NOVEMBER 1, 2023

Sample Gardens

123 Sample Street
Mid City, OH 23445

PREPARED BY:

GENERIC ENERGY CONSULTING

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I. EXECUTIVE SUMMARY

A. PURPOSE AND STATEMENT OF RELIANCE

Generic Energy Consulting, INC (GEC) conducted an energy and water audit for Sample Gardens in Mid City, OH. A site visit was conducted on November 1, 2023. This report has the following purposes, summarized below:

1. Describe the property's main characteristics and benchmark its energy and water performance in comparison to similar properties.
2. Recommend an actionable scope of work designed to improve building systems, reduce energy and water consumption, and reduce operating costs.

The assessment was conducted in accordance with an ASHRAE Level 2 Energy Survey Analysis and follows Fannie Mae's instructions for completing the High Performance Building Report.

This document is to be used for the benefit of Fannie Mae, GENERIC LENDER NA, and their respective clients and contractors. Third parties not associated with Fannie Mae or GENERIC LENDER NA cannot use this document for actions against GEC.

By entering into the agreement with the Lender to conduct the High Performance Building Report as part of the PCA in accordance with Fannie Mae's Form 4099, GEC agrees and acknowledges that Fannie Mae is an intended third-party beneficiary of, and will act in reliance on, the High Performance Building Report and the associated Form 4099.H.

B. FINDINGS

Generic Energy Consulting's investigation of the property identified the areas of utility waste or other property characteristics listed below.

1. The furnaces in the apartments are controlled using programmable thermostats. There are opportunities to upgrade existing programmable thermostats to smart thermostats.
2. The furnaces and condensing units which heat and cool Sample Gardens are inefficient and approaching the end of their useful life.
3. The domestic hot water piping that serves the Sample Gardens is uninsulated in central mechanical rooms. This situation results in heat loss through the pipes.
4. Owner-maintained interior lighting in the Sample Gardens and common areas comprise incandescent, compact, and linear-fluorescent fixtures. Exterior lighting fixtures include halogen technology lamps. There are opportunities to upgrade existing light fixtures to LED technology.
5. The appliances in the Sample Gardens are not ENERGY STAR certified and are approaching the end of their useful lives.
6. The property owner provides domestic hot water heating while water and sewer costs are owner-metered and billed back to tenants via RUBS. The plumbing fixtures in the Sample Gardens, including toilets, faucets, and showerheads, are inefficient.
7. The property has a pool that is open to residents during the summer. The pump serving the pool operates at constant volume, which results in excess consumption of electrical energy.

8. Ample roof space and high baseload electricity use present an opportunity to install solar PV to offset the need to purchase electricity for the property.
9. Installation of a solar PV system must be accompanied by roof replacement for a portion of buildings.

C. RECOMMENDATIONS

Generic Energy Consulting has made recommendations to address these findings and others. The recommendations are summarized in Table 1:

Table 1: EWEM Projected Installed Costs & Annual Cost Savings

EWEM No.	Description of the Selected Energy and Water Efficiency Measure	Installed Cost	Owner Annual Cost Savings	Tenant Annual Cost Savings	Site Energy Savings	GHG Savings	Water Savings
		$	$	$	%	%	%
1	Install 129 ENERGY STAR-certified smart thermostats in apartments. Install one thermostat in the living room of each apartment unit.	$ 44,080	$ 7,612	$ -	3.1%	3.4%	0.0%
2	Install high efficiency heat pumps (10 HSPF, 16 SEER) in apartments to replace existing furnaces and AC units. Equipment must be ENERGY STAR-certified.	$ 608,000	$ 11,513	$ -	5.9%	5.3%	0.0%
3	Insulate all exposed hot water piping located in the basement mechanical rooms, using foam insulation with an R-value of 3 or above.	$ 3,750	$ 1,337	$ -	1.2%	0.7%	0.0%
4	Upgrade non-LED lighting in all apartments to LED. Refer to HPB report for replacement lighting specifications.	$ 49,970	$ 11,497	$ -	4.4%	5.1%	0.0%
5	Upgrade all lighting in building common areas and exterior to LED. Refer to HPB report for replacement lighting specifications.	$ 40,075	$ 5,475	$ -	2.1%	2.4%	0.0%
6	Add occupancy sensor controls to the offices, club room, and bathrooms, in the rental office building and all laundry rooms.	$ 6,000	$ 378	$ -	0.1%	0.2%	0.0%
7	Replace all 129 apartment refrigerators with ENERGY STAR-certified models.	$ 60,000	$ 2,068	$ -	0.8%	0.9%	0.0%
8	Replace all 129 apartment dishwashers with ENERGY STAR-certified models.	$ 113,200	$ 406	$ 356	0.2%	0.2%	1.0%
9	Install 235 low-flow 1.0 GPM WaterSense-certified bathroom faucet aerators.	$ 2,851	$ 997	$ 1,111	0.9%	0.5%	3.3%
10	Install 129 low-flow 1.5 GPM kitchen faucet aerators.	$ 1,851	$ 1,199	$ 1,912	1.1%	0.6%	5.6%
11	Install 181 low-flow 1.5 GPM WaterSense-certified showerheads.	$ 6,983	$ 2,680	$ 3,203	2.4%	1.4%	9.4%
12	Install 235 0.8 GPF WaterSense-certified toilets.	$ 53,675	$ -	$ 6,224	0.0%	0.0%	18.3%
13	Upgrade existing 5-HP continuous-speed pool pump to VSD-controlled pool pump.	$ 2,000	$ 229	$ -	0.1%	0.1%	0.0%
14	Install grid-tied 850.8 kW Solar PV system comprised of 520.8 kW roof-mounted (non-ballasted) and 330 kW canopy-mounted arrays. Selective tree trimming and roof replacement must be included.	$ 2,537,077	$ 156,682	$ -	60.1%	69.2%	0.0%
15	Install foam roof overlap on top of existing roof for building A,B,E,F,G,H,I and leasing office. Must be included if EWEM "install photovoltaic system" is selected.	$ 280,000	$ -	$ -	0.0%	0.0%	0.0%
	TOTAL	**$ 3,809,512**	**$ 202,074**	**$ 12,805**	**82.3%**	**89.9%**	**37.7%**

II. HISTORICAL ENERGY AND WATER PERFORMANCE METRICS

A. UTILITIES

Annual utility consumption for November 2022 – October 2023 is shown in Table 2 below.

This consumption was based on 12 months of owner-provided and -paid utility bill data for electricity, gas, and water. All utilities at the property are owner-metered. Electricity and gas are master-metered and paid by the owner. Water and sewer costs are billed back 100% to tenants via RUBS and are therefore tenant-paid.

Table 2: Historical Energy and Water Consumption and Cost

			Annual Cost		Annual Consumption			
Utility Type	**Energy / Water Uses**	**Utility Payer**	**Owner**	**Tenant**	**Owner-Paid**	**Tenant-Paid**	**Whole Property**	**Units**
Electricity	Includes cooling, heating, lighting, appliances, and other plug loads	Owner	$ 193,611	$ -	1,845,295	0	**1,845,295**	**kWh**
Natural Gas	Includes heating, hot water	Owner	$ 16,794	$ -	21,867	0	**21,867**	**therms gas**
Water and Sewer	Includes landscape irrigation, laundry, dishwashers, toilets, showers, kitchen and bathroom faucets	Tenant	$ -	$ 33,953	0	7,637,734	**7,637,734**	**Gal**
		Total Costs for Owner/Tenant	**$ 210,405**	**$ 33,953**		**Property Site Energy Consumption**	**8,482,847**	**kBTU**
		Total Cost for Property	**$ 244,358**			**Property Water Consumption**	**7,638**	**kGal**

B. END USE BREAKDOWN

The figures below show a breakdown of electricity and gas consumption based on analysis of seasonal patterns from utility data. Electric baseload uses include lighting, appliances, plug loads, pumps, and motors. Natural gas baseload includes domestic hot water and cooking.

