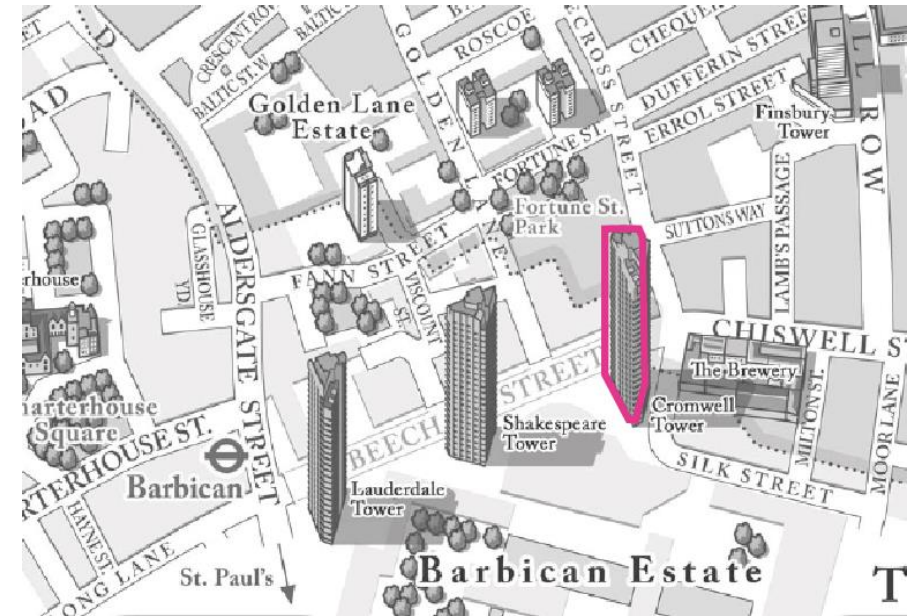
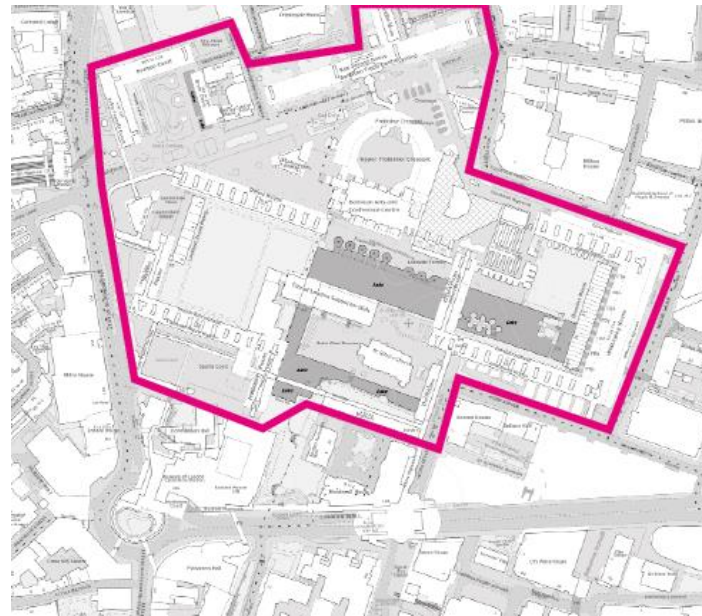
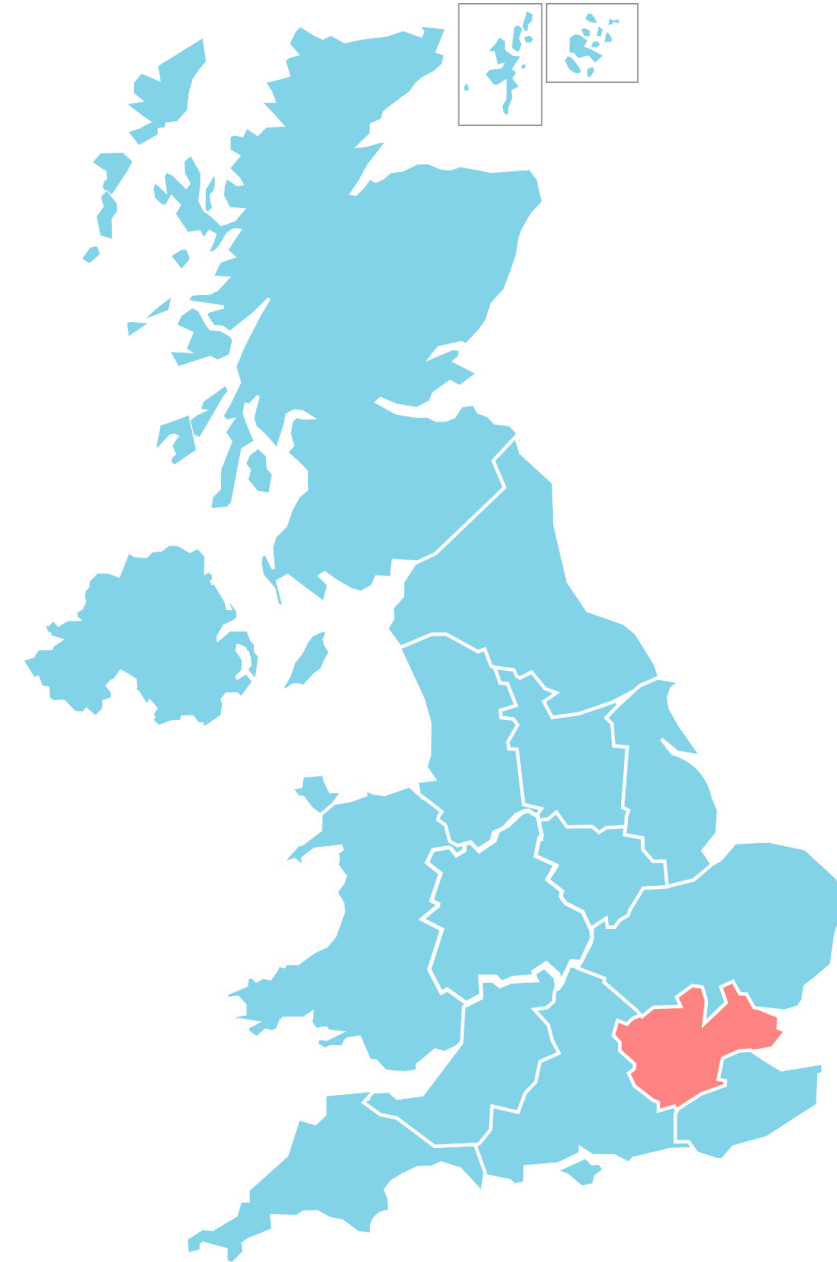


