

# SUSTAINABLE STUDY FOR AFFORDABLE SENIOR HOUSING

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## Golda Meir House Expansion

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SES 5370: Environment, Economics, and Enterprise

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# 1. Project Overview

## 1.1 Introduction

As the population ages, American pension real estate industry will have great market prospects. Pension real estate targets elderly, focusing on universal architectural design and community establishment. Rather than simply providing them accessible and affordable housings, pension real estate also proffers supporting facilities and services, including housekeeping, catering, entertainment, leisure, social contact, rehabilitation, healthcare, and other one-stop services. Under this context, there is still an income gap in mixed-income older people; a sustainable model, both financial and environmental, that fits the middle - and low-income elderly groups should be developed.

2Life Communities, formerly Jewish Community Housing for the Elderly, is a well-established nonprofit provider of senior supportive housing in the Greater Boston area. Since its founding in 1965, 2Life has developed seven distinct properties and nearly 1,300 units, all of which 2Life owns, manages and provides services to: Ulin House, Leventhal House, Kurlat House, and Weinberg House make up 2Life’s complex in Brighton which directly abuts the J.J. Carroll Apartments.



2Life Development Inc., the development arm of 2Life Communities, has been awarded the development rights to a 16,900 square-foot parcel owned by the City of Newton adjacent to Golda Meir House, which will enable them to expand the existing Golda Meir House community. Golda Meir House currently has 199 apartments and a beautiful new “Village Center” with common spaces such as a dining room, lounge, computer center, store, salon, and fitness center, all renovated in 2017-2018 as part of a complete modernization of the property. The expansion proposed to include approximately 68 affordable senior housing residential units, space for a new Program for All-Inclusive Care for the Elderly (PACE) clinic, and other commercial/retail use, as well as new parking spaces, and publicly-accessible open space along Washington St. The extension will be linked to “Village Center”, which offers numerous programs and services to residents. The new residents will benefit from the Village Center, which not only combats isolation for 2 Life residents, but also open to the public to take part in programming.

## 1.2 Design Principles

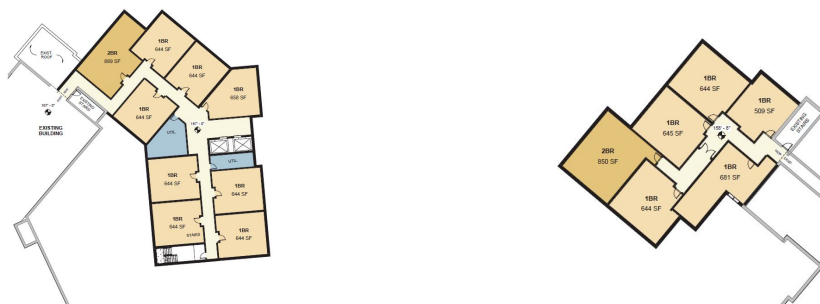
The proposed project will add approximately 68 apartments to 2Life Communities' Golda Meir House through two additions. The 68 new apartments will be added in two additions that connect to the existing building on every floor. The project will also enhance outdoor spaces and utilize the water tower parcel to expand parking. The upper addition will create a new fully accessible entrance from the upper parking lot, and the reconfigured parking lot will expand parking by approximately 29 new spaces.

The project will provide apartments affordable to seniors at a range of incomes as well as to 9 chronically homeless individuals with disabilities. Of the 68 proposed units, approximately 60 will be income-restricted, with the majority set aside for low- and extremely low-income seniors.



The proposed design physically integrates the new additions with the existing building in order to incorporate new residents into this vibrant senior community and incorporate the building's management into a highly efficient operation. By joining 2Life's Golda existing community, new residents will benefit from a wealth of programs, services and support otherwise unavailable in a standalone affordable housing building.

In addition, 2Life will be collaborating with an area college on a graduate student "musician-in-residence" program. One of the apartments will house a graduate student from the New England Conservatory (NEC) who would commit to performances and engagement with our residents. The ground floor of Lower Addition will also feature approximately 11,000 sf for a PACE center, an innovative healthcare model for seniors that will be accessible to eligible 2Life residents and area seniors. In the event that the PACE Center does not move forward, the building would include community-oriented retail and/or program space in a smaller footprint of space.





### 1.3 Investment Budget

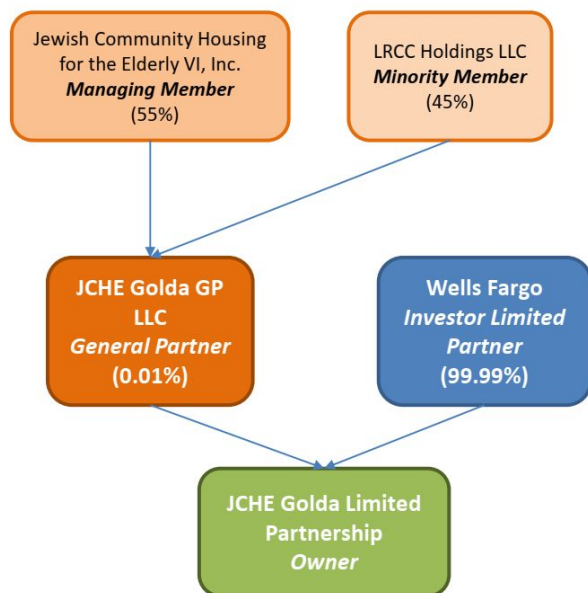
#### 1.3.1 Annual Operational Investment funding sources and uses

The sources of funds are from different public institutions, private sponsors, and limited partners.<sup>2</sup> Life Community is conducting a multi-year public engagement process and as a result of these efforts has become well-known amongst community based organizations, government entities, elected officials, neighbors, and others who could refer potential applicants to the Golda Meir House Expansion. Some of these organizations and entities include the Newton Housing Authority, UCHAN, Engine 6, Livable Newton, Metrowest CD, Newton at Home, Newton Council on Aging, the Newton Senior Center, and Myrtle Baptist Church. JCHE has a close relationship with Springwell, Inc., the Aging Services Access Point for Newton, because Springwell already operates in our Coleman House and Golda Meir House properties.

#### Golda Seller – Previous Owner



#### Golda Buyer – New Owner



In order to make a break-even point, we assume the budget equals the sum of annual operating income and total annual funding. The annual debt service is \$480,940 with a mortgage insurance premium adjusted according to remaining balance per year. The existing investment plan is shown below. The first year operating income after debt service is \$61,161, which should be all distributed for priority payments including asset investor management fee, partnership management fee and deferred development fee. So the cash flow after priority payments is \$ 0 per year.

<b>Debt Service</b>	
Net Operating Income	551,709
Debt Service	(480,904)
Mortgage Insurance Premium	(9,644)
Cash Flow after Debt Service	61,161

(Annual debt service)

Year	0	1	2	3	4	5
	2021	2022	2023	2024	2025	2026
<b>Cash Flow after Debt Service</b>		38,210	43,136	47,986	52,756	57,437
<b>Cash Flow Priority Payments:</b>						
investor Asset Mgmt Fee		(5,000)	(5,150)	(5,305)	(5,464)	(5,628)
Partnership Mgmt Fee		(5,000)	(5,150)	(5,305)	(5,464)	(5,628)
Deferred Development Fee		(28,210)	(32,836)	(37,377)	(41,829)	(46,182)
Cash Flow to General Partner		0	0	0	0	0
Cash Flow to Limited Partner		0	0	0	0	0
<b>Total Priority Payments</b>		<b>(38,210)</b>	<b>(43,136)</b>	<b>(47,986)</b>	<b>(52,756)</b>	<b>(57,437)</b>
<b>Cash Flow after Priority Payments</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

(Net cash flow distribution excerpted from 20 years analysis )

### 1.3.2 Hard Costs and Soft Cost budgets

The hard costs and soft costs budget depend on the fundings amount. In this case, we estimate the total budget for both hard costs and soft costs is \$32,314,845.

