STADIUM ROAD NEIGHBOURHOOD
JULY 2018

BCN ECOLOGIA
Agència d'Ecologia Urbana de Barcelona

UBC

SCARP
School of Community And Regional Planning

Stadium Road Neighbourhood Report 2

COMPARATIVE ANALYSIS OF TWO OPTIONS. JULY 2018

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Introduction

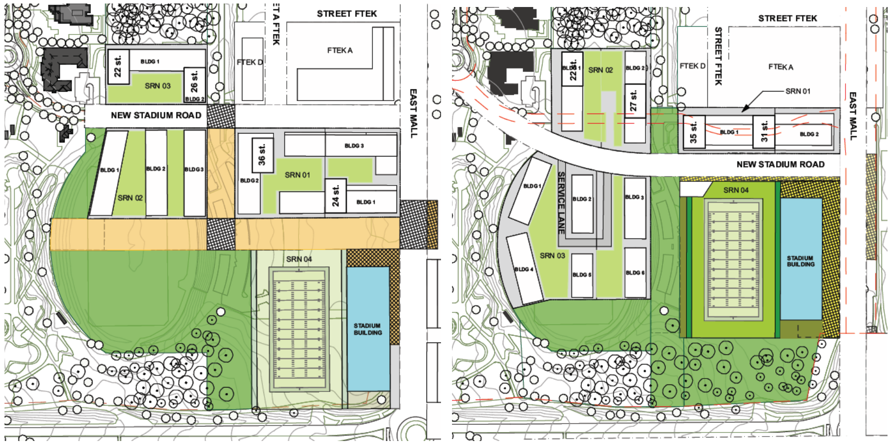
Sustainability is a key factor in urban development plans. Actions designed under sustainability criteria are an important to the densification of the current territorial model which tends towards dispersed urbanization.

However, it is necessary that interventions in the territory align with the principles that define the most sustainable city model: compact in its structure, complex in its organization, as self-sufficient as possible, locally, in the metabolic flows (energy, water, food, materials) and socially cohesive.

The purpose of this document is to evaluate and analyze two urban design options for the Stadium Road Neighborhood to the principles and objectives of ecosystem planning. These principles are shared with those that were adopted by the UBC Board of Governors in December 2017. The two options analyzed identify different planning approaches. The complete options show different relationships of the key components: housing, commercial and community uses and public open spaces.

Ecosystemic urbanism is defined as urbanism that lays the foundations for facing urban challenges (mobility models based on private transport and its consequences in public space, social segregation and gentrification, land use, water, materials and energy, among other problems) through a theoretical and instrumental framework for the design of new urban developments and, above all, the regeneration of existing ones. Urban ecology is a discipline which has a necessary theoretical framework for facing the urban reality holistically and systemically and it is the only discipline which can harmonize urban transformation processes with the laws of nature.

The analysis presented in this report was done before the final volumetric design was completed. While diagrams may differ slightly, results will be minimally impacted by these changes.



ECOSYSTEMIC URBANISM APPROACH
OPTIONS 1 & 2

List of indicators

URBAN MORPHOLOGY AND STRUCTURE
Residential density
Absolute compactness
Corrected compactness
Public Social space per inhabitant

HABITABILITY IN PUBLIC SPACE
Thermal comfort

SUSTAINABLE MOBILITY
Motorized road space
Proximity to the main bicycle lane network
Off-road car parking spaces

URBAN COMPLEXITY
Non-residential activity
Density of legal entities
Urban Diversity Index

GREEN SPACES AND BIODIVERSITY
Green space per inhabitant
Proximity to green spaces
Soil Biotic Index
Green roof ratio

URBAN METABOLISM
Sunlight
Eenrgy demand

SOCIAL COHESION
Provision of afforable housing
Provision of public facilities
Proximity to public facilities

Residential Density

Indicator definition

The total number of dwellings per hectare.

Calculation parameters

CALCULATION FORMULA

Number of dwellings / ha

UNIT

Dwellings/ha

Evaluation parameters

MINIMUM OBJECTIVE

> 80 dwellings/ha

DESIRABLE OBJECTIVE

> 100 dwellings/ha

RESULTS		
Option 1	**185.7 dwellings/ha**	●
Option 2	**172.8 dwellings/ha**	●

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

The two options project a housing density of more than 100 dwellings/ha (desirable objective): 185.7 dwellings / ha in option 1 and 172.8 dwellings/ha in option 2. This density translates into an estimated total population of 3,907 and 3,636 people respectively. The average number of people per household in the Wesbrook neighborhood has been taken as the standard ratio (2.4 inhabitants/dwelling).

As a result, the population density is between 445 and 414 inhabitants per hectare. And an urban fabric has adequate tension if it has enough population to provide it life.

A public space is a meeting place, a place made to be shared, where a large number of urban interests coincide. Interests that may be opposing, in some cases. In order for a public space to exist, or in other words, in order for it to make sense as a space for daily interactions, and as a space that can be used for all the purposes that make us citizens, the public space must be occupied by a sufficient number of inhabitants and legal persons.

The second feature that differentiates a city from a residential area is the number and range of complementary legal persons (in terms of economic activities, associations and institutions). The complex and multifunctional organisation of a city, generated by the range and mixture of uses for that city, is much more complicated than the organisation of a suburb, which has a simplified and monofunctional structure.

Densities a long way above or below these values are not desirable in a more sustainable scenario. The former case would represent congestion, leading to a cost for the population in terms of public space and services, and the latter corresponds to an excessively dispersed type of construction leading to greater resource consumption and not providing enough tension for the normal development of urban functions.

The two options opt for a block type building typology where population density is achieved by building vertically.

This solution is adequate to achieve the critical mass of people required but it requires careful site planning and design to ensure that the residential units and the public spaces receive adequate sunlight.

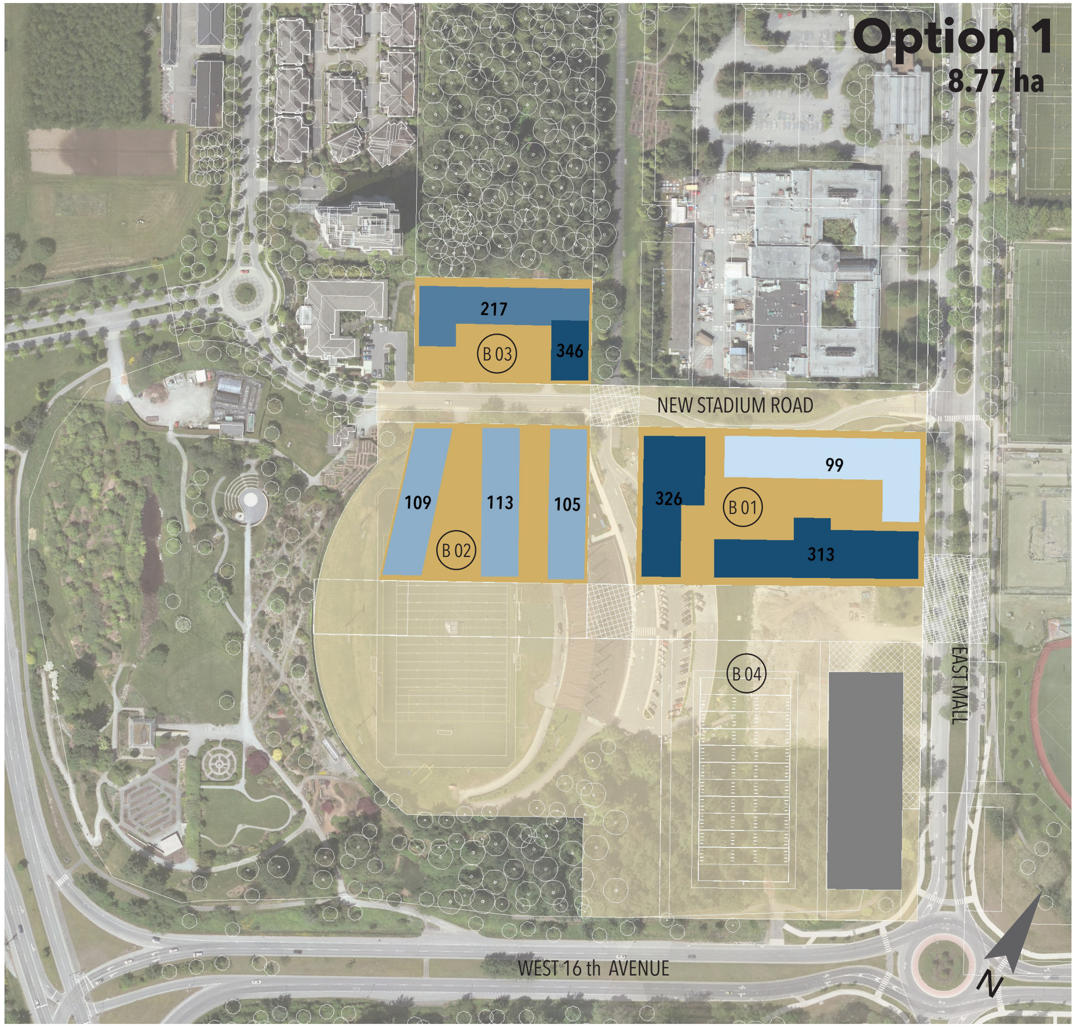
The greatest concentration of housing is located on the inner axis of the new neighborhood that runs through the pedestrian-dominated spaces (for option 1) and through the New Stadium Road (for option 2).