Barbican

Environmental & Behavioural Evaluation



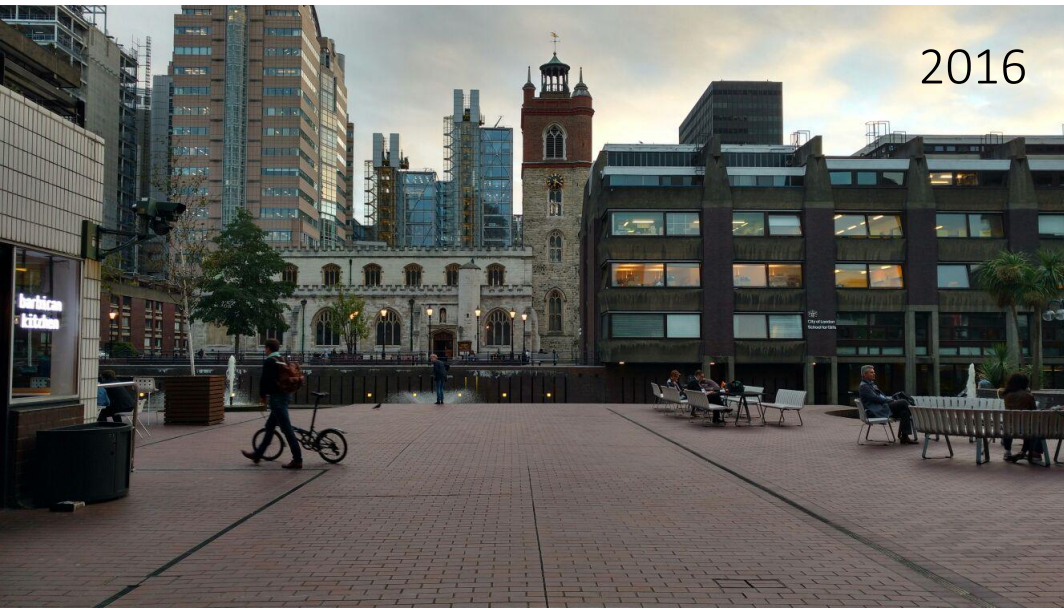
Location



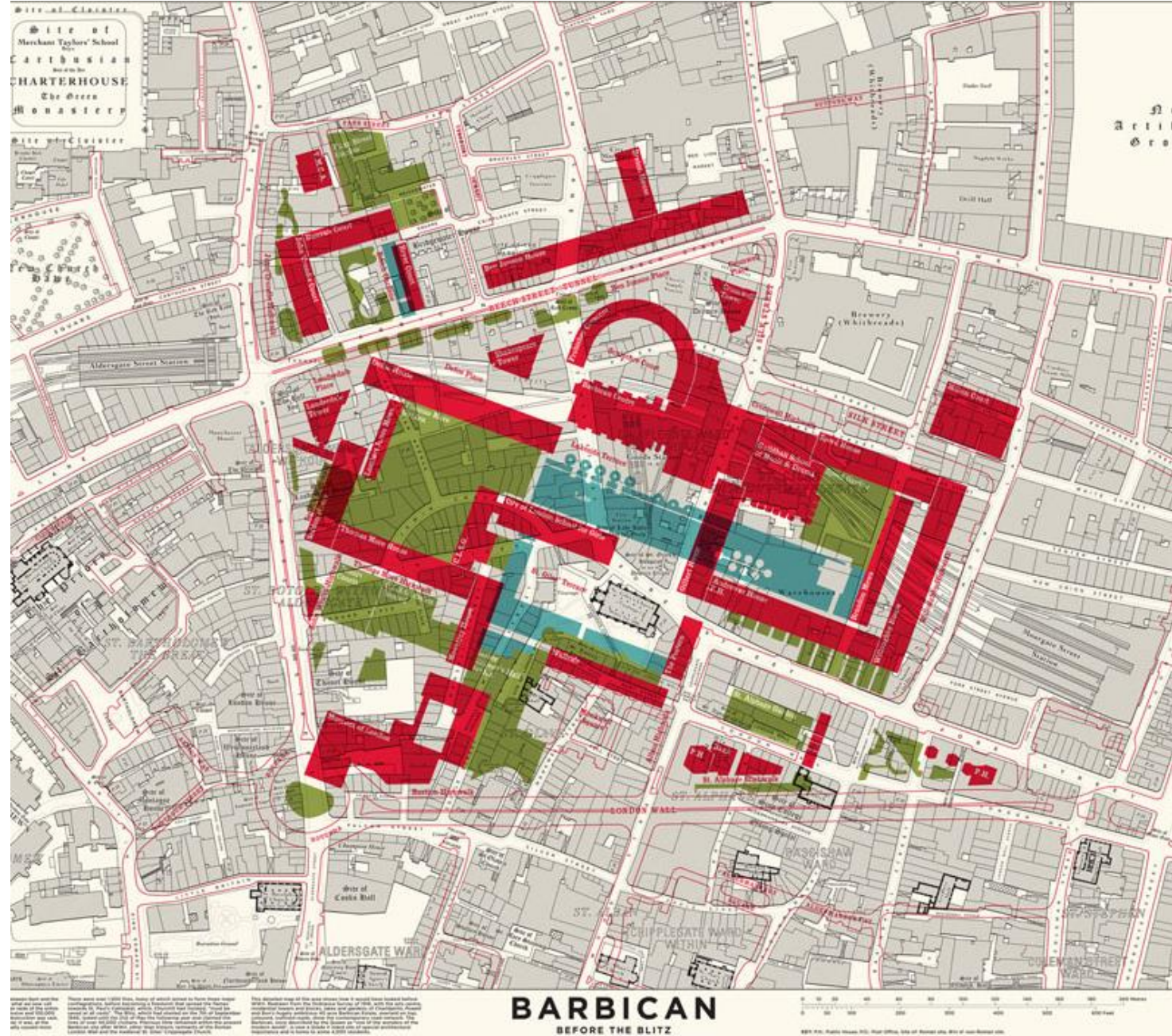
History



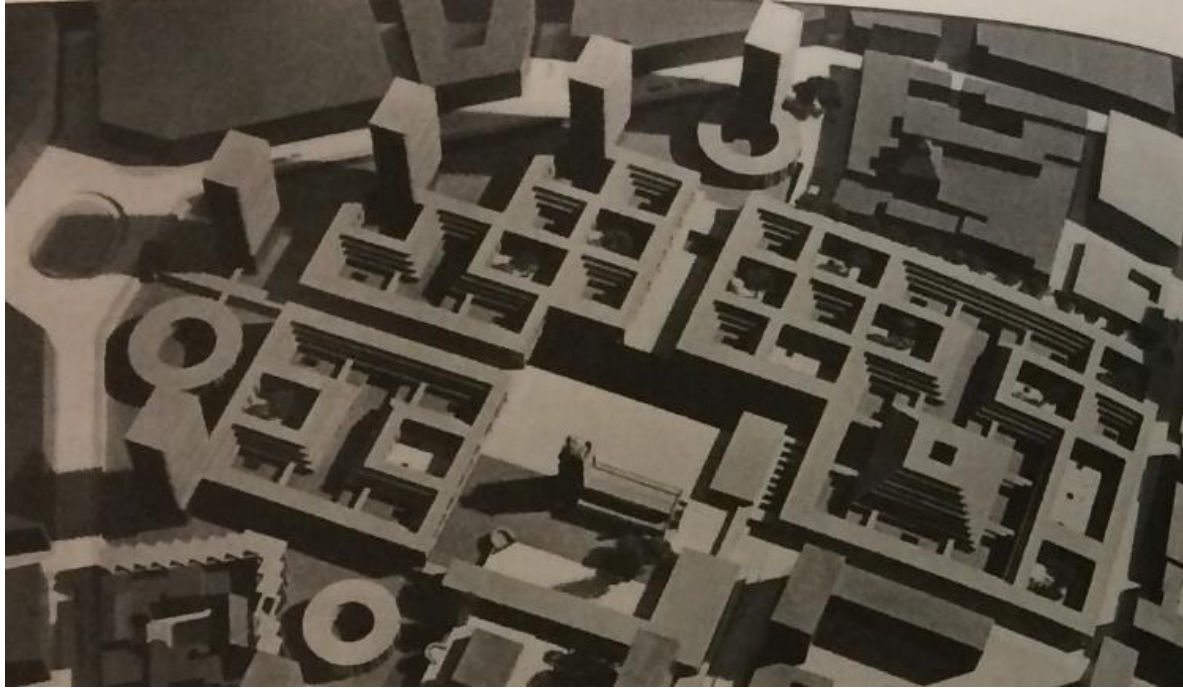
1945



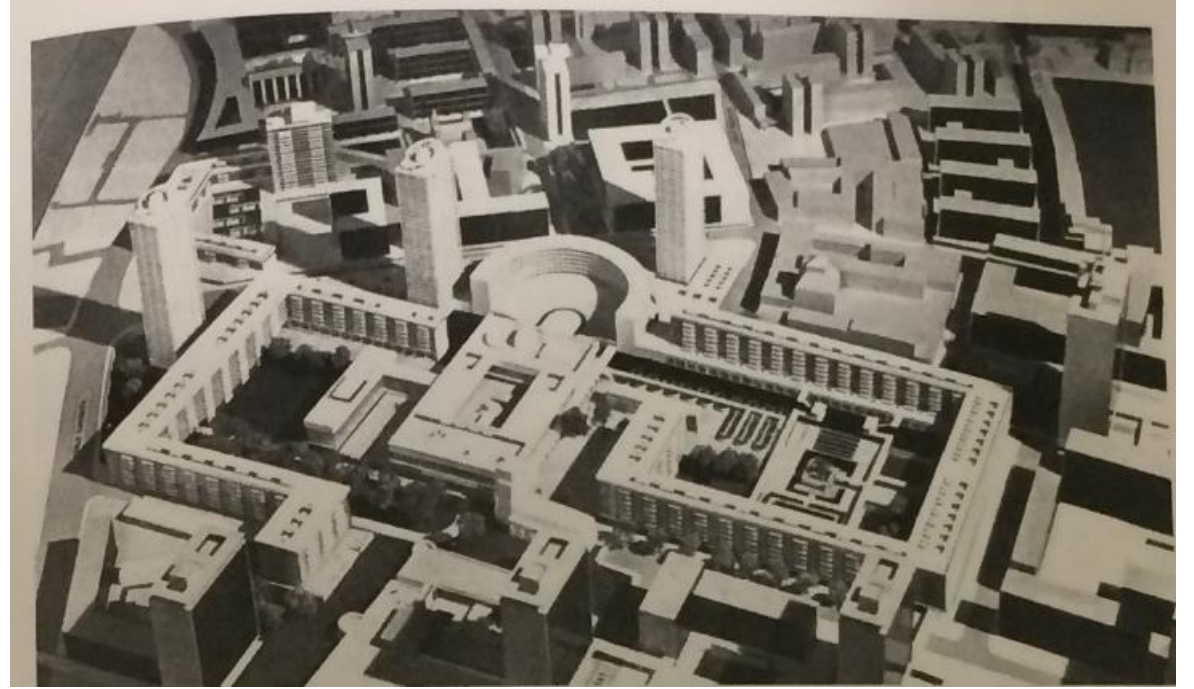
2016



Development of the scheme



Initial scheme 1955

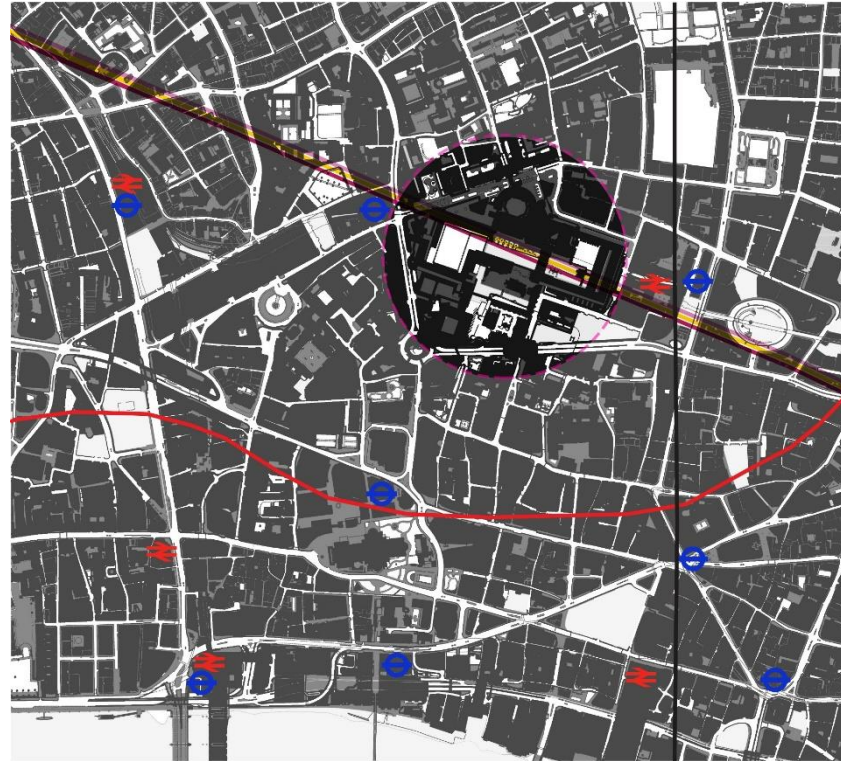


1956 proposal

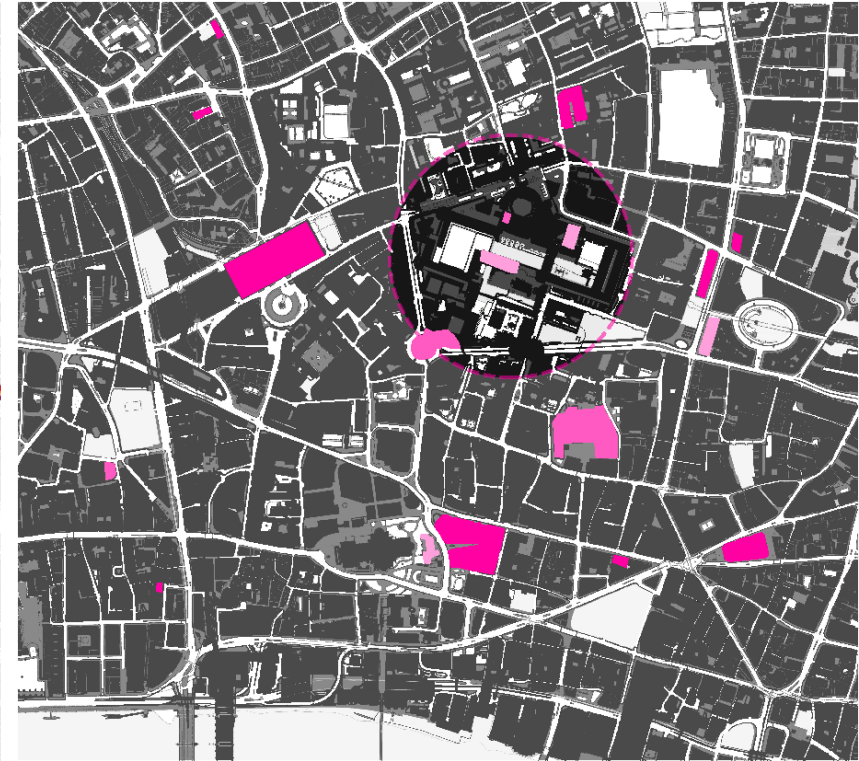
Urban Context



Green spaces & water features

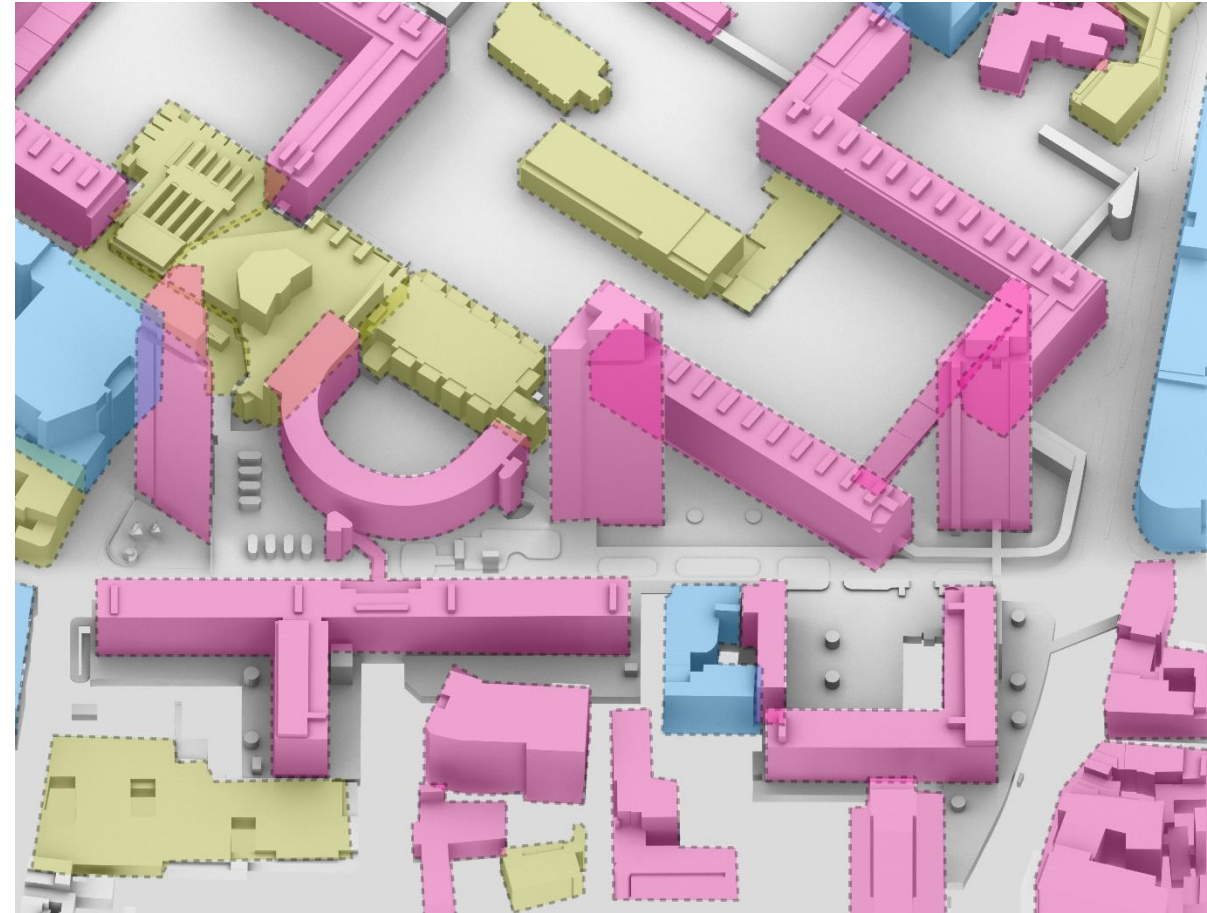
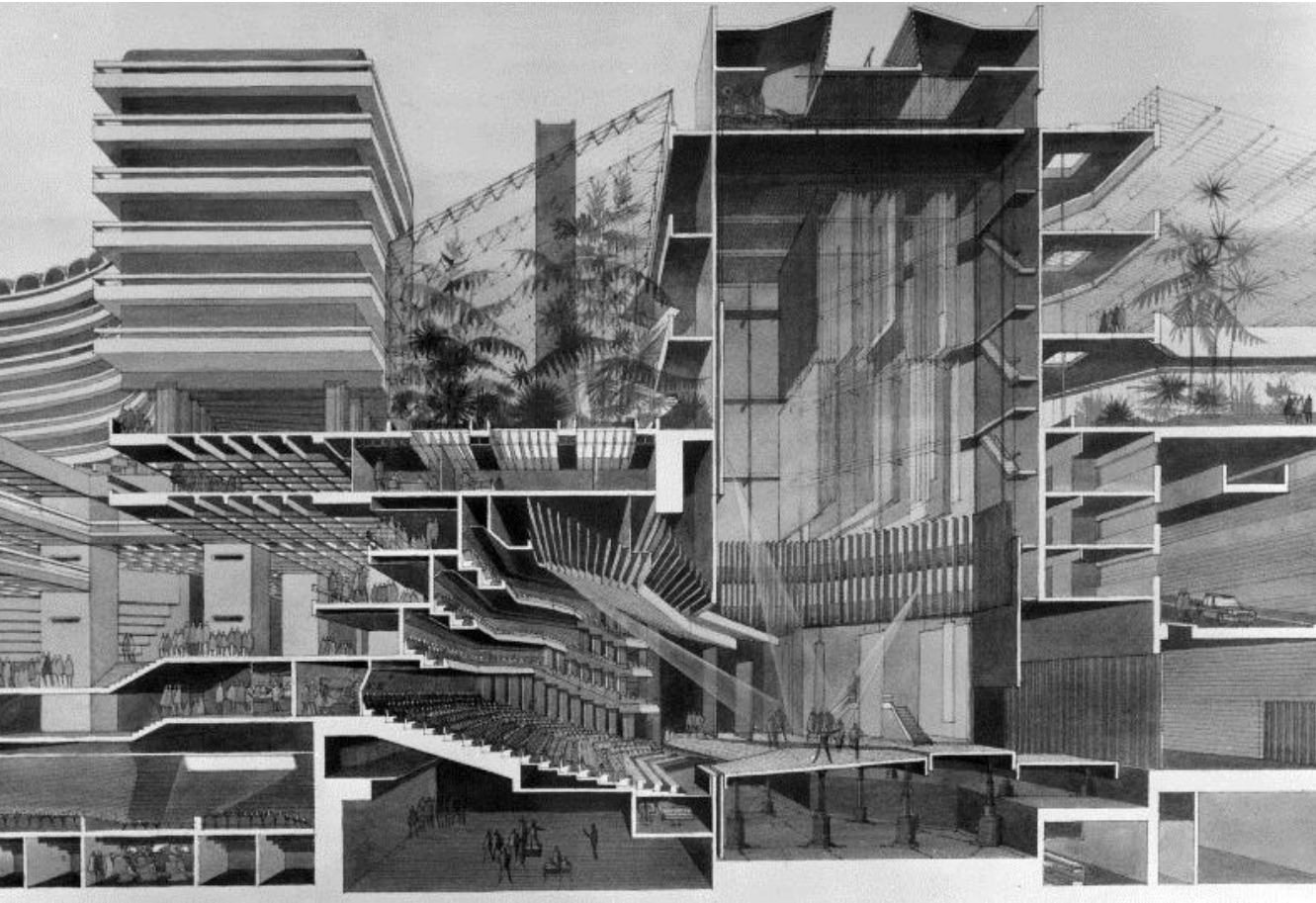


Transport links



Retail & services

Buildings Use Map

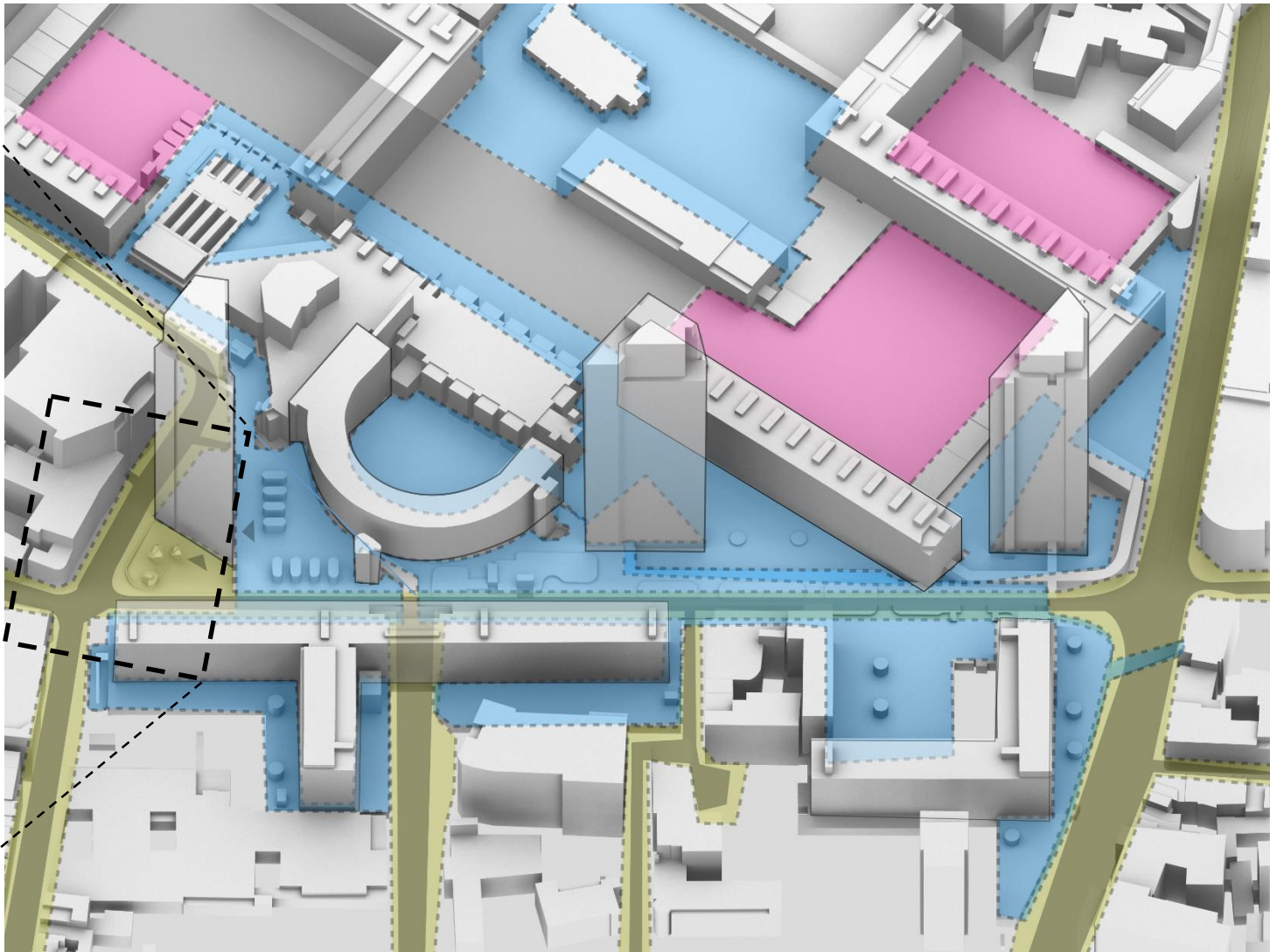
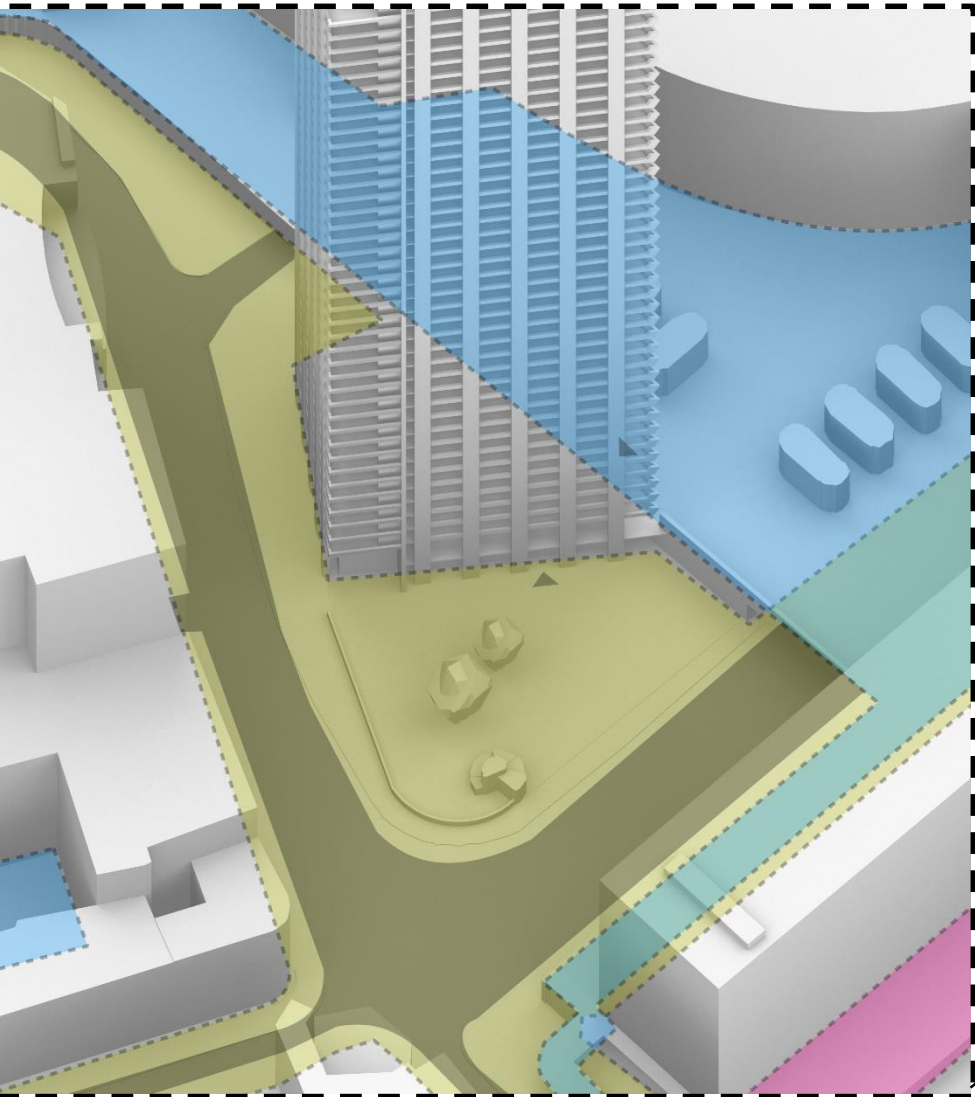