<b>SOURCES</b>		
Newton CPA Funds	\$3,250,000	
Permanent Loan	\$7,770,000	
Federal Tax Credit Equity	\$10,298,970	
State Tax Credit Equity	\$3,999,600	
Utility Rebates	\$74,800	
DHCD Sub Debt	\$3,750,000	
Philanthropy	\$2,546,475	
Deferred Developer Fee	\$625,000	
<b>Total Sources</b>	<b>\$32,314,845</b>	
First Mortgage	\$11,520,000	
<b>USES</b>		
	Total	Per Unit
<b>Acquisition</b>	<b>100</b>	<b>1</b>
<b>Hard Costs</b>		
Cost of Construction	\$23,205,897	\$341,263
Contingency	\$1,160,295	\$17,063
<b>Subtotal Hard Costs</b>	<b>\$24,366,192</b>	<b>\$358,326</b>
<b>Soft Costs</b>		
Water Tower Decommissioning	\$500,000	\$7,353
Architect & Engineering	\$1,392,354	\$20,476
Survey and Permits	\$455,341	\$6,696
Clerk of the Works	\$100,000	\$1,471
Environmental Engineer	\$75,000	\$1,103
Energy/Green Reporting	\$75,000	\$1,103
Bond Premium	\$185,647	\$2,730
Legal	\$200,000	\$2,941

Title/Recording	\$40,000	\$588
Accounting/Cost Cert	\$40,000	\$588
Marketing & Rent-Up	\$25,000	\$368
Real Estate Taxes	\$90,000	\$1,324
Insurance (Construction)	\$55,470	\$816
Appraisal	\$25,000	\$368
Construction Loan Interest	\$700,000	\$10,294
Inspecting Engineer	\$50,000	\$735
Construction Loan Fees	\$113,750	\$1,673
Perm Loan Fees	\$155,400	\$2,285
MIP	\$19,425	\$286
Other Financing Fees	\$5,000	\$74
Relocation	\$60,000	\$882
FF&E	\$20,000	\$294
Utility Fees	\$150,000	\$2,206
Pre-Dev Loan Interest/Fees	\$21,250	\$313
Perm Loan Application Fee	\$23,310	\$343
DHCD Processing Fee	\$60,000	\$882
DHCD Compliance Fee	\$22,500	\$331
Soft Cost Contingency	\$232,972	\$3,426
<b>Subtotal Soft Costs</b>	<b>\$4,892,419</b>	<b>\$71,947</b>
Developer Overhead	\$1,250,000	\$18,382
Developer Fee	\$1,250,000	\$18,382
Operating Reserves	\$556,133	\$8,178
<b>Subtotal Fees/Reserves</b>	<b>\$3,056,133</b>	<b>\$44,943</b>
<b>Total Uses</b>	<b>\$32,314,844</b>	<b>\$475,218</b>



### 1.3.3 Existing Income Analysis

The proposed development will be affordable with multiple tiers of affordability serving extremely low-income and low to moderate-income seniors and chronically homeless individuals broken down as follows:

Affordability Ranges	Number of Units
Up to 30% AMI	8 ( <i>Section 8 PBV</i> )
Up to 50% AMI	22 ( <i>MRVP</i> )
Up to 60% AMI	20
60% to 100% AMI	10
Graduate Student apartments	2
Below Market, Unrestricted Units	6
Live-In Site Rep Unit	1
<b>Total</b>	<b>69</b>

Through the income analysis spreadsheet below, we could see that the residential revenue subtotal is \$1,181,652. Consistent with our experience at other JCHE sites, the low-income assisted residents are expected to have an average annual income of approximately \$11,997, and residents in tax credit units are expected to have an average annual income of approximately \$30,000.

RESIDENTIAL INCOME						
Unit Size	Target Population	Net SF	# of Units	Contract Rent	Annual rent per unit	Gross Rent
1 Bedroom (644SF)	≤30% AMI (Sec 8 Units)		7	\$1,563	\$18,756	\$131,292
	≤50% AMI (MRVP Units)		20	\$1,214	\$14,568	\$291,360
	≤60% AMI (LIHTC)		18	\$1,153	\$13,836	\$249,048
	< 100% AMI		8	\$1,800	\$21,600	\$172,800
	No Income Restriction(Market-rate)		4	\$2,500	\$30,000	\$120,000
<b>Subtotal 1 Bedroom Units</b>			<b>57</b>			<b>\$964,500</b>
2 Bedroom (850SF)	≤30% AMI (Sec 8 Units)		1	\$1,914	\$22,968	\$22,968
	≤50% AMI (MRVP Units)		2	\$1,457	\$17,484	\$34,968
	≤60% AMI (LIHTC)		2	\$1,384	\$16,608	\$33,216
	NEC Units		1	\$800	\$9,600	\$9,600
	< 100% AMI		2	\$2,100	\$25,200	\$50,400
	Resident Manager Unit		1	\$0	\$0	\$0
	No Income Restriction(Market-rate)		2	\$2,750	\$33,000	\$66,000
<b>Subtotal 2 Bedroom Units</b>			<b>11</b>			<b>\$217,152</b>
			<b>Total Units</b>			<b>\$1,181,652</b>
<b>Summary:</b>	<b>Subtotal Net Rentable SF</b>	<b>46,058</b>				
<b>Operating Income</b>						
	≤30% AMI (Sec 8 Units)					\$154,260
	≤50% AMI (MRVP Units)					\$326,328
	≤60% AMI (LIHTC)					\$282,264
	NEC Units					\$9,600
	No Income Restriction(Market-rate)					\$409,200
	<b>Residential Revenue Subtotal</b>					<b>\$1,181,652</b>

### 1.3.4 Operations and Maintenance Budget

Similar to hard costs and soft costs, the annual operation and maintenance budgets depend on annual operation fundings amounts. In order to operate this project at break-even, we assume the operation and maintenance expense per year equals the sum of annual operating income and total annual funding, which is \$1,160,122.

<b>Summary Annual Operations &amp; Maintenance Budget(cannot use CPA funds)</b>	
<b>Sources of Funds</b>	
Residential Income	\$1,181,652
Other Rental Income(laundry,Mass.Rental Voucher Program Services)	\$39,528
Vacancy	(\$61,058)
<b>Total Annual Funding</b>	<b>\$528,759</b>
<b>Uses of Funds</b>	
Management Fee	\$59,083
Administration	\$114,000
Maintenance	\$123,800
Residential Services	\$50,000
Security	\$10,000
Utilities	\$145,000
Reserves	\$24,480
Taxed,insurance	\$105,000
Debt Service	(\$480,904)
Mortgage Insurance Premium	(\$9,644)
Required Debt Service Coverage Ratio(1.10)	\$38,211
<b>Total Annual Cost</b>	<b>\$1,160,122</b>
Sale Cap Rate based on actual NOI achieved during year prior to sale	5.00%
Cost associated with sale (as a percent of gross sale value)	2.00%

