PHOENIX

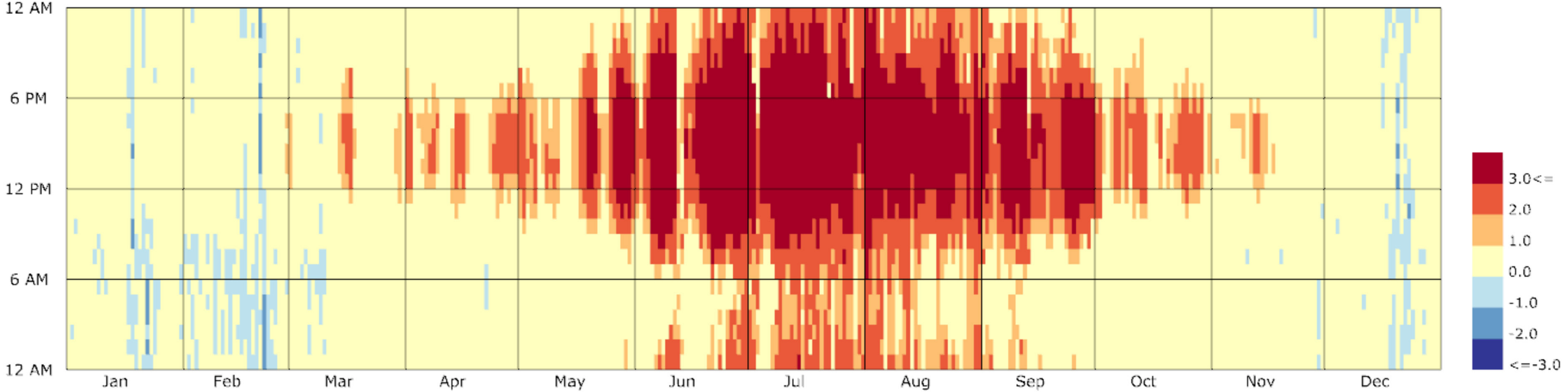
THE NEW CHAUTAUQUA INSTITUTE

MAJED ALBAKR
MUNAZZA BHATTI

PHOENIX, AZ

PHILADELPHIA, PA

1.51 MILLION	POPULATION	1.55 MILLION
38	WALK SCORE	77
○ ● ● ● ●	BLOCK SIZE	● ● ○ ○ ○
○ ○ ○ ● ●	DENSITY	● ● ● ● ●
○ ○ ○ ● ●	TRANSPORTATION	● ● ● ● ○

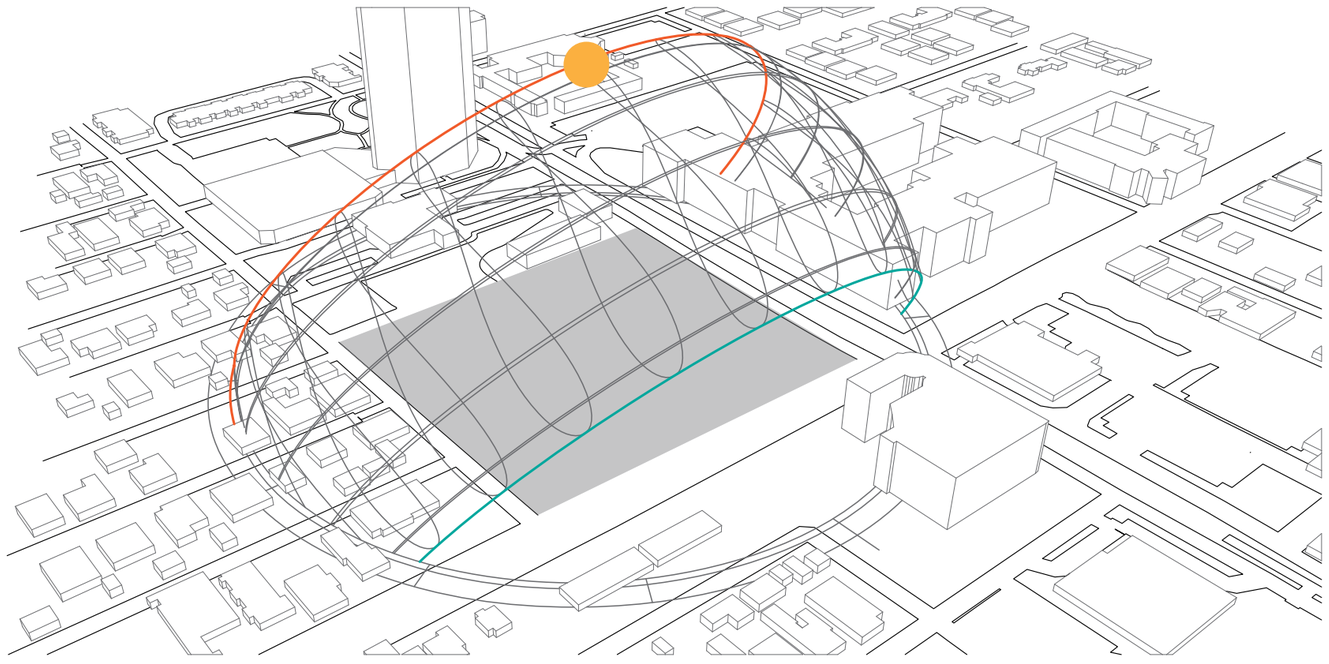


-3 = EXTREME COLD -2 = COLD -1 = COOL 0 = COMFORTABLE 1 = WARM 2 = HOT 3 - EXTREME HEAT

HEAT STRESS 26

% TIME COMFORTABLE 62

COMFORT IN THE SUN



	J	F	M	A	M	J	J	A	S	O	N	D
1 am	49.1	47.6	59.4	62.3	70.4	82.4	86.1	85.3	78.0	64.9	56.0	48.4
2	48.3	46.3	58.4	59.8	68.0	79.9	84.3	83.9	76.9	63.1	54.7	47.2
3	47.1	45.4	57.1	58.2	66.1	77.9	83.1	82.4	75.1	61.8	54.0	46.1
4	46.4	44.2	55.9	56.5	64.1	76.2	81.6	80.9	74.6	60.4	53.3	44.9
5	46.0	43.5	54.5	54.8	62.1	74.1	80.3	79.4	73.6	59.1	52.6	44.3
6	45.7	42.8	53.6	57.7	65.6	74.4	79.9	80.8	72.8	60.3	52.8	44.0
7	45.6	41.7	52.8	60.6	69.1	79.5	82.2	82.3	73.5	61.7	53.1	44.1
8	45.7	42.8	55.9	63.6	72.7	84.4	86.1	83.6	79.2	63.0	53.4	44.7
9	48.1	48.6	61.0	68.3	76.6	89.2	89.6	86.7	84.4	68.4	58.7	48.1
10	51.8	53.6	65.1	72.9	80.5	93.1	92.5	89.7	88.1	73.8	63.9	52.0
11	55.5	57.7	68.3	77.5	84.4	95.3	95.5	92.7	90.9	73.8	69.1	55.4
12 noon	58.6	61.1	71.2	80.2	86.5	98.0	97.6	94.9	93.5	81.7	71.5	57.8
1 pm	61.5	63.4	73.5	82.9	88.7	99.5	99.3	97.0	95.1	84.3	74.0	60.1
2	63.3	65.0	75.2	85.7	90.8	100.7	101.3	99.2	96.7	86.8	76.4	61.6
3	64.5	66.4	76.6	85.7	91.2	102.1	102.6	99.6	97.3	87.0	76.2	62.9
4	64.7	67.0	76.8	85.6	91.5	102.8	103.6	100.0	97.5	87.1	76.1	63.0
5	63.6	66.5	76.5	85.6	91.8	101.7	103.3	100.5	96.7	87.2	75.9	61.5
6	61.0	65.2	75.4	82.3	89.3	101.5	102.2	98.8	95.4	83.5	72.3	58.5
7	58.0	62.4	73.0	78.9	86.8	99.5	99.7	97.0	92.0	79.7	68.6	56.4
8	55.6	59.9	70.9	75.5	84.2	95.2	96.2	95.2	88.5	75.9	64.9	54.3
9	54.1	56.7	67.6	72.8	81.2	92.8	93.4	92.7	85.4	73.3	62.6	52.8
10	53.1	54.3	64.8	70.1	78.3	89.5	91.1	90.3	83.0	70.7	60.3	51.6
11 pm	52.0	51.9	62.9	67.3	75.4	87.5	89.2	87.8	80.7	68.1	58.0	50.7
12 mid	50.5	50.5	60.8	64.9	73.0	84.7	87.8	86.5	79.1	66.3	56.8	49.6

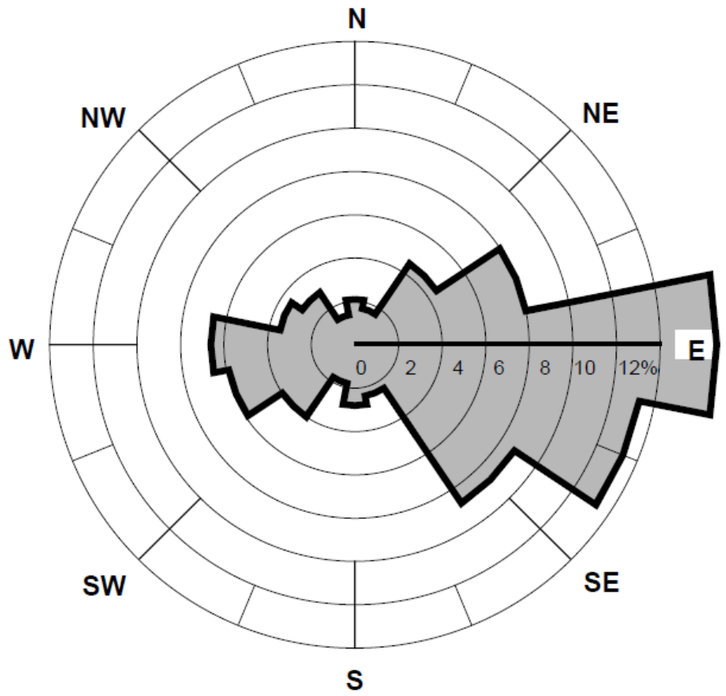
Cold	Cool	Comfort	Hot
<32	32-64.9	65-79.9	≥ 80

Temperature Calendar, Outdoor Space
Mean Hourly Dry Bulb Temperature, (F°)

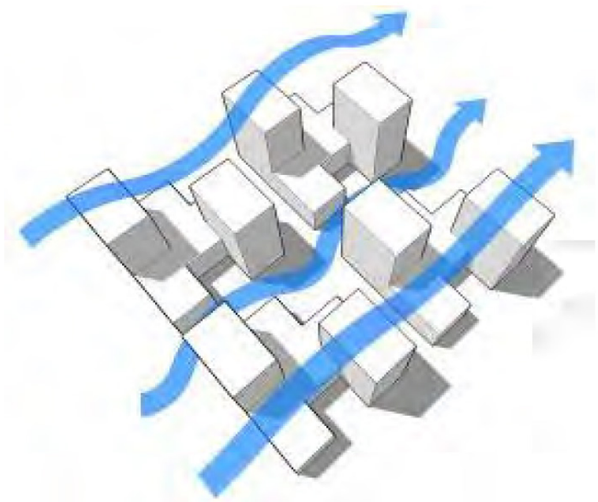
	J	F	M	A	M	J	J	A	S	O	N	D
1 am	C M	C M	C M	C M	C M	O M	O M	O M	O M	C M	C M	C M
2	C M	C M	C M	C M	C M	O M	O M	O M	O M	C M	C M	C M
3	C M	C M	C M	C M	C M	O M	O M	O M	O M	C M	C M	C M
4	C M	C M	C M	C M	C M	O M	O M	O M	O M	C M	C M	C M
5	C M	C M	C M	C M	C M	O M	O M	O M	O M	C M	C M	C M
6	C M	C M	C M	C M	C M	O M	O M	O M	O M	C M	C M	C M
7	C M	C M	C M	C M	O M	O M	O M	O M	O M	C M	C M	C M
8	C M	C M	C M	O M	O M	O M	O M	O M	O M	C M	C M	C M
9	C M	C M	O M	O M	O M	O M	H M	O M	O M	O M	C M	C M
10	C M	O M	O M	O M	O M	H M	H M	H M	O M	O M	O M	C M
11	O M	O M	O M	O M	O M	H M	H M	H M	O M	O M	O M	O M
12 noon	O M	O M	O M	O D	O D	H D	H M	H M	H M	O M	O M	O M
1 pm	O M	C M	O M	O D	O D	H D	H M	H M	H M	O M	O M	O M
2	O M	O M	O M	O D	O D	H D	H M	H M	H M	O M	O M	O M
3	O M	O M	O M	O D	O D	H D	H M	H M	H M	O D	O M	O M
4	O M	O M	O M	O D	O D	H D	H M	H M	H M	O D	O M	O M
5	C M	O M	O M	O D	O D	H D	H M	H M	H M	O D	O M	C M
6	C M	C M	O M	O D	O D	H D	H M	H M	O M	O M	C M	C M
7	C M	C M	O M	O D	O D	H M	H M	H M	O M	O M	C M	C M
8	C M	C M	O M	O D	O D	H M	H M	O M	O M	O M	C M	C M
9	C M	C M	O M	O M	O D	O D	O M	O M	O M	O M	C M	C M
10	C M	C M	C M	O M	O M	O D	O M	O M	O M	O M	C M	C M
11	C M	C M	C M	O M	O M	O M	O M	O M	O M	O M	C M	C M
12 mid	C M	C M	C M	C M	O M	O M	O M	O M	O M	O M	C M	C M

