HARVEST VILLAGE

SOLAR DECATHLON - U.S. DEPARTMENT OF ENERGY - ATTACHED HOUSING
2019 STUDENT DESIGN COMPETITION - DIVISION PRESENTATION
BY **THE NEW RURALISTS**

HARVEST VILLAGE

COMMUNITY MASTERPLAN

PROJECT DATA

- **Location:** 3260 Oxford Millville Rd, Oxford, OH 45056
- **County:** Butler
- **Development Details:** Community housing development of 1, 2 and 3 bedroom attached homes
- **Total Number of Units:** 108
- **Maximum Density:** 12 units/acre
- **Proposed Density:** 4.7 units/acre

- **Unit Sizes (Leaseable SF):**
  1-Bedroom (12): 722 SF
  1-Bedroom Accessible (12): 839 SF
  2-Bedrooom (60): 1,632 SF
  2-Bedroom Accessible (12): 1,394 SF
  3-Bedroom (12): 1,726 SF

TEAM MEMBERS

BEN ARIAS
Zoology Major
Architecture Minor
4th-Year Student
Team Leader

MAITREY PRAJAPATI
Architecture Major
Passive House Consultant
3rd-Year Student
Team Leader

IVAN DYE
Architecture Major
Student-Athlete
3rd-Year Student

AMY FERRIS
Architecture Major
Sustainability Major
3rd-Year Student

EMMA HOY
Engineering Major
Spanish Linguistics Minor
4th-Year Student

BLAKE KEM
Architecture Major
Spanish Major
3rd-Year Student

KARI KRUSE
Architecture Major
Management Minor
4th-Year Student

YUE SHI
Architecture Major
Interactive Media Studies
4th-Year Student

FACULTY AND INDUSTRY PARTNERS

MARY ROGERO
Dept. of Architecture
Associate Professor
Licensed Architect
CPHC, LEED AP

JOHN RICHTER
Dept. of Mechanical and Manufacturing Engineering
Clinical Faculty

HUMAN NATURE

Heapy Engineering
MEP Design Technology Planning Commissioning Energy
Nationally Recognized Leader in Sustainability

MIAMI UNIVERSITY
OXFORD OHIO
DOUG HAMMERLE
Director of Energy Systems

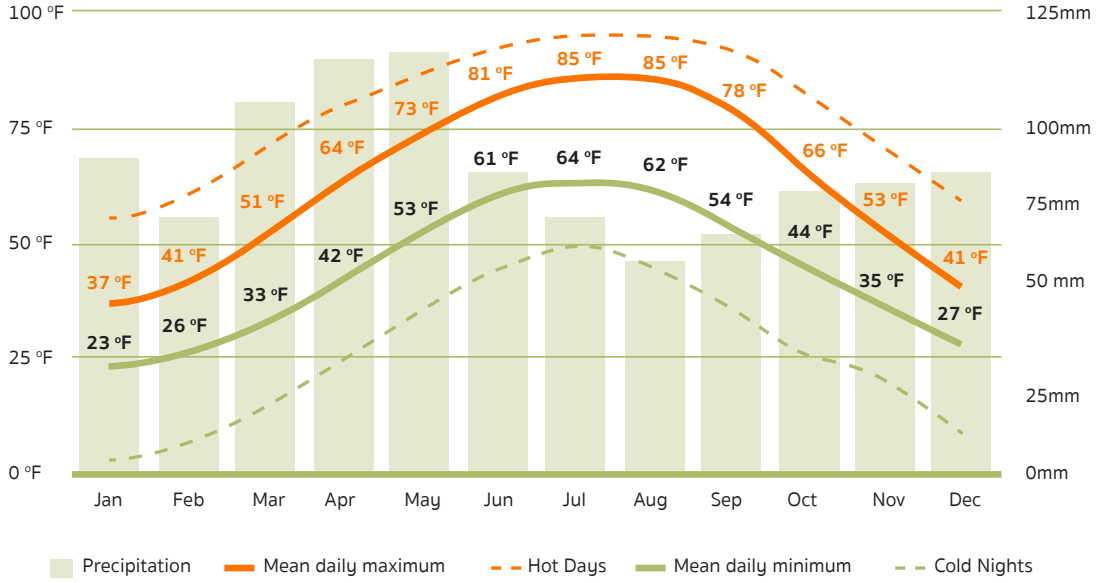
Butler Rural Electric Cooperative, Inc.
Your Touchstone Energy® Partner

CLIMATE

CLIMATE DATA

Climate Zone: 5A
Annual Precipitation: 41.67 inches
Annual Average Sunrise: 177 days, 2,124 hours
Annual Average Global Solar Radiation:
4.39 kWh/m2/day or 1604.41 kWh/m2/year
Elevation: 928 feet
Average Heating Degree Days (68 Degree): 5,931
Average Cooling Degree Days (68 Degree): 977
ASHRAE 99.6% Heating DB: -18.1 F
ASHRAE 99% Heating DB: -14.9 F
ASHRAE 0.4% Cooling DB/MCWB: 32.5/22.5 F
ASHRAE 1% Cooling DB/MCWB: 31.3/22.8 F
Extrapolated EPA Radon Zone: 1

AVERAGE TEMPERATURE AND PRECIPITATION

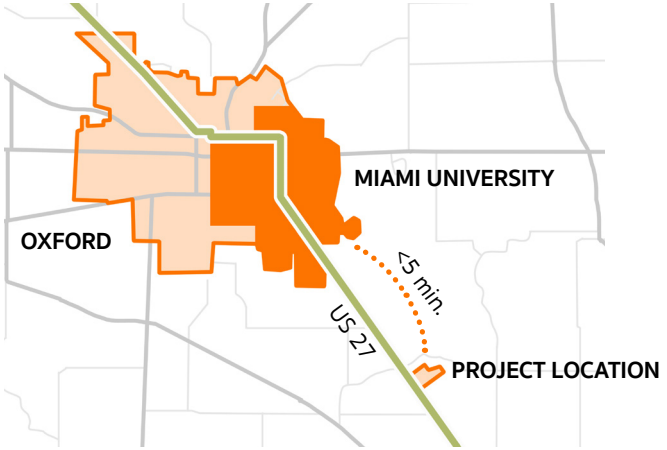


Source: Meteoblue

CONTEXT

AREA PLAN

CONTEXT PLAN



THE CITY

THE NEIGHBORHOOD

THE SITE

TECHNICAL HIGHLIGHTS

PHIUS+ 2018 DESIGN PARAMETERS

- **Annual Heating Demand:** 9.0 kBTU/ft^{2}yr
- **Annual Cooling Demand:** 10.3 kBTU/ft^{2}yr
- **Peak Heat Load:** 5.7 BTU/ft^{2}hr
- **Peak Cool Load:** 5.2 BTU/ft^{2}hr
- **Annual Primary Energy:** 3,840 kWh/p/yr
- **Air Tightness:** 0.06 CFM/ft^2 @ 50 Pa

TECHNICAL SPECIFICATIONS

- **Wall Insulation:** R-34
- **Foundation Insulation:** R-20
- **Roof Insulation:** R-43
- **Window Performance:** Klearwall AluClad Passiv triple pane window units, 0.125 U-value, SHGC: 0.6
- **Door Performance:** Alpen Clear Performance Tyrol Series
- **Wall System:** BuildSMART Multi-Story System w/ Rainscreen
- **Roof System:** Wood Raised-Heel Truss

MEP SYSTEMS

- **Ventilation System:** Ultimate Air ERV
- **Cooling and Heating:** Mitsubishi Electric Horizontal ducted Mini-Split
- **Water Heater:** Rheem (30 - 50 gal.) Electric Water Heater
- **Electrical System:** LED Fixtures
- **Photovoltaics:** Sunflower 4kW - 6kW system
- **Appliances:** Samsung Energy Star, High Efficient Appliances
- **Plumbing:** Low flow, WaterSense certified fixtures

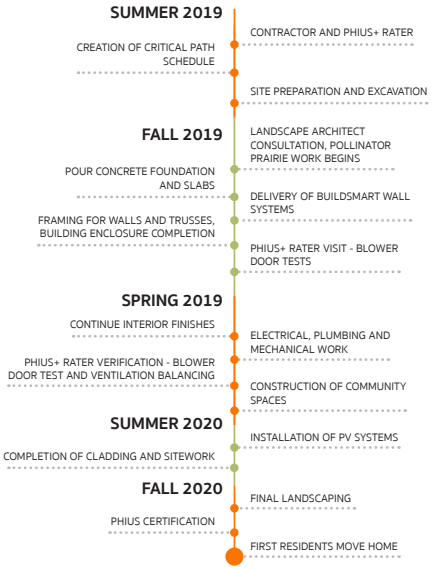
EUI ESTIMATE AT PH STANDARD

- **1-Bed:** 17.29 kBTU/ft^2/yr
- **1-Bed Accessible:** 16.32 kBTU/ft^2/yr
- **2-Bed:** 12.86 kBTU/ft^2/yr
- **2-Bed Accessible:** 11.09 kBTU/ft^2/yr
- **3 Bed:** 14.63 kBTU/ft^2/yr

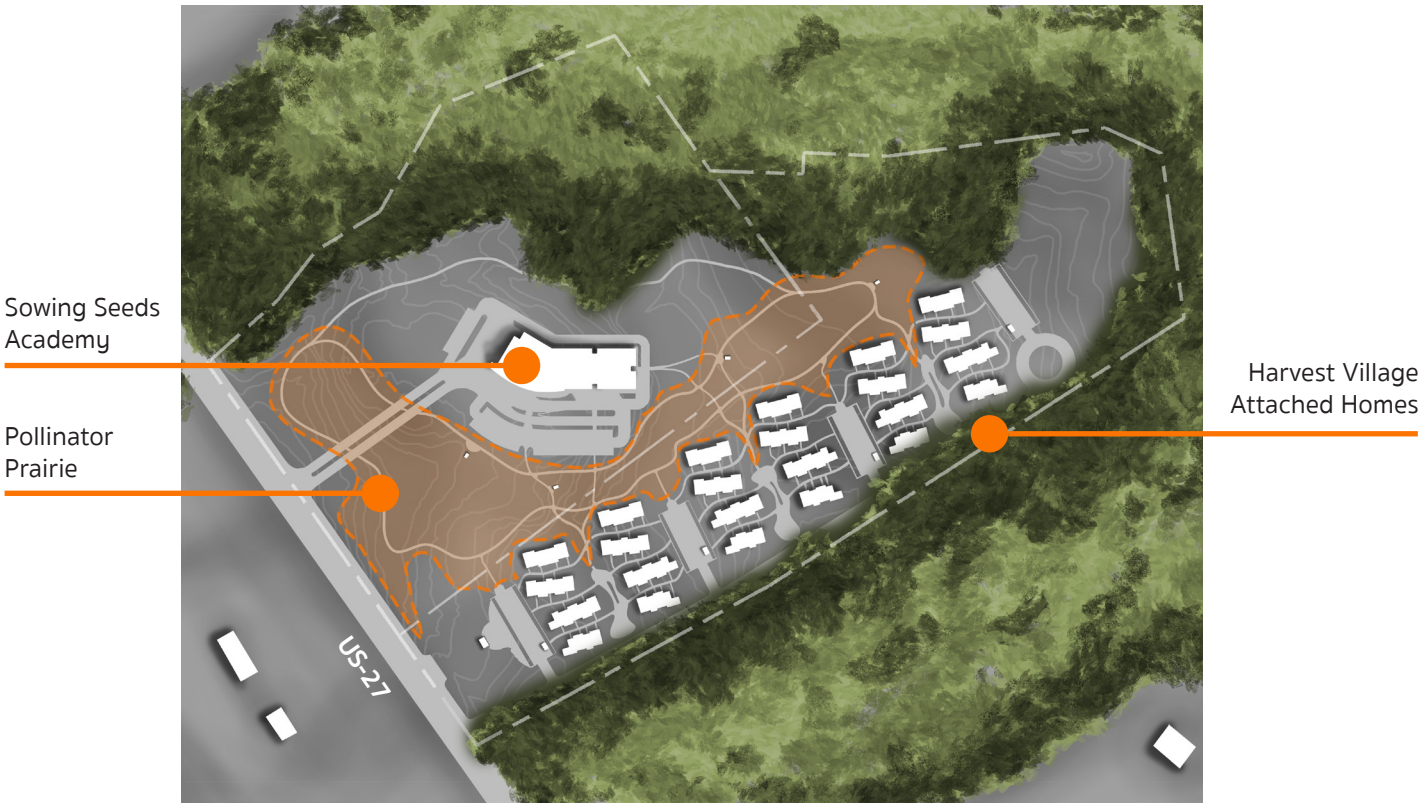
HERS SCORES

- **1-Bed:** 67 before PV, 0 after PV
- **1-Bed Accessible:** 49 before PV, -6 after PV
- **2-Bed:** 64 before PV, -1 after PV
- **2-Bed Accessible:** 58 before PV, -14 after PV
- **3 Bed:** 61 before PV, -6 after PV