 Services /
Hospitality

 Commercial

 Residential

Site Access Map



Public

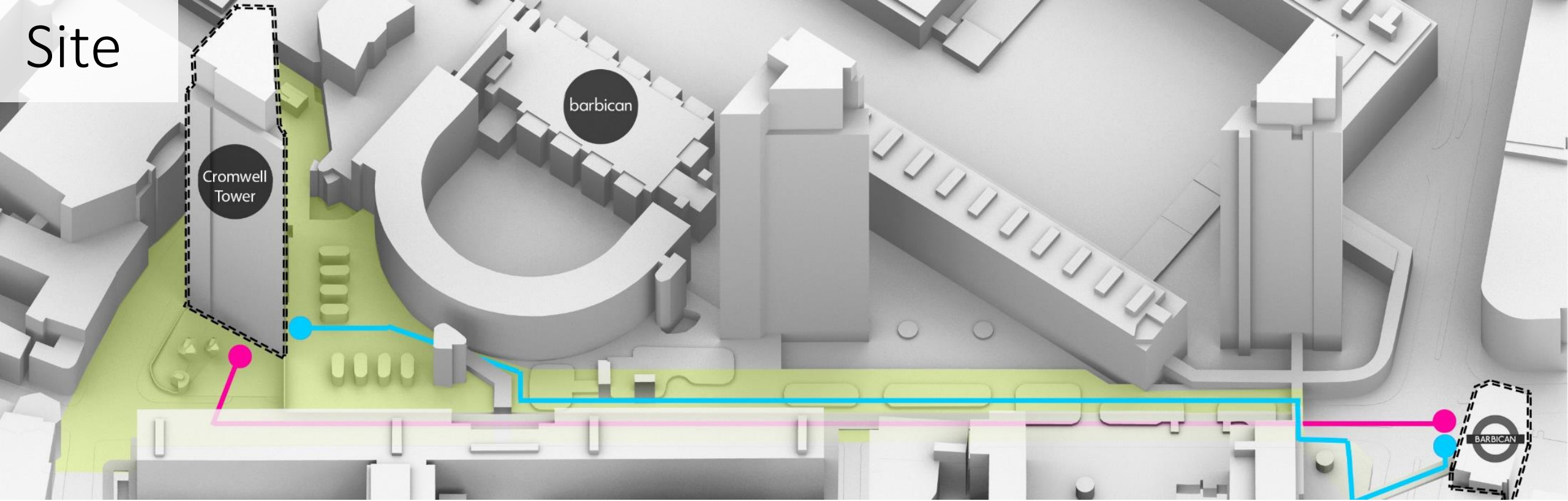


Semi-Public

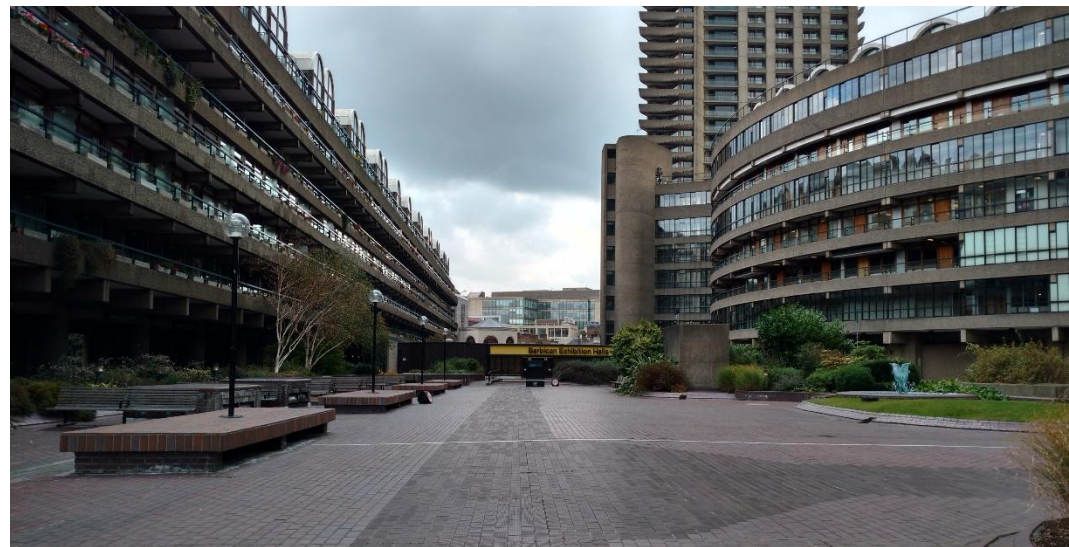


Private

Site



Transport links



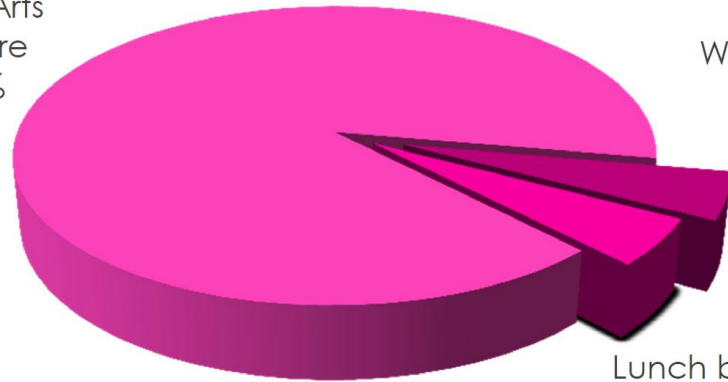
Podium level



Footbridge from Barbican Tube

Survey

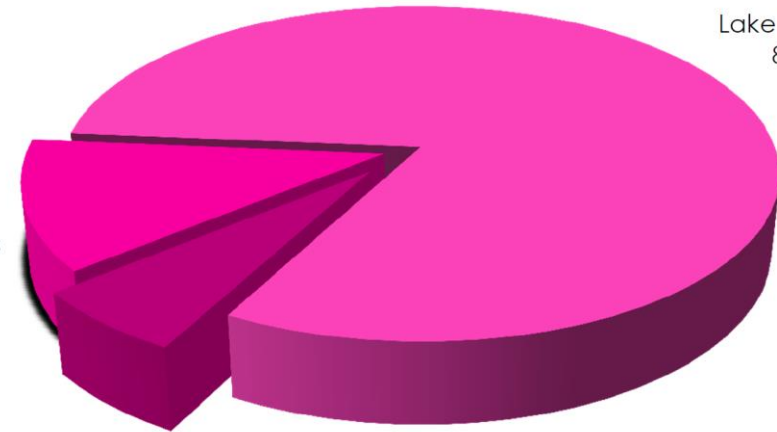
Before or
after Arts
Centre
90%



Walking and
doing a
shortcut
5%

Lunch break
from work
5%

Lake terrace
82%



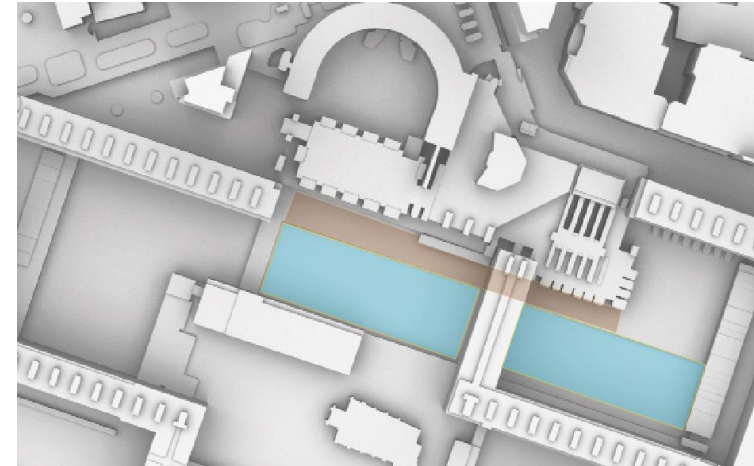
Others
12%

Frobisher
Crescent
surroundings
6%

Granary Square by Regent's Canal



Barbican Centre

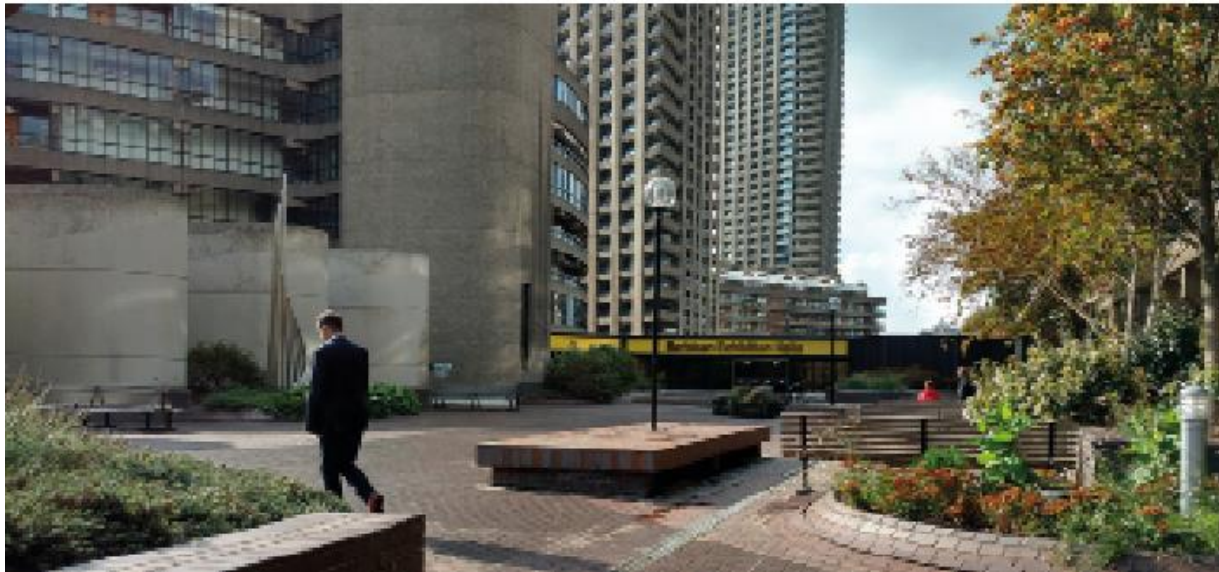


Outdoor patterns of occupancy

Weekdays



Weekends



Spot Measurements

8:00 - 9:00 am

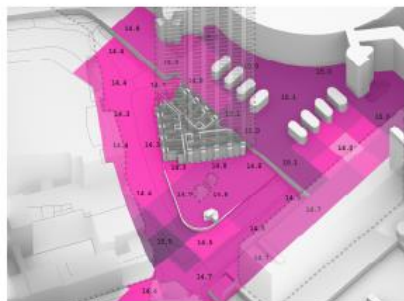


Fig.1 8am - 9am Temperature [°C]

1:00 - 2:00 pm

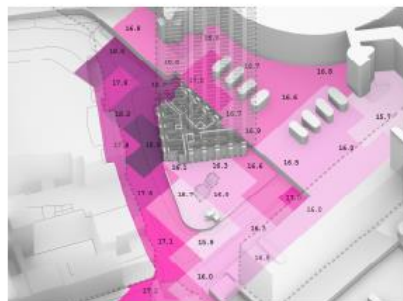


Fig.1 1pm - 2pm Temperature [°C]

5:00 - 6:00 pm

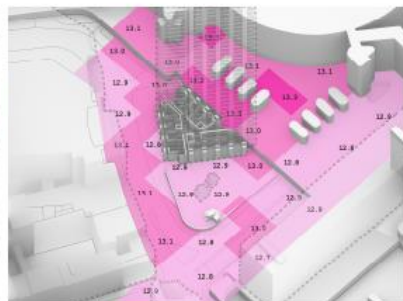
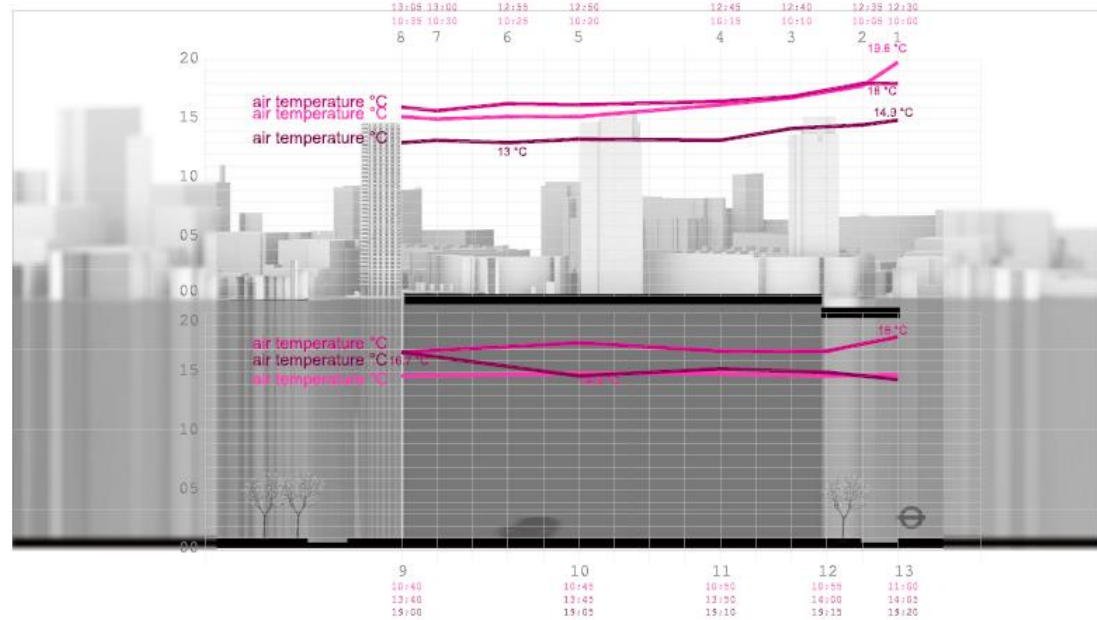


Fig.1 5pm - 6pm Temperature [°C]



8:00 - 9:00 am

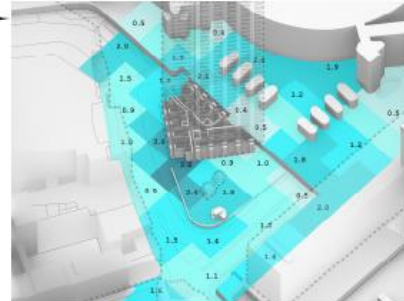


Fig.1 8am - 9am Wind velocity [m/s]

1:00 - 2:00 pm

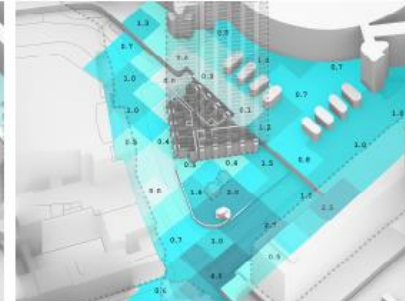


Fig.1 1pm - 2pm Wind velocity [m/s]

5:00 - 6:00 pm

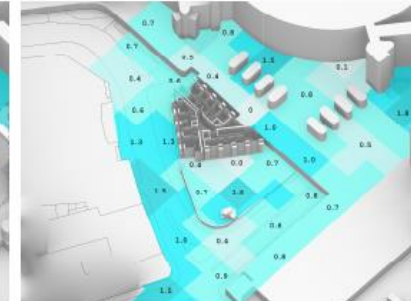
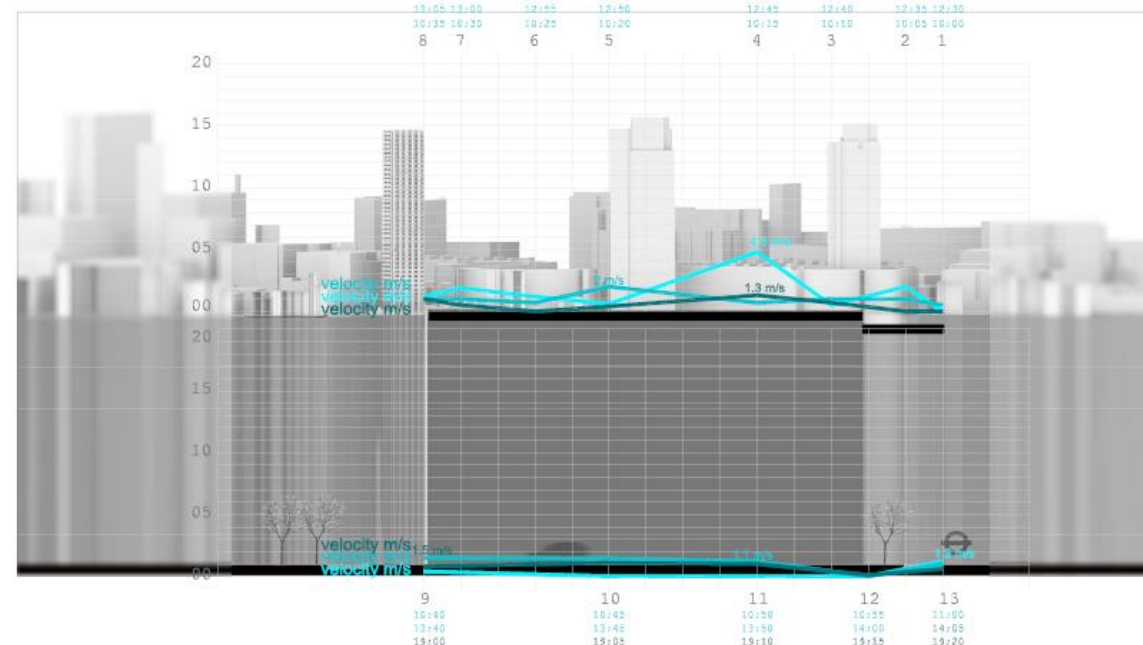


Fig.1 5pm - 6pm Wind velocity [m/s]



Spot Measurements

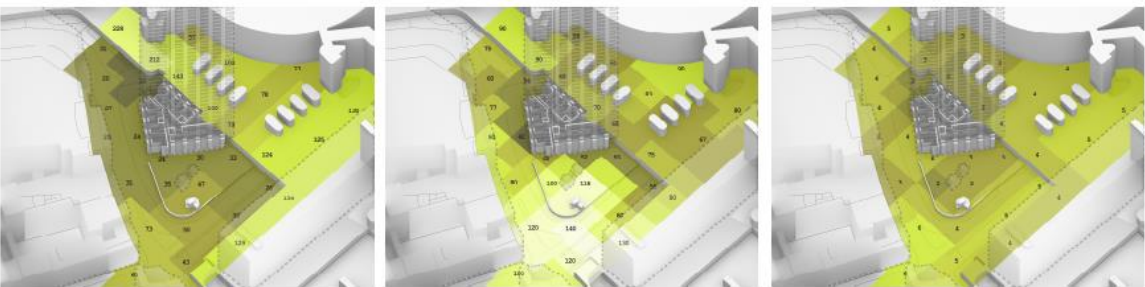


Fig.1 8am - 9am Illuminance [lux] Fig.1 1pm - 2pm Illuminance [lux] Fig.1 5pm - 6pm Illuminance [lux]