Residential Density

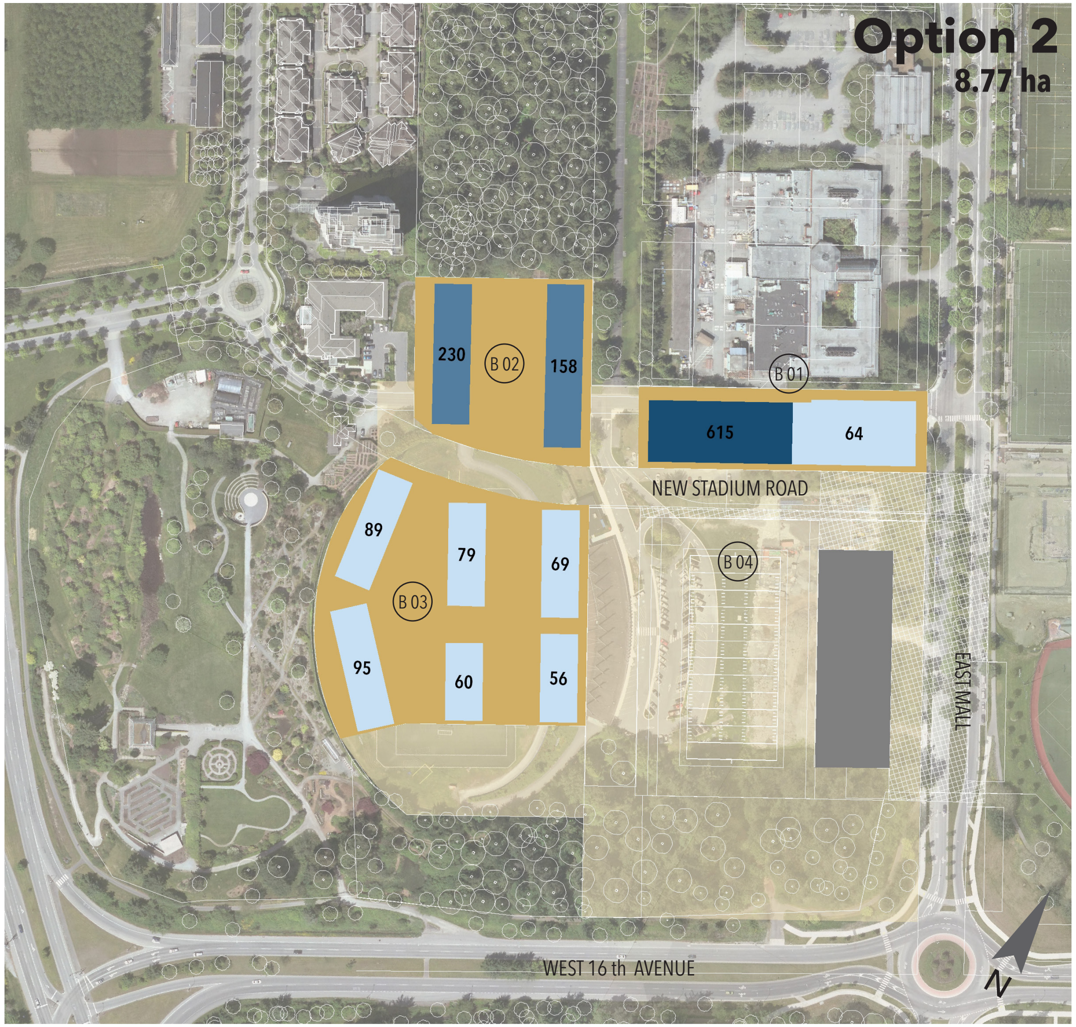
Dwellings/ha

- >250
- 150 to 250
- 100 to 150
- < 100

Residential units: 1,628
Residential Density: 185.7 dwellings/ha
Estimated population: 3,907 inhabitants



Residential units: 1,515
Residential Density: 172.8 dwellings/ha
Estimated population: 3,636 inhabitants



Absolute Compactness

Indicator definition

The relationship between the volume built and the surface of the area of study. The result corresponds to the average height of the building on the entire area.

Calculation parameters

CALCULATION FORMULA
[Volume built (m^3)/ Total area (m^2)]

UNIT
Metres

Evaluation parameters

MINIMUM OBJECTIVE
> 5 metres

DESIRABLE OBJECTIVE
-

RESULTS	
Option 1	**8.3 metres**
Option 2	**8.0 metres**

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

For an urban space to be socially integrating, first of all there needs to be a sufficient number of inhabitants to give it life. An adequate compactness level is one of the key requirements to ensure this is the case. In disperse urban fabrics there are private spaces that cover fundamental recreational needs, which are usually carried out in collective spaces in neighbourhoods in compact cities. This is a necessary condition for compact fabrics to have a good social life, although it is not sufficient. An adequate population density, combined with a good mix of urban functions (housing, facilities, work, third places, leisure spaces and so on), will encourage frequent visits and make the area more attractive, resulting in an increase in spontaneous interactions.

In reference to projected built-up volume, the two options for UBC Stadium Road Neighbourhood reaches positive values for this indicator.

Both options obtain very similar results: **8.3 metres** for option 1 and **8.0 metres** for option 2.

Therefore, both options are going to favour a compact use of land and in this way they fulfill the objective of ecosystemic urbanism. It implies that it's going to facilitate the proximity not only physical but also among people. So the exchange and contact among the information bearers are facilitated and it reduces the mobility need. Also it increases the urban complexity, and the morphologic continuity favors the commercial activity and human interactions.

Also a high degree of compactness at grade implies a reduction in energy demand and resource consumption.

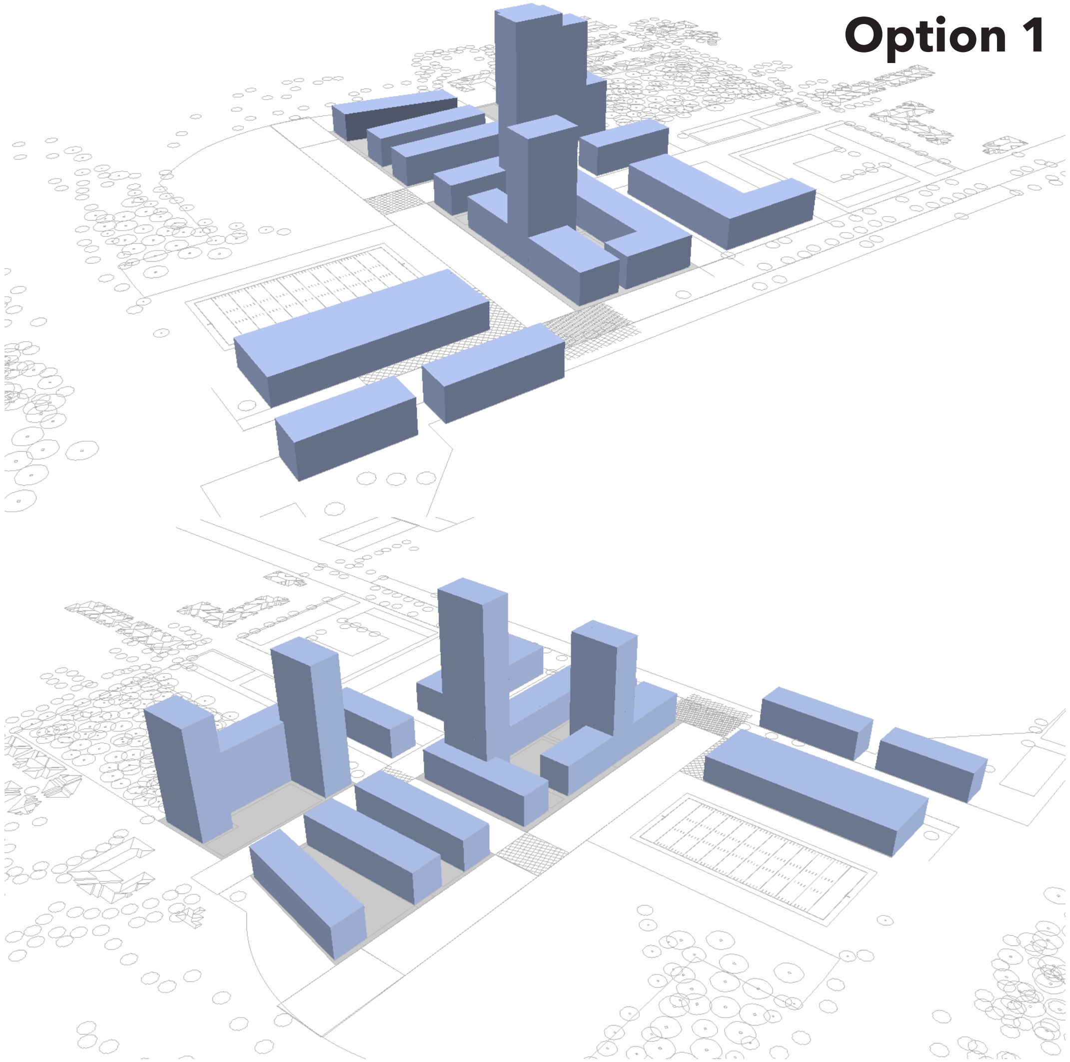
Nevertheless, it will be very important to value how these new proposals fit in the existent fabric, that is defined because it's a low density one and it has different morphologic characteristics if it's compared to the existing fabric.

With efficient compactness, comes the need to have generous green space and a critical balance between built-up volume and high quality outdoor public space.

Absolute Compactness

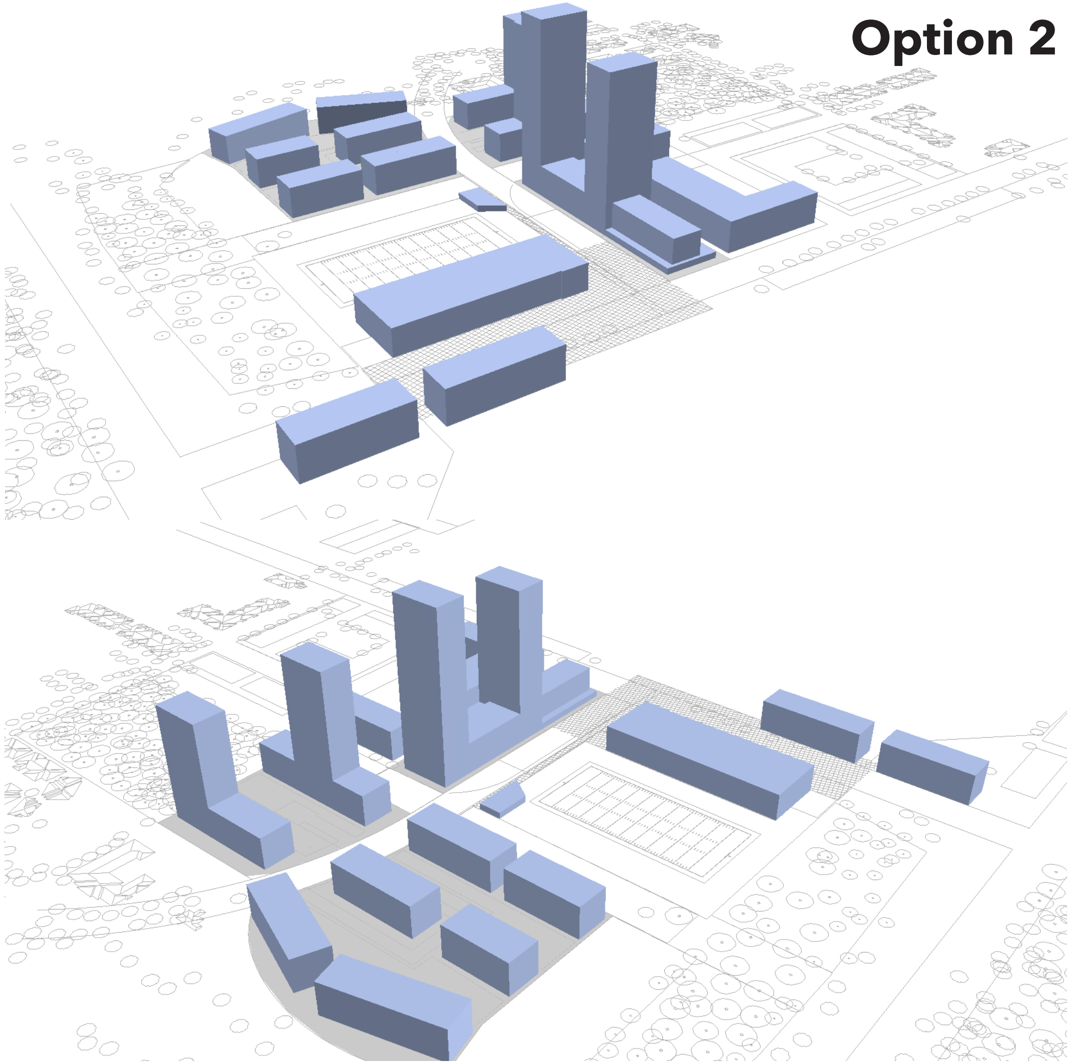
Absolute Compactness: 8.3 metres
Gross buildable area: 1.76 $m^{2\ ceiling}/m^{2\ land}$

Option 1



Absolute Compactness: 8.0 metres
Gross buildable area: 1.59 $m^{2\ ceiling}/m^{2\ land}$

Option 2



Urban equilibrium: Corrected Compactness and Public Social Space per inhabitant

Corrected compactnes: definition

The relationship between the volume built and the staying spaces (defined as the 'public or social' spaces, recreation spaces and urban green spaces) of a given urban fabric.

