3.0 Part 2: Energy Audit

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3.1 Acknowledgements of Part 2: Energy Audit

The Energy Audit Report and Excel RPCA Model were completed by Jason Bing and Henry McElvery of AKT Peerless. AKT Peerless certifies that the report preparers meet the qualifications identified in the RAD Physical Condition Assessment Statement of Work and Contractor Qualifications Part 2.1 (Version 1, October 2012).

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Date: 10-1-13

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Rental Assistance Demonstration (RAD):
PART 2: ENERGY AUDIT

221-253 South Seventh Street Ann Arbor, Michigan 48103
SOUTH SEVENTH

PREPARED FOR	Norstar Development USA, LP 733 Broadway Albany, NY 12207	**ON BEHALF OF**	The Ann Arbor Housing Commission 727 Miller Ave Ann Arbor, MI 48103
PROJECT #	8358E-2-96	**PIC #**	MI064
DATE	September 30, 2013		

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South Seventh

221-253 SOUTH SEVENTH STREET
ANN ARBOR, MICHIGAN 48103

for

Ann Arbor Housing Commission

727 MILLER AVENUE
ANN ARBOR, MICHIGAN 48103

AKT PEERLESS PROJECT NO. #8358E-2-96

1.0 Executive Summary

This report presents the findings and recommendations from a RPCA Energy Audit conducted at South Seventh located at 221-253 South 7th Street in Ann Arbor, Michigan. The Energy Audit follows industry standards and acceptable practice for assessing energy and water performance of multi-family buildings. The audit has been conducted by AKT Peerless and has involved a coordinated effort between AKT Peerless, the Client and building operating staff.

Documents were provided for review, interviews and field investigations were conducted, and building systems were analyzed. In the year analyzed (March, 2012 to February, 2013) the Ann Arbor Housing Commission spent $5,567 on utilities at the subject property. Tenants spent $9,580 in total on utilities at the subject property.

AKT Peerless identified five (5) separate Energy Conservation Measures (ECMs) and one (1) Water Conservation Measure (WCM). The annualized savings of all recommendations totals $4,453 (at current energy and water prices), with the potential to reduce total energy consumption and GHG emissions by 32%. If fully implemented, the payback period from annual energy savings for these ECMs is estimated to be 7.2. Measures associated with common areas (PHA expenses) and measures specific to tenant units have been separated for planning purposes.

Measures best suited for implementation at the End of Useful Life (EUL), advanced ECMs, and measures recommended for further evaluation have been identified and are included in Sections 11-12 of this report.

A preliminary energy use assessment was conducted prior to the cost reduction measure analysis. The figure below describes the historical annual energy consumption and cost for the subject property.

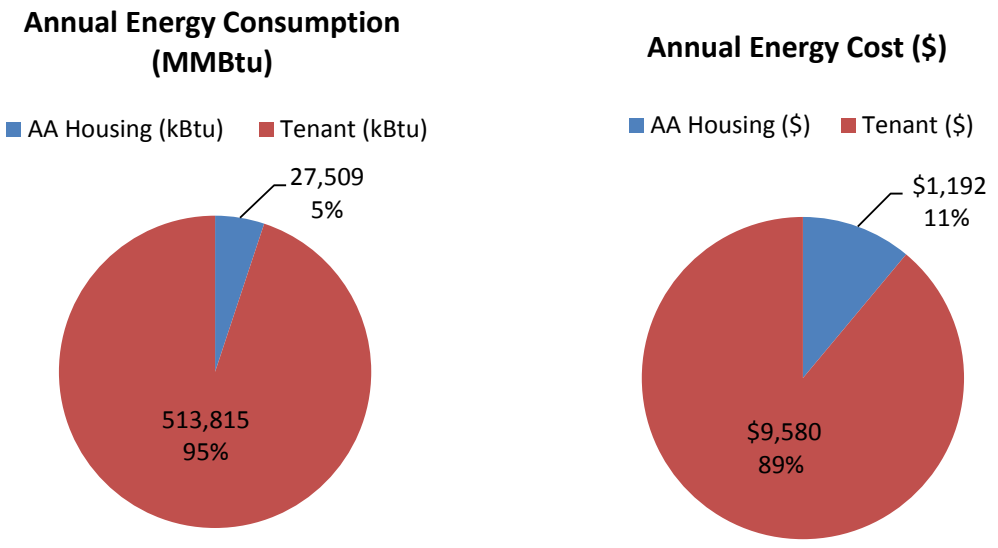


Figure 1. Historical Annual Energy Consumption and Cost

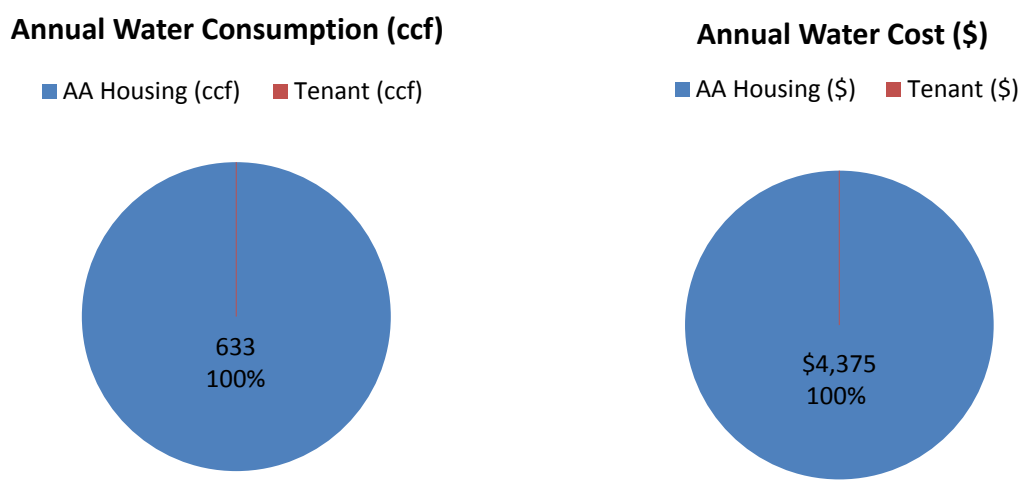


Figure 2. Historical Annual Water Consumption and Cost

The implementation costs and annual savings estimates for each proposed Energy and Water Conservation Measure are presented in Table 1 and Table 2. Table 1 outlines ECMs and WCMs that will directly impact the Owner's annual costs.

Table 1. Financial Summary of All Energy Conservation Measures (Owner)

Energy or Water Conservation Measure	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Install Low-Flow Showerheads, Faucet Aerators and Toilets (entire campus)	WCM1	$5,000	$1,283	3.9
Exterior Lighting Retrofit (entire campus)	ECM1	$6,725	$874	7.7
	Totals	**$11,725**	**$2,157**	**5.4**

The following ECMs are recommended specifically for tenant spaces. Due to separate billing for tenants, the following energy and cost savings will only benefit the tenants.

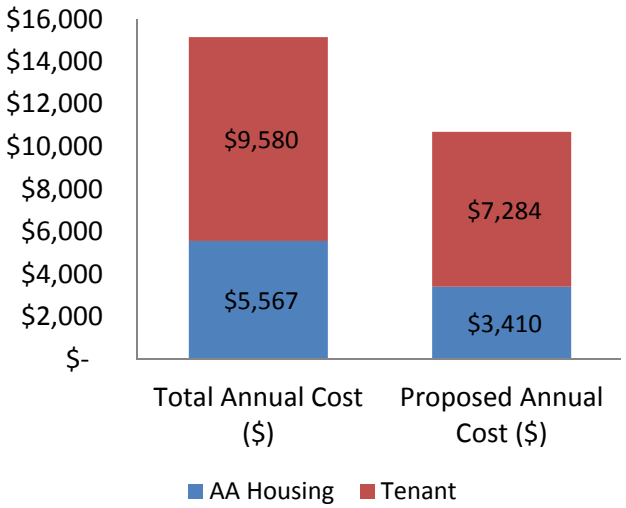
Table 2. Financial Summary of All Energy Conservation Measures (Tenant)

Energy Cost Reduction Measure (ECM)	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Install Programmable Thermostats	ECM2	$2,800	$247	11.3
Control Air Leakage	ECM3	$4,800	$721	6.7
Increase Attic Insulation to R-49	ECM4	$4,840	$393	12.3
Install High Efficiency AC Units	ECM5	$8,000*	$935*	8.6
	Totals	**$20,440**	**$2,296**	**8.9**

*The first cost and annual savings are associated with the installation of a high efficiency item over a standard efficiency item.

Table 3. Impact Summary

% Energy Savings	34%
% Water Savings	25%
% Cost Savings	29%
Annual Cost Savings ($)	$4,453
% Reduction in GHG Emissions (CO_2 Equivalent Metric Tonnes)	32%



2.0 Purpose and Scope

Norstar Development USA, LP, on behalf of the Ann Arbor Housing Commission (the Client), retained AKT Peerless Environmental & Energy Services (AKT Peerless) to conduct an ASHRAE Level II Energy Survey and Analysis of South Seventh located at 221-253 South 7th Street in Ann Arbor, Michigan.

AKT Peerless' scope of work and report is based on its proposal PE-14790, dated June 26, 2013 and authorized by Norstar Development USA, LP on behalf of the Ann Arbor Housing Commission (the Client), and the terms and conditions of that agreement.

The purpose of this report is to assist the Client in evaluating the current energy and water use and energy and water cost of the subject property relative to other, similar properties; and also to identify and develop modifications that will reduce the energy and water use and /or cost of operating the property. This report will identify and provide the savings and cost analysis of all practical measures that meet the client's constraints and economic criteria, along with a discussion of any changes to operation and maintenance procedures. It may also provide a listing of potential capital-intensive improvements that require more thorough data collection and engineering analysis, and a judgment of potential costs and savings.

Relevant documentation has been requested from the client that could aid in the understanding of the subject property's historical energy use. The review of submitted documents does not include comment on the accuracy of such documents or their preparation, methodology, or protocol. The following documents were available for review while performing the analysis:

- Energy Utility Bills
- 2009 United States Greenhouse Gas Inventory, Annex 2
- USEPA Climate Leaders Calculator for Low Emitters
- HUD Residential Energy Benchmark Tool
- HUD Residential Water Use Benchmarking Tool
- National Oceanic Atmospheric Administration "Normal Monthly Heating Degree Days (Base 65)" and "Normal Monthly Cooling Degree Days (Base 65)"

3.0 Additional Scope Considerations

In addition to fully satisfying the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Procedures for Commercial Building Energy Audits, Second Edition 2011, Level II guidelines, this report includes all the necessary requirements of an Energy Audit as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1). These items are identified as follows:

- Heating and cooling systems sized according to the methodology proposed in the Air Conditioning Contractors of America (ACCA) Manual J guide. (See Section 11.4)
- Hot water heater analysis of existing size of individual hot water heater and the appropriate efficiency replacement sizing using First Hour Rating or another professionally recognized sizing tool. (See Section 11.2)
- An initial assessment of the potential feasibility of installing alternative technologies for electricity, heating and cooling systems, and hot water heating at the property. (See Section 13.0)
- An expected end of useful life study for all recommended energy and water efficiency measures.
- Recommendations of any additional professional reports needed (including, for example alternative energy system feasibility studies, air infiltration tests for energy loss and ventilation needs, blower door tests, infrared imaging, duct blasting, etc.)

4.0 General Information

4.1 Audit Team

This audit is the result of a collaborative process between the following AKT Peerless and client personnel:

Table 4. Audit Team

Name	Organization	Title
Jason Bing	AKT Peerless	Building Energy Analyst
Lance Mitchell	Ann Arbor Housing Commission	Facilities & Maintenance Property Manager
Jennifer Hall	Ann Arbor Housing Commission	Executive Director

4.2 Audit Process

AKT Peerless collected historical energy data and floor plans for the building, when available. The square footage of all spaces was determined and the size and location of pertinent mechanical equipment was documented. AKT Peerless conducted a walk-through survey of the building initially on February 12, 2013 and then again on August 8, 2013 collecting specific information on the mechanical, electrical, and plumbing systems as well as occupancy, scheduling, and use patterns.

AKT Peerless utilized industry accepted measuring devices, including but not limited to: a blower door to quantify air infiltration, an infrared camera to visually identify areas of potential energy loss, and a ballast discriminator to identify existing T12 lighting, when applicable. Light levels were measured using a light meter in various areas to compare to Illuminating Engineering Society of North America (IESNA) recommended levels.

A visual inspection of the mechanical equipment, lighting systems, controls, building envelope and plug loads was performed. Mechanical equipment nameplate data was recorded and the specifications and performance data were reviewed and used in this analysis. Additionally, a blower door test was performed on one of the units to determine the air tightness of the apartment units, as well as identify areas of infiltration.

4.3 Energy Calculations Methodology

The primary methods of energy calculation for this analysis were simplified manual and spreadsheet tabulations based on professional standards. Actual calculation methods are discussed in each applicable section.

The end use consumption breakdown, found later in this report, is based on 2003 Commercial Buildings Energy Consumption Survey (CBECS) data for lodgings of relatively similar scale and age.

5.0 Property Description

This section summarizes physical characteristics and general use of the subject property.

5.1 Location

The subject property is located in ASHRAE Climate Zone 5A. According to National Oceanic and Atmospheric Administration recording of heating and cooling degree days, on an annual basis Ann Arbor, MI is expected to experience an average of 6,818 heating degree days (HDD) and 840 cooling degree days (CDD) with a basepoint temperature of 65 degrees Fahrenheit.

5.2 Property Characteristics

General information pertaining to the subject building is summarized in the following table:

Table 5. Property Characteristics

Primary Building Type / Occupancy	Multi-Family (General)
Region	ASHRAE 5A
Date of Construction	1969
Approximate Total Square Footage	4,400 sq ft (550 per unit)

The subject property Primary Building Type is designated as Multi-Family (General). For all energy performance comparisons presented in this report the subject building will be compared to similar buildings of the same Primary Building Type.

5.3 Property Spaces

This complex is divided into four (4) approximately identical buildings. Spaces refer to the building as a whole and the rooms that comprise the building. Typically, the various space types will serve specific functions within the facility. The following table identifies the space types for the subject building.

Table 6. Summary of Property Spaces

Space	Use	Sq Footage	% of Total Area
Eight (8) 1-bdr units	Residential Apartments	550 sf/unit	100%

5.4 Building Occupancy

Occupancy schedule has a significant impact on a facilities energy usage. In fact, the relationship between occupancy and system operating schedules and setpoints are typically more important than equipment efficiencies. The occupancy schedules for the subject building as follows:

Table 7. Building Occupancy Schedule

Day	Time	Use	Average Population
Sunday-Saturday	24/7	Primary Residence	1-2/unit

5.5 Building Envelope

This section summarizes physical characteristics of the subject building envelope.

5.5.1 Walls and Wall Insulation

The typical above grade wall construction appears to be a standard wood framed structure built on a poured concrete foundation with light colored vinyl siding to the outside mechanically fastened to an exterior grade board on 2x4 wood studs. Limited amounts of exterior paneled siding framed with trim create a decorative finish around the around the windows and doors. The overall 5" wide assembly is finished with painted drywall and/or plaster on the interior. Fiberglass insulation was not observed in the exterior walls, but is assumed to be located throughout the perimeter at each building, based on temperature readings and conversation with the tenant. Depth of insulation could not be determined but is assumed at 3.5" and rated at R-11. This is generally considered standard efficiency for age of construction.

These buildings are slab on grade construction. It sits at a lower elevation than the adjacent properties to the north, and may be subject to excessive moisture. A relative humidity reading was taken at the subject unit inspected, and moisture level inside was recorded at 30% RH or greater.

5.5.2 Roof and Roof Insulation

The typical roof design on the four buildings is a gabled, passively vented roof. Approximately 16-24" overhangs with staggered soffit vents run parallel to the ridge and balance a continuous ridge vent. The roof assembly is asphalt shingled roof (grey) over felted wood substrate mechanically fastened to prefabricated or site built 2x wood trusses. The attic inspected contains approximately 3.5" fiberglass batts with an additional 1 to 3 inches of blown cellulose insulation on top of the attic floor for a maximum estimated R-value of 19. The insulation is displaced in several locations, and this uneven distribution of insulation results in a lower effective insulation value in the attic. The attic hatch is not insulated or weather-sealed. Overall, this insulation would be considered substandard efficiency.

5.5.3 Windows and Other Fenestrations

The apartment windows are all dual glazed units with aluminum frames and a 3/8" thermal pane gap, slider style, with two layer of single pane glass (window and integral storm slider). The window units appear to be original. Window frames are thought to be thermally un-broken and are a source of significant air leakage.

5.5.4 Doors

All of the exterior entrance doors are standard hollow metal doors set in aluminum frames with knob handled hardware, and keyed deadbolts. Exterior doors are substandard efficiency and appear to be in fair condition.

5.5.5 Air Leakage

A blower door test was conducted on the building during the site visit. The blower door test was used to quantify air leakage by determining the 50-Pascal airflow rate. This blower door reading, expressed in cubic feet per minute (CFM_{50}), is the actual flow rate measured at 50 Pascals of house pressure. CFM_{50} is the most direct measurement of the airtightness of a building. For the subject property, South Seventh, the blower door airflow rate was 1,730 CFM_{50}.

Using standard industry practice (accounting for wind speed, shielding of the building by external elements, and the buildings height and size), the estimated natural air change rate was calculated to be 1.28 air changes per hour (ACH_n).

5.5.6 Minimum Ventilation Requirement (MVR)

Either air leakage or a whole-house ventilation system must provide acceptable indoor air quality. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) set minimum ventilation requirements (MVRs) to ensure acceptable indoor air quality in homes. The older ASHRAE Standard 62-1989 recognizes air leakage as a legitimate ventilation strategy. The newer ASHRAE Standard 62.2-2007 requires a whole-house mechanical ventilation system.

ASHRAE Standard 62-1989 requires that air leakage must provide at least 15 CFM per person or 0.35 air changes per hour, whichever is greater. For the subject property, South Seventh, the MVR was calculated to be 30 CFM (=0.35 ACH) per average unit. This equates to a building tightness limit (BTL) of 555 CFM_{50} per average unit.

The blower door test determined that air leakage provides excessive ventilation.

5.6 Heating, Ventilation, and Air Conditioning (HVAC)

The HVAC system provides the primary heating, cooling and ventilation needs of the facility. The four (4) buildings at the South Seventh apartments have a decentralized HVAC system in place, with equipment located and zoned for each individual apartment.

Each of the units is heated by one (1) Goodman gas-fired, up-flow forced-air furnace rated at 45 kBtu/h input and 36 kBtu/h output with an 80% AFUE. Heated supply air is generated from the furnace and distributed through insulated ducts located in the attic. Return air is provided through a grille in the mechanical closet, adjacent to the living room, and ducted directly to the unit. The heating for each unit is controlled by a single Honeywell non-programmable dial thermostat.

It was reported that four of the units currently have a window air conditioner for space cooling. One of those units, 221, has two window air conditioners. The units are rated at approximately 1.5 tons and are believed to be around 3 years old.

Ventilation for the units is supplied by both natural ventilation in window openings and a ceiling exhaust fan in each bathroom. The bathroom exhaust fan(s) appear to require maintenance to better remove contaminated air. Additionally, the kitchen has a ductless range hood fan that circulates air with a manual switch.

The domestic hot water for each unit is supplied by a dedicated tank-style, gas-fired, water heater located in a separate mechanical closet. The unit (253) inspected during the site visit contained a Lochinvar, 40 gallon tank with a 34 kBtu/h rating that is approximately 22 years old. This unit is at or near the end of its useful life.

5.7 Lighting

This section describes this property's interior and exterior lighting.

5.7.1 Interior Lighting

Interior Lighting in each of the typical residential units consists of the following fixture types:

Kitchen/Living/Bedroom/Bath

- Standard socket (A lamp) 1 lamp 13W Compact Fluorescent Lamp (CFL) - (3)
- Standard socket (A lamp) 1 lamp (13W CFL) Clg Fan – (2)
- Standard socket (A lamp) 2 lamp (13W CFL) Surface Mount w/lens cover – (1)

The CFLs observed in the subject unit are considered high efficiency lamps, and are assumed to be located throughout the campus.

5.7.2 Exterior Lighting

Exterior lighting for the South Seventh apartments consists of the following for the campus of four (4) buildings:

- 50W High Intensity Discharge (HID) wall-mounted porch light (4 ea - 16 total)
- 250W HID Wallpack security lighting (5 total)

HID technology is considered standard efficiency and can be upgraded. The lighting appears to be operated by photo-sensors, which also may not be functioning properly.

There are two (2) single head light poles on site, providing additional parking lot lighting. These poles are estimated to house 250W HID lamps (2 total). This technology can be replaced with more efficient alternatives.

5.8 Other Equipment (Energy)

Typical apartment unit kitchens include a refrigerator, microwave and range hood for the natural gas-fired stove. Equipment is generally considered standard efficiency equipment. The range hood appears to only circulate air, and is not vented to the outside.

Each apartment unit also supplies an electric hook up (vent, water, and electricity) for a washer and dryer near the rear entrance. Typical washers and dryers observed during field investigations were standard or substandard efficiency units.

5.9 Water Consuming Devices

Each typical apartment unit has devices in the kitchen, bath(s) and basement that consume water. Typical apartment unit kitchens appear to have a standard double sink with standard efficiency aerators. Each apartment appears to have one bathroom, each with a lavatory and toilet. Each bath has a shower/tub. It appears most units have standard efficiency flow devices installed in each of the bathrooms, including showerheads and faucet aerators (2.5 gpm showerhead, 2.0-2.2 gpm faucet aerator). Toilets are 2.5-3.5 gpf units.

5.10 Improvements Since Previous Audits (2009)

The audit team believes the following equipment replacements/upgrades have taken place since the previous energy/water audits were conducted in 2009:

- New (standard efficiency) furnace installed
- New CFLs replaced incandescent bulbs at subject property

6.0 Energy Use Analysis

This section provides information on energy delivery to the subject property.