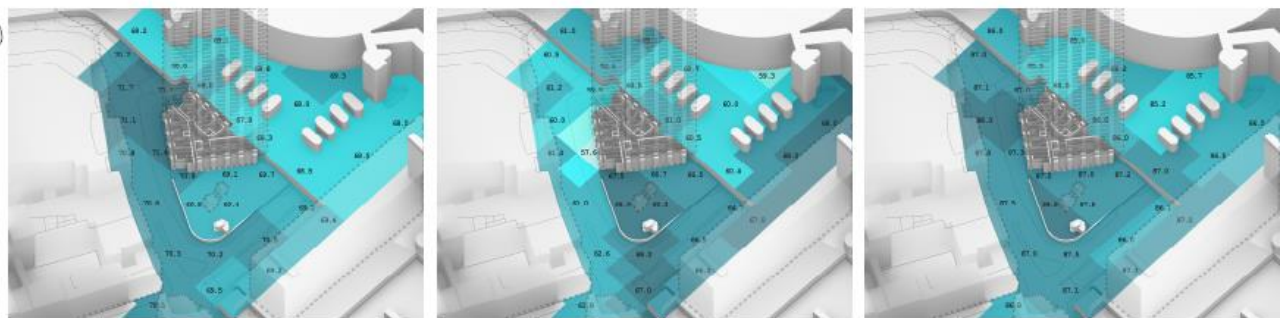
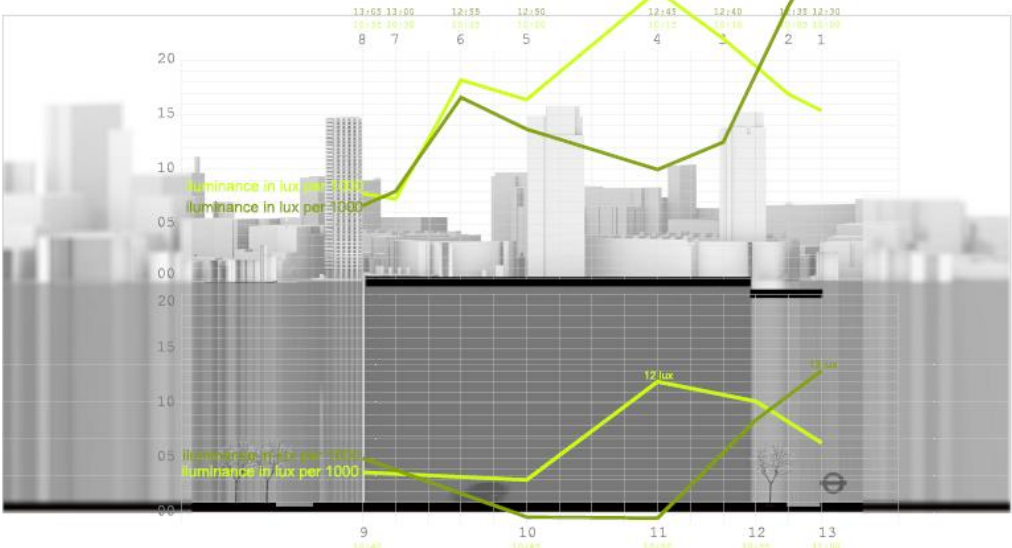
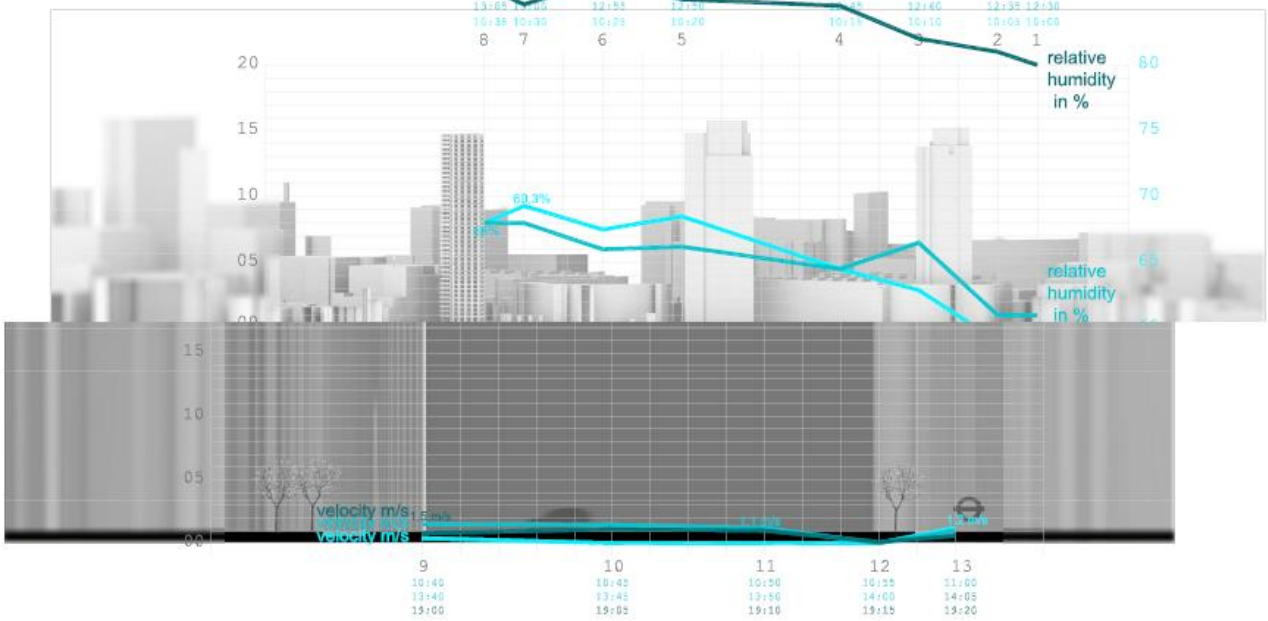


Fig.1 8am - 9am Humidity [%] Fig.1 1pm - 2pm Humidity [%] Fig.1 5pm - 6pm Humidity [%]



“Feel Good” Scale ☺

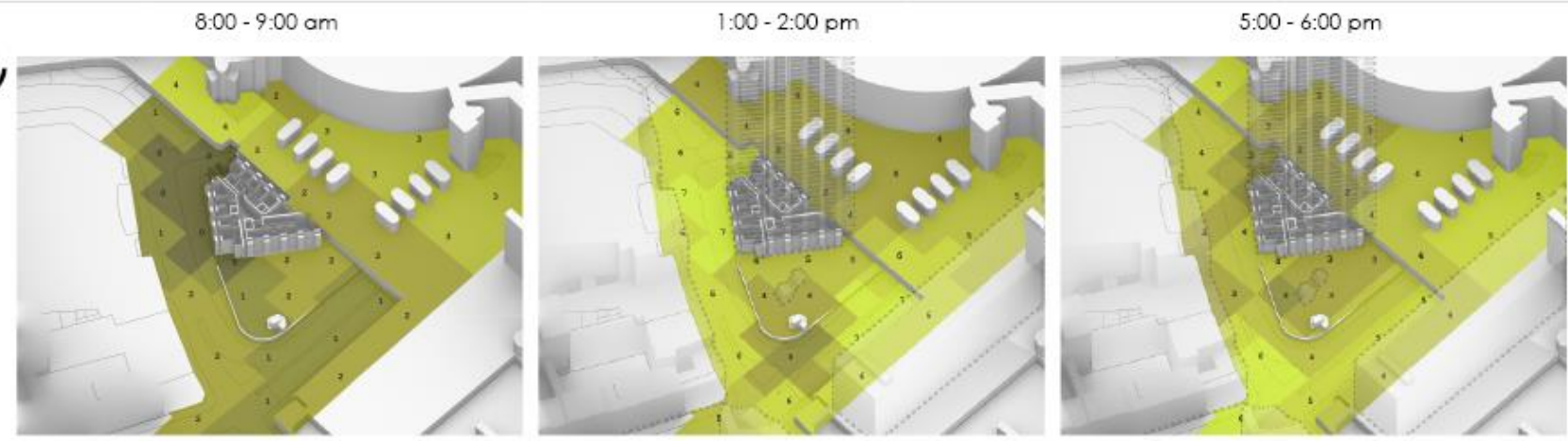
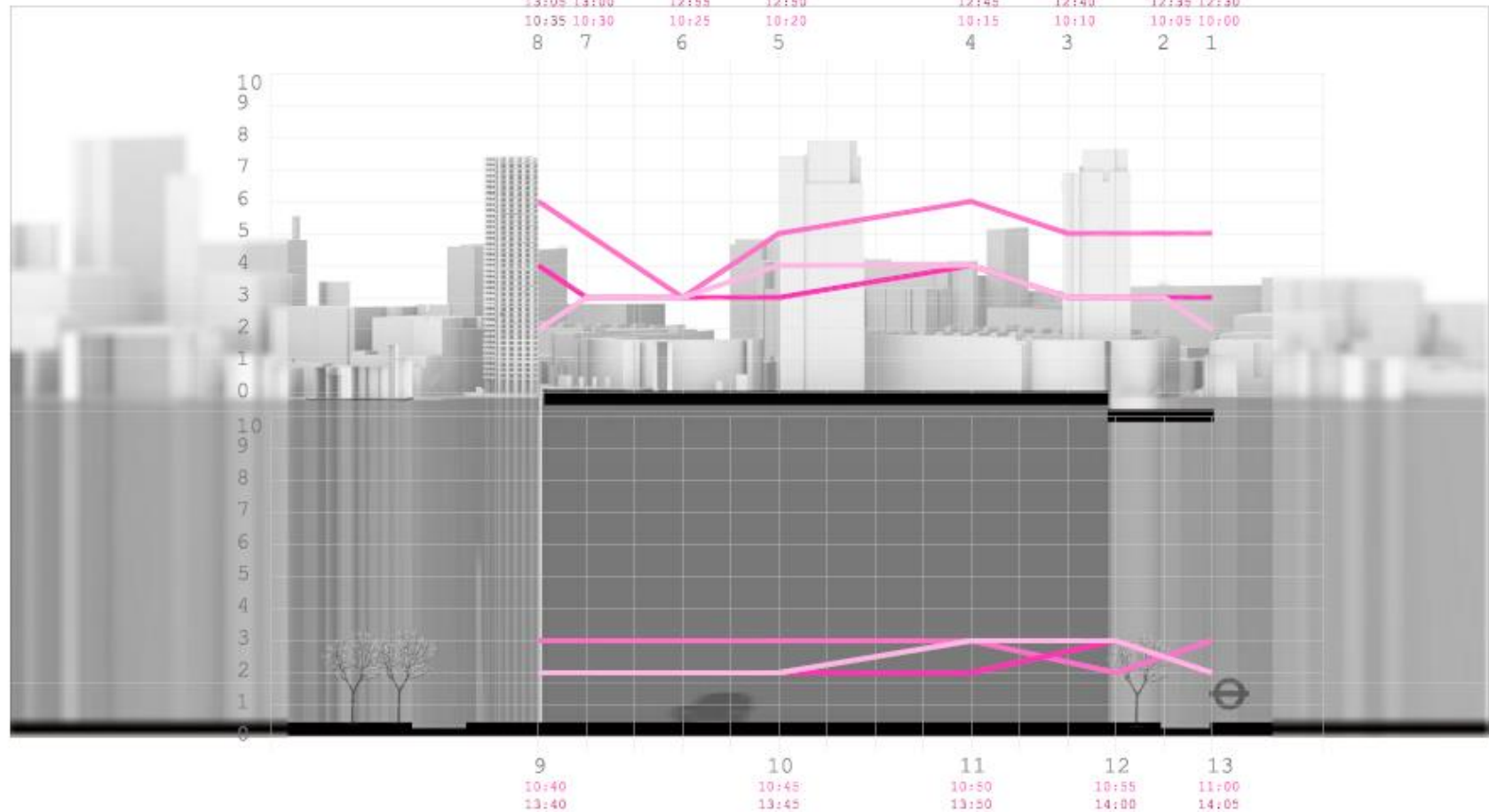


Fig.1 8am - 9am Feel Good Scale [happiness]



Fig.1 1pm - 2pm Feel Good Scale [happiness]

Fig.1 5pm - 6pm Feel Good Scale [happiness]



20:05	20:00	19:50	19:45	19:40	19:35	19:30	19:25
13:05	13:00	12:55	12:50	12:45	12:40	12:35	12:30
10:35	10:30	10:25	10:20	10:15	10:10	10:05	10:00
8	7	6	5	4	3	2	1



Thermal Comfort

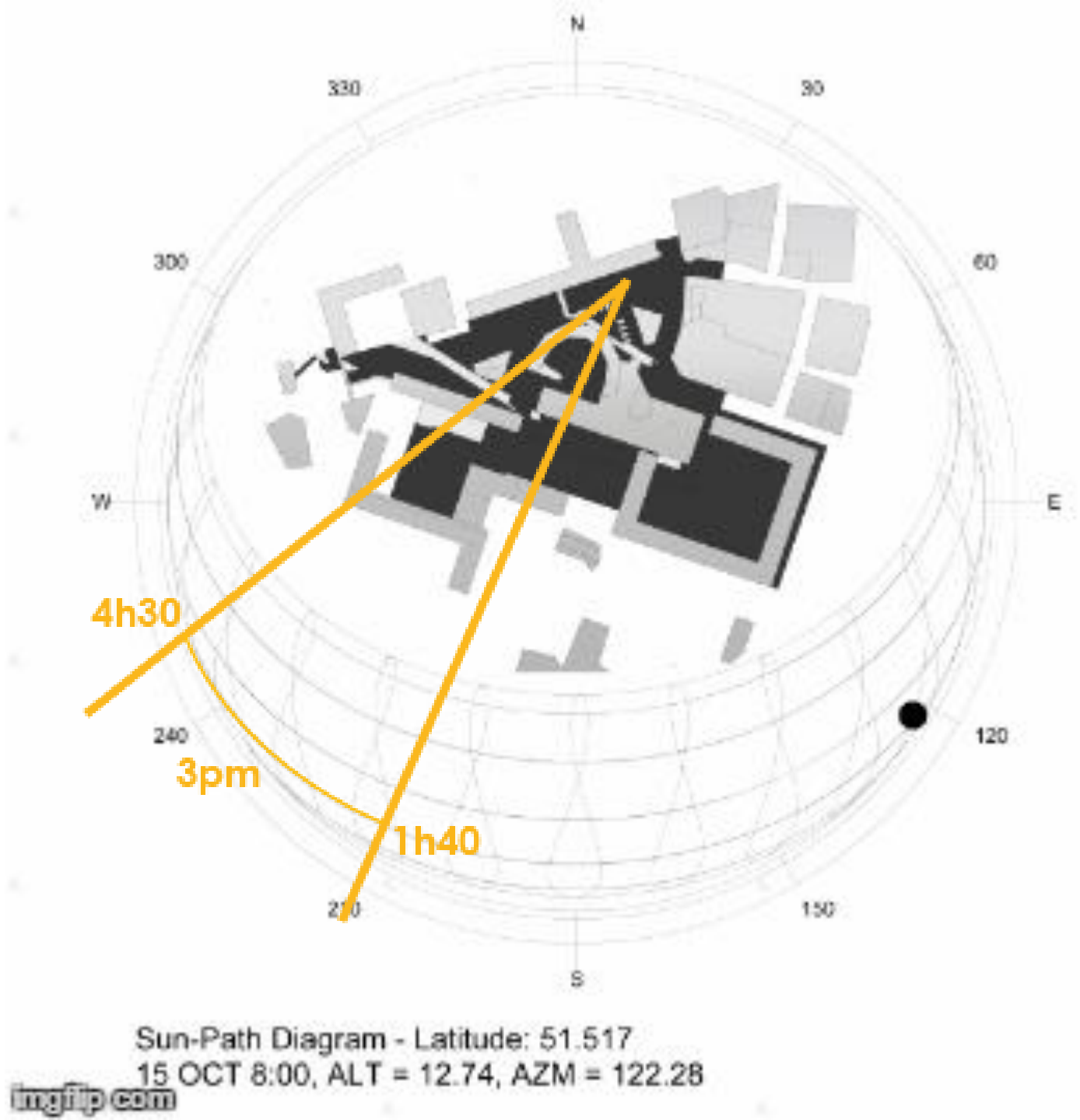
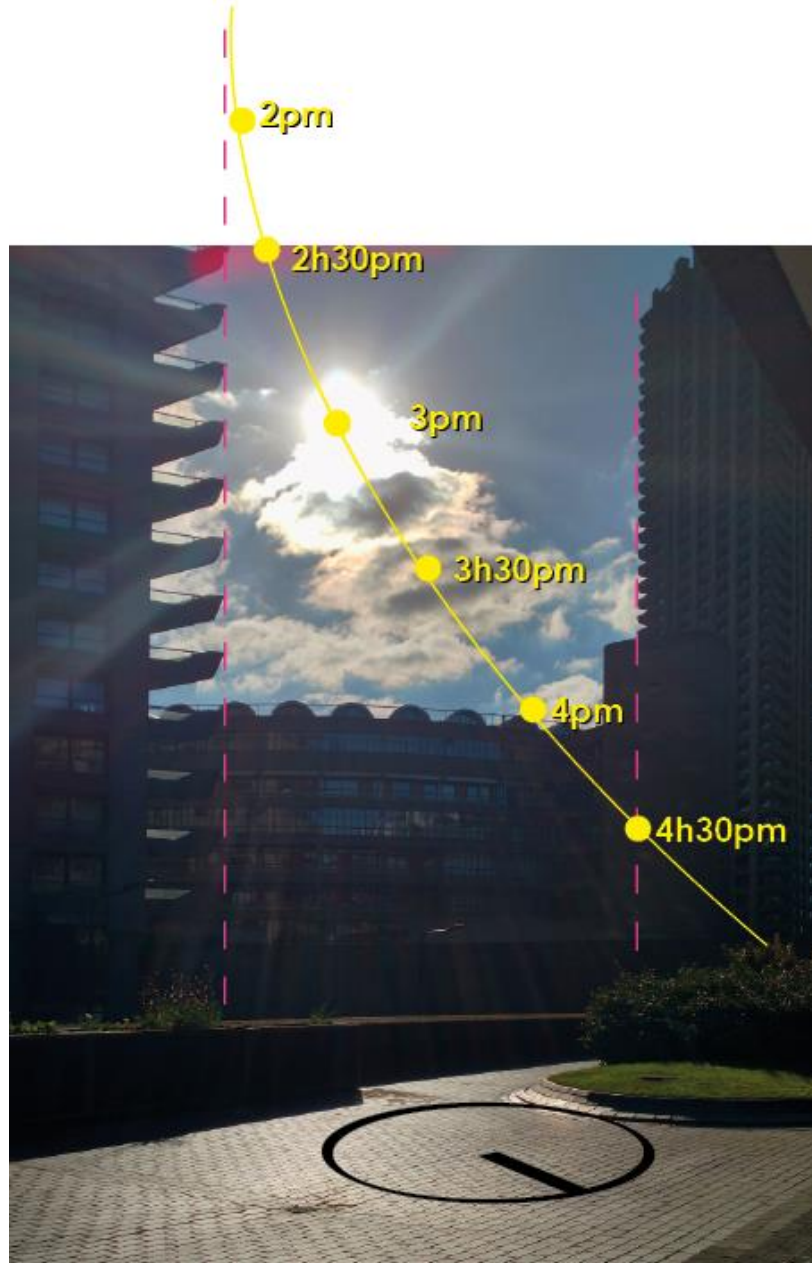
SPOT MEASUREMENTS							SIMULATIONS				
Point of measurement	Date / time	FeelGood Scale 1-10	Dry bulb Temp °C	H %	W m/s	weather	Sun radiation W/m²	Increase by Sun radiation °C 	Decrease by Wind °C 	UTCI results °C	
27	13/10/16 1pm	1	14	59	10	sunny (shade)	100	2,7	-16,2	-0,7	REAL
					0			2,8	0,0	15,5	HYPOTHETIC
30	13/10/16 1pm	4	18	46	6	sunny	550	14,9	-9,5	13,2	REAL
					3			14,9	-4,3	18,4	HYPOTHETIC
					0			14,9	0,0	22,7	HYPOTHETIC
20	13/10/16 1pm	8	16	62	3	sunny	600	16,2	-4,8	17,2	REAL
					6			16,2	-10,5	11,5	HYPOTHETIC
					0			16,2	0,0	22	HYPOTHETIC