Figure 1: Property Electricity Consumption Breakdown

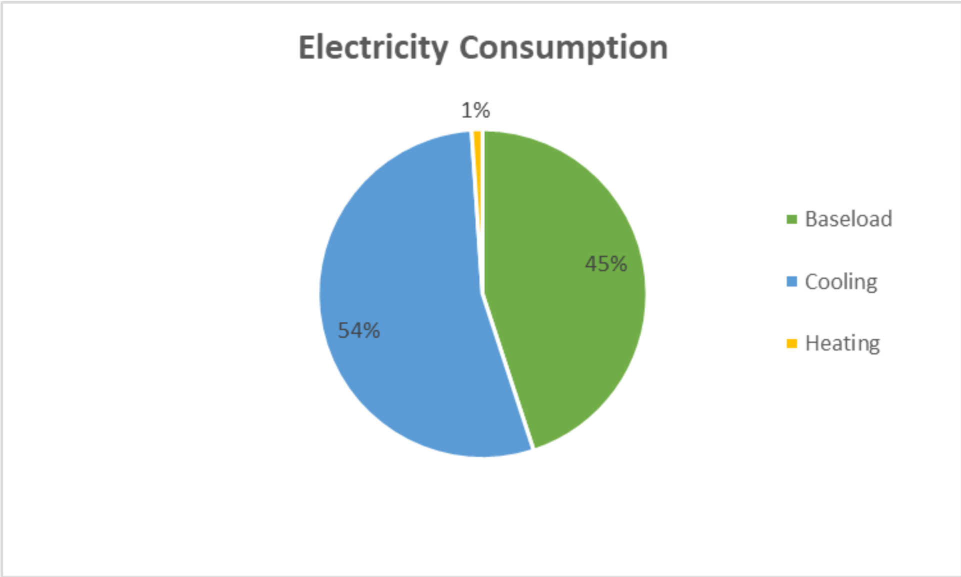
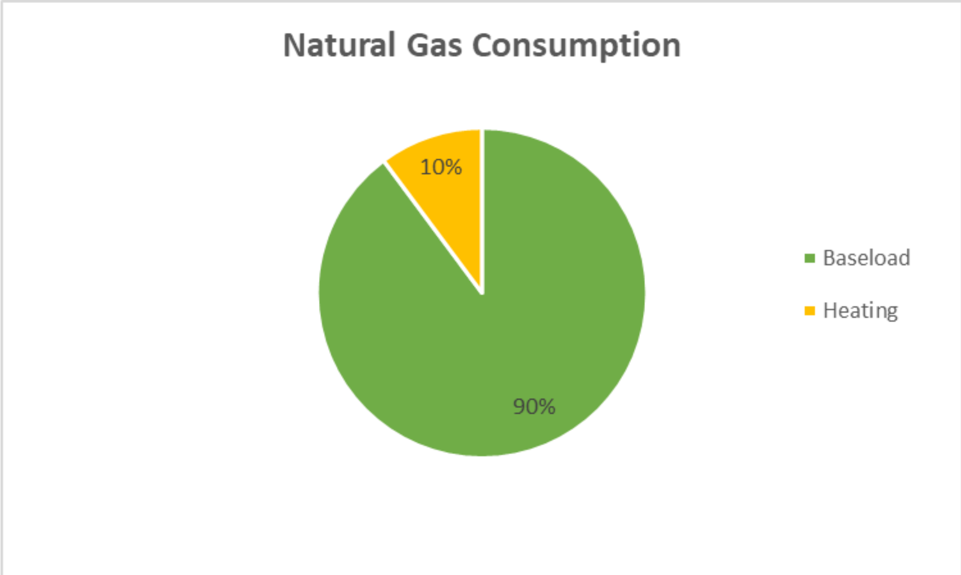


Figure 2: Property Natural Gas Consumption Breakdown



C. MONTHLY UTILITY DATA

The tables below provide monthly historical utility cost and consumption for all energy and water utilities at the property. Electricity and natural gas are fully owner-paid. Water and sewer are fully tenant-paid: 100% of owner costs are passed through to tenants via RUBS.

Figure 3: Monthly Owner/Whole Property Electric Consumption and Cost

Electricity		
Start Date	Usage (kWh)	Usage $
Nov-22	95,040.00	$ 9,739.33
Dec-22	94,736.00	$ 9,339.97
Jan-23	95,635.00	$ 9,822.34
Feb-23	80,480.00	$ 8,887.34
Mar-23	88,749.00	$ 9,700.19
Apr-23	114,150.00	$ 11,168.28
May-23	155,812.00	$ 18,646.15
Jun-23	191,200.00	$ 21,008.43
Jul-23	251,758.00	$ 24,975.50
Aug-23	275,445.00	$ 28,106.30
Sep-23	250,450.00	$ 25,285.59
Oct-23	151,840.00	$ 16,931.21
Annual Total	1,845,295.00	$ 193,610.63

Figure 4: Monthly Owner/Whole Property Gas Consumption and Cost

Gas		
Start Date	Usage (therms)	Usage $
Nov-22	1,734.00	$ 1,385.74
Dec-22	2,148.00	$ 1,747.81
Jan-23	2,986.00	$ 2,450.59
Feb-23	3,364.00	$ 2,547.68
Mar-23	2,105.00	$ 1,501.30
Apr-23	1,551.00	$ 1,199.74
May-23	1,532.00	$ 1,205.72
Jun-23	1,207.00	$ 931.69
Jul-23	1,080.00	$ 832.38
Aug-23	1,077.00	$ 806.73
Sep-23	1,289.00	$ 927.18
Oct-23	1,794.00	$ 1,257.44
Annual Total	21,867.00	$ 16,794.00

Figure 5: Monthly Tenant/Whole Property Water Consumption and Cost

Water		
Start Date	Usage (gal)	Usage $
Nov-22	488,296.25	$ 2,823.29
Dec-22	566,587.75	$ 2,677.95
Jan-23	624,938.75	$ 2,764.01
Feb-23	529,572.25	$ 2,553.84
Mar-23	557,986.25	$ 2,618.92
Apr-23	687,935.75	$ 2,843.96
May-23	751,780.75	$ 2,973.58
Jun-23	747,160.25	$ 3,075.21
Jul-23	744,617.75	$ 3,004.48
Aug-23	733,831.25	$ 3,058.31
Sep-23	631,572.25	$ 2,799.81
Oct-23	573,454.75	$ 2,759.57
Annual Total	7,637,734.00	$ 33,952.93

III. EXISTING SYSTEMS AND EQUIPMENT AND IDENTIFIED EWEMS

A. PROPERTY OVERVIEW

Sample Gardens is a residential property in Mid City, OH. The property has 129 Sample Gardens comprising studio, one- (1), two- (2) three- (3), and four- (4) bedroom floor plans. The floor plans vary based on the size of the Sample Gardens. The property also has a pool, one leasing office, one laundry facility.

The following tables present the basic property characteristics and occupancy breakdowns:

Table 3: Basic Property Characteristics

Property Name	Sample Gardens
Ownership	Rental Sample Gardens managed by Generic Managers Company.
Number of Buildings	11
Number of Floors	2
Year of Construction	1995
Property Use	The property has a club room, management offices, and pool in the leasing office building. Sample Gardens in these buildings are located from basement through 2nd floors.
Occupancy Rate	Residential units are 97% occupied. Occupancy has remained stable in the past year (T-12 occupancy has not fallen below 95% in any given month).

Table 4: Property Gross Floor Area Breakdown

Area Type	Total Area (ft^2)
Residental	118,206
Common Area	12,427
Total	130,633

Table 5: Property Occupancy Breakdown

Apartment Type	Qty	Avg Occupancy (persons)	Total Occupancy at 97% Occupancy Rate (persons)
Studio	12	1.0	12
1 Bedroom	11	2.0	21
2 Bedroom	29	3.0	84
3 Bedroom	54	4.0	210
4 Bedroom	23	5.0	112
Total	129		438

B. EXISTING CONDITIONS AND EWEMs

This section includes an inventory of existing systems and equipment, their current conditions, and recommended EWEMs for each system or equipment. **Table 6** and **Table 7** below summarize the recommended EWEMs along with a breakdown of costs, cost savings and consumption savings for both owners and tenants.

