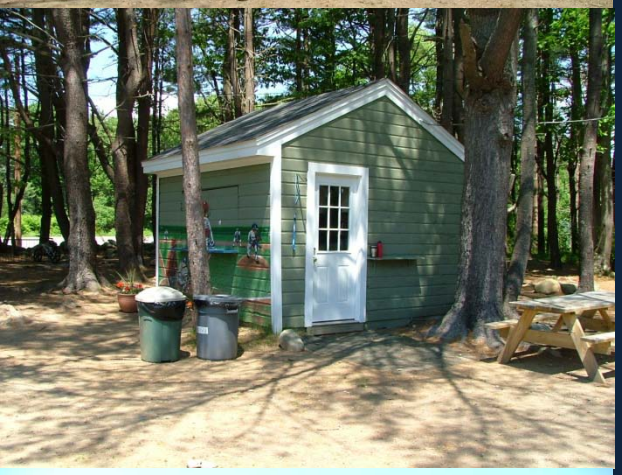

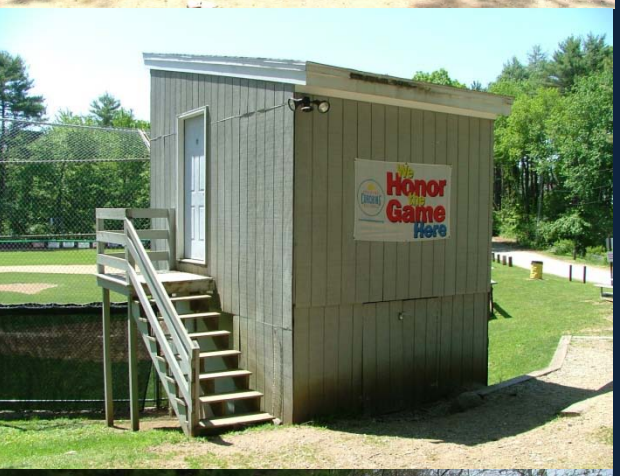

Performance Evaluation and Sustainability Assessment

Rye Recreation Facilities

Rye, New Hampshire

June 2009

Prepared for:

Town of Rye
10 Central Road
Rye, NH 03870

Prepared by:

anix, LLC
4 Margaret Lane
Lee, NH 03861

Acronyms and Abbreviations

ADA	American Disabilities Act
AFUE	Annual Fuel Utilization Efficiency
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
AT/FP	Antiterrorism / Force Protection
BTU	British Thermal Unit
cf	Cubic Feet
CFM	Cubic Feet per Minute
CIP	Cast-In-Place
CMU	Concrete Masonry Unit
DoE	United States Department of Energy
EB	Existing Building
EER	Energy Efficiency Rating
EPA	United States Environmental Protection Agency
GWP	Global Warming Potential
HVAC	Heating, Ventilation, and Air-Conditioning
IBC	International Building Codes
IBCC	International Building Code Council
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IESNA	Illuminating Engineering Society of America
IR	Infra-Red
LEED	Leadership in Energy and Environmental Design
LPG	Liquefied Propane Gas

MEP	Mechanical, Electrical, and Plumbing
M&V	Measurement and Verification
MASB	Minimum Antiterrorism Standards for Buildings
MERV	Minimum Efficiency Rating Value
NC	New Construction
NEC	National Electrical Code
NFPA	National Fire Protection Association
NG	Natural Gas
O.C.	On Center
ODP	Ozone Depletion Potential
PESA	Performance Evaluation and Sustainability Assessment
psi	Pounds per Square Inch
SEER	Seasonal Energy Efficiency Rating
sf	Square Feet
UFC	Unified Facilities Criteria
USGBC	United States Green Building Council
UST	Underground Storage Tank
VRFZ	Variable Refrigerant Flow Zone
VAV	Variable Air Volume
WBDG	Whole Building Design Guide

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1.0 INTRODUCTION

Forward

Buildings constructed prior to 2003 likely do not comply with current energy efficiency standards for new buildings. In 2003, the *International Energy Conservation Code* (IECC) was developed and adopted by most state and municipal building regulators. The IECC was revised in 2009 which defines new standards including more efficient mechanical equipment and thermal performance of building envelopes.

Through diligent evaluation and enhancement of existing buildings and systems, overall building performance and sustainability can be improved substantially. Enhancements to the building will result in reduced consumption of non-renewable energy resources, improved occupant comfort, and reduced impacts to land, water, and air resources.

Purpose

Under an existing contract with the Town of Rye to perform Comprehensive Energy Audits, anix, LLC completed a building Performance Evaluation and Sustainability Assessment (PESA) of the Recreation Facilities Buildings.

The primary objectives of this task are: 1) to evaluate the overall building performance as defined by energy consumption and building integrity; 2) to assess the overall sustainability of the building components and infrastructure; and, 3) provide recommendations that improve building performance and occupant comfort. Consistent with these objectives, the following general scope of this PESA includes: reviewing historical records and existing building drawings; visual inspection of the building components and systems and photographic documentation (Exhibit A); a thermal imaging survey of the building envelope (Exhibit B); and, evaluation and assessment of the building components and systems within the context of current building codes and industry standards.

On June 6th, 2009 anix completed a comprehensive inspection of the Recreation Facilities buildings. Results of this inspection and all information obtained are presented herein. This report also presents pertinent information gathered from a historical records review. Based upon the evaluation, recommendations are provided for consideration. A red flag ( ) symbol included the text body denotes a recommended action; these actions are tabulated in Section 6.0.

Relevant Codes and Standards

The following current building codes and industry standards are applicable to building performance and sustainability. Although determining total compliance with each code and standard is beyond the scope of this PESA, these serve as general guidelines for this building evaluation and assessment.

Table 1.1 – Relevant Codes and Standards

Current Code / Standard	Issuing Agency	Applicability
International Building Codes (IBC), 2006	International Building Code Council (IBCC)	Standards for building construction practices
International Energy Conservation Code (IECC), 2006	International Building Code Council (IBCC)	DoE recognized standard energy code
NFPA Standard 70, National Electrical Code (NES), 2008	National Fire Protection Association (NFPA)	Standards for electrical and life safety practices
NFPA Standard 101, Life Safety Code, 2009	National Fire Protection Association (NFPA)	Industry standard for life safety codes
NFPA Standard 5000, Building Construction and Safety Code, 2009	National Fire Protection Association (NFPA)	Industry standard for fire prevention requirements for new construction
American Disabilities Act (ADA), Title III (CFR 28 Part 36), 1994	U.S. Department of Justice (DoJ)	Building code requirements to accommodate disabled persons
ANSI/ASHRAE/IESNA Standard 90.1, 2007	American Society of Heating, Refrigerating and Air-Conditioning Engineers	DoE and USGBC recognized standard for mechanical and electrical systems
ANSI/ASHRAE Standard 62.1, 2007	American Society of Heating, Refrigerating and Air-Conditioning Engineers	DoE and USGBC recognized standard for ventilation systems
Energy Code for New Federal, Commercial and Multi-Family High-Rise Residential Buildings, 10CFR434.401, 2002	U.S. Department of Energy (DoE)	Older energy code for federal buildings (*currently under revision consistent with other referenced standards*)
ENERGY STAR® Guidelines for Energy Management, Buildings and Plants	U.S. Environmental Protection Agency (EPA)	Energy management program that defines processes to increase energy efficiency of commercial buildings
LEED® Reference Standard for New Construction and Major Renovation, v. 2.2, 2007	U.S. Green Building Council (USGBC)	Defines energy performance and sustainability standards required for LEED® certification of commercial buildings

Records Review

Historical records for the Recreation Facility buildings are limited and no original construction records are available. The following records were reviewed:

- Tax Assessment Records for the Main Recreation Building
- Tax Assessment Records for the Office Trailer

Building Description and History

The Town of Rye Recreation Facility is located off of Locke Road at 55 Recreation Road (Figure 1). Structures at the facility include a main recreation building, an office trailer, a soccer field snack bar, a baseball field snack bar, and an announcer's box for the baseball field. All facilities are located within the southeastern portion of the 200-acre parcel of Town owned land. In addition to the buildings, the facility includes a paved parking lot approximately 0.3 acres in area, a mixed-use field measuring approximately 3.5 acres in area, and a 0.9 acre baseball field.

According to the tax records, the main recreation building was constructed in 1989. Tax records indicate that the office trailer was constructed in1992, however, the actual construction date was 1999 based on

the unit specifications label (Photograph 24). The used trailer was purchased by the Town and moved to its current location (c. 2004). Construction records for the outbuildings are not available – based on observations, they are estimated to be between 10 and 20 years old.

Space Configuration and Use

The total gross area of all of the Recreation Facility buildings is 2,452 square feet. The net conditioned area of the Main Recreation Building is approximately 1,152 square feet and the Office Trailer is 728 square feet in area. Table 1.2 presents the estimated area based on the designated use for the Recreation Facilities. Primary designated use spaces within the Recreation Facilities include public assembly areas for recreation activities.

Table 1.2 – Gross Floor Area by Use

Building	Use Designation	Net Conditioned Area (sf)	% Gross Area
Main Recreation	Assembly	576	50
	Dining / Food Prep	288	25
	Lavatory	216	19
	Mechanical / Utility	72	6
	Subtotal:	1,152	100
Office Trailer	Assembly	560	77
	Storage	168	23
	Subtotal:	728	100
Soccer Snack Bar	Dining / Food Prep	288	100
Baseball Snack Bar	Dining / Food Prep	144	100
Baseball Announcers Booth	Assembly	140	100

The main recreation building functions primarily as an assembly area for recreation related activities such as fitness programs. The two lavatories have exterior entries for common use by all recreation facility users. It is unclear what function the kitchen provides. Because the kitchen and lavatory spaces occupy more than half of the floor area, the assembly area is limited to 576 square-feet (sf) which provides a capacity for approximately 20-persons based on the activity use designation. A larger space would increase the occupant load and the potential revenue resulting from fee-based recreational activities.