<b>Operating Expenses</b>	
<b>Management Fee</b>	<b>\$59,083</b>
<b>Administration</b>	
Payroll, Administrative	\$60,000
Payroll Taxes & Benefits, Admin.	\$18,000
Legal	\$2,000
Audit	\$9,000
Marketing	\$10,000
Telephone	\$3,600
Office Supplies	\$4,400
DHCH Monitoring Fee	\$2,000
Other	\$5,000
<b>Admin Subtotal</b>	<b>\$114,000</b>
<b>Operations</b>	
Payroll, Maintenance	\$50,000
Payroll Taxes & Benefits, Admin	\$15,000
Janitorial Materials	\$4,700
Landscaping	\$5,000
Decorating (inter. only)	\$5,600
Repairs (inter. & ext.)	\$10,000
Elevator Maintenance	\$7,000
Trash Removal	\$7,500
Snow Removal	\$6,000
Extermination	\$1,500
Other: Fire Supp, HVAC	\$11,500
<b>Operations Subtotal</b>	<b>\$123,800</b>

Landscaping	\$5,000
Decorating (inter. only)	\$5,600
Repairs (inter. & ext.)	\$10,000
Elevator Maintenance	\$7,000
Trash Removal	\$7,500
Snow Removal	\$6,000
Extermination	\$1,500
Other: Fire Supp, HVAC	\$11,500
<b>Operations Subtotal</b>	<b>\$123,800</b>
<b>Resident Services</b>	<b>\$50,000</b>
<b>Security</b>	<b>\$10,000</b>
<b>Utilities</b>	
Electricity	\$50,000
Cooling	\$25,000
Heat and Hot Water	\$25,000
Water and Sewer	\$45,000
<b>Utility Subtotal</b>	<b>\$145,000</b>
<b>Replacement Reserve</b>	<b>\$24,480</b>
<b>Real Estate Taxes</b>	<b>\$75,000</b>
Insurance	\$30,000
<b>Taxes, Insurance Subtotal</b>	<b>\$105,000</b>
<b>Total Operating Expenses</b>	<b>\$631,363</b>





Year	Growth Rate	0	1	2	3	15	16	17	18	19	20 (sale)
		2021	2022	2023	2024	2036	2037	2038	2039	2040	2041
<b>TOTAL CONSTRUCTION BUDGET</b>		(32,314,844)									
<b>Net Operational Income</b>			553,238	558,825	564,359	624,200	628,398	632,431	636,289	639,961	0
Replacement Reserves	3%		(24,480)	(25,214)	(25,971)	(37,028)	(38,139)	(39,283)	(40,462)	(41,676)	0
<b>Cash Flow after RR</b>			528,758	533,611	538,388	587,172	590,259	593,148	595,828	598,285	0
<b>Debt Cash Flow</b>											
First Mortgage P&I			(480,904)	(480,904)	(480,904)	(480,904)	(480,904)	(480,904)	(480,904)	(480,904)	0
Mortgage interest Premium			(9,644)	(9,571)	(9,498)	(8,621)	(8,548)	(8,475)	(8,402)	(8,329)	0
DSCR			1.10	1.11	1.12	1.18	1.18	1.18	1.18	1.18	0.00
<b>Cash Flow after Debt Service</b>			38,210	43,136	47,986	97,647	100,807	103,769	106,522	109,052	0
<b>Cash Flow Priority Payments:</b>											
investor Asset Mgmt Fee	3%		(5,000)	(5,150)	(5,305)	(7,563)	(7,790)	(8,024)	(8,264)	(8,512)	0
Partnership Mgmt Fee	3%		(5,000)	(5,150)	(5,305)	(7,563)	(7,790)	(8,024)	(8,264)	(8,512)	0
Deferred Development Fee			(28,210)	(32,836)	(37,377)	(82,521)	(85,227)	(87,722)	(89,933)	(92,028)	0
Cash Flow to General Partner			0	0	0	0	0	0	0	0	0
Cash Flow to Limited Partner			0	0	0	0	0	0	0	0	0
<b>Total Priority Payments</b>			(38,210)	(43,136)	(47,986)	(97,647)	(100,807)	(103,769)	(106,522)	(109,052)	0
<b>Cash Flow after Priority Payments</b>			0	0	0	0	0	0	0	0	0
<b>Adjustments to Derive Cash Contributed/Distributed at Purchases and Sale:</b>											
Subtract Initial Grossed Up initial investment		(32,314,844)									
Add Back initial Debt taken		11,520,000									
<b>Total Net Cash Flow</b>		(20,794,844)									10,160,411
Total owner Cash in and Cash Out at Purchase and Sale		(20,794,844)									10,160,411
Total investor Contributions/Distributions taken in between			0	0	0	0	0	0	0	0	0
Total Owner Cash Flow		(20,794,844)	0	0	0	0	0	0	0	0	10,160,411
Total Cash Flow and Timing for IRR Calculation		(20,794,844)	0	0	0	0	0	0	0	0	10,160,411
<b>IRR</b>	-3.70%										
			Multiple on Investment			0					

(Excerpts of DCF Analysis, appendix A)



## 2.Sustainable Strategy

### 2.1 Objective

2Life is a leader in sustainable design with a commitment to exemplifying best practices in green building design focusing on system efficiency, occupant comfort, indoor air quality, and resilient design. While these elements are important for all, it is important to recognize that thermal comfort, healthy building materials, and emergency backup systems can be especially impactful for older adults.

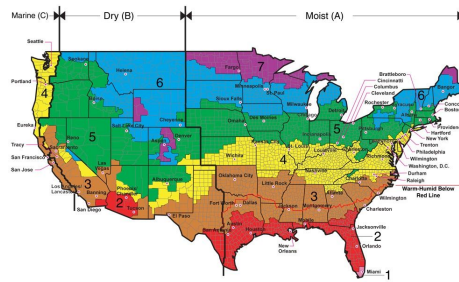
In the Golda Meir House, the green building and sustainable strategies from the following programs were studied and selectly applied:

- LEED Homes Midrise rating system
- ENERGY STAR Certification
- Passive House Certification
- Rooftop Solar PV
- Solar thermal domestic hot water heating
- Zero emissions strategies

### 2.2 Site Improvement

- Landscape
  - Integrate the landscape plans with the stormwater management plan to provide drainage, maximize stormwater absorption, and direct water to plantings to reduce the need for irrigation.
  - minimizing turf due to intensive irrigation and mowing requirements
- Irrigation
  - Install timer/controller that activates the valves for each watering zone at the best time of day to minimize evaporative losses while maintaining healthy plants and obeying local regulations and water-use guidance.
  - Install soil moisture sensor controller per vegetation zone (based on irrigation demand) or rain delay controller.

### 2.3 Passive Solar Heating and Cooling



WINDOWS				SKYLIGHTS		
CLIMATE ZONE	U-FACTOR <sup>1</sup>	SHGC <sup>2</sup>		CLIMATE ZONE	U-FACTOR <sup>1</sup>	SHGC <sup>2</sup>
Northern	≤0.27	Any	Prescriptive	Northern	≤ 0.50	Any
	≥0.28	≥0.32		Equivalent Energy Performance	North Central	≤ 0.53
	≥0.29	≥0.37	South Central		≤ 0.53	≤ 0.28
	≥0.30	≥0.42	Southern		≤ 0.60	≤ 0.28
North Central	≤ 0.30	≤ 0.40				
South Central	≤ 0.30	≤ 0.25				
Southern	≤ 0.40	≤ 0.25				

