MIAMI

Janki A Vyas | Ksenia Knyazkina

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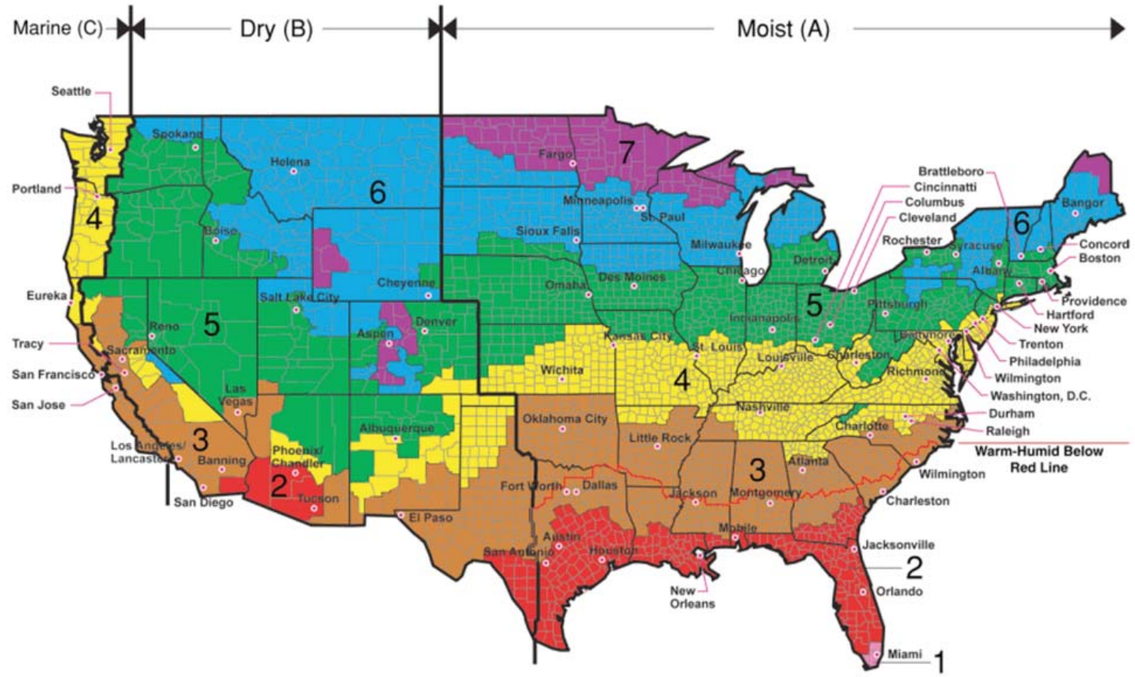
CLIMATE ANALYSIS

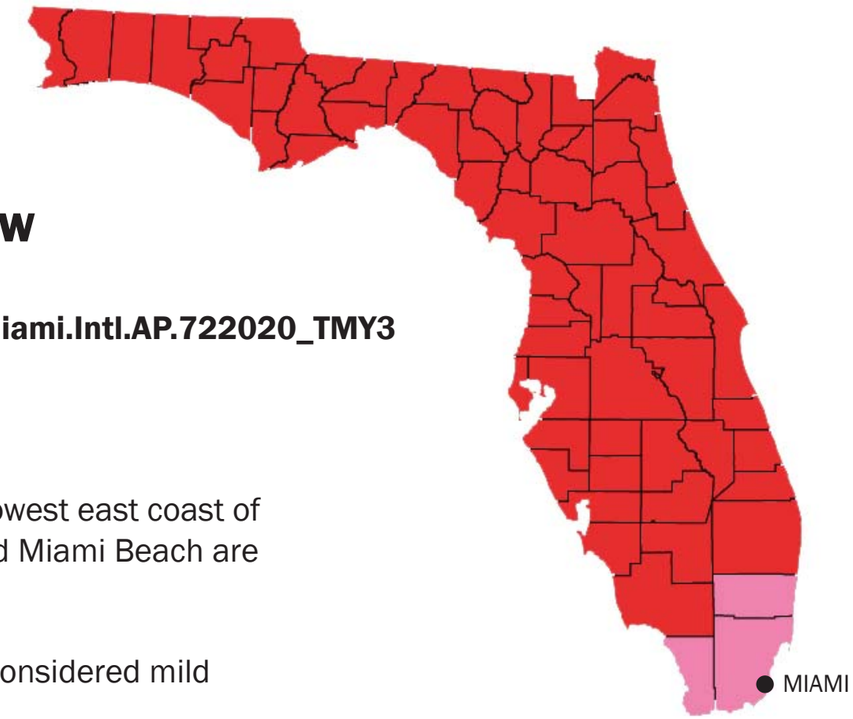


http://www.iaqsource.com/article.php/ashrae-climate-zone-map/?id=194

City: **Miami**
State: **Florida**
Country: **United State**

25.76°N -80.21°W

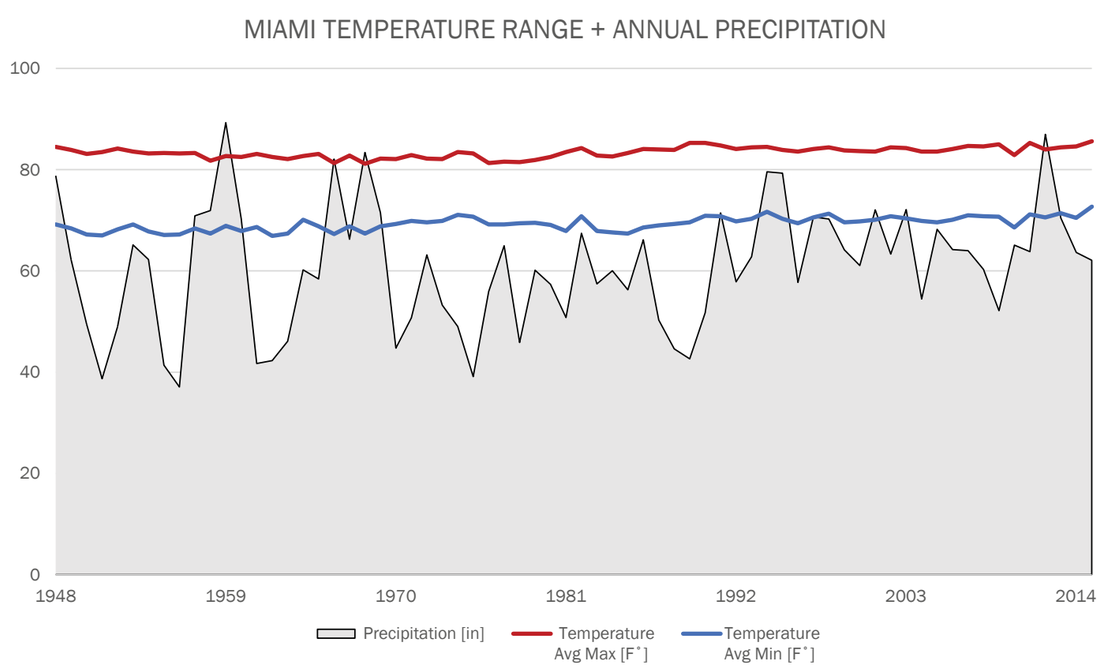
Weather File: **USA_FL_Miami.Intl.AP.722020_TMY3**



https://energycode.pnl.gov/EnergyCodeReqs/?state=Florida

Miami is located at the lowest east coast of Florida. Biscayne Bay and Miami Beach are both to the east.

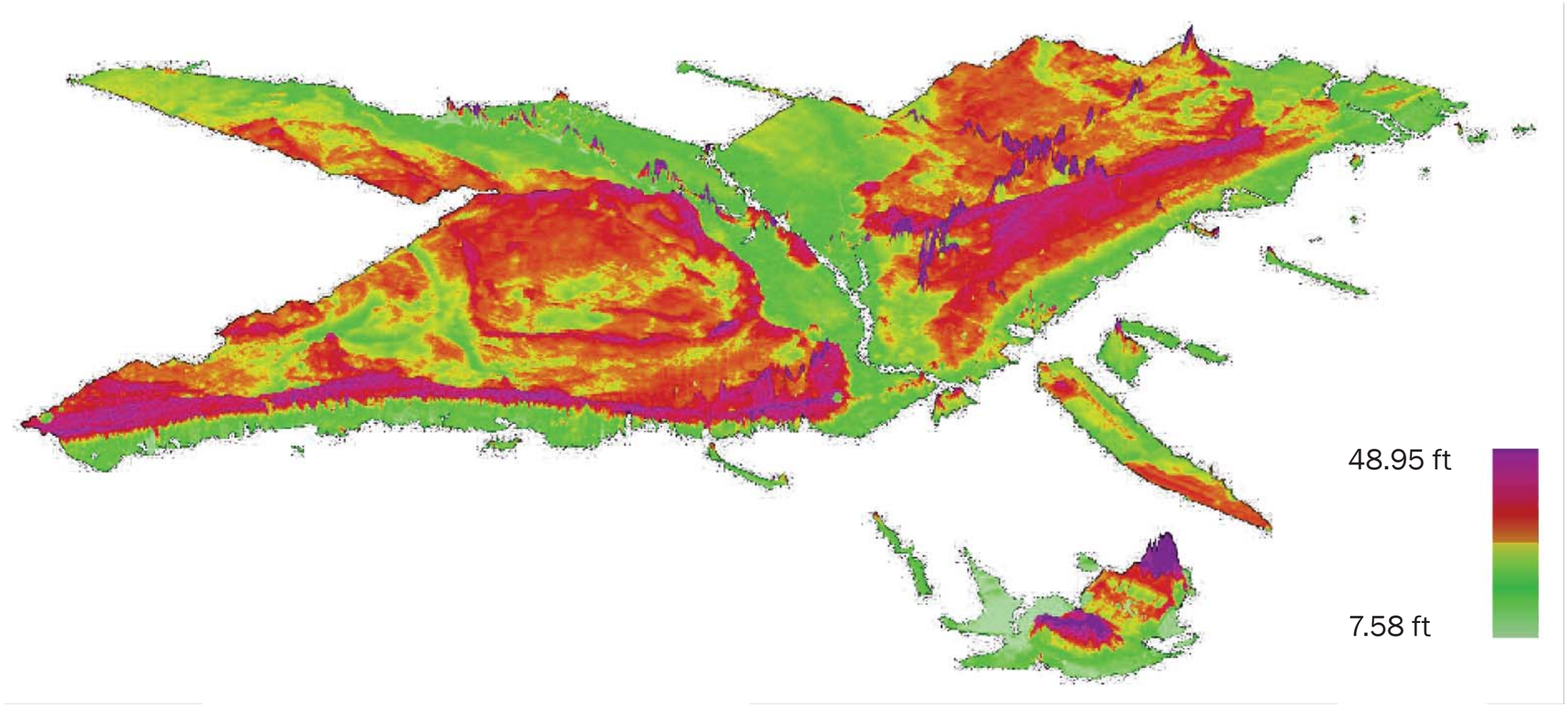
The climate of Miami is considered mild subtropical marine.



Summers are long and hot with plentiful rainfall, averaging about 60 inches a year. Temperatures range from average lows of 75-76°F to highs of 88-90°F.

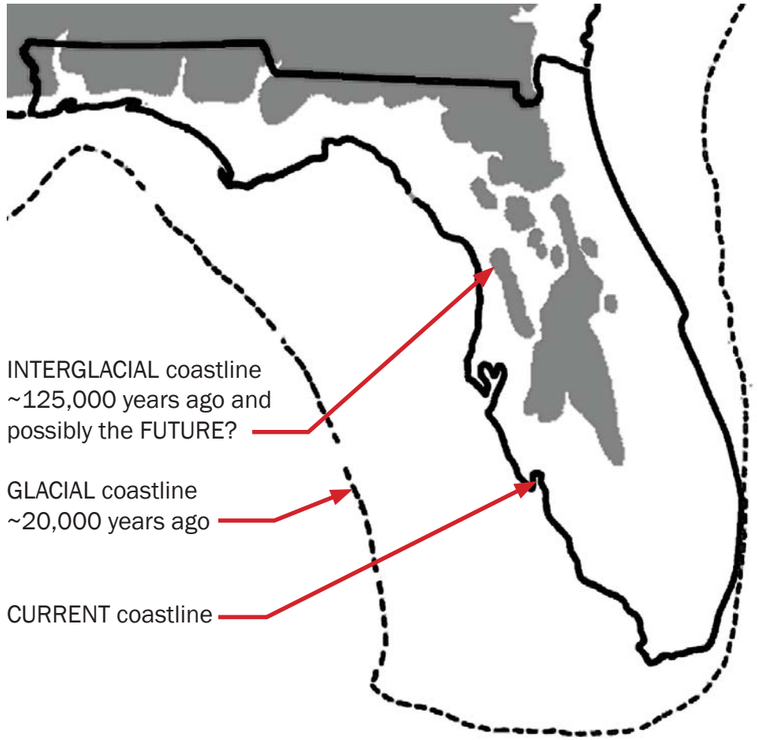
Winters are mild and dry. Conditions outdoors in the winter, spring and fall are pleasant. Temperatures range from average lows of 60-61°F to highs of 76-77°F.

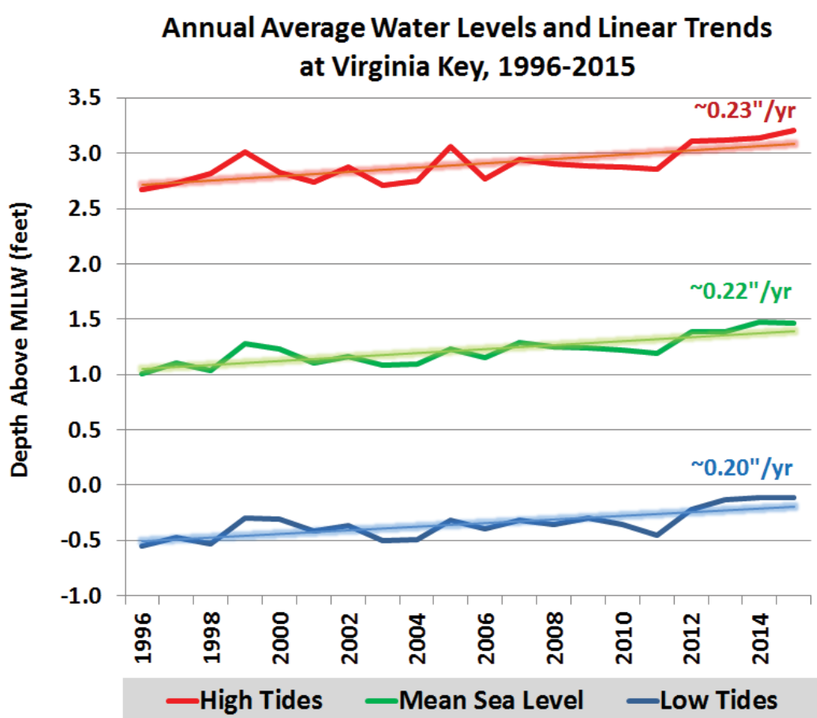
Overall, Miami is a hot and humid climate with very humid nights and cooling ocean breezes. Buildings generally need cooling for most of the year.



Miami and its suburbs are located on a broad plain between the Florida Everglades to the west and Biscayne Bay to the east, which also extends from Florida Bay north to Lake Okeechobee. The elevation of the area never rises above 40 ft (12 m)and averages at around 6 ft (1.8 m) above mean sea level in most neighborhoods, especially near the coast. The highest undulations are found along the coastal Miami Rock Ridge, whose substrate underlies most of the eastern Miami metropolitan region. The main portion of the city lies on the shores of Biscayne Bay which contains several hundred natural and artificially created barrier islands, the largest of which contains Miami Beach and South Beach. The Gulf Stream, a warm ocean current, runs northward just 15 miles (24 km) off the coast, allowing the city's climate to stay warm and mild all year.

SEA LEVEL RISE_Projections





1 ft sea rise
2050

3 ft sea rise
2110

5 ft sea rise
2170

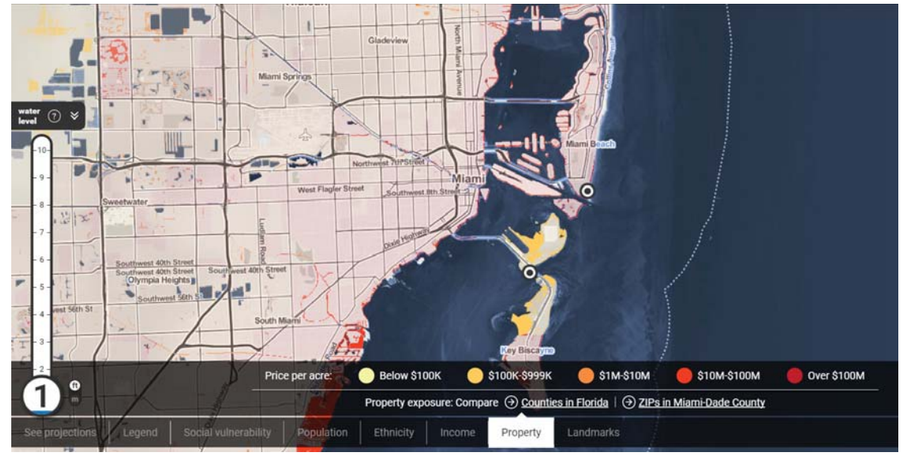
7 ft sea rise
2200

9 ft sea rise
2200

10 ft sea rise
2200

SEA LEVEL RISE_Projections + Associated Land Value

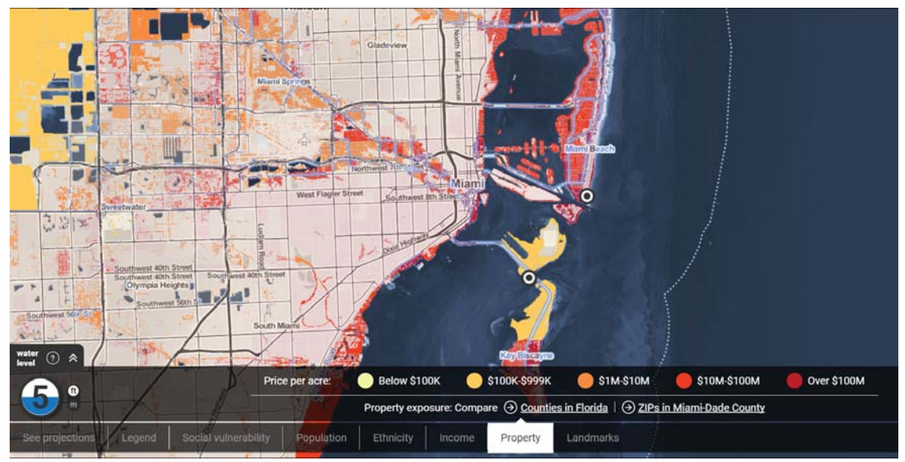
1 ft sea rise
2050



Value of Property @ 1 ft sea rise [2050]

3 ft sea rise
2110

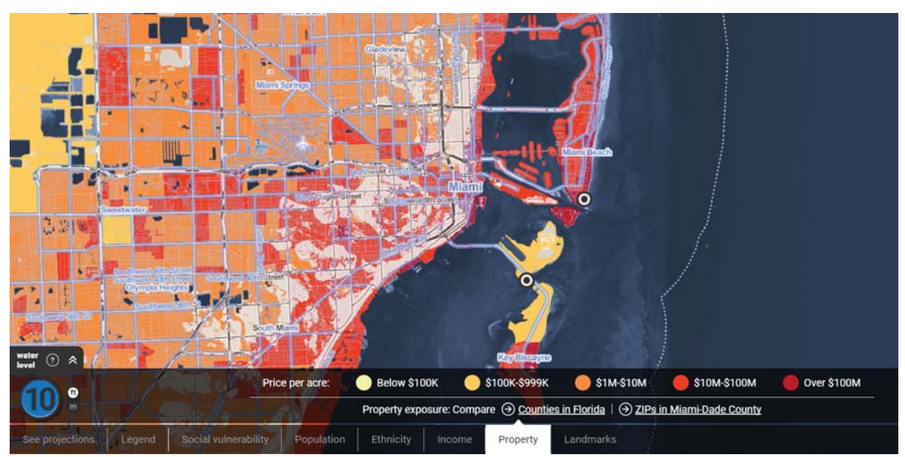
5 ft sea rise
2170



Value of Property @ 5 ft sea rise [2170]

7 ft sea rise
2200

9 ft sea rise
2200



Value of Property @ 10 ft sea rise [2200]

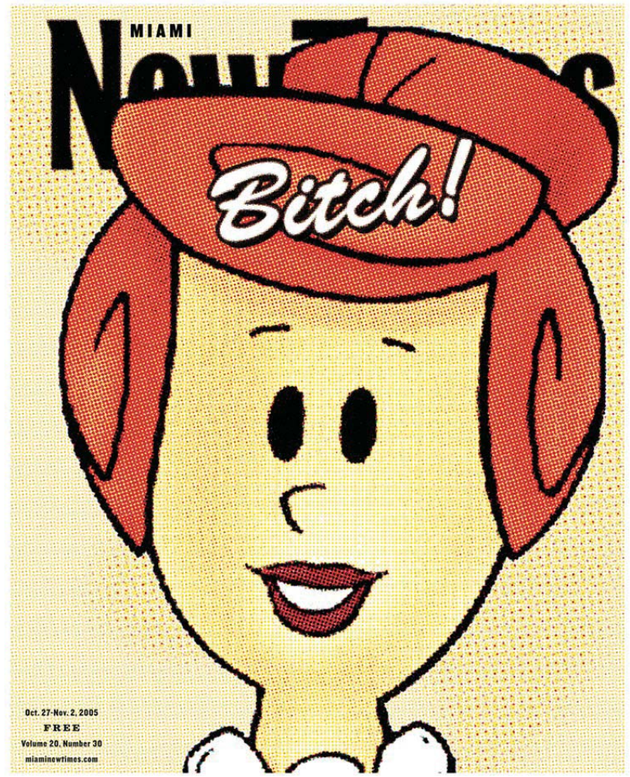
10 ft sea rise
2200

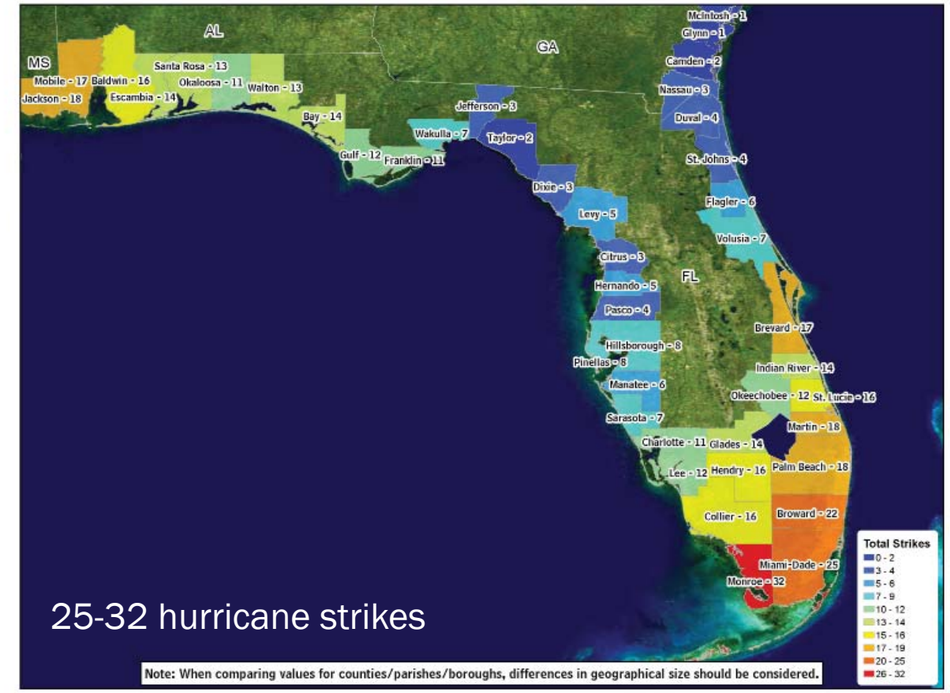
SEA LEVEL RISE_Matheson Hammock King Tide 2015

the last hurricane hit Miami was Hurricane Wilma in 2005...

the motorola razr was cutting edge tech

U.S.- Cuba relations were on the fritz





25-32 hurricane strikes

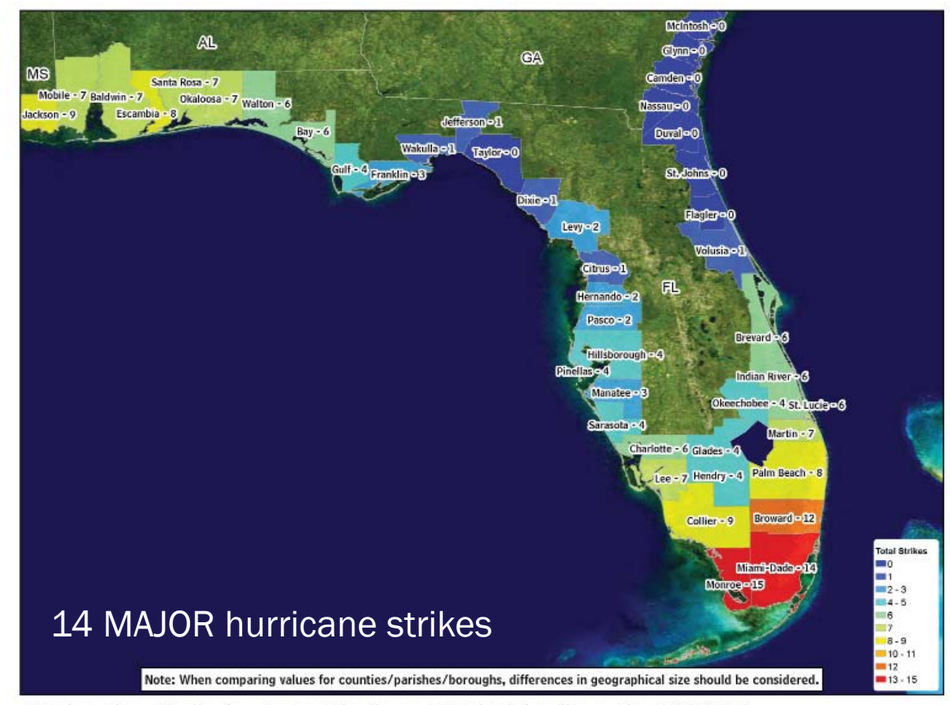
Total number of hurricane strikes by counties/parishes/boroughs, 1900-2010

Data from NWS NHC 46: Hurricane Experience Levels of Coastal County Populations from Texas to Maine. Jerry D. Jarrell, Paul J. Hebert, and Max Mayfield. August, 1992, with updates.

Noone knew of
a Kardashian
beyond Kim

MIAMI HEAT

The Miami Heat hadn't won a single NBA championship



14 MAJOR hurricane strikes

Total number of major hurricane strikes by counties/parishes/boroughs, 1900-2010

Data from NWS NHC 46: Hurricane Experience Levels of Coastal County Populations from Texas to Maine. Jerry D. Jarrell, Paul J. Hebert, and Max Mayfield. August, 1992, with updates.

HURRICANE_Wilma

October 25, 2005

September 14, 2005

Total cost of Hurricane Wilma's damage

$29.4 billion

CLIMATE ANALYSIS

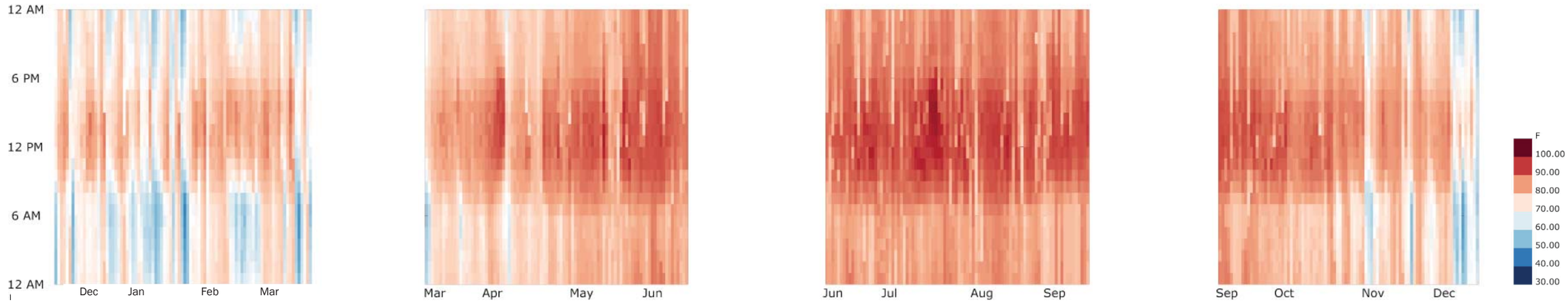
WINTER
December 21 - March 20

SPRING
March 21 - June 20

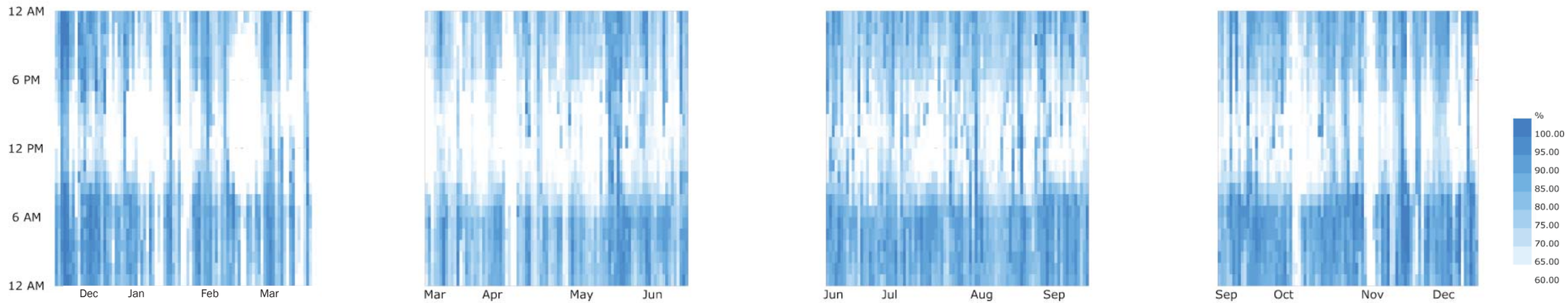
SUMMER
June 21 - September 20

FALL
September 21 - December 20

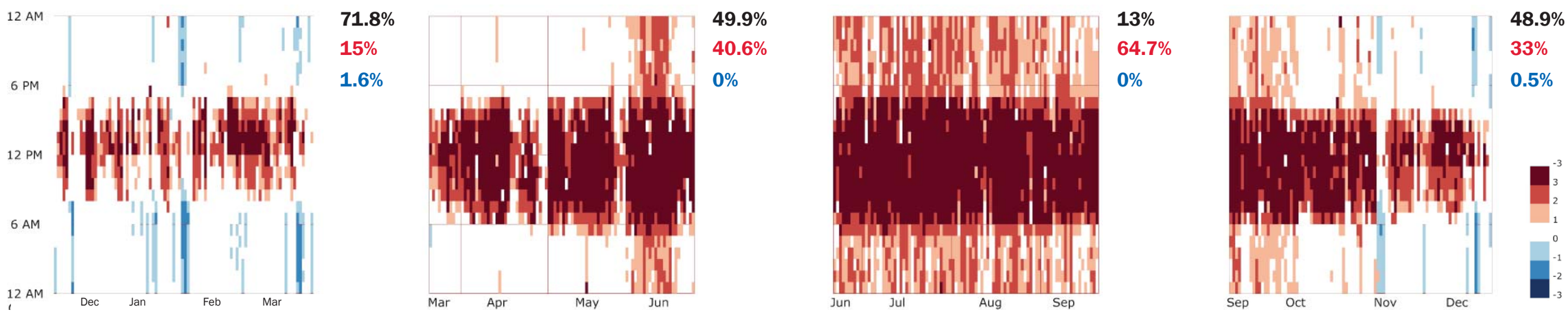
AIR TEMPERATURE



RELATIVE HUMIDITY



UNIVERSAL THERMAL COMFORT INDEX (UTCI)



71.8%	15%	1.6%
49.9%	40.6%	0%
13%	64.7%	0%
48.9%	33%	0.5%

CLIMATE ANALYSIS

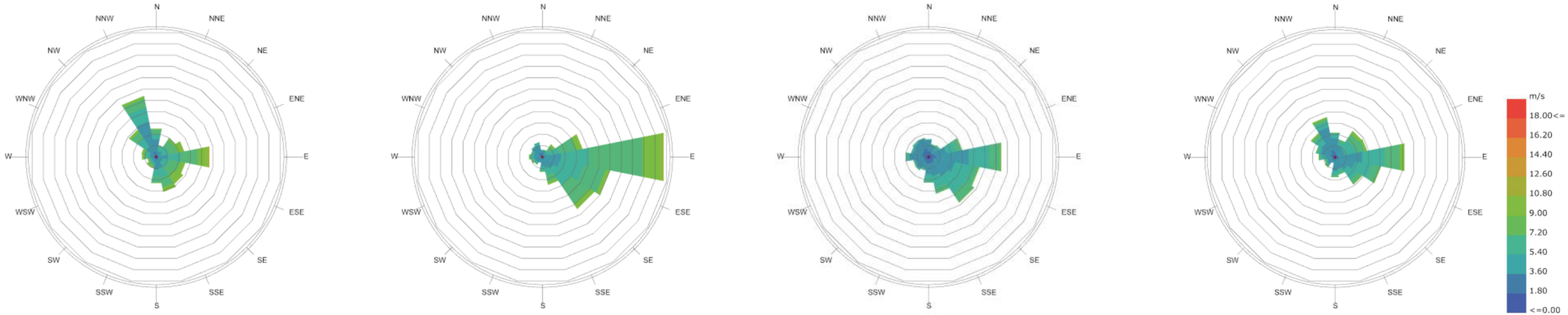
WINTER
December 21 - March 20

SPRING
March 21 - June 20

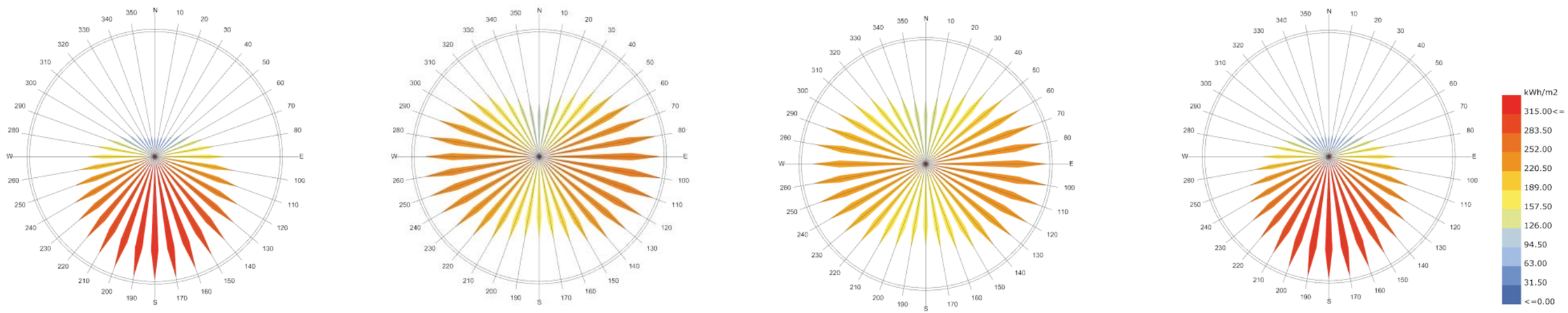
SUMMER
June 21 - September 20

FALL
September 21 - December 20

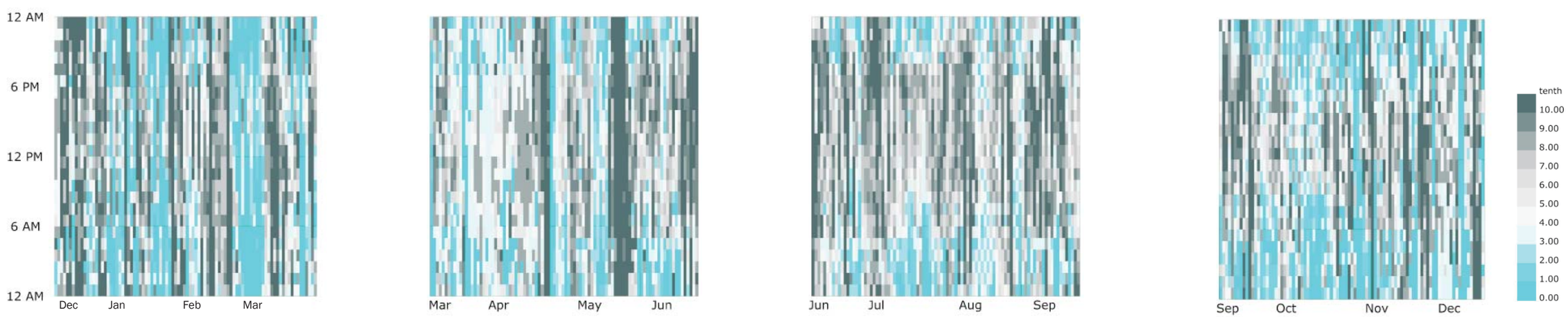
WIND SPEED + DIRECTION



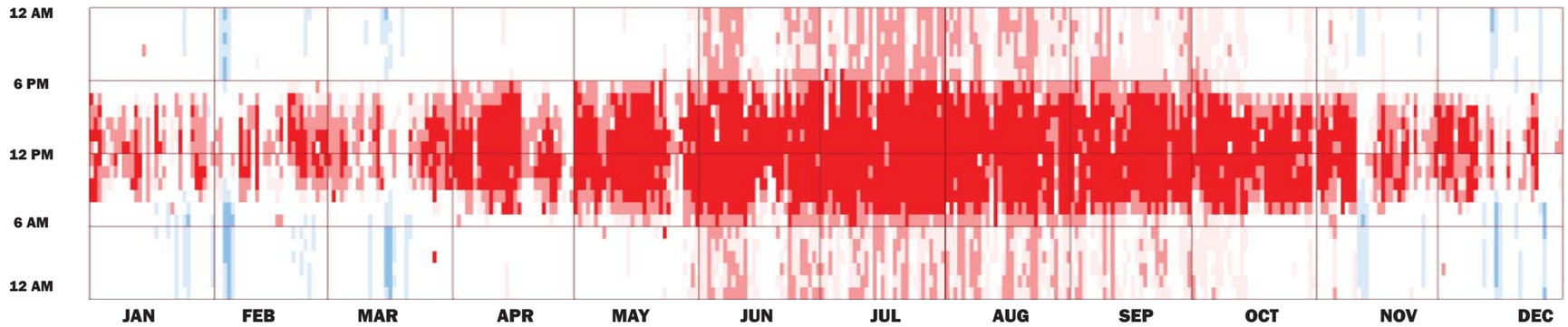
TOTAL RADIATION



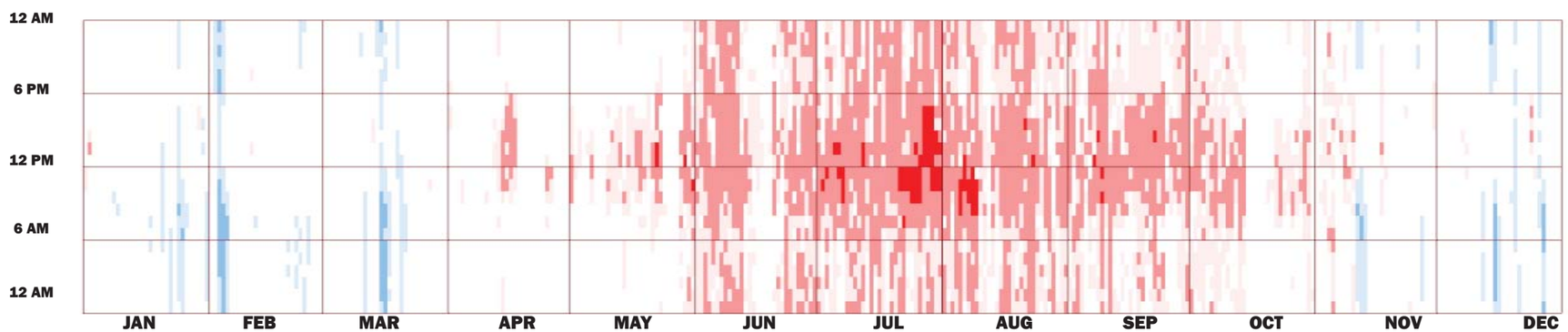
SKY COVER



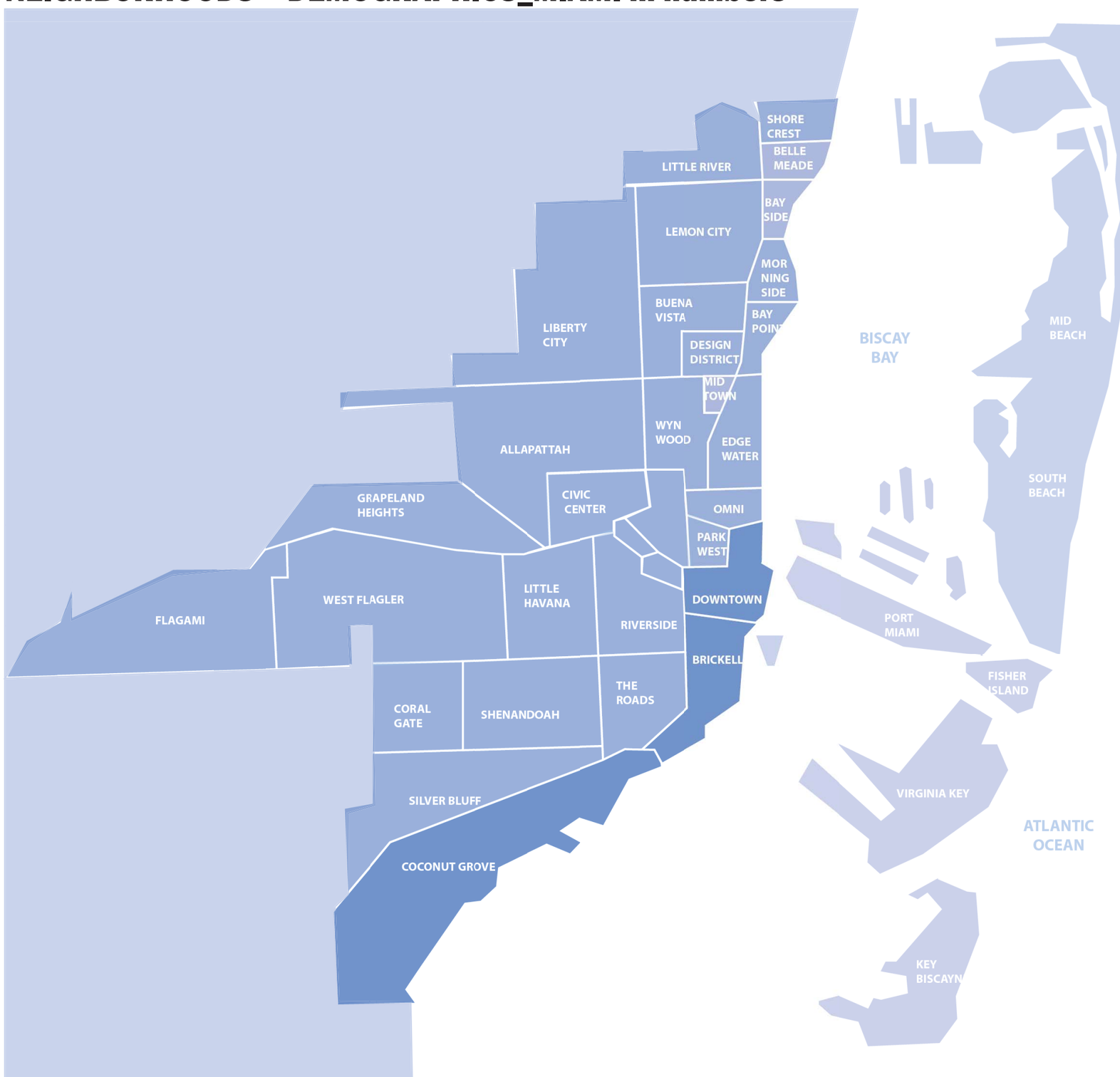
OUTDOOR COMFORT **NO SHADES** **45% ANNUALLY**



OUTDOOR COMFORT **WITH SHADES** **61% ANNUALLY**



NEIGHBORHOODS + DEMOGRAPHICS_MIAMI in numbers



8 most walkable city in USA

6 ft average elevation

399,457 population

11, 135 people per square mile

HISTORY

POPULATION

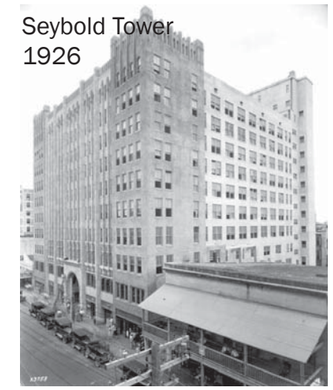
500 B.C
the Tequesta people inhabited land alongside other Indian groups they reached the astonishing number of 100,000 in population

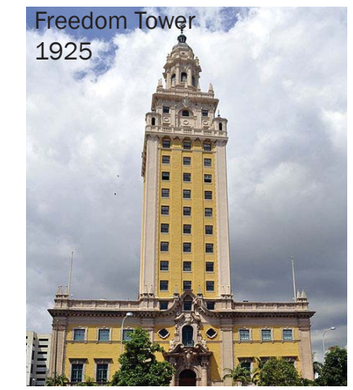
1800
The first permanent European settlers arrived to this ground in the early 19th century. They ferociously disputed the terrain in three Seminole Wars.

1896
Miami incorporated as a city after extension of Florida East Coast to Miami

1900

1920
With the railroad, progress came to Miami and the first boom occurred in 1900s to 1930s; many of Downtown's early high-rises were constructed in this time period





110,637 | 249,688 | 300 | 346,681 | 1,681 | 362,470 | 29,571 | 430,332

1925 Real Estate Bubble Burst

1926 Miami Hurricane

1930 Great Depression.

1950
1959 Fidel Castro rose to power - wave of immigration

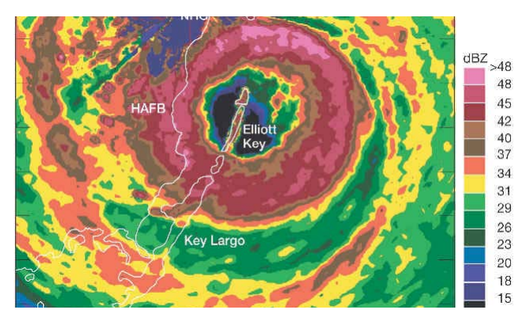
1980

1992 Hurricane Andrew

2000

2014

2200 Sea level is expected to rise for 10 ft



MIAMI 21
your city, your plan

HISTORICAL ARCHITECTURAL STYLE

FRAME VERNACULAR
(1840s—present)

Palm Cottage (Flager Worker's House)

BAHAMIAN OR CONCH
(1890-1920s)

Stirrup House

COMMERCIAL MASONRY VERNACULAR
(1835-1925)

Waddell Building

BUNGALOW
(1910-1930s)

Palm Grove Historic District Residence

BELVEDERE BUNGALOW
(1910-1930)

J. Jacob Hubbard House

MISSION
(1910-1930s)

Wyatt-Thomas House

MASONRY VERNACULAR
(1840s-present)

Dr. William Chapman House

HISTORICAL ARCHITECTURAL STYLE

MEDITERRANEAN REVIVAL
(1917-1930s)

Coconut Grove Playhouse

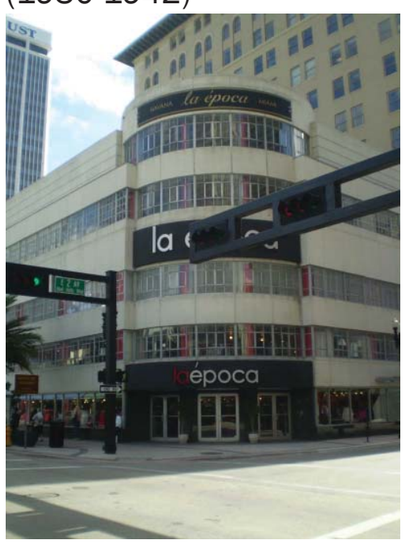
NEO-CLASSICAL
(1893- c. 1940)

George E. Nolan House

ART DECO
(1929-1940)

Shrine Building

STREAMLINE AND DEPRESSION MODERNE
(1930-1942)



Walgreen Drug Store

Alfred I DuPont Building

MIAMI MODERN
(1945-1965)

Vagabond Hotel

ZONING + LAND USE

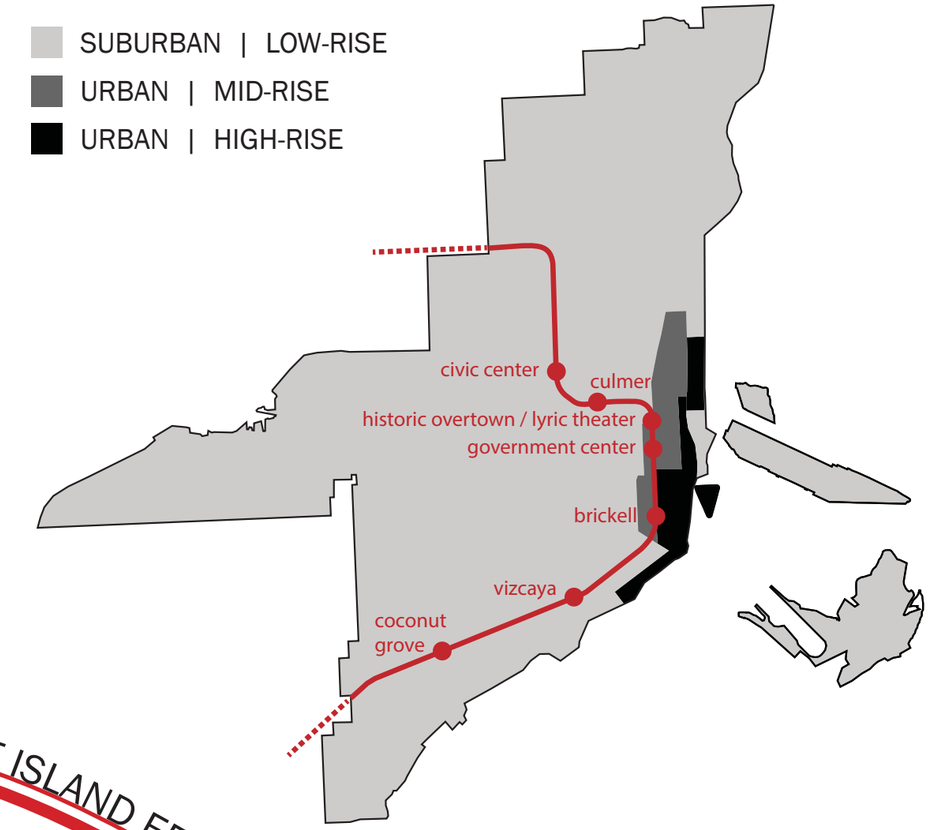
1500 SW 1st Ave
Brickell
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2016 Google
Image Landsat
Google earth
2012
25°45'19.07" N 80°11'41.88" W elev 300 ft eye alt 1293 ft

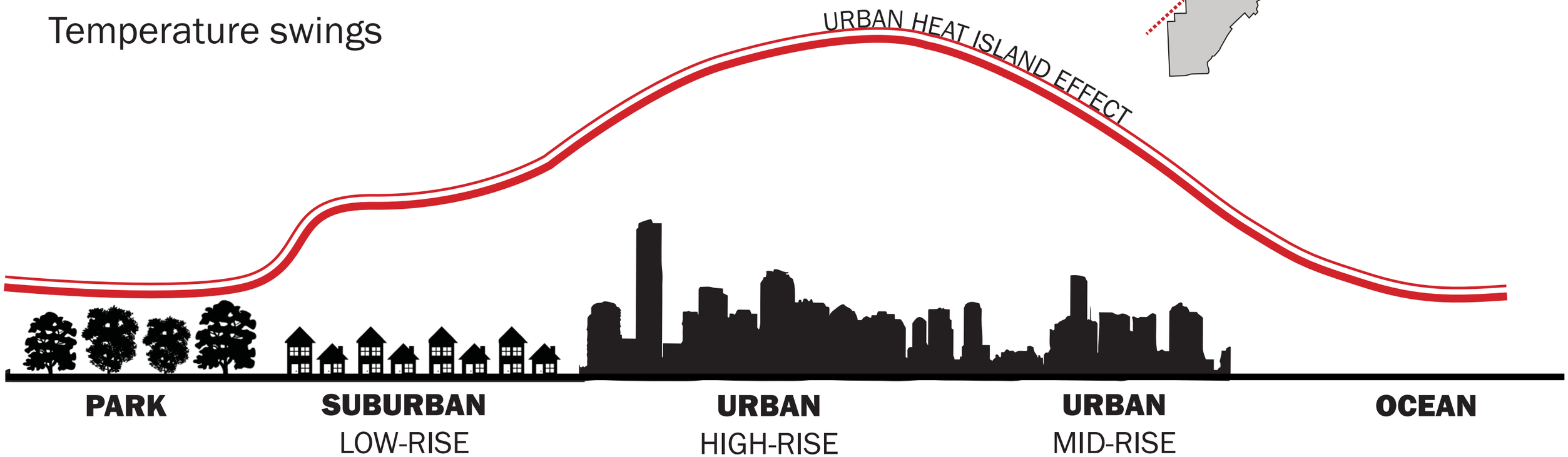
MIAMI

one of top three USA cities with most intense urban heat island effect

+ 0.92 - 1.49 C

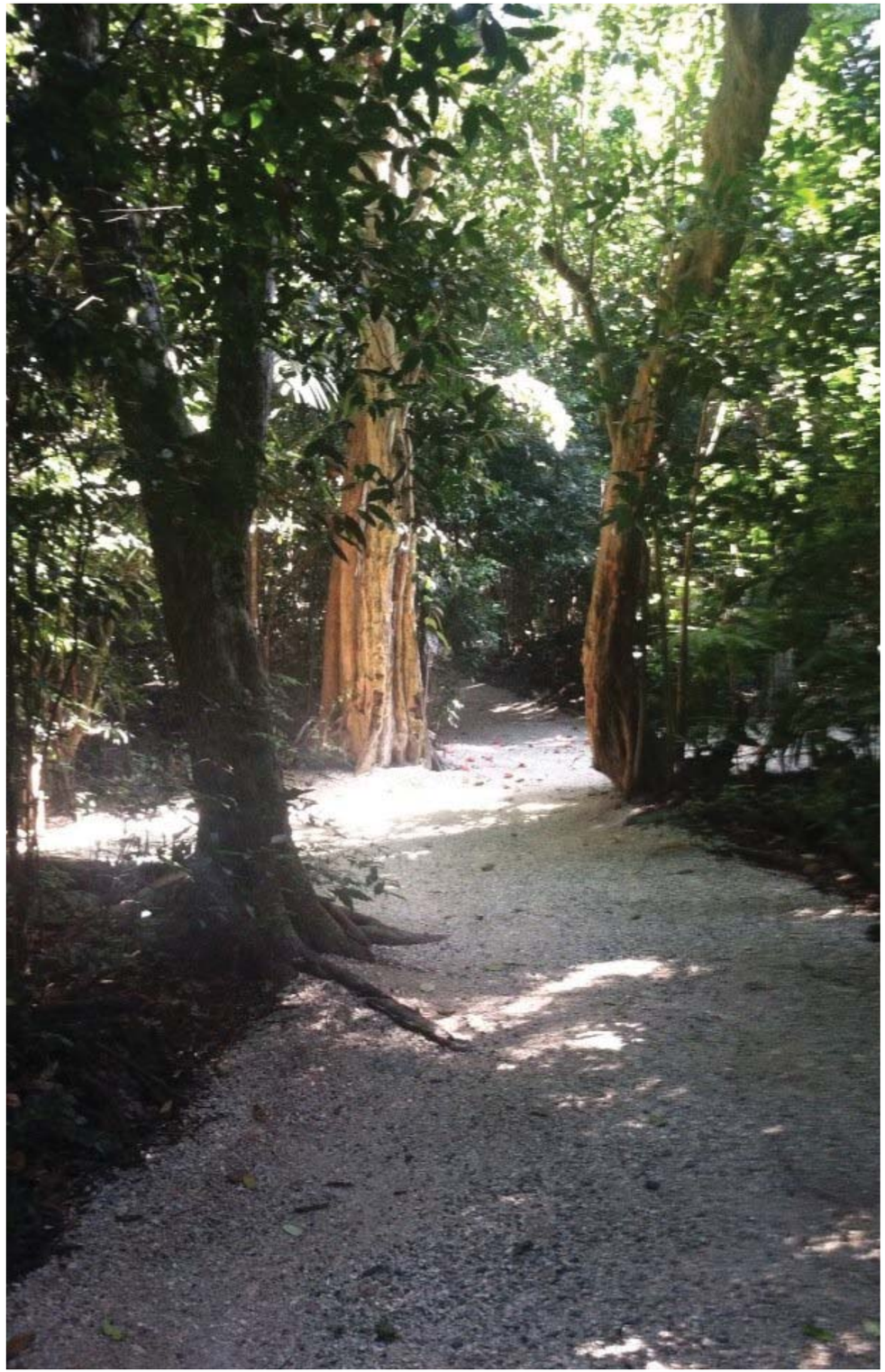
Temperature swings

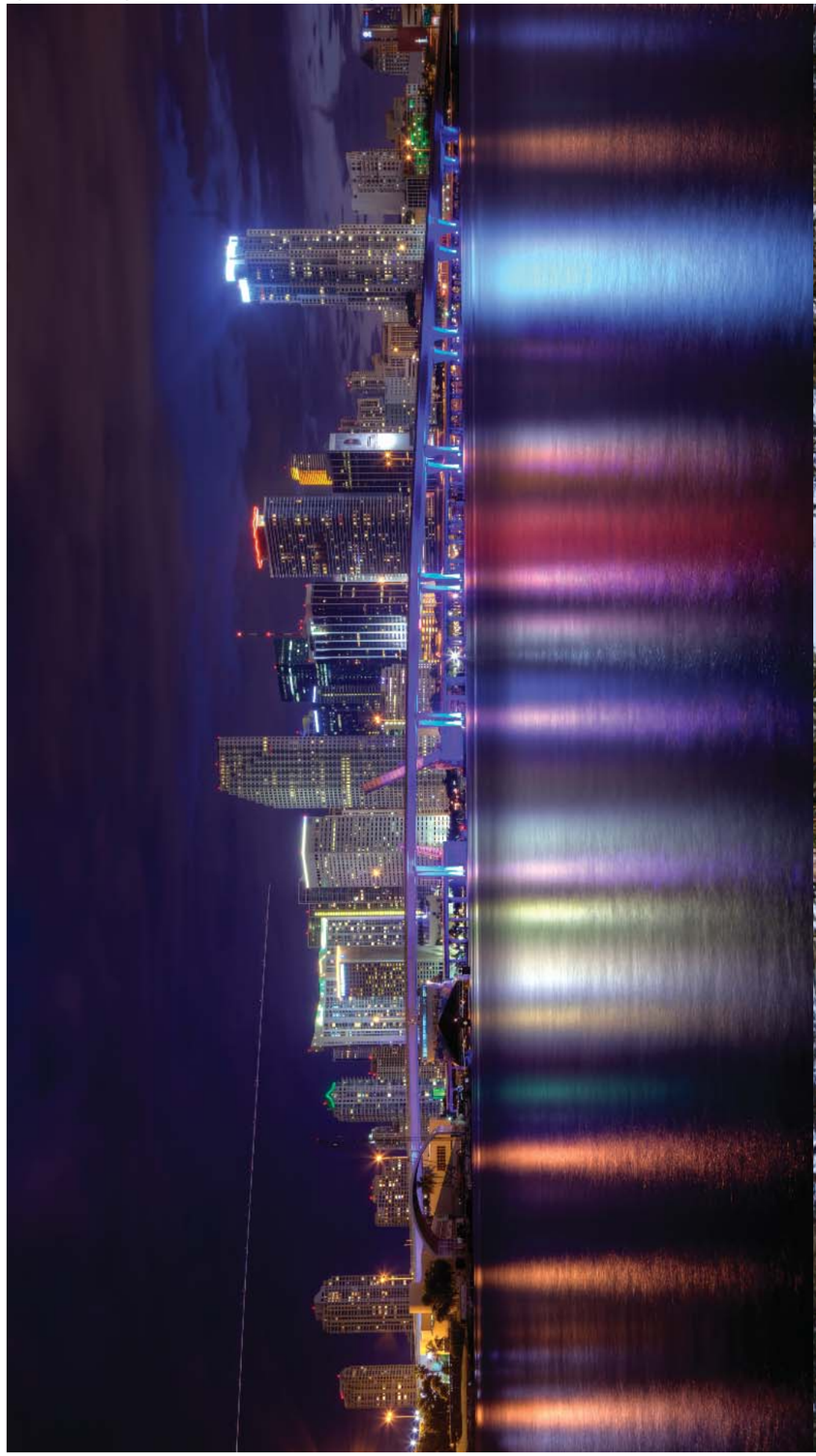




http://www.abpan.com/wp-content/uploads/2014/08/macarthur-causeway.jpg

http://www.designboom.com/wp-content/uploads/2015/02/jacob-brillhart-architecture-house-miami-florida-designboom-10.jpg





PUBLIC TRANSPORTATION INFRASTRUCTURE_Metrorail Underline + MPath

69% MIAMI WORKERS **DRIVE ALONE** TO WORK

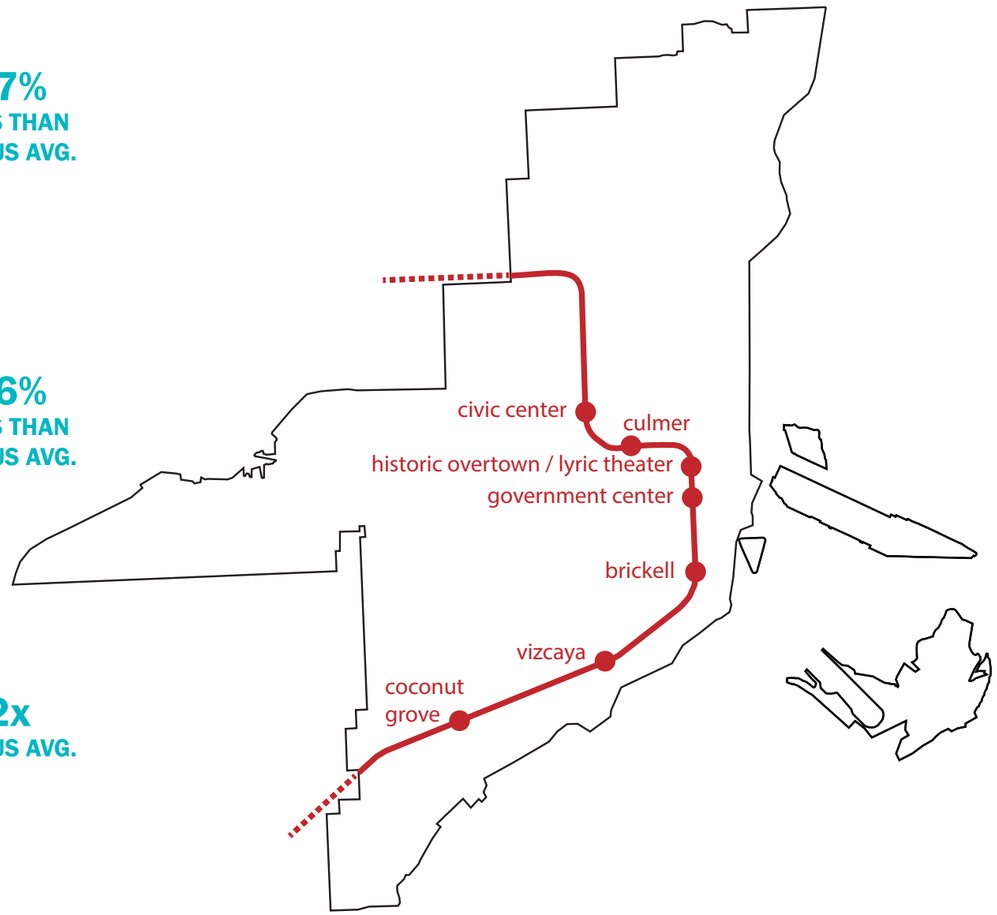
~7% **LESS THAN THE US AVG.**

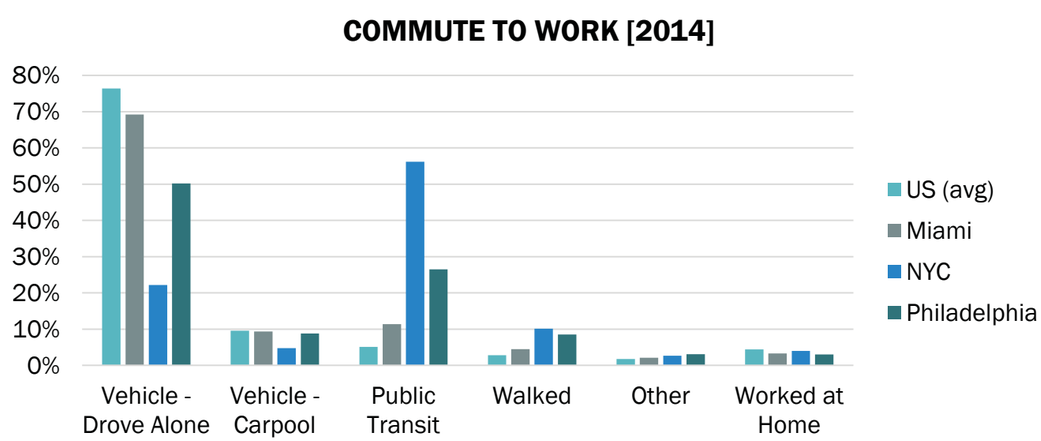
11% TAKE **PUBLIC TRANSPORTATION** TO WORK

~6% **LESS THAN THE US AVG.**

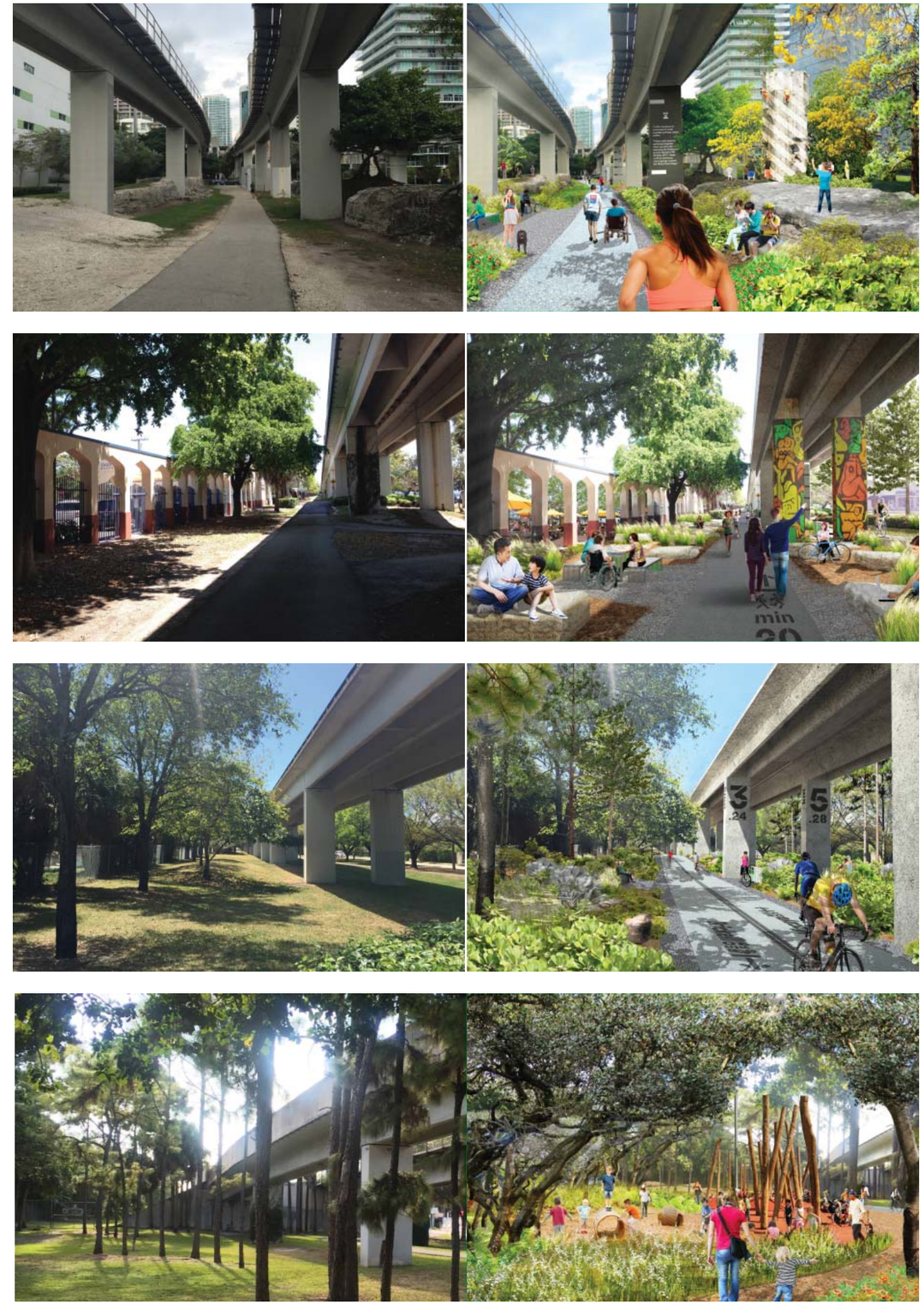
2.8% **WALK** TO WORK

2x **THE US AVG.**

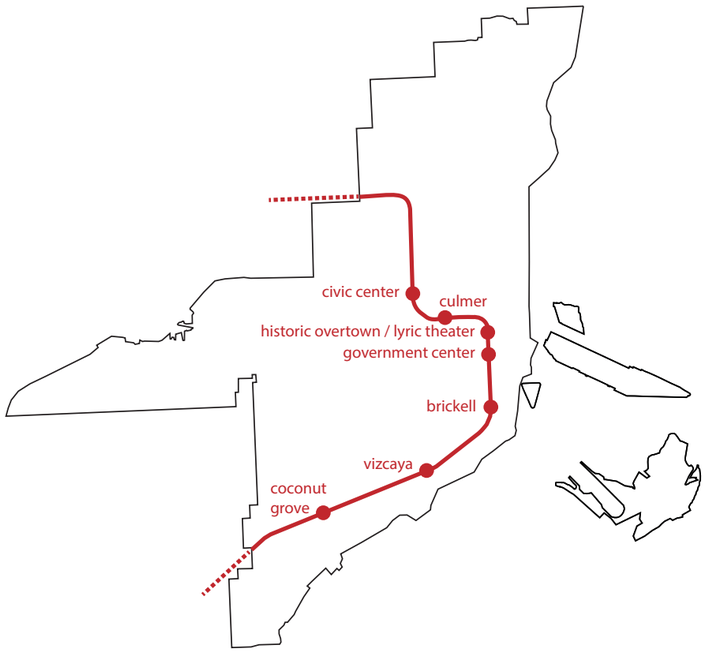


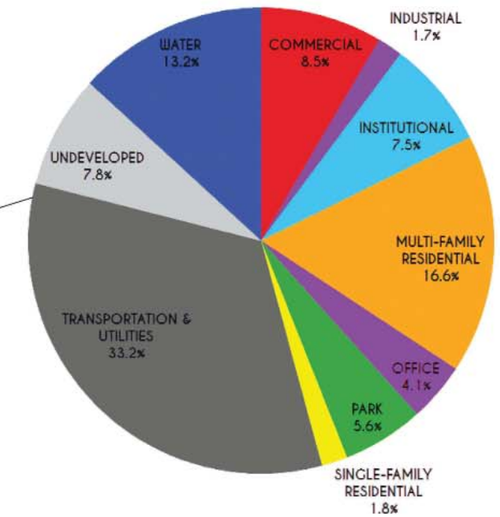


Source: U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates

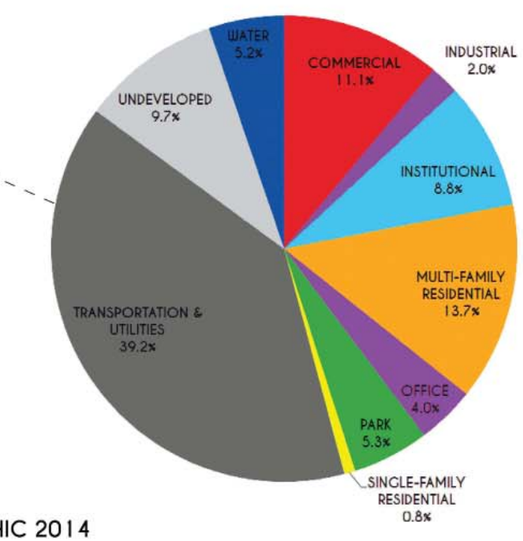


GOVERNMENT CENTER





1 MILE
AS-THE-PIGEON-FLIES



1 MILE
ALONG-THE-STREET-NETWORK

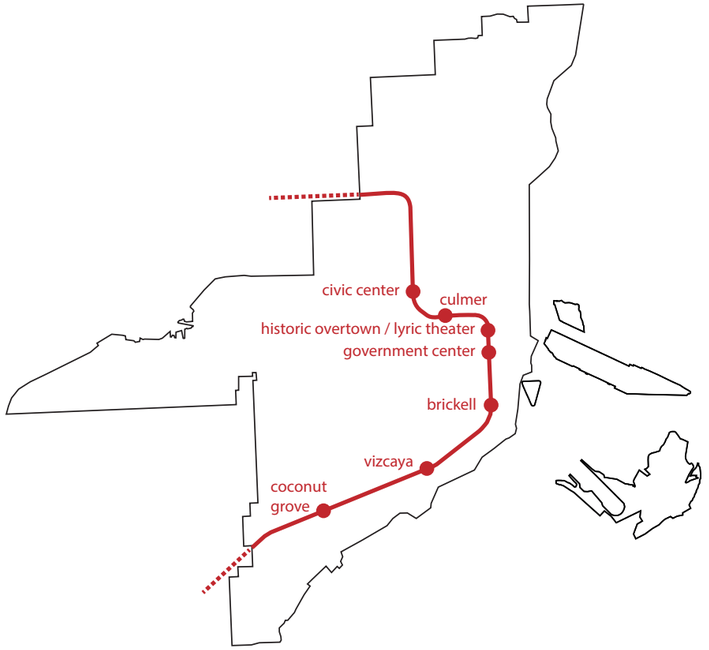
LAND-USE CLASSES

- AGRICULTURAL
- COMMERCIAL
- INDUSTRIAL
- INSTITUTIONAL
- MULTI-FAMILY RESIDENTIAL
- OFFICE
- PARK
- SINGLE-FAMILY RESIDENTIAL
- TRANSPORTATION & UTILITIES
- UNDEVELOPED
- WATER

0 0.25 0.5 1 MILE

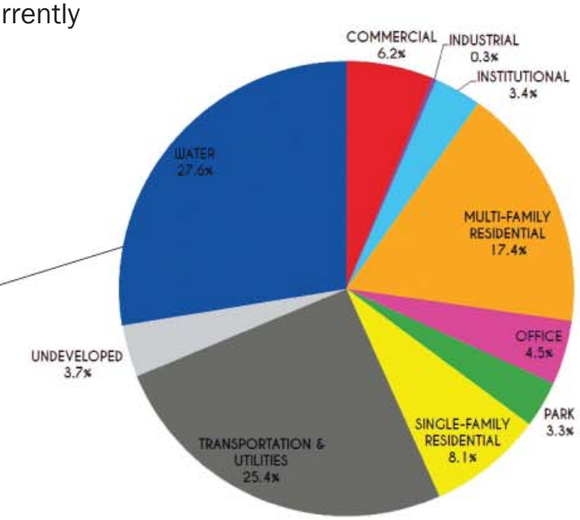
MIAMI GEOGRAPHIC 2014

LAND USE_Brickell Station

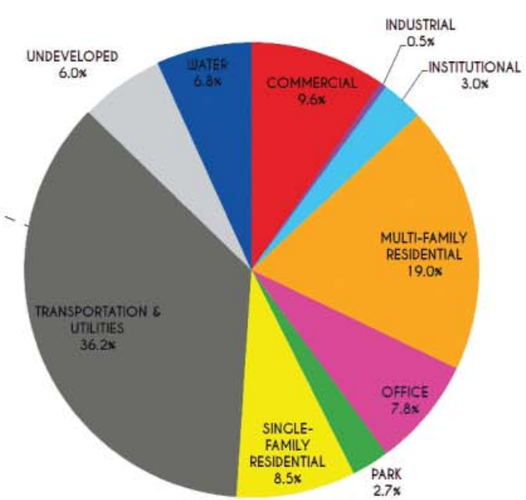


Settled: **1830**
Lowest Elevation: **0 - 5 ft**
Population: **26,472 (2010 U.S. Census)**
Density: **27,302/ sq mi**

With Brickell serving as the financial business district of our urban core, it's no surprise to find significant commercial (9.6%) and office (7.8%) space. It's an increasingly residential area too, with nearly 20% dedicated to condos and apartments, comprising the largest land-use class in the area: multi-family residential. 6% of undeveloped land is currently actively being eaten up by the future Brickell City Center.