The office trailer currently provides assembly/meeting space in the larger open area and the end-office serves as a storage room for office equipment. The soccer snack bar functions primarily as a food preparation area and storage area. The baseball snack bar and announcer's booth are single function units.

Based on Town personnel accounts, the need for a new community center to support expanding recreation activities has been identified. Assuming that a new center is constructed, the other spaces could be reconfigured. Potential reconfiguration includes removing the temporary office trailer unit and utilizing the main recreation building for meeting/assembly functions. Other suggestions include converting the main building kitchen area into a snack bar and utilizing the baseball snack bar as an equipment storage shed.

In conjunction with Town master planning initiatives, the recreation use requirements should be considered including the potential to improve revenue yielding activities to offset construction costs of new facilities such as a community center .

2.0 BUILDING SYSTEMS PERFORMANCE EVALUATION

Envelope Integrity and Performance

The building envelopes of the Recreation Facility buildings were evaluated based on a visual inspection and a thermal imaging survey of all building systems and components. Representative photographs are presented in Exhibit A and the infrared thermal survey report is presented as Exhibit B.

Foundation

The main Recreation Building is supported by a concrete slab-on-grade foundation. No drawings were available but it presumed that the slab foundation is four-inches thick and is reinforced with steel wire mesh or bars. Visual inspection of the floor did not reveal and notable deficiencies including differential settlement, cracking, or spalling (Photographs 31-33).

The office trailer is supported by concrete masonry blocks set upon a concrete slab-on-grade (Photograph 28). No notable deficiencies were observed on the concrete slab. The trailer is secured with hurricane straps to resist wind uplift.

Foundations for the outbuildings include concrete slab-on-grade (Baseball Snack Bar) and concrete or cement block pier footings supporting a timber-framed floor (Soccer Snack Bar and Announcers Booth). No foundation deficiencies were observed in the outbuildings.

Floors

Floors in the Main Recreation Building and the Baseball Snack Bar are exposed concrete slab-on-grade floors. The Office Trailer floor system consists of a plywood subfloor covered with carpeting. Floor covering in the Main Recreation Building includes rubber mats in the exercise/activity room. The Announcers Booth has an exposed plywood subfloor and the Soccer Snack Bar floor is covered with carpeting.

Structural Members

All of the recreation facility buildings are conventional timber-framed structures. The Main Recreation Building includes 2-inch by 4-inch timber framed walls (16-inches O.C.) with 2-inch by 6-inch timber ceiling joists and rafters framed 24-inches O.C. (Photograph 61). The trailer and outbuildings are also constructed with timber walls studs, floor joists (except Baseball Snack Bar), and ceiling joists. No structural deficiencies were noted in the buildings.

Walls

All walls are constructed with 4-inch timber studs and siding. The Main Recreation Building and the Office Trailer contain fiberglass batt insulation in the wall cavities. Table 2.1 presents the identified wall sections for each Recreation Facility building.

Table 2.1 – Perimeter Wall Sections

Location	Wall Section	Cavity Insulation
Main Recreation Building	Cedar Clapboard Siding, 5/8" plywood sheathing, 4" timber frame cavity, 5/8" GWB.	FGB Batt
Office Trailer	Vinyl Siding, 5/8" plywood sheathing, 4" timber frame cavity, 1/4" wall panel.	FGB Batt
Baseball Snack Bar	¾" Pine T&G Siding, 4" timber frame cavity.	None
Announcers Booth	T-111 Siding, 4" timber frame cavity	None
Soccer Snack Bar	Cedar Clapboard Siding, 5/8" plywood sheathing, ¼" wall panel.	None

Legend: GWB = Gypsum Wall Board, EPS = Extruded Polystyrene, FGB = Fiberglass Batt

Ceilings

Ceilings are located in the Main Recreation building, the Office trailer, and Soccer Snack Bar. Respective materials include painted plywood in the Main Recreation Building and panel-board in the other buildings.

Attic

The attic space in the Main Recreation Building was inspected for insulation integrity and ventilation. Fiberglass batts (R-30) are installed in the ceiling joists – some gaps were noted (Photographs 55, 57, 63) at ceiling diffusers, exhaust fans, and furnace. Repair of the insulation gaps is recommended.

Venting of the attic space is provided by passive eave vents and a continuous ridge vent. Mechanical venting would significantly reduce heat loading to the building in summer months. Therefore, installation of a thermostatically controlled exhaust fan (min. 1,000 CFM) is recommended. Self-contained photovoltaic powered fan units are the most practical solution.

Roof

The Recreation Facilities roof was inspected to determine composition and existing condition. The roof consists of an asphalt shingle roof over plywood sheathing and the system appeared to be in satisfactory condition (Photograph 31). The roof eaves are boxed style and because there is no flashing extension board, runoff runs down the fascia board. Water damage of the fascia is evident including peeling paint and discolored wood. Installation of a 3/4-inch by 2-inch fascia extension board and new edge flashing are recommended. Other recommendations include scraping, sanding, priming, and re-painting the fascia boards and siding with a high-quality exterior paint.

Roofing systems on all other buildings include asphalt shingle systems. The roof shingles on the Soccer Snack Bar are showing signs of failure including warped shingles (Photographs 99-104). It is recommended that the roof shingles and edge flashing be replaced within the next two years to prevent damage to the roof sheathing boards. With the exception of squirrel damage on the Office Trailer soffit (Photograph 7), no other roofing deficiencies were noted.

Windows and Glazing

Windows in the Main Recreation Building are wood framed double-hung units with double pane glazing. The glazing and frame assemblies have low UV and air infiltration efficiency ratings. All units appeared to be in satisfactory condition. Future replacement of the windows should consider high-efficiency units to reduce solar heat-gain and air leakage. The windows in the Office Trailer are vinyl framed units with better performance ratings than those in the Main Recreation Building.

Doors

The Main Recreation Building has four entry doors including one on each end of the building and one each for the two lavatories on the rear wall. Door construction consists of steel panel units with insulated cores. Noted deficiencies included poor weather-stripping allowing significant air infiltration into the building (Photographs 45 and 46). It is recommended that new weather-stripping be installed on all entry doors. Weather-stripping on the Office Trailer entry doors also requires replacement (Photographs 14 and 15).

Exterior Trim

Peeling paint was noted on the fascia boards of the Main Recreation Building (Photograph 31). Because there are no flashing extension boards, the edge flashing sits directly on the fascia board and water runs onto the fascia causing moisture damage. As mentioned in the roof section, installation of a flashing board and new edge flashing is recommended. The peeling paint should be removed and the fascia board should be re-primed and painted.

The rear fascia on the Announcers Booth also showed indications of moisture damage resulting from roof runoff (Photograph 98) – it is recommended that the fascia be re-primed and painted. The paint on the Soccer Snack Bar trim and siding is deteriorated and peeling. To prevent damage to the wood trim, it is recommended that all trim and siding be scraped, sanded, re-primed, and painted.

With the exception of the squirrel damage to the vinyl soffit on the Office Trailer (Photograph 7), no other deficiencies were noted.

Mechanical Systems

Heating

All HVAC systems for the Main Office Building are located in the attic space including the furnace and supply and return ducting. Heating is provided by a propane-fired furnace (Photograph 59), fan unit, and insulated ducting. The furnace appears to be relatively new and efficient. Recommendations for the unit include replacing the supply and return air filters with high-efficiency filters having a MERV of 13 or higher.

Heating for the Office Trailer is supplied by a propane-fired direct-venting furnace unit (Photographs 12, 13, and 26). The unit is relatively efficient and recommendations include annual inspection (fall) of the duct vent to ensure that it is not blocked by nesting insects, rodents, or birds. Blockage of the vent will reduce unit efficiency and may increase carbon monoxide (CO) levels inside the trailer. Installation and annual testing of a CO detection unit inside the Main Recreation Building and the Office Trailer are also recommended.

Cooling

There are no mechanical cooling systems in any of the Recreation Facilities buildings. Passive cooling is provided by operable windows and doors. If the Town elects to install cooling systems, consideration of high-efficiency units having a minimum SEER rating of 18 is recommended.

Humidity Control

No humidity control systems are located in any of the Recreation Facilities buildings.

Ventilation

Currently there is no outdoor air ventilation system in the conditioned space of the Main Recreation Building. The attic furnace obtains combustion air from the unconditioned attic space and supply air is recycled from the conditioned space below via a return plenum (Photograph 65). As a result, no fresh air is introduced into the conditioned space of the building. During heating periods (winter) when the building is fully occupied, the lack of ventilation will lead to excessive carbon dioxide (CO^2) levels and relative humidity levels. Inadequate ventilation also increases the potential for mold formation. Installation of a heat-recovering ventilation system is recommended to improve building ventilation and indoor air quality.

Exhaust ventilation is limited to ceiling-mounted exhaust fans located in each lavatory. Inspection of the exhaust ducting revealed reduced air flow due to excessively long duct runs and extreme bends in the ducting thereby reducing the exhaust efficiency (Photographs 54 and 55). Based on the current ducting configuration, the exhaust flow rate is reduced by an estimated 50% from the rated air-flow of the fan unit. It is recommended that the ducting be shortened and run directly to the nearest soffit for venting to improve venting efficiency and indoor air quality. Heavy-gauge aluminum ducting is also recommended over the existing thin foil ducting.

