ENERGY USAGE ANALYSIS

5810 PARK HEIGHTS AVENUE
BALTIMORE, MD 21215

DRAFT

Prepared By:

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Suite 2
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For:

T.W. Ellis, LLC
725 North Hickory Avenue
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August 5, 2011

1. CERTIFICATION/DISCLAIMER

K.C. Madigan & Associates, LLC has completed an Energy Usage Analysis of the residence located at 5810 Park Heights Avenue in Baltimore, Maryland.

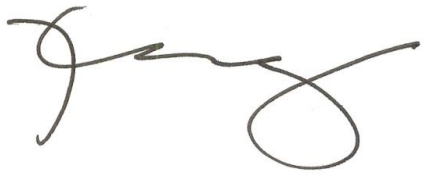
The analysis was performed at the Client's request using methods and procedures consistent with good commercial and customary practice and using methods and procedures as outlined in K.C. Madigan & Associates' Proposal.

This report is exclusively for the use and benefit of the Client identified on the first page and is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose, without the advance written consent of K.C. Madigan & Associates.

The opinions K.C. Madigan & Associates expresses in this report were formed utilizing the degree of skill and care ordinarily exercised by any prudent architect or engineer in the same community under similar circumstances. K.C. Madigan & Associates assumes no responsibility or liability for the accuracy of information contained in this report which has been obtained from the Client or the Client's representatives, from other interested parties, or from the public domain. The conclusions presented represent K.C. Madigan & Associates' professional judgment based on information obtained during the course of this assignment. The conclusions presented are based on the data provided, observations made, and conditions that existed specifically on the date of the assessment.

The energy usage analysis and conclusions contained in this report have been reviewed for technical accuracy. However, because energy usage and consumption ultimately depends on behavioral factors, the weather, and many other factors outside our control, K.C. Madigan & Associates does not guarantee the energy usage and consumption conclusions included in this report. K.C. Madigan & Associates shall in no event be liable should the actual energy usage and consumption of the property vary from that indicated in this report.

Any questions regarding this report should be directed to Keith C. Madigan, P.E. at keithm@kcmadigan.com or (410) 370-5073.



Keith C. Madigan, P.E.
Principal

K.C. Madigan & Associates, LLC

2. INTRODUCTION

T.W. Ellis, LLC retained K.C. Madigan & Associates to perform an analysis of the pre- and post-renovation energy usage of the residential property located at 5810 Park Heights Avenue in Baltimore, Maryland.

The property is an approximately 1,890 square foot, wood-framed 2-story residential structure with a partially below-grade basement. Maryland Department of Assessments and Taxation records indicate that the property was originally constructed in 1933.

It is our understanding that T.W. Ellis is contracted to perform substantial interior and exterior renovations to the property as part of a community redevelopment effort and T.W. Ellis desires to obtain Certification for the renovated property under the NAHB National Green Building Standard – Green Remodel Program.

K.C. Madigan & Associates was provided with limited historical energy consumption for the property as well as the following new construction renovation plans as prepared by Shannon Comer Architects for reference:

- CS - Cover Sheet dated 2/23/11
- SP - Site Plan dated 2/23/11
- D1.1 – Demo Plans dated 2/23/11
- A1.1 – Floor Plans dated 2/23/11
- A2.1 – Elevations dated 2/23/11

Site visits to the property were made on April 5, 2011, May 23, 2011, and August 5, 2011.

3. ENERGY CONSUMPTION EVALUATION

Pre-Renovation

The pre-renovation property was heated via an oil fired boiler hydronic system and cooled via window air conditioning units. The model number and date of installation of the boiler could not be identified but the installation was approximately 30 years old or greater. Historical utility records indicate that an average of 900 gallons of No.2 fuel oil were consumed by the property on an annual basis. Likewise, the window air conditioning units were at least 10 years old or greater. The pre-renovation existing windows were of wood-frame single pane construction and limited to no insulation was observed in the walls.