1 MILE
AS-THE-PIGEON-FLIES



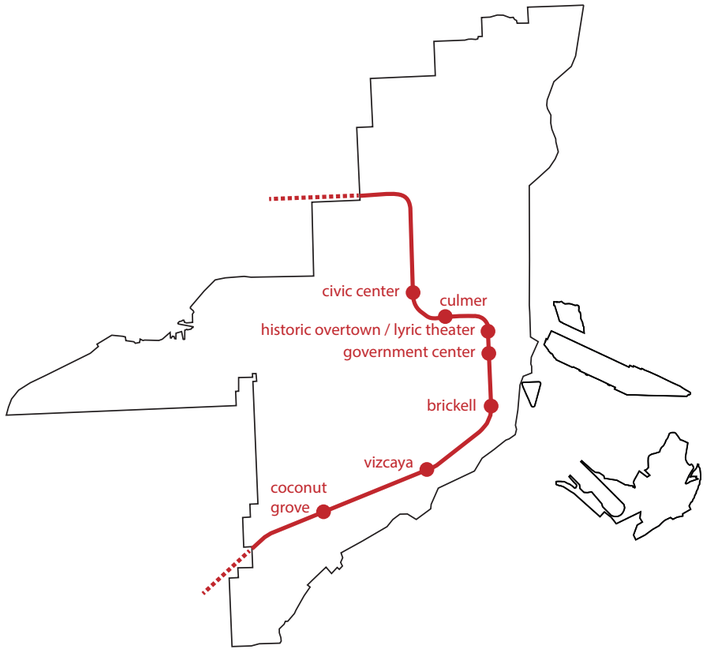
1 MILE
ALONG-THE-STREET-NETWORK

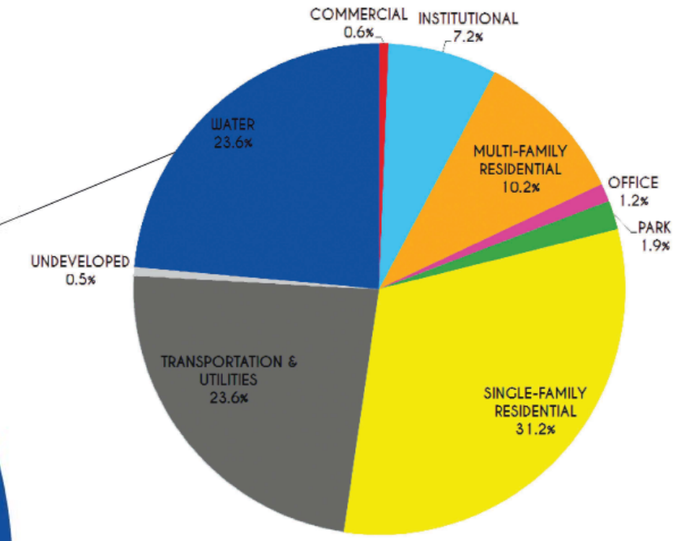
AGRICULTURAL
COMMERCIAL
INDUSTRIAL
INSTITUTIONAL
MULTI-FAMILY RESIDENTIAL
OFFICE
PARK
SINGLE-FAMILY RESIDENTIAL
TRANSPORTATION & UTILITIES
UNDEVELOPED
WATER

0 0.25 0.5 1 MILE

MIAMI GEOGRAPHIC 2014

LAND USE_Vizcaya Station

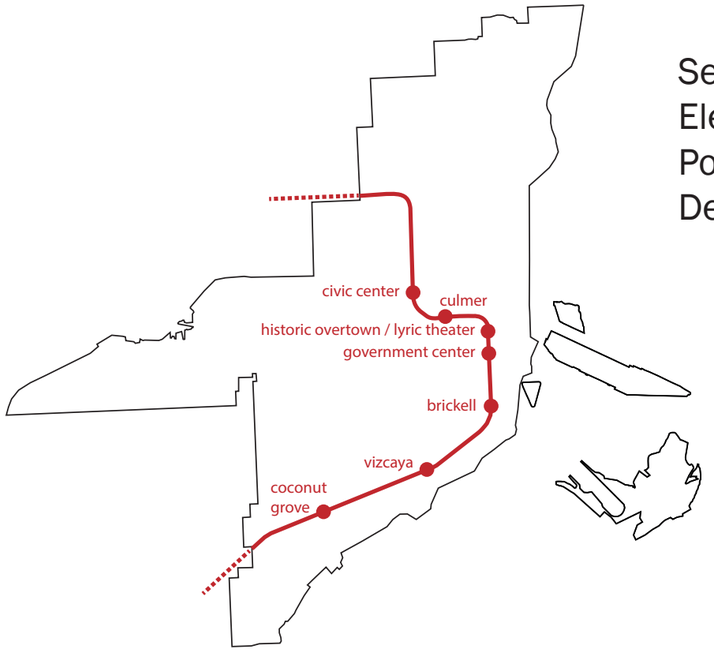




- AGRICULTURAL
- COMMERCIAL
- INDUSTRIAL
- INSTITUTIONAL
- MULTI-FAMILY RESIDENTIAL
- OFFICE
- PARK
- SINGLE-FAMILY RESIDENTIAL
- TRANSPORTATION & UTILITIES
- UNDEVELOPED
- WATER

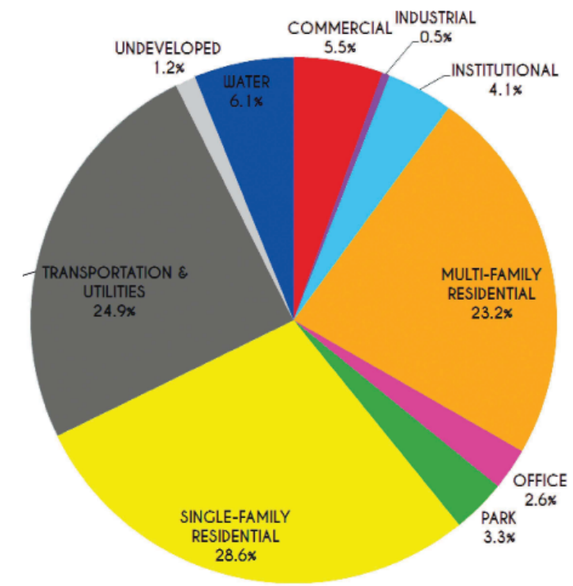
Vizcaya station is adjacent to the single-family neighborhood known as The Roads, the historic mansions along the bay and in south Brickell, some high-rise condos, the soon-to-be-relocated Miami Museum of Science, gorgeous City of Miami Alice Wainwright park and, of course, lovely and historic Vizcaya Museum and Gardens.

LAND USE_Coconut Grove Station



Settled: 1825
Elevation: 13 - 24 ft
Population: 20,076
Density: 8,006/ sq mi

Coconut Grove is the oldest continuously inhabited neighborhood of Miami.



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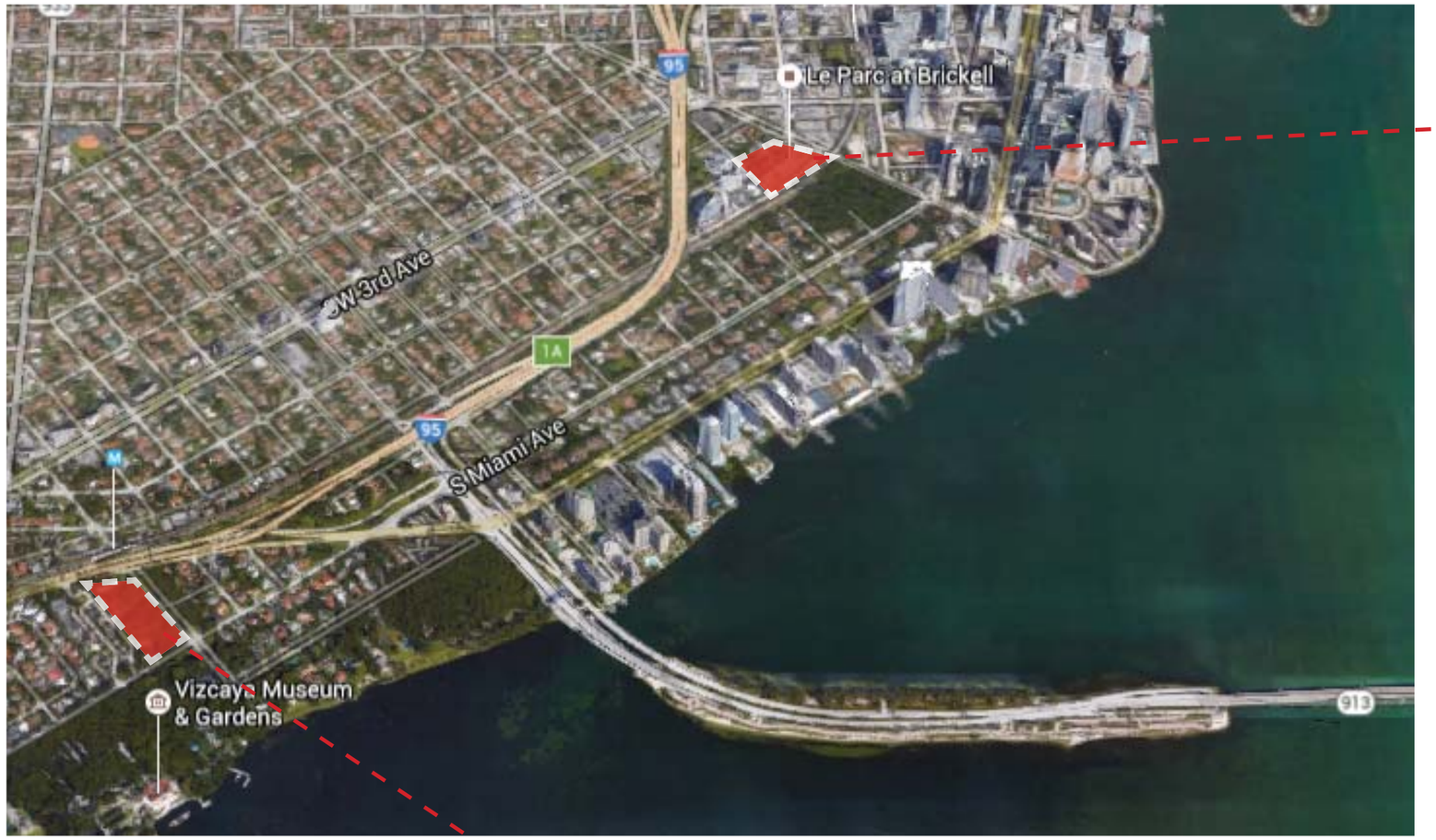
Coconut Grove neighborhood is over 55% residential, with 29,5% single family houses and 27.4% multifamily houses. Such an even split of single and multifamily homes is a feature all along SW 27th Avenue.



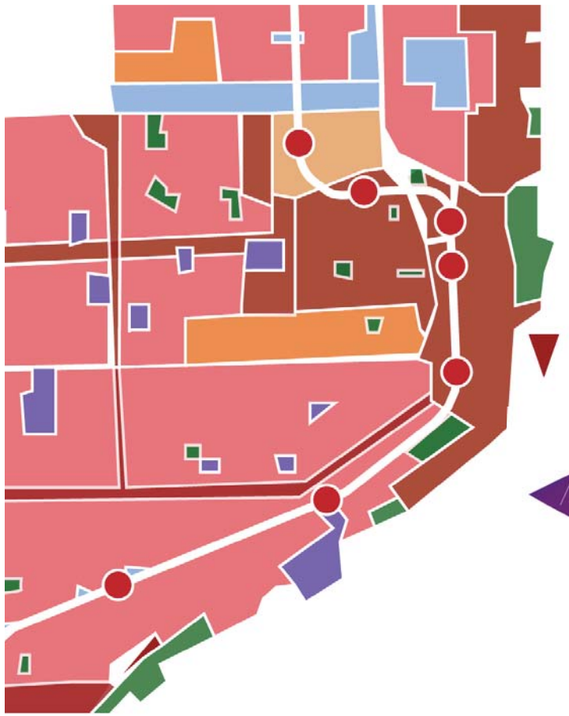
SITE 1. BRICKELL PARK

Located between Urban Core and General Urban zones.
Park across the road provide the “natural buffer” protecting site from overheating.
Surrounding high-rise building provide free shading.

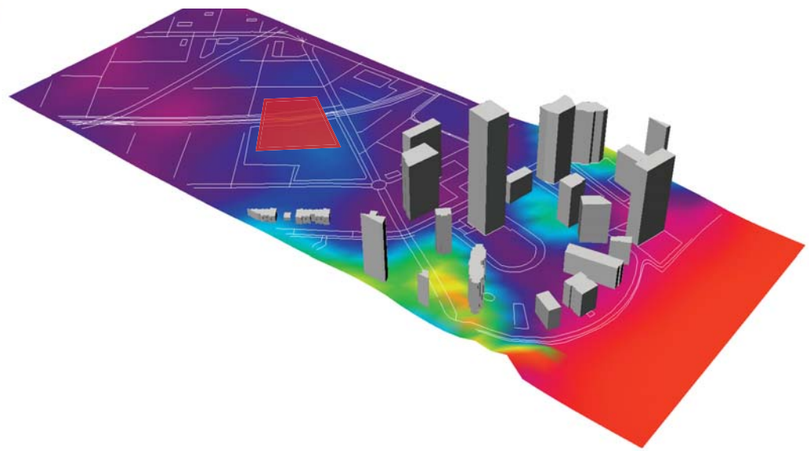
SITE 2. VIZCAYA

Situated in close access to Vizcaya Park, ocean shore, and Underline.

BRICKELL PARK_PROSPECTIVE SITE 1



Neighborhood: **Bickell**
Elevation: 5 - 6 ft
Distance from the shore: 3,146 ft
Area: 296,233 sq ft
Zone: Urban Core (Density 27,302/sq mi)
Sub Urban (Density 8,006 / sq mi)



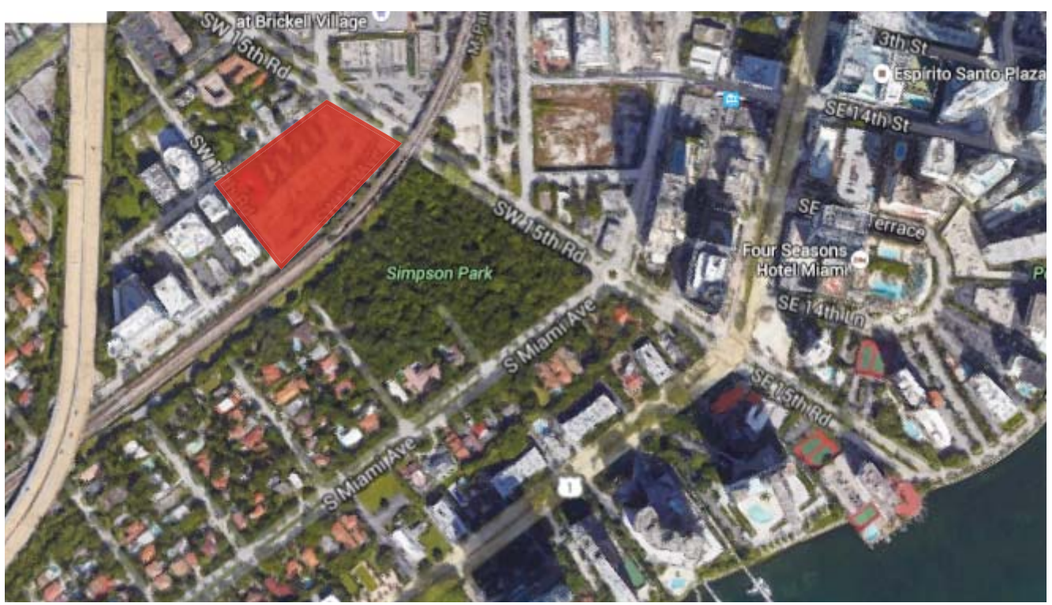
Features of the site :

Simpson Park - natural reservation, passive park

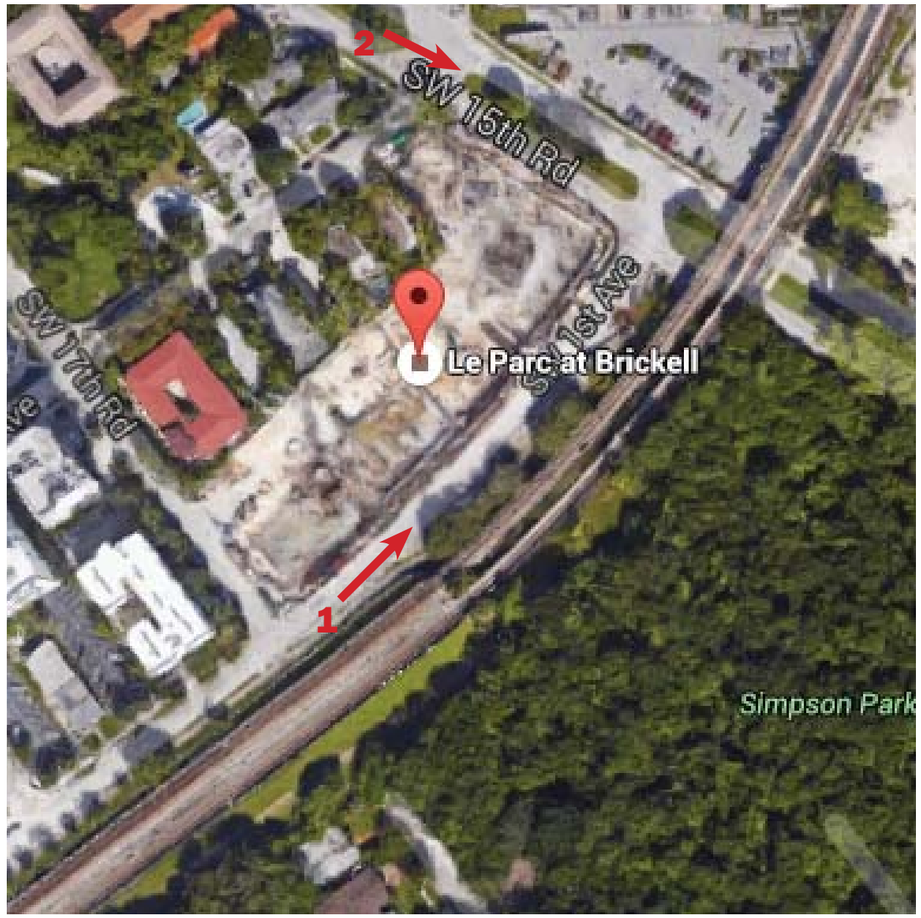
High-rise office and residential buildings provide free shading

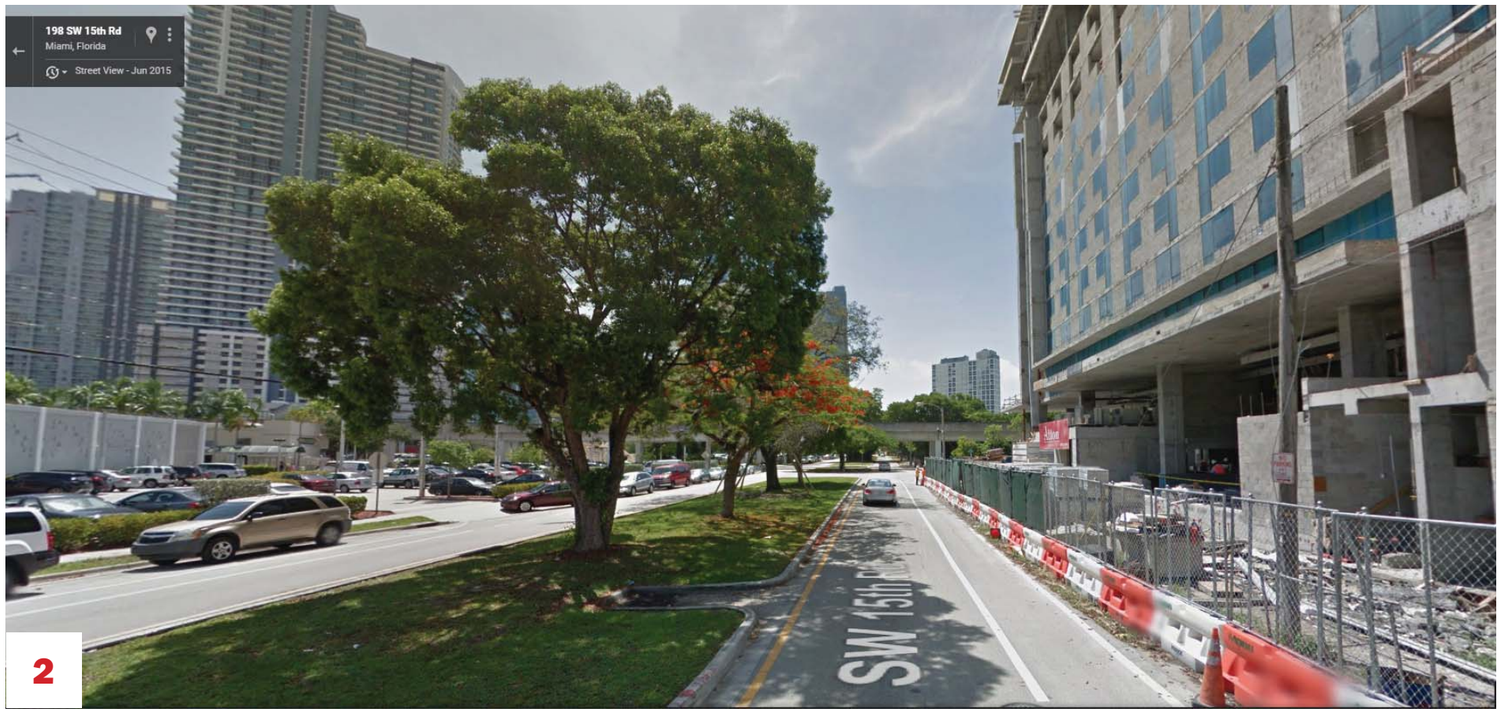
Located precisely on the edge urban and suburban zones

Programs:
Office, Residential, Hospitality / Recreation,

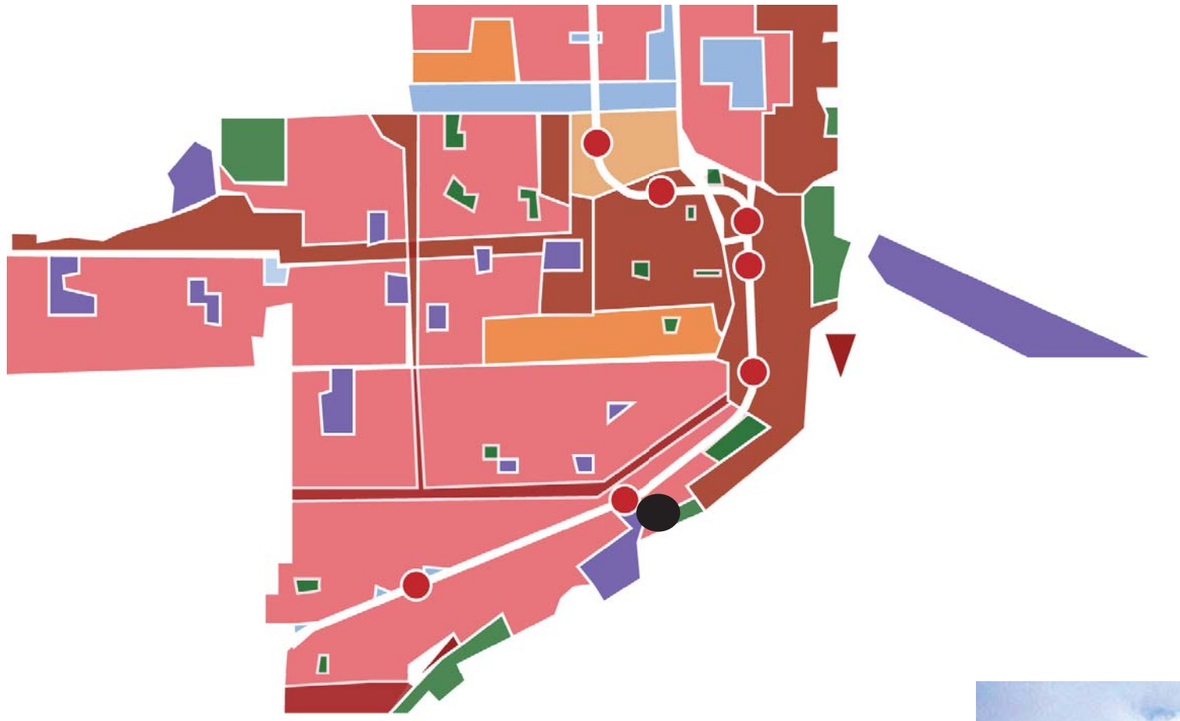


BRICKELL PARK_PROSPECTIVE SITE 1



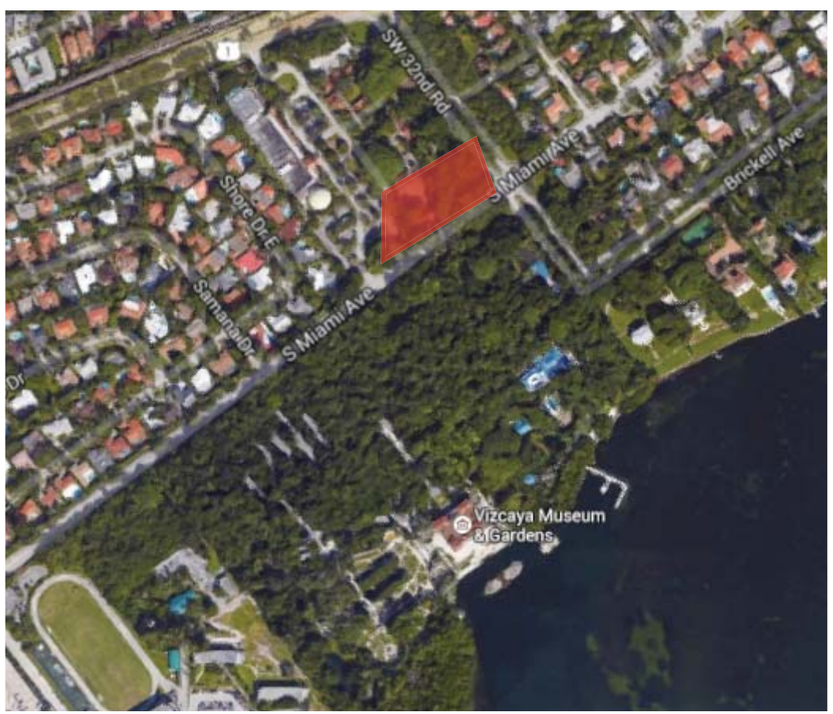


VIZCAYA_PROSPECTIVE SITE 2

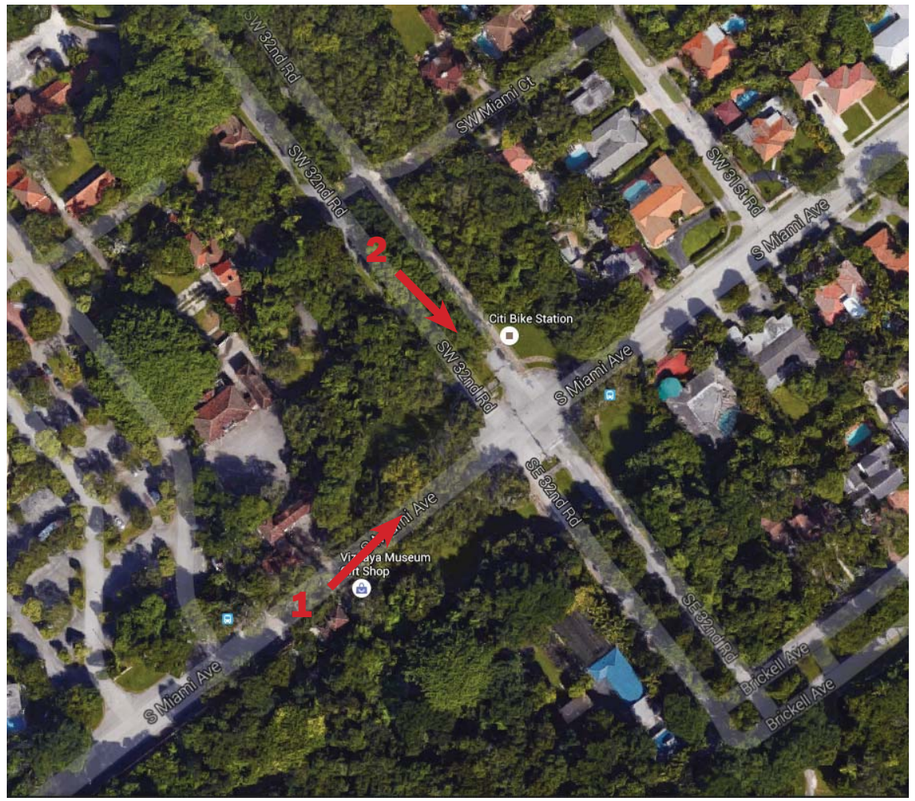


Neighborhood: **Brickell**
Elevation: 4 - 5 ft
Distance from the shore: 1,856 ft
Area: 187,576 sq ft
Zone: Sub Urban (Density 8,006 / sq mi)

Features of the site :
Vizcaya Museum and Garden



VIZCAYA_PROSPECTIVE SITE 2



BRICKELL

Brickell is an urban neighborhood of Greater Downtown Miami, Florida, United States. Directly south of the historic CBD, Brickell is Miami and South Florida's major financial district.

Brickell was settled in the modern era in the mid-1800s by early pioneers, growing to become Miami's "Millionaire's Row" in the early 1900s after the construction of lavish mansions along Brickell Avenue by Mary Brickell. By the 1970s, office towers, hotels and apartments began replacing the historic mansions. Today, Brickell has grown to overtake the city's historic central business district to the north, as one of the largest financial districts in the United States. With a fast-growing residential population, Brickell is one of Miami's fastest-growing as well as its most dense neighborhood.

Brickell has a large concentration of wealthy Argentine, Colombian, Cuban, Nicaraguan and Venezuelan residents. Many work in the neighborhood's financial and trade sectors, or live in Brickell part-time.

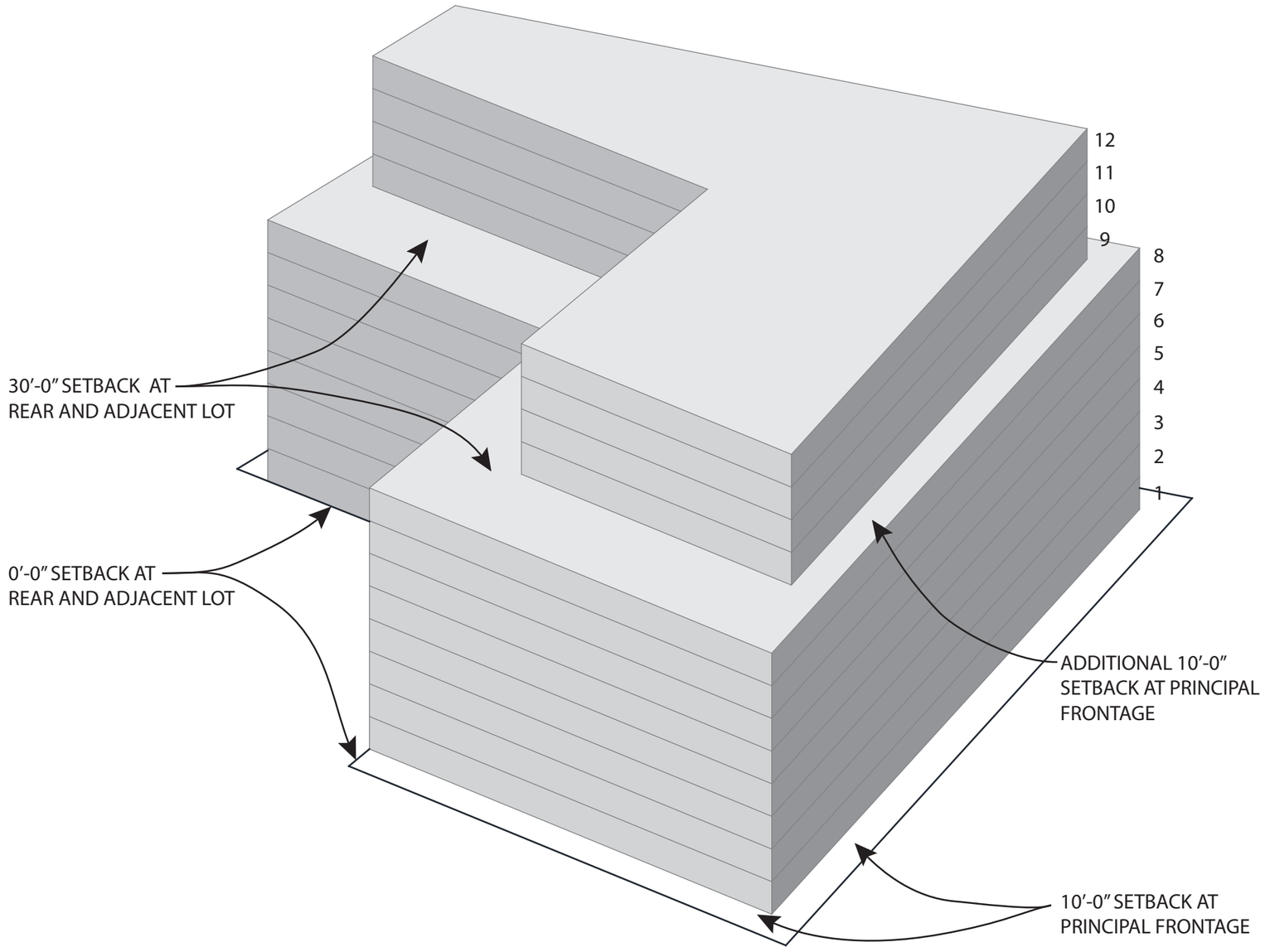
Brickell is served by Metrobus throughout the area, the Miami Metrorail, and the Metromover.

West Brickell - residential neighborhood with low and mid rise apartment houses. Condominium boom started here in 2012 - luxury apartments replaced prewar homes.

Southeast Brickell - single family homes from early 1900 on the south and high-rise residential towers along east side.

Financial District - historically banks headquarters and commercial offices were build here, but nowadays area is getting more residential.

ZONING ENVELOPE



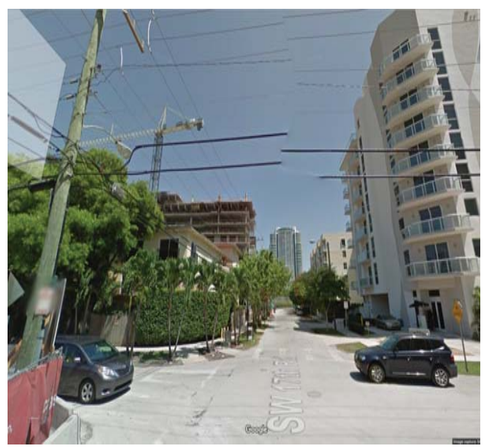
LOT OCCUPATION	
a. Lot Area	5,000 s.f. min.; 40,000 s.f. max.
b. Lot Width	50 ft min.
c. Lot Coverage	
- 1-8 Stories	80% max.
- Above 8th Story	15,000 sq. ft. max. Floorplate for Residential & Lodging 30,000 sq. ft. max. Floorplate for Office & Commercial
d. Floor Lot Ratio (FLR)	5 / 25% additional Public Benefit
e. Frontage at front Setback	70% min.
f. Open Space	10% Lot Area min.
9. Density	150 du/ac max.*

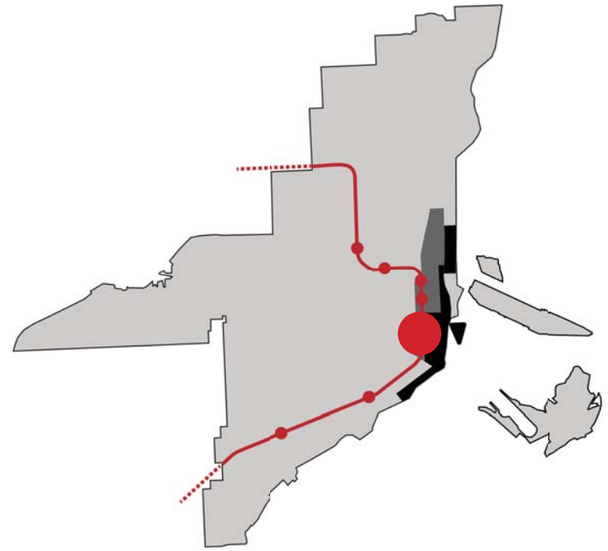
BUILDING SETBACK	
a. Principal Front	10 ft. min.; 20 ft. min. above 8th Story
b. Secondary Front	10 ft. min.; 20 ft. min. above 8th Story
c. Side	0 ft. min.; 30 ft. min. above 8th Story
d. Rear	0 ft. min.; 30 ft. min. above 8th Story
e. Abutting Side or Rear T5	0 ft. min. 1st through 5th Story 10 ft. min. 6st through 8th Story 30 ft. min. above 8h Story
Abutting Side or Rear T4	6 ft. min. 1st through 5th Story 26 ft. min. above 5th Story
Abutting Side or Rear T3	10% of Lot depth** min. 1st through 2nd Story 26 ft. min. 3rd through 5th Story 46 ft. min. above 5th Story

FRONTAGE	
a. Common Lawn	prohibited
b. Porch & Fence	prohibited
c. Terrace or L.C.	prohibited
d. Forecourt	permitted
e. Stoop	permitted
f. Shopfront	permitted (T6-8 L and T6-8 O only)
9. Gallery	permitted by Special Area Plan
h. Arcade	permitted by Special Area Plan

BUILDING HEIGHT	
a. Min. Height	2 Stories
b. Max. Height	8 Stories
c. Max. Benefit Height	4 Stories Abutting all Transects Zones except T3

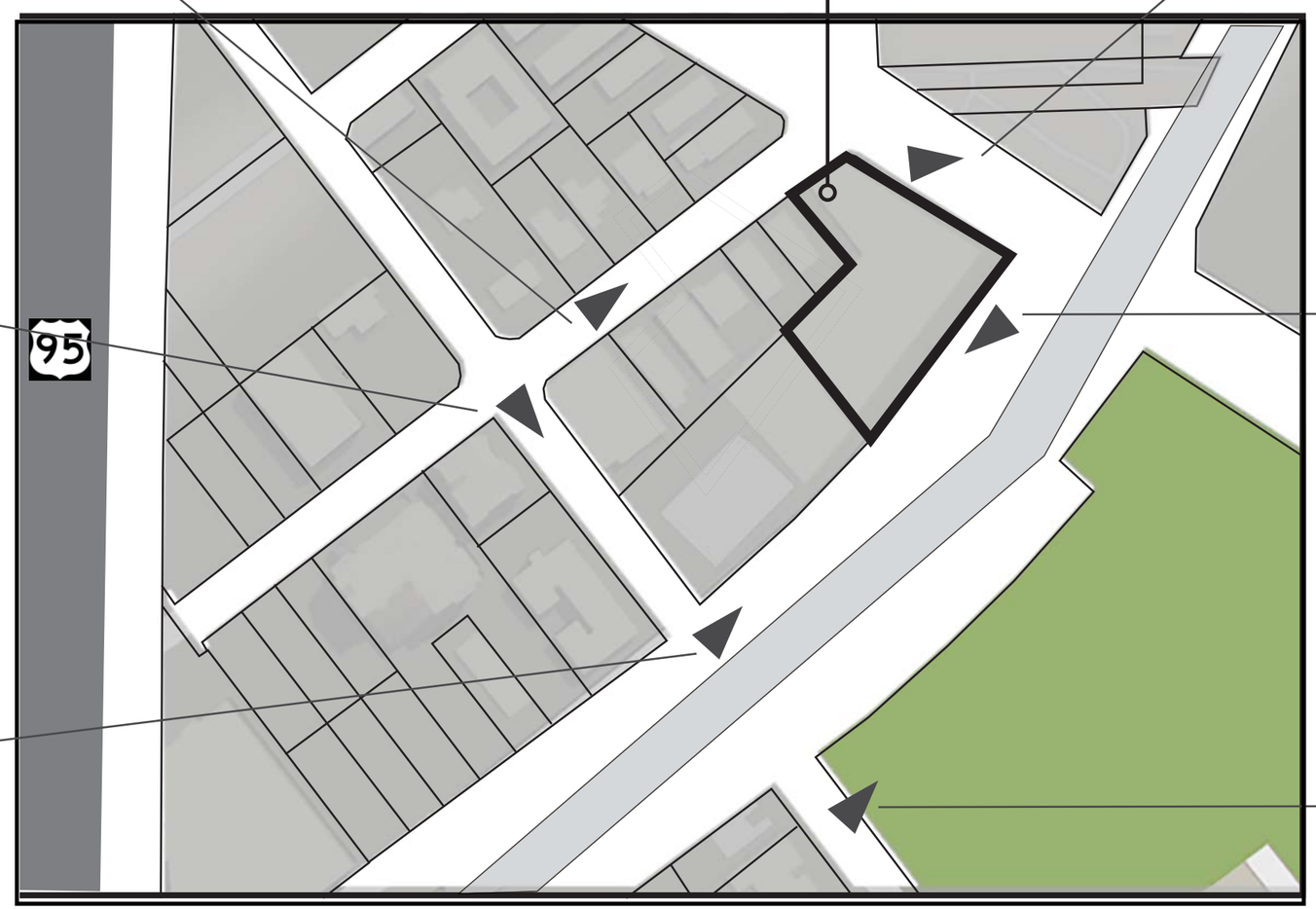
SITE

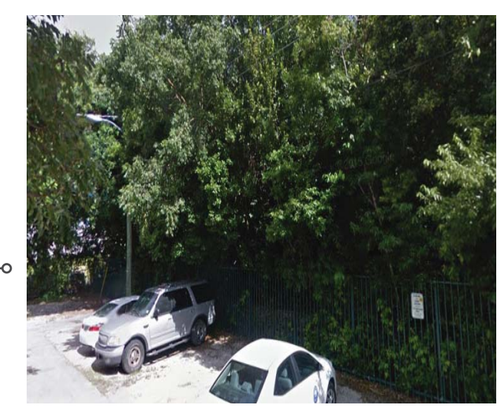




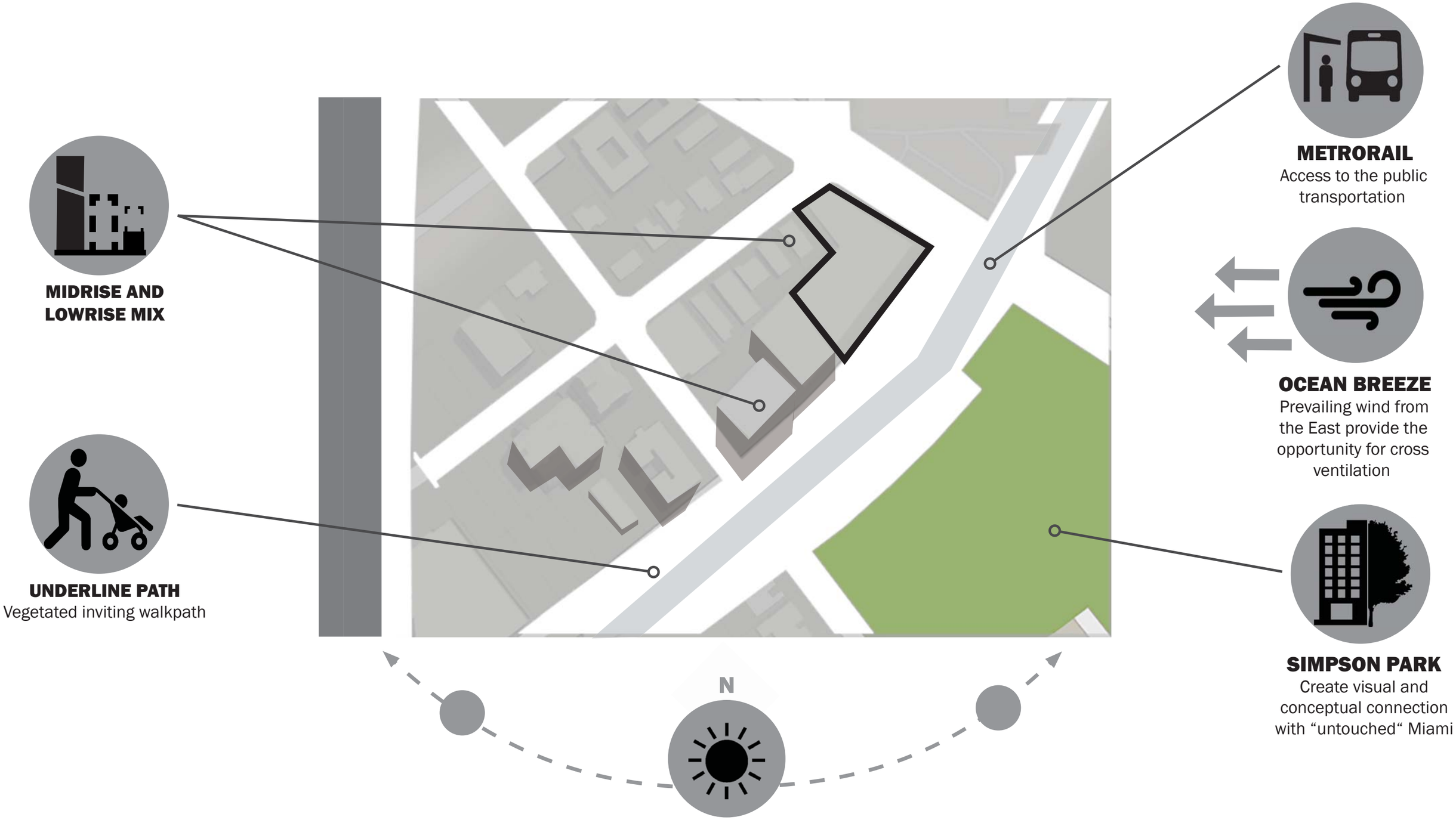
PROPOSED SITE

Lot Size: **39,852 SF**
Zone: **T6-8 Urban Core Zone**



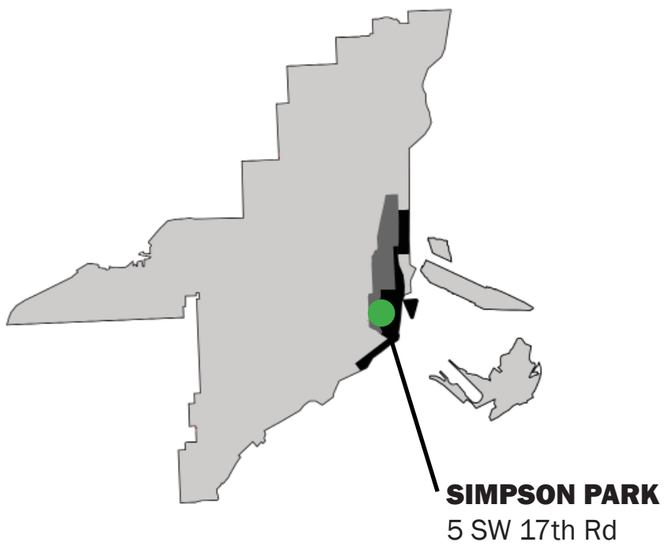


SITE CONTEXT



MICROCLIMATE

The climate in the understory is shaded, humid and damp. Wind is greatly dampened, resulting in a still environment. Heat and humidity speeds up the decomposition of matter resulting in poor soil quality beyond the top layer.



EMERGENT LAYER

Typically evergreens, which are able to withstand harsher temperatures and higher winds. Eagles, butterflies, and bats inhabit this layer.

CANOPY LAYER

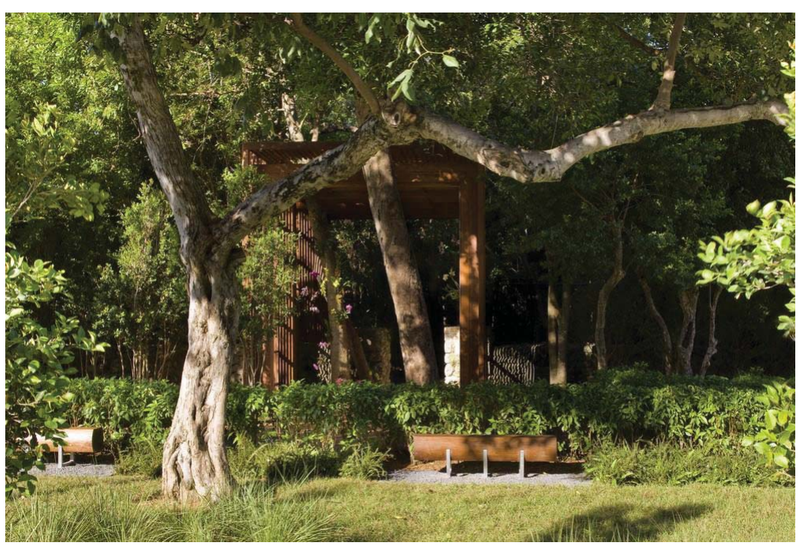
The densest areas of biodiversity are found in the forest canopy, a continuous cover formed by adjacent treetops. It traps moisture & humidity underneath & blocks ~95% of the sunlight.

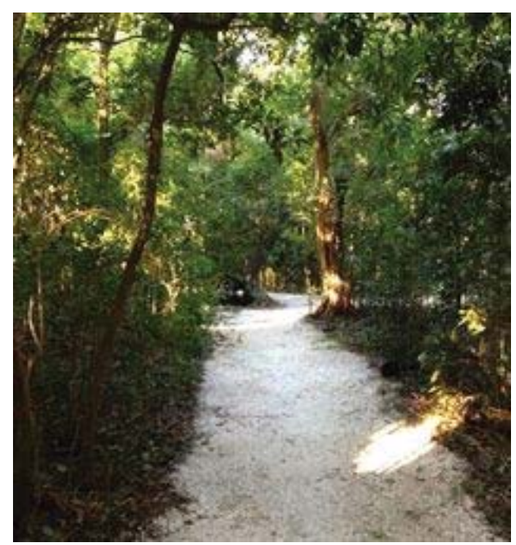
UNDERSTORY LAYER

The leaves are much larger at this layer since very little light makes it down from the canopy.

FOREST FLOOR

The forest floor is relatively clear of vegetation, since very little sunlight penetrates to ground level. It contains mostly decaying plant and animal matter, which disappear quickly due to the lack of sunlight.





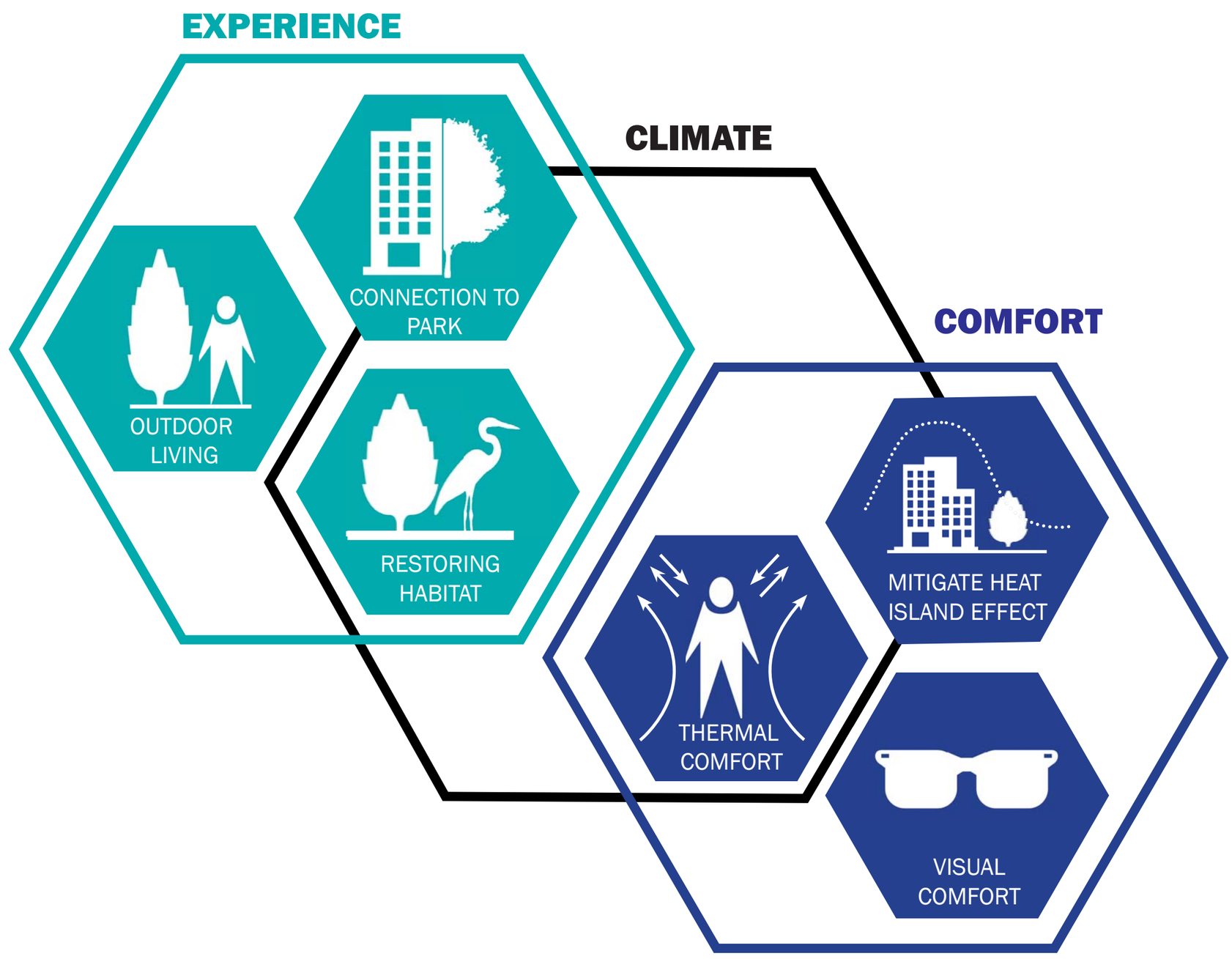
GOALS AND STRATEGIES

ARCHITECTURAL SHADING

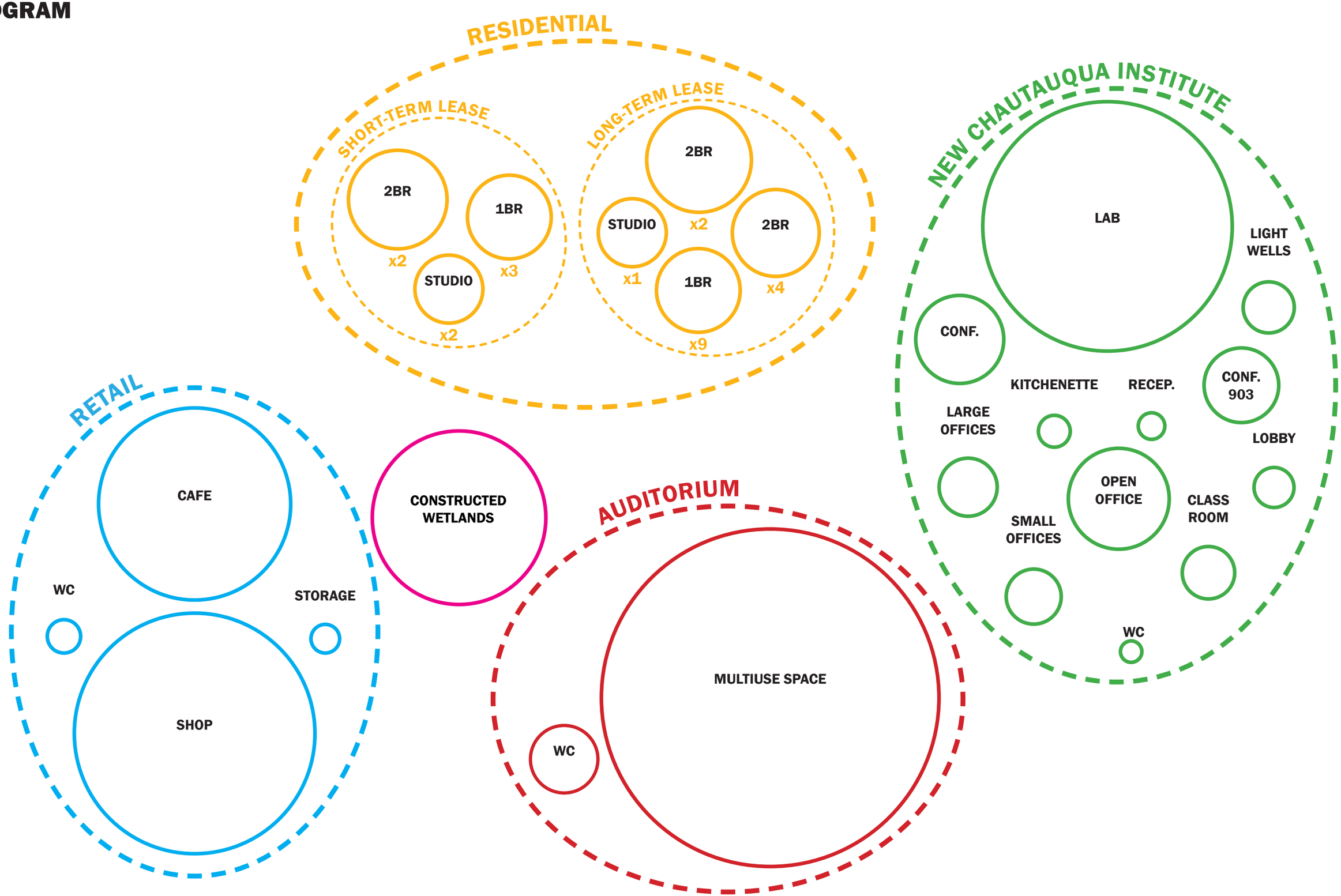
VEGETATIVE SHADING

BUFFER ZONES

VENTILATION

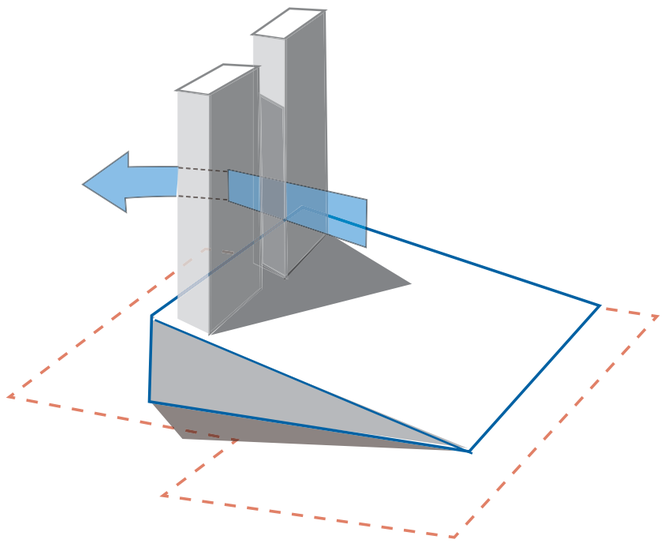


PROGRAM

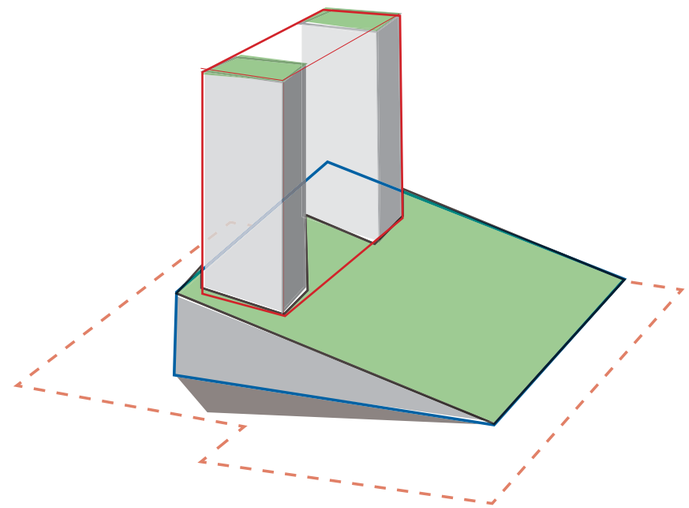

RESIDENTIAL
SHORT-TERM LEASE
2BR
x2
1BR
x3
STUDIO
x2
LONG-TERM LEASE
2BR
x2
STUDIO
x1
2BR
x4
1BR
x9
NEW CHAUTAUQUA INSTITUTE
LAB
LIGHT WELLS
CONF.
KITCHENETTE
RECEP.
CONF. 903
LARGE OFFICES
LOBBY
OPEN OFFICE
CLASS ROOM
SMALL OFFICES
WC
RETAIL
CAFE
WC
STORAGE
SHOP
CONSTRUCTED WETLANDS
AUDITORIUM
MULTIUSE SPACE
WC

EARLY CONCEPTUAL MASSING STUDIES

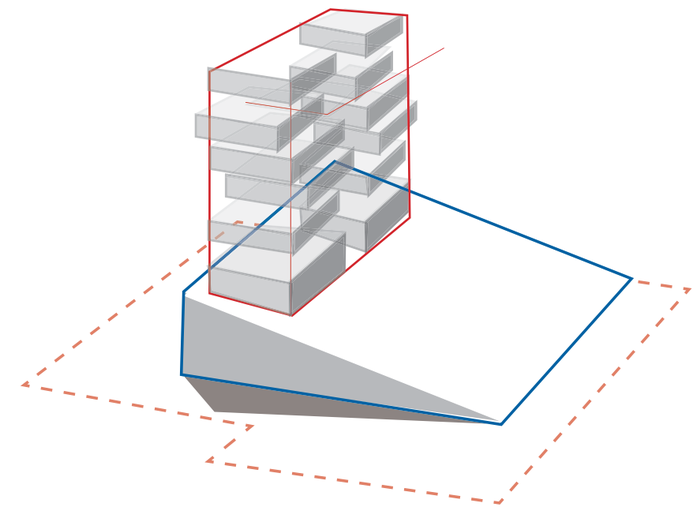
LIVING / PRIVATE SPACE
CONCEPTUAL STUDY DIAGRAMS



Thin massing to maximize natural ventilation potential and allow for shading from structures

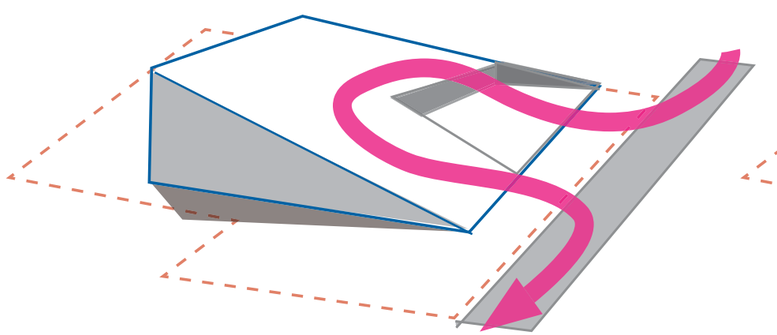


Water harvesting by sloping surfaces and green roofs

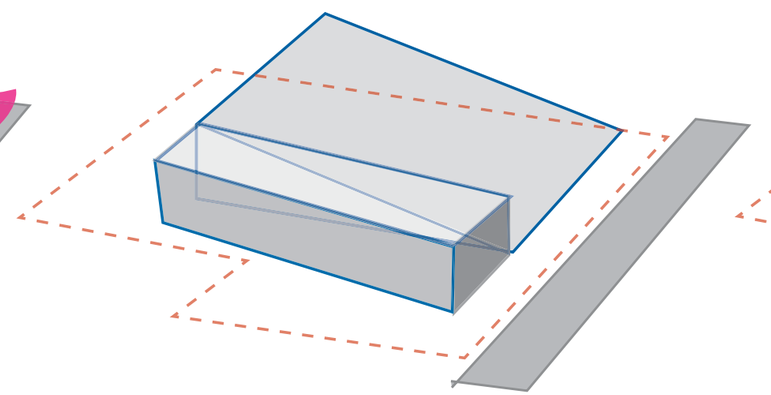


Staggering to allow for terrace spaces

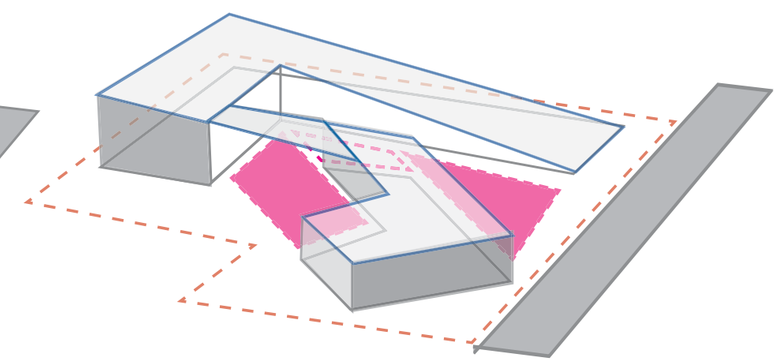
WORK / PUBLIC SPACE
CONCEPTUAL STUDY DIAGRAMS



Inviting site corner with public plaza, place for respite, contemplation.

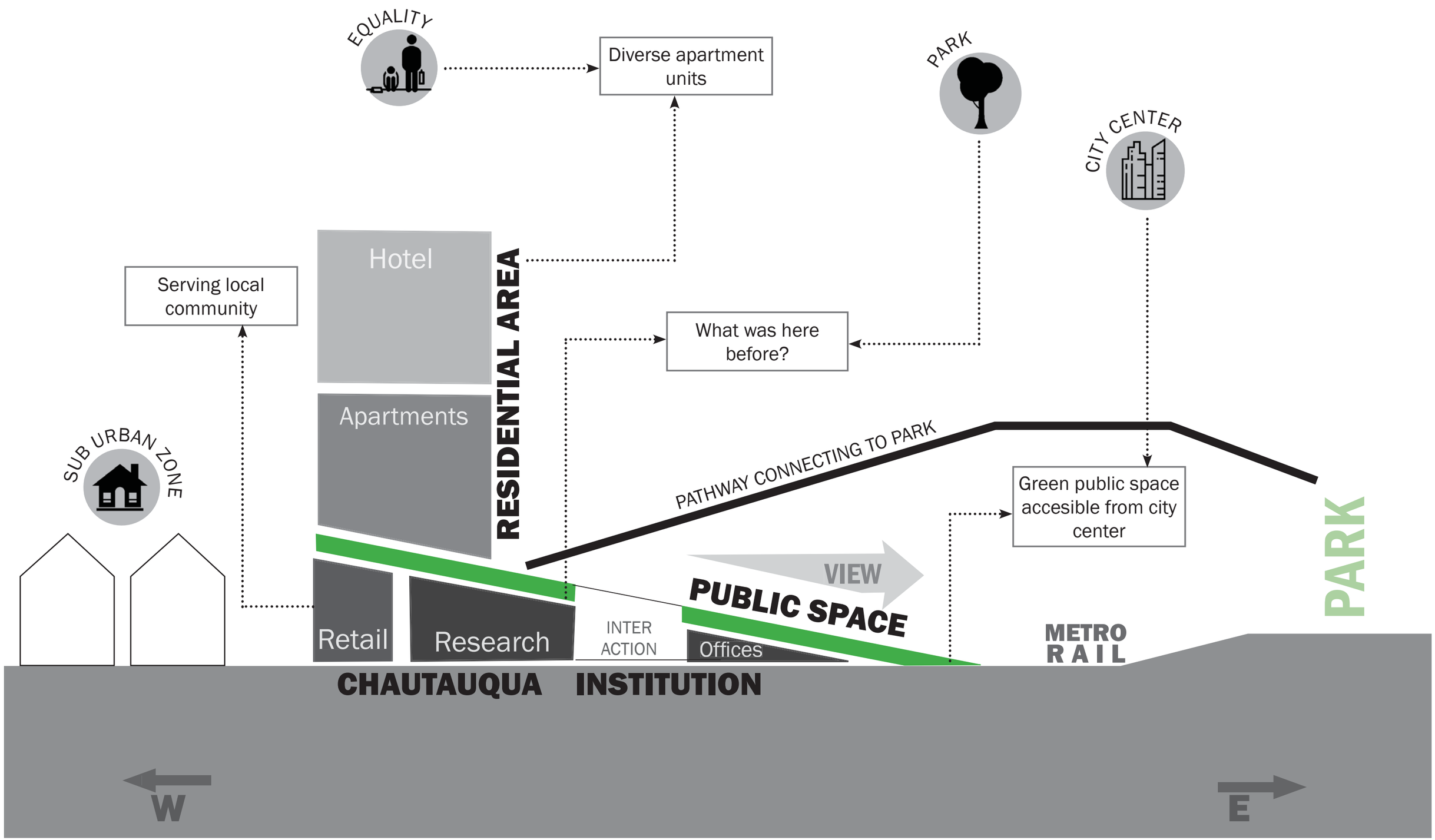


Green house to the south for study of natural flora and fauna.