Other recommendations include replacing all existing furnace air filters with high-efficiency filters having a MERV rating of 13 or better (Photographs 58 and 66).

Electrical Systems

Supply and Distribution

Electric is supplied to the Recreation Facilities buildings via overhead transmission lines. The main 200-amp service panel is located in the Main Recreation Building utility room (Photographs 73 and 74). The Office Trailer, Baseball Snack Bar, and the Announcers Booth are all metered through the single meter located on the Main Recreation Building. The Soccer Snack Bar has its own meter (Photograph 100) and a 50-amp service panel (Photograph 107).

The Recreation Building metered usage on the date of inspection was 0.55 kW/h (Photograph 77) when no HVAC equipment was operating. Assuming that the usage was for lighting and plug loads only, it represents approximately 25% of the peak load capacity at 50 amps (110v) which is within the acceptable range.

Some electrical deficiencies were noted including missing outlet covers in the Announcers Booth (Photograph 95), a non-GFCI protected outlet beneath the sink in the Baseball Snack Bar (Photograph 80), and deteriorated wire insulation on the Baseball Snack Bar hot water heater (Photograph 81). Repair of these deficiencies is recommended.

Lighting

Lighting fixtures in the Recreation Facilities consist of incandescent and fluorescent lamp fixtures. Exterior lighting fixtures consist of halogen lamps with motion sensitive controllers (Photographs 33, 91, and 104) and incandescent fixtures with manual toggle switches (Photographs 3, 4, and 34).

Fluorescent fixtures in the Main Recreation Building are very low-efficiency units with measured consumption on a single fixture of 1.18 amps or 130 watts (Photograph 44). Lighting fixture recommendations include replacing or retrofitting all fluorescent fixtures with low-wattage ballasts and lamps, replacing all exterior halogen lamps with fluorescent lamps, and replacing all incandescent lamps with fluorescent bulbs. Other recommendations include installing motion-sensitive controls for interior lighting and replacing the exterior incandescent fixtures with motion-sensitive fluorescent unit. PSNH offers a lighting retrofit program to help offset the capital cost.

With the exception of the Main Recreation Building lavatories where lighting is poor, lighting power density appears to be sufficient for the intended uses in the Recreation Facilities buildings.

Appliances

Electrical appliances in the Recreation Facilities buildings include multiple refrigerators (3), microwave ovens, coffee-makers, a beverage refrigerator (Baseball Snack Bar), and a range unit in the Main Recreation Building kitchen (Photographs 35, 47, 87, 88, 89, and 90). None of the appliances are EnergyStar® rated and all of the refrigerators are older inefficient units.

Measured amperage on the refrigerator in the Soccer Snack Bar was 2.39-amps (Photograph 108) which is nearly three times the consumption of a new equivalently sized EnergyStar® rated refrigerator. Based on the predicted energy savings, replacement of this refrigerator with an EnergyStar® unit would provide a return on investment within three years. The refrigerator/freezers in the Baseball Snack Bar (Photograph 88) and Main Building kitchen (Photograph 35) are more efficient but future replacement of these units is also recommended. The beverage refrigerator unit in the Baseball Snack Bar (Photograph 90) consumes a substantial amount of electricity with a measured usage of 4.95-amps – this is more than five times an equivalently sized EnergyStar® refrigerator. Annual energy cost to operate this unit is approximately $600 – the return on investment to replace this with an EnergyStar® unit would be one year.

Mechanical Equipment

An air ventilation unit is located in the Office Trailer (Photographs 9-11) and it is relatively efficient. Other equipment includes domestic hot water heating units in the Main Recreation Building (Photograph 75) and the Baseball Snack Bar (Photographs 82 and 83). Performance and condition of the domestic hot water tanks are discussed further in the following Plumbing Systems section.

Electronics

There are few electronics in the Recreation Facilities buildings. Items noted include portable radios and sprinkler system controls.

Plumbing Systems

Water Supply and Distribution

Water for the Recreation Facilities is supplied from a public distribution system managed by a State regulated utility company (Aquarion Water, Inc.). No distribution system issues were noted and supply pressures are adequate for the current uses.

Domestic Hot Water

Domestic hot water heating units are located in the Main Recreation Building (Photograph 75) and the Baseball Snack Bar (Photographs 82 and 83). The 8-gallon tank in the Baseball Snack Bar is showing evidence of corrosion and the electrical cord insulation is deteriorated thus creating a potential safety hazard – replacement of this unit is recommended. Both of these units are older low-efficiency and ideally they should be replaced with high-efficiency wall-mounted tankless units.

Fixtures

Plumbing fixtures including kitchen sinks, lavatory sinks, and toilets are located in the Main Recreation Building and the Baseball Snack Bar (Photographs 36-39, 41, 67, 68, and 87). All fixtures were in good working condition and no deficiencies were noted.

Sanitary Systems

All sanitary wastes drain to two on-site storage vaults located on the east side of the Main Recreation Building (Photographs 49-51). According to accounts by Town personnel, the funds to construct the on-site distribution system were not available at the time so only the tanks were installed with the expectation that the distribution system would be installed in the near future. Because the current system is incomplete, it does not comply with NHDES regulations for on-site distribution systems. Therefore, installation of an on-site distribution system is recommended.

Under the current configuration, the tanks are frequently pumped and sewage is transported to a waste-water treatment plant for off-site treatment. There are high-level alarms on each tank (Photograph 48), however, neither alarm was sounding when the tanks were filled to capacity (Photograph 51). After re-setting the alarms they did sound suggesting that they were manually disabled or timed-out. It is recommended that the alarms be tested and checked weekly to prevent overfilling of the tanks until a new distribution system is constructed.

Hazardous Building Materials

Completion of a detailed building materials hazardous survey is beyond the scope of this evaluation, however, the following information is provided based on the building age and observations noted during the inspection. This is not intended to be a comprehensive listing and is provided as anecdotal information only.

Asbestos Containing Materials

Some common asbestos containing materials (ACMs) used in building construction prior to the mid-1970s include:

- Pipe insulation
- Refractory masonry
- Asphaltic roofing
- Flooring tiles
- Mastics and adhesives
- Window glazing compound
- Wall plaster
- Siding (transite)

- Piping (transite)

Considering the age of the Recreation Facilities buildings and infrastructure, it is unlikely that any ACMs are present.

Lead Paint

Considering the age of the Recreation Facilities buildings and infrastructure, it is unlikely that any lead painted surfaces are present.

Mercury

Mercury containing devices in the Recreation Facilities building include fluorescent light bulbs. Used bulbs should be segregated for proper disposal/recycling.

PCBs

Many older fluorescent lighting ballasts were manufactured with PCB containing capacitors. All of the older fluorescent units (pre-1980) should be suspected to contain PCB capacitors. Removal of the fixture housing will reveal the capacitors and unless they are clearly marked "DOES NOT CONTAIN PCBs", then it should be presumed that the capacitors do contain PCBs.

Petroleum Impacted Soils

Because there is no history of petroleum tanks at the site, it is unlikely that there are any petroleum impacted soils.

3.0 BUILDING CODE COMPLIANCE

Although establishing compliance with current building code and regulatory requirements including the *International Building Code* (IBC) standards and the *American Disabilities Act* (ADA) is not the objective of this evaluation, following are some observations that may warrant further evaluation as part of planned building maintenance and alterations. Planned building renovations should also consider compliance with current and applicable building code standards, particularly the *International Existing Building Code* (IEBC, 2009) and all standards referenced thereto.

Building Systems

Insulation

The current building envelope insulation does not comply with current *International Energy and Conservation Code, 2009* (IECC, 2009) standards. Potential improvements to the thermal envelope are discussed further in Section 2.0.

Mechanical

No mechanical code issues were noted during the inspection.

Electrical

The existing electrical distribution was evaluated based on current *National Electrical Cod*e (NEC, 2008) standards. Specific items noted during inspection that warrant further evaluation include:

- Deteriorated insulation on the hot water heater cord in the Baseball Snack Bar.
- No GFCI protection on the outlet located under the sink in the Baseball Snack Bar.
- Missing faceplate on Announcer Booth outlet.

Plumbing

No plumbing code compliance issues were noted during the inspection.

Sanitary

Currently there is no on-site distribution system for sanitary wastes. The existing tanks are pumped when they are at capacity and sewage is transported off-site to a waste-water treatment plant. Current sanitary code does not allow for temporary storage of sanitary wastes and compliance requires construction of a distribution system in conformance with NHDES regulations.

Life Safety

Life safety code issues noted during the inspection include missing or disconnected smoke detectors in the Office Trailer (Photograph 18) and in the Main Recreation Building where no smoke detectors were identified. Other noted concerns include a lack of fire extinguishers in all buildings.

ADA Compliance

Parking

Handicap accessible parking spaces are provided and clearly marked in the main Recreation Facilities parking area.

Access and Egress

The Main Recreation Building and the Office Trailer do have adequate access/egress including ramped entries.

Lavatory Facilities

The public lavatory facilities in the Main Recreation Building do appear to comply with ADA space requirements for accommodating wheelchair access.

Kitchen Facilities

As currently configured, the kitchens do not comply with ADA standards for wheelchair access including countertop and sink access. However, it is assumed that there is limited use in the kitchen and that a recreation staff person would be available to assist handicapped persons as needed.

Alarms

In addition to audible alarms, ADA requires that visual alarms are also present in occupied areas. No visual indication alarms such as strobe lights are located in the lavatories.