Energy use and cost indices for each fuel or demand type, and their combined total, have been developed using generally accepted industry methods and benchmarking tools provided by the Department of Housing and Urban Development (HUD) . The Energy Utilization Index (EUI) and cost index of the subject building are compared (benchmarked) with the EUI and cost index of similar buildings evaluated in the HUD Residential Energy Benchmark Tool.

AKT Peerless was not provided with all of the utility bills for this analysis, and this portion has been estimated. The following figures summarize the most recent annual energy consumption and costs for this property. These graphs reflect South Seventh's estimated annual utility consumption and cost**.**

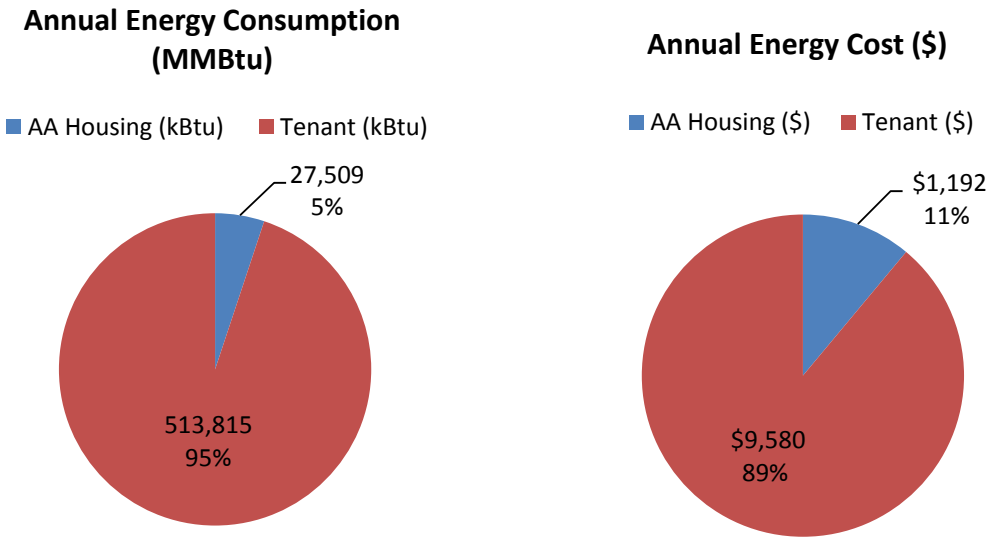


Figure 3. Historical Annual Energy Consumption and Cost

6.1 Electricity

Electricity is supplied and delivered to the subject property by DTE Energy. Historic common area and tenant electrical uses compared to cooling degree days is summarized in the following figure:

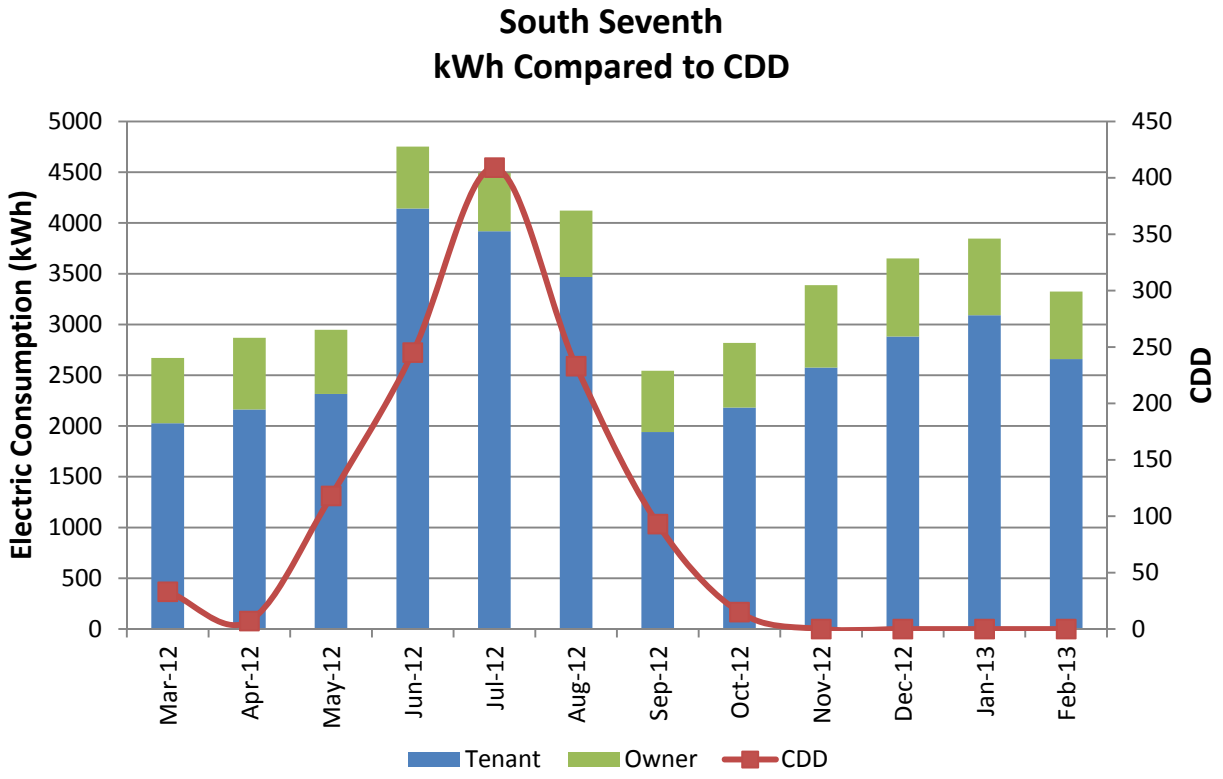


Figure 4. Electricity Consumption Graph

Table 8. Annual Electricity Metrics

	Owner	Tenant
Consumption	8,062 kWh	33,365 kWh
Energy Use Intensity	1.83 kWh / sf	7.58 kWh / sf
MMBtu	28 MMBtu	114 MMBtu

	Owner	Tenant
Cost per kWh	$0.148 / kWh	$0.159 / kWh
Cost per ft^2	$0.27 / sf	$1.20 / sf
Electricity Cost	$1,192	$5,296

Based on the method described in Section 3.3, Energy Calculations Methodology, the following figure shows the estimated electricity consumption per end use.

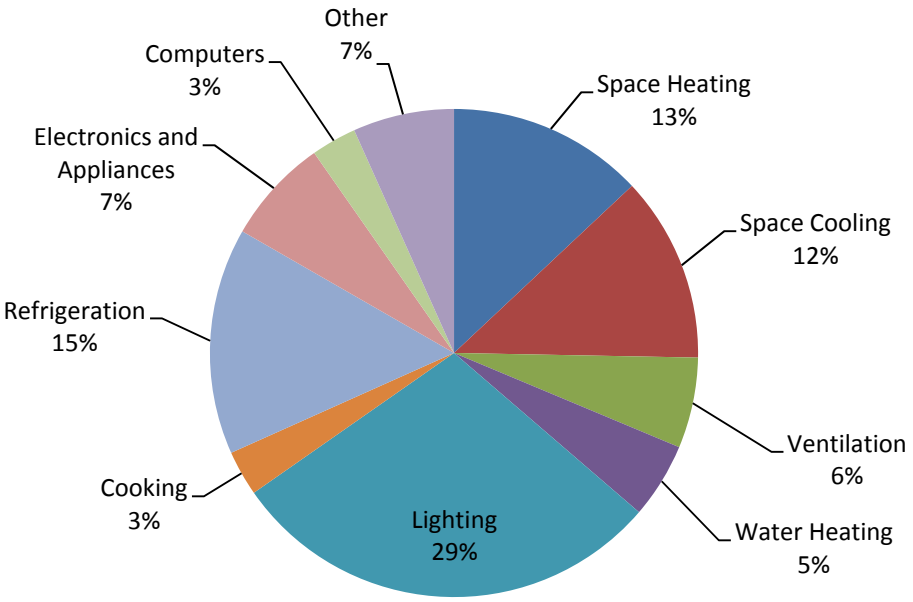


Figure 5. Estimated Electricity Consumption Per End Use

6.2 Natural Gas

Natural gas is supplied and delivered to the subject property by DTE Energy. Historic natural gas use is summarized in the following figure:

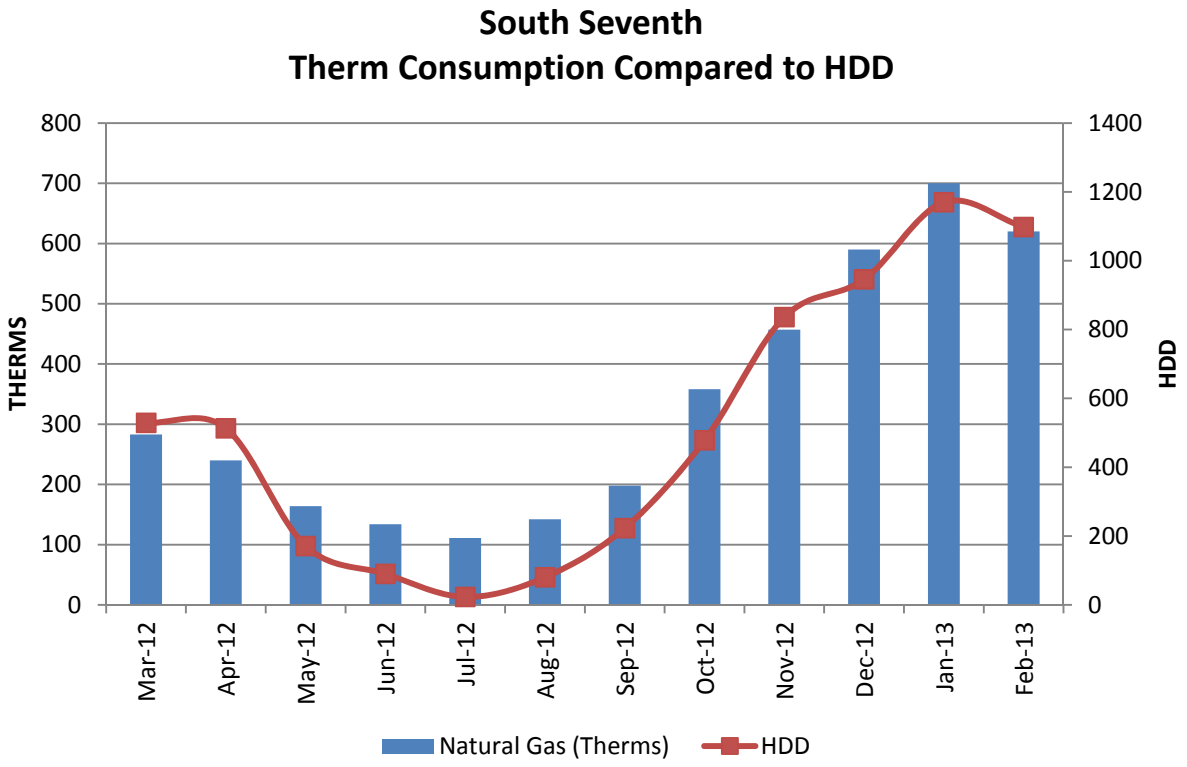


Figure 6. Natural Gas Consumption Graph

Table 9. Annual Natural Gas Metrics

	Tenant
Consumption	3,997 therms
Energy Use Intensity	0.91 therms / ft^2
MMBtu	400 MMBtu

	Tenant
Cost per therm	$1.07 / therm
Cost per ft^2	$0.97 / ft^2
Natural Gas Cost	$4,284

Based on the method described in Section 3.3, Energy Calculations Methodology, the following figure shows the estimated natural gas consumption breakdown by end use.

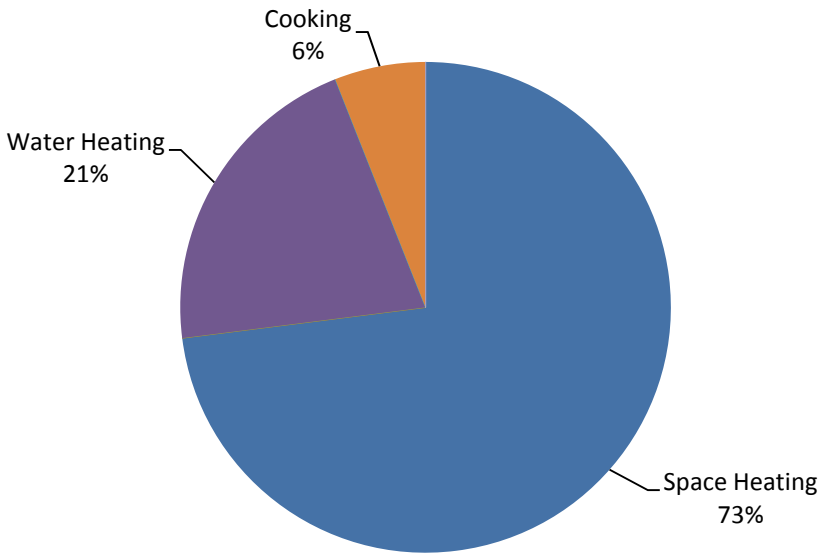


Figure 7. Estimated Natural Gas Consumption Per End Use

6.3 Domestic Water Use

For the time period covered by client provided records, historic domestic water use is summarized in the following figures.

Providers	Number of Meters Provided	Unit of Consumption
City of Ann Arbor	8	CCF

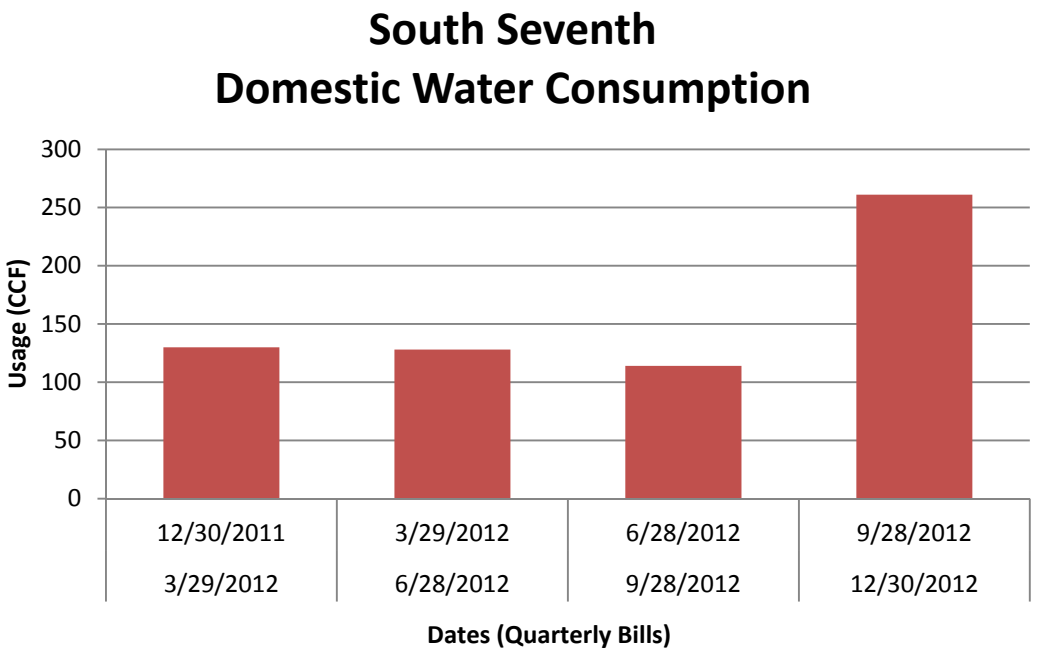


Figure 8. Domestic Water Consumption Graph (Owner)

Table 10. Annual Domestic Water Metrics

Consumption	633 CCF
Water Cost	$4,375

Cost per ccf	$6.91 / CCF
Cost per ft^2	$0.99 / ft^2

The provided annual water consumption was 633 CCF. Average cost per CCF for domestic water and sewer on an annual basis is $6.91. Total annual domestic water and sewer cost is $4,375.

According to the EPA, residential water use accounts for more than half of the publicly supplied water in the United States. For this reason, the EPA has introduced the WaterSense program to identify possible water efficiency methods and technologies for consumers throughout the country. Considering the responsibility that typically lies with the tenants, multi-family homes are no stranger to excessive water usage. Fortunately, implementation of improved technologies throughout these facilities can impact the water supply as well as the rising overhead costs associated with distribution and collection.

The HUD Energy Benchmarking Tool was used to compare water consumption data for the subject property to typical water consumption data for similar HUD properties. The tool utilizes normalized data from its database of more than 9,100 buildings to provide comparative metrics on domestic water consumption based on a facility's historic water data and design characteristics. Finally, a score is generated for the analyzed building to identify its ranking among similar buildings.

The Residential End Uses of Water study (REUWS) published in 1999 by the AWWA Research Foundation and the American Water Works Association is a research study that examined where water is used in single-family homes in North America. Conducted by Aquacraft, PMCL, and John Olaf Nelson, the REUWS was the largest study of its kind to be completed in North America and efforts are underway to repeat the effort and obtain updated results. The "end uses" of water include all the places where water is used in a single-family home such as toilets, showers, clothes washers, faucets, lawn watering, etc. The full REUWS final report is available to the public at no charge from the Water Research Foundation (WRF).

Figure 8 below shows the REUWS typical domestic water consumption breakdown by end use.

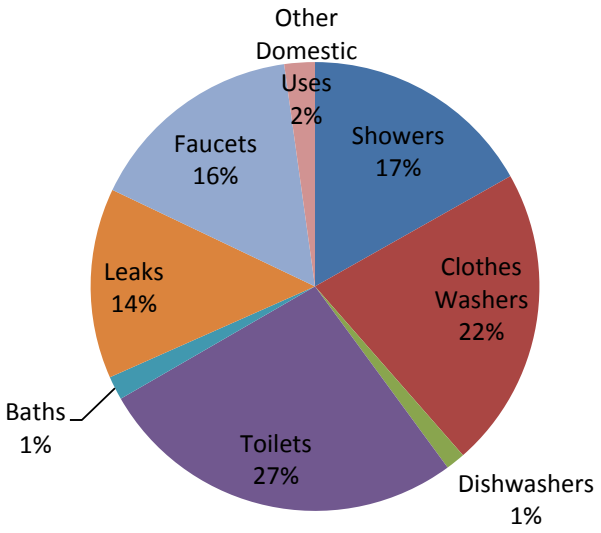


Figure 9. Domestic Water Typical End Use

6.4 Utility Cost Breakdown

The disparate energy types (electricity and natural gas for this facility) and water costs have been aggregated to provide a breakdown of total utility cost into end use components. The breakdown of energy and water cost is based on the energy use breakdown, as described in Section 3.3, Energy Calculations Methodology.

The following table and charts detail the breakdown of energy and water costs. It should be noted that the consumption percentage identified in Section 5.1 Electricity, Section 5.2 Natural Gas, and Section 5.3 Domestic Water Use and the overall cost percentage for each end use are different. This is due to the cost difference for purchasing each energy type.

Currently, Ann Arbor Housing Commission pays $42.57 per MMBtu of electricity. The tenants pay $46.46 per MMBtu of electricity and $10.71 per MMBtu of natural gas.

Table 11. Annual Utility Use Breakdown

Categories	Electricity (MMBtu)	NG (MMBtu)	Total Consumption (MMBtu)	Consumption (%)
Space Heating	18	292	310	57%
Cooling	17	0	17	3%
Ventilation	9	0	9	2%
Water Heating	7	84	91	17%
Lighting	41	0	41	8%
Cooking	4	24	28	5%
Refrigeration	21	0	21	4%
Electronics and Appliances	10	0	10	2%
Computers	4	0	4	1%
Other	10	0	10	2%
TOTAL	**142**	**400**	**542**	

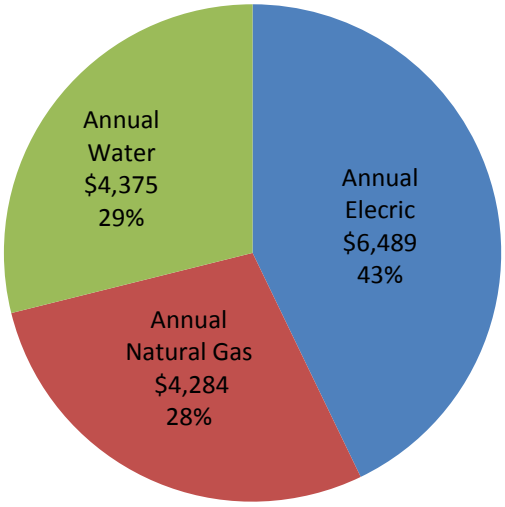


Figure 10. Annual Utility Cost by Type (Owner + Tenant)

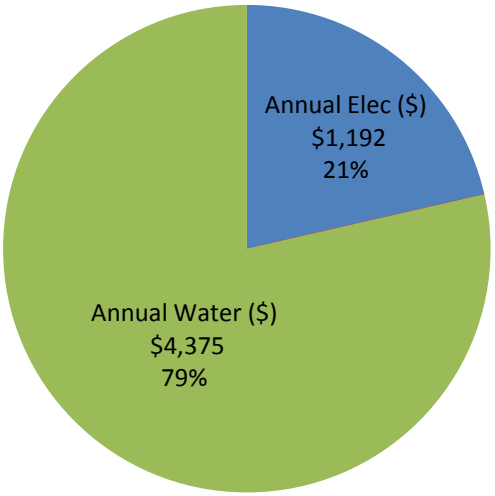


Figure 11. Annual Utility Cost by Type (Owner)

7.0 Energy Performance Benchmark

A benchmark is a standard by which something can be measured. Energy Benchmarking is the comparison of one building's energy consumption to the use of energy in a similar building. HUD's Office of Public and Indian Housing (PIH) has developed the Energy Benchmarking Tool to establish if a building's energy consumption is higher or lower than expected energy usage for similar buildings. AKT Peerless utilized the HUD Energy Benchmarking Tool to quantify the performance of the subject building relative to the family of HUD residential buildings.

