Honeywell

Honeywell Building Solutions

Energy Audit Report

Presented To:

City of Bangor, Maine

City Buildings

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INTRODUCTION

Purpose

Honeywell is pleased to submit our proposal for comprehensive energy efficiency and HVAC upgrades throughout the City of Bangor buildings. The proposal is intended to provide an overview of our recommendations to reduce and contain energy costs throughout the City Buildings. In addition, it was developed to outline additional "non-energy saving" improvements designed to provide a more comfortable and healthy working environment.

Background – Why This Program is Needed

In order to reduce energy consumption and address deficiencies in its facilities, the City of Bangor and Honeywell agreed to explore the potential to use Energy Savings Performance Contracting as a vehicle to provide and fund necessary improvements. The philosophy behind this analysis is to identify improvements that can be paid for by utilizing energy and operational savings, with no financial risk. Our solution provides a means to upgrade your facilities and improve conditions, without any additions to your budget. The measures identified in this audit fulfill the City's needs by providing needed facility improvements, improved building comfort, and energy and operational cost reductions. The proposed project(s) maximizes the improvements that can be paid through savings.

In our discussions with City representatives, we identified several primary needs that will be addressed in Honeywell's proposed solution. The primary needs that we identified are:

- ***Reduce Operating Costs*** - The first priority is to implement a project that makes economic sense for the City by reducing operating costs, and creating a savings stream that will pay for the project.
- ***Improve the Comfort of the Occupants*** – Some of the current building HVAC systems are not operating properly. Comfort issues exist in a number of buildings. In some cases it is due to antiquated equipment, in others it is existing systems not operating properly. This project outlines a plan to addresses those issues. As a result, uneven heating and cooling conditions are having a negative impact on the comfort of the occupants of the facilities. Our solution addresses these issues by upgrading the systems, and by repairing existing equipment that will remain in place. Our recommendations will also enable building staff and occupants to control their conditions more precisely, thereby improving both comfort and efficiency.
- ***Address Aging Equipment*** - Our discussions with City personnel, as well as our physical examination of the facilities, identified a number of pieces of critical equipment that are well beyond their useful life.

Honeywell extends its sincere thanks to all City of Bangor personnel who assisted with the development of this report.

Audit Overview

Although this report focuses on the designated "City Buildings," we will provide a general overview of our survey process to date. This overview is intended to provide an update to the City of the current stage of the overall energy audit of all City buildings, including the Airport, Waste Water Treatment Building and the School Department. In addition, this overview is intended to provide an outline of the energy usage baseline information we have established in order to receive feedback from the City.

In the Fall of 2006, Honeywell started the data collection for the energy audit. This included gathering utility data and developing a master list of all utility accounts. Our initial goal was to establish an energy baseline for all energy and utility bills paid by the City of Bangor. In addition, we wanted to evaluate and validate the billing information including the address, meter number, account numbers, utility rates, and the City department responsible for payment. This included the input and evaluation of 24 months of actual bills for all City accounts.

The following table summarizes the number of accounts and bills entered. The revised number of accounts represents number of accounts included in the audit based upon the current list of buildings. To date, accounts have been eliminated due to the size of the bill and location (i.e. street, traffic lights and leased buildings).

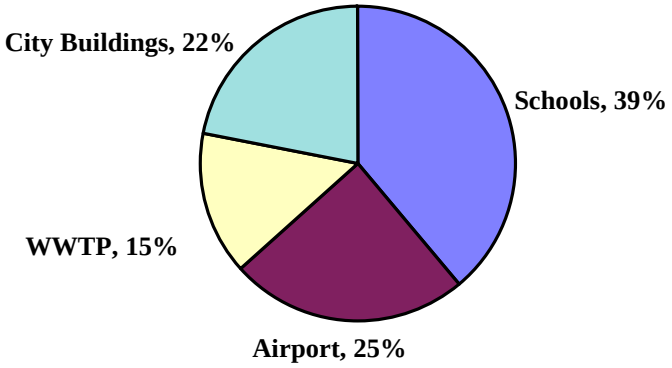
Utility Type	# of Accounts	# of Bills Reviewed	Revised # of Accounts
Electric	188	4,512	64
Fuel Oil	47	1292	32
Propane	4	54	4
Water & Sewer	59	472	47
Diesel		178	N/A

Once winter arrived with consistently cold temperatures, we began data logging in the buildings to document building operating conditions for temperature and equipment run times. Data loggers utilized included temperature, lighting and motor loggers. In addition to the energy baseline development process, we started our detailed surveys of the list of buildings and applicable City infrastructure provided. To date, the initial detailed surveys have been completed.

Consistent with the findings of this report, our next steps is to review with the designated City employees the preliminary scope of work identified at the four different building segments that have been identified. The segments include "City Buildings," "Airport Buildings," "Waste Water Treatment Building & Infrastructure," and the "School Department Buildings."

The following is an overview of the buildings included in this group, along with a summary of their existing utility consumption data.

Utility Costs by Type of Building



City Buildings

Included on the following page.

City Buildings

Base Year:			
Armory Electric =	July 04 to June 06	Health & Welfare Electric =	July 04 to June 06
Armory Oil =	July 04 to June 06	Health & Welfare Oil =	July 04 to June 06
Armory Water/Sewer =	July 04 to June 06	Health & Welfare Water/Sewer =	August 06 to July 07
Bangor Auditorium/Civic Center Electric =	July 04 to June 06	Mansfield Baseball Stadium Electric =	July 04 to June 06
Bangor Auditorium/Civic Center Oil =	July 04 to June 06	Mansfield Baseball Stadium Oil =	NA
Bangor Auditorium/Civic Center Water/Sewer =	NA	Mansfield Baseball Stadium Water/Sewe	July 05 to June 06
Central Fire Station Electric =	July 04 to June 06	Park Woods Apartments Electric =	July 05 to June 06
Central Fire Station Oil =	July 04 to June 06	Park Woods Apartments Oil =	July 05 to June 07
Central Fire Station Water/Sewer =	July 04 to June 06	Park Woods Apartments Water/Sewer =	February 05 to January 06
City Hall Electric =	July 04 to June 06	Public Works Building Electric =	July 04 to June 06
City Hall Oil =	July 04 to June 06	Public Works Building Oil =	July 04 to June 06
City Hall Water/Sewer =	September 04 to August 06	Public Works Building Water/Sewer =	July 04 to June 06
Fire Station #5 Electric =	July 04 to June 06	Recycling/Bus Electric =	July 04 to June 06
Fire Station #5 Oil =	July 04 to June 06	Recycling/Bus LP Gas =	July 04 to June 06
Fire Station #5 Water/Sewer =	July 04 to June 06	Recycling/Bus Water/Sewer =	August 04 to July 06
Fleet Maintenance Building Electric =	July 04 to June 06	Sawyer Arena Electric =	July 04 to June 06
Fleet Maintenance Building LP Gas =	July 04 to June 06	Sawyer Arena Oil =	July 04 to June 06
Fleet Maintenance Building Water/Sewer =	August 05 to July 06	Sawyer Arena Water/Sewer =	July 05 to June 06
Golf Course Club House Electric =	July 04 to June 06	Union St Athletic Complex Electric =	July 04 to June 06
Golf Course Club House Oil =	July 04 to June 06	Union St Athletic Complex Oil =	July 04 to June 06
Golf Course Club House Water/Sewer =	July 05 to June 06	Union St Athletic Complex Water/Sewer =	NA

	Electric				# 2 Fuel Oil			# 5 Fuel Oil			Propane (LP Gas)			Water/Sewer			Total $	Total	$
Building	Average KW	Ann. kWh	$	Blended $/kWh	Gallons	$	$/Gal	Gallons	$	$/Gal	Gallons	$	$/Gal	Gallons	$	$/Gal	All Utilities	Square Feet	Per SF
Armory Building (Parks & Rec)	29	119,200	$ 16,354	$ 0.137	10,524	22,620	$ 2.1494							208,318	$ 1,694	$0.008132	$ 40,668	16,575	$ 2.45
Bangor Auditorium/Civic Center	168.3	579,000	$ 77,632	$ 0.134				54,925	90,651	$ 1.6505	-	-		837,386	6,669	$0.007964	$ 174,952	51,793	$ 3.38
Central Fire Station	51.1	160,160	$ 22,476	$ 0.140	8,656	18,683	$ 2.1584							326,128	$ 2,628	$0.008058	$ 43,787	18,576	$ 2.36
City Hall	91.1	314,160	$ 42,194	$ 0.134	21,534	46,564	$ 2.1623							237,116	1,948	$0.008215	$ 90,706	39,708	$ 2.28
Fire Station #5	0	38,880	$ 5,607	$ 0.144	2,672	5,765	$ 2.1576							124,542	$ 1,084	$0.008704	$ 12,456	5,923	$ 2.10
Fleet Maintenance Building	35.3	130,560	$ 18,268	$ 0.140							14,654	21,906	$ 1.4949	83,028	739	$0.008901	$ 40,913	15,200	$ 2.69
Golf Course Club House	0	17,789	$ 2,666	$ 0.150	1,386	$ 2,939	$ 2.1205							234,872	1,300	$0.005535	$ 6,905	3,175	$ 2.17
Health & Welfare	59.8	324,240	$ 41,140	$ 0.127	61,342	$ 125,421	$ 2.0446							2,936,648	23,355	$0.007953	$ 189,916	65,000	$ 2.92
Mansfield Baseball Stadium	122.0	69,120	$ 19,872	$ 0.288										234,872	1,300	$0.005535	$ 21,172	4,920	$ 4.30
Park Woods Apartments - 60 Buildings	0	623,826	$ 98,741	$ 0.158	157,688	$ 341,552	$ 2.1660							2,349,468	18,681	$0.007951	$ 458,974	39,620	$ 11.58
Public Works Building	50.9	149,680	$ 21,123	$ 0.141	8,810	18,438	$ 2.0928							619,718	$ 5,543	$0.008944	$ 45,104	18,374	$ 2.45
Recycling Center/Bus Garage/Bus Wash Bay	92.4	206,280	$ 30,265	$ 0.147							15,858	23,735	$ 1.4967	193,358	1,612	$0.008337	$ 55,612	30,960	$ 1.80
Sawyer Arena Ice Rink	111.8	349,160	$ 49,208	$ 0.141	10,275	22,034	$ 2.1444							234,872	1,300	$0.005535	$ 72,542	41,400	$ 1.75
Union Street Athletic Complex	88.5	56,650	$ 13,175	$ 0.233	2,178	4,683	$ 2.1501										$ 17,858		
	900.2	**3,138,705**	**$ 458,722**	**$ 0.146**	**285,065**	**$ 608,699**	**$ 2.1353**	**54,925**	**$ 90,651**	**$ 1.6505**	**30,512**	**$ 45,641**	**$ 1.4958**	**8,620,326**	**$ 67,853**	**$0.007871**	**$ 1,271,566**	**351,224**	**$ 3.62**

9,549,716 Gallons

Annual Summary by Utility:	Utility	Baseline
	Electric	**$ 458,722**
	Fuel Oil	**$ 608,699**
	Fuel Oil	**$ 90,651**
	Propane	**$ 45,641**
	Water & Sewer	**$ 67,853**
	Total	**$ 1,271,566**

Airport Buildings

Building	Electric				# 2 Fuel Oil			Water and Sewer			Total $
	Average KW	Ann. kWh	$	$/kWh	Gallons	$	$/Gal	CCF	$	$/CCF	All Utilities
Bldg 464/Dock 13	55.3	86,680	$ 14,922	$ 0.172	24,841	52,055	$ 2.0955	20	356	$ 17.7940	$ 67,332
Building 96/FAA	25.3	72,360	$ 10,659	$ 0.147	4,895	10,599	$ 2.1655	60	$ 440	$ 7.3405	$ 21,699
Building 100/Airfield Maint	46.2	160,830	$ 22,857	$ 0.142	2,005	4,341	$ 2.1655	225	$ 1,431	$ 6.3581	$ 28,628
Building 121 Gen Aviation	-	88,268	$ 12,561	$ 0.142	2,494	5,332	$ 2.1383	130	$ 809	$ 6.2266	$ 18,702
Building 252 Hangar 8/9	-	25,080	$ 3,684	$ 0.147	3,241	7,019	$ 2.1655	-	108	#DIV/0!	$ 10,810
Building 253 Bldg Maint	0	72,135	$ 10,335	$ 0.143	9,475	20,517	$ 2.1655	264	$ 1,656	$ 6.2712	$ 32,508
Building 461 Dock 10	82.7	342,435	$ 46,981	$ 0.137	22,507	47,223	$ 2.0981	363	2,384	$ 6.5675	$ 96,588
Building 463 Dock 12	28.4	98,892	$ 14,564	$ 0.147	8,500	18,113		12	$ 356	$ 29.6567	$ 33,032
Domestic & International Arrivals	482.6	3,013,009	$ 366,429	$ 0.122	111,045	225,533	$ 2.0310	3,852	$ 21,998	$ 5.7109	$ 613,960
Ramp and Ramp Lights	0	15,591	$ 2,359	$ 0.151	-	$ -	$ -	-	-	#DIV/0!	$ 2,359
Beacon	0	10,252	$ 1,595	$ 0.156						#DIV/0!	$ 1,595
Tank Farm	0	24,607	$ 3,501	$ 0.142				38	301	$ 7.9161	$ 3,802
	720.6	**4,010,139**	**$ 510,448**	**$ 0.127**	**189,002**	**$ 390,731**	**$ 2.0673**	**4,964**	**$ 29,839**	**$ 6.0110**	**$ 931,017**

3,713,072 Gallons

Annual Summary by Utility:	Utility	Baseline
	Electric	$ 510,448
	Fuel Oil	$ 390,731
	Water	$ 8,981
	Sewer	$ 20,857
	Total	$ 931,017

Waste Water Treatment Building & Infrastructure

July 2005 to June 2006

Building	Electric				# 2 Fuel Oil			# 5 Fuel Oil			Water/Sewer			Total $
	Average KW	Ann. kWh	$	$/kWh	Gallons	$	$/Gal	Gallons	$	$/Gal	CCF	$	$/Gal	All Utilities
Waste Water Treatment	1043.7	4,403,400	$ 427,846	$ 0.097	29,613	63,125	$ 2.1317				1,186	1,991	$ 1.6786	$ 492,961
Admin Building											352	703	$ 1.9982	$ 703
Maintenance Building											2	97	$ 48.4650	$ 97
1 Washington Street											152	345		$ 345
Kenduskeag Pump Station	194.4	425,200	$ 61,806	$ 0.145	-	-	#DIV/0!				-		#DIV/0!	$ 61,806
	1,238.0	**4,828,600**	**$ 489,652**	**$ 0.101**	**29,613**	**$ 63,125**	**$ 2.1317**	-	$ -	**#DIV/0!**	**1,692**	**$ 3,136**	**$ 1.8532**	**$ 555,913**

1,265,616 gallons

Annual Summary by Utility:	Utility	Baseline
	Electric	$ 489,652
	Fuel Oil	$ 63,125
	Water	$ 3,136
	Sewer	$ -
	Total	$ 555,913

School Department Buildings

July 2005-June 2006

Building	Electric				# 2 Fuel Oil			Water/Sewer			Total $
	Average KW	Ann. kWh	$	$/kWh	Gallons	$	$/Gal	CCF	$	Combined $/CCF	All Utilities
Abraham Lincoln	91.6	203,790	$ 29,189	$ 0.143	26,004	$ 55,931	$ 2.1508	547	$ 3,280	$ 6.00	$ 88,399
Downeast Elementary	-	214,900	$ 28,653	$ 0.133	33,768	$ 73,448	$ 2.1751	952	$ 3,541	$ 3.72	$ 105,642
Fourteenth Streeet	25.4	80,820	$ 11,650	$ 0.144	19,013	$ 42,045	$ 2.2114	319	$ 1,980	$ 6.21	$ 55,675
Fruit St Elementary	58.7	150,600	$ 21,748	$ 0.144	32,003	$ 68,902	$ 2.1530	625	$ 3,733	$ 5.97	$ 94,383
Vine Street School	44.2	147,800	$ 20,483	$ 0.139	34,195	$ 76,136	$ 2.2265	594	$ 3,556	$ 5.99	$ 100,175
William S Cohen	166.4	461,280	$ 64,240	$ 0.139	60,093	$ 133,775	$ 2.2261	1,006	$ 6,105	$ 6.07	$ 204,119
Cameron Stadium	83.4	46,063	$ 9,579	$ 0.208	-	$ -	$ -	999	$ 5,890	$ 5.90	$ 15,469
Fairmount	65.8	150,200	$ 22,075	$ 0.147	37,014	$ 82,466	$ 2.2280	1,443	$ 8,302	$ 5.75	$ 112,844
Mary Snow	44.0	123,640	$ 18,041	$ 0.146	27,119	$ 61,027	$ 2.2503	900	$ 5,268	$ 5.85	$ 84,336
James F. Doughty	127	393,650	$ 53,637	$ 0.136	48,225	$ 106,868	$ 2.2160	900	$ 5,452	$ 6.06	$ 165,957
Bangor High School	323.2	1,152,000	$ 152,897	$ 0.133	125,520	$ 263,695	$ 2.1008	4,691	$ 26,714	$ 5.69	$ 443,307
	1,029.7	**3,124,743**	**$ 432,192**	**$ 0.138**	**442,954**	**$ 964,294**	**$ 2.1770**	**12,976**	**$ 73,820**	**$ 5.6888**	**$ 1,470,305**

9,706,340 Gallons

Annual Summary by Utility:	Utility	Baseline
	Electric	$ 432,192
	Fuel Oil	$ 964,294
	Water	$ 21,441
	Sewer	$ 52,379
	Total	$ 1,470,305

Baseline Energy History

Honeywell studied and analyzed a two year history of the facility's electrical, fuel oil, LP gas, water and sewer consumption. The baseline energy period selected is as follows:

Base Year Period	Electric	Fuel Oil	Water & Sewer	LP Gas
All Buildings	July 2005 to June 2006	July 2005 to June 2006	July 2005 to June 2006	July 2005 to June 2006

City Buildings Current Utility Rates

Utility information provided by the City and the utility providers included consumption data for Electric, LP Gas, Fuel Oil & Water and Sewer. The usage per building was taken directly from the utility billing information.

The following is a summary of utility costs by building, unit and type that will be utilized in our energy savings calculations.

Utility	Rate Description	Cost per Unit	Utility Account Number	Meter Number
City Hall	Med Commercial LPP Demand	$6.88/kW	4220-0049040-5	015553277
	Electric Consumption	$0.12350/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
Central Fire Station	Med Commercial LPS Demand	$6.96/kW	41966-0072311-0	002806972
	Electric Consumption	$0.12759/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
Fire Station #5	General Service Consumption	$0.1168/kWh	4220-0063538-1	070078051
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
Bass Park Lighting	Med Commercial LPP Demand	$6.88/kW	4215-0053988-5	002759625
	Electric Consumption	$0.12350/kWh		
Bangor Auditorium	Med Commercial LPS Demand	$6.96/kW	41974-0053982-9	004738909
	Electric Consumption	$0.12759/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
#5 Fuel Oil	Fuel Oil- Consumption	$1.70/Gallon		
Athletic Complex Union Street	Med Commercial LPS Demand	$6.96/kW	4222-0109007-1	083959314
	Electric Consumption	$0.12759/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
Armory	Med Commercial LPS Demand	$6.96/kW	4217-0040834-5	017190627
	Electric Consumption	$0.12759/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
Sawyer Arena	Med Commercial LPS Demand	$6.96/kW	4220-0107482-2	011069562
	Electric Consumption	$0.12759/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
Public Works Admin	Med Commercial LPP Demand	$6.88/kW	4223-0029786-6	013775404
	Electric Consumption	$0.12350/kWh		
	General Service Consumption	$0.15591/kWh	18151-0166262-5	007131791
	Water - Consumption	$2.06/CCF		
	LP Gas - Consumption	$1.466/Gallon		
	Fuel Oil- Consumption	$2.0539/Gallon		
Fleet Maintenance/Motor Pool	Med Commercial LPS Demand	$6.96/kW	18151-0028132-2	017190562
	Electric Consumption	$0.12759/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	LP Gas - Consumption	$1.466/Gallon		
Mansfield Park Baseball	Med Commercial LPS Demand	$6.96/kW	4217-0107483-9	011069655
	Electric Consumption	$0.12759/kWh		
	Water - Consumption	$2.06/CCF		
Maine Avenue Recycling	Med Commercial LPP Demand	$6.88/kW	4223-0072691-8	001135756
	Electric Consumption	$0.12350/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	LP Gas - Consumption	$1.466/Gallon		
Webster Avenue Golf Course Clubhouse	General Service Consumption	$0.15591/kWh	4217-0110764-1	007131791
	Water - Consumption	$2.06/CCF		
	LP Gas - Consumption	$1.466/Gallon		
	Fuel Oil- Consumption	$2.0539/Gallon		
Park Woods	Residential Service-Consumption	$0.17533/kWh	4221-0044822-0	082557098
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		
103 Texas Avenue: Health & Welfare	Med Commercial LPP Demand	$6.88/kW	18143-0107410.7	083861884
	Electric Consumption	$0.12350/kWh		
	Water & Sewer - Consumption	$7.28/CCF		
	Fuel Oil- Consumption	$2.0539/Gallon		

Electric Utility Rate Analysis - Base Year Vs Current Rates

Building	Rate Schedule	2005-2006 Electric				2005-2006 Electric at Current Rates			
		Average KW	Ann. kWh	$	$/kWh	KW $	kWh $	Total $	Avg $/kWh
City Hall	LPP	90.9	314,160	$ 42,194	$ 0.134	7,505.2	38,799	$ 46,304	$ 0.147
Central Fire Station	LPS	51.1	160,160	$ 22,476	$ 0.140	4,266.5	20,435	$ 24,701	$ 0.154
Fire Station #5	GS	-	38,880	$ 5,607	$ 0.144		6,062	$ 6,062	$ 0.156
Bass Park Lighting	LPP	151.5	122,700	$ 25,326	$ 0.206	12,507.7	15,153	$ 27,661	$ 0.225
Bangor Auditorium	LPS	168.3	579,000	$ 77,632	$ 0.134	14,057.8	73,875	$ 87,932	$ 0.152
Athletic Complex Union St	LPS	118.0	56,650	$ 13,175	$ 0.233	9,851.7	7,228	$ 17,080	$ 0.301
Armory	LPS	29	119,200	$ 16,354	$ 0.137	2,426.0	15,209	$ 17,635	$ 0.148
Sawyer Arena	LPS	111.7	349,160	$ 49,208	$ 0.141	9,331.8	44,549	$ 53,881	$ 0.154
Public Works Admin	LPP	50.9	153,971	$ 21,785	$ 0.141	4,200.2	19,015	$ 23,216	$ 0.151
Motor Pool/Fleet Maint	LPS	35.2	130,560	$ 18,268	$ 0.140	2,941.0	16,658	$ 19,599	$ 0.150
Mansfield Park/Baseball	LPS	209.1	69,120	$ 18,264	$ 0.264	17,463.3	8,819	$ 26,282	$ 0.380
Maine Ave Recycling	LPP	92.4	206,280	$ 30,265	$ 0.147	7,627.2	25,476	$ 33,103	$ 0.160
Webster Ave Golf Clubhouse	GS	0	17,789	$ 2,666	$ 0.150		2,773	$ 2,773	$ 0.156
Park Woods (1 Bldg 11-17)	RS	0	21,872	$ 3,487	$ 0.159		3,835	$ 3,835	$ 0.175
103 Texas Ave (Health & W)	LPP	59.8	324,240	$ 41,140	$ 0.127	4,933.8	40,044	$ 44,977	$ 0.139
		1,167.9	**2,663,742**	**$ 387,848**	**$ 0.146**	**97,112.3**	**337,930**	**$ 435,042**	**$ 0.163**

Summary of Existing Energy Costs & Usage

The following is a summary of the energy usage and costs during the two years of information collected and analyzed.