4.0 SUSTAINABILITY ASSESSMENT

Although based largely upon the building performance evaluation, the following sustainability assessment provides a more holistic approach to evaluating the site and building and assessing overall sustainability, which by implication, also measures building performance. Because much of the information is provided

in the Performance Evaluation narrative, the reader should review that section to establish a competent understanding of the site, building, and all components.

This assessment is consistent with current industry sustainability initiatives and more specifically the intent of the U.S. Green Building Council (USGBC), *Leadership in Energy and Environmental Design* (LEED) program. The following sections provide a qualitative assessment of the Recreation Facilities and a general description of recommended performance and sustainability enhancements.

Site

The Recreation Facilities buildings and associated infrastructure are located within a 200-acre parcel of Town owned land. Current land use designations include a Town Hall building, a Town cemetery, deeded conservation lands, and protected wetlands (Figure 1).

Storm water within the Recreation Facilities site generally flows from the northwest to the southeast eventually draining to wetlands and estuaries at the southernmost edge of the Town parcel (Figure 1). No storm water drainage structures were identified at the site. Landscaped areas, including the athletic fields, are covered with native grasses, groundcover, trees, and shrubs. Existing vegetation is in good condition and all soils are well stabilized.

Based on the proximity to the adjacent wetland areas and estuaries, recommended best management practices include limiting the use of fertilizers, herbicides, and pesticides on the athletic fields and using organic treatment products .

Water

Water is supplied to the Recreation Facilities by a State regulated private utility company (Aquarian Water, Inc.) and water is sourced from deep wells located within Rye and surrounding communities. Water usage for the Recreation Facilities includes the plumbing fixtures in the lavatory and kitchen areas and irrigation for the baseball field. Section 2.0 presents suggestions for reducing water consumption with low-flow fixtures.

Irrigation systems can be a source of significant water consumption. Best management practices include limiting the watering frequency to once every 3-days watering in early morning hours, and installing an evapotranspiration sensor. Other measures include over-seeding with native drought-resistant grasses. These simple measures will not only reduce water consumption and cost, but will also promote deeper grass-root establishment thereby improving the drought-resistance of the grasses .

Specific measures to reduce water consumption on the fixtures include installing low-flow aerators on all sink faucets, installing low-flow toilets (1.2 gallons per flush or less), and installing motion-sensitive controlled faucets . Installing local tankless hot water heating units beneath each sink will also reduce water consumption by providing instant hot water at the tap .

Energy and Atmosphere

Mechanical Systems

The existing propane-fired heating unit in the Main Recreation Building is relatively efficient and with annual maintenance should provide years of service. Recommendations to improve system efficiency and occupant comfort include:

- Programmable thermostat management with setbacks and pre and post-occupancy ventilation.
- Installing high-efficiency air filters with MERV of 13 or better.
- Improving insulation on the heating supply ductwork in the attic to R-10 or better.
- Installing a heat-recovering ventilation unit with carbon dioxide sensor/controls and automatic exhaust fan controls.

Domestic Hot Water

Potential improvements for domestic hot water supply include installing high-efficiency tankless units at each sink. This would reduce energy consumption and water consumption by providing instant hot water at the tap. Additional benefit includes eliminating the heat loss from uninsulated distribution piping in wall cavities. A single tankless unit would provide hot water to both lavatory sinks and the kitchen sink in the Main Recreation Building.

Thermal Envelope

The existing thermal envelope for the Main Recreation Building and the Office Trailer were constructed to comply with earlier code standards and do not meet current code standards. Because the Office Trailer is a temporary structure with a low-use frequency, improving the envelope may not provide best value. If the Main Recreation Building is to continue in service then improvements to the envelope should be considered including improving wall insulation, ceiling insulation, and floor insulation. Assembly descriptions and associated R-values for the Main Recreation Building floors, walls, and roofs are summarized in Table 4.1.

Table 4.1 – Main Recreation Building Thermal Envelope R-Values

Building Component	Assembly Description	Effective Assembly R-Value(1)
Floors – Carpet	4" Concrete w/ carpet	1.5
Floors	4" Concrete	0.3
Perimeter Walls	Cedar clapboard siding, 5/8" plywood sheathing, 4" timber frame wall, FGB, ½" Wallboard	15
Ceiling / Attic Floor	6" FGB	20

(1) Assembly values include interior air films (0.68 for walls and 0.61 for ceilings) and exterior air films (0.17).

Methods to improve the floor insulation include installing 1-inch of foil-faced polyisocyanurate board on the concrete deck and covering it with a high-insulating pad and carpeting. This would improve the floor to an R-value of approximately 10.

The most cost-effective and least intrusive method to improve the walls is to remove the existing clapboards siding and trim, install 2-inches of foil-faced polyisocyanurate board, and replace the trim and siding. This would provide an additional thermal value of R-14 raising the total assembly value to nearly R-30. The ceiling/attic floor could be simply improved by installing a second 6-inch layer of

fiberglass batt insulation orientated perpendicular to the joists (to cover existing air gaps). This would provide an additional R-value of 20.

Based on the condition of the existing doors and windows, improving the seals and weather-stripping would substantially improve the building envelope by reducing air infiltration.

Renewable Energy Considerations

To explore potential renewable energy applications, the following table (Table 4.2) presents a preliminary evaluation of potential technologies that might be practically implemented for the Recreation Facilities buildings considering site constraints and building function. Each renewable energy application should consider economics including initial capital costs and future cost-savings as well as the feasibility of the application based on specific site and building characteristics.

All of the proposed renewable energy applications would improve the sustainability of the Rye Recreation Facility. With the exception of Green Grid Power, each technology poses unique risks with respect to function, operating costs, and future costs of nonrenewable energies including coal, gas, and oil. The one consistent consideration among all of the renewable technologies is that the larger scale the application, the more economically feasible it becomes. Therefore, the Town might consider large-scale renewable energy applications that could support multiple buildings and facilities including the Public Library, Public Safety Complex, and Town Hall.

Table 4.2 – Potential Renewable Energy Applications

Energy Application	Economic Considerations	Feasibility Assessment
Photovoltaic Systems	PV systems are relatively expensive and without significant State financial incentives, the ROI period is long.	There is limited area for panel erection and substantial tree growth shades much of the area.
Solar Domestic Hot Water	Systems are relatively expensive due to installation of piping network and they have a substantial ROI period.	Considering that the domestic hot water demand is very low for the Recreation Facilities, the payback period would be significant.
Combined Heat and Power Systems	CHP or cogeneration systems are proven technology in the industrial sector. Systems are typically developed for large power demand industry and commercial facilities.	Because the unit is powered by a combustion engine, noise and exhaust emissions are a concern considering the proximity to residential areas. A large fuel storage tank would be necessary.
Geothermal Heating/Cooling	Geothermal heating/cooling systems can be very cost-effective systems depending on site constraints and are very simple and proven technology. ROI in the New England area varies from 5-20 years for the wells and piping system (not including equipment).	The Recreation Facilities site and adjoining parcel is large and wells could be easily sited. Because the building is relatively small, the payback period will be substantial (>15 years). A community system could be constructed to reduce the cost and increase the scale of the system.
Wind Power	Small-scale wind power systems are very costly compared to the energy savings. Systems are proving to be less efficient than expected in New England.	Wind towers would require a State permit and a Town zoning variance based on the height. The town-owned lands to the southeast may provide conditions favorable for a wind turbine – a feasibility study would be required.
Biomass Heating	Biomass systems can be cost effective assuming an endless supply of inexpensive biofuel.	Technology for small-scale applications is relatively new. Biomass fuel is a commodity with limited availability and pricing will

		increase with demand.
Green Grid Power	Regulated power supply from private energy companies provided at a higher rate. No capital investment in technology that can become obsolescent. Can terminate agreement at anytime.	Energy is developed by alternative Green technologies including wind farms, hydroelectric, and PV farms. Typically requires a minimum contract term (1-2 yrs.).

Materials and Resources

The Town of Rye currently has a recycling program and diligent separation of recyclable wastes from the Recreation Facilities is encouraged. Other sustainable initiatives may include using only non-toxic cleaners. Building materials can also be replaced with Green building materials that reduce the use of natural resources and material toxins. For example, the existing carpeting and wall paint contain a high level of volatile organic compounds (VOCs) that are released to the indoor air over time thereby degrading indoor air quality. Replacement of these materials should consider using zero-VOC products. Incorporating rapidly renewable natural materials such as bamboo, cork, and other products should also be considered as part of any major building renovation projects.

Indoor Environmental Quality

Heating and Cooling Venting

As discussed in Section 2.0, outdoor air supply to the Main Recreation Building is inadequate and increased ventilation would improve indoor air quality and occupant comfort. This is best achieved by adding a heat-recovering ventilation unit.

Humidity Control

Considering the small size of the Main Recreation Building the addition of a humidity control system may not be prudent. Instead the heat-recovering ventilation system provides much greater value and will help to control relative humidity levels inside the building.

Lighting

Replacement or retrofitting of the existing fluorescent and incandescent fixtures will reduce reliance on electrical energy for the Recreation Facilities. As mentioned in Section 2.0, PSNH offers a program to help finance the cost of retrofitting existing fixtures. Other recommendations include changing all incandescent lamps to compact fluorescent lamps (CFLs), and installing motion sensitive controls on light switches in common areas such as lavatories, meeting rooms, kitchens, and offices.

Daylighting

Daylighting within the Main Recreation Building is provided by window units operable. Table 4.3 presents a summary of the window areas for each wall in the Recreation Facilities.