Table 6: EWEM Projected Installed Costs & Annual Cost Savings

EWEM No.	Description of the Selected Energy and Water Efficiency Measure	Installed Cost	Owner Annual Cost Savings	Tenant Annual Cost Savings	Site Energy Savings	GHG Savings	Water Savings
		$	$	$	%	%	%
1	Install 129 ENERGY STAR-certified smart thermostats in apartments. Install one thermostat in the living room of each apartment unit.	$ 44,080	$ 7,612	$ -	3.1%	3.4%	0.0%
2	Install high efficiency heat pumps (10 HSPF, 16 SEER) in apartments to replace existing furnaces and AC units. Equipment must be ENERGY STAR-certified.	$ 608,000	$ 11,513	$ -	5.9%	5.3%	0.0%
3	Insulate all exposed hot water piping located in the basement mechanical rooms, using foam insulation with an R-value of 3 or above.	$ 3,750	$ 1,337	$ -	1.2%	0.7%	0.0%
4	Upgrade non-LED lighting in all apartments to LED. Refer to HPB report for replacement lighting specifications.	$ 49,970	$ 11,497	$ -	4.4%	5.1%	0.0%
5	Upgrade all lighting in building common areas and exterior to LED. Refer to HPB report for replacement lighting specifications.	$ 40,075	$ 5,475	$ -	2.1%	2.4%	0.0%
6	Add occupancy sensor controls to the offices, club room, and bathrooms, in the rental office building and all laundry rooms.	$ 6,000	$ 378	$ -	0.1%	0.2%	0.0%
7	Replace all 129 apartment refrigerators with ENERGY STAR-certified models.	$ 60,000	$ 2,068	$ -	0.8%	0.9%	0.0%
8	Replace all 129 apartment dishwashers with ENERGY STAR-certified models.	$ 113,200	$ 406	$ 356	0.2%	0.2%	1.0%
9	Install 235 low-flow 1.0 GPM WaterSense-certified bathroom faucet aerators.	$ 2,851	$ 997	$ 1,111	0.9%	0.5%	3.3%
10	Install 129 low-flow 1.5 GPM kitchen faucet aerators.	$ 1,851	$ 1,199	$ 1,912	1.1%	0.6%	5.6%
11	Install 181 low-flow 1.5 GPM WaterSense-certified showerheads.	$ 6,983	$ 2,680	$ 3,203	2.4%	1.4%	9.4%
12	Install 235 0.8 GPF WaterSense-certified toilets.	$ 53,675	$ -	$ 6,224	0.0%	0.0%	18.3%
13	Upgrade existing 5-HP continuous-speed pool pump to VSD-controlled pool pump.	$ 2,000	$ 229	$ -	0.1%	0.1%	0.0%
14	Install grid-tied 850.8 kW Solar PV system comprised of 520.8 kW roof-mounted (non-ballasted) and 330 kW canopy-mounted arrays. Selective tree trimming and roof replacement must be included.	$ 2,537,077	$ 156,682	$ -	60.1%	69.2%	0.0%
15	Install foam roof overlap on top of existing roof for building A,B,E,F,G,H,I and leasing office. Must be included if EWEM "install photovoltaic system" is selected.	$ 280,000	$ -	$ -	0.0%	0.0%	0.0%
	TOTAL	**$ 3,809,512**	**$ 202,074**	**$ 12,805**	**82.3%**	**89.9%**	**37.7%**

Table 7: EWEM Projected Annual Consumption Savings

EWEM No.	Description of the Selected Energy and Water Efficiency Measure	Whole Property Consumption Savings: Annual Electricity Savings	Annual Natural Gas Savings	Annual Water Savings	Site Energy Savings	GHG Savings	Water Savings
		kWh	therms gas	Gal	%	%	%
1	Install 129 ENERGY STAR-certified smart thermostats in apartments. Install one thermostat in the living room of each apartment unit.	70,097	198	-	3.1%	3.4%	0.0%
2	Install high efficiency heat pumps (10 HSPF, 16 SEER) in apartments to replace existing furnaces and AC units. Equipment must be ENERGY STAR-certified.	82,590	2,187	-	5.9%	5.3%	0.0%
3	Insulate all exposed hot water piping located in the basement mechanical rooms, using foam insulation with an R-value of 3 or above.	-	1,027	-	1.2%	0.7%	0.0%
4	Upgrade non-LED lighting in all apartments to LED. Refer to HPB report for replacement lighting specifications.	109,580	-	-	4.4%	5.1%	0.0%
5	Upgrade all lighting in building common areas and exterior to LED. Refer to HPB report for replacement lighting specifications.	52,186	-	-	2.1%	2.4%	0.0%
6	Add occupancy sensor controls to the offices, club room, and bathrooms, in the rental office building and all laundry rooms.	3,603	-	-	0.1%	0.2%	0.0%
7	Replace all 129 apartment refrigerators with ENERGY STAR-certified models.	19,708	-	-	0.8%	0.9%	0.0%
8	Replace all 129 apartment dishwashers with ENERGY STAR-certified models.	3,870	-	80,000	0.2%	0.2%	1.0%
9	Install 235 low-flow 1.0 GPM WaterSense-certified bathroom faucet aerators.	-	766	250,000	0.9%	0.5%	3.3%
10	Install 129 low-flow 1.5 GPM kitchen faucet aerators.	-	921	430,000	1.1%	0.6%	5.6%
11	Install 181 low-flow 1.5 GPM WaterSense-certified showerheads.	-	2,058	720,500	2.4%	1.4%	9.4%
12	Install 235 0.8 GPF WaterSense-certified toilets.	-	-	1,400,000	0.0%	0.0%	18.3%
13	Upgrade existing 5-HP continuous-speed pool pump to VSD-controlled pool pump.	2,179	-	-	0.1%	0.1%	0.0%
14	Install grid-tied 850.8 kW Solar PV system comprised of 520.8 kW roof-mounted (non-ballasted) and 330 kW canopy-mounted arrays. Selective tree trimming and roof replacement must be included.	1,493,330	-	-	60.1%	69.2%	0.0%
15	Install foam roof overlap on top of existing roof for building A,B,E,F,G,H,I and leasing office. Must be included if EWEM "install photovoltaic system" is selected.	-	-	-	0.0%	0.0%	0.0%
	TOTAL	**1,837,143**	**7,157**	**2,880,500**	**82.3%**	**89.9%**	**37.7%**

HVAC

Heating and Cooling: Dedicated vertical natural gas furnaces provide heating to the Sample Gardens and rental office building. The furnaces serving the Sample Gardens each have a heating capacity of 44,000 BTU/Hr and the furnaces serving the rental office building each have a capacity of 80,000 BTU/Hr. The existing furnaces that serve Sample Gardens range in age between 13-17 years and are approaching the end of their useful lives.

Cooling to units is provided by a dedicated condensing unit. The air conditioning system tempers the outdoor air to provide conditioned air to the space based on the thermostat settings. The condensing units serving the Sample Gardens have a 2-Ton cooling capacity and use R-22 refrigerant. Due to their lower efficiency, these units should be replaced.

A dedicated thermostat is installed in the common spaces in the Sample Gardens to control heating and cooling. The thermostat allows the occupant to choose the mode of conditioning and choose a temperature setpoint. The existing thermostats have simple programming capabilities.

Figure 6: Typical Furnace in Sample Gardens

Figure 7: Typical Furnace in Club House

Figure 8: Typical Condensing Unit for Sample Gardens

Figure 9: Typical Thermostat in Apartment

Ventilation: Apartment kitchens and bathrooms are ventilated mechanically. Each bathroom is equipped with a ceiling-mounted exhaust fan. Each kitchen is equipped with a ductless range hood. The ventilation systems are intermittent and turn on when the residents turn the switch on.

Figure 10: Typical Exhaust Fan in Apartment Bathroom

Figure 11: Typical Ductless Range Hood in Apartment Kitchen

EWEM 1: INSTALL ENERGY STAR-CERTIFIED SMART THERMOSTATS IN Sample Gardens

Improvement Summary:	Install one (1) ENERGY STAR certified Smart thermostat to control the operation of the furnace within the living room of each tenant apartment. Thermostats shall be selected based upon the units' electrical ratings. Thermostats shall be located: • 4 to 6 ft. above finished floor (AFF) • On an interior wall, away from direct sunlight, furniture, shelves, doors, windows, skylights, drafts, fixtures, and any heat-generating or radiating appliances • In a location where natural room air currents occur (i.e., away from supply diffusers and exhaust areas, such as kitchens and bathrooms).
Benefits Attained:	Replacing the existing thermostats with ENERGY STAR smart thermostats will reduce overheating or overcooling of the Sample Gardens. They will allow the residents to control the heating and cooling in their Sample Gardens more closely, improving comfort. Many devices can also sense when a space is empty, reducing heating and cooling when occupants are away.
Assumptions:	GEC modeled the savings using spreadsheet-based calculations and published results of typical smart thermostat savings. We based a load profile on common engineering practices and property staff interviews. The savings baseline assumes that the overall temperature in the Sample Gardens will be reduced by at least 1°F.

Figure 12: Typical Furnace Thermostat

Figure 13: ENERGY STAR-certified Smart Thermostat

EWEM 2: INSTALL HIGH EFFICIENCY HEAT PUMPS AND HIGH EFFICIENCY CONDENSING UNITS (AC)

Improvement Summary:	Install high efficiency heat pumps (minimum 10 HSPF, 16 SEER) in Sample Gardens to replace existing furnaces and AC units. Equipment must be ENERGY STAR-certified.
Benefits Attained:	While replacing heating and cooling units for Sample Gardens is an expensive measure, many of the units will need replacement in the coming years as they are reaching the end of their useful life. Replacing now with high efficiency alternatives provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions:	To calculate heating and cooling savings, we assumed an improvement in efficiency from 75% AFUE to a HSPF of 10 for heating and from 12 to 16 SEER for cooling units. We used existing system specifications and historical fuel usage data for heating and cooling to calculate the estimated run-hours for existing equipment and true-up to existing utility consumption.