Utility Analysis Period: 7/05-6/06 vs. 7/04-6/05

	Current Year (7/05-6/06)				Prior Year (7/04-6/05)			
	Electric	Fuel Oil (Gallons)	Propane LP Gas (Gallons)	Water Sewer (CCF)	Electric	Fuel Oil (Gallons)	Propane LP Gas (Gallons)	Water Sewer (CCF)
Utility Costs	$2,143,602	$1,974,451	$51,342	$180,849	$1,878,487	$1,374,795	$51,802	$179,633
Utility Usage	16,165,345	938,542	34,326	37,035	16,188,161	892,953	41,419	33,297
$ Cost/Unit	$0.1326	$2.10	$1.50	$4.88	$0.1160	$1.54	$1.25	$5.39
Change in Cost	**14%**	**44%**	**-1%**	**1%**				
Change in Usage	0%	5%	-17%	11%				
Change in $ Cost/Unit	**14%**	**37%**	**20%**	**-9%**				

Optimum use of facility will keep usage down and help reduce costs

Note: The utility data above is based on the original survey list and utility bills provided for the Bangor Airport, Public Buildings and Schools. This does not reflect the total utility usage in the proposed scope of work.

The 2006-2007 heating degree days was significantly lower than the previous year (it was a warmer winter). The fuel oil usage should have been significantly less in the 2006-2007 year and was not, indicating heating system issues.

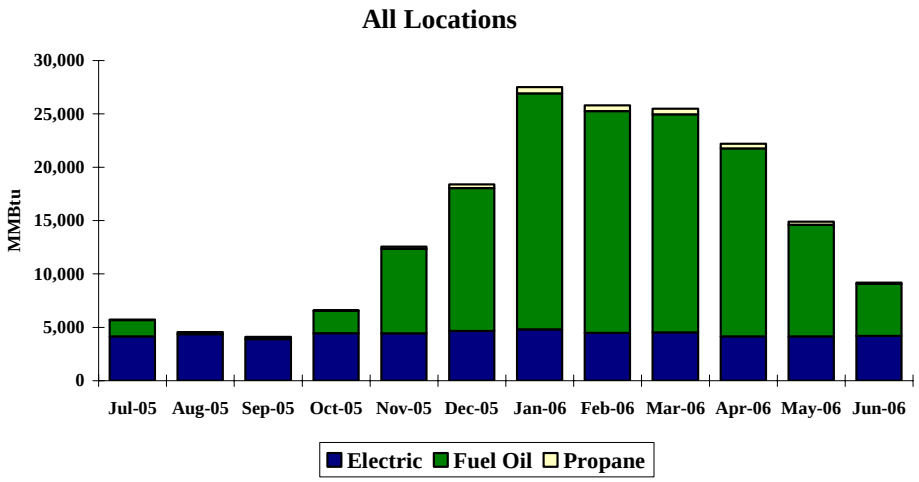
Utility Analysis Project Scope of Work Buildings: 7/05-6/06 vs. 7/04-6/05

	Phase 1 Utility Data				Not included in Phase 1			
	Electric	Fuel Oil (Gallons)	Propane LP Gas (Gallons)	Water Sewer (CCF)	Electric	Fuel Oil (Gallons)	Propane LP Gas (Gallons)	Water Sewer (CCF)
Utility Costs	$1,820,140	$1,755,104	$51,342	$161,878	$323,462	$219,347	$0	$18,971
Utility Usage	14,627,224	833,873	34,326	32,399	1,538,121	104,669	0	4,636
$ Cost/Unit	$0.1244	$2.10	$1.50	$5.00				

Note: The utility data above is based on the proposed scope of work.

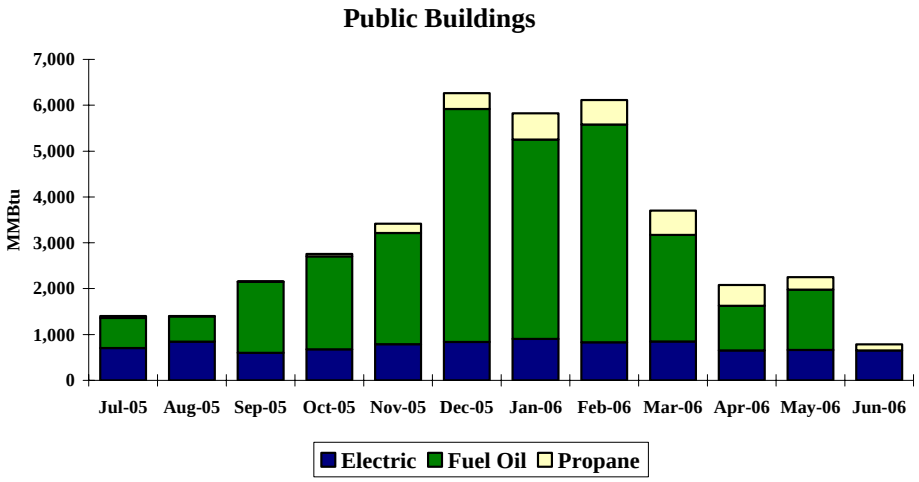
Propane data was requested only for those buildings in the scope of work.

Total Existing Energy Units by Location



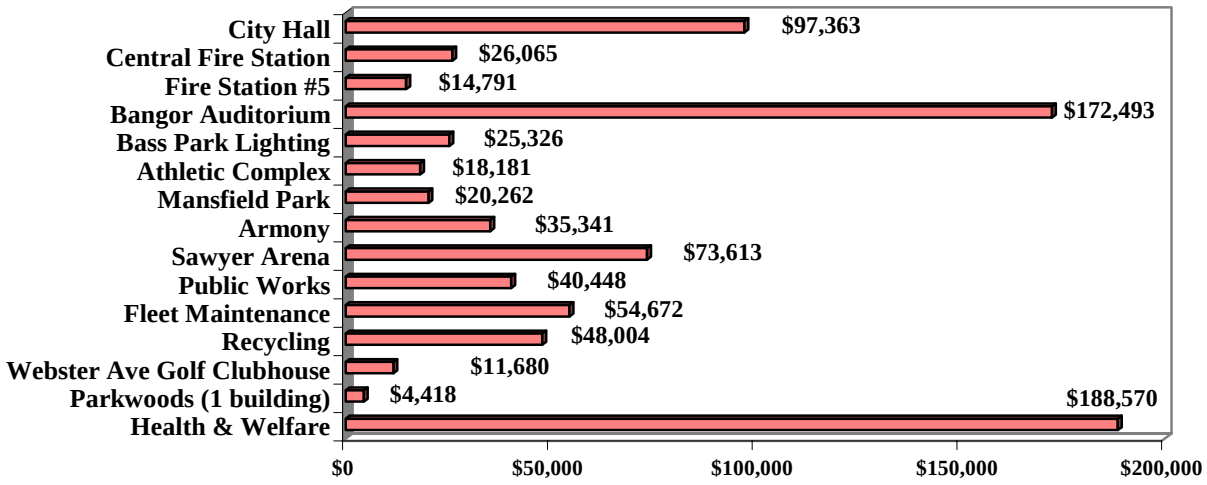
	Total $	Total Units
Electric - kWh	$1,820,140	14,627,224
Water and Sewer - CCF	$161,878	32,399
Fuel Oil - Gallons	$1,755,104	833,873
LP Gas (Propane) - Gallons	$51,342	34,326
7/05-6/06 Total	$3,788,464	

Total Existing Energy Units by Location



	Total $	Total Units
Electric - kWh	$387,848	2,663,742
Water and Sewer - CCF	$55,083	12,767
Fuel Oil - Gallons	$336,954	172,304
LP Gas (Propane) - Gallons	$51,342	34,326
7/05-6/06 Total	$831,227	

Total Existing Energy Spend by Location for City Buildings



Information for this study was primarily obtained during site visits, review of construction drawings, interviews with facility and building personnel, equipment nameplate data, available utility data, and equipment measurements. Operating information was obtained from data collected during the survey and dialogues with facility staff.

Scope of Work Overview

This report provides improvements to reduce energy consumption and operational costs in the City of Bangor buildings. The following improvements have been identified and recommended for implementation to improve energy efficiency, building comfort, and to address facility deficiencies. A summary of the energy savings strategies and proposed upgrades are outlined by building and by option in the table on the following page. A more detailed description of our survey findings and proposed solutions are contained in the next section of this report.

Measurement and Verification – Guaranteed Performance

Honeywell proposes a cost-effective plan for Measurement and Verification (M&V) to ensure that the guaranteed savings are realized over the contract term. Our proposed approach strikes a balance between the cost of M&V, and the level of information required to substantiate our savings guarantee and performance.

Prior to construction, Honeywell has established baseline efficiencies and operational parameters. Parameters that are beyond Honeywell's control, such as operating hours, energy rates, and others, will be agreed upon between Honeywell and the City of Bangor, and stipulated for the term of the contract. After construction is completed, Honeywell will conduct post-installation measurements in accordance with the M&V Plan. Actual savings will then be determined from the baseline measurements, post-installation measurements, and agreed-upon stipulated parameters. In the event that actual savings are less than the guaranteed savings, Honeywell will take steps to identify and implement, at its cost, the necessary improvements to generate sufficient savings, or pay the City of Bangor the difference between the actual and guaranteed savings. Finally, on an annual basis, Honeywell will conduct site surveys and measurements to confirm that the efficiency and operating conditions for each energy conservation measure are maintained.

Scope of Work Overview

Building	ECM #	Energy Conservation Measure	Annual Energy Cost Savings	Annual O&M Cost Savings	Total Annual Cost Savings	Installed Cost	Estimated Utility Incentive	Installed Cost Less Utility Incentive	Simple Payback (Years)
Armory Building (Parks & Recreation)	1A	Lighting Upgrades	$7,462	$570	$8,032	$59,859	$6,315	$53,544	6.7
	2A	Building Envelope Upgrades	$537	$0	$537	$5,376		$5,376	10.0
	3A	Water Conservation Upgrades	$549	$23	$572	$5,333		$5,333	9.3
	4A	Fuel Oil Heater	$835	$0	$835	$4,414		$4,414	5.3
	5A	Convert Maintenance Office Electric Heat To Hot Water Heat	$545	$0	$545	$33,291		$33,291	61.1
	6A	Self Funded Controls Modifications	$2,411	$0	$2,411	$17,612		$17,612	7.3
	7A	New Office Ventilation/Air Conditioning	($1,180)	$0	($1,180)	$107,059		$107,059	NA
	8A	De-Stratification Fans for Gymnasium	$0	$0	$0	$7,925		$7,925	NA
	9A	New Heating Branch Lines To Rifle Range Area	$0	$0	$0	$8,813		$8,813	NA
	10A	New Toilet Exhaust Fan For 3 Story Office Wing	($97)	$0	($97)	$5,988		$5,988	NA
	11A	Boiler Room Ventilation Fan System	($263)	$0	($263)	$25,141		$25,141	NA
	12A	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $112,791 and savings are $4,818/yr for a simple payback of 23.4 Years)	$2,411	$0	$2,411	$38,655		$38,655	16.0
Bangor Auditorium/Civic Center	1BA	Lighting Upgrades	$1,047	$0	$1,047	$7,880	$850	$7,030	6.7
	2BA	De-Stratification Fan Circuiting For Auditorium	$2,755	$0	$2,755	$9,430		$9,430	3.4
	3BA	New Boiler Combustion Controls	$2,971	$0	$2,971	$16,590		$16,590	5.6
	4BA	Upgrade Existing AHU Controls In Auditorium	$2,085	$0	$2,085	$8,736		$8,736	4.2
	5BA	Modify Existing Exhaust In Auditorium	$753	$0	$753	$8,469		$8,469	11.2
Central Fire Station	1CF	Lighting Upgrades	$733	$1,793	$2,526	$14,612	$465	$14,147	5.6
	2CF	Building Envelope Upgrades	$150	$0	$150	$1,408		$1,408	9.4
	3CF	Water Conservation Upgrades	$919	$47	$966	$3,610		$3,610	3.7
	4CF	Fuel Oil Heater	$778	$0	$778	$7,168		$7,168	9.2
	5CF	Night Setback Controls For Chief's Office, Secretary's Office, Conference Room, Mechanic's Bay And Wash Bay	$827	$0	$827	$11,888		$11,888	14.4
	6CF	Remove 2 Gravity Exhausters & Replace With Exhaust Fans	$76	$0	$76	$13,033		$13,033	171.5
	7CF	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $128,720 and savings are $1,648/yr for a simple payback of 78.1 Years)	$824	$0	$824	$42,266		$42,266	51.3
	8CF	Replace Existing Basement Air Handling Unit	($644)	$0	($644)	$25,835	$450	$25,385	NA
	9CF	Replace 5 Existing Rooftop AC Units	($4,329)	$0	($4,329)	$210,232	$1,605	$208,627	NA
	10CF	Provide New Chimney Draft Fan	($119)	$0	($119)	$20,474		$20,474	NA
	11CF	Extend Emergency Generator Exhaust Outlet Pipe	$0	$0	$0	$569		$569	NA
	12CF	New Duplex Fuel Oil Transfer Pump Set	$0	$0	$0	$17,117		$17,117	NA
City Hall	1CH	Lighting Upgrades	$363	$0	$363	$4,229	$675	$3,554	9.8
	2CG	Building Envelope Upgrades	$180	$0	$180	$1,760		$1,760	9.8
	3CH	Water Conservation Upgrades	$1,008	$47	$1,055	$8,836		$8,836	8.4
	4CH	Fuel Oil Heater	$1,337	$0	$1,337	$4,439		$4,439	3.3
	5CH	New Boiler Combustion Controls	$1,739	$0	$1,739	$16,448		$16,448	9.5
	6CH	Steam Trap Replacement	$8,252	$5,660	$13,912	$109,513		$109,513	7.9
	7CH	Exhaust Fan Controls	$536	$0	$536	$22,507		$22,507	42.0
	8CH	Replace HV-2 Exhaust Duct Damper Actuator And Adjust Outside Air Damper	$114	$0	$114	$476		$476	4.2
	9CH	Domestic Hot Water System Upgrades	$0	$0	$0	$8,484		$8,484	NA
	10CH	Condensate Return Vent Pipe Relocation	$0	$0	$0	$4,504		$4,504	NA
	11CH	Boiler Room Combustion Air Upgrades	($223)	$0	($223)	$29,974		$29,974	NA
	12CH	Upgrade Chimney Access Door	$0	$0	$0	$4,200		$4,200	NA
	13CH	Basement AC Unit Dehumidification Upgrades	$0	$0	$0	$1,791		$1,791	NA
	14CH	Service/Replace Exhaust Fans	($358)	$0	($358)	$26,922		$26,922	NA
	15CH	Replace Chimney Cap	$0	$0	$0	$5,368		$5,368	NA
	16CH	Disconnect From Louver & Seal Exhaust Ductwork At First Floor Corner Offices	$114	$0	$114	$952		$952	8.4
	17CH	Replace HV-2 And Provide Air Conditioning	($3,263)	$0	($3,263)	$385,981	$1,050	$384,931	NA
	18CH	Replace HV-3 And Provide Air Conditioning	($1,631)	$0	($1,631)	$183,631	$845	$182,786	NA
	19CH	New Boiler	$0	$0	$0	$126,334		$126,334	NA
	20CH	Convert Heating System From Steam To Hot Water (Note: Savings listed includes steam trap replacement savings)	$15,048	$5,660	$20,708	$795,747		$795,747	38.4
	21CH	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $200,790 and savings are $3,883/yr for a simple payback of 51.7 Years)	$0	$0	$0	$31,082		$31,082	NA
	22CH	Replace Front Entrance Doors	$0	$0	$0	$120,450		$120,450	NA
Fire Station #5	1FS	Lighting Upgrades	$171	$0	$171	$1,493	$140	$1,353	7.9
	2FS	Building Envelope Upgrades	$649	$0	$649	$5,692		$5,692	8.8
	3FS	Water Conservation Upgrades	$358	$12	$370	$2,501		$2,501	6.8
	4FS	Fuel Oil Heater	$323	$0	$323	$1,761		$1,761	5.5
	5FS	Fan Coil Unit Retro-Commissioning	($221)	$0	($221)	$1,039		$1,039	NA
	6FS	DDC Controls Upgrade	$716	$0	$716	$33,127		$33,127	46.3
Fleet Maintenance Building	1FM	Lighting Upgrades	$2,061	$262	$2,323	$23,956	$2,700	$21,256	9.2
	2FM	Lighting Upgrades For Paint Room	($380)	$0	($380)	$20,133		$20,133	NA
	3FM	Building Envelope Upgrades	$210	$0	$210	$2,128		$2,128	10.1
	4FM	Water Conservation Upgrades	$294	$23	$317	$5,689		$5,689	17.9
	5FM	Destratification Fans For Work Bays & Shops	$3,884	$0	$3,884	$17,375		$17,375	4.5
	6FM	Remove Electric Radiators & Upgrade Hot Water Radiators In Main Office Area	$253	$0	$253	$10,128		$10,128	40.0
	7FM	New Night Setback Controls For Main Office Area	$639	$0	$639	$1,048		$1,048	1.6
	8FM	New HVAC For Main Office	($1,189)	$0	($1,189)	$61,650	$250	$61,400	NA
	9FM	New Ventilation Units For Two Main Work Bays	($8,128)	$0	($8,128)	$260,019	$108	$259,911	NA
	10FM	New Paint Shop Make-Up Air Unit	($3,701)	$0	($3,701)	$78,713	$54	$78,659	NA
	11FM	Make-Up Air Ductwork Modifications For Paint Shop	$0	$0	$0	$15,891		$15,891	NA
	12FM	New Ventilation System For Body Shop	($1,266)	$0	($1,266)	$52,798		$52,798	NA
	13FM	New Ventilation System For Parts Room	($1,267)	$0	($1,267)	$19,231		$19,231	NA
	14FM	New Rooftop Exhaust Fans	($744)	$0	($744)	$44,962		$44,962	NA
	15FM	New Wall Exhaust Fan	($63)	$0	($63)	$4,682		$4,682	NA
	16FM	Replace Working Bay Windows	$5,610	$0	$5,610	$94,910		$94,910	16.9
	17FM	Provide Fan Coil Unit For Motor Pool Office	($114)	$0	($114)	$15,062		$15,062	NA
Golf Course Club House	1G	Lighting Upgrades	$273	$0	$273	$3,125	$265	$2,860	10.5
	2G	Building Envelope Upgrades	$147	$0	$147	$1,507		$1,507	10.2
	3G	Water Conservation Upgrades	$163	$23	$186	$5,777		$5,777	31.1
	4G	Night Setback Controls	$476	$0	$476	$2,131	$714	$1,417	3.0
Health & Welfare	1HW	Lighting Upgrades	$156	$0	$156	$1,990	$215	$1,775	11.4
	2HW	Building Envelope Upgrades	$1,080	$0	$1,080	$13,100		$13,100	12.1
	3HW	Water Conservation Upgrades	$6,349	$287	$6,636	$64,763		$64,763	9.8
Mansfield Baseball Stadium	1M	Lighting Upgrades	$203	$0	$203	$5,482	$0	$5,482	27.0
	2M	Water Conservation	$665	$82	$747	$16,557		$16,557	22.2
	3M	New Exhaust Systems For Toilet Rooms	($144)	$0	($144)	$21,916		$21,916	NA
Park Woods Apartments - 60 Units	1PWA	Lighting Upgrades	$10,691	$860	$11,551	$93,641	$7,920	$85,721	7.4
	2PWA	Building Envelope Upgrades	$3,608	$0	$3,608	$36,477		$36,477	10.1
	3PWA	Water Conservation Upgrades	$9,683	$704	$10,387	$125,535		$125,535	12.1
	4PWA	Fuel Oil Heaters	$15,088	$0	$15,088	$31,057		$31,057	2.1
Public Works Building	1PWB	Lighting Upgrades	$4,165	$559	$4,724	$38,312	$2,465	$35,847	7.6
	2PWB	Building Envelope Upgrades	$378	$0	$378	$3,917		$3,917	10.4
	3PWB	Water Conservation Upgrades	$939	$41	$980	$8,824		$8,824	9.0
	4PWB	Fuel Oil Heater	$536	$0	$536	$3,813		$3,813	7.1
	5PWB	De-Stratification Fans	$901	$0	$901	$16,251		$16,251	18.0
	6PWB	Insulate Heating Water Piping	$2,494	$0	$2,494	$29,658		$29,658	11.9
	7PWB	Cap Ridge Vents	$641	$0	$641	$3,552		$3,552	5.5
	8PWB	Modify Electric Engine Block Heater Controls	$289	$0	$289	$8,881		$8,881	30.7
	9PWB	Self Funded Controls Modifications	$1,349	$0	$1,349	$12,610		$12,610	9.3
	10PWB	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $127,700 and savings are $2,243/yr for a simple payback of 56.9 Years)	$900	$0	$900	$53,560		$53,560	59.5
	11PWB	New Office HVAC Unit With Ventilation	($974)	$0	($974)	$80,686	$600	$80,086	NA
	12PWB	Replace Men's/Women's Room Exhaust Fan	($142)	$0	($142)	$6,561		$6,561	NA

Building	ECM #	Energy Conservation Measure	Annual Energy Cost Savings	Annual O&M Cost Savings	Total Annual Cost Savings	Installed Cost	Estimated Utility Incentive	Installed Cost Less Utility Incentive	Simple Payback (Years)
Recycling Center/Bus Garage/Bus Wash Bay	1R	Lighting Upgrades	$2,183	$0	$2,183	$20,323	$2,575	$17,748	8.1
	2R	Building Envelope Upgrades	$1,797	$0	$1,797	$15,293		$15,293	8.5
	3R	Water Conservation Upgrades	$11	$0	$11	$21		$21	1.9
	4R	De-Stratification Fans For Recycling Center's Process Room	$374	$0	$374	$5,372		$5,372	14.4
	5R	Manage Baler & Glass Crusher Operation In Recycling Center	$916	$0	$916	$1,761		$1,761	1.9
	6R	Night Setback Controls For Bus Wash Bay	$773	$0	$773	$7,573		$7,573	9.8
	7R	Night Setback Controls For Recycling Center	$1,353	$0	$1,353	$14,090		$14,090	10.4
	8R	Controls To Disable Heat When Overhead Doors Are Open	$408	$0	$408	$5,284		$5,284	12.9
Sawyer Arena Ice Rink	1S	Lighting Upgrades	$5,310	$0	$5,310	$32,214	$3,315	$28,899	5.4
	2S	Building Envelope Upgrades	$298	$0	$298	$2,934		$2,934	9.8
	3S	Fuel Oil Heater	$767	$0	$767	$3,717		$3,717	4.8
	4S	Upgrade Warming/Spectator Area AHU Controls	$1,269	$0	$1,269	$8,657		$8,657	6.8
	5S	Upgrade Locker Room AHU Controls	$932	$0	$932	$8,657		$8,657	9.3
	6S	Provide Infrared Ice Surface Temperature Control System	$1,531	$0	$1,531	$16,101		$16,101	10.5
	7S	Provide Liquid Pressure Amplifier Pumps For Chiller	$4,173	$0	$4,173	$25,624		$25,624	6.1
	8S	Provide Fan Coil Unit For Manager's Office	($109)	$0	($109)	$19,586		$19,586	NA
	9S	Balance Air Supply To Locker Rooms	$0	$0	$0	$1,125		$1,125	NA
	11S	New Water Fountain	($117)	$0	($117)	$5,127		$5,127	NA
	12S	Extend Munters Unit Supply Duct	$0	$0	$0	$36,358		$36,358	NA
	13S	Provide New Glycol Pumps With VFD's	$1,776	$0	$1,776	$54,364	$1,781	$52,583	29.6
Union Street Athletic Complex - Softball Lighting	1U	Lighting Upgrades	$113	$0	$113	$785	$150	$635	5.6
Vending Mizers	1VM	Vending Mizers	$4,977	$0	$4,977	$18,916	$0	$18,916	3.8
Conversion From Oil/LP Gas To Natural Gas/Dual Fuel	1CONV	Bangor Auditorium	($5,561)	$0	($5,561)	$61,124		$61,124	NA
	2CONV	Central Fire Station	$3,123	$0	$3,123	$34,576		$34,576	11.1
	3CONV	City Hall	$6,661	$0	$6,661	$19,327		$19,327	2.9
	4CONV	Fleet Maintenance Building	$4,022	$0	$4,022	$28,707		$28,707	7.1
	5CONV	Public Works Building	$1,838	$0	$1,838	$25,169		$25,169	13.7
	6CONV	Recycling/Bus Garage	$3,653	$0	$3,653	$29,904		$29,904	8.2
Computer Power Management	1CPM	Verdiem Computer Power Management System	$3,998	$0	$3,998	$11,799	$3,952	$7,847	2.0
Standpipe Lighting	1SL	Standpipe Lighting	$1,569	$716	$2,285	$4,461	$0	$4,461	2.0
Standpipe Wiring Upgrades	1SW	Standpipe Wiring Upgrades	$0	$0	$0	$50,000		$50,000	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Financial Summary

Honeywell's financial analysis focused on all of the recommended energy conservation and capital improvement measures designed to increase energy efficiency, improve comfort and indoor air quality conditions.

