



West Allis LED Lighting Memo

City of West Allis

17-1034.00

July 27th, 2017



July 27, 2017

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West Allis City Hall

7525 W Greenfield Ave

West Allis, WI 53214

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Introduction

The purpose of this memo is to report the findings of the West Allis Lighting Survey performed by Harwood Engineering and to summarize the potential energy and cost savings resulting from a fluorescent lighting to energy-efficient light-emitting diode (LED) lighting conversion. Ten West Allis municipal buildings were covered in the survey: the Health Department building, the Department of Public Works building, the Senior Center, City Hall, the Police Department building, the Library, the Fire Administration building, and Fire Stations #1, #2, and #3. On each survey walkthrough, Harwood used original building plans to count and confirm light fixture types, type and number of lamps, hours of use, and room lighting controls. Every accessible room was included in the survey, and, whenever inaccessible, building records were used to infer survey information.

Using the information gathered, Harwood examined three different types of LED replacements. The replacements are described as follows:

- LED fixture replacement—a full lighting redesign where existing light fixtures are demolished and replaced with energy-efficient LED fixtures.
- LED plug and play lamp replacement—fluorescent lamps are removed from their fixtures and replaced with LED lamps.
- LED line voltage replacement—the ballast (a device that regulates voltage) connected to a fluorescent fixture is removed and the fixture is converted to run at full line voltage. An LED lamp is then installed into the fixture.

Survey Summaries

Health Department

The Health Department building's fixtures are good candidates for LED plug and play or line voltage retrofit since they are still in good condition. Occupancy sensors would be a good fit in exam rooms and the open offices. Fixture replacements will be required for the high-bay fixtures in the vestibules

Department of Public Works

Of all the buildings surveyed, the fixtures in the Public Works Building are in the roughest condition. Fixtures were added as needed throughout the building, and most are standard 4' fluorescent strip fixtures with one or two lamps. The fixtures in the garages are 4 lamp fluorescent high bays which are good candidates to be replaced with more efficient LED high bay fixtures.

City Hall

Similar to the Health Department, the majority of City Halls fixtures are in good working order—especially those in the more recently renovated parts of the building. This is another good location for LED retrofit of existing fixtures. The common council chambers were surveyed, but were not included in calculations because many of the fixtures are decorative, and LED replacement lamps are incompatible. Private and open offices are good candidates for occupancy sensors within the building.



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Senior Center

The Senior Center's fixtures are older, but have been well-maintained, show few signs of wear, and are good candidates for LED retrofit. Fixtures are not in need of replacement. Given the sporadic schedule of classes, each community room could benefit from automatic lighting controls. One mechanical room in the basement was inaccessible, but the plans were mostly accurate throughout the rest of the building.

Police Department

The Police Department has newer fixtures than most of the other buildings surveyed. Few fixtures were in need of replacement, but one location was in the shooting range where double-head halogen fixtures are mounted horizontally on the sound baffling suspended from the ceiling. Occupancy sensor candidates should include the garage and open office areas. One high security area was inaccessible during the survey, and plans were used to predict lighting and usage in that case.

Library

There are a number of fixtures in the Library that should be under consideration for replacement. The sodium lights in the lobby and the high-bay fluorescent in the main floor can offer plenty of energy savings if replaced with LED fixtures. The other fixtures in the building are in good condition and can be retrofitted fairly easily. The staff areas could benefit from occupancy sensors to allow the lighting to dim or switch off when the rooms are vacant.

Fire Administration

The Fire Administration building has modern fixtures which are in very good condition. LED retrofits would allow for greater energy efficiency and suit this building well. Occupancy sensors could go in the offices, locker rooms, and fitness center.

Fire Station #1

Fire Station #1 has older fixtures and the apparatus bay strip fixtures may be good candidates for LED replacements. The common areas are in need of updated lighting, and the fixtures are appropriate for LED retrofit. Occupancy sensors can go in the locker rooms and common areas.

Fire Station #2

The fixtures in Station #2 appeared to be in the best condition of the three stations and are perfect candidates for LED retrofit. The apparatus bay strip fixtures, like Station #1, could be replaced with LED replacements to offer better efficiency in that area.



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Fire Station #3

Station #3 has many fixtures in need of an update. The surface mount square fixtures in the corridors will require full replacement as the lamps are costly and there are no LED retrofit equivalents. The apparatus bay has similar fixtures to stations #1 and #2 and is therefore a good candidate for fixture replacements, and the strip lighting in the basement is fitted with very inefficient T-12 linear fluorescent lamps.

The end of this memo has an appendix that contains the calculations for all surveyed building. Full results are available by request and were not attached due to length.

