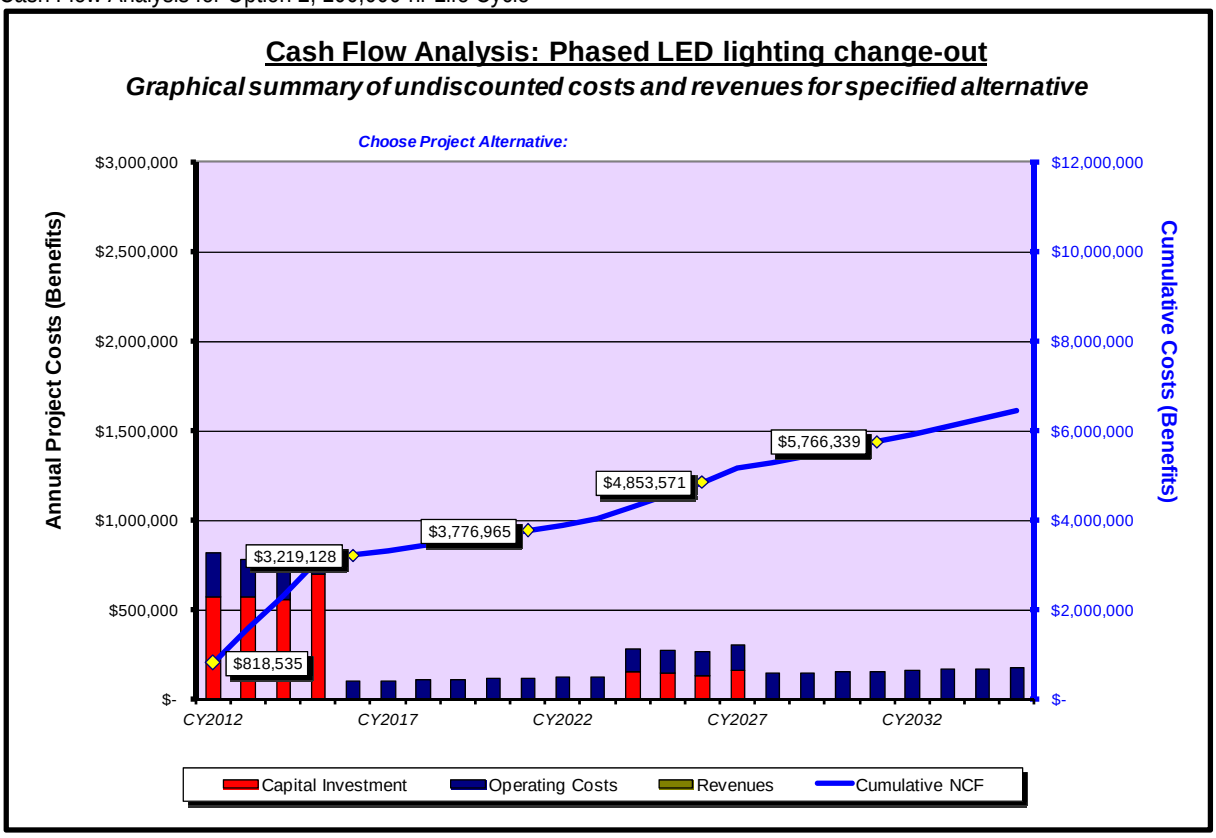


FIGURE C-5
Cash Flow Analysis for Option 3; 50,000-hr Life Cycle