Consistent with the terms and conditions of the technical energy audit agreement, Honeywell has developed a 10-year, self funded project option for consideration. This project option is financed over a 10-year period utilizing a lease purchase agreement with a fixed interest rate of 4.09%. The City, at its discretion, can develop a customized project based upon the list of improvements it chooses to implement.

The analysis breaks out the financial impacts on the City budget on a fiscal year basis over a 20-year term. Several assumptions have been made in putting together this projection. These assumptions include:

- 10 year financing at 4.09% interest
- Energy and general inflation rate of 3.5%
- No significant changes in facilities, equipment, uses, or operations
- Operational savings as outlined
- Efficiency Maine rebates in the amount of $31,866

The table below summarizes the financial impacts of implementing Honeywell's recommendations:

10 Year Project:

Project Cost	$1,223,251
Efficiency Maine Incentives	$31,866
1st Year Savings	$153,225
Annual Lease Payments	$127,204
Cumulative Cash Flow over 10 Years	$305,263
Cumulative Cash Flow over 15 years	$2,840,874

The following pages provide a Pro Forma that displays a detailed, year by year breakout of the financial impacts of the 10 year self funded project option. This initial analysis assumes a step up repayment schedule for the financing increasing at a fixed 3.5% per year.

The finance company has the ability to structure payments to track the savings stream, so that each year is a positive or neutral cash flow. Payments can also be aligned to match additional annual capital payments that the City may choose to invest for certain projects.

10 Year Pro Forma:

Honeywell

CITY OF BANGOR PERFORMANCE CONTRACTING PROJECT
20 YEAR FINANCIAL ANALYSIS
FINANCIAL INSTRUMENT - 10 YEAR LEASE PURCHASE AGREEMENT

Project Cost	**$1,223,251**
Eff ME Rebates*	**$31,866**
Amount Financed	**$1,191,385**
Interest Rate	**4.09%**
Term	**10 Years**

Inflation Rate **3.5%**

Fiscal Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**TOTAL**
Energy Savings	$142,360	$147,343	$152,500	$157,837	$163,361	$169,079	$174,997	$181,122	$187,461	$194,022	$200,813	$207,841	$215,116	$222,645	$230,437	$238,503	$246,850	$255,490	$264,432	$273,687	$4,025,896
Operational Savings*	$10,865	$11,245	$11,639	$12,046	$12,468	$12,904	$13,356	$13,823	$14,307	$14,808	$15,326	$15,863	$16,418	$16,992	$17,587	$18,203	$18,840	$19,499	$20,182	$20,888	$307,259
TOTAL UTILITY & OPERATIONAL SAVINGS	**$153,225**	**$158,588**	**$164,138**	**$169,883**	**$175,829**	**$181,983**	**$188,353**	**$194,945**	**$201,768**	**$208,830**	**$216,139**	**$223,704**	**$231,533**	**$239,637**	**$248,024**	**$256,705**	**$265,690**	**$274,989**	**$284,614**	**$294,575**	**$4,333,154**
Project Costs																					
Project Financing	$127,204	$131,656	$136,264	$141,033	$145,970	$151,078	$156,366	$161,839	$167,503	$173,366											$1,492,280
M&V*	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD											
Support Services	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD											
TOTAL COSTS	$127,204	$131,656	$136,264	$141,033	$145,970	$151,078	$156,366	$161,839	$167,503	$173,366											$1,492,280
NET ANNUAL BUDGET IMPA(	$26,021	$26,932	$27,874	$28,850	$29,860	$30,905	$31,986	$33,106	$34,265	$35,464	$216,139	$223,704	$231,533	$239,637	$248,024	$256,705	$265,690	$274,989	$284,614	$294,575	$2,840,874
CUMMULATIVE CASH FLOW	$26,021	$52,953	$80,827	$109,677	$139,537	$170,442	$202,428	$235,534	$269,799	$305,263	$521,402	$745,105	$976,639	$1,216,276	$1,464,301	$1,721,006	$1,986,696	$2,261,685	$2,546,299	$2,840,874	$2,840,874

* Efficiency Maine Rebates - Are projected at this time and subject to final approval.

* Operational Savings - At this time operational savings associated with reduced lighting replacement costs, plumbing repair costs and steam trap repair/replacement costs have been included.

* M&V & Support Sevices - The final method and cost for M&V along with ongoing maintenance and support services needs to be determined. Cost of these measures are not included in the cash flow.
This aspect of the solution will be negotiated and finalized during final project development.

Armory Building

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The Armory building was built in the 1950's and was renovated in 1960. The building is comprised of a 3-story office section, a gymnasium, repair shop, maintenance office, and a wash bay and garage. The facility is approximately 16,575 square feet. See remainder of this report for additional comments.

Heating System:
The original building was heated by steam that was later replaced by a hot water heating system. There is a disconnected steam space heater suspended from the roof in the garage area. The garage is not currently heated.

The existing heating system is supplied from an HB Smith cast iron sectional hot water boiler. The boiler is rated at 1,477 MBH NET IBR output. The boiler is outfitted with a Carlin burner with a firing rate of 11.4 to 19.8 gph of #2 fuel oil.

There are five heating pump zones. Heat is provided by hot water radiation in the offices and the gymnasium. The repair shop and wash bay are heated by hot water unit heaters. The maintenance offices are heated with electric baseboard radiators.

Air Conditioning Systems:
The building has no central air conditioning system. Several offices use window A/C units.

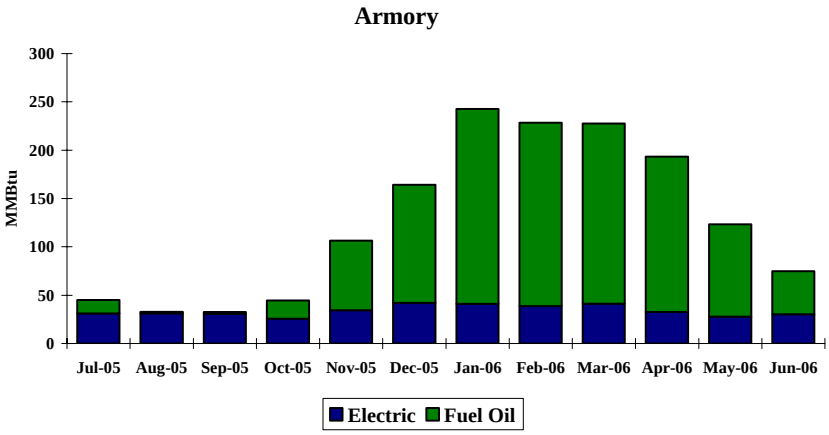
Ventilation Systems:
There is no means of mechanical ventilation for the building. Exhaust fans provide exhaust for toilet rooms, the kitchen hood and the 3-story office wing. The exhaust fan for the 3-story office wing is currently out of service. The offices in the 3-story office wing and maintenance office have operable windows, but no means of mechanical ventilation. The gymnasium has no means of mechanical ventilation.

Temperature Control Systems:

Controls throughout the building are electric controls, with self contained automatic control valves in corridors and toilet rooms.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$16,354	119,200
Water and Sewer - CCF	$1,908	314
Fuel Oil - Gallons	$17,079	7,946
7/05-6/06 Total	$35,341	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings					Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH					
Bangor Auditorium/Civic Center	1BA	Lighting Upgrades	9	7,744		$0	$1,047	$7,030	6.7
	2BA	De-Stratification Fan Circuiting For Auditorium		(1,445)	1,781	$0	$2,755	$9,430	3.4
	3BA	New Boiler Combustion Controls			1,800	$0	$2,971	$16,590	5.6
	4BA	Upgrade Existing AHU Controls In Auditorium			1,263	$0	$2,085	$8,736	4.2
	5BA	Modify Existing Exhaust In Auditorium			456	$0	$753	$8,469	11.2

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. ***246 - 4 ft T12 fixtures being retrofit to high performance T8 lamp and ballast combination.***
2. ***28 - 400 watt metal halide high bay fixtures in gym to 4 lamp T5HO fixtures with Wire Guards and PIR occupancy sensor controls.***
3. ***3 – Fixtures with incandescent lamps to be relamped to compact fluorescent lamps.***
4. ***21 – Fixtures with incandescent lamps to be replaced with new 4 ft. 2 lamp vapor tight fluorescent fixtures with high performance high lumen T8 lamp and ballast combination.***
5. ***18 – Fixtures with 2- 8 ft. high output lamps to be replaced with new 8 ft. 4 lamp vapor tight fluorescent fixtures with high performance high lumen T8 lamp and ballast combination.***
6. ***2 – Fixtures with incandescent lamps to be replaced with new 4 ft. 2 lamp wrap around fluorescent fixtures with high performance T8 lamp and ballast combination.***
7. ***8 – Wall -Switch Passive Infrared Occupancy Sensors.***

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. ***6 - Single Commercial Doors to be weather-stripped.***
2. ***6 - Double Commercial Doors to be weather-stripped.***

3. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. ***Quantity of 4 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.***
2. ***Quantity of 3 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.***

3. ***Quantity of 6 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.***

4. ***Fuel Oil Heater:***

Existing Conditions:

A. The existing boiler uses #2 oil as a fuel source.

Proposed Upgrades:

A. Provide a combustion oil heater for the existing boiler. The combustion oil heater will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls.

Add Oil Heater to Existing #2 Oil Burner

5. **Convert Maintenance Office Electric Heat to Hot Water Heat:**

Existing Conditions:

A. The maintenance office area is currently heated with 16 feet of electric baseboard radiation. This is the most costly method of heating the space.

B. The gymnasium, maintenance offices and wash bay areas are heated from the common hot water header with one control valve located in the gymnasium. The highest temperature from the three area thermostats is a control signal for the heating controller. The gymnasium, which is the largest heated space, is very often overheated because the heating demand is coming from other much smaller areas

Proposed Upgrades:

A. Provide new hot water baseboard radiation and associated controls for the maintenance office.

B. Install new hot water piping with control valves for the maintenance office and wash bay. The new piping will be branched off the main hot water heating header in the gymnasium, upstream of the existing temperature control valve. This retrofit will provide better comfort for the heated areas and will reduce fuel oil consumption

6. Self Funded Controls Modifications:

Existing Conditions:

A. Controls throughout the building are electric controls, with self contained automatic control valves in corridors and toilet rooms. There is no night automatic setback strategy in place.

B. There does not appear to be an effective hot water reset strategy in place, and it also appears that the heating water pumps are manually turned on and off.

Proposed Upgrades:

A. Provide basic zone night setback controls, which would involve cycling heating water pumps on and off during unoccupied hours, based on temperature that is monitored at a representative location in the heating zone. This type of night setback control is not as effective as a full DDC controls upgrade throughout the building, but is a lower cost approach to providing some amount of night setback savings.

B. Provide boiler room controls to supply an automatic heating water reset strategy, and to automatically turn the heating water pumps on and off based on outside air temperature.

7. New Office Ventilation/Air Conditioning:

Existing Conditions:

A. The 3-story office wing has no means of mechanical ventilation. Most of the office spaces have operable windows. Several offices have window A/C units.

Proposed Upgrades:

A. Through discussions with the customer, it has been determined that the areas that are most in need of new ventilation systems are the basement offices, the first floor Reception Office, and the first floor Conference Room. Provide ducted ventilation systems to supply code compliant ventilation air to these spaces. The ducted systems will not provide air conditioning because air conditioning through ducted systems causes the ductwork to be much larger in size, and there is very limited space to run ductwork in these areas. Due to space limitations, new ductwork will need to be run exposed in the spaces, and will be painted white.

B. At the customer's request, air conditioning is desired for the first floor Reception Office and the first floor Conference Room. Provide new split system ductless air conditioning units for these spaces.

8. De-Stratification Fans for Gymnasium:

Existing Conditions:

A. The Gymnasium is constructed with a steep slope roof and high ceiling. This allows warm air to naturally stratify at the higher level walls and roof. Heat transfer through the high walls and roof causes substantial heat losses. There are 2 existing unit heaters in the Gymnasium, and these unit heaters are utilized as paddle fans to force warm air back down to the floor area. These unit heaters are not used to heat the Gymnasium. These existing unit heaters are very old and have exceeded their useful service life.

Proposed Upgrades:

A. Remove the 2 existing unit heaters and provide 2 new de-stratification fans (with guards) in the gymnasium to force warm air down to the floor during the heating season. This item would normally be considered a self funded item, however due to the fact that there are 2 existing unit heaters which are effectively being utilized as de-stratification fans, this item is being listed in the "Additional Capital Improvements" section of the report.

9. New Heating Branch Lines To Rifle Range Area:

Existing Conditions:

A. The rifle range is an unheated space. It was brought to our attention by the occupants that there is a desire to have heating mains run to the rifle range so that heat can be added to the rifle range at a later date.

Proposed Upgrades:

A. Provide new valved and capped heating branch lines to the rifle range, for future use.

10. New Toilet Exhaust Fan for 3-Story Office Wing:

Existing Conditions:

A. The existing exhaust fan for the 3-story office wing is not operable. The fan serves toilet rooms and Janitors' closets.

Proposed Upgrades:

A. Provide a new, appropriately sized exhaust fan to replace the existing fan.

11. Boiler Room Ventilation Fan System:

Existing Conditions:

A. The boiler room was very warm during our survey, and the building occupants indicated that the kitchen and offices above the boiler room overheat due to radiated heat from the boiler room.

Proposed Upgrades:

A. Provide a new exhaust and make-up air systems for the boiler room, to remove excessive heat from the boiler room.

12. DDC Controls Upgrade:

Existing Conditions:

A. Controls throughout the building are electric controls, with self contained automatic control valves in corridors and toilet rooms.

Proposed Upgrades:

A. Remove all existing electric controls and provide a new direct digital control (DDC) system. Provide DDC controls for all offices and for all exhaust fans, air handling units, boilers, pumps and alarms. Provide "stand alone" local electric/self contained controls for toilet rooms, corridors, vestibules and storage rooms. A new DDC control system will allow the use of additional energy saving control strategies and will provide additional operational benefits.

Provide user friendly interface graphics that will allow simple adjustments of schedules and temperature setpoints by authorized building occupants. Provide web based access to the control system so that authorized users can access the system from a remote site. Provide graphical user interface software, and provide sufficient training as required to allow the customer to perform basic setpoint and schedule adjustments. Some examples of energy saving strategies that are available with DDC controls are:

1. Enhanced time of day scheduling.
2. Data trending. Status of points can be electronically monitored to aid in troubleshooting.
3. Tighter space temperature control.
4. Demand based ventilation controls for single rooms that are served by a dedicated air handling unit.
5. Graphical user interface allows the on-staff facilities personnel to monitor and make adjustments to the control system parameters.
6. All DDC space sensors can be individually monitored to help with identifying temperature control problems.
7. Night setback savings are maximized because each room can be set back during unoccupied times.

Bangor Auditorium / Civic Center

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The Auditorium building was built in 1955. The Civic Center wing was added in 1977.

The original building is comprised of the original auditorium section, the lobby with ticket booths, and adjacent offices. The 1977 addition is two story building comprised of offices and meeting rooms. The entire facility is approximately 51,793 square feet.

The windows throughout the auditorium are single pane and several are broken.

Honeywell understands that the Auditorium complex is planned to be demolished in approximately 5 years and replaced with a new facility. With this in mind, Honeywell has been directed to proposing only those upgrades that will provide a 5 year or less payback. See remainder of this report for additional comments.

Heating System:
The old 1955 auditorium building is heated by steam and the 1977 addition is hot water heating system. The steam is produced by one Cleaver Brooks 150 HP fire tube steam boiler manufactured in 1987. The maximum boiler firing rate is 6,277 MBH. The boiler is burning #5 fuel oil. An electric heater preheats fuel oil before is delivered to the burner. Outside air louvers provide the combustion air. There is a steam-to-hot water converter in the boiler room to provide hot water for the Civic Center wing heating system.

The main auditorium heating is hot air delivered by 14 air handling units, with only 6 of these units being currently utilized. The air handling units have steam heating coils. The offices are heated by electric radiators.

The Civic Center wing is heated by hot water radiation.

Air Conditioning Systems:

The auditorium has no mechanical air conditioning systems. Several offices on the building perimeter are furnished with window A/C units.

The Civic Center wing is air conditioned by 9 packaged rooftop units. The units serve various zones in the Civic Center wing. The transition hall offices between the auditorium and Civic Center wing have window A/C units.

Ventilation Systems:

Fresh air for the auditorium is delivered by air handling units through outside air dampers. There are 6 exhaust fans on the roof of the auditorium which provide local exhaust. In addition to the exhaust fans, there are 6 exhaust dampers, 3 at each back side of the seating areas, which are modulated based on CO2 levels in the upper auditorium.

Some of the exhaust fans' gravity dampers stay partially open when fans are off, resulting in additional heat losses.

Fresh air for the Civic Center wing is provided by rooftop units with outside air dampers. Exhaust fans serve toilets.

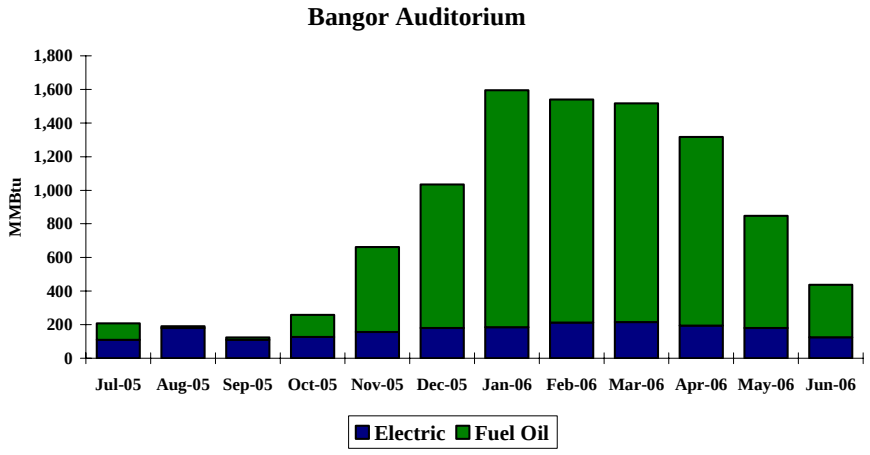
Temperature Control Systems:

The auditorium has a Siebe 8000 controller which controls 6 air handling units. Two air handling units are manually controlled, with thermostats in the controlled spaces.

The Civic Center wing has a Siemens 8000 DDC control system.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$77,632	579,000
Water and Sewer - CCF	$6,619	1,104
Fuel Oil - Gallons #5 Oil	$88,241	53,465
7/05-6/06 Total	$172,493	

Honeywell

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings					Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH					
Bangor Auditorium/ Civic Center	1BA	Lighting Upgrades	9	7,744		$0	$1,047	$7,030	6.7
	2BA	De-Stratification Fan Circuiting For Auditorium		(1,445)	1,781	$0	$2,755	$9,430	3.4
	3BA	New Boiler Combustion Controls			1,800	$0	$2,971	$16,590	5.6
	4BA	Upgrade Existing AHU Controls In Auditorium			1,263	$0	$2,085	$8,736	4.2
	5BA	Modify Existing Exhaust In Auditorium			456	$0	$753	$8,469	11.2

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 15 – Compact fluorescent and incandescent Exit signs to new LED Exit Signs with battery back up.
2. 4 - 400 watt Metal Halide Low Bay Fixtures in Food Court to 4 lamp T5HO fixtures with Wire Guards and PIR occupancy sensor controls.
3. Occupancy sensors will be added to C Hall.