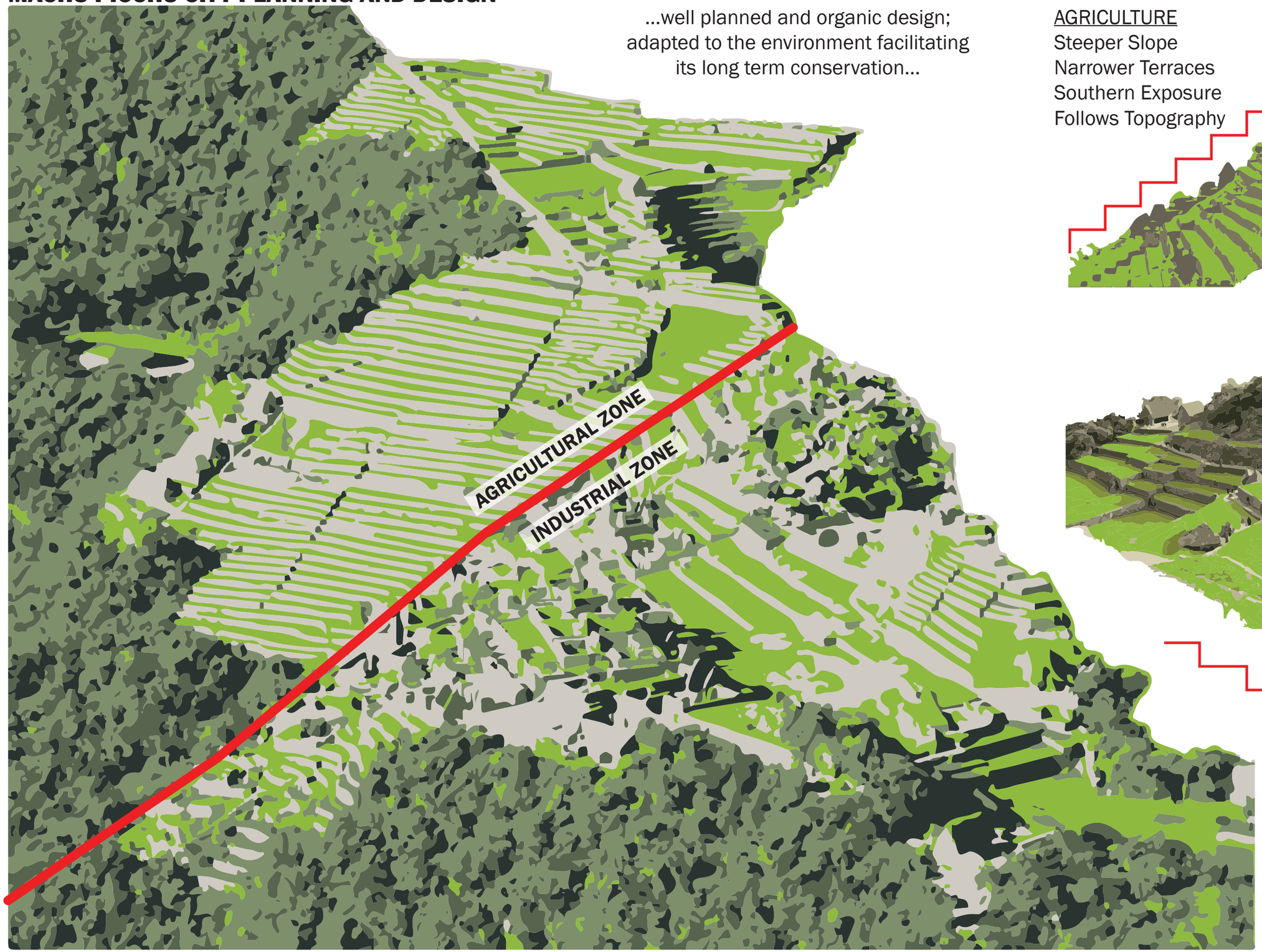
Private courtyard tucked away to the inside for office and residential use.

PROGRAM SYNTHESIS

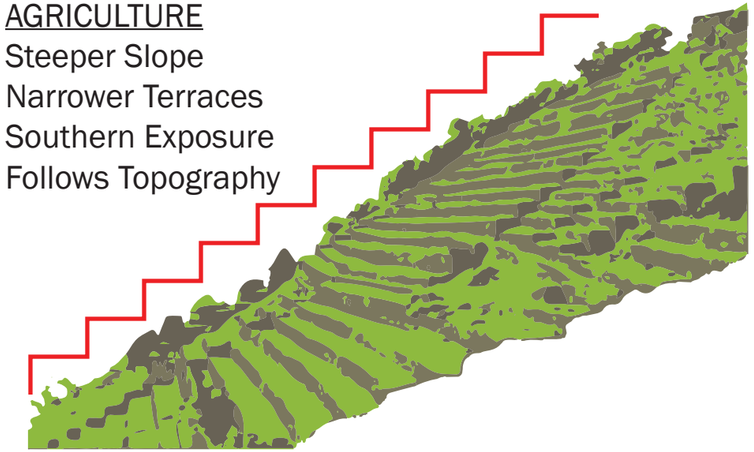


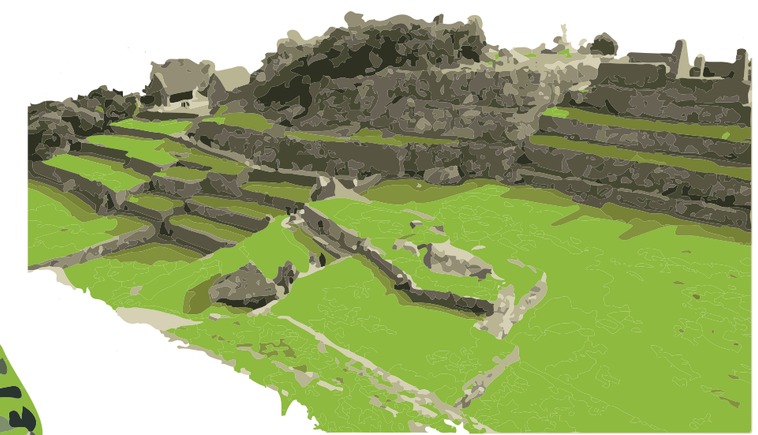
MACHU PICCHU CITY PLANNING AND DESIGN

...well planned and organic design;
adapted to the environment facilitating
its long term conservation...



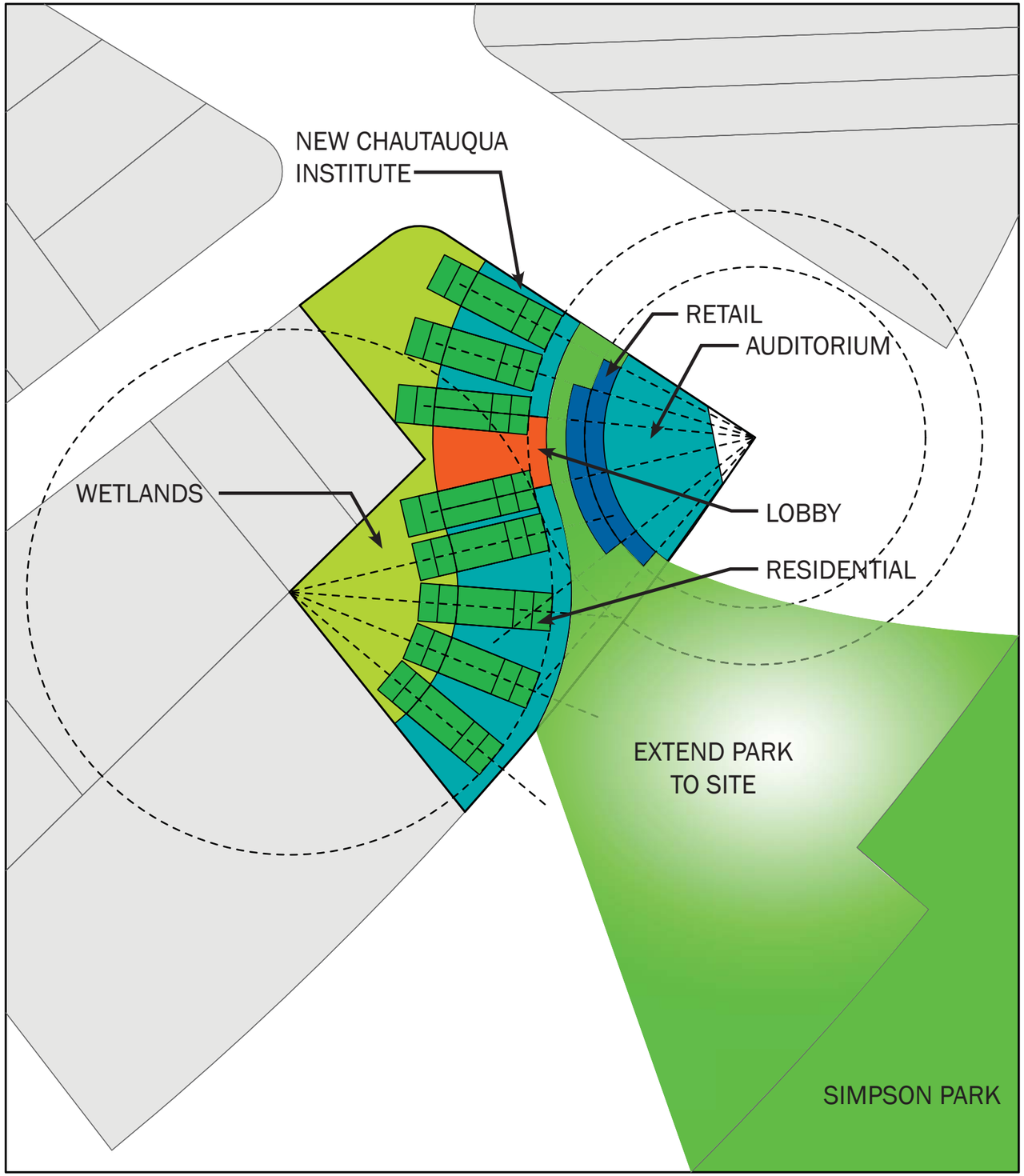
AGRICULTURE
Steeper Slope
Narrower Terraces
Southern Exposure
Follows Topography



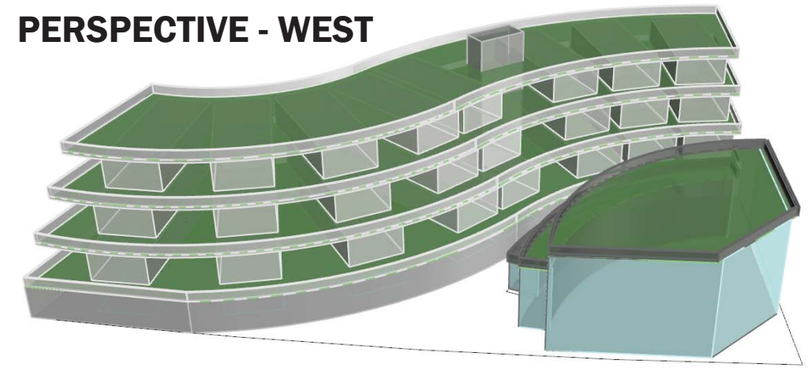


INDUSTRIAL
Gentle Slope
Varying Terrace Depths
Buildings Shade Terraces
Flatter Terrain

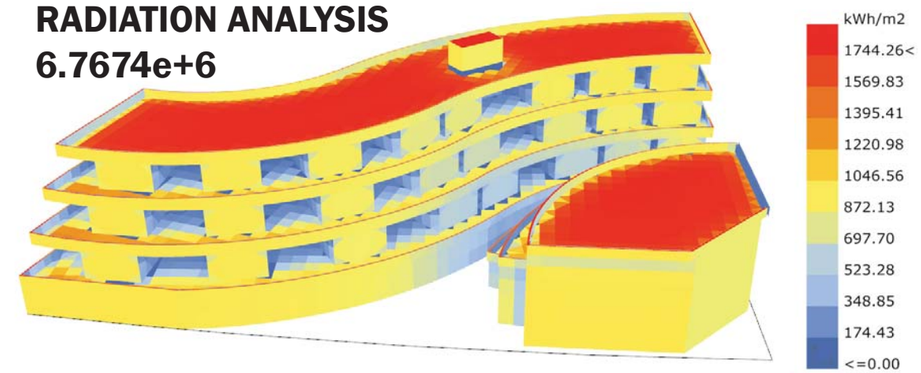
CONCEPTUAL DESIGN_SCHEME 1

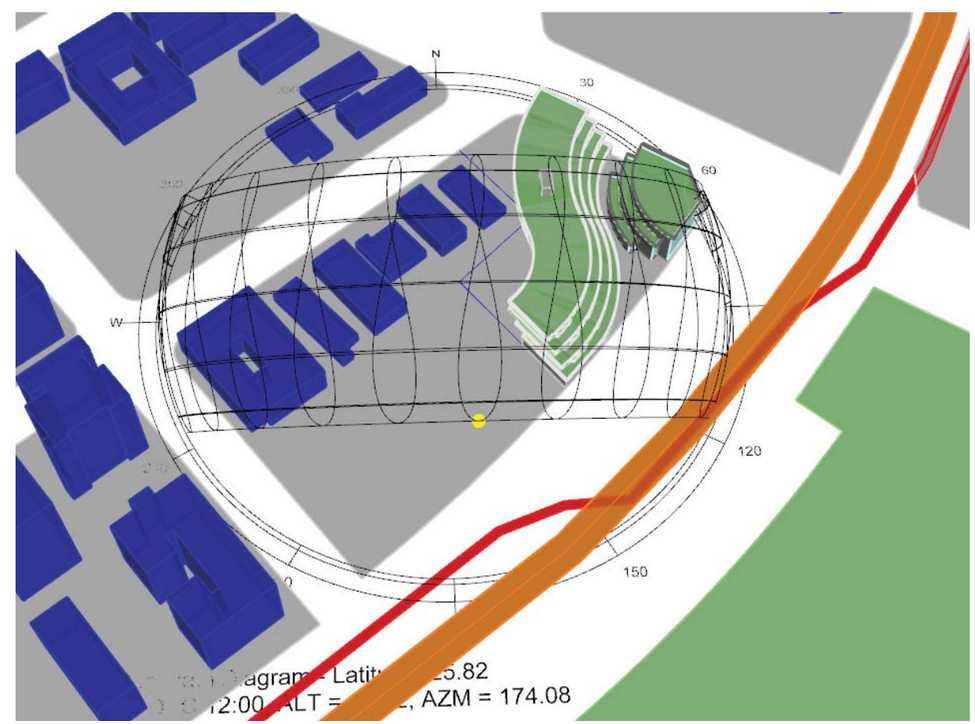


PERSPECTIVE - WEST

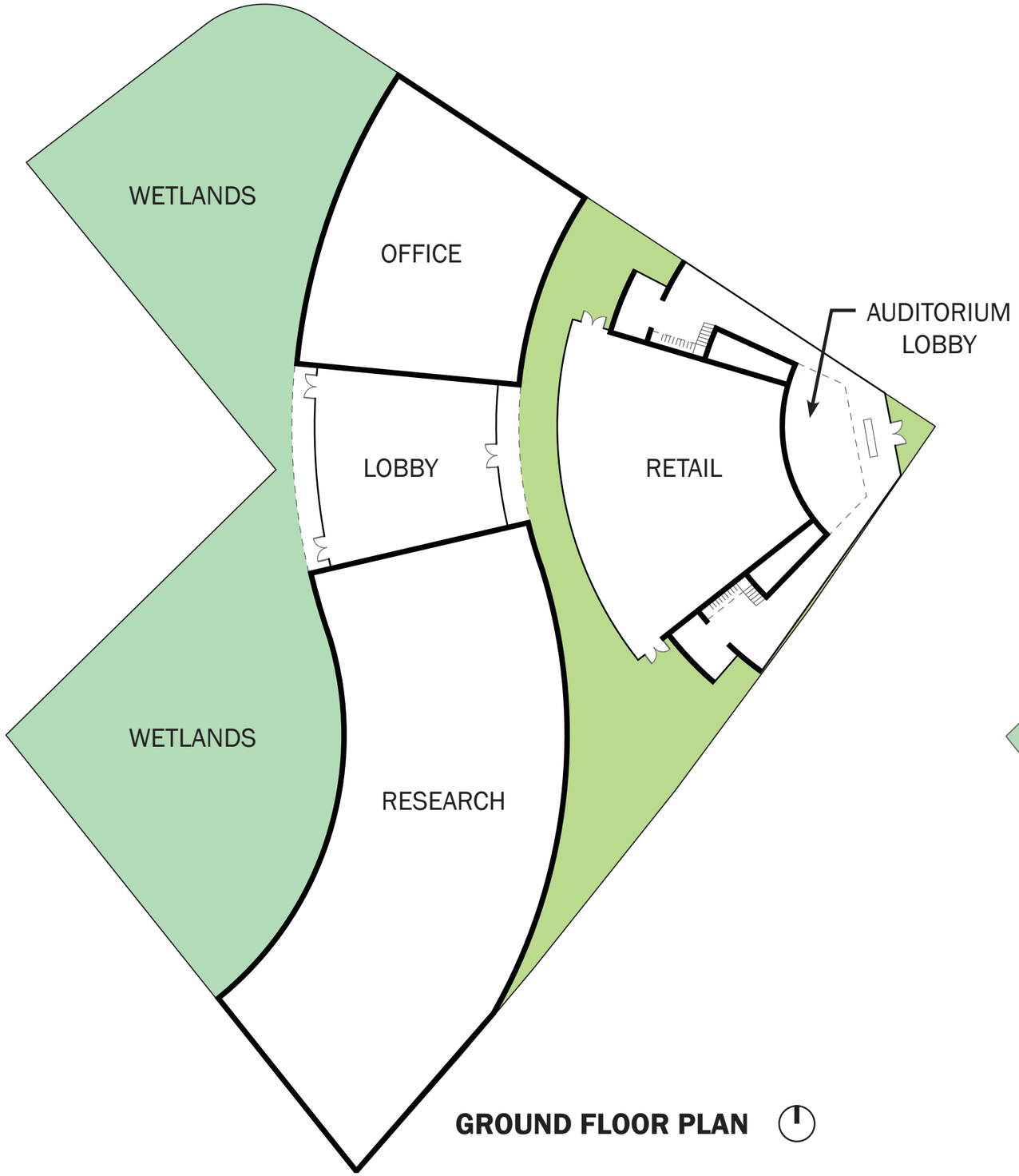


RADIATION ANALYSIS
6.7674e+6

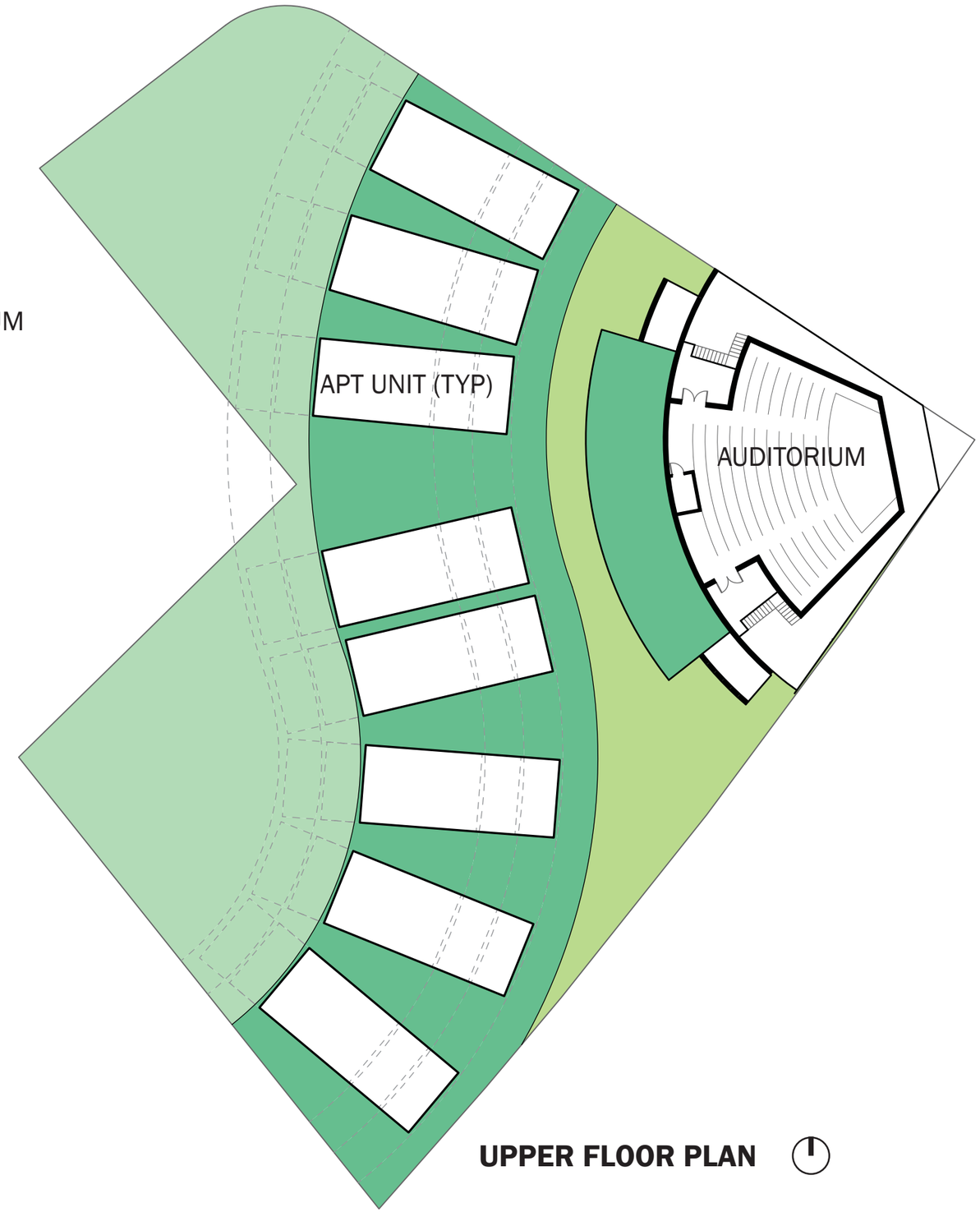




CONCEPTUAL DESIGN_SCHEME 1

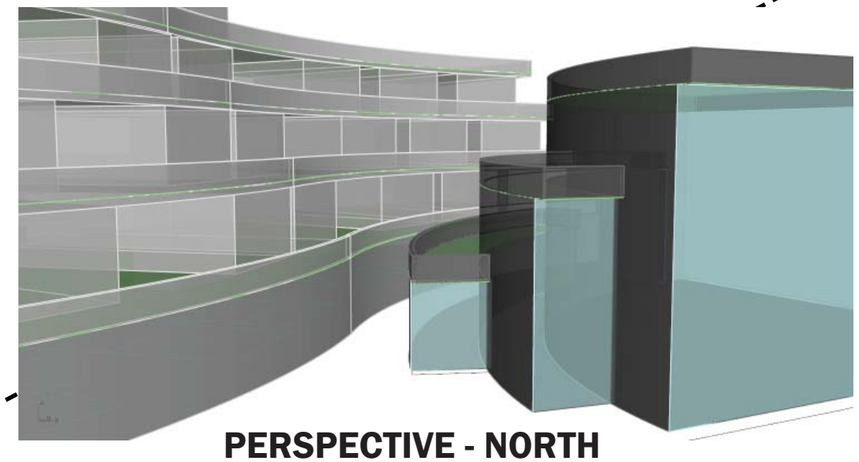


GROUND FLOOR PLAN

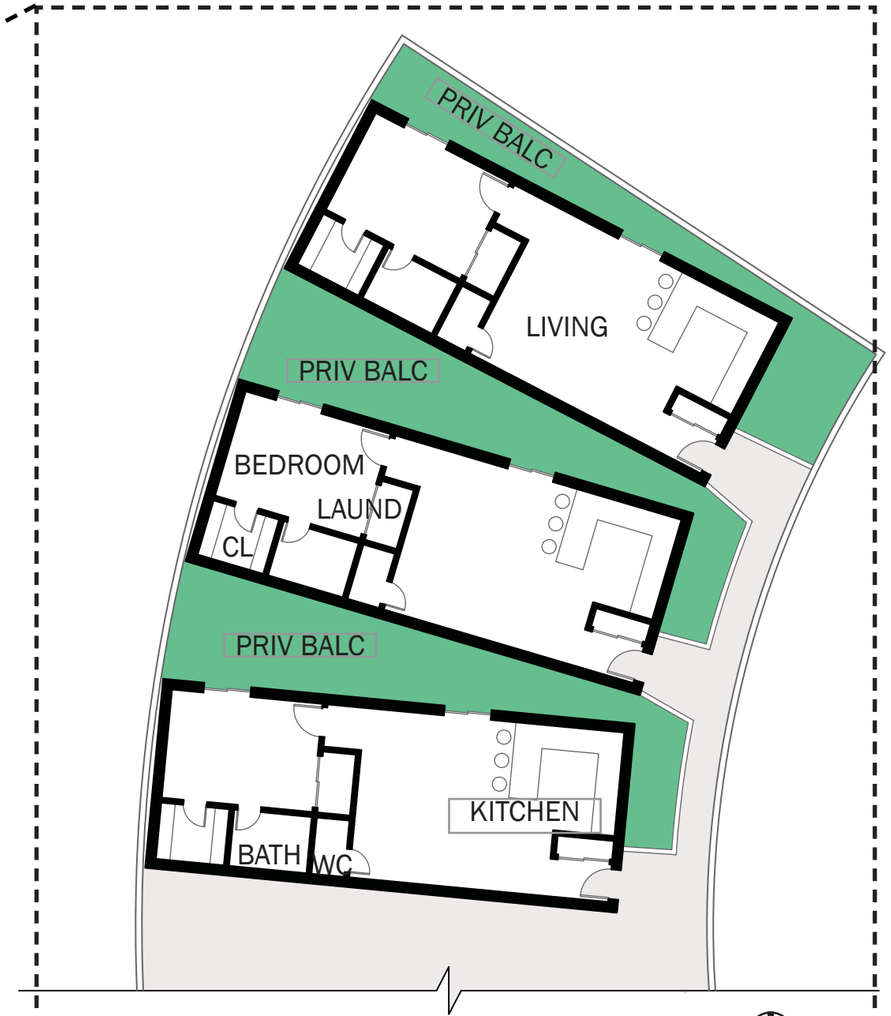


UPPER FLOOR PLAN

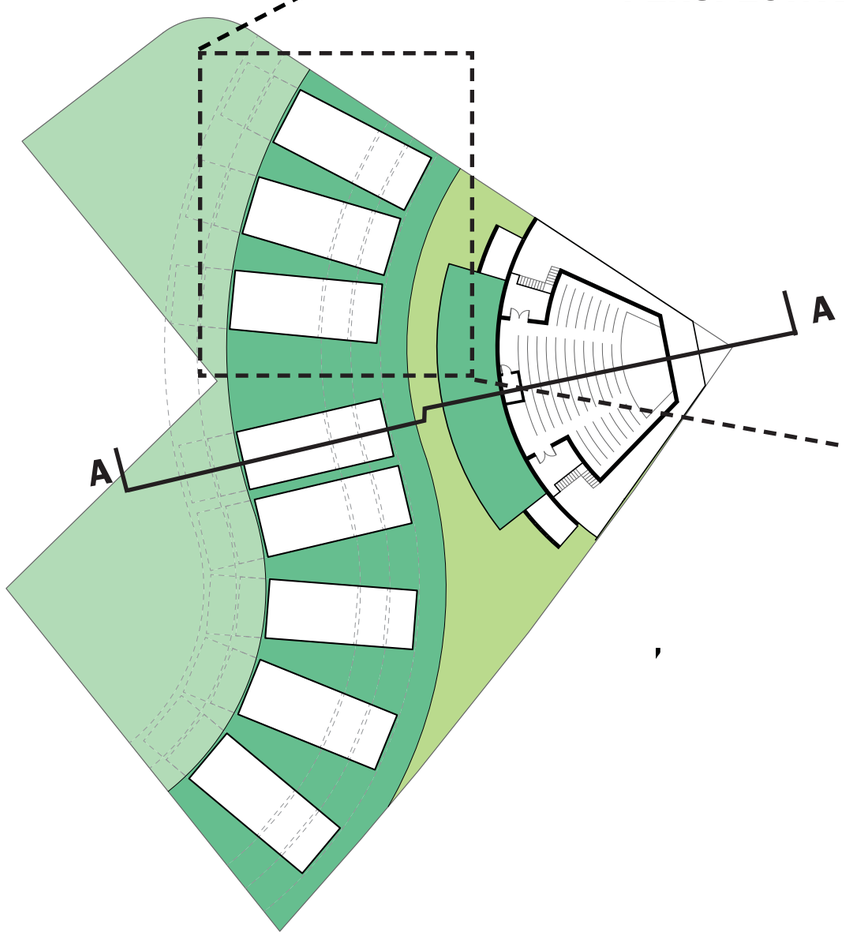
CONCEPTUAL DESIGN_SCHEME 1



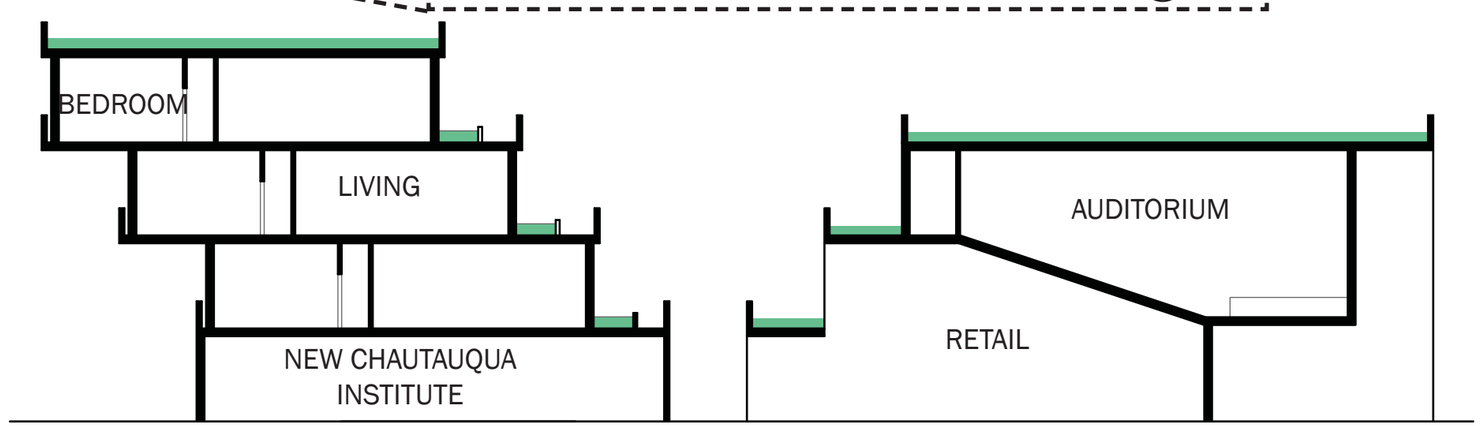
PERSPECTIVE - NORTH



SCHEMATIC APARTMENT PLAN (TYP)

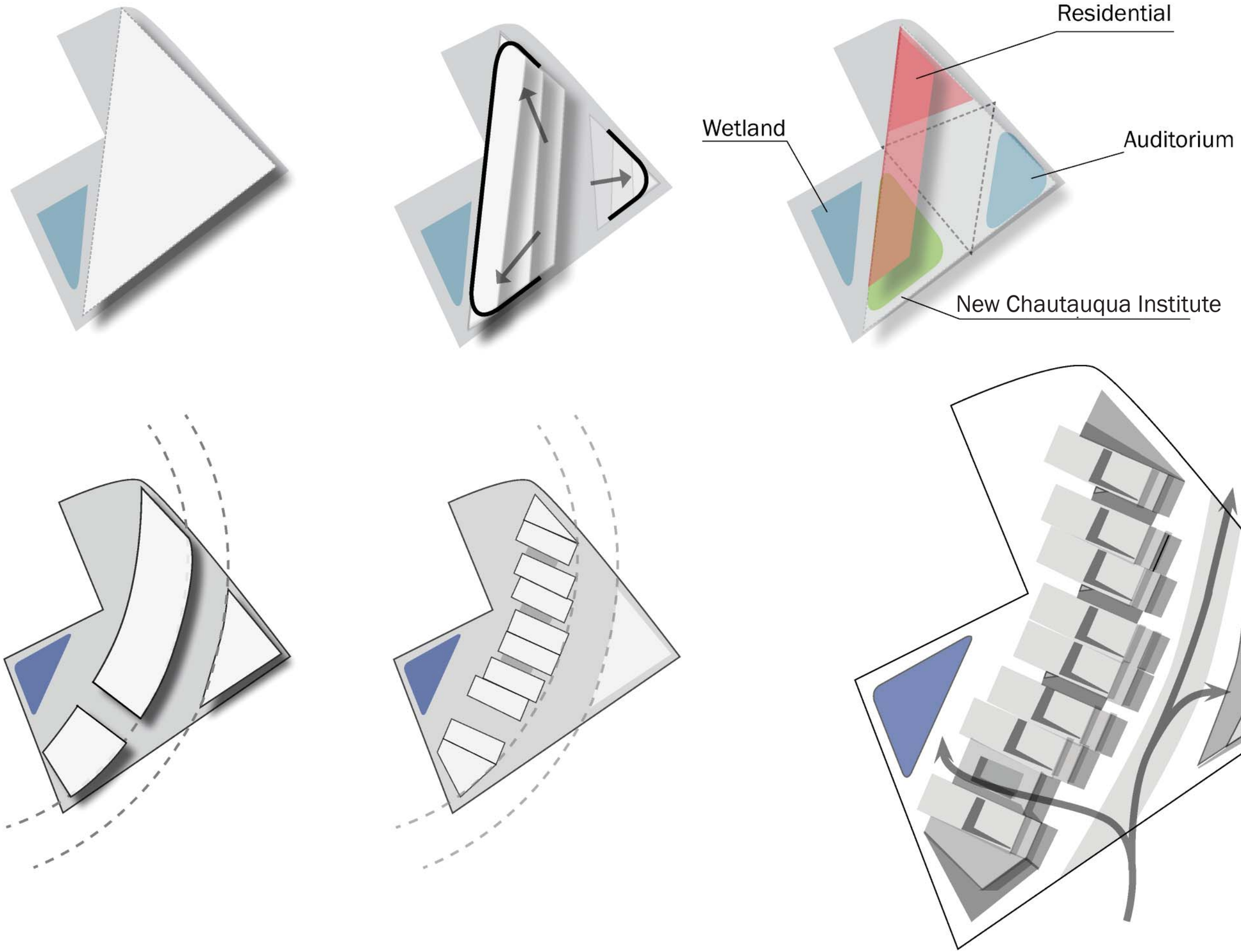


KEY PLAN



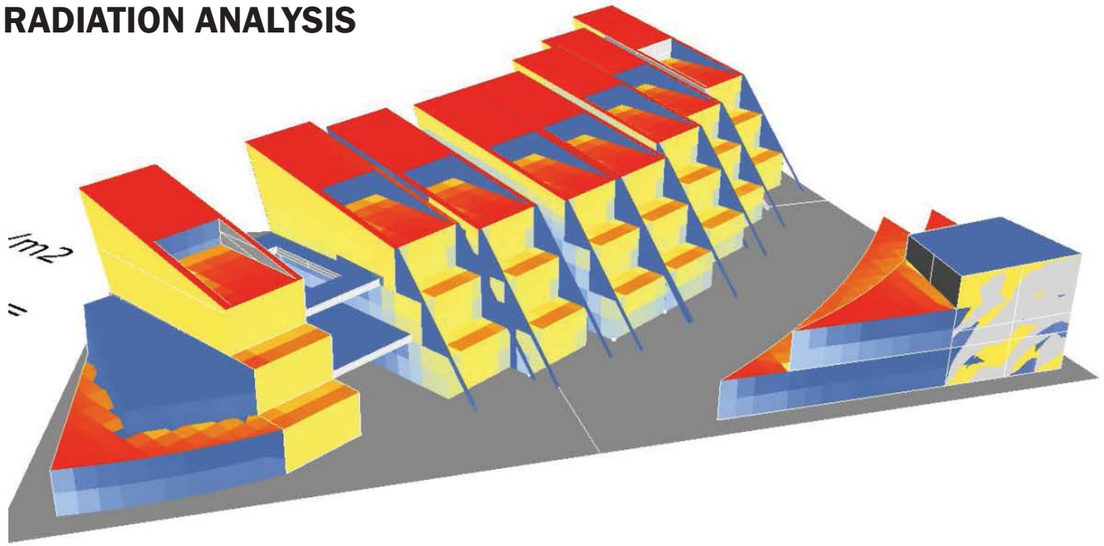
SCHEMATIC SECTION A

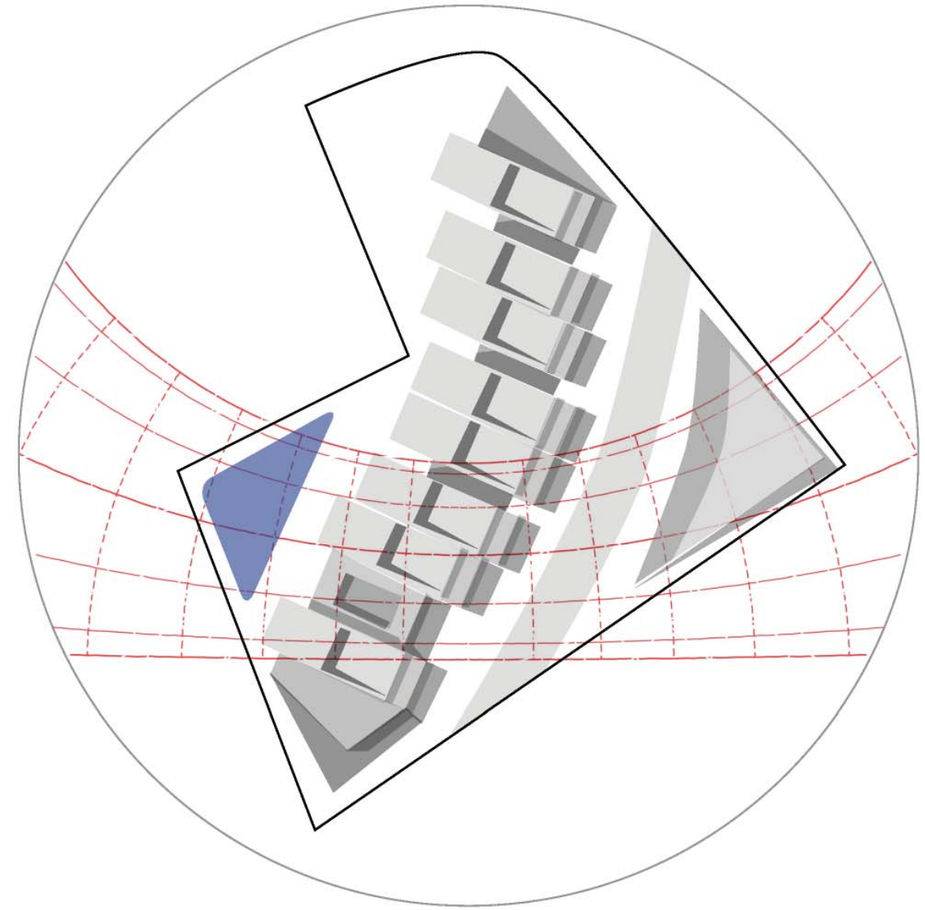
CONCEPTUAL DESIGN_SCHEME 2



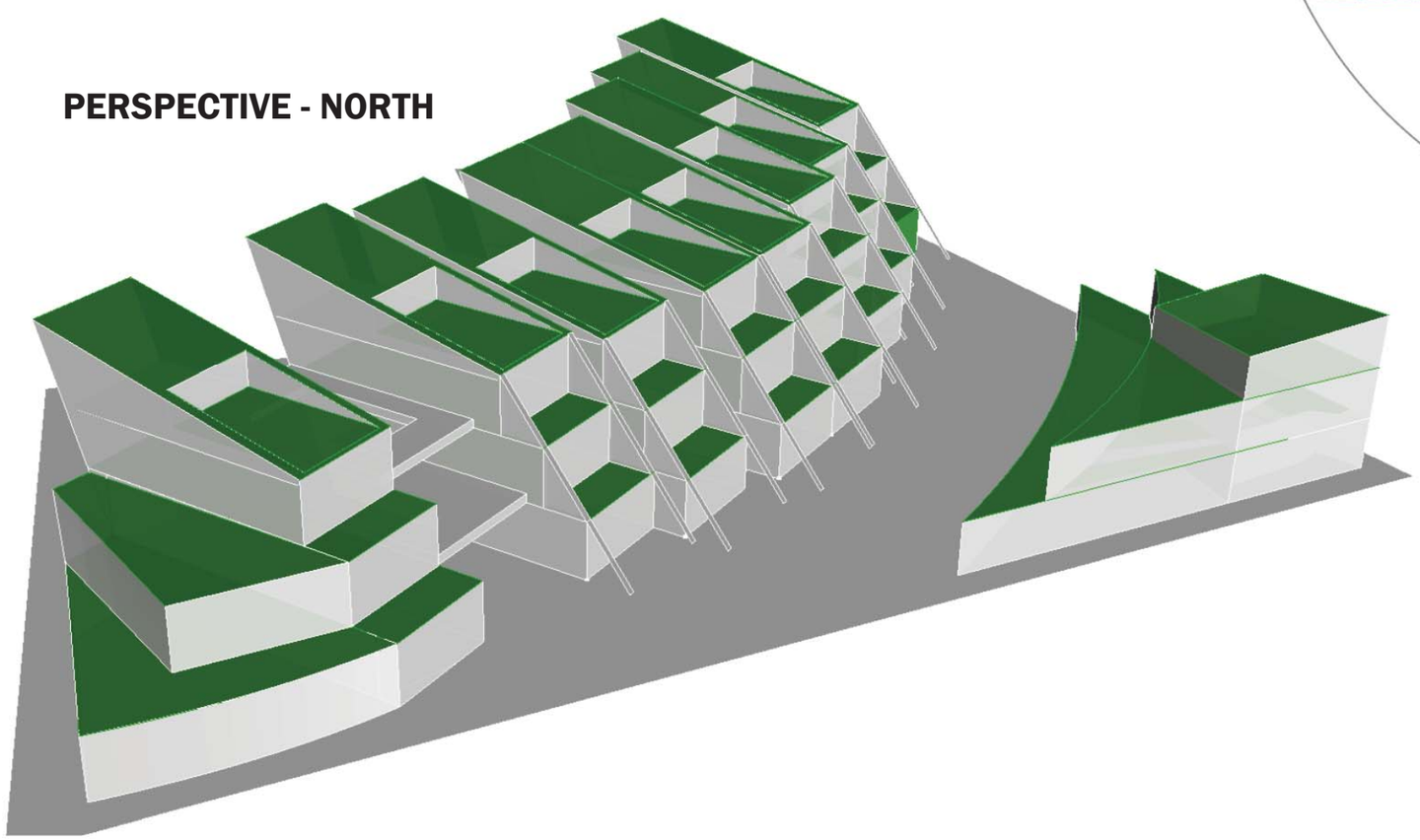
CONCEPTUAL DESIGN_SCHEME 2

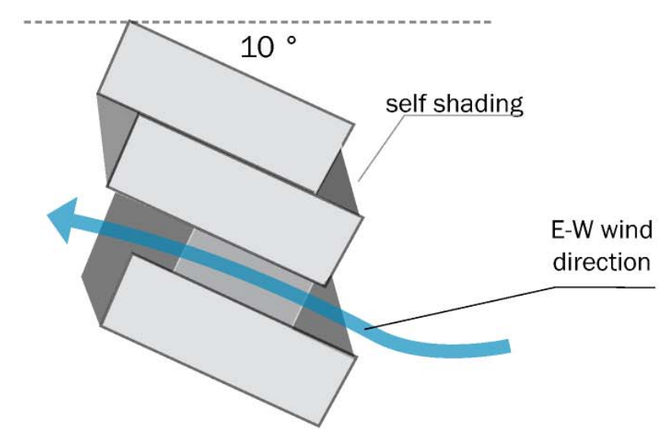
RADIATION ANALYSIS



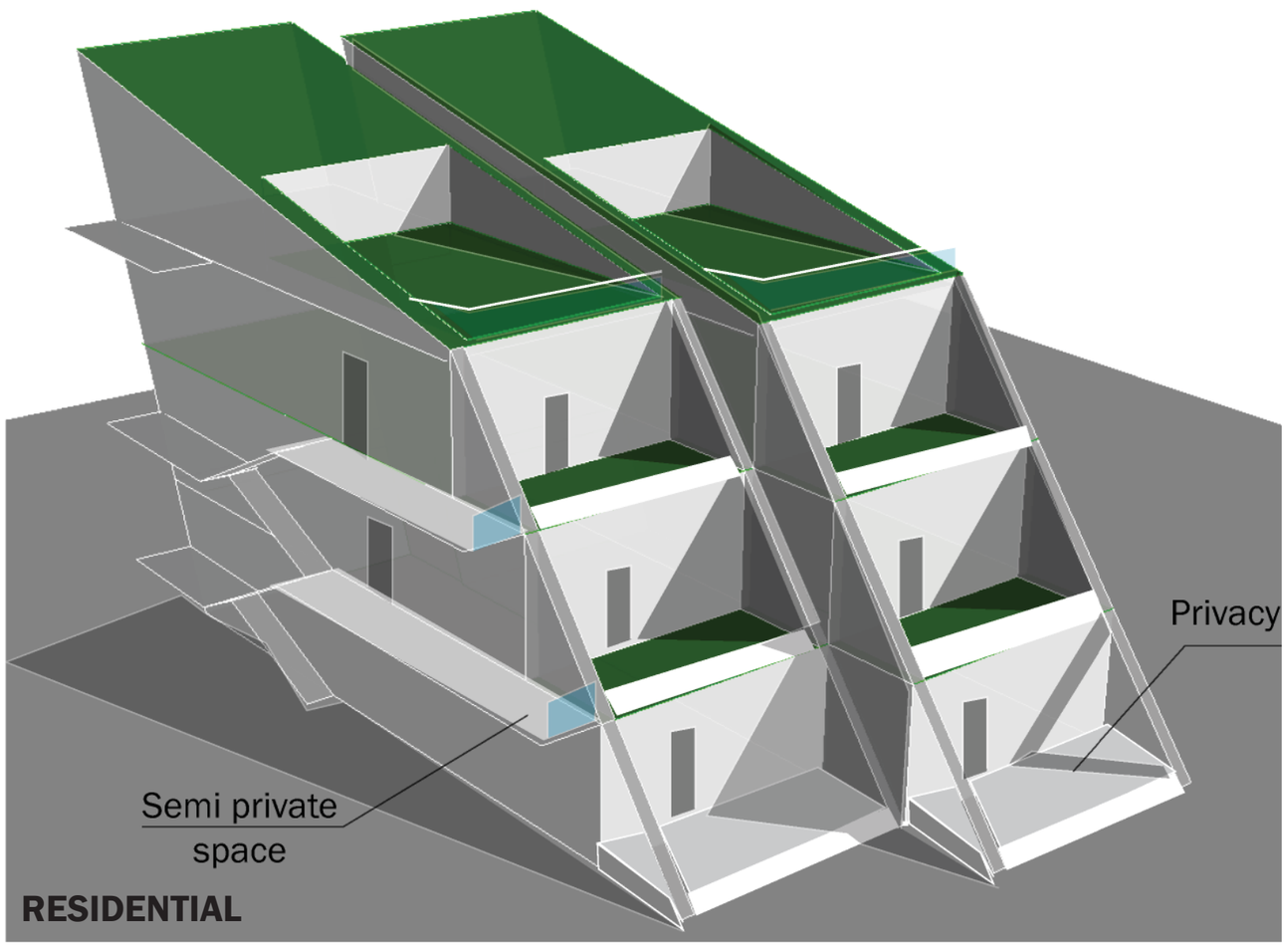


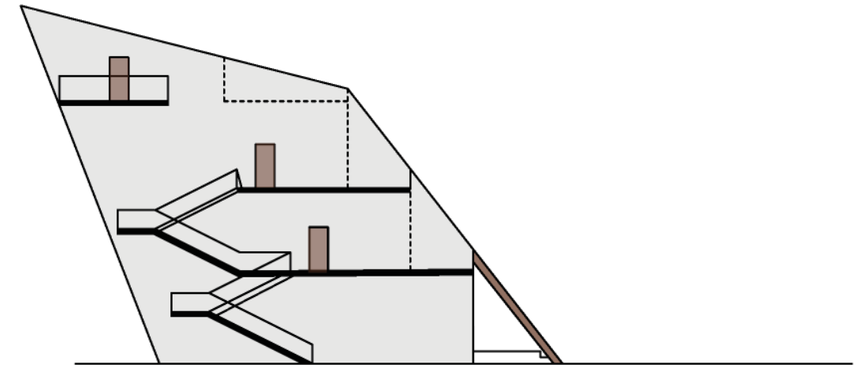
PERSPECTIVE - NORTH



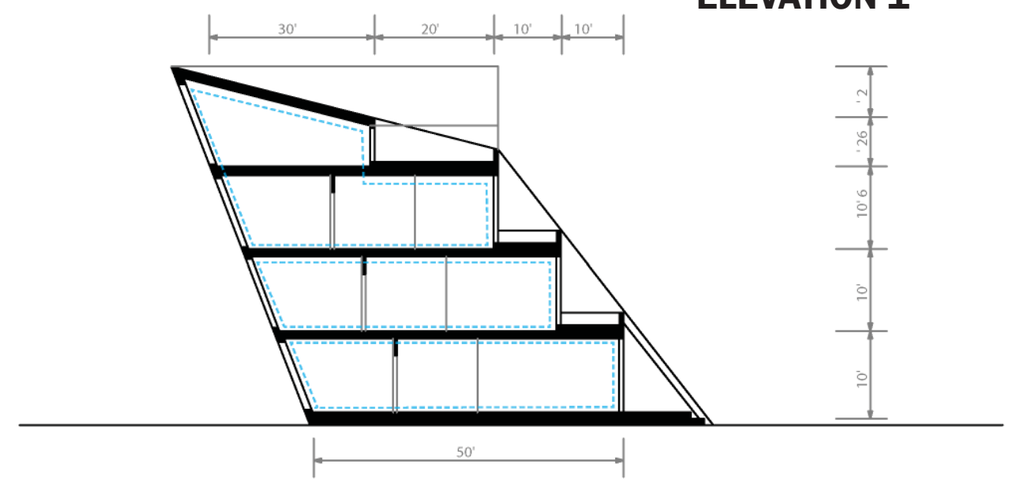


CONCEPTUAL DESIGN_SCHEME 2

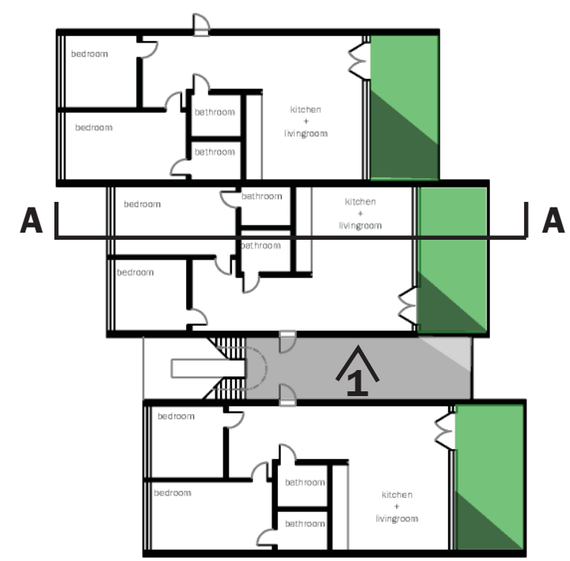




ELEVATION 1

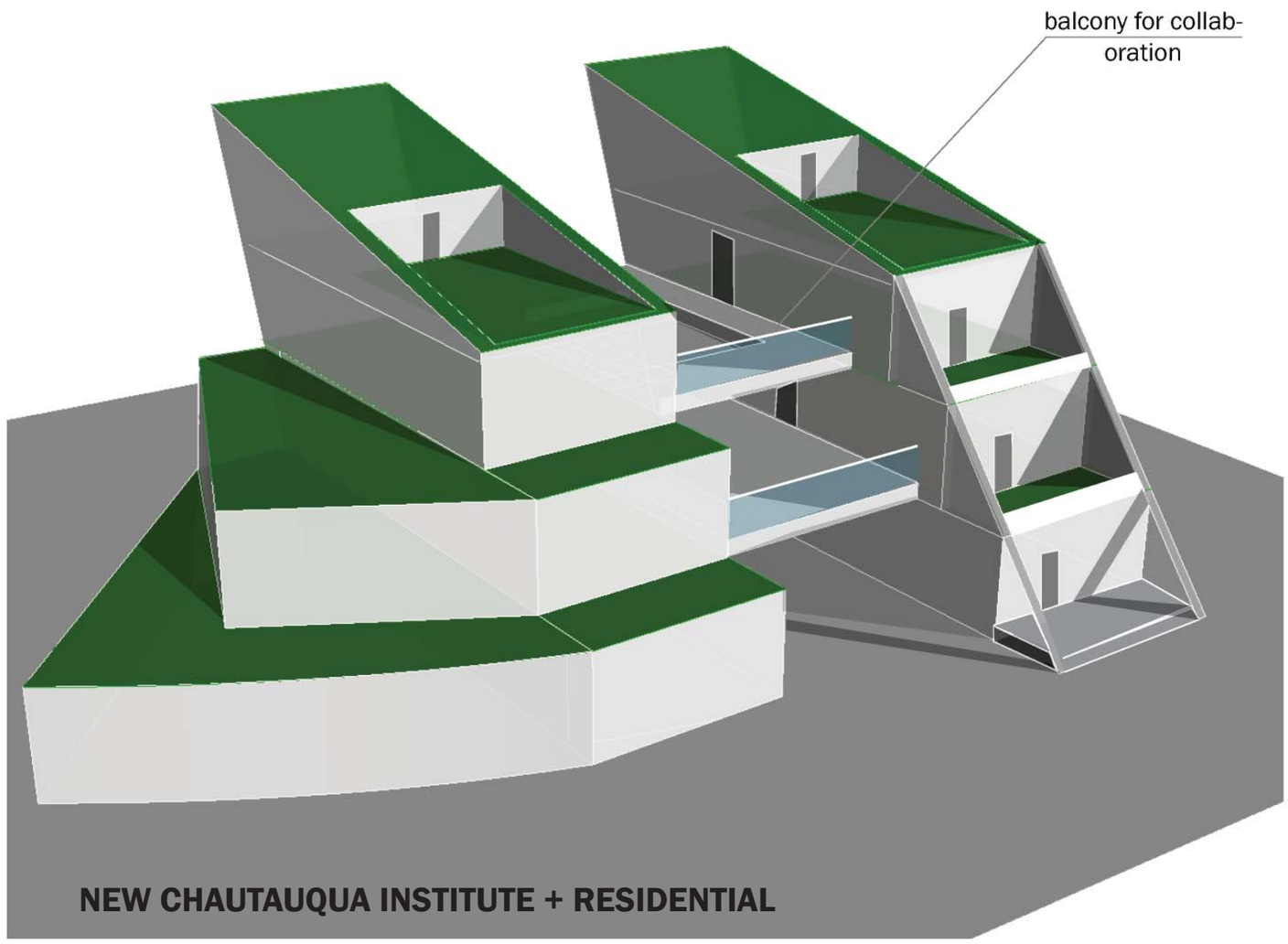


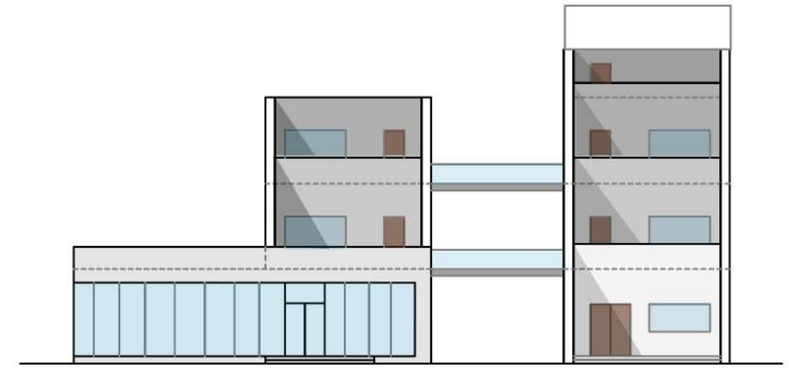
SECTION A



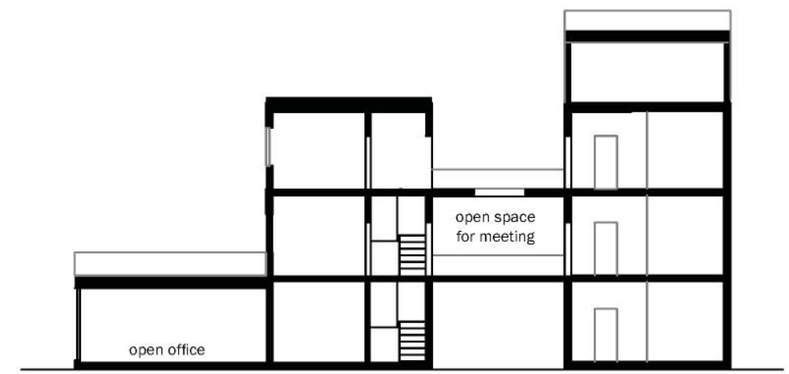
PLAN

CONCEPTUAL DESIGN_SCHEME 2

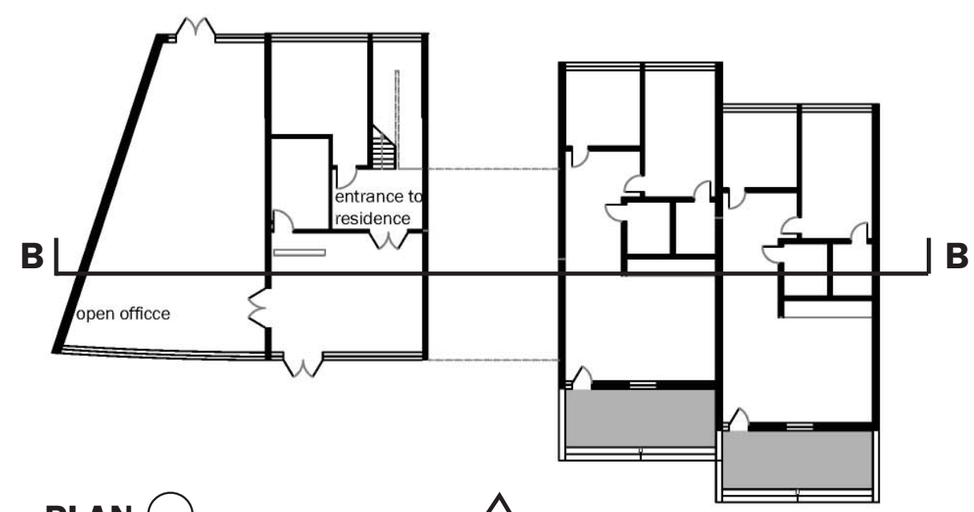




ELEVATION 2

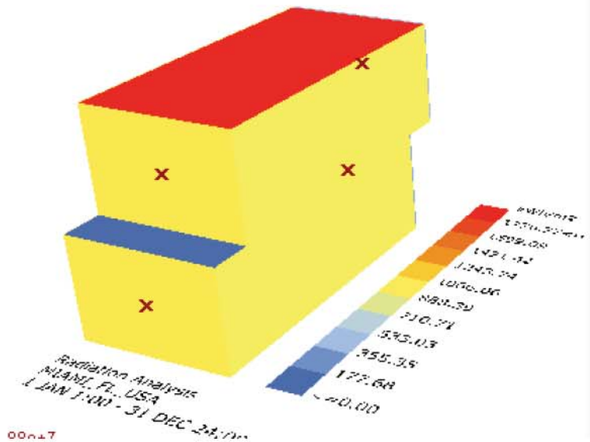


SECTION B

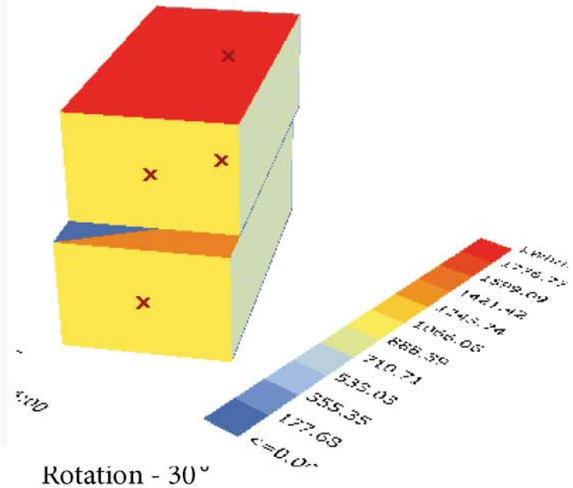


PLAN

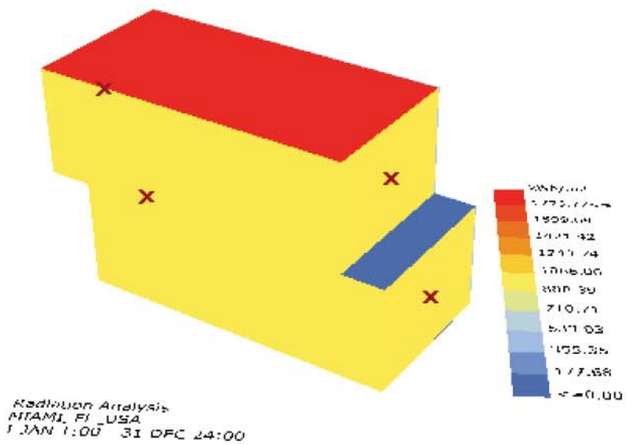
RESIDENTIAL UNIT DAYLIGHT & RADIATION STUDY



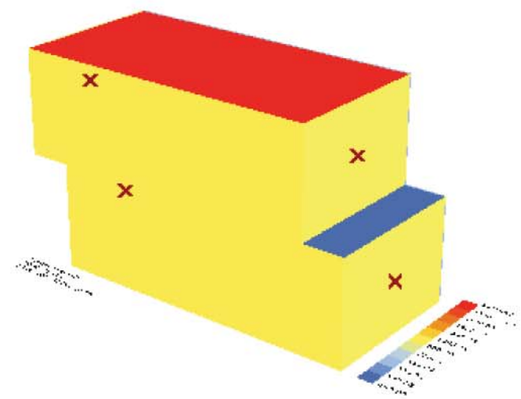
Rotation - 0°
Solar gains 16.39 MW/ft2



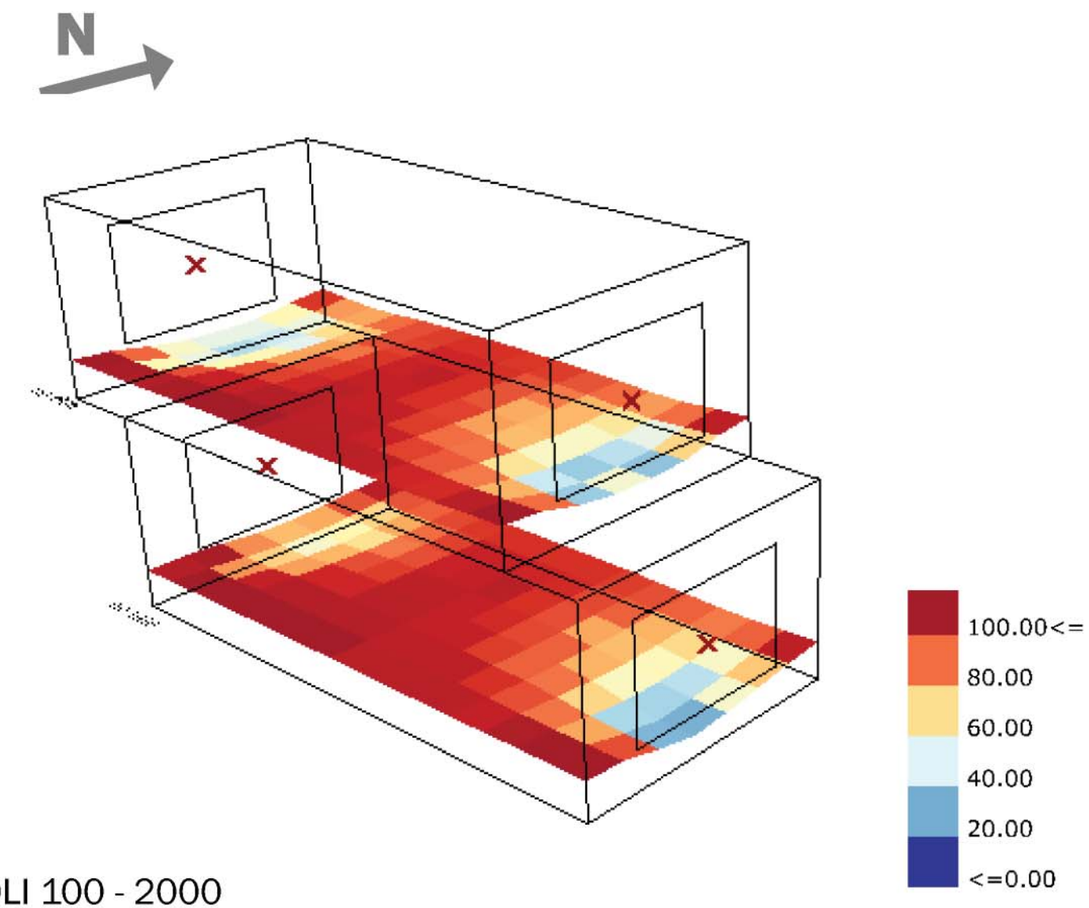
Rotation - 30°
Solar gains 16. MW/ft2



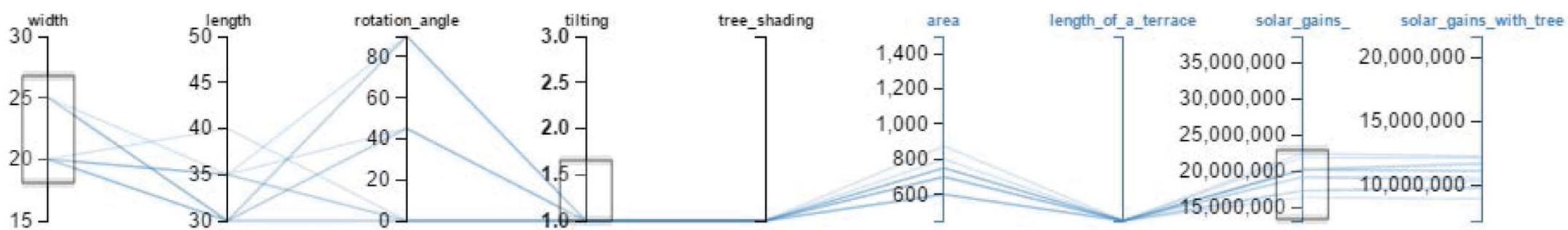
Rotation - 60°
Solar gains 14.17 MW/ft2



Rotation - 90°
Solar gains 13.39 MW/ft2

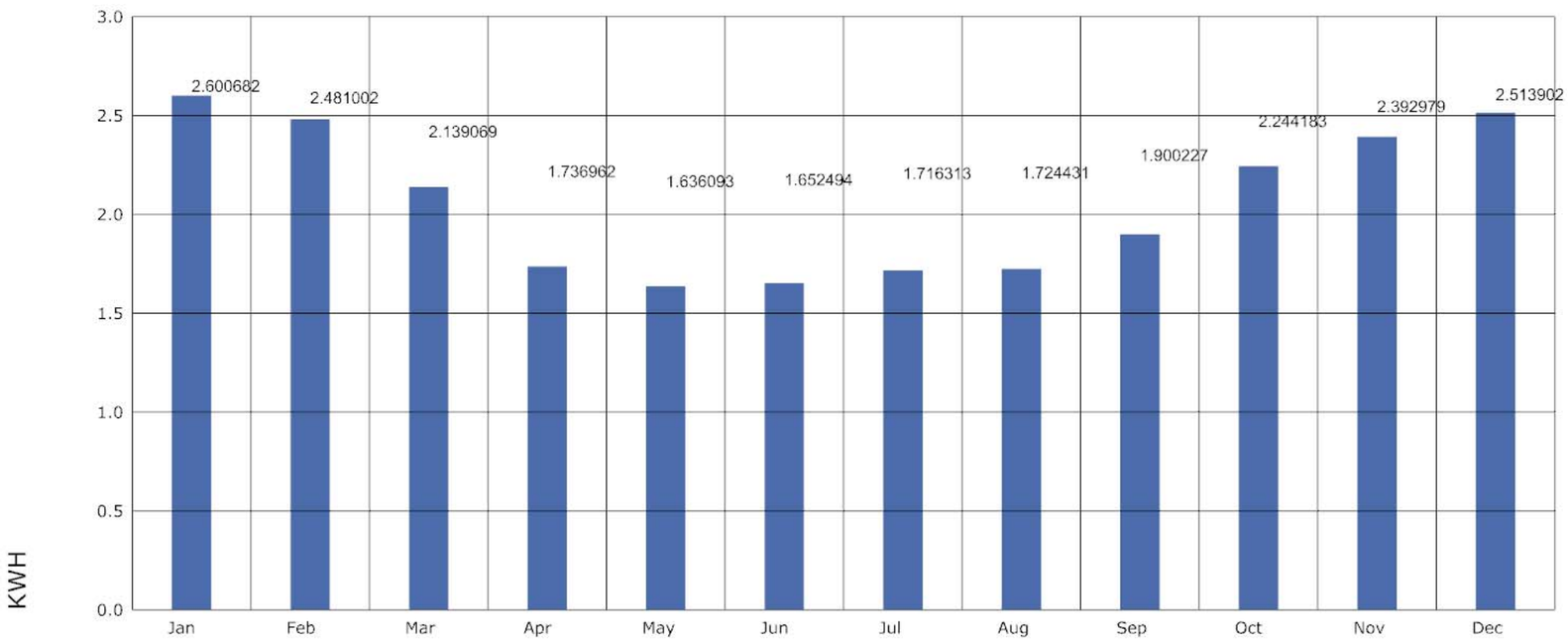


UDLI 100 - 2000



ENERGY SIMULATIONS_SIMPLE THERMODYNAMIC STUDY

AVERAGE SOLAR GAIN



NATURAL VENTILATION CONFIGURATION

20°C MIN OUTDOOR AIR TEMPERATURE

28°C MAX OUTDOOR AIR TEMPERATURE

TEST CASE CONSTRUCTION

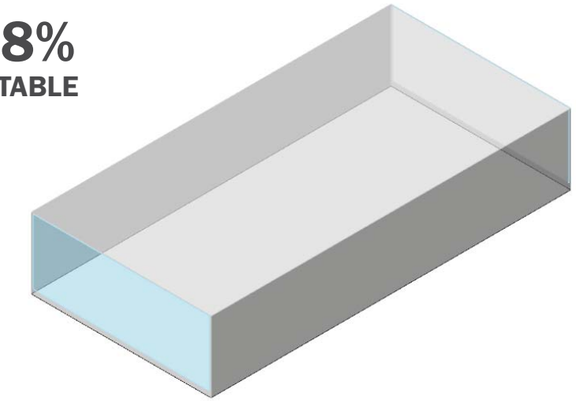
WALLS 1” STUCCO | 8” CONCRETE | +/- 1” INSULATION | 1/2” GYPBOARD