CONSTRUCTION TIMELINE

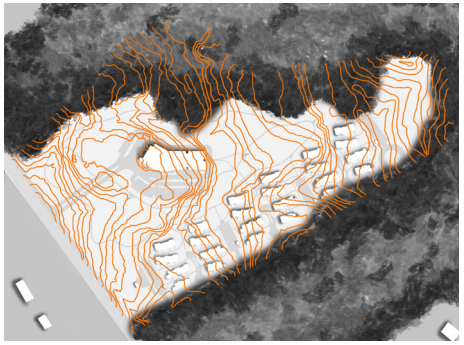


SITE

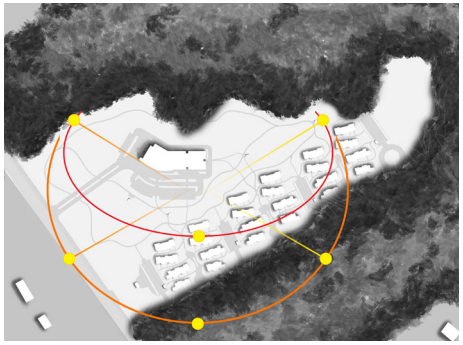

Sowing Seeds Academy
Pollinator Prairie
Harvest Village Attached Homes
US-27

SITE ANALYSIS

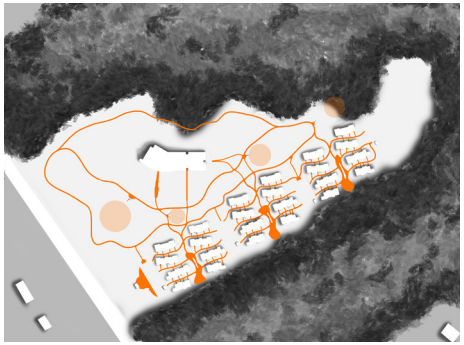
Wind



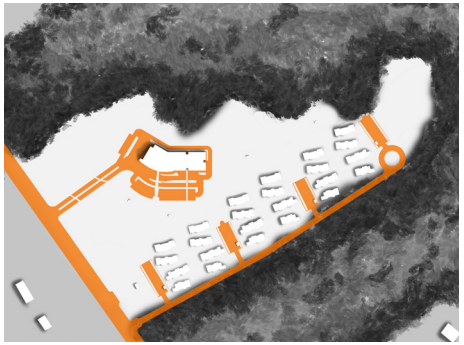
Topography



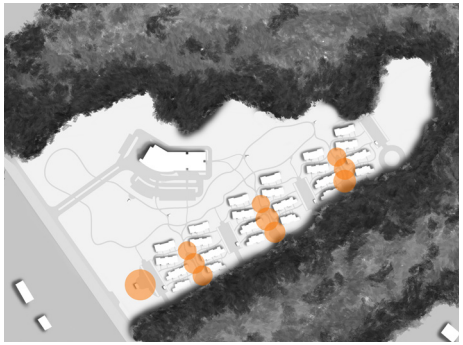
Sun Path



Paths and Nodes



Parking and Hardscapes



Community Spaces

NARRATIVES

STACY AND REBECCA |
UNIT TYPE "A": 2 BEDROOM

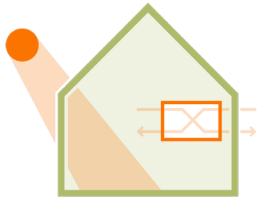
LAWRENCE AND ETHEL |
UNIT TYPE "B": 1 BEDROOM

RICARDO |
UNIT TYPE "C": 1 BEDROOM

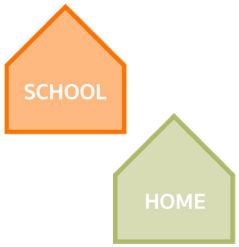
THE MITCHELL FAMILY |
UNIT TYPE "D": 3 BEDROOM

PROJECT GOALS

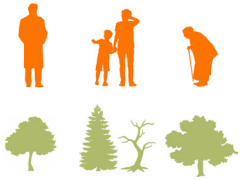
PASSIVE HOUSE



SYMBIOSIS BETWEEN EDUCATION AND LIVING



ECOLOGICAL REGENERATION



EFFICIENT, MARKET-READY HOUSING

PERSONAL ENERGY USE MONITORING

DYNAMIC AND UNIVERSAL DESIGN

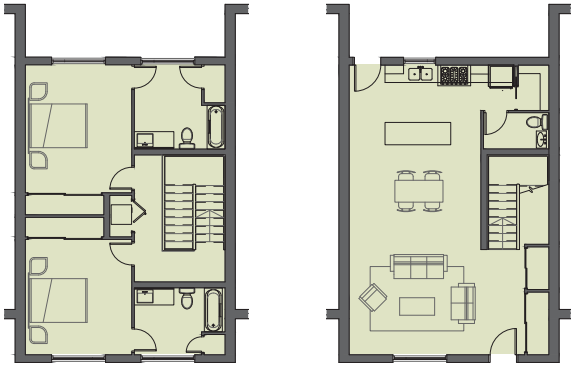
UNIT PLANS

UNIT TYPE “1”
1 BEDROOM, 1 1/2 BATH
722 SF

x12

First Floor Plan | Second Floor Plan

UNIT TYPE “2”
2 BEDROOM, 2 1/2 BATH
1,632 SF

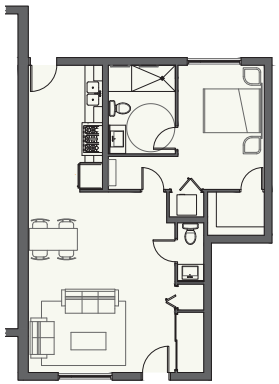


Second Floor Plan | First Floor Plan

x60

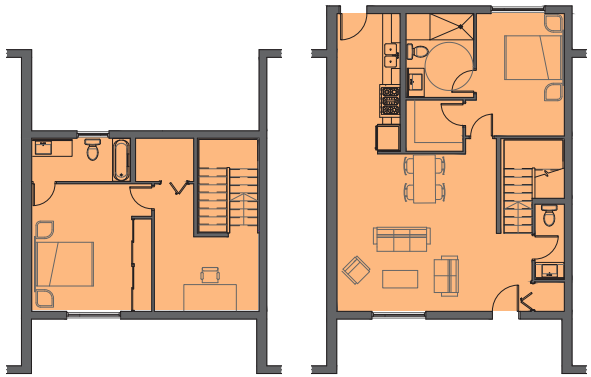
UNIT TYPE “1A”
1 BEDROOM, 1 BATH ACCESSIBLE
839 SF

x12



First Floor Plan

UNIT TYPE “2A”
2 BEDROOM, 2 1/2 BATH ACCESSIBLE
1,394 SF



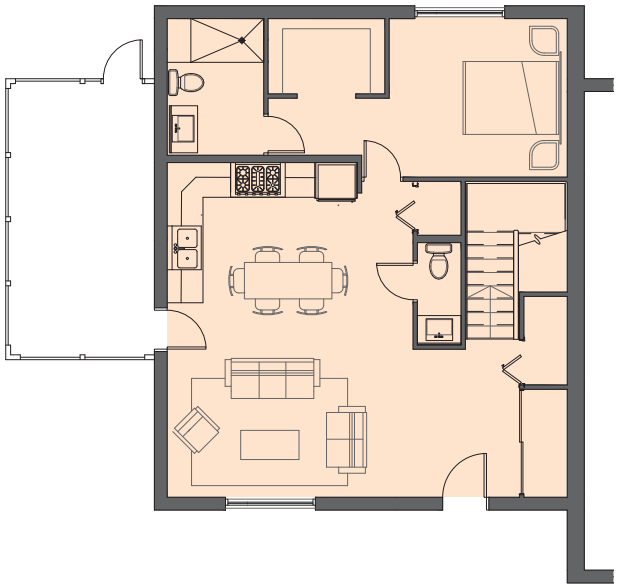
Second Floor Plan | First Floor Plan

x12

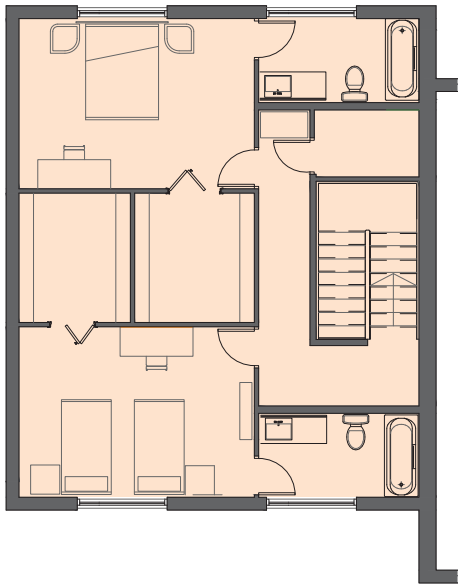
UNIT PLANS

UNIT TYPE "3"

3 BEDROOM, 3 1/2 BATH ACCESSIBLE
1,726 SF



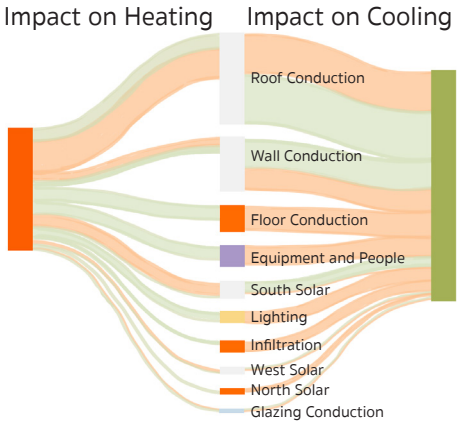
First Floor Plan



Second Floor Plan

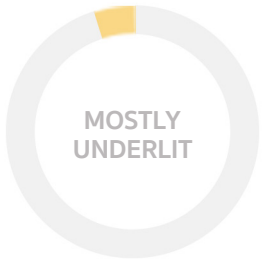
x12

SEFAIRA



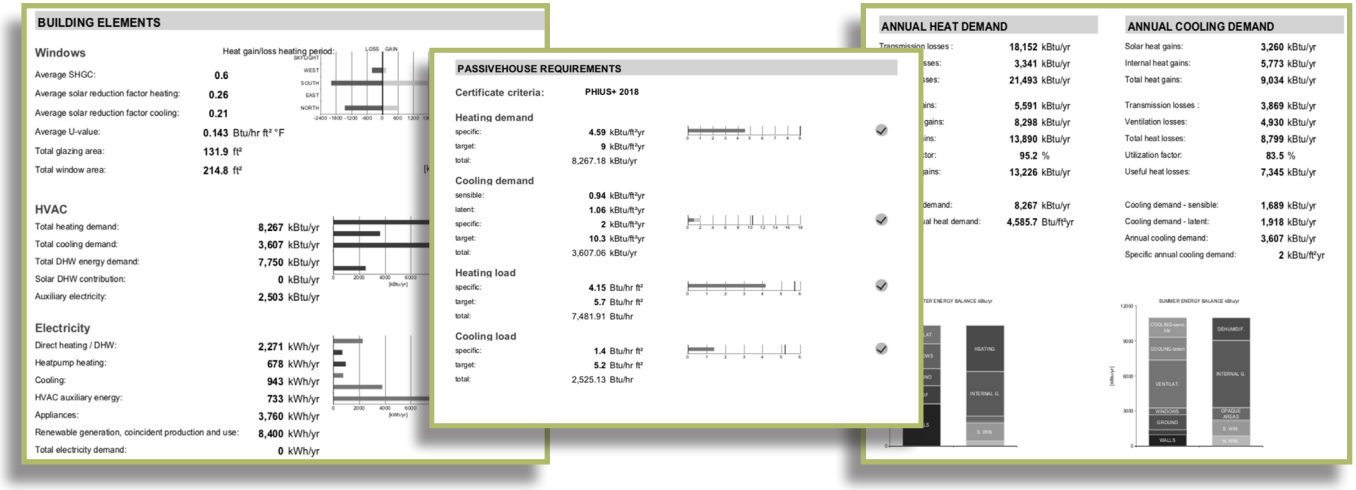
3-Bedroom Unit Total Floor Area

1,917 gsf



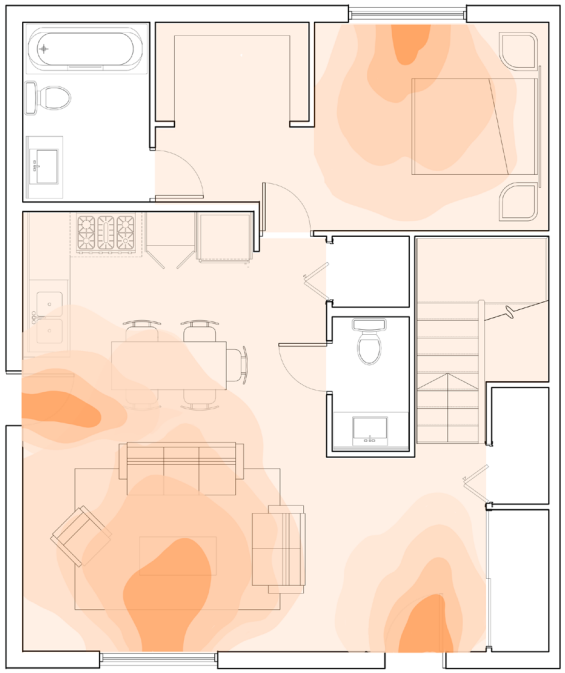
*Based solely on direct sunlight, excluding interior ambient light

WUFI PASSIVE

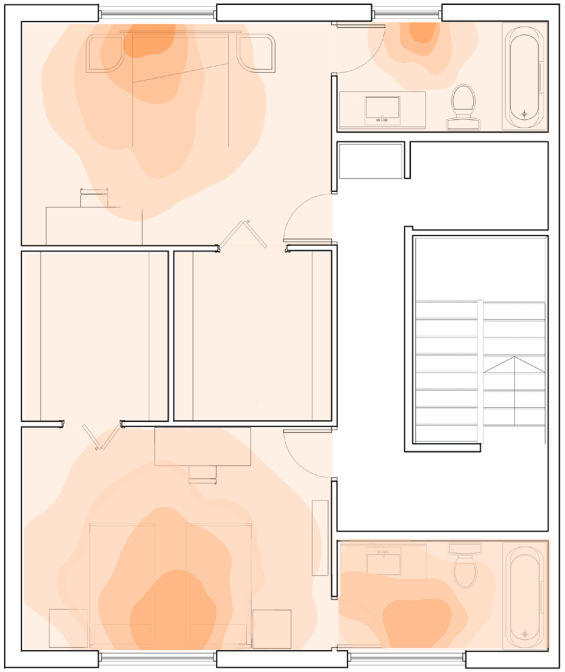


DAYLIGHTING

ILLUMINANCE DIAGRAM



First Floor Plan



Second Floor Plan

100 — 10,000

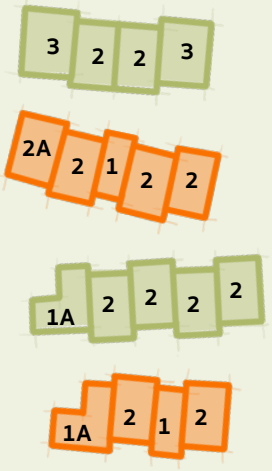
Illuminance (LUX)