2. De-Stratification Fan Circuiting For Auditorium:

Existing Conditions:

A. The auditorium de-stratification fans are circuited in a way that does not allow the de-stratification fans above the seating areas to be controlled independently from the fans over the main floor area. It was brought to our attention that all of the de-stratification fans must be turned off during many events because the air movement from the fans over the main floor area is disruptive to many of the events. If the de-stratification fans were re-circuited, then the fans above the upper seating areas could remain on during events. It was brought to our attention that when auditorium is fully occupied, a temperature of 70 deg F at the floor level would result in a temperature of 82 deg F at upper seating level.

Proposed Upgrades:

A. Rewired the existing de-stratification fans so the fans will work in 3 blocks: 1 across of each upper seating areas and 1 across the main floor area. This arrangement will allow for continuous winter operation of the fans at the upper seating areas, and will give the flexibility to turn the fans above the main floor area off when they are disruptive to certain events. Allowing these fans to operate during the heating season will help to de-stratify the air and will reduce heat losses through the roof and high wall areas.

3. New Boiler Combustion Controls:

Existing Conditions:

A. The fuel oil burner is furnished with mechanical combustion air/fuel ratio controls. The optimal combustion air/oil ratio setting is achieved by setting the oil stroke that is linked to the air damper. This adjustment might be good at the time when the burner is tuned. Over time, the air/fuel ratio can drift to either richer or leaner ratios, causing inefficient burning and resulting in loss of combustion efficiency.

Proposed Upgrades:

A. Install a new microprocessor burner controller that will provide more reliable and efficient burning.

Add New Combustion Controls to Existing Boiler

4. Upgrade Existing AHU Controls in Auditorium:

Existing Conditions:

A. 4 of the 6 air handling units that are currently used for the auditorium reportedly have a minimum setting of 10% outside air.
B. The CO2 sensors in the auditorium are installed high in the upper seating area.
C. At the time of our survey, the CO2 sensors were found to be giving abnormally low readings. Some of the readings were 132 PPM, 354 PPM, 350 PPM. Since outside air CO2 is typically in the vicinity of 400 PPM, it is more than likely that these sensors are either off calibration or are faulty.

Proposed Upgrades:

A. Provide controls to control outdoor air from the 4 air handling units based on space CO2. If space CO2 is low, allow the outdoor air dampers to close.
B. Since CO2 is heavier than air, CO2 from the upper seating areas will tend to drop to the lower main floor area. For this reason, additional CO2 sensors should be installed at the main floor level.
C. It was brought to our attention that the CO2 sensors in the upper seating area were installed because of complaints and the threat of legal action due to poor air quality during events. Because of this, we recommend that the CO2 sensors in the upper seating areas not be removed (even though CO2 is heavier than air and should migrate down to the lower main floor area), however the CO2 sensors should be re-calibrated or replaced so they are providing accurate readings.

5. Modify Existing Exhaust in Auditorium:

Existing Conditions:

A. The 6 exhaust fans on the auditorium roof have gravity backdraft dampers. The backdraft dampers do not close completely and they will occasionally open when the wind blows. Open dampers at the roof level are a significant source of heat loss.

Proposed Upgrades:

A. Remove the 2 exhaust fans at the center of the auditorium roof and cap their roof curbs. For the remaining 4 exhaust fans, remove the existing gravity backdraft dampers and replace them with new, tight sealing motorized dampers which will open when the exhaust fans run.

Central Fire Station

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The Central Fire Station was built in 1977. The building is 2 stories, with vehicle bays and offices at the ground level and offices and living spaces on the upper floor. The facility is approximately 18,576 square feet. See remainder of this report for additional comments.

Heating System:
The building is heated with (2) HB Smith 25 Mills hot water cast iron sectional boilers, each with a capacity of 521,700 BTU/HR NET IBR. The fuel source is #2 heating oil.

Hot water baseboard radiation provides heating for the perimeter offices, and suspended hot water unit heaters provide heat for the vehicle bays. There are 2 heating water pump zones, and each zone has (2) 100% redundant pumps. Lead/lag pump operation is manually controlled.

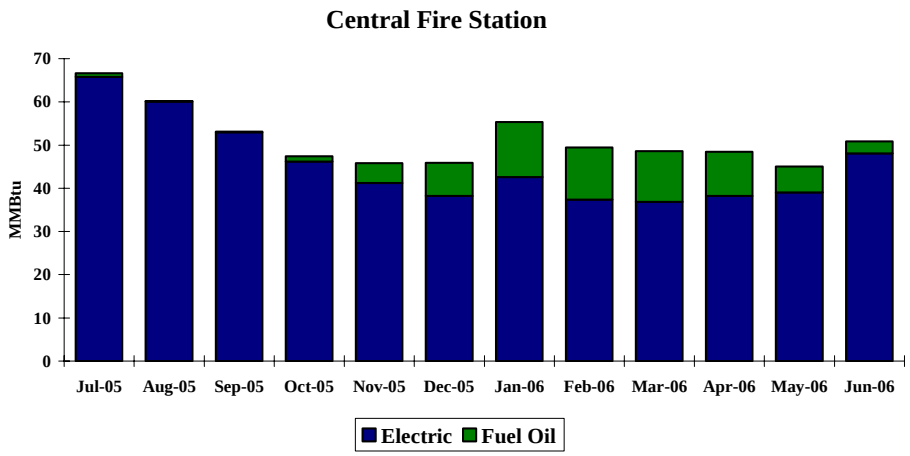
Air Conditioning Systems:
There are 5 rooftop air conditioning units which serve the second floor offices and living spaces, as well as the first floor Lobby and adjacent offices. An air handling unit located in the basement boiler room provides air conditioning for the first floor Secretary's office.

Ventilation Systems:
The air handling unit located in the basement boiler room has the ability to provide ventilation air for the Secretary's office on first floor. The 5 rooftop air conditioning units are strictly recirculation type air handling systems, and they have no ability to provide ventilation air.

Temperature Control Systems:
Temperature controls throughout the building are primarily local electric controls. All building systems are operated 24/7.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$22,476	160,160
Water and Sewer - CCF	$2,616	431
Fuel Oil - Gallons	$972	501
7/05-6/06 Total	$26,065	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Central Fire Station	1CF	Lighting Upgrades	6	5,292			$1,793	$2,526	$14,147	5.6
	2CF	Building Envelope Upgrades			69		$0	$150	$1,408	9.4
	3CF	Water Conservation Upgrades			121	81,132	$47	$966	$3,610	3.7
	4CF	Fuel Oil Heater		(521)	392		$0	$778	$7,168	9.2
	5CF	Night Setback Controls For Chief's Office, Secretary's Office, Conference Room, Mechanic's Bay And Wash Bay			414		$0	$827	$11,888	14.4
	6CF	Remove 2 Gravity Exhausters & Replace With Exhaust Fans	(4)	(475)	77		$0	$76	$13,033	171.5
	7CF	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $128,720 and savings are $1,648/yr for a			413		$0	$824	$42,266	51.3
	8CF	Replace Existing Basement Air Handling Unit		(2,995)	(121)		$0	($644)	$25,385	NA
	9CF	Replace 5 Existing Rooftop AC Units		(27,096)	(404)		$0	($4,329)	$208,627	NA
	10CF	Provide New Chimney Draft Fan	(4)	(702)			$0	($119)	$20,474	NA
	11CF	Extend Emergency Generator Exhaust Outlet Pipe					$0	$0	$569	NA
	12CF	New Duplex Fuel Oil Transfer Pump Set					$0	$0	$17,117	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. ***48-8 ft. 2 lamp T8 strip fixtures being upgraded to new high efficiency 2 lamp T5HO fixtures with high performance T5HO lamp and ballast combination.(30,000 hr. rated Program Start combination). Existing 2 - 8 ft. T8 lamp combination currently in use has short lamp life with frequent starts from occupancy sensors in use now..***
2. ***21 - 4 ft T12 fixtures being retrofit to high performance T8 lamp and ballast combination.***
3. ***1 – Incandescent Exit sign to new LED Exit Sign with battery back up.***
4. ***5 – Fixtures with incandescent lamps to be replaced with new 4 ft. 1 lamp strip fluorescent fixtures with high performance T8 lamp and ballast combination.***
5. ***Occupancy sensors will be added to Repair Bay Loft and Boiler Room.***
6. ***Occupancy sensor will be added to Ambulance Bay to turn on 2 fixtures to when backing in.***
7. ***2 – Wall -Switch Dual Technology Occupancy Sensors.***

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. ***5 - Single Commercial Doors to be weather-stripped.***

3. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. ***Quantity of 8 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.***
2. ***Quantity of 14 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.***

3. ***Quantity of 2 - Replace the existing threaded showerheads on exposed shower assemblies with new 2.0 gpm massage action pressure compensating ABS high-impact showerheads and applicable adaptors.***

4. Fuel Oil Heater:

Existing Conditions:

A. The existing boilers use #2 oil as a fuel source.

Proposed Upgrades:

A. Provide combustion oil heaters for the existing boilers. The combustion oil heaters will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls.

Add Oil Heater to Existing #2 Oil Burner

5. Night Setback Controls for Chief's Office, Secretary's Office, Conference Room, Mechanic's Bay and Wash Bay:

Existing Conditions:

A. The entire building is currently maintained at occupied setpoint temperatures 24/7. Most of the building is occupied 24/7, however it was brought to our attention that the Chief's Office, the Secretary's Office, the Conference Room, the Mechanic's Bay and the Wash Bay are not occupied at night, and temperatures could be set back at night in those spaces to save energy.

Proposed Upgrades:

A. Provide night setback controls for the Chief's office, the Secretary's Office, the Conference Room, the Mechanic's Bay and the Wash Bay.

6. Remove 2 Gravity Exhausters And Replace With Exhaust Fans:

Existing Conditions:

A. There are 2 rooftop gravity exhausters which are constantly open to the outdoors. Warm air constantly escapes out of these exhausters. One of the gravity exhausters serves the Secretary's Office and the other one serves a basement Work Room.

Proposed Upgrades:

A. Remove the 2 gravity ventilators and install new powered exhaust fans with backdraft dampers. Provide a local switch to operate the exhaust fan for the Work Room, and control the fan for the Secretary's Office through the DDC control system to run during occupied hours.

7. DDC Controls Upgrade:

Existing Conditions:

A. The existing electric controls system is approximately 30 years old and it was brought to our attention that controls are failing. Recently there have been automatic control valves which have had to be replaced. Controls upgrade should be considered.
B. It appears that both boilers are operated a maximum design temperature at all times. Lead/lag control of the boilers does not appear to be in use.
C. There is no automatic lead/lad pump operation in place. The lead/lag pump operation is achieved by manually switching pumps on and off.
D. The 4 existing toilet exhaust fans run 24/7.

Proposed Upgrades:

A. Remove all existing electric controls and provide a new direct digital control (DDC) system. Provide DDC controls for all offices and for all exhaust fans, air handling units, boilers, pumps and alarms. Provide "stand alone" local electric/self contained controls for toilet rooms, corridors, vestibules and storage rooms. A new DDC control system will allow the use of additional energy saving control strategies, and will provide additional operational benefits. Provide user friendly interface graphics that will allow simple adjustments of schedules and temperature setpoints by authorized building occupants. Provide web based access to the control system so that authorized users can access the system from a remote site. Provide graphical user interface software, and provide sufficient training as required to allow the customer to perform basic setpoint and schedule adjustments. Some examples of energy saving strategies that are available with DDC controls are:
   1. Enhanced time of day scheduling.
   2. Data trending. Status of points can be electronically monitored to aid in troubleshooting.
   3. Tighter space temperature control.
   4. Graphical user interface allows the on-staff facilities personnel to monitor and make adjustments to the control system parameters.
   5. All DDC space sensors can be individually monitored to help with identifying temperature control problems
   6. Night setback savings are maximized because each room can be set back during unoccupied times.
B. Provide wiring modifications to the 4 existing exhaust fans so that they will be controlled by light switches.
C. At the customer's request, the new temperature sensors in the vehicle bays will have no local adjustment capabilities. Control of these sensors will be only through graphics on the operator work station.

8. Replace Existing Basement Air Handling Unit:

Existing Conditions:

A. The existing basement air handling unit, which serves the Secretary's Office, is original, which makes it approximately 30 years old. The unit is in fair to poor condition. Internal insulation in the unit has deteriorated. The unit has exceeded its expected service life and replacement should be considered.

B. This air handling unit has the ability to bring in ventilation air, however during our survey we observed that the ventilation air damper was not opening at all. The condensing unit was running to provide air conditioning for the Secretary's Office, and the outdoor air temperature was low enough to provide "free cooling" by bringing in outdoor air to cool the space instead of running the condensing unit. This indicates that controls are not operating properly.

C. This air handling unit only operates on a call for heat or cooling. If space temperature is satisfied, the unit does not run, so no ventilation air is provided when the space temperature is satisfied.

Proposed Upgrades:

A. Remove the existing air handling unit and provide a new, double wall insulated air handling unit, with insulation sandwiched between metal panels so there is no insulation exposed to the air stream.

B. Provide new DDC controls for the new air handling unit.

Basement Air Handling Unit to be Replaced

9. Replace 5 Existing Rooftop AC Units:

Existing Conditions:

A. The 5 existing rooftop ducted air conditioning units are original, which makes them approximately 30 years old. The units are in poor condition. These units have exceeded their expected service life and replacement should be considered.

B. The 5 existing rooftop units are strictly recirculation type units. None of these units have the ability to provide outdoor air to ventilate the spaces that they serve, so all of the spaces that are served by these units have no means of mechanical ventilation.

Proposed Upgrades:

A. Remove the 5 existing rooftop air conditioning units and replace them with new rooftop ventilation and air conditioning units. The new units will have the ability to provide code compliant ventilation air. Provide new DDC controls to control the new units.

B. Provide new duct mounted reheat coils in the supply duct mains of the 5 systems served by the new rooftop units. The new duct mounted reheat coils will temper the new ventilation air. Provide new DDC controls for the reheat coils.

Typical Rooftop Units to be Replaced

10. Provide New Chimney Draft Fan:

Existing Conditions:

A. The existing chimney terminates approximately 3 above the roof. This does not create a problem with current conditions because the 5 existing rooftop AC units provide no ventilation air. If the 5 existing rooftop AC units are removed and 5 new ventilation and air conditioning units are provided, the new units will have fresh air intake openings to draw in ventilation air, and the fumes from the chimney will likely be drawn into the intakes and distributed into the building.

Proposed Upgrades:

A. Provide a new chimney draft fan on the top of the chimney, to force chimney fumes up into the air so that the risk of drawing fumes into the new air handling units is minimized.

11. Extend Emergency Generator Exhaust Outlet Pipe:

Existing Conditions:

A. The existing emergency generator exhaust pipe is currently terminated approximately 4 feet above the roof. This does not create a problem with current conditions because the 5 existing rooftop AC units provide no ventilation air. If the 5 existing rooftop AC units are removed and 5 new ventilation and air conditioning units are provided, the new units will have fresh air intake openings to draw in ventilation air, and the fumes from the generator will likely be drawn into the intakes and distributed into the building.

Proposed Upgrades:

A. Extend the existing generator exhaust pipe up so that it terminates a minimum of 10 feet above the roof.

12. New Duplex Fuel Oil Transfer Pump Set:

Existing Conditions:

A. There is only 1 fuel oil transfer pump in the boiler room. The boiler room is set up with 2 boilers and with 2 sets of heating water pumps. There is 100% redundancy in the entire heating system with the exception of the fuel oil transfer pump.

Proposed Upgrades:

A. Provide a new duplex fuel oil transfer pump set.

Existing Fuel Oil Transfer Pump – to be Replaced with Duplex Pump Set

City Hall

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The City Hall building was the original 1913 Post Office building, and a major renovation was done in 1968 to convert the use to City Hall. The building has a basement and 3 upper floors, with an attic space that houses an air handling unit and various exhaust fans. The building is comprised of various city management offices. The building is approximately 39,700 square feet. See remainder of this report for additional comments.

Heating System:
A Cleaver Brooks CB 100-100 steam boiler provides heat for the building. The entire building is heated with steam. The boiler capacity is 4,184 MBH input, and the burner uses #2 fuel oil. The boiler's burner is designed with mechanical adjustment for air/fuel oil ratio. The boiler feed water is chemically treated.

Air Conditioning Systems:
The building does not have a central air conditioning system. It was brought to our attention that there are a total of 48 window A/C units, with an average output of 10,000 BTU/HR each, serving individual offices throughout the building. The window AC units are removed in the winter and re-installed in the summer.

In the basement there two air handling units with DX refrigerant cooling coils. These units serve Central Services and Information Services.

HV-2, which is located above the ceiling of the first floor corridor, has had 2 duct mounted cooling coils and associated rooftop condensing units installed recently. These cooling systems provide cooling for the interior center core area (City Clerk, Voter Registration, Lunch Room, etc).

The Treasury Department on the First Floor has a ductless split air conditioning system.

Ventilation Systems:

There is one air handling (HV-3) unit located in the attic. This unit serves the Council Chambers, the adjacent Conference Rooms, and the City Manager's Office. The unit has the ability to bring in outdoor air, and the outside air dampers were found to be positioned to bring in a minimum amount of outdoor air during our survey.

There is one air handling unit (HV-2) located above the ceiling of the first floor corridor. This unit provides ventilation for the second floor Legal Department, School Department, Human Resources, Engineering Department, and Planning Department, as well as the First Floor center core area (City Clerk, Lunch Room, Voter Registration, etc.) and the First Floor Code Enforcement Department.

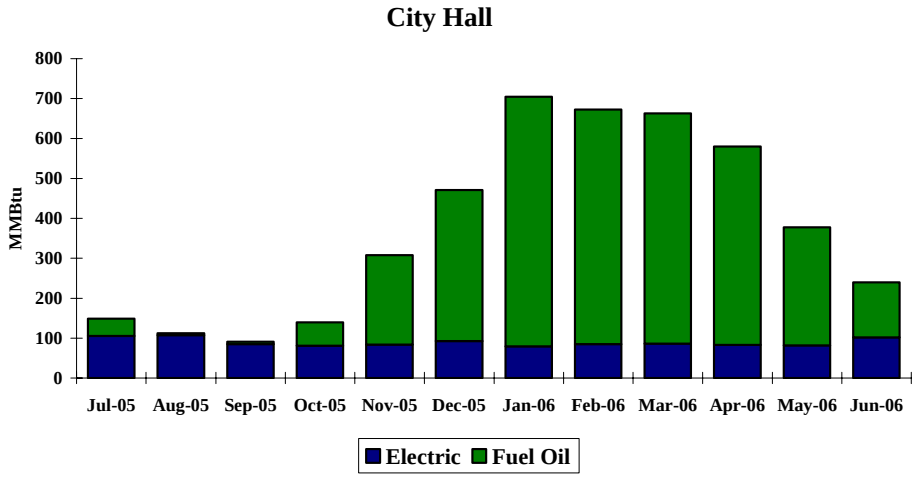
There are 2 air handling units in the basement which provide ventilation for Central Services and Information Services. All spaces not listed above have no means of mechanical ventilation. The building has several exhaust fans which are located primarily in the attic space. The exhaust fans serve various spaces throughout the building.

Temperature Control Systems:

The building's control system is pneumatic from the original installation.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$42,194	314,160
Water and Sewer - CCF	$1,973	319
Fuel Oil - Gallons	$53,196	24,601
7/05-6/06 Total	$97,363	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
City Hall	1CH	Lighting Upgrades	0	1,580			$0	$363	$3,554	9.8
	2CG	Building Envelope Upgrades			83		$0	$180	$1,760	9.8
	3CH	Water Conservation Upgrades			175	75,929	$47	$1,055	$8,836	8.4
	4CH	Fuel Oil Heater		(891)	670		$0	$1,337	$4,439	3.3
	5CH	New Boiler Combustion Controls			804		$0	$1,739	$16,448	9.5
	6CH	Steam Trap Replacement			3,816		$5,660	$13,912	$109,513	7.9
	7CH	Exhaust Fan Controls		4,339			$0	$536	$22,507	42.0
	8CH	Replace HV-2 Exhaust Duct Damper Actuator And Adjust Outside Air Damper			53		$0	$114	$476	4.2
	9CH	Domestic Hot Water System Upgrades					$0	$0	$8,484	NA
	10CH	Condensate Return Vent Pipe Relocation					$0	$0	$4,504	NA
	11CH	Boiler Room Combustion Air Upgrades	(11)	(1,166)			$0	($223)	$29,974	NA
	12CH	Upgrade Chimney Access Door					$0	$0	$4,200	NA
	13CH	Basement AC Unit Dehumidification Upgrades					$0	$0	$1,791	NA
	14CH	Service/Replace Exhaust Fans	(15)	(2,054)			$0	($358)	$26,922	NA
	15CH	Replace Chimney Cap					$0	$0	$5,368	NA
	16CH	Disconnect From Louver & Seal Exhaust Ductwork At First Floor Corner Offices			53		$0	$114	$952	8.4
	17CH	Replace HV-2 And Provide Air Conditioning	(270)	(11,379)			$0	($3,263)	$384,931	NA
	18CH	Replace HV-3 And Provide Air Conditioning	(135)	(5,689)			$0	($1,631)	$182,786	NA
	19CH	New Boiler					$0	$0	$126,334	NA
	20CH	Convert Heating System From Steam To Hot Water (Note: Savings listed includes steam trap replacement savings)			6,962		$5,660	$20,708	$795,747	38.4
	21CH	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $200,790 and savings are $3,883/yr for a					$0	$0	$31,082	NA
	22CH	Replace Front Entrance Doors					$0	$0	$120,450	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 25 – Wall -Switch Passive Infrared Occupancy Sensors.

2. 2 – Ceiling Mount Occupancy Sensors – Dual Technology.

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. 3 - Double Commercial Doors to be weather-stripped.

3. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. ***Quantity of 7 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.***
2. ***Quantity of 1 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.***
3. ***Quantity of 22 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.***

4. Fuel Oil Heater:

Existing Conditions:

A. The existing boiler uses #2 oil as a fuel source.

Proposed Upgrades:

A. Provide a combustion oil heater for the existing boiler. The combustion oil heater will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls.

5. New Boiler Combustion Controls:

Existing Conditions:

A. The fuel oil burner is furnished with mechanical combustion air/fuel ratio controls. The optimal combustion air/oil ratio setting is achieved by setting the oil stroke that is linked to the air damper. This adjustment might be good at the time when the burner is tuned. Over time, the air/fuel ratio can drift to either richer or leaner ratios, causing inefficient burning and resulting in loss of combustion efficiency.

Proposed Upgrades:

A. Install a new microprocessor burner controller that will provide more reliable and efficient burning.

Install New Boiler Combustion Controls

6. Steam Trap Repair & Replacement:

Existing Conditions:

A. The condensate receiver vent pipe in the boiler room is constantly venting a very significant amount of steam into the boiler. During the time of our survey, the outside air temperature was relatively mild and the boiler ran constantly the entire time that we were there. These are indications that there are faulty steam traps in the system. On site as-built drawings indicate that there are 156 steam traps in the building, of which 98 are thermostatic and the balance are F&T. It was acknowledged that there are problems with steam traps.