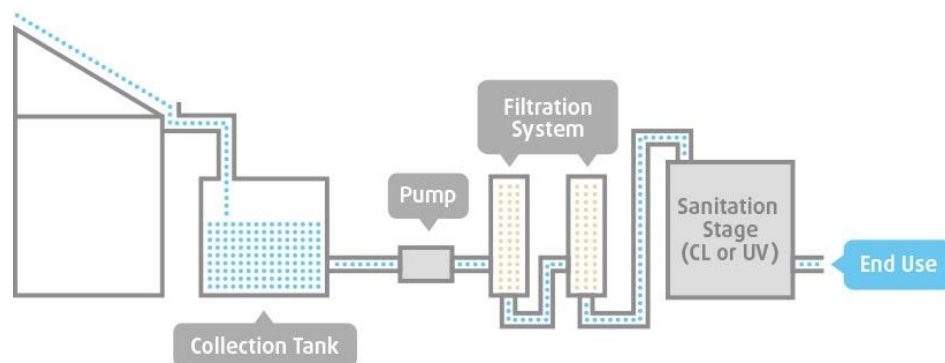
Air Leakage ≤ 0.3 cfm/ft<sup>2</sup>  
<sup>1</sup> Btu/h ft<sup>2</sup>·°F  
<sup>2</sup> Solar Heat Gain Coefficient

- Glazing and shading:
  - Provide windows that are ENERGY STAR Certified, and are appropriate to the climate zones outlined by ENERGY STAR.
  - For south-facing windows, 50% of windows needs to be shaded by June 21

- During the cooling season, block direct heat gain from the sun shining through glass on the east and especially west sides of the facility.
- Passive cooling strategies
  - Plant deciduous shade trees at the south façades.
  - Maximize cross ventilation by installing operable windows at the leeward and windward sides of the building.
  - Install light-colored roofing or coat existing roofs with light-colored elastomeric coatings.

## 2.4 Water

- Water-conserving fixtures
- Efficient Plumbing Layout and Design
  - To minimize water loss from delivering hot water, the hot water delivery system shall store no more than 0.5 gallons of water in any piping/manifold between the fixture and the water heating source or recirculation line.
  - Demand-initiated recirculation systems
  - Well insulated hot water pipes:  $\frac{1}{2}$  or  $\frac{3}{4}$  inch pipe sleeves made with polyethylene or neoprene foam
- Surface Stormwater Management
  - Use rainwater-harvesting systems to reduce precipitation runoff volumes and rates.



- Non-Potable Water Reuse
  - treated greywater
  - water from a municipal recycled water system specifically treated for non-potable uses
  - air-conditioning condensate
  - blowdown water from boilers and cooling towers

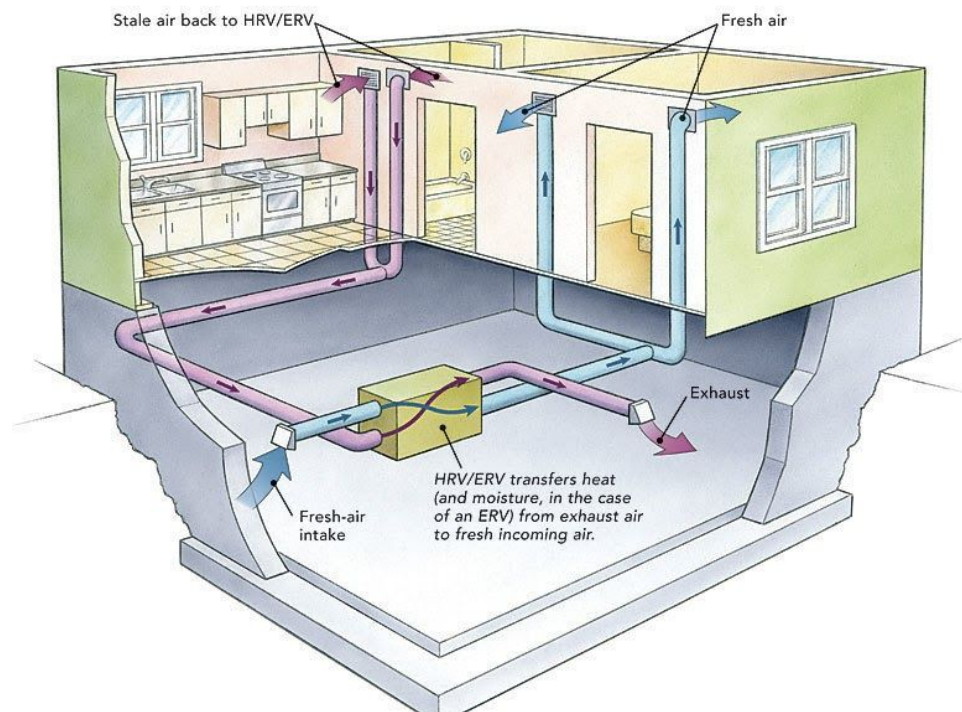
## 2.5 Lighting

- Natural Light
  - Maximize daylighting
  - Increase openings in underlit open areas
- LED lightings

- Use T-8 (or even T-5) fixtures, ENERGY STAR certified LEDs, and other energy-efficient lighting systems that improve light quality and reduce heat gain
- Install LED exit signs
- Lighting Control
  - Dimmable lighting fixtures in well-lit areas
  - Install occupancy sensors to automatically turn off lights when no one is present and back on when people return
  - Programmable lighting control in common areas, clinic, lounges, storage rooms, back-of-house spaces, laundry rooms, and other low-traffic areas

## 2.6 Heating, Ventilating, and Air Conditioning (HVACs)

- Make-up air conditioners with ERVs
  - Installing air conditioners with energy recovery ventilators (ERVs) prevent outside air from rushing in when doors are opened



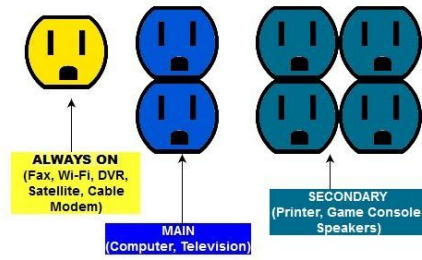
- Programable thermostats
  - Programmable thermostats with control valves on the baseboards in each unit, allowing tenants to control temperature within the parameters of the EMS and preventing them from opening windows when units are being heated
- Sizing of Heating and Cooling Equipment
  - sizing to the sensible load

## 2.7 Power

- Roof solar PV
  - Installing rooftop solar photovoltaic (PV) to offset the overall site energy usage
- Provide smart power strip for residents to purchase at a discount rate



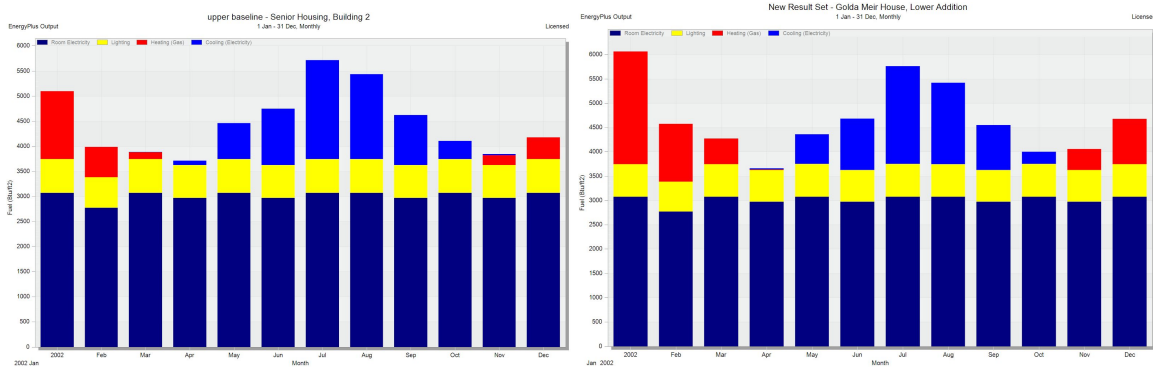
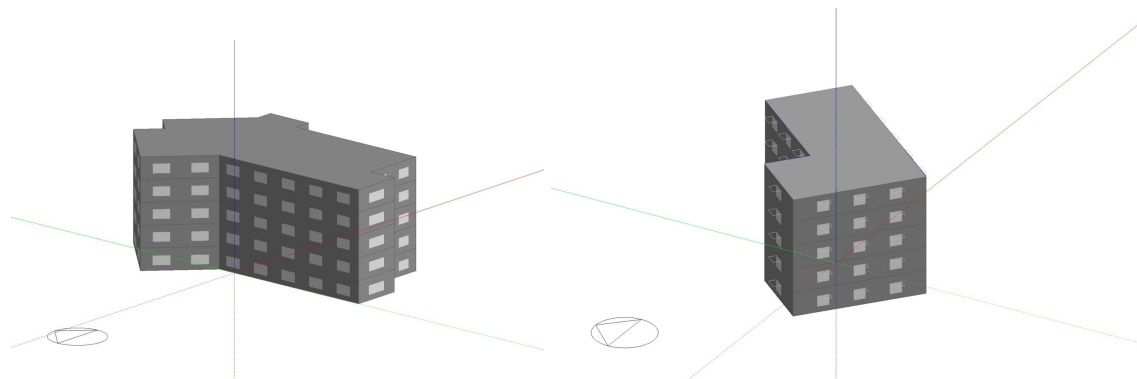
- Plug electronics into a "smart" power strip that let you designate which electronics should always be on, and which ones do not need power when they're not in use. The area around each outlet is often color-coded to help users configure the strip for maximum power savings.