ROOF 8” CONCRETE | EXTENSIVE GREEN ROOF *

FLOOR 8” CONCRETE

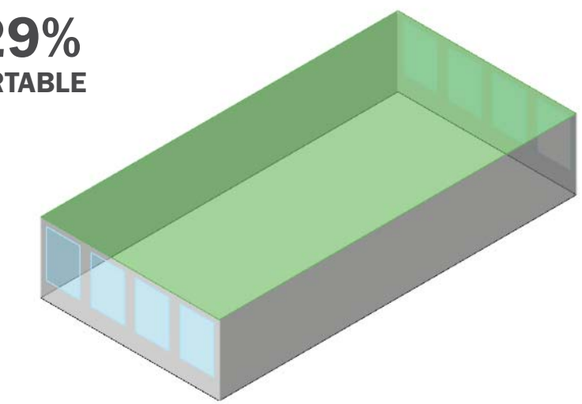
NO GREEN ROOF_90% GLAZED_70% OPEN

21.98%
COMFORTABLE



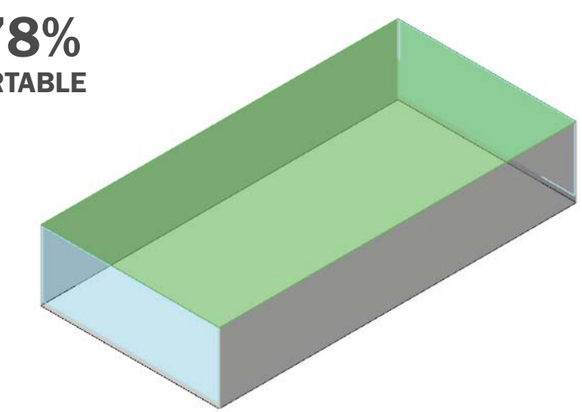
GREEN ROOF_50% GLAZED_50% OPEN

16.29%
COMFORTABLE

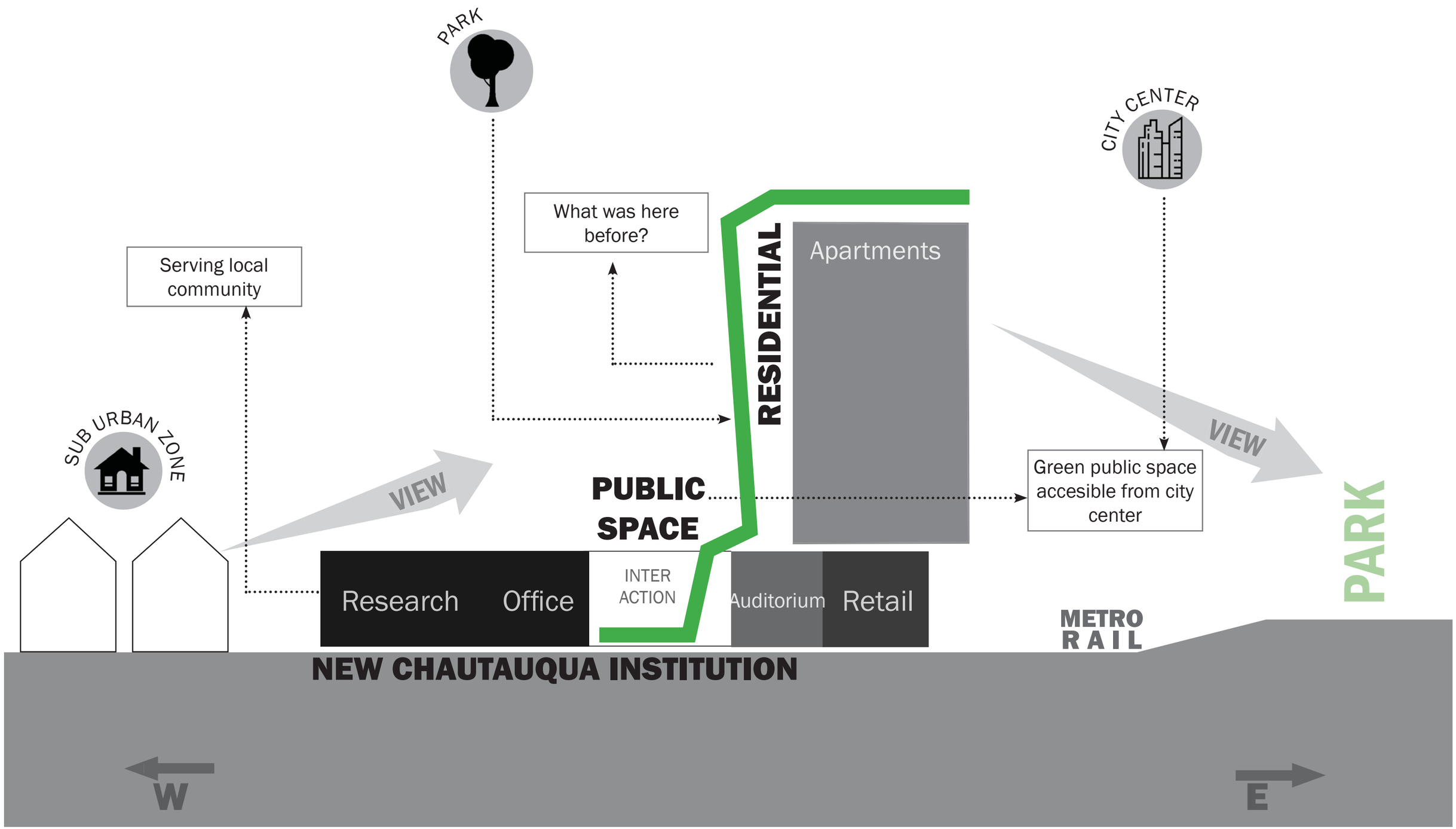


GREEN ROOF_90% GLAZED_70% OPEN

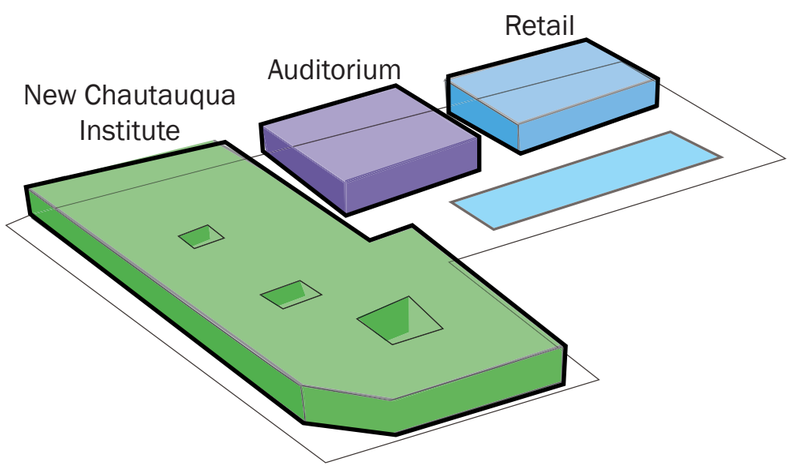
16.78%
COMFORTABLE



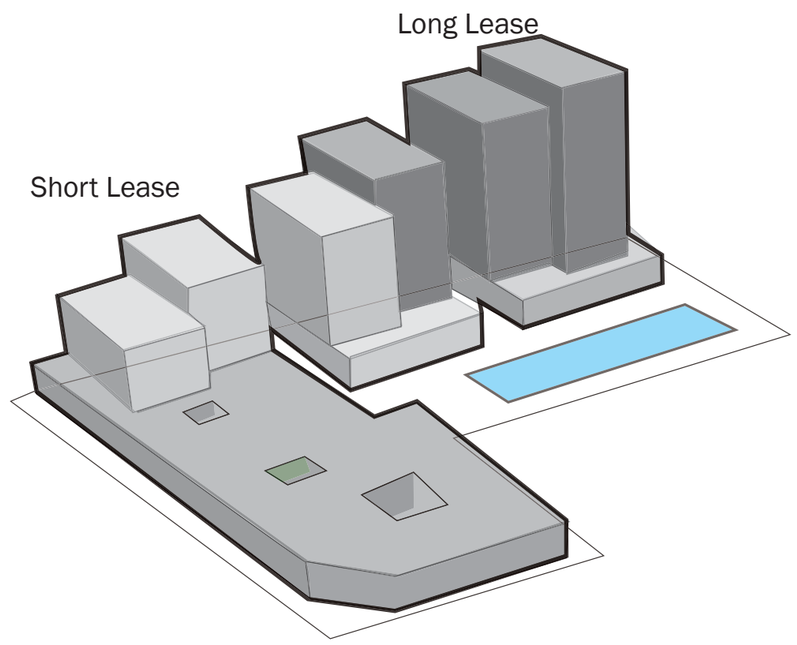
PROGRAM SYNTHESIS



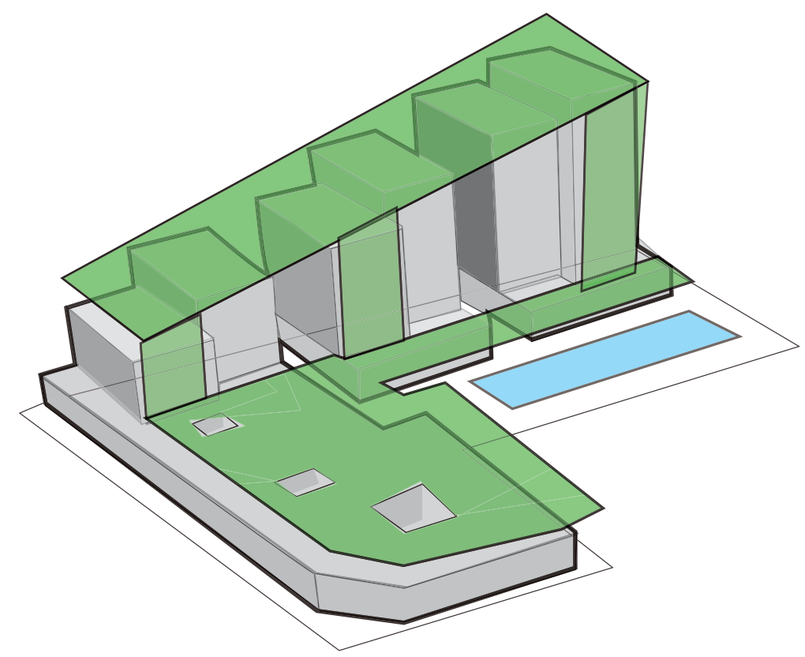
MASSING APPROACH



GROUND FLOOR

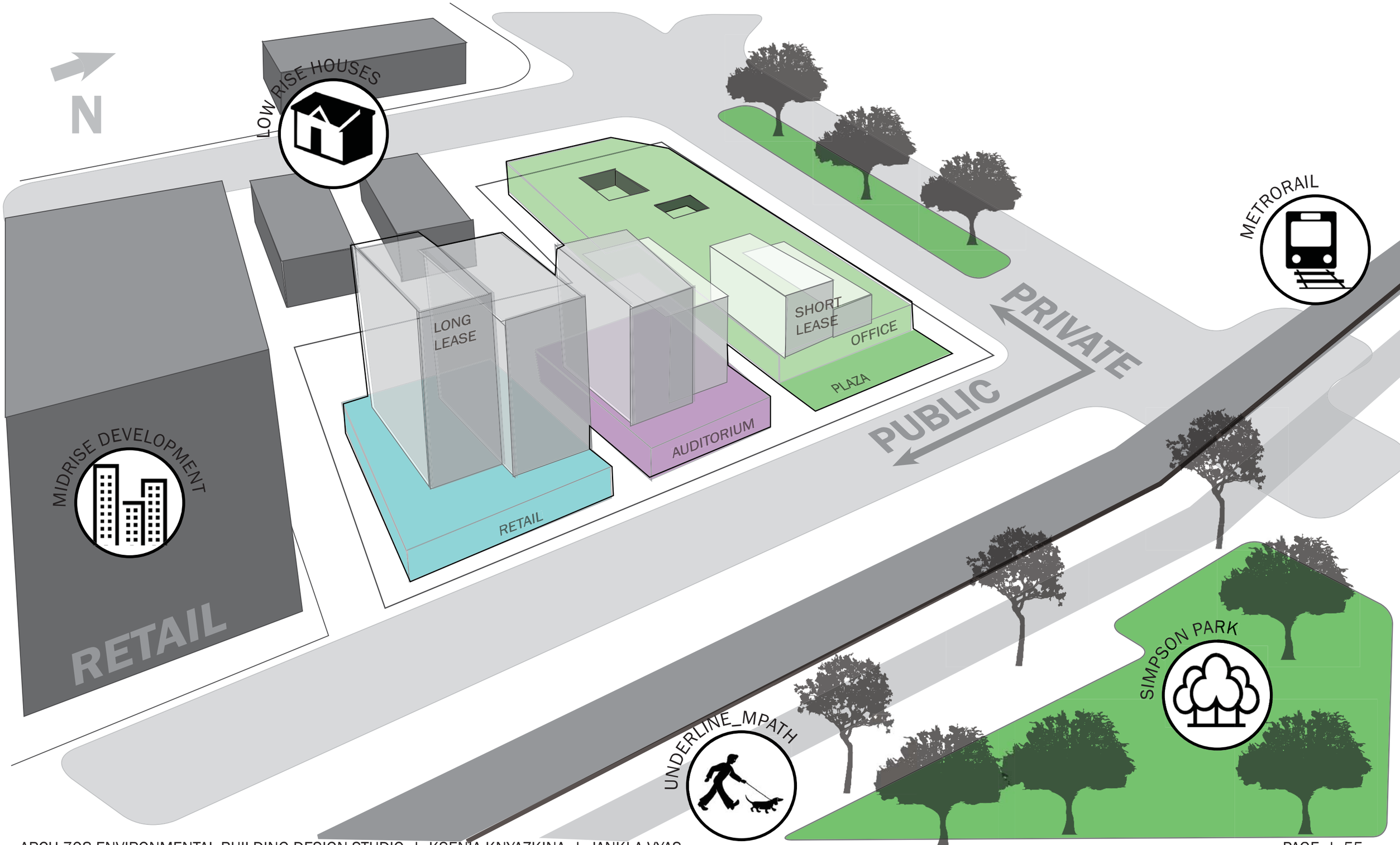


RESIDENTIAL UNITS

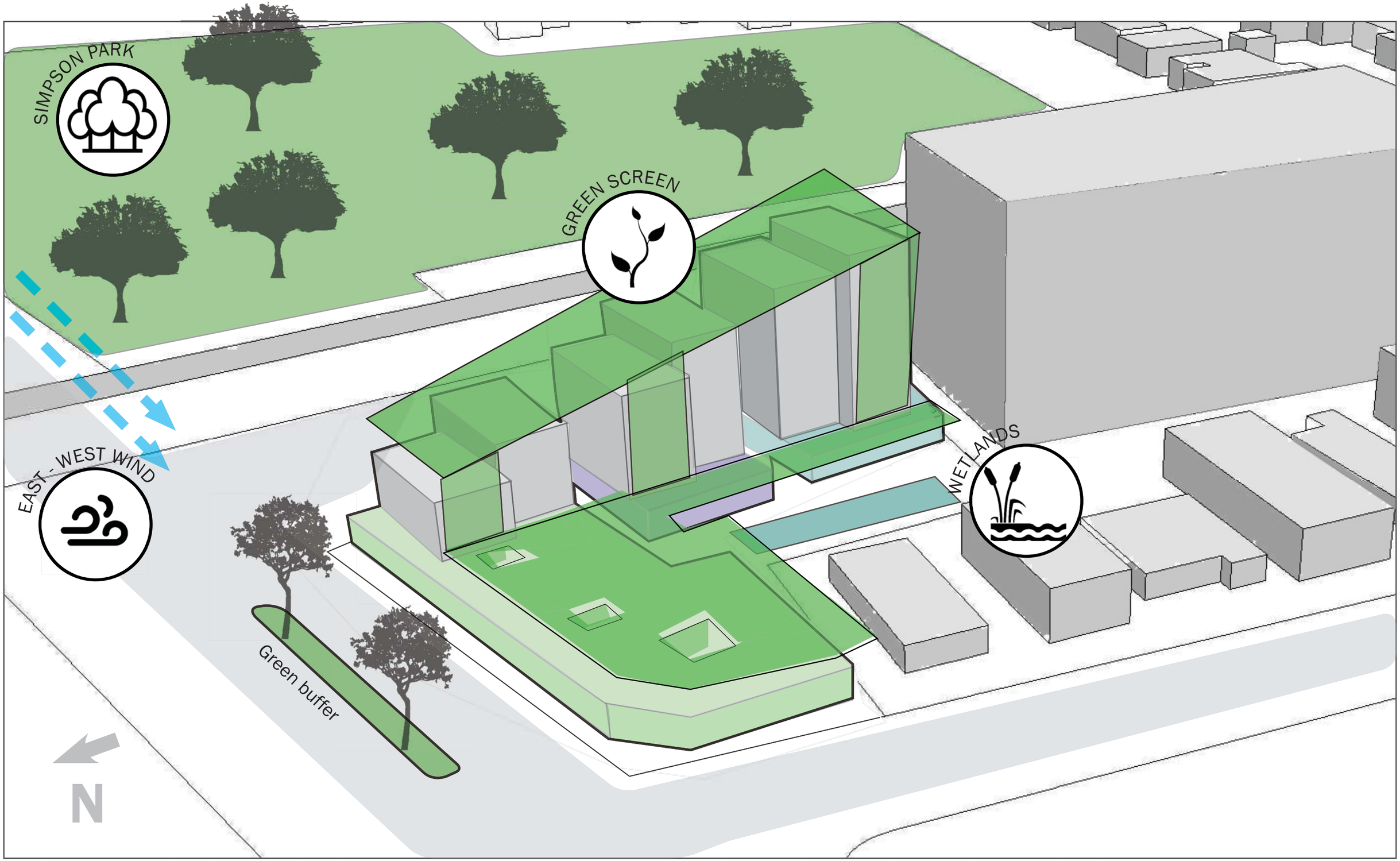


SCREEN

URBAN FORCES

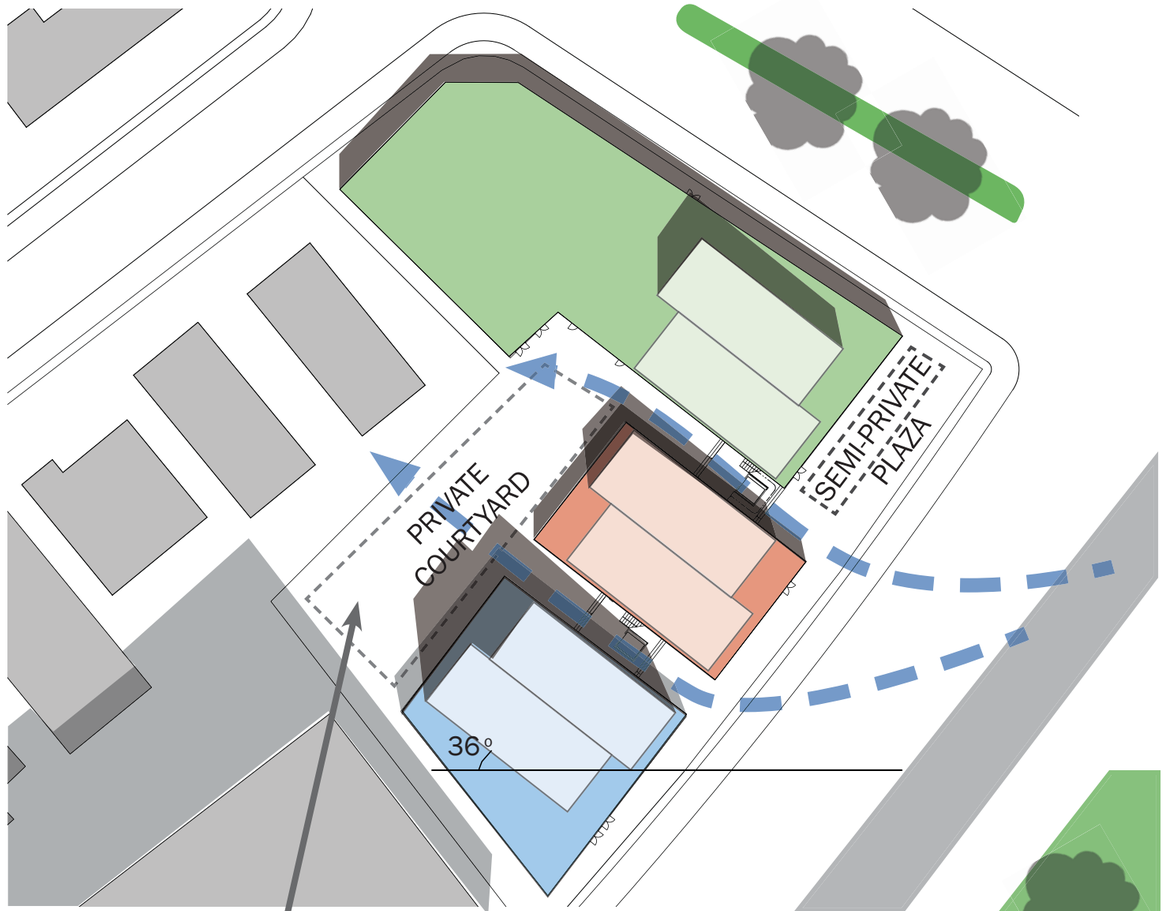


ENVIRONMENTAL FORCES



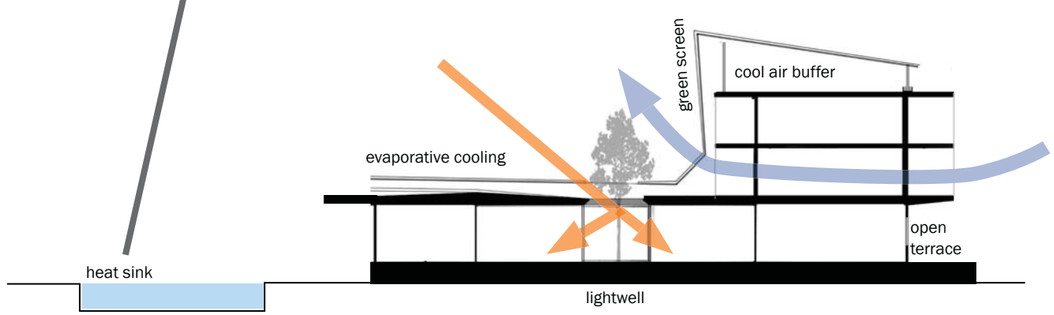
DESIGN APPROACH

ORIENTATION

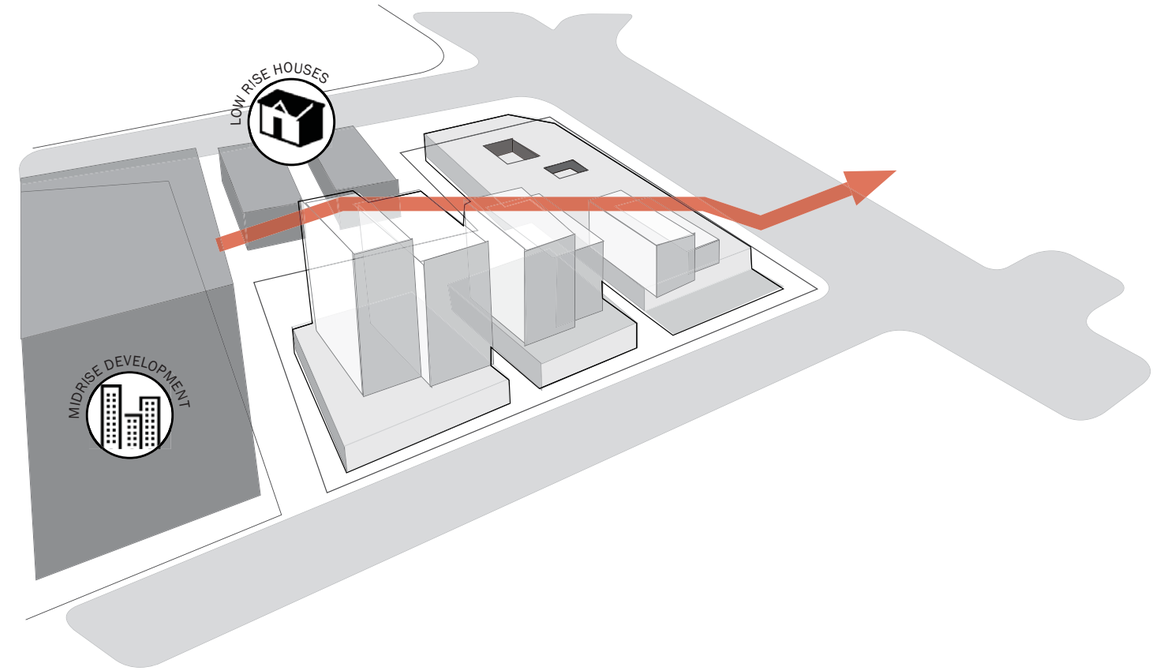


East-West orientation with 36° rotation, to use breeze from the ocean and shade parts of the west facade from evening sun.

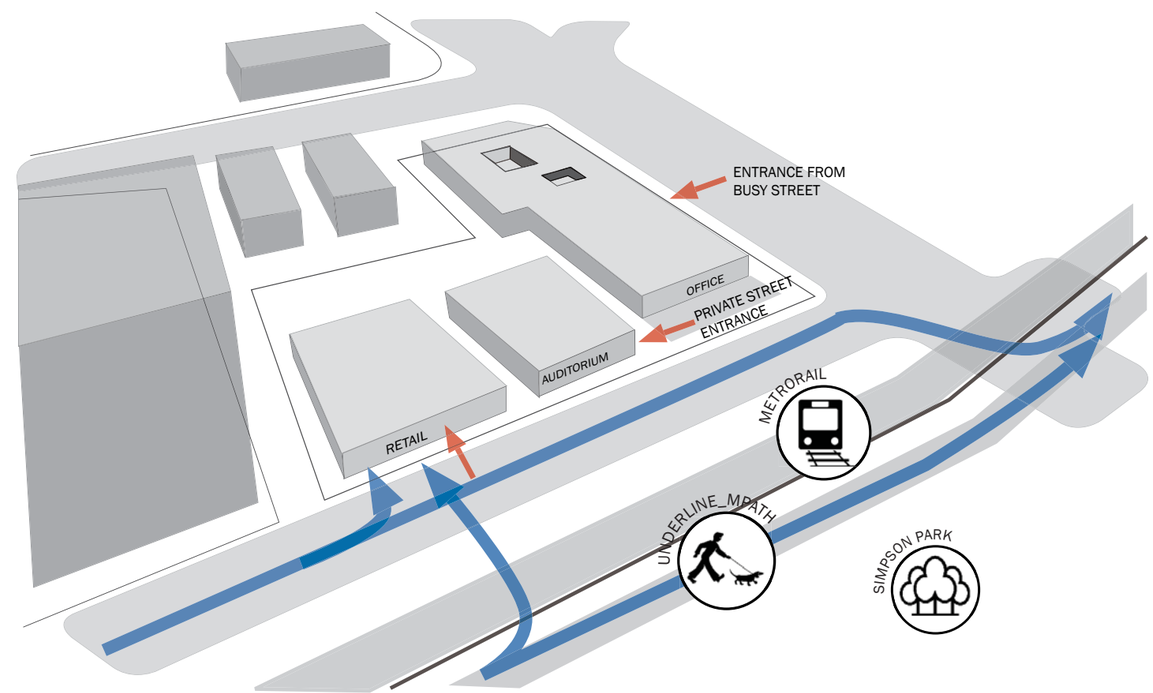
WETLANDS AS A HEAT SINK



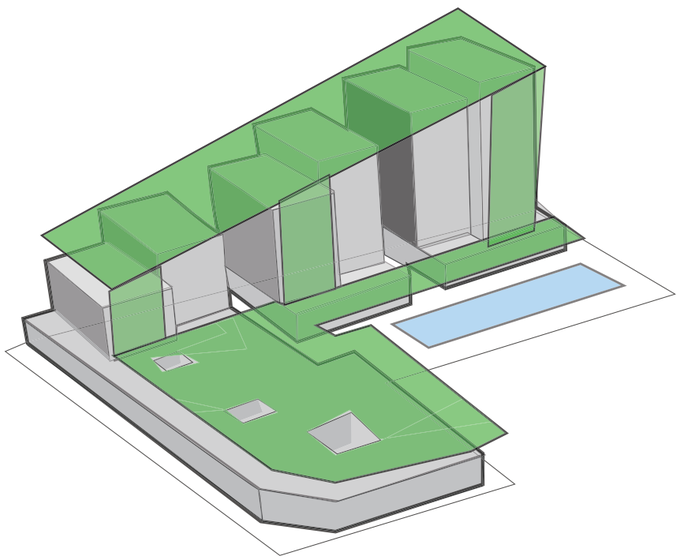
MIDRISE - LOWRISE HEIGHT MITIGATION

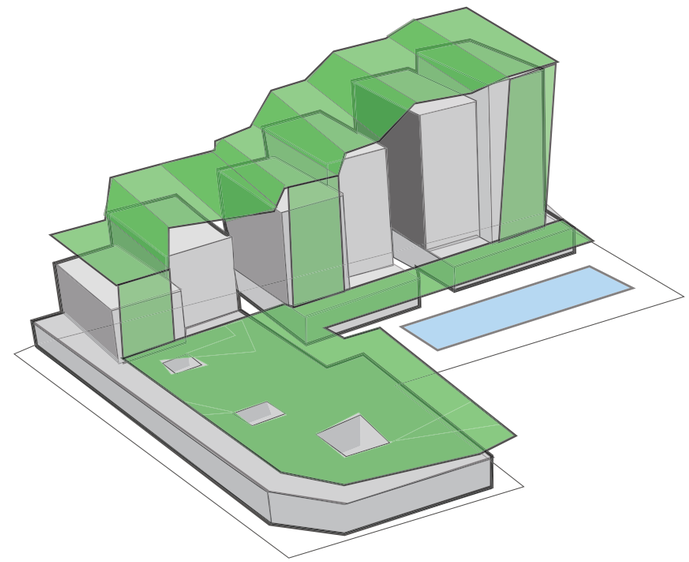


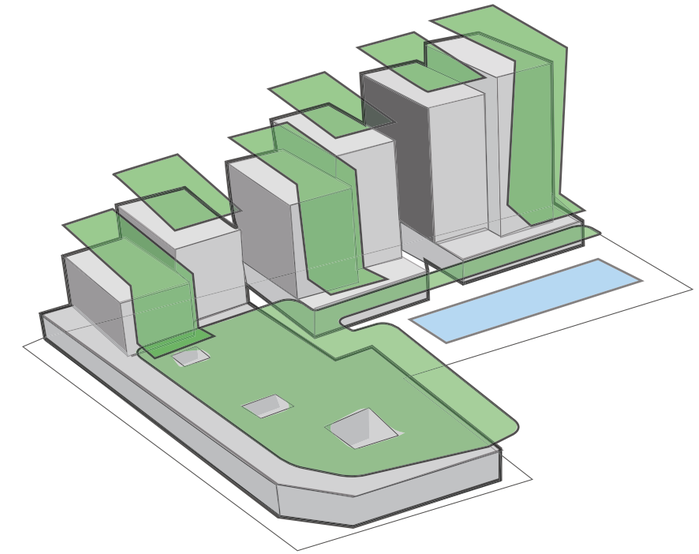
ENTRANCE HIERARCHY



TRELLIS + VEGETATION STUDY







PASSION VINE

-

5-10 FT

YUCCA

3-6 FT

3-12 FT

WILD COFFEE

4-10 FT

4-10 FT

LEATHER FERN

3-5 FT

4-8 FT

MORNING GLORY

0.5 FT

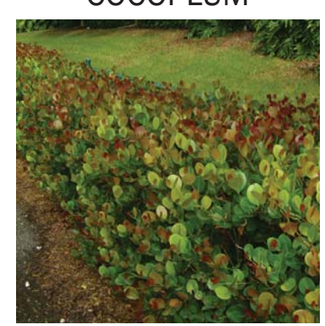
10-75 FT

SCRUB PALMETTO

4-6 FT

4-6 FT

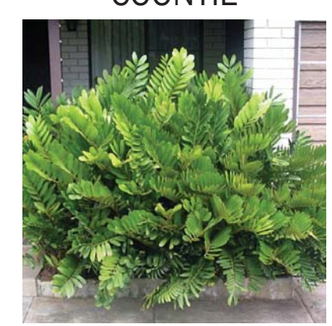
COCOPLUM



10-20 FT

3-30 FT

COONTIE

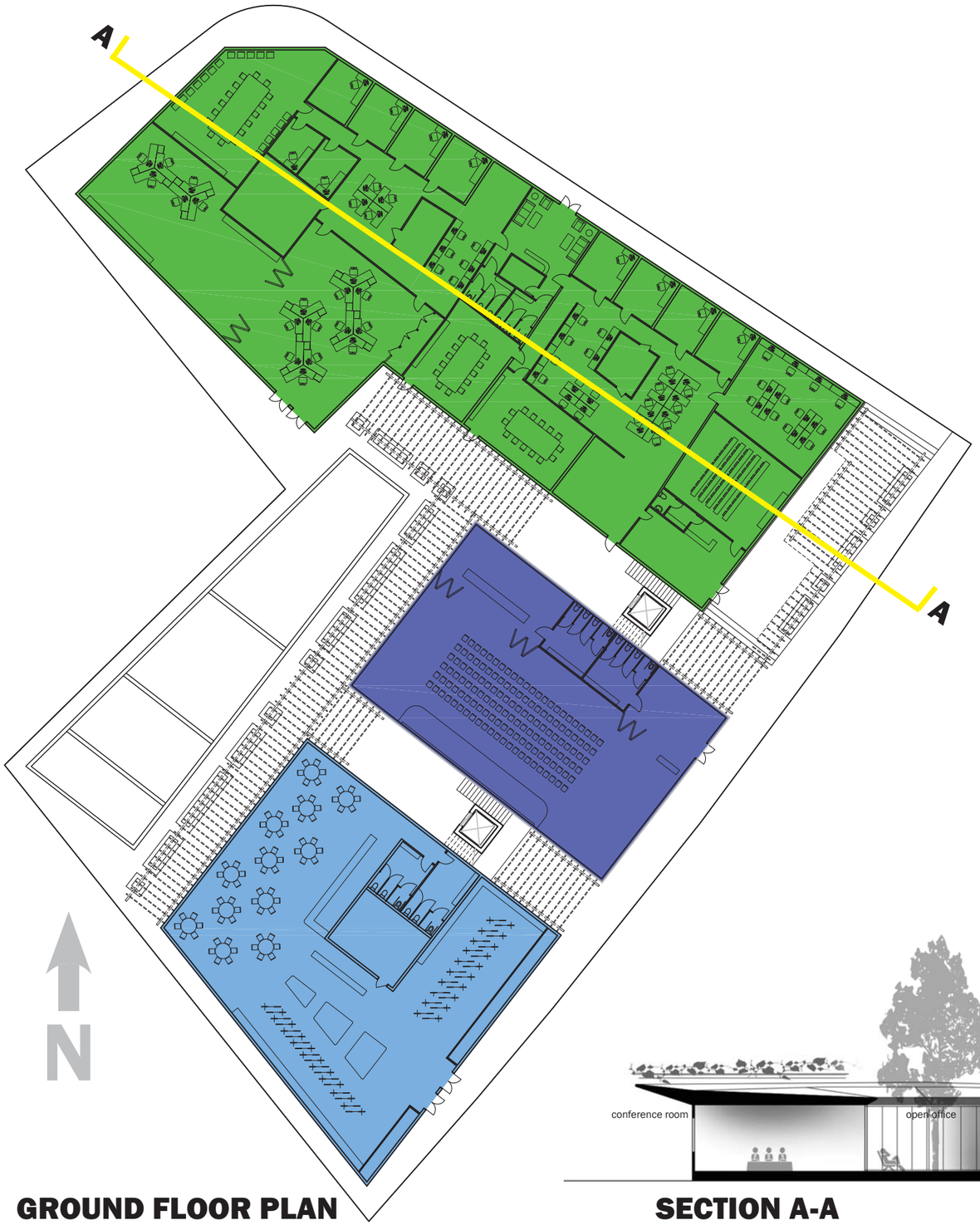


3-5 FT

1-5 FT

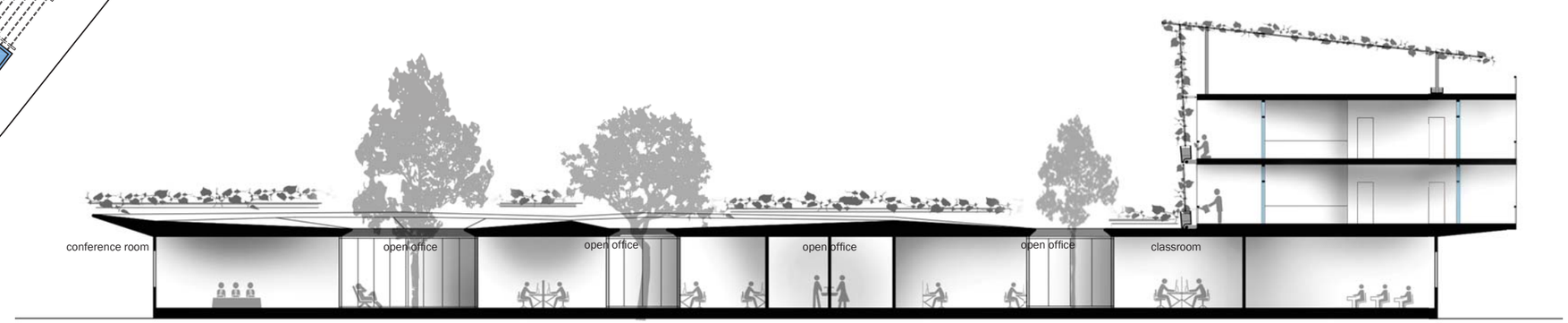
FIRST PROPOSAL

GROUND FLOOR



GROUND FLOOR PLAN

SITE PLAN



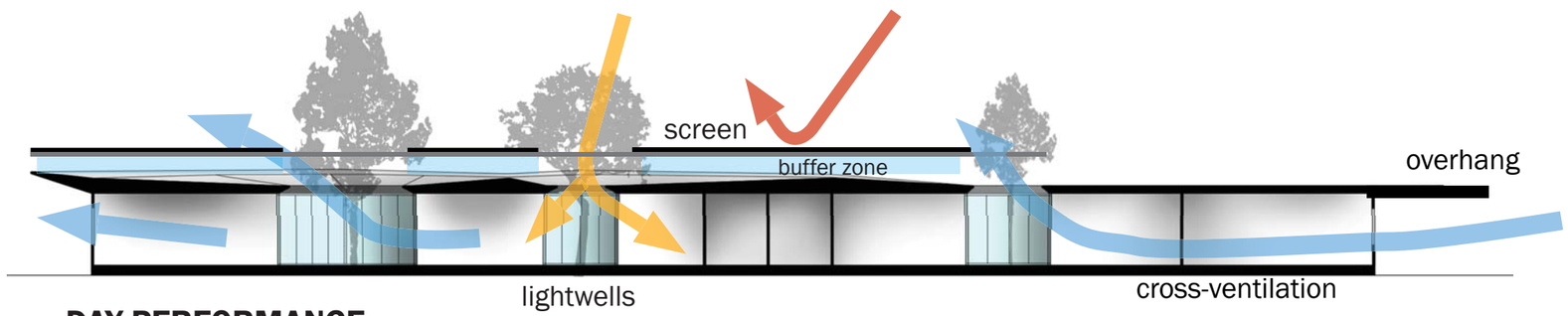
SECTION A-A

OFFICE REQUIREMENTS + KEY DESIGN FACTORS

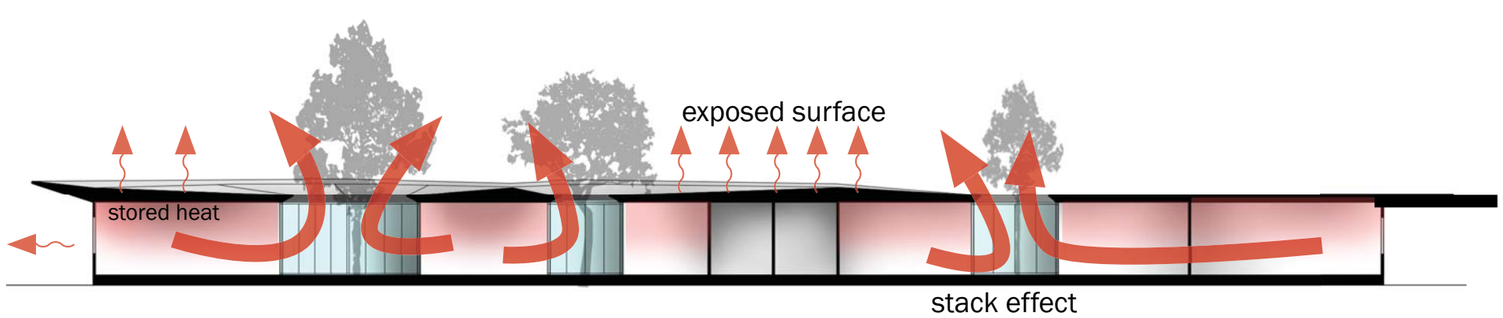
DAYLIGHTING
Evenly spread sunlight
300 lux min

GLARE
Prevent overlit spaces
and glare

THERMAL COMFORT
Maintain temperature
in a range 20 - 28 C

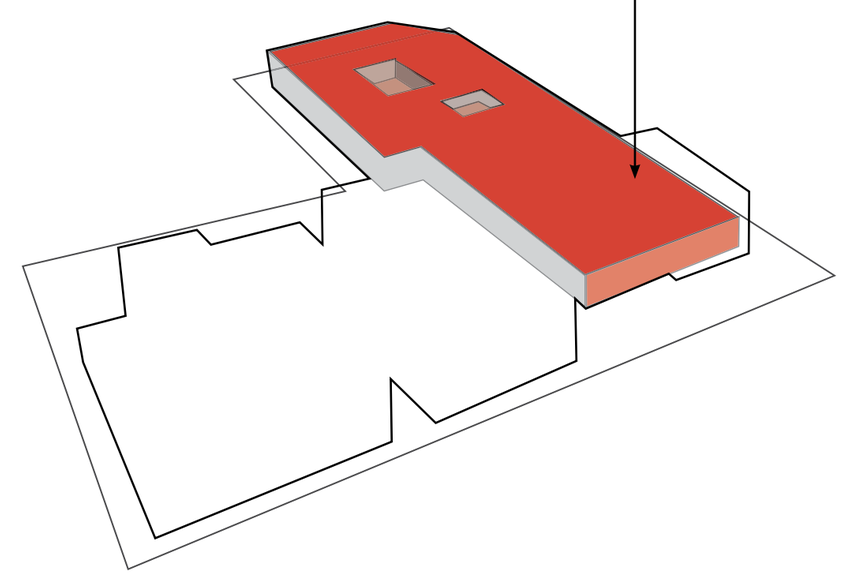


DAY PERFORMANCE

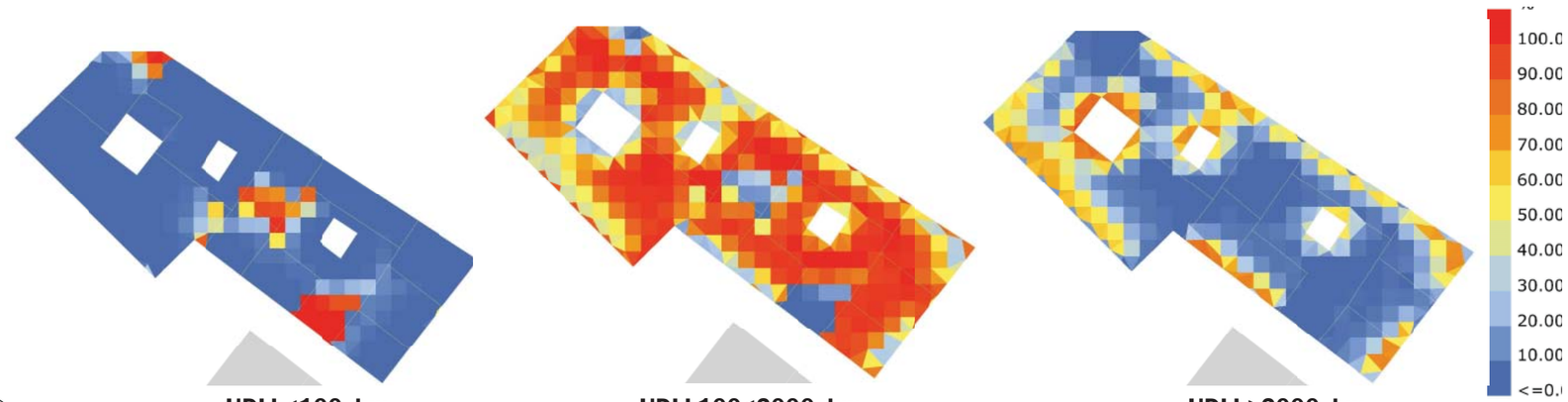


NIGHT PERFORMANCE

PROBLEMATIC ZONES
Roof Exposed to direct solar radiation. **East & West** Exposed to the sun



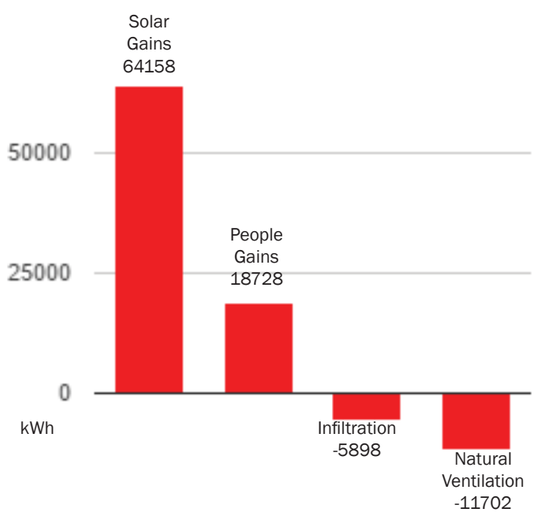
NEW CHAUTAUQUA INSTITUTE

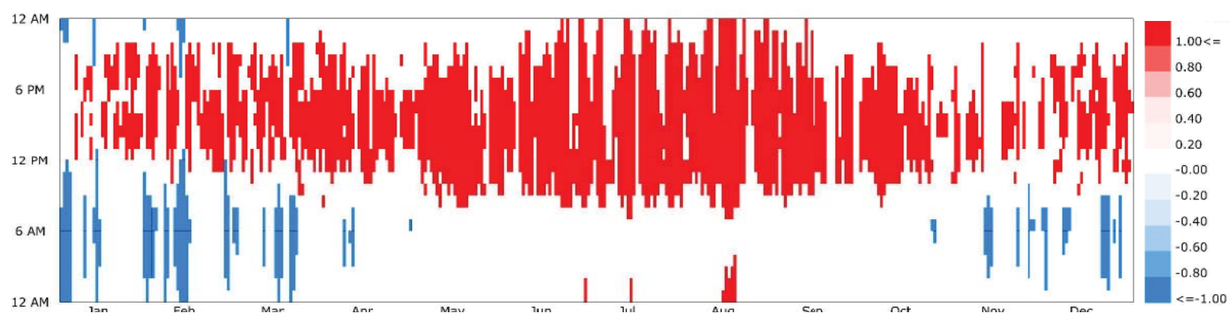


UDLI <100 lux

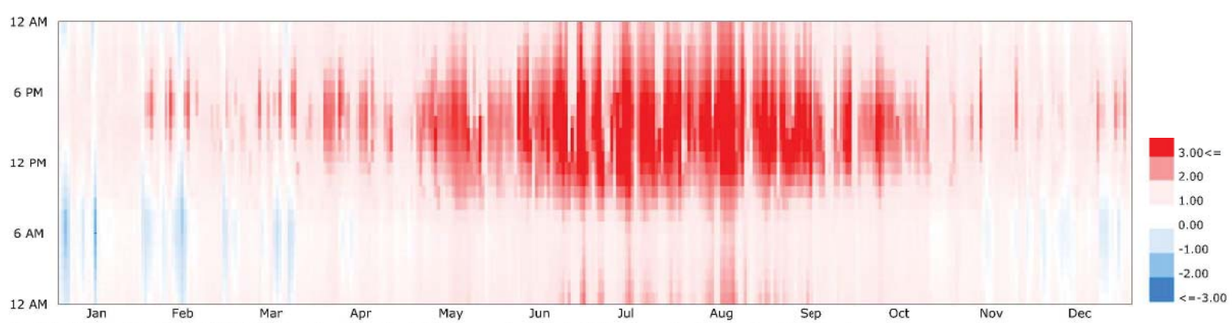
UDLI 100<2000 lux

UDLI >2000 lux

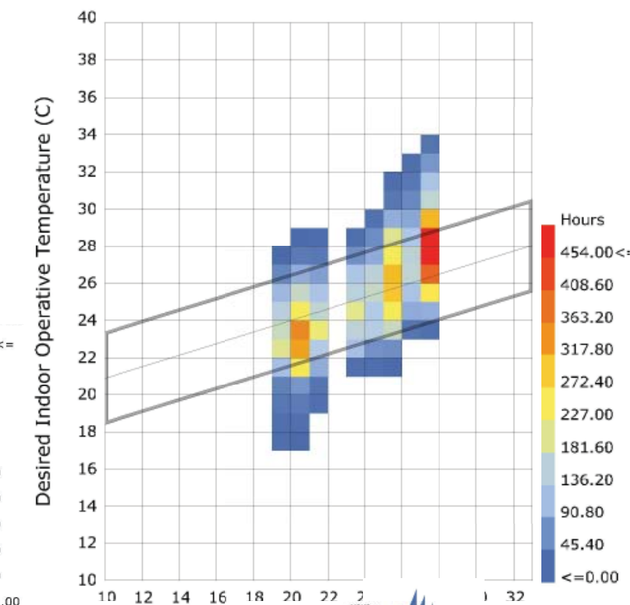




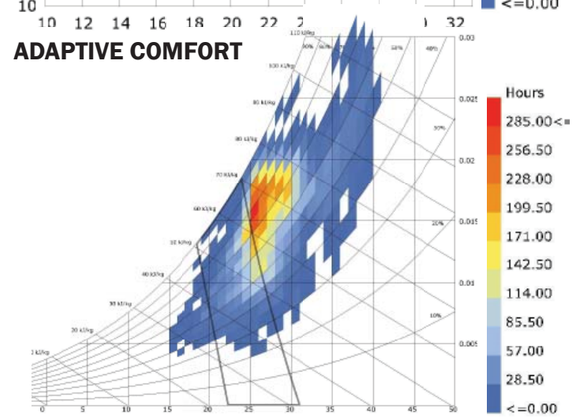
ADAPTIVE COMFORT 65,67 % 1 - hot , 0 - comfortable , -1 - cold



PMV 12.80% 3 - hot , 2 - warm, 1 - slightly warm, 0 - neutral , -1 - slightly cool, -2 - cool, -3 - cold

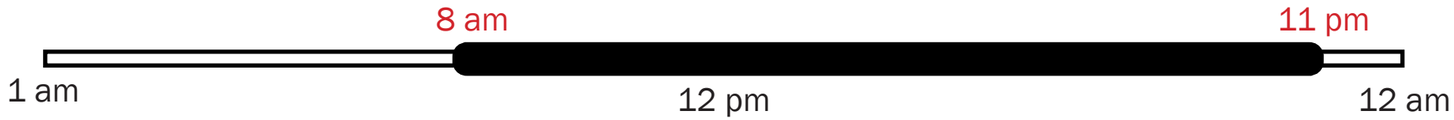


ADAPTIVE COMFORT



PSYCHROMETRIC CHART

AUDITORIUM REQUIREMENTS + KEY DESIGN FACTORS



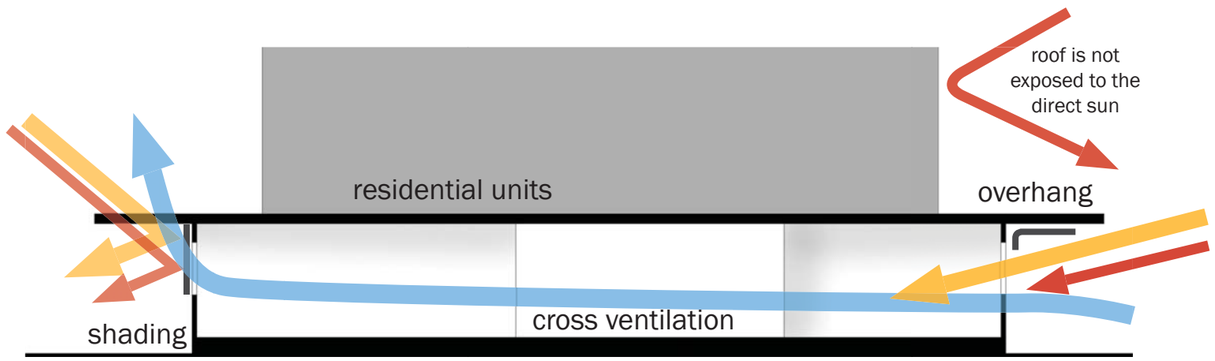
REQUIRED COMFORTABLE HOURS

DAYLIGHTING
Evenly spread sunlight
300 lux min

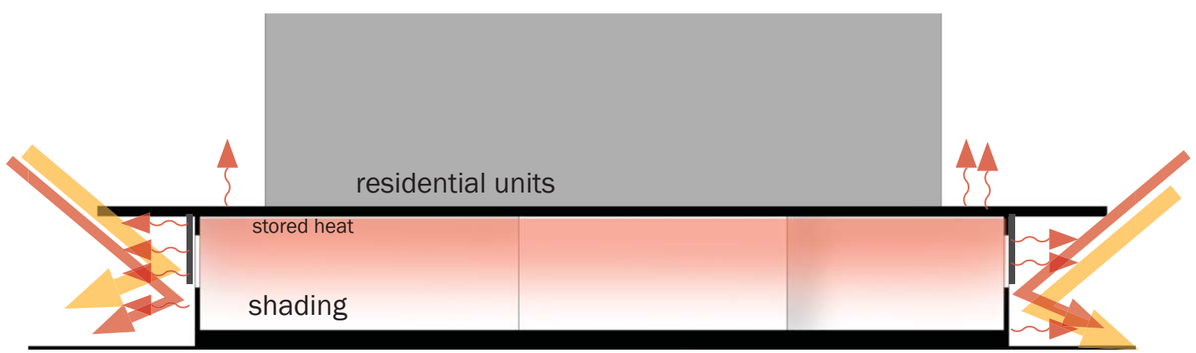
GLARE
Prevent overlit spaces
and glare

THERMAL COMFORT
Maintain temperature
in a range 20 - 28 C

FLEXIBILITY
Space designed to be
functional for multiple
uses

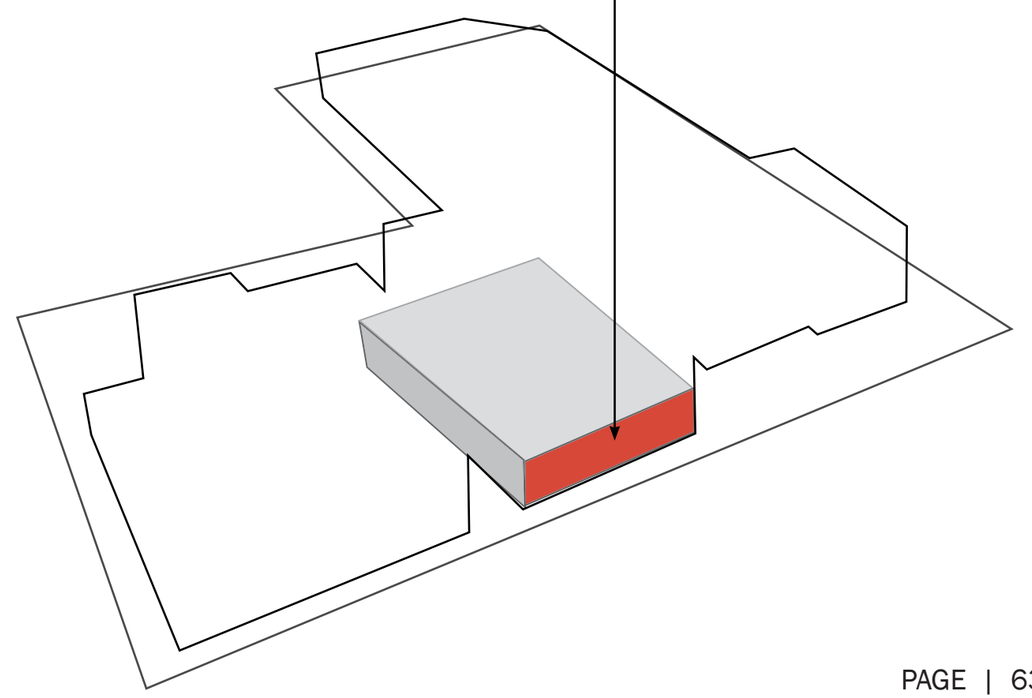


DAY / OCCUPIED PERFORMANCE

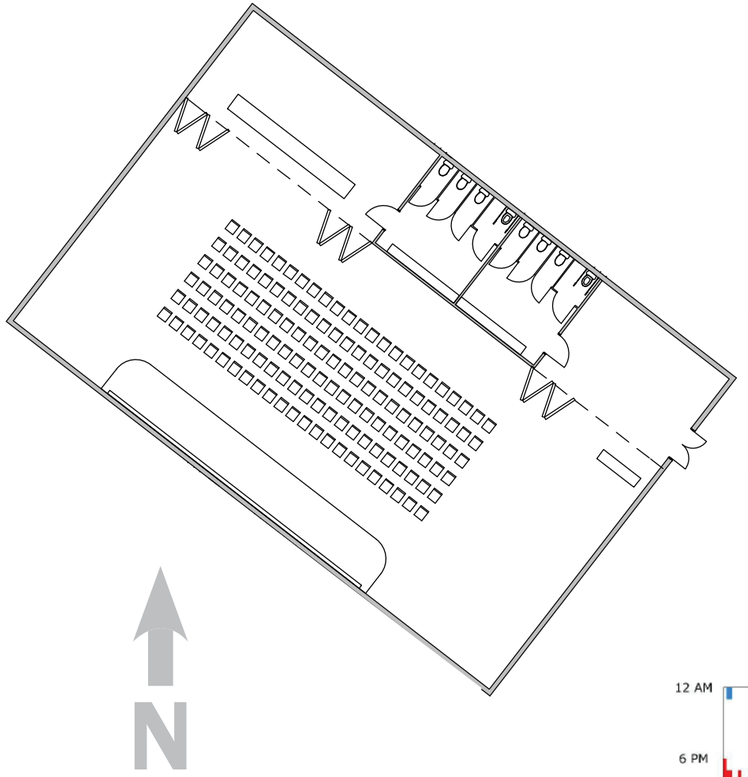


NIGHT / UNOCCUPIED PERFORMANCE

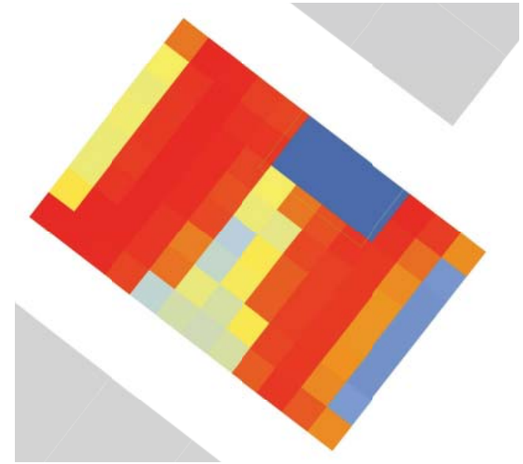
PROBLEMATIC ZONES
Roof Protected by Residential above. **East & West** Exposed to the sun



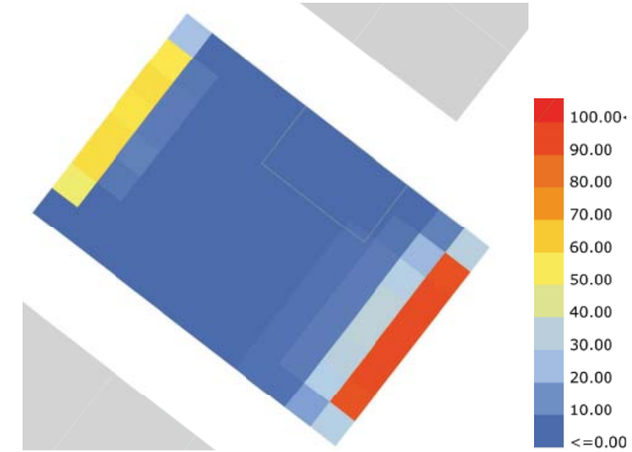
AUDITORIUM



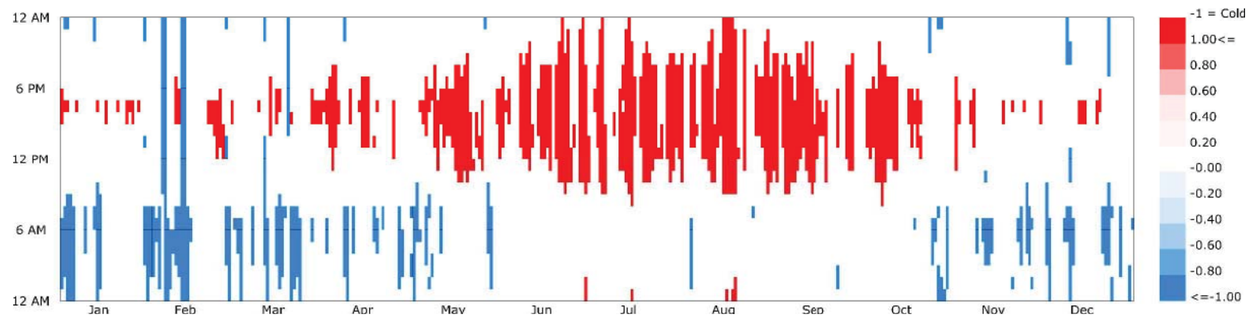
UDLI <100 lux



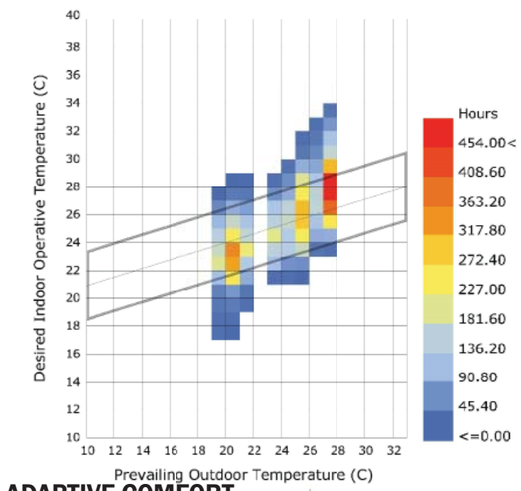
UDLI 100-2000 lux



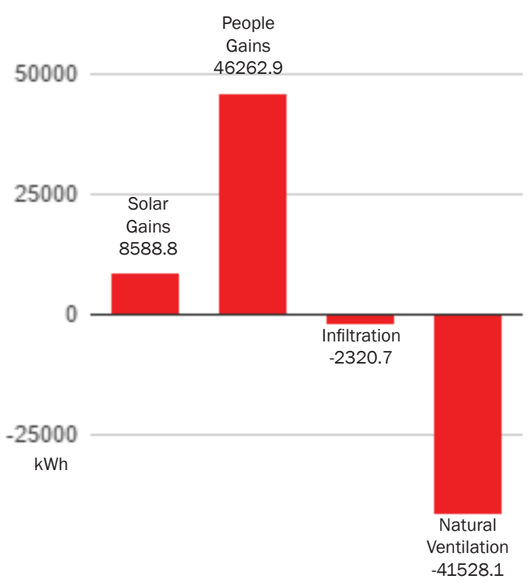
UDLI >2000 lux

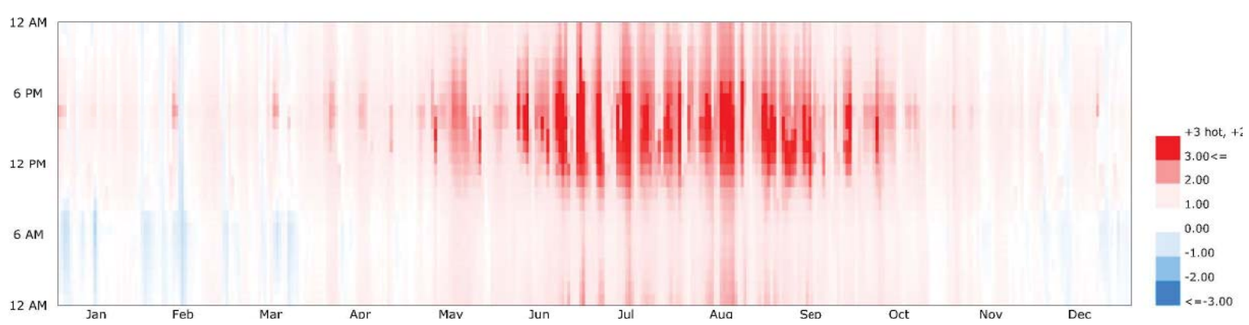


ADAPTIVE COMFORT 79.82% 1 - hot , 0 - comfortable , -1 - cold

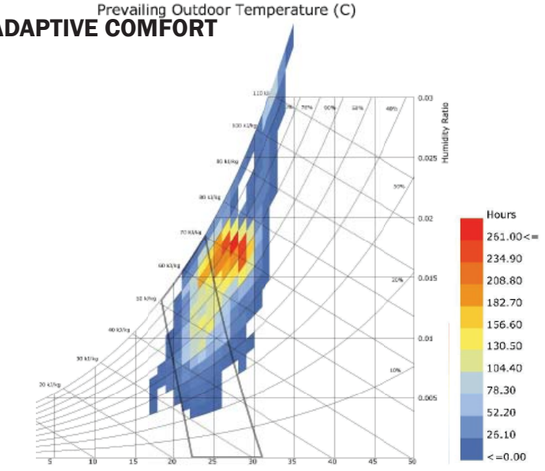


ADAPTIVE COMFORT





PMV 29.34% 3 - hot , 2 - warm, 1 - slightly warm, 0 - neutral , -1 - slightly cool, -2 - cool, -3 - cold



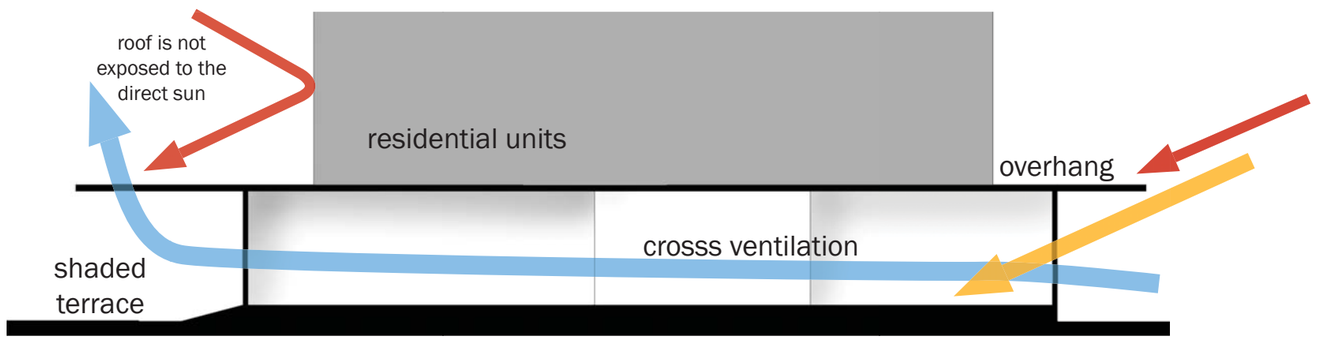
PSYCHROMETRIC CHART

RETAIL REQUIREMENTS + KEY DESIGN FACTORS

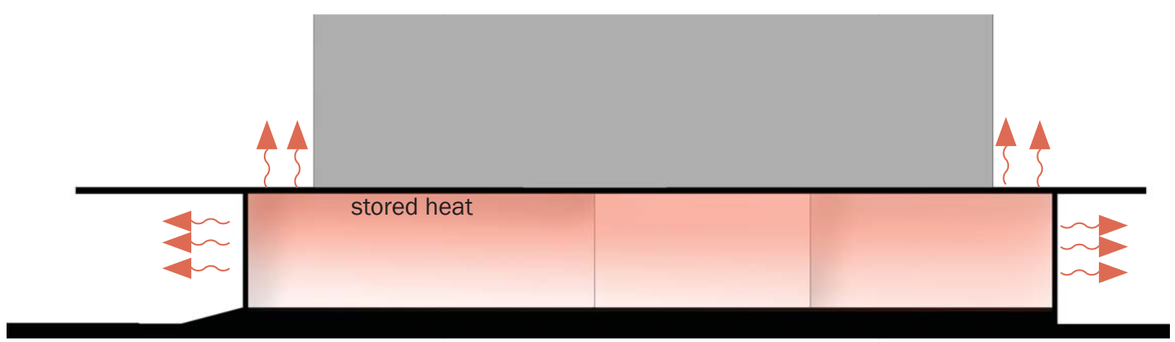
DAYLIGHTING
Evenly spread sunlight
300 lux min

GLARE
Prevent overlit spaces
and glare

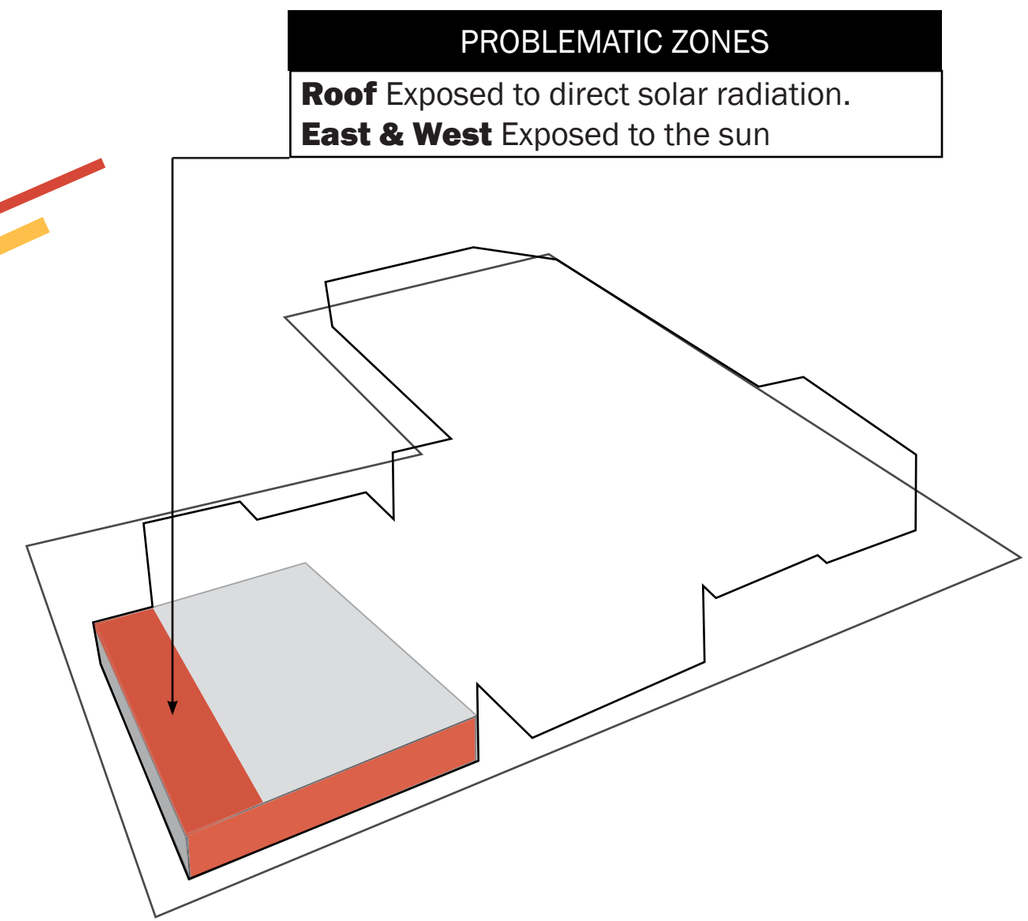
THERMAL COMFORT
Maintain temperature
in a range 20 - 28 C