Proposed Upgrades:

A. Repair or replace 156 steam traps throughout the building. Thermostatic steam traps will be rebuilt with Barnes and Jones Cage Units and have new covers installed, or replaced with new Barnes and Jones thermostatic traps if repairing the trap is not possible. Non-thermostatic traps will be replaced with the equivalent Barnes and Jones float and thermostatic (F&T) traps.

Note: As part of the "Additional Capital Improvements" section of this report, Honeywell recommends considering the replacement of the steam heating system with a new hot water heating system. If this recommendation is accepted, a steam trap survey and replacement will not be necessary.

Steam Venting from Condensate Receiver Vent Pipe

7. Exhaust Fan Controls:

Existing Conditions:

A. At 6:20 PM during our survey, we observed about half of the 11 exhaust fans in the attic to be turned off. Most of the building was unoccupied, and most if not all of the fans should have been off. It was brought to our attention that many of the exhaust fans in the building are controlled by switches that are located in the occupied spaces, and the occupants are either not diligent in shutting the fans off at night, or they are not aware that the fans are manually controlled.

B. At 10:50 AM during our survey, we observed that EF-9, 11, 12, 13, 16 & 17 were not operating.

Proposed Upgrades:

A. Provide new controls to automatically shut the building's exhaust fans off during unoccupied times.
B. Investigate EF-9, 11, 12, 13, 16 & 17 to ensure that they are operational. The fans are in proper operating condition and it is determined that repair of controls is required to make them operational, the repairs will be covered under this scope of work item. If it is determined that any or all of the fans are not in operating condition and fan replacement is required, the fan replacement will be covered under the capital improvement upgrades (listed elsewhere in this report).

8. Replace HV-2 Exhaust Duct Damper Actuator and Adjust Outside Air Damper:

Existing Conditions:

A. The existing HV-2 unit (located above the corridor ceiling on the first floor) has a motorized damper in it's exhaust duct which does not close. The damper stays open when HV-2 is off, which allows cold air to migrate through the exhaust ductwork and into the building.
B. HV-2 outside air damper does not fully close when the unit is turned off. The damper remains approximately 5% open. The correction for this is simply an adjustment of linkage.

Proposed Upgrades:

A. Replace the exhaust duct motorized damper actuator with a new actuator, and ensure proper operation.
B. Adjust the linkage for HV-2 outside air damper to ensure that it fully closes.

9. Domestic Hot Water System Upgrades:

Existing Conditions:

A. We were informed that domestic hot water takes a long time to get to the lavatories in the building, and this is particularly a problem during the winter. The recirculating pump for the domestic hot water system small and is also made of cast iron, which is a code violation.
B. In the summer, domestic hot water is provided through a 50 gallon oil fired domestic water heater. In the winter, domestic hot water is provided through tankless coils in the boiler.

Proposed Upgrades:

A. Replace the existing cast iron domestic hot water pump with a larger, bronze pump.
B. Provide a new circulating pump between the boiler's tankless coil and the 50 gallon water heater so that the water heater's 50 gal tank can be used as storage in the winter when the boiler is in operation. This will provide additional storage capacity in the winter, which appears to be the worst time of year for this domestic hot water issue.

Replace Existing Cast Iron DHW Pump with New, Larger Bronze Pump

10. Condensate Return Vent Pipe Relocation:

Existing Conditions:

A. The vent pipe for the condensate receiver tank is open ended inside of the boiler room. This is a code violation.

Proposed Upgrades:

A. Extend the existing condensate receiver vent pipe to the outside of the building.

11. Boiler Room Combustion Air Upgrades:

Existing Conditions:

A. Combustion air for the boiler room is accomplished by a fan which supplies outdoor air to the boiler room when the boiler operates. The fan supplies more air to the boiler room than the boiler can exhaust up through the chimney (as determined by smoke tests), and therefore the boiler room is under a positive pressure. Having the boiler room under a positive pressure creates the strong potential of forcing boiler room fumes out into the building. Boiler rooms are typically kept at a neutral to slightly negative pressure to avoid this.

Proposed Upgrades:

A. Remove the existing boiler room combustion air fan and replace it with a new "Exhausto" combustion air fan system with variable frequency drive and pressure control. Control the new system to maintain a slight negative pressure in the boiler room at all times.

B. Provide a new exhaust fan for the boiler room, to aid in removing heat from the boiler room. Interlock control of this new exhaust fan system with the new "Exhausto" combustion air fan system.

Existing Boiler Room Combustion Air Fan

12. <u>Upgrade Chimney Access Door:</u>

<u>Existing Conditions:</u>

A. Access to the base of the chimney for cleanout service is covered by a sheet of plywood. This is a code violation. The access door should be a fire rated metal cleanout access door.

<u>Proposed Upgrades:</u>

A. Replace the plywood panel with a fire rated metal cleanout access door.

13. <u>Basement AC Unit Dehumidification Upgrades:</u>

<u>Existing Conditions:</u>

A. We have been informed that the 2 new Magic Air 5 ton AC units in the basement do not provide adequate dehumidification of air during the humid summer months, to the point where additional self contained dehumidifier units have had to be used. The units are controlled in response to space temperatures. There are no reheat coils in place to allow for a true dehumidification mode of operation.

B. The 2 Magic Aire units each have fresh air intake ducts which have motorized dampers that should close when the units are off. We found that the dampers remained open when the units shut off. This allows cold air to migrate through the ductwork and into the building when the units are off.

C. The fresh air intake and return air ductwork for the Magic Aire units have no volume dampers to balance the amount of outdoor air to the units. With no volume dampers, the air takes the path of least resistance, and it is likely that the units are drawing in more outdoor air than is needed by code. This would create an unnecessary cooling load on the units in the summer.

<u>Proposed Upgrades:</u>

A. Repair/replace the outdoor air dampers to ensure that they close when the units are off.

B. Provide new volume dampers and provide air balancing of the outdoor air and return air to the 2 Magic Aire units.

Note: The above upgrades are included in the project estimate. It was discussed and agree upon that the two above listed modifications may have a significant enough impact to provide satisfactory results regarding system performance. It was also discussed and agreed upon that if these upgrades do not provide a satisfactory increase in performance, then the following upgrades can be considered at a later date. The following upgrades are not included in our project estimate:

Additional Upgrades To Be Performed At A Later Date, If Necessary:
Provide new duct mounted reheat coils and associated controls to allow for a dehumidification mode of operation for these 2 units. Since the boiler is turned off in the summer, provide a dedicated oil fired water heater to provide hot water for the reheat coils in the summer

14. Service/Replace Exhaust Fans:

Existing Conditions:

A. At 10:50 AM during our survey, we observed that EF-9, 11, 12, 13, 16 & 17 were not operating.

Proposed Upgrades:

A. Investigate EF-9, 11, 12, 13, 16 & 17 to ensure that they are operational. Repair/replace exhaust fans as required to ensure proper operation.

15. Replace Chimney Cap:

Existing Conditions:

A. The existing chimney cap is rusting out and is in poor condition. If not replaced, the chimney cap will corrode and will fall off.

Proposed Upgrades:

A. Replace chimney cap.

Replace Rusting Chimney Cap

16. Disconnect From Louver And Seal Exhaust Ductwork At First Floor Corner Offices:

Existing Conditions:

A. On the first floor, the 2 offices in the corner of the building, near the Assessing Department and near Stair #1, have old exhaust systems which were abandoned some time ago. These rooms were a laboratory and a conference room for the Health Department, so the exhaust systems were necessary at the time. These exhaust systems are no longer necessary, and they have been turned off. Although the fans have been turned off, the ductwork is still allowing cold air to migrate from the wall louver into the building; this is apparent because the occupants have placed cardboard over the ceiling exhaust grilles to stop cold air from migrating into the rooms.

Proposed Upgrades:

A. Disconnect the existing exhaust ductwork from the exhaust louver and seal the louver plenum airtight to ensure that cold air will not migrate into the building.

B. The existing exhaust system will remain abandoned in place.

17. Replace HV-2 And Provide Air Conditioning:

Existing Conditions:

A. The existing HV-2 unit, which is located above the ceiling in the first floor corridor, is the original unit from the 1968 renovation. This unit provides ventilation for the second floor Legal Department, School Department, Human Resources, Engineering Department, and Planning Department, as well as the First Floor center core area (City Clerk, Lunch Room, Voter Registration, etc.) and the First Floor Code Enforcement Department. The unit is in fair to poor condition and it has exceeded its expected service life. With the exception of 2 duct mounted cooling coils which were recently installed to provide air conditioning to the center core area of the first floor, this unit does not provide air conditioning. The unit is also difficult to access for maintenance and service.

B. Based on the 1968 drawings, HV-2 was designed with an external static pressure capability of 0.5" ESP. It is a certainty that the actual external static pressure of this system would need to be far in excess of 0.5" in order to achieve design airflow. What this means in laymen's terms is that the existing unit does not have enough fan capacity to provide design airflow.

Proposed Upgrades:

A. Remove the existing HV-2 unit and provide a new rooftop HVAC unit. The new unit will be located on the roof directly above the existing unit, which will provide better access for maintenance and service. Provide access to the roof through the second floor storage room. The new unit will have a DX cooling coil and associated DDC controls to provide air conditioning for all spaces served by the unit. The new unit will be appropriately sized to provide the proper design airflow.

B. Utilize the existing duct mounted reheat coils and existing ductwork to the extent possible. Provide new variable air volume (VAV) boxes in the existing supply ductwork that is served by HV-2. Provide associated DDC controls to ensure proper temperature control for each zone.

18. Replace HV-3 And Provide Air Conditioning:

Existing Conditions:

A. The existing HV-3 unit, which is located in the attic, is the original unit from the 1968 renovation. This unit serves the Council Chambers, the adjacent Conference Rooms, and the City Manager's Office. The unit is in fair to poor condition and it has exceeded its expected service life. This unit does not provide air conditioning. The unit is also difficult to access for maintenance and service.

Proposed Upgrades:

A. Remove the existing HV-3 unit and provide a new rooftop HVAC unit. The new unit will be located on the roof directly above the existing unit, which will provide better access for maintenance and service. The new unit will have a DX cooling coil and associated DDC controls to provide air conditioning for all spaces served by the unit. The new unit will be appropriately sized to provide the proper design airflow.

B. Utilize the existing duct mounted reheat coils and the existing ductwork to the extent possible. Provide new variable air volume (VAV) boxes in the existing supply ductwork that is served by HV-3. Provide associated DDC controls to ensure proper temperature control for each zone.

19. New Boiler:

Existing Conditions:

A. There is 1 existing boiler in the boiler room. A building of this size and significance should have 2 boilers so that the building can continue to operate if a boiler is down for service.

Proposed Upgrades:

A. Provide a new cast iron sectional boiler. A fire tube boiler was considered, and although it is physically possible to rig a second fire tube boiler into the boiler room, it would be a very costly proposition. For this reason, a new cast iron sectional boiler is proposed.

20. Convert Heating System From Steam To Hot Water:

Existing Conditions:

A. We have been told that the steam heating system in this building has been problematic with respect to faulty steam traps throughout the years. In order for a steam system to operate as efficiently as possible, an effective steam trap maintenance and replacement program is a necessity. It is not uncommon for steam traps to fail in less than 10 years. We very seldom find a steam building that has had an effective steam trap maintenance and replacement program in place. This is due primarily to the fact that steam trap maintenance is time consuming and labor intensive, and building facilities personnel are rarely capable of giving them the attention that they need. Steam heating systems are also much less efficient than hot water heating systems, due to the elevated pipe temperatures and associated heat loss through piping, boilers, and accessories.

Proposed Upgrades:

A. Convert the existing steam system to a hot water heating system. Convert the steam boiler to a hot water boiler and provide new heating water pumps, valves and accessories. Remove all steam traps and utilize the existing steam and condensate return piping mains for the new heating water supply and return mains.

B. Vacuum clean all finned tube radiators and convector coils to ensure that they will provide effective heat transfer, and re-use the existing radiators and convectors with the new hot water system.

C. Provide new isolation valves, drain valves, air vents and control valves for all terminal heating units, to ensure that all valves and accessories are in good condition for the terminal heating units.

21. DDC Controls Upgrade:

Existing Conditions:

A. Controls throughout the building are pneumatic controls. Controls are original (1968), they have exceeded life expectancy, and they are in fair to poor condition.

Proposed Upgrades:

A. Remove all existing pneumatic controls and provide a new direct digital control (DDC) system. Provide DDC controls for all offices and for all exhaust fans, air handling units, boilers, pumps and alarms. Provide "stand alone" local electric/self contained controls for toilet rooms, corridors, vestibules and storage rooms. A new DDC control system will allow the use of additional energy saving control strategies and will provide additional operational benefits. Provide user friendly interface graphics that will allow simple adjustments of schedules and temperature setpoints by authorized building occupants. Provide web based access to the control system so that authorized users can access the system from a remote site. Provide graphical user interface software, and provide sufficient training as required to allow the customer to perform basic setpoint and schedule adjustments. Some examples of energy saving strategies that are available with DDC controls are:

1. Enhanced time of day scheduling.
2. Data trending. Status of points can be electronically monitored to aid in troubleshooting.
3. Tighter space temperature control.
4. Graphical user interface allows the on-staff facilities personnel to monitor and make adjustments to the control system parameters.
5. All DDC space sensors can be individually monitored to help with identifying temperature control problems.
6. Night setback savings are maximized because each room can be set back during unoccupied times.

22. Replace Front Entrance Doors:

Existing Conditions:

A. The front entrance doors are old and are difficult to open. It was brought to our attention that there is a desire to replace these doors.

Proposed Upgrades:

A. Provide new front entrance doors. The doors at the outside of the vestibule as well as the interior vestibule doors will be replaced. Automatic door openers are also recommended and are included in our proposal.

Fire Station #5

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
Fire Station #5 was built in 1993. In 2000/2001, additional blown insulation was added to insulate the attic, which helped to significantly reduce heat losses. The building is comprised of offices, living spaces, and vehicle bays, all on 1 floor. The building is 5,923 square feet. See remainder of this report for additional comments.

Heating System:
The building is heated by HB Smith 19 Series 4 section hot water boiler. The boiler has capacity of 359 MBH NET IBR output. The fuel source is #2 oil. The boiler also heats the domestic hot water that is stored in a Boilermate storage tank.

The offices and living spaces are heated by perimeter hot water baseboard radiation. The vehicle bays are heated by overhead hot water unit heaters.

Air Conditioning Systems:
The kitchen and living room areas have split system fan coil air conditioners.

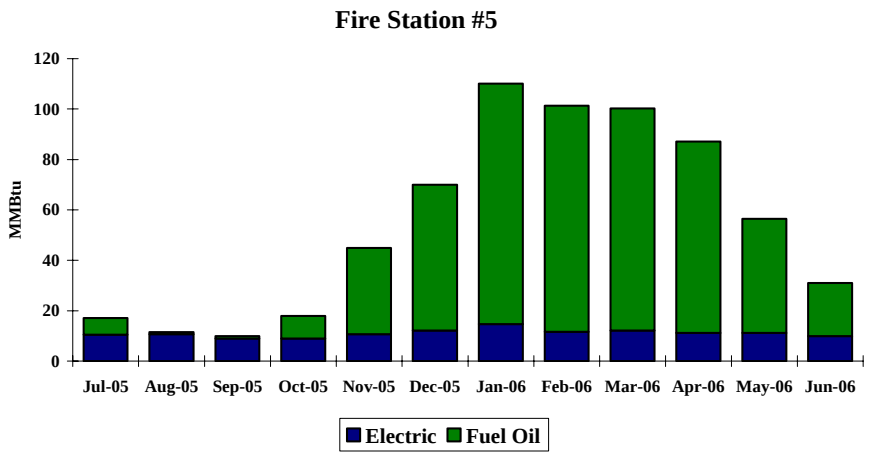
Ventilation Systems:
A fan coil unit (FC-4) provides ventilation and make-up air for the building.

The vehicle bays are equipped with an automated Plymovent exhaust system for vehicle exhaust.

Temperature Control Systems:
Temperature control is by local electric controls.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$5,607	38,880
Water and Sewer - CCF	$1,123	172
Fuel Oil - Gallons	$8,062	3,759
7/05-6/06 Total	$14,791	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Fire Station #5	1FS	Lighting Upgrades	1	1,188			$0	$171	$1,353	7.9
	2FS	Building Envelope Upgrades			301		$0	$649	$5,692	8.8
	3FS	Water Conservation Upgrades			44	29,959	$12	$370	$2,501	6.8
	4FS	Fuel Oil Heater		(221)	166		$0	$323	$1,761	5.5
	5FS	Fan Coil Unit Retro-Commissioning	(2)	(1,533)	(1,211)		$0	($221)	$1,039	NA
	6FS	DDC Controls Upgrade		3,791	216		$0	$716	$33,127	46.3

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 7– 14 watt incandescent Exit signs to new LED Exit Signs with battery back up.

2. *1 – Fixture with T12 lamps to be replaced with new 4 ft. 2 lamp Wrap around Fluorescent fixtures with High Performance T8 Lamp and Ballast Combination.*
3. *Occupancy sensor will be added to Locker Room.*
4. *Occupancy sensor will be added to Ambulance Bay to turn on 2 fixtures to when backing in.*

2. ***Building Envelope Upgrades:***

Existing Conditions:

A. *A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.*

Proposed Upgrades:

A. *Provide the following building envelope upgrades:*
   1. *5 Single Commercial Doors to be weather-stripped*
   2. *3 Over Head Doors to be weather-stripped*

3. ***Water Conservation Upgrades:***

Existing Conditions:

A. *A water conservation survey has been performed to evaluate the need for water conservation upgrades.*

Proposed Upgrades:

A. *Provide the following water conservation upgrades:*
   1. *Quantity of 2 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.*
   2. *Quantity of 1 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.*
   3. *Quantity of 2 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.*
   4. *Quantity of 1 - Replace the existing threaded showerheads on exposed shower assemblies with new 2.0 gpm massage action pressure compensating ABS high-impact showerheads and applicable adaptors.*

4. ***Fuel Oil Heater:***

Existing Conditions:

A. *The existing boiler uses #2 oil as a fuel source.*

Proposed Upgrades:

A. *Provide a combustion oil heater for the existing boiler. The combustion oil heater will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls.*

Add Oil Heater to Existing #2 Oil Burner

5. <u>Fan Coil Unit Retro-Commissioning :</u>

<u>Existing Conditions:</u>

A. Fan coil unit FC-4 (provides ventilation and make-up air for the building) was found to be OFF during our survey. We were told that the unit is kept off because it uses too much energy. This unit should be operated to provide proper ventilation and proper make-up air for the building's exhaust systems.

B. FC-4 was found to have an outside air damper that has a long delay when the unit is turned off. The outside air damper should close immediately when the unit is turned OFF.

<u>Proposed Upgrades:</u>

A. Provide Retro-Commissioning and controls modifications to FC-4 to ensure that the unit operates properly and that the outside air damper closes immediately when the unit is turned OFF. Instruct the building occupants that this unit must run while the building is occupied so that proper ventilation and make-up air will be provided.

6. <u>DDC Controls Upgrade:</u>

<u>Existing Conditions:</u>

A. Controls throughout the building are local electric controls.

Proposed Upgrades:

A. Remove all existing electric controls and provide a new direct digital control (DDC) system. Provide DDC controls for all offices and for all exhaust fans, the fan coil unit, the vehicle bays, boilers, pumps and alarms. Provide "stand alone" local electric/self contained controls for toilet rooms, corridors, vestibules and storage rooms. A new DDC control system will allow the use of additional energy saving control strategies and will provide additional operational benefits. Provide user friendly interface graphics that will allow simple adjustments of schedules and temperature setpoints by authorized building occupants. Provide web based access to the control system so that authorized users can access the system from a remote site. Provide graphical user interface software, and provide sufficient training as required to allow the customer to perform basic setpoint and schedule adjustments. Some examples of energy saving strategies that are available with DDC controls are:
   1. Enhanced time of day scheduling.
   2. Data trending. Status of points can be electronically monitored to aid in troubleshooting.
   3. Tighter space temperature control.
   4. Demand based ventilation controls for single rooms that are served by a dedicated air handling unit.
   5. Graphical user interface allows the on-staff facilities personnel to monitor and make adjustments to the control system parameters.
   6. All DDC space sensors can be individually monitored to help with identifying temperature control problems.
   7. Night setback savings are maximized because each room can be set back during unoccupied times.

B. At the customer's request, the new temperature sensors in the vehicle bays will have no local adjustment capabilities. Control of these sensors will be only through graphics on the operator work station.

Fleet Maintenance Building

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The original part of the Fleet building was built in 1950's. The building is comprised of 2 work bays, a paint shop, a tire shop, a body shop, a parts store room, and offices. The facility is approximately 15,200 square feet. See remainder of this report for additional comments.

Heating System:
Heating hot water for the main offices is generated by an HB Smith Series G200 hot water boiler with a propane burner. The boiler capacity is 140,000 BTU/HR input and 110,000 BTU/HR output. Terminal heaters in the main offices are a combination of hot water baseboard radiation and electric baseboard radiation. Heating water for the Service Manager's Office, Foreman's Office, upstairs Break Room, Toilet Rooms and Parts Room is generated by an HB Smith PG300-S/W-5 hot water boiler with propane burner. The boiler capacity is 300,000 BTU/HR input and 240,000 BTU/HR output. Terminal heaters are hot water baseboard radiation and suspended unit heaters.

Each of 2 work bays is furnished with a waste oil furnace suspended from the ceiling with capacity of 400,000 BTU/HR for each heater. The work bays and the adjacent shops (Paint Shop, Body Shop, Machine Shop, Tire Room) are heated by overhead LP gas infrared heaters.

Air Conditioning Systems:
There are no central air conditioning systems in the building. Window A/C units are used for the offices in the summer.

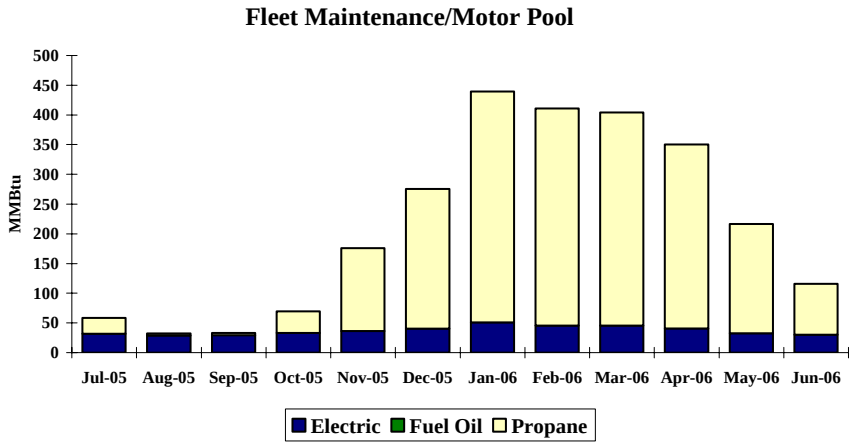
Ventilation Systems:
There is no means of mechanical ventilation in the building. The offices have operable windows, the working bay areas have exhaust fans and welding area is furnished with a manually operated exhaust fan. The Paint Shop has an exhaust fan and a make-up air unit, both located on the roof. The Paint Shop make-up air unit is reportedly not in use.