Table 4.3 – Daylighting Areas

Wall Orientation	Wall Area (sf)	Window Area (sf)	% Total
North	480	15	3.1%
South	480	30	6.3%
East	300	7.5	2.5%
West	300	0	0%
TOTAL:	1,560	53	3.4%

Minimum daylighting as defined by LEED standards require a minimum glazing factor of 2% in at least 75% of regularly occupied spaces. Therefore, the Main Recreation Building exceeds the recommended standards with a net window area of 3.4% of the total wall area.

Radon Gas

Radon gas is a naturally occurring radioactive gas that is regionally present within the New England region. Radon gas can enter buildings through small cracks in the foundation walls and floors and accumulate in the indoor atmosphere. The Main Recreation Building does not contain a radon mitigation system – to ensure that radon concentrations are below the EPA threshold; annual radon testing is recommended .

VOCs

Storage of VOC containing liquids in the occupied spaces of the Main Recreation Building and the Soccer Snack Bar creates a potential hazard to building occupants (Photographs 72 and 107). VOCs in liquids such as cleaners, paints, lubricants, and gasoline will volatize in the indoor atmosphere creating an inhalation hazard to occupants. Recommendations include relocating all VOC liquids to a storage area located outside of the occupied spaces .

5.0 ENERGY MODELING

Method and Purpose

Using the eQUEST energy simulation program (v. 3.63), a more quantitative assessment of the Recreation Facilities energy consumption was completed. This simulation program is recognized and accepted by the U.S. Department of Energy (DoE), Energy Efficiency and Renewable Energy (EERE) program and the USGBC LEED program. Independent models were completed to provide a more accurate evaluation of energy performance based on the building configurations and the designated use. Local public utility rates for electric (Public Services of New Hampshire) were used in all simulations. Net electric costs are estimated at $0.14/kWh based on current PSNH small commercial rates. Heating oil pricing of $2.80 per gallon ($2.01/therm) based on current, averaged local market pricing is assumed. Natural gas and propane rates are $1.65/therm based on current Keyspan commercial rates.

It is noted that the eQUEST simulation program is somewhat limited when replicating conditions in existing buildings and that there are variables that must be assumed based on unknown building conditions and use characteristics. Therefore, the simulation model should be considered as a tool used to establish benchmark conditions to which building and systems enhancements can be evaluated against to determine the enhancements that provide best value in terms of energy performance.

A baseline model and simulation was completed for the Main Recreation Building to establish the benchmark conditions against which enhancements are measured. Because major building improvements are not proposed (e.g., new HVAC systems), a series of Energy Efficiency Measures were integrated into the baseline model to identify potential energy use reduction and the associated cost savings. Based on

this simulation, the EEMs that provide best value for the Recreation Facilities are improving the building envelope including adding insulation to the walls, attic floor, and slab concrete floor.

Simulation reports for the baseline and each EEM are presented in Exhibit C and include:

- Detailed monthly and annual energy consumption by use category;
- Estimated monthly and annual energy costs;
- Monthly peak consumption by use category; and,
- Summary monthly and annual consumption by energy type (electric and gas/oil).

Because there are many variables affecting actual consumption and associated costs including building use and occupancy, actual efficiencies of existing equipment and systems, controls, actual utility costs, and limitations inherent to the energy simulation software, the presented values should be considered within a -15% to +10% range.

Simulation Results

The baseline model yields an annual electric energy usage of 7,725 kWh and a gas usage of 563 therms (Exhibit C). Predicted annual costs for the existing building are $1,082 and $1,131. Table 5.1 presents the cumulative estimated energy consumption reductions and associated cost savings for each proposed EEM enhancement.

Table 5.1 – Energy Efficiency Measure Results

Potential Building Enhancements		Est. Annual Energy Reduction		Est. Annual Cost Savings(1)
No.	EEM Description	Oil / NG (therms)	Electric (kWh)	
1	Improve Building Envelope – Add Attic Floor Insulation (R-21)	565	7,726	($5)
2	Improve Building Envelope – Add Wall Insulation (R-14)	523	7,708	$83
3	Improve Building Envelope – Add Floor Insulation (R-5)	387	7,651	$364

(1) Estimated costs are based on current (June 2009) public utility and heating-oil rates for the southern NH region.

Based on the results of the EEMs, the most value added measure is installing insulation on the concrete slab floor. Note that EEM No. 1 (attic insulation) results in increased energy consumption and costs. This is explained by the reduced solar heat load emanating from the attic space through the ceiling and into the conditioned space below during transitional seasons (spring and fall). This lost heat load results in increased heating system operation and energy use.

It is important to note that the EEM results are based on the current building systems with no cooling. If air-conditioning systems are added to the building the simulation results will change substantially. That is, the predicted energy use delta for each EEM (as compared to the new baseline) will increase and adding attic insulation will provide a net reduction in energy consumption.

6.0 SUMMARY RECOMMENDATIONS

The following summary recommendations are provided with the intent of improving the overall performance and sustainability of the Recreation Facilities buildings. Determining which recommendations are appropriate for the building depend on the planned use designation and lifecycle,

Town of Rye initiatives, and budgetary means. The red flag ( ) symbol included the text body denotes recommendations that are included in one of the three tier categories. The three tier categories are based on life safety concerns, implementation costs, potential energy reduction and cost savings, operation and maintenance costs, and occupant comfort.

1. **Tier I Recommendations**: Tier I recommendations include maintenance related items that are relatively simple and low-cost to implement. They also include critical items associated with life-safety concerns and items that if left unattended to could result in damage to building components. Tier I recommendations are presented in Table 6.1.
2. **Tier II Recommendations**: Tier II recommendations are those that should be considered in current budgetary planning for building improvements – they can be major or minor improvements. They generally will provide substantial energy savings and/or improved occupant comfort. Tier II recommendations are presented in Table 6.2.
3. **Tier III Recommendations**: Tier III recommendations are major improvements affecting one or more building components. These are generally longer-term capital improvements that may be more economical to complete as part of a larger improvement project. Tier III recommendations are presented in Table 6.3.

Included in the tables are budgetary costs to implement the associated initiative. These costs are provided for planning purposes only and more detailed estimates should be prepared as initiatives are selected for implementation.

Table 6.1 – Tier I Recommendations

No.	Noted Item	Recommended Action	Budgetary Cost
1	Main Recreation Building: Insulation gaps in attic floor insulation.	Fill gaps with fiberglass.	$500
2	Main Recreation Building: No fascia extension board causing runoff damage to fascia board and clapboard siding.	Install a fascia extension board and new edge flashing.	$1,200
3	Main Recreation Building: Doors and windows seals are poor allowing air infiltration.	Replace seals and add new weather-stripping.	$800
4	Office Trailer: Doors and windows seals are poor allowing air infiltration.	Replace seals and add new weather-stripping.	$800
5	Main Recreation Building: Furnace filters are low efficiency resulting in poor indoor air quality.	Replace filters with filters having a MERV rating of 13 or better.	$200
6	Office Trailer: Wall-mounted direct vent on the propane furnace can be blocked with debris or from nesting birds or rodents thereby blocking gas exhaust.	Inspect the direct vent each fall prior to system start-up.	$0
7	Main Recreation Building & Office Trailer: No carbon monoxide (CO) detectors in occupied spaces.	Install CO detectors in occupied spaces.	$120
8	Main Recreation Building: Lavatory exhaust fan ducting runs are excessive and poorly routed thereby restricting air flow.	Shorten duct runs and route directly to the nearest soffit location.	$300
9	Announcers Booth: Missing electrical outlet faceplate.	Install new faceplate.	$3

10	Baseball Snack Bar: The outlet located beneath sink (wet location) is not GFCI protected (code violation).	Replace outlet with GFCI receptacle.	$20
11	Baseball Snack Bar: Wire insulation on electric hot water heater is missing and unsafe. Older unit is also showing indications of pending failure (corrosion).	Replace unit with a high-efficiency tankless hot water heater.	$800
12	Baseball Snack Bar: The glass beverage cooler is extremely inefficient and costly to operate.	Replace cooler with an EnergyStar rated unit.	$400
13	Main Recreation Building: Sanitary holding tanks were filled to capacity and the alarms were not sounding.	Inspect and test alarm operation weekly.	$0
14	ALL: No smoke detection units in buildings.	Install hard-wired smoke detection units in all occupied spaces.	$800
15	ALL: No fire extinguishers located in buildings.	Install fire extinguisher stations and units and inspect annually (Rye Fire Department).	$500
16	Main Recreation Building: No visual fire alarms in lavatories for ADA compliance.	Install strobe light units in 2 lavatories in conjunction with new smoke detectors.	$300
17	The Recreation facilities and turf fields are located in close proximity to sensitive wetlands and estuary habitat.	Limit use of fertilizers, herbicides, and pesticides and use organic products.	$400/yr.
18	Irrigation system for baseball field can consume large volumes of water.	Implement BMPs including limiting operating schedule to once per 3 days, install evapotranspiration detector, and irrigate early in the morning.	$0
19	Main Recreation Building and Office Trailer: Programmable thermostats may not be set to the most efficient setback schedule.	Check and adjust thermostat schedules and setback temperatures to reduce heating system operation.	$0
20	Main Recreation Building: Radon gas can infiltrate the slab floor and accumulate inside the building.	Test for radon gas annually.	$200
21	Main Recreation Building & Soccer Snack Bar: VOC containing liquids stored in occupied spaces.	Relocate all VOC liquids to a storage area located in a non-occupied space such as a outdoor shed.	$0