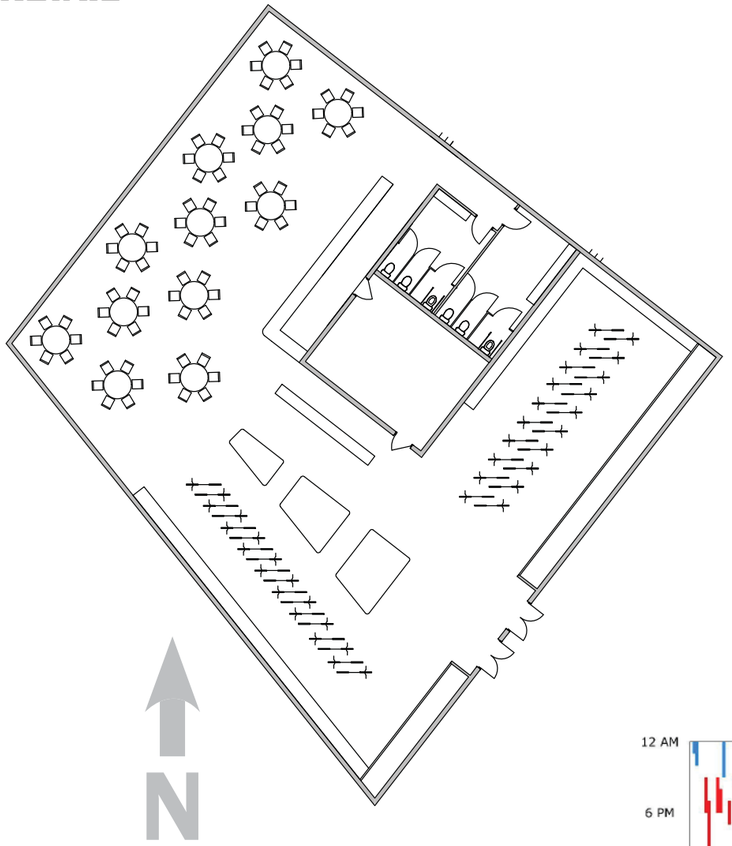
DAY PERFORMANCE

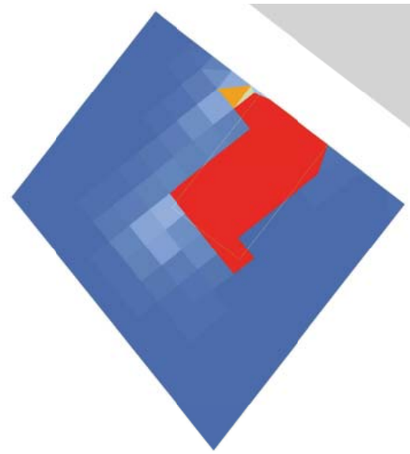


NIGHT PERFORMANCE

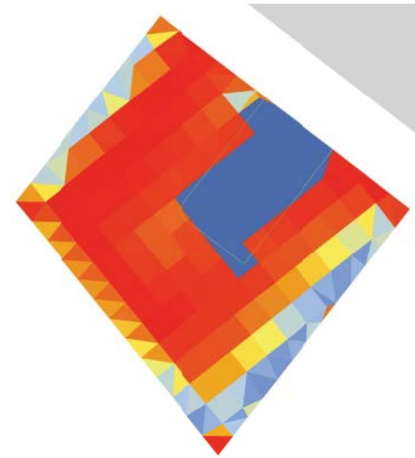


RETAIL

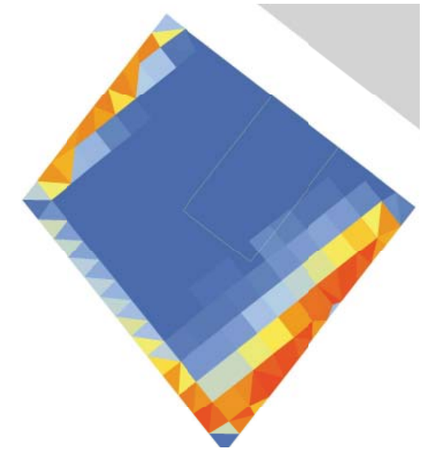




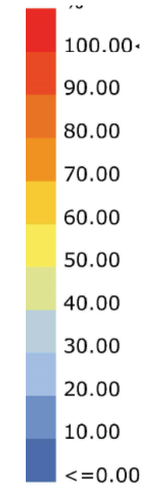
UDLI <100 lux

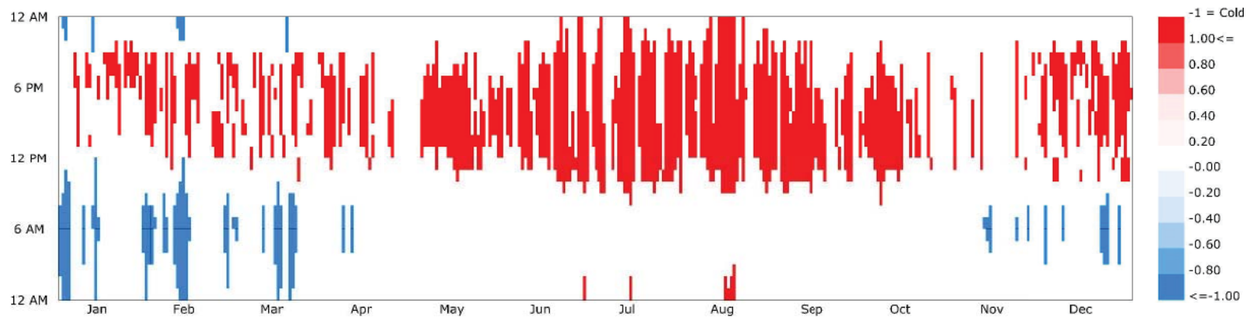


UDLI 100-2000 lux

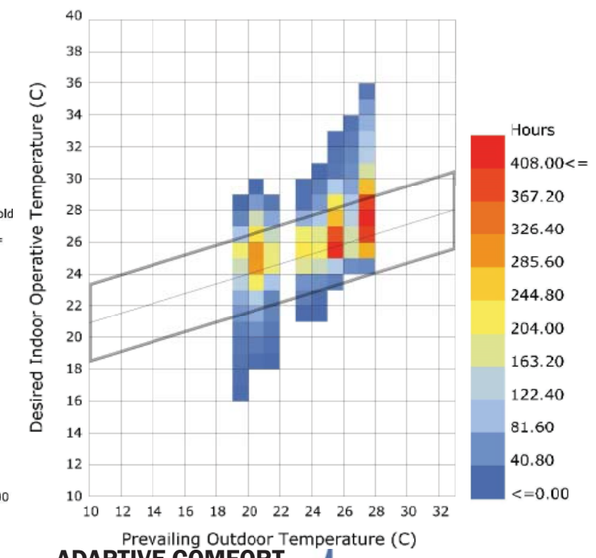


UDLI >2000 lux

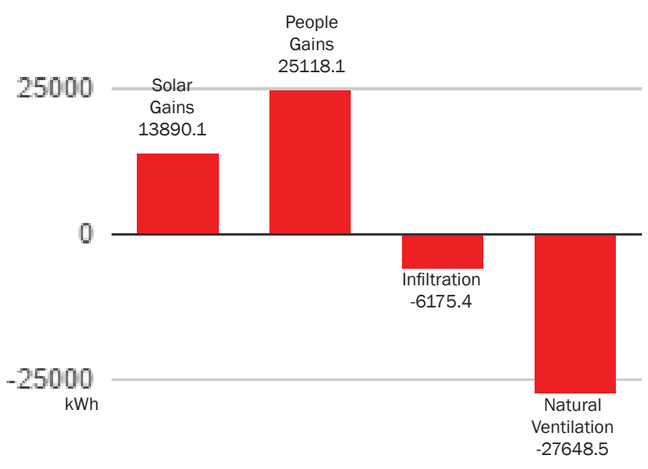


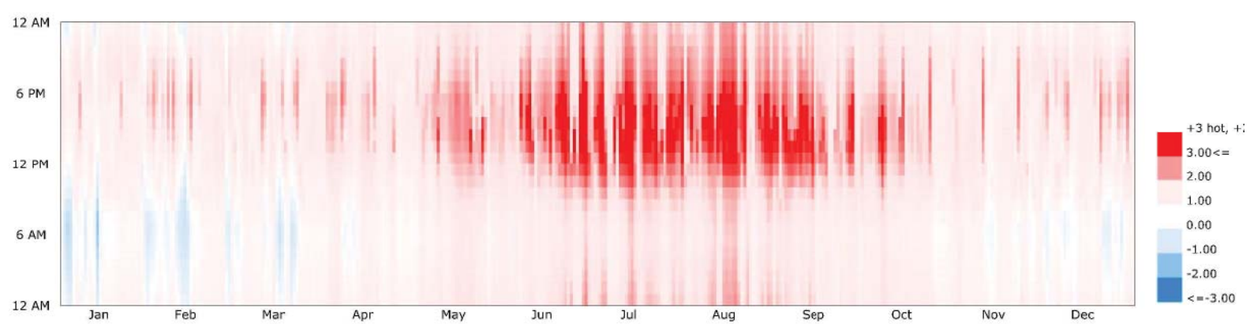


ADAPTIVE COMFORT 76.40% 1 - hot , 0 - comfortable , -1 - cold

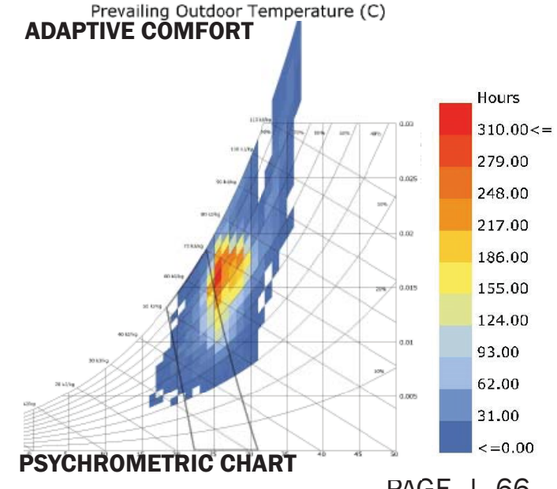


ADAPTIVE COMFORT





PMV 12.93% 3 - hot , 2 - warm, 1 - slightly warm, 0 - neutral , -1 - slightly cool, -2 - cool, -3 - cold



PSYCHROMETRIC CHART

RESIDENTIAL

2ND LEVEL

3RD LEVEL

4TH LEVEL

RESIDENTIAL

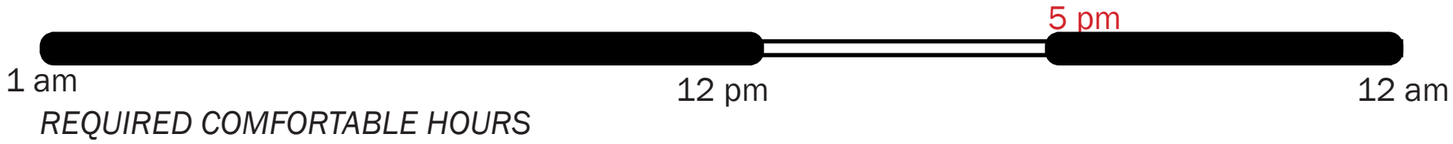
4TH LEVEL

5TH LEVEL

6TH LEVEL

7TH LEVEL

RESIDENTIAL UNIT REQUIREMENTS + KEY DESIGN FACTORS



REQUIRED COMFORTABLE HOURS

DAYLIGHTING
Evenly spread sunlight
300 lux min

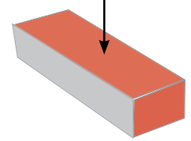
GLARE
Prevent overlit spaces
and glare

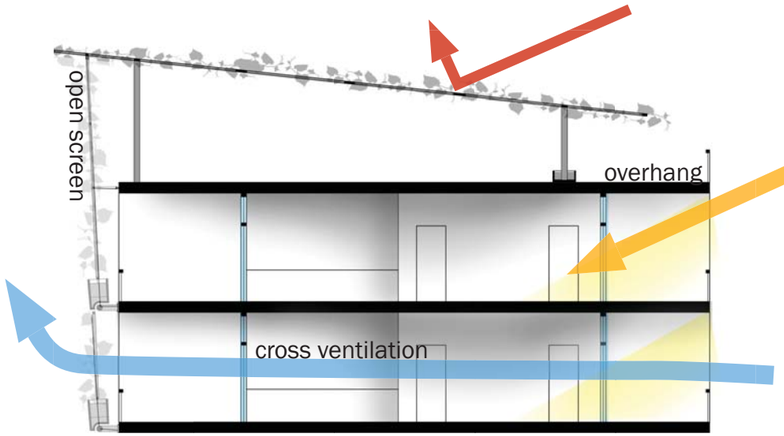
THERMAL COMFORT
Maintain temperature
in a range 20 - 28 C

CONTROL HUMIDITY
Spaces with high humidity
level [kitchen/bathrooms] are
located leeward