CALCULATED RELEVANCE OF WEATHER ELEMENTS TO THERMAL COMFORT

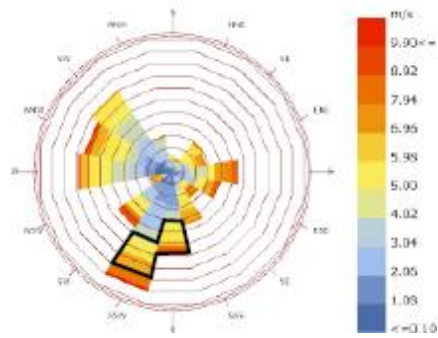
	Real Temp °C	Perceived Temp °C	Difference °C	FeelGood Scale 1-10		
27	14,0	-0,7	14,7	1 -	14,29% -	85,71% +
30	18,0	13,2	4,8	4	61,07%	38,93%
20	16,0	17,2	1,2	8 +	77,14% +	22,86% -



October – Daylight Hours

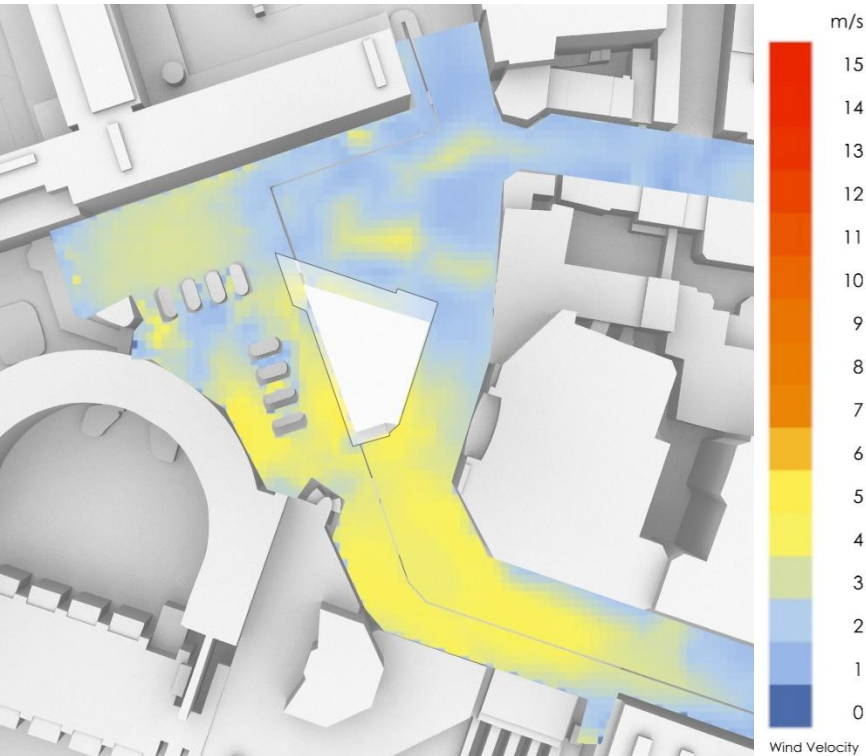


Universal Thermal Climate Index OCTOBER



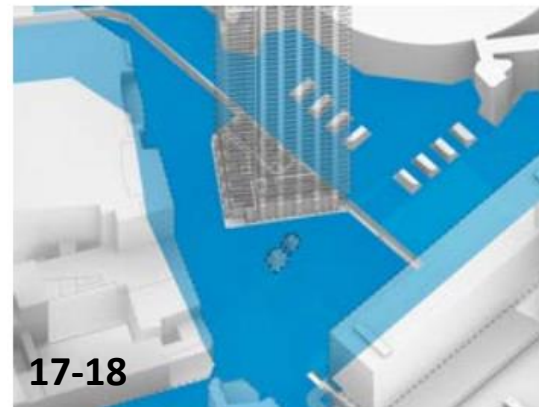
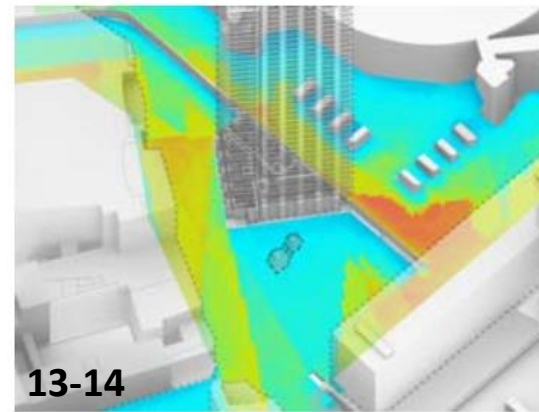
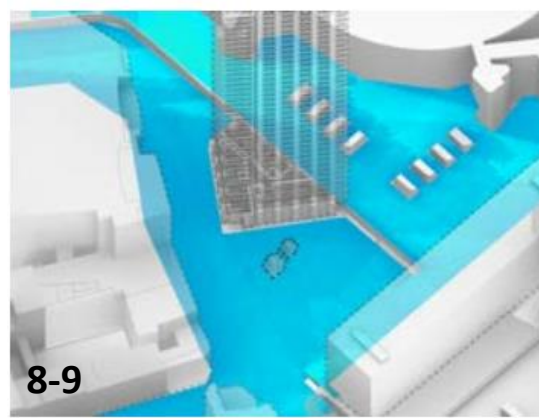
Avg Db = 14.4°C
Avg RH = 68%

+



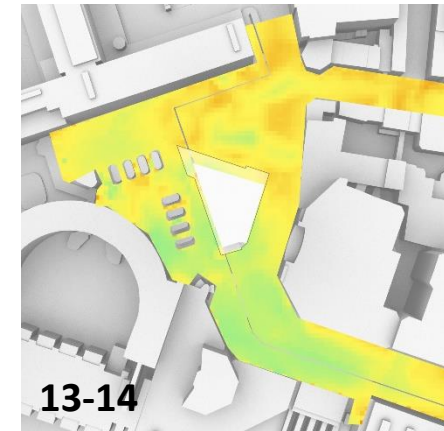
Wind CFD simulation

+

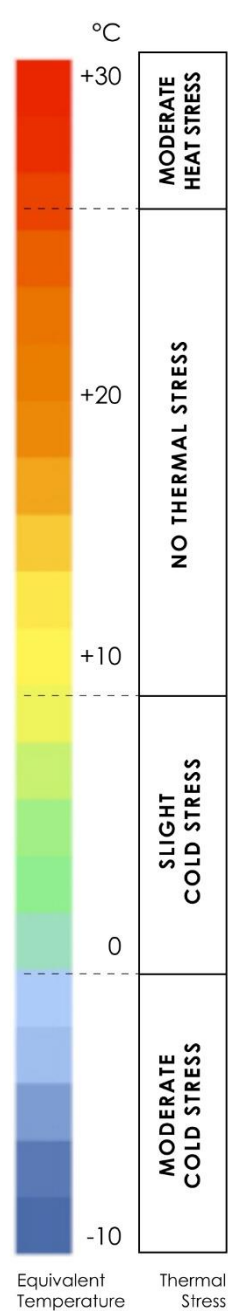


Solar Radiation

=

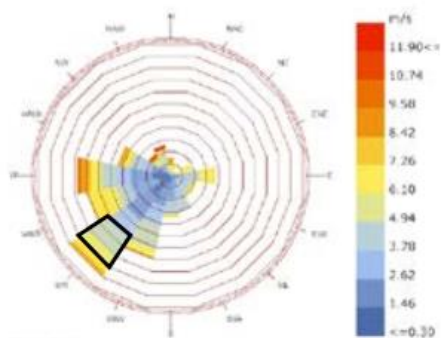


UTCI



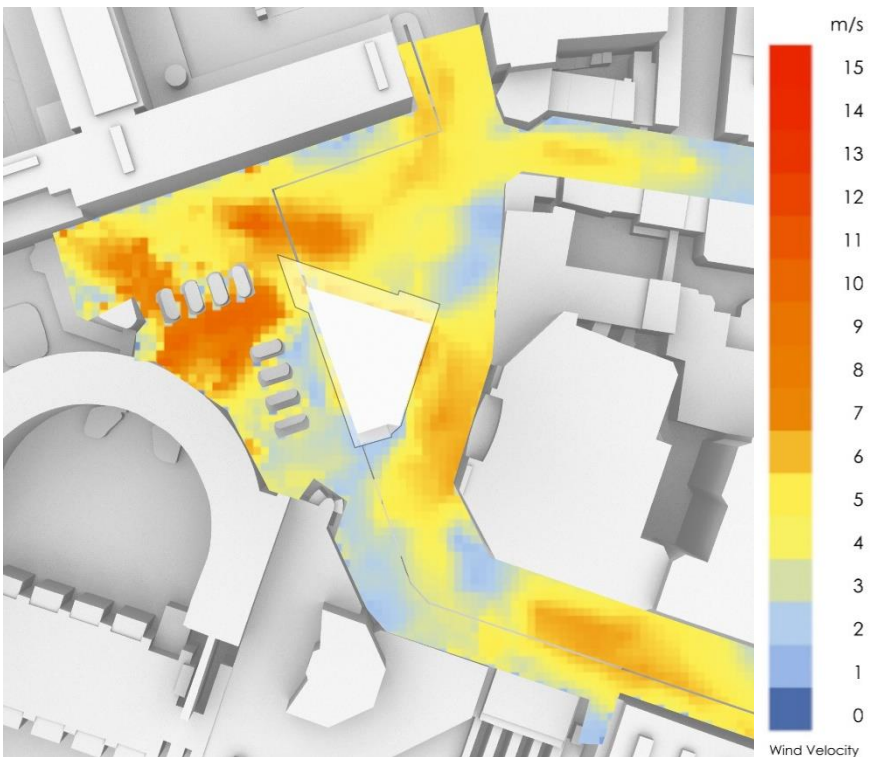
Universal Thermal Climate Index

JANUARY

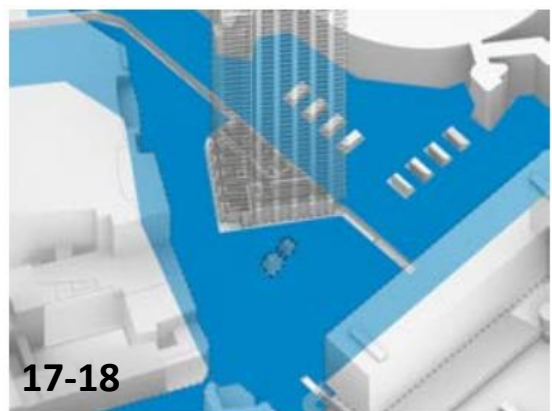
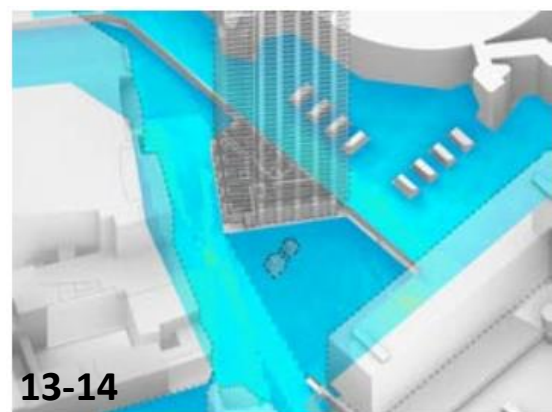


Avg Db = 7.2°C
Avg RH = 72%

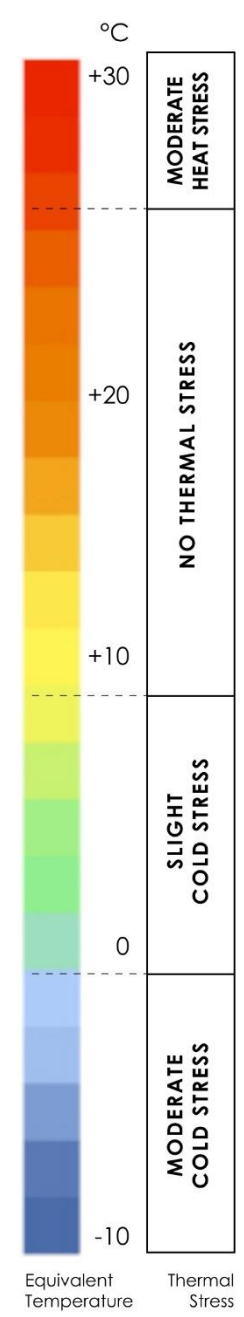
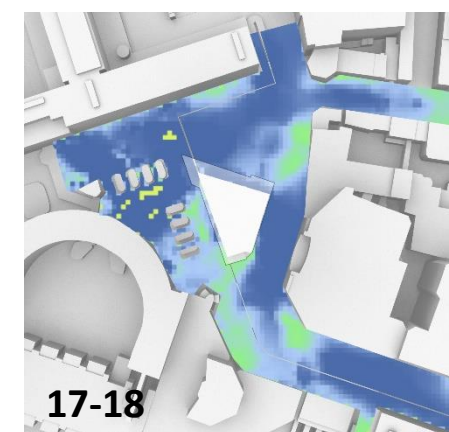
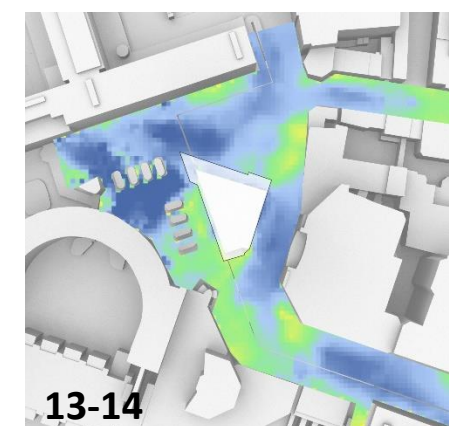
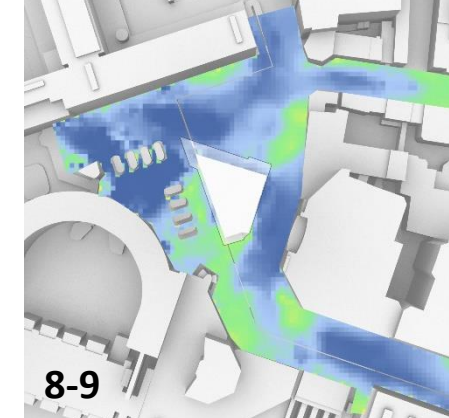
+