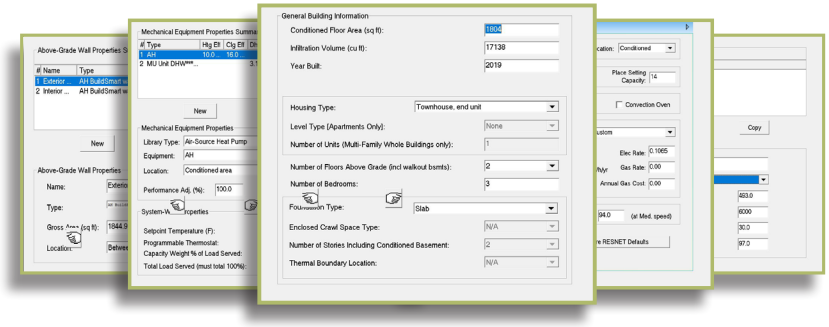
- Based on average annual illuminance

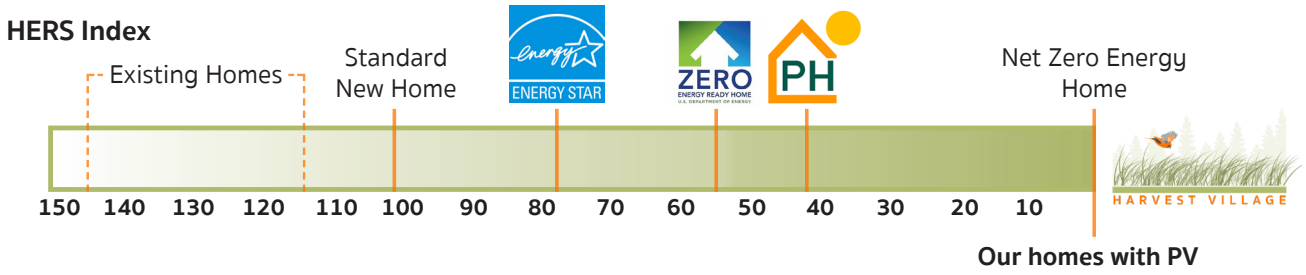
REM/RATE AND HERS ANALYSIS

ROW	UNIT TYPE	HERS BEFORE PV	HERS AFTER PV	COOLING LOAD (MMBtu)	HEATING LOAD (MMBtu)	ANNUAL COST ($)
A	3	61	-6	8.7	5.1	-39
	2	64	-1	7.1	4.2	53
B	1	67	0	4.7	3.2	62
	2	64	-1	7.1	4.2	53
	2A	58	-14	6.9	5.3	-146
C	1A	49	-6	3.1	2.6	-11
	2	64	-1	7.1	4.2	53
D	1	67	0	4.7	3.2	62
	1A	49	-6	3.1	2.6	-11
	2	64	-1	7.1	4.2	53

UNIT TYPE ARRANGEMENTS:

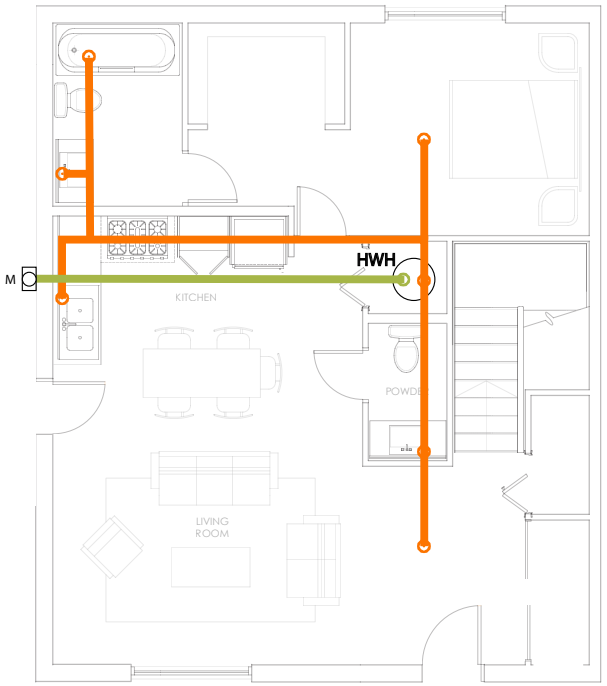






PLUMBING AND WATER USAGE

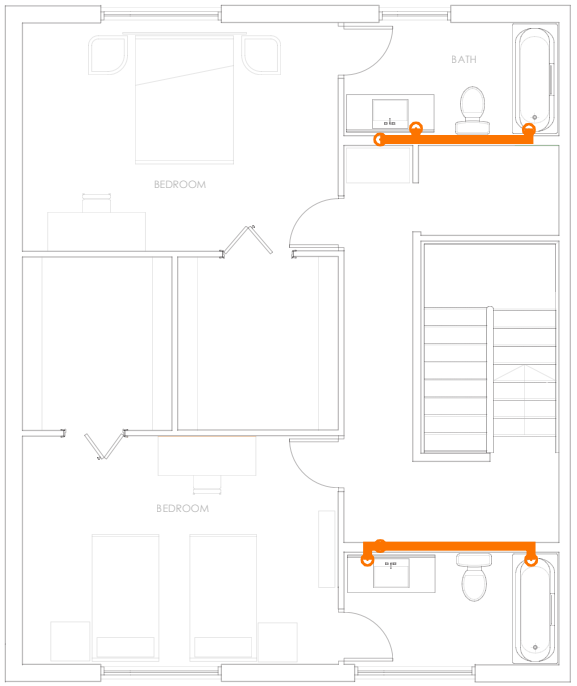
SCHEMATIC HOT WATER PLAN



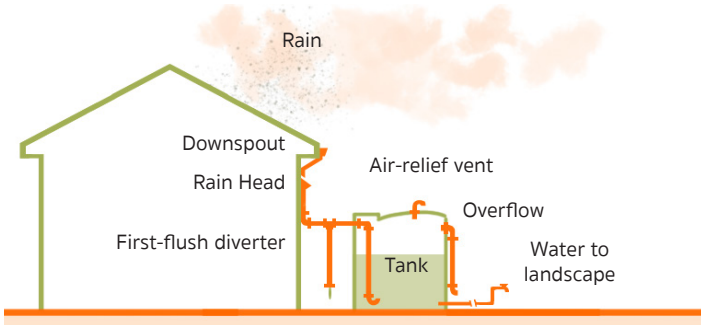
First Floor Plan

LEGEND:

- Hot
- Cold

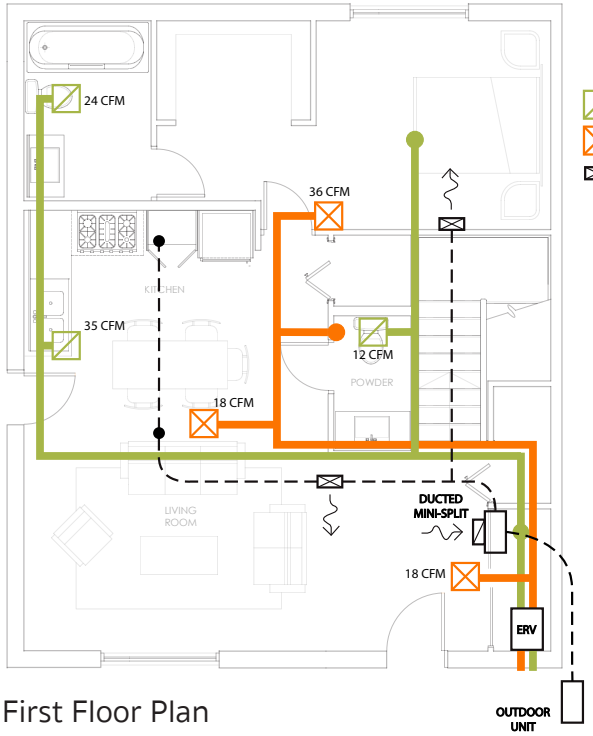


Second Floor Plan



ERV AND VENTILATION

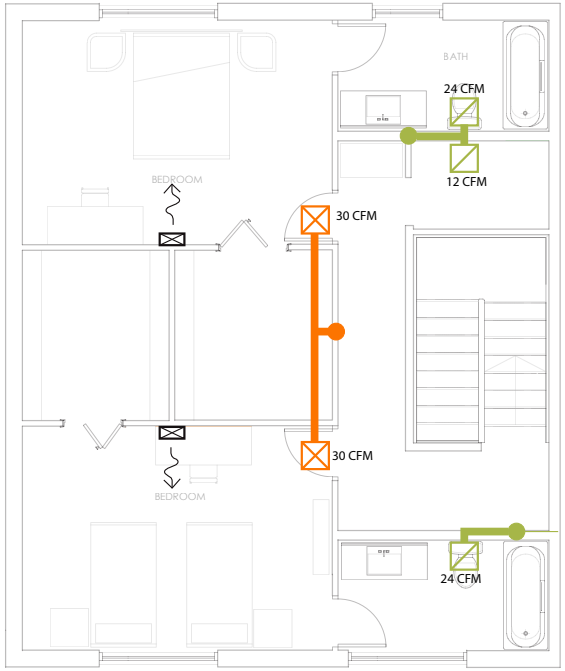
SCHEMATIC MECHANICAL PLAN



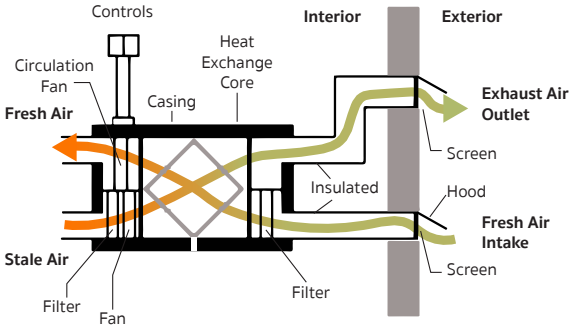
First Floor Plan

LEGEND:

- Exhaust
- ERV Supply
- Mini-Split Supply

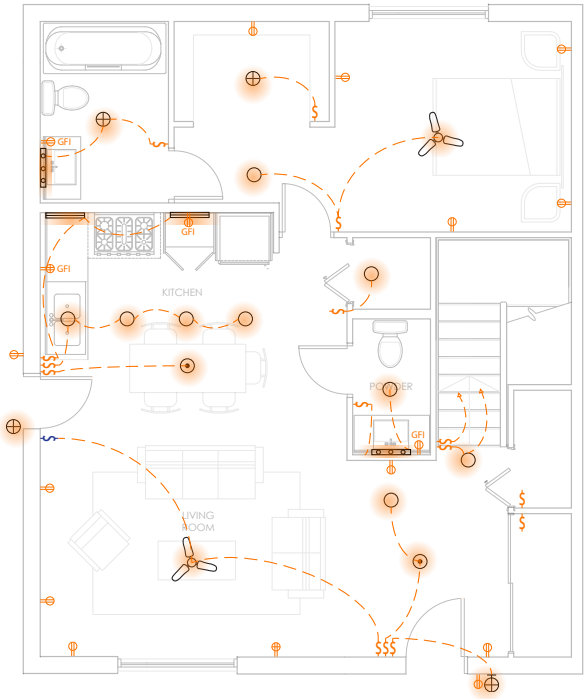


Second Floor Plan



ELECTRICAL

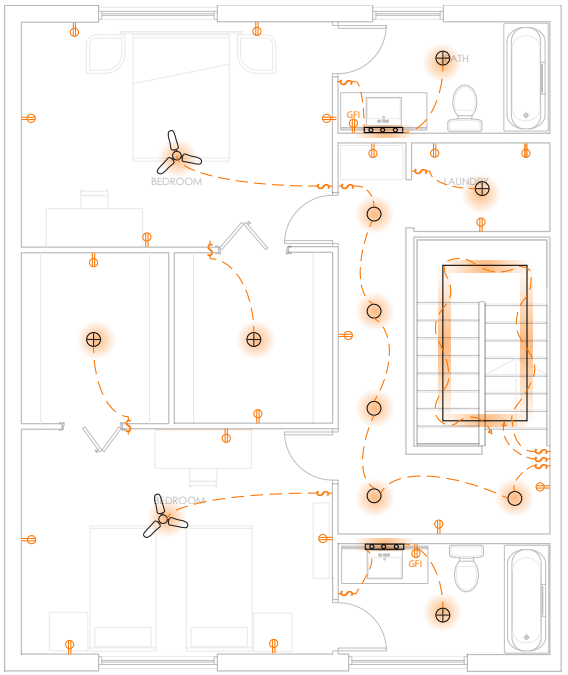
SCHEMATIC ELECTRICAL PLAN



First Floor Plan

LEGEND:

- Duplex
- GFI
- Quad
- Dedicated Outlet
- Switch



Second Floor Plan

4" SURFACE MOUNT
CCT ULTRA THIN LED RAZOR SERIES
10 WATT, 120 VOLT

LED BAR
2' BRINK SLIM LED BATH BAR
20.5 WATT, 120 VOLT

CEILING FAN
DEMPSEY W/ TURNABLE WHITE LED LIGHT 52"
20 WATT

COVE LIGHT
24" COOPER LIGHTING LC32
9 WATT, 120 VOLT

8" SURFACE MOUNT
ULTRA THIN LED RAZOR SERIES
18 WATT, 120 VOLT

LED SLIMLINE
14" LED SLIMLINE UNDER CABINET
2 WATT, 120 VOLT

PENDANT
ZEVO PENDANT
10.5 WATT, 120 VOLT

EXTERIOR WALL LIGHT
GAGE LED OUTDOOR WALL LIGHT
29.9 WATT, 120 VOLT

FINANCIAL SUMMARIES

CONSTRUCTION COST SUMMARY

Construction Element	Baseline	Harvest Village
Site Work	$ 9,890	$ 9,349
Foundations	$ 15,966	$ 14,173
Framing	$ 25,562	$ 32,830
Exterior Finishes	$ 20,367	$ 26,465
Major Systems Rough-Ins	$ 20,367	$ 18,897
Interior Finishes	$ 42,235	$ 43,822
Final Steps	$ 10,321	$ 3,749
Other	$ 2,934	$ 20,650
Total 3 Bed Constr. Cost	**$ 147,642**	**$ 169,935**
1 Bed	$ 61,760	$ 98, 835
1 Bed Accessible	$ 70,998	$ 112,974
2 Bed	$ 139,601	$ 139,976
2 Bed Accessible	$ 119,243	$ 132,659

SALES PRICE SUMMARY

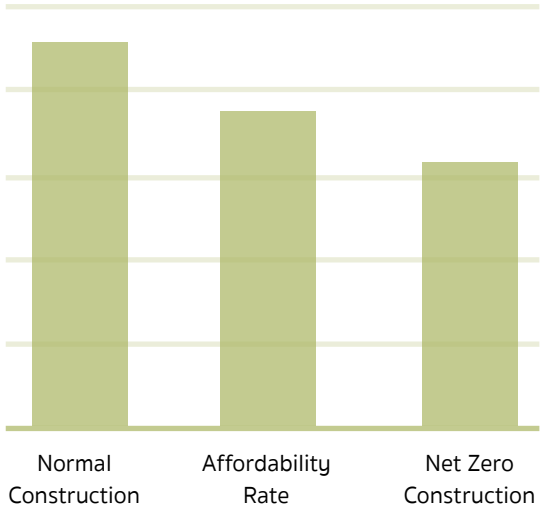
	Baseline	Harvest Village
Finished Lot Cost	$ 44,636	$ 28,292
Financing Costs	$ 3,282	$ 3,559
Overhead and General Expenses	$ 10,388	$ 11,264
Marketing Cost	$2,552	$ 2,767
Sales Commission	$ 8,528	$ 9,247
Profit	$ 22,318	$ 21,210
Total 3 Bed Constr. Sales Price	**$ 239,346**	**$ 253,094**

AFFORDABILITY

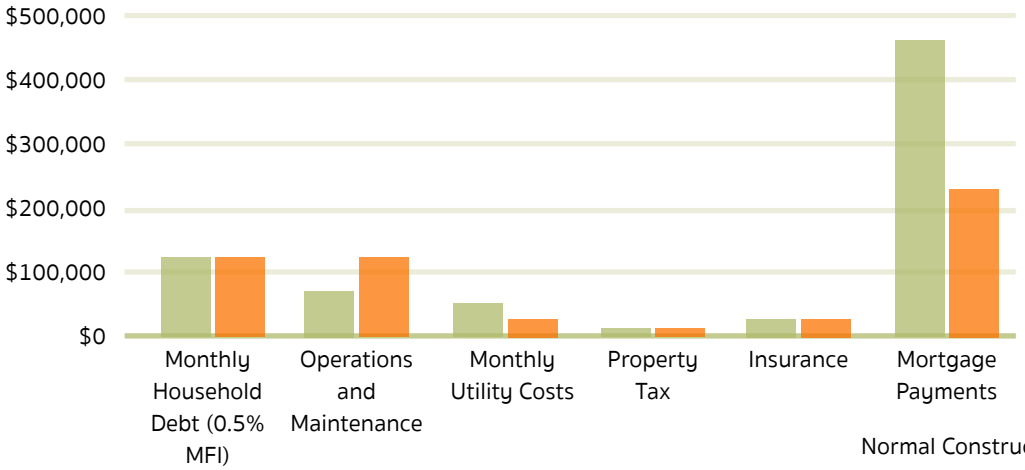
MONTHLY COST OF LIVING SUMMARY

	Baseline	Harvest Village
Total Sales Price	$ 239,346	$ 253,094
Monthly Household Debt	$ 315	$ 315
Operations and Maintenance	$ 196	$ 300
Monthly Utility Costs	$ 160	$ 88
Property Taxes	$ 332	$ 316
Insurance	$ 79	$ 80
Mortgage	$ 1,283	$ 624
Total Monthly Cost	**$ 2,365**	**$ 1,724**
Estimate Target Family Income	**$ 63,000**	**$63,000**
Debt to Income Ratio	**45%**	**31%**

OWNERSHIP AFFORDABILITY COMPARISON

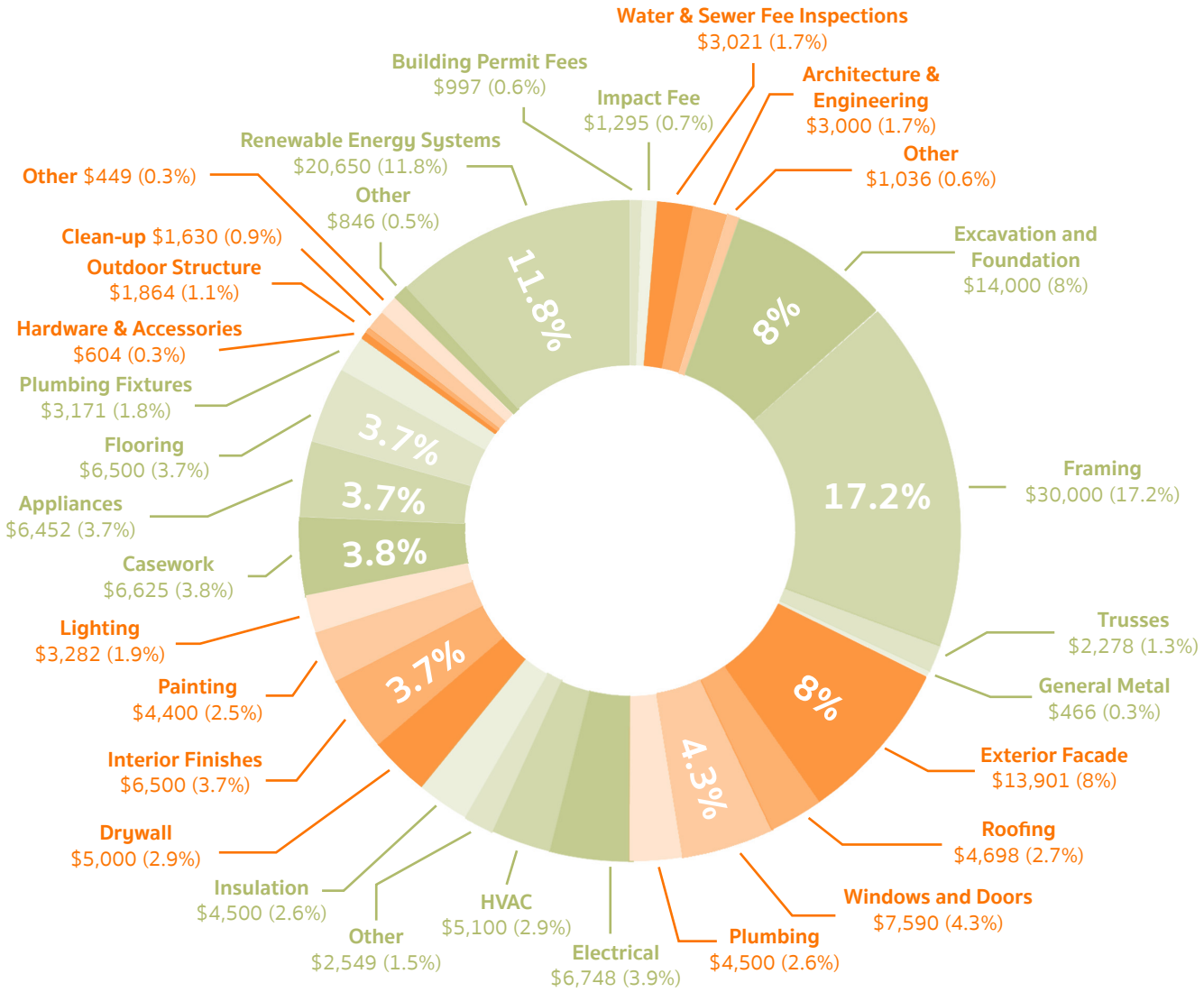


30-YEAR COST TO OWN AND OPERATE



30-YEAR COST SUMMARY

FINANCIAL ANALYSIS



PV ARRAY AND MICRO-GRID

COMMUNITY PV ARRAY SUMMARY

Unit	Angle	Effective EUI	Load (kWh/yr)	System Size for year 1 (Panels)	System Size for Year 25 (Panels)
1B	30	**17.29**	**4525**	**3.45 kW (10)**	**3.725 kW (11)**
1BA	30	**16.32**	**4825**	**3.725 kW (11)**	**3.81 kW (11)**
2B	30	**12.86**	**6500**	**4.83 kW (14)**	**5.175 kW (15)**
2BA	30	**11.09**	**8150**	**6.21 kW (18)**	**6.555 kW (19)**
3B	30	**14.63**	**8400**	**6.21 kW (18)**	**6.55 kW (19)**

PV ARRAY AND MICRO-GRID

3-BEDROOM PV ARRAY

8,407 kWh/Year

System output range from 7,702 to 8,332 kWh per year this location.

Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Value ($)
January	3.02	482	40
February	4.18	593	49
March	4.48	694	58
April	5.64	802	66
May	5.89	843	70
June	6.22	846	70
July	6.26	875	73
August	6.29	873	72
September	5.59	767	64
October	4.61	670	56
November	3.47	524	43
December	2.72	438	36
ANNUAL	4.86	8,407	$697

LOCATION:

Weather Data Source: Lat, Lon: 39.49, -84.7 (1.4mi)
Latitude: 39.49 N
Longitude: 84.7 W

PV SYSTEM SPECIFICATIONS:

DC System Size: 6 kW
Module Type: Standard
Array Type: Fixed (Open Rack)
Array Tilt: 30°
Array Azimuth: 180°
System Losses: 12.74%
Inverter Efficiency: 96%
DC to AC Size Ratio: 1.2

ECONOMICS:

Average Retail Electricity Rate: 0.083 $/kWh

PERFORMANCE METRICS:

Capacity Factor: 16.0%

PANEL:

Sunflower X21 345
Size: 41.2” x 61.3”, 19.11 W/ft²
Efficiency: 91.75% after 25 years

POLLINATOR PRAIRIE

NATIVE AND POLLINATOR-FRIENDLY VEGETATION

Black-eyed Susan

Ohio Spiderwort

Milkweed

Lavender

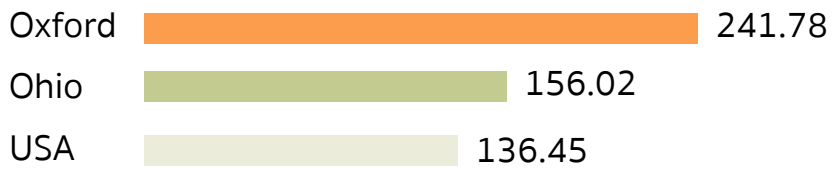
Sunflower

Ohio Goldenrod

Flowering Dogwood

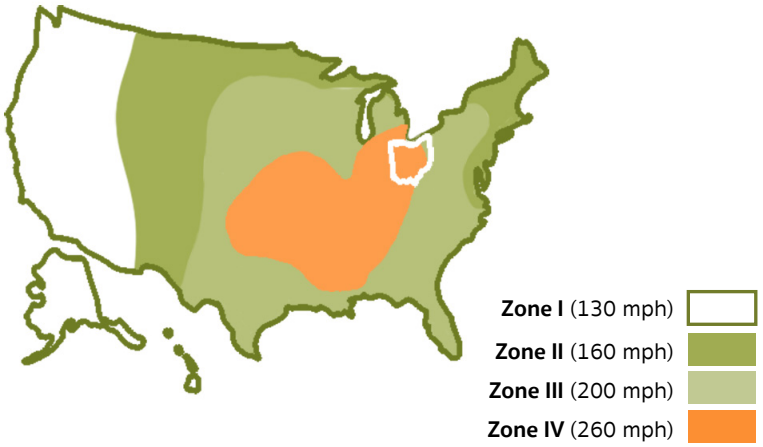
STORM MITIGATION

TORNADO INDEX VALUE



The tornado index value is calculated base on historical tornado data using **USA.com** algorithms. It is an indicator of the tornado level in a region. A higher tornado index value translates to a higher risk of a catastrophic event.