### 3. Energy Model

#### 3.1 Baseline Analysis

We use designbuilder as the tool to build the energy model and verify the energy-saving effectiveness of selected sustainable strategies. With the default setting, double pane glass windows, 20 percent window to wall ratio, 2-pipe fan coil system of HVAC, LED lighting and get the baseline data which is 161.45 kBtu/ft2 Source EUI for the upper addition and 168.92 kBtu/ft2 Source EUI for the lower addition.



Site and Source Energy

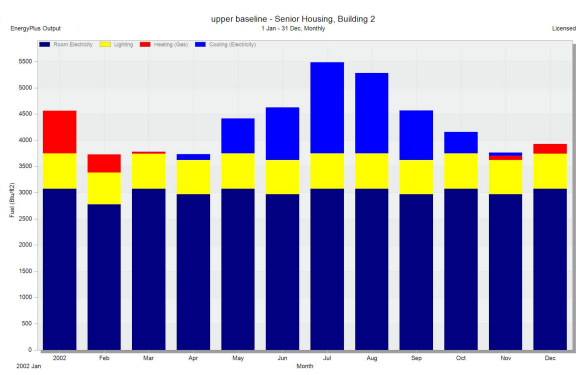
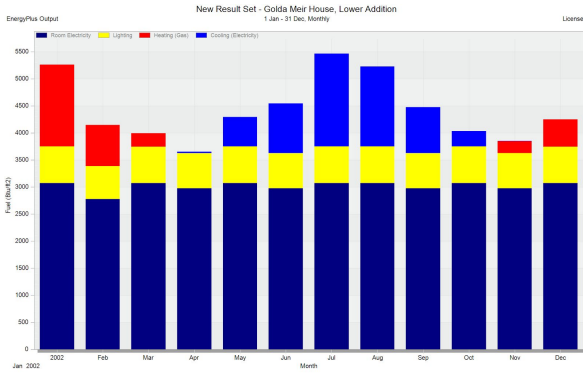
	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft2]
Total Site Energy	2845198.65	59.04
Net Site Energy	2845198.65	59.04
Total Source Energy	7780748.37	161.45
Net Source Energy	7780748.37	161.45

Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft2]
Total Site Energy	996936.35	60.58
Net Site Energy	996936.35	60.58
Total Source Energy	2779659.94	168.92
Net Source Energy	2779659.94	168.92

#### 3.2 Triple Pane Glass

When changing double pane glass to triple pane glass, the heating energy usage in winter drops a lot and saves the total annual energy use by 3%. The energy-saving effects are more obvious in the lower addition building.



Site and Source Energy

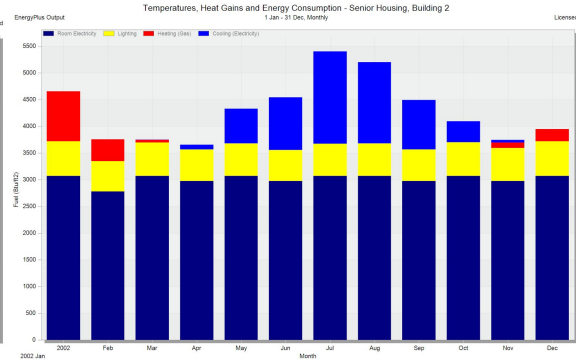
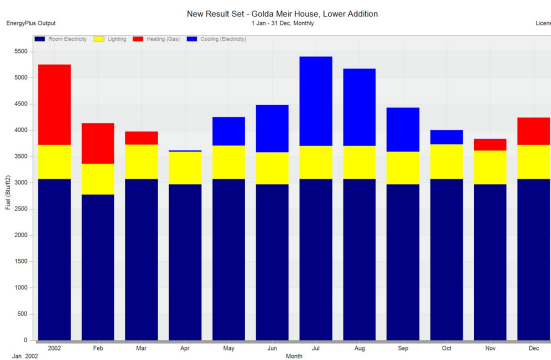
	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft2]
Total Site Energy	2749622.24	57.06
Net Site Energy	2749622.24	57.06
Total Source Energy	7546119.46	156.58
Net Source Energy	7546119.46	156.58

Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft2]
Total Site Energy	944516.57	57.40
Net Site Energy	944516.57	57.40
Total Source Energy	2646611.14	160.83
Net Source Energy	2646611.14	160.83

### 3.3 Occupancy Sensors

Occupancy Sensors help to decrease the lighting energy usage, but only saves the total annual energy use by 0.9%.



Site and Source Energy

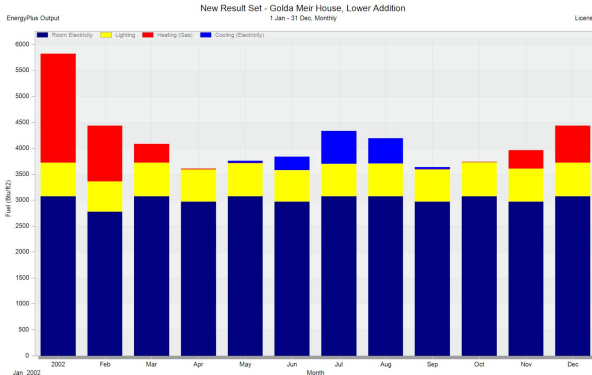
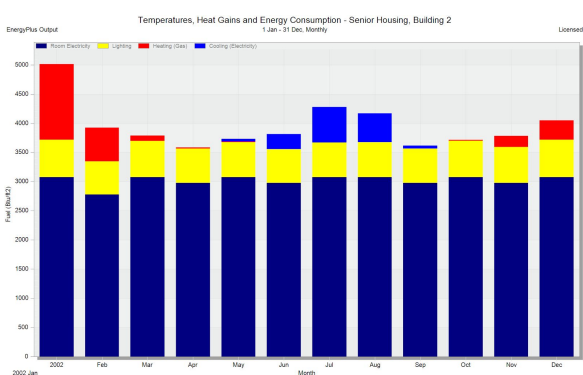
	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft2]
Total Site Energy	2719654.81	56.43
Net Site Energy	2719654.81	56.43
Total Source Energy	7477875.23	155.17
Net Source Energy	7477875.23	155.17

Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft2]
Total Site Energy	937609.91	56.98
Net Site Energy	937609.91	56.98
Total Source Energy	2628165.68	159.71
Net Source Energy	2628165.68	159.71

### 3.4 HVAC

When updating the 2-pipe fan coil system of HVAC to 4-pipe system, the cooling energy usage in summer drops dramatically and saves the total annual energy use by 6.1%. But the heating energy usage in winter increases a bit.