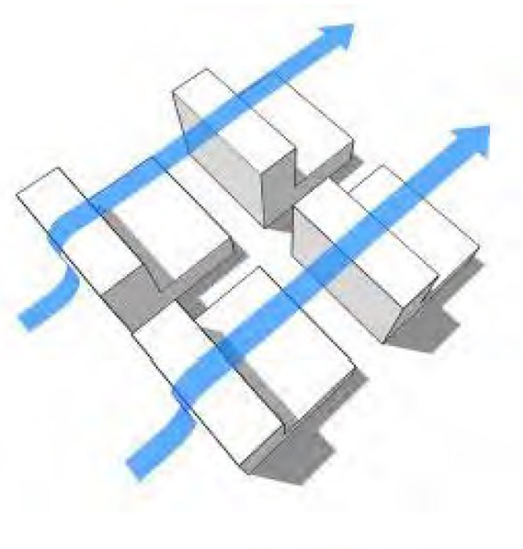
Humidity	Temperature: Hot	Comfort	Cold
Dry	HD	OD	CD
Moderate	HM	OM	CM
Humid	HH	OH	CH

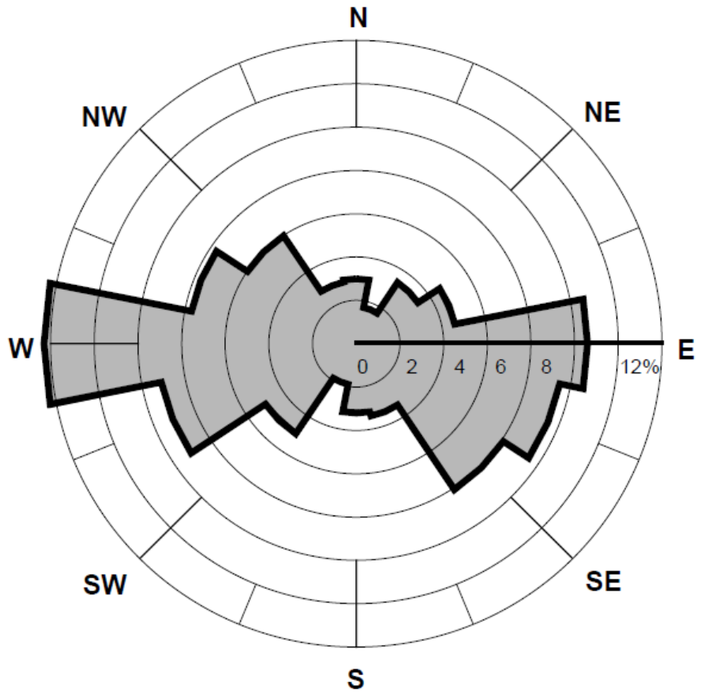
Bioclimatic Calendar (Expanded for Wind and Radiation)
based on temperature + humidity, referenced to bioclimatic chart



Wind Rose: January







Wind Rose: July

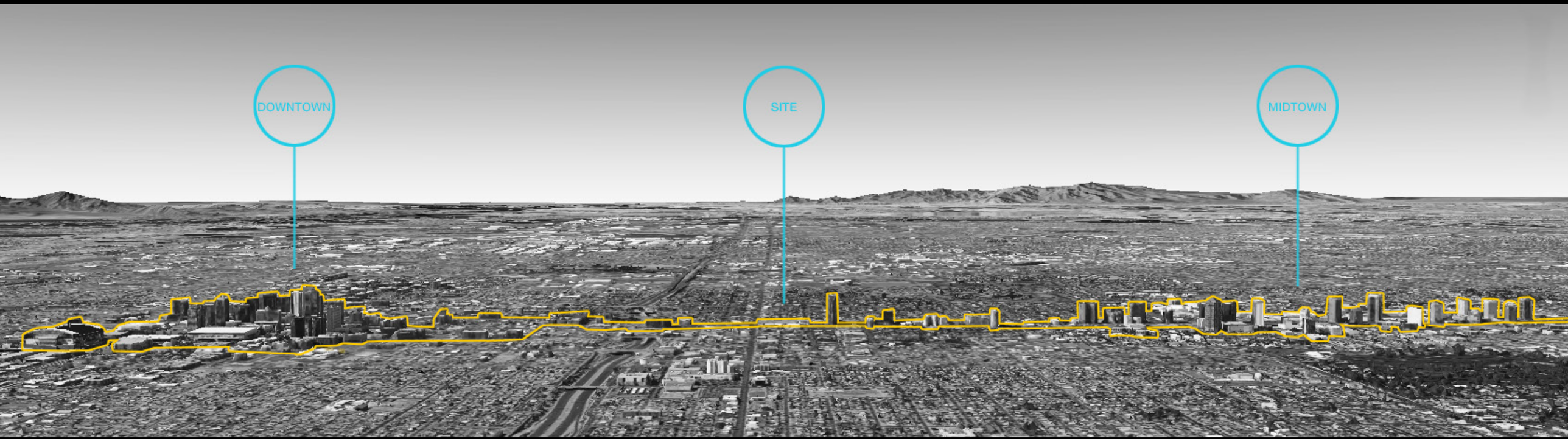
	J	F	M	A	M	J	J	A	S	O	N	D
1 am	WSW 2.1	N 3.0	N 2.7	E 2.9	N 2.8	E 2.8	E 3.3	ESE 3.4	E 3.5	N 2.5	N 2.6	E 2.3
2	E 2.4	SE 3.2	W 2.7	N 2.9	NNE 2.8	N 2.2	E 3.2	N 3.4	E 3.2	E 2.5	E 2.6	E 2.3
3	ESE 2.2	W 3.2	ESE 2.8	E 2.9	N 2.8	N 2.7	ESE 3.1	ESE 3.3	W 3.1	SE 2.7	ESE 2.7	E 1.8
4	E 2.5	W 3.1	E 3.1	E 2.8	E 2.8	NNW 2.6	N 3.0	ESE 3.2	ESE 2.8	ESE 2.9	ESE 2.8	E 1.7
5	WSW 2.9	SE 3.3	E 3.1	WNW 2.8	E 2.8	E 2.9	N 2.7	WSW 3.2	ESE 3.0	ESE 3.0	E 2.8	E 1.7
6	ESE 2.7	E 3.3	N 3.3	ESE 3.1	ESE 3.0	SE 2.7	ESE 2.6	W 3.1	E 2.6	E 3.1	W 2.9	ESE 1.6
7	ESE 2.8	W 3.0	E 3.5	E 3.4	ESE 3.1	SE 3.3	WSW 2.7	E 3.1	WSW 2.8	E 3.2	E 2.9	ESE 1.7
8	WSW 2.5	WSW 3.2	WSW 3.3	E 3.7	E 3.4	E 3.4	E 2.9	E 3.1	W 3.2	E 3.2	E 2.9	ESE 2.1
9	W 2.8	W 3.5	ESE 3.5	WSW 3.5	E 3.2	W 3.8	E 3.1	SE 3.0	SE 4.0	W 3.2	W 3.0	WSW 2.4
10	E 3.1	ESE 3.5	W 3.3	W 3.3	W 3.1	E 3.8	ESE 3.3	ESE 3.0	E 3.8	W 3.2	W 3.2	W 2.6
11 am	E 2.9	W 3.5	W 3.6	N 3.1	ESE 3.0	E 4.2	W 3.5	W 2.9	SE 3.6	W 3.3	SW 3.3	E 3.2
12 noon	W 2.9	W 3.7	N 3.0	E 3.4	E 3.3	E 4.1	W 3.7	E 3.3	W 3.5	W 3.2	W 3.1	E 3.4
1 pm	N 2.7	ESE 3.2	NW 3.0	ESE 3.6	N 3.6	W 4.3	ESE 3.7	W 3.7	WNW 3.4	ESE 3.2	W 3.0	W 3.2
2	W 2.8	E 3.2	WSW 3.7	NW 3.9	WNW 3.9	W 4.8	WNW 4.6	N 4.1	ESE 3.7	W 3.2	WSW 2.8	W 2.9
3	NE 2.8	N 3.4	W 3.8	W 4.1	SE 4.2	E 4.4	S 4.9	W 4.2	WNW 3.6	S 3.3	E 2.7	E 3.2
4	E 2.7	SSE 3.6	W 4.1	W 4.2	E 4.5	NNW 4.7	S 5.0	ESE 4.2	N 3.4	ESE 3.4	W 2.5	ESE 3.0
5	ESE 2.7	ESE 3.6	E 4.4	ESE 4.4	N 4.8	SE 5.1	ENE 5.1	ENE 4.2	E 3.4	ESE 3.5	E 2.4	ESE 2.7
6	ESE 2.0	S 3.5	W 4.5	SW 3.9	NW 4.3	W 5.2	ESE 5.2	ESE 4.1	E 3.5	ESE 3.1	ESE 2.2	E 2.2
7	SE 2.2	E 3.2	ESE 3.3	ESE 3.4	SE 3.8	E 4.5	E 5.5	ESE 4.0	E 3.1	E 2.6	W 2.0	WNW 1.7
8	NE 2.1	ESE 2.6	W 2.7	E 2.9	ESE 3.4	E 3.8	E 4.4	E 3.9	E 2.8	ESE 2.2	E 1.8	E 1.7
9	ESE 1.6	ESE 2.2	E 2.5	E 2.9	E 3.2	E 2.9	ESE 3.9	SE 3.8	E 2.4	E 2.2	E 2.1	E 1.8
10	ESE 1.8	ESE 2.2	E 2.6	E 2.9	E 3.0	E 2.9	SE 3.7	E 3.7	E 3.0	W 2.3	E 2.3	E 2.1
11 pm	N 2.1	N 2.9	N 2.6	N 2.9	E 2.8	N 2.8	N 3.4	E 3.6	E 3.0	ESE 2.4	E 2.6	ESE 2.4
12 mid	E 2.5	E 3.1	W 2.8	W 2.9	W 2.8	ENE 2.8	N 3.5	N 3.5	N 3.6	N 2.5	WSW 2.6	W 2.6

0-5 | 5.1-9 | 9.1-12 | >12

Wind Conditions Calendar (CITY CENTER)
Most Frequent Wind Direction & Mean Hourly Wind Speed (mph)