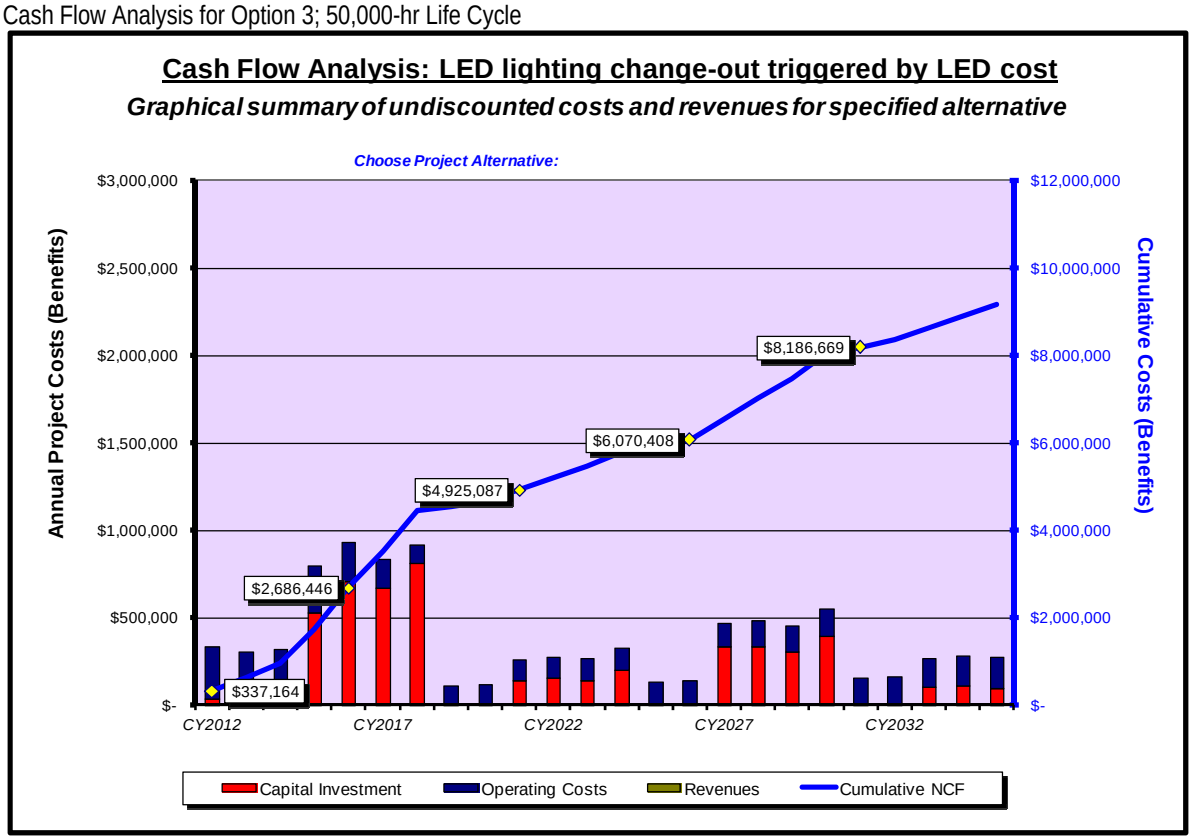


FIGURE C-6
Cash Flow Analysis for Option 3; 100,000-hr Life Cycle