Site and Source Energy

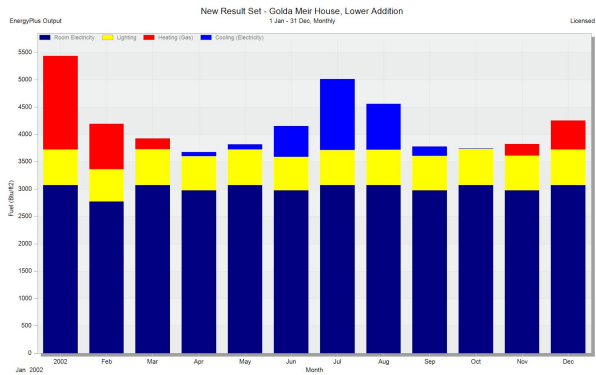
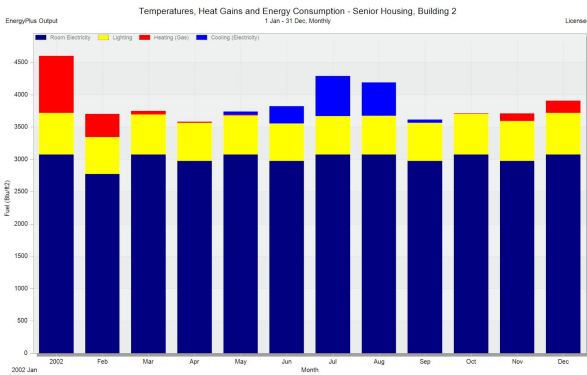
	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft <sup>2</sup> ]
Total Site Energy	2265180.42	47.00
Net Site Energy	2265180.42	47.00
Total Source Energy	7010843.08	145.48
Net Source Energy	7010843.08	145.48

Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft <sup>2</sup> ]
Total Site Energy	793114.02	50.06
Net Site Energy	793114.02	50.06
Total Source Energy	2391813.19	150.97
Net Source Energy	2391813.19	150.97

### 3.5 Wall Insulation

By increasing the insulation thickness of the wall to meet the U-value requirement of 0.20 W/m<sup>2</sup>K, the total annual energy use decreases by 1%, the reduction mainly occurs in the heating energy use in winter.



Site and Source Energy

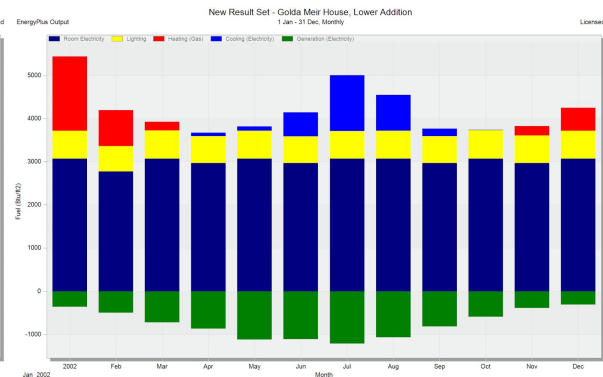
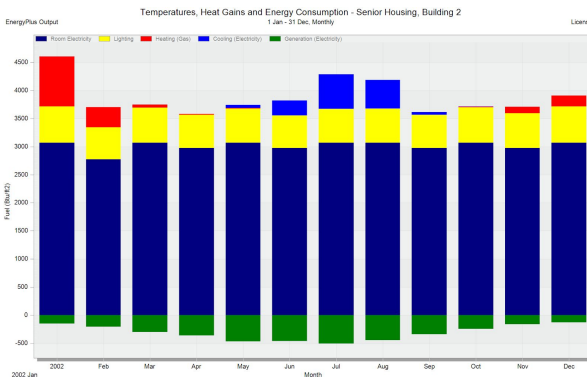
	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft <sup>2</sup> ]
Total Site Energy	2233553.43	46.52
Net Site Energy	2233553.43	46.52
Total Source Energy	6893099.47	143.57
Net Source Energy	6893099.47	143.57

Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft <sup>2</sup> ]
Total Site Energy	799423.16	48.58
Net Site Energy	799423.16	48.58
Total Source Energy	2485729.28	151.06
Net Source Energy	2485729.28	151.06

### 3.6 Roof PV

Using half of the roof area with Solar PV, the net source energy decreases by 8%. The lower addition has higher energy output efficiency with more than 1000 Btu/ft<sup>2</sup> energy output in the summer.



Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft <sup>2</sup> ]
Total Site Energy	2233553.43	46.52
Net Site Energy	2052355.88	42.75
Total Source Energy	6893099.47	143.57
Net Source Energy	6319246.83	131.62

Site and Source Energy

	Total Energy [kBtu]	Energy Per Total Building Area [kBtu/ft <sup>2</sup> ]
Total Site Energy	792994.16	50.05
Net Site Energy	649856.74	41.02
Total Source Energy	2392132.77	150.99
Net Source Energy	1938816.56	122.37

### 3.7 Summary

Sustainable Strategies		Quantity		Energy saving
1.Passive Solar Heating/Cooling	Triple Pane	5508 SQFT	10 Per SQFT	3.0%
2.Lighting	Occupancy sensors	68 Units	550 Per UNIT	0.9%
3.HVAC	IEEC-2000	44358 SQFT	6 Per SQFT	6.1%
4. Water	Low-flow devices	68 Units	300 Per UNIT	4.0%
	Grey Water System	68 Units	3750 Per UNIT	
	Rainwater Harvesting System	2 Units	15000 Per UNIT	
5.Envelope	Wall Insulation	27500 SQFT	1 Per SQFT	1.0%
6.Passive Solar Heating/Cooling	PV Roof	5070 SQFT	85 Per SQFT	8.0%

## 4.Economic Analysis

Generally, the return on investment in the real estate market has fallen to 8-14 percent especially in pension real estate sector, and affordable project always keeps the IRR as 0%, so we think the unleveraged IRR in existing plan is reasonable, which is -3.7%, but the negative part would be compensated by utility rebates and Federal and State Tax Credit Equity.

Our exit plan is clear, in the twentieth year of holding the property, we plan to sell it and a government-led senior housing institution may be our potential buyer to use the property for social welfare. Or alternatively, the 2 life community could still be the asset manager and acquire the property by themselves under the new guidance of the Governor’s Council on Aging in Massachusetts.

### 4.1 Development Budget

All the budgets are the same as the existing proposal. We estimate the total budget for both hard costs and soft costs is \$32,314,845, and the operation and maintenance expense per year equals the sum of annual operating income and total annual funding, which is \$1,160,122.

### 4.2 Units Rents

In order to build an affordable but mixed- income community, the proposed project will add approximately 68 apartments to 2Life Communities’ Golda Meir House through two additions. The project will provide apartments affordable to seniors at a range of incomes as well as to 9 chronically homeless individuals with disabilities. Of the 68 proposed units, approximately 60 will be income-restricted, with the majority set aside for low- and extremely low-income seniors.