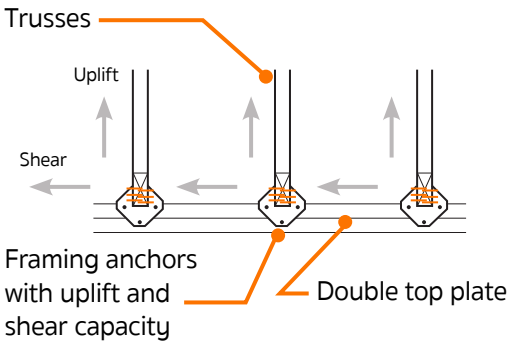
WIND ZONE MAP



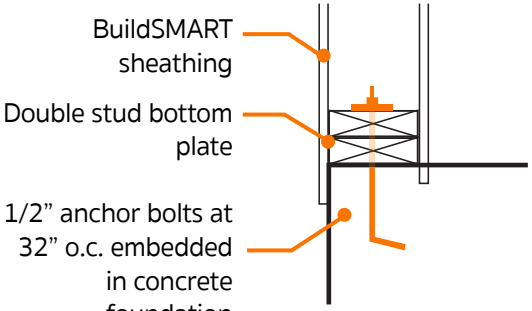
STORM MITIGATION

TORNADO-RESISTIVE CONSTRUCTION

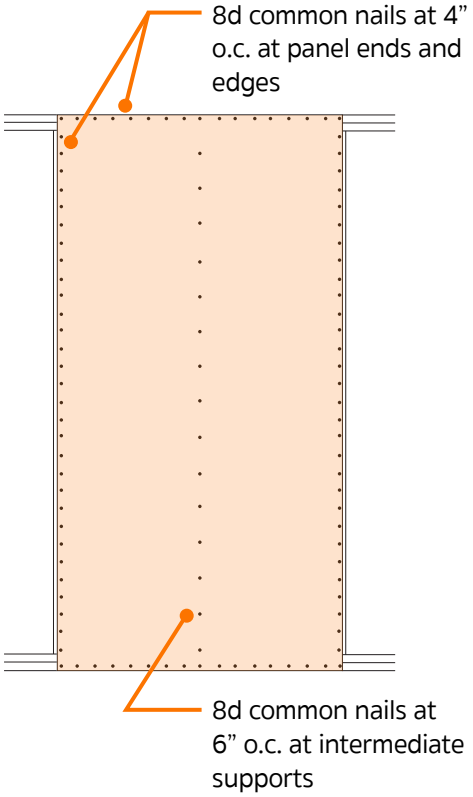
- **Rafters to top plates**



- **Bottom plates to found.**

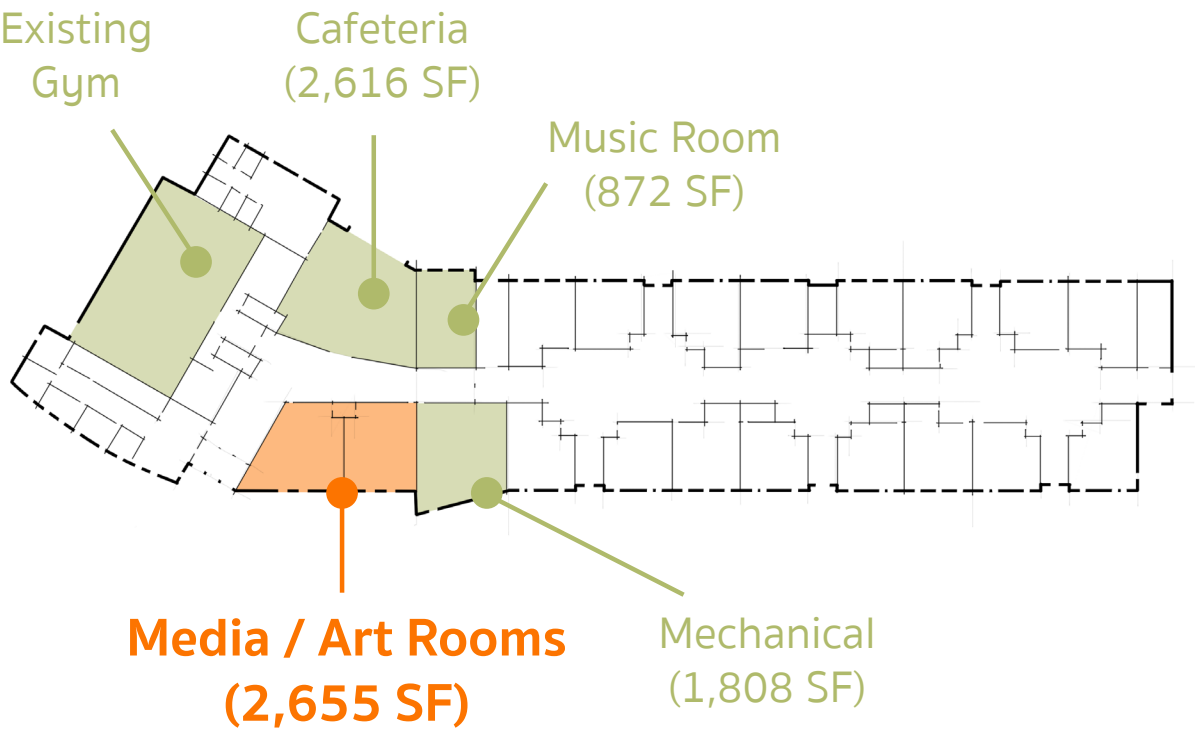


- **Sheathing to studs**



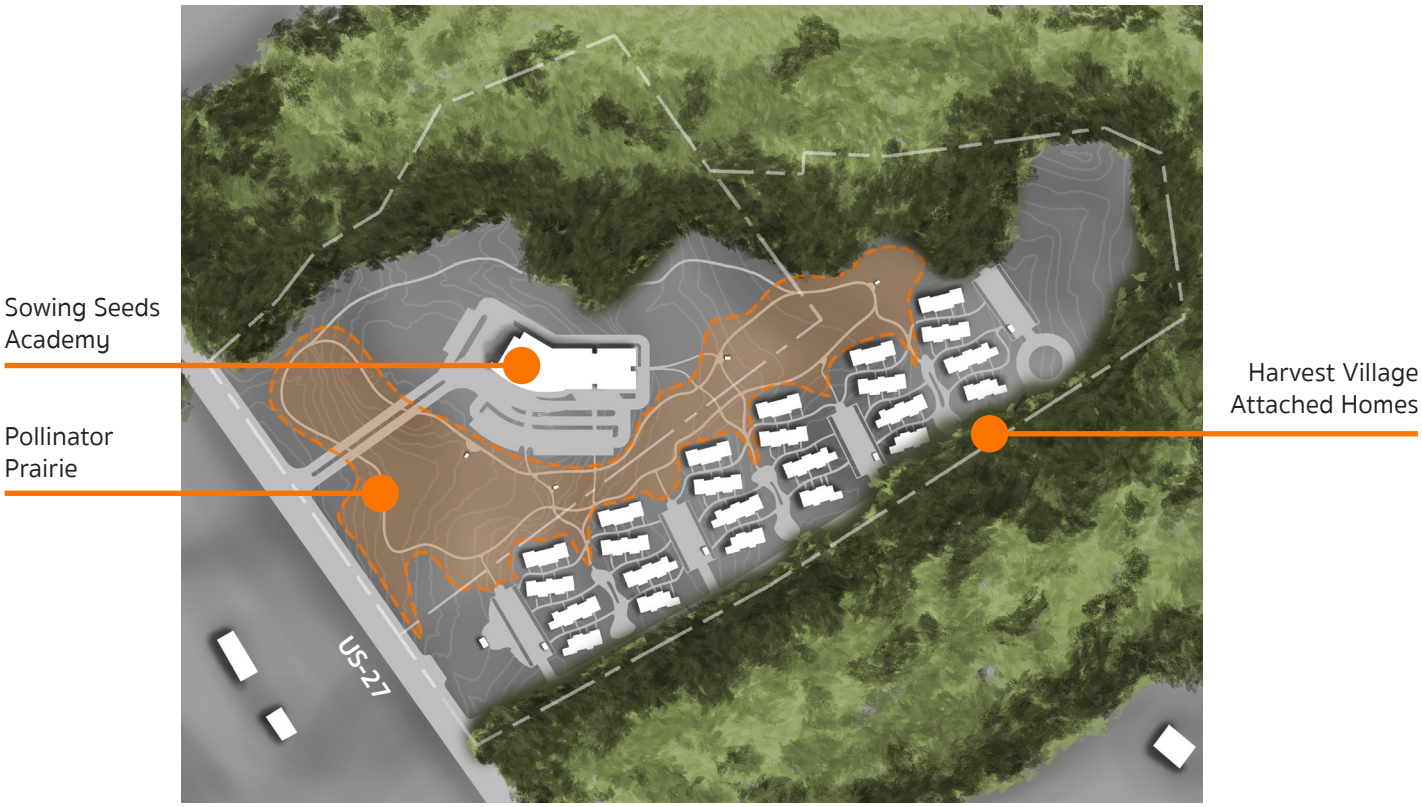
STORM MITIGATION

TORNADO SHELTER



SOWING SEEDS ELEMENTARY FIRST FLOOR PLAN

SITE


Sowing Seeds Academy
Pollinator Prairie
Harvest Village Attached Homes
US-27

BUILDING ELEVATIONS

SOUTH ELEVATION

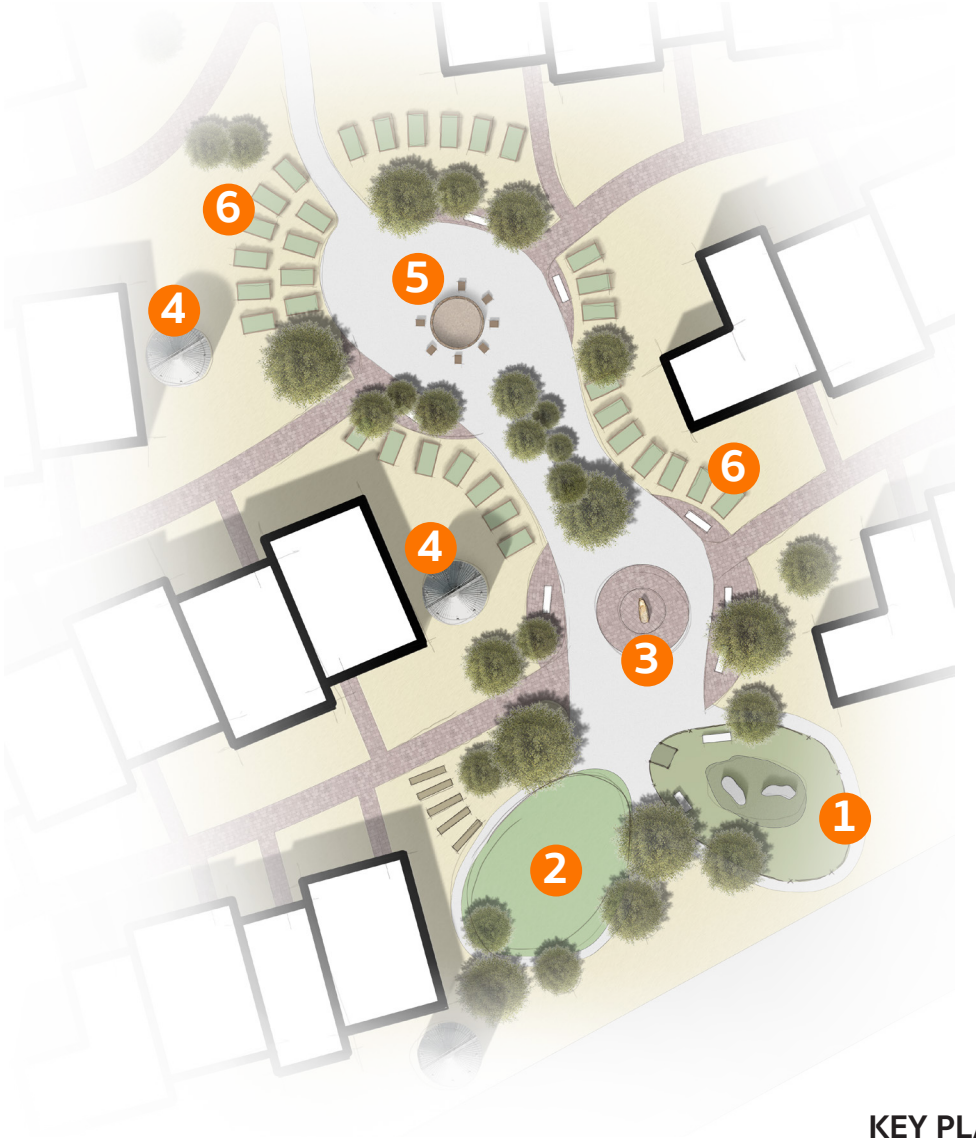
NORTH ELEVATION

BUILDING ELEVATIONS

WEST ELEVATION

TRANSVERSE SECTION (NORTH - SOUTH)