SITE
SOLUTIONS

SITE & PROGRAM



_DEVELOP A MODEL FOR PHOENIX TO PROMOTE A HEALTHY ENVIRONMENT FOR RESIDENTIAL AND COMMERCIAL USE

1 INCREASE WALKABILITY
2 CONVENIENT HOUSING
3 COOLER ATMOSPHERE

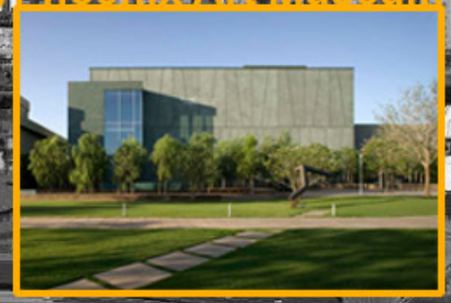
TRANSPORTATION

SITE

Phoenix Theater

Burton Barr Library

Phoenix Art Museum



Arizona School for the Arts

500 m

Arizona Jewish Historical Society

Phoenix Trolley Museum

Phoenix Center for the Arts

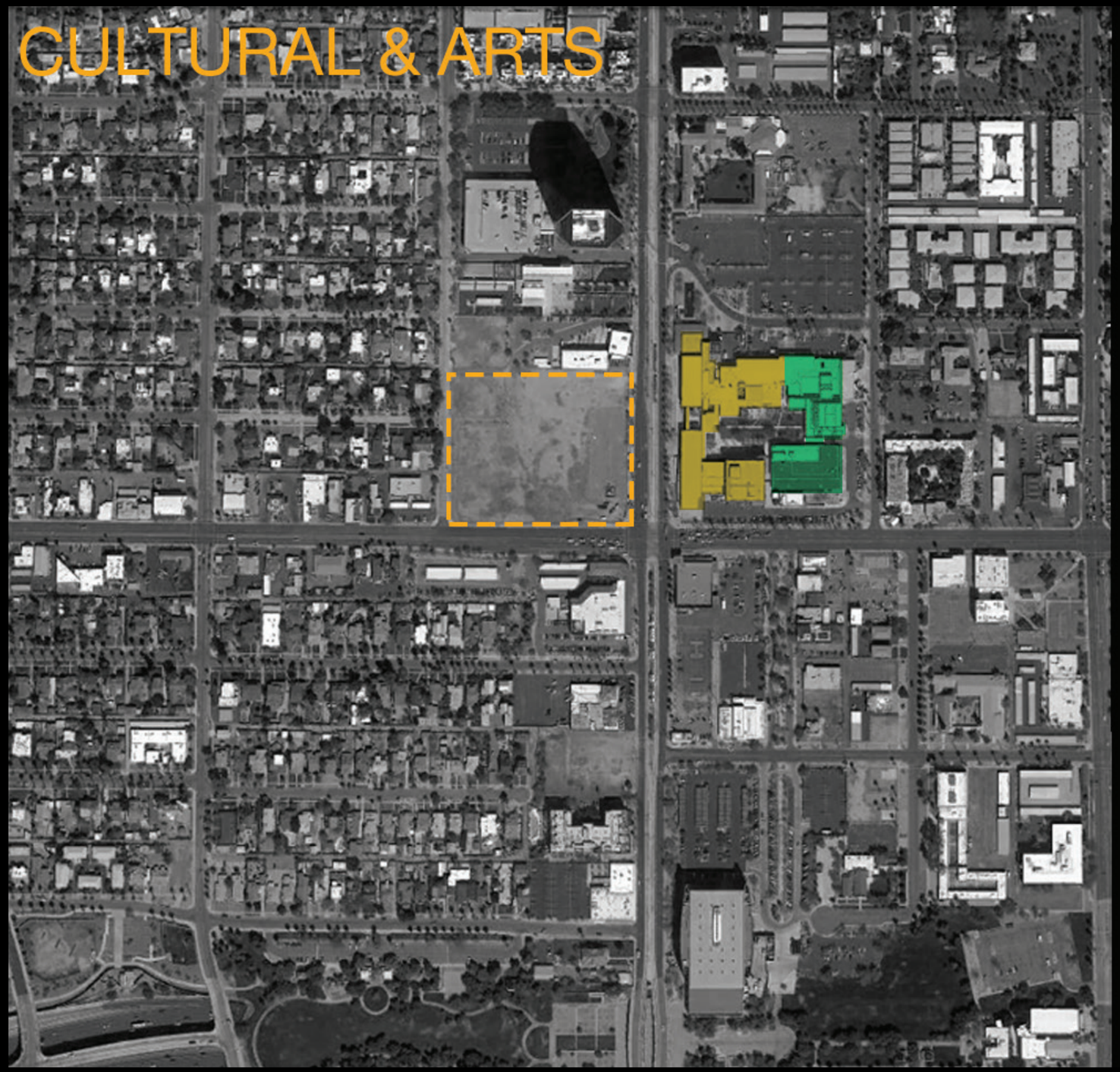
Great Arizona Puppet Theater

The Irish Cultural Center

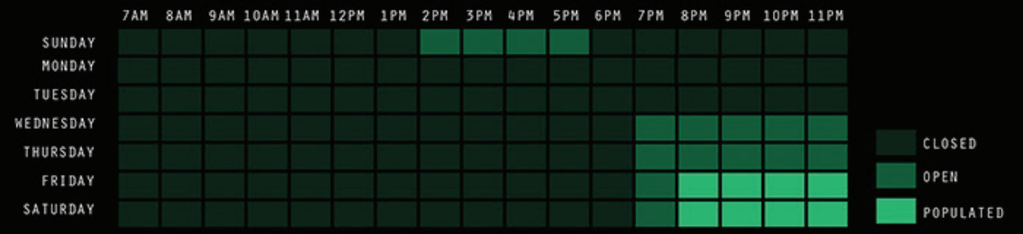
The Firehouse

1000 m

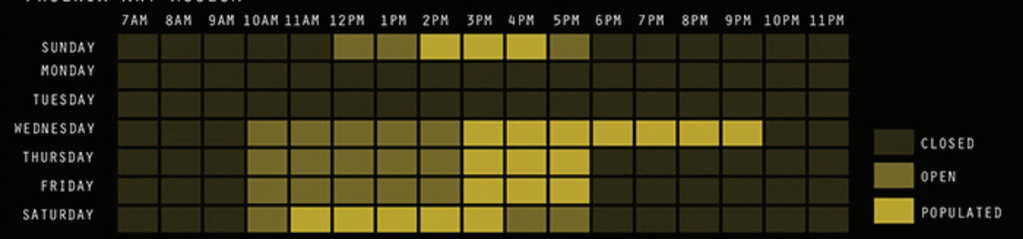
CULTURAL & ARTS



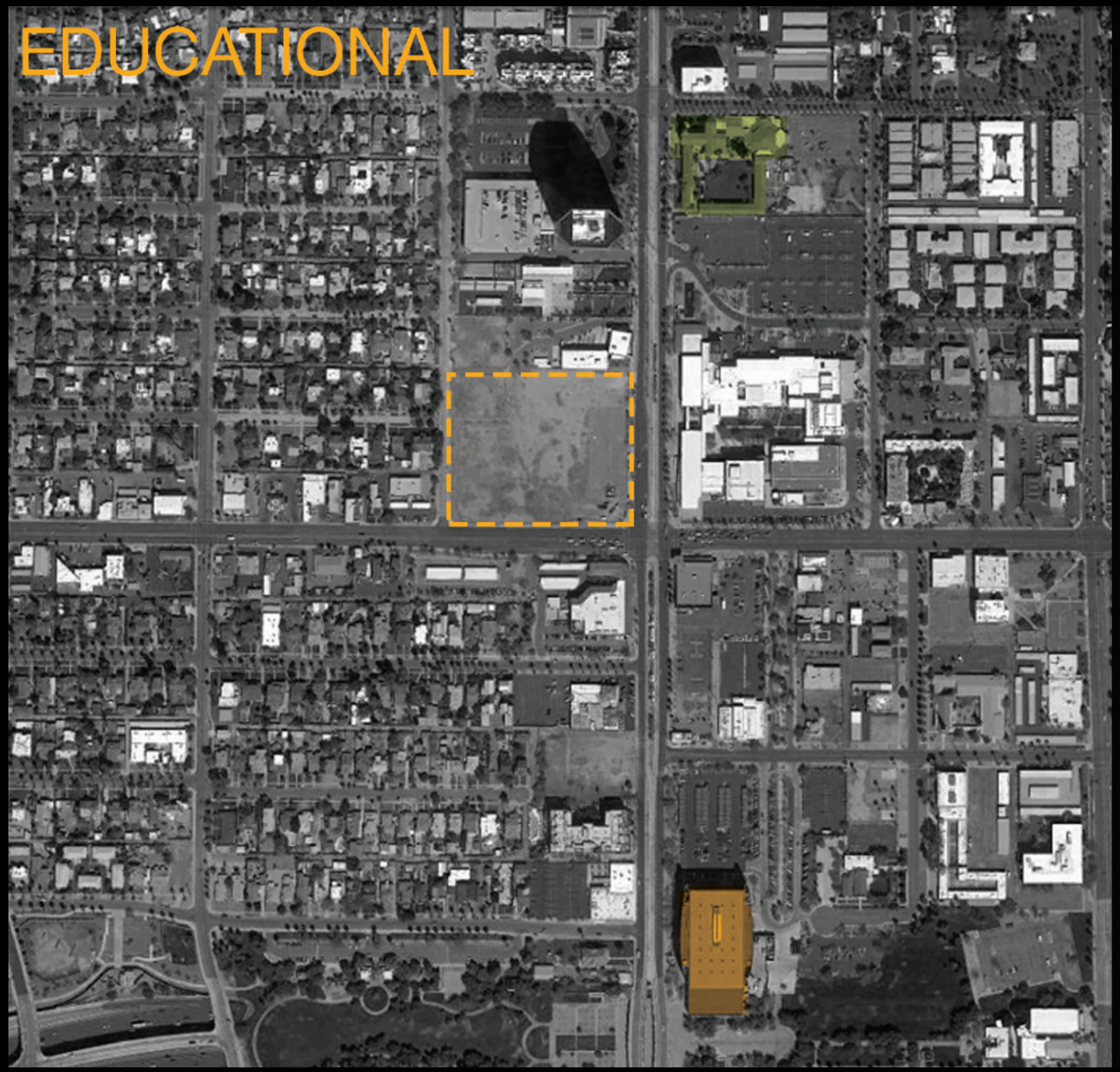
PHOENIX THEATER

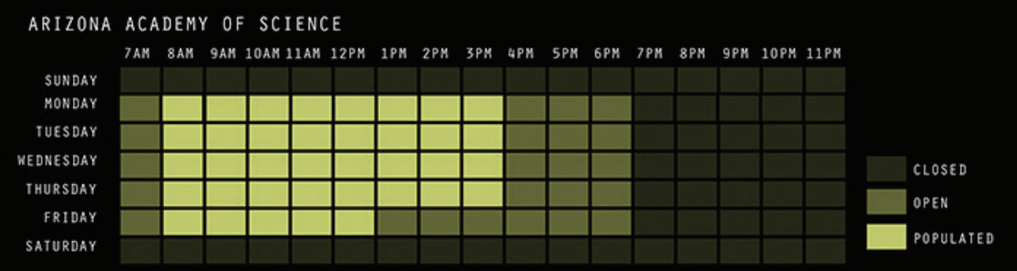