Calculation parameters

CALCULATION FORMULA
[Built volume (m^3) / staying public space (m^2)]

UNIT
Metres

Evaluation parameters

MINIMUM OBJECTIVE
10-50 metres

DESIRABLE OBJECTIVE
10-25 metres

RESULTS	
Option 1	**11.5 metres**
Option 2	**12.2 metres**

0 1 2 3 4 5 6 7 8 9 10

Public Social space per inhabitant: definition

Public Social space[1] - PSS- (space for citizen use) per inhabitant.

Calculation parameters

CALCULATION FORMULA
[Area of Public Social space (m^2) / Total population]

UNIT
m^2 (sqm) / inhabitant

Evaluation parameters

MINIMUM OBJECTIVE
> 10 m^2/inhabitant

DESIRABLE OBJECTIVE
> 15 m^2/inhabitant

RESULTS	
Option 1	**13.8 m^2/inhab**
Option 2	**13.9 m^2/inhab**

[1] This term is equivalent to Barcelona's 'Public Staying Space'.

Assessment of results

This indicator corrects the absolute compactness, because an excessive compactness can cause urban congestion and saturation. It gives the idea of a lighter urban fabric, so that activities related to public staying space are encouraged.

Public Social space is that in which, due to its morphological and functional characteristics, allows, to varying degrees, the interaction between people or between people and the accessible public environment: parks, squares, pedestrian streets, block interior spaces, boulevards, avenues and sidewalks over a specific width (5 metres) that allow two people to stop to talk without hindering the passing of pedestrians.

For both options the obtained results of **corrected compactness** indictor are positive (at the low threshold; "loose fabric"); they reach the desirable objectives, **11.5 metres** for option 1 and **12.2 metres** for option 2.

With regard to **Public Social space** per inhabitant, the results are positive for both options: 13.8 (option 1) and 13.9 m^2/inhabitant. Option 1 has more public social space than 2 (3,437 m^2) but also higher estimated population. If we consider the total Public Social space (both for public and private use), the results ascend to 16.2 and 15.8 m^2/inhabitant respectively.

Urban equilibrium

Corrected Compactness and Public Social Space per inhabitant

Typology of spaces

Public space
- Park (SS)
- Plazas & Promenades (SS)
- Sidewalk (SS)
- Courtyards/green space (SS)
- Road
- Service lane

Private space
- Open space / Setbacks (SS)
- Green roof - walkable (SS)
- Public Social space in top (SS)

Total Social space: 63,110 sq.m.
- Public: 54,066 (86 %)
- Private: 9,044 (14 %)

Public Social space/inhabitant: 13.8 ***(16.2 public+privat)***

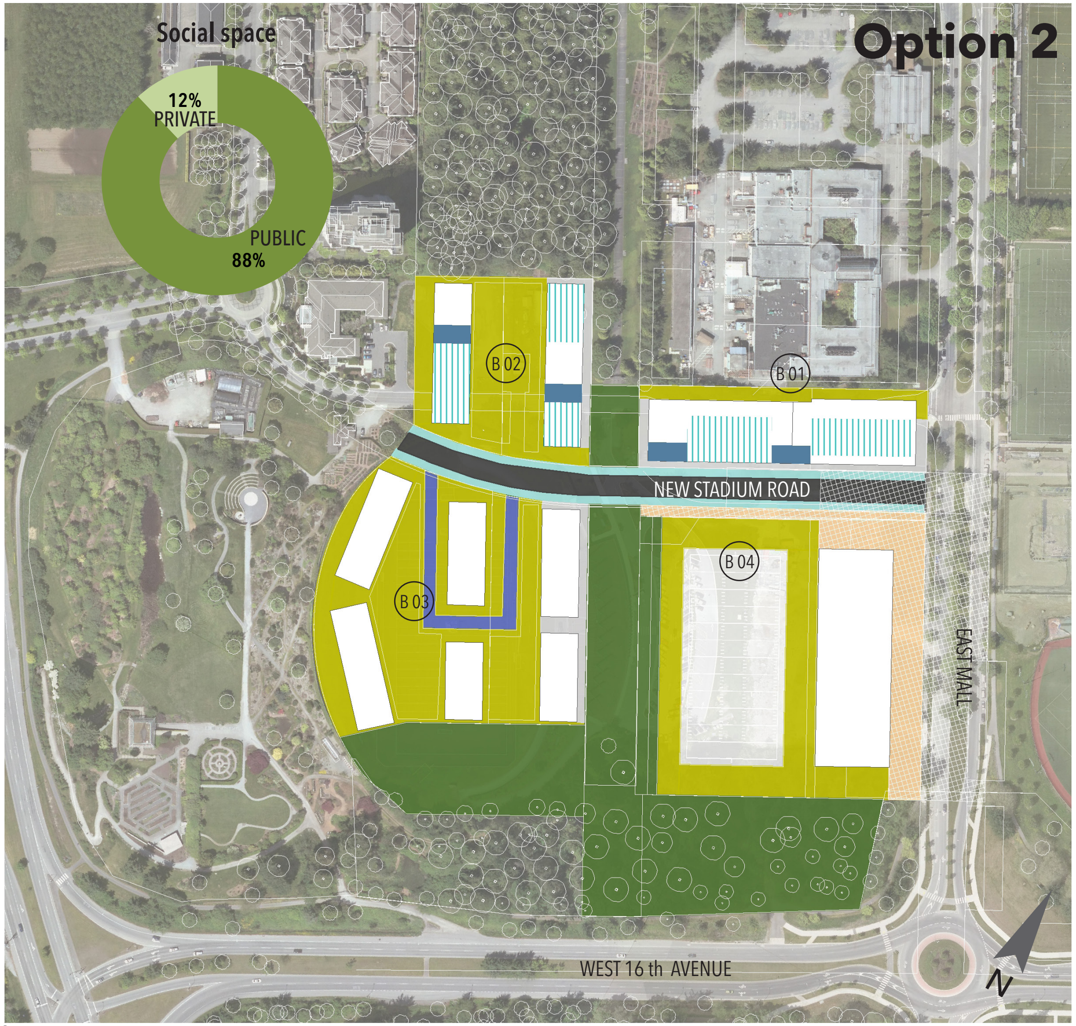
Corrected compactness: 11.5 m

Total Social space: 57,538 sq.m.
- Public: 50,629 (88 %)
- Private: 6,909 (12 %)

Public Social space/inhabitant: 13.9 ***(15.8 public+privat)***

Corrected compactness: 12.2 m

SS: Social Space



Thermal comfort

Thermal comfort: definition

The average radiant temperature in °C in pedestrian areas between 8h - 22h.

Calculation parameters

CALCULATION FORMULA
Radiant temperatures per hour/ 15h (results from heat simulation)

UNIT
°C

Evaluation parameters

MINIMUM OBJECTIVE
< 30°C in Summer conditions > 5°C in Winter conditions

DESIRABLE OBJECTIVE
< 26°C in Summer conditions > 10°C in Winter conditions

RESULTS	
Option 1	**27.4°C summer** **11.7°C winter**
Option 2	**30.4°C summer** **7.5°C winter**

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

Microclimate conditions have an important relation with urban morphology and structure definition in terms of thermal comfort and energy consumption in buildings. Definition of the urban fabric needs to consider weather conditions in order to provide optimal comfort levels at outdoors and indoors spaces.

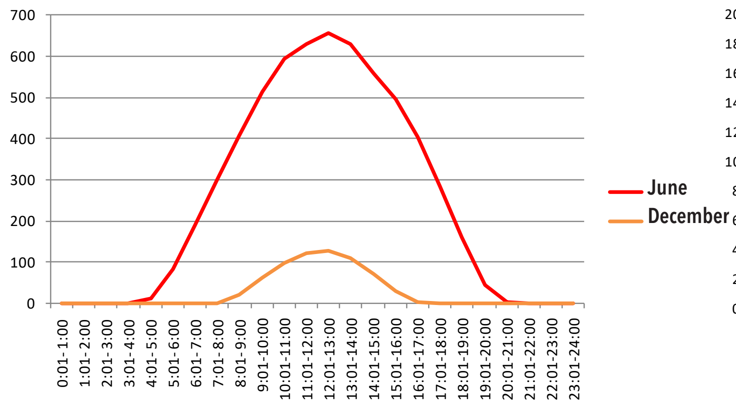
Vancouver has an coastal climate, cool and humid. Winters are mostly rainy and present an average air temperature between 7°C and 3°C. Summer days are characterized by low solar radiation and temperatures between 12°C - 20°C.

In this case, the most critical conditions are in winter, so urban fabric must aware an optimal insolation of open spaces and buildings.

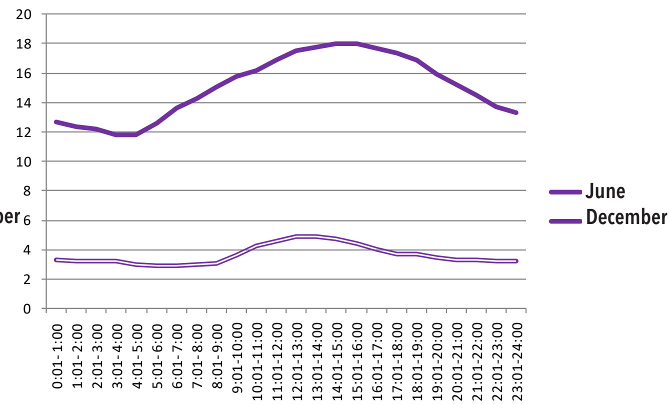
In order to compare both options proposed for the project, heat transfer simulations have been realized for summer and winter conditions. All surfaces in pavements respond to the project characteristics facilitated to BCNecologia.

According to the material distribution roads and public spaces for each option, both simulations considered asphalt surface conditions for roads and concrete material for pedestrian areas.

The results indicate that option 1 has a better performance. In summer conditions, the results obtained for all surfaces in option 1 present lower radiant temperatures respect option 2 (5% above) and in winter conditions, option 1 present warmer temperatures than option 2 (22% above).



Radiation in Vancouver (W/m^2 h)



Air Temperature in Vancouver (°C / h)

Thermal comfort

Assessment of results

In relation to public space, temperatures in pedestrian areas, present differences between both options. The figures show the results for pedestrian areas, the average radiant temperatures from 8h - 22h (potential time use of public space considered).