+



=

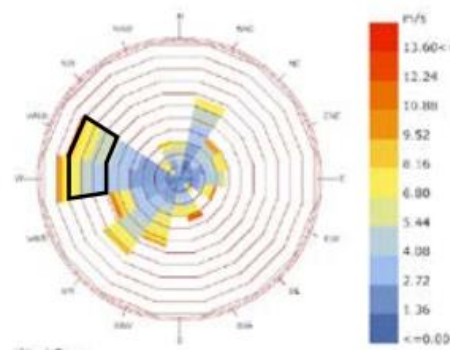


Wind CFD simulation

Solar Radiation

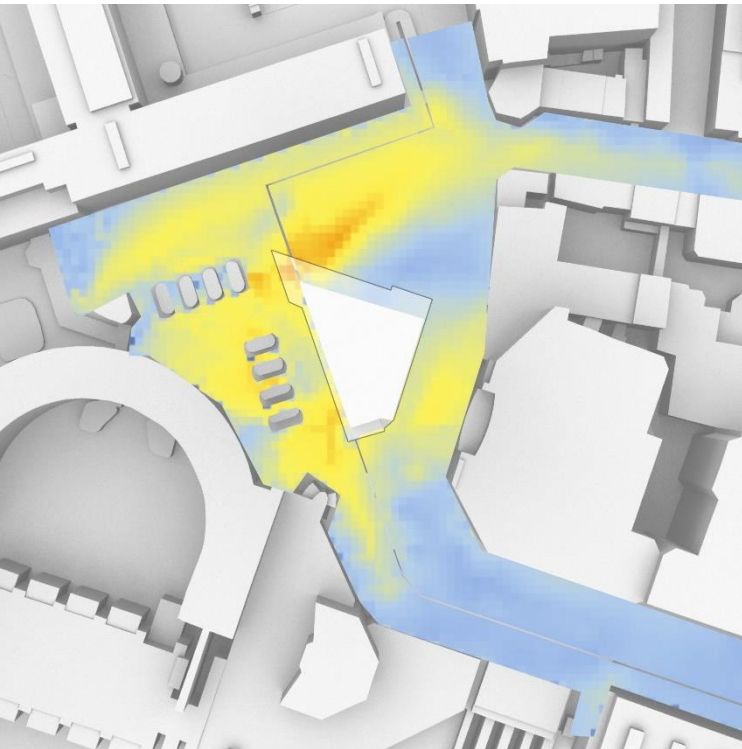
UTCI

Universal Thermal Climate Index JULY



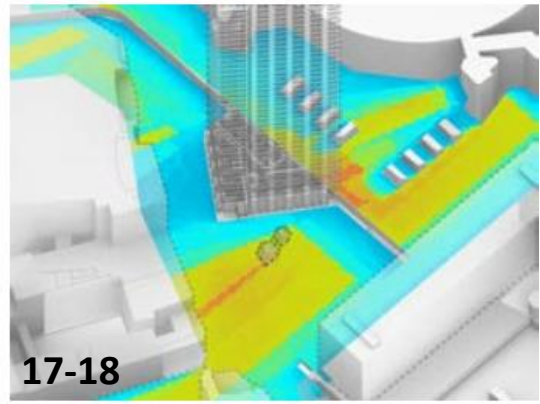
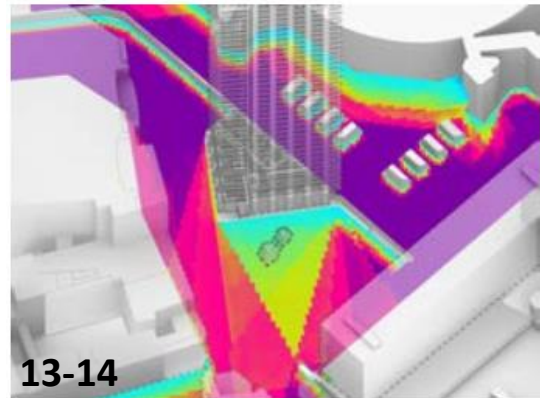
Avg Db = 20.9°C
Avg RH = 55%

+



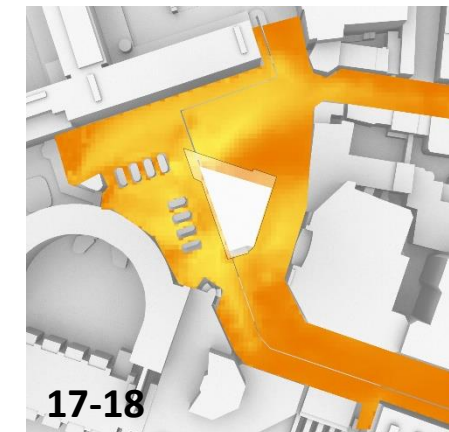
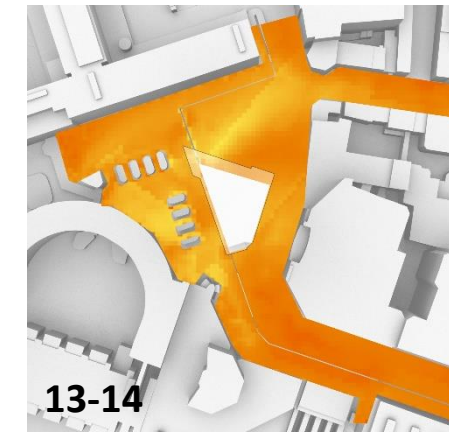
Wind CFD simulation

+

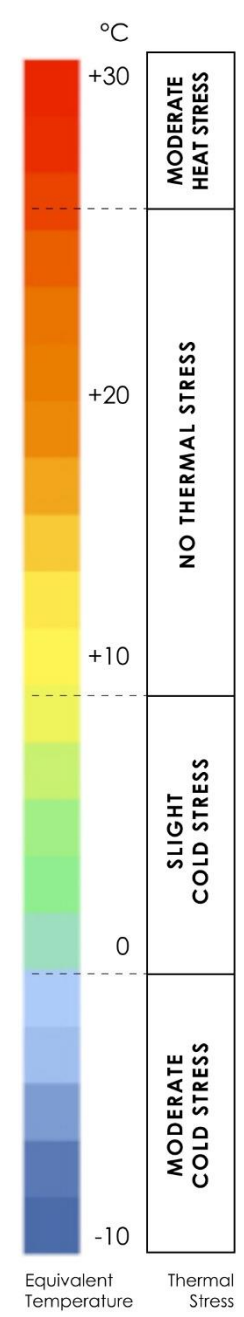


Solar Radiation

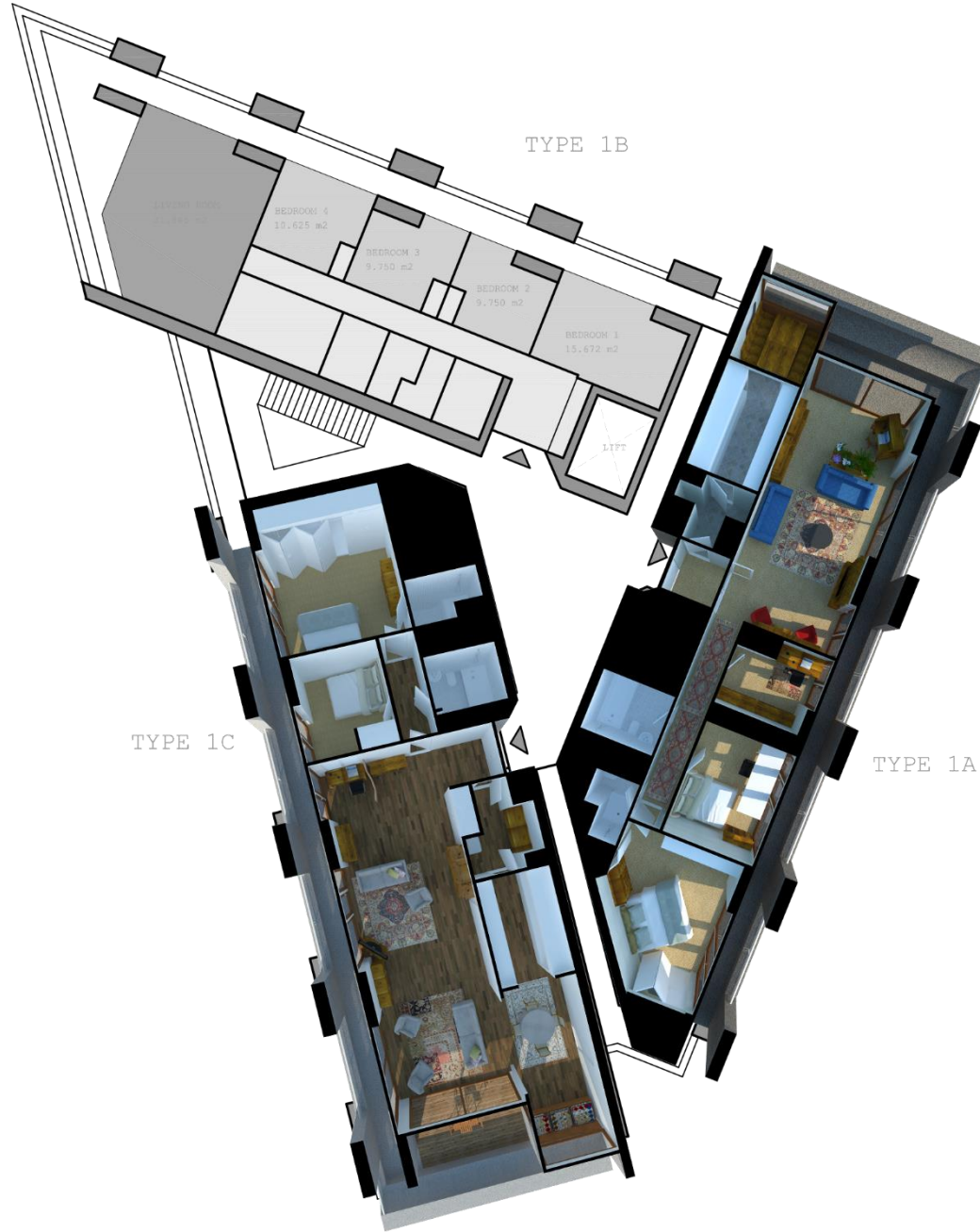
=



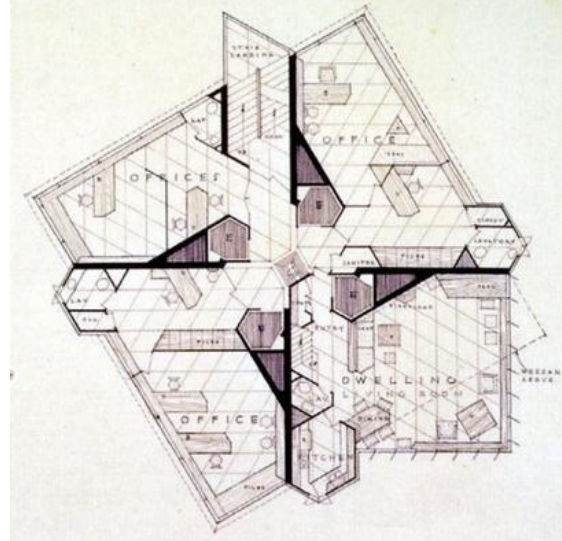
UTCI



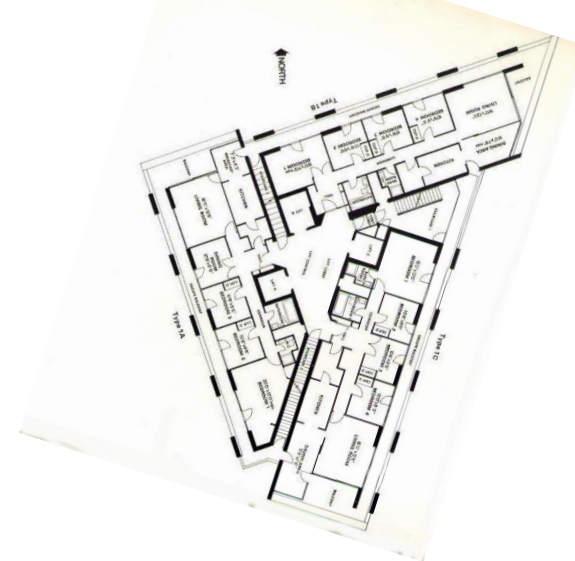
Cromwell Tower



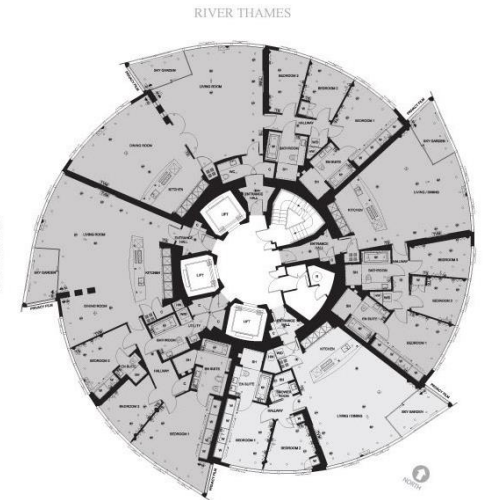
Architectural Precedence



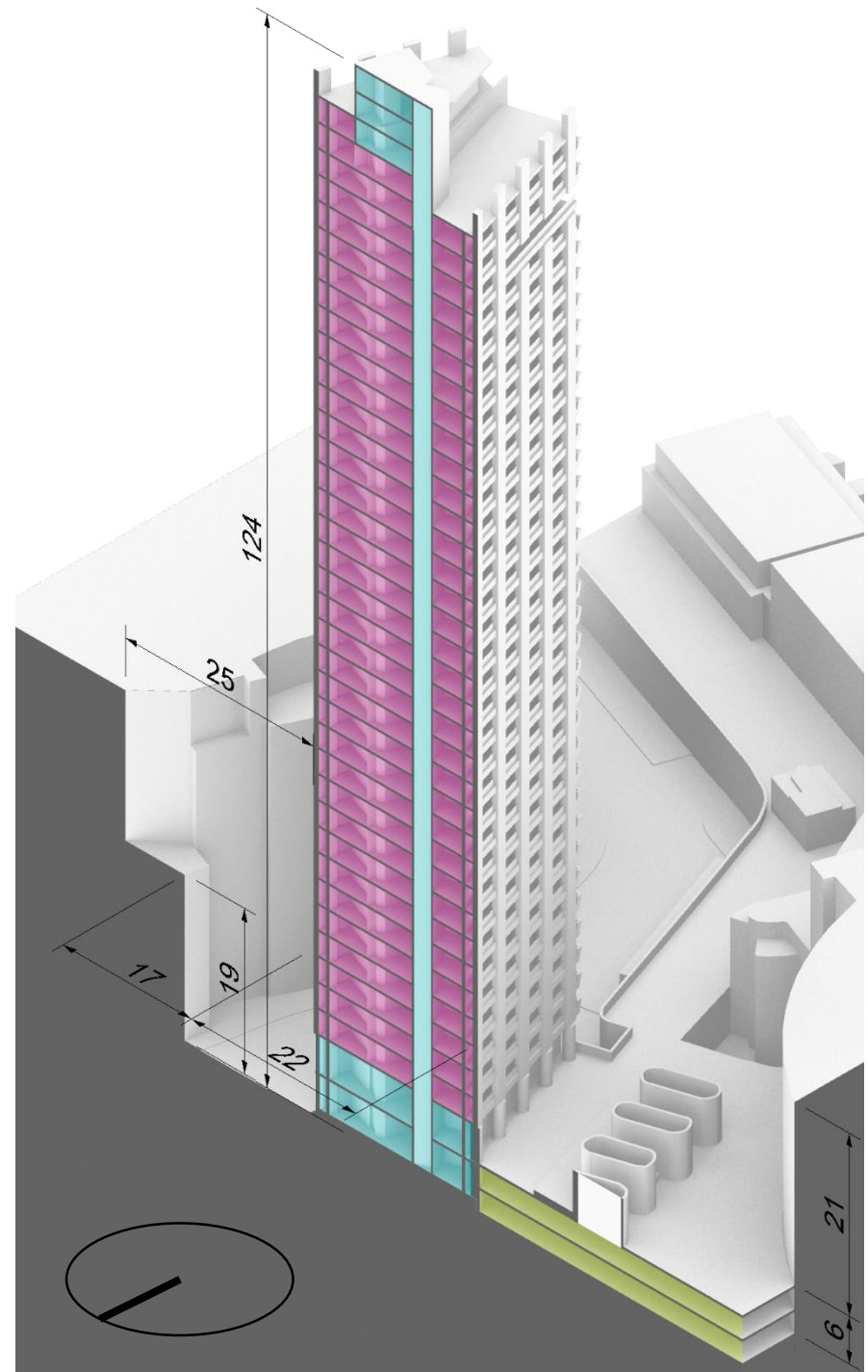
Price Tower 1955



Cromwell Tower 1973



Vauxhall Tower 2014

[illegible]

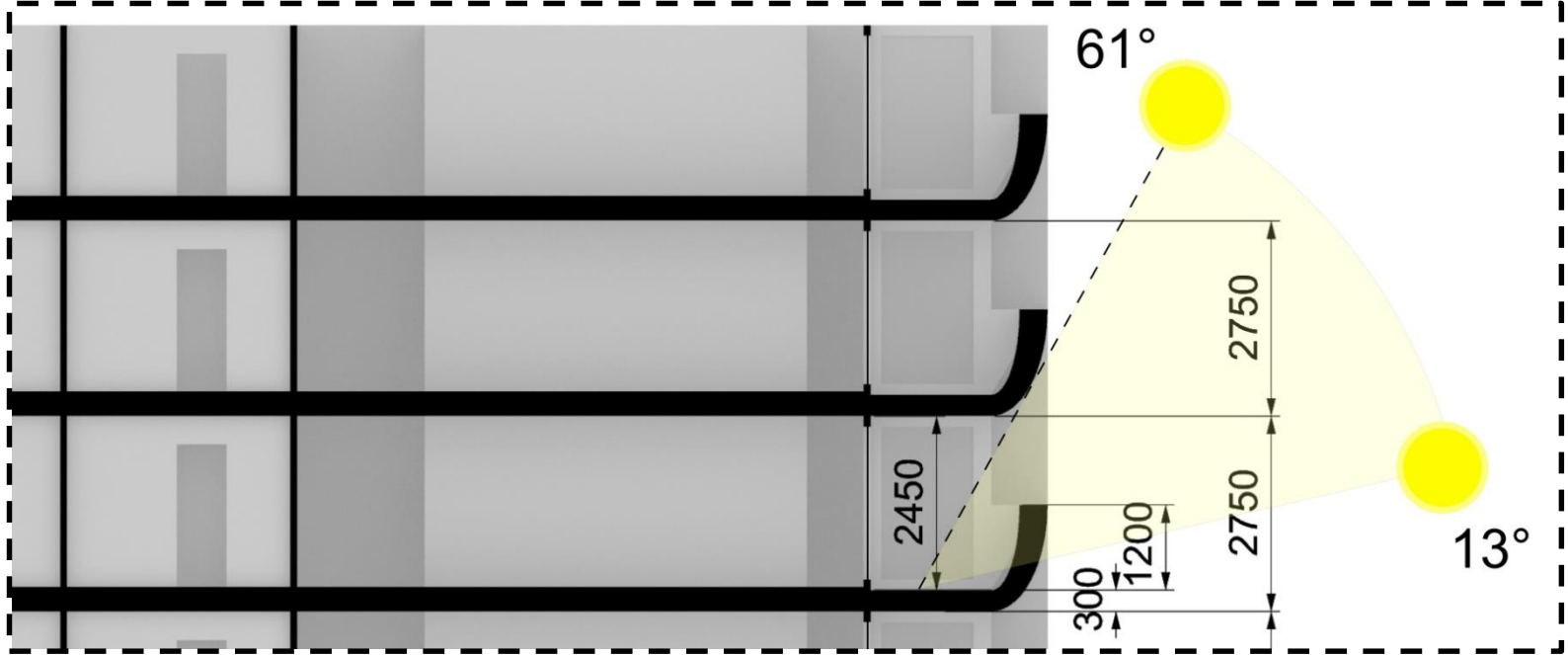
Cromwell Tower Sections

EXTERNAL FAÇADE:

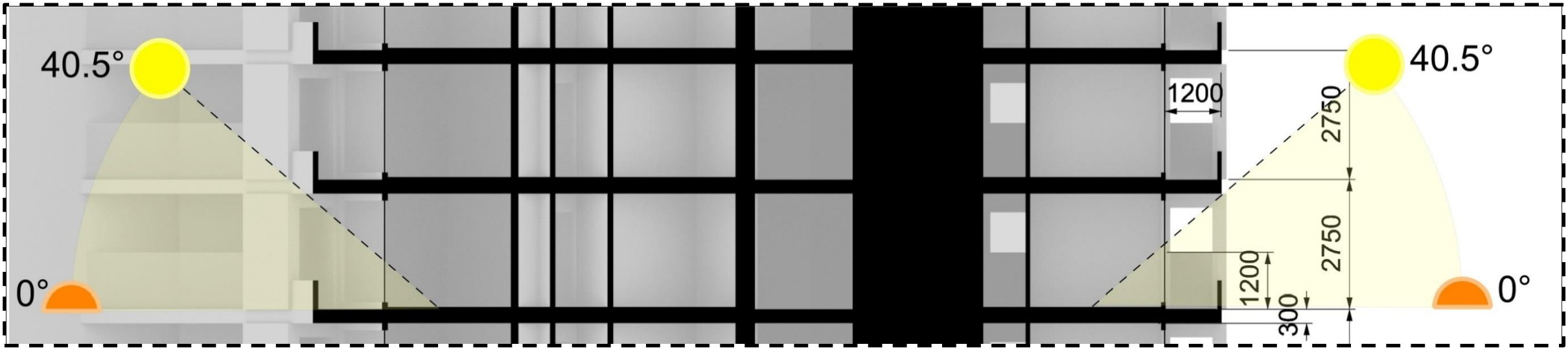
GLAZING/FLOOR RATIO: 35%
GLAZING RATIO: 51%

300mm CONCRETE WALLS: $U=3W/m^2K$
DOUBLE GLAZING: $U=2.5W/m^2k$

FABRIC HEAT LOSS PER APARTMENT:
40Kwh/day

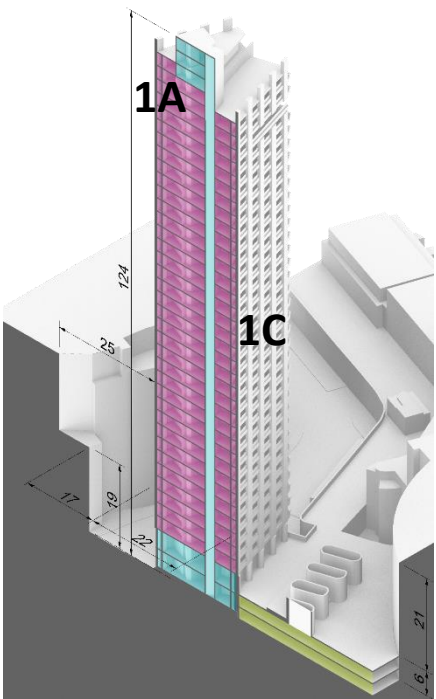


SECTION A-A (NORTH-SOUTH)



SECTION B-B (EAST-WEST)

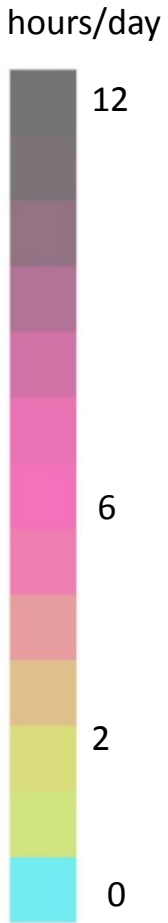
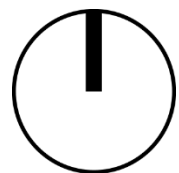
Cromwell Tower Solar Access



Solar Access Simulation:
Winter Solstice

1A (36th floor)

1C (15th floor)



Occupancy

7:00-8:30

12:00-13:00

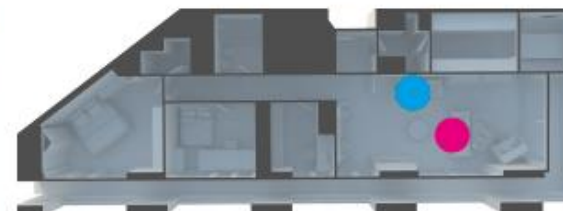
14:00-18:00

18:00-20:00

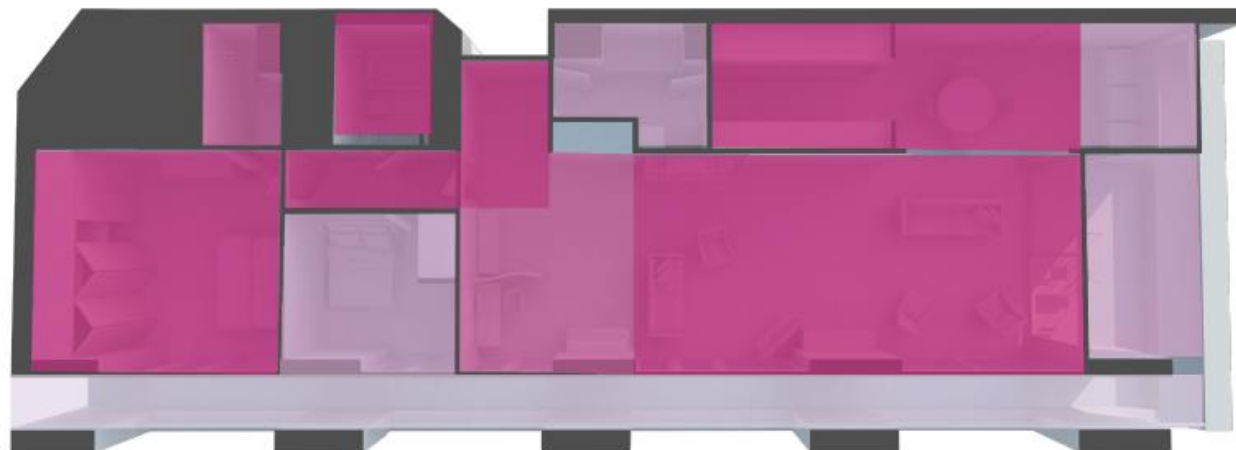
PAYNE:



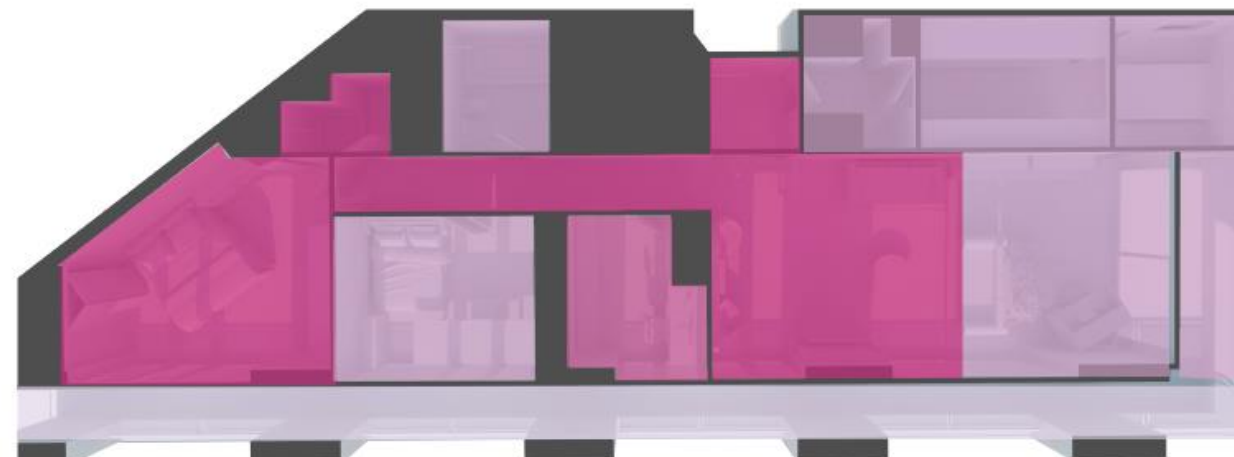
QUINN:



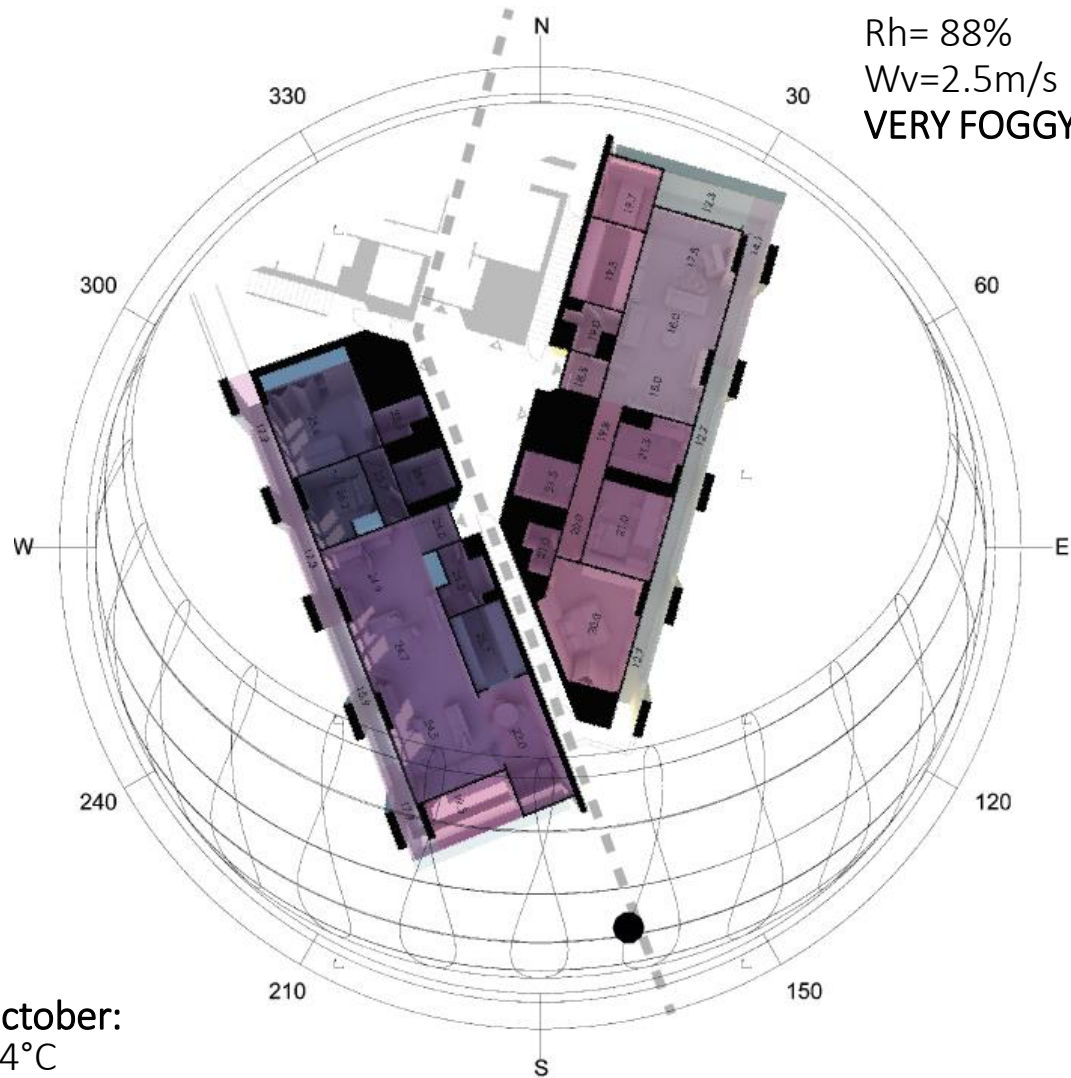
QUINN:



PAYNE:

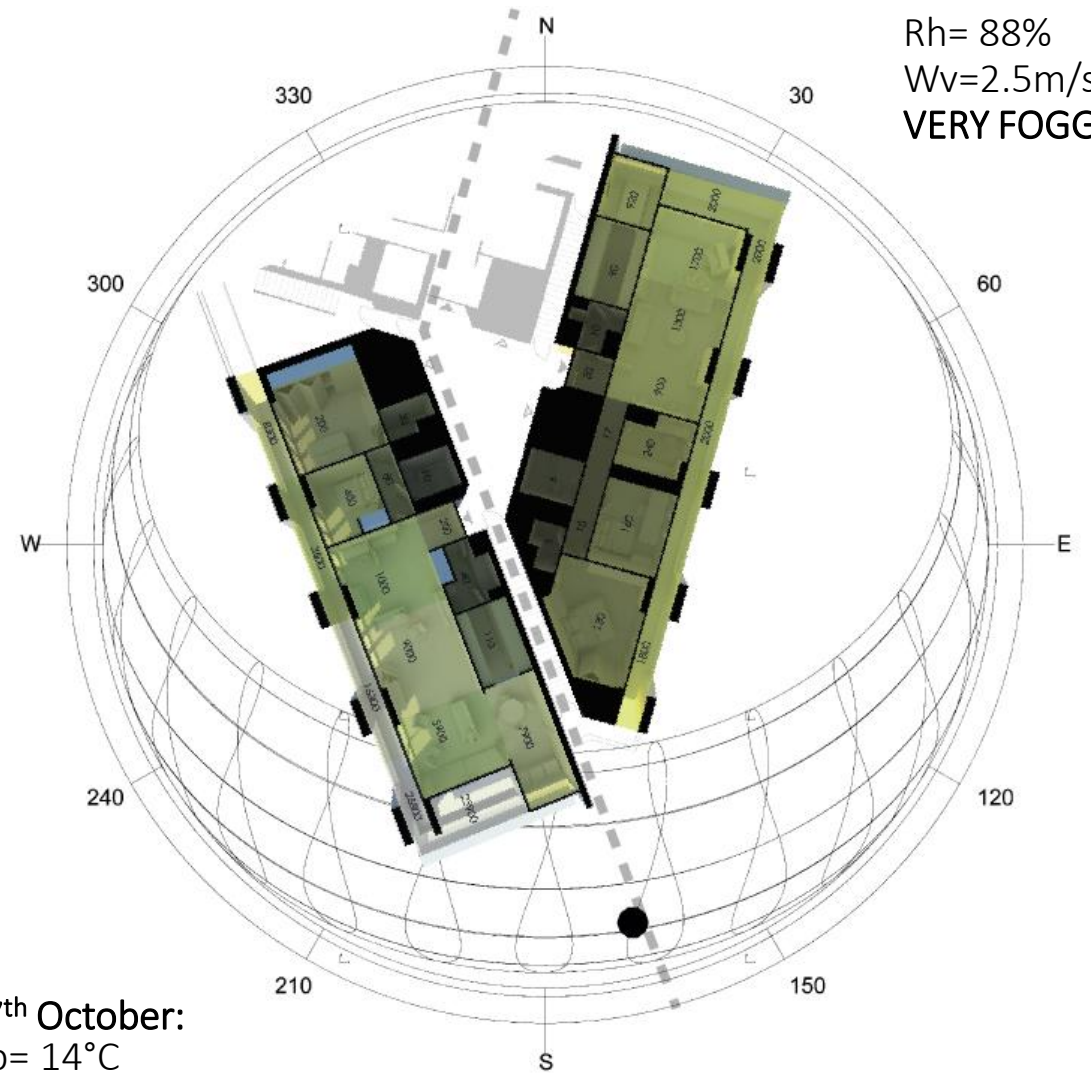


Measurements



17th October:
Db= 14°C
Rh= 85%
Wv=2.7m/s

29th October:
Db= 13°C
Rh= 88%
Wv=2.5m/s
VERY FOGGY

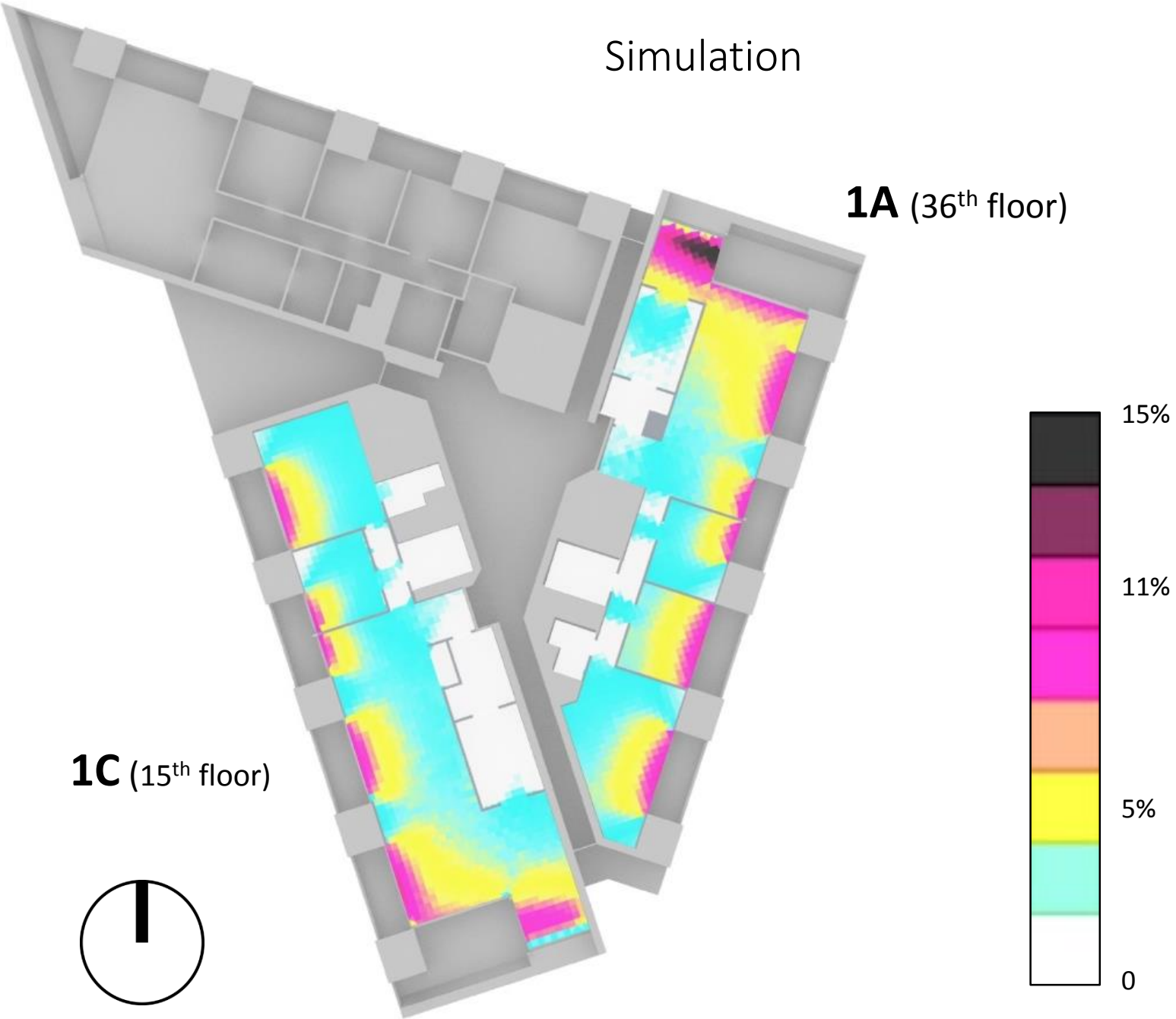
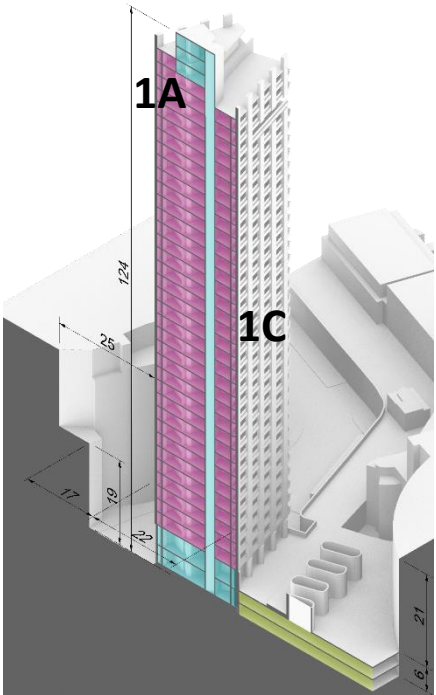