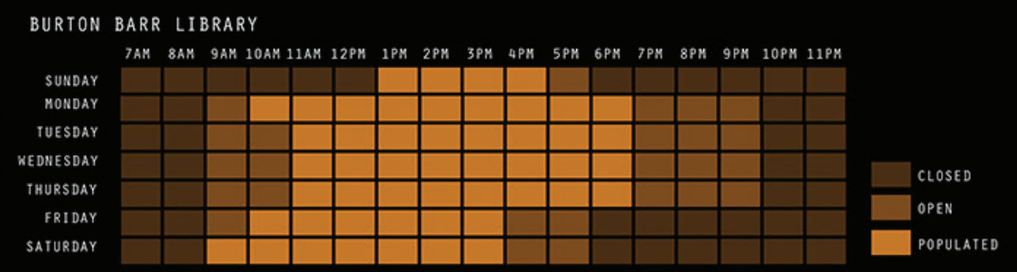
PHOENIX ART MUSEUM



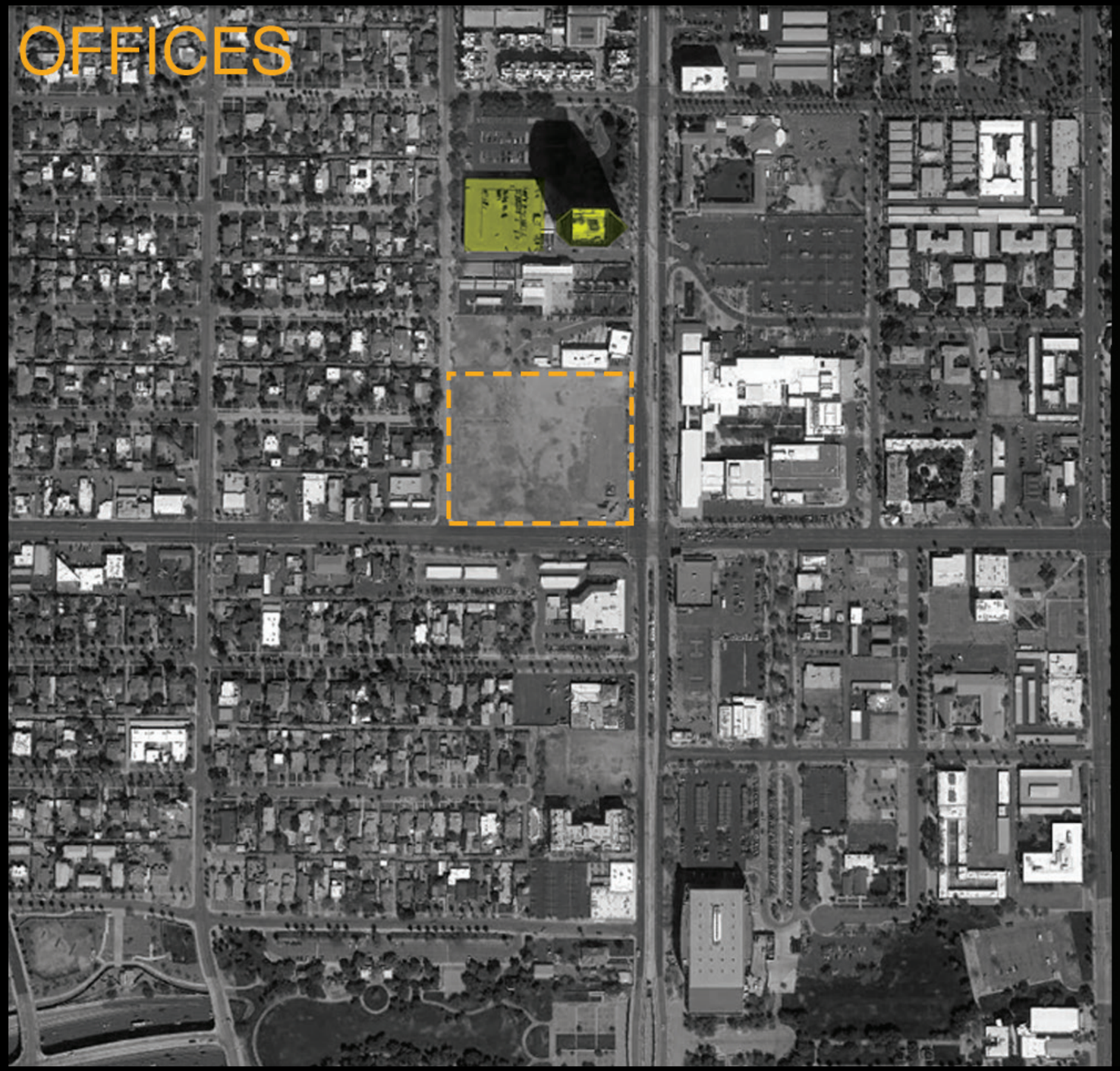
EDUCATIONAL







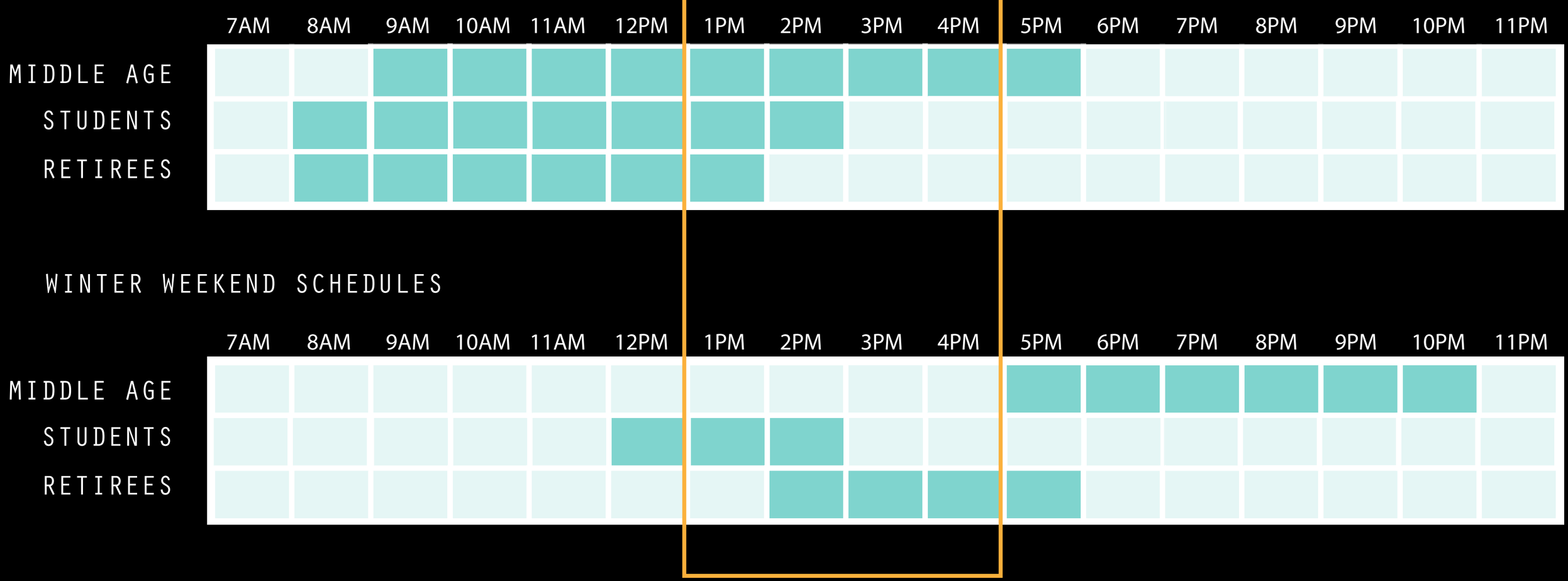
OFFICES



VIAD CORPORATIONS
RR DONNELLEY

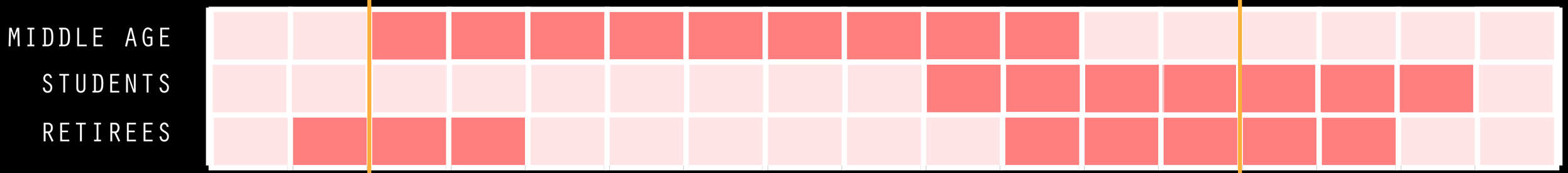
37.7% 0-24
53.3% 25-64
9.1% 65 AND OVER

WINTER WEEKDAY SCHEDULES

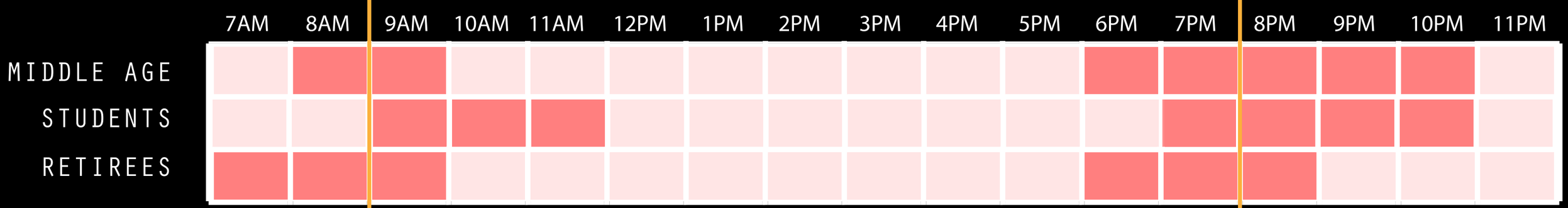


WINTER WEEKEND SCHEDULES

SUMMER WEEKDAY SCHEDULES

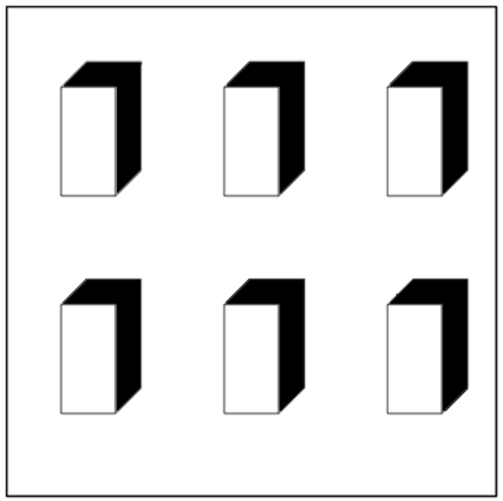


SUMMER WEEKEND SCHEDULES

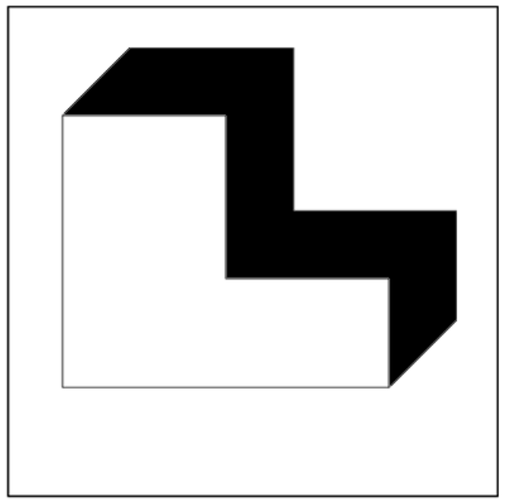



CONNECTION
Image Landsat
Google

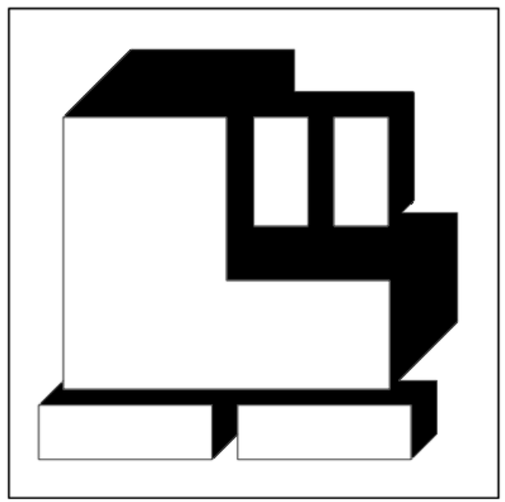
URBAN DENSITY



TYPICAL RESIDENTIAL FABRIC
(MINIMAL SHADING)



TYPICAL COMMERCIAL BUILDING
(ACCEPTABLE SHADING)



NARROW FABRIC OF MULTIPLE
BUILDINGS
(SUFFICIENT SHADING)