Based upon the observed conditions onsite, the information available, and reasonable assumptions regarding the condition and pre-renovation operation of the property, the property's pre-renovation annual energy usage is determined to be as follows:

ENERGY SOURCE	QUANTITY CONSUMED	KBTU
No. 2 Fuel Oil	900 gallons	124,650 kBtu
Electricity - Cooling	7,002 kWh	23,891 kBtu
Electricity - Other	4,750 kWh	16,208 kBtu
Natural Gas	235 therms	23,500 kBtu
Total Pre-Renovation Energy Usage		**188,249 kBtu**

* Calculation details are included in the report appendix.

Post-Renovation

The scope of the improvements completed as part of the property renovations includes several elements that will provide significant future energy usage savings for the property. These improvements include, but are not limited to, the installation of batt insulation in the walls, the installation of an Energy Star compliant air sealing package, the installation of insulated/low-e glazed window assemblies, the installation of a high-efficiency gas furnace, and the installation of a high-efficiency central air conditioning system. The energy consumption savings for these improvements is projected to be as follows:

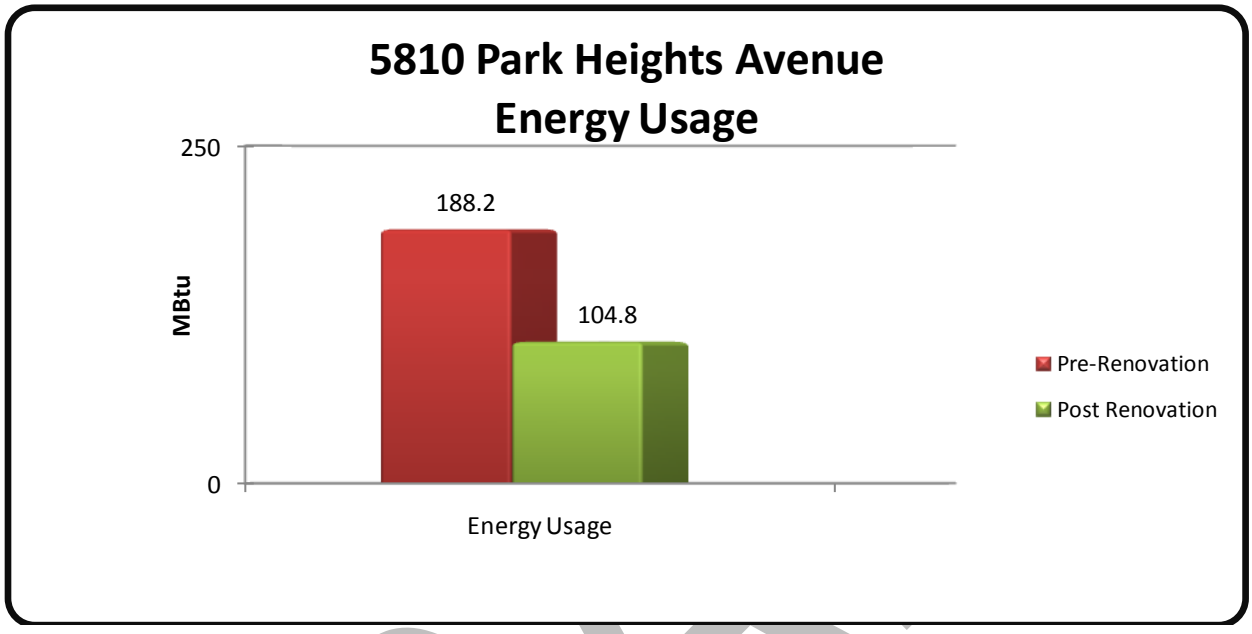
IMPROVEMENT	ENERGY SAVINGS	KBTU
Installation of R13 Wall Insulation	333 therms	33,300 kBtu
Installation of Air Sealing Package	76 therms	7,600 kBtu
Installation of Insulated/Low E Windows	198 therms	19,800 kBtu
Installation of High-Efficiency Gas Furnace	90 gal (equivalent)	12,465 kBtu
Installation of Central Air Conditioning System	3,010 kWh	10,270 kBtu
Total Post-Renovation Energy Savings		83,435 kBtu
Total Post-Renovation Energy Usage		**104,814 kBtu**

* Calculation details are included in the report appendix.

4. CONCLUSION

Energy Usage Reduction

Based upon the above analysis, the energy usage reduction anticipated post-renovation at the property is 83,435 kBtu which represents a 44.3 % reduction from the pre-renovation energy usage.