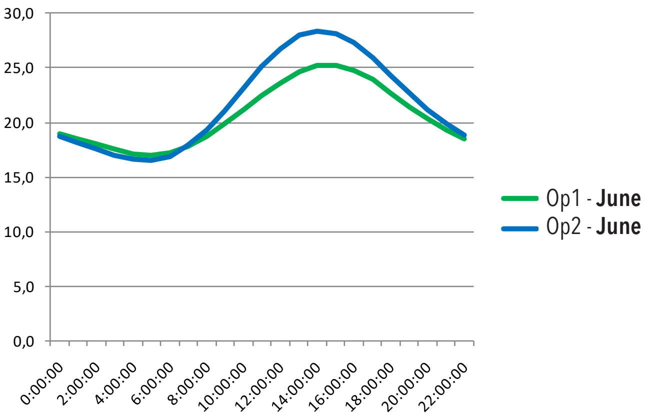
Overall Radiant Temperatures (°C)
Pedestrian Areas 8h - 22h

	Summer (June)	Winter (December)
Option 1	27,4°C	11,7°C
Option 2	30,4°C	7,5°C
Difference °C %	3°C *11%*	4,2°C *55%*

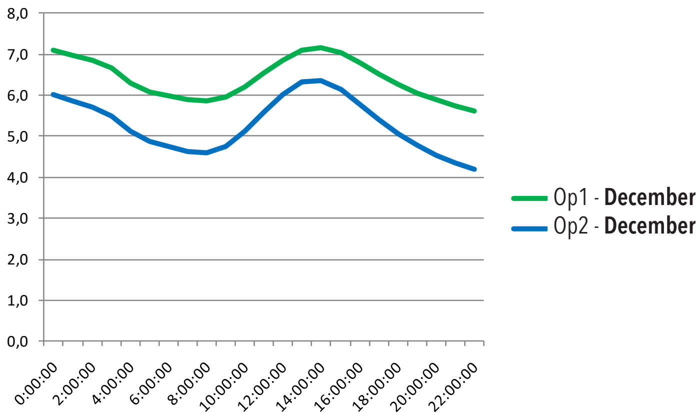
Urban morphology of option 1 allows more insolation of these areas, key aspect to allow more comfortable public spaces in winter days.

In this case, it is recommended to design public spaces combining an adequeate tree election and pavements with albedo 0,35 - 0,5 in order to maintain the maximum solar radiation in winter.

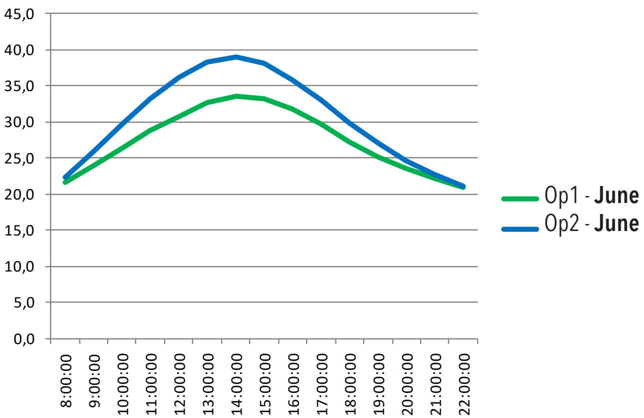
All surfaces - Average radiant temperatures (°C)
Summer 24h



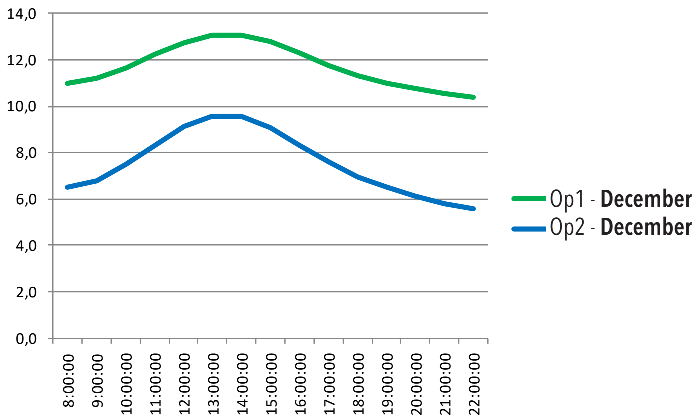
All surfaces - Average radiant temperatures (°C)
Winter 24h