<b>UNIT COMPOSITION</b> <i>List number of units in each category.</i>						
<b>UNIT TYPE</b>	<b>≤ 30% AMI *</b>	<b>≤ 50% AMI *</b>	<b>≤ 60% AMI</b>	<b>&lt;100% AMI</b>	<b>No Income Restriction (Market-Rate)</b>	<b>TOTAL</b>
<b>1 BR</b>	7	20	18	8	4	<b>57</b>
<b>2 BR</b>	1	2	2	2	4**	<b>11</b>

\*\*Includes 1 resident manager unit with no rent, and 1 unit with reduced rent set-aside for NEC graduate students. Rents for all other units with no income restriction are proposed to be below a true “market rate.”

The Golda Meir House Expansion will have 59 one-bedroom apartments and 10 two-bedroom apartments. Four apartments will be fully accessible per the standards of the Massachusetts Architectural Access Board. The other 65 apartments will have a variety of universal design features, including easy handicapped adaptability, to help make aging in community an easy option for as long as possible.

#### 4.2.1 Existing Income Analysis

The existing proposal gets revenue on residential unit rent with no commercial space.



<b>RESIDENTIAL INCOME</b>						
Unit Size	Target Population	Net SF	# of Units	Contract Rent	Utility Allowance	Gross Rent
<b>1 Bedroom (644SF)</b>						
	≤30% AMI (Sec 8 Units)		7	\$1,563		\$131,292
	≤50% AMI (MRVP Units)		20	\$1,214		\$291,360
	≤60% AMI (LIHTC)		18	\$1,153		\$249,048
	< 100% AMI		8	\$1,800		\$172,800
	No Income Restriction(Market-rate)		4	\$2,500		\$120,000
<b>Subtotal 1 Bedroom Units</b>			<b>57</b>			<b>\$964,500</b>
<b>2 Bedroom (850SF)</b>						
	≤30% AMI (Sec 8 Units)		1	\$1,914		\$22,968
	≤50% AMI (MRVP Units)		2	\$1,457		\$34,968
	≤60% AMI (LIHTC)		2	\$1,384		\$33,216
	NEC Units		1	\$800		\$9,600
	< 100% AMI		2	\$2,100		\$50,400
	Resident Manager Unit		1	\$0		
	No Income Restriction(Market-rate)		2	\$2,750		\$66,000
<b>Subtotal 2 Bedroom Units</b>			<b>11</b>			<b>\$217,152</b>
			<b>Total Units</b>	<b>68</b>		<b>\$1,181,652</b>
<b>Summary:</b>		<b>Subtotal Net Rentable SF</b>	<b>46,058</b>			
<b>Operating Income</b>						
≤30% AMI (Sec 8 Units)						\$154,260
≤50% AMI (MRVP Units)						\$326,328
≤60% AMI (LIHTC)						\$282,264
NEC Units						\$9,600
No Income Restriction(Market-rate)						\$409,200
<b>Residential Revenue Subtotal</b>						<b>\$1,181,652</b>

<b>CASH FLOW income</b>			
Gross Residential Income			1,181,652
Gross Commercial Income			-
Other Income(parking, laundry, MRVP Services)			39,528
<b>Vacancy</b>			
Residential Vacancy ( Section 8)		3%	(7,713)
Residential Vacancy (MRVP )		3%	(16,316)
Residential Vacancy (LIHRC-60%Units )		3%	(14,113)
Residential Vacancy (NEC Units)		5%	(480)
Residential Vacancy (Moderate Market Rate)		5%	(20,460)
Commercial Vacancy		10%	-
Other vacancy			(1,976)
<b>Total vacancy</b>			<b>(61,058)</b>
<b>Effective Gross Income</b>			<b>1,160,122</b>
(Operating Expenses - Op Ex spreadsheet)			(631,363)
<b>Net Operating Income</b>			<b>528,759</b>
			<i>Per Unit</i>
Capitalized Value		5.00%	10,575,180
			155,517

## 4.2.2 Adjusted with Sustainable Strategies Income Analysis

For our new proposal, we want to reduce 2 units and add 1,710 SQ FT for a small retail and grocery, which brings \$25,500 more annual income.

<b>RESIDENTIAL INCOME</b>						
Unit Size	Target Population	Net SF	# of Units	Contract Rent	Utility Allowance	Gross Rent
<b>1 Bedroom (644SF)</b>						
	≤30% AMI (Sec 8 Units)		7	\$1,563		\$131,292
	≤50% AMI (MRVP Units)		20	\$1,214		\$291,360
	≤60% AMI (LIHTC)		18	\$1,153		\$249,048
	< 100% AMI		8	\$1,800		\$172,800
	No Income Restriction(Market-rate)		4	\$2,500		\$120,000
<b>Subtotal 1 Bedroom Units (850SF)</b>			<b>57</b>			<b>\$964,500</b>
<b>2 Bedroom</b>						
	≤30% AMI (Sec 8 Units)		1	\$1,914		\$22,968
	≤50% AMI (MRVP Units)		2	\$1,457		\$34,968
	≤60% AMI (LIHTC)		2	\$1,384		\$33,216
	NEC Units		0	\$800		\$0
	< 100% AMI		2	\$2,100		\$50,400
	Resident Manager Unit		0	\$9,600		\$0
	No Income Restriction(Market-rate)		2	\$2,750		\$66,000
<b>Subtotal 2 Bedroom Units</b>			<b>9</b>			<b>\$207,552</b>
			<b>Total Units</b>	<b>66</b>		<b>\$1,172,052</b>
<b>Summary:</b>		<b>Subtotal Net Rentable SF</b>	<b>44,358</b>			
<b>Operating Income</b>						
≤30% AMI (Sec 8 Units)						\$154,260
≤50% AMI (MRVP Units)						\$326,328
≤60% AMI (LIHTC)						\$282,264
NEC Units						\$9,600
No Income Restriction(Market-rate)						\$409,200
<b>Residential Revenue Subtotal</b>						<b>\$1,181,652</b>

<b>COMMERCIAL INCOME</b>				
Unit	Unit	Net SF	Rent/SF (NNN)	Annual Income
Commercial 1		1,700	\$ 15.00	25,500
Commercial 2		-	\$ 9.00	0
Commercial 3		-	\$ 9.00	0
<b>Total Commercial SF</b>		<b>1,700</b>	<b>\$ 11.00</b>	<b>25,500</b>





According to the DCF analysis, the unleveraged IRR is -2.0%, which is basically the same as the original proposal and our baseline.

## 4.4 Breakeven Strategy

### 4.4.1 Additive Initial Investment caused by sustainable Strategies

For sustainable strategy, we first listed 7 strategies and calculated the initial investment, energy saving effect.

Sustainable Strategies		Quantity	Initial investment	Energy saving	Original Utility Fee	Utility Fee Saving	
1.Passive Solar Heating/Cooling	Triple Pane Glass	5508 SQFT	10 Per SQFT	\$55,080	3.0%	\$60,900	\$1,837
	South Facing Exterior Shading	680 SQFT	400 Per Ft	\$264,000			
2.Lighting	Occupancy sensors	68 Units	550 Per UNIT	\$37,400	0.9%	\$17,400	\$157
3.Passive Solar Heating/Cooling	PV Roof	5070 SQFT	85 Per SQFT	\$430,950	8.0%	\$145,000	\$11,600
4.HVAC	IEEC-2000	44358 SQFT	6 Per SQFT	\$266,148	6.1%	\$60,900	\$3,722
5. Water	Low-flow devices	68 Units	300 Per UNIT	\$20,400	4.0%	\$44,950	\$1,798
	Grey Water System	68 Units	3750 Per UNIT	\$255,000			
	Rainwater Harvesting System	2 Units	15000 Per UNIT	\$30,000			
6.Envelope	Wall Insulation	27500 SQFT	1 Per SQFT	\$30,250	1.0%	\$60,900	\$609
7.Passive Solar Heating/Cooling	Triple Pane Glass	5508 SQFT	10 Per SQFT	\$55,080	3.0%	\$60,900	\$1,837

After 15 year DCF analysis, we summarize the results as below:

Because this project is a non-profit one and also a long-term rental apartment, we've relaxed the payback period a bit, and we think it's reasonable to invest in strategies with less than 50 years payback period.