Temperature Control Systems:

Temperature controls throughout the building are local electric controls.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$18,268	130,560
Water and Sewer - CCF	$1,478	222
LP Gas (Propane) - Gallons	$34,926	23,334
Fuel Oil - Gallons	$0	0
7/05-6/06 Total	$54,672	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		LP Gas (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Fleet Maintenance Building	1FM	Lighting Upgrades	34	14,213			$262	$2,323	$21,256	9.2
	2FM	Lighting Upgrades For Paint Room	(11)	(2,359)			$0	($380)	$20,133	NA
	3FM	Building Envelope Upgrades			141		$0	$210	$2,128	10.1
	4FM	Water Conservation Upgrades			32	27,648	$23	$317	$5,689	17.9
	5FM	Destratification Fans For Work Bays & Shops		(2,891)	2,845		$0	$3,884	$17,375	4.5
	6FM	Remove Electric Radiators & Upgrade Hot Water Radiators In Main Office Area	45	7,500	(680)		$0	$253	$10,128	40.0
	7FM	New Night Setback Controls For Main Office Area			428		$0	$639	$1,048	1.6
	8FM	New HVAC For Main Office	(47)	(5,519)	(104)		$0	($1,189)	$61,400	NA
	9FM	New Ventilation Units For Two Main Work Bays	(105)	(27,383)	(2,610)		$0	($8,128)	$259,911	NA
	10FM	New Paint Shop Make-Up Air Unit	(25)	(3,160)	(2,088)		$0	($3,701)	$78,659	NA
	11FM	Make-Up Air Ductwork Modifications For Paint Shop					$0	$0	$15,891	NA
	12FM	New Ventilation System For Body Shop	(8)	(1,826)	(652)		$0	($1,266)	$52,798	NA
	13FM	New Ventilation System For Parts Room	(8)	(1,826)	(652)		$0	($1,267)	$19,231	NA
	14FM	New Rooftop Exhaust Fans	(28)	(4,297)			$0	($744)	$44,962	NA
	15FM	New Wall Exhaust Fan	(4)	(263)			$0	($63)	$4,682	NA
	16FM	Replace Working Bay Windows			3,753		$0	$5,610	$94,910	16.9
	17FM	Provide Fan Coil Unit For Motor Pool Office	(2)	(411)	(31)		$0	($114)	$15,062	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. ***125 – 4' 2 Lamp T8 Hood Fixtures in Bays to 14 - 4 lamp T5HO fixtures with Wire Guards.***
2. ***32 - 4' 2 Lamp T8 Hood Fixtures in Bays to 6 - 4 lamp T5HO fixtures with Wire Guards and Daylight Harvesting sensors controls.***
3. ***9 - 4 ft T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination.***
4. ***1 – Fixtures with incandescent lamps to be replaced with new 4 ft. 2 lamp Strip Fluorescent fixtures with High Performance T8 Lamp and Ballast Combination.***
5. ***Occupancy sensors will be added to Locker Room in Loft, Tire Room and Oil Room.***
6. ***2 – Wall -Switch Passive Infrared Occupancy Sensors.***

2. Lighting Upgrades For Paint Room:

Existing Conditions:

A. A request was made by the users to upgrade the lighting in the Paint Room. Upgrading lighting in the Paint Room will not result in energy savings; in fact it will result in additional energy use, however the request has been made to improve lighting in this room. This lighting scope of work is being listed separately because there are no energy savings.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. Install new lighting in the existing Paint Room.

3. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. ***7 - Single Commercial Doors to be weather-stripped.***

4. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:
   1. Quantity of 4 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.
   2. Quantity of 3 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.
   3. Quantity of 2 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.

5. De-Stratification Fans for Work Bays and Shops:

Existing Conditions:

A. The work bays have high ceilings which allow heat to stratify up high.

Proposed Upgrades:

A. Provide de-stratification fans in the following areas:
   1. 1 fan in Body Shop.
   2. 1 in Alleyway.
   3. 1 in Machine Shop.
   4. 1 in Tire Shop.
   5. 2 in each of the 2 work bays (total of 4).

The fans will force warm air down to the floor during the heating season.

6. Remove Electric Radiators & Upgrade Hot Water Radiators In Main Office Area:

Existing Conditions:

A. The main office area has residential style hot water baseboard radiators as well as electric baseboard radiators. The electric radiators are mounted on the wall above the hot water radiators. We were told that the electric radiators were installed because the hot water radiators did not provide enough heat.

Proposed Upgrades:

A. Remove the electric baseboard radiators and the residential style hot water baseboard radiators, and provide new high capacity commercial grade baseboard radiation.

Remove Electric Radiators and Residential Style Hot Water Radiators and Provide New High Output Commercial Radiators

7. New Night Setback Controls For Main Office Area:

Existing Conditions:

A. We were informed that programmable thermostats have previously been installed in the Main Office Area, however the occupants do not use them to save energy.

Proposed Upgrades:

A. Provide new night setback controls with override button to override temperature back to occupied settings for a 2 hour period in the Main Office Area. The controller will be placed in a location where only authorized persons can access it.

8. New HVAC for Main Office Area:

Existing Conditions:

A. The main office area currently has no means of mechanical ventilation and no central air conditioning system.

Proposed Upgrades:

A. Provide a new heating, ventilating and air conditioning system and associated ductwork for the Main Office area. Install the new unit outdoors on a concrete pad behind the office area (this will eliminate any structural issues that would be encountered by placing the unit on the roof). The ceilings are concealed spline and are 10' in height. To provide room for supply and return ducts, the ceilings will have to be lowered along with lowering lights and sprinkler heads. Provide a duct mounted reheat coil to temper the supply air and aid in heating the spaces in the winter. Provide new DDC controls for temperature control and for efficient operation.

9. New Ventilation Units For Two Main Work Bays:

Existing Conditions:

A. The old suspended air handling units in the two main work bays are disconnected and their goosenecks have been sealed shut. There is no means of mechanical ventilation for the work bays.

Proposed Upgrades:

A. Install new rooftop gas fired ventilation units for the two main work bays, to provide ventilation and make-up air to the work bays.

10. New Paint Shop Make-Up Air Unit:

Existing Conditions:

A. It was brought to our attention that the existing make-up air unit for the Paint Shop exhaust system failed this past winter. The unit is old and is in fair to poor condition. Without a make-up air unit, the Paint Shop exhaust fan draws make-up air from any place that it can get it, which results in the building being placed under a negative pressure and cold air being drawn in through door seals and window gaps.

Proposed Upgrades:

A. Remove the existing make-up air unit and provide a new gas fired make-up air unit. Provide new controls to interlock make-up air unit with the exhaust fan operation and to maintain proper discharge air temperature.

11. Make-Up Air Ductwork Modifications For Paint Shop:

Existing Conditions:

A. We were informed that the make up air system for the Paint Shop has not been used during the painting process due to high velocity discharge that affected the quality of painting. There is simply an open ended duct that blows down to the floor, and that creates air movement that affects the flow of paint from the paint guns.

Proposed Upgrades:

A. Modify the supply air ductwork to achieve a low air distribution velocity to accommodate a painting environment while the make-up air unit is running.

12. New Ventilation System for Body Shop:

Existing Conditions:

A. The Body Shop has no means of mechanical ventilation/make-up air.

Note: The Machine Shop, Alleyway and Tire Room also have no means of mechanical ventilation/make-up air. It was brought to our attention that the Machine Shop does not get used, and that the Alleyway and the Tire Shop are not occupied spaces, so there is no need for ventilation systems for these areas.

Proposed Upgrades:

A. Provide a new rooftop ventilation unit and associated ductwork to provide ventilation/make-up air to the Body Shop.

13. New Ventilation System For Parts Room:

Existing Conditions:

A. The Parts Room has no means of mechanical ventilation.

Proposed Upgrades:

A. Provide a new ducted fan coil unit provide ventilation to the Parts Room.

14. New Rooftop Exhaust Fans:

Existing Conditions:

A. Several rooftop exhaust fans are old and are in poor condition. Some of the fans either have no backdraft dampers or have backdraft dampers which are not fully closing and are allowing cold air to migrate into the building.
B. The ladies Room has no exhaust.
C. The Body Shop has no exhaust.

Proposed Upgrades:

A. Remove the following rooftop exhaust fans and provide new, appropriately sized exhaust fans:
   1. 1 general exhaust fan in each of the 2 work bays, near the partition wall that separates the 2 work bays. Total of 2 fans.
   2. 1 vehicle exhaust fan near the Men's Room.
   3. 1 exhaust fan for toilet rooms.
   4. 1 exhaust fan for Paint Shop.
   5. There is an existing old exhaust fan which serves the Machine Shop exhaust hood. It was brought to our attention that the Machine Shop does not get used, so there is no need for an exhaust hood in the Machine Shop. The existing exhaust fan and exhaust hood will be removed, and the roof curb will be capped.

B. Provide new exhaust ductwork to tie the Ladies Room in with the Men's Room exhaust system.

C. Provide a new general exhaust system for the Body Shop.

Old Exhaust Fans to be Replaced or Removed

15. New Wall Exhaust Fan:

Existing Conditions:

A. The existing wall exhaust fan in the work bay near the toilet rooms is old and is in poor condition. The backdraft damper does not close tightly, so heat escapes through the backdraft damper when the fan is off.

Proposed Upgrades:

A. Install new wall exhaust fan with new tight closing motorized damper.

16. Replace Working Bay Windows:

Existing Conditions:

A. The 2 work bays have original windows. The windows are very large, they are single pane and they are very inefficient. There is also a significant amount of infiltration occurring around the window frames.

Proposed Upgrades:

A. Due to high paybacks typically associated with window replacements, Honeywell usually does not include window replacements in their energy retrofit projects. This building, however, has a large enough percentage of window area, and the condition of the windows is such that payback may be more attractive, although it will likely not be a self funded energy conservation measure. A final economic analysis will be performed, but at this time we are recommending that window replacement for the work bays be included in the scope of work. Replace the work bay windows with new double pane frame insulated windows. If acceptable to the customer, block off some of the window area and make the new window area smaller, to increase savings.

17. Provide Fan Coil Unit For Motor Pool Office:

Existing Conditions:

A. There is currently no ventilation in the Motor Pool Office area. This is an internal office, and therefore it has no windows for natural ventilation.

Proposed Upgrades:

A. Provide a fan coil unit to serve the Motor Pool office. The fan coil unit will have the ability to bring in outdoor air to provide some minimal cooling effect for the room, and it will also provide ventilation to the room.

Golf Course Clubhouse

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
Golf clubhouse is a relatively new one story building with partial basement. It is comprised of a dining room with bar and kitchen, a pro shop, men's and women's lock rooms, mechanical room and storage room.

The building is approximately 3,175 square feet. See remainder of this report for additional comments.

Heating System:
The building is heated by one oil fired forced air furnace with ductwork distributed throughout the building. The furnace is rated for 134,000 BTU/HR and the fuel source is #2 oil.

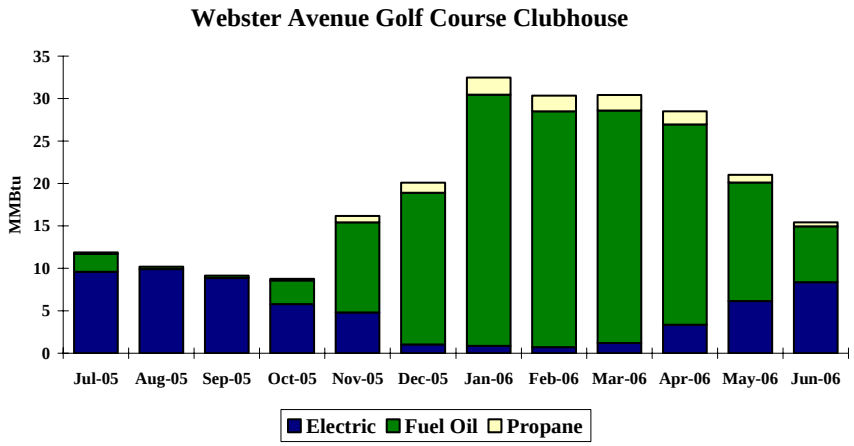
Air Conditioning Systems:
The building has 2 outdoor condensing units which serve duct mounted DX cooling coils.

Ventilation Systems:
The existing forced air furnace system does not have the ability to bring in outside air, so there is no means of mechanical ventilation for the building. The pro shop and dining area have operable windows. The kitchen is equipped with an operating exhaust hood system.

Temperature Control Systems:
The pro shop and dining areas have one electric thermostat each. Controls are all electric, and there is no night setback strategy in place.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$2,666	17,789
Water and Sewer - CCF	$6,369	4,047
LP Gas (Propane) - Gallons	$174	119
Fuel Oil - Gallons	$2,470	1,165
7/05-6/06 Total	$11,680	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Golf Course Club House	1G	Lighting Upgrades	6	1,751			$0	$273	$2,860	10.5
	2G	Building Envelope Upgrades			69		$0	$147	$1,507	10.2
	3G	Water Conservation Upgrades			22	21,043	$23	$186	$5,777	31.1
	4G	Night Setback Controls		3,051			$0	$476	$1,417	3.0

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 11 - 4 ft T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination.

2. 14 – Fixtures with 65 watt incandescent lamps to be upgraded with 23 watt Long Life Compact Fluorescent Induction lamps.

3. *2 – Incandescent Exit sign to new LED Exit Sign with battery back up.*
4. *Occupancy sensors will be added to Locker Rooms.*

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. ***5 - Single Commercial Doors to be weather-stripped.***

3. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. Quantity of 4 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.
2. Quantity of 2 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.
3. Quantity of 4 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.

4. Night Setback Controls:

Existing Conditions:

A. Controls are local electric thermostats, and there is currently no means to automatically adjust setpoint temperatures at night to save energy.

Proposed Upgrades:

A. Provide night setback controls to automatically adjust night temperatures for energy savings. Provide override buttons to override space temperature back to daytime settings if desired.

Ventilation Note: The existing forced air furnace which supplies air throughout the building does not have the ability to bring in outdoor air. Because of this, there is no means of mechanical ventilation for the building. The ventilation code technically does allow operable windows to qualify for space ventilation, provided that window open area is equal to or greater than 4% of the floor area. Since this building is only used in spring, summer and fall, using windows for ventilation is reasonable. These conditions are listed for information only; no upgrades are proposed.

Health & Welfare

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The Health & Welfare building is a single story building comprised of a nursing home section and administrative offices.

Heating System:
The building is heated by two HB Smith cast iron sectional steam boilers. Each boiler has a capacity of 3,494,000 BTU/HR NET IBR output. The fuel source is #2 oil. Steam pressure is 7 psig. Steam is transferred to the heating distribution room where it is converted to hot water through several heat exchangers. Hot water is then distributed throughout the building for heating.

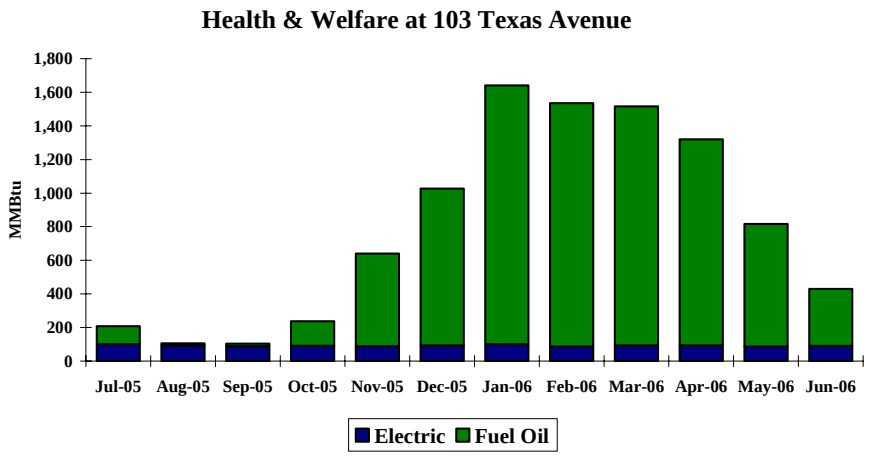
Air Conditioning Systems:
It appears that there is no air conditioning in the building, except that some offices are furnished with window A/C units.

Ventilation Systems:
The Blue Room and adjacent rooms have mechanical ventilation provided by an air-to-air heat recovery unit. The remainder of the facility has little to no means of mechanical ventilation.

Temperature Control Systems:
During walk down through the Nursing Home, Honeywell learned that there is a major renovation project on the way with a completed design and the bidding process in progress. We were informed that the renovation project includes replacement of the boilers to new hot water boilers, conversion from steam to hot water, and addition of new HVAC systems and controls. Due to this major HVAC system renovation, Honeywell will refrain from making energy savings recommendations for the HVAC systems. The only energy savings recommendations will be lighting, building envelope, and water conservation, which are not affected by the HVAC system upgrades.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$41,140	324,240
Water and Sewer - CCF	$23,355	3,926
Fuel Oil - Gallons	$124,075	60,684
7/05-6/06 Total	$188,570	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Health & Welfare	1HW	Lighting Upgrades	6	896			$0	$156	$1,775	11.4
	2HW	Building Envelope Upgrades			528		$0	$1,080	$13,100	12.1
	3HW	Water Conservation Upgrades			594	644,765	$287	$6,636	$64,763	9.8

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 7 - 4 ft T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination.

2. 9 – Fixtures with 50 watt incandescent lamps to be replaced with new 8 ft. 2 lamp High Efficiency Wrap around Fluorescent fixtures with High Performance T8 Lamp and Ballast Combination.

3. *Occupancy sensors will be added to 128 File Room and Copier Room.*
4. *1 – Wall -Switch Passive Infrared Occupancy Sensor.*

2. ***Building Envelope Upgrades:***

Existing Conditions:

A. *A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.*

Proposed Upgrades:

A. *Provide the following building envelope upgrades:*
   1. *11 - Single Commercial Doors to be weather-stripped.*
   2. *5 - Double Commercial Doors to be weather-stripped.*
   3. *3 - Roof Top Ventilator to be opened, perimeter sealed, dampers lubricated, 128 linear feet.*

3. ***Water Conservation Upgrades:***

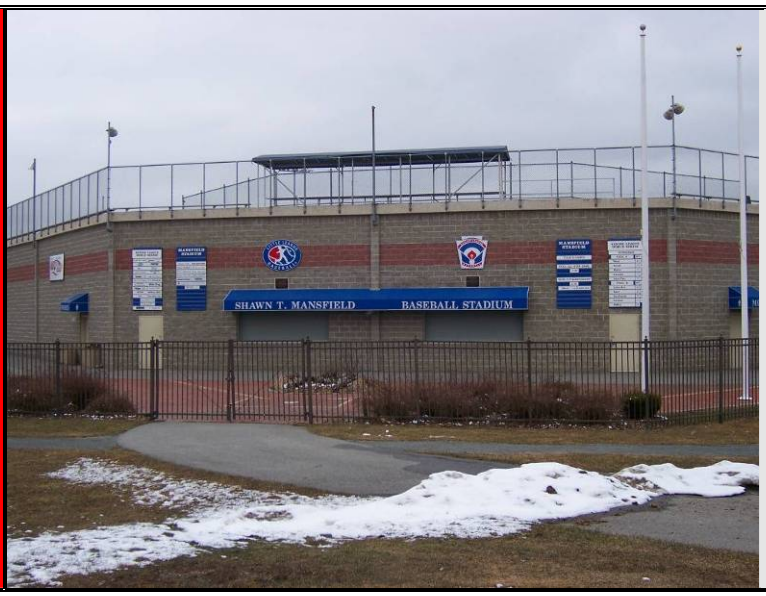
Existing Conditions:

A. *A water conservation survey has been performed to evaluate the need for water conservation upgrades.*

Proposed Upgrades:

A. *Provide the following water conservation upgrades:*
   1. *Quantity of 49 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.*
   2. *Quantity of 56 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.*

Mansfield Stadium



SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
Mansfield baseball Stadium is a concrete block structure that contains ticket booths, a concession area, toilet rooms and storage rooms.

Heating System:
The building is not heated in the winter.

Air Conditioning Systems:
The building has no air conditioning.

Ventilation Systems:
The building has no means of mechanical ventilation.

Temperature Control Systems:
Temperature controls throughout the building are local electric controls.

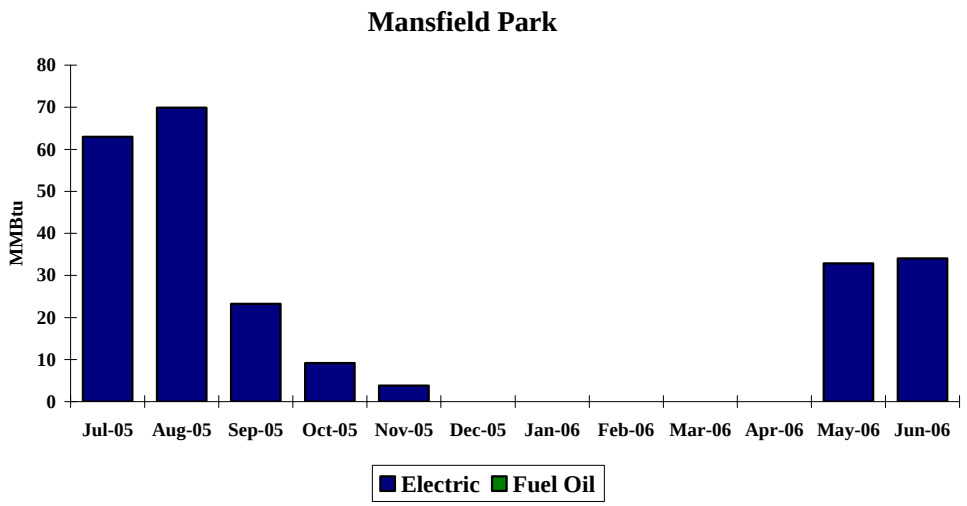
SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Mansfield Baseball Stadium	1M	Lighting Upgrades	18	529			$0	$203	$5,482	27.0
	2M	Water Conservation			92	85,312	$82	$747	$16,557	22.2
	3M	New Exhaust Systems For Toilet Rooms	(4)	(878)			$0	($144)	$21,916	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$18,264	69,120
Water and Sewer - CCF	$1,998	820
Fuel Oil - Gallons	$0	0
7/05-6/06 Total	$20,262	

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. **Lighting Upgrades:**

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:
   1. 34 - 4 ft. & 8 ft. T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination.
   2. 4 – Fixture with T12 lamps and missing lens to be replaced with new 4 ft. 2 lamp Vapor Tight Fluorescent fixtures with High Performance T8 Lamp and Ballast Combination.
   3. 10 – Fixtures with incandescent lamps to be relamped to Compact Fluorescent lamps.