This statistical analysis of the HUD tool is based on filters for the building's location, gross square footage, total number of units and year of construction (refer to the appendix for more information regarding dataset filters). This filtered data set is used to calculate the benchmarks for an overall benchmark Energy Use Intensity (EUI) as well as the Energy Cost Intensity (ECI). The benchmarks shown in the portfolio summary are derived from the statistical analysis described in this section.

The following table compares the building energy performance of the subject property and the established benchmark.

Table 12. HUD Residential Energy Use Benchmarking Tool

	Actual	Benchmark
Score Against Peers	36	50
EUI (Energy Use Index)	123.0 kBtu/ft^2	106.1 kBtu/ft^2
$ ECI (Energy Cost Index)	2.45 $ / ft^2	2.11 $ / ft^2

8.0 Water Performance Benchmark

Water Benchmarking is the comparison of one building's water utilization to the use of water in a similar building. HUD's Office of Public and Indian Housing (PIH) has developed the preliminary benchmarking tool to establish if a building's water utilization is higher or lower than normal usage for similar buildings.

In order to develop the water consumption benchmarking tool, water consumption data was collected through voluntary release of information from thousands of buildings in nearly 350 PHAs nationwide. Regression analyses were performed on these datasets to see which of over 30 characteristics were most closely linked to water conservation.

Your building will score from 0 - 100, where 0 means water consumption is probably excessive and 100 means that the building probably uses water very efficiently. Important: this is a whole-building tool. Water use inputs include resident-paid consumption, when applicable/available.

The table below quantifies the performance of a use-defined building relative to the family of HUD residential buildings.

Table 13. HUD Residential Water Use Benchmarking Tool

	Actual	Benchmark
Score Against Peers	55	50
WUI (Water Use Intensity)	107.6 gal/ft^2	114.7 gal/ft^2
WCI (Water Cost Intensity)	0.99 $ / ft^2	1.06 $ / ft^2

9.0 Operations and Maintenance (O&M) Opportunities

Operation and maintenance make up the largest portion of the economic and environmental life cycle of a building and have become primary considerations of building owners and operators. Effective O&M is one of the most cost-effective methods for ensuring reliability, safety, and energy efficiency. Inadequate maintenance of energy-using systems is a major cause of energy waste in both the Federal government and the private sector. Improvements to facility maintenance programs can often be accomplished immediately and at a relatively low cost.

The following recommendations are believed to have the opportunity to reduce energy and water consumption for the facility.

9.1 Develop a Preventative Maintenance Plan for Equipment

Planned or preventative maintenance is proactive (in contrast to reactive) and allows the maintenance manager control over when and how maintenance activities are completed. When a maintenance manager has control over facility maintenance, budgets can be established accurately, staff time can be used effectively, and the spare parts and supplies inventory can be managed more efficiently.

Regardless of which strategy is used, maintenance should be seen as a way to maximize profit and/or reduce operating costs. From this perspective, the main functions of a maintenance department/staff are as follows:

- Control availability of equipment at minimum cost
- Extend the useful life of equipment
- Keep equipment in a condition to operate as economically and energy efficiently as is practical

The maintenance department/staff would be responsible for the following tasks:

- Maintenance planning
- Organizing resources, including staffing, parts, tools, and equipment
- Developing and executing the maintenance plan
- Controlling maintenance activities
- Budgeting

At the time of the assessment, the Facilities Director indicated that a plan is currently being established for the housing authority. It is recommended this continue. Additional considerations for the future plans should include, but not be limited to:

- Energy efficiency for vacant apartments at move-out
- Tenant education
- Tenant support maintenance program
- Tenant incentives program

9.2 Institute an Energy Star Purchasing Policy

Energy costs associated with electrical plug loads should be minimized where possible. Plug loads are electrical devices plugged into the building's electrical system and generally include things like appliances and fixtures. When purchasing appliances and fixtures, the U.S. EPA ENERGY STAR standards should be specified. Manufacturers are required to meet certain energy efficiency criteria before they can label a product with the ENERGY STAR emblem, so these products represent your best energy saving value.

9.3 Utilize Setback/Programmable Thermostats

Heating requirements in residential buildings will typically depend on the comfort level of the occupants. Generally speaking, residents should try to keep the temperature at the lowest possible level while still maintaining comfort for all its occupants. Natural gas savings for this measure can be significant (5%-20%).

Recommended heating temperatures for residential buildings is in the range of 68-72°F. These temperatures apply to occupied daytime hours; a reduction to 55°F is recommended when homes are unoccupied or occupants are asleep.

Even a minor temperature setback during unoccupied building hours can produce a substantial savings. Owners should consider reviewing current heating temperatures in comparison to recommended levels with their residents. Significant energy savings can often be achieved for FREE by adjusting thermostats.

The recommended cooling temperature for residential buildings is 76°F during daytime hours. When air conditioning a building, you should try to keep the cooling temperature at the highest possible setting while still maintaining comfort.

The savings can be quite significant for this measure. For example, it can cost up to *36% more* to cool offices to 72°F rather than 76°F.

(Ideally, the air conditioning should be shut off when the building is unoccupied, but studies have shown that over half of the savings available are achieved with just a 5-degree increase. Even minor temperature increases during unoccupied hours can produce a good savings).

9.4 Water Heater Tank and Pipe Insulation

A water heater keeps water continually heated to a specific, set temperature. As the water loses heat through the tank walls during periods of non-use, the burner or heating element has to reheat the water. An insulation jacket will reduce the heat loss and, as a result, the energy required to maintain the hot water temperature and the water heater will not need to cycle as often. The insulation jacket enables the heater to bring the water up to temperature quicker, too, saving additional energy. Certain manufacturers may prohibit this on newer models. Please consult the tank manufacturer for newer models.

During periods of non-use, the heated water will rise to the top of the tank. The pipes can actually draw heat out of the tank, like a *wick*, and should be insulated. The first ten feet of hot and cold piping, if

accessible, should be wrapped. If the water heating system is located in an unconditioned (cold) area, all accessible piping should be insulated.

9.5 Adequately Seal Doors and Windows

Infiltration is the flow of air through openings in a building. In order to reduce infiltration, the cracks and holes in a building must be adequately sealed. Maintaining caulking and weather stripping in good condition saves both money and energy. It also preserves the building and improves the comfort of its occupants. Verify that all doors and windows are adequately sealed. Verify that doors in existing entrance hallways are being closed to prevent unnecessary infiltration. Also, inspect the exterior of the buildings for cracks or other damage.

Older windows can be a major source of heat loss and air leakage, and can greatly impact the heating load on a building. A detailed engineering study is generally required to determine the best way to upgrade windows. However, be sure to consider low-e high performance glazing when window replacement becomes necessary. The additional cost will usually be paid for in energy savings in less than ten years.

A solution to infiltration from the bathroom exhaust fan involves installing a backdraft damper in the vent to restrict the flow of unwanted air into the building while still allowing the fan to properly exhaust unwanted air.

9.6 Regularly Clean Heating Equipment and Ductwork

A typical problem with multifamily properties is the presence of uneven heating within each unit. This is often attributed to the distribution system as well as the maintenance of the heating equipment. Heating systems that are not maintained can begin to collect debris in places like filters or the interior of the ductwork where it interferes with the flow of conditioned air from the furnace. This misdirected flow can cause a temperature differential between the rooms in the apartment and influence the occupants to adjust the appropriate thermostat set point.

Scheduled cleaning maintenance of the heating equipment and distribution system will not only ensure the occupant's continued comfort, but will also reduce the unnecessary energy consumption from increased temperature settings. Additionally, the proper maintenance will increase the lifetime of the equipment.

10.0 Proposed Energy Conservations Measures (ECMs) and Water Conservation Measures (WCMs)

This analysis identified and included three primary types of ECM/WCMs:

- ECM/WCMs impacting the Owner (the Client) costs; and
- ECM/WCMs impacting the Tenant(s) costs; and
- ECM/WCMs to be implemented at the End of Useful Life (EUL) of equipment (includes both Owner and Tenant impacts)

The energy and water audit of the facility identified five (5) energy conservation measures (ECMs) and one (1) water conservation measure (WCM). These ECMs are estimated to provide approximately $4,453 in annual savings. The investment required to implement all of the measures before the inclusion of applicable utility incentives is estimated to be $32,165. These savings measures are summarized within this section. Incentives are not included in the calculation of payback times and savings calculations. Utilizing available incentives is expected to reduce project costs and decrease simple payback.

Table 14. Financial Summary of ECMs and WCMs

Energy Cost Reduction Measure (ECM)	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Install Low-Flow Showerheads, Faucet Aerators and Toilets (entire campus)	WCM1	$5,000	$1,284	3.9
Exterior Lighting Retrofit (entire campus)	ECM1	$6,725	$874	7.7
Install Programmable Thermostats	ECM2	$2,800	$247	11.4
Control Air Leakage	ECM3	$4,800	$721	6.7
Increase Attic Insulation to R-49	ECM4	$4,840	$393	12.3
Install High Efficiency AC Units	ECM5	$8,000*	$935*	8.6
	Totals	**$32,165**	**$4,453**	**7.2**

*The first cost and annual savings are associated with the installation of a high efficiency item over a standard efficiency item.

Table 15. Summary of Energy Savings for ECMs and WCMs

ECM Description	kWh Annual Savings (kWh)	Therm Annual Savings (Therms)	Water Annual Savings (ccf)	GHG Reduction (Metric Tonnes)
Install Low-Flow Showerheads, Faucet Aerators and Toilets (entire campus)	0	179	158	0.95
Exterior Lighting Retrofit (entire campus)	5,907	0	0	4.37
Install Programmable Thermostats	0	230	0	1.22
Control Air Leakage	0	673	0	3.57
Increase Attic Insulation to R-49	0	367	0	1.95
Install High Efficiency AC Units	5,888	0	0	4.36
Totals	**11,795**	**1,449**	**158**	**16.42**

Table 16. Measures for Consideration at the End of Useful Life (EUL) of Equipment

Energy Cost Reduction Measure (ECM)	ID	Additional First Cost	Annual Savings	Simple Payback (yrs)
Replace Refrigerators with Energy Star Models	EUL1	$50	$9	5.6
Replace Old Hot Water Heaters	EUL2	$150	$35	4.3
Replace Windows with Energy Star Models	EUL3	$1,656	$447	3.7
Install High Efficiency Furnaces	EUL4	$7,200	$557	12.9
Totals		**$9,056**	**$1,048**	**8.6**

10.1 WCM1 - Install Low-Flow Showerheads and Faucet Aerators (entire campus)

Summary						
Cost to Implement	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**Water Savings (gal/yr)**	**GHG Reduction (Metric Tonnes)**
$5,000	$1,284	3.9	0	179	118,184	0.95

Recommendation Description

In some areas, water and sewer rates have increased dramatically over the past few years and are rivaling the cost of energy. Reducing water use through conservation strategies can generate significant cost savings. These strategies include implementing low flow shower heads and faucet aerators.

Existing tank at subject property

WaterSense, a program sponsored by the U.S. Environmental Protection Agency (EPA), is helping consumers identify high performance water-efficient toilets that can reduce water use in the home and help preserve the nation's water resources.

It is recommended to install a low-flow faucet aerator (0.5 GPM) in each bathroom on the entire campus. Additionally, it is recommended to replace every showerhead with a low-flow showerhead (1.5 GPM).

Toilets

Significant advances in technology over the past decade have resulted in the availability of reliable, high-quality water-saving toilets on the market. Older toilets (pre-1994) typically have a flush volume of 3.5 gallons per flush (GPF) or greater. The current standard for new toilets is 1.6 GPF.

It is recommended that all older toilets (3.5 GPF / pre-1994) be replaced with new toilets meeting the 1.6 GPF (at minimum) or (recommended) replace with a toilet certified with the WaterSense label. Such toilets use 20 percent less water than the current federal standard, while still providing equal or superior performance. WaterSense, a program sponsored by the U.S. Environmental Protection Agency (EPA), is helping consumers identify high performance water-efficient toilets that can reduce water use in the home and help preserve the nation's water resources.

Assumptions

Calculation of savings is based on replacing eight (8) showerheads currently using 2.5 GPM with a new showerhead using 1.5 GPM. A value of 8 min of shower use per occupant per day (from the REUWS survey referenced in Section 5.3) was used, assuming four occupants or greater in each house.

Lavatory water savings calculation were based on replacing eight (8) faucet aerators using 2.0-2.2 GPM with a low-flow faucet aerator (>0.5 or equal up to 1 GPM) in each of the residential unit bathrooms.

Toilet water savings is based on replacing eight (8) toilets using 3.5 GPF with new toilets using 1.6 GPF (1.28 recommended). A value of 4 flushes per occupant per day (from the REUWS survey referenced in Section 5.3) was used. In total, the analysis of replacing showerheads, faucet aerators and toilets produced a water savings of greater than or equal to 13,193 gallons per household annually (8 total households).

Incentives

DTE Energy's Multifamily Program is offering direct install incentives for low-flow showerheads and faucet aerators. The required application for this program is included in the appendix of this report.

Expected Useful Life Study

Faucet aerators and showerheads have an expected useful life of ten years and toilets have an expected useful life of 20 years. It is believed that faucets and showerheads were installed approximately 10 years and are need of replacement.

10.2 ECM1 - Exterior Lighting Retrofit (entire campus)

Summary					
Cost to Implement	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$6,725	$874	7.7	5,907	0	4.37

Recommendation Description

Exterior lighting on the building façade and around the building is outdated. Significantly more efficient lighting options exist. Therefore, it is recommended that exterior lighting be retrofitted with more efficient lighting. Specifically, light emitting diode (LED) lighting.

The existing HID exterior lighting is outdated, and significantly more efficient lighting options are readily available. For this application, it is recommended that exterior lighting be retrofitted with more efficient light emitting diode (LED) lighting.

Along with significant electrical savings at equivalent lumen output, maintenance will be greatly reduced as the LED lights proposed have an L_{70} lifespan of 100,000 hours. L_{70} is an industry standard to express the useful lifespan of an LED. It indicates the number of hours before light output drops to 70% of initial output. Maintenance reduction is not factored into the savings calculated for this report. LED lighting is considered a green technology due to the high fixture efficacy and the absence of mercury, arsenic, and ultraviolet (UV) light.

The initial cost of this project is the material cost for five (5) of the subject exterior wall packs and 16 of the exterior wall packs at entries and stairs. Two (2) parking lot single head fixtures were also included. Again, the additional savings associated with reduced maintenance costs are not included in the calculated savings.

Assumptions

It is assumed that all the lighting is used at night and is property owned.

Installation of new LED wall packs would be performed by in-house maintenance staff at no additional labor cost.

It is assumed that the proposed fixtures will provide adequate light level for safety and security purposes. The lighting calculator spreadsheet result is included in the appendix.

Calculations

This ECM analysis was based on replacing the existing wall pack fixtures with 10 watt high performance LED wall packs and replacing security lighting with model # FXLEDSFN/PCS watt high performance LED.

Specification sheets for the analyzed models are included in the appendix.

$$Energy\ Cost\ Savings = Energy\ Consumption\ Savings\ \times Energy\ Cost\ per\ kWh$$

Where:

$$Energy\ Consumption\ Savings = Existing\ Usage - Proposed\ Usage$$

$$Usage = \sum (\#\ of\ fixtures\ \times watts\ per\ fixture\ \times burn\ hours)$$

Incentives

DTE Energy's Multifamily Program is offering incentives for replacing existing HID exterior lighting with LED lighting. Existing lighting must operate more than 3,833 hours per year and replacement must result in at least a 40% power reduction. In addition, the replacement lamp must have an efficacy of at least 35 lumens per watt. The application and specifications for these incentives is included in the appendix.

Expected Useful Life Study

Lamps in the exterior light fixtures were installed in 2008 and have an expected useful life of six years. It is believed that the lamps will need to be replaced next year. The expected useful life of an LED replacement fixture is typically around 15 years.

10.3 ECM2 - Install Programmable Thermostats

Summary					
Cost to Implement	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$2,800	$247	11.3	0	230	1.22

Recommendation Description

Currently, control of the furnace heat in each home is by a digital thermostat located in the living area. The thermostat observed during the site visit was a manual, Honeywell brand non-programmable thermostat.

Existing Thermostat @ 253

It is recommended that a programmable thermostat is installed to control the heat. The programmable thermostats would allow a nighttime setback to be employed, thereby saving energy on heating during overnight hours.

Because the thermostat is controlled by the resident, a "tamper-proof" type design should be considered. Tenant or resident energy education is crucial when replacing manual thermostats with temperature limiting programmable thermostats. At the time of installation, tenants and residents should be informed about why the thermostats were selected and how they operate.

At the time of the site visit the thermostat in the subject unit observed was set to 78 °F.
This is exceptionally high, and may be due to the fact that the resident leaves windows open.

Recommended temperature settings are included below:

	Heating Daytime Setting	**Heating Nightime Setback**
Current Setpoints (estimated)	74-78 °F	74-78 °F
Proposed Setpoints	72 °F	67 °F

Calculations

Calculations were performed using an energy savings calculator that was developed by the U.S. EPA and U.S. DOE for estimating purposes. The calculator was modified to more closely represent the actual building heating load. Weekday and weekend typical usage pattern used an 8 hour nighttime setback of 67 degrees and a regular set-point of 72 degrees.

Assumptions

The subject energy savings calculator assumes the following:
Savings per Degree of Setback (Heating Season) = 3% based on Industry Data 2004

The baseline energy consumption for heating dedicated to the building was estimated using a combination of the consumption profiles in Section 5.2 and the auditor's judgment. Resultant consumption was 230 MMBtu for heating.

A reduction of 5 degrees (nighttime setback of 67 degrees) for an 8 hour setback every night was assumed.

Incentives

DTE Energy's Multifamily Program is offering a direct install incentive for installing programmable thermostats in the individual units. The required application is included in the appendix of this report.

Expected Useful Life Study

The existing manual thermostats have an expected useful life of 15 years. These thermostats were installed in 1999 and will reach the end of their useful life in 2014. At this time, replacement of the manual thermostats with programmable thermostats, with the same expected useful life, is recommended.

10.4 ECM3 - Control Air Leakage

Summary					
Cost to Implement	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$4,800	$721	6.7	0	673	3.57

Recommendation Description

Air leakage through holes, gaps, cracks, penetrations, and electrical receptacles is a major source of heat loss from a dwelling unit. Controlling this air leakage through a combination of weather stripping and strategic sealing can significantly reduce the amount of heat lost to the outside, thus reducing the amount of energy needed to heat the dwelling unit. Insulation also can help reduce air leakage.

In addition to saving energy, controlling air leakage can reduce moisture problems and reduce the influx of odors and contaminated air from the basement and other units, while increasing the overall comfort of the residents.

But reducing air leakage through air-sealing techniques is more complicated than simply weather-stripping and caulking. Two important principles must be understood. First, even if a building is full of holes, air will not move through those holes unless there is a difference in pressure between indoors and outdoors. This pressure differential depends on the difference between indoor and outdoor temperatures, wind speed and direction, and mechanical ventilation. If there is no pressure differential, the air stands still and does not leak in or out. This is important because sealing a hole where there is no pressure differential will not save energy. Pressure tends to be highest on upper and lower floors and in basements. In the heating season, hot air rises and pushes on the ceiling, creating high positive pressure and eventually leaking out. When it does leak out, it is replaced by cold air coming into the lower part of a building, where the pressure is negative from all the warm air moving upward. This force is called the “stack effect.”

Bath exhaust vent connection to outside should be verified

The second important principle is that air sealing can affect air quality. Air leakage is the primary source of ventilation in many buildings. Tightening a building by reducing air leakage can endanger the health of the occupants in buildings with no mechanical ventilation. This risk is highest in buildings with significant sources of indoor air pollution, such as back drafting from gas appliances or high occupancy levels. If a building does not have mechanical ventilation, it is recommended that a ventilation system be installed before air leakage is significantly reduced.

<u>For the subject property, South Seventh:</u> (see Section 5.5.5 and 5.5.6 for details)

The blower door test determined that air leakage is adequate for ventilation, but excessive. **It is highly recommended that air sealing is performed at this property.**

The blower door airflow rate was estimated at 1,730 CFM_{50}.
The building tightness limit (BTL) is 555 CFM_{50}.
Therefore, an air leakage reduction limit of 68% should not be exceeded.

Air Sealing Strategy:

Air seal the home to the minimum ventilation rate (MVR) for air leakage, but **not** below. During the blower test of one representative sample unit, the air leakage was identified to be in the following areas:


Loose fixtures at bathroom ceiling creating air pathways

1) Window areas are the cause of drafts. All interior window casing should be sealed with caulk (outside of the casing to the wall, inside of the casing to the jamb extensions, and the jamb extensions to the window frame). Products such as Dap's Seal & Peal (removable weather-strip caulk provides a watertight and weatherproof seal to temporarily seal out drafts and save energy / peels away when removal is desired / won't damage painted surfaces) can be used to air seal the leaks between the slider units and window frame. The tested unit had weather stripping at the entry doors (complete jambs and new threshold sweep), but all units should be checked for the same.

2) Floor to wall joints have air leakage. Base molding and shoe molding should be caulked complete at floor and wall.

3) Wall penetrations have air leakage. Plumbing pipes under sinks, electrical outlets, and other wall and ceiling penetrations should be sealed.

4) Air seal the attic as necessary. This would include ceiling and top plate penetrations (electrical and plumbing vent stack); also, the perimeter furring cavity is likely to have significant air leakage.

5) There may be significant leakage present in the ducts in these units. A duct blasting test is recommended for this property to ensure minimal leakage is present in the ducts.

Assumptions

Air sealing would cost approximately $600 per unit ($4,800 total for the facility) to achieve 75% of the targeted 68% reduction in air leakage This is difficult to predict, and it is highly recommended to air seal a sample unit while conducting periodic "post" blower door tests to track air sealing progress and verify scope of work. This method should result in a scope of work that will provide a predictable reduction in air leakage.