COMMUNITY GREENWAY



Porous Concrete

Crushed Gravel

Permeable Pavers

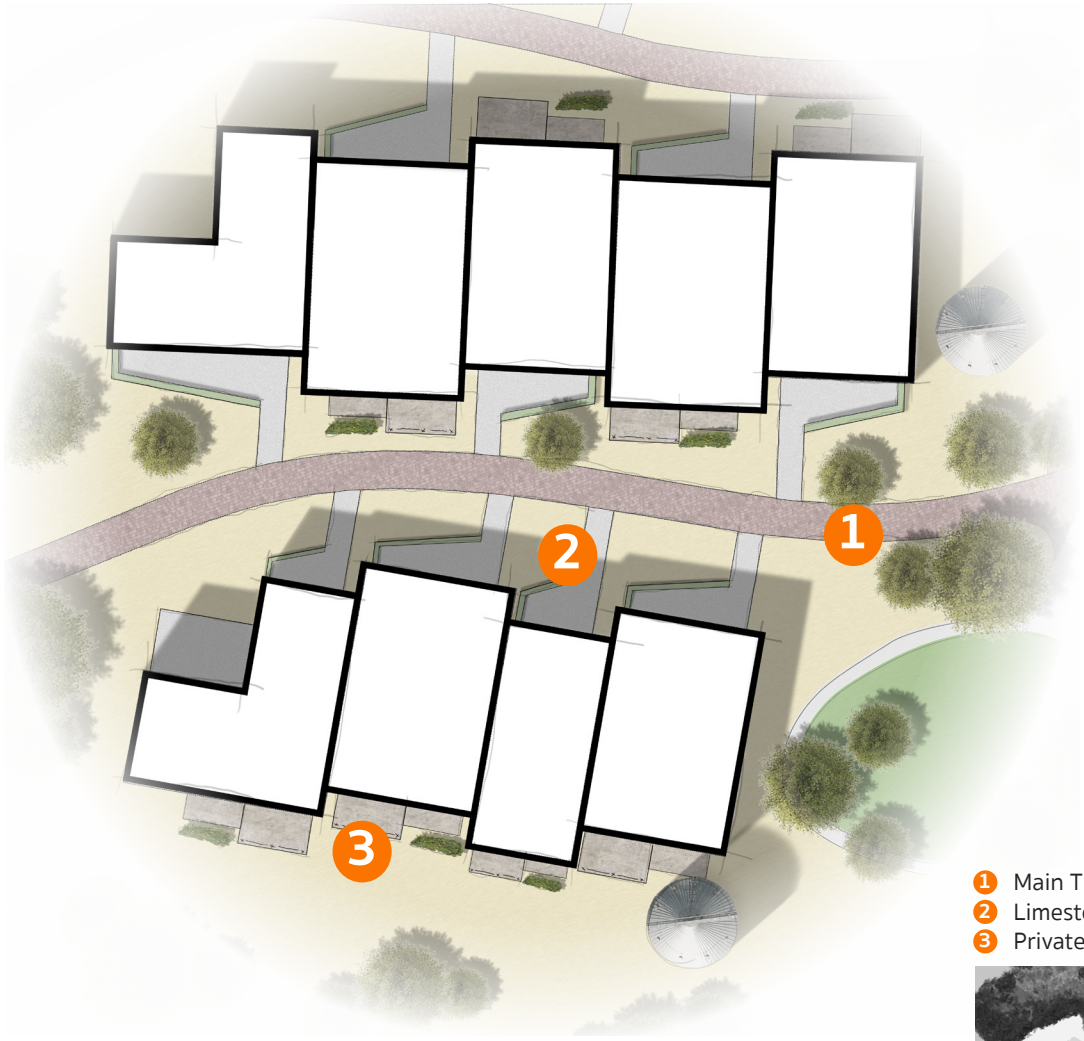
1. Dog Park
2. Open Lawn
3. Limestone Water Feature
4. Cistern
5. Community Fire Pit
6. Garden Plots

KEY PLAN

COMMUNITY GREENWAY

KEY PLAN

COMMUNITY ALLEY



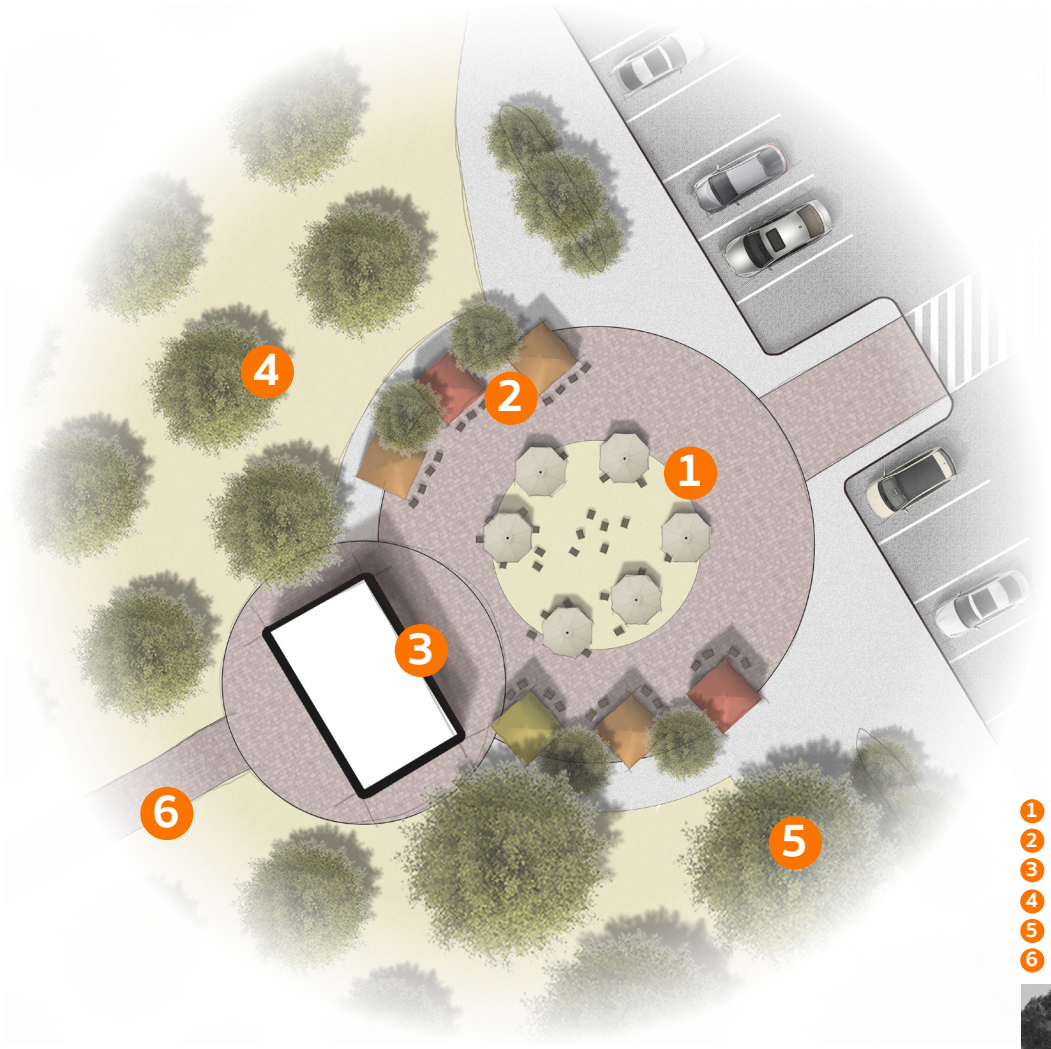
1. Main Thoroughfare
2. Limestone Entry Enclosure
3. Private Fenced Back Patio

KEY PLAN

COMMUNITY ALLEY

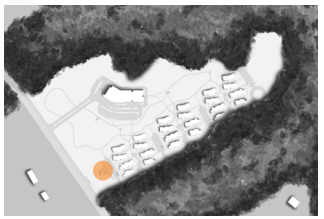
KEY PLAN

COMMUNITY BARN



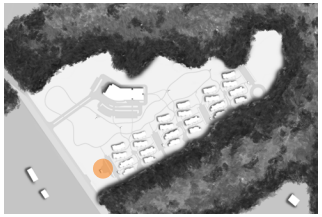
1. Grassed Lawn
2. Farmers Market
3. Community Barn
4. Apple Orchard
5. Walnut Orchard
6. Path to BCRTA Bus Stop

KEY PLAN



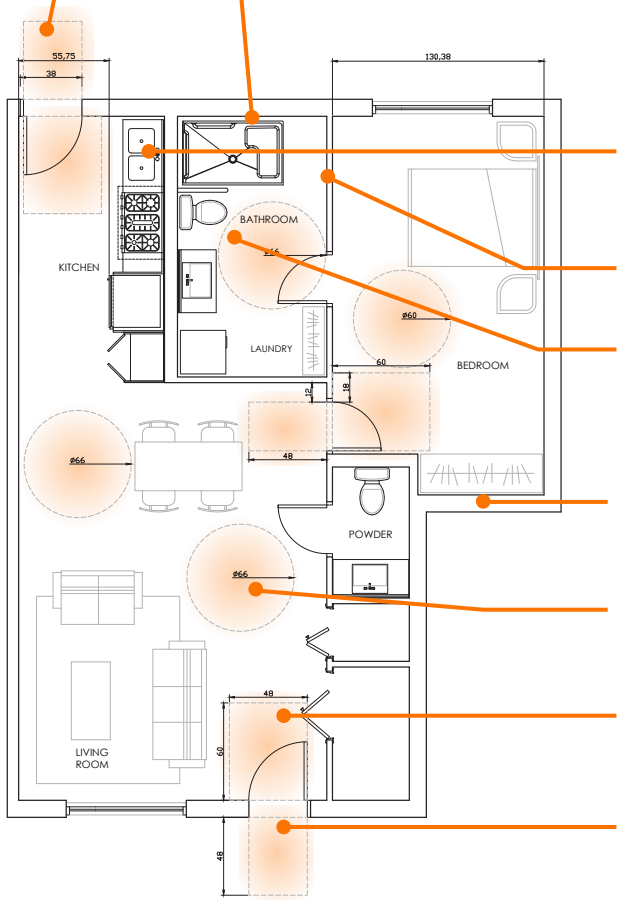
COMMUNITY BARN

KEY PLAN



UNIVERSAL DESIGN

ACCESSIBILITY PLAN



HARVEST VILLAGE COMMUNITY APP

ENVELOPE AIR SEALING STRATEGY

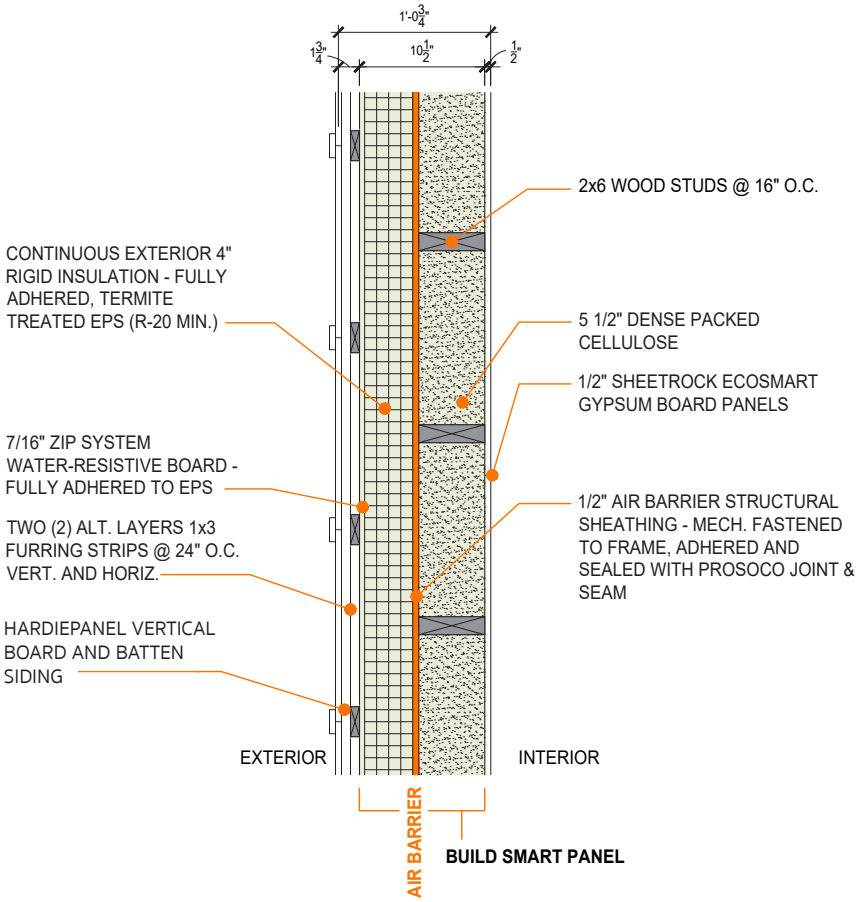
TYPICAL WALL TYPE DETAIL

LEGEND:

- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:

Foundation Insulation: R-20
Wall Insulation: R-34
Roof Insulation: R-43
Tightness: 0.06 cfm/ft^2 @ 50 Pa



ENVELOPE AIR SEALING STRATEGY

LEGEND:

- BuildSMART wall panel
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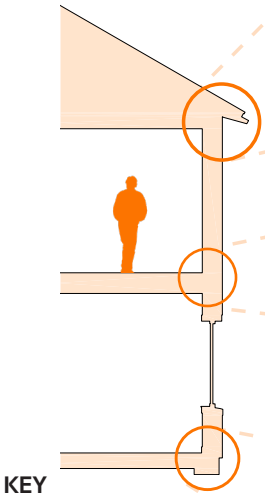
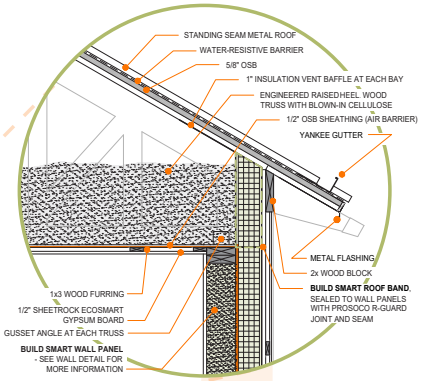
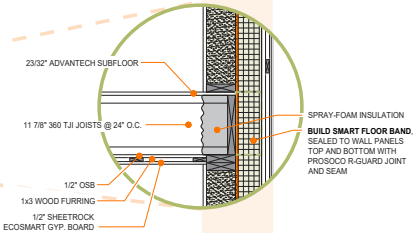