PRIMARY

15 FT

SECONDARY

12 FT

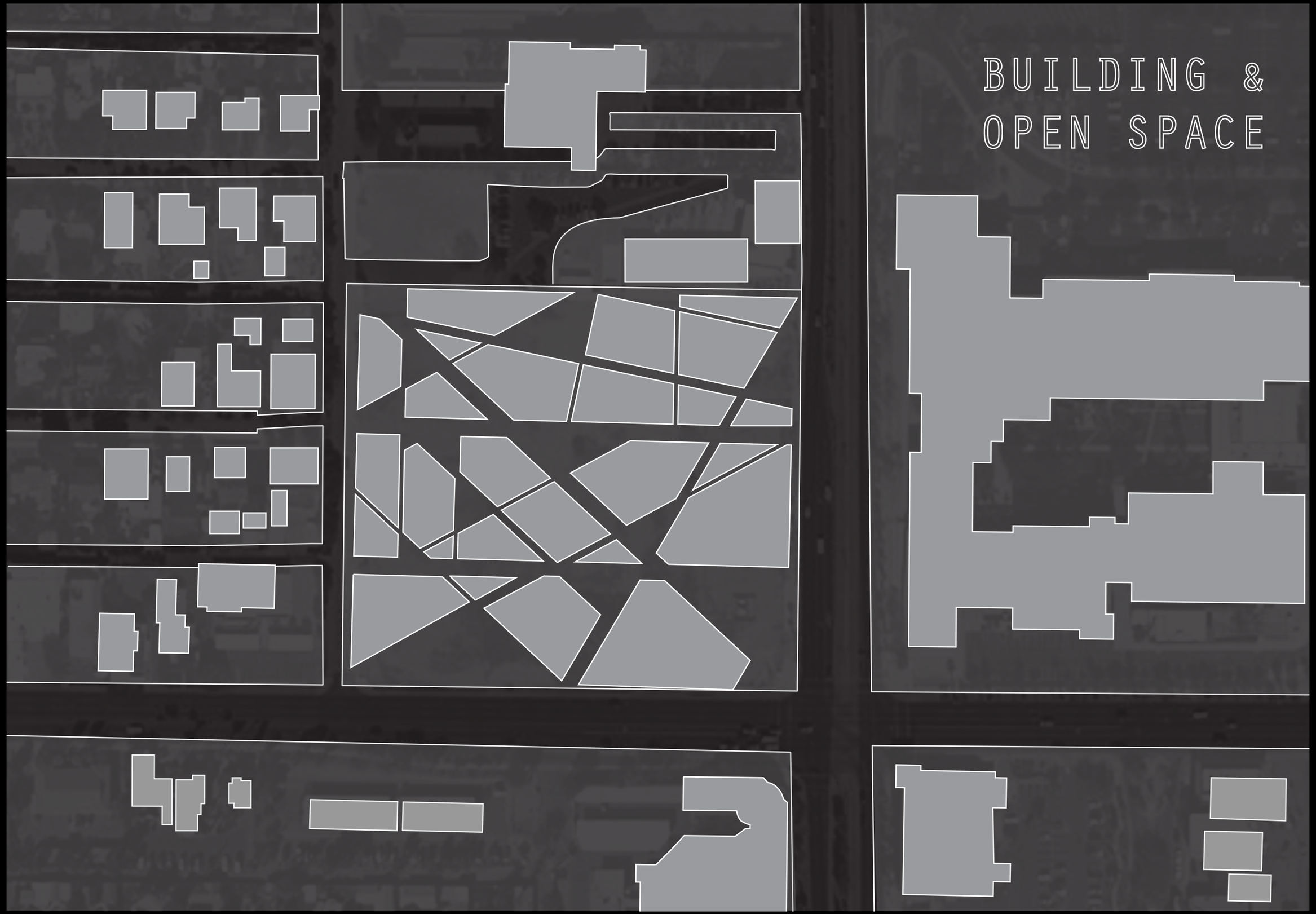

TERTIARY
9 FT

BUILDING SIZE

< 5,000 sqft

> 15,000 sqft

BUILDING & OPEN SPACE

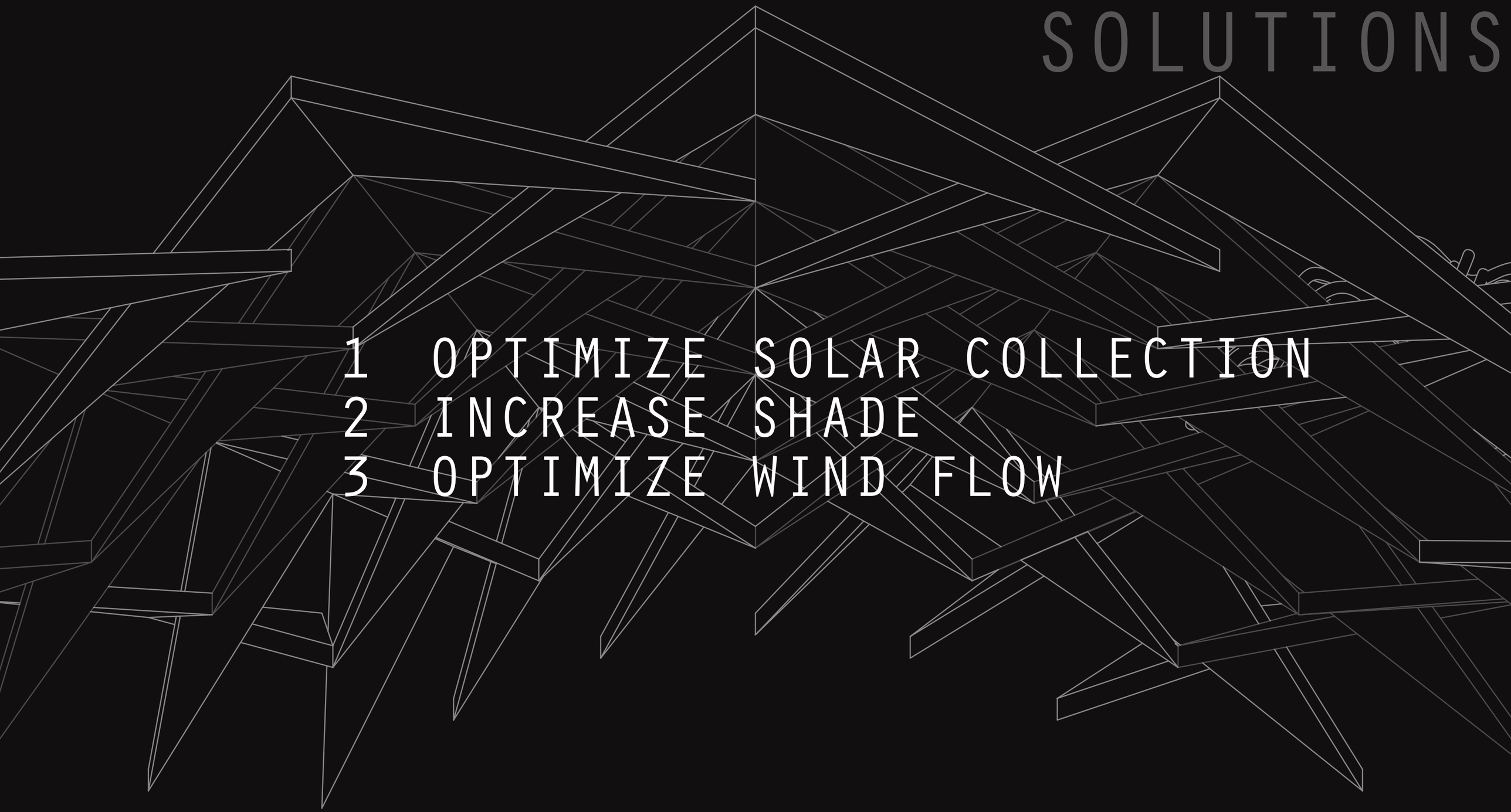


PROGRAM

RESIDENTIAL

COMMERCIAL

ENVIRONMENTAL SOLUTIONS



1 OPTIMIZE SOLAR COLLECTION
2 INCREASE SHADE
3 OPTIMIZE WIND FLOW

TO OBTAIN A FURTHER UNDERSTANDING ABOUT ON HOW TO CREATE THE IDEAL CONDITIONS IN THE SITE, AN INVESTIGATION HAS BEEN CONDUCTED USING “DESIGN EXPLORER” TO DETERMINE WHICH COMBINATION OF VARIABLES ARE CAPABLE OF ACHIEVING THE DESIRED CONDITIONS, WHICH ARE:

- INCREASING OUTDOOR COMFORT
- DECREASING HEAT STRESS
- SUFFICIENT INDOOR DAYLIGHTING

OUTPUTS

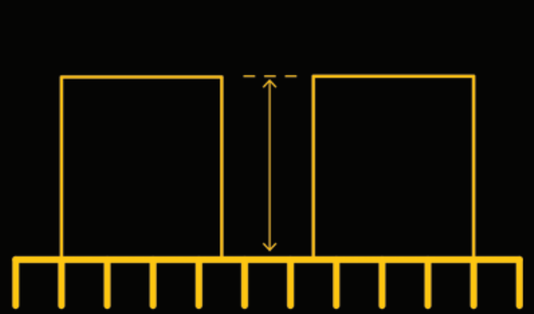
AVG TIME COMFORTABLE BETWEEN BUILDINGS (APR - OCT)

HEAT STRESS BETWEEN BUILDINGS (APR-OCT)

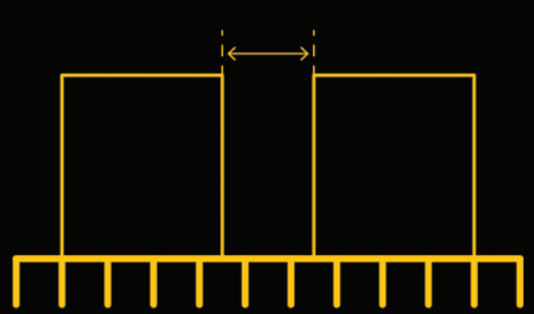
BUILDING A : AVG DAYLIGHT FACTOR ABOVE 2%

BUILDING B : AVG DAYLIGHT FACTOR ABOVE 2%

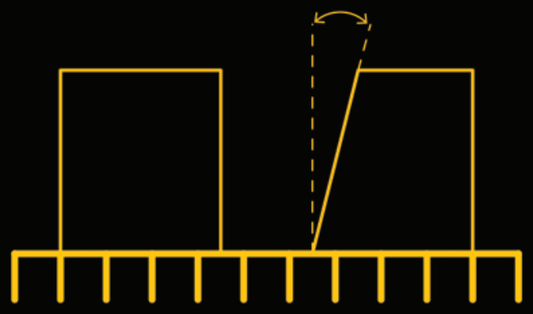
PARAMETERS TO INVESTIGATE:



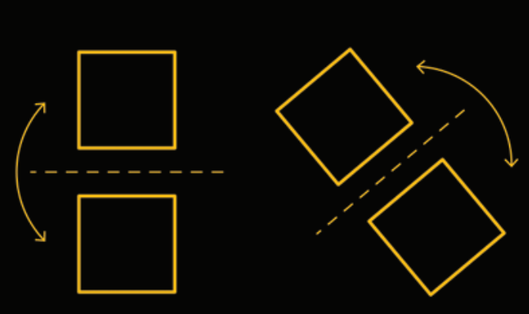
HEIGHT



DISTANCE

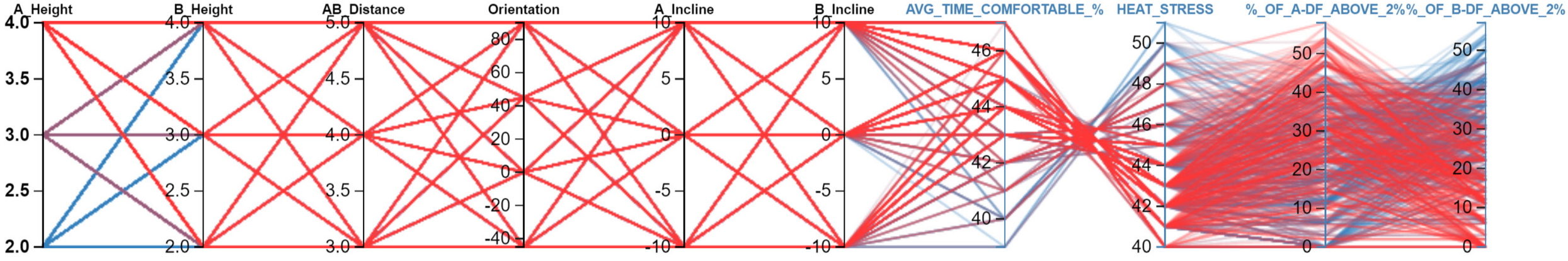


INCLINATION

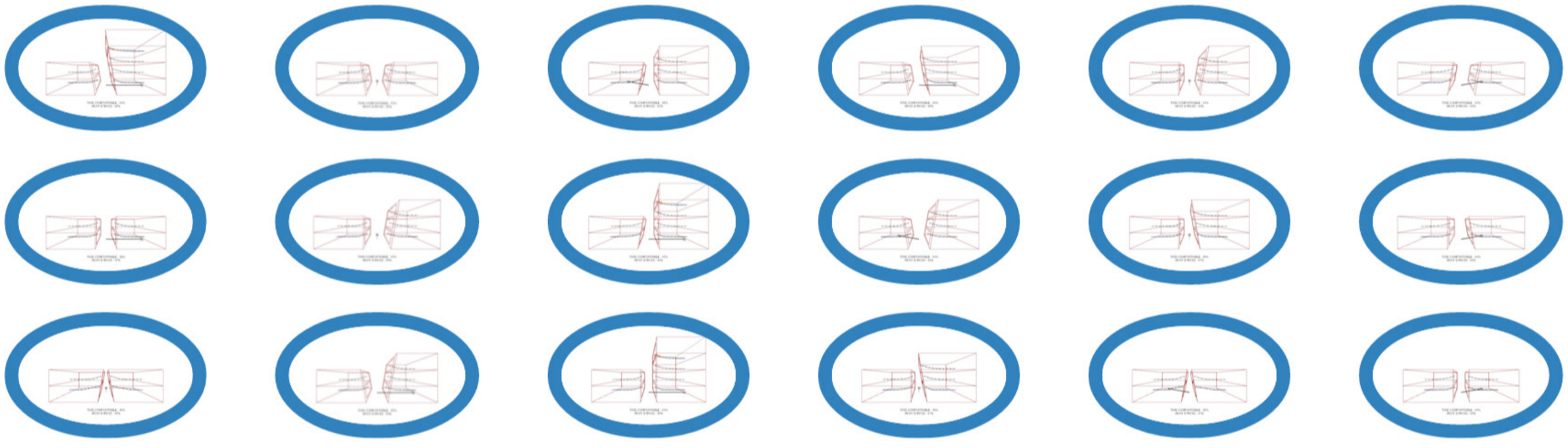


ORIENTATION

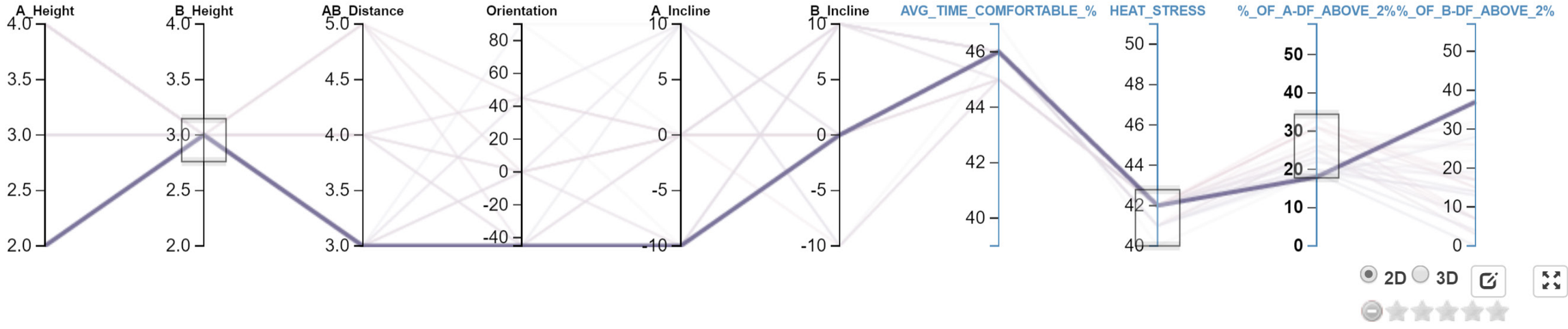
DesignExplorer

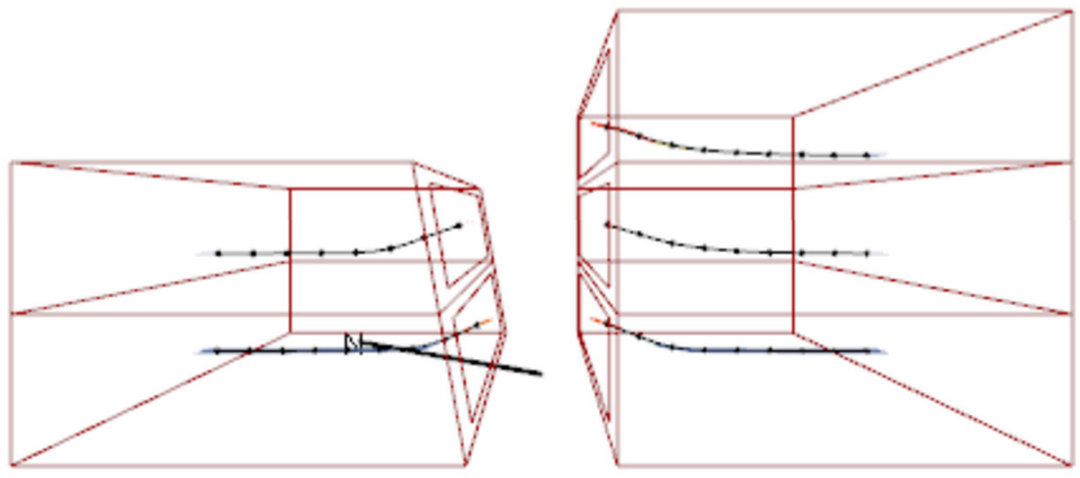


AVERAGE TIME COMFORTABLE AND HEAT STRESS
BETWEEN APRIL 01 TO OCTOBER 31

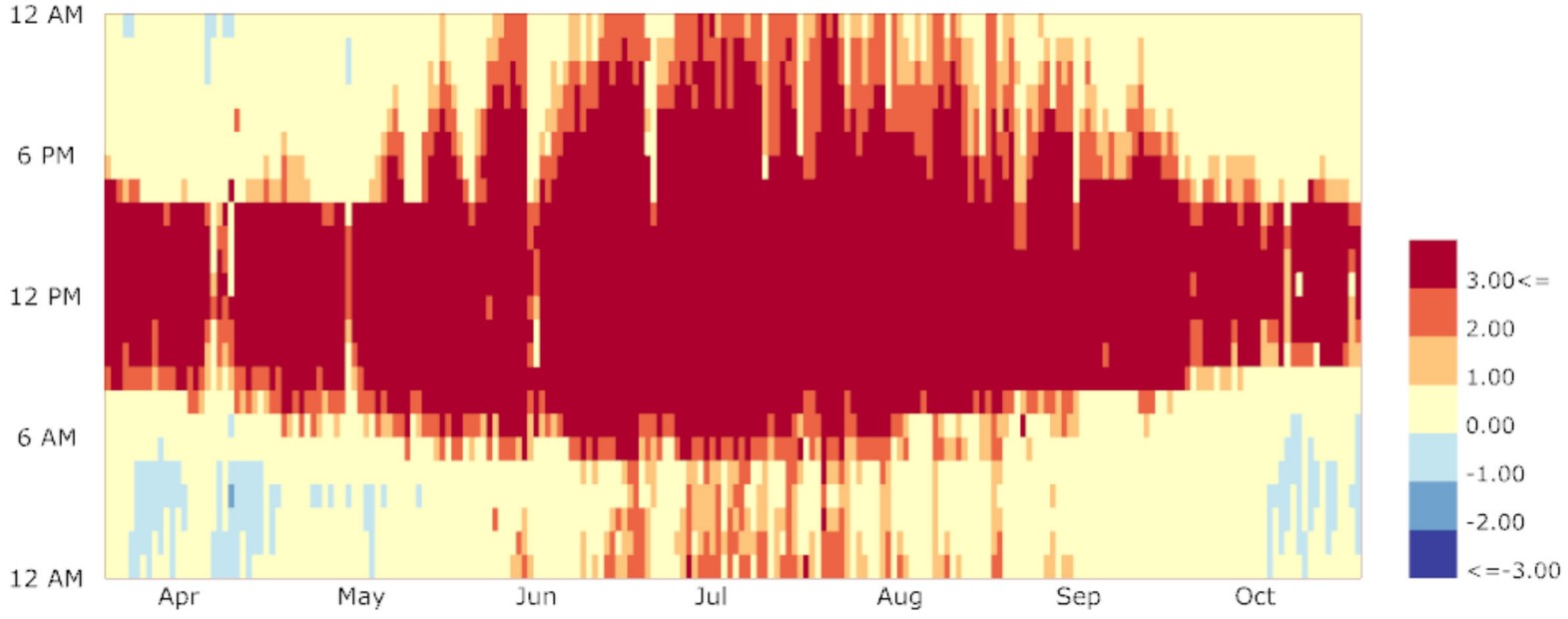


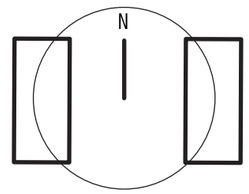
AVERAGE TIME COMFORTABLE AND HEAT STRESS BETWEEN APRIL 01 TO OCTOBER 31

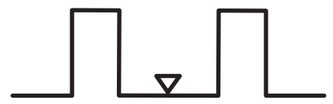




TIME COMFORTABLE : 46%
HEAT STRESS : 42%



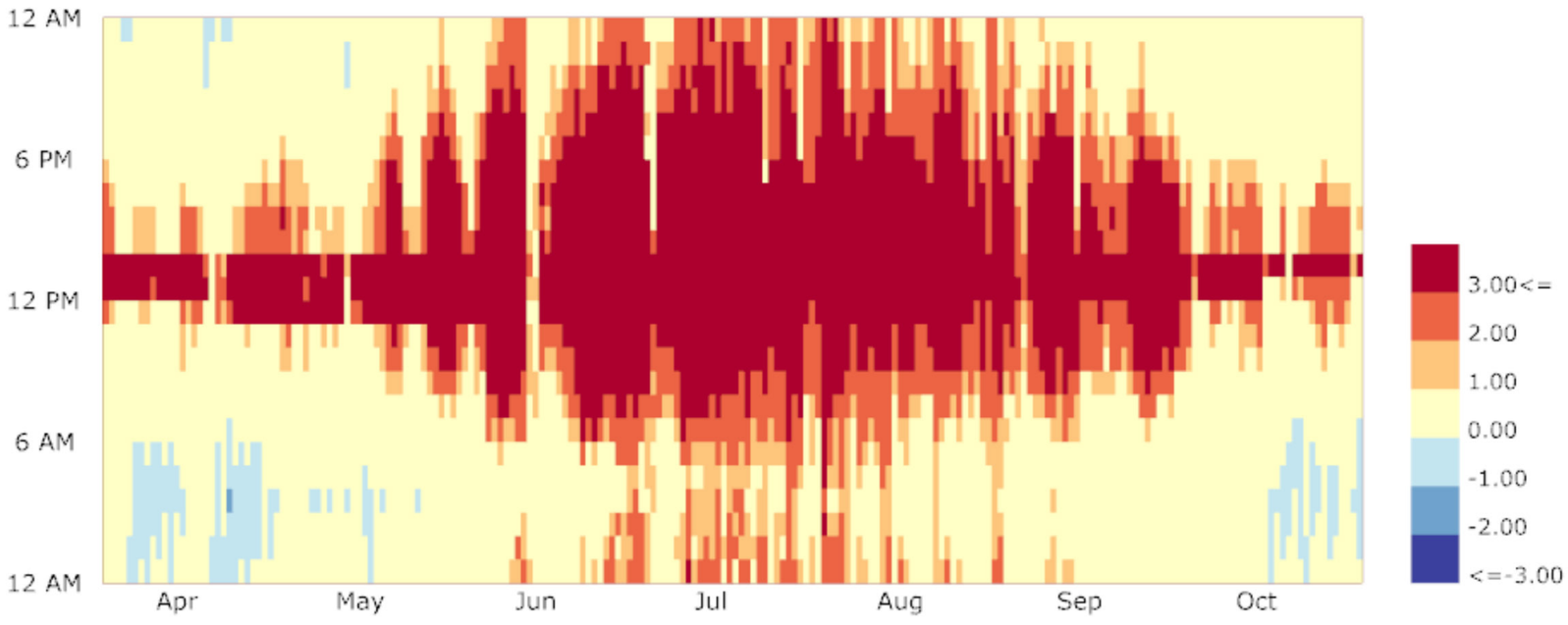


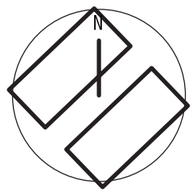


BASE CASE

BETWEEN APRIL 01 TO OCTOBER 31
AVG TIME COMFORTABLE : 37%
HEAT STRESS : 53%

-3 = EXTREME COLD -2 = COLD -1 = COOL 0 = COMFORTABLE 1 = WARM 2 = HOT 3 - EXTREME HEAT



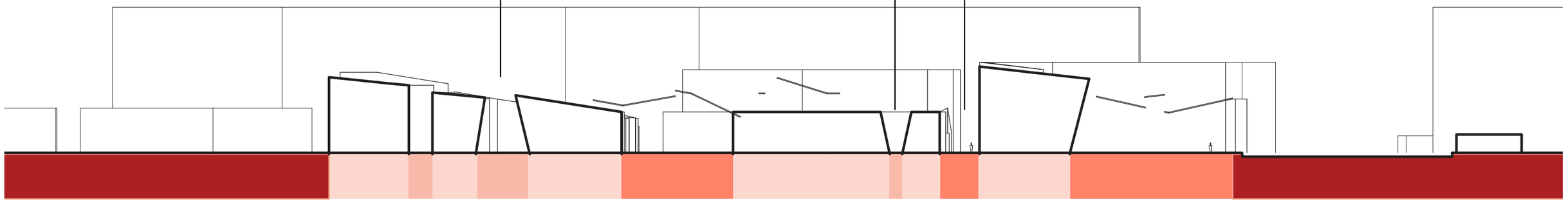


A2 B3 -45 DEG 3M

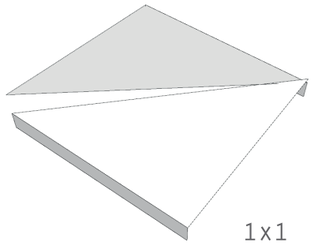
BETWEEN APRIL 01 TO OCTOBER 31
AVG TIME COMFORTABLE : 46%
HEAT STRESS : 42%

-3 = EXTREME COLD -2 = COLD -1 = COOL 0 = COMFORTABLE 1 = WARM 2 = HOT 3 - EXTREME HEAT

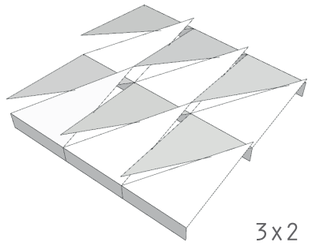
BUILDING TYPE	WIDE PATH INWARD	NARROW PATH OUTWARD	PERPENDICULAR



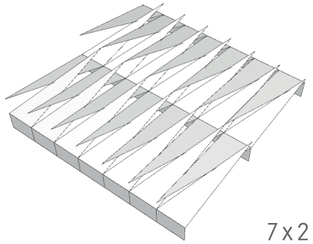
HEAT STRESS	43-45%	46-49%	>50%



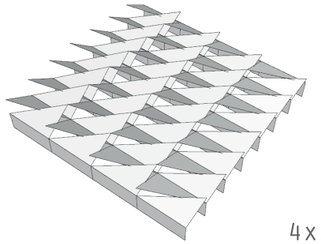
1x1



3x2



7x2



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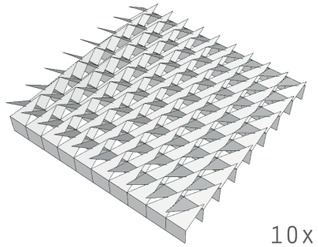

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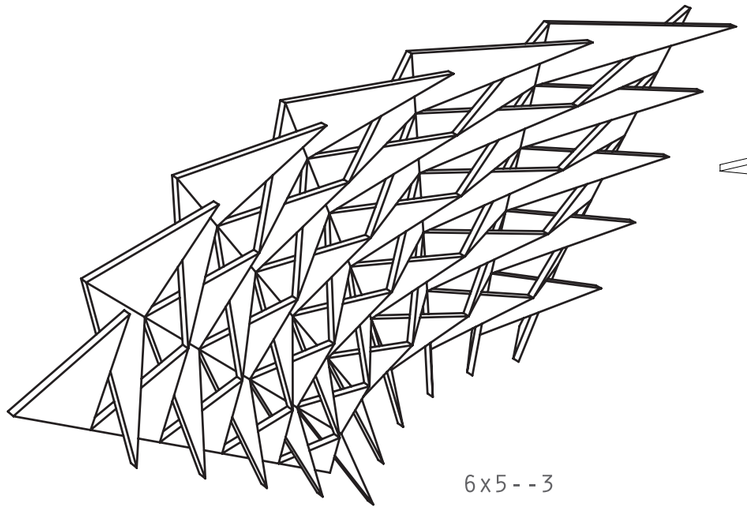
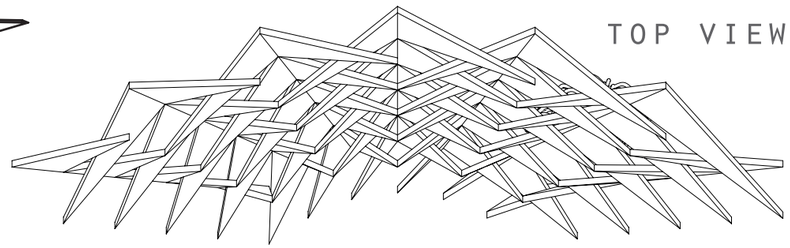
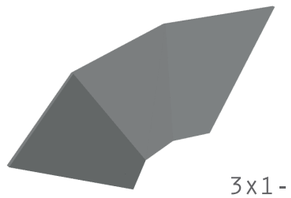