Calculations

See Section 5.5.5 and 5.5.6 for details.
The sensible heat loss due to excess air leakage was estimated based on a 51% reduction of existing air leakage (48 CFM). This preserves the MVR detailed in the recommended description above. Equation used for estimation was: Q = 1.08 * (48 cfm) * (6818 HDD) * 24 hr/day = 8,482,683 Btu (approx. 84 therms) per unit.

Incentives
DTE Energy's Multifamily Program is not offering incentives for air sealing at the present time.
Expected Useful Life Study
Depending on the applied location, the life expectancy of caulks and sealants can be in the range of five to ten years. It is believed that the areas identified with air leakage have either never been sealed in the past or need to be resealed.

10.5 ECM4 - Increase Attic Insulation to R-49

Summary					
Cost to Implement	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$4,840	$393	14.2	0	367	1.95

Recommendation Description

Attic insulation reduces the amount of heat that flows from a dwelling unit through the attic to the cold outside air. By reducing this heat loss, attic insulation reduces the amount of energy needed to heat the dwelling unit in the winter. In the summer, attic insulation saves on cooling costs and keeps buildings more comfortable by reducing the conduction of heat from the hot attic through the ceiling and into the unit.

Existing attic @ 253

A material's resistance to heat flow is measured in units of "R-value". The higher the R-value, the better the insulating property. The R-value of insulation depends on the type of insulation and its thickness. Optimal R-value for attic insulation depends on the existing insulation, fuel costs, and climate.

The attic inspected contains approximately 3.5" fiberglass batts with an additional 1-3" of blown cellulose insulation on top of the attic floor for a maximum estimated R-value of 19. Overall, this insulation would be considered substandard efficiency (<R-21).

This ECM explored adding an additional insulation level of R-30 or better, bringing the total to R-49, which is the target Energy Star recommended insulation level for retrofitting wood-framed buildings in this climate zone.

If the attic insulation is increased at some point in the future, be sure to do any required air sealing first. Also, rafter vents (insulation baffles) will likely be required to achieve the desired insulation depth near the eaves. The following is from the Energy Star website regarding rafter vents:

To completely cover your attic floor with insulation out to the eaves you need to install rafter vents (also called insulation baffles). Complete coverage of the attic floor along with sealing air leaks will ensure you get the best performance from your insulation. Rafter vents ensure the soffit vents are clear and there is a channel for outside air to move into the attic at the soffits and out through the gable or ridge vent. To install the rafter vents, staple them directly to the roof decking. Rafter vents come in 4-foot lengths and 14-1/2 and 22-1/2 inch widths for different rafter spacings.

Rafter vents should be placed in your attic ceiling in between the rafters at the point where your attic ceiling meets your attic floor.

Once they are in place, you can then place the batts or blankets, or blow insulation, right out to the very edge of the attic floor. Note: Blown insulation may require an additional block to prevent insulation from being blown into the soffit. A piece of rigid foam board placed on the outer edge of the top plate works very well for this

Assumptions

Assumes an estimated cost of $1.10 per square foot (from RS Means) of approximately 6 to 7 inches of an additional blown loose -fill cellulose insulation.

Calculations

The conductive heat loss due through the ceiling was estimated based comparing an effective insulation value of R-17 in the ceiling area with an R-49 ceiling area. Equation used for estimation was the standard heat loss: Q = U * A * (6,818 HDD) * 24 hr/day

Incentives

DTE Energy's Multifamily Program is not offering incentives to add insulation to attic spaces at the present time.

Expected Useful Life Study

Aside from potential exposure to environmental elements, insulation, for the most part, has an expected useful life of over fifty years. Adding insulation to the existing layer should be considered when the existing insulation is still in good condition and is sufficient to fulfill code requirements.

10.6 ECM5 - Install High Efficiency AC Units

Summary					
Premium Cost*	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$8,000	$935	8.6	5,888	0	4.36

Recommendation Description

According to the Great Lakes Adaption Assessment for Cities, the estimated number of days reaching temperatures at or above 90 degrees in Southeast Michigan will increase to 30-50 days per year due to global climate changes. With many of the Ann Arbor Housing residents being disabled or elderly, health issues often are exacerbated by the hot and humid weather. Consequently, AAHC plans on including air conditioning to all the tenant spaces.

At the present time, only a few of the tenant units at South Seventh have window air conditioners for space cooling. It was stated that four of the units have at least one air conditioner, with one of these units having two air conditioners. In cases where window air conditioners are present, the resident is responsible for those purchases and installation. Often, improper installation can cause damage to the windows and walls. Additionally, the appropriate size is not always selected; thus reducing the efficiency of the unit and increasing energy costs.

Several options, including geothermal systems and through-the-wall units, were considered for South Seventh. A geothermal system appears infeasible due the property being located on a floodway. Alternatively, through-the-wall units are feasible for this property; however, installation would involve framing, interior finish, and exterior finish work.

The most efficient option for this property is a ductless mini-split system. This system consists of both an indoor and outdoor unit. The indoor unit is mounted on a wall or ceiling and includes very little wiring. The unit is connected to the outdoor unit with just a few refrigerant lines running through a small opening in the exterior wall. The outdoor unit has a small footprint and can easily be hidden behind the surrounding landscape.

The efficiency of an air-conditioning unit is identified by the Seasonal Energy Efficiency Ratio (SEER) rating. The SEER rating of a unit is the cooling output during a typical cooling-season divided by the total electric energy input during the same period. The higher the unit's SEER rating the more energy efficient it is. Standard efficiency through-the-wall air conditioners typically have SEER ratings at or below 10. Technological developments have produced great advances in air conditioning efficiency, with current split system SEER ratings of 18 or better. Ductless mini-split systems on the market today have a rating of 19 SEER or higher.

It is recommended that AAHC install ductless split-systems instead of through-the-wall air conditioners in all tenant spaces.

Calculations

This ECM analyzes the cost savings associated with installing ductless mini-split systems over through-the-wall air conditioners in all of the units at South Seventh. *The premium cost is the difference between the cost of the high efficiency item (ductless split systems) and the standard replacement item (through-the-wall room air conditioners).

Equipment and installation cost of $2,500 for a through-the-wall air conditioner (10 SEER).
Base cost of $2,710 for ductless mini-split system (19 SEER).
Additional labor cost of $800 per unit for high efficiency installation. This is for the cost of installing necessary refrigerant and electrical lines.

An online Air-Conditioning Cost Calculator was used to generate all estimates used in this ECM. The result output is included in the appendix. For the purposes of this report, it was assumed that four of the tenant spaces were being considered for air-conditioning upgrades. On average, the typical number of annual cooling hours was estimated to be about 600 hours and the typical rating per unit to be approximately 1.5 tons.

Incentives

DTE Energy's Multifamily Program is not offering incentives to install high efficiency air conditioners at the present time.

Expected Useful Life Study

Room air-conditioners typically have an expected useful life of 15 years. The recommended ductless split system also has an expected useful life of 15 years.

Manual J Calculation Results

To confirm appropriate sizing of the recommended cooling equipment, AKT Peerless performed calculations in accordance with Air Conditioning Contractors of America (ACCA) Manual J guidelines. An industry accepted software program, HVAC-Calc Residential 4.0.58c, was used to calculate the heat loss and heat gain in a unit. A detailed report of the Manual J calculations is included in the appendix of this report.

It was assumed that most of the units at South Seventh were all constructed in a similar manner; therefore, the sizing of cooling systems would be the same for all eight units. According to the calculations, the total heat gain for a typical unit would be approximately 11 kBtu/h. It should be noted that these calculations have assumed previously recommended ECMs have already been implemented. Recommended size for the air-conditioning system should be around 1 to 1.5 ton units per tenant space.

11.0 ECMs for End of Useful Life (EUL)

The following are ECMs for which the calculated payback period exceeds the useful life of the product, when considered for immediate replacement. However, these ECMs have a viable payback period when the replacement occurs at the end of the product's useful life (EUL), since the item would be replaced at this time in any case. In order to demonstrate the benefit of upgrading to an energy efficient product, only the premium cost for upgrading to the energy efficient product is considered in the initial investment. The premium cost is the difference between the cost of the energy efficient item and the standard replacement item.

11.1 EUL1 - Replace Older Refrigerators with Energy Star Models

Summary (per refrigerator)

Premium Cost	Estimated Annual Cost Savings	Simple Payback (years)	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Emissions (Metric Tonnes)
$50	$9	5.6	57	0	0.04

Recommendation Description

After lighting, refrigerators are the second largest users of electricity in most households (not including households with electric heat or hot water). Older refrigerators can use up to four times more electricity than the most efficient new models available in the same size.


Existing Refrigerator

Replacing these inefficient units with new, more efficient refrigerators can realize substantial energy and cost savings. In many cases, it is cost-effective to replace older refrigerators before scheduled replacement because of the electricity cost savings.

It was believed that these 1 bedroom homes have refrigerators approximately 15 cu ft. and the units were manufactured between 1997-2000. The replacement model used in the ECM calculation is 15 cu ft. model that is estimated to use 343 kWh per year and has an estimated cost of $500 each. This automatic-defrost model is ENERGY STAR® qualified because it is 15 percent more efficient than federal standards require. By contrast, the average refrigerator in that size purchased before 1990 uses around 1,100 kWh, with older units using more than 1,500 kWh per year.

Assumptions

There exist a total of eight (8) refrigerators that were likely manufactured on or before 2000 and are approximately 15 cubic feet in capacity.

Calculations

The Stanford University Appliance Calculator was used to generate all estimates used in this ECM. The

calculator result output is included in the appendix.

The Appliance Calculator Project is part of the Stanford Large-Scale Energy Reductions through Sensors, Feedback & Information Technology Initiative, an Advanced Research Projects Agency for Energy research program (ARPA-e), funded by the Department of Energy http://arpa-e.energy.gov/

Incentives

DTE Energy's Multifamily Program is not offering incentives to install Energy Star products at the present time.

Expected Useful Life Study

The expected useful life of refrigerators is approximately fifteen years. The existing refrigerators are at or near the end of their useful life and are recommended for replacement.

11.2 EUL2 - Replace Hot Water Heaters with Energy Star Models

Summary (per water heater)					
Premium Cost	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$150	$35	4.3	0	33	0.18

Recommendation Description

Usually, a water heater is replaced only when it fails. But if the existing water heater is at least ten years old, it is near the end of its useful life, and it may make sense to replace it before it fails. By replacing the water heater before it stops working, the HA may enjoy significant energy savings, in addition to avoiding a situation in which residents are without hot water while a new system is being selected. Replacements of old water heaters that are oversized will generally yield higher savings than if the old system is appropriately sized. In any case, if the old water heater is leaking or shows signs of heavy rust or water streaking in the combustion chamber, it should be replaced (Weingarten and Weingarten 1996).

Existing tank at sample unit > 20 years old

The energy factor (EF) indicates a water heater's overall energy efficiency based on the amount of hot water produced per unit of fuel consumed over a typical day. This includes the following:

- Recovery efficiency – how efficiently the heat from the energy source is transferred to the water
- Standby losses – the percentage of heat loss per hour from the stored water compared to the heat content of the water (water heaters with storage tanks)
- Cycling losses – the loss of heat as the water circulates through a water heater tank, and/or inlet and outlet pipes.

A new standard efficiency 40-gallon gas water heater has a current minimum Energy Factor of 0.59, due to inefficiencies of combustion, a central flue carrying heat away with combustion exhaust, and a continuous gas pilot light, as well as standby losses through insulation and thermo-siphoning.

This ECM recommends Energy Star qualified gas water heaters (Energy Factor of 0.67 or greater). This represents a 14% percent savings compared to a standard efficiency gas water heater. In addition to reducing standby losses with added insulation and anti-thermo-siphon device (heat traps), these improved efficiencies can be achieved for very little added cost by using electronic ignition instead of a pilot light, having automatic draft dampers, and reducing losses out the flue by recovering more of the heat first.

Energy Star Qualifying Models: Residential High-Efficiency Gas Storage Water Heaters
http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WGS

- Minimum Energy Factor (EF) of 0.67 as of September 1st, 2010.
- Minimum First Hour Rating (FHR) of 67 gallons
- Annual energy savings of 14% (Based on the National Gas Average Energy Cost and a

comparison to a conventional gas water heater with an EF rating of 0.59)

Calculations

Data used in this ECM are from a cost comparison study conducted by the American Council for an Energy-Efficient Economy (ACEEE). http://aceee.org/about

Incentives

DTE Energy's Multifamily Program is not offering incentives for replacing older hot water heaters with Energy Star models at this time.

Expected Useful Life Study

Hot water heaters have an expected useful life of ten years. The existing hot water heaters were installed at different times. The following lists the hot water heaters per tenant unit and their installed date:

Tenant Unit #	Tank Size	Installed Date
Unit 251	40 gallon	2007
Unit 241, 243, 253	40 gallon	2011
Unit 233	40 gallon	2012
Unit 231	30 gallon	2005
Unit 221	30 gallon	1989
Unit 223	30 gallon	2002

Units 221 and 223 have hot water heaters that are at their expected useful life and are in need of replacement immediately.

First Hour Rating Calculation

Use	Avg. Gal. of Hot Water Use		Times used during 1 hour		Gallons used in 1 hour
Shower (8 minutes avg.)	10	x	# of tenants	=	10/20
Shaving (.05 gpm)	2	x	1	=	2
Hand Dishwashing or Food prep (2 gpm)	4	x	1	=	4
Clothes Washer (one load)	7	x	1	=	7
			Total Peak Hour Demand	=	23/33

Depending on the anticipated number of tenants in a unit, the recommended size for replacement hot water heaters is 30 gallon tanks. Some of the existing tank sizes in units are adequate for standard replacements; however, it is recommended that any existing 40 gallon tanks be replaced with 30 gallon tanks at the end of their useful life.

11.3 EUL3 - Install Energy Star Windows

Summary					
Premium Cost	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Reduction (Metric Tonnes)**
$1,656	$514	3.7	0	480	2.55

Recommendation Description

Windows play a major role in the energy use and comfort of a dwelling unit. In the winter, heat in a room is lost when cold outside air infiltrates into the dwelling unit around the edges of the window. Heat can also be lost by conduction directly through the pane, even if the window fits tightly. The cold drafts and the chilly window pane make the room uncomfortable. But windows can also help to heat a room, by letting the sun's rays enter. Solar radiation is beneficial in the winter but can be a major source of discomfort in hot summer climates.

It is recommended that the existing tenant windows be replaced with Energy Star rated windows to reduce the energy consumption caused by overheating. Replacing poor-quality windows can save 10% to 20% on energy consumption for heating.

It is important to choose a window that is right for the particular climate. In most climates, the best energy buy for residential windows is a medium-performance window, such as a gas-filled, double-pane window with low-emissivity glazing and a wood or vinyl frame. This type of window is typically about 5% to 15% more expensive than plain double-pane windows (E Source 1995). Higher-performance windows may be cost-effective in areas with severe winter climates and expensive heating fuel. In climates with mild winters and hot summers, a window with a reflective or selective coating should be specified.

ENERGY STAR® Qualification Criteria for Residential Windows, Doors, and Skylights

Windows

Climate Zone	U-Factor[1]	SHGC[2]	
Northern	≤ 0.30	Any	Prescriptive
	=0.31	≥ 0.35	Equivalent Energy Performance
	=0.32	≥ 0.40	
North-Central	≤ 0.32	≤ 0.40	
South-Central	≤ 0.35	≤ 0.30	
Southern	≤ 0.60	≤ 0.27	

[1] *Btu/h-ft²-°F*

[2] *Fraction of incident solar radiation*

Doors

Glazing Level	U-Factor[1]	SHGC[2]
Opaque	≤ 0.21	No Rating
≤ ½-Lite	≤ 0.27	≤ 0.30
> ½-Lite	≤ 0.32	≤ 0.30

Skylights

Climate Zone	U-Factor[1]	SHGC[2]
Northern	≤ 0.55	Any
North-Central	≤ 0.55	≤ 0.40
South-Central	≤ 0.57	≤ 0.30
Southern	≤ 0.70	≤ 0.30

Source:
http://www.energystar.gov/ia/partners/prod_development/archives/downloads/windows_doors/Windows_Doors_and_Skylights_Program_Requirements.pdf?8c9b-add8

Assumptions
It is estimated that the entire campus has approximately 552 ft^2 of window eligible for this ECM.
Incentives
DTE Energy's Multifamily Program is not offering incentives for installing Energy Star rate windows at this time.
Expected Useful Life Study
Windows have an expected useful life of 30 years. A portion of the windows have recently been upgraded. The remaining windows are believed to be at or near their expected useful life and are in need of replacement.

11.4 EUL4 - Install High Efficiency Furnaces

Summary					
Premium Cost to Upgrade	**Estimated Annual Cost Savings**	**Simple Payback (years)**	**Electricity Savings (kWh)**	**Natural Gas Savings (therms)**	**GHG Emissions (Metric Tonnes)**
$7,200	$557	12.9	0	520	2.76

Recommendation Description

Replacing the old heating plant in a building can generate considerable savings if the existing equipment is inefficient and/or the fuel source is expensive compared to other options. A furnace near the end of its useful life is a particularly good candidate for replacement with high-efficiency equipment. Unfortunately, this opportunity was missed by the AAHC when three (3) of the furnaces were recently replaced with standard efficiency (80%) units in 2011.

Because of technology advances, new furnaces are much more efficient than they used to be, presenting opportunities for significant savings on heating costs. Existing furnaces have a designed efficiency of 80-81%. Replacement units are available with efficiencies of up to 95%. Significant energy savings can be realized with the installation of more efficient units. This ECM is calculated for replacing all eight (8) furnaces (80% AFUE) with high efficiency furnaces, (92% AFUE) at the end of useful life.

Calculations

Natural gas consumption of existing furnaces is approximately equal to 73% of total consumption (2,918 therms for furnace heating). Efficiency gain from 80% to 92% with high efficiency units.

Base cost of $1,900 for standard efficiency furnaces (80% AFUE).
Base cost of $2,600 for high efficiency furnaces (92% AFUE).
Additional labor cost of $200 per furnace for high efficiency installation. This is for the cost of installing necessary PVC venting runs through the exterior wall.

Incentives

The Detroit HVAC Incentives offers up to $300 in incentives for a replacement of natural gas furnaces. An implementation of this incentive with the ECM would aggregate savings with labor and the new furnace to $300 for a natural gas furnace of 94% or higher efficiency. Refer to table in appendix for further details. A retrofit of 8 new furnaces on the property amounts to a potential of $2,400 in incentives.

Additional Federal Tax Credits are available for replacing furnaces where up to 30% of the installed cost or $1,500 for all systems in each unit retrofit, whichever is less, can be reimbursed at the end of the year.

Expected Useful Life Study

Furnaces have an expected useful life of 20 years. The existing units were installed at different dates. The following lists the furnaces per tenant unit and their installed date:

Tenant Unit #	Installed Date
Unit 241, 243,253	2011
Unit 223	1997
Unit 221, 223, 231, 233	2002

Unit 223 has a furnace that is at its expected useful life and should be replaced soon.

Manual J Calculation Results

To confirm appropriate sizing of the recommended heating equipment, AKT Peerless performed calculations in accordance with Air Conditioning Contractors of America (ACCA) Manual J guidelines. An industry accepted software program, HVAC-Calc Residential 4.0.58c, was used to calculate the heat loss and heat gain in a unit. A detailed report of the Manual J calculations is included in the appendix of this report.

It was assumed that most of the units at South Seventh were all constructed in a similar manner; therefore, the sizing of heating systems would be identical for all eight units. Overall values for the heat loss within the software are often increased by a factor of 15% to 25% to account for averages used in the winter design temperatures. According to the calculations, the total heat loss for a typical unit would be approximately 27 kBtu/h. It should be noted that these calculations have assumed previously recommended ECMs have already been implemented. Because high-efficiency furnaces are not typically manufactured with a rating below 45kBtu/h, it is believed that the existing furnace size is appropriate for all of the units.

12.0 Advanced ECMs and/or ECMs Recommended for Further Evaluation

The following capital intensive measures may be feasible but would require an additional, detailed engineering analysis of the entire facility.

12.1 FE1 - Add Wall Insulation incl. Continuous @ Perimeter

Recommendation Description

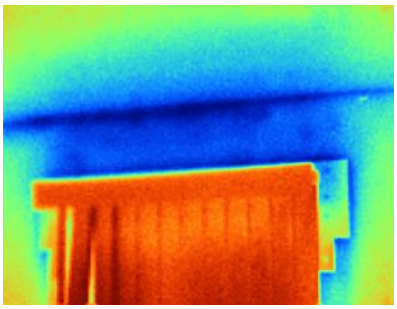
The purpose of wall insulation is to reduce the amount of heat that flows from a dwelling unit through the walls to the cold outside air. By reducing this heat loss, wall insulation reduces the amount of energy needed to heat the dwelling unit. Wall insulation also can save on cooling costs and reduce overheating in the summer.

A material's resistance to heat flow is measured in units of "R-value." Higher R-values have better insulating properties. The R-value of insulation depends on the type of insulation and its thickness.

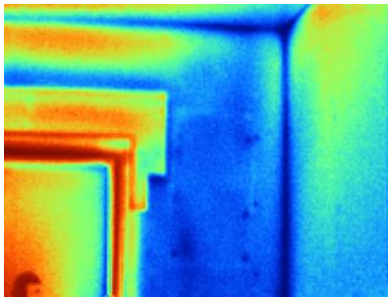
Based on the age of the property and the unknown condition of any existing wall insulation, an in-depth study would be required to establish the costs and potential savings of implementing this recommendation.

An infrared (IR) thermal imaging camera was used during the site visit to evaluate the thermal properties of a similar construction home at North Maple Estates. The findings are detailed below:

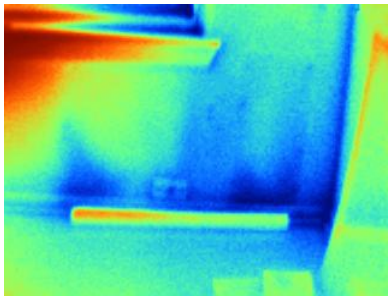
Wall insulation appears to have settled in wall cavities or was never insulated to top of stud bays.



Displays thermal bridging at headers above windows.