DOMESTIC HOT WATER

Eight (8) natural gas water heaters with integrated storage tanks provide domestic hot water (DHW) to the Sample Gardens. These heaters are located in eight (8) different locations and have a combined input capacity of 300,000 BTU/hr. A natural gas-fired water heater with an input capacity of 78,000 BTU/hr serves the rental office building. The heaters are controlled based on a hot water temperature setpoint. The temperature setpoints observed during our visit appeared to be appropriate for the property and hot water was measured in units at reasonable temperatures. A recirculation pump serves each heater to ensure hot water is available at all fixtures.

Figure 14: Typical Domestic Hot Water Heater

Figure 15: Typical DHW Recirculation Pump

EWEM 3: INSULATE DOMESTIC HOT WATER PIPING

Improvement Summary:	Insulate all exposed hot water piping located in the basement mechanical rooms, using foam insulation with an R-value of 3 or above.
Benefits Attained:	Exposed pipes in unconditioned spaces are a significant cause of heat loss from domestic hot water systems. Moreover, when their surface temperatures are in excess of 100°F, they present a major health & safety liability. Insulating these pipes will reduce energy consumption by reducing the heat loss through uninsulated piping. It will also address the health and safety concerns of the facility staff working around exposed piping.
Assumptions:	The energy savings for this measure were modeled using 3EPlus calculation tool.

LIGHTING

Interior lighting at the property comprises a variety of fixtures. The rental office building has a mixture of compact and linear-fluorescent fixtures. The common areas in the apartment buildings have fixtures with incandescent lamps. The laundry rooms have T12 fluorescent technology fixtures.

Owner installed and maintained fixtures in the Sample Gardens include fixtures with incandescent bulbs in the kitchen, apartment entrance, and bathroom. The facility maintenance staff has been replacing burnt out bulbs with CFL lamps in the kitchen and living room fixtures.

The majority of the exterior lighting fixtures comprise wall-mounted floodlights with 300 W halogen lamps. These fixtures are controlled using photocells mounted on the wall next to the fixture. A detailed lighting survey can be found in the Exhibit D.

Figure 16: Typical Laundry Fixtures

Figure 17: Typical Club House Lighting

Figure 18: Typical Apartment Fixture

Figure 19: Typical Apartment Bathroom Fixture

EWEM 4: UPGRADE APARTMENT LIGHTING

Improvement Summary:	Implement a lighting retrofit project in Sample Gardens with the following major items: • Retrofit existing linear fluorescent T12 fixtures with 15-watt LED lamps. • Retrofit existing 60-watt incandescent lamps and 13-watt CFLs with 8-watt LED lamps in the Sample Gardens. See Tables 14 and 15 for detailed lighting descriptions and recommendations.
Benefits Attained:	Installing high-efficiency lighting will significantly reduce tenant electrical consumption while maintaining equivalent or better light levels. Also, many of the recommended bulbs and fixtures have longer lifespans. This measure will reduce the number of bulbs replaced at the property as well as maintenance costs.
Assumptions:	GEC modeled this improvement using spreadsheet-based calculations. Light runtime hours were based on observations from the site visit and on discussions with property staff and residents.

EWEM 5: UPGRADE COMMON AREA LIGHTING

Improvement Summary:	Implement a lighting retrofit in building common areas and exterior, including the following major items: • Retrofit existing incandescent, compact, and linear-fluorescent technology fixtures with LED technology lamps. • Retrofit the exterior lighting fixtures with LED technology fixtures. Halogen lamps shall be replaced with LED lamps with similar or higher wattage output. Property staff shall be trained on the operation and maintenance of the new high-efficiency lighting systems.
Benefits Attained:	Installing high-efficiency lighting will significantly reduce the property's electrical consumption while maintaining equivalent or better light levels. In addition, many of the recommended bulbs and fixtures have longer lifespans, which will reduce the number of bulbs replaced at the property.
Assumptions:	GEC modeled this improvement using spreadsheet-based calculations. Light runtime hours were based on observations made on site and discussions with property staff.

EWEM 6: UPGRADE COMMON AREA LIGHTING CONTROLS

Improvement Summary:	Add occupancy sensor controls to offices, club room, gym, maintenance areas, and bathrooms in the rental office building. Occupancy sensors also shall be added to all the laundry rooms in building common areas. Property staff shall be trained on the operation and maintenance of the new high-efficiency lighting systems.
Benefits Attained:	Occupancy controls will produce savings in electrical energy by turning off lighting fixtures in areas with no occupants.
Assumptions:	GEC modeled this improvement using spreadsheet-based calculations. Light runtime hours were based on observations made on site and discussions with property staff.

APPLIANCES

The Sample Gardens at the property are each equipped with a refrigerator, a dishwasher, a natural gas stove, and a natural gas oven. The refrigerators throughout the property vary in age and annual consumption. Based on our in-unit survey, all of the refrigerators warrant replacement. During our site survey, we conducted tests on a sampling of in-unit refrigerators. According to the sample set and discussion with the property staff, approximately 70% of the refrigerators are not ENERGY STAR-certified and some refrigerators are over 10 years old. The existing refrigerators use considerably more energy than ENERGY STAR-certified equivalents.

Laundry service at the property is provided through dedicated leased laundry equipment in the property's laundry facility. Based on the age of the equipment, they do not warrant replacement. The dryers use natural gas.

Figure 20: Typical Apartment Dishwasher

Figure 21: Typical Apartment Refrigerator

Figure 22: Typical Common Area Washers

Figure 23: Typical Common Area Dryers

EWEM 7: REPLACE 129 APARTMENT REFRIGERATORS WITH ENERGY STAR-CERTIFIED MODELS

Improvement Summary:	Install 129 new ENERGY STAR-certified refrigerators in place of the existing inefficient refrigerators. A full assessment shall be conducted to determine the proper sizing and replacement schedule. Refrigerators shall possess top-mounted freezers and be appropriately sized. Ice-maker and dispenser models are not recommended because they use 15% more energy than standard ENERGY STAR-certified refrigerators and will increase the purchase price.
Benefits Attained:	ENERGY STAR-certified refrigerators are equipped with high-efficiency compressors that have improved insulation; they also consume approximately 25% less energy than similar non-ENERGY STAR models. Models with top-mounted freezers use 10-25% less energy than bottom or side-by-side models.
Assumptions:	This improvement was based on data acquired from a sample of 15 Sample Gardens that we extrapolated to determine the estimated total consumption of the refrigerators. Actual quantities may vary from these estimates during replacement. Costs for this measure were

	based on common costs of equivalent sized ENERGY STAR-certified refrigerators. The savings calculations assume new refrigerator electricity consumption at 325 kWh annually.

EWEM 8: REPLACE 129 APARTMENT DISHWASHERS WITH ENERGY STAR-CERTIFIED MODELS

Improvement Summary:	Install 129 new ENERGY STAR-certified dishwashers in place of the existing inefficient dishwashers. A full assessment shall be conducted to determine the proper sizing and replacement schedule.
Benefits Attained:	ENERGY STAR-certified dishwashers use 12% less energy and 30% less water than similar non-ENERGY STAR models. Existing dishwashers that use 6 gallons per cycle (GPC) are significantly less efficient than the current ENERGY STAR minimum performance standard of 3.5 GPC.
Assumptions:	This improvement was based on data acquired from a sample of 15 Sample Gardens that we extrapolated to determine the estimated total consumption of the dishwashers. Actual quantities may vary from these estimates during replacement. Costs for this measure were based on common costs of equivalent sized ENERGY STAR-certified dishwashers. The savings calculations assume new dishwasher water consumption of 3.5 GPC and energy consumption of 270 kWh/yr.

WATER

The city provides domestic water to the Sample Gardens at the property. Water enters at the pressure provided by the city and is then served to the Sample Gardens.

GEC found the plumbing fixtures in all sampled Sample Gardens to be identical. The kitchen and bathroom faucets are rated at 2 gallons per minute (GPM) but their average flowrates were measured by GEC to be 2.4 GPM and 2.04 GPM, respectively. The showerheads are rated at 2 GPM, but the average flowrate was measured to be 2.25 GPM. The toilets in the apartment are rated to flush 1.6 gallons per flush but were measured to flush about 2.54 gallons per flush, which contributes significantly to the high water usage at the property. A sample of volumetric flowrates at the faucets and showerheads as well as toilet flush rates can be found in the Exhibit D.