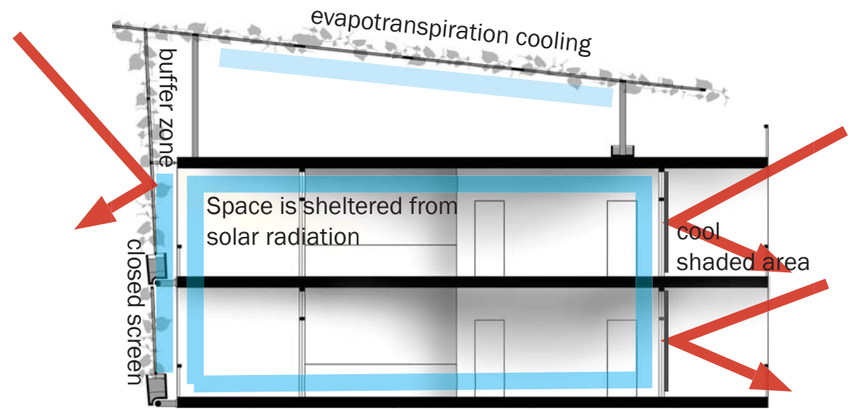
PROBLEMATIC ZONES

Roof Exposed to direct solar radiation.
East & West Exposed to the sun

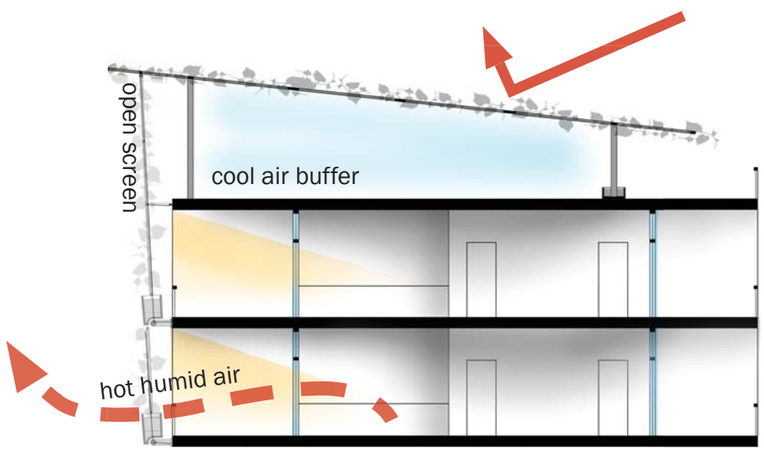




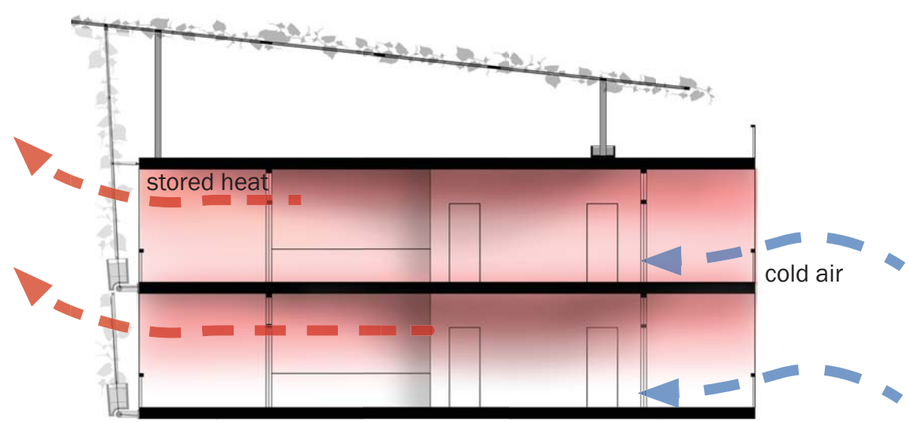
MORNING PERFORMANCE



UNOCCUPIED PERFORMANCE

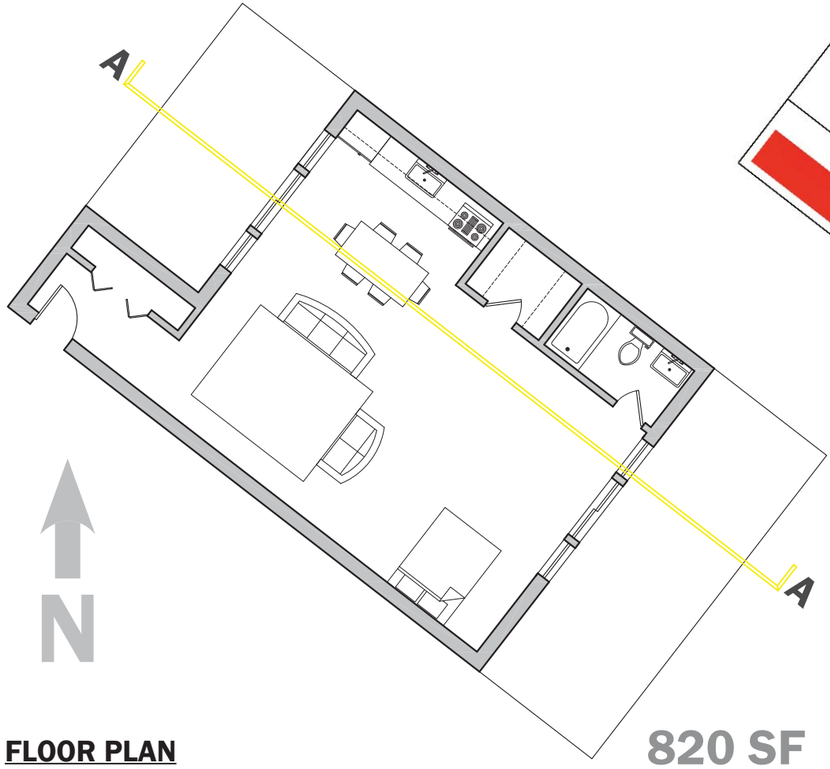


AFTERNOON PERFORMANCE

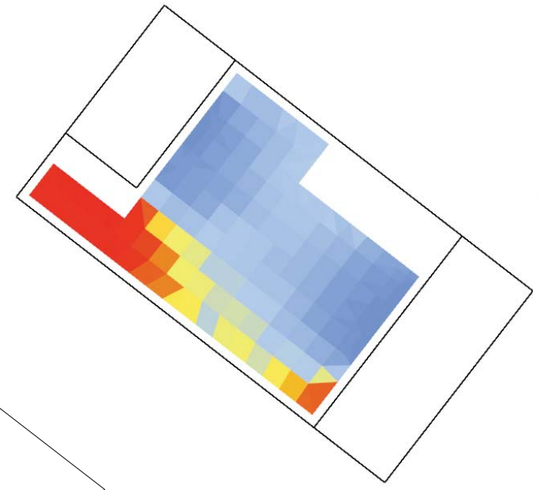


NIGHT PERFORMANCE

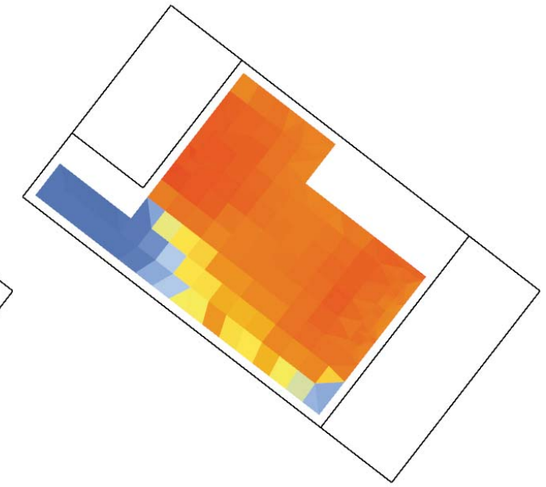
STUDIO



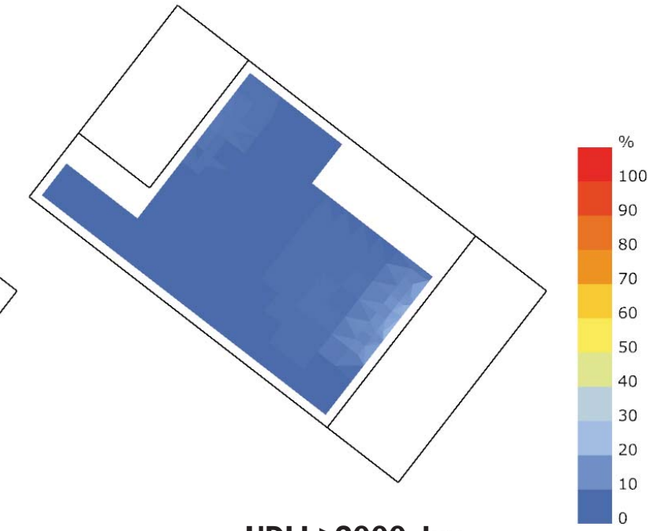
FLOOR PLAN



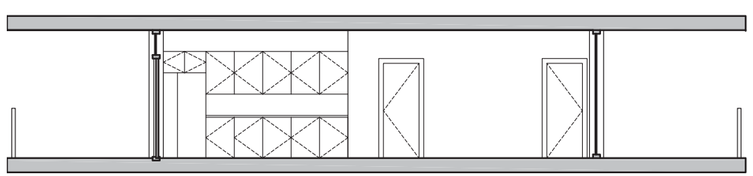
UDLI <100 lux



UDLI 100-2000 lux

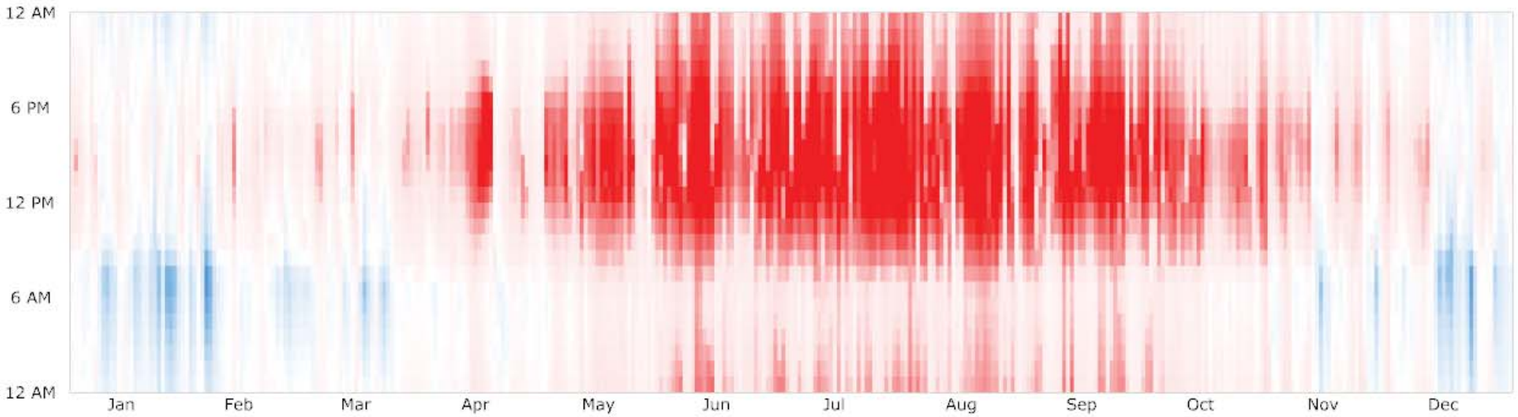


UDLI >2000 lux



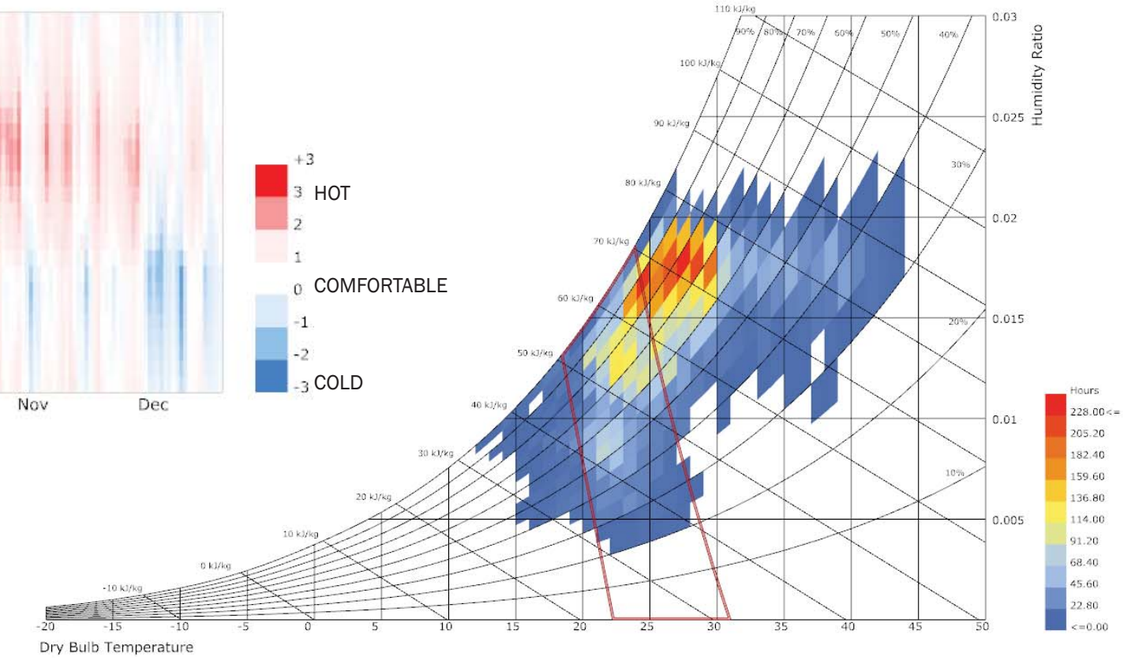
SECTION A-A

STUDIO

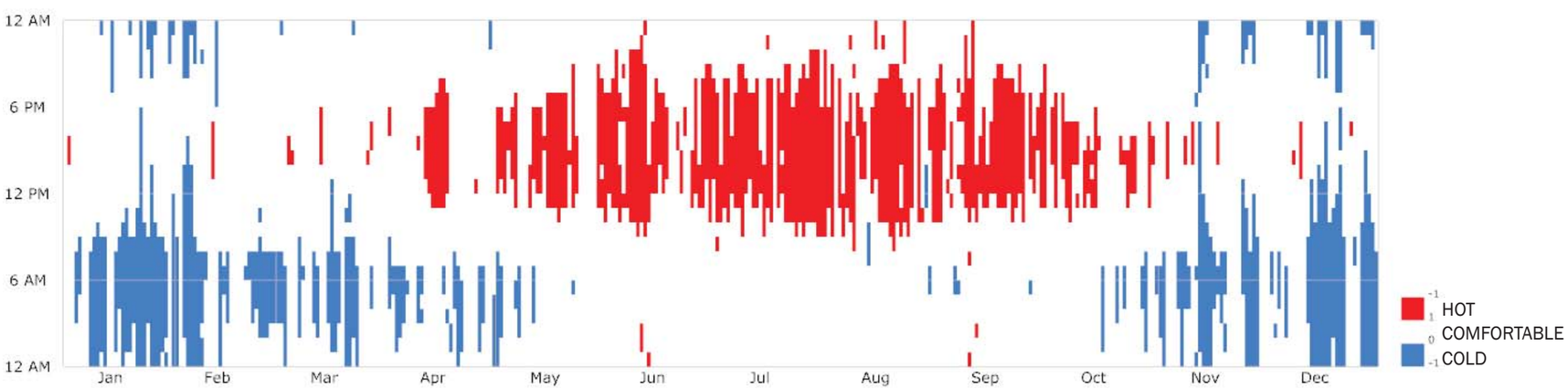


PREDICTED MEAN VOTE

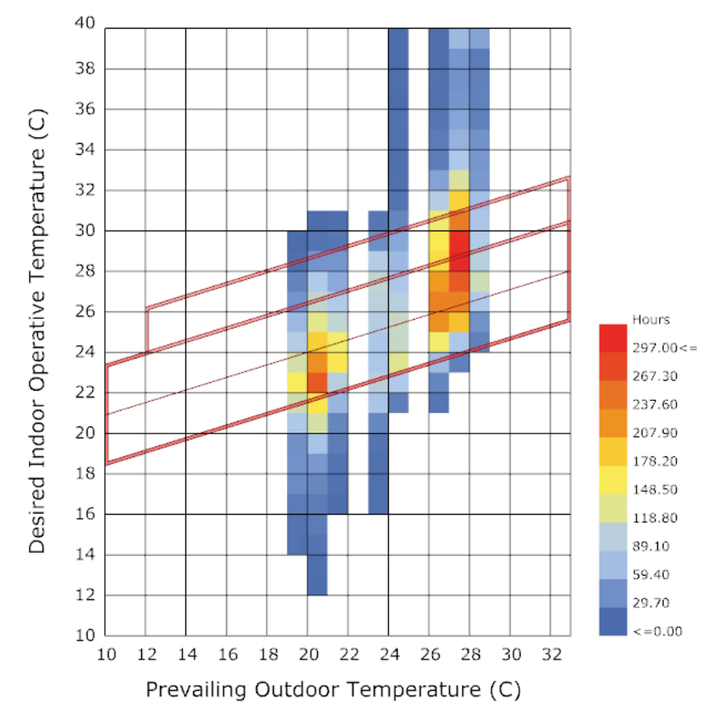
23% COMFORT



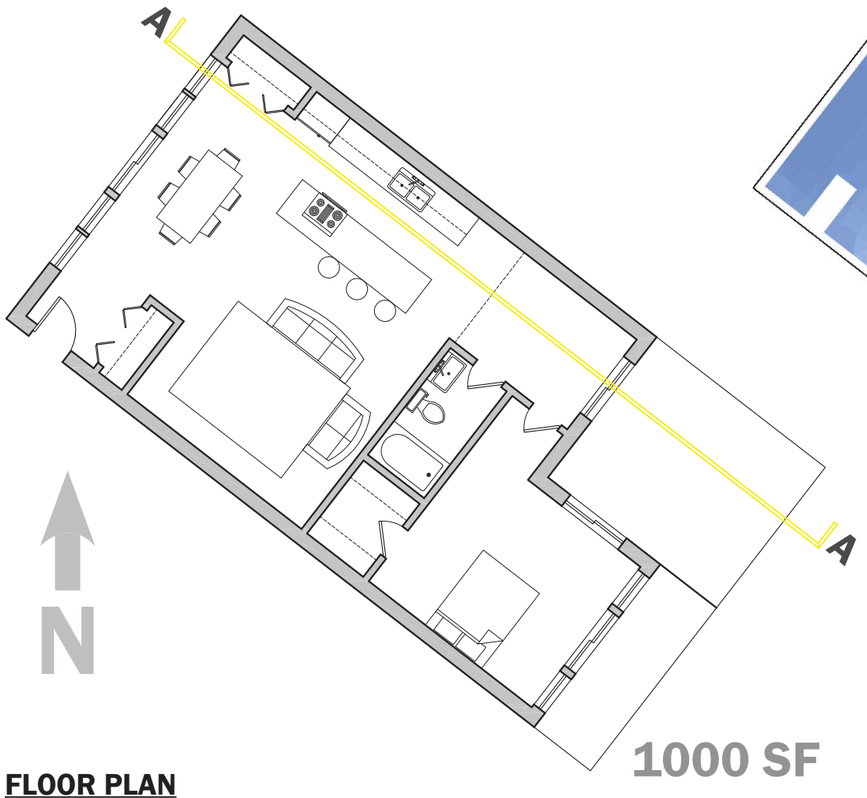
74% COMFORT



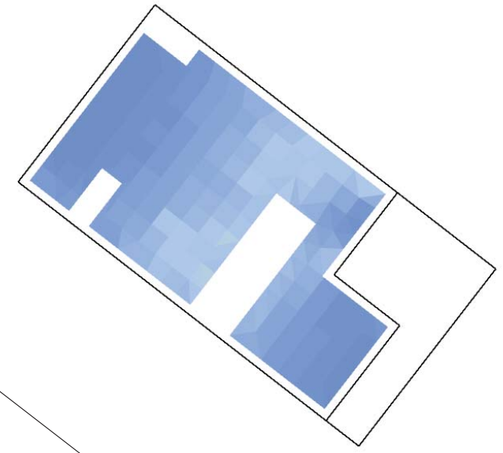
ADAPTIVE COMFORT



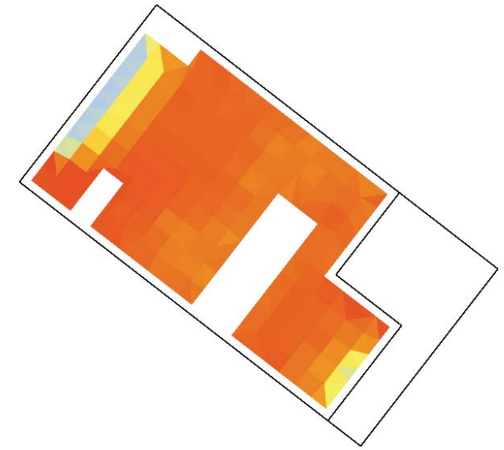
1 BEDROOM UNIT



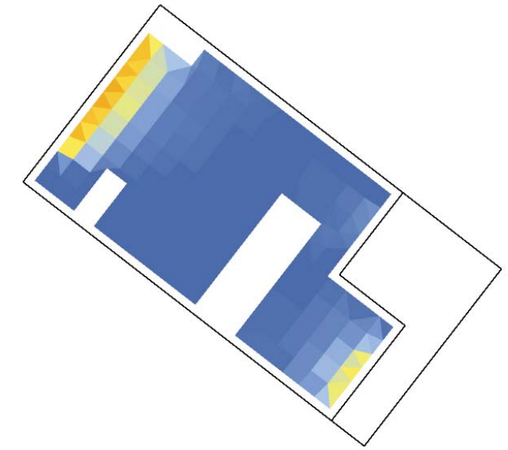
FLOOR PLAN



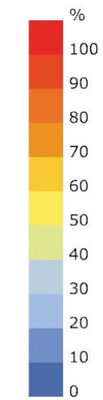
UDLI <100 lux

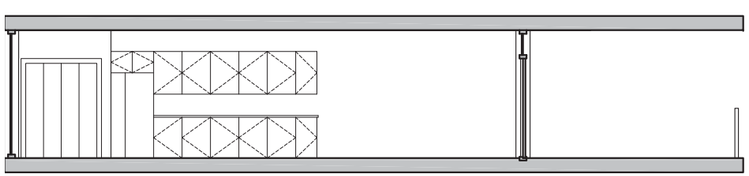


UDLI 100-2000 lux



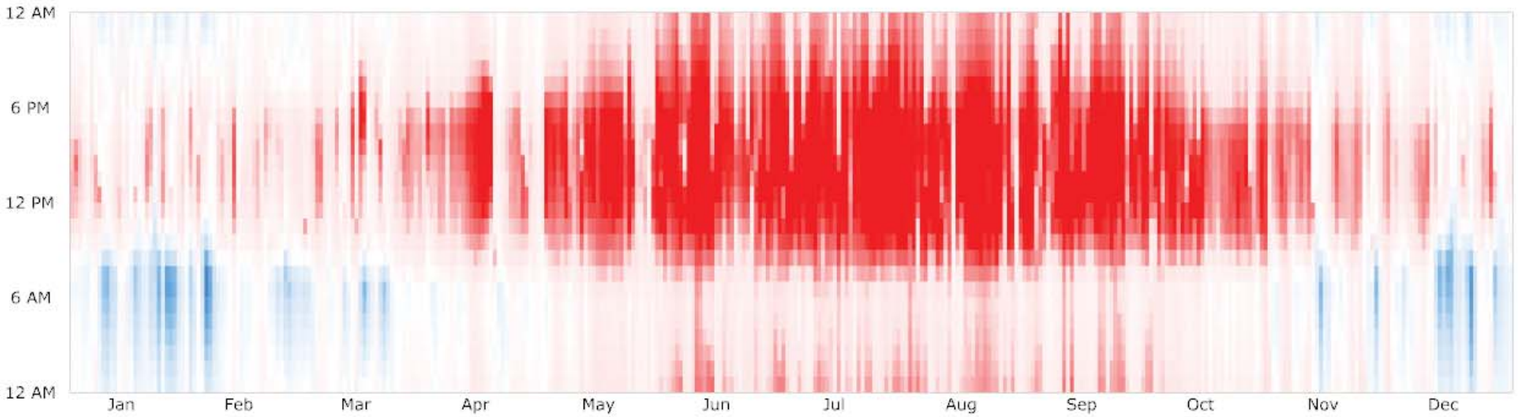
UDLI >2000 lux

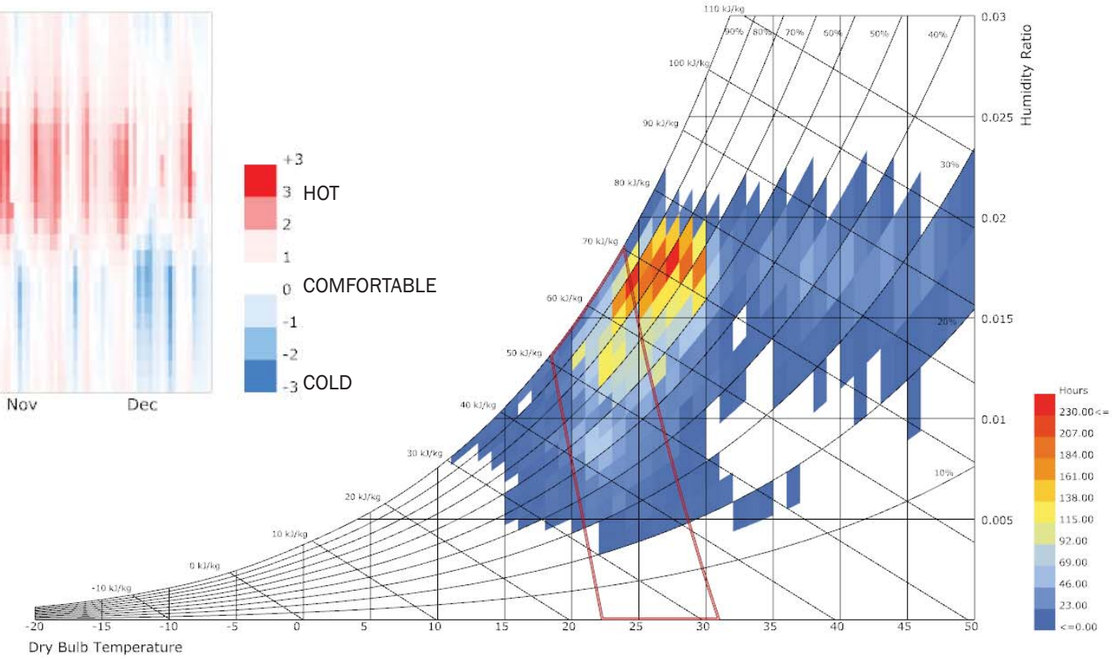




SECTION A-A

1 BEDROOM UNIT

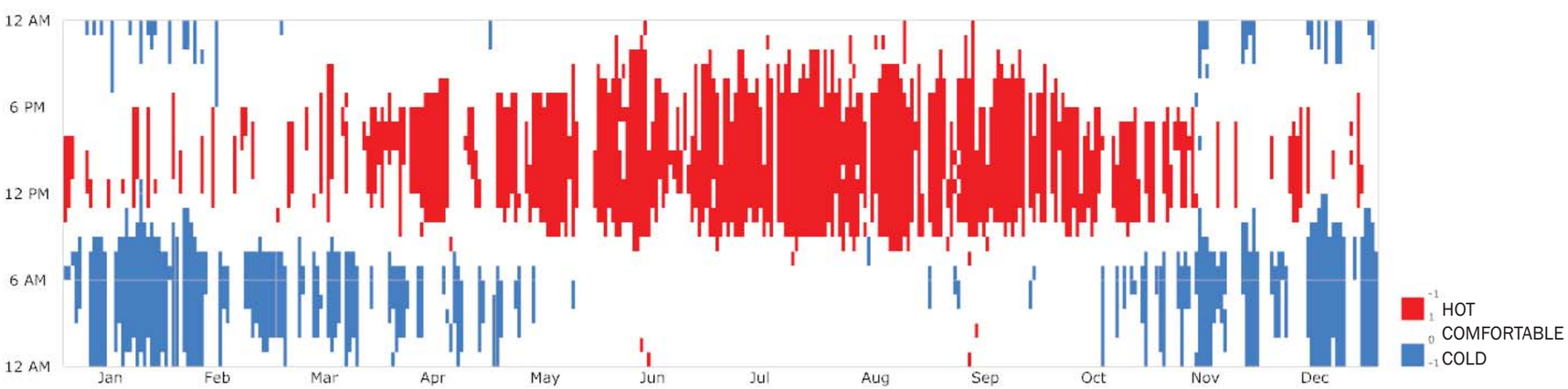


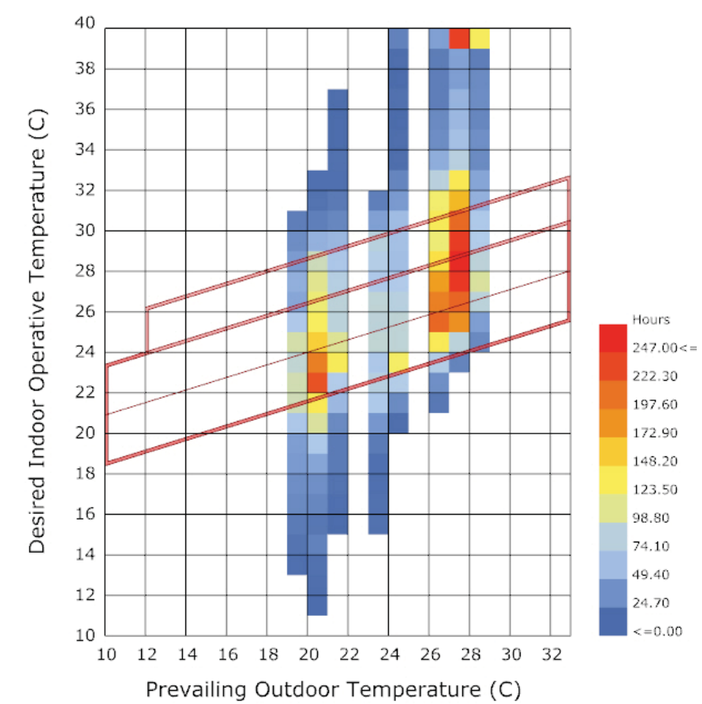


PREDICTED MEAN VOTE

21% COMFORT

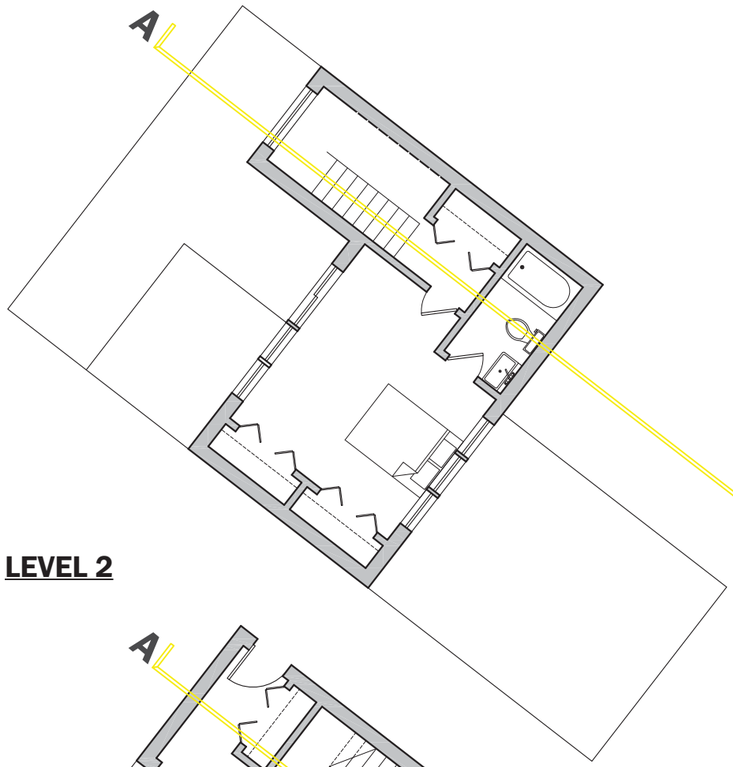
68% COMFORT



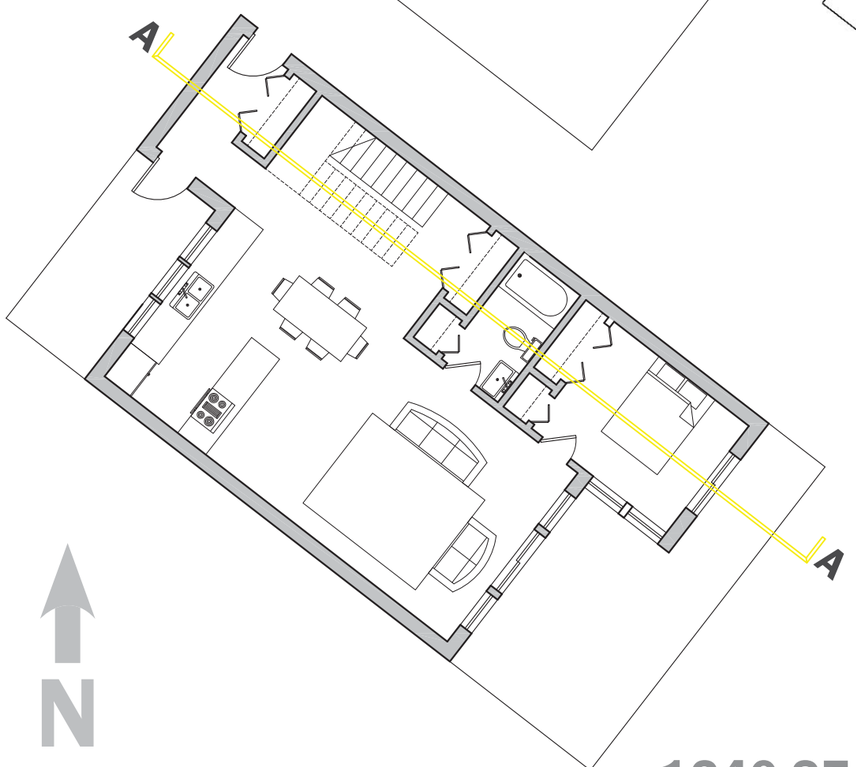


ADAPTIVE COMFORT

2 BEDROOM UNIT_TYPE A

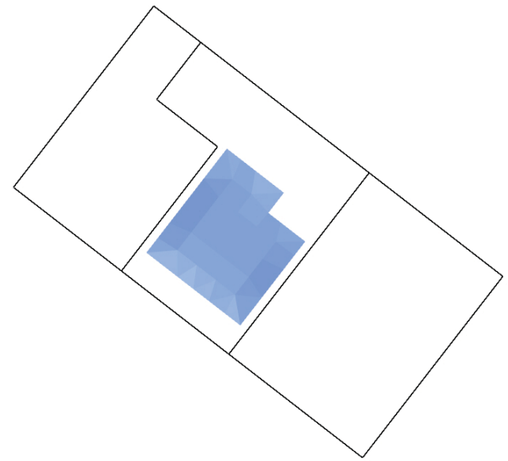


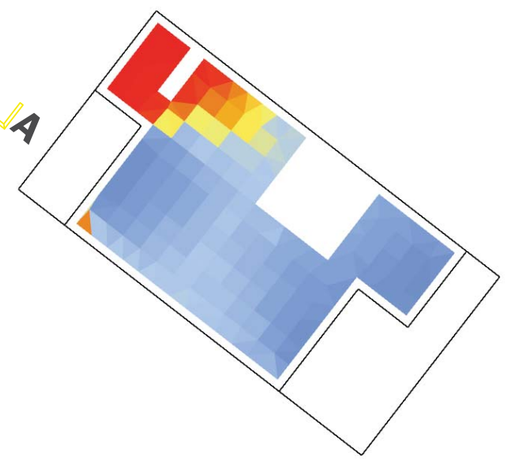
LEVEL 2



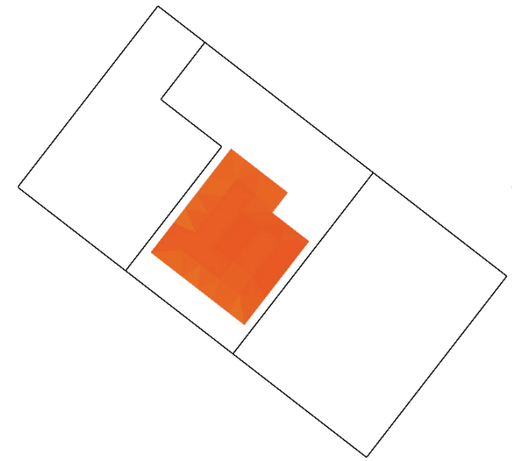
LEVEL 1

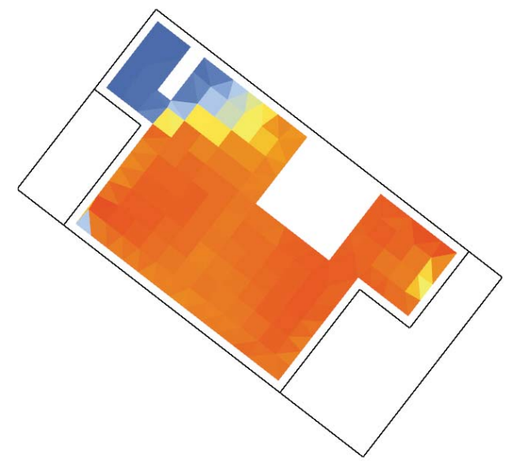
1240 SF



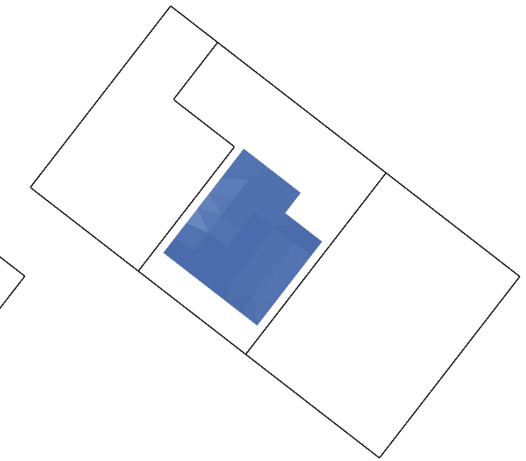


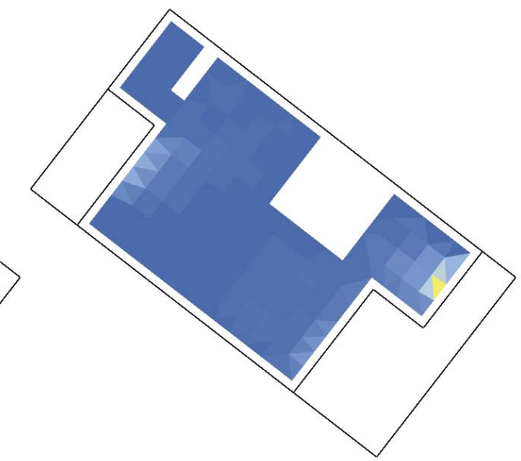
UDLI <100 lux



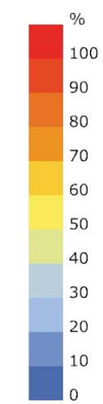


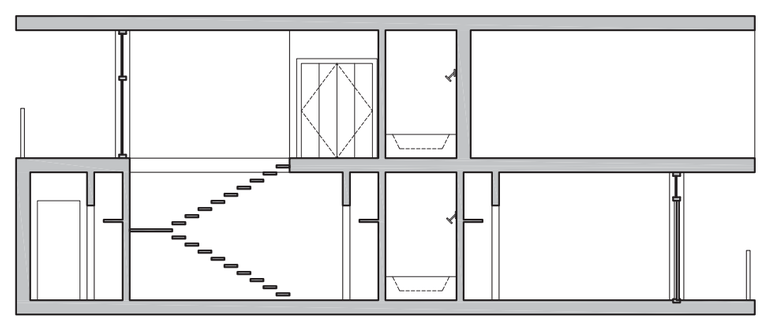
UDLI 100-2000 lux





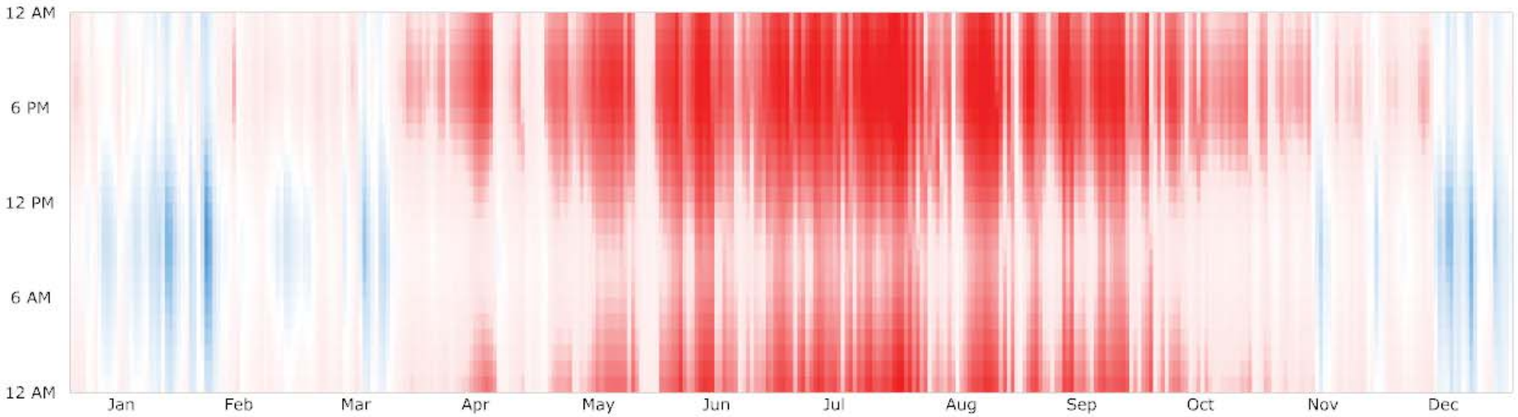
UDLI >2000 lux

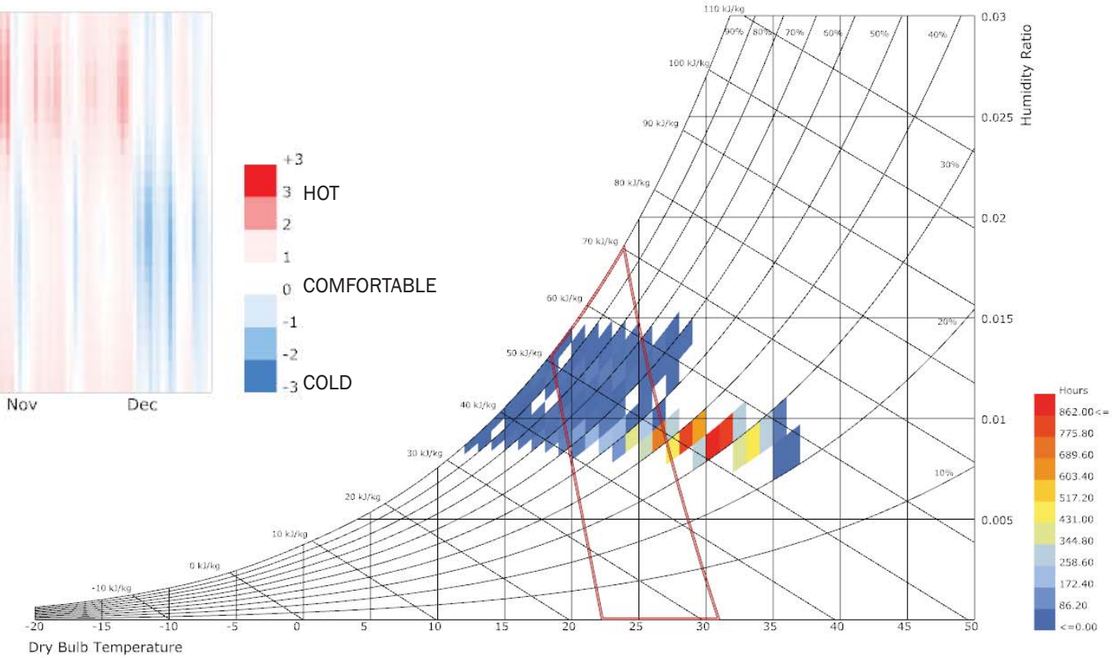




SECTION A

2 BEDROOM UNIT TYPE A LEVEL 1

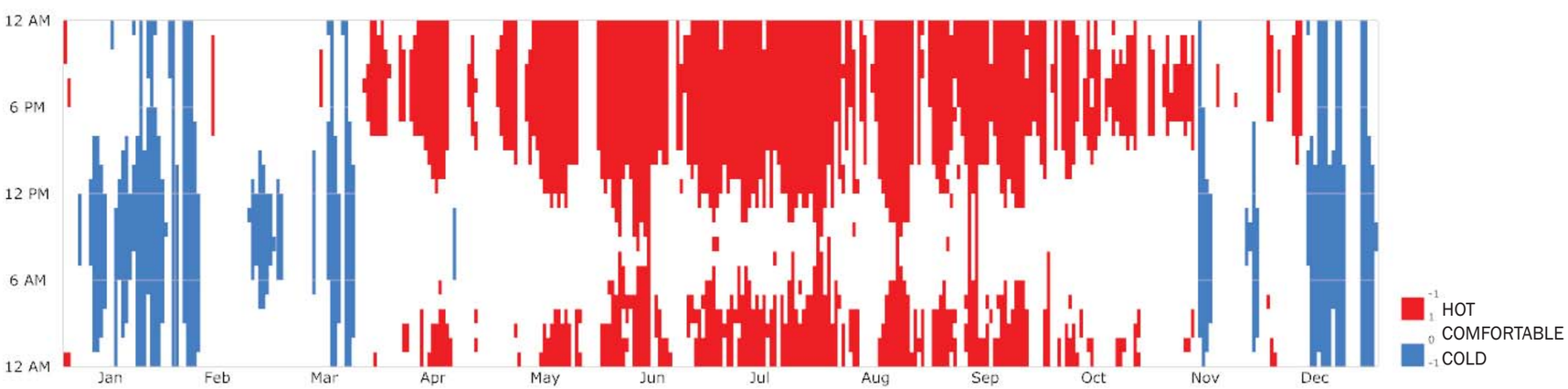


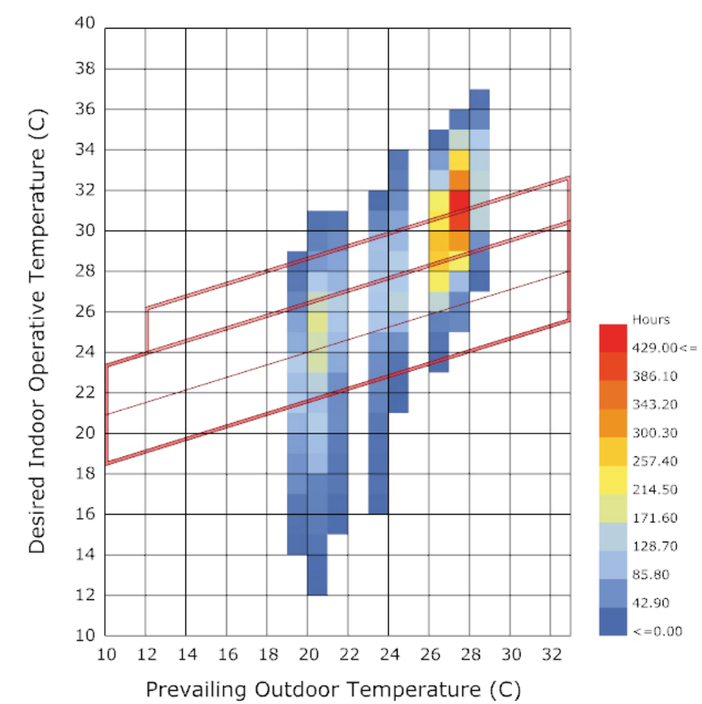


PREDICTED MEAN VOTE

15% COMFORT

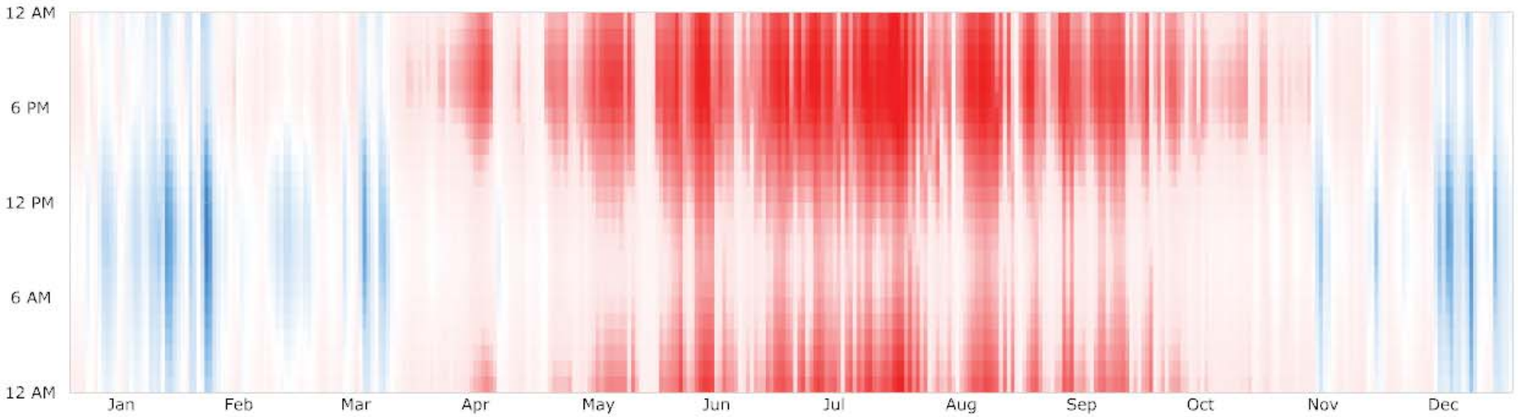
60% COMFORT

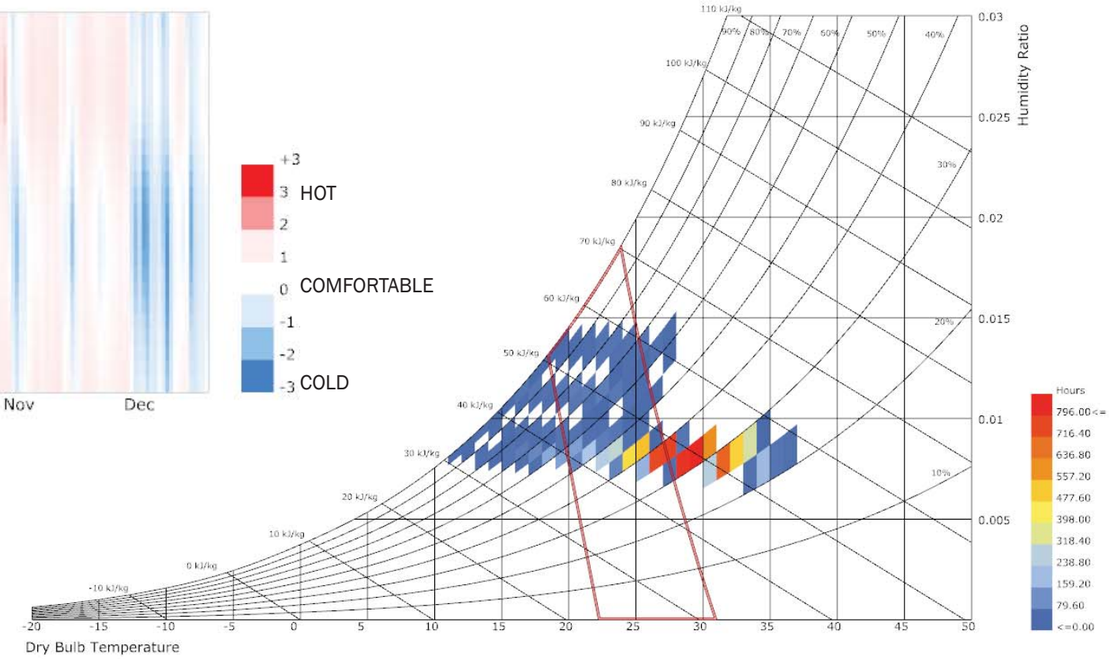




ADAPTIVE COMFORT

2 BEDROOM UNIT TYPE A LEVEL 2

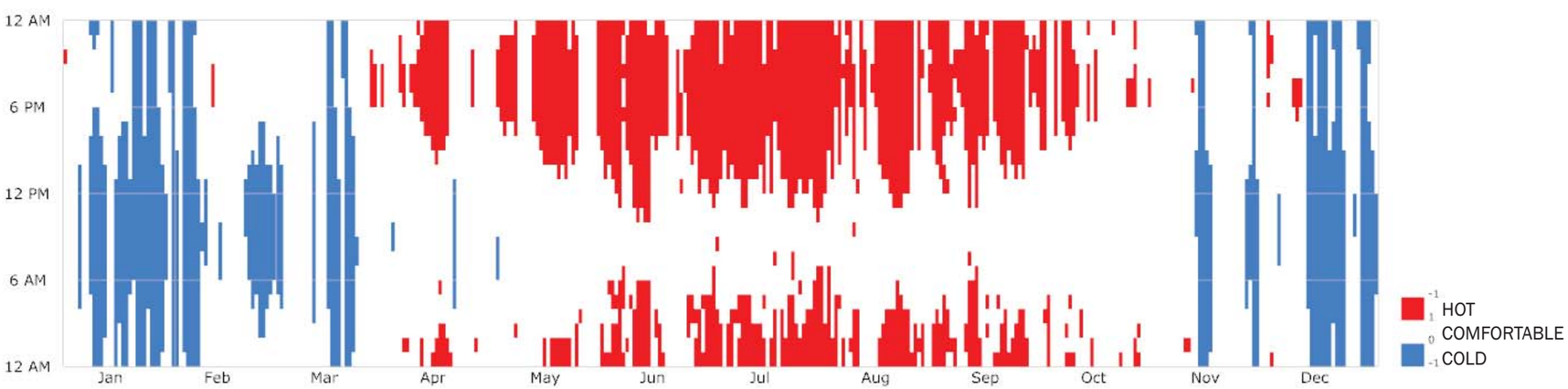


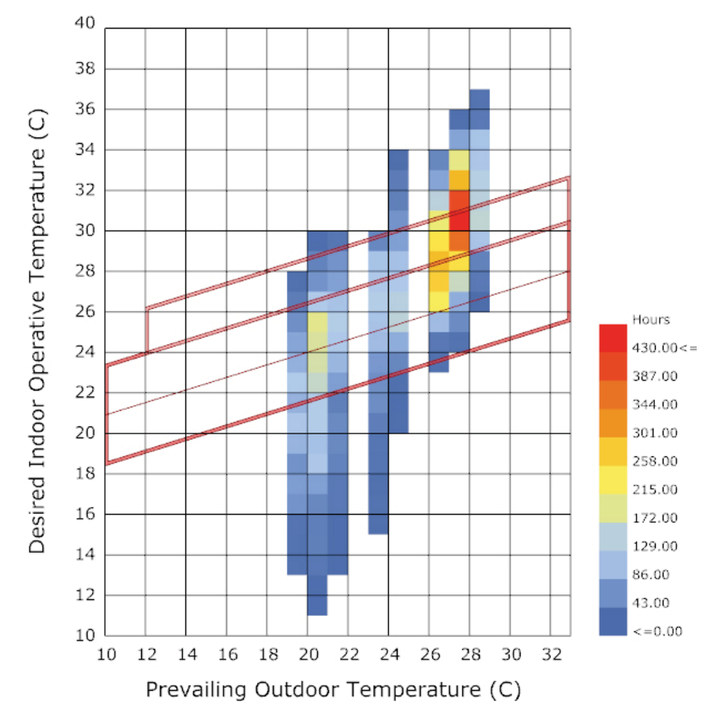


PREDICTED MEAN VOTE

17% COMFORT

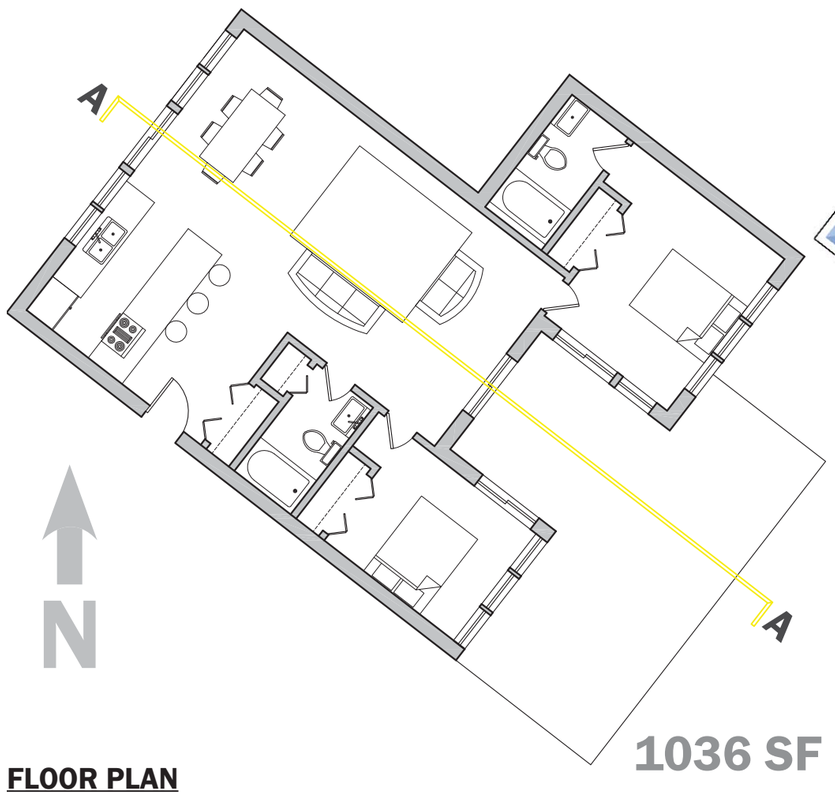
65% COMFORT





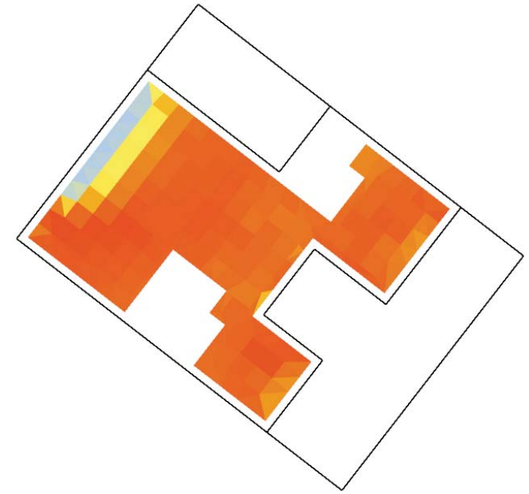
ADAPTIVE COMFORT

2 BEDROOM UNIT_TYPE B

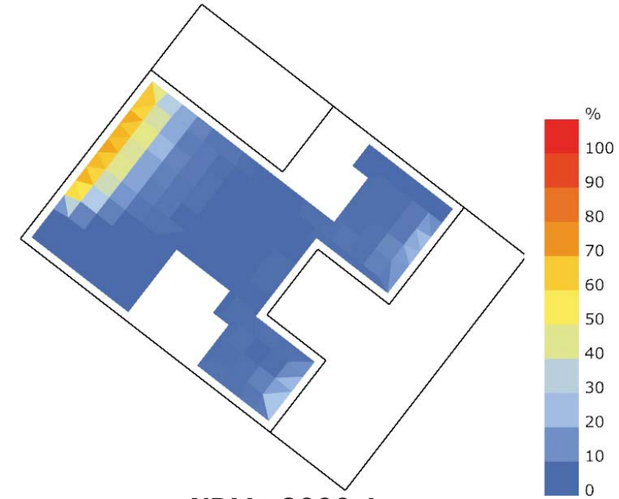


FLOOR PLAN

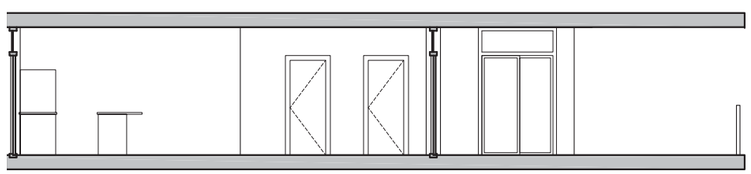
UDLI <100 lux



UDLI 100-2000 lux

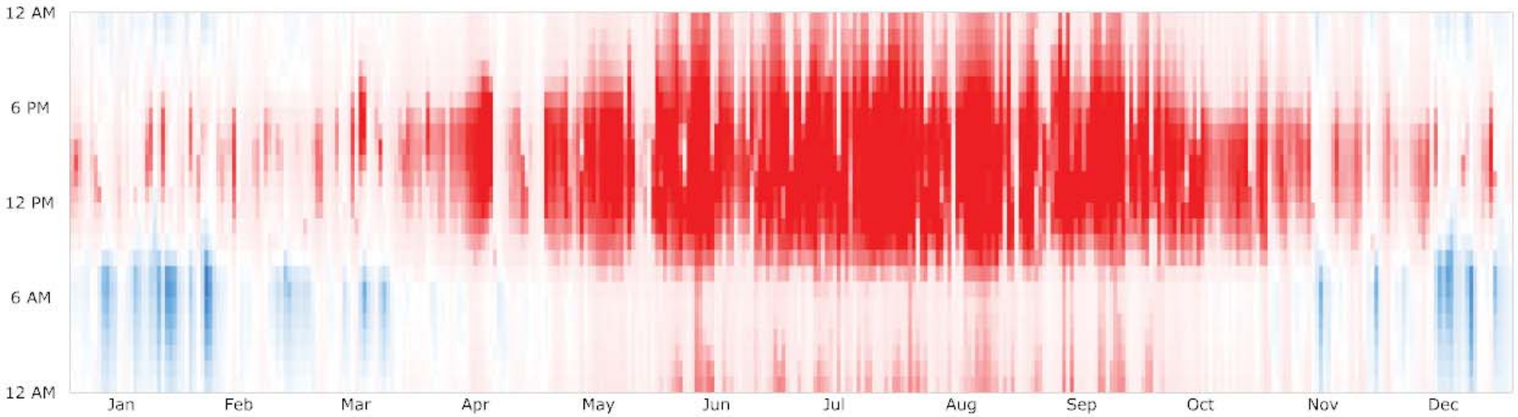


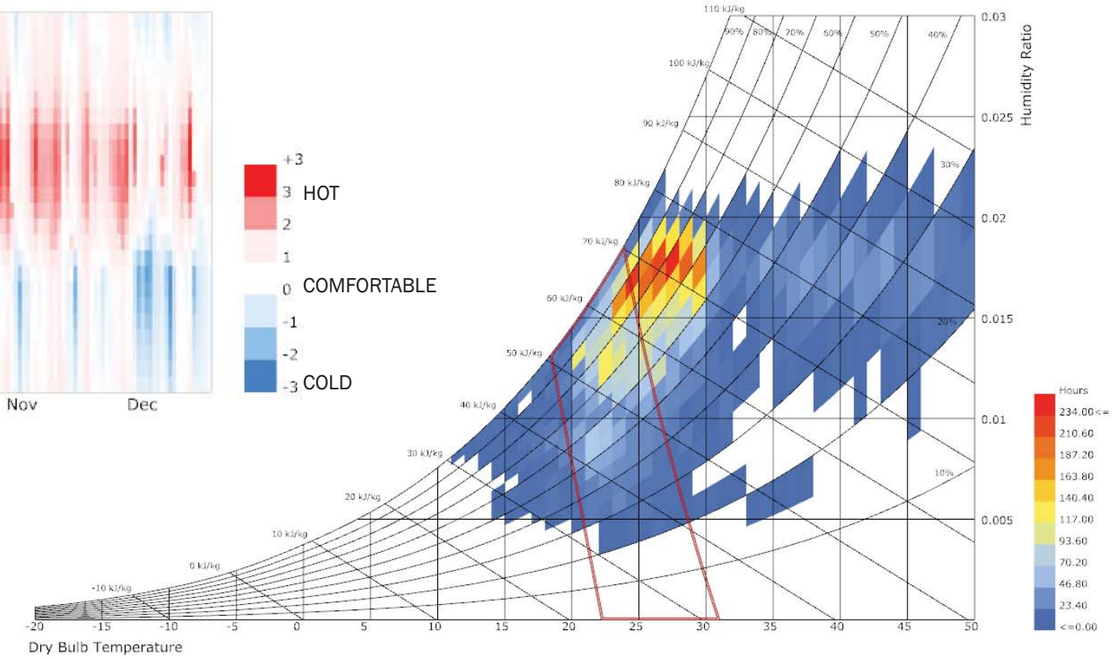
UDLI >2000 lux



SECTION A

2 BEDROOM UNIT TYPE B

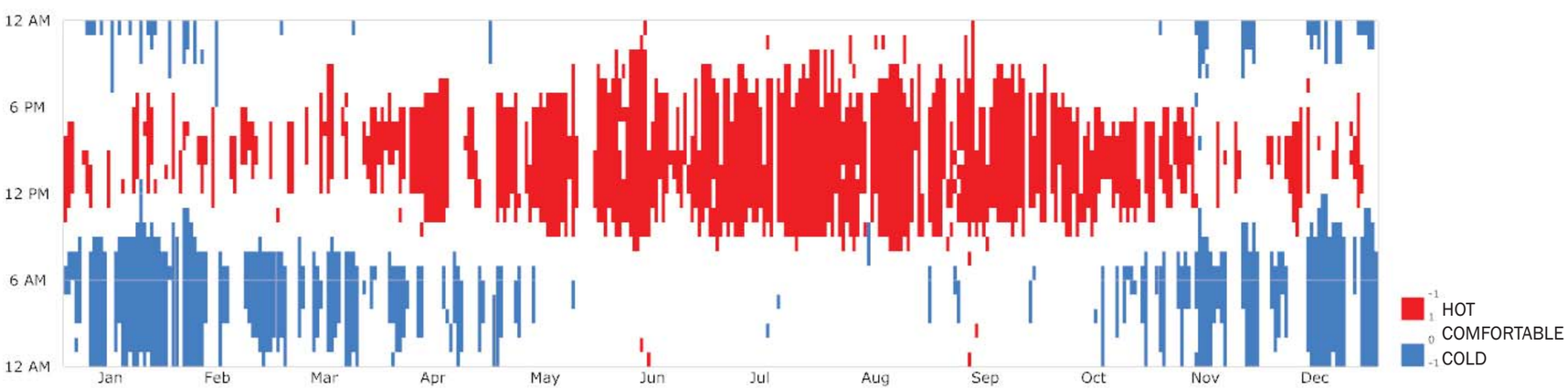


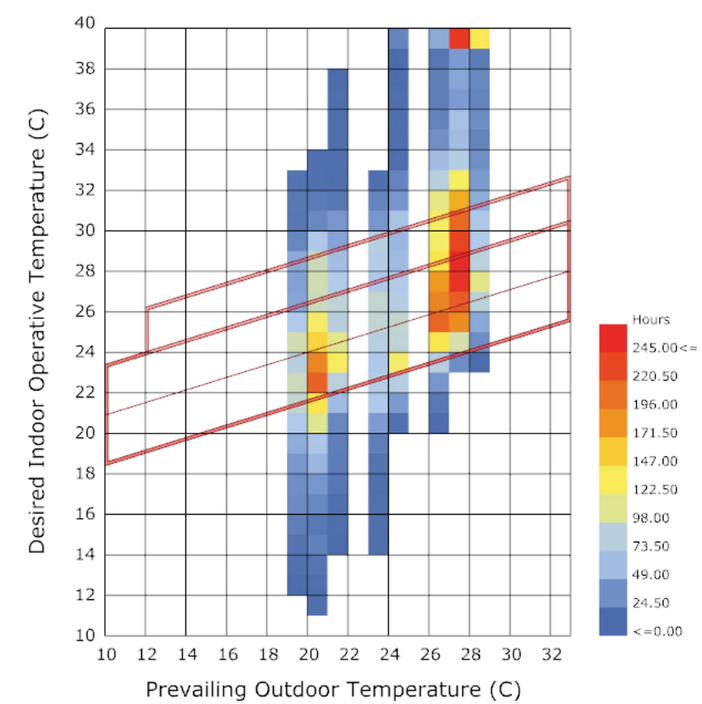


PREDICTED MEAN VOTE

21% COMFORT

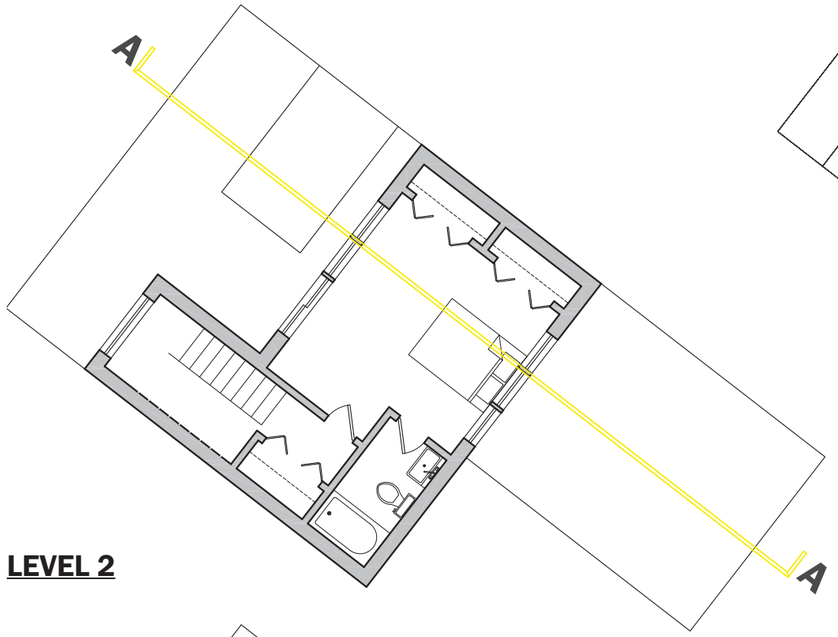
67% COMFORT



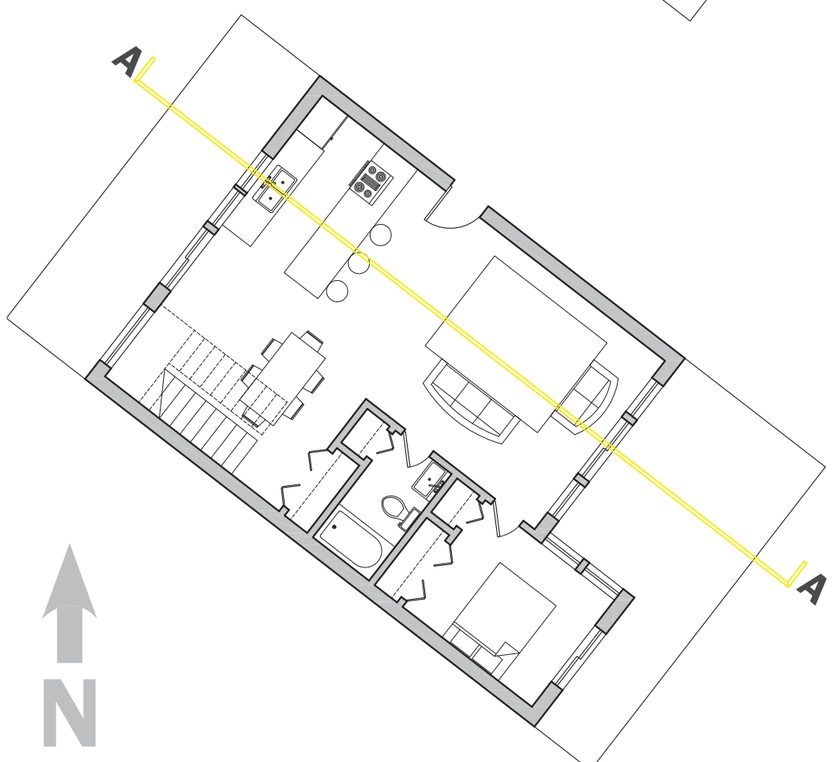


ADAPTIVE COMFORT

2 BEDROOM UNIT_TYPE C

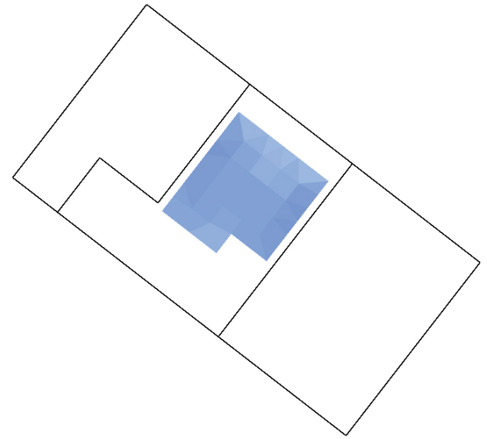


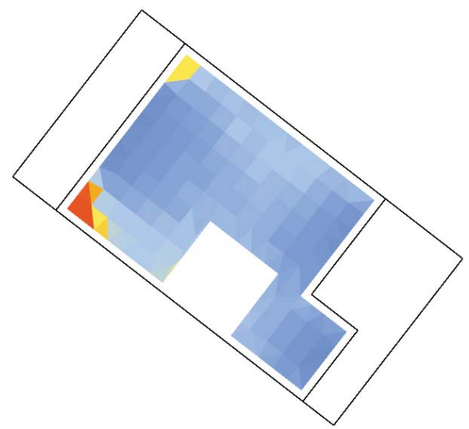
LEVEL 2



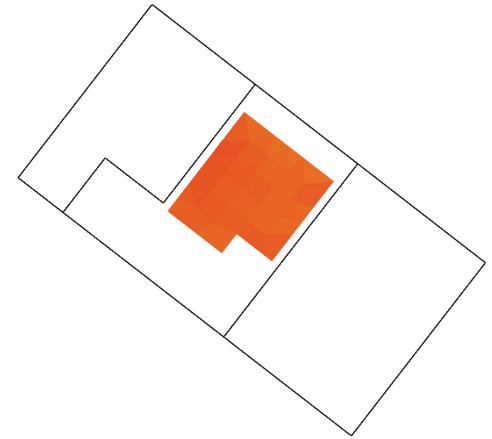
LEVEL 1

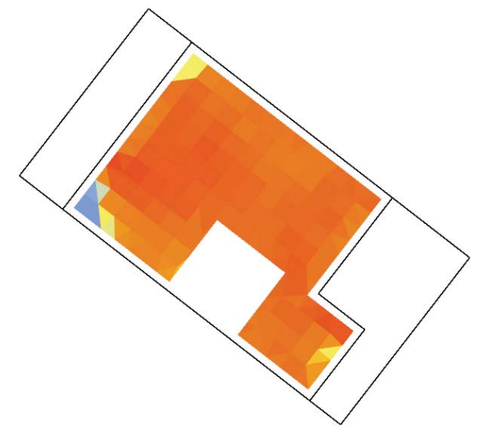
1170 SF



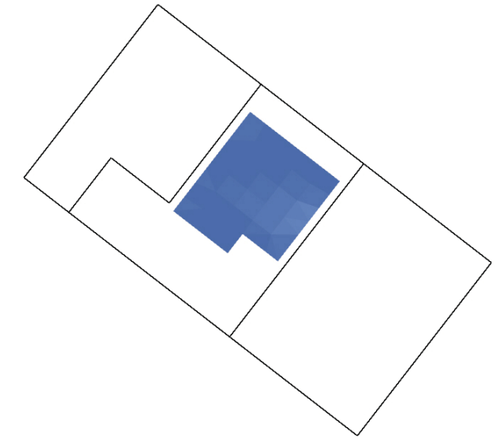


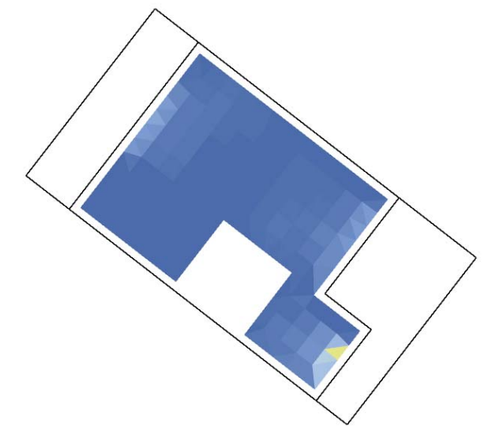
UDLI <100 lux



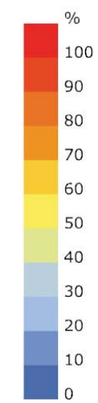


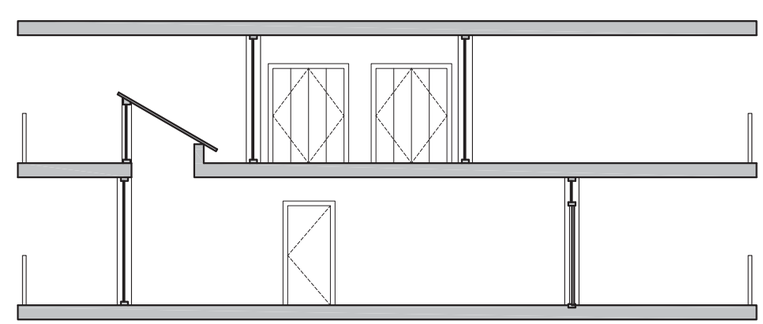
UDLI 100-2000 lux





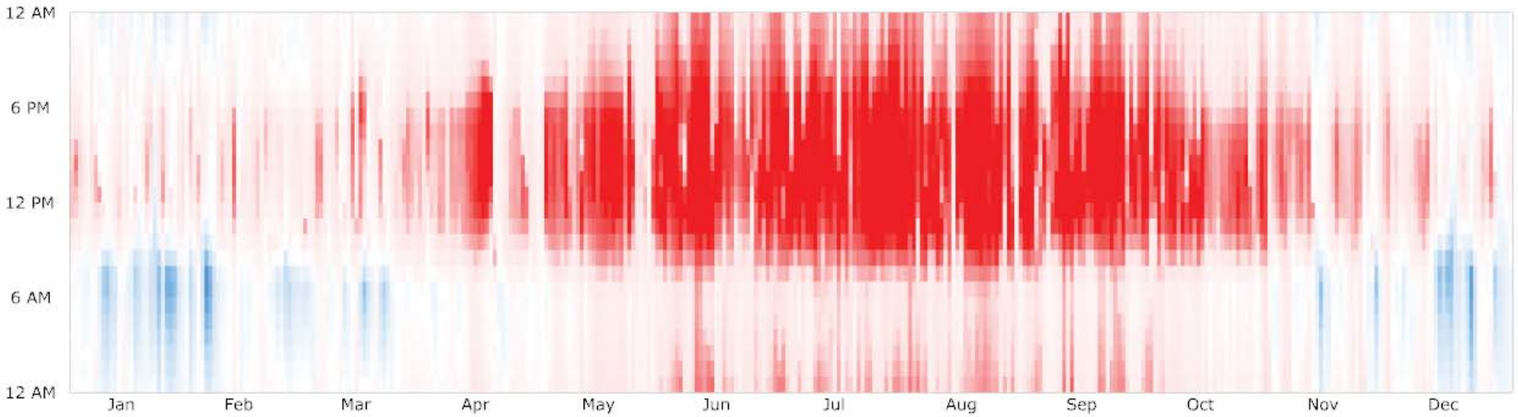
UDLI >2000 lux

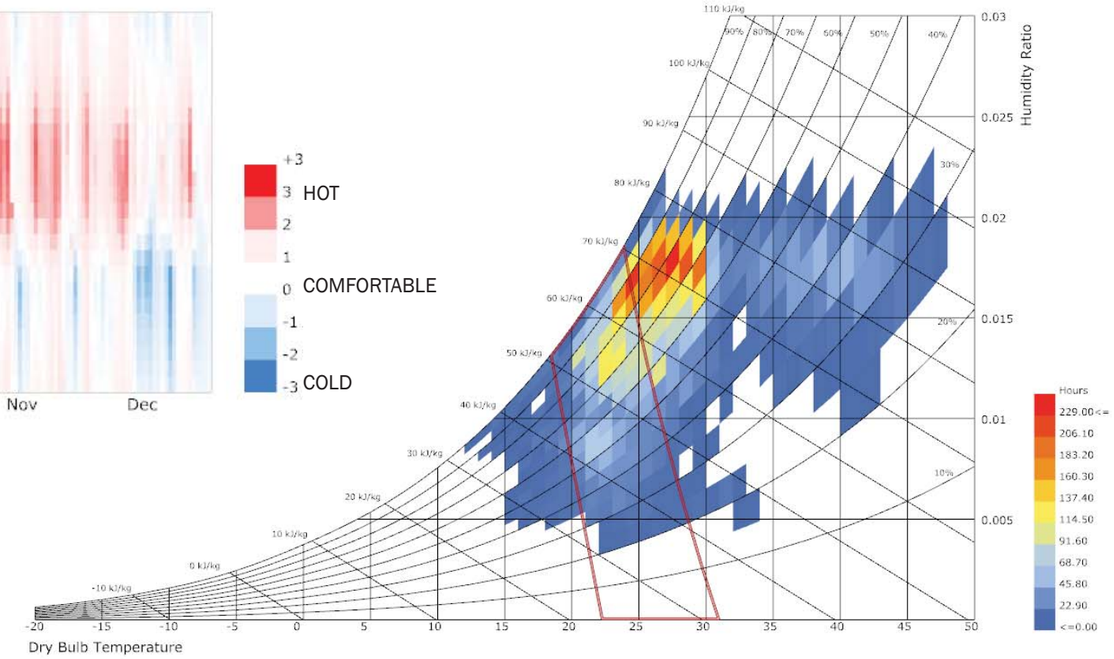




SECTION A

2 BEDROOM UNIT TYPE C LEVEL 1

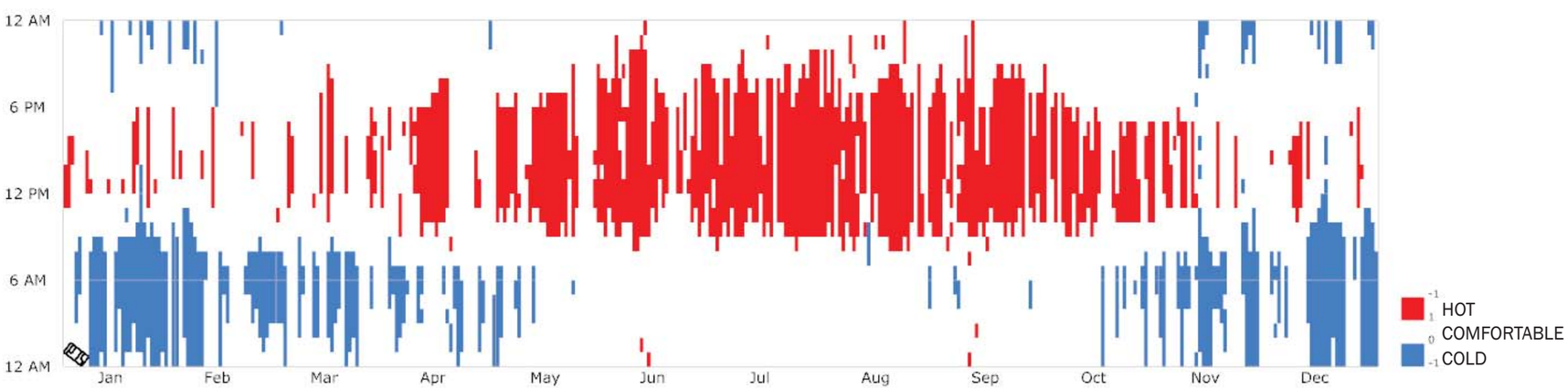


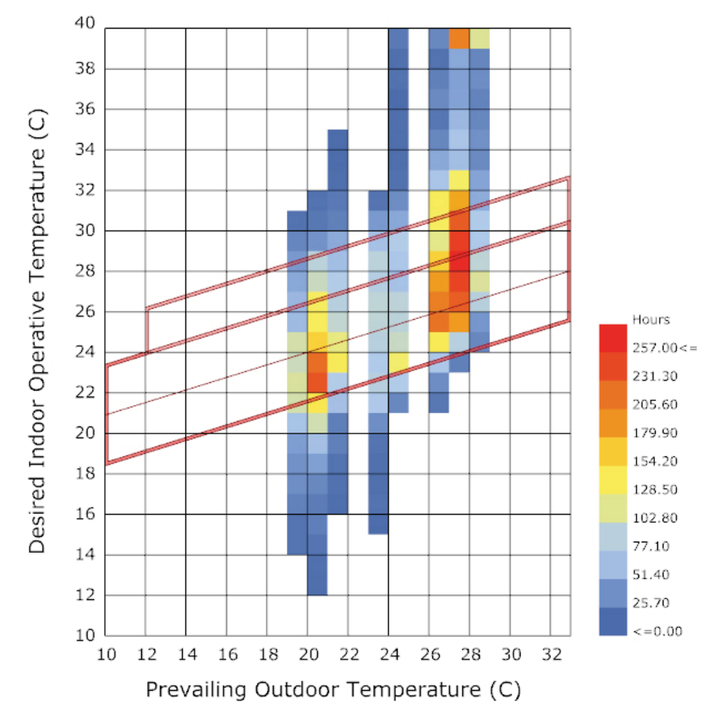


PREDICTED MEAN VOTE

21% COMFORT

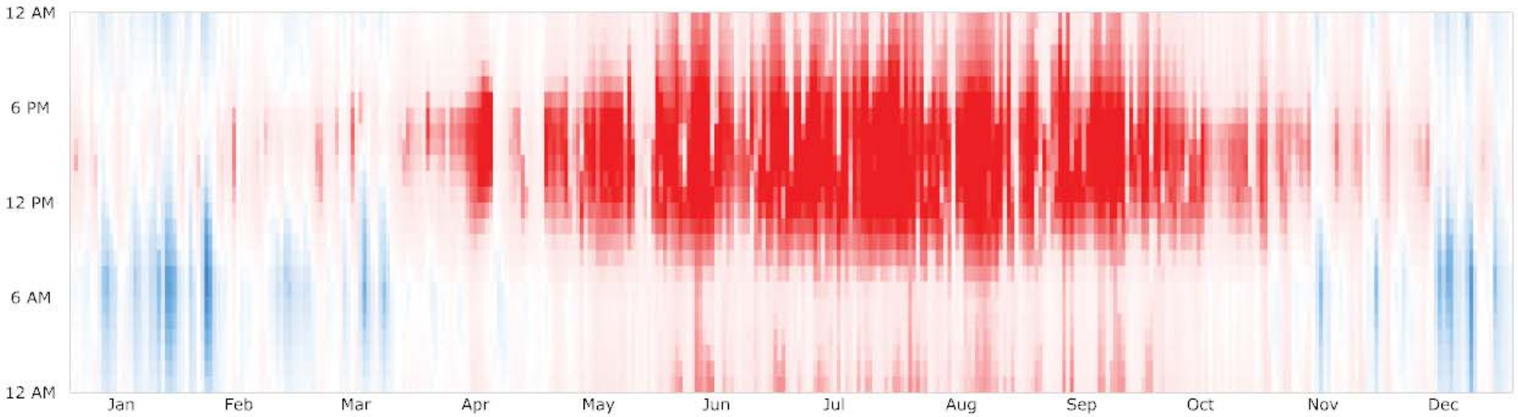
70% COMFORT

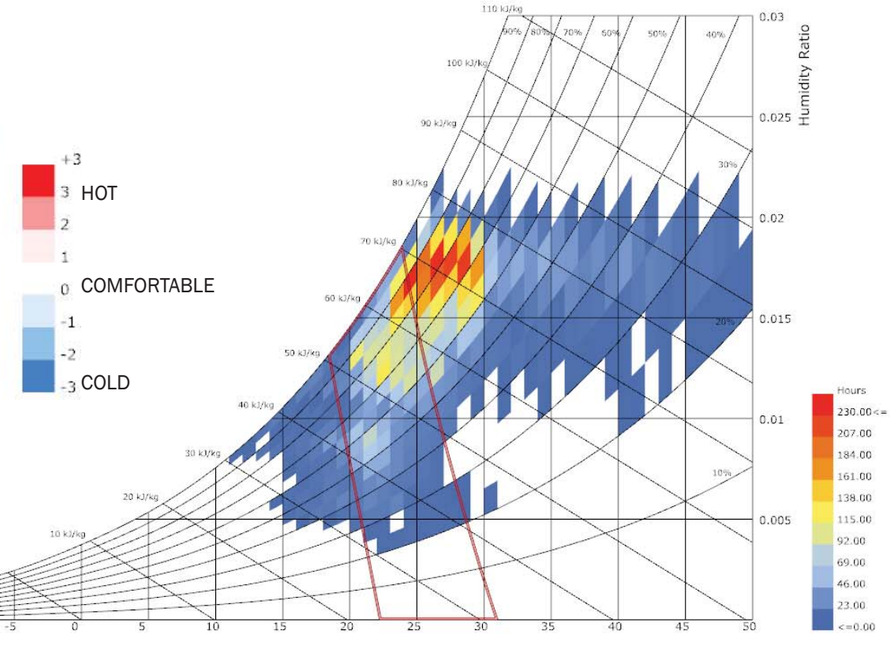




ADAPTIVE COMFORT

2 BEDROOM UNIT TYPE C LEVEL 2

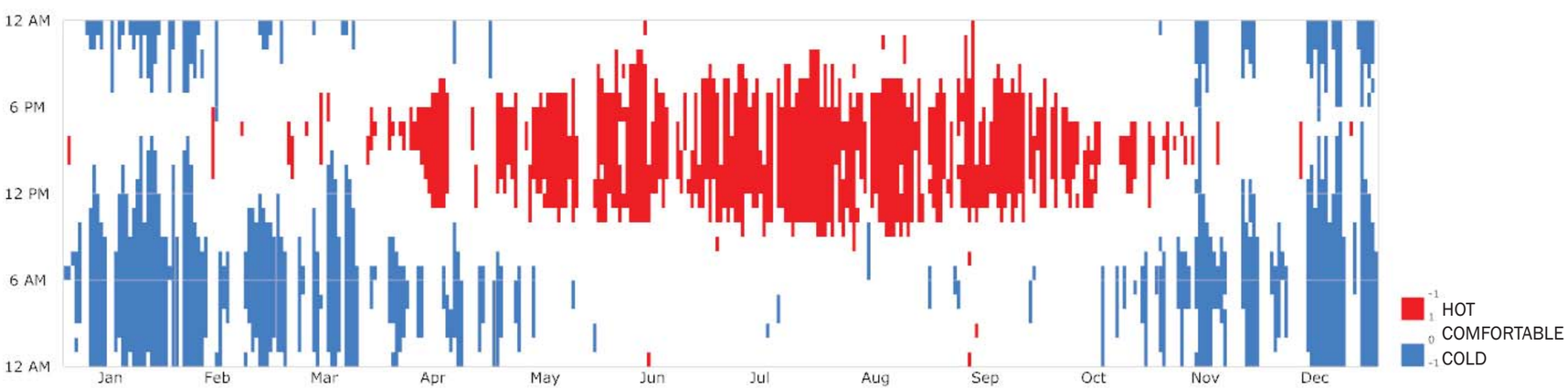


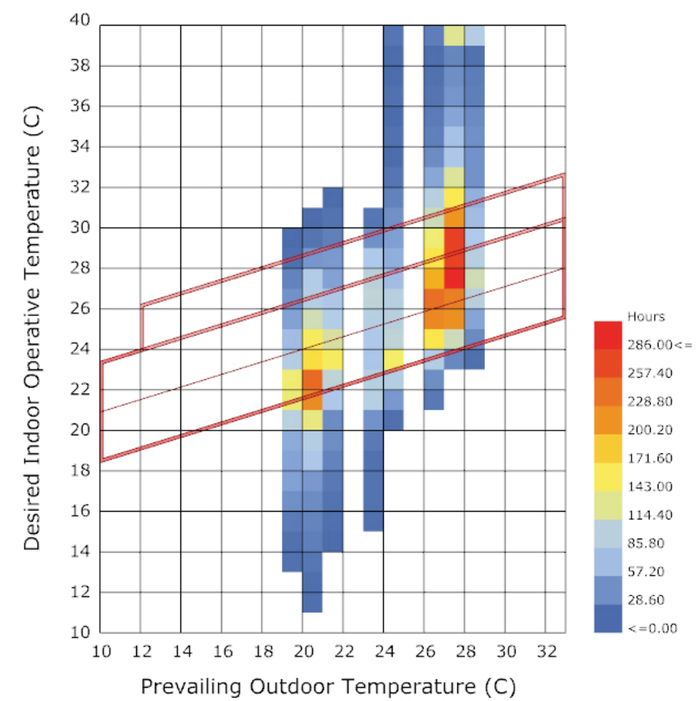


PREDICTED MEAN VOTE

23% COMFORT

70% COMFORT

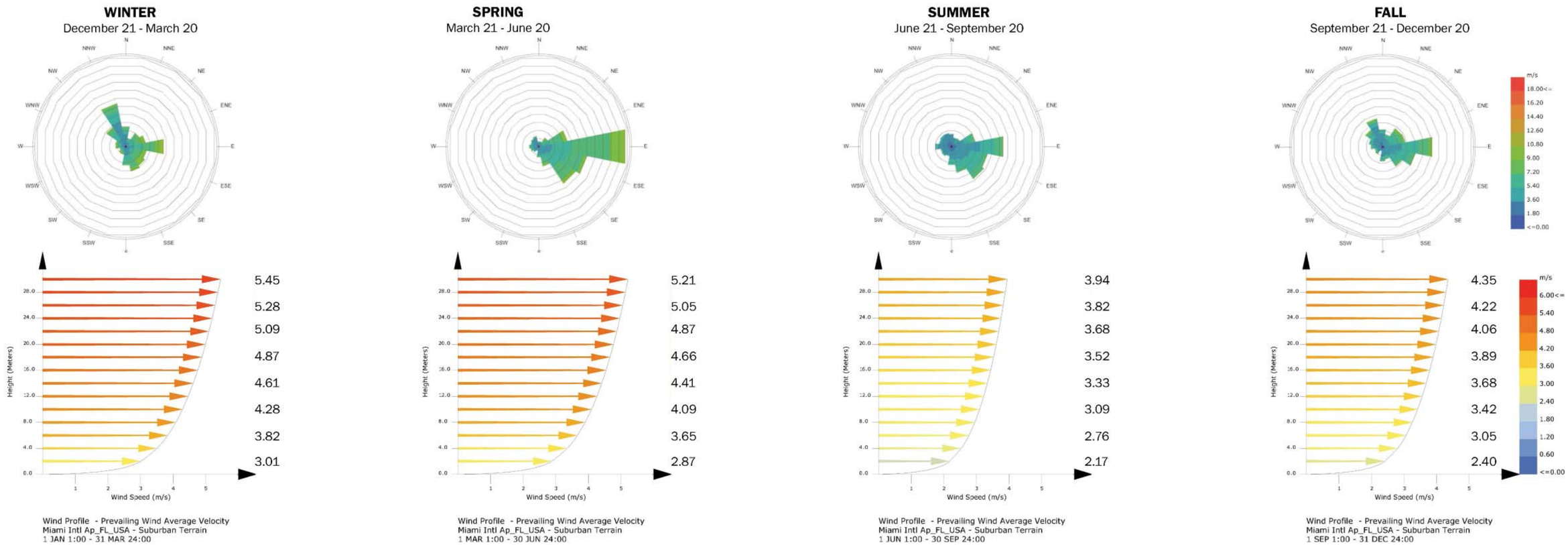




ADAPTIVE COMFORT

VENTILATION BASED APPROACH

WIND RESPONSIVE DESIGN



WORKFLOW

Check wind speed near each residential unit facade.
CFD simulation in the scale neighborhood

→

Analyse minimum air speed, required to create thermal comfort

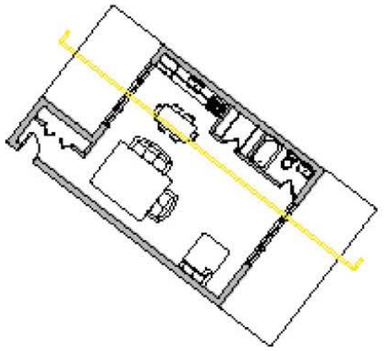
Adaptive and PMV models

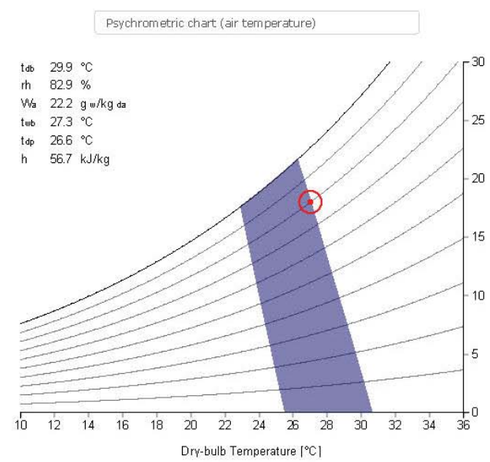
→

Block or redirect wind with trellis or facade geometry

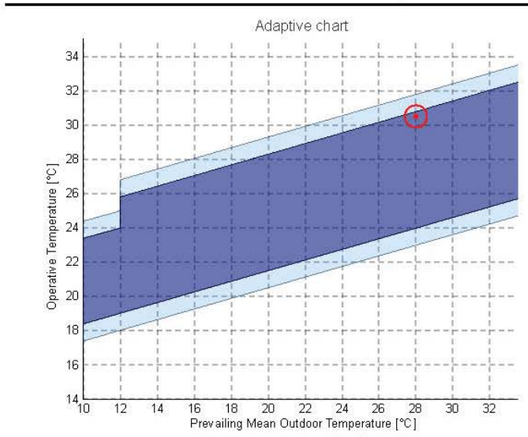
MINIMUM REQUIRED AIR SPEED FOR THERMAL COMFORT

STUDIO



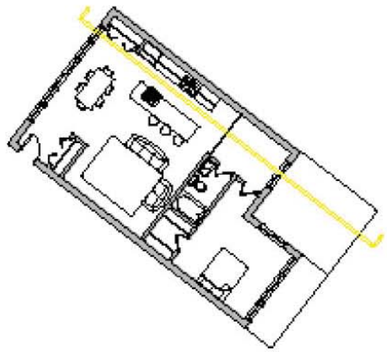


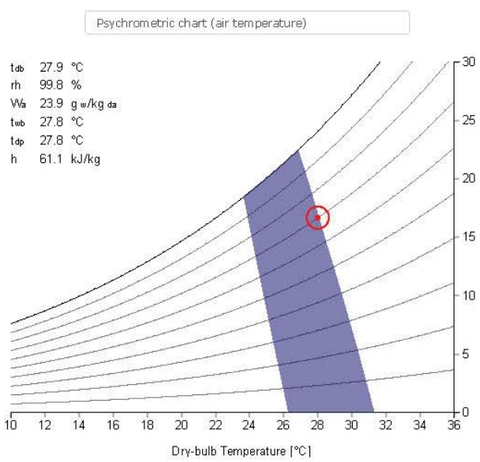
AIR SPEED: 0.61 m/s
120.1 fpm



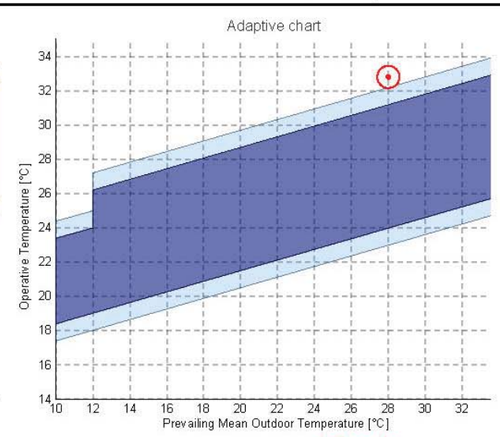
AIR SPEED: 0.9 m/s
177 fpm

1 BEDROOM



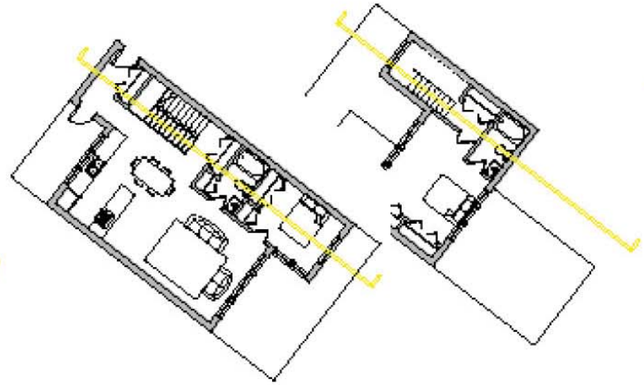


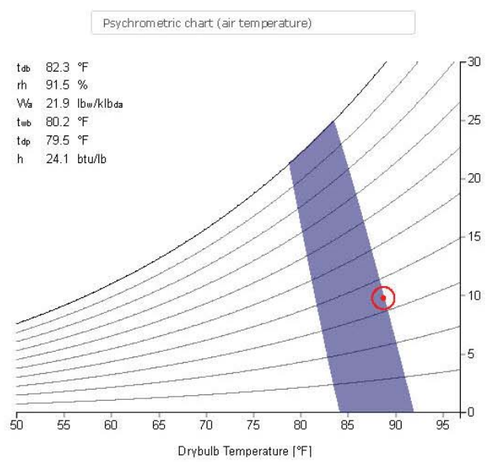
AIR SPEED: 0.77 m/s
151.6 fpm



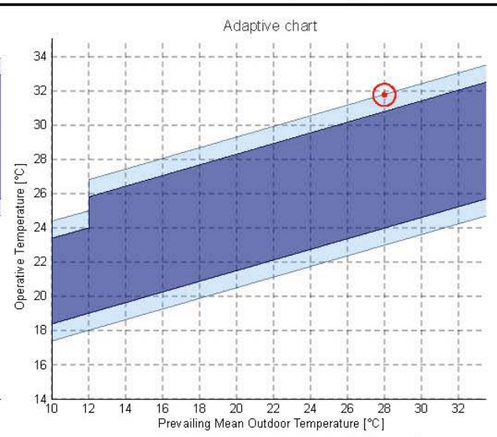
AIR SPEED: 1,2 m/s
236 fpm

2 BEDROOM. A



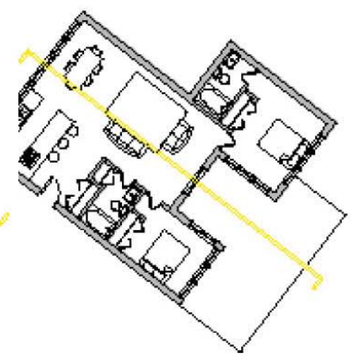


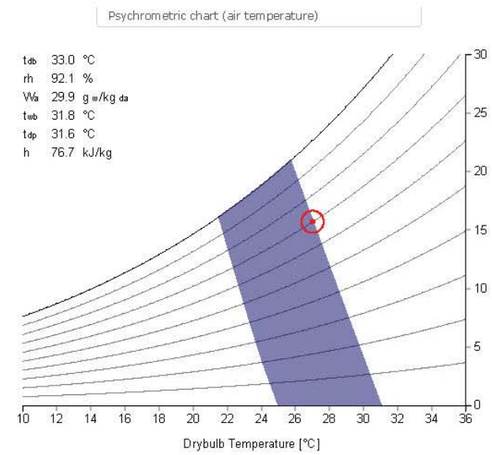
AIR SPEED: 0.76 m/s
150 fpm



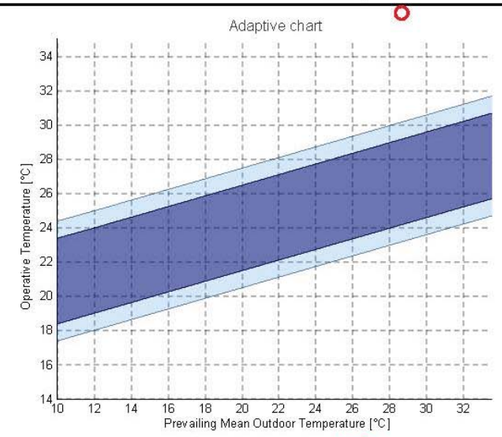
AIR SPEED: 0.9 m/s
177 fpm

2 BEDROOM. B



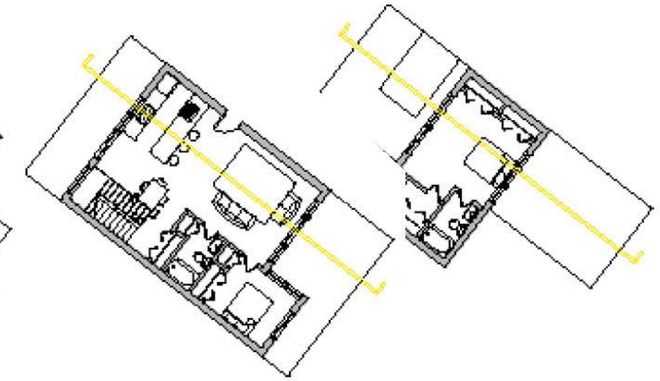


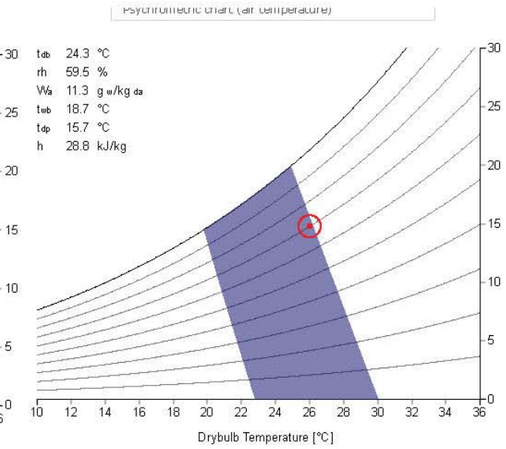
AIR SPEED: 0.29 m/s
57.1 fpm



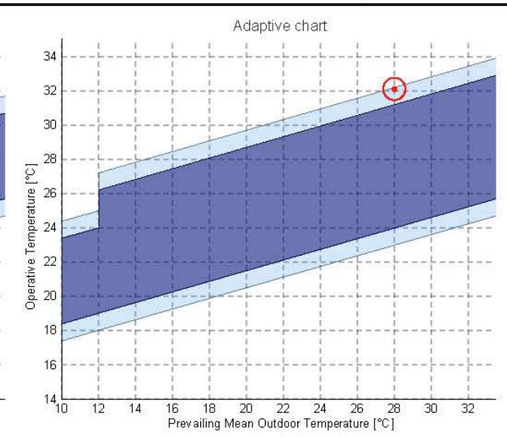
AIR SPEED: - m/s
- fpm

2 BEDROOM. C





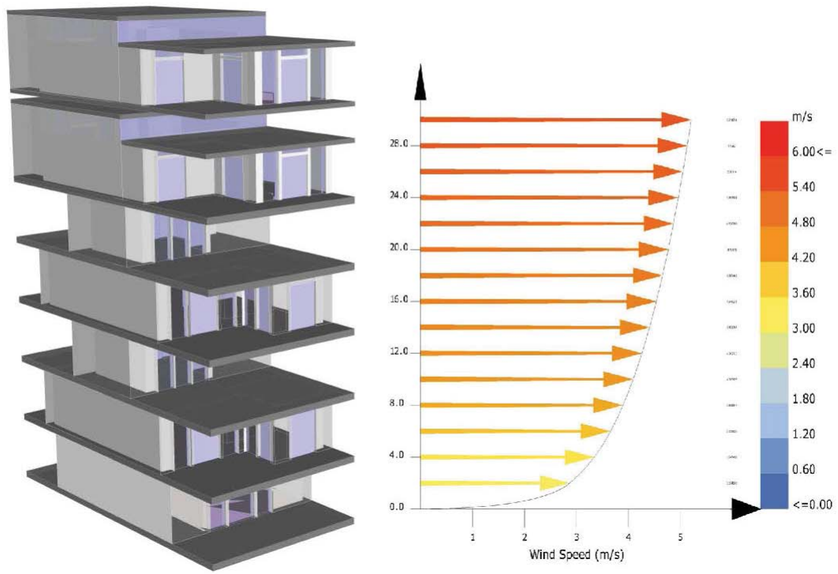
AIR SPEED: 0.15 m/s
29.5 fpm



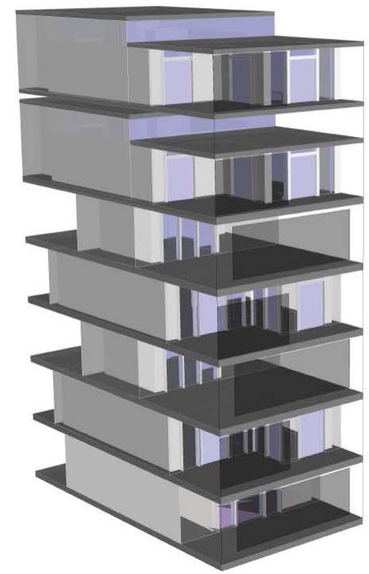
AIR SPEED: 1.2 m/s
236 fpm

SCREEN / TRELLIS _ STUDY

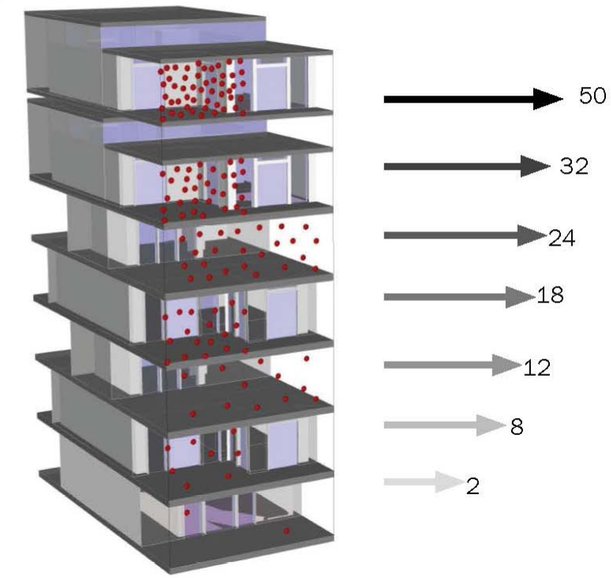
1 Base Geometry



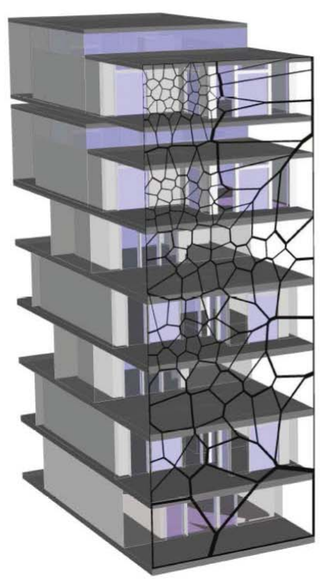
2 Localizing areas to cover
Responsive to program



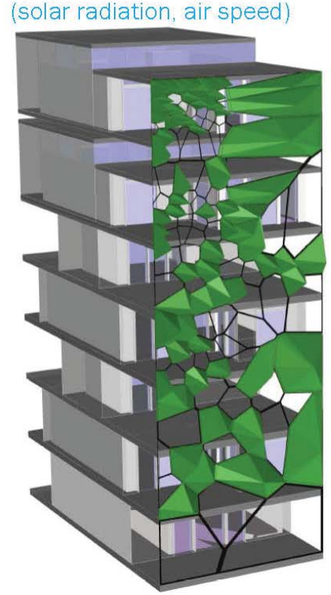
3 Define density of mesh
Responsive to wind speed



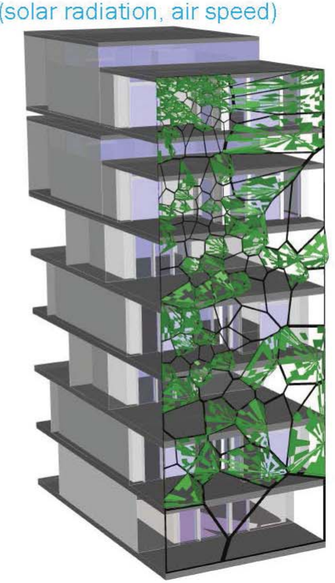
4 Creating mesh



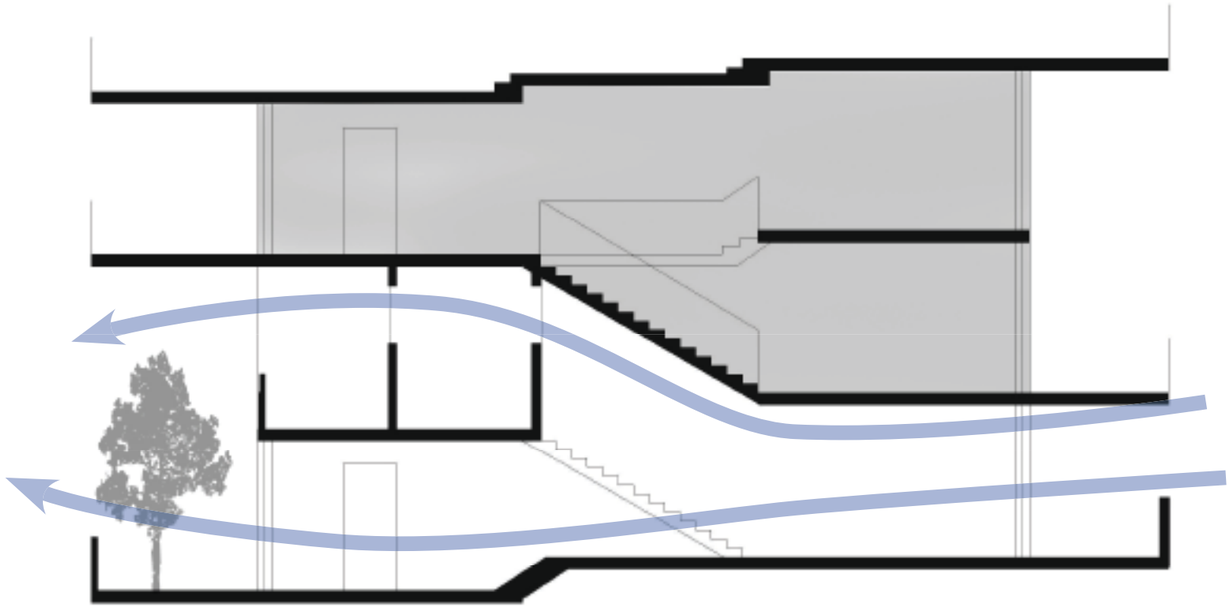
5 Cover smaller cells
(solar radiation, air speed)



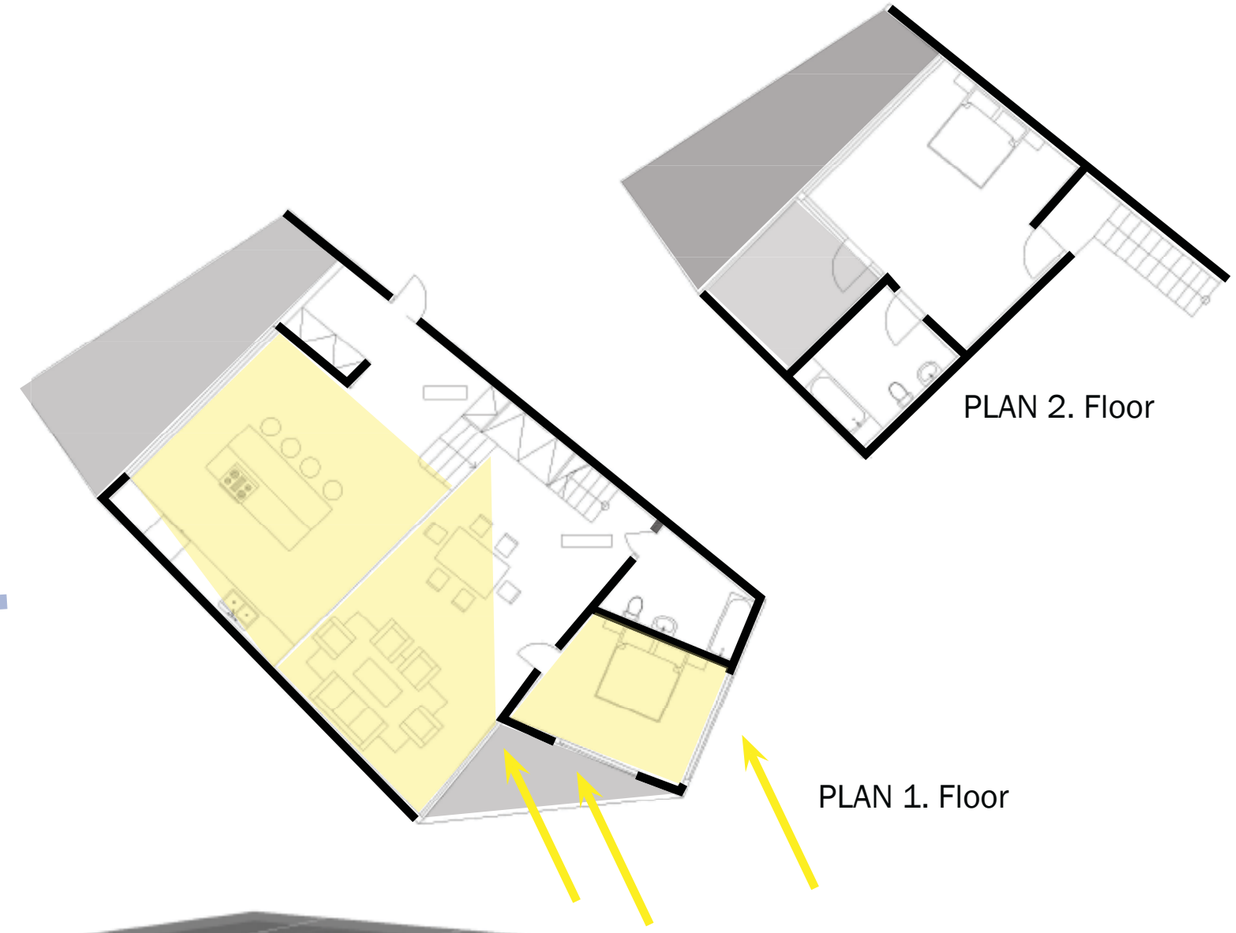
6 Perforate cels
(solar radiation, air speed)

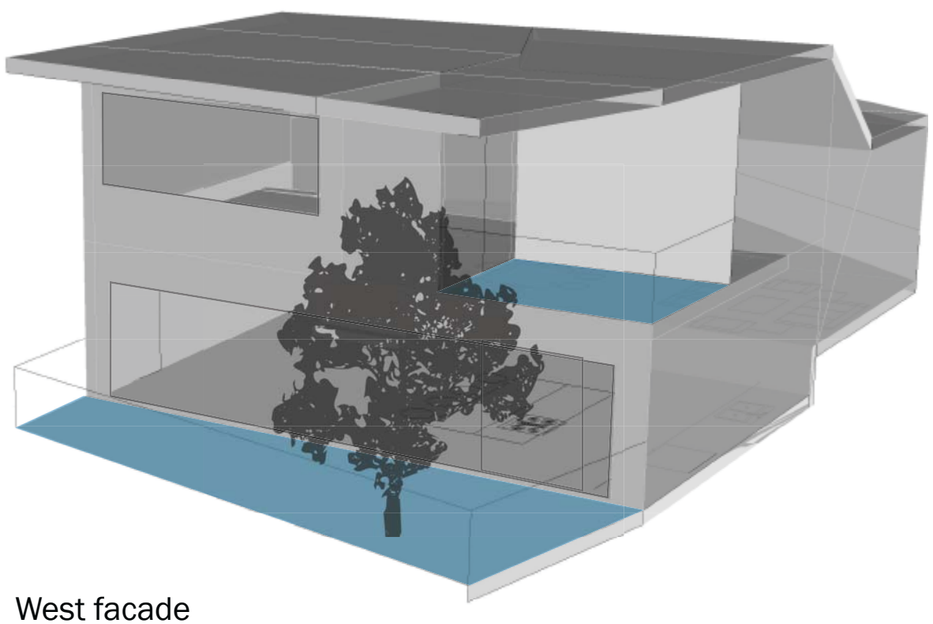


2 BEDROOM UNIT / DESIGN FOR CROSS VENTILATION

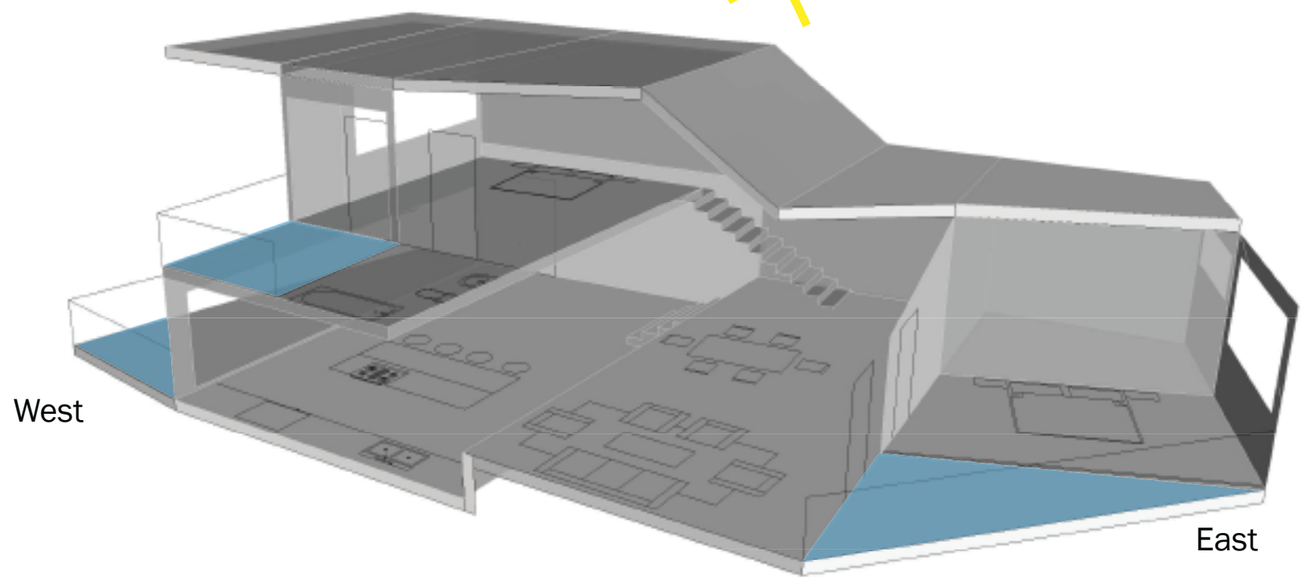


SECTION



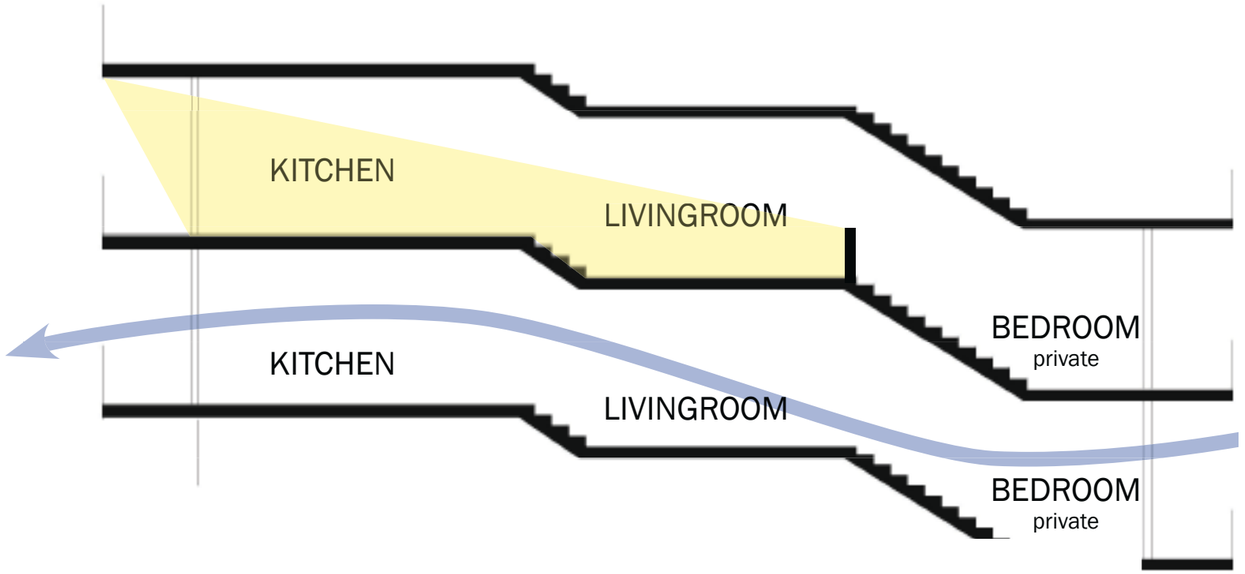


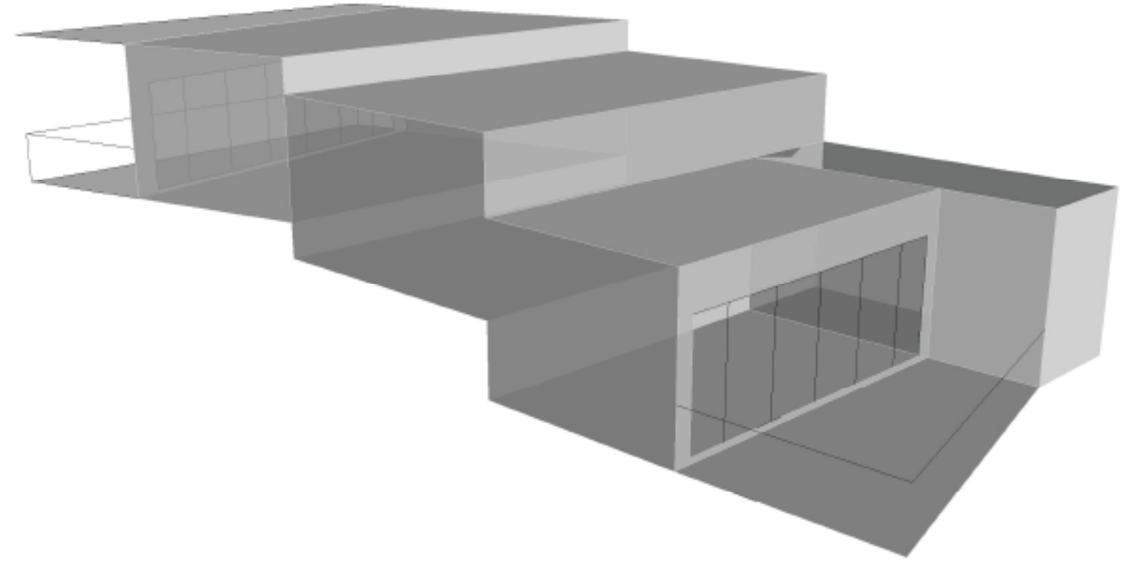
West facade



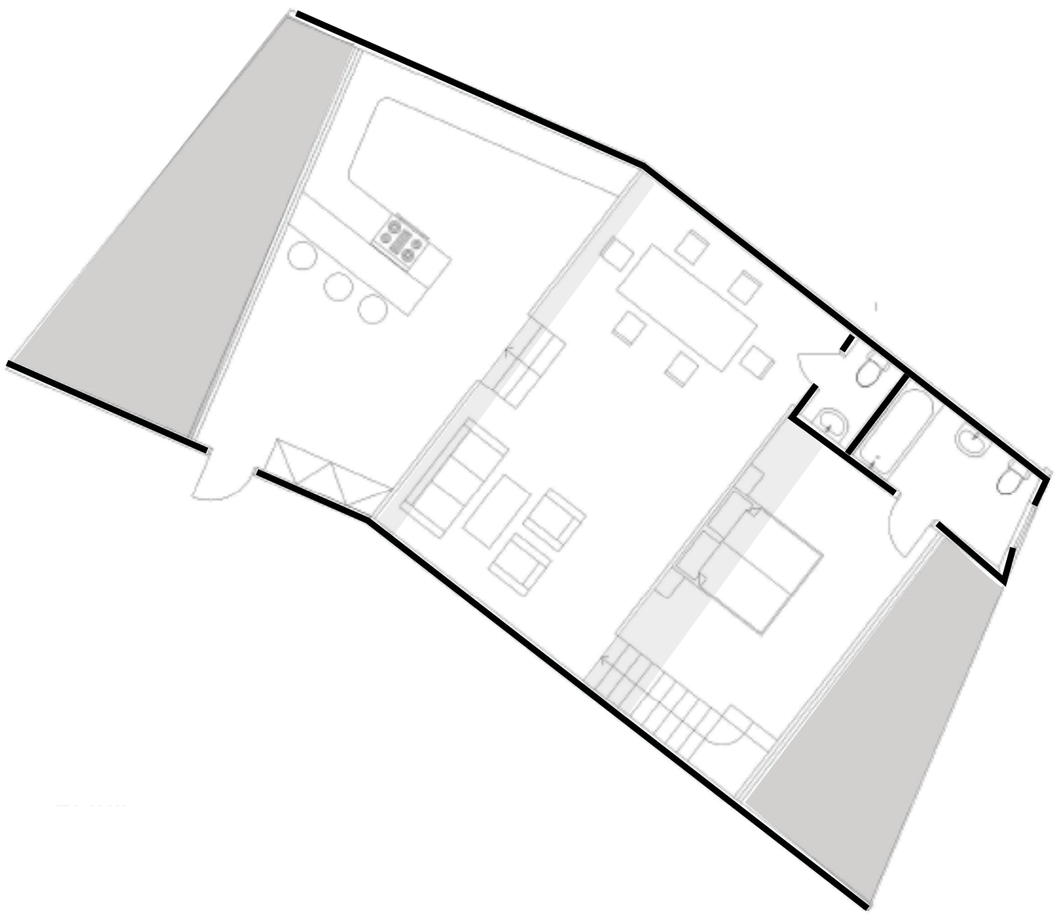
SECTION

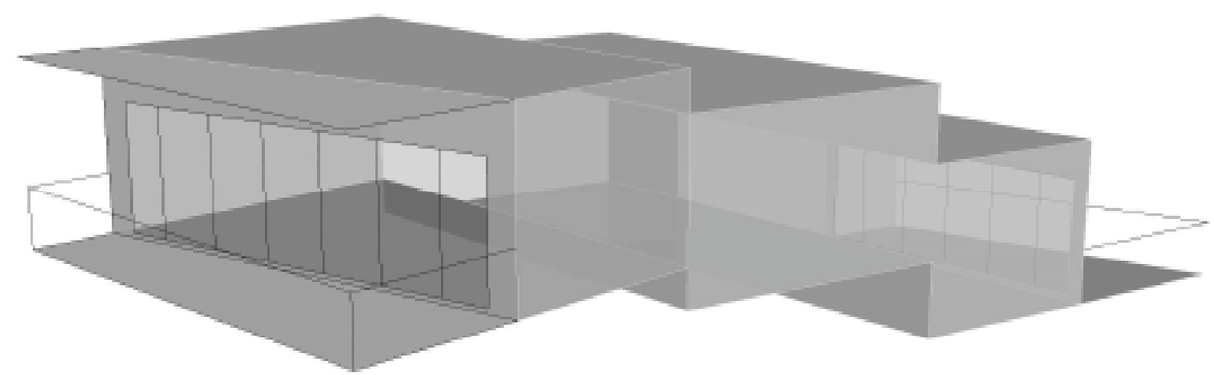
STUDIO UNIT / DESIGN FOR CROSS VENTILATION