Table 6.2 – Tier II Recommendations

No.	Noted Item	Recommended Action	Budgetary Cost
1	Main Recreation Building: Insufficient venting of attic space increases heat loading to building in summer.	Install a thermostatically controlled solar powered exhaust fan (min. 1,000 cfm).	$1,000
2	Main Recreation Building: There is no outdoor air ventilation for conditioned spaces resulting in poor indoor air quality.	Install a heat-recovering ventilation unit.	$2,200
3	ALL: Interior and exterior lighting fixtures and lamps are inefficient.	Replace or retrofit existing fluorescent fixtures with low-wattage ballasts and lamps. Replace all incandescent lamps with CFLs.	$1,700
4	ALL: Interior lighting fixtures are controlled by manual toggle switches.	Install motion-sensitive switches in common areas.	$500
5	Main Recreation Building: Peeling paint on fascia boards and clapboard siding.	Scrape, sand, prime, and re-paint trim and siding with a high quality exterior paint.	$3,800
6	Soccer Snack Bar: Peeling paint on fascia boards and clapboard siding.	Scrape, sand, prime, and re-paint trim and siding with a high quality exterior paint.	$1,500
7	Announcers Booth: Peeling paint on fascia boards and clapboard siding.	Scrape, sand, prime, and re-paint trim and siding with a high quality exterior paint.	$2,000
8	Soccer Snack Bar: Old refrigerator is very inefficient.	Replace refrigerator with an EnergyStar rated unit.	$400
9	Main Recreation Building: There is no on-site sanitary distribution system and holding tanks require frequent pumping.	Design and install a new gravity distribution system per NHDES regulations and connect to the existing holding tanks.	$20,000
10	Main Recreation Building: There is no insulation on the exposed concrete slab floor.	Install 1" of polyisocyanurate board on concrete floor and cover with carpeting.	$3,000

Table 6.3 – Tier III Recommendations

No.	Noted Item	Recommended Action	Budgetary Cost
1	Soccer Snack Bar: Roof shingles in poor condition.	Replace roof shingles and edge flashing.	$2,500
2	Main Recreation Building: The domestic hot water heater is inefficient and costly to operate.	Replace unit with a high-efficiency tankless hot water heater.	$800
3	Main Recreation Building: Plumbing fixtures are not water-conserving units and increase volume to sanitary system.	Install low-flow aerators on sinks, retrofit toilets to reduce flush volume, and install motion sensitive controls on lavatory sinks.	$1,000
4	Main Recreation Building: Wall insulation has low thermal efficiency.	Remove exterior clapboard and install 2" of polyisocyanurate board on sheating, and replace clapboard.	$7,200

FIGURE 1

Site Map

anix

anix, LLC
4 Margaret Lane
Lee, NH 03861
(603)292-6245
www.anixcm.com

Town of Rye, NH
Town Hall
10 Central Road
Rye, NH 03870
Tel: 603.964.5523

ISSUE
06.06.09

RE-ISSUE

PROJECT NO.
09021

PROJECT
Town Hall PESA

DRAWN BY
TN

DESCRIPTION
Site Map

P

01

Exhibit A

Photographs

(separate electronic file)

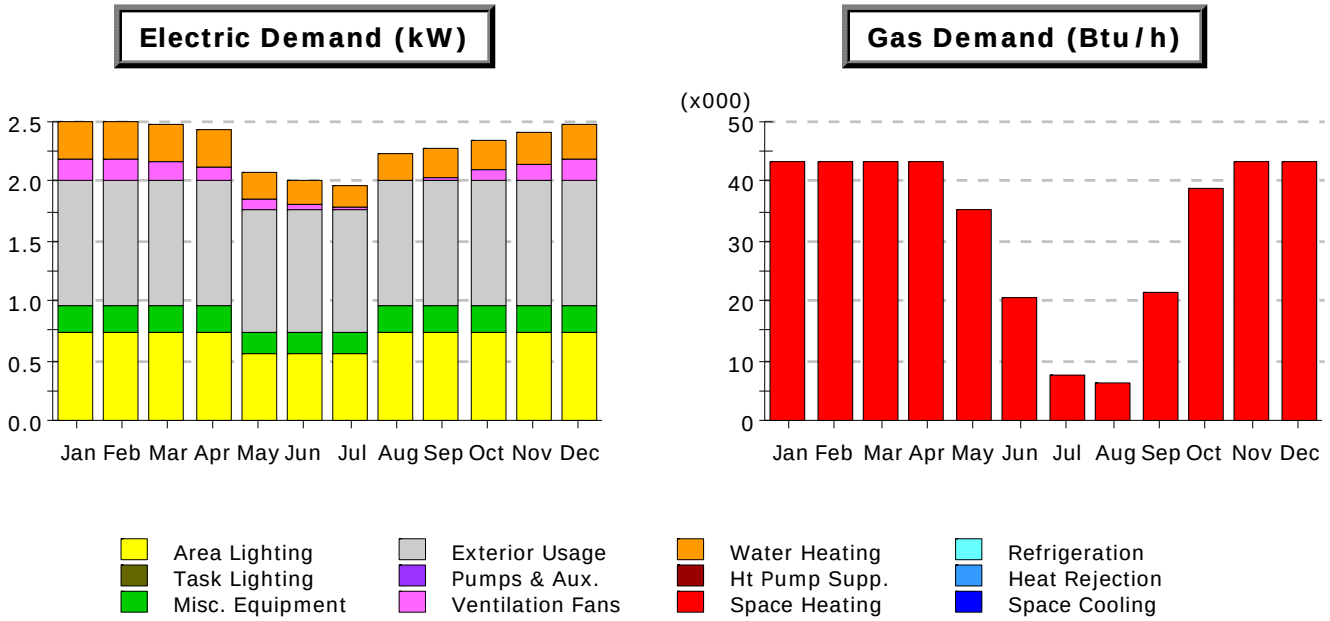
Exhibit B

Infrared Thermal Imaging Report

(separate electronic file)

Exhibit C

Building Energy Simulation Reports



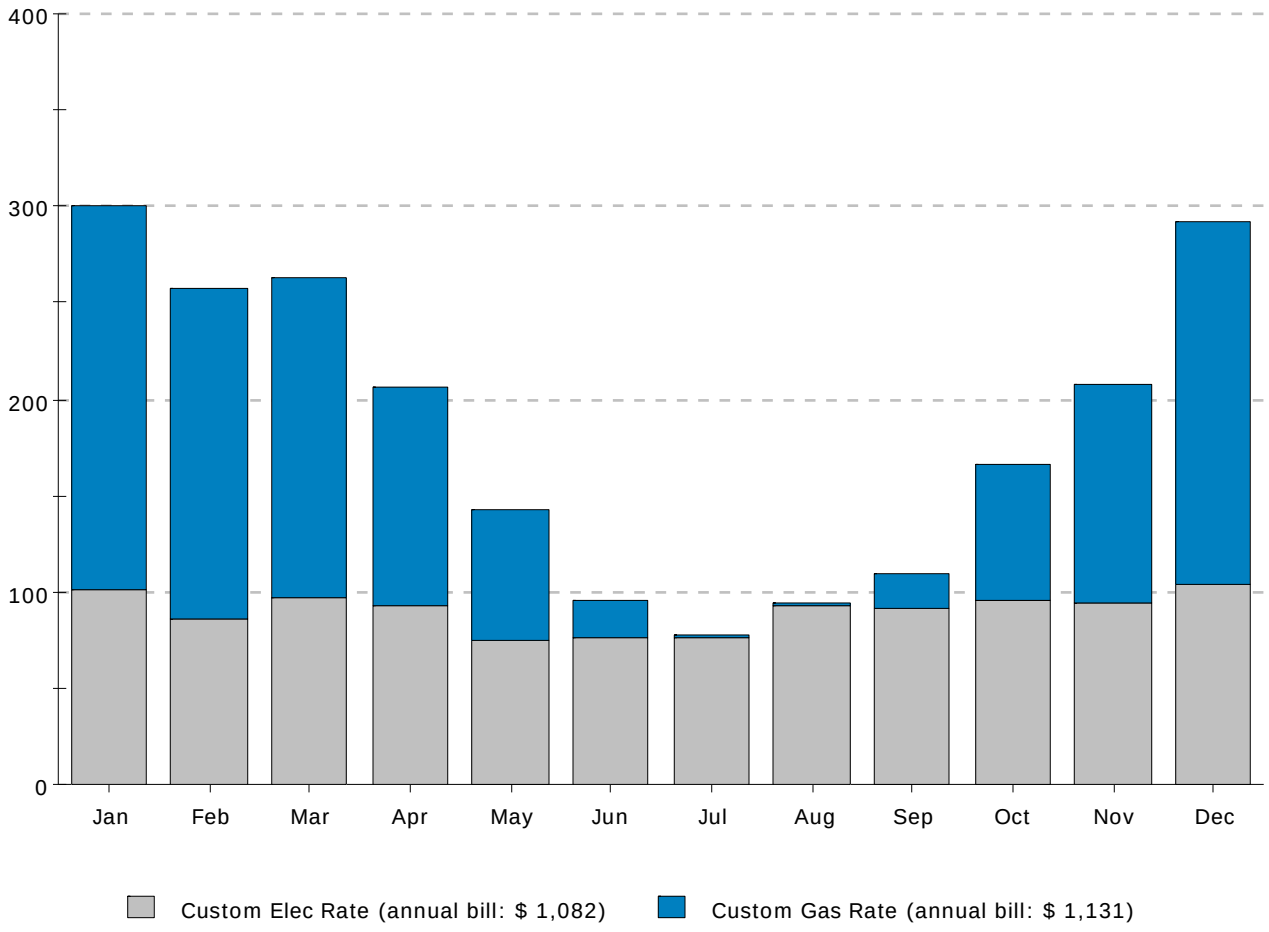
Electric Demand (kW)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.30	0.31	0.31	0.31	0.23	0.21	0.20	0.24	0.24	0.25	0.27	0.29	3.16
Vent. Fans	0.19	0.18	0.16	0.11	0.09	0.04	0.01	-	0.03	0.09	0.14	0.19	1.23
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	12.44
Misc. Equip.	0.23	0.23	0.23	0.23	0.18	0.18	0.18	0.23	0.23	0.23	0.23	0.23	2.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.73	0.73	0.73	0.73	0.55	0.55	0.55	0.73	0.73	0.73	0.73	0.73	8.22
Total	2.50	2.50	2.48	2.42	2.08	2.02	1.97	2.24	2.27	2.34	2.40	2.48	27.70