Pedestrian areas - Average radiant temperatures (°C)
Summer 8h - 22h

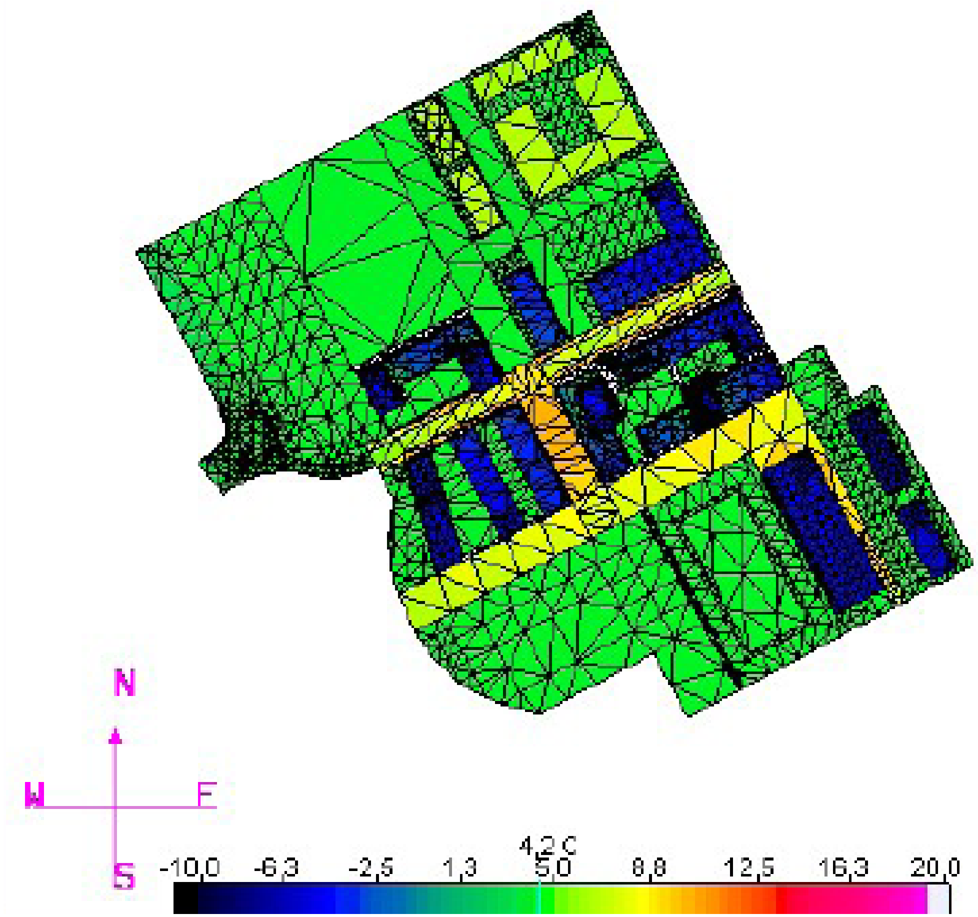


Pedestrian areas - Average radiant temperatures (°C)
Winter 8h - 22h

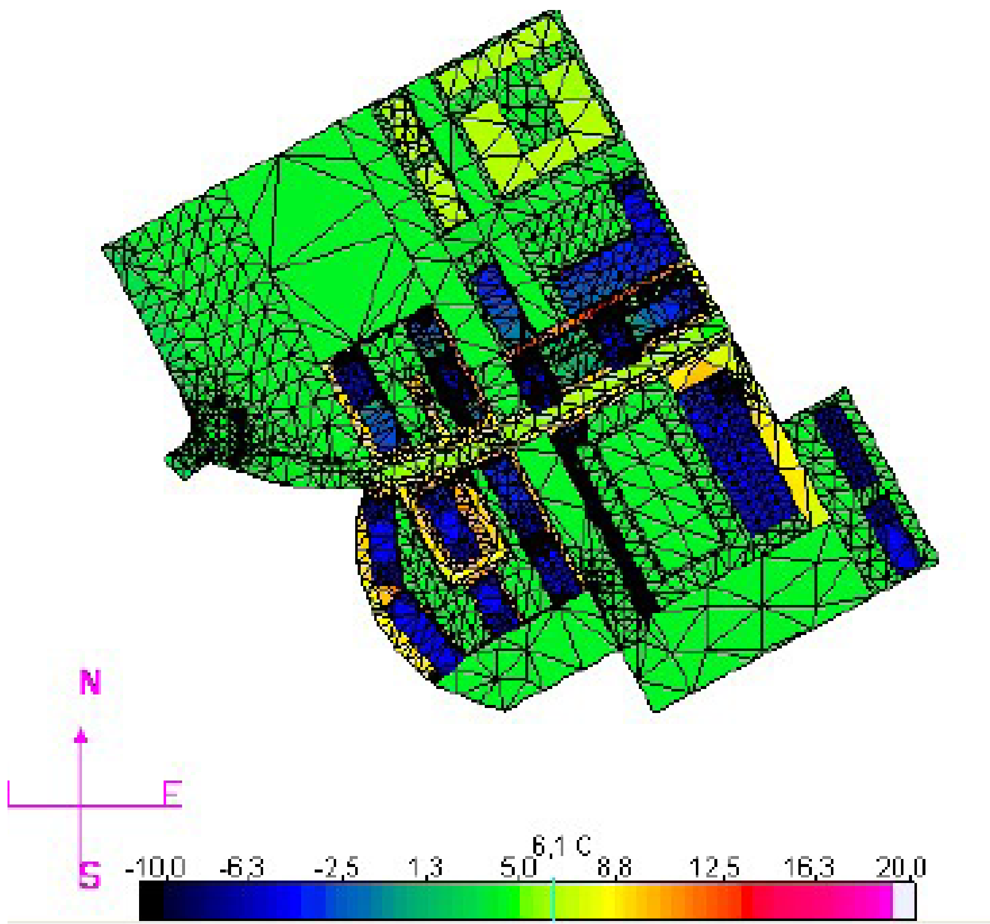


Winter day

Option 1

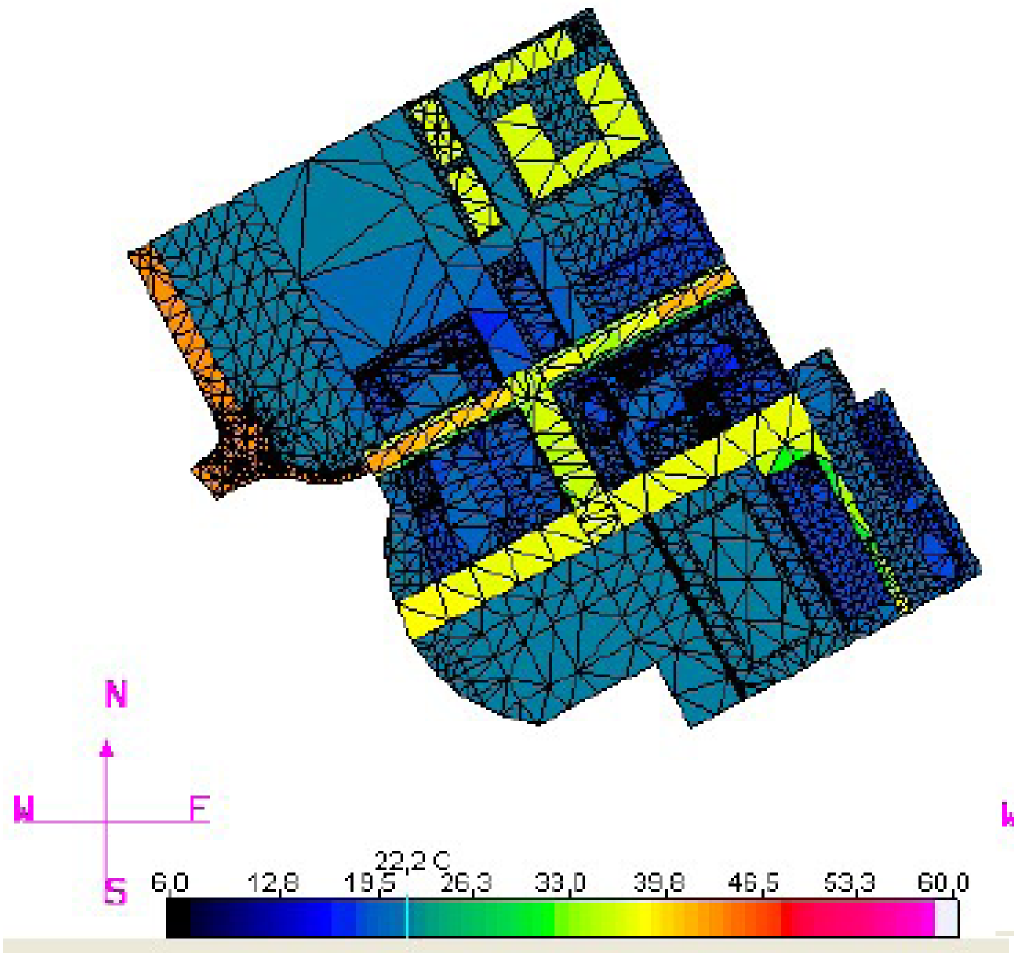


Option 2

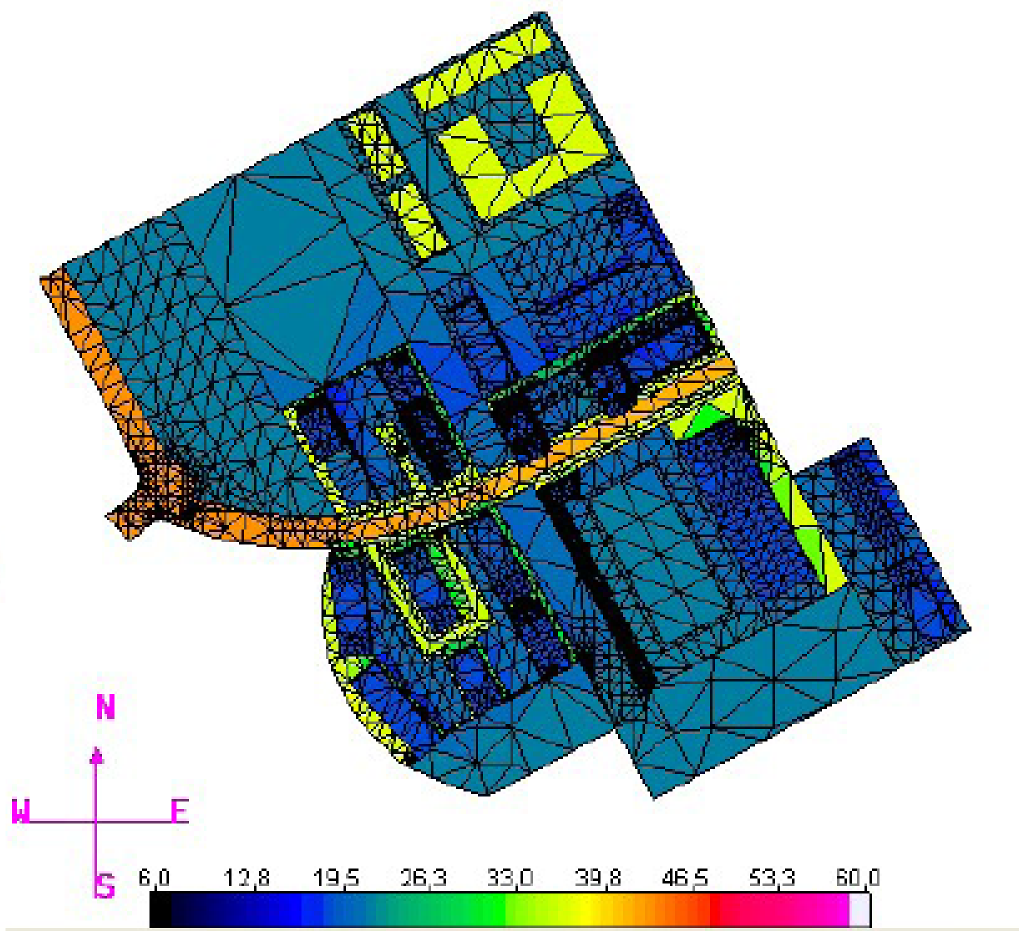


Summer day

Option 1



Option 2



SUSTAINABLE MOBILITY

Motorized road space

Motorized road space: definition

The street surface area used by vehicles (space exclusively for vehicles) in relation to the total street surface area (pedestrian/space for community life and vehicular road).

Calculation parameters

CALCULATION FORMULA
[Street surface area exclusively for vehicles / Total street surface area (vehicles + pedestrians/space for community life] x 100
UNIT
%

Evaluation parameters

MINIMUM OBJECTIVE
< 40 % of street space exclusively for vehicles

DESIRABLE OBJECTIVE
< 25 % of street space exclusively for vehicles

RESULTS	
Option 1	6.1 %
Option 2	8.9 %

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

The projected road space is, mostly, for pedestrian use and/or space for community life. The percentage reached in option 1 is very satisfactory because only 5.7 % of the public space is motorized road space; the remaining 94.3 % is space exclusively used by pedestrian or space for shared use with priority for pedestrians. In option 2, the result amounts to 8.3 %. This second option incorporates a service line that gives access to the buildings of block 03 (SRN 03). More than 90 % of the public space is freed up for pedestrian use.

In both options the project configures a superblock concept where a clear road hierarchy is defined. The structure aims to leave a perimeter inside the basic roadways (East Mall and new Stadium Road), covering a big area, which will not allow vehicular traffic. In addition to prioritising pedestrian travel, interactions and cohabitation are encouraged.

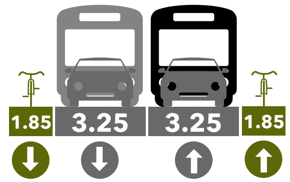
East Mall is excluded from the calculation because it is located outside the Stadium Road neighbourhood boundary.

The aim of this indicator is to increase the amount of street space to exercise all citizens' rights that the city offers: recreation, leisure, relaxation, expression, participation, exchange, culture, knowledge, etc. If the activities and uses of public areas are significantly increased, people's aspirations will be not simply be stop at being pedestrians, but it will then include becoming true citizens in the urban fabric. Also if the distribution ratio of vehicles and people in public areas is reversed, the city residents' needs will be prioritized.

Other recommendations:

The neighborhood has very small dimensions (less than 300 by 300 metres on each side). In this context it is proposed to reorganize the mobility networks of the entire Campus implementing superblocks as the basis of the new functional and urbanistic model.

- Transformation of the street section (East Mall & West 16th Ave); from avenue to urban street; 25 metres street width (approx.). Section type (road space) for West 16 th Avenue:



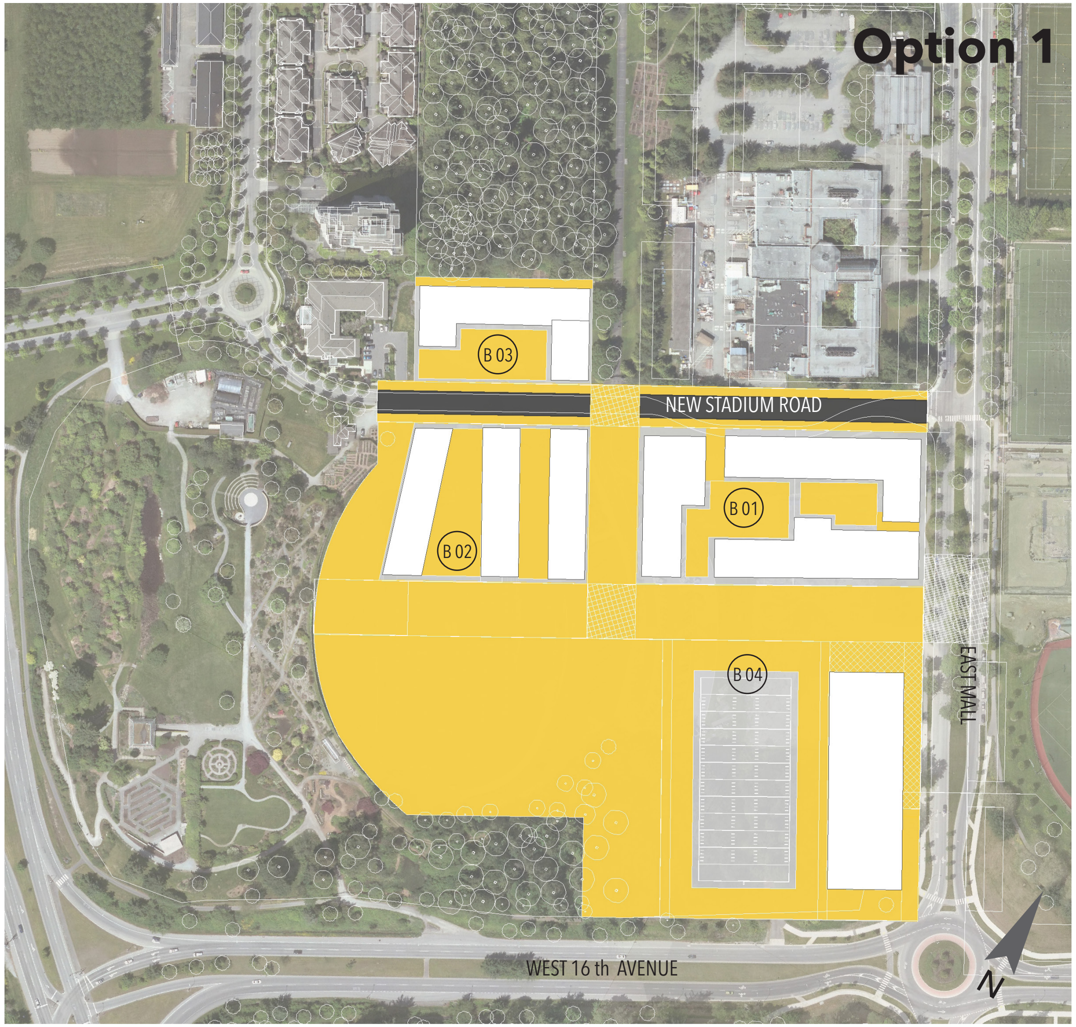
SUSTAINABLE MOBILITY

Motorized road space

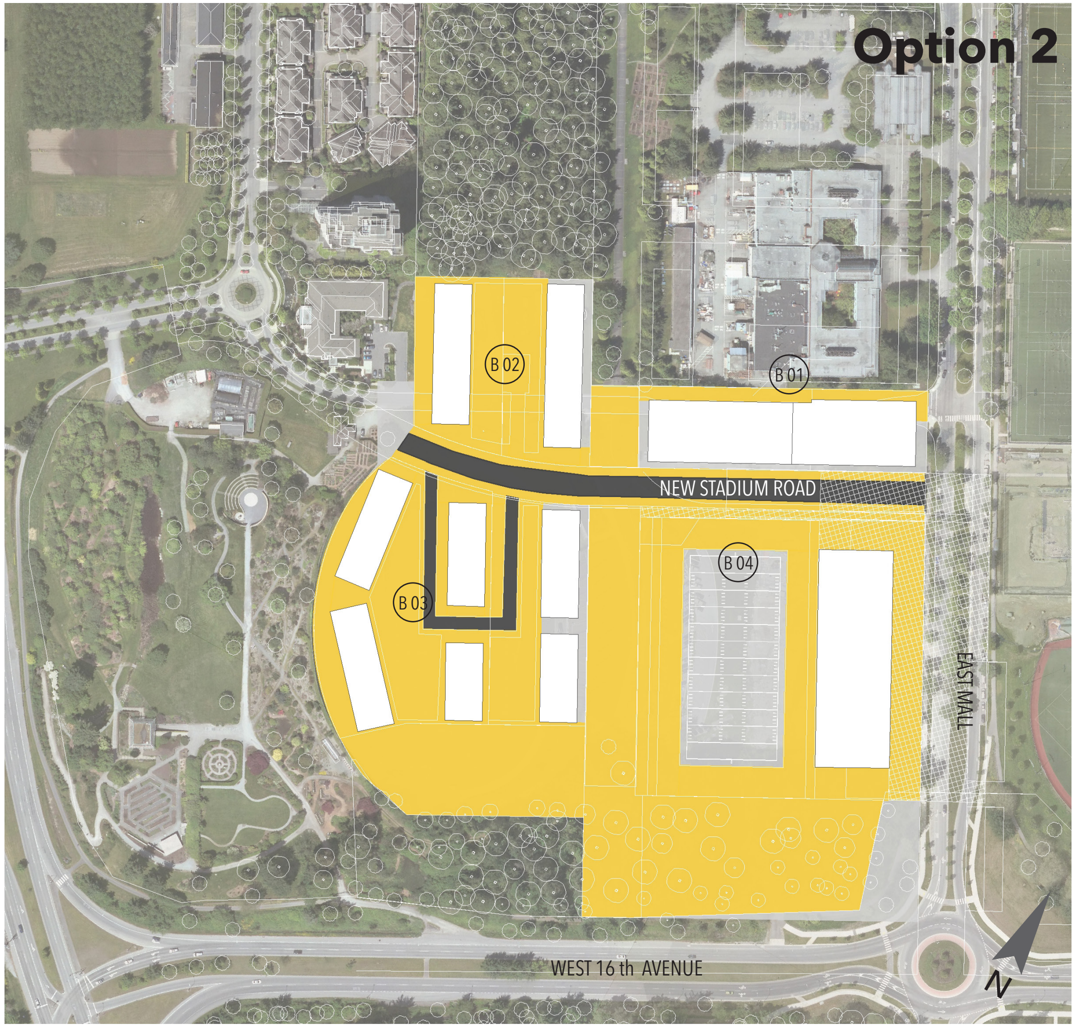
Road space

- Space exclusively for vehicles
- Space exclusively for pedestrians / shared use with priority for pedestrians

Motorized road space: **5.7 %**



Motorized road space: **8.3 %**



Proximity to the main bicycle lane network

Proximity to bike line network: definition

The proportion of population (residents) that has access to the main bicycle network (less than 300 metres).

Calculation parameters

CALCULATION FORMULA

[Population with coverage to the main bicycle lane network/ Total population]

UNIT

% population

Evaluation parameters

MINIMUM OBJECTIVE

> 75 % population

DESIRABLE OBJECTIVE

100 population

RESULTS	
Option 1	**100 % population**
Option 2	**100 % population**

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

100% of the population has access, to less than 300 metres to the main bicycle network (allocated in East Mall).

The proposal includes a multi-modal road (New Stadium Road): a secondary bicycle network with shared use (bicycles will share the lane with the rest of the vehicles).

Within the Stadium Road Neighbourhood bicycle adapts to pedestrian activity (recommendation of 10 km/h maximum speed). This speed allows to pacify and share the space with all the uses and rights for citizens, including those of the most vulnerable people. Bicycles could travel in both directions (wihout bicycle lane).

Bicycle parking areas are totally necessary to promote cycling as a usual mode of transport. Parking facilities should offer comfort and security and should be well located and be useful for commuters, offering as well the potential for modal shift.

The proposal includes bicycle residential parking in order to avoid the bicycle theft and promote cycling. These facilities will be restricted to the use of the residents of each block. It is considered 2 bikes for each unit.

Other recommendations:

- Bicycle street parking: specially designed for bicycle parking destination, specially short-term. Indicated in places with commercial activity potential or next to public facilities. The area should be covered within 100m distance from the bike rack to avoid having bikes chained to fences, trees, etc.
- Bicycle public parking (Stadium building): specially planned for public transport intermodality. It would be desirable to have a little repair station with some tools for the basic maintenance of the bicycles.
- Parking hubs: allocated in the entrance of East Mall (future buildings) in order to promote intermodality (home-hub by bike).

Estimation of bicycle parking supply:

USE		OPTION 1	OPTION 2
Residential	2 places/dwelling	3,256	3,030
Office/academic	1 place/100 GFA sq.m	79	29
Stadium	5 places/100 places capacity	250	250
Facilities (daycare, social space, etc.)	1 place/100 GFA sq.m	43	47
Retail	1 place/100 GFA sq.m	35	31
Green spaces	1 place/100 sq.m	209	210
Total	**Bicycle spaces**	3,872	3,597

Proximity to the main bicycle lane network

Bike network

Main network

Bike lane (segregated)

Shared use /vehicles

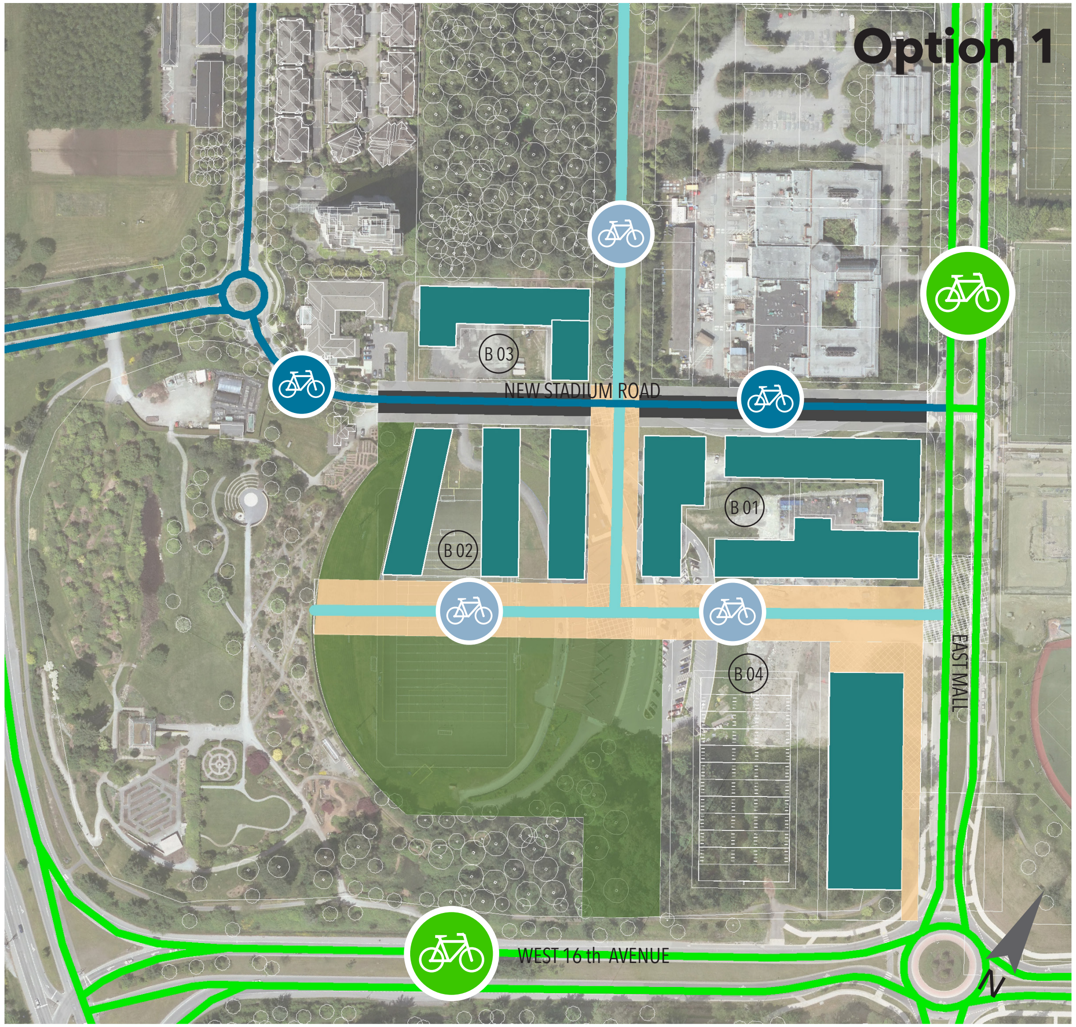
Shared - use space

Shared use / pedestrians
Priority for pedestrians; bicycles adapt to pedestrian activity. Two-way bicycle circulation.