Results

Using the data gathered from the survey, Harwood then estimated the kilowatt-hour (kWh) savings for each replacement type and calculated the cost savings based on each building's WE Energies rate. On top of the rate savings, LED lamps also carry fewer yearly maintenance costs than fluorescent lamps as LEDs need to be replaced far less often. From these values, we found the total cost savings for each building.

Harwood Engineering then discussed the project with multiple lighting representatives and electrical contractors. From those discussions, estimates on equipment and installation costs were obtained. Using a per fixture equipment and construction cost, we found the total cost of replacement for each building.

Lastly, we investigated Focus on Energy Wisconsin lighting rebates. The incentives come in two varieties: prescriptive incentives, and custom incentives. Prescriptive incentives are typically a simple rebate on the cost of each new fixture based on the fixture-type being replaced. Custom incentives are more personalized and take all aspects of a project into account and typically are calculated based on energy in kWh saved.

Using the above factors we have calculated the payback period for each building under all three LED replacement options, and, based on that information, as well as feedback from electrical contractors and West Allis maintenance personnel, we suggest moving forward with an LED line voltage replacement in every compatible fixture. In the few fixtures that are not compatible and for the high-bay fixtures, we recommend a full LED fixture replacement.

The benefits from LED line voltage replacements are many. Line voltage replacements have great payback periods across the board, make use of existing fixtures, and remove a possible point of failure in the fixture—the ballast. Most importantly, line voltage replacements make it easier for maintenance to deal with lamp replacement as each fixture is under the same voltage and there is far less danger of installing an incorrect lamp, which could cause an electric shock or fire.

The tables below contain estimated paybacks and installation costs of the hybrid Line Voltage LED/fixture replacement for each building.



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Line Voltage Replacement		
	Payback (Years)	
Building	Prescriptive Incentive	Custom Incentive
Health Department	3.29	2.93
Senior Center	3.78	3.61
Fire Station 3	3.69	3.82
Police Department	4.66	4.01
Library	4.62	4.06
City Hall	5.34	4.84
Fire Station 2	4.76	4.87
Fire Department Administration	5.66	5.05
Fire Station 1	5.25	5.29
Department of Public Works	8.18	8.51

Table 1: Comparison of Estimated Line Voltage/Fixture Replacement Paybacks by Incentive Type

Line Voltage Replacement		
Building	Installation Cost	Savings (per year)
Police Department	\$72,547.00	\$14,634.00
Library	\$63,290.00	\$12,589.00
City Hall	\$56,176.00	\$9,850.00
Department of Public Works	\$87,470.00	\$9,706.00
Senior Center	\$20,332.00	\$5,011.00
Fire Station 2	\$23,020.00	\$4,307.00
Health Department	\$14,401.00	\$4,043.00
Fire Station 3	\$12,270.00	\$2,970.00
Fire Station 1	\$13,204.00	\$2,282.00
Fire Department Administration	\$13,216.00	\$2,197.00

Table 2: Estimated Installation Costs and Cost Savings of hybrid Line Voltage/Fixture Replacement



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Conclusion

Harwood Engineering recommends seeking the highest Focus on Energy incentive through Line Voltage LED replacement following the below 2-year plan:

2 Year Plan		
	Building	Estimated Cost
Year One	City Hall	\$56,176.00
	Health Department	\$14,401.00
	Library	\$63,290.00
	Senior Center	\$20,332.00
	Fire Station #2	\$23,020.00
	5 Buildings	\$177,219.00
Year Two	Fire Station #1	\$13,204.00
	Fire Station # 3	\$12,270.00
	Fire Department Administration	\$13,216.00
	Police Department	\$72,547.00
	Department of Public Works	\$87,470.00
	5 Buildings	\$198,707.00
Overall Total	10 Buildings	\$375,926.00

Table 3: Recommended 2 Year Plan

The above plan takes both payback period and cost savings into account, while ensuring that all stakeholders are being addressed. It also considers the best methods to maximize received Focus on Energy incentives.

In most of the buildings, custom Focus on Energy incentives are greater than prescriptive incentives. This is due to the City of West Allis qualifying for the Comprehensive Lighting Initiative, which allows for municipalities to receive a greater incentive rate if 75% or more of the fixtures in a building are upgraded and automatic lighting controls are included in the design. In buildings such as the Fire Stations, where prescriptive incentives are greater, automatic controls will not be necessary for incentives, though they are still recommended.

If the project is approved and can begin before the end of the year, the next step will be gaining Focus on Energy pre-approval, which can be applied for using the calculations Harwood Engineering has prepared for Year One. Pre-approval guarantees incentives under the current structure which ensures that rebates will not change in the short term with Focus on Energy program adjustments. With the incentives



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guaranteed, annotated plans of the buildings can be drawn up with fixture replacements designated and specified, and the project can begin bidding.