Sustainable Strategies	IRR=	payback period=	
1.Passive Solar Heating/Cooling	Triple Pane Glass	-19.46%	
	South Facing Exterior Shading		142.00
2.Lighting	Occupancy sensors	-21.57%	
3.Passive Solar Heating/Cooling	PV Roof	-7.23%	
4.HVAC	IEEC-2000	-12.90%	
5. Water	Low-flow devices	-4.47%	
	Grey Water System		23.56
	Rainwater Harvesting System		
6.Envelope	Wall Insulation	-9.85%	
7.Passive Solar Heating/Cooling	Triple Pane Glass	-5.15%	

As a conclusion, we would invest in passive solar heating/cooling with PV roof, HVAC ICCE-2000, water system, wall insulation and triple pane glass. And the investment will reduce 13% of utility expense per year, which is shown in Appendix B.

### 4.4.2 Village Center Financial Influence

Our budget assumes that we will temporarily relocate the residents from the five units to be reconfigured and moved them back to the reconfigured apartments. The relocation budget also assumes that we will permanently relocate the residents of the four existing units that will be lost to other similar units in Golda Meir House prior to the start of construction.

Besides, we add more commercial space to provide the community one more retail and grocery and get income to offset our investment on sustainable equipment.

## 5. Social Benefits

### 5.1 Public Open Spaces



Approximately 11,500 sf of open space on the existing water tower will be added to the project site. Like other 2Life properties' outdoor spaces, the new open space will be available to the broader Newton community. The open space will include outdoor amenities such as an intergenerational play area, outdoor fitness equipment, and passive shaded areas for rest and relaxation.

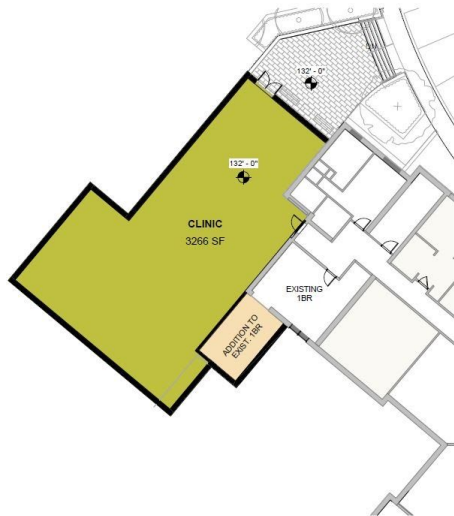
### 5.2 Ground-floor Village Center Space

The extension is well-connected to the Village Center located in the ground floor of the existing Golda Meir House. The Village Center includes a multipurpose room, a lounge, an exercise room, and a salon. The public spaces will also open up during certain hours for the broader community to take part in many activities in the building such as lecture series, concerts, and fitness programs in wishing to promote intergenerational activity.



### 5.3 Access to Innovative Healthcare

The proposed Project includes approximately 3,266 sf for a clinic partnering with Programs of All-Inclusive Care for the Elderly (PACE). Medical experts will visit weekly to provide a comprehensive health and wellness program that helps frail seniors meet their health care needs in the community instead of going to a nursing home. It will be particularly beneficial for extremely low-income older adults who are both Medicare and Medicaid eligible.



## 5.4 Supportive Programs



The building accommodates the needs of the diverse residents as they age. A service team will provide continually evolving services not only for the essential support for disable residents but also offers a wide variety of wellbeing and social programs, which will including:

- Active Maintenance:
  - Vents clearance: Make sure that areas in front of vents are clear of furniture and paper. As much as 25 percent more energy is required to distribute air when vents are blocked.
  - Clean refrigerator: for existing refrigerators, clean refrigerator coils twice a year and replace door gaskets if a dollar bill easily slips out when closed between the door's seals.
- Cooking class: incorporating cooking classes is an excellent way to incentivize residents to eat healthy and prepare meals with fresh foods. The cooking class will include ingredients from the community garden
- Resident Manual: provide a guide for elderly residents that explains the intent, benefits, use, and maintenance of their home's green features and practices. The Resident Manual will encourage green and healthy activities. Those topics shall include, but are not limited to:
  - a routine maintenance plan, outlining responsibilities of residents and maintenance staff with contact information for residents to use for maintenance issues



- HVAC operation
- location of electrical, mechanical, gas, and water turn offs
- recycling and waste management
- energy and water consumption information
- integrated pest management protocols
- interior Active Design features
- community garden and other fresh food resources

## 5.5 Job Creation

The construction of the project is expected to generate and foster over 100 direct and indirect jobs. Besides the indirect jobs created from the construction. Permanent jobs will include new positions such as in resident services & maintenance and new clinic employees. In addition, 2Life anticipates annual local vendor contracts for landscaping, HVACs systems, and weekend farmers' markets in new public open space.

## 5.6 Transit-Oriented Development

The site is located near MBTA Green Line Woodland Station, which provides easy access between the site and downtown Boston, Harvard Square and Massachusetts General Hospital. The proposed Social Sustainable Amenity Package will include van services for shopping and cultural amenities each week, helping many residents remain independent without owning a car. The project also proposes relocating and upgrading the existing MBTA bus shelter on Washington St along with a new Bluebikes station.





## 6. Conclusion

Based on the analysis above, the affordable senior housing project is reliable for sustainable strategy investment. Firstly, the developing need for senior housings in Boston and the preferential policy of the government guarantee the potential market size. It is reasonable to believe that the demand will keep growing among low and middle-income elder people. Secondly, the unleveraged IRR is -2%, which not only keeps breaking even but actually we get higher returns compared with the original plan. Above all, the project is worth being developed because it can not only benefit the old people but only provide the neighborhood with much more social benefits.

### (1) Financial aspect:

This project is very special as a non-profit one. Our budget is limited but we still could get a high level of sustainability and become required in the U.S. building code. With this level of sustainability, the building still operates at break even. Since we have other fundings and rebates, the developer could even make a profit.

The other strategy to operate at break-even is to add some commercial space for rental income in a community from other residents as we mentioned in the center village chapter.

### (2) Sustainable aspect:

This project investigates sustainability from several aspects, such as passive solar heating and cooling, site improvements, lighting, and power, from construction to operation. The proposed Golda Meir additions will include a number of sustainable design features, including a very tight envelope and sustainable systems to use energy and water most efficiently. Although some of the sustainable solutions have a payback period longer than 20 years, the energy savings are still crucial and will benefit the long-term operation. Some of the strategies not only can alleviate the environmental costs, but also provide mental and physical protection to the venerable elderly residents.

### (3) Social aspect:

Although non-profit, this kind of project provides affordable senior housing in a supportive, caring community. Fifty-seven of the 69 apartments in the Golda Meir House Expansion are restricted to the elderly. Some apartments are designed to meet Massachusetts Architectural Access Board standards, and applicants for these units must require the special design features of these units. All units feature universal design adaptation to help make apartments more livable as people age.

### (4) Hedonic aspect:

One benefit we could consider is to provide the elder people an inclusive program to live in the community equally. This project tries to narrow the income gap through Lottery Procedure for Extremely Low-Income units.

As a senior housing project, Golda Meir House provides the elder residents a collective living space. According to *The Longevity Economy: Inside the World's Fastest-Growing, Most Misunderstood Market* (Public Affairs, 2017), a stronger life purpose was associated with decreased mortality, social engagement, a favorable lifestyle.