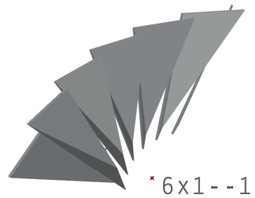
6x5--3

TOP VIEW

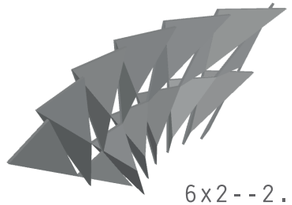




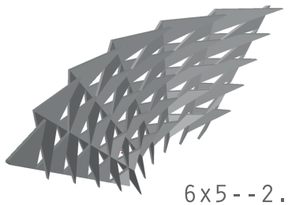
3x1--1



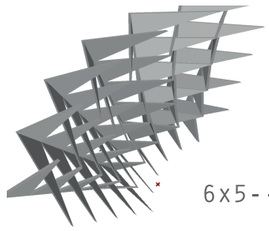
6x1--1



6x2--2.5

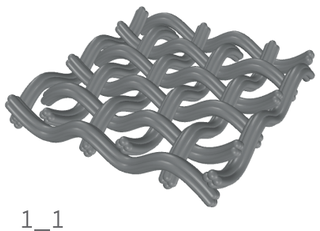


6x5--2.5

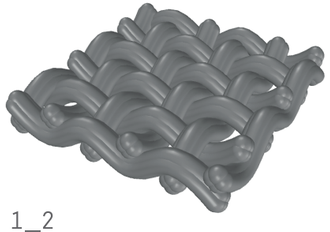


6x5--5

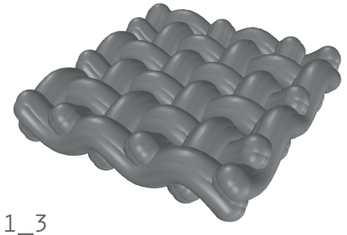
SCALES



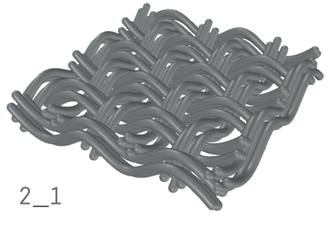
1_1



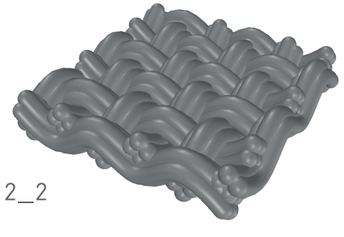
1_2



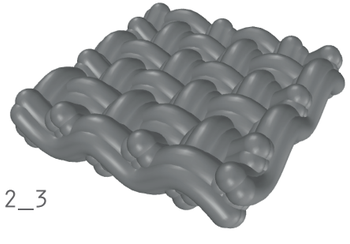
1_3



2_1

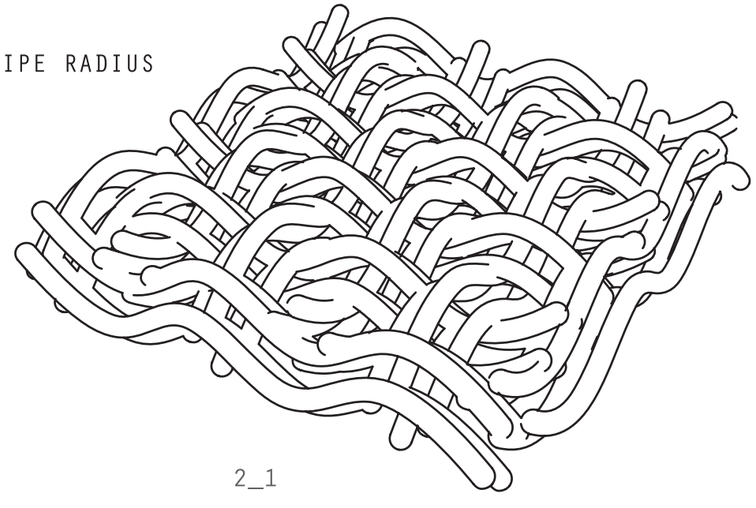


2_2



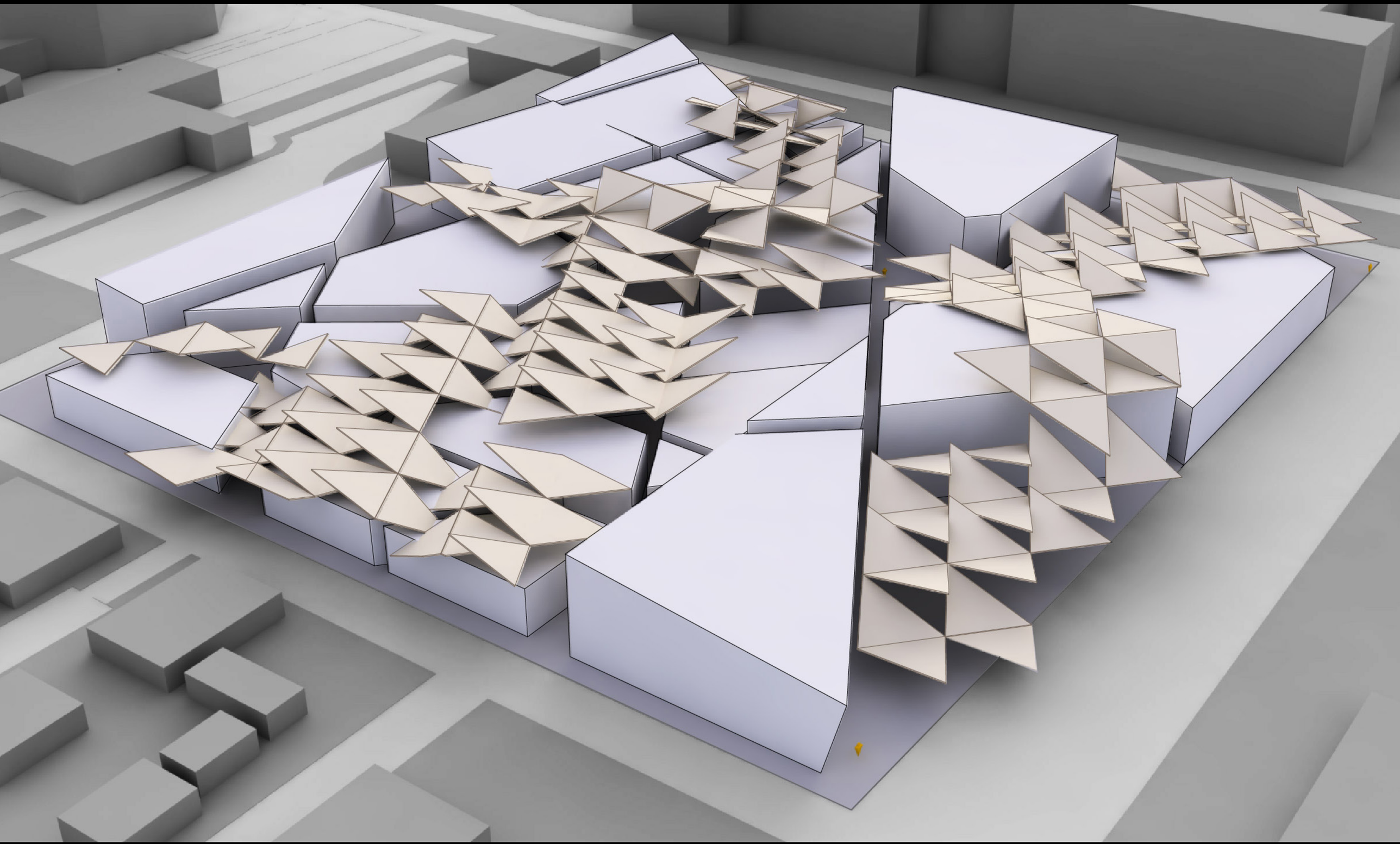
2_3

DENSITY _ PIPE RADIUS



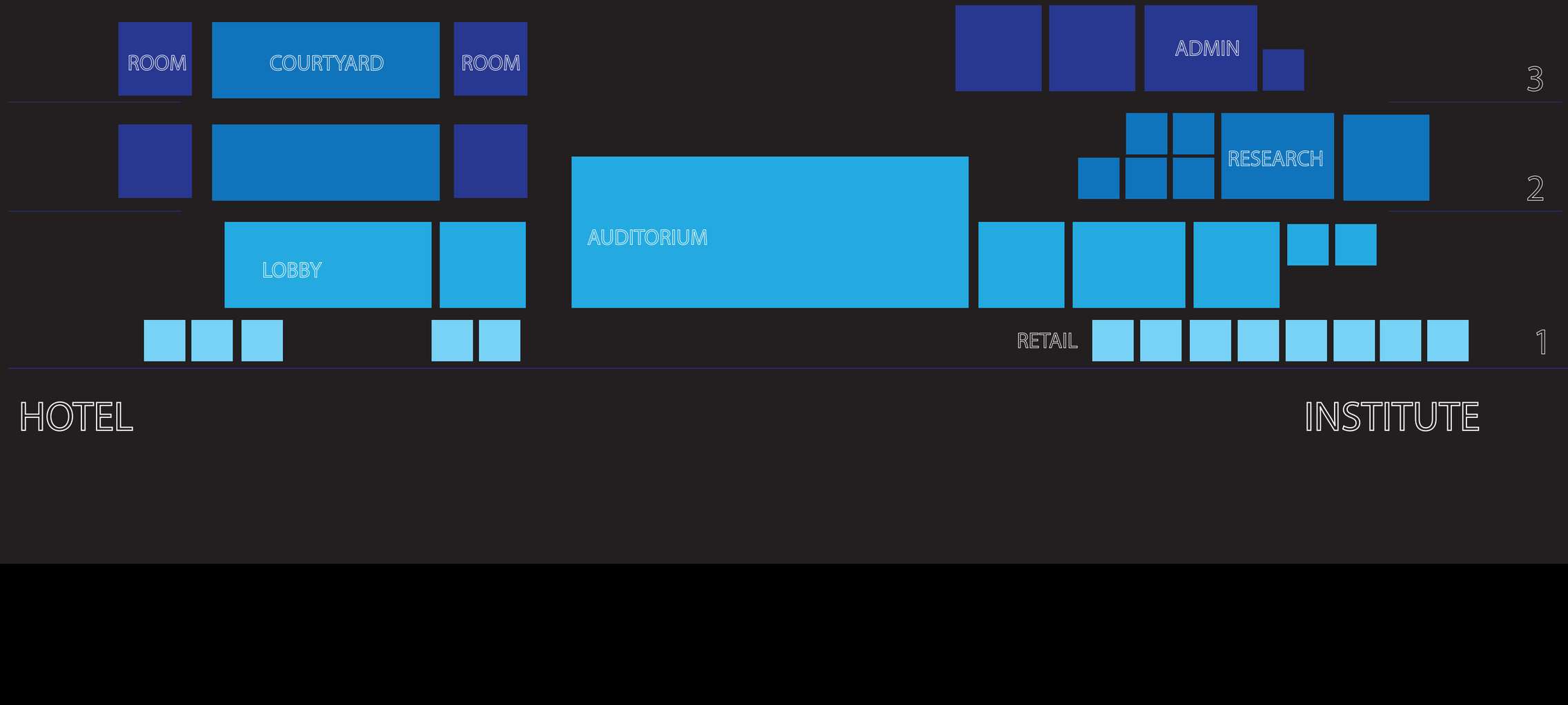
2_1

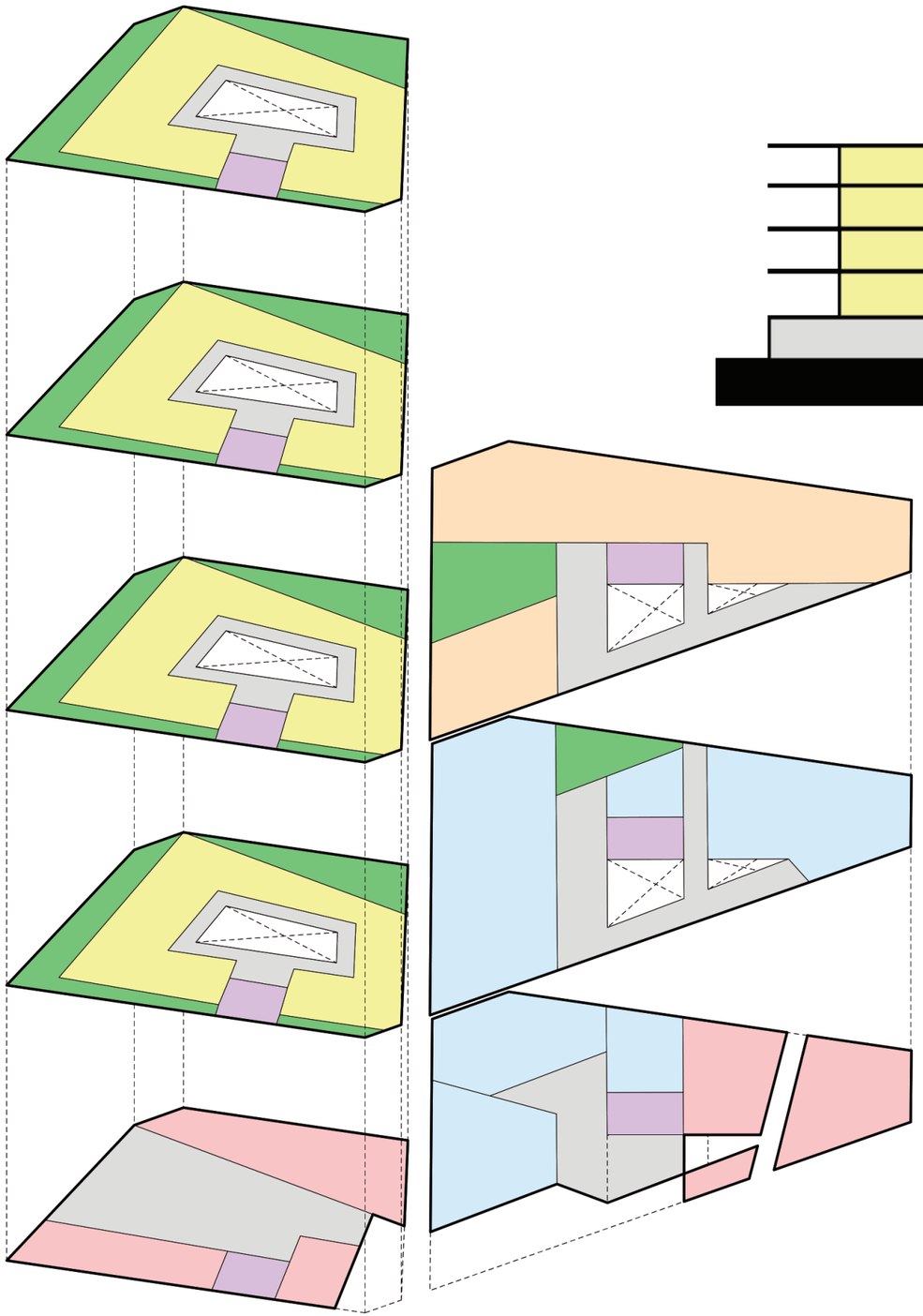
WOVEN

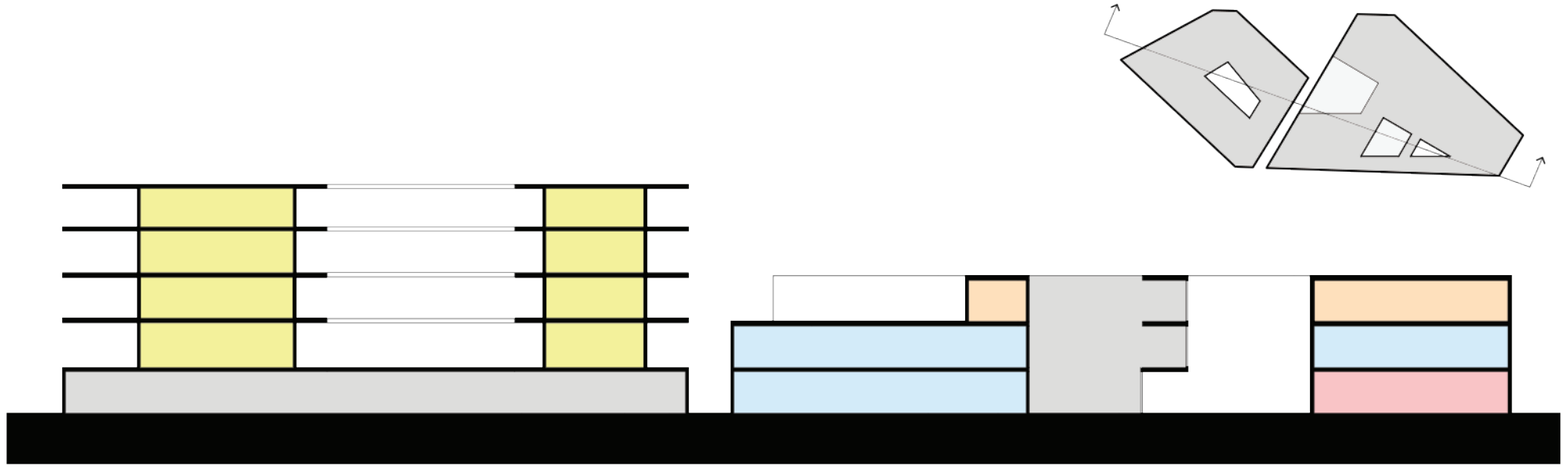


THE INSTITUTE
PROGRAM

PROGRAM MASSING SECTION







EDUCATIONAL

COMMERCIAL

ADMINISTRATION

RESIDENTIAL

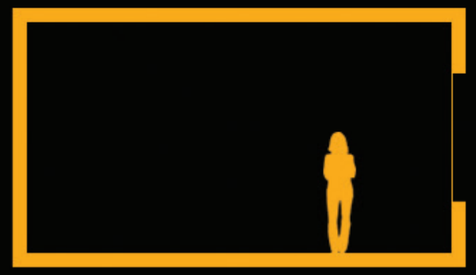
SERVICES/ELEVATORS

LOBBY/CORRIDORS

TERRACES/OPEN SPACES

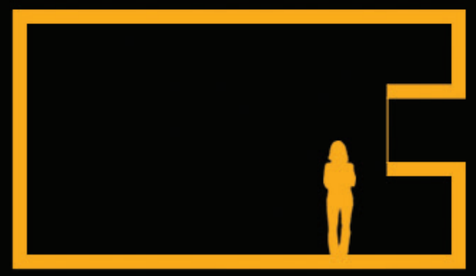
FACADE ITERATIONS:

CONTROL SITUATION