Figure 24: Typical Kitchen Sink

Figure 25: Typical Bathroom Plumbing Fixtures

Swimming Pool: The property houses a non-heated, outdoor swimming pool located behind the rental office building. The pool is open from Memorial Day weekend through Labor Day weekend. A single 5-HP pump circulates water through the pool and operates on constant flow.

Figure 26: Pool Pump

Figure 27: Pool Water Meter

Irrigation System: The property has an irrigation control system installed in the pool pump room. According to the facility maintenance staff, the system is dysfunctional and not in use, and the property confirmed it does not hire a third-party contractor to provide irrigation. There is a minor amount of landscaping at the property that is irrigated by the property staff by hand but was found not to contribute significantly to seasonal water usage.

EWEM 9: INSTALL 235 LOW-FLOW 1.0 GPM WATERSENSE-CERTIFIED BATHROOM FAUCET AERATORS

Improvement Summary:	Retrofit 235 bathroom faucets at the property with a 1.0 GPM low-flow WaterSense-certified aerator. Both the aerator and aerator housing should be replaced.
Benefits Attained:	Aerators mix air and water to reduce volumetric flowrate while maintaining a similar perceived flowrate as existing fixtures. This measure will reduce the amount of hot and cold water used by the plumbing fixtures. The reduction in hot water usage will result in energy savings by reducing the hot water load on the domestic hot water heaters.
Assumptions:	For the savings calculation, GEC assumed that each bathroom faucet is used for 2 minutes per occupant per day. GEC also assumed an adoption rate of 75% in the analysis.

EWEM 10: INSTALL 129 LOW-FLOW 1.5 GPM KITCHEN FAUCET AERATORS

Improvement Summary:	Retrofit 129 kitchen faucets at the property with a 1.5 GPM low-flow aerator. Kitchen faucet aerators should be of a similar quality to WaterSense-certified fixtures. Both the aerator and aerator housing should be replaced.

Benefits Attained:	Aerators mix air and water to reduce volumetric flowrate while maintaining a similar perceived flowrate as existing fixtures. This measure will reduce the amount of hot and cold water used by the plumbing fixtures. The reduction in hot water usage will result in energy savings by reducing the hot water load on the domestic hot water heaters.
Assumptions:	For the savings calculation, GEC assumed that the kitchen faucet is used for 4 minutes per occupant per day. GEC also assumed an adoption rate of 75% in the analysis.

EWEM 11: INSTALL 181 LOW-FLOW 1.5 GPM WATERSENSE-CERTIFIED SHOWERHEADS

Improvement Summary:	Replace 181 showerheads with 1.5 GPM low-flow WaterSense-certified showerheads.
Benefits Attained:	This measure will reduce the amount of hot and cold water used by the plumbing fixtures. The reduction in hot water usage will result in energy savings by reducing the hot water load on the domestic hot water heaters.
Assumptions:	For the savings calculation, GEC assumed that each shower is used for 8 minutes per occupant per day. GEC also assumed an adoption rate of 75% in the analysis.

EWEM 12: INSTALL 235 WATERSENSE-CERTIFIED 0.8 GPF TOILETS

Improvement Summary:	Replace 235 existing toilet fixtures with 0.8 GPF pressure-assisted toilets. Pressure-assisted toilets are hybrids of gravity and flush-valve toilets. A pressurized tank, placed inside the porcelain tank, compresses a pocket of air and releases pressurized water into the bowl and out the trap way at high velocity, creating a vigorous flushing action that whisks away waste and cleans the bowl. The flushing action of these toilets is quieter than common pressure-assisted toilets. GEC observed that the piping configuration at the property should allow for 0.8 GPF toilets to be installed without extensive replacement of plumbing. An experienced plumbing contractor should be engaged to assess requirements prior to installation.
Benefits Attained:	Replacing old model toilets with new low-flow toilets will immediately reduce the water consumption at the property. Water-efficient pressure-assisted toilets also reduce the pressure demand on the water supply. These toilets require less maintenance because they have fewer moving parts. Moreover, with a pressure-assisted system, the flush water is contained in a plastic tank inside the ceramic tank, which eliminates the potential for condensation (sweating) on the outside of the tank. This design prevents water from dripping onto the floor, which may result in mold growth and damage to the flooring.
Assumptions:	GEC modeled water savings as a reduction in toilet flow rates per flush from the average flow rates measured on site to the recommended flow rate, specified above. GEC assumed that toilets are flushed five (5) times per day per occupant and 100% of the toilets will be replaced.

Figure 28: Typical Existing 1.6 GPF Toilet

Figure 29: Typical Test Result for Toilet Flush Test

EWEM 13: INSTALL VFDS ON POOL PUMP

Improvement Summary:	GEC recommends replacing the existing 5-HP continuous-speed pool pump with a variable frequency drive (VFD)-controlled pool pump. VFDs will take advantage of the varying pool water circulation demand to reduce the speed of the pool pump. The drive allows the pump to unload, which saves energy by delivering only the amount of water required by the operating heat pumps.
Benefits Attained:	Installing VFD-controlled pool pumps will result in savings through reduced electrical consumption when the pumps operate at lower speeds. The VFD-controlled pool pumps also have additional ancillary benefits. By avoiding hard start/stop of the pumps every day with manual controls or timer controls, the pumps will last longer and require less maintenance and repair. Additionally, pumps are often oversized, which results in sediment forcing through the filter, which may cause damage to the pump and chemical systems. With VFDs, this damage can be reduced, therefore resulting in a longer useful life for the pump.
Assumptions:	GEC modeled this improvement using spreadsheet-based calculations. GEC based savings and cost estimates on the information provided by a local irrigation controls contractor.

Figure 30: Existing Pool Pump

Figure 31: Typical VFD-Controlled Pool Pump

ONSITE ENERGY GENERATION

There is currently no onsite energy generation at Sample Gardens. The property has significant potential for a solar photovoltaic (PV) system, with a large unshaded low-slope roof area with minimal mechanical equipment and a large consistent electric baseload throughout the year. In addition to the roof, there is a potential to construct carports over resident parking areas to provide for canopy-mounted arrays.

Given the building layout and dispersed DHW systems, this property is not a good candidate for a combined heat and power (cogeneration) installation.

EWEM 14: INSTALL 850.8 KW SOLAR PHOTOVOLTAIC SYSTEM

Improvement Summary:	Install grid-tied 850.8 kW Solar PV System comprised of 520.8 kW roof-mounted (non-ballasted) and 330 kW canopy-mounted arrays. Selective tree trimming and roof replacement must be included as per the Technical Solar Report.
Benefits Attained:	By generating renewable electricity onsite, a solar electric system would significantly reduce the property's utility electric purchase, eliminating associated carbon emissions, and reduce the property's exposure to future electric price swings.
Assumptions:	The solar PV system feasibility and size was assessed given available roof space, pitch and orientation and typical electricity production per kW of installed capacity for the property's location. The proposed photovoltaic system was sized to produce 1,493,330 kWh. The system is designed to meet 82% of the historic electricity load (61% of total site energy load including gas), which is appropriate and accounts for planned efficiency upgrades. Further information about assumptions for this recommendation can be found in the Solar Technical Report for Sample Gardens completed by Generic Energy Consulting.

ENVELOPE

Façade: The building's façade is constructed of a brick veneer and concrete masonry structure. Based on our observation and discussion with the facility maintenance staff, the wall is made of face brick on the exterior followed by a 2" air space and 6" concrete masonry block. The concrete block is followed by metal studs and 3 ½"-thick batt insulation with a vapor barrier. The interior portion of the wall is 5/8"-thick gypsum board. The overall R-value of the wall composition is estimated to be 16.

Roof: Buildings on site are constructed with flat shed roofs. Building roofs are Trumbull built up roofs. Most roofs have fiberglass insulation, and several have been retrofitted with sprayed polyurethane foam. Roof framing consists of site-built wooden rafters, supporting plywood or OSB roof decking. Roof framing is made up of 2x8's on 16" centers, which adequately supports 2.5-3lbs per sq. ft for new solar panels. Median age of the roofs is 10 years. Foam roofs (Buildings C, D, J, and K) have reported age of 4-5 years. Other roofs have reported age of 20 years.

Figure 32: Typical Façade at the Property

Figure 33: Typical Rooftop View

Exterior Windows and Doors: The majority of the windows at the property are sliding type with double pane glass and ½" air gap. The windows appear to have functional weatherstripping and appeared to allow minimal draft through them when closed. All windows have aluminum framing with a thermal break.

Each residential building at the property has one (1) main door for residents to access the building. These doors are made of wood and have a wooden frame. The doors appear to have functional weatherstripping. All the Sample Gardens at the property have sliding doors that provide access to a balcony or a patio. During the in-unit survey, we observed that the majority of the doors in the Sample Gardens have functional weatherstripping and appear to have minimal infiltration into the Sample Gardens.