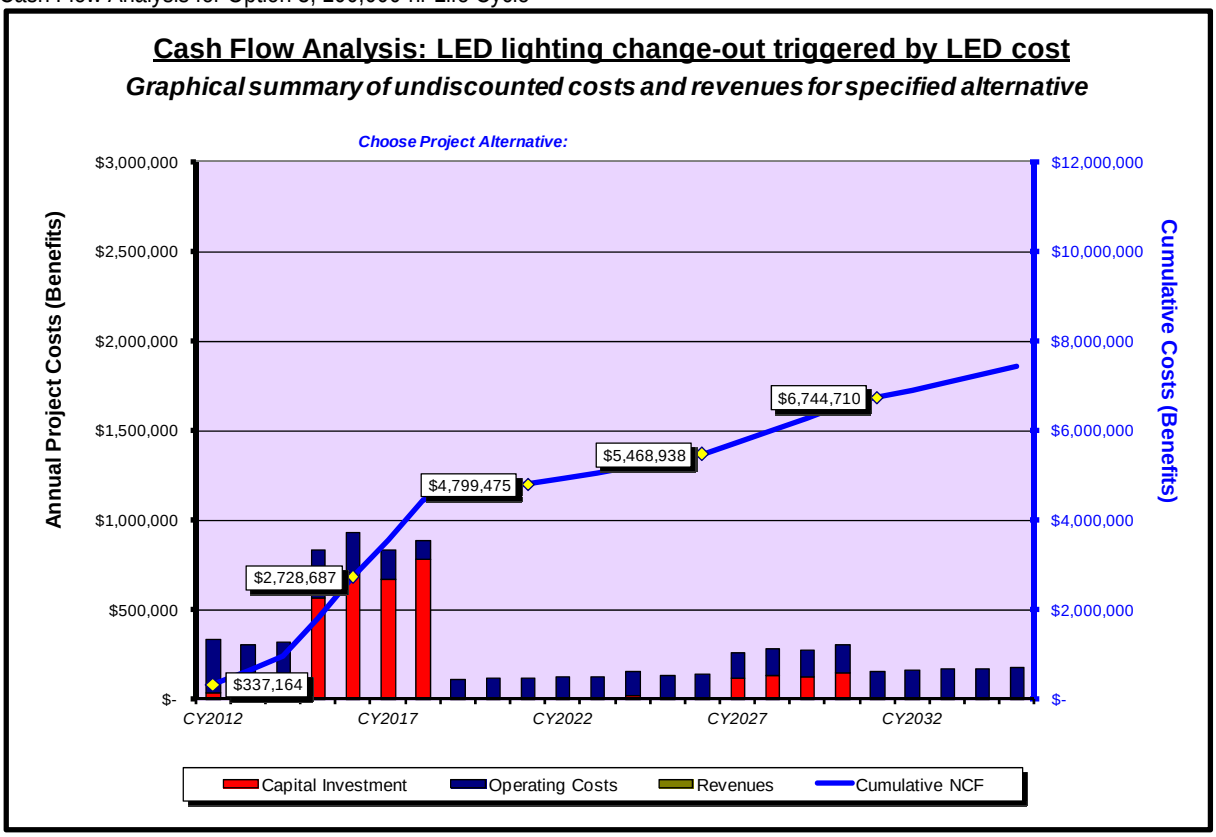


FIGURE C-7
Cash Flow Analysis for Option 4; 