Displays missing insulation above door header.



Displays poorly placed insulation above baseboard.

One solution would be to use the IR camera on a colder day, and mark areas that need insulation. Those voided areas could then be then filled with dense pack cellulose.

Furthermore, the Owner should investigate the use of exterior foam insulation panels whenever these buildings undergo exterior renovation (ie, replacement of siding). Foam insulation sheathing reduces thermal bridging through structural elements like wood studs, where it serves as a thermal break. Adding insulation, either in the cavities or continuous insulation on the exterior, requires further study.

Incentives

DTE Energy's Multifamily Program is not offering incentives for insulation at this time.

Expected Useful Life Study

Aside from potential exposure to environmental elements, insulation, for the most part, has an expected useful life of over fifty years. Adding insulation to the existing layer should be considered when the existing insulation is still in good condition and is sufficient to fulfill code requirements.

12.2 FE2 - Replace/Invest in Energy Star Clothes Washers

Recommendation Description

Because the Owner of the property is responsible for paying the water utility, the audit team believes an investigation into high efficiency clothes washers may be a sound investment for the Ann Arbor Housing Commission.

Typically, residents are responsible for providing their own washers and dryers. This reduces a first cost for the housing commission – however, residents appear to be installing/utilizing the cheapest functioning units available. These units are often very old, and extremely inefficient. This results in high electrical energy consumption, but even greater water consumption.

In the past few years, the change in design and operation of the clothes washer units has allowed the consumer to reduce water usage and drying time. Typical high-efficiency washers use 27 gallons of water per load. In contrast, conventional models that were built from 1980 to the late nineties consumed between 43 and 51 gallons of water per load.

In addition to a reduction in water usage, many of the energy efficient washers will minimize the amount of hot water use by utilizing cold water as much as possible. The faster cycle on the efficient washers also minimizes the time needed to dry clothes, which overall minimizes the electrical consumption for laundry.

The existing washers at the subject property were identified to be approximately 10-20 years old. It is assumed that all tenant units are occupied; however, the typical usage of the laundry units is unknown and would require additional analysis to properly determine the savings from installing Energy Star rated washing machine units. Additionally, converting the existing washing machines to only using a cold rinse can also provide substantial savings based on tenant usage.

Because the Owner is responsible for water consumption, and water costs continue to rise, the team recommends a further life cycle investigation into funding and installing Owner-supplied (cold rinse) Energy Star units.

Incentives

DTE Energy's Multifamily Program is not offering incentives for installing Energy Star products at the present time.

Expected Useful Life Study

With typical use, the average clothes washing machine has an expected useful life of 14 years. It is believed that the existing units are at or near the end of their useful life.

13.0 Feasibility Assessment of Green Energy Technologies

The following Green Energy Technologies were evaluated for their application at the subject property:

13.1 Photovoltaic for Electricity

Implementing photovoltaic panels for electricity at the subject property is not recommended due to high installation costs. Further study is not recommended.

13.2 Solar Thermal for Hot Water Heating

Hot water usage at the subject property is not high enough to justify initial costs of solar heating therefore the property is not a viable candidate of solar thermal for hot water heating. Further study is not recommended.

13.3 Wind Turbine

The property is not a viable candidate of installing wind turbines due to insufficient wind power in this geographic area. Further study is not recommended.

13.4 Combined Heat and Power

The property has less than 80 units (a rule of thumb for minimum number of units for feasibility) and does not have a central power source. The property is not a viable candidate of implementing combined heat and power and further study is not recommended.

13.5 Geothermal Heat Pumps

Geothermal heat pumps were originally considered by the Ann Arbor Housing Commission for this property. While the property has sufficient acreage to drill wells, the property is in a flood way that will interfere with the system. Further study is not recommended.

13.6 Fuel Cells

Due to the high initial costs associated with fuel cells, implementation is not recommended at the subject property. Further study is not recommended.

14.0 Recommendations & Impact

Based on the analysis described in this report, AKT Peerless believes substantial energy conservation opportunities are available, and recommends implementation of all proposed ECMs.

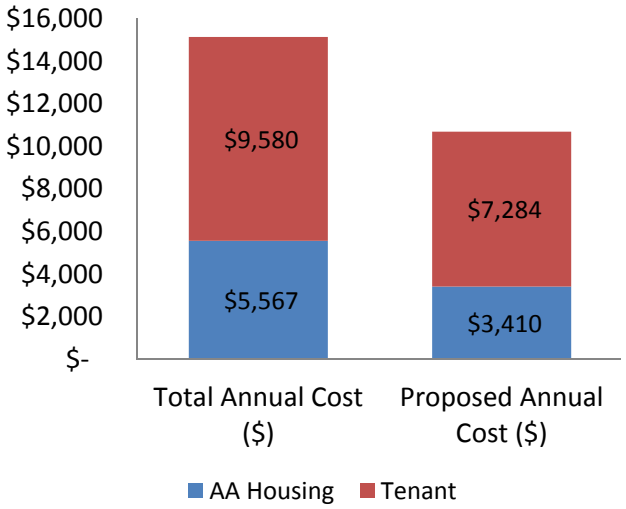
The combined annual EUI for the subject building is estimated at 123.0 kBtu per square foot per year. The annual energy cost index is an estimated $2.45 per square foot per year. Reduction of fuel (non-electrical) and electrical energy consumption through the implementation of recommended ECMs will potentially result in a reduced EUI of 80.91 kBtu per square foot per year, a potentially reduced annual cost index of $1.44 per square foot per year, and potential total annual energy cost savings of $4,453 per year.

An additional result of implementing the recommended ECMs would be the reduction of greenhouse gas (GHG) emissions by 16.42 metric tonnes. Measurements of greenhouse gas emissions are based on data gathered from the United States Environmental Protection Agency (USEPA) eGRID database.

The subject building is located in eGRID electric utility sub-region RFCW. Greenhouse gas emissions from electrical consumption are based on emissions data measured at the electrical generating facilities serving consumers located in the specified eGRID utility sub-region, and therefore greenhouse gas emissions and the estimated reduction in greenhouse gas emissions reflect the mix of fuel sources used by the regional electrical utilities serving the subject property. Emissions factors for natural gas consumption are based on data gathered from the 2009 United States Greenhouse Gas Inventory, Annex 2.

Table 17. Impact Summary

% Energy Savings	34%
% Water Savings	25%
% Cost Savings	29%
Annual Cost Savings ($)	$4,453
% Reduction in GHG Emissions (CO_2 Equivalent Metric Tonnes)	32%



15.0 Limitations

AKT Peerless accepts responsibility for the competent performance of its duties in executing this assignment and preparing this report in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages. Although AKT Peerless believes the results contained in herein are reliable, AKT Peerless cannot warrant or guarantee that the information provided is exhaustive, or that the information provided by the client, third parties, or the secondary information sources cited in this report is complete or accurate.

Nothing in this report constitutes a legal opinion or legal advice. For information regarding individual or organizational liability, AKT Peerless recommends consultation with independent legal counsel.

ASHRAE *Procedures for Commercial Building Energy Audits* recommends that the Energy Analyst apply a consistent definition of building square footage to both the subject building and to similar buildings used for energy performance comparisons. AKT Peerless cannot evaluate the accuracy or consistency of building square footage measurements of similar buildings included in the comparison database.

The Energy Analyst has not evaluated the potential financial savings from changing to a different utility price structure due to limited details on provided rate structures.

Also, the Energy Analyst has not verified that the property owner/operator has reported all sources and records of energy consumed at the subject property. Potentially unreported information may include, but is not limited to, bills, meters, and types of energy consumed. Inaccurate information provided to the energy analyst and information not reported to the energy analyst may influence the findings of report.

16.0 Signatures

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Recent annual electricity consumption, cost is summarized in the following tables:

Natural Gas

NATURAL GAS UBA
AAHC Site: **South Seventh**
Meter #:

Month	Start	End	Days	HDD	Consumption Therms	Actual (0) Estm. (1)	Delivery $	Gas $	Total $
Mar-12	15-Mar-12		29	529	283	0	$ -	$325	$325
Apr-12	13-Apr-12		32	513	240	0	$ -	$288	$288
May-12	15-May-12		30	171	164	0	$ -	$205	$205
Jun-12	14-Jun-12		30	90	134	0	$ -	$193	$193
Jul-12	14-Jul-12		28	23	111	0	$ -	$173	$173
Aug-12	11-Aug-12		34	80	142	0	$ -	$199	$199
Sep-12	14-Sep-12		28	223	198	0	$ -	$247	$247
Oct-12	12-Oct-12		28	478	358	0	$ -	$385	$385
Nov-12	9-Nov-12		32	836	457	0	$ -	$473	$473
Dec-12	11-Dec-12		31	946	590	0	$ -	$567	$567
Jan-13	11-Jan-13		32	1170	700	0	$ -	$641	$641
Feb-13	12-Feb-13		30	1098	620	0	$ -	$587	$587
				6,157	**3,997**				**$4,284**
									$1.0718 $/Therm

Electricity

ELECTRICAL UBA
AAHC Site: **South Seventh**
Meter #:

Month	Start	End	Days	HDD	CDD	Actual (0) Estm. (1)	Consumption kWh	Total Charges ($)
Mar-12	15-Mar-12		29	529	33	0	2670	$424.57
Apr-12	13-Apr-12		32	513	7	0	2869	$464.43
May-12	15-May-12		30	171	118	0	2948	$358.34
Jun-12	14-Jun-12		30	90	245	0	4752	$751.09
Jul-12	14-Jul-12		28	23	409	0	4494	$706.13
Aug-12	11-Aug-12		34	80	233	0	4122	$635.49
Sep-12	14-Sep-12		28	223	93	0	2544	$417.55
Oct-12	12-Oct-12		28	478	15	0	2819	$457.96
Nov-12	9-Nov-12		32	836	0	0	3388	$542.78
Dec-12	11-Dec-12		31	946	0	0	3651	$581.49
Jan-13	11-Jan-13		32	1170	0	0	3846	$602.58
Feb-13	12-Feb-13		30	1098	0	0	3324	$546.09
				6157	**1153**		**41,427**	**$6,488.50**
								$0.1566 Blended $/kWh

HUD Residential Energy Use Benchmarking Tool

For single-family, semi-detached, row/townhouse, multi-family walk-up, and elevator buildings.

The HUD Residential Energy Use Benchmarking Tool quantifies the performance of a user-defined building relative to the family of HUD residential buildings. A score of 75 denotes performance at the top 25th percentile of HUD residential buildings. A score of 50 denotes performance at the 50th percentile (in the middle) of HUD residential buildings. For definitions or help on the terms below, simply click on any underlined text. Click on "Return" to come back to this page.

Directions**: **Provide entries in ALL the grey spaces that apply for your Building Description and Annual Energy Consumption.

Building Description

Preliminary: 9/17/07

Building Name: South Seventh (optional entry)

5-digit Zip Code: 48103 *Not Sure?*

Heating Degree Days: 6818

Mapping Location: *Ann Arbor, MI*

Cooling Degree Days: 840

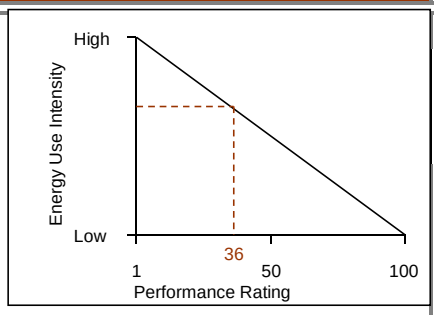
	Gross Floor Area (ft2)	Total Number of Units	Is This a Multifamily Building with Central Laundry? (Y/N)	Is this a Multi-Family Walkup Building? (Y/N)	Heated Floor Area (ft2)	Year Built
Building Description:	4,400	8	N	N	4,400	1969

Annual Consumption

	Electricity	Gas	#2 Fuel Oil	#4 Fuel Oil	District Steam	District Hot Water	Propane
Select Units:	kWh	Therms	Gal	Gal	kLbs	MMBtu	Gal
Energy	41,427	3,997					
Cost ($)	6,489	4,284					
Calculated unit cost:	$0.16 $/kWh	$1.07 $/therm	$/gallon	$/gallon	$/klbs	$/kBtu	$/gallon

Results

	Your Building	HUD Typical
Score Against Peers	**36**	**50**
Building Site Energy Use (kBtu/year)	**541,050**	**466,842**
Site Energy Use Intensity (kBtu/ft2-year)	**123.0**	**106.1**
Energy Cost Intensity ($/ft2-year)	**2.45**	**2.11**
Total Annual Energy Cost ($/year)	**10,772**	**9,295**



HUD Residential Water Use Benchmarking Tool

For single-family, semi-detached, row/townhouse, multi-family walk-up and elevator buildings.

The HUD Residential Water Use Benchmarking Tool quantifies the performance of a user-defined building relative to the family of HUD residential buildings. A score of 75 denotes performance at the top 25th percentile of HUD residential buildings. A score of 50 denotes performance at the 50th percentile (in the middle) of HUD residential buildings. For definitions or help on the terms below, simply click on any underlined text. Click on "Return" text to come back to this page.

Directions: Provide entries in the gray spaces below with your building description and annual water consumption.

Building Description

ORNL 8/22/2007

Building Name: South Seventh (optional entry)

5-digit Zip Code: 48103 *Not Sure?*

Mapping Location: *Ann Arbor, MI*

	Gross Floor Area of Building(s) (ft2)	Building(s) is Single-Family Detached or Semi-Detached? (Y/N)	Is Residents Water Use Paid Directly by the PHA? (Y/N)	Number of Units in Building(s)	Number of Units in Building(s) with In-Unit Laundry Hookups or Central Laundry Access?	How Many Buildings share this Water Meter?
Building Description:	4,400	N	Y	8	8	8

Annual Consumption

Building Annual Water Use: 473,484 (gallons/year)

Building Annual Water Use Cost: 4,375 ($/year)

Average Annual Water Cost: $0.9 ($/100 gallons)

Results

	Your Building	HUD Typical
Score Against Peers	**55**	**50**
Annual Water Use (gal/year)	**473,484**	**504,623**
Annual Water Use Intensity (gal/ft2-year)	**107.6**	**114.7**
Annual Water Cost Intensity ($/ft2-year)	**0.99**	**1.06**
Total Annual Water Cost ($/year)	**4,375**	**4,663**

Photo 1: Front view of complex

Photo 2: Side view of complex with exterior lighting

Photo 3: Typical window at complex

Photo 4: Utility meters on outside of complex

Photo 5: DHW storage tank in mechanical closet

Photo 6: Furnace in mechanical closet

Photo 7: Older furnace filter

Photo 8: Bathroom faucet with aerator

Photo 9: Typical bathroom showerhead

Photo 10: Standard toilet in bathrooms

Photo 11: Standard refrigerator

Photo 12: Gas stove and range

Photo 13: Microwave and kitchen appliances

Photo 14: Blown insulation in attic space

Photo 15: Supply ducting to ceiling registers

Photo 16: Hatch to attic space

Lighting Summary

Interior Lighting

Zone / Space	Qty	Burn Hours	Existing Fixture Type	Existing Fixture	Input Watts per Fixture	Annual Consumption (kWh)	Proposed Fixture Type	Proposed Fixture	Input Watts per Fixture2	Annual Consumption (kWh)3	Demand Reduction (kW)	Retrofit Cost ($)	Annual Energy Savings (kWh)	Annual Cost Savings ($)	SP (yrs)
Tenant Spaces	48	1456	CFL	CFL	13	909	CFL	No Proposed Retrofit (Keep the Same)	13	909	0.00	$ 168.00	0	$0.00	#DIV/0!
										TOTALS	0.00	$ 168.00	0	$0.00	#DIV/0!

Exterior Lighting

Zone / Space	Qty	Burn Hours	Existing Fixture Type	Existing Fixture	Input Watts per Fixture	Annual Consumption (kWh)	Proposed Fixture Type	Proposed Fixture	Input Watts per Fixture2	Annual Consumption (kWh)3	Demand Reduction (kW)	Retrofit Cost ($)	Annual Energy Savings (kWh)	Annual Cost Savings ($)	SP (yrs)
Exterior Wallpacks	16	2704	MH50	50 watt High Pressure Sodium	66	2856	10W LED	10W Entrance Wall Pack	10	433	N/A	$2,800.00	2,423	$358.39	7.81
Exterior Wallpacks	5	2704	HPS250	250 watt High Pressure Sodiun	275	3719	FXLEDSFN/PCS	RAB 78w LED Wall Pack	91	1231	N/A	$2,425.00	2,488	$367.99	6.59
Exterior Parking Lot Lights	2	2704	HPS250	250 watt High Pressure Sodiun	275	1487	LED/IND	LED* or Induction* (250W Equivalent)	91	492	N/A	$1,500.00	995	$147.20	10.19
					616	8062				TOTALS	N/A	$6,725.00	5,906.54	$873.58	7.70

BARRON TRACE LITE

TLED101

MINI POLYCARBONATE LED WALL PACK

Model Number:

Accessories:

Type:

Job:

Approvals:

DESCRIPTION

The TLED101 series mini wallpack features a durable, vandal resistant, injection molded Bronze polycarbonate enclosure combined with a high performance LED light source that makes it a durable and efficient choice. Constructed of polycarbonate with a die cast aluminum base plate, the TLED101 is fully sealed and gasketed, is IP 65 rated and UL listed for Wet Locations. Available with a 10 watt LED light engine, the TLED101 provides an ideal light distribution and has a wide spectrum of applications including schools, office complexes, light commercial, apartments and recreational facilities.

SPECIFICATIONS

Construction:
Precision molded polycarbonate housing is mounted to a die cast aluminum base plate that provides superior heat dissipation while still maintaining an economical luminaire with durable performance. Fixture is completely sealed and gasketed with corrosion-resistant stainless steel captive fasteners. The LED light engine is protected by a high impact, UV stabilized polycarbonate prismatic refractor.

Optics:
TLED101 series mini wallpack delivers exceptional light quality, efficiency and light distribution. The 10 watt LED light engine powered by a constant current control driver provides a 50,000 hour rated life, 70% lumen maintenance, 4700K CCT and a CRI of ≥85. A low LED thermal junction (Tj) of 70°C (158°F) at a design ambient of 25°C (77°F) supports long life and low lumen depreciation.

Electrical:
LED light engines and drivers are securely mounted directly to the die cast aluminum base plate optimizing thermal management. LEDLITElogic heat sinking technology moves heat away from the LEDs maximizing system performance and delivering 50,000+ hour life with >70% lumen maintenance. The TLED101 series operates from 120-277V 50/60Hz with an auto-ranging voltage controlled circuit and simple two (2) wire input. The TLED101 is suitable for operation in -30°C (-22°F) to 40°C (104°F) ambient conditions. Optional transient surge protection and photocontrols are available.

Environmentally Friendly Design:
TLED101 luminaires consume very little energy and provide long life in comparison to traditional lamp technologies. Our manufacturing process utilizes no harmful chemicals such as mercury or lead and the LED light engines emit an extremely low UV and minimal heat. The compact design allows for the use of fewer materials and is recyclable, resulting in less overall waste.

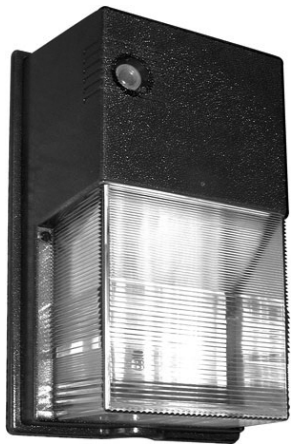
Installation:
The TLED101 series is ideal for mounting to any vertical surface and easily attaches to a 3" or 4" j-box. The TLED101 can also be surface mounted using the ½" conduit entry point at the bottom of the housing.

IESNA LM-79 and LM-80:
The TLED101 is evaluated in accordance with the parameters outlined and reported by LM-79 and LM-80 documents.

Listing:
UL Listed for wet locations.

Warranty:
The TLED101 LEDLITElogic series features a 5 year warranty.

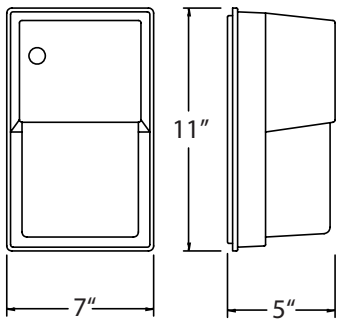
LEDLITElogic



Fixture Performance			
Watts	**Lumens**	**Lumens Per Watt (LPW)**	**Total Watts**
10	900	90	14

NOTE: Lumen maintenance and lfe (part of LM-80 data) are per published information from primary LED suppliers and is based on design operation at their specified thermal management and electrical design parameters.

DIMENSIONS



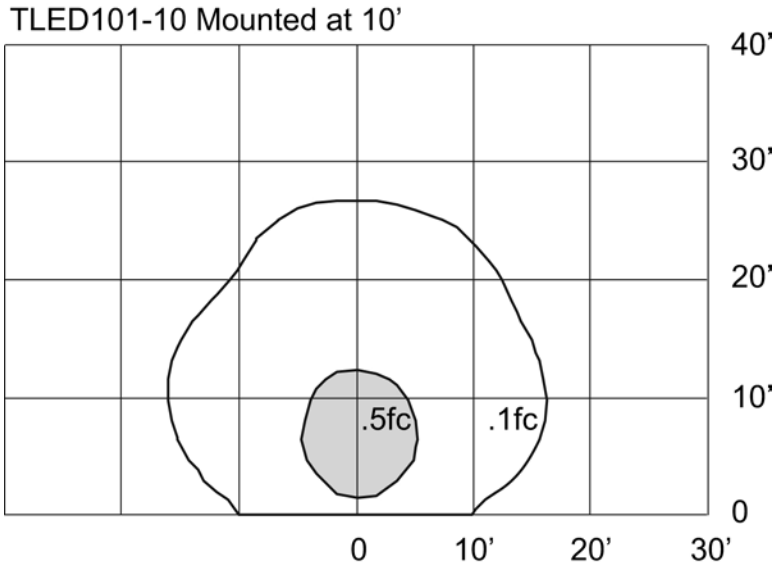
Approximate Weight: 4 lbs.