We at Harwood Engineering are delighted to have the opportunity to work with the City of West Allis, and look forward to serving the project in all capacities. If you have any questions, comments, or requests for copies of survey results and calculations, please feel free to contact us using the information at the bottom of the document, or email at logan.brick@hecl.com.

Appendix

The attached tables are the custom incentive calculation summaries for each building. Due to the amount of fixtures in some buildings, two tables extend across multiple pages. Each table is labeled and they are in the following order:

1. West Allis Health Department (1 page)
2. West Allis Department of Public Works Building (1 page)
3. West Allis City Hall (2 pages)
4. West Allis Senior Center (1 page)
5. West Allis Police Department (2 pages)
6. West Allis Library (1 page)
7. West Allis Fire Administration Building (1 page)
8. West Allis Fire Station #1 (1 page)
9. West Allis Fire Station #2 (1 page)
10. West Allis Fire Station #3 (1 page)



255 North 21st Street, Milwaukee, Wisconsin 53233 Phone: (414) 475-5554 Fax: (414) 773-9299 www.hecl.com

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West Ails City Hall

Room Number	Room Name	Area (m²)	Annual Energy Usage (kWh)	Peak Power (kW)	Replacement Fixture	Annual Energy Usage of Replacement (kWh)	Annual Energy Savings (kWh)	Annual Maintenance Cost Saving	Cost of New Equipment	Cost of Utility	Total Installation Cost	Payback Period (Years)
1	Server Room	150	2711	2711	NA	NA	0	NA	NA	NA	NA	NA
2	3 Storage	150	531	531	NA	NA	0	NA	NA	NA	NA	NA
3	4 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
4	5 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
5	6 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
6	7 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
7	8 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
8	9 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
9	10 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
10	11 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
11	12 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
12	13 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
13	14 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
14	15 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
15	16 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
16	17 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
17	18 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
18	19 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
19	20 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
20	21 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
21	22 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
22	23 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
23	24 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
24	25 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
25	26 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
26	27 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
27	28 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
28	29 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
29	30 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
30	31 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
31	32 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
32	33 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
33	34 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
34	35 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
35	36 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
36	37 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
37	38 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
38	39 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
39	40 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
40	41 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
41	42 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
42	43 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
43	44 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
44	45 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
45	46 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
46	47 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
47	48 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
48	49 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
49	50 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
50	51 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
51	52 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
52	53 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
53	54 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
54	55 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
55	56 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
56	57 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
57	58 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
58	59 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
59	60 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
60	61 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
61	62 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
62	63 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
63	64 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
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66	67 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
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68	69 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
69	70 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
70	71 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
71	72 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
72	73 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
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75	76 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
76	77 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
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78	79 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
79	80 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
80	81 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
81	82 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
82	83 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
83	84 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
84	85 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
85	86 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
86	87 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
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88	89 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
89	90 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
90	91 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
91	92 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
92	93 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
93	94 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
94	95 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
95	96 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
96	97 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
97	98 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
98	99 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
99	100 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
100	101 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
101	102 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
102	103 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
103	104 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
104	105 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
105	106 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
106	107 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
107	108 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
108	109 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
109	110 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
110	111 Reception	1500	822	1100	NA	NA	0	NA	NA	NA	NA	NA
111	112 Reception	1500	822	1100	NA	NA	0					

West Hills Police Department

Room Number	Room Name	Actual Hours of Use	Annual Total Energy Usage (kWh)	Replacement Power	Annual Energy Usage of Replacement (kWh)	Annual Energy Savings (kWh)	Annual Maintenance Cost Savings	Cost of New Equipment	Payback Period (Years)
11	11st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
2	2nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
3	3rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
4	4th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
5	5th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
6	6th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
7	7th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
8	8th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
9	9th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
10	10th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
11	11th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
12	12th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
13	13th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
14	14th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
15	15th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
16	16th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
17	17th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
18	18th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
19	19th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
20	20th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
21	21st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
22	22nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
23	23rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
24	24th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
25	25th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
26	26th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
27	27th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
28	28th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
29	29th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
30	30th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
31	31st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
32	32nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
33	33rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
34	34th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
35	35th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
36	36th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
37	37th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
38	38th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
39	39th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
40	40th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
41	41st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
42	42nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
43	43rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
44	44th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
45	45th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
46	46th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
47	47th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
48	48th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
49	49th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
50	50th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
51	51st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
52	52nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
53	53rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
54	54th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
55	55th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
56	56th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
57	57th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
58	58th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
59	59th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
60	60th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
61	61st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
62	62nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
63	63rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
64	64th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
65	65th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
66	66th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
67	67th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
68	68th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
69	69th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
70	70th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
71	71st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
72	72nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
73	73rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
74	74th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
75	75th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
76	76th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
77	77th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
78	78th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
79	79th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
80	80th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
81	81st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
82	82nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
83	83rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
84	84th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
85	85th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
86	86th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
87	87th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
88	88th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
89	89th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
90	90th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
91	91st	2400	2400	2400	2400	0	\$5.97	\$120	20.0
92	92nd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
93	93rd	2400	2400	2400	2400	0	\$5.97	\$120	20.0
94	94th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
95	95th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
96	96th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
97	97th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
98	98th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
99	99th	2400	2400	2400	2400	0	\$5.97	\$120	20.0
100	100th	2400	2400	2400	2400	0	\$5.97	\$120	20.0