Total Pre-Renovation Energy Usage	188,249 kBtu
Total Post-Renovation Energy Usage	104,814 kBtu
Projected Energy Usage Reduction (kBtu)	83,435 kBtu
Projected Energy Usage Reduction (%)	44.3 %

5. APPENDIX -CALCULATIONS/PHOTOS

Photo #1	Pre-Renovation Front Elevation

Photo #1	Pre-Renovation Side Elevation

Photo #3	Pre-Renovation Oil Boiler

Photo #4	New Batt Insulation in Walls

Photo #5	Renovation Plumbing Rough-In

Photo #6	New Natural Gas Furnace and Air Handling Unit

Photo #7	New Programmable Thermostat

Photo #2	New Window Elevation

Photo #9	New Ground Mounted Exterior Condensing Unit

Photo #10	New CFL Recessed Lighting Fixture

Photo #11	Post-Renovation Front Elevation

Photo #12	Post Renovation Side Elevation

5810 Park Heights Avenue - Baltimore, MD

Pre-Renovation Energy Usage Calculations

No.2 Fuel Oil

(900 gallons) X (138.5 kBtu/gal) = 124,650 kBtu

Electricity

Cooling - (6 Units) X (1,167 kWH) X (3.412 kBtu/kWh) = 23,891 kBtu

Other - (4,750 kWh) X (3.412 kBtu/kWh) = 16,208 kBtu

Natural Gas

HWH - (235 therms) X (100 kBtu/therm) = 23,500 kBtu

Total Pre-Renovation Energy Usage = 124,650 kBtu + 23,891 kBtu + 16,208 kBtu + 23,500 kBtu = **188,249 kBtu***

*Estimated

Life Cycle Cost Estimate for
1 ENERGY STAR Qualified Room Air Conditioner(s)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors.

Enter your own values in the gray boxes or use our default values.

4

Number of units	1	
Electricity Rate ($/kWh)	$0.120	
	ENERGY STAR Qualified	**Conventional Unit**
Initial Cost per Unit (estimated retail price)	$220	$170
Energy Efficiency Ratio (EER)	10.8	9.0
Cooling Capacity of Air Conditioner (Btu/hr)	10,000	10,000

Annual and Life Cycle Costs and Savings for 1 Room Air Conditioner(s)

	1 ENERGY STAR Qualified	1 Conventional Unit(s)	Savings with ENERGY
Annual Operating Costs*			
Energy cost	$117	$140	$23
Energy consumption (kWh)	*972*	*1,167*	*194*
Maintenance cost	$0	$0	$0
Total	**$117**	**$140**	**$23**
Life Cycle Costs*			
Operating costs (energy and maintenance)	$867	$1,041	$173
Energy costs	$867	$1,041	$173
Energy consumption (kWh)	*8,750*	*10,500*	*1,750*
Maintenance costs	$0	$0	$0
Purchase price for 1 unit(s)	$220	$170	-$50
Total	**$1,087**	**$1,211**	**$123**
		Simple payback of initial additional cost (years)†	**2.1**

Post-Renovation Energy Usage Calculations

Install Wall Insulation

Step 1	Obtain total cost of installing wall insulation:				
					$
Step 2	Transfer the following information from the Survey:				
	a Heating degree-day zone:		2.88		DDZ
	b Wall construction and siding type:				
	c Wall area to be insulated:		2315		sq. ft.
	d Cost of heating fuel:	Gas:			$/therm
		Oil:			$/gal
		Electric:			$/kWh
		Propane:			$/gal
Step 3	Obtain the following savings factors from Table 1:				
Table 1	Savings factor for existing wall type and fuel:		0.05		
Step 4	Estimate annual energy savings:				

2a		2c		3			
2.88	x	2315.00	x	0.05	=	333.36	/yr

Step 5 Estimate annual energy savings:

4		2d			
333.36	x		=	0.00	/yr

Step 6 Calculate payback period:

1		5			
0.00	/	0.00	=	0.00	yrs

Table 1: Savings Factors for Installing Wall Insulation

Instructions:

1) Find your wall construction type (see Step 2b).
2) Proceed across table to column with your heating fuel type.
3) Select the appropriate savings factor and transfer it to Step 3.