RoHS COMPLIANT

c UL us LISTED

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

SAMPLE PHOTOMETRICS



ORDERING INFORMATION

TLED101	10	DT	TP	PC1
SERIES	TOTAL WATTS	VOLTS	OPTIONS (Factory Installed)	ACCESSORIES[1] (Field Installed)
TLED101	10 = 10 Watts	DT = 120/277V	TP = Transient Protection System	PC1 = 120V Photocontrol PC2 = 208-277V Photocontrol

[1] Order As Separate Line Item

BARRON lighting group

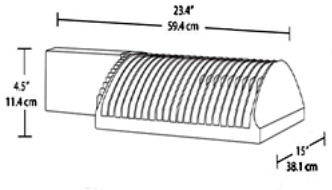
1911 West Parkside Lane • Phoenix, AZ 85027
888.533.3948 • 623.580.3948 • Fax: 623.580.8948
www.trace-lite.com • www.barronltg.com

ALED2T78

Specification Grade Area lights available in IES Type II, III and IV distributions. For use in parking lots, roadways, pathways and general area lighting. Mounts to 4" square steel poles at 15-25'. Designed to replace 250W Metal Halide Area Lights. Patent Pending thermal management system. 5 Year Warranty.

Color: Bronze

Weight: 32.0 lbs



LED Info

Watts:	78W
Color Temp:	5100K (Cool)
Color Accuracy:	68
L70 Lifespan:	100000
LM79 Lumens:	5,263
Efficacy:	58 LPW

Driver Info

Type:	Constant Current
120V:	0.78 A
208V:	0.50 A
240V:	0.44 A
277V:	0.38 A
Input Watts:	90W
Efficiency:	86%

Technical Specifications

UL Listing:
Suitable for wet locations as a downlight.

Lumen Maintenance:
100,000-hour LED lifespan based on IES LM-80 results and TM-21 calculations.

IES Classification:
The Type II distribution is ideal for wide walkways, on ramps and entrance roadways, bike paths and other long and narrow lighting applications. This type is meant for lighting larger areas and usually is located near the roadside. This type of lighting is commonly found on smaller side streets or jogging paths.

Effective Projected Area :
EPA = 0.75

LEDs:
Six (6) multi-chip, 13W, high-output, long-life LEDs

Drivers:
Three drivers, constant current, Class 2, 100 - 277V, 50 - 60 Hz, 100 - 277VAC .04 Amps.

Fixture Efficacy:
58 Lumens per Watt

Ambient Temperature:
Suitable for use in 40°C ambient temperatures.

Surge Protection:
6 KV

Cold Weather Starting:
The minimum starting temperature is -40°F/-40°C

Thermal Management:
Superior heat sinking with external Air-Flow fins.

Housing:
Die cast aluminum housing, lens frame and mounting arm.

Color Stability:
RAB LEDs exceed industry standards for chromatic stability.

Color Accuracy:
68 CRI

Color Temperature (Nominal CCT):
5100K

Color Uniformity:
RAB's range of CCT (Correlated color temperature) follows the guidelines of the American National Standard for Specifications for the Chromaticity of Solid State Lighting (SSL) Products, ANSI C78.377-2008.

Reflector:
Specular aluminum.

Gaskets:
High temperature silicone gaskets.

Finish:
Chip and fade resistant polyester powder coat finish.

Green Technology:
Mercury and UV free.

IESNA LM-79 & IESNA LM-80 Testing:
RAB LED luminaires have been tested by an independent laboratory in accordance with IESNA LM-79 and 80, and have received the Department of Energy "Lighting Facts" label.

Replacement:
The ALED78 replaces 250W Metal Halide Area Lights.

California Title 24:
ALED78 complies with California Title 24 building and electrical codes.

Warranty:
LED fixtures give you peace of mind because both the fixture and driver components are backed by RAB's 5 Year Warranty. For more information,

Patents:
The ALED design is protected by patents pending in the U.S., Canada, China, Taiwan and Mexico.

For use on LEED Buildings :
IDA Dark Sky Approval means that this fixture can be used to achieve LEED Credits for Light Pollution Reduction

Dark Sky Approved :
The International Dark Sky Association has approved this product as a full cutoff, fully shielded luminaire.

Country of Origin:
Designed by RAB in New Jersey and assembled in the USA by RAB's IBEW Local 3 workers.

Buy American Act Compliant:
This product is a COTS item manufactured in the United States, and is compliant with the Buy American Act.

Recovery Act (ARRA) Compliant:
This product complies with the 52.225-21 "Required Use of American Iron, Steel, and Manufactured Goods-- Buy American Act-- Construction Materials (October 2010)

Trade Agreements Act Compliant:
This product is a COTS item manufactured in the United States, and is compliant with the Trade Agreements Act.

GSA Schedule:
Suitable in accordance with FAR Subpart 25.4

Tenant Unit Programmable Thermostats (8)

This energy savings calculator was developed by the U.S. EPA and U.S. DOE and is provided for estimating purposes only. Actual energy savings may vary based on use and other factors. The calculator was modified by the auditor as detailed in subject report.

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

Number of Units	8
Initial Cost for one programmable thermostat	$51
Initial Cost for one manual thermostat	$1
Unit Fuel Cost (Cooling) ($/kWh)	$0.158
Unit Fuel Cost (Heating) ($/Therm)	$1.07

24 Hour Typical Usage Patterns*

	Weekday	Weekend
Nighttime Set-Back/Set-Up Hours	8	8
Daytime Set-Back/Set-Up Hours	16	16
Hours without Set-Back/Set-Up	0	0

Choose your city from the drop-down menu

City: MI-Detroit

Heating Season*

Typical Indoor Temperature w/o Set-Back	74
Nighttime Set-Back Temperature (Average)	67
Daytime Set-Back Temperature (Average)	72
Heating System Type	Gas Furnace

Cooling Season*

Typical Indoor Temperature w/o Set-Up	75
Nighttime Set-Up Temperature (Average)	82
Daytime Set-Up Temperature (Average)	82
Cooling System Type	None

****All temperatures are in degrees Fahrenheit. Setpoint is defined as the temperature setting for any given time period. Set-back temperature is defined as the lower setpoint temperature for the energy-savings periods during the heating season, generally nighttime and daytime. Set-up temperature is defined as the higher setpoint temperature for the energy-savings periods during the cooling season, generally nighttime and daytime.***

	8 Programmable Thermostat(s)	8 Manual Thermostat(s)	Savings
Annual Energy Costs			
Heating Energy Cost	$2,295	$2,545	$250
Heating Energy Consumption (MBTU)	*214*	*237*	*23*
Cooling Energy Cost	$0	$0	$0
Cooling Energy Consumption (MBTU)	*0.0*	*0.0*	*0*
Total	**$2,295**	**$2,545**	**$250**

YOUR ENERGY SAVINGS℠

YourEnergySavings.com
DTE Energy

DTE Energy
Multifamily Program

DTE Multifamily Program Application

Required Site Information

SITE NAME		FEDERAL TAX ID

SITE ADDRESS		

CITY	STATE	ZIP CODE

SITE REPRESENTATIVE NAME	SITE REPRESENTATIVE PHONE #
SITE REPRESENTATIVE EMAIL ADDRESS	SITE REPRESENTATIVE FAX #
SECONDARY REPRESENTATIVE NAME	SECONDARY REPRESENTATIVE PHONE #

Required Management Company/Owner Information

MANAGEMENT COMPANY NAME		FEDERAL TAX ID

MAILING ADDRESS		

CITY	STATE	ZIP CODE

MANAGEMENT COMPANY REPRESENTATIVE NAME	MANAGEMENT REPRESENTATIVE PHONE #
MANAGEMENT COMPANY EMAIL ADDRESS	MANAGEMENT COMPANY FAX #
SECONDARY REPRESENTATIVE NAME	SECONDARY REPRESENTATIVE PHONE #

Required Site Information

ELECTRICITY PROVIDER	ELECTRIC ACCOUNT NUMBER	GAS PROVIDER	GAS ACCOUNT NUMBER
YEAR BUILT	TOTAL # OF UNITS	TOTAL # OF BUILDINGS	TOTAL # OF VACANT UNITS

TOTAL NUMBER OF FLOORS	DOES BUILDING HAVE BASEMENTS?	MAX # OF BATHROOMS PER UNIT
MAX # OF SHOWERS PER UNIT	MAX # OF SINKS PER BATHROOM	AVERAGE SQUARE FOOTAGE OF UNITS

Optional Site Information

TOTAL # OF SHOWERS ON PROPERTY	TOTAL # OF SINKS ON PROPERTY	ARE WATER HEATERS IN UNITS?

DTE Energy Multifamily Program Lighting Specifications

LIGHTING SPECIFICATIONS

All lighting projects are expected to comply with the Illuminating Engineering Society of North America (IESNA) recommended lighting levels or the local code. All final applications must include manufacturers' specification sheets for lamps and ballasts. All incentives are for one-for-one replacements except as noted.

Compact Fluorescent Lamps, Screw-In (≤ 31 Watts)
Incentives are available for the replacement of incandescent lamps with CFLs that are ENERGY STAR® rated or that meet ENERGY STAR® criteria. The lamps must have a luminous efficacy of ≥ 50 lumens per watt (LPW). Incentive is per lamp. *Note: This incentive is not available for CFLs purchased at retail stores participating in the DTE Energy CFL discount program. Incentives for CFLs purchased from those retailers is included in the discounted price.*

Compact Fluorescent Lamps, Screw-In (> 31 Watts)
Incentives are available for the replacement of incandescent lamps with high wattage CFLs. The new lamp must have a luminous efficacy of ≥ 65 lumens per watt (LPW). Incentive is per lamp. *Note: This incentive is not available for CFLs purchased at retail stores participating in the DTE Energy CFL discount program. Incentives for CFLs purchased from those retailers is included in the discounted price.*

Compact Fluorescent Fixtures
Incentives are available for upgrades to interior hardwired compact fluorescent fixtures. Replacement fixtures must be new fixtures or modular hardwired retrofits with hardwired electronic ballasts. The compact fluorescent ballast must be programmed start or programmed rapid start with a power factor (PF) ≥ 0.90 and a total harmonic distortion (THD) ≤ 20%. Incentive is per fixture.

Compact Fluorescent Reflector Flood Lamps
Incentives are available to install CFL reflector flood lamps to replace incandescent reflector flood lamps. The CFL reflector flood lamps must have a luminous efficacy of ≥ 33 lumens per watt (LPW). Incentive is per lamp. *Note: This incentive is not available for CFL's purchased at retail stores participating in the DTE Energy CFL discount program. Incentives for CFLs purchased from those retailers is included in the discounted price.*

42W 8-Lamp Compact Fluorescent High Bay Fixture
Incentives are available in high-bay applications (ceiling heights over 15 feet) for replacing any lighting fixtures greater than or equal to 350W with 42 Watt, 8 lamp compact fluorescent fixtures. Replacement fixtures must contain specular reflectors and electronic ballasts with a power factor (PF) ≥ 0.90. Incentive is per fixture.

ENERGY STAR® Qualified LED Recessed Down Light
Incentives are available to replace incandescent recessed lights with ENERGY STAR® qualified LED recessed down lights. Replacement lights must have a minimum efficacy of 35 lumens per watt. Incentive is per lamp. *Note: This incentive is not available for lamps purchased at retail stores participating in the DTE Energy lamp discount program. Incentive for lamps purchased from those retailers is included in the discounted price.*

Standard Linear Fluorescent Retrofit
Incentives are available for replacing existing T12 lamps and magnetic ballasts with T8 or T5 lamps and electronic ballasts. The new fixture lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥ 20 kHz), UL listed, and warranted against defects for a minimum of 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic discharge (THD) ≤ 20 % at full power output. For 2 and 3-foot lamps, ballasts must have THD ≤ 32 % at full light output. Incentive is per fixture.

High Output T8/T5 Lamp and Ballast replacing T12 Fluorescent Lamp
Incentives are available for replacing existing T12 lamps and magnetic ballasts with T5HO or T8HO lamps and electronic ballasts. The replacement lamps must have a CRI ≥ 80. Incentive is per fixture.

Low Wattage 4-foot T8 Lamps (Lamps Only)
Incentives are available for replacing 32 Watt T8 lamps with reduced (low) wattage T8 lamps when an electronic ballast is already present. The lamps must be reduced wattage in accordance with the Consortium for Energy Efficiency© (CEE©) specifications (www.cee1.org) and as summarized in Table 2 below. Low wattage lamps must be either 25W or 28W and CEE© Listed. Qualified products can be found at http://www.cee1.org/com/com-lt/com-lt-main.php3. Incentive is per lamp.

High Performance 4-foot T8 Lamp and Ballast
Incentives are available for replacing existing T12 or T12HO lamps and magnetic ballasts or standard T8 lamps and electronic ballasts with high performance T8 lamps and electronic ballasts. Replacement fixtures must high performance in accordance with the Consortium for Energy Efficiency© (CEE©) high performance T8 specification, available at www.cee1.org, which and is summarized in Table 1 below. A list of qualified lamps and ballasts can be found at: http://www.cee1.org/com/com-lt/com-lt-main.php3. Both the lamp and ballast must meet the specification in order to be eligible for an incentive. Incentive is per fixture.

LIGHTING SPECIFICATIONS

Table 1: High Performance T8 Specifications

High Performance T8 and T5 Characteristics				
Mean System Efficacy	≥ 90 Mean Lumens per Watt (MLPW) for Instant Start Ballasts			
	≥ 88 MLPW for Programmed Rapid Start Ballasts			
Performance Characteristics for Lamps				
Color Rendering Index (CRI)	≥ 80			
Minimum Initial Lamp Lumens	≥ 3100 Lumens *			
Lamp Life	≥ 24,000 Hours			
Lumen Maintenance or Minimum Mean Lumens	≥ 94% or ≥ 2900 Mean Lumens			
Performance Characteristics for Ballasts				
Ballast Efficacy Factor (BEF) BEF = (BFx100)/Ballast Input Watts	**Instant Start Ballast (BEF)**			
	Lamps	Low BF ≤ 0.85	Norm 0.85 < BF ≤ 1.0	High BF ≥ 1.01
	1	> 3.08	> 3.11	NA
	2	> 1.60	> 1.58	> 1.55
	3	≥ 1.04	≥ 1.05	≥ 1.04
	4	≥ 0.79	≥ 0.80	≥ 0.77
	Programmed Rapid Start Ballast (BEF)			
	1	≥ 2.84	≥ 2.84	NA
	2	≥ 1.48	≥ 1.47	≥ 1.51
	3	≥ 0.97	≥ 1.00	≥ 1.00
	4	≥ 0.76	≥ 0.75	≥ 0.75
Ballast Frequency	20 to 33 kHz or ≥ 40 kHz			
Power Factor	≥ 0.90			
Total Harmonic Distortion	≤ 20%			

* For lamp with color temperatures ≥ 4500k. 2950 minimum initial lamp lumens are allowed.

Low Wattage 4-foot T8 Lamp and Ballast

Incentives are available for replacing T12 systems with reduced (low) wattage lamp and electronic ballast systems. The lamps and ballasts must meet the Consortium for Energy Efficiency© (CEE©) specification (www.cee1.org) and summarized in Table 8-2 on the following page. Qualified lamp and ballast products can be found at http://www.cee1.org/com/com-lt/com-lt-main.php3. Both the lamp and ballast must qualify in order to receive an incentive for the system. Incentive is per fixture.

Table 2: Reduced (Low) Wattage 4-foot Lamps and Ballasts

Performance Characteristics for Lamps(1)		
Mean System Efficacy	≥ 90 MLPW	
Color Rendering Index (CRI)	≥ 80	
Minimum Initial Lamp Lumens	≥ 2585 Lumens for 28 W	
	≥ 2400 Lumens for 25 W	
Lamp Life(2)	≥ 18,000 hrs at three hours per start	
Lumen Maintenance –or- Minimum Mean Lumens(3)	≥ 94% -or- ≥ 2430 Lumens for 28 W ≥ 2256 Lumens for 25 W	
Performance Characteristics for 28 and 25 W Ballasts		
Ballast Frequency	20 to 33 Hz or ≥ 40 kHz	
Power Factor	≥ 0.90	
Total Harmonic Distortion	≤ 20%	
Performance Characteristics for Ballasts(4), 28 W systems		
Ballast Efficiency Factor (BEF)	Instant Start Ballast (BEF)	
BEF = [BF x 100]/Ballast Input Watts Based on: (1) Type of ballast (2) No. of lamps driven by ballast (3) Ballast Factor	Lamps	All BEF Ranges
	1	≥ 3.52
	2	≥ 1.76
	3	≥ 1.16
	4	≥ 0.88
Performance Characteristics for Ballasts(4), 25 W systems		
Ballast Efficiency Factor (BEF)	Instant Start Ballast (BEF)	
BEF = [BF x 100]/Ballast Input Watts Based on: (1) Type of ballast (2) No. of lamps driven by ballast (3) Ballast Factor	Lamps	All BEF Ranges
	1	≥ 3.95
	2	≥ 1.98
	3	≥ 1.32
	4	≥ 0.99

(1) Lamps ≥ 4500 K and/or 24,000 hours have a system efficacy specified ≥ 88 MLPW. Minimum initial and mean lumen levels are specified as follows: for 28 W lamps, limits are 2600/2340. For 25 W lamps, limits are 2300/2185.

(2)Life rating is based on an Instant Start Ballast tested in accordance with ANSI protocols. When used for Programmed Start Ballast, life may be increased depending upon the operating hours per start.

(3) Mean lumens measures at 7,200 hours

(4) Multi-Voltage Ballasts must meet or exceed the listed Ballast Efficiency Factor when operated on at least one of the intended operating voltages.

LIGHTING SPECIFICATIONS

High Output T5 and 4-foot T8 New Fixture Replacing HID
Incentives are available for replacements of HID fixtures with T8 or T5HO lamps and electronic ballasts. The T8 or T5HO lamps must have a color rendering index (CRI) ≥ 80. The electronic ballast must be high frequency (≥ 20 kHz), UL listed, and warranted against defects for 5 years. Ballasts must have a power factor (PF) ≥ 0.90. Ballasts for 4-foot lamps must have total harmonic distortion (THD) ≤ 20% at full light output. This incentive is available for high-bay and low-bay fluorescent applications. Incentive is per fixture.

Pulse Start Metal Halide (retrofit only)
Incentives are available for replacing existing HID fixtures with pulse start metal halide fixtures in high-bay applications. Incentive is per fixture.

Exterior HID to LED/Induction Lighting Retrofit
Incentives are available for exterior applications for replacing existing high intensity discharge fixtures with LED or Induction fixtures. Existing fixtures must operate > 3,833 hours per year (> 10.5 hours per day). Fixture replacement must result in at least a 40% power reduction. LED fixtures must have a minimum efficacy of 35 lumens per watt. Eligible applications include canopy lighting and wall-packs. This incentive can be combined with incentives for exterior/garage bi-level control. Incentive is per fixture.

Garage HID to LED/Induction Lighting Retrofit
Incentives are available for garage and parking deck applications for replacing existing high intensity discharge fixtures with LED or Induction fixtures. Existing fixtures must operate 8760 hours per year or whenever the garage is open. Fixture replacement must result in at least a 40% power reduction. LED fixtures must have a minimum efficacy of 35 lumens per watt. Incentive is per fixture.

Exit Signs
Incentives are available for high-efficiency exit signs replacing or retrofitting an existing incandescent exit sign. Electroluminescent, T1, and LED exit signs are eligible. Non-electrified and remote exit signs are not eligible. All replacement exit signs must be UL or ETL listed, have a minimum lifetime of 10 years, and have an input wattage ≤ 5 Watts per face or be ENERGY STAR® listed. Incentive is per sign.

LED Traffic and Pedestrian Lights
Incentives are available for LED traffic lights on a per-signal basis (including arrows) that replace or retrofit an existing incandescent traffic signal. At minimum, red and green lamps must be retrofitted to qualify for the signal incentive. LED Signals must have a wattage of ≤17 watts per signal. Incentives are not available for spare lights. Lights must be hardwired, with the exception of pedestrian hand signals. Incentive is per signal.

Occupancy Sensors
Incentives are available for occupancy sensors for low occupancy interior areas, which automatically turn lights on when movement is detected. The minimum amount of time for the lights to stay on when no movement is sensed (delay set time) should be 10 minutes. The sensors can be passive infrared (PIR) or ultrasonic. All sensors should be hard-wired and control interior lighting fixtures. *To assist in rebate processing, provide the inventory of the controlled fixtures with the Final Application*. Incentive is per sensor.

Central Lighting Control
Incentives are available for automated central lighting control systems with override capabilities. This measure includes time clocks, package programmable relay panels, and complete building automation controls. Photo-sensors may also be incorporated into the central lighting control system. Incentive is per 10,000 square feet of controlled area.

Switching Controls for Multilevel Lighting
Incentives are available to install switching controls for multilevel lighting which may be used with daylight or occupancy sensors. If combined with daylight sensors, the controls must be commissioned in order to ensure proper sensor calibration and energy savings. This measure is applicable to spaces that require various lighting schemes such as classrooms, auditoriums, conference rooms and warehouses with skylights. Incentive is per 10,000 square feet of controlled area.

Daylight Sensor Controls
Incentives are available for new daylight sensor controls in spaces with reasonable amounts of sunlight exposure and areas where task lighting is not critical. The controls can be on/off, stepped, or continuous (dimming). The on/off controller should turn off artificial lighting when the interior illuminance meets the desired indoor lighting level. Daylight sensor controls are required to be commissioned in order to ensure proper sensor calibration and energy savings. Incentive is per 10,000 SF of controlled area.

Exterior Lighting, Bi-Level Control with Override
Incentives are available for retrofitting existing, exterior HID lighting with bi-level controls that reduce lighting levels by at least 50% when the space is unoccupied. The HID lighting must have an electronic ballast capable of reduced power levels, and be coupled with motion sensors to bring the light back to full lumen output for security reasons. Eligible controls include on-off controls, dimmers, and hi-lo ballast controls. This measure is applicable to exterior fixtures that are on during the night. Incentive is per fixture.