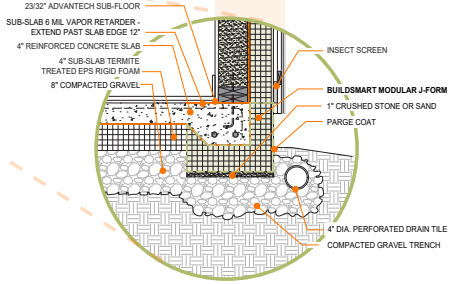
KEY
NOT TO SCALE



WALL TO ROOF DETAIL



2ND FLOOR DETAIL



FOUNDATION DETAIL

UNIT SEPARATION AIR SEALING STRATEGY

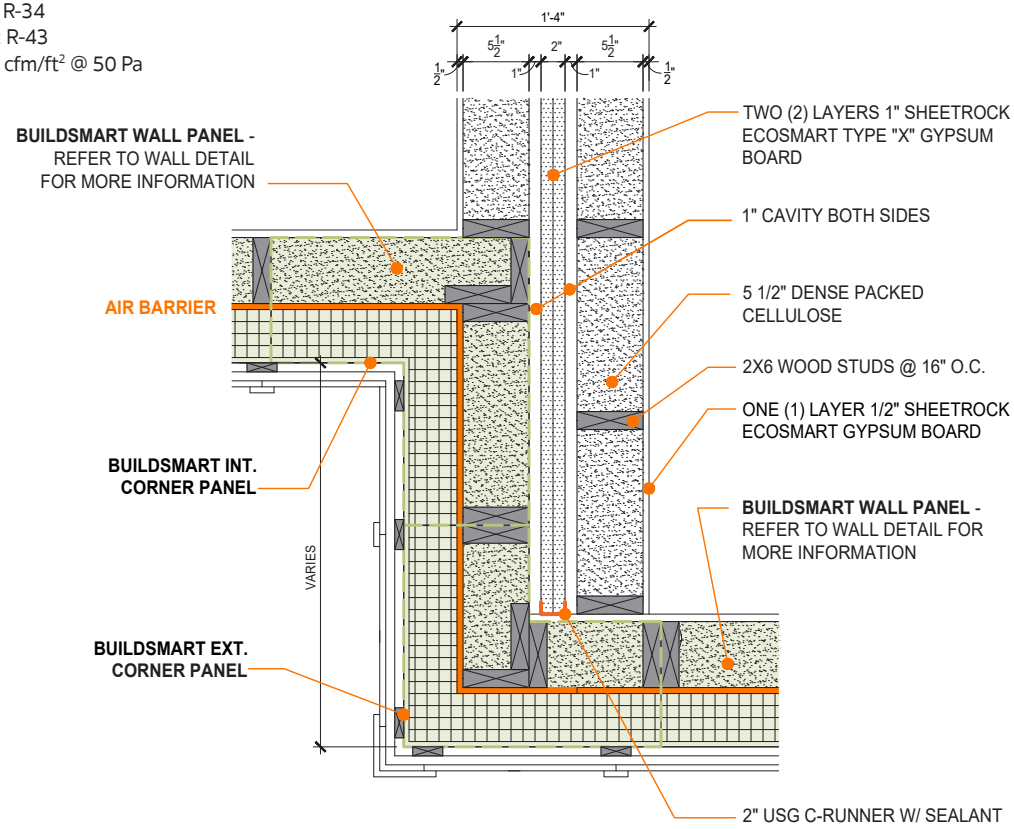
CORNER PLAN DETAIL

LEGEND:

- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:

Foundation Insulation: R-20
Wall Insulation: R-34
Roof Insulation: R-43
Tightness: 0.06 cfm/ft^2 @ 50 Pa



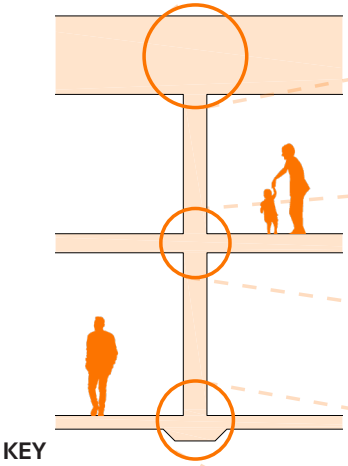
UNIT SEPARATION AIR SEALING STRATEGY

LEGEND:

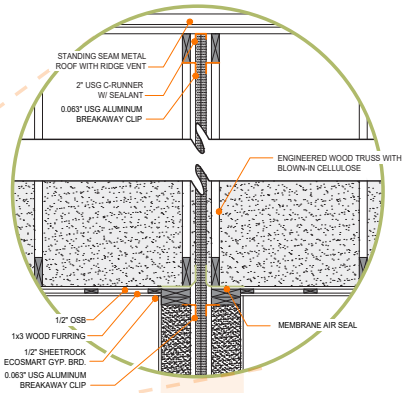
- BuildSMART wall panel
- BuildSMART component
- Air Barrier

PASSIVE HOUSE CRITERIA:

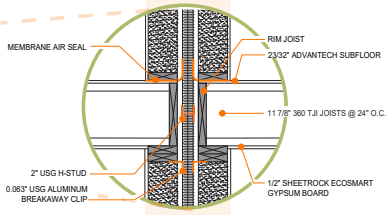
Foundation Insulation: R-20
Wall Insulation: R-34
Roof Insulation: R-43
Tightness: 0.06 cfm/ft^2 @ 50 Pa



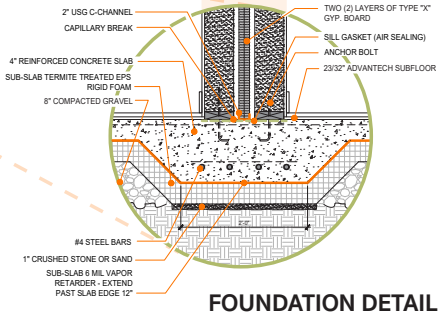
KEY
NOT TO SCALE



WALL TO ROOF DETAIL



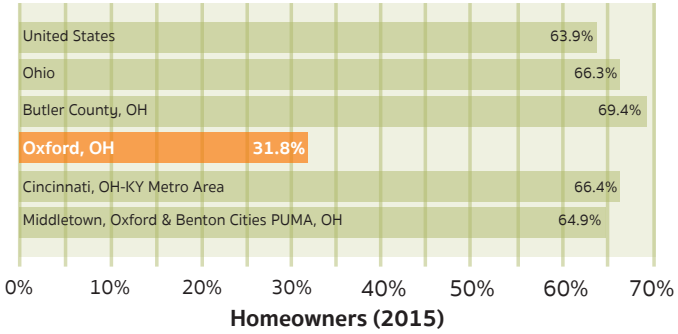
2ND FLOOR DETAIL

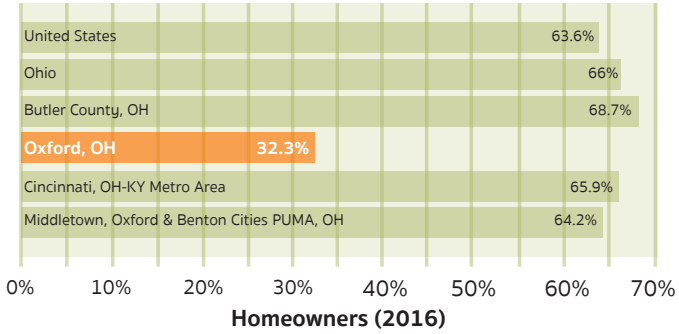


FOUNDATION DETAIL

MARKET ANALYSIS

RENT VS OWN ANALYSIS

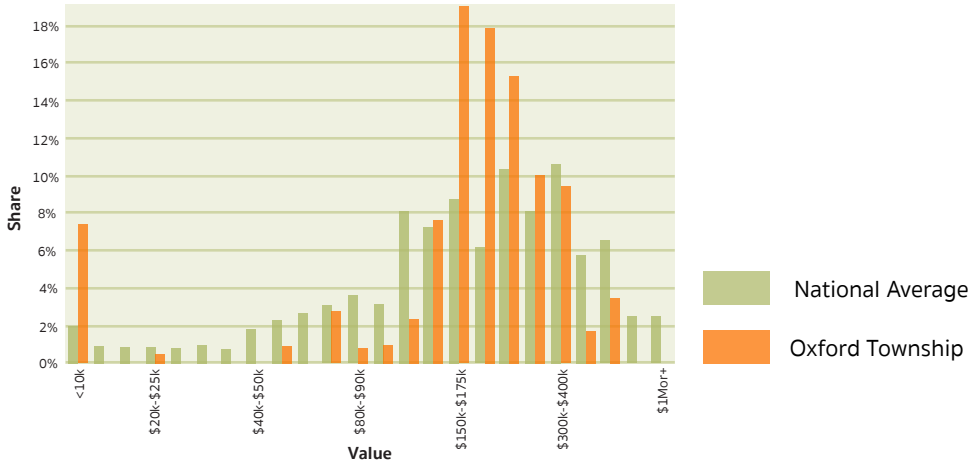




COMMUTER ANALYSIS

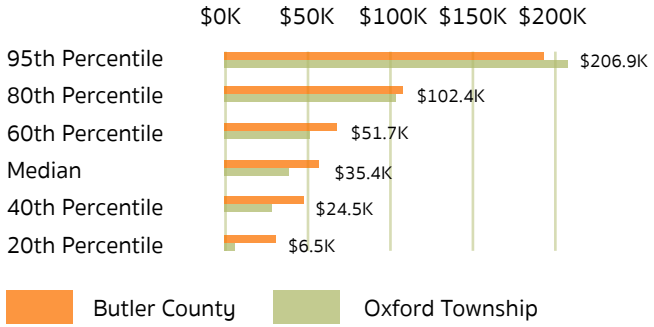
Vehicles	Greenhouse Gas Reduction	Fuel Conserved	Recycled Waste Equivalent	Annual Electricity Consumption Equivalent
1	12,000 lbs	500 gal	2 tons	1 Household
4	48,000 lbs	2,000 gal	8 tons	3 Households
8	96,000 lbs	4,000 gal	16 tons	6 Households