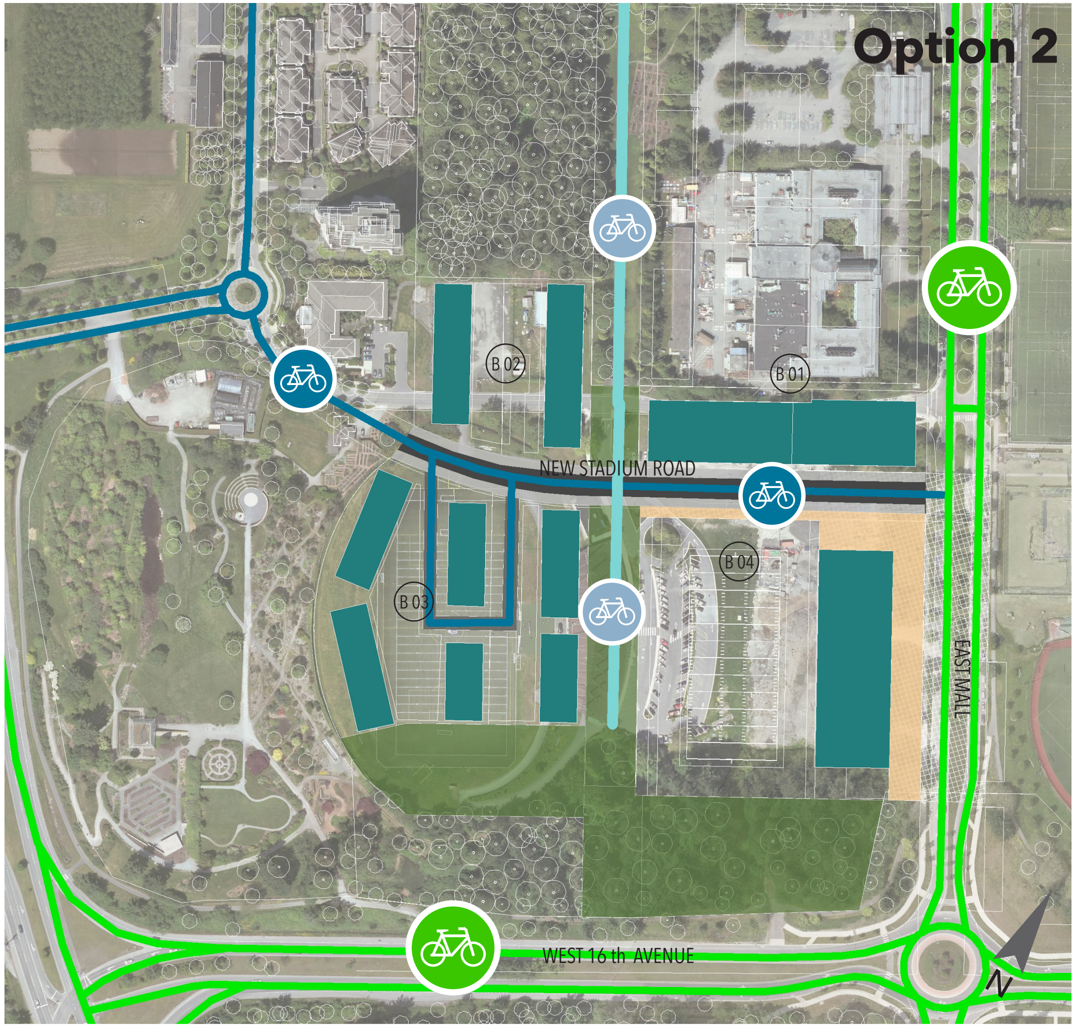
Parking places

Bicycle parking

Proximity to bike line network:
100 % population (< 300 metres)



Proximity to bike line network:
100 % population (< 300 metres)



Off-road car parking spaces

Off-road car parking spaces: definition

The percentage of parking spaces for motor vehicles located off-road.

Calculation parameters

CALCULATION FORMULA

[Number of parking spaces off road / Total number of places off and on road parking] x 100

UNIT

% off-road car parking places

Evaluation parameters

MINIMUM OBJECTIVE

> 80 %

DESIRABLE OBJECTIVE

> 90 %

RESULTS		
Option 1	**>90 %**	●
Option 2	**>90 %**	●

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

The proposal meets the entire demand of residential parking estimated in 1,250 spots for the option 1 and 1,050 spaces for the option 2. This allocation translates in one ratio of 0.77 and 0.69 spaces for housing respectively. In this sense, it is positive that the offer does not go so far as to cover the standard demand of a space for housing (1 space for housing or more). It particularly encourages the use of alternative modes of transport to the private automobile.

The car parking space indicator is satisfactory because more than 90 % of the car parking spaces are off-road.

The proposal chooses the underground parkings' construction of up 4 levels in each of the blocks. This formula is a counter-productive measure not only in the dissuasion of use of private vehicle but also because of its weight in the energy demand of construction (and associated emission of $C0_2$) and the constant required mechanical ventilation.

The residents will have access to their parking across a basic route (East Mall) but also across the New Stadium Road (currently a calm street; 30 Km/h). With the intention of not increasing the vehicles' flow in the quarter, it is recommended not to locate short-term parking spaces (rotation car park) in these two routes' driveway. One option would be to locate limited parking time on West 16th Avenue (between East Mall and SW Marine Dr.).

Other recommendations:

- Also it is proposed to detach, as far as possible, the parking of the housing across parking hubs, allocated in the entrance of East Mall (future buildings) or under the Stadium. In any case, the access distance to these parking will be less than 300 metres; this distance is appropriate to match distance access to private vehicle with the distance access to the public transport.

- Another measure to consider is the creation of a Distribution Logistic Platform (DLP) in a parking hub in order to concentrate the loading and unloading operations. Once goods are stored DLP handles their distribution to shops and offices in the neighborhood. The difference between a conventional goods distribution scenario is that this distribution is performed through electrical vehicles or bicycles, reducing emissions and gases on the inner streets of Stadium Road Neighbourhood.

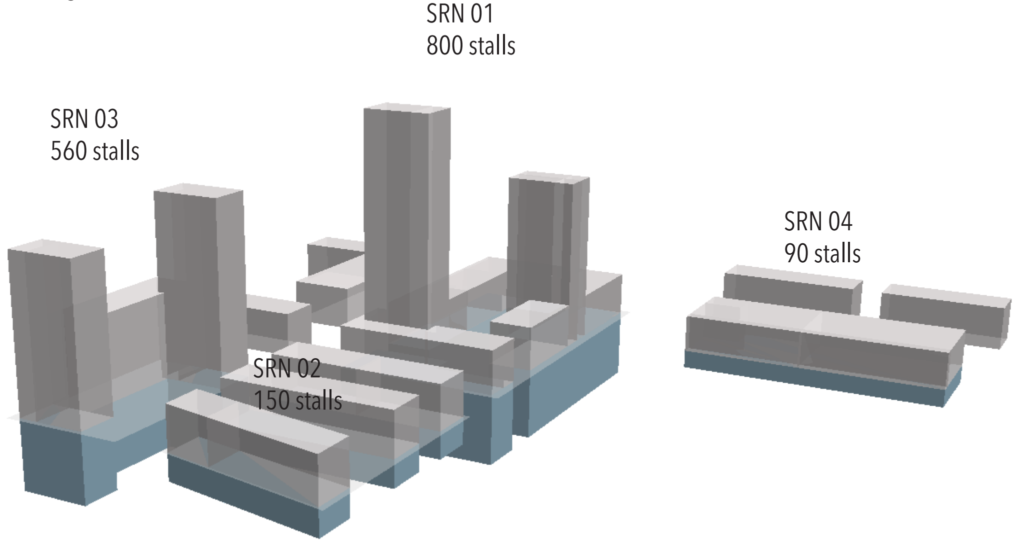
Off-road car parking spaces

Option 1

Off-road parking spaces: **> 90 %**
Provision of parking spaces for vehicles: **0.77 spaces/dwelling**

Estimated parking need	
Residential	1,250
Non-residential	330
TOTAL	1,580
Parking spaces/dwelling	0.77

Parking Demand:

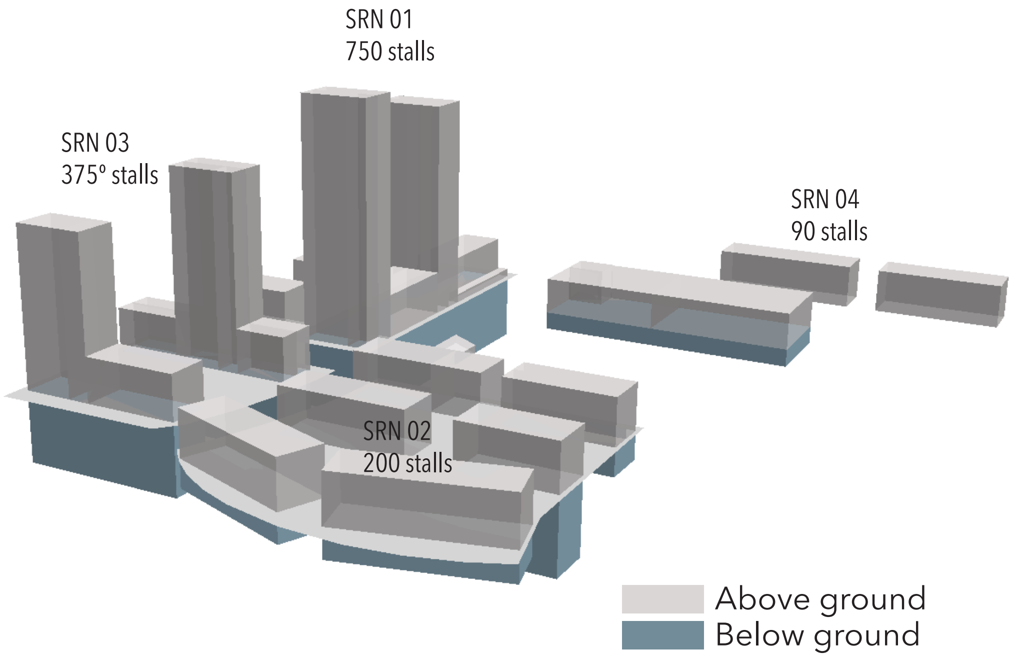


Option 2

Off-road parking spaces: **> 90 %**
Provision of parking spaces for vehicles: **0.69 spaces/dwelling**

Estimated parking need	
Residential	1,050
Non-residential	230
TOTAL	1,280
Parking spaces/dwelling	0.69

Parking Demand:



Balance between residential and non-residential activity

Non-residential area: definition

The non-residential area is the sum of the surface occupied by commercial, services and production (GFA sq.m.) in relation to the total GFA sq.m. (public facilities/community space are excluded; Stadium included).

Calculation parameters

CALCULATION FORMULA

[Built area for commercial, services and production uses (sq.m) / Total built area (total sq.m)]

UNIT

% non-residential uses (GFA sq.m)

Evaluation parameters

MINIMUM OBJECTIVE

> 20 %

DESIRABLE OBJECTIVE

> 20 - 35 %

RESULTS

Option 1	**10.4 %**	●
Option 2	**7.7 %**	●

0 1 2 3 4 5 6 7 8 9 10

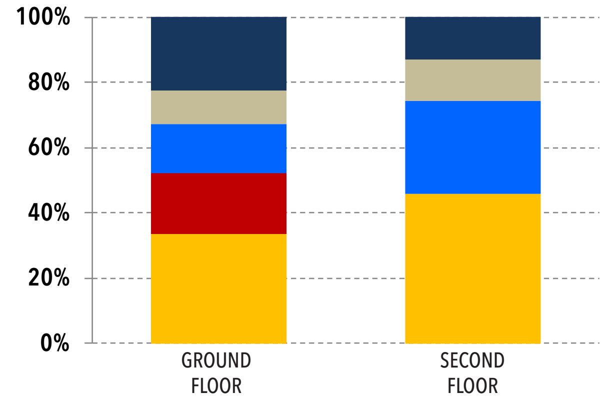
Assessment of results

The total built surface area destined for commercial, services and production use is 10.4 % for option 1 and 7.7 % for option 2. The considered uses are: office/academic, retail and the Stadium area. The rest of uses have not been considered because they are potential public facilities. This result does not reach to the minimum objective (20 %).