Light Tube
Incentives are available for new light tubes (tubular skylights) 10 inches to 21 inches in diameter. This measure is applicable to spaces that normally require electric lighting during peak hours (1 - 4 p.m. weekdays during the summer). The light tube must still allow an adequate amount of light during overcast conditions and must be coupled to daylight sensing controls. Incentive is per tube.

Delamping
Incentives are available for the permanent removal of existing fluorescent lamps. Permanent lamp removal is the net reduction in the quantity of lamps after a project is completed. Customers are responsible for determining whether reflectors are necessary in order to maintain adequate lighting levels. Lighting retrofits are expected to meet the Illuminating Engineering Society of North America (IESNA) recommended light levels. Unused lamps, lamp holders, and ballasts must be removed permanently from the fixture and disposed of in accordance with local regulations. This measure is applicable when retrofitting from T12 lamps to T8 lamps only. Removal of lamps from a T12 fixture that is not being retrofitted with T8 lamps is not eligible for this incentive, but may be eligible for other incentives. Incentive is per lamp removed.

HVAC (ELECTRIC) SPECIFICATIONS

Programmable Thermostat Setback/Setup (Air Conditioning)
Incentives are available for replacement programmable thermostats that meet ENERGY STAR® criteria and replace any non-programmable thermostat to automatically adjust the temperature at pre-selected times. To meet ENERGY STAR® standards, thermostats must be capable of maintaining two separate programs (to address the different comfort needs of weekdays and weekends) and up to four temperature settings for each program. A current list of ENERGY STAR® qualified thermostats may be found at http://downloads.energystar.gov/bi/qplist/prog_thermostat_prod_list.pdf. Incentive is per thermostat.

GAS SPECIFICATIONS

All final applications must include manufacturers' equipment specification sheets

General Clause for Heating Measures
Prescriptive incentives are available only for retrofit projects using natural gas as the primary fuel source. If a dual-fuel system is used, or if natural gas is the back-up or redundant fuel, the custom incentive application must be used. The incentives for boilers are only available for equipment used in space heating conditions, except for steam traps. Equipment for process load may be eligible for custom incentives.

Steam Trap Repair/Replacement
Incentives are available for the repair or replacement of steam traps that have failed open and that are leaking steam. Incentive is not available for traps that have failed closed or that are plugged. Replacement with an orifice trap is not eligible. Incentive is available once per 24 month period, per facility. Steam trap repair work must be recorded and the service report must be attached to the incentive application. Incentive is per repaired or replaced trap. The report must contain:

- Name of Survey/Repair Technician
- Survey/Repair Date
- System nominal steam pressure
- Annual hours of operation
- Number of steam traps serviced
- Per steam trap:
    - ID tag number, location and type of trap
    - If repair or replaced:
        - Orifice Size
        - Pre-and Post Conditions (e.g., Functioning/Not Functioning, Leaking/Not Leaking)

Pipe Wrap - Steam Boiler
Incentives are available for insulation applied to bare steam boiler piping. Insulation must have an applied thickness of 1 inch and an thermal resistance of R-4. A minimum of 10 linear feet of pipe must be insulated. The bare pipe size must be ½ inch or larger. Incentive is per linear foot of insulation.

Pipe Wrap - Hot Water Boiler
Incentives are available for insulation applied to bare hot water boiler piping. Insulation must have an applied thickness of 1 inch and an thermal resistance of R-4. A minimum of 10 linear feet of pipe must be insulated. The bare pipe size must be ½ inch or larger. Incentive is per linear foot of insulation.

Programmable Thermostat Setback/Setup (Gas Heat)
Incentives are available for new programmable thermostats that meet ENERGY STAR® criteria and replace any non-programmable thermostat to automatically adjust the temperature at pre-selected times. To meet ENERGY STAR® criteria, thermostats must be capable of maintaining two separate programs (to address the different comfort needs of weekdays and weekends) and up to four temperature settings for each program. A current list of ENERGY STAR® qualified thermostats may be found at http://downloads.energystar.gov/bi/qplist/prog_thermostat_prod_list.pdf. Incentive is per thermostat.

GAS SPECIFICATIONS

All final applications must include manufacturers' equipment specification sheets

Boiler Tune-up (Space Heating Boilers Only)
Incentives are available for tune-ups to natural gas fired, space heating boilers. Burners must be adjusted to improve combustion efficiency as needed. The incentive is available once in a 24 month period. Boiler size must be 110 MBH or greater. The service provider must perform before and after combustion analyses and attach the tune-up report to the Final Application. Incentive is per boiler. Tune-up report must contain the following information:

- Name of the technician performing tune-up
- Date of tune-up
- Boiler type (hot water, low pressure steam, high pressure steam)
- Boiler nameplate information (make, model, capacity)
- Annual hours of operation
- Pre-and Post combustion analysis results (an electronic flue gas analyzer must be used) including
    - o Combustion efficiency
    - o Stack temperature
    - o Flue gas levels of O2, CO2 and CO
- Statement that the following were performed:
    - o Check and adjust combustion air flow and air intake as needed
    - o Check burner and gas input
    - o Check draft control dampers
    - o Clean burners, nozzles, combustion chamber and heat exchanger surface (when weather or operating schedule permits
    - o Check combustion chamber seals
    - o Check for proper venting
    - o Complete visual inspection of system piping and installation
    - o Check safety controls

Boiler Water Reset Control
Incentives are available for boiler water reset controls added to existing boilers operating with a constant supply temperature. Incentives are for existing space heating boilers only. A replacement boiler with boiler reset controls is not eligible. The system must be set so that the minimum temperature is not more than 10°F above manufacturer's recommended minimum return temperature. For controls on multiple boilers to be eligible, control strategy must stage the lag boiler(s) only after the lead boiler fails to maintain the desired boiler water temperature. Incentive is per boiler.

Air Conditioning Cost Calculator

Results

	System 1	System 2
Annual Energy Used (kWh)	1020	284
Operating Cost/year ($)	163.20†	45.47

By choosing the System 2 over System 1, you will save (on average) $118 /year in energy costs.

Please note that space Cooling operating cost and savings numbers are provided for comparison purposes only. Your costs will vary, according to such factors as home insulation, climate, and size of your home.

† Please adjust the Cooling Hours until the System 1 costs match your actual annual cooling costs if known.

Return

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For: South Seventh
221 South Seventh Street
Ann Arbor, Michigan 48103

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range:	Medium

Building Component	Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	10,610	460	11,070 (1 tons)	22,898
First Floor	10,610	460	11,070	22,898
All Rooms	10,610	460	11,070	22,898
Infiltration - Tightness: Avg.; Winter ACH: 1.3 ; Summer ACH: 1.3	1,457	0	1,457	6,767
Duct - Supply above 120; Exposed to outdoor ambient; R-4	1,384	0	1,384	3,816
People	600	460	1,060	0
Miscellaneous	1,200	0	1,200	0
Floor - Concrete slab on grade; Concrete; No edge insulation	0	0	0	4,949
W Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	200	0	200	737
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	1,670	0	1,670	774
Door - Metal; Fiberglass; Storm	116	0	116	429
E Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	188	0	188	693

Building Component	Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Window - Double pane; Vinyl frame; Clear glass - No inside shading; Coating: None (clear glass); No outside shading.	2,199	0	2,199	1,019
Door - Metal; Fiberglass; Storm	116	0	116	429
S Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	329	0	329	1,217
N Wall - Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none	51	0	51	187
Ceiling - Under ventilated attic; R-19 (4 - 6.5 inch); Dark	1,100	0	1,100	1,881
Whole House	10,610	460	11,070 (1 tons)	22,898

In accordance with ACCA Manual J

Report Prepared By:

AKT Peerless

For: South Seventh Different Orientation
South Seventh Street
Ann Arbor, Michigan 48103

Design Conditions: Yipsilanti

Indoor:		Outdoor:	
Summer temperature:	75	Summer temperature:	89
Winter temperature:	70	Winter temperature:	5
Relative humidity:	50	Summer grains of moisture:	22
		Daily temperature range:	Medium

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Whole House	546 sq.ft.	7,891	460	8,351 (0.5 tons)	22,898
First Floor		7,891	460	8,351	22,898
All Rooms	546 sq.ft.	7,891	460	8,351	22,898
Infiltration		1,457	0	1,457	6,767
- Tightness: Avg.; Winter ACH: 1.3 ; Summer ACH: 1.3					
Duct		1,029	0	1,029	3,816
- Supply above 120; Exposed to outdoor ambient; R-4					
People	2	600	460	1,060	0
Miscellaneous		1,200	0	1,200	0
Floor	546 sq.ft.	0	0	0	4,949
- Concrete slab on grade; Concrete; No edge insulation					
S Wall	126 sq.ft.	200	0	200	737
- Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none					
Window	24 sq.ft.	854	0	854	774
- Double pane; Vinyl frame; Clear glass					
- No inside shading; Coating: None (clear glass); No outside shading.					
Door	18 sq.ft.	116	0	116	429
- Metal; Fiberglass; Storm					
N Wall	118.4 sq.ft.	188	0	188	693
- Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none					

Building Component		Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Window	31.6 sq.ft.	651	0	651	1,019
- Double pane; Vinyl frame; Clear glass					
- No inside shading; Coating: None (clear glass); No outside shading.					
Door	18 sq.ft.	116	0	116	429
- Metal; Fiberglass; Storm					
E Wall	208 sq.ft.	329	0	329	1,217
- Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none					
W Wall	32 sq.ft.	51	0	51	187
- Wood frame, with sheathing, siding or brick; R-113 1/2 in.; none					
Ceiling	546 sq.ft.	1,100	0	1,100	1,881
- Under ventilated attic; R-19 (4 - 6.5 inch); Dark					
Whole House	546 sq.ft.	7,891	460	8,351 (0.5 tons)	22,898

4.0 Part 3: Utility Consumption Baseline

AKTPEERLESS

Rental Assistance Demonstration (RAD): CONSUMPTION NARRATIVE REPORT

221 - 253 South Seventh Street, Ann Arbor, Michigan 48103
SOUTH SEVENTH

PREPARED FOR Norstar Development USA, LP
733 Broadway
Albany, NY 12207

PROJECT # 8358E-3-96

DATE September 9, 2013

ON BEHALF OF The Ann Arbor
Housing Commission
727 Miller Ave
Ann Arbor, MI 48103

PIC # MI064

Table of Contents

AKTPEERLESS

1.0 EXECUTIVE SUMMARY

1.1 Purpose and Scope of Work

The purpose of the Part 3: Utility Consumption Baseline is to establish a twelve-month consumption baseline for normalized heating, cooling, lighting, and other electric, gas and water usage (not cost) for the subject property as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1).

This report contains data on all utility usage at the subject property, both tenant-paid and owner-paid (if applicable), and including all common areas for a full 12-month period. It establishes a baseline to allow for benchmarking, and for future measurement of consumption and costs. As such, the utility baseline creates a whole building consumption profile, addressing missing utility data, vacancies, and weather patterns, in achieving its aim of establishing that standard on which future consumption can be compared.

1.2 Subject Site Description

1.2.1 General Site Description

The subject property contains four (4) 1,100 square foot multi-family buildings. The subject buildings were constructed in 1969 and are single story duplexes. There are a total of eight (8) one bedroom, one bathroom units at the site. The subject building is generally referred to as South Seventh.

1.2.2 Site Utilities and Usage

Each unit at the subject property has an electric meter, a natural gas meter, and a water meter. One common electric meter exists for exterior lights. Therefore, there are a total of nine (7) electric meters, eight (8) natural gas meters, and eight (8) water meters at the site.

1.3 Baseline Site Energy Consumption

The Actual Site Energy Use, Energy Use Intensity (EUI), Weather Normalized Site Energy Use and Weather Normalized EUI displayed below are consistent with the ASHRAE Procedures for Commercial Building Energy Audits. This methodology establishes the property's baseline use and cost conditions that are representative of the building's energy performance.

This statistical analysis removes the bias of independent variables such as historic weather, occupancy and operating hours. These calculations have been normalized to the mean values of the independent variables impacting the building's energy performance and represent the most probable performance under actual conditions accounting for weather, occupancy and operating hour variability.

As the subject site has been 100% occupied for the duration of the analysis period, no pro-forma adjustment factors to the consumption have been made.

1.3.1 Actual Site Energy Use and EUI

Actual Site Energy Use	Actual Site Energy Use Intensity (EUI)
541,091 kBtu/yr	122.98 kBtu/ ft^2/yr

1.3.2 Weather Normalized Site Energy Use and EUI

Weather Normalized Site Energy Use	Weather Normalized Site Energy Use Intensity (EUI)
568,960 kBtu/yr	129.31 kBtu/ft^2/yr

2.0 INTRODUCTION

2.1 Purpose

The purpose of the Part 3: Utility Consumption Baseline is to establish a twelve-month consumption baseline for normalized heating, cooling, lighting, and other electric, gas and water usage (not cost) for the subject property as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1).

This report contains data on all utility usage at the subject property, both tenant-paid and owner-paid (if applicable), and including all common areas for a full 12-month period. It establishes a baseline to allow for benchmarking, and for future measurement of consumption and costs. As such, the utility baseline creates a whole building consumption profile, addressing missing utility data, vacancies, and weather patterns, in achieving its aim of establishing that standard on which future consumption can be compared.

2.2 Scope of Work

AKT Peerless' scope-of-services is based on its proposal PE-14790, dated June 26, 2013 and authorized by Norstar Development USA, LP on behalf of the Ann Arbor Housing Commission (the Client) on July 3, 2013, and the terms and conditions of that agreement.

The purpose of the Part 3: Utility Consumption Baseline is to establish a twelve-month consumption baseline for normalized heating, cooling, lighting, and other electric, gas and water usage (not cost) for the subject property as defined in the Rental Assistance Demonstration (RAD): Physical Condition Assessment (RPCA) statement of Work and Contractor Qualifications released by the Department of Housing and Urban Development (HUD) in October 2012 (Version 1).

This report contains data on all utility usage at the subject property, both tenant-paid and owner-paid (if applicable), and including all common areas for a full 12-month period. It establishes a baseline to allow for benchmarking, and for future measurement of consumption and costs. As such, the utility baseline

creates a whole building consumption profile, addressing missing utility data, vacancies, and weather patterns, in achieving its aim of establishing that standard on which future consumption can be compared.

3.0 SUBJECT SITE DESCRIPTION

3.1 General Site Description

The subject property contains four (4) 1,100 square foot multi-family buildings. The subject buildings were constructed in 169 and are single story duplexes. There are a total of eight (8) one bedroom, one bathroom units at the site. The subject building is generally referred to as South Seventh.

3.2 Current/Planned Use of the Property

The subject property has been used as a multi-family structure and operated by the AAHC since its initial construction in 1969. AAHC is participating in HUD's Rental Assistance Demonstration pilot program and intends to continue operating the building as a multi-family residential facility.

4.0 ENERGY CONSUMPTION ANALYSIS

This section provides information on energy utilities associated with the subject property.

4.1 Electricity

The following figure (Figure 4.1) identifies monthly electrical consumption (kWh) in comparison to cooling degree days (CDD). Cooling Degree Days (CDD) are roughly proportional to the energy used for cooling a building, while Heating Degree Days, (HDD) are roughly proportional to the energy used for heating a building. In general, daily degree days are the difference between a base point temperature (65 degrees) and the average outside temperature.

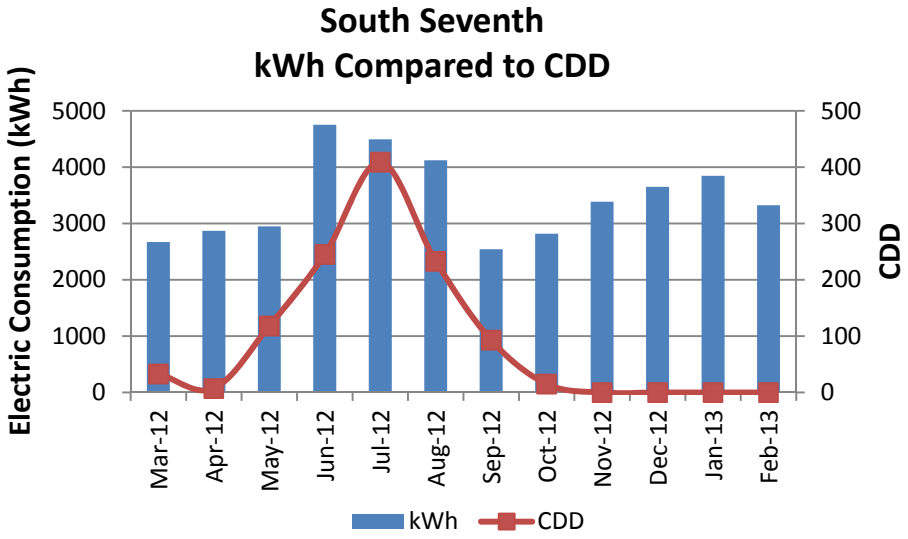


Figure 4.1 Electricity Consumption Graph

The following table (Table 4.1) identifies key information regarding the electric utility associated with the property.

Table 4-1 Annual Electricity Metrics

Vendor	DTE Energy
Meters on Site	Residential - Eight (8) Non-Residential (Common) - One (1)
Use for Residential	Lighting, electric appliances, tenant plug loads, tenant ac window units (if present), washing machines, furnace blower and control.
Use for Non-Residential	Exterior lighting
Responsible for Payment	Tenant; Owner (Common)
Rate	$0.159 / kWh (Tenant) $0.148 /kWh (Common)
Site Consumption	41,427 kWh / year (141,391 kBtu / year)
Energy Use Intensity (EUI)	9.42 kWh / ft^2 (32.13 kBtu / ft^2)
Weather Normalized Site Consumption	40,051 kWh / year (136,694 kBtu / year)
Weather Normalized EUI	9.10 kWh / ft^2 (31.07 kBtu / ft^2)

AKT Peerless received tenant electric bill information in an electronic spreadsheet from the owner (AAHC) for the subject property. This spreadsheet included the following information for each individual unit at the subject property: meter read date, invoice amount ($), usage days per billing period, and net usage (kWh). For the subject property, South Seventh, monthly electrical data was included from September 2011 to February 2013. The most current twelve (12) months of electrical data provided (March 2012 through February 2013) were used for this analysis and input into the RPCA model.

The actual electric consumption was adjusted to produce a weather-normalized summary of electric consumption. This process involved the following steps:

- CDD for the base year billing periods were calculated. Source for CDD is www.degreedays.net (using temperature data from www.wunderground.com) at weather station ANN ARBOR MUNICIPAL AIRPORT, MI, US (83.74W,42.22N), Station ID: KARB.
- Base year billing consumption (kWh) and CDD were normalized by number of days in each billing period.
- Relationship between usage (kWh/day) and weather (CDD/day) was established by using spreadsheet software (Excel) to determine the “best fit” linear regression trend line and R^2 value. The R^2 value is a statistical indicator that represents goodness of fit of the tread line, with $R^2 > 0.75$ considered an acceptable fit.

- Weather Normalized Site Consumption was calculated using the linear regression equation and the 10 year average CDD per month.

4.2 Natural Gas

The following figure (Figure 4.2) identifies monthly natural gas consumption (therms) in comparison to heating degree days (HDD). HDD are roughly proportional to the energy used for heating a building. In general, daily degree days are the difference between a base point temperature (65 degrees) and the average outside temperature.

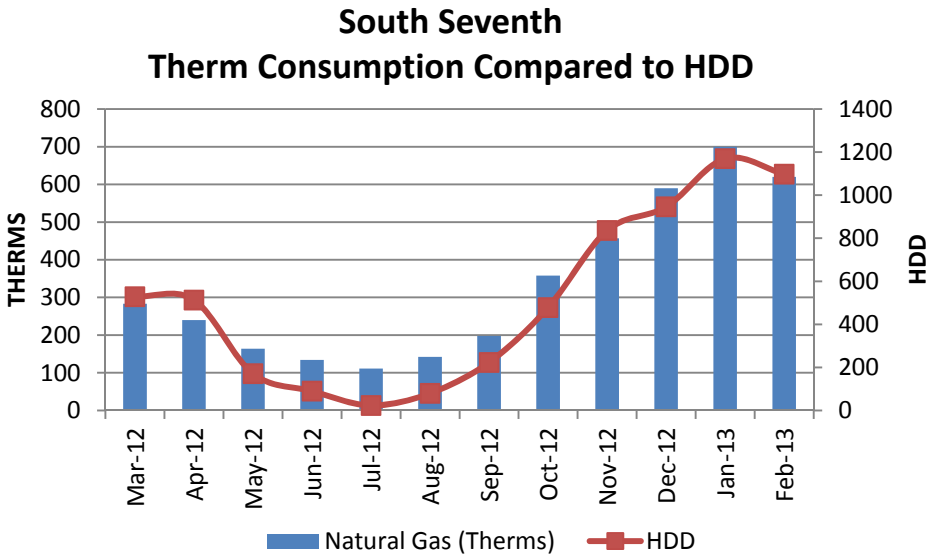


Figure 4.2 Natural Gas Consumption Graph

The following table (Table 4.2) identifies key information regarding the natural gas utility associated with the property.

Table 4-2 Annual Natural Gas Metrics

Vendor	DTE Energy
Meters on Site	Residential – Eight (8) Non-Residential (Common) – None (0)
Use for Residential	Gas-fired furnaces for space heating, ranges for cooking, dryers for laundry.
Use for Non-Residential	None
Responsible for Payment	Tenant

Rate	$1.072 / therm
Site Consumption	3,997 therms / year (399,700 kBtu / year)
Energy Use Intensity (EUI)	90.84 kBtu / ft^2
Weather Normalized Site Consumption	4,326 therms / year (432,267 kBtu / year)
Weather Normalized EUI	98.24 kBtu / ft^2

AKT Peerless received tenant natural gas bill information in an electronic spreadsheet from the owner (AAHC) for the subject property. This spreadsheet included the following information for each individual unit at the subject property: meter read date, invoice amount ($), usage days per billing period, and net usage (therms). For the subject property, South Seventh, monthly natural gas data was included from September 2011 to February 2013. The most current twelve (12) months of natural gas data provided (March 2013 through February 2013) were used for this analysis and input into the RPCA model.