2. **Water Conservation Upgrades:**

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. Quantity of 14 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.
2. Quantity of 5 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.
3. Quantity of 12 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.

3. New Exhaust Systems For Toilet Rooms:

Existing Conditions:

A. There are 4 toilet rooms that have no local exhaust.

Proposed Upgrades:

A. Provide new exhaust systems for the 4 toilet rooms. Control new exhaust systems with light switches.

Park Woods Apartments (60 Units)

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Buildings:
The Park Woods complex consists of 20 building with the total of 60 residential apartment units. One apartment unit was surveyed (11 Bolling Drive) and was considered as a "typical" unit. See remainder of this report for additional comments.

Heating System:
Each building has hot water New York FR-147/173-W boiler with capacity 127/150 MBH NET IBR output at firing rate of 1.25/1.5 gph of oil #2.

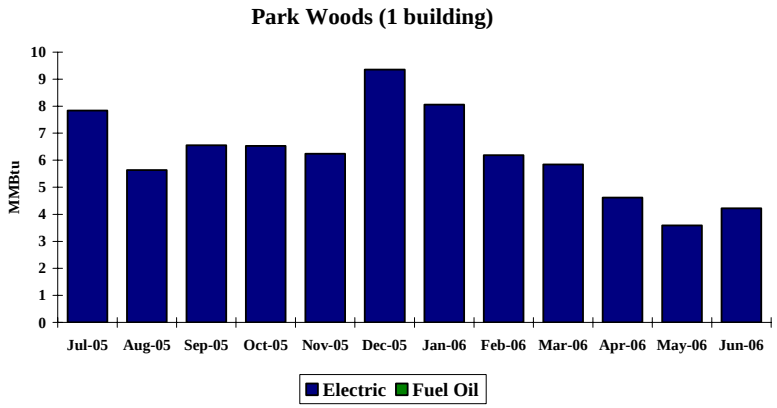
Air Conditioning Systems:
There is no central air conditioning in these buildings.

Ventilation Systems:
There is no means of mechanical ventilation in these buildings. The apartments have operable windows, which technically meets the ventilation code.

Temperature Control Systems:
Each apartment has a single electric thermostat which controls a pump in the boiler room. Thermostats are not programmable, so temperatures in the apartments are maintained at a constant temperature 24/7 unless they are manually set back at night by the occupants.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$3,487	21,872
Water and Sewer - CCF	$931	151
Fuel Oil - Gallons	$0	0
7/05-6/06 Total	$4,418	

Note: Parkwoods Fuel Oil has not been provided

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Park Woods Apartments - 60 Units	1PWA	Lighting Upgrades	595	67,543			$860	$11,551	$85,721	7.4
	2PWA	Building Envelope Upgrades			1,666		$0	$3,608	$36,477	10.1
	3PWA	Water Conservation Upgrades			1,403	828,696	$704	$10,387	$125,535	12.1
	4PWA	Fuel Oil Heaters		(10,282)	7,731		$0	$15,088	$31,057	2.1

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 480 – Fixtures with incandescent lamps to be replaced with new Energy Star Compact Fluorescent Ceiling Mount Decretive Glass lens fixtures.

2. 120 – Exterior Fixtures with incandescent lamps to be replaced with New Compact Fluorescent Wall Mount, Vandal Resistant fixtures with built in photo cell.

3. *60 – Bath Fixtures with incandescent lamps to be replaced with new Energy Star Compact Fluorescent Wall Mount fixtures.*
4. *60 - Bath Fan/ Light Fixtures with incandescent lamps to be relamped to Compact Fluorescent lamps.*

2. ***Building Envelope Upgrades:***

Existing Conditions:

A. *A preliminary building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades. Additional survey time is required.*

Proposed Upgrades:

A. *Provide the following building envelope upgrades:*
   1. *120 - Single Commercial Doors to be weather-stripped.*

3. ***Water Conservation Upgrades:***

Existing Conditions:

A. *A water conservation survey has been performed to evaluate the need for water conservation upgrades.*

Proposed Upgrades:

A. *Provide the following water conservation upgrades:*
   1. *Quantity of 120 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.*
   2. *Quantity of 180 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.*
   3. *Quantity of 60 - Replace the existing threaded showerheads on exposed shower assemblies with new 2.0 gpm massage action pressure compensating ABS high-impact showerheads and applicable adaptors.*

4. ***Fuel Oil Heaters:***

Existing Conditions:

A. *The existing boilers use #2 oil as a fuel source.*

Proposed Upgrades:

A. *Provide combustion oil heaters for the existing boilers. The combustion oil heaters will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls. Our proposal shall include combustion oil heaters for 20 boilers.*

Add Oil Heater to Existing #2 Oil Burner

Public Works Building

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The Public Works building was built in 1978. The building is comprised of Offices, a Lunch Room, a Carpenter Shop, a Sign Shop, a Paint Shop and 2 Stock Rooms. The facility is approximately 18,374 square feet. See remainder of this report for additional comments.

Heating System:
The building is heated by an HB Smith model 19A-8 hot water cast iron sectional boiler. Boiler capacity is 924,000 BTU/HR NET IBR output. Hot water is distributed throughout the building by 4 heating water pumps. Hot water baseboard radiation serves the office areas and hot water unit heaters serve the shop areas.

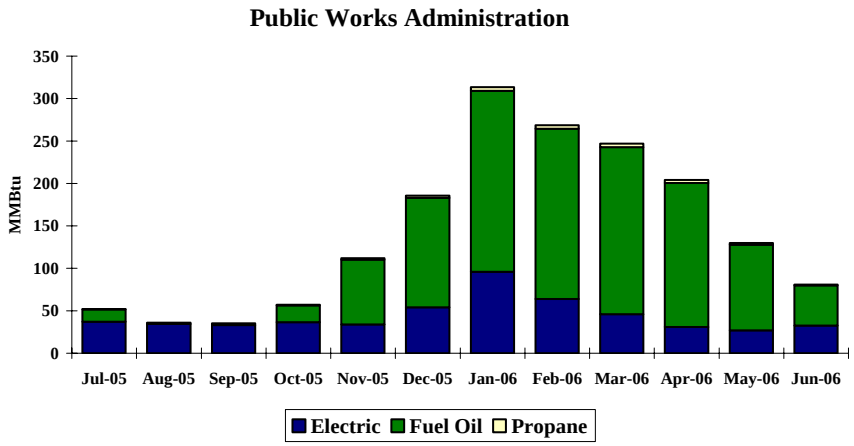
Air Conditioning Systems:
There is one ducted air conditioning unit that serves the office area. This is a recirculation type air handling unit, with no ability to bring in outdoor air.

Ventilation Systems:
There is no means of mechanical ventilation in the building.

Temperature Control Systems:
Temperature controls throughout the building are local electric controls.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$21,785	153,971
Water and Sewer - CCF	$703	352
LP Gas (Propane) - Gallons	$385	260
Fuel Oil - Gallons	$17,575	8,398
7/05-6/06 Total	$40,448	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Public Works Building	1PWB	Lighting Upgrades	121	26,104			$559	$4,724	$35,847	7.6
	2PWB	Building Envelope Upgrades			180		$0	$378	$3,917	10.4
	3PWB	Water Conservation Upgrades			83	85,498	$41	$980	$8,824	9.0
	4PWB	Fuel Oil Heater		(371)	279		$0	$536	$3,813	7.1
	5PWB	De-Stratification Fans		(1,414)	514		$0	$901	$16,251	18.0
	6PWB	Insulate Heating Water Piping			1,192		$0	$2,494	$29,658	11.9
	7PWB	Cap Ridge Vents			306		$0	$641	$3,552	5.5
	8PWB	Modify Electric Engine Block Heater Controls	42				$0	$289	$8,881	30.7
	9PWB	Self Funded Controls Modifications			647		$0	$1,349	$12,610	9.3
	10PWB	DDC Controls Upgrade (Note: Costs and savings listed here exclude controls related costs and savings from all other ECM's which contain DDC controls. If DDC controls upgrade is done as a stand-alone ECM, cost is $127,700 and savings are $2,243/yr.			432		$0	$900	$53,560	59.5
	11PWB	New Office HVAC Unit With Ventilation	(8)	(5,292)	(126)		$0	($974)	$80,086	NA
	12PWB	Replace Men's/Women's Room Exhaust Fan	(4)	(913)			$0	($142)	$6,561	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. ***Lighting Upgrades:***

   Existing Conditions:

   A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Honeywell

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. ***66 - 8 ft T12 High Output fixtures being retrofit to High Performance, High Lumen T8 Lamp and Ballast Combination.***
2. ***17 - 4 ft T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination***
3. ***81 – 2'x4' Recessed Fixtures (Old and Yellowed) with 4- 4 ft. T8 lamps to be replaced with new 2 ft. x ft. 2 lamp High Efficiency Recessed fixtures with High Performance T8 Lamp and Ballast Combination***
4. ***1– 30 watt incandescent Exit sign to new LED Exit Sign with battery back up.***
5. ***Occupancy sensors will be added to Elec. Dept. Offices, Stock Rooms, Utility, Microwave and Break Room.***
6. ***7 – Wall -Switch Passive Infrared Occupancy Sensors.***
7. ***1 – Ceiling Mount Dual Technology Occupancy Sensor.***

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. ***9 - Single Commercial Doors to be weather-stripped.***
2. ***2 - Double Commercial Doors to be weather-stripped.***

3. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. ***Quantity of 7 - Replace toilets bowls with new Kohler (or equivalent) 1.6 gpf china and flushmeter valves with new Sloan Regal 1.6 gpf flushmeter valves. Replace tank toilets with Kohler (or equivalent) 1.6 gpf combination toilets.***
2. ***Quantity of 4 - Replace existing flush valves on urinals with new Sloan Regal 1.0 gpf flushometer or 3.5 gpf valves. All existing china will remain intact.***
3. ***Quantity of 6 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.***

4. Fuel Oil Heater:

Existing Conditions:

A. The existing boiler uses #2 oil as a fuel source.

Proposed Upgrades:

A. Provide a combustion oil heater for the existing boiler. The combustion oil heater will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls.

Add Oil Heater to Existing #2 Oil Burner

5. De-Stratification Fans:

Existing Conditions:

A. The following heated areas have high ceilings which allow heat to stratify up high:

- Heated Stock Room
- Electric Division Room
- Carpentry Shop
- Paint Shop
- Sign Shop

Proposed Upgrades:

A. Provide de-stratification fans for the following heated areas, to force warm air down to the floor during the heating season:

- 2 fans in Stock Room
- 1 fan in Electric Division Room
- 2 fans in Carpentry Shop
- 1 fan in Paint Shop
- No fan will be added to Sign Shop because there is no overhead door in this room.

6. Insulate Heating Water Piping:

Existing Conditions:

A. None of the heating water piping throughout the building is insulated. This results in significant heat loss to the ceiling cavity, which ultimately results in additional heat loss through the roof.

B. ***A portion of the building has blanket insulation that has been installed directly above the suspended ceiling. It appears that this may have been done in the office area only, in an effort to provide insulation for the area served by the air conditioning unit.***

Proposed Upgrades:

A. ***Provide piping insulation only for the piping that is not above the areas of blanket insulation. Access to the piping above the blanket insulation would be very messy, very difficult, and very costly.***

7. ***Cap Ridge Vents:***

Existing Conditions:

A. ***There are several ridge vents which were originally intended to be manually controlled by chains and pulleys. It was brought to our attention that these ridge vents are left as-is and are not manipulated. These ridge vents allow heat to escape in the winter.***

Proposed Upgrades:

A. ***Remove the rooftop ridge vents and provide insulated and sealed caps.***

Existing Ridge Vent to be Capped

8. **Modify Electric Engine Block Heaters Controls:**

Existing Conditions:

A. It was brought to our attention that there are approximately 44 vehicles that have engine block heaters that are plugged in during cold weather. We were told that the block heaters average 1500 watts each. We were also told that although there are 4 timeclocks in place to be able to stagger the use of the block heaters, these timeclocks do not get used in a staged approach, and all block heaters are energized at once. The 4 timeclocks control 10, 10, 19 and 5 engine heater circuits respectively.

Proposed Upgrades:

A. After reviewing the utility bills, it is apparent to us that the engine block heaters must be under some sort of staged use pattern. The winter electrical demand numbers do not support the idea that the engine block heaters are all operating at the same time. Because of this, we cannot claim large savings from staging the use of the engine block heaters. One minor change that can be made is to provide electrical modifications to equalize the timeclocks that have 19 and 5 circuits. By re-wiring these 2 timeclocks, each can have 12 circuits, which will decrease demand by 7 circuits x 1500 watts.

B. It has been requested that we provide control of the staging of the engine block heaters from the new DDC control system. The reason for this is to prevent the building occupants from overriding timeclocks and allowing multiple timeclocks to be energized at the same time, which would impact electrical demand. Since the utility bills indicate that the timeclocks are currently providing staged operation of the engine block heaters, there would be no savings associated with incorporating the timeclocks into the new DDC control system, but per the users request we will include this scope of work in our proposal and it will be treated as a non self funded capital improvement.

9. Self Funded Controls Modifications:

Existing Conditions:

A. Controls throughout the building are local electric controls. There is no automatic night setback strategy in place.

Proposed Upgrades:

A. Provide basic zone night setback controls, which would involve cycling heating water pumps on and off during unoccupied hours based on temperature that is monitored at a representative location in the heating zone. This type of night setback control is not as effective as a full DDC controls upgrade throughout the building, but it is a lower cost approach to providing some amount of night setback savings.

B. Provide boiler room controls to supply an automatic heating water reset strategy and to automatically turn the heating water pumps on and off based on outside air temperature.

10. DDC Controls Upgrade:

Existing Conditions:

A. Controls throughout the building are electric controls.

Proposed Upgrades:

A. Remove all existing electric controls and provide a new direct digital control (DDC) system. Provide DDC controls for all offices and for all exhaust fans, air handling units, boilers, pumps and alarms. Provide "stand alone" local electric/self contained controls for toilet rooms, corridors, vestibules and storage rooms. A new DDC control system will allow the use of additional energy saving control strategies and will provide additional operational benefits.

Provide user friendly interface graphics that will allow simple adjustments of schedules and temperature setpoints by authorized building occupants. Provide web based access to the control system so that authorized users can access the system from a remote site. Provide graphical user interface software, and provide sufficient training as required to allow the customer to perform basic setpoint and schedule adjustments. Some examples of energy saving strategies that are available with DDC controls are:

1. Enhanced time of day scheduling.
2. Data trending. Status of points can be electronically monitored to aid in troubleshooting.
3. Tighter space temperature control.
4. Demand based ventilation controls for single rooms that are served by a dedicated air handling unit.
5. Graphical user interface allows the on-staff facilities personnel to monitor and make adjustments to the control system parameters.
6. All DDC space sensors can be individually monitored to help with identifying temperature control problems.
7. Night setback savings are maximized because each room can be set back during unoccupied times.

11. New Office HVAC Unit With Ventilation:

Existing Conditions:

A. The existing air handling unit that serves the offices is a recirculation type air handling unit. It does not have the ability to bring in outdoor air to ventilate the spaces.
B. The existing air handling unit is located above a suspended ceiling and is very difficult to access for maintenance and service.

Proposed Upgrades:

A. Replace the existing office air handling unit with a new air handling unit that is capable of providing code compliant ventilation air to the office spaces. The new unit will provide heating, ventilation and air conditioning. The new unit will be a floor mounted unit located inside of the building (at a location to be determined) which will provide much better access for maintenance and service.

12. Replace Men's/Women's Room Exhaust Fan:

Existing Conditions:

A. The Men's/Women's room exhaust fan is not operational.

Proposed Upgrades:

A. Provide a new, appropriately sized exhaust fan for the Men's/Women's Room.

Recycling Center / Bus Garage / Bus Wash Bay

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS – RECYCLING CENTER:

Building:
The Recycle Center is a barn style building which consists of an office area, waste material collection bins for public use, main waste storage hall and waste packaging process room. See remainder of this report for additional comments. See remainder of this report for additional comments.

Heating System:
The main storage hall and waste recycle bins are not heated. The process room is heated by overhead propane fired infrared heaters.

Air Conditioning Systems:
There is no air conditioning in this building.

Ventilation Systems:
The building has no means of mechanical ventilation. The main gate is open during working hours and office has operable windows.

Temperature Control Systems:
Local electric controls are used to control the overhead infrared heaters.

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS – BUS GARAGE AREA:

Building:
The Bus Garage is a relatively new addition to the recycling building. The building consists of five bus bays, each of which can house 2 busses. The building is insulated.

Heating System:
The Bus Garages have a hot water radiant floor heating system. A hot water boiler with propane burner is located in the mechanical equipment room adjacent to the bus wash bay. The boiler has a dedicated propane usage meter.

Air Conditioning Systems:
There is no air conditioning in this building.

Ventilation Systems:
There is not mechanical ventilation for this building. Flue gas from the boiler is vented through the stack that penetrates through the roof.

Temperature Control Systems:
The bus garage has local electric temperature controls. The temperature in the bus garage is maintained at 62 deg F all the time during the heating season.

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS – BUS WASH BAY:

Building:
The bus wash bay is a relatively new addition to the recycling building. The wash bay consists of a single bay which houses an automated bus wash system. See remainder of this report for additional comments.

Heating System:
The bus wash bay is heated by suspended propane unit heaters.

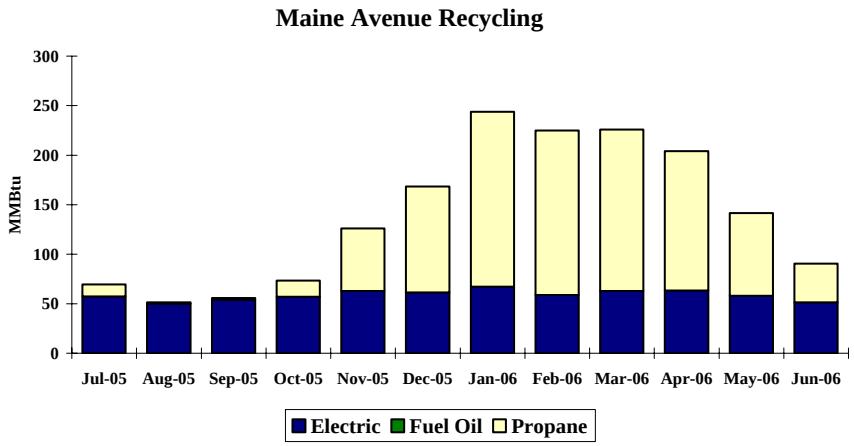
Air Conditioning Systems:
There is no air conditioning in the building.

Ventilation Systems:
There is not means of mechanical ventilation in the building.

Temperature Control Systems:
The bus wash bay has local electric temperature controls. Space temperature is maintained at 68 to 70 degrees F 24/7 during the heating season. There is concern that a lower temperature setting could cause water on the floor to freeze.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$30,265	206,280
Water and Sewer - CCF	$1,882	270
LP Gas (Propane) - Gallons	$15,857	10,613
Fuel Oil - Gallons	$0	0
7/05-6/06 Total	$48,004	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings						Installed Cost ($)	Simple Payback (Years)
			Electric		LP Gas (Gallons)	Water (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH						
Recycling Center/Bus Garage/Bus Wash Bay	1R	Lighting Upgrades	66	14,008			$0	$2,183	$17,748	8.1
	2R	Building Envelope Upgrades			1,200		$0	$1,797	$15,293	8.5
	3R	Water Conservation Upgrades			3	768	$0	$11	$21	1.9
	4R	De-Stratification Fans For Recycling Center's Process Room		(723)	310		$0	$374	$5,372	14.4
	5R	Manage Baler & Glass Crusher Operation In Recycling Center	133				$0	$916	$1,761	1.9
	6R	Night Setback Controls For Bus Wash Bay			474		$0	$773	$7,573	9.8
	7R	Night Setback Controls For Recycling Center			947		$0	$1,353	$14,090	10.4
	8R	Controls To Disable Heat When Overhead Doors Are Open			273		$0	$408	$5,284	12.9

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. ***Lighting Upgrades:***

   Existing Conditions:

   A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 23 - 400 watt Metal Halide & High Pressure Sodium High Bay Fixtures to 4 lamp T5HO fixtures with Wire Guards.

2. 5 - 400 watt Metal Halide Low Bay Fixtures in Bulk Storage Area to 4 lamp T5HO fixtures with Wire Guards and PIR occupancy sensor controls.

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey will be performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. 9 – Overhead doors to be weather-stripped.

3. Water Conservation Upgrades:

Existing Conditions:

A. A water conservation survey has been performed to evaluate the need for water conservation upgrades.

Proposed Upgrades:

A. Provide the following water conservation upgrades:

1. Quantity of 1 - Replace existing faucet threaded aerators with new Neoperl 0.5 gpm, 1.0 gpm and 1.5 gpm tamper resistant faucets restrictors and applicable adaptors. Non-Threaded basin cock faucets will not be replaced or retrofit.

4. De-Stratification Fans for Recycling Center's Process Room:

Existing Conditions:

A. The packaging room is heated by infrared heaters which are approximately 20' above the floor. Warm air naturally flows up to the roof and side walls above the heaters. This results in increased heat loss through the roof and the high walls.

Proposed Upgrades:

A. Install 2 de-stratification fans in the packaging room to force warm air down to the floor during the heating season.

5. Manage Baler and Glass Crusher Operation In Recycling Center:

Existing Conditions:

A. The baler and glass crusher occasionally operate simultaneously. Since both are on the same electric meter, the recorded KW demand charge for the building is effected by both electric motors. The extensive KW use for just a 15-minute period can not only increase the charge for that month but can also affect the payment for the following 11 months.

Proposed Upgrades:

A. Provide controls that will prevent the simultaneous operation of the glass crusher and the baler. Note: We were told that this would not create an undo hardship on the staff members in the facility.

Note: Honeywell investigated an opportunity to upgrade the baler motor with a variable frequency drive so that peak demand and energy use could be decreased. We discussed this concept with the baler manufacturer and they indicated that the use of a VFD is not feasible and is not recommended.

6. Night Setback Controls For Bus Wash Bay:

Existing Conditions:

A. The bus wash bay is maintained at a constant 68 to 70 degree F temperature, 24/7. The space is used weekdays from 5:00 AM to 8:00 PM. There is no night setback control strategy in place.

B. The existing bus wash bay thermostats are located in the space, and are therefore subjected to very moist conditions, and the thermostats are not intended for use in this type of environment.

Proposed Upgrades:

A. Provide night setback controls for the bus wash bay, to set the space temperature down to 55 degrees F during unoccupied times. Because of concerns of ice formation on the floor if the space temperature is decreased, provide new temperature sensors located near the overhead doors and 12" off of the ground so that adequate temperature can be maintained to prevent ice formation.

B. Replace the existing thermostats with new temperature sensors that have remote bulbs. Locate the temperature sensors in a dry space, and locate the remote sensing bulbs in the bus wash bay.