17th October:
Db= 14°C
Rh= 85%
Wv=2.7m/s

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Db= 13°C
Rh= 88%
Wv=2.5m/s
VERY FOGGY

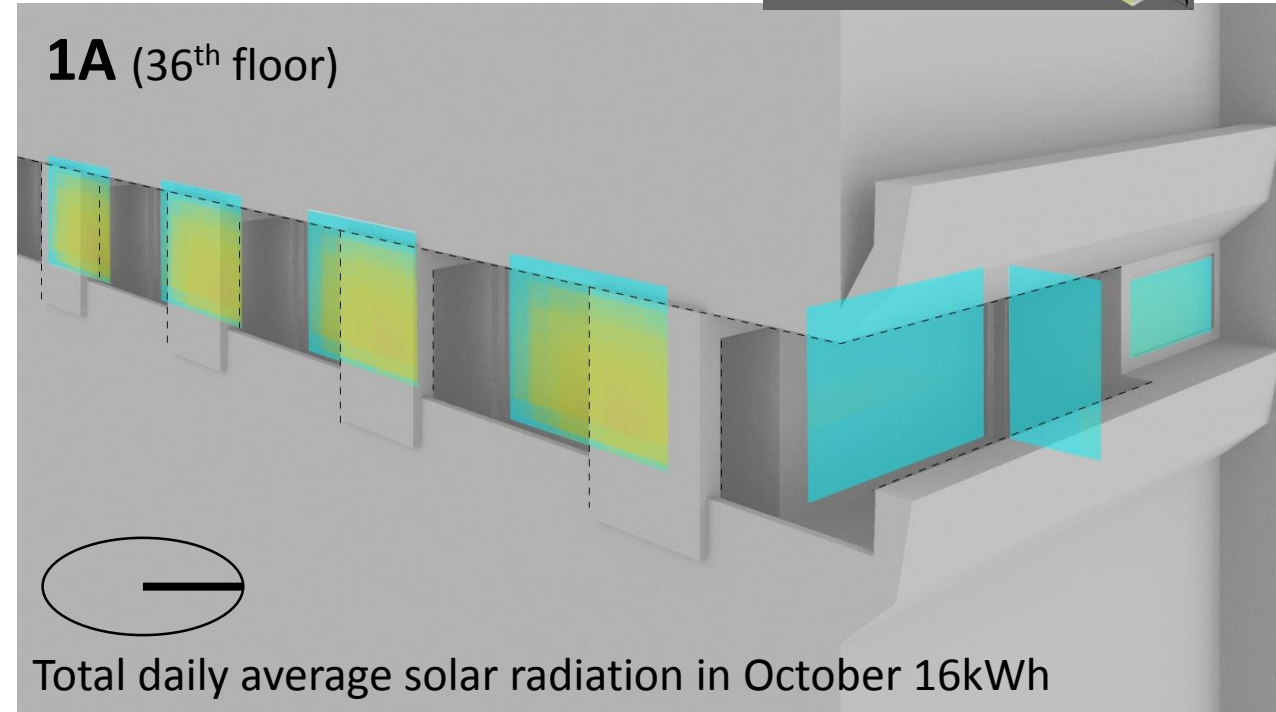
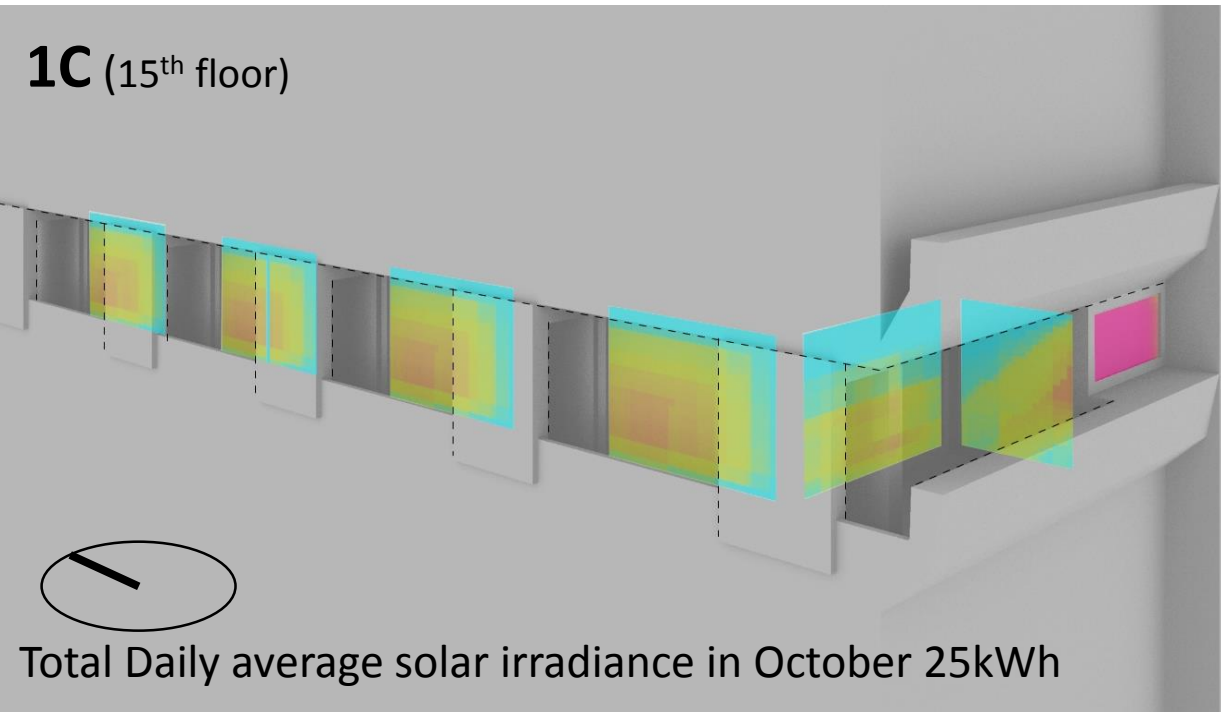
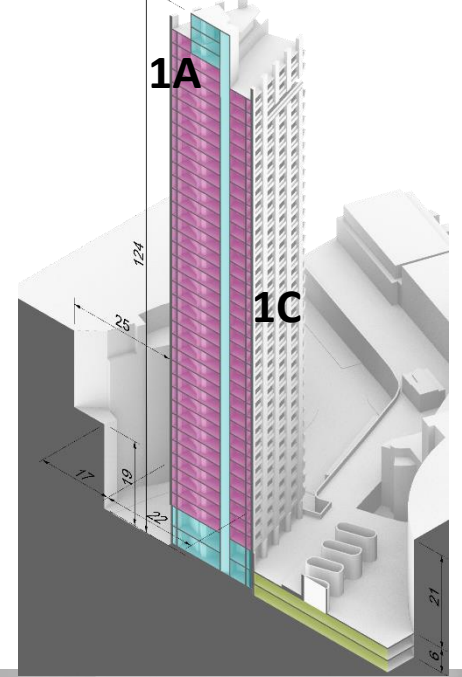
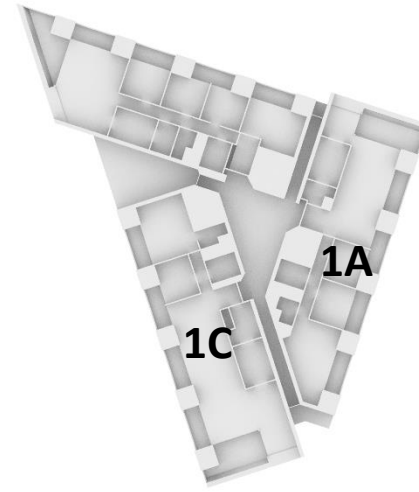
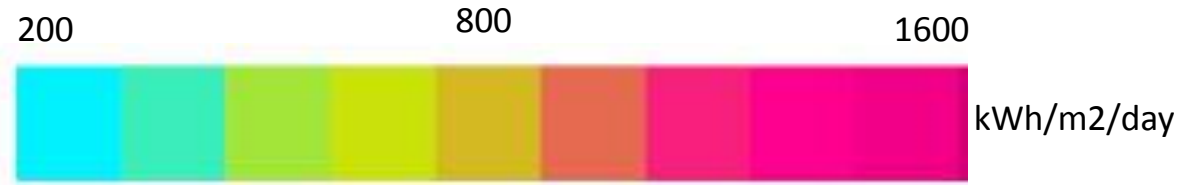
Cromwell Tower

Day Light Factor



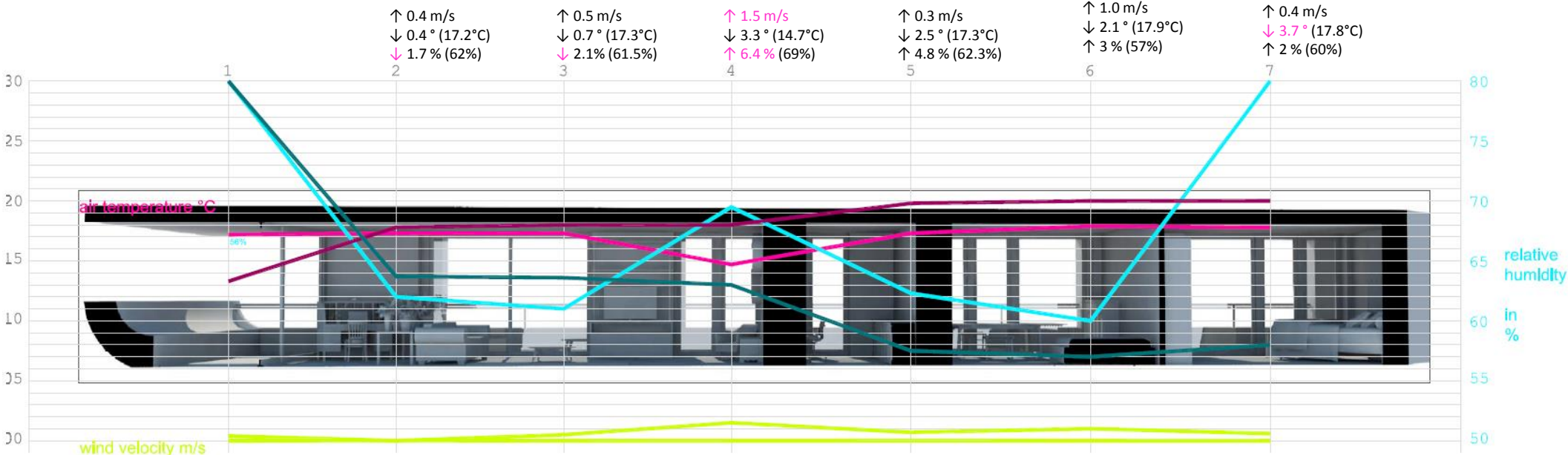
Cromwell Tower

Daily Solar Radiation

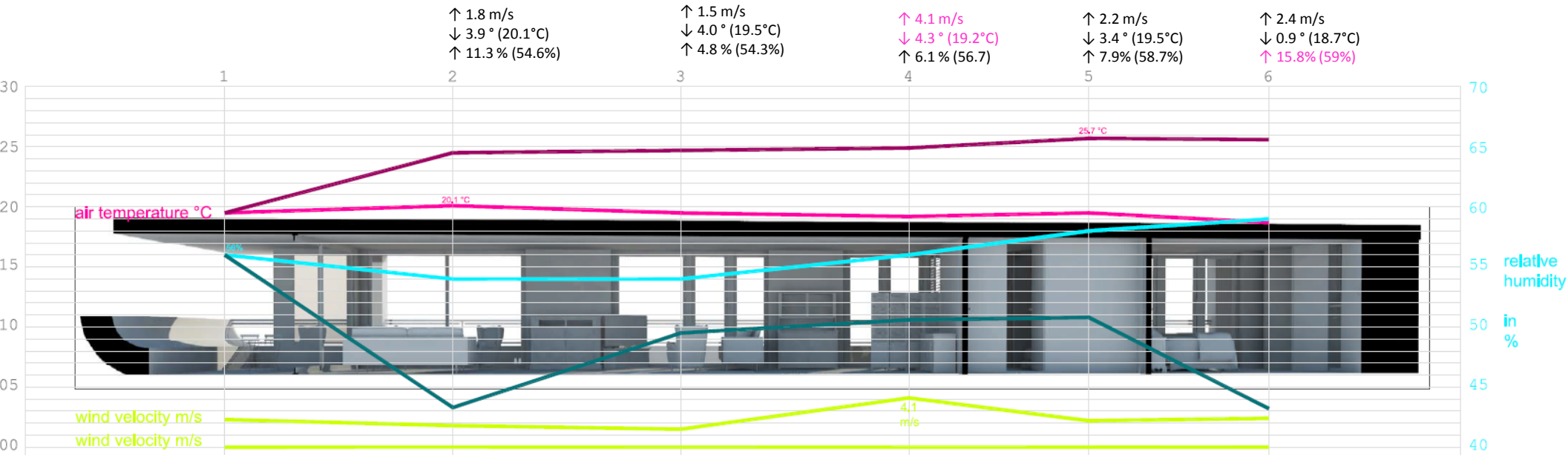


Wind impact

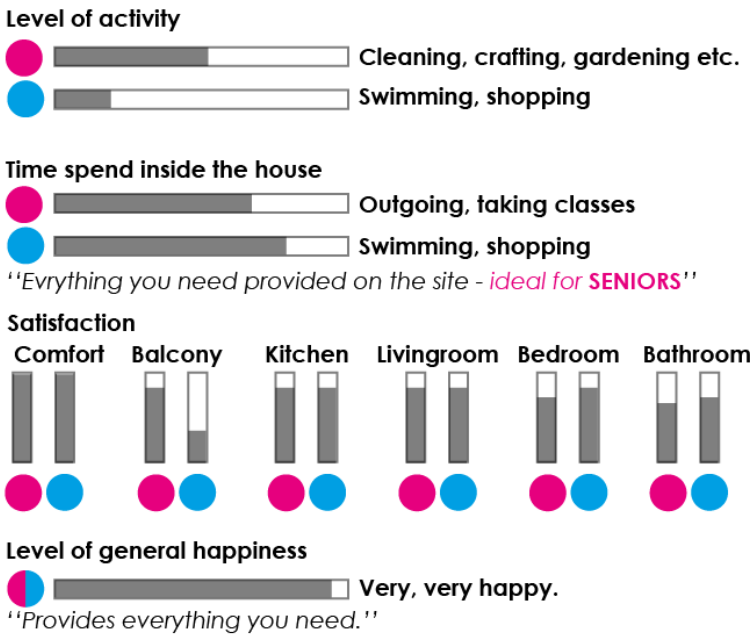
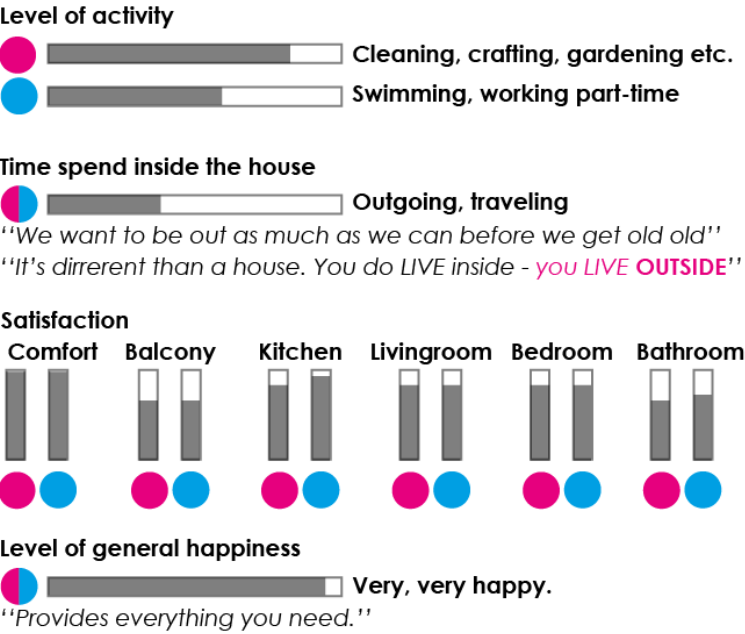
1A 36th floor
Mr & Mrs
Payne



1C 15th floor
Mr & Mrs
Quinn



Occupants Perception



Occupants Perception