The actual natural gas consumption was adjusted to produce a weather-normalized summary of natural gas consumption. This process involved the following steps:

- HDD for the base year billing periods were calculated. Source for HDD is www.degreedays.net (using temperature data from www.wunderground.com) at weather station ANN ARBOR MUNICIPAL AIRPORT, MI, US (83.74W,42.22N), Station ID: KARB.
- Base year billing consumption (therms) and HDD were normalized by number of days in each billing period.
- Relationship between usage (therms/day) and weather (HDD/day) was established by using spreadsheet software (Excel) to determine the "best fit" linear regression trend line and R^2 value. The R^2 value is a statistical indicator that represents goodness of fit of the tread line, with $R^2 > 0.75$ considered an acceptable fit.
- Weather Normalized Site Consumption was calculated using the linear regression equation and the 10 year average HDD per month.

5.0 LIMITATIONS

5.1 Assumptions

The Ann Arbor Housing Commission (AAHC), the property owner, released utility information to AKT Peerless delivered directly from the utility provider(s), DTE Energy. It is assumed that this monthly usage and cost data is accurate and contains no data gaps or errors.

Information on how the utilities are utilized was generated from conversations with AAHC staff and results of the RPCA through the Energy Audit.

5.2 Limitations and Exceptions

AKT Peerless accepts responsibility for the competent performance of its duties in executing this assignment and preparing this report in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages. Although AKT Peerless believes the results contained herein are reliable, AKT Peerless cannot warrant or guarantee that the information provided is exhaustive, or that the information provided by the client, owner, third parties, or the secondary information sources cited in this report is complete or accurate.

AKT Peerless has not verified that the property owner/operator has reported all sources and records of energy consumed at the subject property. Potentially unreported information may include, but is not limited to, bills, meters, and types of energy consumed. Inaccurate information provided to AKT Peerless and information not reported to AKT Peerless may influence the findings of report.

AKT Peerless has not verified the accuracy of building floor area as reported by the owner.

Should additional information become available to the Client or Owner that differs significantly from our understanding of conditions presented in this report, AKT Peerless requests that such information be forwarded immediately to our attention so that we may reassess the conclusions provided herein and amend this project's scope of services as necessary and appropriate.

Nothing in this report constitutes a legal opinion or legal advice. For information regarding individual or organizational liability, AKT Peerless recommends consultation with independent legal counsel.

6.0 SIGNATURES

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Building Analyst Professional No. 5023902
Building Performance Institute

AKTPEERLESS

4.1 Acknowledgements of Part 3: Utility Consumption Baseline

The Consumption Narrative Report and Utility Consumption – Summary and Utility Consumption – Monthly worksheets in the RPCA Model were completed by Linnea Fraser and Henry McElvery of AKT Peerless. AKT Peerless certifies that the report preparers meet the qualifications identified in the RAD Physical Condition Assessment Statement of Work and Contractor Qualifications Part 3.2 (Version 1, October 2012).

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Building Analyst Professional No. 5023902
Building Performance Institute

Date: September 30, 2013

Part 3 Consumption Narrative Report and Excel RPCA Model were Received and Reviewed by Owner:

Jennifer Hall, Executive Director
Ann Arbor Housing Commission
727 Miller Ave
Ann Arbor, MI 48103
Phone:734-794-6720
Fax: 734-994-0781

Date: 10-1-13

5.0 Part 4: Integrated Pest Management Inspection

Rental Assistance Demonstration Program (RAD)
Integrated Pest Management Inspection Report

8/07/2013

Project Name: Ann Arbor Housing South Seventh Street
FHA Number:
Section 8 Expiration Date:

Dear Ann Arbor Housing:

At the meeting held on July 26th of 2013, we provided the 8 units with Integrated Pest Management (IPM) materials and information to assist in gathering data for the property's IPM review. Below is a report of our glue trap findings, comments, and infestation status (high, moderate, low, none). (Lengthen the table as needed to reflect all units, whether glue traps were returned to IPM inspector or not. Include results from common areas monitored such as laundry, interior trash handling, and storage areas.)

Unit	Visually Inspected	# Traps Collected	Kitchen Trap Count	Bathroom Trap Count	Maintenance Issues	Housekeeping Issues	Other Comments	Status (H, M, L, N)
243	Y	0	n/a	n/a			Tenant reports ants and spiders	N
241	N	2	0	0	Moisture damage around tub.		1 fruit fly in kitchen trap. 1 spider in the bathroom trap.	N

							Tenant reports spiders.	
233	Y	3	0	0		Clutter		N
231	N	3	0	0			1 silverfish in kitchen trap. 1 pillbug in the bedroom trap. Bathroom trap was actually in the living room. Tenant reports general pests.	N
223	N	3	0	0			1 silverfish and 2 spiders in bathroom trap. 1 spider in bedroom trap.	N
221	N	2	n/a	0	Moisture pooling around water heater.		1 fungus gnat in bathroom trap.	N
253	N	3	0	0			Vacant Unit.	N
251	N	2	0	0	Gaps around baseboard where ants are reported as coming in.		Ants reported in kitchen and bathroom.	N

After analyzing the findings of the glue traps, we conducted a visual inspection of **2 units (see attached photos)** and have concluded that the glue trap findings do reflect the current state of infestation in the units and property.

The Green Retrofit Physical Condition Assessment scope of work, at Part 3.2.D.ii requires a ". . . detailed narrative describing the property's pest infestation, if any, and a corrective course of action for each infestation, and if needed, specific actions for serious infestations within individual units." **(IPM Inspector – add comments below)**

We also provided monitoring devices for all bedrooms on 7/26/2013, and removed them on 08/08/2013. We felt it prudent to monitor these areas for bed bugs as they are of increasing concern. We did not capture any bed bugs in the monitoring devices we installed, nor did we observe any signs of bed bugs during our inspections.

During our inspection of the eight units at South Seventh, we found no signs of roaches. Furthermore, our detailed inspections of 2 units also failed to reveal any pests of significance. There were Sentricon stations around the exterior of building 241 – 243 from a previous termite issue and there was a pallet behind building 231 – 233 that had old termite activity on it. I found no live around the pallet. Unit 233 had major clutter issues that would be an issue should she ever develop a pest problem. 5 of the 8 units reported occasional invaders. To minimize the amount of activity of these occasional invaders, we recommend: sealing exterior entry points (gaps, holes, etc), removing the clutter from around the foundation which holds moisture against the side of the building. Some pipes and lines going into the building have gaps around them. These openings provide access to pests and should be sealed.

In addition to the inspection of the units, we inspected the interior and exterior areas of the property for evidence of infestations in the trash disposal areas, laundry facilities, storage areas and any other common area where water and/or food storage is present. Additionally, we inspected all areas where the envelope has been penetrated and all points of ingress/egress for any entry points for pests. Below are our findings for these areas, with a status (high, moderate, low, none) noted, and comments for corrective measures, both immediate and long-term. (Lengthen the table as needed to reflect all areas inspected)

Area	Comments	Status
Exterior	There are several areas on the exterior of the buildings where entry points need to be sealed. There are a few downspouts that need to be fixed so that the water flows away from the building. The trees/bushes should be trimmed away from the buildings so that they are not touching or overhanging. The gutters look like they need to be cleaned. Plugged gutters can cause moisture issues. There is some clutter around the buildings but especially behind 233. This clutter provides cover for rodents and other pests. Railroad ties have been used in the landscaping. This and other areas where there is wood to soil contact are at risk for termite issues. With the accounts history of termites I recommend these be removed and replaced with a non-wood alternative. The rotting pallet and other excess wood should be removed for this reason also.	H

Based on the above findings, interviews with the property managers, maintenance staff, and tenants, and the review of all documentation made available to us regarding past Pest Control effort we conclude the following course of action is required: (The RPCA Scope of Work requires, at Part 3.2.D.iv, "[the report details]… an immediate course of action, which identifies and estimates the cost of the measures required to address the pest infestations for each identified group (see prior paragraph) and an continuing course of action for using IPM principles at the property"). **(IPM Inspector - add detailed comments below for the units and the common areas including the recommendations from Exhibit 2)**

We discussed current practices with the administrator. At this time a pest control professional with a staff person inspects/treats units on an as needed basis. All units are subject to annual inspections during which pest activity is also looked for. We recommend the following: 1) Adding exterior multicatch rodent traps on the exterior, particularly near entry doors, 2) Installing insect monitors in all units and schedule regular inspections by the pest control professional instead of relying on the observations of the staff and tenants, we estimate the cost of a monthly service to be around $8 per unit with a minimum service charge of $32. and 3) Most pest policies are currently verbal. We recommend developing specific policies for pests of concern and getting these policies down in writing.

Sincerely,
Christina L. Driksna License # C006070435
Service Supervisor, Griffin Pest Solutions
Member of QualityPro Green

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
1. Communicate Policies Communicate ownership/ management's IPM policies and procedures to: • All building occupants • Administrative staff • Maintenance personnel • Contractors.	☒ Written pest control policy in place. ☒ Policy communicated to: ☒ Staff. ☒ Resident services. ☒ Maintenance staff. ☐ Renovation/rehabilitation staff/contractors. ☒ Pest control services. ☒ Policy communicated to residents.	The resident handbook is currently under revision at South Seventh Street Apartments. It addresses what the tenants can expect from the housing commission, including treatment 2x a year. It also states tenant responsibilities. Residents are given 24 hours notice for any pest inspection or treatment. In the leasing contract, residents are notified there is a pest management company the apartment complex utilizes.
2. Identify Problem Pests Identify pests and environmental conditions that limit the spread of pests. ***CONTINUED FROM COLUMN ON THE FAR RIGHT: In the lease it is written that the tenant must contact the manager with any pest or housekeeping issues. Units are inspected annually. Maintenance and pest control notifies the office of any sanitation/clutter issues as well as any maintenance issues that are conducive to pest infestation when servicing units on an individual basis.	☒ Policy described strategy to address pests: ☒ Rats. ☒ Mice. ☒ Cockroaches. ☒ Bedbugs. ☐ Other pests: _____ _____ ☒ Policy described strategy to address environmental conditions: ☒ Water damage and effective cleanup. ☒ Housekeeping and maintenance within the apartment units.	Verbal policy for the listed insects. Never had a problem with rats. If there is a problem with rats or mice, they will notify pest control and seal any areas the rodents are entering the apartment. Cockroach and bed bug issues are high priority and pest control is notified as soon as possible. All other reported pest issues are lower priority. Maintenance has ant bait stations that they hand out to tenants reporting ant issues. *Continued on the far left column.*

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
3. Monitor and Track Establish an ongoing monitoring and record keeping system for: • Regular sampling and assessment of pests • Surveillance techniques • Remedial actions taken • Assessment of program effectiveness.	☒ Pest control complaints: ☒ Maintained accurate, up-to-date, and accessible tracking reports maintained. ☒ Recorded in electronic format. ☒ Analyzed regularly for timeliness, recurrent problems and other trends. ☒ Action taken based on analysis of complaints. ☒ Ongoing and regular monitoring of trash handling areas and common areas: ☒ Visual monitoring. ☐ Glue trap monitoring. ☐ Ongoing and regular inspection of exterior areas. ☐ Results of visual monitoring and glue trap monitoring recorded and tracked. ☒ Annual inspection of each resident for housekeeping and maintenance concerns. ☐ Annual summary of results of complaint and monitoring analysis.	Records are given from the pest management company and are available online through the customer portal. All work orders are input into the computer and are usually taken care of within 5 days by the pest management company if for high priority pests but no longer than 30 days - Trash areas are inspected once a week and cleaned if necessary Exterior inspections are completed on an as needed basis by maintenance staff. Results of monitoring are recorded by pest management company and made available online. Annual inspections are completed by a combination of managment, maintenance staff and outside contractors. All issues found are written up and everything is fixed asap
4. Set Thresholds for Action Determine, with involvement of residents: • Pest population levels – by species – that will be tolerated • Thresholds at which pest populations warrant action.	☒ Zero tolerance set for priority pests: rats, mice, cockroaches, and bedbugs. ☒ Residents and staff aware of zero tolerance policy. ☒ Tolerances set for other pests such as ants and spiders.	Staff is aware of verbal zero tolerance policy. Other low priority pests are addressed as needed. Office hands out bait stations for ants when issues are reported

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
5. Improve Non-Pesticide Methods Improve: • Mechanical pest management methods • Sanitation • Waste management • Natural control agents.	☒ Regular and ongoing cleaning of [*Frequency]* ☐ Interior trash handling areas [n/a] ☒ Exterior trash handling areas [1 x week] ☐ Laundry rooms [n/a] ☐ Storage areas [n/a] ☐ Regular removal of interior trash [n/a] ☒ Confirm dumpsters ☒ Are of adequate size ☒ Are in good repair ☒ Have tightly fitting lids ☐ Are located at least 25 feet from building ☐ Show no signs of overflow problems.	Interior trash is taken out by tenants from their own apartments and placed in their trash bins that they must take to the road on trash day. Once a week on Thursday, maintenance checks for any oversized items that need to be picked up and disposed of.
6. Prevent Pest Entry and Movement • Monitor and maintain structures and grounds including ○ Sealing cracks ○ Eliminating moisture intrusion and accumulation • Add physical barriers to pest entry and movement.	☐ Exterior holes greater than ¼" sealed. ☐ Cracks in walls, foundation and floor sealed. ☒ Sewer traps filled with water. ☒ Screens in place on opened windows and doors in warm weather. ☒ Door sweeps in good working condition. ☐ Materials damaged by water quickly repaired or replaced. ☐ Cause of water damage corrected.	Exterior holes that are 1/4 inch or larger need to be sealed. There are some door sweeps that need to be lowered or replaced. Cracks in the foundation should be sealed to prevent pest entry. Ants are of particular issue because of this as well as the expansion joint between the sidewalk and the building not being sealed properly. Some signs of leaks around windows. The leaks should be corrected and the damage repaired. Some screens are damaged and need to be replaced.

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**

7. Educate Residents and Update Leases
• Develop an outreach/educational program
• Ensure that leases reflect residents' responsibilities for:
  ○ Proper housekeeping
  ○ Reporting presence of pests, leaks, and mold.
	☒ Resident leases set specific requirements for:
	  ☒ Housekeeping, sanitation, and trash storage.
	  ☒ Reporting of pests, leaks, and mold.
	☒ Educational materials on pest control and pesticide use provided to residents.
	☒ New residents expressly told that they are responsible for proper housekeeping and reporting presence of pests, leaks, and mold.
	☐ Units inspected within one month after moving in.
	☒ Residents regularly reminded of responsibilities.
	☐ Resident told to notify resident services before using any pesticides spray or fogger.
		Educational materials on bed bugs from the state are occasionally handed out along with a request that they report any issues to management immediately.
		
		Units are not inspected within one month of moving in unless a problem is reported.
		
		Resident responsibilities are posted and available in the resident handbook. Residents are not specifically prohibited from using pesticides nor required to notify resident services before their use. Residents are told to report any issues so that the pest management company can address them. However the handbook does recommend tenants use boric acid in their cupboards to control pests.

8. Enforce Lease Enforce lease provisions regarding resident responsibilities such as: • Housekeeping • Sanitation • Trash removal and storage.	☒ Pest control services and maintenance alerting resident services to housekeeping, sanitation and trash problems on an identified, established schedule. ☒ Resident services addressing residents with housekeeping problems through education. ☒ Residents with ongoing or unresolved housekeeping, sanitation or trash problems addressed through enforcement of lease.	Management tries to get assistance for tenants who have ongoing or unresolved housekeeping, sanitation or trash problems through resident services if the resident is unable to do it themselves. Failure to dispose of garbage, waste and rubbish in a safe and sanitary manner (16i) and failure to allow inspection or extermination services (16q) are listed as grounds for lease termination.

Rental Assistance Demonstration Program (RAD)
Effective Integrated Pest Management for Affordable Housing

Essential Elements of Effective IPM (per HUD May 27, 2007 Guidance)	**Status at Development** (checkmark all that are present)	**Comment on Existing Strategies and Deficiencies; Make Recommendations**
9. Use Pesticides Only When Necessary Use pesticides only when necessary, with preference for products that, while producing the desired level of effectiveness, pose the least harm to human health and the environment, and, as appropriate, notifying PHA management before application.	☐ Snap traps used for mice. ☒ Rodenticides only used in tamper-resistant plastic boxes. ☒ No sprays or foggers used by staff, contractors, or residents without written, advance approval of property manager. ☐ Boric acid and baits used at unit turnover.	There is no specific treatment of units at turnover unless a problem is found. If a unit has an issue that is discovered at the time of turnover, the pest management company is notified and the unit is scheduled for treatment.
10. Post Signs Provide and post 'Pesticide Use Notification' signs or other warnings.	☒ Program in place to notify residents and staff of pesticide use. ☒ Signs used to notify residents and staff in advance of pesticide application (if for other than bait stations). ☒ Residents notified after units treated. ☒ Residents notified after common areas treated.	All staff are notified of pesticide use 24 hours in advance. All residents receive notices 24 hours prior to a pesticide application or inspection. Cloudy house stickers are provided by the pest management company after common areas are treated.
11. Summary	☒ How many of the ten Essential Elements of Effective IPM listed in this chart are: - Fully addressed? 4 - Partially addressed? 6 - Missing entirely? 0	There are a few policies that need to be written about the pest management service at South Seventh Street Apartments and information pamphlets made available to tenants.

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Seventh Street Apartments**

Photo #1:	Street elevation

Photo #2:	Location previously had issue with termites. Termite stations.

Photo #3:	Hole In siding, entry point for pests

Photo #4:	Clogged Gutters can create a moisture issue

Photo #5:	Clutter can hold moisture against the building and provide harborage.

Photo #6:	More Clutter.

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Seventh Street Apartments**

Photo #7:	Wood/Soil contact is attractive to termites which have been an issue in the past

Photo #8:	Gap under door potential entry point for pests

Photo #9:	Ground slopes toward the building. Moisture will have a harder time flowing away.

Photo #10:	Tree with damage close to building has ants. Branches overhanging should be trimmed.

Photo #11:	Plants touching and/or overhanging the building should be trimmed.

Photo #12:	Brush pile so close to cans is an ideal place for rodents to hide.

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Seventh Street Apartments**

Photo #13:	Concrete downspout should be moved closer to building to allow water to flow away.

Photo #14:	Expansion joint between sidewalk and building should be sealed.

Photo #15:	Branches touching roofline should be trimmed

Photo #16:	Wood/soil contact is attractive to termites. Railroad ties should be replaced with non-wood alternative.

Photo #17:	Downspout missing bottom.

Photo #18:	Water pool here if not adjusted.

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Seventh Street Apartments**

Photo #19:	Potential entry point for pests.

Photo #190:	Severely cluttered unit

Photo #21:	Unit 233 Living room

Photo #22:	Unit 233 Kitchen

Photo #23:	Unit 233 bathroom

Photo #24:	Unit 233 Bedroom

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Seventh Street Apartments**

Photo #25:	Kitchen, Typical one bedroom unit

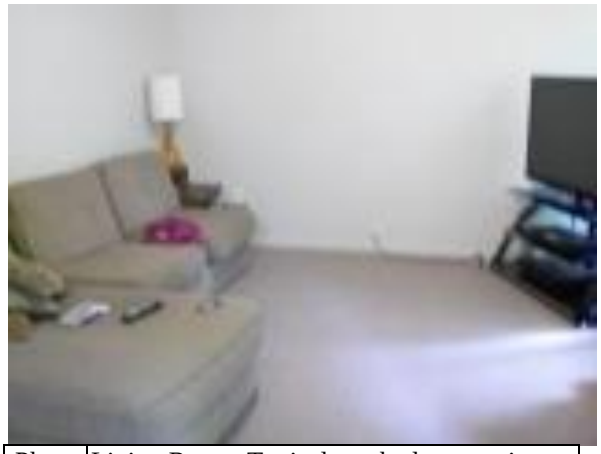

Photo #26:	Living Room, Typical one bedroom unit

Photo #27:	Laundry, Typical one bedroom unit

Photo #28:	Bedroom, Typical one bedroom unit

Photo #29:	Bathroom, Typical one bedroom unit

Photo #30:	Vacant one bedroom unit, Living room

PEST INSPECTION PHOTOGRAPHIC RECORD

Project No.: XXXXX.09R-XXX.257 **Project Name: Seventh Street Apartments**

Photo #31:	Vacant one bedroom unit, Kitchen

Photo #32:	Vacant one bedroom unit, Bathroom

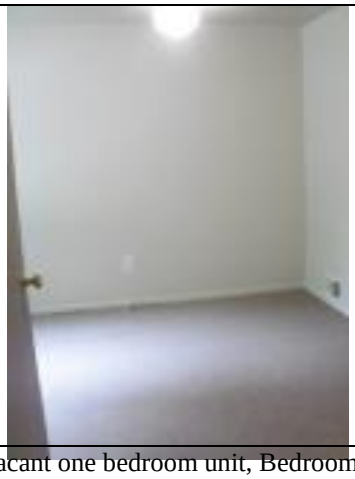

Photo #33:	Vacant one bedroom unit, Bedroom

Photo #34:	Vacant one bedroom unit, Laundry area

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Christina Driksna who completed NPMA GreenPro Test on 3/3/2009

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official signature

AKTPEERLESS

5.1 Acknowledgements of Part 4: Integrated Pest Management Inspection (IPMI)

The IPMI, Exhibit 4 – IPMI Report and Exhibit 5 – Effective IPM for Affordable Housing were completed by Christina L. Driksna of Griffin Pest Solutions. Griffin Pest Solutions certifies that the report preparers meet the qualifications identified in the RAD Physical Condition Assessment Statement of Work and Contractor Qualifications Part 4.1 (Version 1, October 2012).

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Part 4 IPMI Exhibit 4 and Exhibit 5 were Received and Reviewed by Owner:

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