50,000-hr Life Cycle

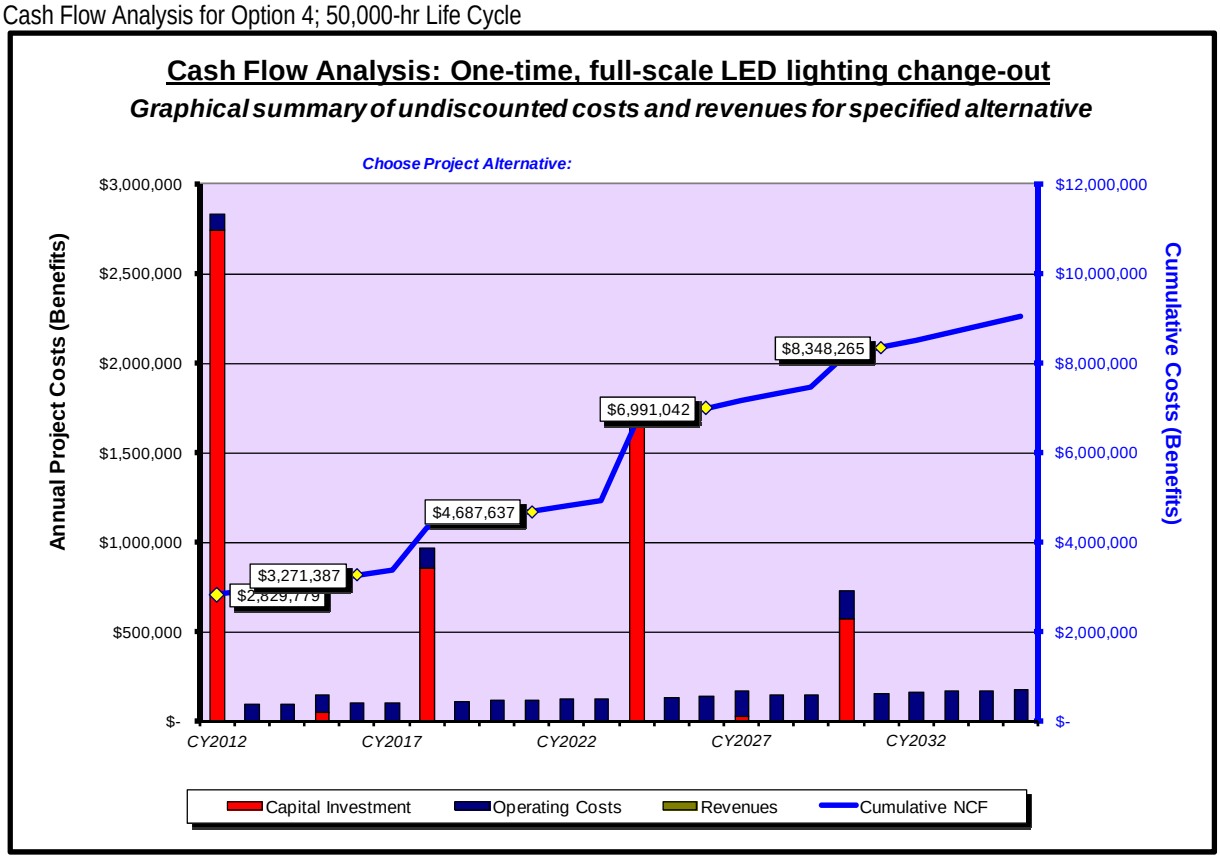
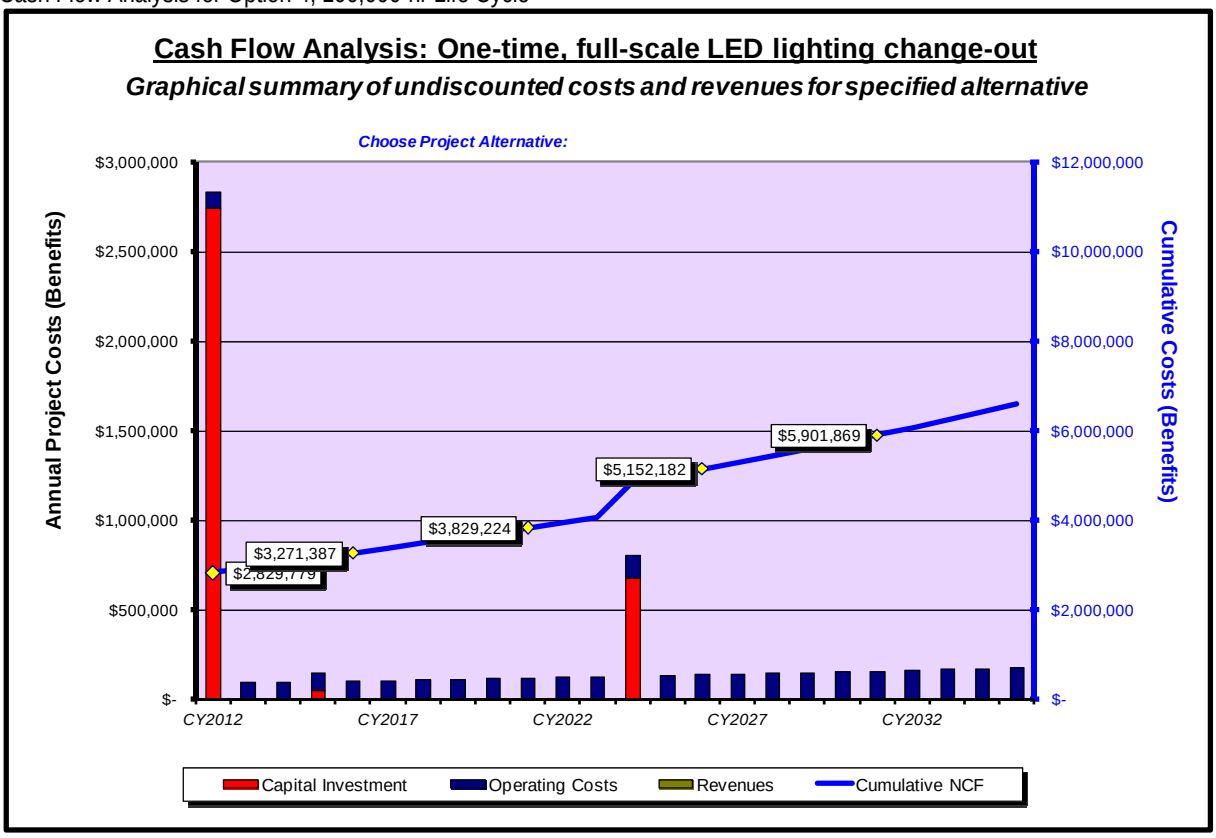