	Heating Fuel Type			
Wall Construction	**Gas**	**Oil**	**Electric**	**Propane**
Wood frame (unisulated)				
Wood siding	0.049	0.035	1.00	0.053
Aluminum siding	0.052	0.037	1.06	0.057
Brick siding	0.050	0.036	1.02	0.055
Masonry wall (uninsulated)				
Concrete block	0.107	0.076	2.19	0.117
All brick	0.085	0.061	1.75	0.093

Replace Ineffficient Cooling Equipment

Existing Cooling Equipment		New Cooling Equipment	
Please enter the total tonnage of the cooling plant:	5	Please enter the total tonnage of the new cooling equipment:	3
Please input the existing EER the cooling plant:	9.0	Please input the EER of the new cooling equipment:	13.00
Existing kW/ton:	1.33	New kW/ton:	0.92
Estimated annual operating hours:	950	Estimated new annual operating hours:	1,200
Annual kWh consumption of the existing cooling plant:	6,333	Annual kWh consumption of the new cooling equipment:	3,323

Energy Savings Summary

Annual kWh savings with new cooling plant:	3,010
Estimated total annual cost savings:	$ -
Estimated installed cost of new cooling plant	
Simple Payback (years):	

Replace Inefficient Heating Plant

Step 1 Obtain total cost of replacing the heating plant, including equipment, labor, structural alterations, etc.

		$

Step 2 Transfer the following information from the Survey:

a	Annual heating fuel consumption:	Gas:		therms/yr
		Oil:	900	gal/yr
		Propane:		gal/yr
b	Measured/Estimated Combustion efficiency of existing plant:		85%	
	Estimated Combustion efficiency of new boiler plant:		95%	
c	Cost of heating fuel:	Gas:		$/therm
		Oil:		$/gal
		Propane:		$/gal

Step 3 Estimate efficiency improvement (as a decimal fraction):

			2b		
	95%	-	85%	=	10%

Step 4 Estimate annual energy savings:

	3		2a			
Gas:	10%	x	-	=	-	therms/yr
Oil:	10%	x	900.00	=	90	
Propane:		x	0.00	=		$/yr

Install Replacement Windows

Step 1	Obtain total cost of replacing windows:				
					$
Step 2	Transfer the following information from the Survey:				
	a Heating degree-day zone:		2.88	DDZ	
	b Area of windows to be replaced:		235	sq. ft.	
	c Total volume of buildings in development:		10200	cu. ft.	
	d Are existing windows adequately weatherstripped:				
	e Cost of heating fuel:	Gas:		$/therm	
		Oil:		$/gal	
		Electric:		$/kWh	
		Propane:		$/gal	
Step 3	Obtain the following savings factors from Tables 1 and 2:				
Table 1	**a** Conductance savings factor:		0.18		
Table 2	**b** Infiltration savings factor:		0.0026		

Step 4 Estimate annual energy savings due to conduction losses:

2a		2b		3a			
2.88	x	235.00	x	0.18	=	121.82	/yr

Step 5 Estimate annual energy savings due to infiltration losses:

2a		2c		3b			
2.88	x	10200.00	x	0.00	=	76.38	/yr

Step 6 Estimate total energy savings:

		4		5			
		121.82	+	76.38	=	198.20	/yr

Control Building Air Leakage

Step 1 Obtain total cost of air sealing:

# of Units		cost/unit:			Total Cost

Step 2 Transfer the following information from the Survey:

a	Heating degree-day zone:	2.88	DDZ
b	Total volume of buildings in development:	10,200	cu. ft.
c	Cost of heating fuel: Gas:		$/therm

Step 3 Obtain the following savings factors from Table 1:

Table 1 Infiltration savings factor: 0.0026

Step 4 Estimate annual energy savings:

2a		2b		3			
2.88	x	10,200	x	0.003	=	76	therm/yr

Step 5 Calculate annual energy savings:

4		2c			
76	x	0.00	=	0	$/yr

Step 6 Calculate payback period:

1		5			
0	/	0	=		yrs

Table 1: Infiltration Savings Factors

Fuel	Savings Factor
Gas	0.0026
Oil	0.0019
Electric	0.053
Propane	0.0028