Figure 34: Typical Window in Sample Gardens

Figure 35: Typical Balcony Door

EWEM 15: REPLACE ROOF

Improvement Summary:	Install foam roof overlap on top of existing roof for Buildings A, B, E, F, G, H, I, and leasing office. (This recommendation is required to be selected as part of the EWEM “Install 850.8kW Solar PV system.”)
Benefits Attained:	Improved roofing would be an overlap on top of the existing roofing. The foam overlap will seal around the solar attachments.
Assumptions:	The following assumptions were made for the proposed roof installation: • Due to their age, roofs at Buildings A, B, E, F, G, H, I and the leasing office need to be replaced to support installation of a solar PV system • Proper installation of the solar PV system would not void the warranty of the new roofs for replacement.

ELECTRIFICATION

Reducing the negative environmental impact from building energy use requires both the building and the electricity grid to be free of fossil fuels. The U.S. electricity grid has seen a 15% annual compound growth rate in wind and solar generation between 2015-2020[1], on its way towards a national goal of a 100% clean grid by 2035[2]. While improving building efficiency through EWEMs are an important step to reducing carbon emissions, net-zero emissions cannot be achieved as long as fossil fuels are still any part of building operation.

The chart below compares estimated carbon emissions of the property's as-is energy use and equivalent all-electric energy use with all recommended EWEM upgrades, according to national clean grid scenarios targeted in the next 15 years. The "fully electric" property includes an assumed efficiency gain for replacing on-site fuel combustion (80% efficient) with electricity (100%), however, efficiencies as high as 300% can be achieved with heat pump technology.

[1] Jaeger, J. World Resources Institute. (2021). *Explaining the exponential growth of renewable energy.* https://www.wri.org/insights/growth-renewable-energy-sector-explained

[2] U.S. Department of Energy. (2021). *Reimagining and rebuilding America's energy grid.* https://www.energy.gov/articles/reimagining-and-rebuilding-americas-energy-grid

Note: The "fully electric property" may show more carbon emissions than the "existing property" in the current electricity grid scenario because the national electricity grid currently relies largely on fossil fuels. The chart assumes the same energy consumption as the existing property and national average grid emissions; it does not take into account the higher efficiencies achievable with electric equipment or the wide range of carbon intensities among regional electricity grids. This short-term rise in emissions may be accurate for properties with local grids heavily reliant on fossil fuels (such as coal) but will be less relevant as the grid gets cleaner and can be mitigated with highly efficient electric equipment and renewable power sources (such as on-site solar).

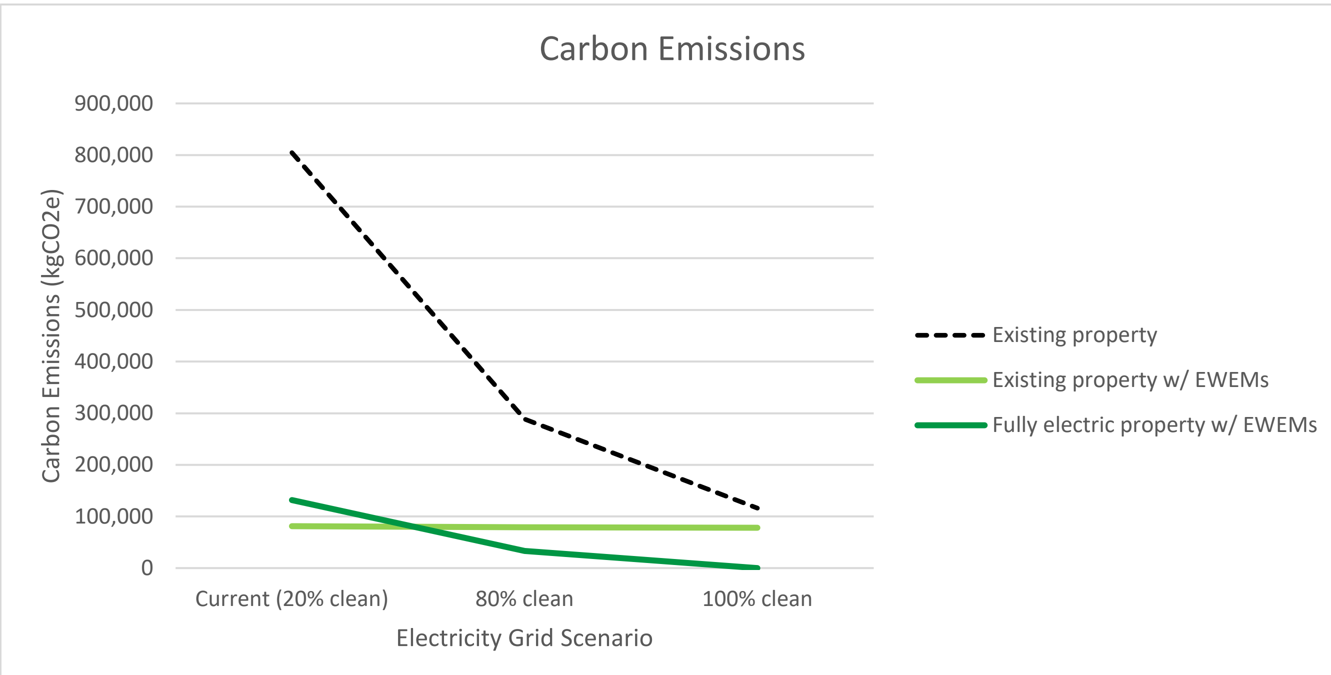


Figure 36. Modeled impacts.

Note: Numbers in this document should be considered illustrative examples only. Modeled carbon emissions are based on national average emissions factors; actual emissions will vary according to state and local grid conditions.

Building Equipment Electrification Upgrades:

Based on equipment at this property, equipment for space heating and domestic hot water heating is suited for electrification upgrades. Space heating is supported by natural gas. GEC recommends the wall furnace to be upgraded to a heat pump. Domestic hot water heating at this property is currently supported by natural gas. The size of the parking area at this property is also suitable for installation of electric vehicle (EV) charging stations.

Barriers to Electrification:

Laundry dryers currently use gas. However, laundry equipment is leased; thus, the owner cannot switch to electric dryers as a capital improvement. While DHW is currently supplied by an inefficient gas system, the existing electrical capacity in the water heater closets was deemed to be insufficient for electrification with heat pump water heaters without significant upgrades to electrical capacity.

The table below shows the potential electrification upgrades and electrification barriers.

Table 8: Potential Electrification Upgrades and Barriers

#	Potential Building Equipment Upgrades Towards Electrification	Applicable?
1	Upgrade electric service, breakers, wiring, and plugs required for conversion to all electric	No
2	Upgrade cooking, laundry, and/or other appliances to electric	Yes
3	Upgrade space heating equipment to electric	Yes
4	Upgrade DHW heating equipment to electric	Yes
5	Upgrade existing electric equipment to higher efficiency technology (electric resistance to heat pump, induction, etc.)	No
6	Install electric vehicle (EV) charging stations	Yes
Supporting comments:		
EV charging in parking is feasible. DHW and space heating are currently supported by natural gas. Cooking is currently natural gas.		
#	**Potential Barriers to Electrification**	**Applicable?**
1	Upfront cost of equipment and installation	Yes
2	Cost of electricity	Yes
3	Space constraints for heat pump equipment	No
4	Domestic Hot Water: No suitable technology is available for this specific building application	Yes
5	Space Heating/Other: No suitable technology is available for this specific building application	No
6	Property is already fully electric	No
Supporting comments:		
Switching from a furnace + air conditioner to a more efficient heat pump is recommended as an EWEM. EV charging and electric DHW may be feasible.		