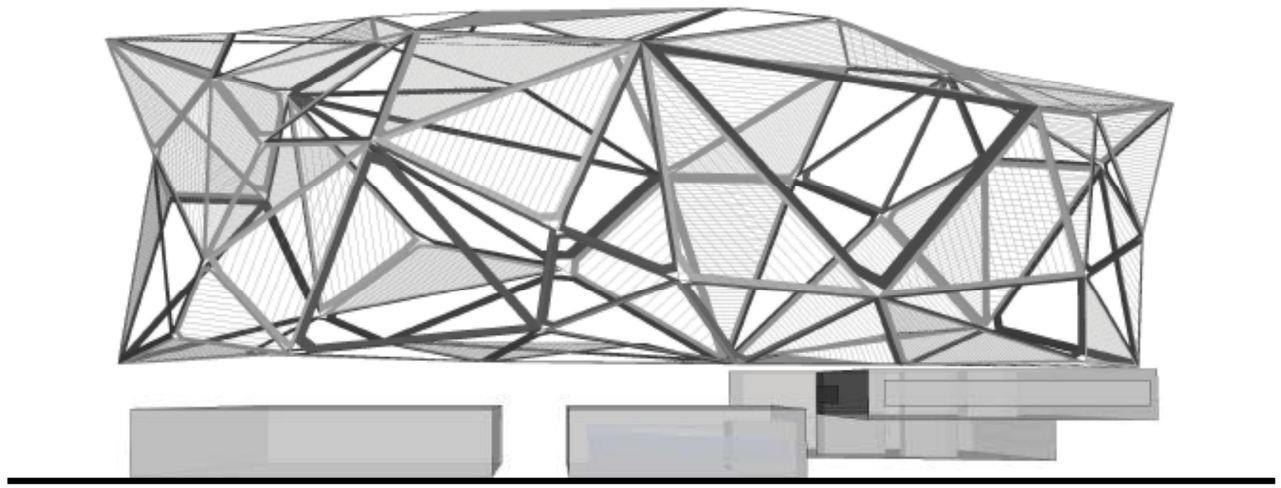


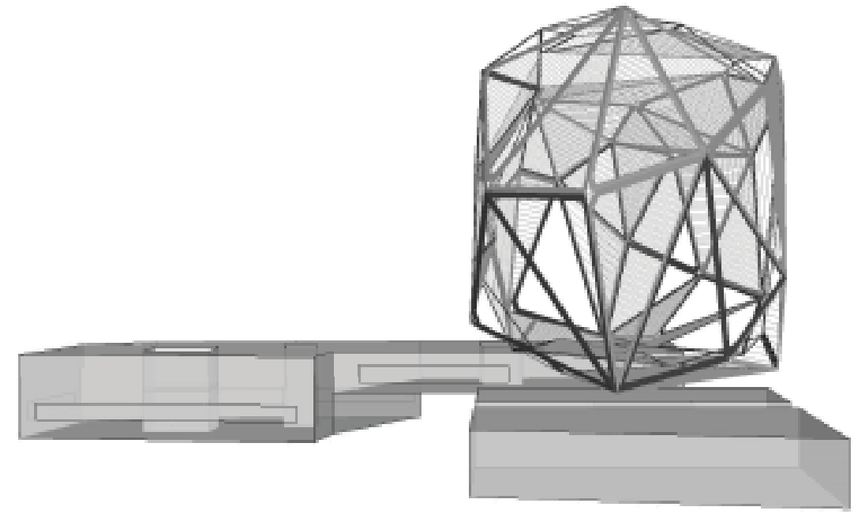
East facade

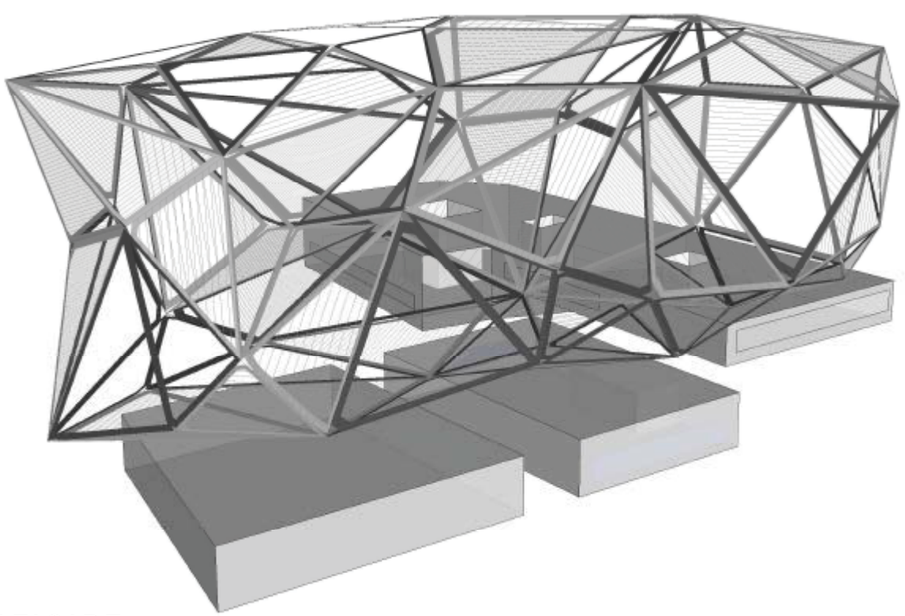




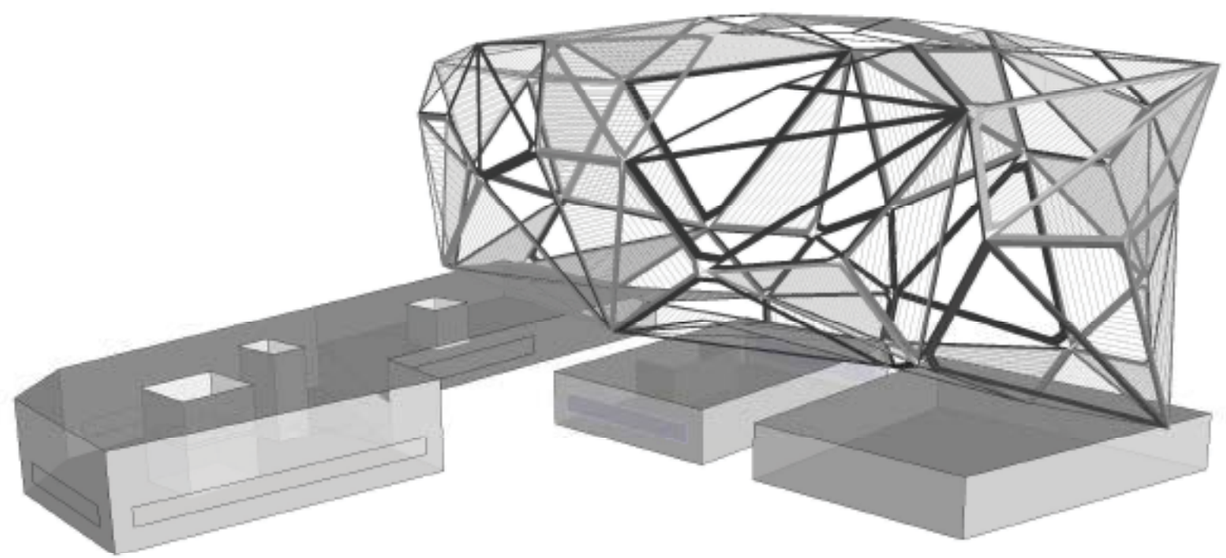
West facade







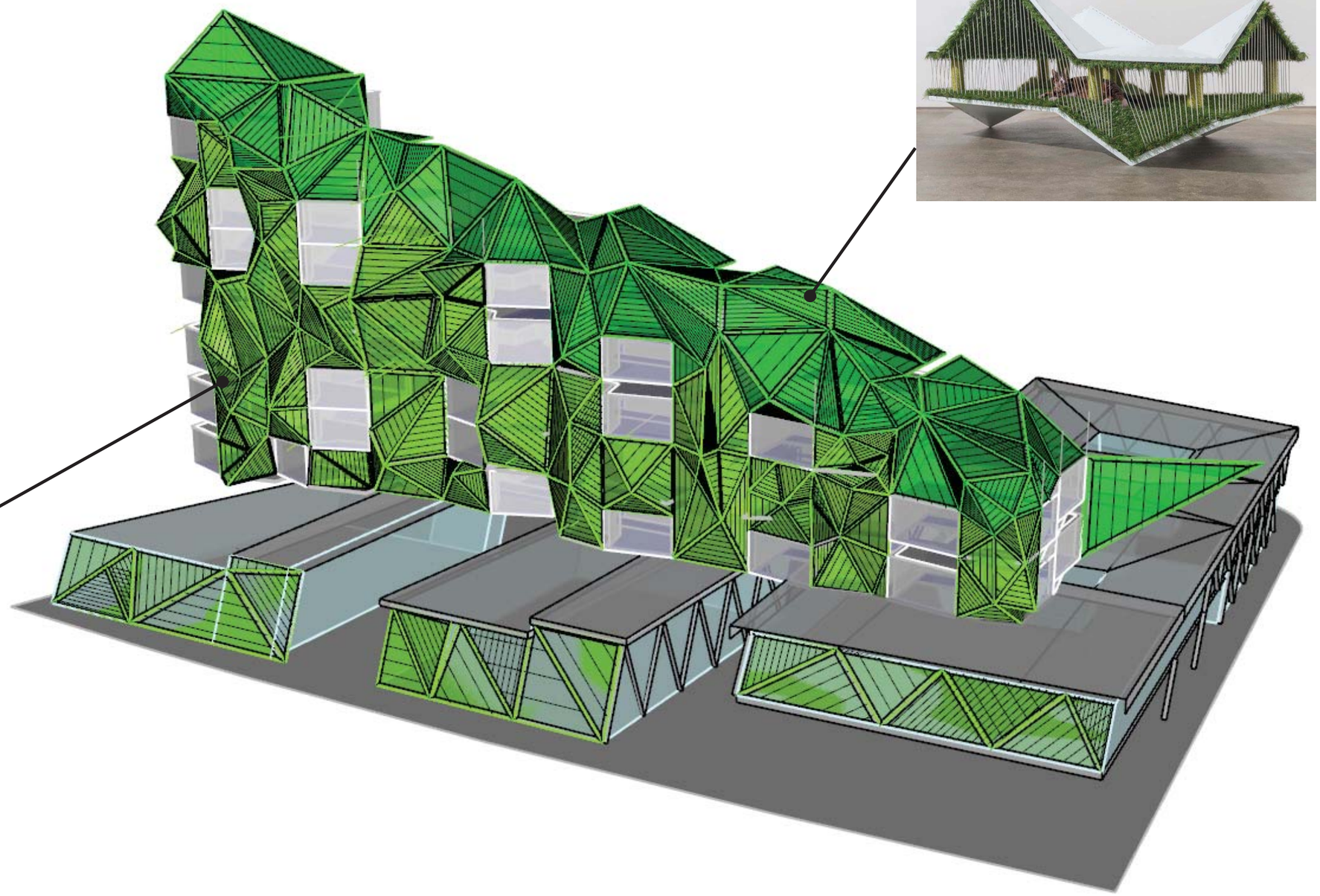
EAST FACADE



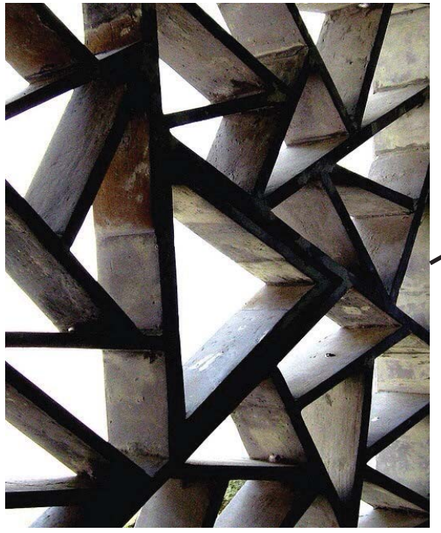
WEST FACADE

SCREEN / TRELLIS MATERIALITY

OUTDOOR SPACES

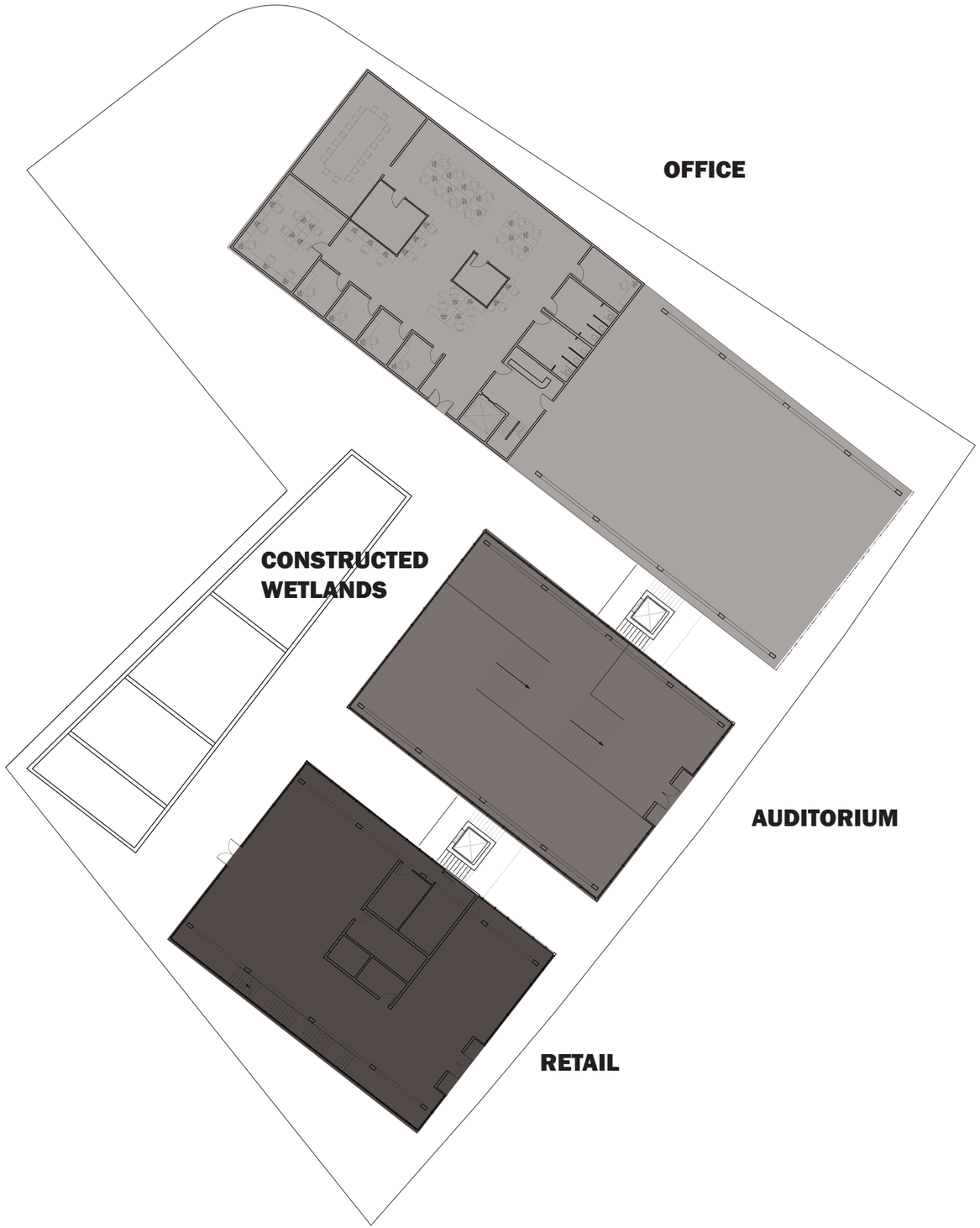


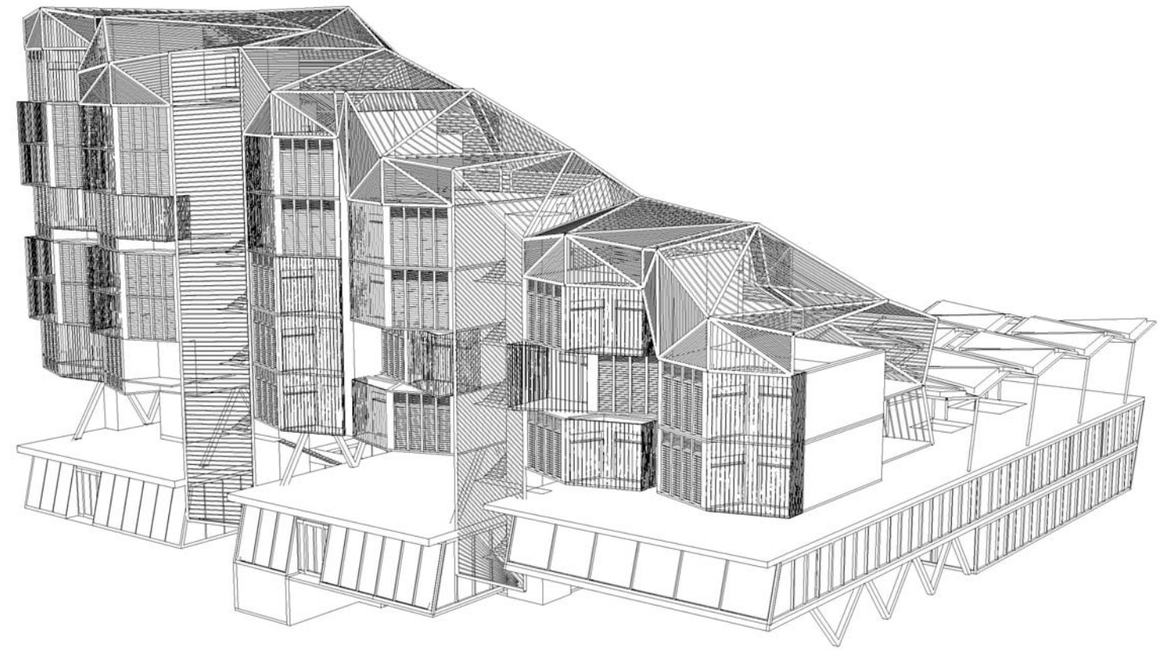
INDOOR SPACES

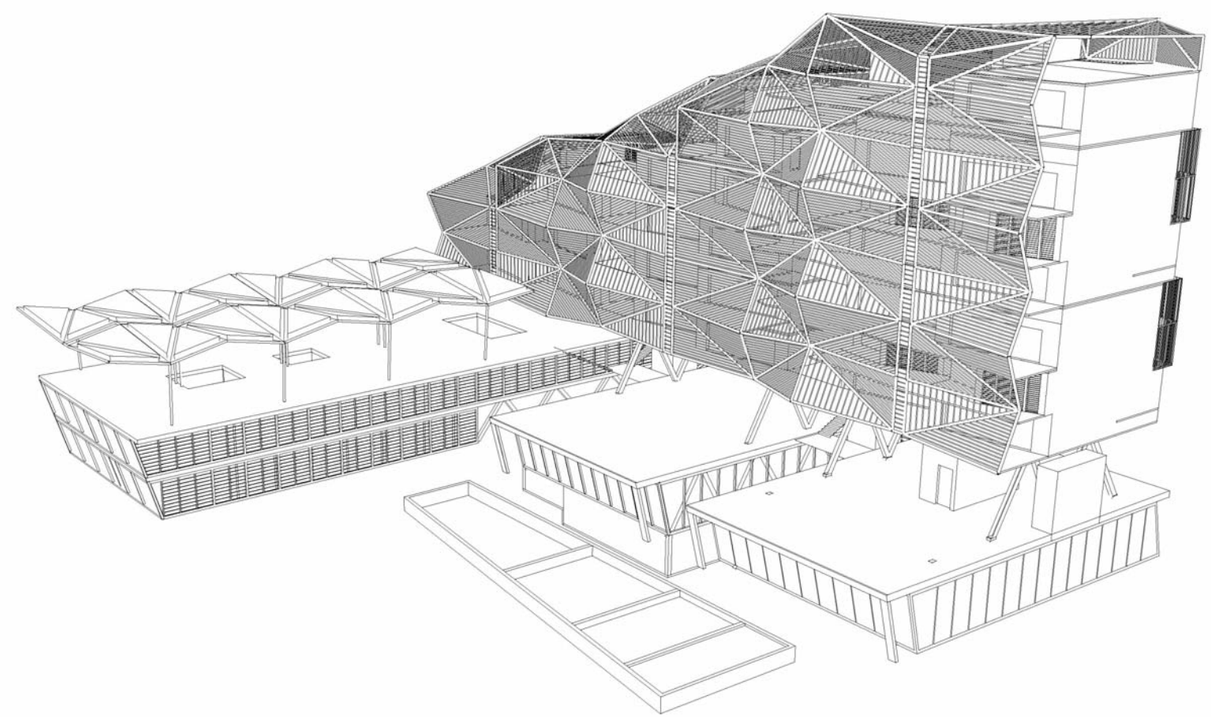


FINAL DESIGN

GROUND FLOOR WITH BIRDS EYE VIEWS OF BUILDINGS





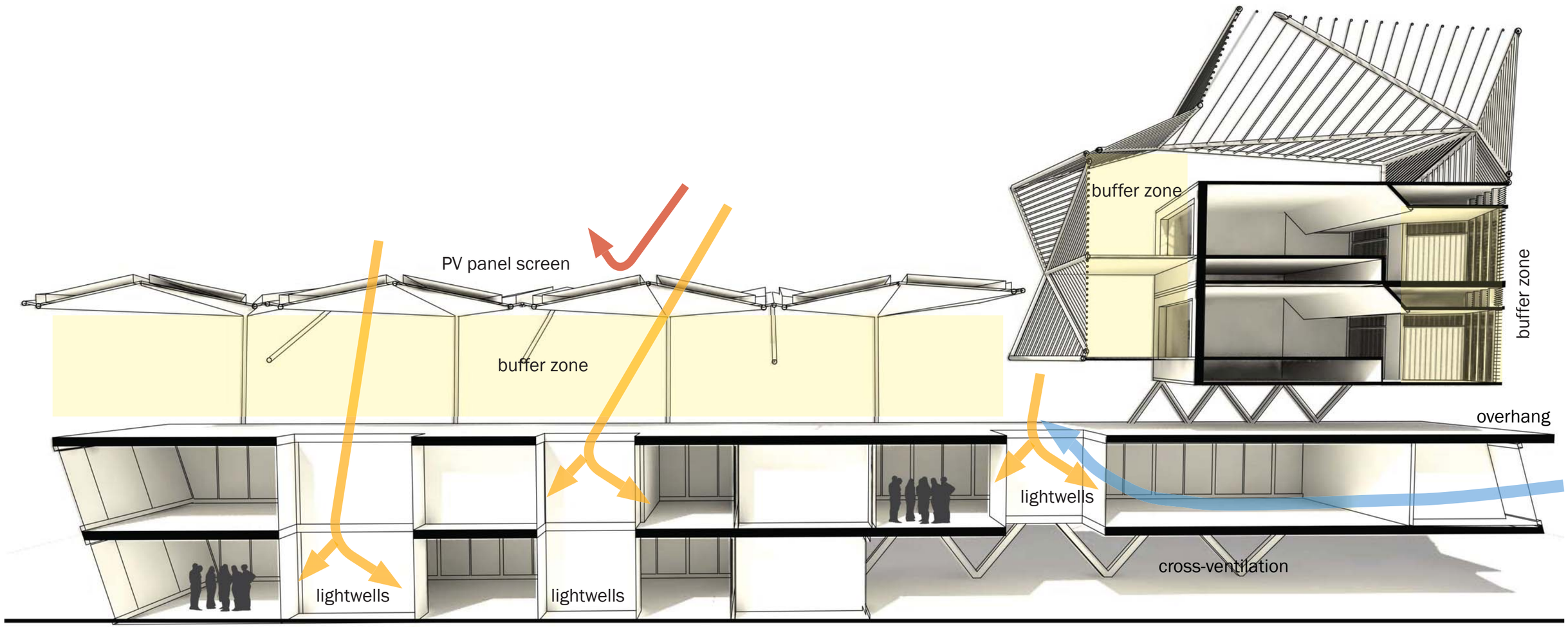


OFFICE PERFORMANCE REQUIREMENTS

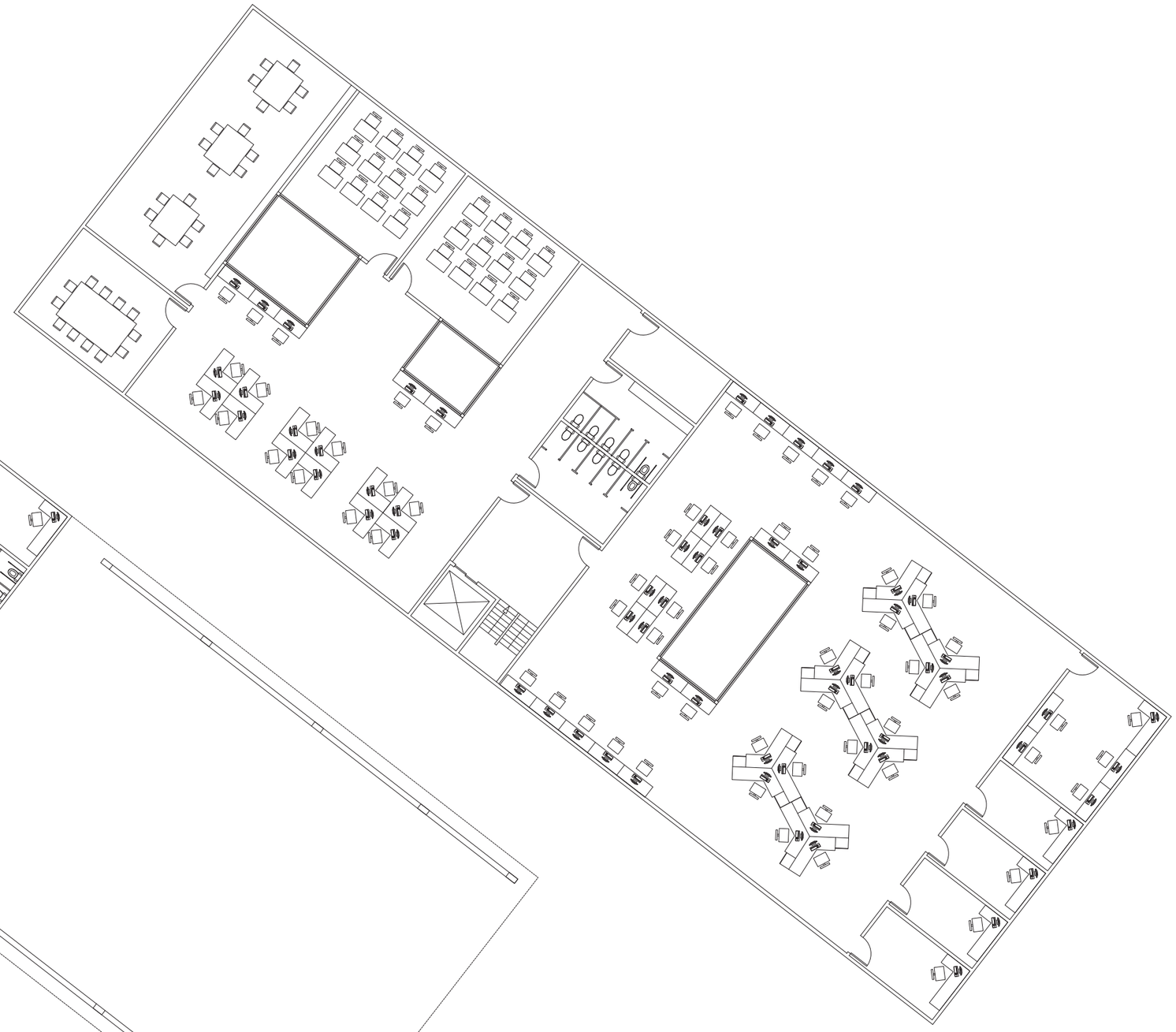
DAYLIGHTING
Evenly spread sunlight
300 lux min

GLARE
Prevent overlit spaces
and glare

THERMAL COMFORT
Maintain temperature
in a range 20 - 28 C

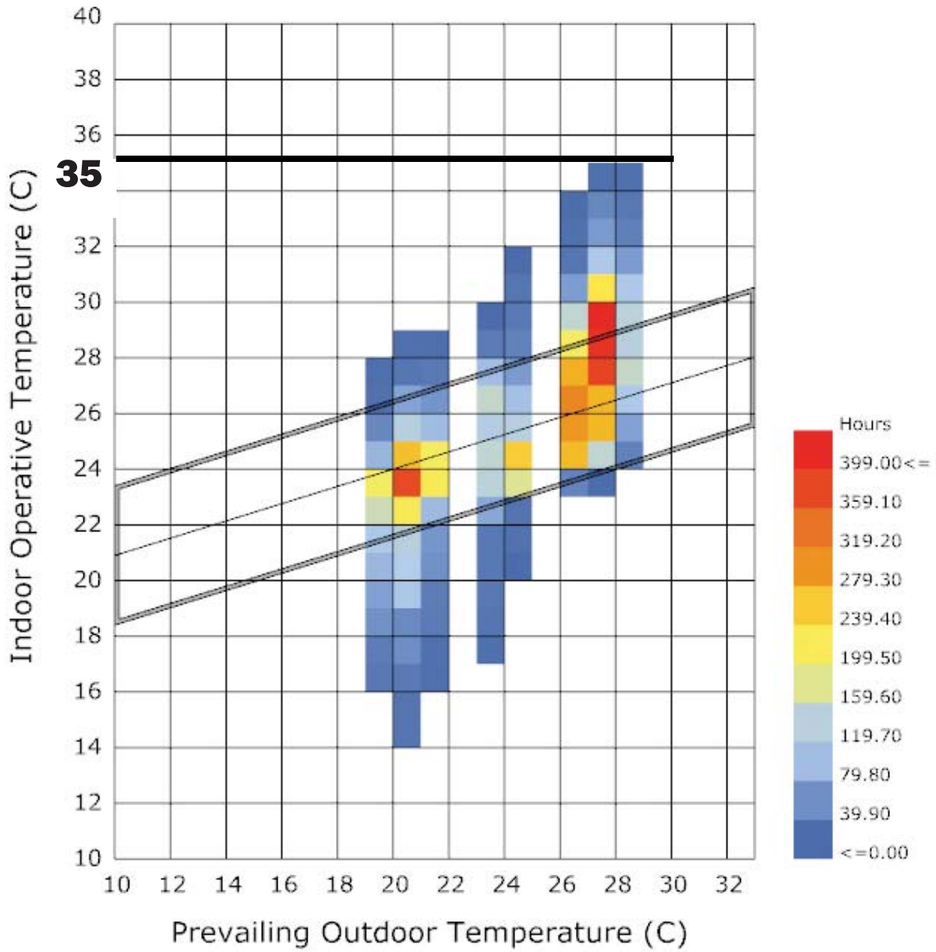


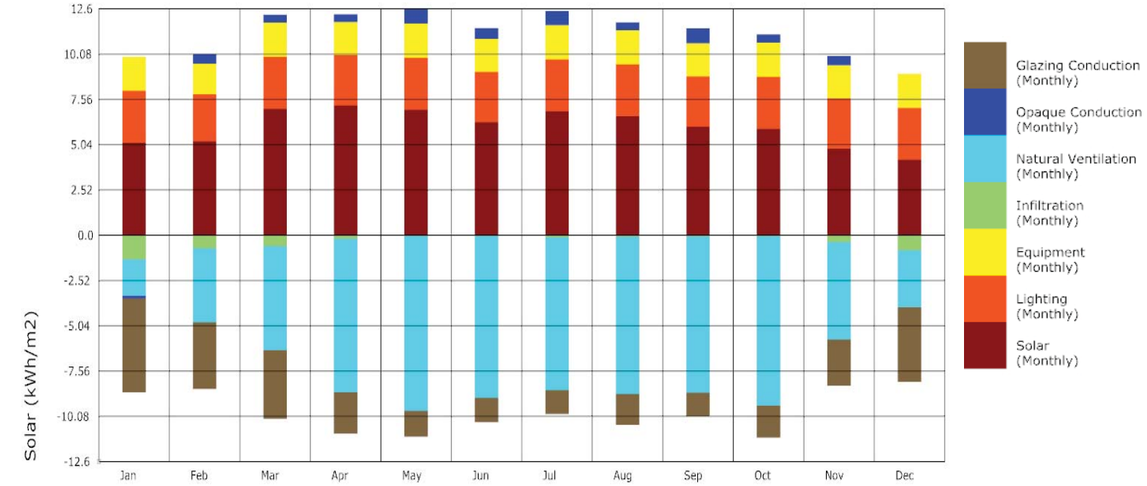
GROUND FLOOR PLAN



FIRST FLOOR PLAN

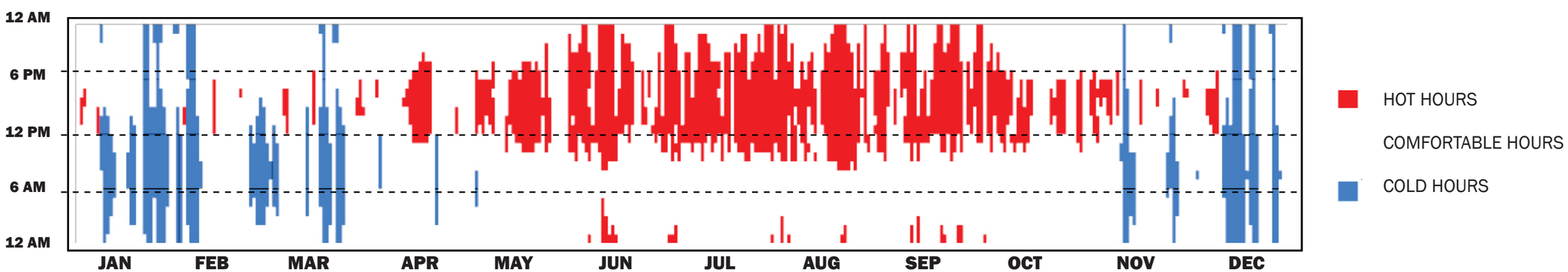
OFFICE COMFORT ANALYSIS



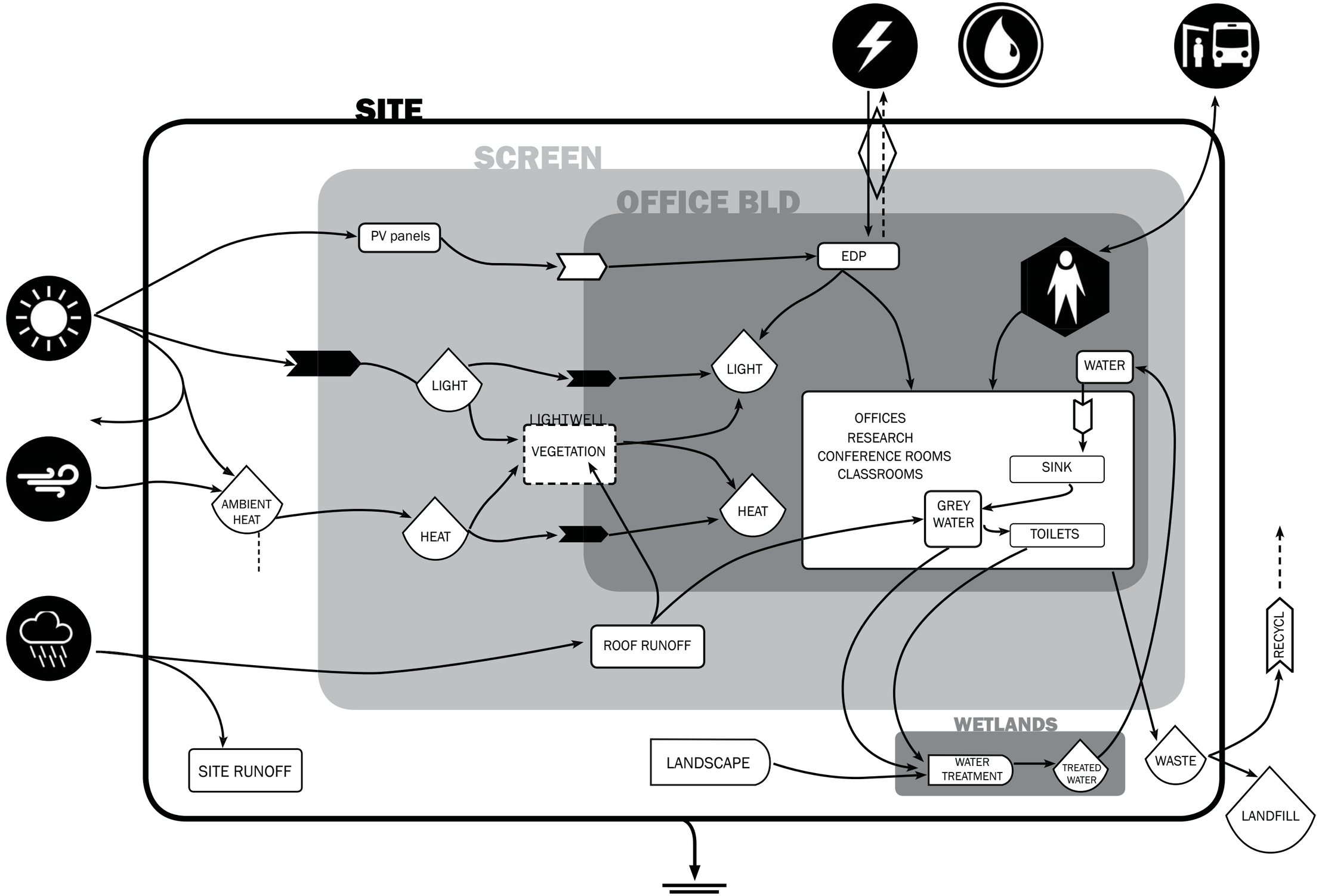


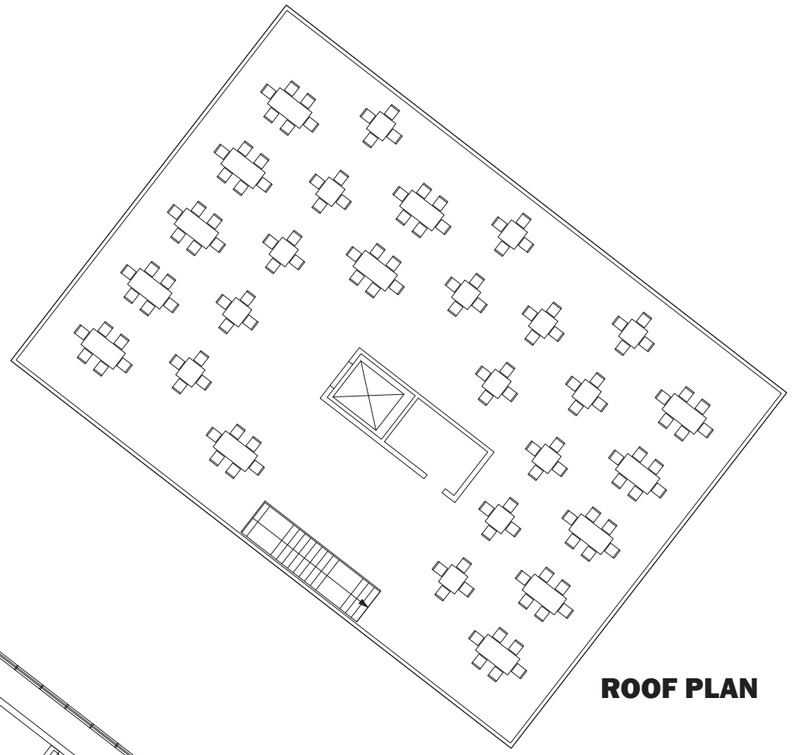
Miami Intl Ap FL USA TMY3

ENERGY BALANCE (WITHOUT SYSTEMS)

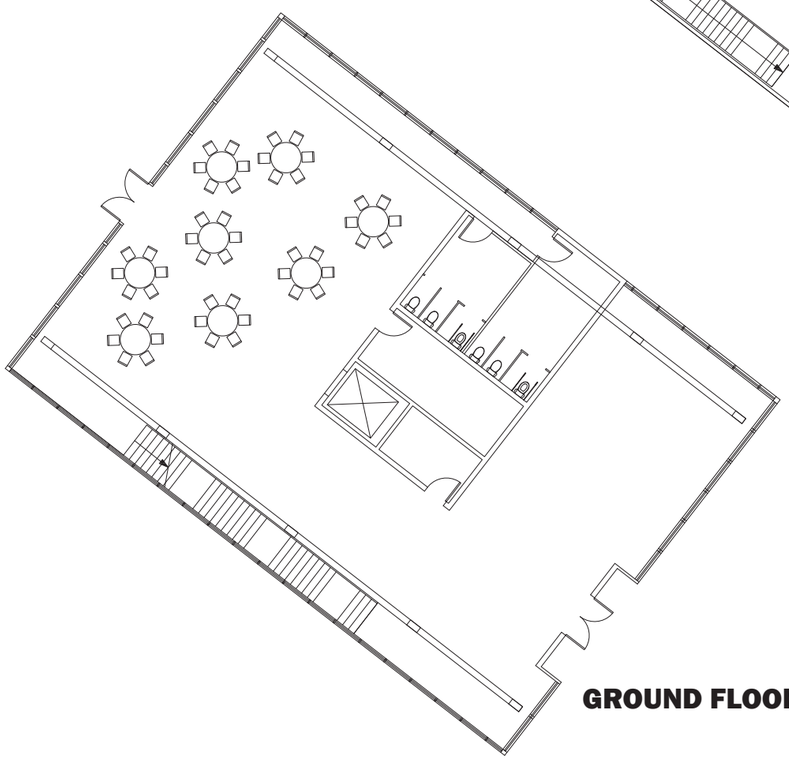


ADAPTIVE COMFORT OPEN OFFICE **71.62%** ANNUALY

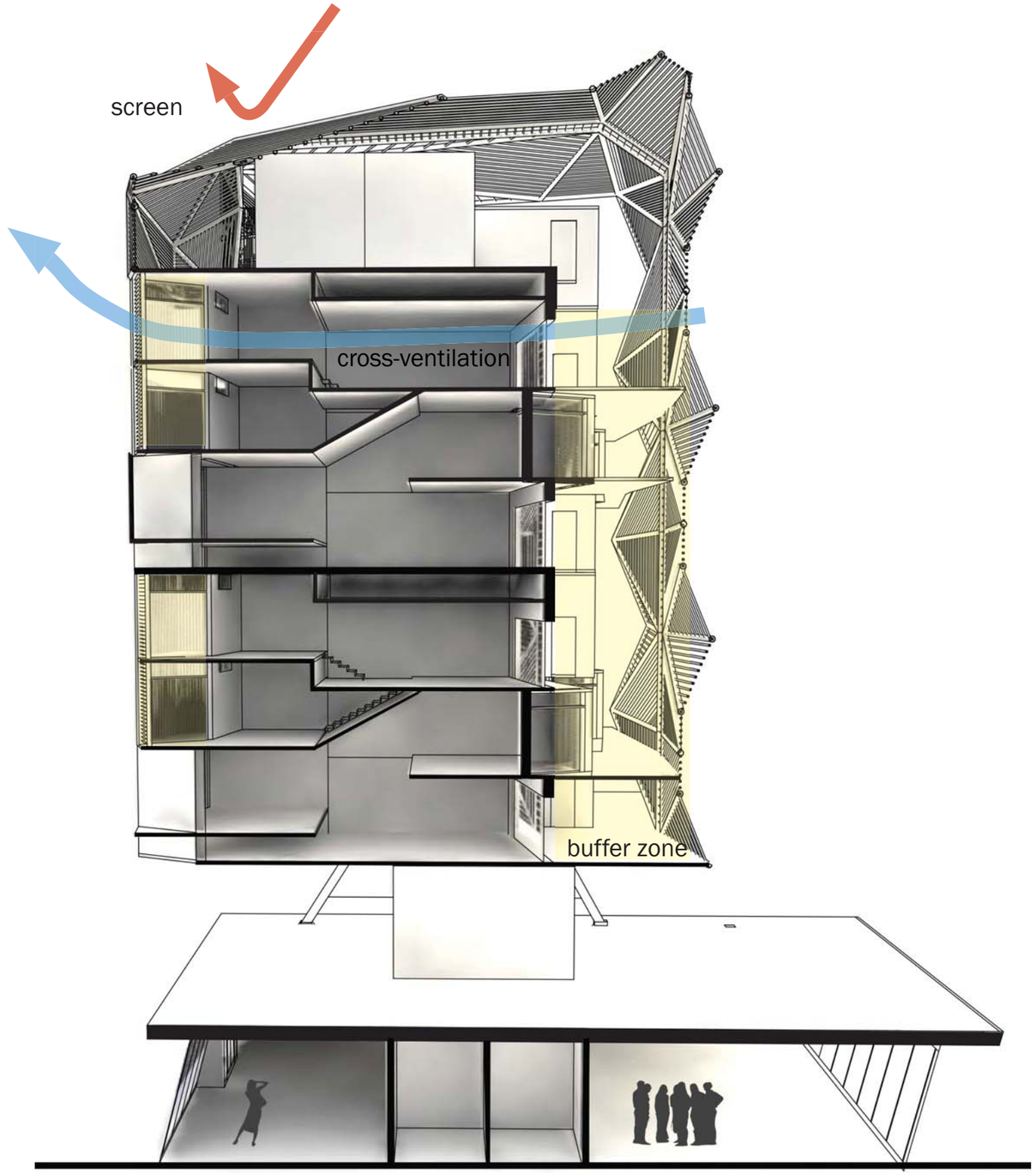

SITE
SCREEN
OFFICE BLD
PV panels
EDP
LIGHT
LIGHT
LIGHTWELL
VEGETATION
WATER
OFFICES
RESEARCH
CONFERENCE ROOMS
CLASSROOMS
SINK
GREY WATER
TOILETS
AMBIENT HEAT
HEAT
HEAT
ROOF RUNOFF
RECYCL
WETLANDS
WATER TREATMENT
TREATED WATER
WASTE
LANDSCAPE
SITE RUNOFF
LANDFILL

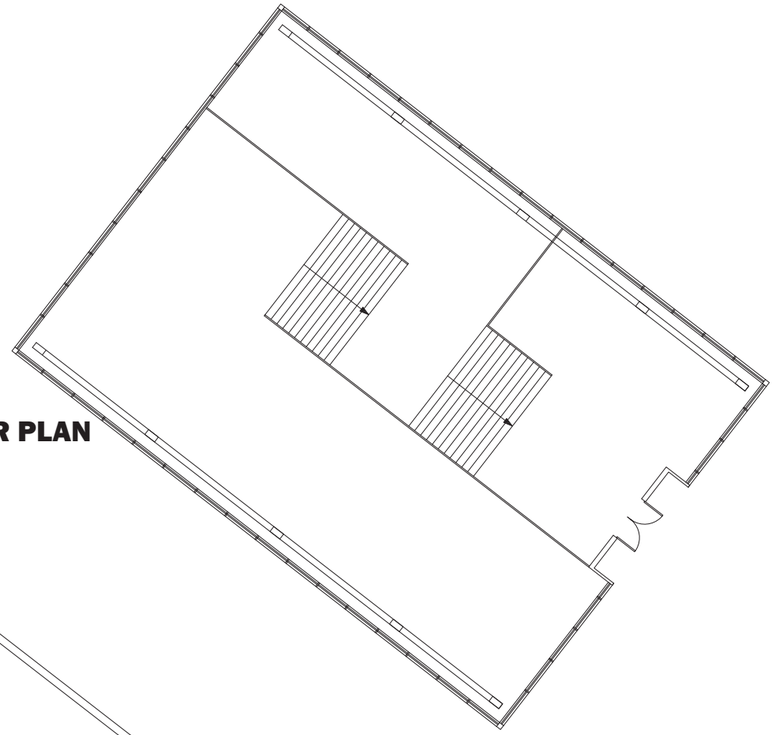


ROOF PLAN

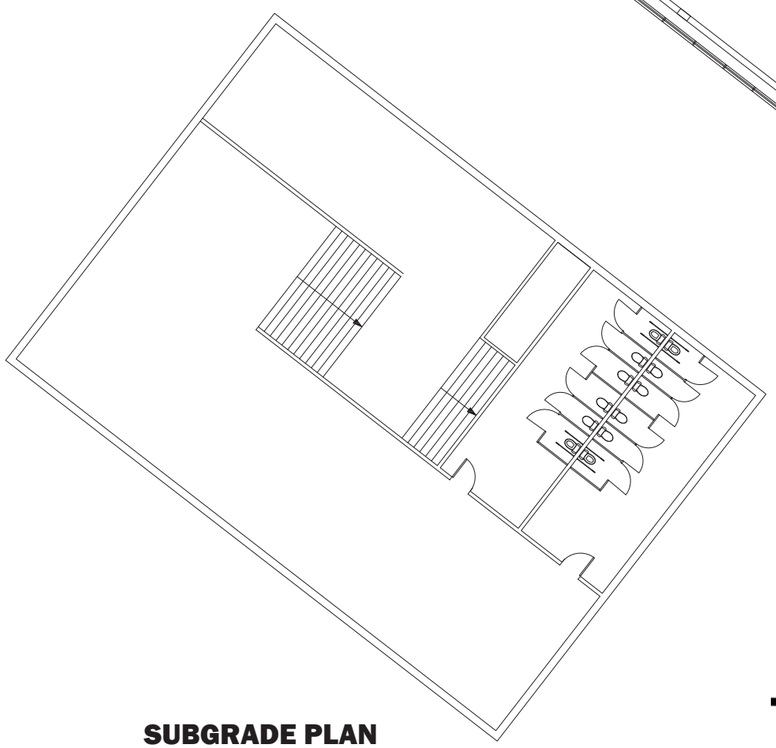


GROUND FLOOR PLAN

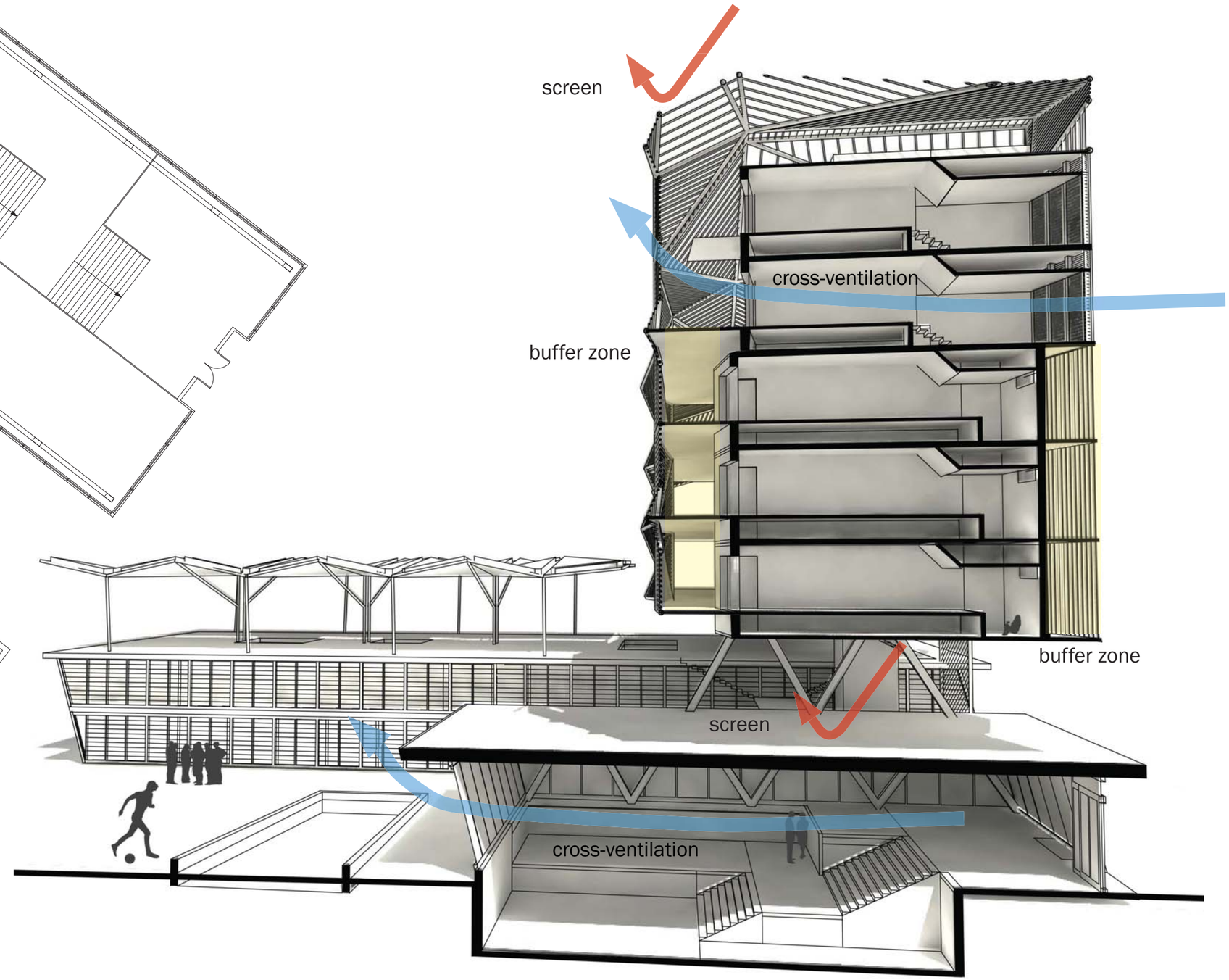




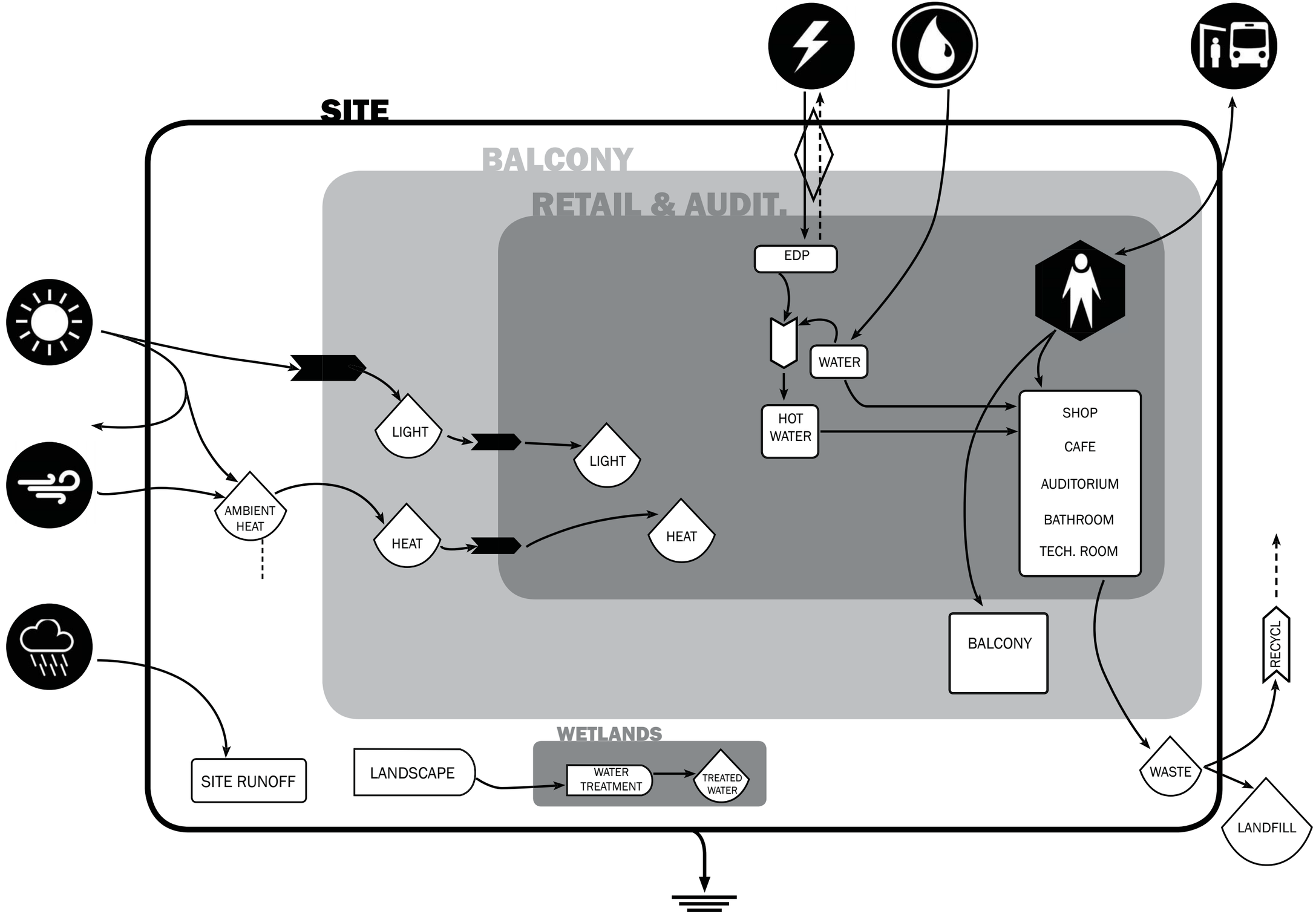
GROUND FLOOR PLAN



SUBGRADE PLAN



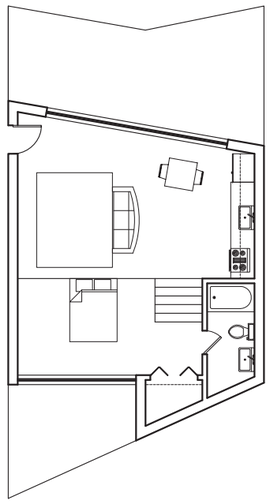
RETAIL + AUDITORIUM E[M]ERGY DIAGRAM



STUDIO
1 BR UNIT A
1 BR UNIT B
2 BR UNIT A
2 BR UNIT B

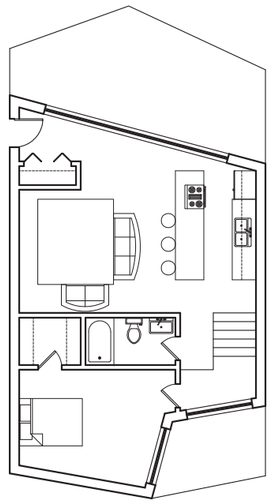
RESIDENTIAL UNIT MIX AND SIZES

STUDIO



670 SF

1 BEDROOM A



813 SF

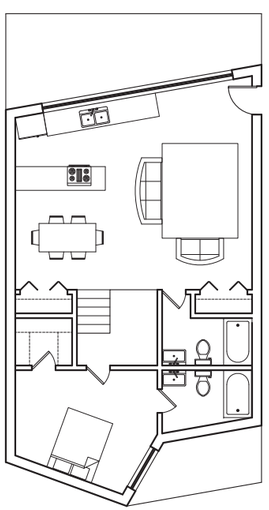
Figure 10

Unit Mix and Size Comparison

Submarket Unit Mix Comparison	Product Type		Studio %	1-Bedroom %	2-Bedroom %	3-Bedroom %	4+-Bedroom %
Downtown Miami*	Existing		13%	39%	39%	7%	2%
Brickell	Proposed/Under Construction		8%	42%	42%	7%	1%
Edgewater	Proposed/Under Construction		0%	22%	50%	22%	6%
Unit Size Comparison		**Average Unit Size (SF)**	**(SF)**	**(SF)**	**(SF)**	**(SF)**	**(SF)**
Downtown Miami*	Existing	1,110	795	826	1,264	1,915	2,959
Brickell	Proposed/Under Construction	1,202	580	840	1,220	1,551	2,088
Edgewater	Proposed/Under Construction	1,375	N/A	973	1,364	1,712	3,008

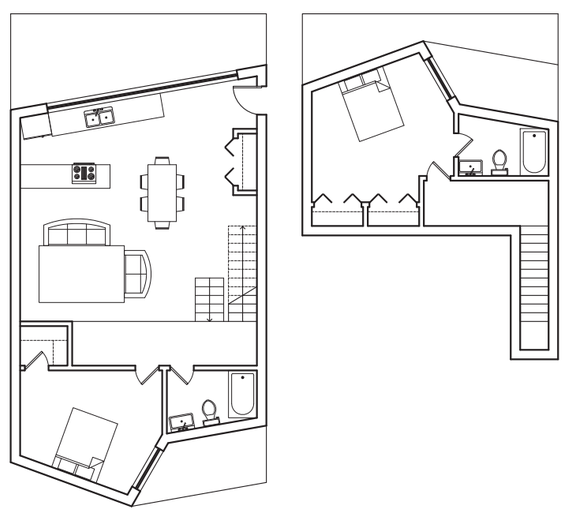
* Sample of over 17,000 units from 75 +/- existing condo projects.