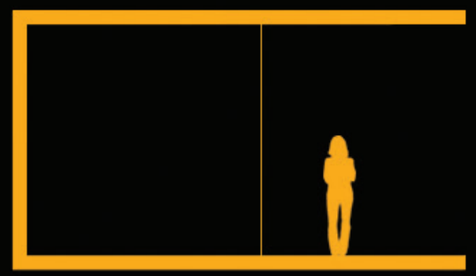


THE VARIABLES:
- DIMENSION OF OPENINGS
- DEPTH OF OPENINGS
- NUMBER OF OPENINGS
- ORIENTATION OF OPENINGS

NARROW OPENING



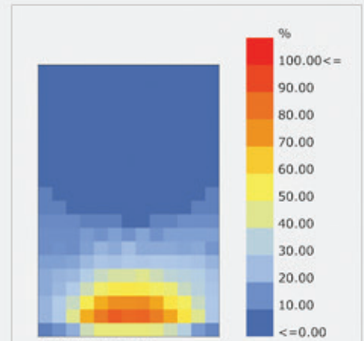
BALCONY



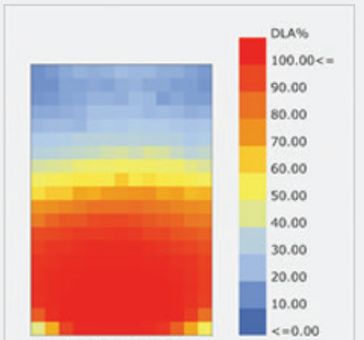
FACADE ITERATIONS:

CONTROL SITUATION

SDA=58%
ADAPTIVE COMFORT=37%

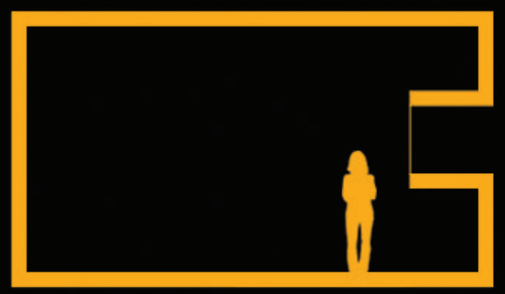


UDLI >2000

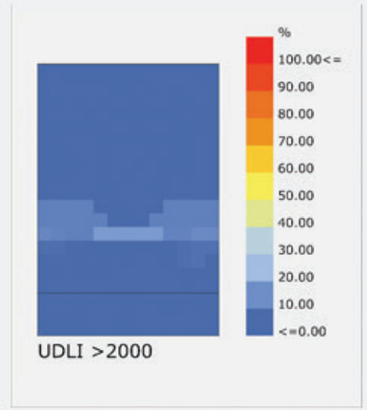


Annual Daylight Autonomy

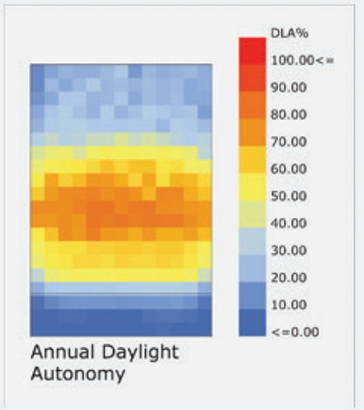
NARROW OPENING



SDA=38%
ADAPTIVE COMFORT=30%

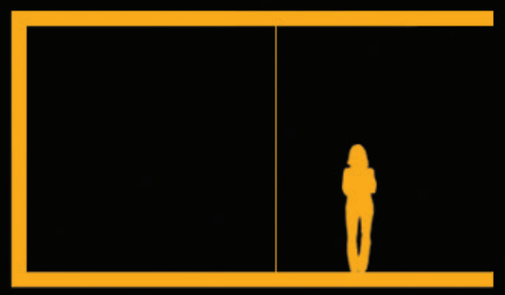


UDLI >2000

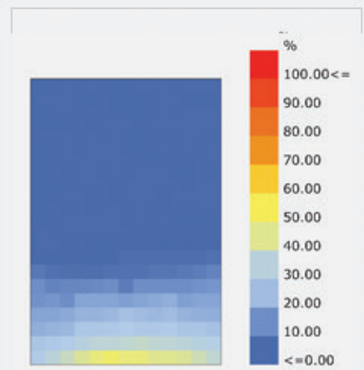


Annual Daylight Autonomy

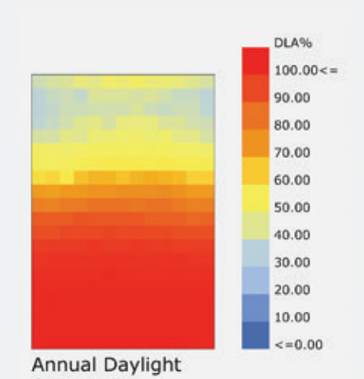
BALCONY



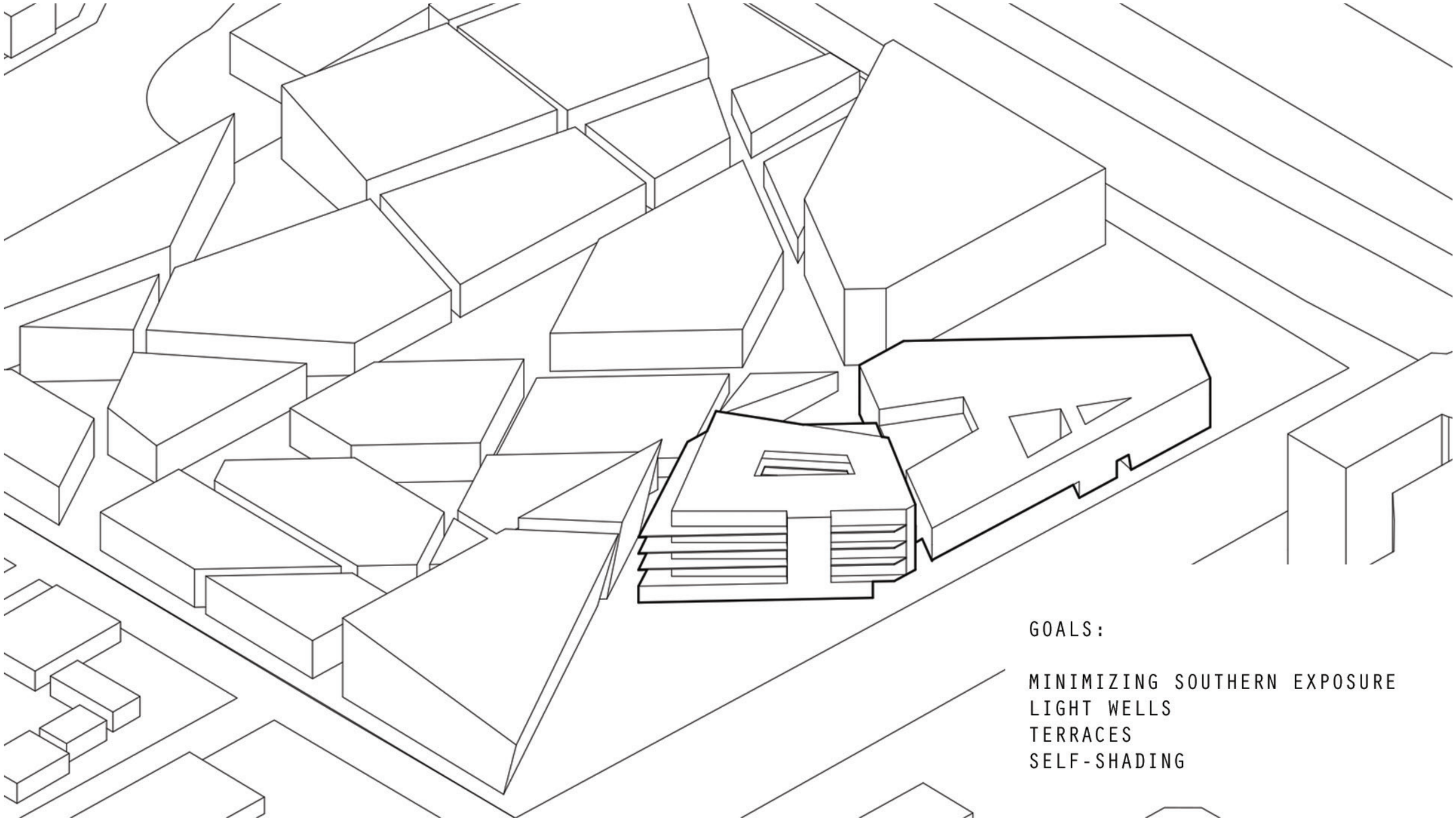
SDA=69%
ADAPTIVE COMFORT=31%



UDLI >2000



Annual Daylight Autonomy



GOALS:

MINIMIZING SOUTHERN EXPOSURE
LIGHT WELLS
TERRACES
SELF-SHADING

FURTHER DEVELOPMENT

BUILDING PERFORMANCE
- COMFORT AND DAYLIGHTING
SIMULATING POTENTIAL OF COOLING TOWERS

FINE TUNING SECONDARY SHADING SYSTEM

SOLAR COLLECTION POTENTIAL

FACADE ANALYSIS