EXHIBIT A: PHOTO DOCUMENTATION

Figure 37: Typical Apartment Refrigerator

Figure 38: Tag Showing Refrigerator Information

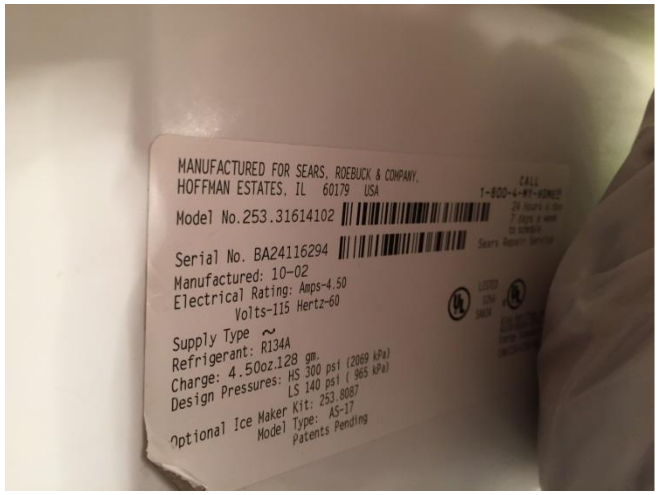


Figure 39: Typical Bathroom Fixture

Figure 40: Typical Kitchen Fixture

Figure 41: Typical Common Area Fixture

Figure 42: Typical DHW Piping

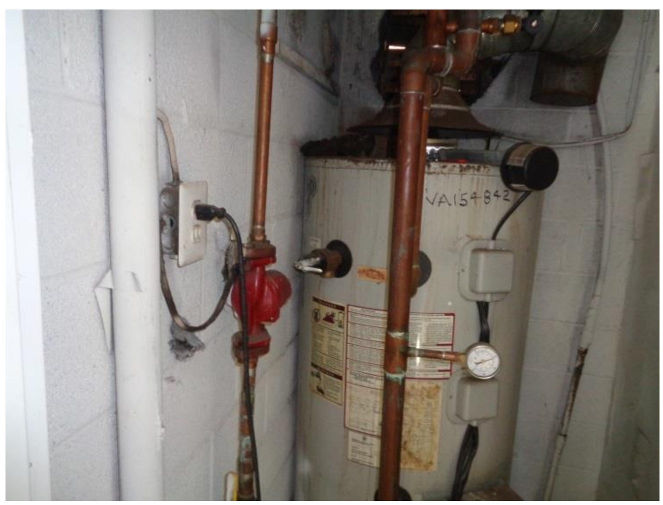


EXHIBIT B: STATEMENT OF QUALIFICATIONS

An energy audit site visit to Sample Gardens was performed on November 1, 2023 by General Energy Consulting, Inc. GEC has been providing energy assessments and consulting services for multifamily properties for over 6 years. Our qualified staff has deep experience with energy modeling, property surveys, assessing the feasibility and estimating costs for energy and water improvements. This audit was conducted in accordance with ASHRAE standards. A list of staff members responsible for the HPB report and analysis is shown below, including relevant qualifications.

Table 9: Energy Auditing Team

Title	Name	Certifications
Technical Team Leader	Kayla Wright	CEM, LEEP AP, PE
Project Manager	Carrie Zhang	CEM, LEED AP, NABCEP
Solar Designer	Sol R Consultant	NABCEP
Technical Reviewer	Rey Viewer	CEM

EXHIBIT C: PORTFOLIO MANAGER STATEMENT OF ENERGY PERFORMANCE

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Javelina Heights Apartments

Primary Property Function: Multifamily Housing
Gross Floor Area (ft²): 130,633
Built: 1995

For Year Ending: October 31, 2023
Date Generated: November 7, 2023

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Javelina Heights Apartments 1258 Blake Ave Payson, AZ, 85541	________________ (__)___-_____ ________________	________________ (__)___-_____ ________________

Property ID: 9876543

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
130.8 kBtu/ft²

Source EUI
151.2 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	17,438,138 (88%)
Natural Gas (kBtu)	2,296,035 (12%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	103.5
National Median Source EUI (kBtu/ft²)	247.6
% Diff from National Median Source EUI	39%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	311

WATER SCORECARD

51

out of 100

Javelina Heights Apartments

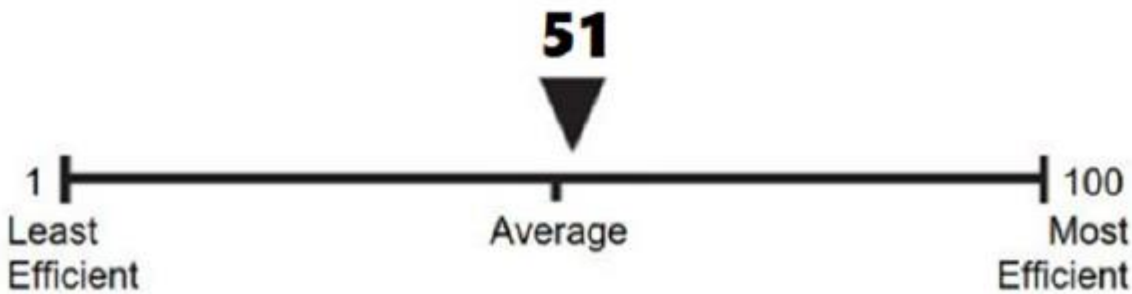
Primary Function: Multifamily Housing
Gross Floor Area (ft²): 130,633
Built: 1995

Property Address:
Javelina Heights Apartments
1258 Blake Ave
Payson, AZ, 85541

For Year Ending: October 31, 2023

Date Generated: November 7, 2023

For the year ending October 31, 2023, this building used 58.5 **gallons of water per square feet.** Here's how that compares to similiar buildings nationwide:



About this Score

The U.S. Environmental Protection Agency's (EPA) Water Score is generated by the ENERGY STAR® Portfolio Manager® tool and supported by WaterSense®. The Score offers a 1 - 100 measurement of how efficiently this property uses water, compared to similar properties nationwide, when normalized for climate and operational characteristics. Learn more at www.epa.gov/WaterSense.

EPA WaterSense

ENERGY STAR® PortfolioManager®

EXHIBIT D: ENERGY CALCULATIONS AND ASSUMPTIONS

A property energy model was created using spreadsheet calculations based on appropriate and industry-accepted engineering formulas and standards from organizations such as ASHRAE. Cost estimates are based on standard construction cost-books such as RS-Means, and technical discussions with equipment manufacturers and local contractors.

The building's historical energy consumption and the data collected on site were analyzed and "trued-up" in order to create energy models of the building's systems. These models were used to predict energy and cost savings for the recommended measures. For this audit, GEC used proprietary spreadsheet models to estimate savings for the proposed retrofits.

Information regarding the recommended installation of a solar PV system was updated according to results from the Technical Solar Assessment, conducted and reported by GEC.

Key information on building systems, including the results of performance tests conducting onsite are included in the tables on the following pages.

A. LIST OF EQUIPMENT

Table 10: Heating Equipment

ID	Type	Location	Make	Model	Quantity	Year of Manufacture	Heating Fuel	Heating Capacity (MBH)	Efficiency (% AFUE)
1	Furnace	Apartments	Bryant	383KAV024045AJJA	52	2006-2010	Natural Gas	44	80
2	Furnace	Apartments	Bryant	383KAV036045AJJA	77	2006-2009	Natural Gas	44	80
3	Furnace	Rental Office	Bryant	Deluxe 26	3	2016	Natural Gas	80	80

Table 11: Cooling Equipment

ID	Type	Location	Make	Model	Quantity	Year of Manufacture	Cooling Type	Cooling Capacity (Tons)	Efficiency (SEER)
1	Condensing Unit	Apartments	Goodman	CRT24-1A	52	2005-2008	Direct Expansion	2	12
2	Condensing Unit	Apartments	Goodman	CKL42-1L	77	2006-2009	Direct Expansion	3.5	10
3	Condensing Unit	Rental Office	Bryant	CRT24-1A	3	2016	Direct Expansion	2	12

Table 12: Domestic Hot Water Heaters

ID	Type	Location	Make	Model	Quantity	Year of Manufacture	Hot Water Heating Fuel	Heating Capacity (MBH)	Storage Capacity (gal)	Efficiency (% AFUE)
1	Domestic Hot Water Heater	Apartment Buildings	A.O. Smith	CRT24-1A	8	2012-2014	Natural Gas	35	40	80
2	Domestic Hot Water Heater	Rental Office	Hydrotherm	MR 1200B	1	2010	Natural Gas	78	40	80

Table 13: Dishwashers

ID	Location	Make	Model	Quantity	Year of Manufacture	Water Usage (gal/cycle)	Usage (kWh/yr)
1	Apartments	Kenmore	13002	54	2010	6.5	450
2	Apartments	GE	GDF520PGJWW	75	2012	5.5	450

Table 14: Refrigerators

ID	Location	Make	Model	Year	Size (sq ft)	kWh/yr	Qty
1	Sample Gardens	Electrolux	FFTR1816LWL	2014	18	404	34
2	Sample Gardens	GE	GTE18GTHBRWW	2012	18	625	95

Table 15: Laundry Equipment

#	Type	Location	Make	Model	Quantity
1	Washer	Common Area Laundry	Cadwell and Gregory	FEONRYPS112TW02	6
2	Dryer	Common Area Laundry	Cadwell and Gregory	SDGYZ09WF	6

Table 16: Lighting Audit (Common Areas)