FIGURE C-8
Cash Flow Analysis for Option 4; 100,000-hr Life Cycle



Attachment D

Non-Financial Evaluation of Parking Deck Lighting Options

FIGURE D-1
Non-Financial Evaluation Criteria and Criteria Weightings

Non-Financial Project Evaluation Criteria

RESET

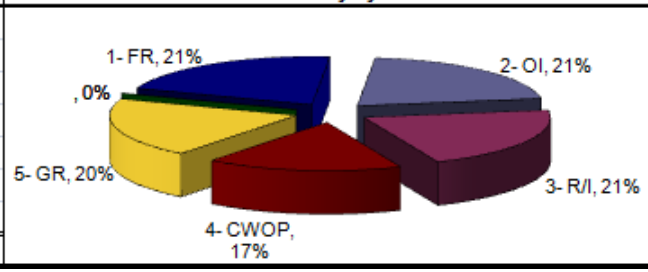
This worksheet allows the user to identify and define non-financial criteria for project evaluation.
For each criterion, the user assigns relative importance, chooses an appropriate performance scale, and determines the scoring mechanism for each scale.

Use this section to identify and describe relevant non-financial criteria

	Non-Financial Criteria	Detailed Description of Criteria
1	Financially Responsible	CAPEX, OPEX, Payback Period; Good use of public funds
2	Operational Impacts	Operational changes that lead to increased energy efficiency and/or operating efficiency; Departmental operating budget adjustments; Staff behavioral changes may be required
3	Realistic / Implementable	Can be incorporated into the way the City "does business" (organization, processes, procurement); Reasonable amount of staff time and effort; Technology and market maturity; Legal; Meets regulatory requirements
4	Coordinates with Other Projects	Can be a component of current or future projects; Common responsible parties and common internal or external partners
5	GHG Reduction	Greenhouse Gas (GHG) Reduction Potential
6		
7		

Use this section to assign relative importance and specify performance scales for each criterion

	Non-Financial Criteria	Weights	Relative Priority by Criterion	Choose Relevant Scale
1	Financially Responsible	21.0%		Numerical Scale
2	Operational Impacts	21.0%		Numerical Scale
3	Realistic / Implementable	21.0%		Numerical Scale
4	Coordinates with Other Projects	17.0%		Numerical Scale
5	GHG Reduction	20.0%		Numerical Scale
6		0.0%		
7		0.0%		
		100.0%		



Performance Scales

- Scale Descriptions
- Define Raw Scores Associated with Scales
- Create Custom Scale

FIGURE D-2
Non-Financial Evaluation Criteria Performance Scale Description (Selection: Numeric Scale)