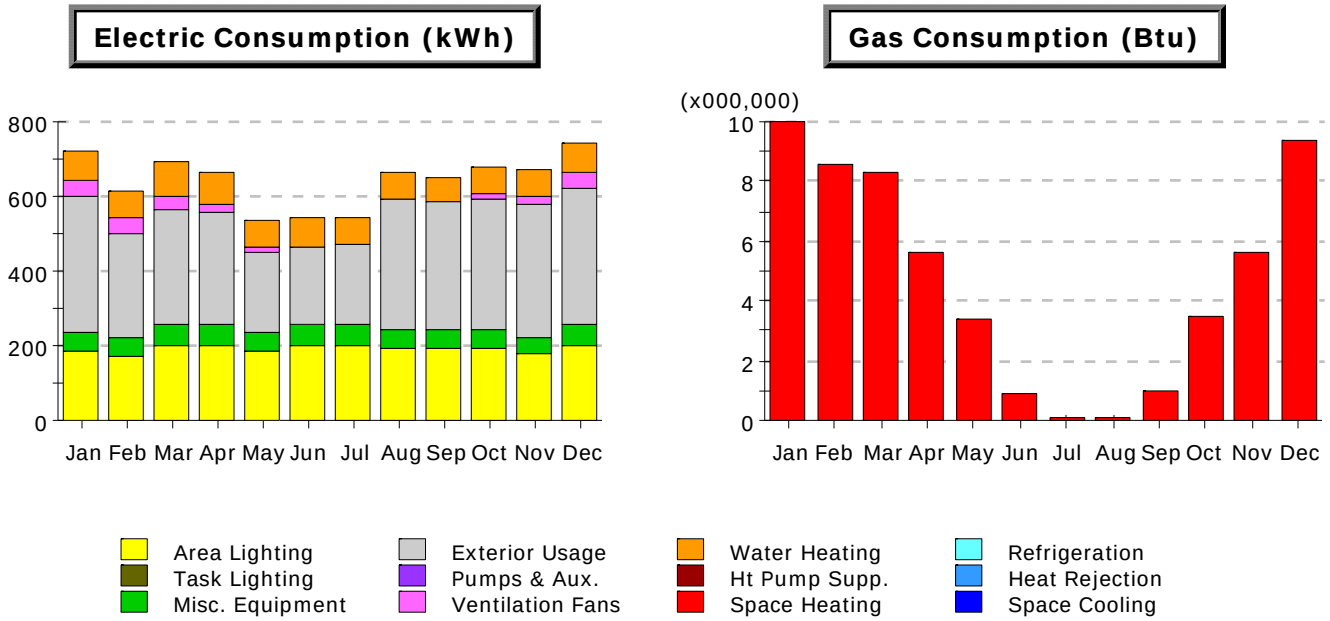
Gas Demand (Btu/h x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	43.39	43.39	43.39	43.39	35.19	20.45	7.41	6.23	21.33	39.00	43.39	43.39	389.98
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	43.39	43.39	43.39	43.39	35.19	20.45	7.41	6.23	21.33	39.00	43.39	43.39	389.98

Monthly Utility Bills ($)



Total Annual Bill Across All Rates: $ 2,213



Electric Consumption (kWh)

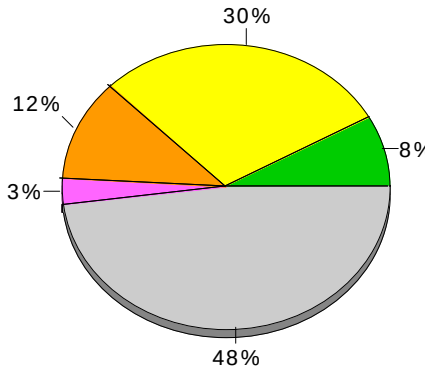
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	80.7	78.0	89.2	86.6	75.9	75.2	70.4	65.4	65.3	68.7	67.7	81.8	905.1
Vent. Fans	42.8	36.3	34.6	22.8	13.3	3.3	0.1	0.2	3.4	13.8	22.9	39.6	233.0
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	367.8	282.2	312.5	302.4	216.1	209.1	216.1	351.8	340.4	351.8	356.0	367.8	3,673.9
Misc. Equip.	49.4	46.6	53.7	53.5	49.4	53.5	53.7	51.6	51.3	51.5	47.1	53.7	615.0
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	184.0	174.1	201.0	200.5	184.0	200.5	201.0	192.5	192.0	192.4	175.0	201.0	2,298.1
Total	724.8	617.3	691.0	665.8	538.6	541.6	541.3	661.4	652.5	678.2	668.7	743.9	7,725.1

Gas Consumption (Btu x000,000)

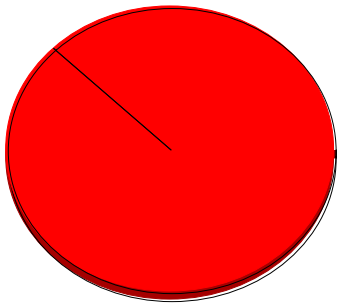
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	9.96	8.54	8.28	5.61	3.40	0.93	0.05	0.06	0.95	3.52	5.61	9.36	56.26
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	9.96	8.54	8.28	5.61	3.40	0.93	0.05	0.06	0.95	3.52	5.61	9.36	56.26

Annual Energy Consumption by Enduse

	Electricity kWh	Natural Gas Btu (x000)	Steam Btu	Chilled Water Btu
Space Cool	-	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	-	56,259	-	-
HP Supp.	-	-	-	-
Hot Water	905.1	-	-	-
Vent. Fans	233.0	-	-	-
Pumps & Aux.	-	-	-	-
Ext. Usage	3,673.9	-	-	-
Misc. Equip.	615.0	-	-	-
Task Lights	-	-	-	-
Area Lights	2,298.1	-	-	-
Total	7,725.1	56,259	-	-



Electricity



Natural Gas

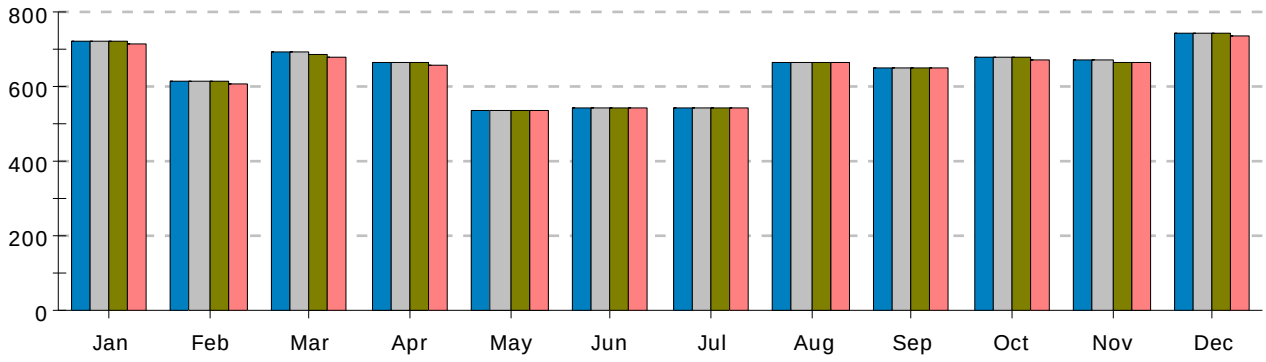
Annual Energy and Demand (pg 1 of 2)

		Ann. Source Energy		Annual Site Energy		Lighting	HVAC Energy			Peak	
		Total Mbtu	EUI kBtu/sf/yr	Elect kWh	Nat Gas Therms	Electric kWh	Electric kWh	Nat Gas Therms	Total Mbtu	Elect kW	Cooling Tons
Annual Energy USE or DEMAND											
0	Base Design	135	117.50	7,725	563	2,298	233	563	57	2	--
1	0+Roof Insul EEM	136	117.74	7,726	565	2,298	234	565	57	2	--
2	1+Ext Wall Insul EEM	131	113.88	7,708	523	2,298	216	523	53	2	--
3	2+Grnd Floor Insul EEM	117	101.61	7,651	387	2,298	157	387	39	2	--
Incremental SAVINGS	**(values are relative to previous measure (% savings are relative to base case use), negative entries indicate increased use)**										
1	0+Roof Insul EEM	-0	-0.24 (-0%)	-1 (-0%)	-3 (-0%)	0 (0%)	-1 (-0%)	-3 (-0%)	-0 (-0%)	0 (0%)	--
2	1+Ext Wall Insul EEM	4	3.86 (3%)	18 (0%)	43 (8%)	0 (0%)	18 (8%)	43 (8%)	4 (8%)	0 (0%)	--
3	2+Grnd Floor Insul EEM	14	12.27 (10%)	57 (1%)	135 (24%)	0 (0%)	59 (25%)	135 (24%)	14 (24%)	0 (1%)	--
Cumulative SAVINGS	**(values (and % savings) are relative to the Base Case, negative entries indicate increased use)**										
1	0+Roof Insul EEM	-0	-0.24 (-0%)	-1 (-0%)	-3 (-0%)	0 (0%)	-1 (-0%)	-3 (-0%)	-0 (-0%)	0 (0%)	--
2	1+Ext Wall Insul EEM	4	3.62 (3%)	17 (0%)	40 (7%)	0 (0%)	17 (7%)	40 (7%)	4 (7%)	0 (0%)	--
3	2+Grnd Floor Insul EEM	18	15.89 (14%)	74 (1%)	175 (31%)	0 (0%)	76 (33%)	175 (31%)	18 (31%)	0 (2%)	--