West Mills Fire Administration Building

Room Number	Room Name	Fixture Description	Annual Hours of Use	Annual Energy Usage (kWh)	Replacement Option	Replacement Fixture	Annual Energy Usage of Replacement (kWh)	Annual Energy Savings (kWh)	Annual Energy Cost Savings	Annual Maintenance Cost Savings	Focus on Energy Intensive	Cost of New Equipment	Cost of Labor	Total Installation Cost	Payback Period (Years)
201	Stair	4' x 6' Wall Pack	2,000	3,000	24' Parabolic Troffer	2,000	128	128	\$20.00	\$2.56	\$5.79	\$22.80	\$24.00	\$46.80	4.27
202	1 Male's Toilet	4' x 6' Wall Pack	2,000	1,000	24' Parabolic Troffer	2,000	49	49	\$9.17	\$1.17	\$5.19	\$21.60	\$23.00	\$44.80	4.55
203	1 Female's Toilet	4' x 6' Wall Pack	2,000	1,000	24' Parabolic Troffer	2,000	117	117	\$18.24	\$2.34	\$5.19	\$46.60	\$49.00	\$95.80	4.72
3	3 Showers	JP Surface Quartz - Wall Unit	1,200	1,200	JP Surface Quartz - Wall Unit	1,200	43	43	\$5.10	\$4.10	\$2.60	\$108.00	\$112.00	\$216.00	17.88
4	3 Showers	JP Surface Quartz - Wall Unit	1,200	1,200	JP Surface Quartz - Wall Unit	1,200	21	21	\$14.44	\$11.64	\$2.10	\$24.00	\$26.00	\$50.00	17.66
5	3 Showers	JP Surface Quartz - Wall Unit	1,200	1,200	JP Surface Quartz - Wall Unit	1,200	99	99	\$18.27	\$14.87	\$6.38	\$88.00	\$94.00	\$180.00	4.27
6	8' x 12' Wall Pack	4' x 6' Wall Pack	2,000	50	24' Parabolic Troffer	2,000	1	1	\$0.15	\$0.15	\$1.19	\$0.20	\$2.00	\$2.00	20.19
8	8' x 12' Wall Pack	4' x 6' Wall Pack	2,000	50	24' Parabolic Troffer	2,000	2	2	\$0.30	\$0.30	\$2.38	\$0.40	\$4.00	\$4.00	40.38
11	11 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	2834	2834	\$222.24	\$283.40	\$99.80	\$283.60	\$292.00	\$576.00	4.66
12	12 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	1890	1890	\$151.14	\$199.80	\$74.40	\$189.20	\$196.00	\$385.00	4.78
13	13 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	464	464	\$37.92	\$48.16	\$18.40	\$46.40	\$48.00	\$94.00	5.77
14	14 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	301	301	\$24.54	\$31.16	\$12.00	\$30.40	\$32.00	\$62.00	5.77
15	15 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	313	313	\$25.64	\$32.64	\$12.60	\$31.60	\$33.00	\$64.00	6.14
16	16 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	31	31	\$2.52	\$3.24	\$1.20	\$3.00	\$3.00	\$6.00	12.03
17	17 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	31	31	\$2.52	\$3.24	\$1.20	\$3.00	\$3.00	\$6.00	12.03
18	18 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
19	19 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
20	20 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
21	21 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
22	22 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
23	23 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
24	24 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
25	25 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
26	26 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
27	27 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
28	28 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
29	29 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
30	30 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
31	31 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
32	32 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
33	33 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
34	34 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
35	35 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
36	36 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
37	37 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
38	38 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
39	39 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
40	40 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
41	41 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
42	42 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
43	43 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
44	44 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
45	45 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
46	46 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
47	47 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
48	48 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
49	49 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
50	50 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
51	51 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
52	52 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
53	53 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
54	54 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
55	55 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
56	56 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
57	57 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
58	58 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
59	59 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
60	60 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
61	61 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
62	62 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
63	63 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
64	64 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
65	65 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
66	66 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
67	67 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
68	68 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
69	69 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
70	70 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
71	71 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23	23	\$1.86	\$2.38	\$0.90	\$2.30	\$2.30	\$4.60	11.86
72	72 Men's Office	24' Parabolic Troffer	2,000	2,000	24' Parabolic Troffer	2,000	23								