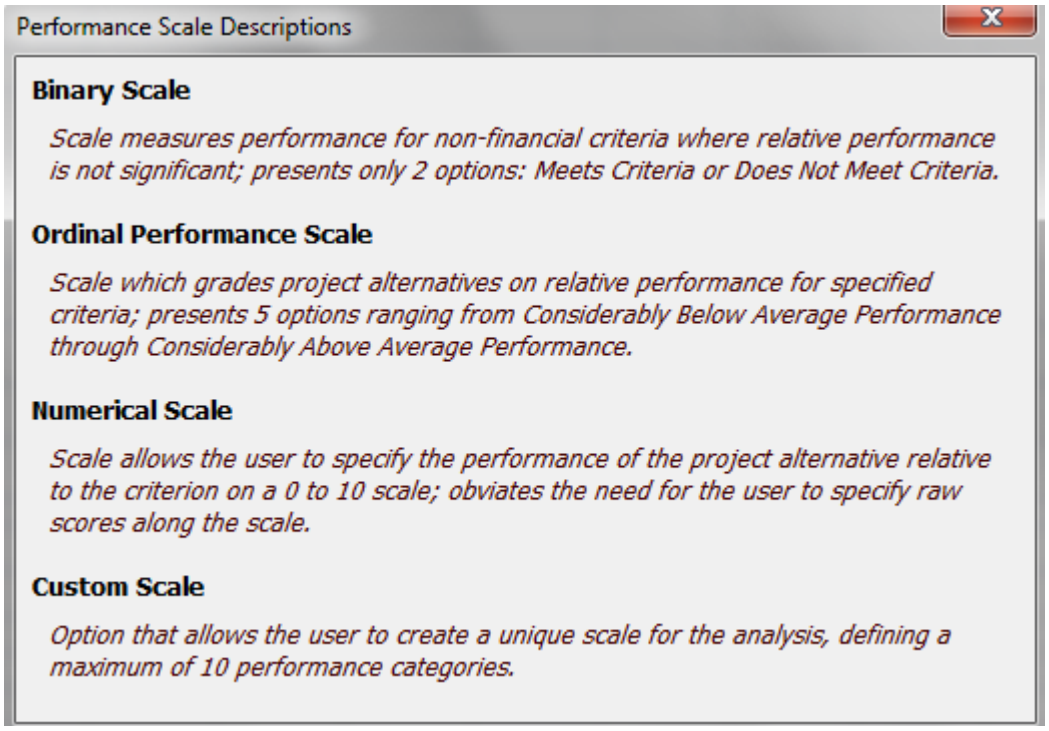


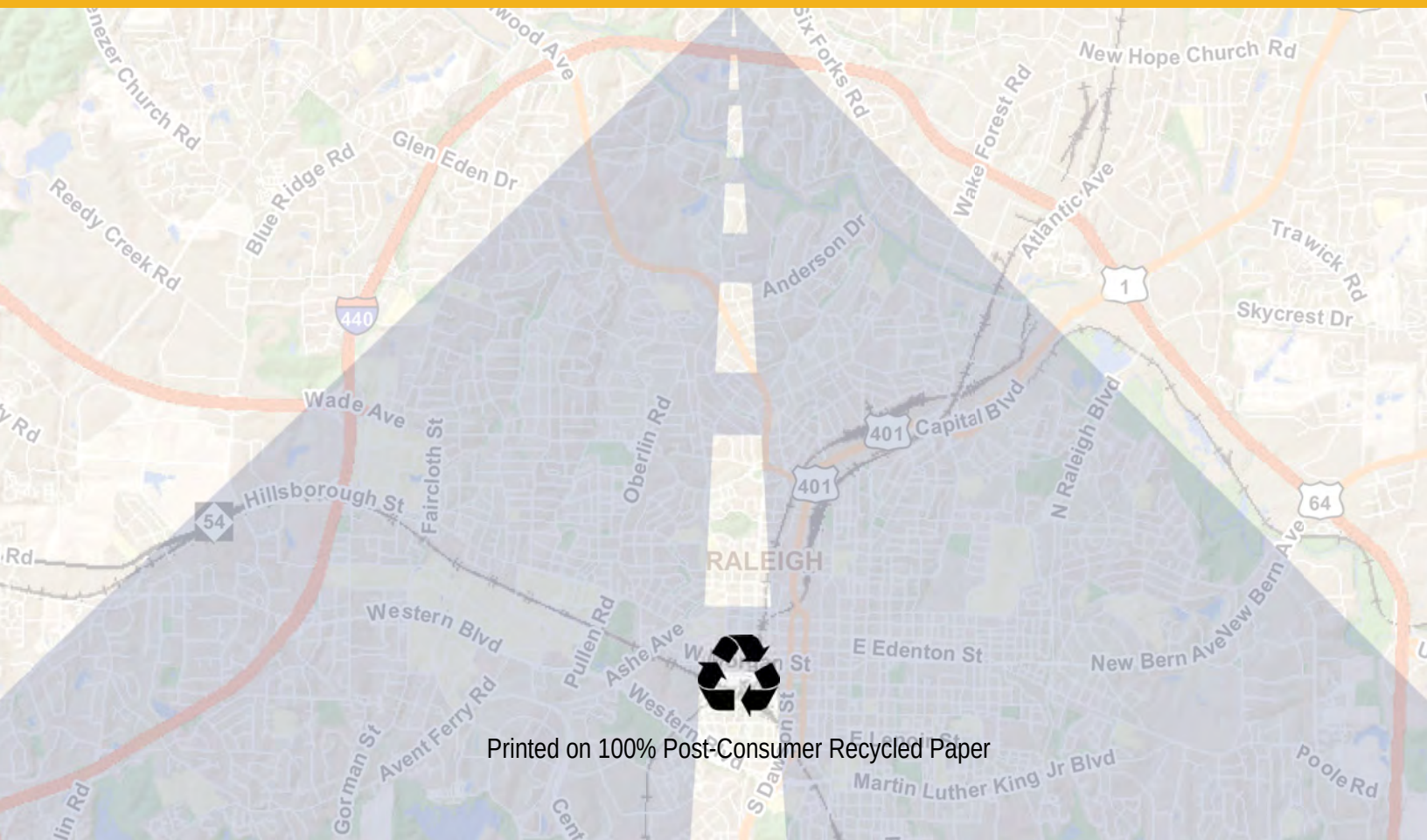
FIGURE D-3
Non-Financial Evaluation Scores and Results

Non-Financial: Project Alternative Evaluation, Scores, and Results

RESET Evaluation

This worksheet allows the user to evaluate each project alternative against the chosen performance scale, and displays the results of the analysis

Type of Performance Scale Specified:	Numerical	Numerical	Numerical	Numerical	Numerical				
	Financially Responsible	Operational Impacts	Realistic / Implementable	Coordinates with Other Projects	GHG Reduction				
Rate Performance: use this section to rate the performance of the project alternatives against specified non-financial criteria									
Status quo	5	5	10	0	0				
Phased LED lighting change-out	8	10	9	7	5				
LED lighting change-out triggered by LED cost	8	10	9	7	5				
One-time, full-scale LED lighting change-out	8	8	8	7	5				
Calculate Raw Scores: this section determines the raw score for each non-financial criterion and project alternative based on previous input from user									
Status quo	5	5	10	0	0				
Phased LED lighting change-out	8	10	9	7	5				
LED lighting change-out triggered by LED cost	8	10	9	7	5				
One-time, full-scale LED lighting change-out	8	8	8	7	5				
Weighted Score and Results: this section applies the user-specified weights and develops the overall Non-Financial Score for each project alternative									
Priority Weighting:	21.0%	21.0%	21.0%	17.0%	20.0%			Total Score	% of High
Status quo	1.05	1.05	2.10	0.00	0.00			4.20	53%
Phased LED lighting change-out	1.68	2.10	1.89	1.19	1.00			*7.86*	NA
LED lighting change-out triggered by LED cost	1.68	2.10	1.89	1.19	1.00			*7.86*	NA
One-time, full-scale LED lighting change-out	1.68	1.68	1.68	1.19	1.00			7.23	92%



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