Existing						Proposed				
#	Service	Location	Qty	Fixture Description	Annual Consumption (kWh)	Fixture Upgrade	Annual Consumption (kWh) Before Controls	Control Qty	Control Type	Annual Consumption (kWh) With Controls
1	Common Area	Laundry Room	39	4-Lamp 40 Watt T12 Linear Fluorescent	30,843	4-Lamp 15 Watt Linear LED	11,566	31	Occupancy Sensor	8,808
2	Common Area	Stairs	20	1 Lamp, 13 Watt CFL Fixture	2,179	Relamp with 8 Watt LED	1,341	-	-	1,341
3	Common Area	Stairs	10	1 Lamp 60 Watt Incandescent	5,029	1 Lamp 8 Watt LED	671	-	-	671
4	Common Area	Entrance	10	1 Lamp 60 Watt Incandescent	2,514	1 Lamp 8 Watt LED	335	-	-	335
5	Common Area	Bottom Stairs	10	1 Lamp 22 Watt T9 Fluorescent Circline Fixture	1,936	1 Lamp 17 Watt Circuline	1,496	-	-	1,496
6	Exterior	Exterior	33	1 Lamp 300 Watt Halogen Floodlight	42,583	1 Lamp 175 Watt LED Floodlight	24,840	-	-	24,840
7	Rental Office	Club Room	3	4-Lamp 34 Watt T12 Linear Fluorescent	3,383	4-Lamp 15 Watt Linear LED	1,493	2	Occupancy Sensor	1,194
8	Rental Office	Club Room	4	1 Lamp 26 Watt CFL	562	1 Lamp 8 Watt LED	173	-	-	173
9	Rental Office	Offices	5	4-Lamp 34 Watt T12 Linear Fluorescent	4,510	4-Lamp 15 Watt Linear LED	1,990	2	Occupancy Sensor	1,751
10	Rental Office	Offices	2	1 Lamp 13 Watt CFL	117	Relamp with 8 Watt LED	72	-	-	72
11	Rental Office	Gym	2	4-Lamp 34 Watt T12 Linear Fluorescent	1,127	4-Lamp 15 Watt Linear LED	497	2	Occupancy Sensor	348
12	Rental Office	Lobby	5	1 Lamp 13 Watt CFL	375	Relamp with 8 Watt LED	231	-	-	231
13	Rental Office	Maintenance	4	2-Lamp 34 Watt T12 Linear Fluorescent	1,409	2-Lamp 15 Watt Linear LED	622	1	Occupancy Sensor	575
14	Rental Office	Bathroom	2	4-Lamp 34 Watt T12 Linear Fluorescent	1,691	4-Lamp 15 Watt Linear LED	746	1	Occupancy Sensor	634
	Total		149		98,258		46,072	39		42,469

Table 17: Lighting Audit (In Unit)

Existing						Proposed	
#	Service	Location	Qty	Fixture Description	Annual Consumption (kWh)	Fixture Upgrade	Annual Consumption (kWh)
1	Apartments	Living Room	117	4 Lamp 60 Watt Incandescent	34,196	4 Lamp 8 Watt LED	4,559
2	Apartments	Living Room	117	4 Lamp 13 Watt CFL Fixture	7,446	4 Lamp 8 Watt LED	4,582
3	Apartments	Kitchen	129	4-Lamp 34 Watt T12 Linear Fluorescent	27,187	4-Lamp 15 Watt Linear LED	11,994
4	Apartments	Kitchen	129	1 Lamp 60 Watt Incandescent	11,423	1 Lamp 8 Watt LED	1,523
5	Apartments	Hallway	117	1 Lamp 13 Watt Incandescent	718	Relamp with 8 Watt LED	442
6	Apartments	Hallway	106	1 Lamp 60 Watt Incandescent	3,944	1 Lamp 8 Watt LED	526
7	Apartments	Hallway	77	1 Lamp 22 Watt T9 Fluorescent Circuline Fixture	503	1 Lamp 17 Watt LED Circuline	389
8	Apartments	Dining Room	117	4 Lamp 60 Watt Incandescent	27,234	4 Lamp 8 Watt LED	3,631
9	Apartments	Dining Room	117	4 Lamp 13 Watt CFL	1,524	4 Lamp 8 Watt LED	938
10	Apartments	Closet	129	2 Lamp 13 Watt CFL	1,237	2 Lamp 8 Watt LED	761
11	Apartments	Bathroom	235	5 Lamp 60 Watt Incandescent	9,519	5 Lamp 8 Watt LED	1,269
12	Apartments	Bedroom	335	4 Lamp 13 Watt CFL	4,442	4 Lamp 8 Watt LED	2,734
13	Apartments	Bedroom	335	4 Lamp 60 Watt Incandescent	15,641	4 Lamp 8 Watt LED	2,085
Total			2060		145,014		35,434

B. TEST RESULTS

Table 18: In-unit Test Results

ID	Building	Unit ID	Unit Type	Number of Bedrooms	Number of Bathrooms	Number of Occupants	DHW Temperature (deg F)	Kitchen Faucet (GPM)	Bathroom Faucet (GPM)	Showerhead (GPM)	Toilet (GPF)
1	3511	103	2BR	2	1	4	127	2.2	2	2.3	3.3
2	7200	204	1BR	1	1	2	130	2.5	2	2	2.5
3	7208	101	1BR	1	1	3	140	2.5	2.3	3	2
4	7204	102	1BR	1	1	2	128	2.4	2.5	2	2
5	7204	202	Studio	1	1	1	126	2.5	2	2	3
6	7200	204	2BR	2	1	2	126	2.5	2	2.5	2.6
7	7201	206	3BR	3	1.5	4	128	2.5	2	2.2	2.8
8	7202	103	4BR	4	2	5	113	2.5	2	2.5	3
9	7202	204	3BR	3	1.5	4	115	2.4	2	2	2.2
10	7201	102	2BR	2	1	2	125	2.3	1.6	2	2
Average							125.7	2.4	2.04	2.25	2.54

EXHIBIT E: RECOMMENDED OPERATIONS AND MAINTENANCE ACTIVITIES TO REDUCE ENERGY/WATER CONSUMPTION

Proper operation and maintenance (O&M) of building systems and equipment are essential to ensure the highest level of energy and water performance and therefore the greatest savings. GEC recommends the following low- or no-cost O&M activities and their recommended frequency.

Frequency	Activity
Weekly	Do a site walk to survey for property conditions
	Check for exterior lighting that needs replacement
Monthly	Check and monitor for leaks in plumbing system including faucets, showerheads, toilets, and piping
	Inspect pool pumps for proper performance
	Inspect insulation for presence of pests
	Inspect samples of apartment and common area thermostats for proper function and appropriate setpoints
Semi-annually and on unit turnover	Check Sample Gardens for replacements of HVAC equipment and components (including filters)
	Check Sample Gardens for faucet and showerhead fixtures that have been replaced/removed by tenants and need replacement
	Check toilets for leaks
	Check Sample Gardens for LED lighting that needs replacement
Semi-annually	Check roofing system for potential damage
Annually	Check aerators for mineral build-up and remove when present
	Schedule tree trimming for solar PV system to prevent shading
	Schedule solar panel cleaning

EXHIBIT F: PVWATTS CALCULATOR RESULTS

Note that estimated solar production from PVWatts is a rough estimate. The exact estimate of solar output is included in the 4099.I and Technical Solar Assessment.

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lesser performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at //sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

The energy output range is based on analysis of 30 years of historical weather data, and is intended to provide an indication of the possible interannual variability in generation for a Fixed (open rack) PV system at this location.

RESULTS

1,493,238 kWh/Year*

System output may range from 1,424,400 to 1,548,637 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	4.93	106,448
February	5.31	101,416
March	6.16	126,549
April	7.40	144,478
May	7.63	150,186
June	7.82	143,658
July	6.56	124,316
August	6.79	129,301
September	6.81	126,792
October	6.35	127,162
November	5.47	110,591
December	4.67	102,341
Annual	**6.33**	**1,493,238**

Location and Station Identification

Requested Location	1258 Blake Ave, Payson, AZ
Weather Data Source	Lat, Lng: 34.25, -111.34 1.3 mi
Latitude	34.25° N
Longitude	111.34° W

PV System Specifications

DC System Size	850.9 kW
Module Type	Standard
Array Type	Fixed (open rack)
System Losses	11.13%
Array Tilt	25°
Array Azimuth	180°
DC to AC Size Ratio	1.2
Inverter Efficiency	96%
Ground Coverage Ratio	0.4
Albedo	*From weather file*
Bifacial	No (0)

Monthly Irradiance Loss

Jan	Feb	Mar	Apr	May	June
0%	0%	0%	0%	0%	0%

July	Aug	Sept	Oct	Nov	Dec
0%	0%	0%	0%	0%	0%

Performance Metrics

DC Capacity Factor	20.0%