Annual Costs (pg 2 of 2)

		Annual Utility Cost					Incentives		LCC
		Electric kWh($)	Electric kW($)	Electric Total($)	Nat Gas Total($)	Total ($)	Owner ($)	Design Team ($)	Total (PV$)
Annual COST									
0	Base Design	$ 1,082	--	$ 1,082	$ 1,131	$ 2,213			$ 14,516
1	0+Roof Insul EEM	$ 1,082	--	$ 1,082	$ 1,136	$ 2,218			$ 14,549
2	1+Ext Wall Insul EEM	$ 1,079	--	$ 1,079	$ 1,051	$ 2,130			$ 13,967
3	2+Grnd Floor Insul EEM	$ 1,071	--	$ 1,071	$ 778	$ 1,849			$ 12,106
Incremental SAVINGS	**(values are relative to previous measure (% savings are relative to base case cost), negative entries indicate increased cost)**								
1	0+Roof Insul EEM	$ 0	--	$ 0	$ -5	$ -5			$ -33
2	1+Ext Wall Insul EEM	$ 3	--	$ 3	$ 85	$ 88			$ 583
3	2+Grnd Floor Insul EEM	$ 8	--	$ 8	$ 273	$ 281			$ 1,860
Cumulative SAVINGS	**(values (and % savings) are relative to the Base Case, negative entries indicate increased cost)**								
1	0+Roof Insul EEM	$ 0	--	$ 0	$ -5	$ -5			$ -33
2	1+Ext Wall Insul EEM	$ 3	--	$ 3	$ 80	$ 83			$ 549
3	2+Grnd Floor Insul EEM	$ 11	--	$ 11	$ 353	$ 364			$ 2,410

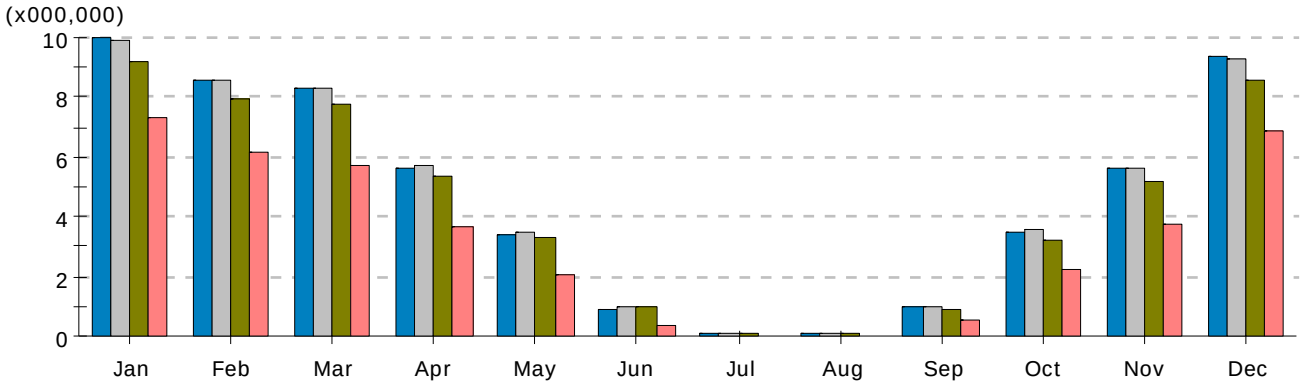
Electric Consumption (kWh)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Run 1.	724.8	617.3	691.0	665.8	538.6	541.6	541.3	661.4	652.5	678.2	668.7	743.9	7,725.1
Run 2.	724.6	617.3	691.1	666.2	539.1	541.9	541.4	661.5	652.7	678.3	668.6	743.6	7,726.1
Run 3.	721.3	614.5	688.6	664.8	538.2	541.6	541.3	661.4	652.1	676.8	666.7	740.3	7,707.8
Run 4.	713.0	606.8	680.0	657.7	533.2	539.5	540.9	661.1	650.8	673.2	661.1	733.1	7,650.6
Run 5.													

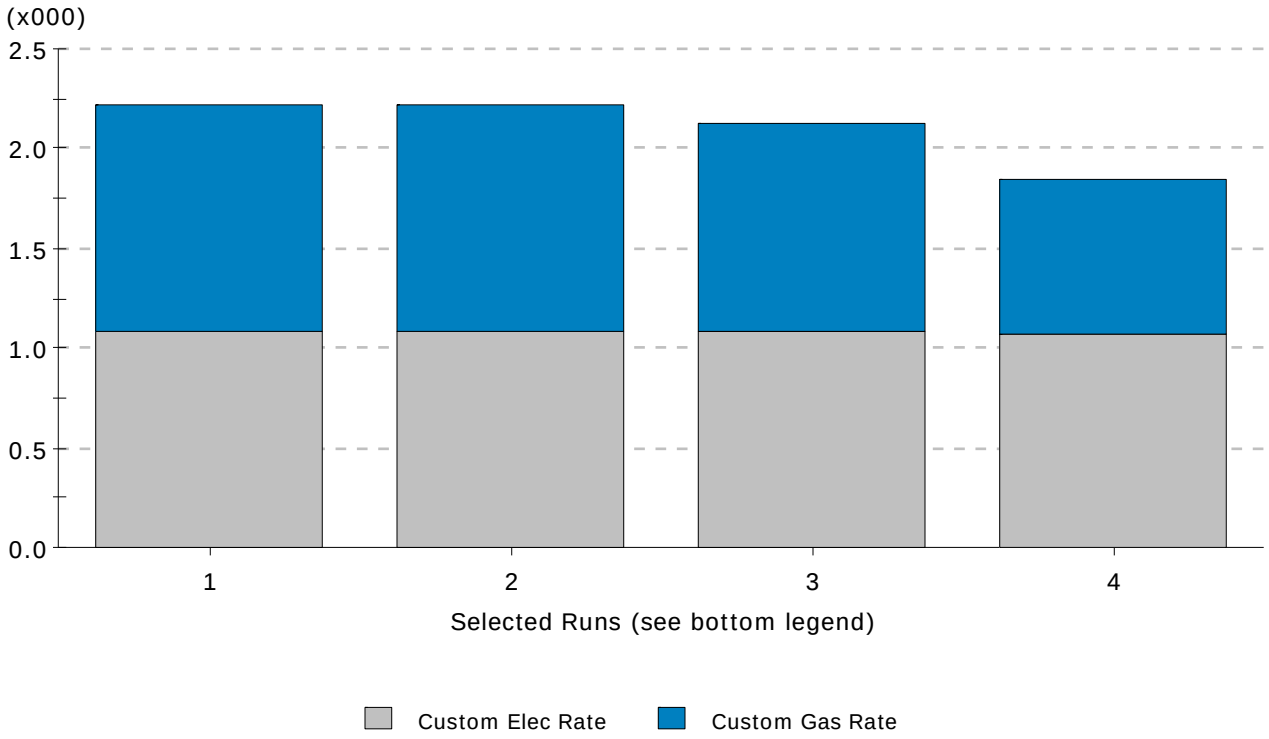
1. Town of Rye - Recreation Bldg - Baseline Design (07/17/09 @ 19:35)
2. Town of Rye - Recreation Bldg - Roof Insul EEM (07/17/09 @ 19:35)
3. Town of Rye - Recreation Bldg - Ext Wall Insul EEM (07/17/09 @ 19:35)
4. Town of Rye - Recreation Bldg - Grnd Floor Insul EEM (07/17/09 @ 19:35)

Gas Consumption (Btu)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Run 1.	9.96	8.54	8.28	5.61	3.40	0.93	0.05	0.06	0.95	3.52	5.61	9.36	56.26
Run 2.	9.92	8.53	8.30	5.70	3.51	1.01	0.06	0.07	1.01	3.53	5.59	9.30	56.53
Run 3.	9.19	7.91	7.73	5.37	3.30	0.94	0.05	0.05	0.86	3.17	5.14	8.56	52.26
Run 4.	7.31	6.13	5.72	3.66	2.05	0.40	0.02	0.03	0.51	2.23	3.79	6.88	38.72
Run 5.													

Annual Utility Bills ($)



1. Town of Rye - Recreation Bldg - Baseline Design (07/17/09 @ 19:35) (annual bill: $ 2,213)
2. Town of Rye - Recreation Bldg - Roof Insul EEM (07/17/09 @ 19:35) (annual bill: $ 2,218)
3. Town of Rye - Recreation Bldg - Ext Wall Insul EEM (07/17/09 @ 19:35) (annual bill: $ 2,130)
4. Town of Rye - Recreation Bldg - Grnd Floor Insul EEM (07/17/09 @ 19:35) (annual bill: $ 1,849)