7. Night Setback Controls For Recycling Center:

Existing Conditions:

A. The recycling center has local electric controls which control the overhead infrared heaters. There are no night setback controls in place.

Proposed Upgrades:

A. Provide night setback controls for the recycling center, to set the space temperature down to 55 degrees F during unoccupied times.

8. Controls To Disable Heat When Overhead Doors Are Open:

Existing Conditions:

A. There are currently no controls in place to prevent the heaters from heating when the overhead doors are opened. Because heat continues to be generated from the heaters, the workers are less likely to be diligent about closing the overhead doors.

Proposed Upgrades:

A. Provide controls to lock out the heaters when the overhead doors are opened. This modification will minimize wasted heat and will be an incentive to the workers to keep the overhead doors closed whenever possible. The sensors and associated wiring will be located at high elevations, in order to minimize the ability of the occupants to tamper with and override the sensors.

Sawyer Arena

SECTION CONTENTS:

- GENERAL BUILDING & HVAC SYSTEM DESCRIPTIONS
- SCOPE OF WORK, COST AND SAVINGS SUMMARY

GENERAL BUILDING AND HVAC SYSTEM DESCRIPTIONS:

Building:
The Sawyer Arena Ice Rink is comprised of the ice rink area, locker rooms, a boiler/mechanical room, a coach/manager office, a kitchen/concession area and a warming/spectator area.

The facility is approximately 41,400 square feet. See remainder of this report for additional comments.

Heating System:
The building is heated by a Smith 19 Series cast iron sectional hot water boiler with a capacity of 863,000 BTU/HR NET IBR output. The fuel source is #2 oil.

The boiler also heats domestic hot water for 2 holding tanks.

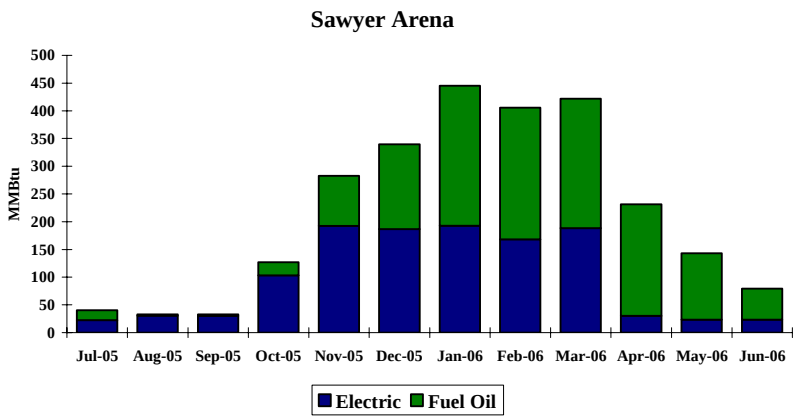
Air Conditioning Systems:
There is not air conditioning in this building.

Ventilation Systems:
Mechanical ventilation is provided for the warming/spectator area, for the locker rooms and for the kitchen/concession area. There are exhaust fans for the men's and women's toilets.

Temperature Control Systems:
Temperature controls throughout the building are local electric controls.

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$49,208	349,160
Water and Sewer - CCF	$3,061	466
Fuel Oil - Gallons	$21,344	9,953
7/05-6/06 Total	$73,613	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings					Installed Cost ($)	Simple Payback (Years)
			Electric		Oil (Gallons)	O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH					
Sawyer Arena Ice Rink	1S	Lighting Upgrades	68	37,905		$0	$5,310	$28,899	5.4
	2S	Building Envelope Upgrades			139	$0	$298	$2,934	9.8
	3S	Fuel Oil Heater		(628)	472	$0	$767	$3,717	4.8
	4S	Upgrade Warming/Spectator Area AHU Controls		3,414	388	$0	$1,269	$8,657	6.8
	5S	Upgrade Locker Room AHU Controls		1,868	324	$0	$932	$8,657	9.3
	6S	Provide Infrared Ice Surface Temperature Control System		12,000		$0	$1,531	$16,101	10.5
	7S	Provide Liquid Pressure Amplifier Pumps For Chiller		32,709		$0	$4,173	$25,624	6.1
	8S	Provide Fan Coil Unit For Manager's Office	(2)	(411)	(20)	$0	($109)	$19,586	NA
	9S	Balance Air Supply To Locker Rooms				$0	$0	$1,125	NA
	11S	New Water Fountain	(8)	(464)		$0	($117)	$5,127	NA
	12S	Extend Munters Unit Supply Duct				$0	$0	$36,358	NA
	13S	Provide New Glycol Pumps With VFD's		13,922		$0	$1,776	$52,583	29.6

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. ***18 - 4 ft. & 8 ft. T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination.***
2. ***4 – 30 watt incandescent Exit signs to new LED Exit Signs with battery back up.***
3. ***40 - 400 watt Metal Halide High Bay Fixtures in Rink to 4 lamp T5HO fixtures with Heavy Duty Wire Guards.***
4. ***1 – Fixture with incandescent lamp to be replaced with new 4 ft. 2 lamp Wrap Around Fluorescent fixtures with High Performance T8 Lamp and Ballast Combination.***
5. ***1 – Fixture with 2- 8 ft. High Output lamps to be replaced with new 8 ft. 4 lamp Vapor Tight Fluorescent fixtures with High Performance High Lumen T8 Lamp and Ballast Combination.***
6. ***NEED TO ADD OCC SENSORS.***

2. Building Envelope Upgrades:

Existing Conditions:

A. A building envelope survey has been performed to evaluate the need for building envelope insulation and sealing upgrades.

Proposed Upgrades:

A. Provide the following building envelope upgrades:

1. ***6 - Single Commercial Doors to be weather-stripped.***
2. ***1 - Double Commercial Doors to be weather-stripped.***
3. ***2 – Interior Single Commercial Doors to be weather-stripped.***

3. Fuel Oil Heater:

Existing Conditions:

A. The existing boiler uses #2 oil as a fuel source.

Proposed Upgrades:

A. Provide a combustion oil heater for the existing boiler. The combustion oil heater will increase boiler system efficiency by providing a cleaner and more complete burning of oil, and decreasing the build-up of soot on the boiler walls.

Add Oil Heater to Existing #2 Oil Burner

4. ***Upgrade Warming/Spectator Area AHU Controls:***

Existing Conditions:

A. ***The air handling unit that serves the Warming/Spectator area runs 24/7, based on the timeclock. The outside air damper is 30-40% open all the times.***

Proposed Upgrades:

A. ***Provide new DDC controls for the air handling unit. Controls will utilize a space temperature sensor, a space occupancy sensor, and a space CO2 sensor to control air handling unit operation and the amount of outdoor air. The AHU will run only if the temperature drops below setpoint or if there is occupancy in the space. When the AHU is running, the amount of outdoor air will be controlled by the space CO2 level.***

5. ***Upgrade Locker Room AHU Controls:***

Existing Conditions:

A. ***The air handling unit that serves the Locker Rooms runs 24/7, based on the timeclock. The outside air damper is approximately 40% open at all times.***

Proposed Upgrades:

A. ***Provide new controls for the air handling unit, complete with electronic timeclock with battery back-up. The new controls will run the unit during occupied hours, or during unoccupied hours when there is a call for heating.***

6. ***Provide Infrared Ice Surface Temperature Control System:***

Existing Conditions:

A. ***The chiller is internally controlled based on the demand. There is no feedback for ice surface temperature.***

Proposed Upgrades:

A. ***Provide an Infrared Ice Surface Temperature Control system. The ice surface temperature infrared signal will be a control signal fed to the new control system. The ice rink cooling demand will be precisely managed and the chiller operation will be optimized. The infrared ice surface temperature control system will be interlocked with the chiller controls and the glycol pump's variable frequency drive to optimize the system's performance.***

7. ***Provide Liquid Pressure Amplifier Pumps For Chiller:***

Existing Conditions:

A. ***The Trane air cooled chiller efficiency could be improved by the addition of two (2) HySave Liquid Pressure amplifier pumps which would allow the chiller head pressure to float downward while maintaining proper liquid supply to the chiller expansion valves.***

Proposed Upgrades:

A. ***Provide tow (2) HySave Liquid Pressure amplifier pumps and associated wiring and controls for the existing Trane chiller.***

8. Provide Fan Coil Unit for Manager's Office:

Existing Conditions:

A. The Manager's office constantly overheats because it is open to the warming room.

Proposed Upgrades:

A. Provide a fan coil unit to serve the manager's office. The fan coil unit will have the ability to bring in outdoor air to cool the room, and it will also provide ventilation to the room. It should be noted that the door to the manager's office will need to be kept closed so that the fan coil unit and the warming room AHU do not "fight" each other.

9. Balance Air Supply To Locker Rooms:

Existing Conditions:

A. The locker rooms all receive their heat from the locker room air handling unit. It was brought to our attention that some of the locker rooms receive adequate heat and others do not. This is an indication that the airflow to the individual locker rooms is not properly balanced..

Proposed Upgrades:

A. Provide air balancing of the locker room system to improve temperature control in the locker rooms. Although air balancing alone will not provide perfect temperature control, we should be able to better equalize temperature control in the locker rooms.

10. New Water Fountain:

Proposed Upgrades:

A. At the customer's request, provide a new water fountain.

11. Extend Munters Unit Supply Duct:

Existing Conditions:

A. The supply ductwork for the existing Munters dehumidification unit is currently configured with a single diffuser distributing air at the end of the rink. The return air grille is not far from the supply diffuser, so short circuiting of air occurs, and the dry supply air is not effectively distributed throughout the arena. During our survey, it was reported to us that there are occasionally some humidity issues in the building.

Proposed Upgrades:

A. Extend the supply air ductwork so that supply air is distributed down the bleacher side of the rink instead of the single diffuser distributing air at the end of the rink. This change would provide better distribution of dehumidified air the length of the rink, improving humidity issues reported at our meeting, and minimizing short cycling of supply to return air.

12. Provide New Glycol Pumps With VFD's:

Existing Conditions:

A. The existing glycol pump runs at full speed 24/7 from mid October to end of March. The pump runs at full speed regardless of whether the chiller is on or off.

B. There is only 1 glycol pump. If the pump should fail, there is no back-up to keep the ice making system operational while the pump is being repaired. The chiller has 2 compressors, so if one compressor fails there is still some capacity available to keep the system operating, but if the single glycol pump should fail then the system will be inoperable until the pump is repaired. This single glycol pump is basically the weakest link in the system.
C. The glycol pump has an inefficient motor. The motor has been replaced at least once.
D. Based on discussion with ice rink system manufacturers, it appears that glycol pump may be undersized.

Proposed Upgrades:

A. Remove the glycol pump and provide 2 new glycol pumps, each sized for 100% system capacity.
B. Provide controls for the new pumps to automatically switch pump operation on a weekly basis, to achieve equal run time for both pumps.
C. Provide variable frequency drives for each of the glycol pumps and provide associated controls to slow the pump speed down based on system demand. This will save energy.
D. The new pumps will be appropriately sized.

Existing Glycol Pump to be Replaced with 2 Pumps with VFD's

Note: During our survey, we were asked to verify whether or not refurbishing or replacement of the existing chiller should be considered. The reason for this is that the Trane company, which supplied and services the chiller, recommended that the chiller be refurbished because it is over 10 years old.

The chiller appeared to be in good condition, and facilities staff indicated that they have been diligent in ensuring that the chiller receives proper maintenance and service. We contacted a compressor manufacturer and were told that compressors of this type should not require refurbishing until the run hours exceed 50,000 HRS. This was also confirmed by several Honeywell technicians who maintain and service chillers of this type. Trend data from the chiller controller indicates that the 2 compressors have a total run time of 32,517 HRS for 1 compressor and 30,885 hrs for the other compressor. Based on this run hour data, the physical appearance of the chiller, and the record of diligent maintenance and service, we do not recommend chiller replacement or refurbishment.

Note: During one of our surveys, it was noted that the doors were open, intake dampers were open and exhaust fans were "on", as the Munters dehumidification unit was operating. It is a waste of energy to operate the Munters unit while the arena's exhaust fans are "on" and intake louvers are open. We recommend that the Munter dehumidification unit be operated while the exhaust fans are "off" and the intake dampers located at the fan end of the arena are "closed". During our survey, we advised the building operator that he should either operate the Munters unit or operate the exhaust fans, but both systems should not operate simultaneously. This energy conservation measure is strictly dependent on the building operator, and there is no work by Honeywell for this measure. Although savings can be expected if this recommendation is followed, no savings will be guaranteed because it is impossible to accurately quantify the savings.

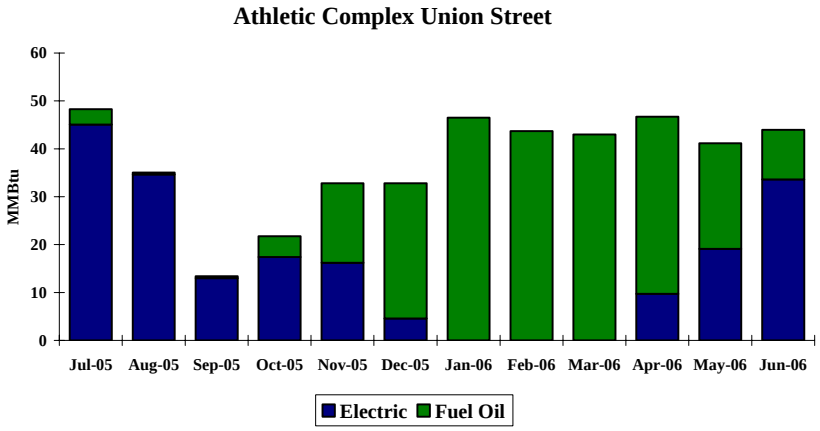
Union Street Athletic Complex

SECTION CONTENTS:

- SCOPE OF WORK, COST AND SAVINGS SUMMARY

Energy Usage Base Year Data:

Total Existing Energy Units by Location



Utility	Total $	Total Units
Electric - kWh	$13,175	56,650
Water and Sewer - CCF	$1,066	173
Fuel Oil - Gallons	$3,939	1,832
7/05-6/06 Total	$18,181	

SCOPE OF WORK, COST AND SAVINGS SUMMARY:

Building	ECM #	Energy Conservation Measure	Savings				Installed Cost ($)	Simple Payback (Years)
			Electric		O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH				
Union Street Athletic Complex - Softball Lighting	1U	Lighting Upgrades	9	443	$0	$113	$635	5.6

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Lighting Upgrades:

Existing Conditions:

A. A lighting survey has been performed to evaluate the need for lighting efficiency upgrades.

Proposed Upgrades:

A. Provide the following lighting upgrades:

1. 10 - 4 ft. T12 fixtures being retrofit to High Performance T8 Lamp and Ballast Combination.

Additional City Wide Energy Conservation Measures

Note: Items that are ***red, bold and italicized*** are those items which are included in the 10 year self funded project.

1. Vending Mizers:

Existing Conditions:

Most vending machines experience periods of high usage and other times of low occupancy when display lights and full compressor operation are not absolutely necessary. It can be advantageous from an energy savings standpoint to temporarily reduce compressor cycle times and/or turn off display lights in these vending machines during periods of no occupancy. A device called "vending mizer" will provide such energy saving functions.

Unfortunately there are some product vendors who are not accepting of this concept, and we have run into situations where the vendor will not allow the Vending Mizer to be installed on their vending machines. Discussions would need to occur between Honeywell, the City of Bangor, and the City of Bangor's product vendors to determine if this is an energy conservation measure which will be acceptable.

Proposed Upgrades:

Provide the following Vending Mizer upgrades:

A. Armory Building (Parks & Recreation):
- ***1. Provide 1 cold product Vending Mizer.***
- ***2. Provide 1 snack products Vending Mizer.***

B. Bangor Auditorium/Civic Center:
- ***1. Provide 18 cold product Vending Mizers.***

C. Central Fire Station:
- ***1. Provide 3 cold product Vending Mizers.***
- ***2. Provide 1 snack products Vending Mizer.***

D. City Hall:
- ***1. Provide 2 cold product Vending Mizers.***
- ***2. Provide 1 snack products Vending Mizer.***

E. Fire Station #5:
- ***1. Provide 1 cold product Vending Mizer.***

F. Fleet Maintenance Building:
- ***1. Provide 1 cold product Vending Mizer.***

G. Mansfield Baseball Stadium:
- ***1. Provide 9 cold products Vending Misers.***

H. Public Works Building:
- ***1. Provide 2 cold products Vending Misers.***
- ***2. Provide 1 snack products Vending Mizer.***

I. Sawyer Arena Ice Rink:
1. *Provide 4 cold products Vending Misers.*

J. Union Street Athletic Complex:
1. *Provide 2 cold products Vending Misers.*

K. Parking Garage:
1. *Provide 2 cold product Vending Mizers.*
2. *Provide 2 snack products Vending Mizers.*

Scope of Work, Cost and Savings Summary:

Building	ECM #	Energy Conservation Measure	Savings				Installed Cost ($)	Simple Payback (Years)
			Electric		O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH				
Vending Mizers	1VM	Vending Mizers		39,100	$0	$4,977	$18,916	3.8

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

2. Conversion from Oil/LP Gas to Natural Gas/Dual Fuel:

Existing Conditions:

Most of the city buildings are currently using #2 oil as a fuel source. Discussions are currently under way between Honeywell and Bangor Gas to determine the economic feasibility of running new natural gas lines to any and all buildings in this project. Based on these discussions, several buildings are candidates for conversion. Buildings with existing oil burners will be converted to combination oil/natural gas burners. Buildings with existing L.P. Gas burners will be converted to Natural Gas.

Proposed Upgrades:

Provide the following conversions from oil/L.P. Gas to Natural Gas/Dual Fuel:

A. Bangor Auditorium/Civic Center:
1. Convert existing Cleaver Brooks oil fired burner to dual fuel (oil/natural gas) burner.

B. Central Fire Station:
1. *Convert the burners on the 2 existing boilers from oil to dual fuel (oil/natural gas) burners.*

C. City Hall:
1. *If an additional boiler is provided at City Hall (recommended elsewhere in this report), then the new boiler will be provided with a combination gas/oil burner and the existing Cleaver Brooks boiler will remain as an oil only boiler and will be used as a back-up boiler. If the additional boiler is not provided, convert the existing Cleaver Brooks oil fired burner to dual fuel (oil/natural gas) burner.*

D. Fleet Maintenance Building:
1. *Convert the 2 existing boilers and the existing infrared heaters from L.P. gas to natural gas.*

E. Public Works Building:
1. *Convert the burner on the existing boiler from oil to dual fuel (oil/natural gas) burner.*

F. Recycling Center/Bus Garage/Bus Wash Bay:
1. *Convert the existing boilers, water heater and infrared heaters from L.P. Gas to natural gas.*

Scope of Work, Cost and Savings Summary:

Building	ECM #	Energy Conservation Measure	Savings					Installed Cost ($)	Simple Payback (Years)
			Oil (Gallons)	LP Gas (Gallons)	Natural Gas (Therms)	O&M Savings ($)	Total Annual Cost Savings ($)		
Conversion From Oil/LP Gas To Natural Gas/Dual Fuel	1CONV	Bangor Auditorium	44,662		(62,800)	$0	($5,561)	$61,124	NA
	2CONV	Central Fire Station	7,055		(9,296)	$0	$3,123	$34,576	11.1
	3CONV	City Hall	12,064		(15,896)	$0	$6,661	$19,327	2.9
	4CONV	Fleet Maintenance Building		12,818	(11,665)	$0	$4,022	$28,707	7.1
	5CONV	Public Works Building	5,023		(6,619)	$0	$1,838	$25,169	13.7
	6CONV	Recycling/Bus Garage		11,631	(10,585)	$0	$3,653	$29,904	8.2

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

3. Computer Power Management:

Existing Conditions:

Offices and school rooms throughout the city contain many desktop computers. Despite the fact that most PC's have the capability to shift to a low power state when not in use, the vast majority of these devices typically do not do so. Typically, a large number of CPU's are continually left in an "always on" mode. Often there are a large number of machines that are not shut down at night, often at the request or mandate of the IT department that is responsible for managing them.

Earlier versions of computer power management software often resulted in impacts to both users and to productivity, conflicts that were primarily caused because computer hardware was often unable to "wake up" from a low power state. As a result, many organizations institutionalized policies against using power management, producing a generation of workers who thought that power management of PC's was not possible.

Many IT departments have instituted bans against power management for another reason: because they want PC's to be on and available at all times in the event that a virus update, system maintenance or other network activities are to be conducted.

ProposedUpgrades:

We propose the implementation of a central computer power management system which will provide centralized control over the power management features of 250 personal computers within the network. This centralized control feature allows the city to set standards that insure that when PC's are not in use that they are either using low power states appropriately or that they are completely shut down. This will allow the city to establish network energy policies that insure that the maximum amount of energy will be saved without negatively impacting end users or placing a burden upon the network.

Scope of Work, Cost and Savings Summary:

Building	ECM #	Energy Conservation Measure	Savings				Installed Cost ($)	Simple Payback (Years)
			Electric		O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH				
Computer Power Management	1CPM	Verdiem Computer Power Management System		32,375	$0	$3,998	$7,847	2.0

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

4. Lighting Upgrades For Standpipe:

Existing Conditions:

A. The standpipe is lighted at night by 288 – 11 watt incandescent light bulbs. Lighting is controlled by a photocell so that lights are on whenever it is dark.
B. The existing lighting infrastructure is old and in need of repairs.

Proposed Upgrades:

a. 288 - Replace the existing 11 watt incandescent light bulbs with new 1 watt LED light bulbs.

Scope of Work, Cost and Savings Summary:

Building	ECM #	Energy Conservation Measure	Savings				Installed Cost ($)	Simple Payback (Years)
			Electric		O&M Savings ($)	Total Annual Cost Savings ($)		
			KW	KWH				
Standpipe Lighting	1SL	Standpipe Lighting	35	1,104	$716	$2,285	$4,461	2.0

10 Year Self Funded Project Consists Of All Items Shaded In Yellow

5. Wiring Upgrades For Standpipe:

Existing Conditions:

A. The existing Standpipe lighting infrastructure is old and in need of repairs. The wiring and fixtures are not appropriate for outdoor installations, and the installation does not meet current electrical code requirements.

Proposed Upgrades:

A. Remove the existing wiring and associated light fixtures (quantity of 288) around the perimeter of the top of the Standpipe and replace with a new low voltage wiring system and weatherproof LED light fixtures with 1 watt LED bulbs. LED bulbs run on low voltage power, and the installation of low voltage wiring and light fixtures will help to reduce the cost of the LED bulbs because each bulb will not need to have an integral transformer.

Scope of Work, Cost and Savings Summary:

Building	ECM #	Energy Conservation Measure	Installed Cost ($)	Simple Payback (Years)
Standpipe Wiring Upgrades	1SW	Standpipe Wiring Upgrades	$50,000	NA

10 Year Self Funded Project Consists Of All Items Shaded In Yellow