PROPERTY VALUE



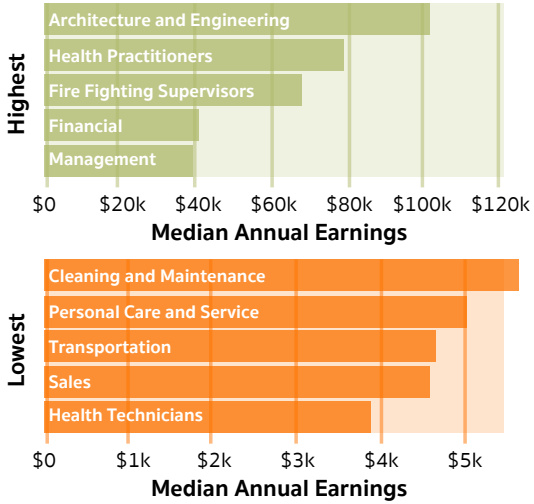
INCOME

HOUSEHOLD INCOME PERCENTILES



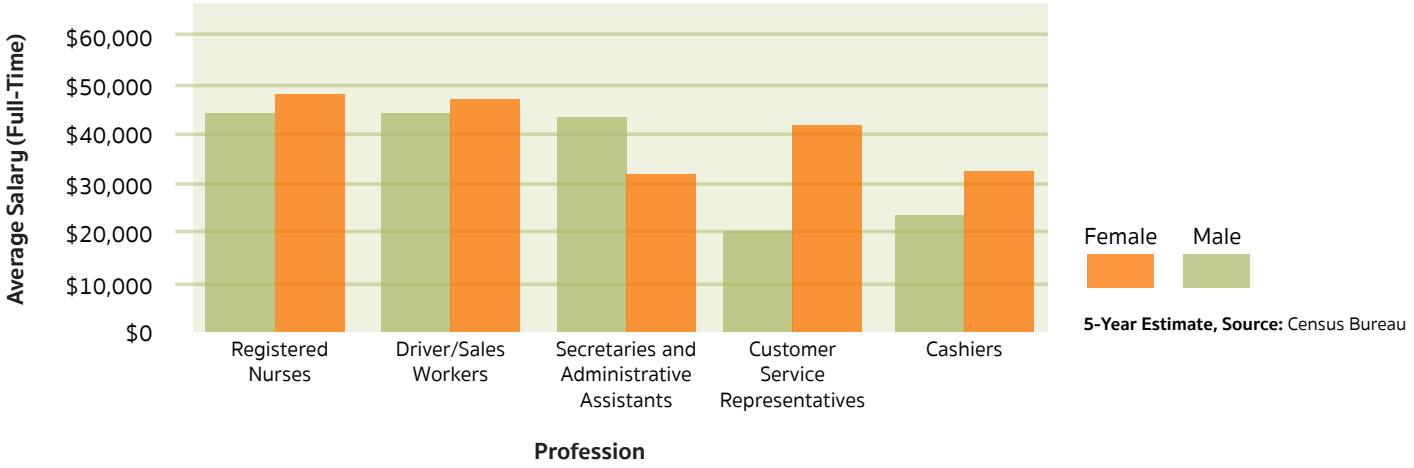
Source: Statistical Atlas

MEDIAN HOUSEHOLD INCOME



5-Year Estimate, Source: Census Bureau

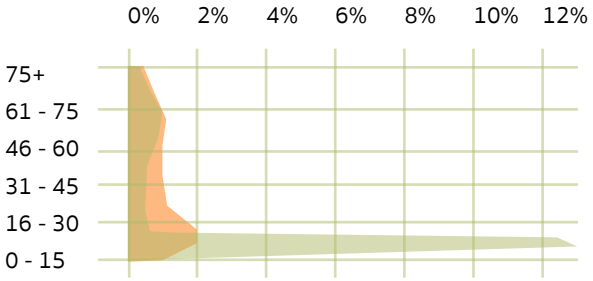
WAGE BY GENDER



5-Year Estimate, Source: Census Bureau

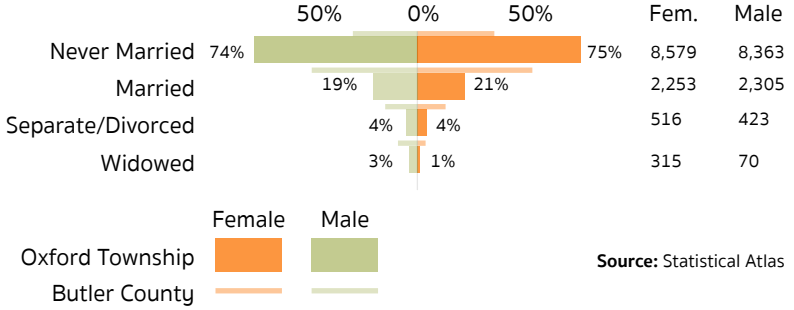
DEMOGRAPHICS

AGE STRUCTURE



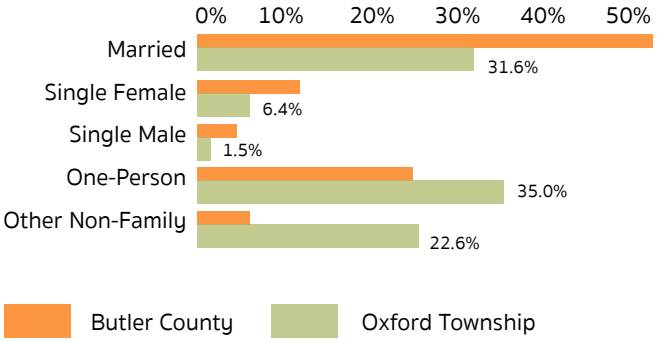
Source: Statistical Atlas

MARITAL STATUS



Source: Statistical Atlas

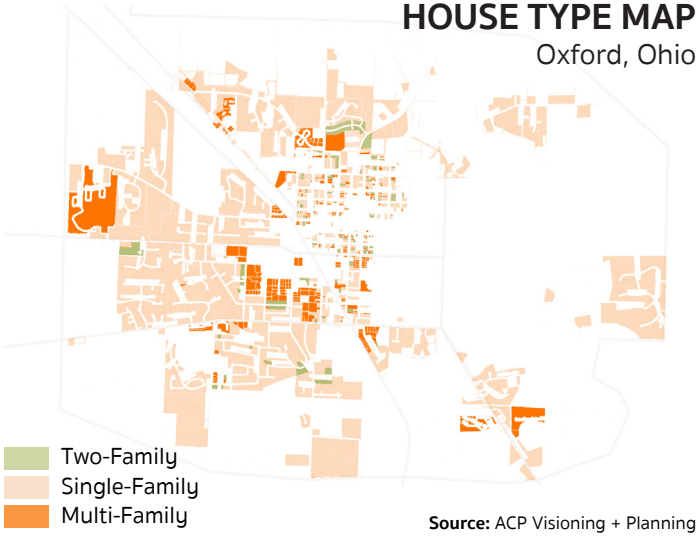
HOUSEHOLD TYPE



Source: Statistical Atlas

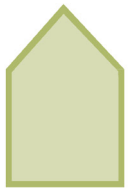
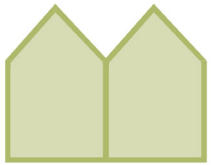
HOUSE TYPE MAP

Oxford, Ohio



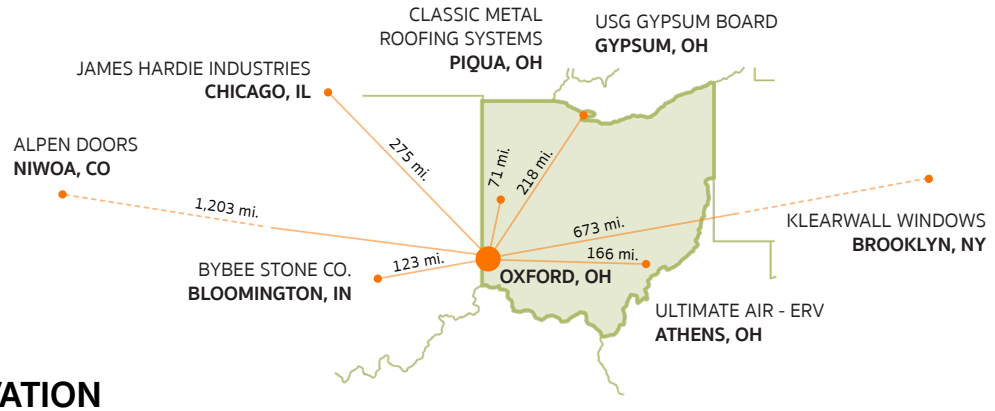
Source: ACP Visioning + Planning

DEMOGRAPHICS

	Pros	Cons
 **Single-Family**	• More privacy • More space • Independence • Consistent re-sale value	• Additional costs and upkeep • Unsustainable density and inefficient
 **Multi-Family**	• Ideal real estate investment • Multi-generational living	• Smaller, less private • Large building envelope compared to square footage
 **Attached Homes**	• Stellar envelope performance • Enhanced privacy • Most affordable	• Smaller units • Generally lack sufficient common spaces for social interaction

EXTERIOR MATERIALS

LOCALIZATION OF SUSTAINABLE MATERIALS



DETAIL ELEVATION

STANDING SEAM METAL ROOF
Cool Colored Roof
95% Recycled Aluminum Cans
Locally Sourced

HARDIEPANEL VERTICAL SIDING
Moisture and Rot-Resistant
Enhanced Durability
Locally Sourced

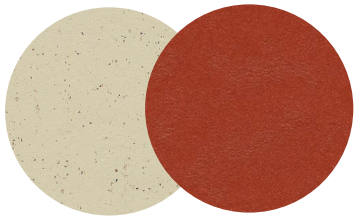
TRIPLE PANE WINDOW
Increased Insulation Value
Low-Emissivity

LIMESTONE ENTRY ENCLOSURE
Low Carbon Footprint
Durable
Locally Sourced

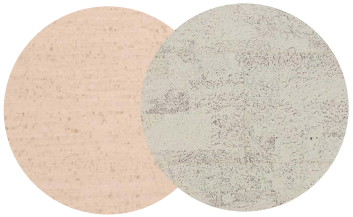
INTERIOR DESIGN

LIVING ROOM

Berber Carpets



Forbo Marmoleum Tiles

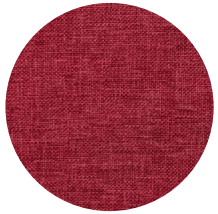


Lisbon Cork Flooring

INTERIOR DESIGN

LIVING ROOM

Sherwin Williams Interior Latex Paint



“Carmine” Polyfiber Fabric

Walnut

Minimo Peel and Stick Backsplash

Paperstone Gun Metal Countertop

APPLIANCES

REFRIGERATOR

SAMSUNG RS22HDHPNSR *22 cu. ft. Counter Depth Side-By-Side Refrigerator*
Price: $1800

- ENERGY STAR - compliant (646 kWh/yr)
- ADA - compliant
- LED Tower Lighting
- Six Temperature Sensors

RANGE

SAMSUNG NE58F9710WS *Flex Duo™ Slide-in Electric Range*
Price: **$1800**

- Auto Shut-Off Option
- Slide-In Universal Design
- Large Capacity Oven
  Hidden Bake Element: 3,000 W
  Convection Element/Heater: 1,250 W

DISHWASHER

SAMSUNG DW80M2020US *Dishwasher*
Price: **$ 480**

- ENERGY STAR - rated (249 kWh/yr)
- ADA - compliant
- Digital Water Leakage Sensor

WASHER

SAMSUNG WW6800 *2.2 cu. ft. 24" Front Load Washer with Super Speed*
Price: **$800**

- ENERGY STAR - rated (90 kWh/yr)
- CEE Tier 1
- IMEF 2.25, IWF = 4.0

DRYER

SAMSUNG DV6800H *4.0 cu. ft. 24" Heat Pump Dryer with Smart Care*
Price: **$800**

- Ventless Heat-Pump Dryer
- ENERGY STAR - rated (148 kWh/yr)
- Smart Care Mobile Device Synchronization

COMFORT

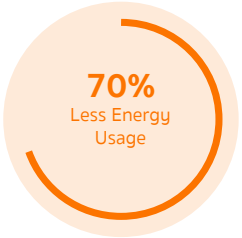
The sound of a train horn outside would be the equivalent of a dishwasher running inside!

THE HOME ENERGY RATING SYSTEM

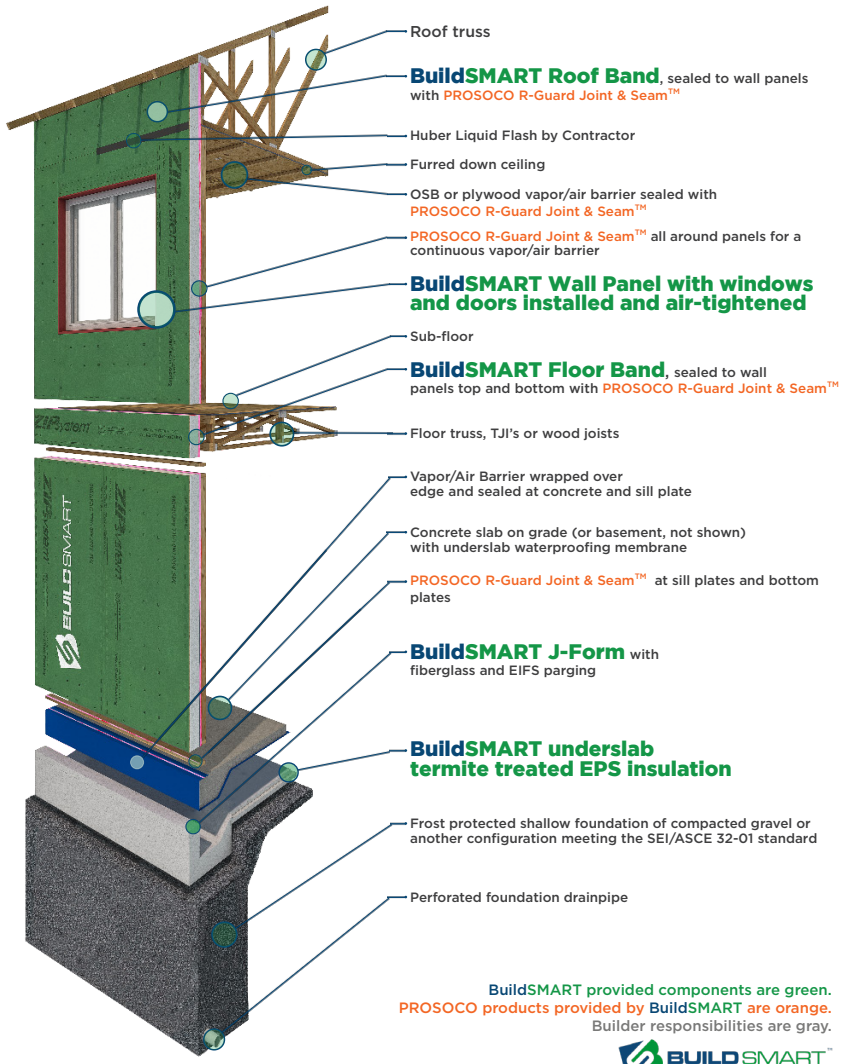
BuildSMART as the primary build solution with a HERS Index standard significantly lower than the average national home.

QUANTIFIABLE AND RIGOROUS

BuildSMART system, coupled with Passive building principles, significantly reduces overall energy usage.



MODULARITY

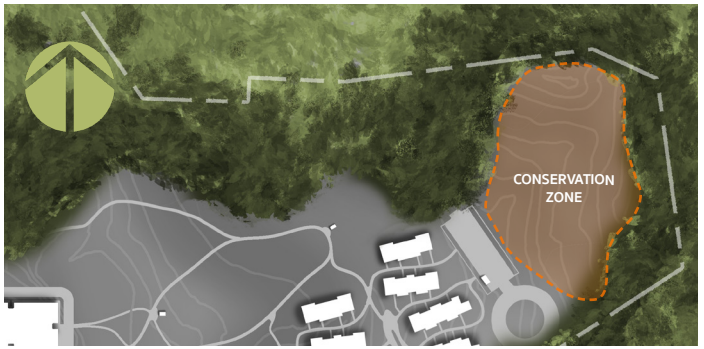


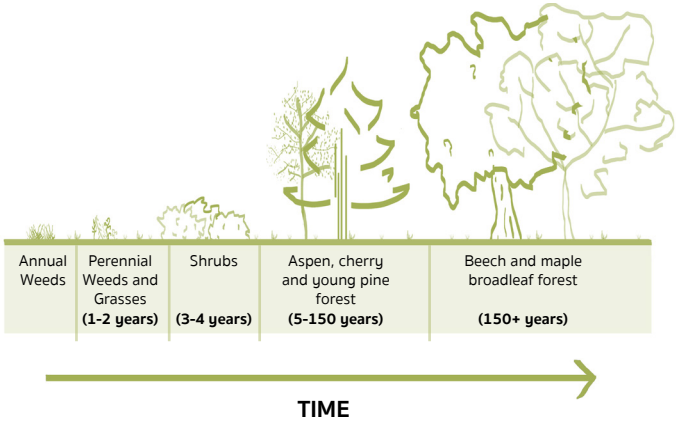
Source: buildsmartna.com

CONSERVATION ZONE

SITE IMAGE

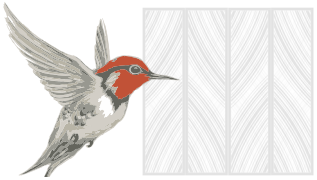
SITE LOCATION





POLLINATOR PRAIRIE

POLLINATORS



Birds

Monarchs

Butterflies

Bees

BEE GARDEN

POLLINATOR PRAIRIE

MONARCH GARDEN