1 BEDROOM B



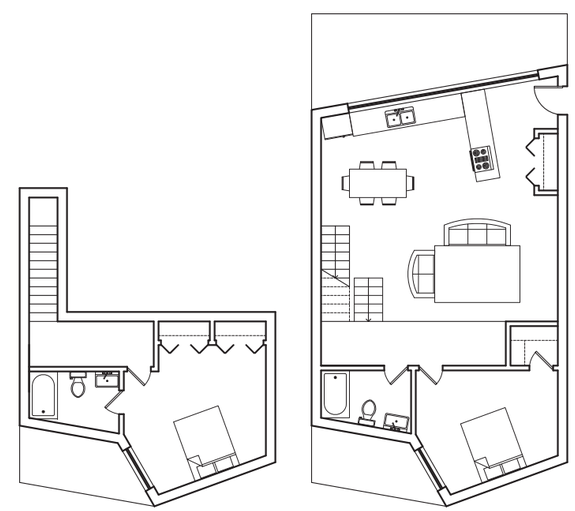
940 SF

2 BEDROOM A



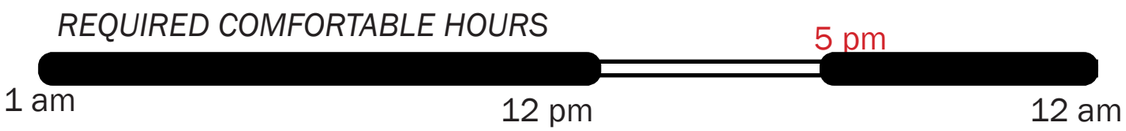
1290 SF

2 BEDROOM B



1290 SF

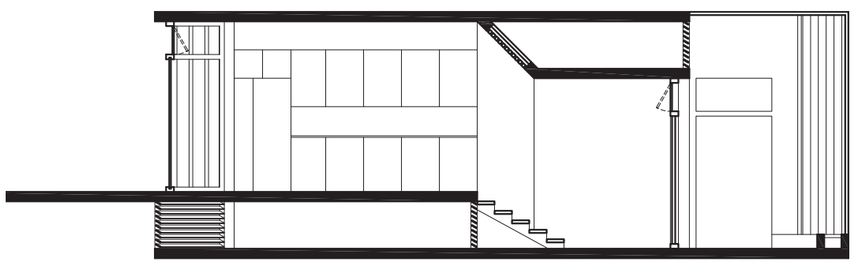
STUDIO PERFORMANCE REQUIREMENTS



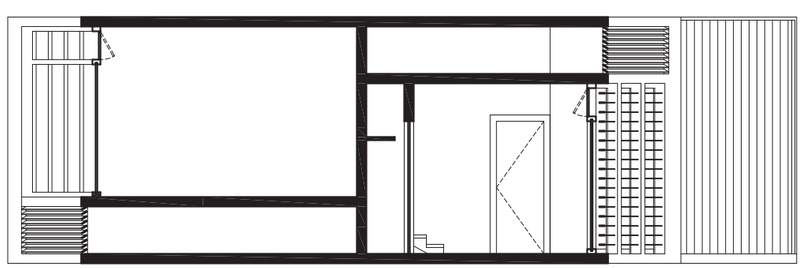
DAYLIGHTING
Evenly spread sunlight
300 lux min

THERMAL COMFORT
Maintain temperature
in a range 20 - 28 C

CONTROL HUMIDITY
Spaces with high humidity
level [kitchen/bathrooms]
are located leeward



SECTION A



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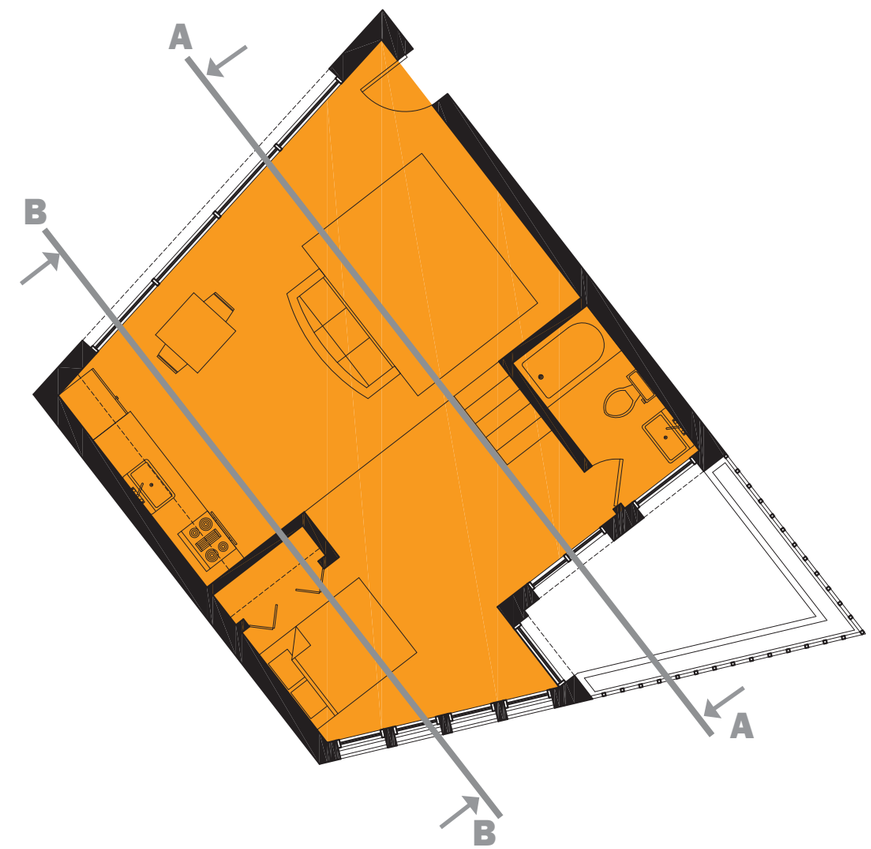
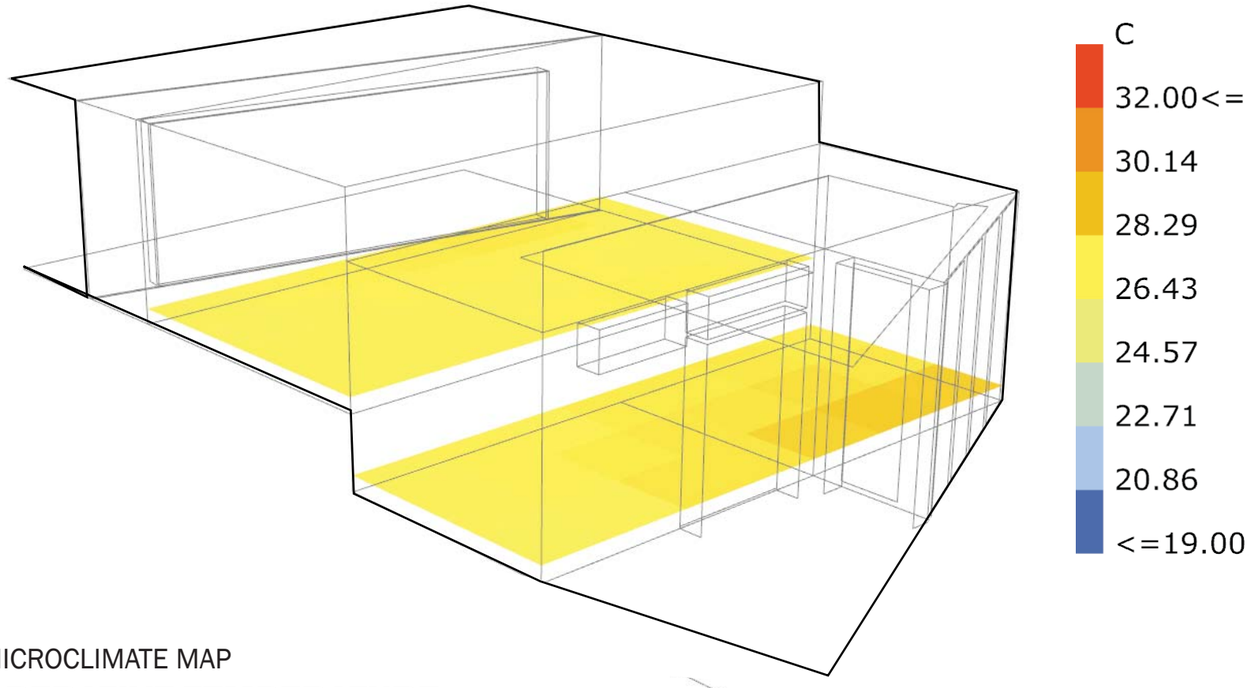
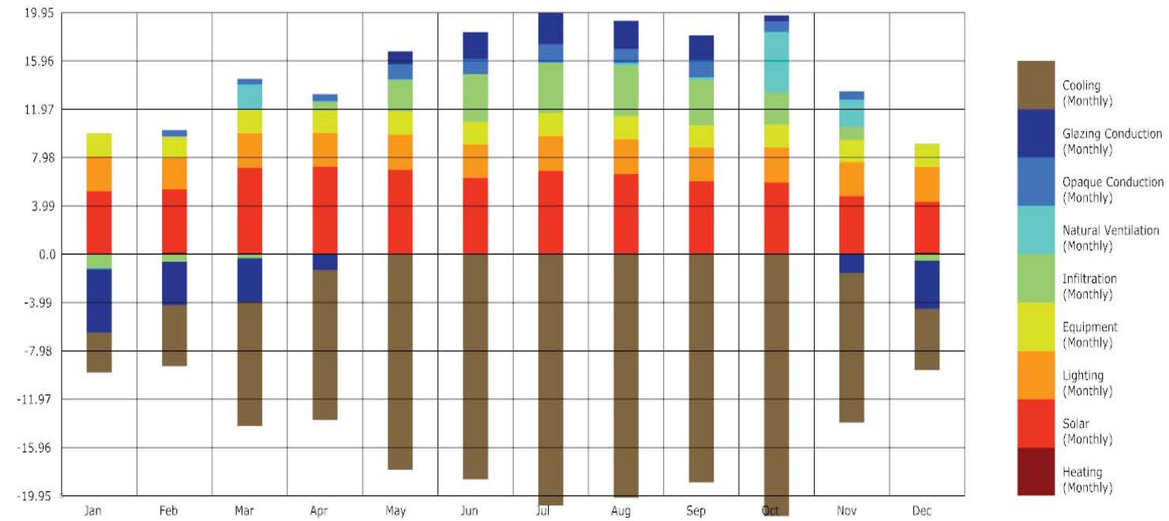


STUDIO THERMAL COMFORT

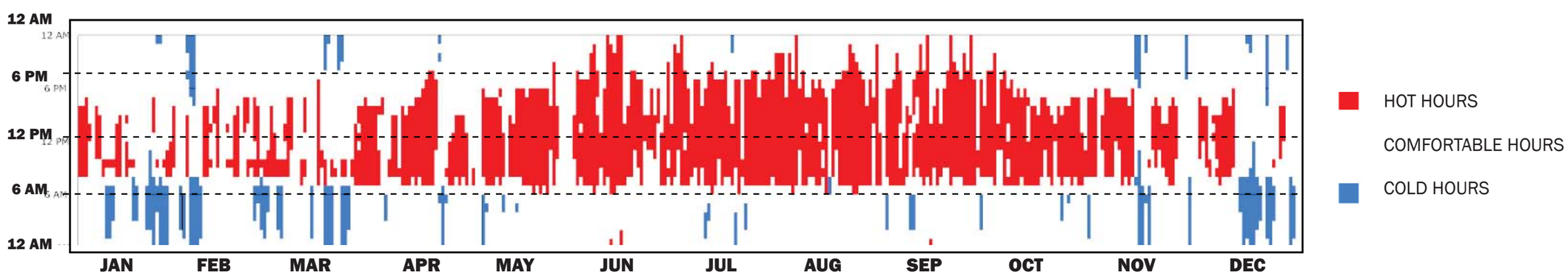


MICROCLIMATE MAP

OPERATIVE TEMPERATURE



ENERGY BALANCE

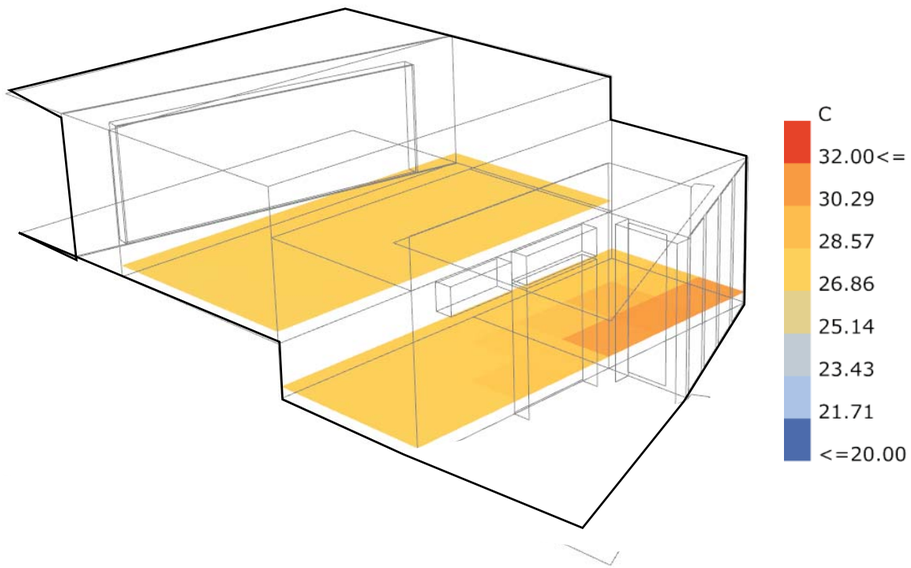


ADAPTIVE COMFORT LIVINGROOM

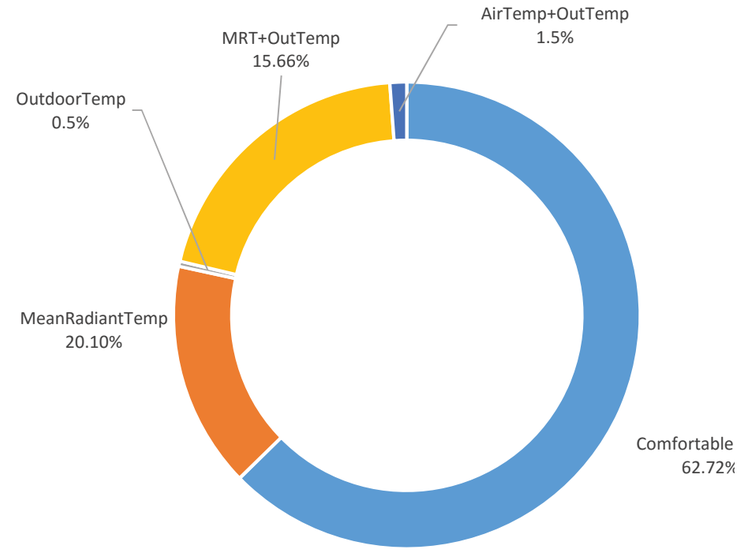
77.62% ANNUALLY

STUDIO SHADING BENEFIT

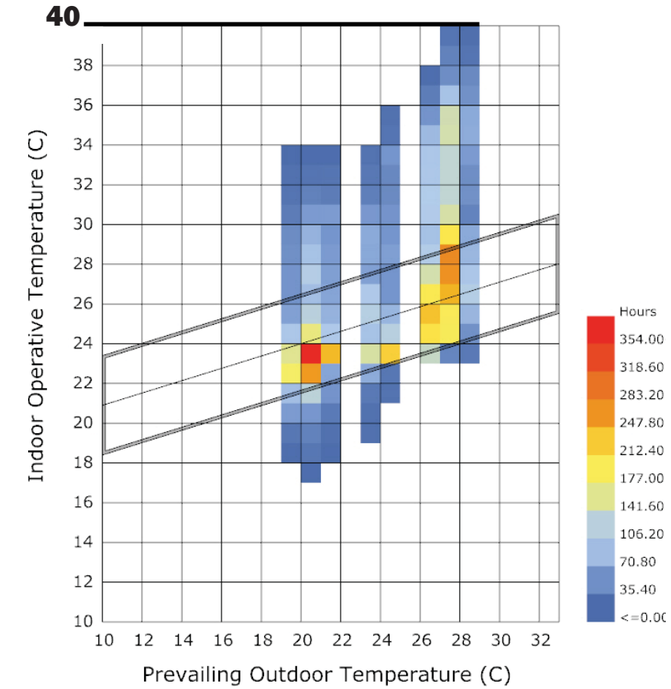
WITHOUT SHADING



MEAN RADIANT TEMPERATURE

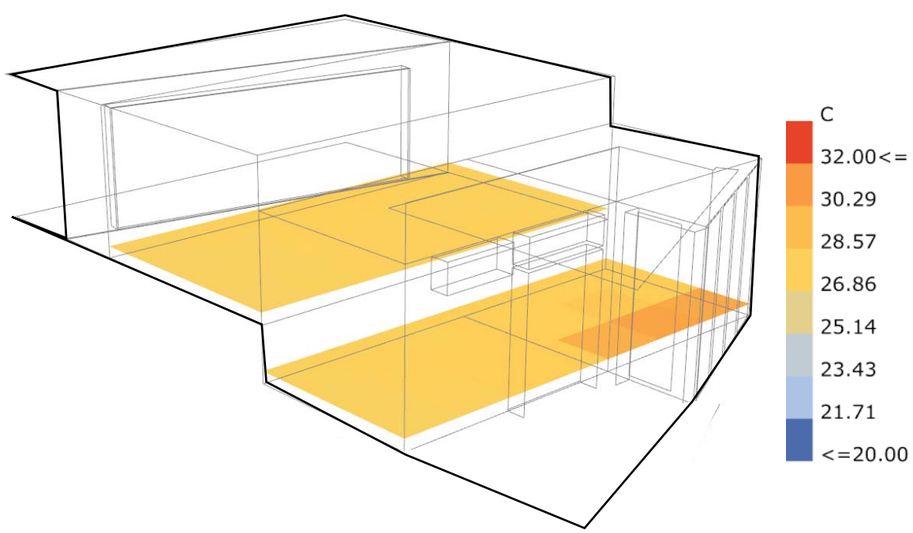


ANNUAL ADAPTIVE
COMFORT BREAK DOWN

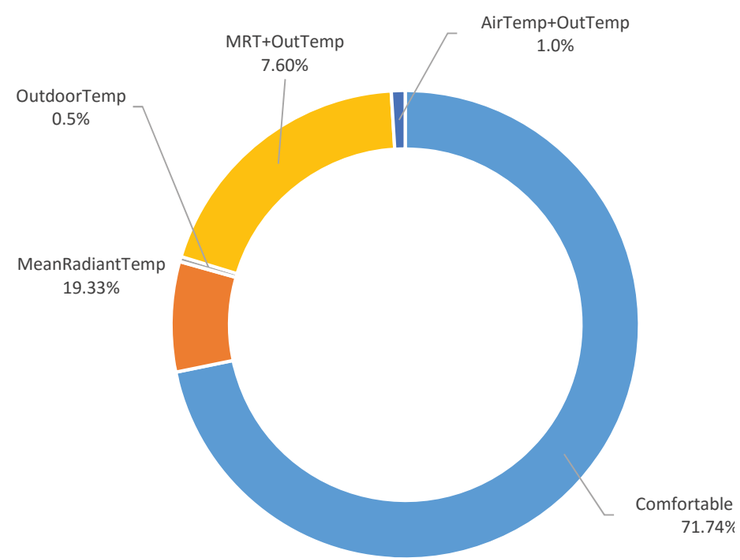


ADAPTIVE COMFORT CHART

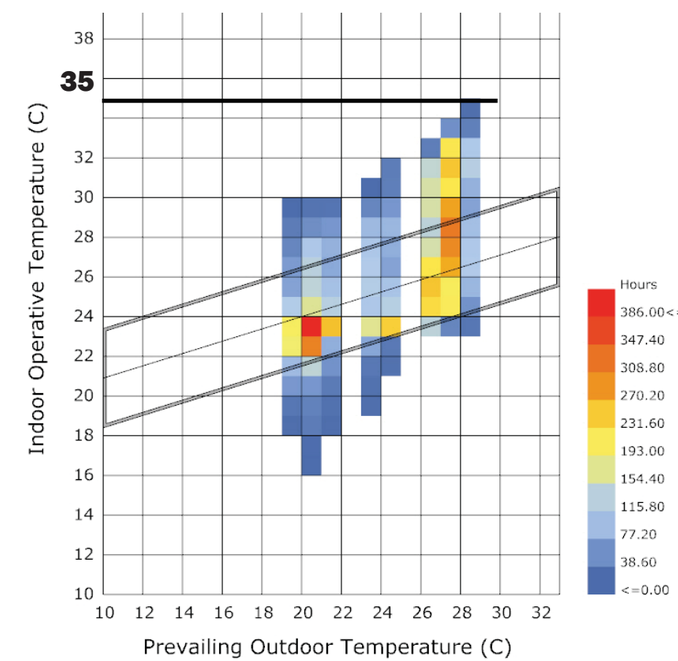
WITH SHADING



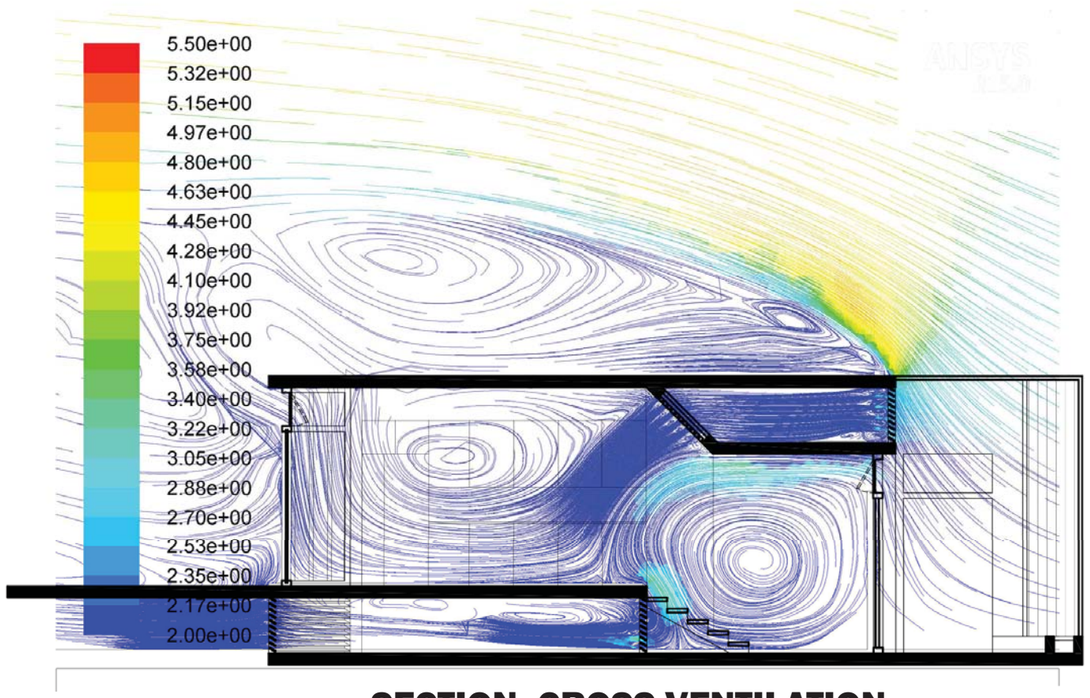
MEAN RADIANT TEMPERATURE



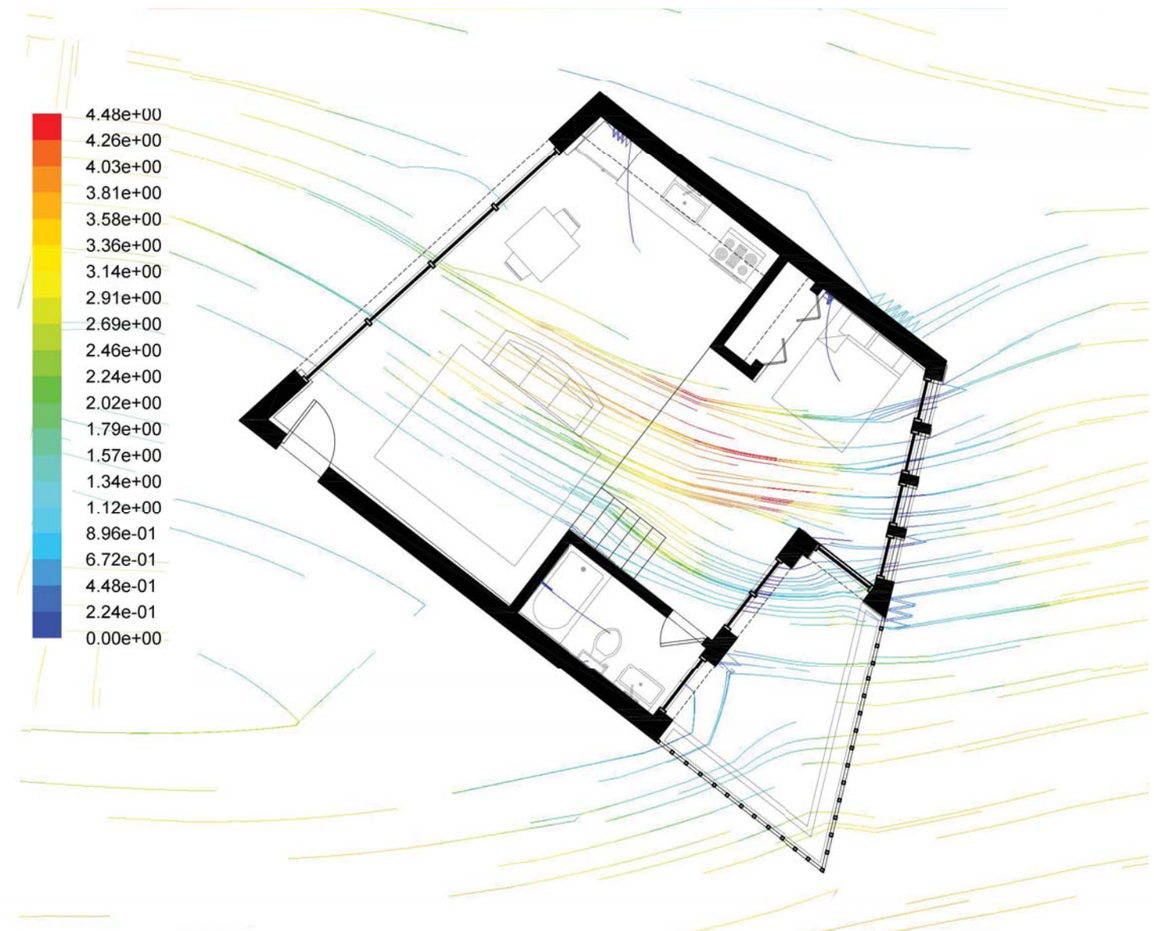
ANNUAL ADAPTIVE
COMFORT BREAK DOWN



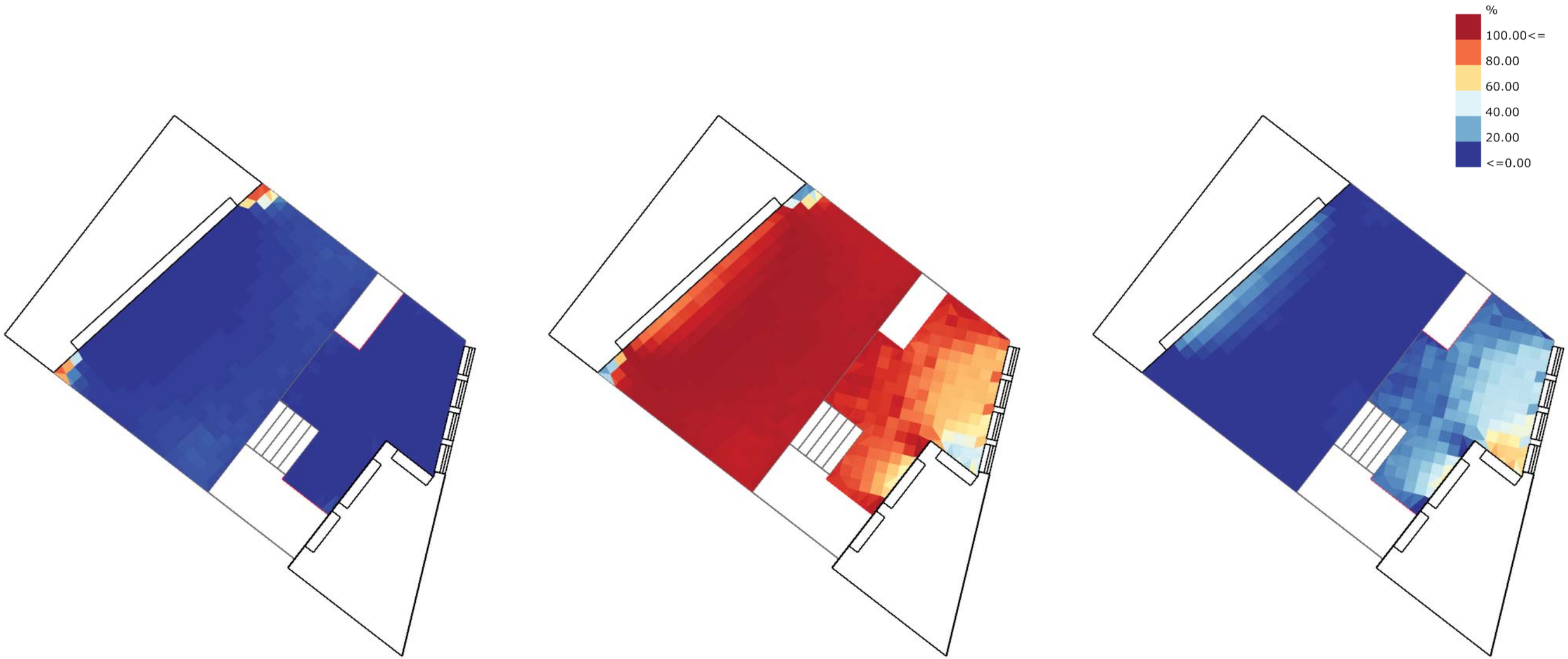
ADAPTIVE COMFORT CHART



SECTION. CROSS VENTILATION



PLAN. CROSS VENTILATION

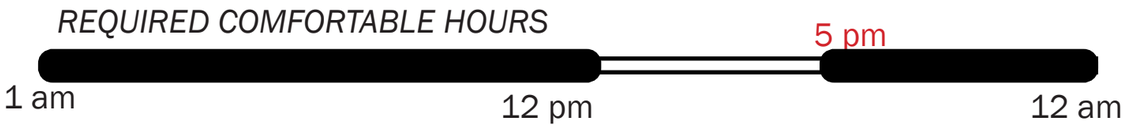


USEFUL DAYLIGHT ILLUMINANCE
<100

USEFUL DAYLIGHT ILLUMINANCE
100-2000

USEFUL DAYLIGHT ILLUMINANCE
>2000

2 BEDROOM UNIT PERFORMANCE REQUIREMENTS



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300 lux min

THERMAL COMFORT
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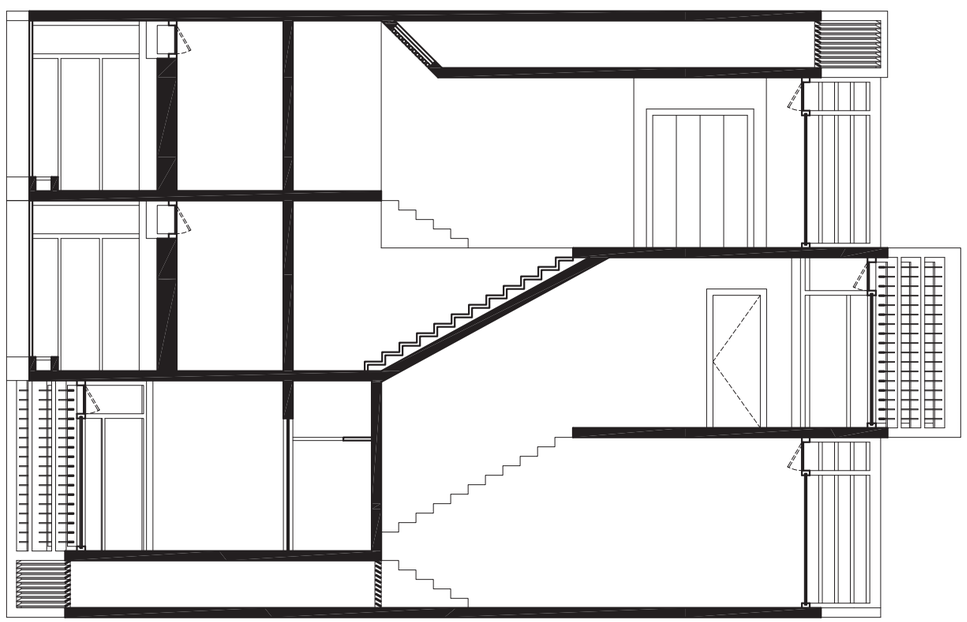
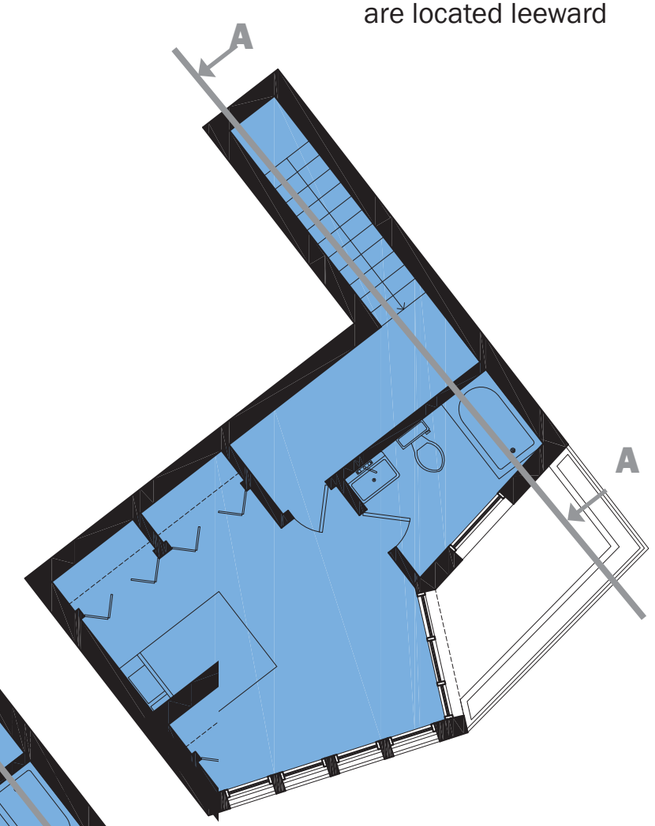
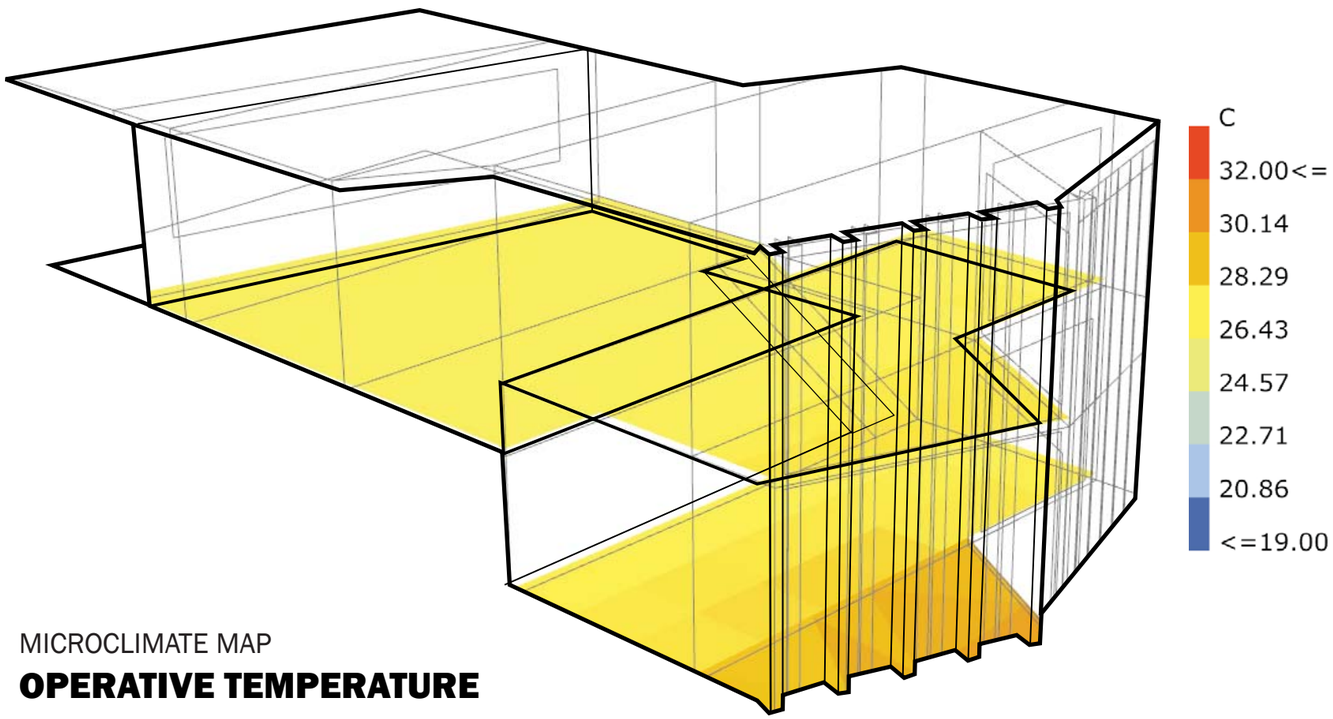


SECTION A

PLAN 1 floor

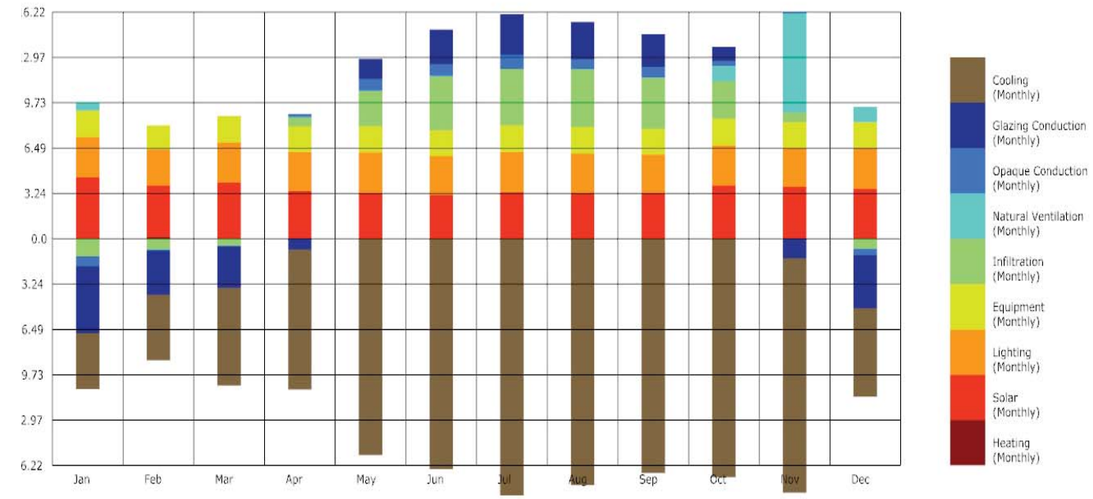


PLAN 2 floor

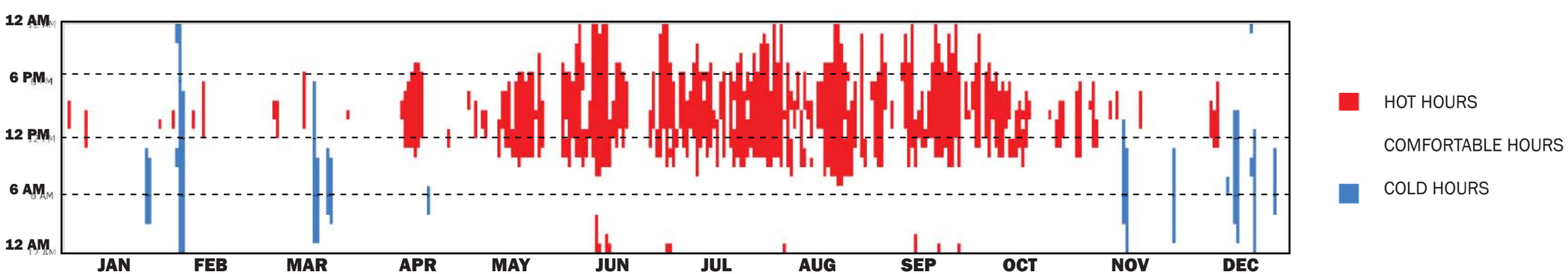


MICROCLIMATE MAP

OPERATIVE TEMPERATURE



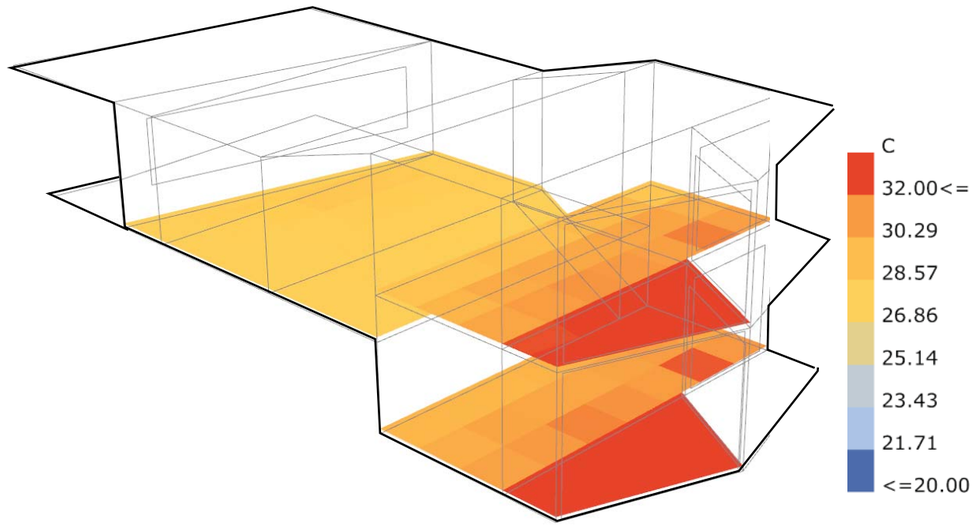
ENERGY BALANCE



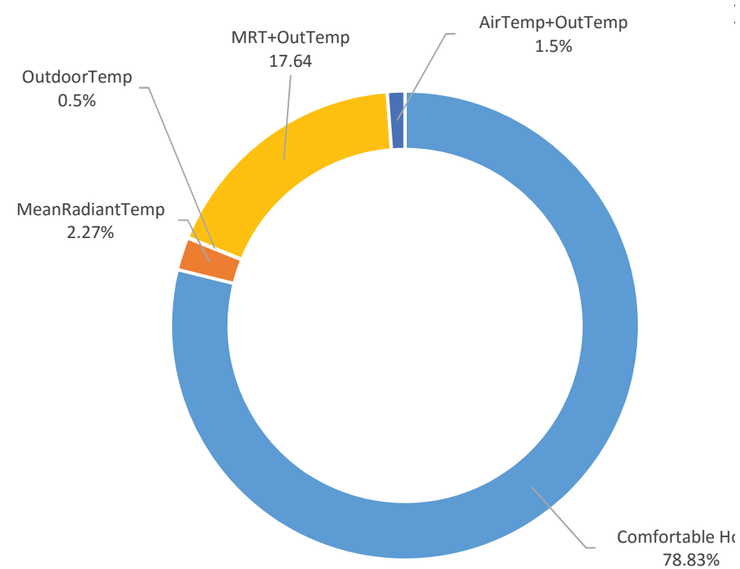
ADAPTIVE COMFORT - LIVINGROOM **84.99%** ANNUALLY

SCREEN BENEFIT

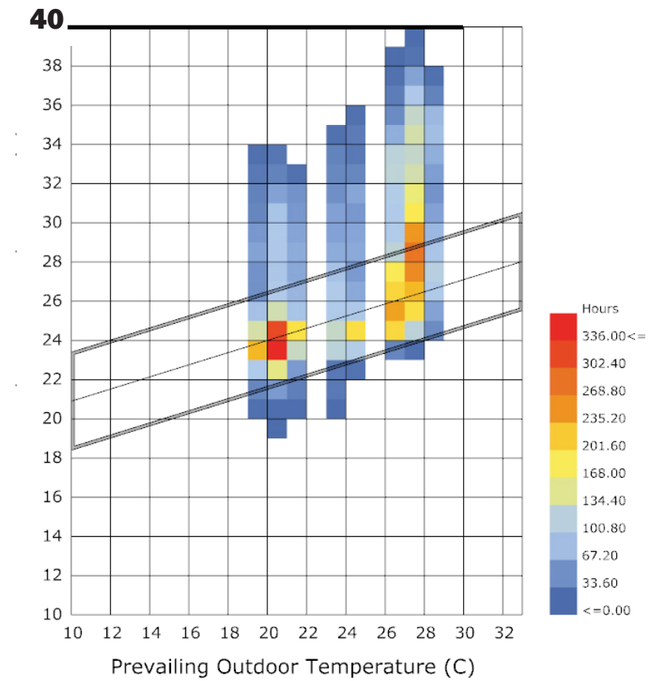
WITHOUT SHADING



MEAN RADIANT TEMPERATURE

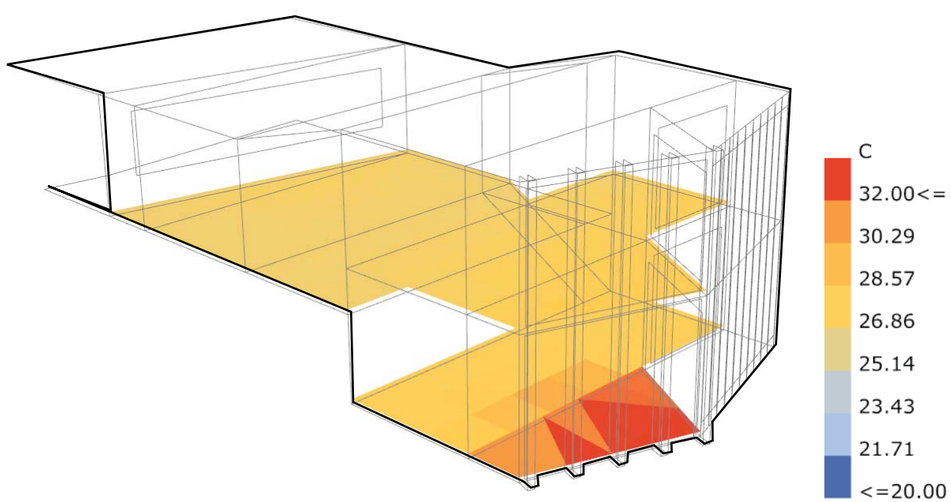


ANNUAL ADAPTIVE
COMFORT BREAK DOWN

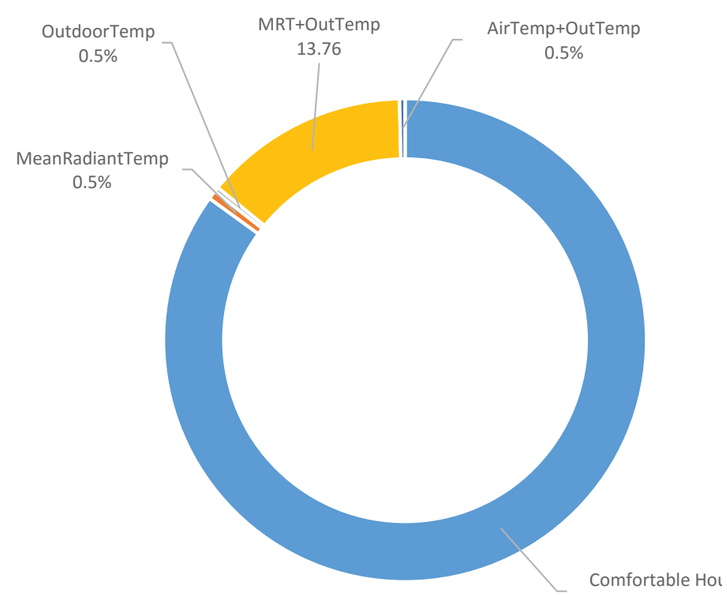


ADAPTIVE COMFORT CHART

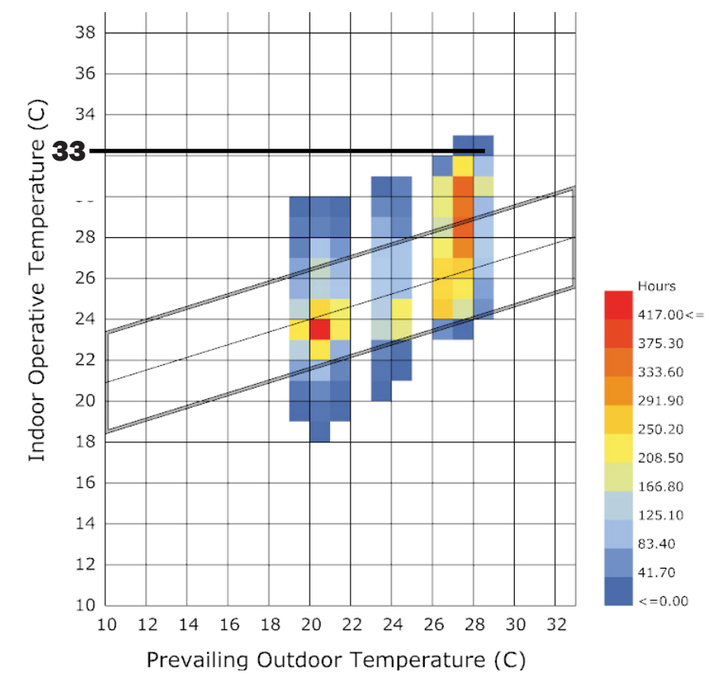
WITH SHADING



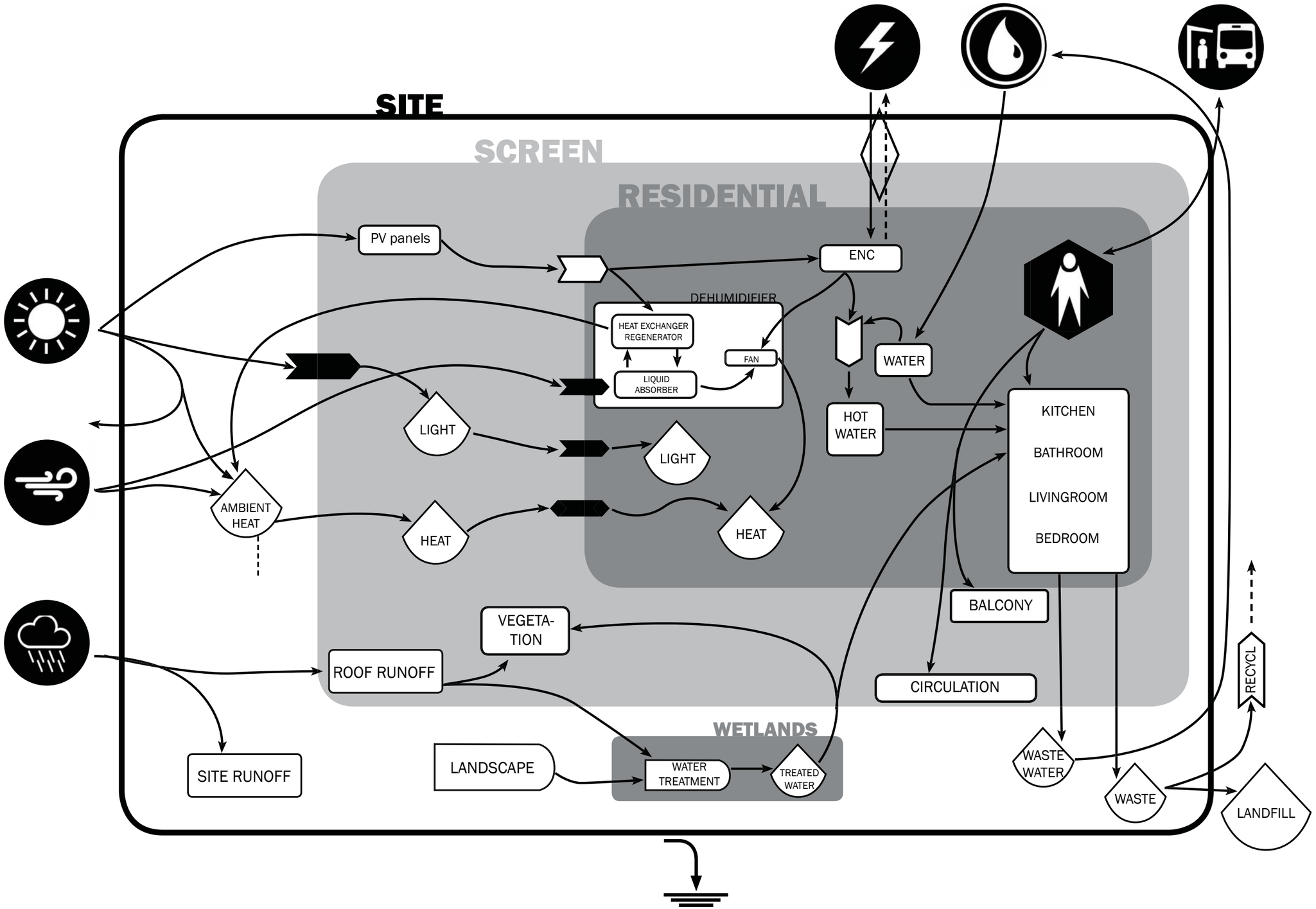
MEAN RADIANT TEMPERATURE



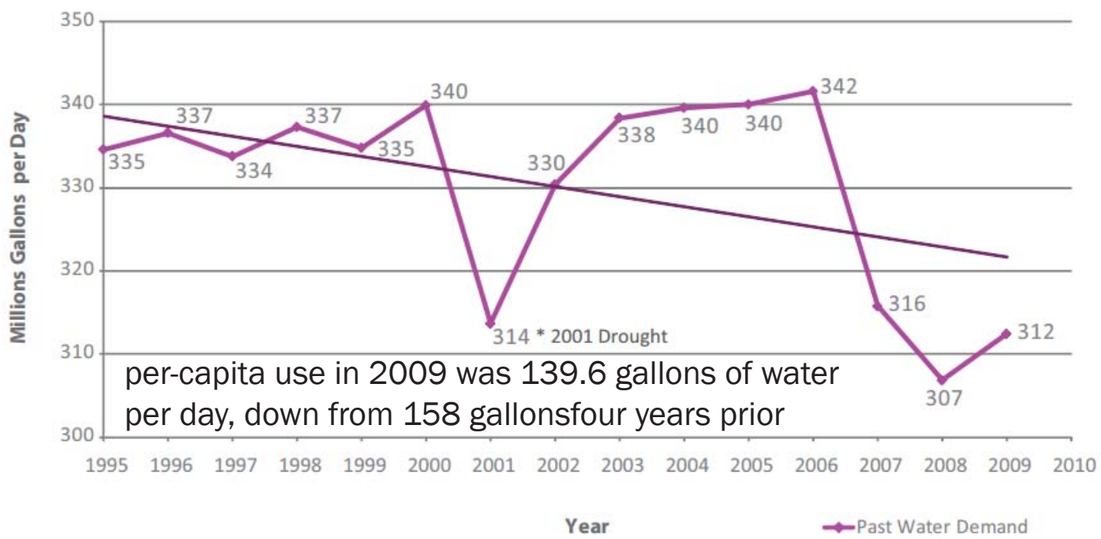
ANNUAL ADAPTIVE
COMFORT BREAK DOWN



ADAPTIVE COMFORT CHART

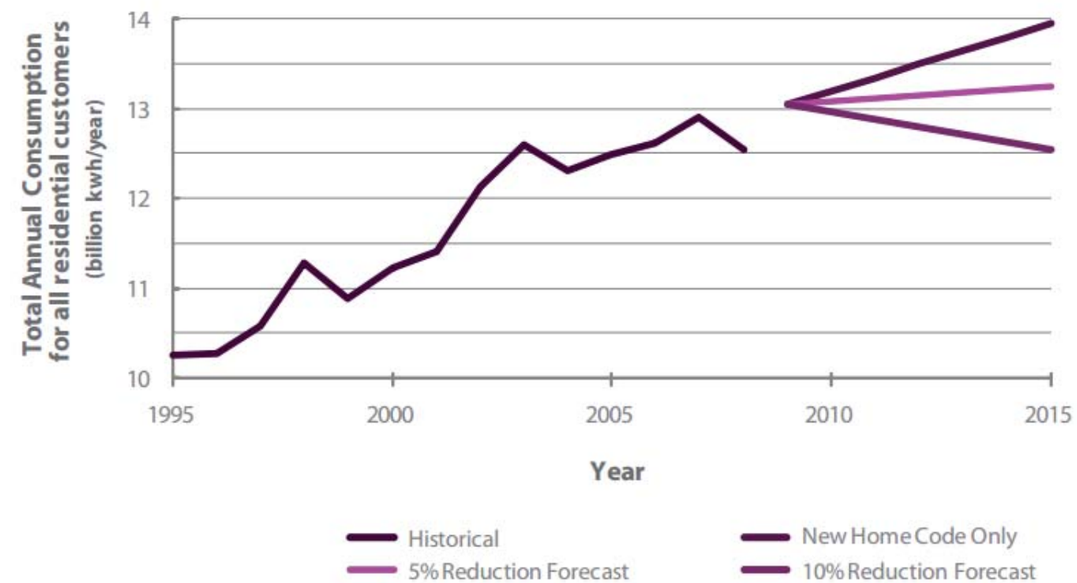

SITE
SCREEN
RESIDENTIAL
PV panels
ENC
DEHUMIDIFIER
HEAT EXCHANGER REGENERATOR
FAN
LIQUID ABSORBER
WATER
HOT WATER
KITCHEN
BATHROOM
LIVINGROOM
BEDROOM
LIGHT
LIGHT
AMBIENT HEAT
HEAT
HEAT
BALCONY
VEGETA-TION
ROOF RUNOFF
CIRCULATION
RECYCL
WETLANDS
SITE RUNOFF
LANDSCAPE
WATER TREATMENT
TREATED WATER
WASTE WATER
WASTE
LANDFILL

Historical Community-wide Average Water Use

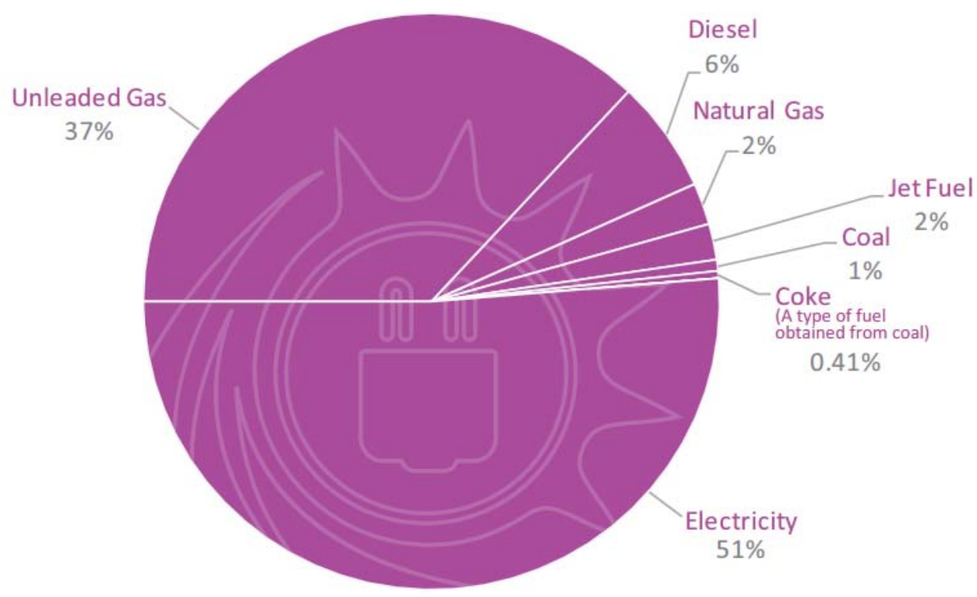


per-capita use in 2009 was 139.6 gallons of water per day, down from 158 gallonsfour years prior

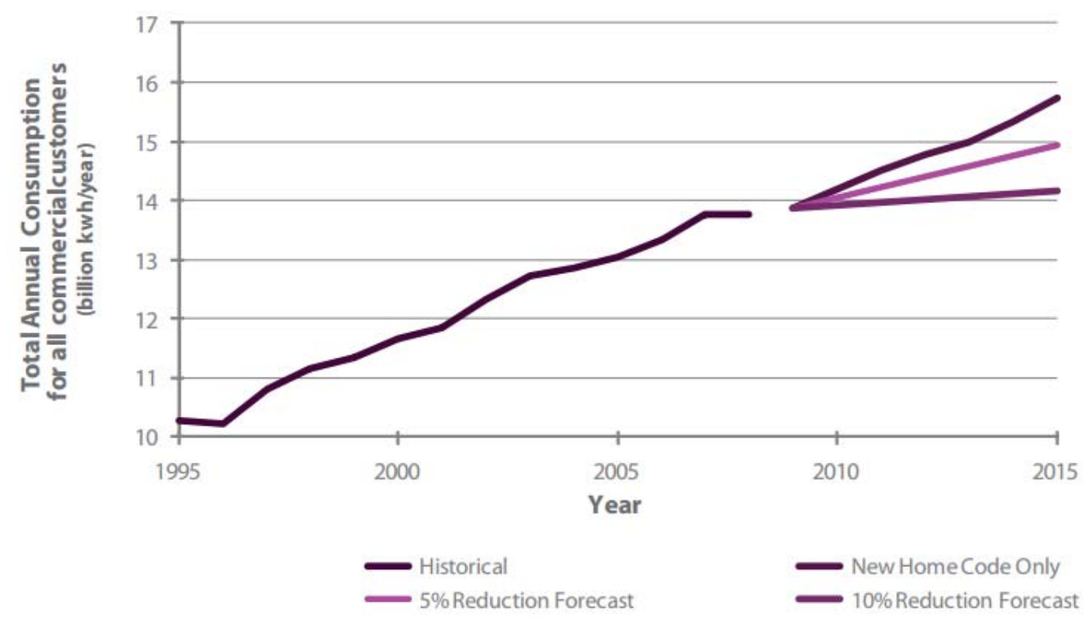
Miami-Dade County Residential Consumption Projections

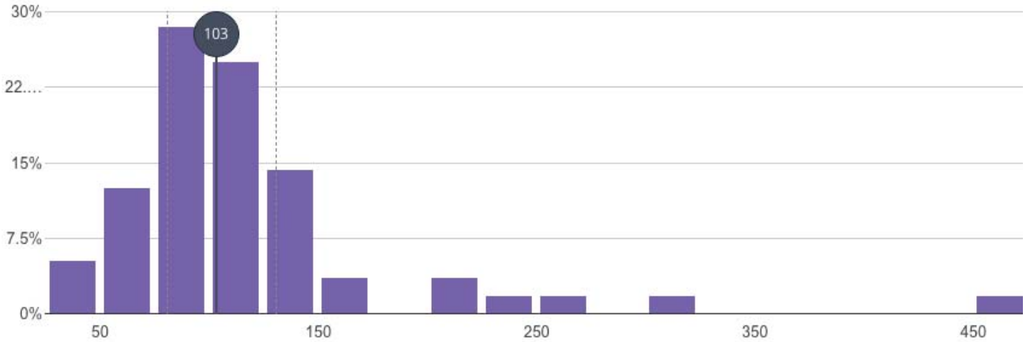


Miami-Dade County Community Fuel Emissions by Type (2005)

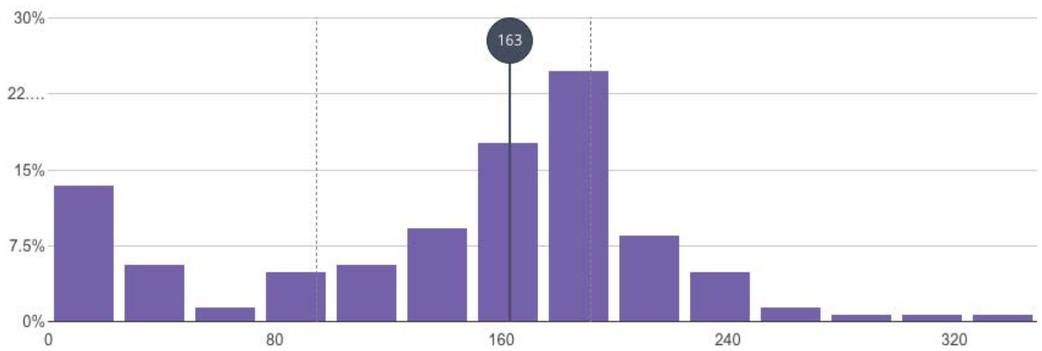


Miami-Dade County Commercial Consumption Projections





Miami, Residential Buildings



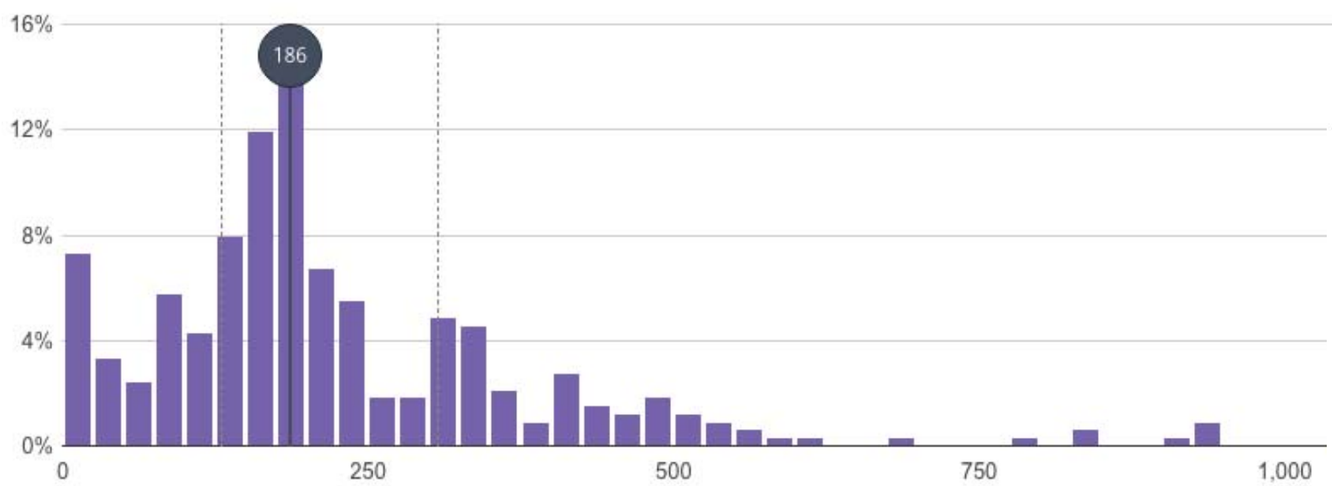
Miami, Office Buildings

Renewable Energy Sources. Florida

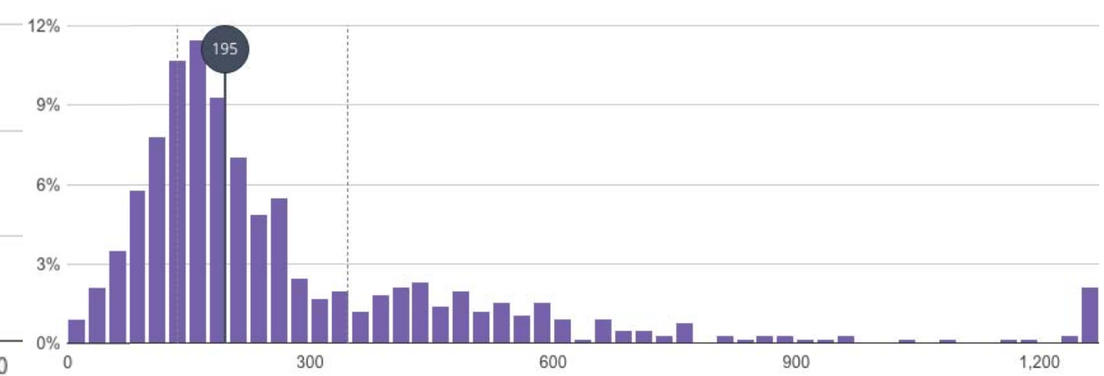
Florida gets only a small portion of its electricity from renewable sources. Most of its renewable energy comes from biomass, with fractions from hydroelectricity generators in the Panhandle and solar energy facilities scattered around the state. Agricultural and municipal solid waste, landfill and waste gas, and waste heat recovery dominate Florida's renewable energy facilities.

Solar power

In 1930s most new homes build in South Florida came equipped with their own solar water heaters. Florida has 85% of the maximum solar energy potential of any place in the country, at 7.2 kilowatt-hours per day. [Florida Solar Energy Center]. The number of solar thermal and photovoltaic (PV) installations in Florida is increasing, thanks to both local initiatives and good solar resources statewide. About one-third of the additional renewable energy capacity expected to be built through 2023 is solar PV.



Miami, Commercial Buildings



USA, Commercial Buildings

Established in 2007, the City of Miami Office of Sustainable Initiatives created the MiPlan - Climate Action Plan with a main target to reduce GHG.

GREEN BUILDING

Green Building - Since 2010 the City has required LEED Silver certification for all new construction over 50,000 square feet. To date, 47 LEED certified projects have been completed within the City.

WATER

Code adopted in 2009 requires use of efficient water fixtures in new construction and restricted landscape irrigation to fixed times and days of the week.

ZONING CODE

In 2010, the City adopted a Smart Growth based zoning code which emphasizes mixed use development around nodes of transportation

MiPlan

WASTE

Miami adopted single stream recycling program in 2012

TRANSPORTATION

Miami has increased alternative transportation options through addition of trolley system serving 5 routed and 36 miles and over 30 miles of bike lines.

ENERGY EFFICIENCY

In City owned buildings, an energy efficiency retrofit program has resulted in cost savings in excess of $320,000 per year to date from energy and maintenance reductions

TREES

city planted over 6,000 trees in the last five years through its tree giveaway programs.

LEED Regional Priority Credit

Renewable Energy Production

Optimize Energy Performance

Bicycle Facilities

Site Development: protect or restore habitat

Light Pollution Reduction

STORMWATER MANAGEMENT????

First LEED certified building in Miami - Hampton Inn and Suites - was build in 2012.

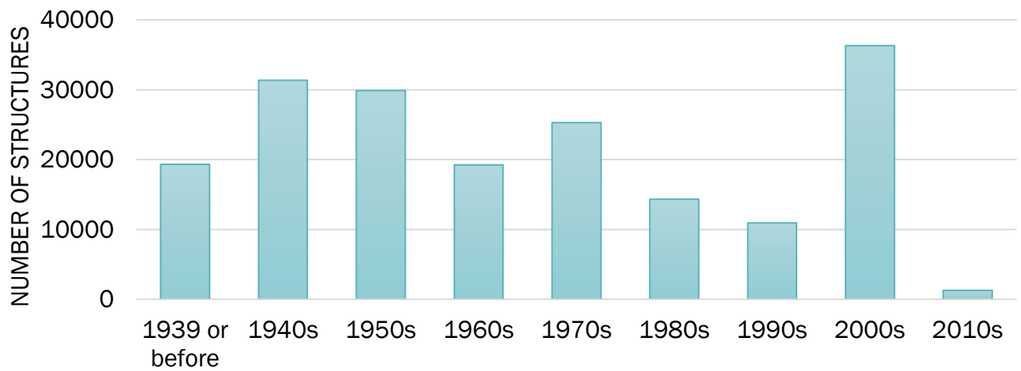
LEED Silver certification or equivalent is required for new construction over 50,000 square feet

45
LEED certified projects in Miami

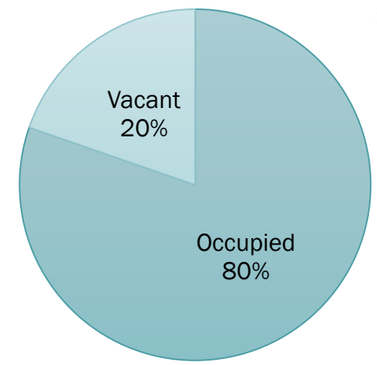
Most of projects are Commercial offices and residential houses, however the list include K-12, restaurants, Industrial projects, and sport arena

PROGRAM_Residential_Miami Statistics

CONSTRUCTION OVER TIME

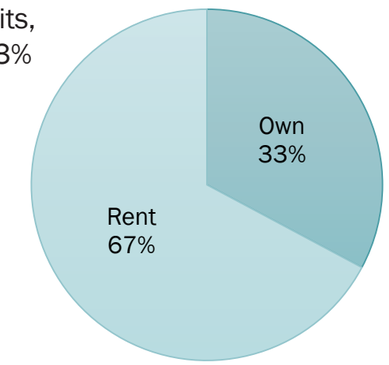


HOUSING OCCUPANCY

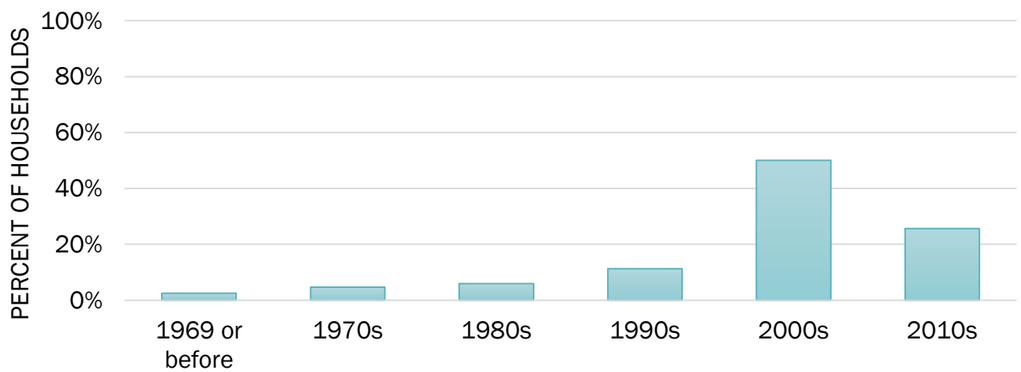


Of the 80% occupied units, 67% are rented while 33% are owner occupied.

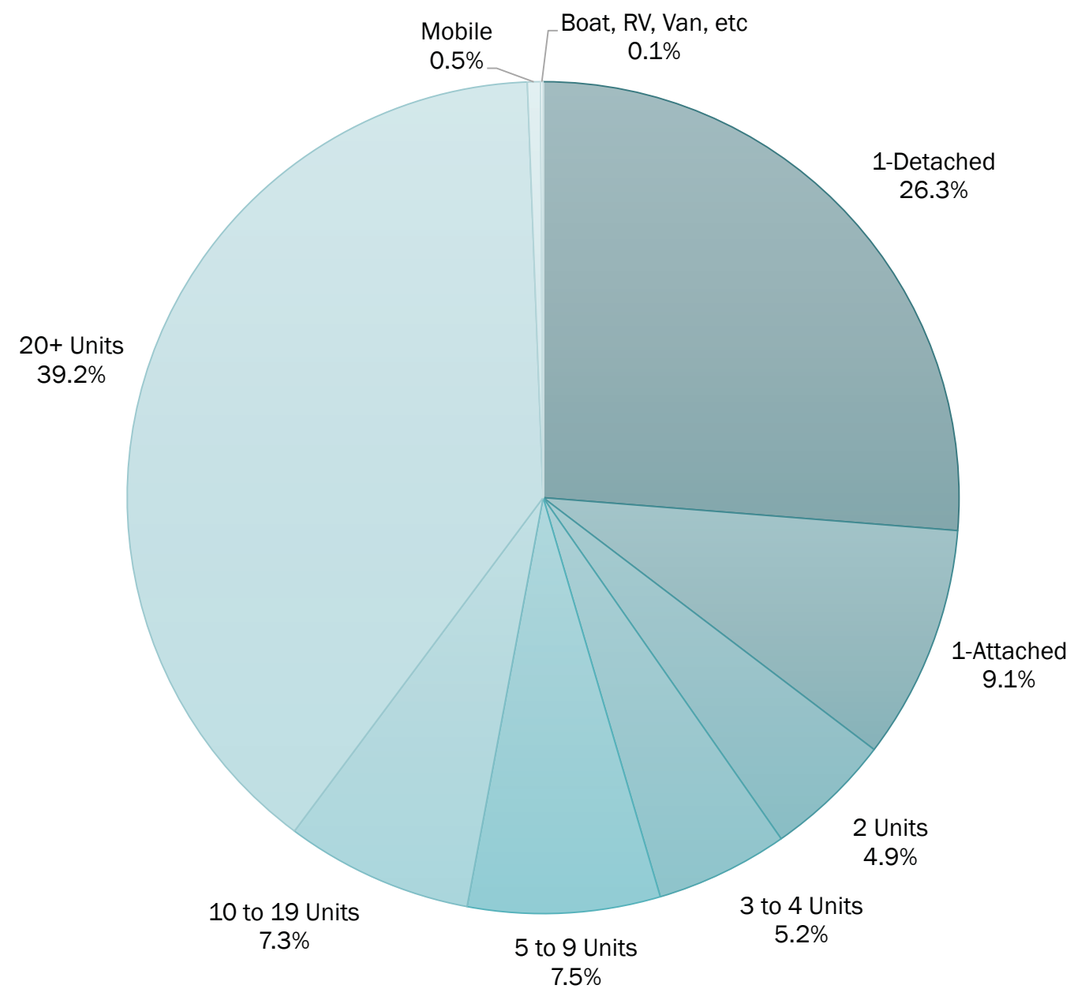
HOUSING TENURE



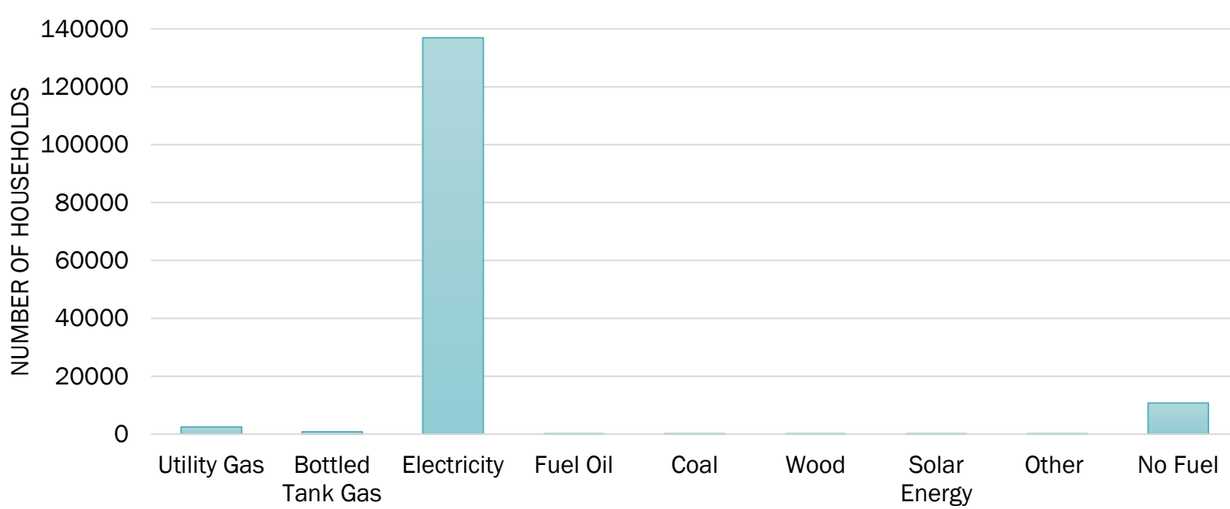
MOVE IN PERIOD



NUMBER OF UNITS IN STRUCTURE

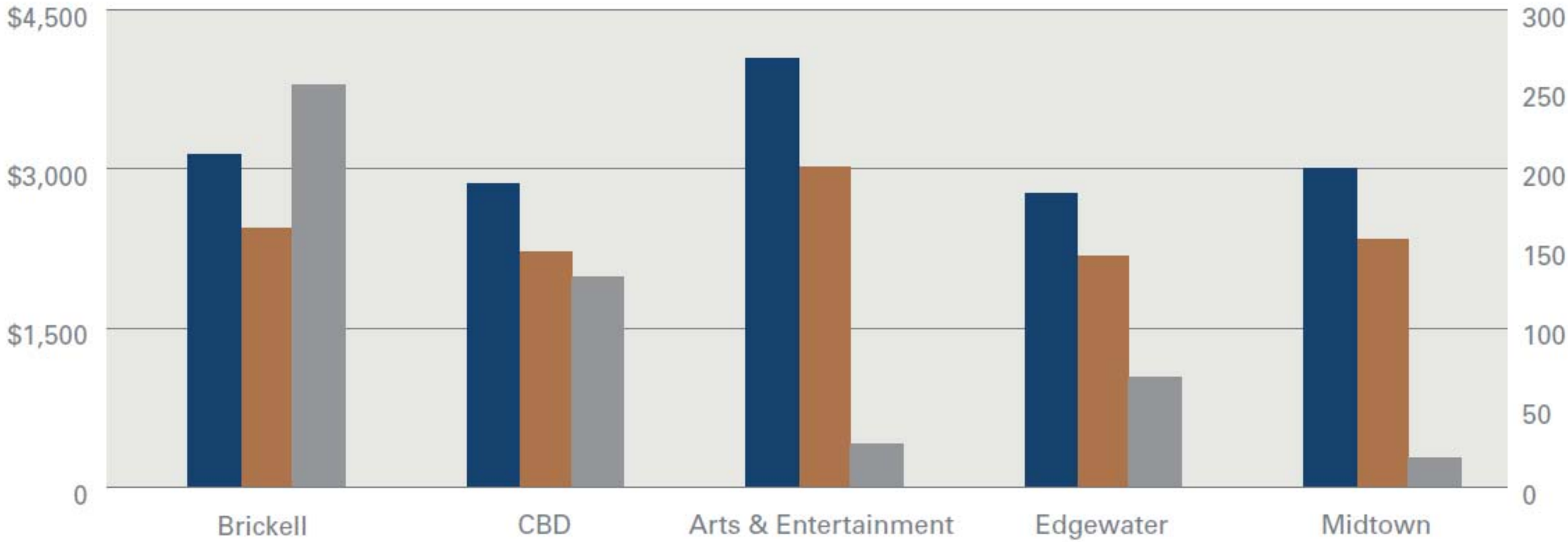


HEATING FUEL TYPE



Average Current Asking vs. Achieved Leasing Price and Monthly Velocity by Submarket (2013-2014)

■ Average Asking Leasing Price ■ Average Achieved Leasing Price ■ # of Leases/Month



	Brickell	CBD	Arts & Entertainment	Edgewater	Midtown
■	$3,133	$2,865	$4,043	$2,775	$3,007
■	$2,435	$2,219	$3,024	$2,185	$2,334
■	252	132	27	69	18