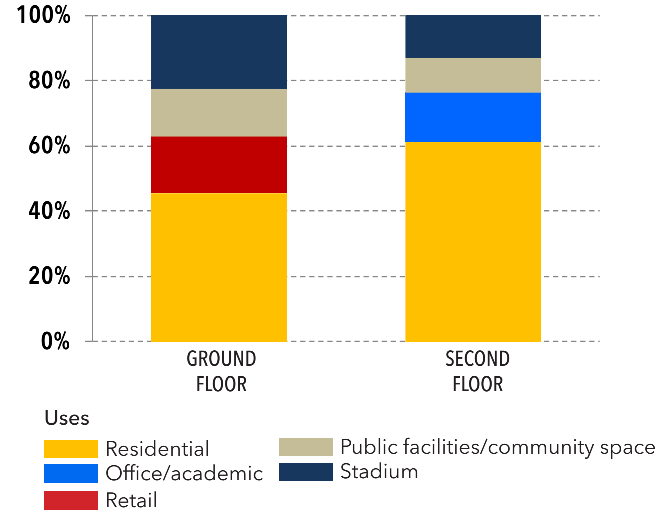
In both options the commercial and service activities are concentrated in the East quadrant, that is, in the block of buildings next to East Mall and part of the new Stadium Road (option 2) and part of the interior promenade (option 1). It means that the people's flow on foot to the adjacent quarters (Wesbrook Place or Hawthorn Place) are not going to penetrate into the heart of the neighbourhood and Carolinian Forest Garden. This arrangement does not promote the generation of a commercial node in the centre of the community.

33.5 % of ground floor's surface is identified for residential use in the option 1 and 45.6 % in the option 2. Although in the second floor 54.3 % of the uses is not residential (option 1), and 38.7 % in the option 2, these parameters are insufficient to create an urban fabric balanced for the diversity of uses and urban functions.

Option1. Distribution of uses (sq.m)



Option 2. Distribution of uses (sq.m)

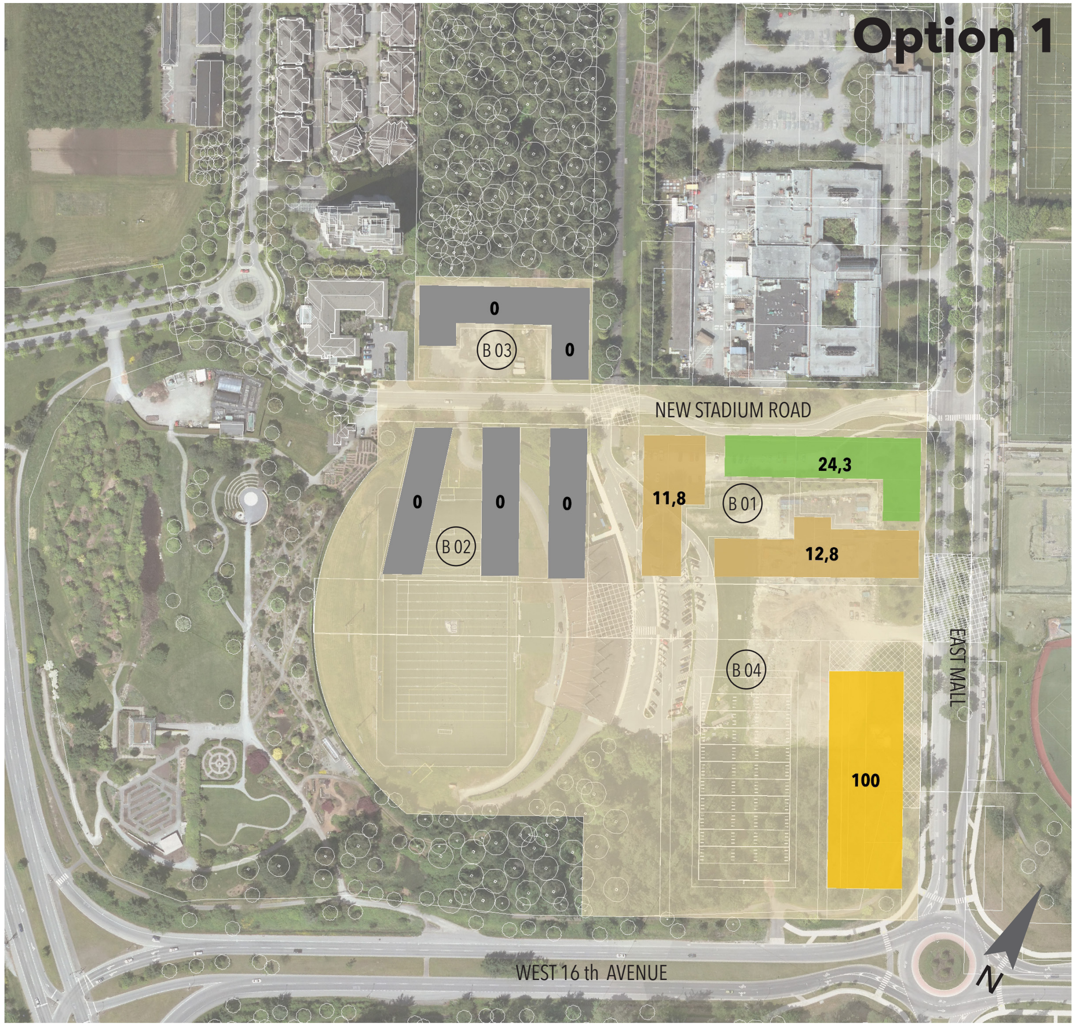


Balance between residential and non-residential activity

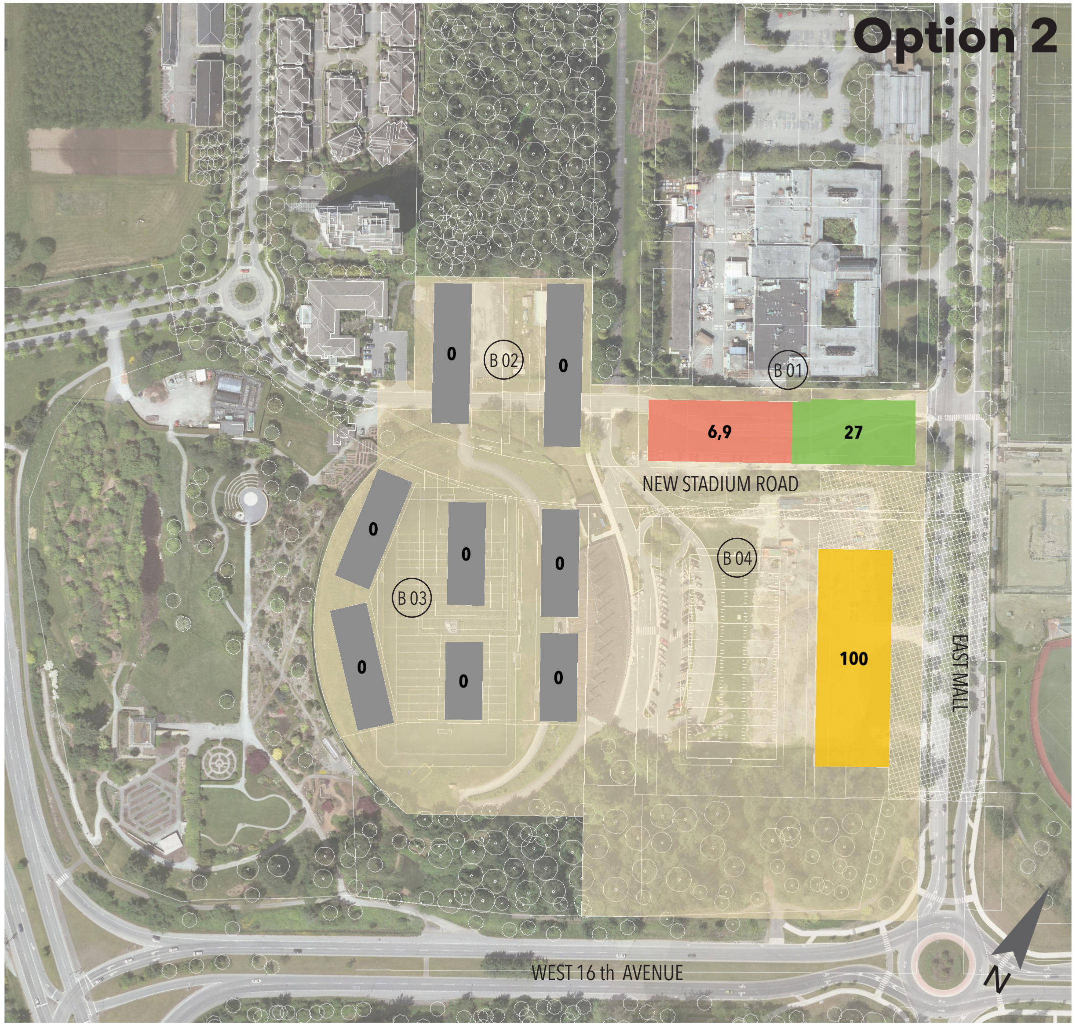
Non-residential use (%)

- > 35 %
- *Good balance*: 20 % to 35 %
- 10 % to 20 %
- 1 % to 10 %
- *Residential use only*: 0 %

Non-residential uses (total GFA): **10.4 %**
Non-residential uses (ground floor): **66.5 %**
Public facilities (daycare, social space, etc.) are not included.



Non-residential uses (total GFA): **7.7 %**
Non-residential uses (ground floor): **54.4 %**
Public facilities (daycare, social space, etc.) are not included.



Density of legal activities

Density of legal entities: definition

The number of ground-floor activities per hectare.

Calculation parameters

CALCULATION FORMULA
Number of Legal Entities / ha

UNIT
Number of activities /ha

Evaluation parameters

MINIMUM OBJECTIVE
> 15 activities/ha

DESIRABLE OBJECTIVE
> 25 activities/ha

RESULTS		
Option 1	**11.1 activities/ha**	● (4)
Option 2	**8.9 activities/ha**	● (3)

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

The total number of activities estimated for option 1 is 97 and 78 for option 2. This percentage is not enough in relation to the total housing area. The result is currently not enough to obtain an urban fabric with high diversity and specialization of urban functions (spaces of attraction).

The study of urban fabrics in different cities (Mediterranean, South American and Russian) demonstrate that a percentage of non-residential floor area below 20 %, corresponds to "residential" (< 10 %) or "media" (between 10 and 15 %) urban fabrics with little ability to create a complex urban fabric.

The inclusion of some private courtyards in the residential blocks does not help to generate a dynamic public space that strengthens commercial and social links. The percentage of vibrant facades is 30.5 % in option 1 and 27.4 % in option 2. The recommended objective is higher than 50%.

The coexistence of multiple uses (housing, commercial, etc.) ensures a more even distribution of human activities and presence, between night and day and between weekdays and holidays, thus it favors activities in the public space day and night.

The surface identified to retail in both options (3,500 and 3,100 square metres respectively) is not enough to cover the commercial needs. A correct allocation of commercial activities of daily use corresponds to 6.5 % activities for every 1.000 inhabitant. In the study field this relation is estimated in 5.1 activities. Consequently it will be difficult to implement a varied and specialized commercial and services offer.

The block building typology is more present in the option 2 than in option 1 and that does not favor the activities allocation in ground floor (less useful surface) if we compare to a typology of closed or semi closed block.

As much as possible, it is recommended to encourage the insertion of activities of various formats and types in the residential fabric (offices, workshops, small family businesses, etc.). At a later stage in planning, it is recommended that the division of space for shops and offices range between 50 and 200m^2.

Density of legal activities

Density of Legal Entities: **11.1 activities/ha**
Vibrant facades: **30.5 %**
Knowledge activities (estimated): **44.3 %**

Legal Entities estimated (total)	
Ground floor uses	43
Second floor uses	27
Top uses (community/social space)	10
Stadium building	2 (retail) + 14 Shared space+ 1
TOTAL	**97**

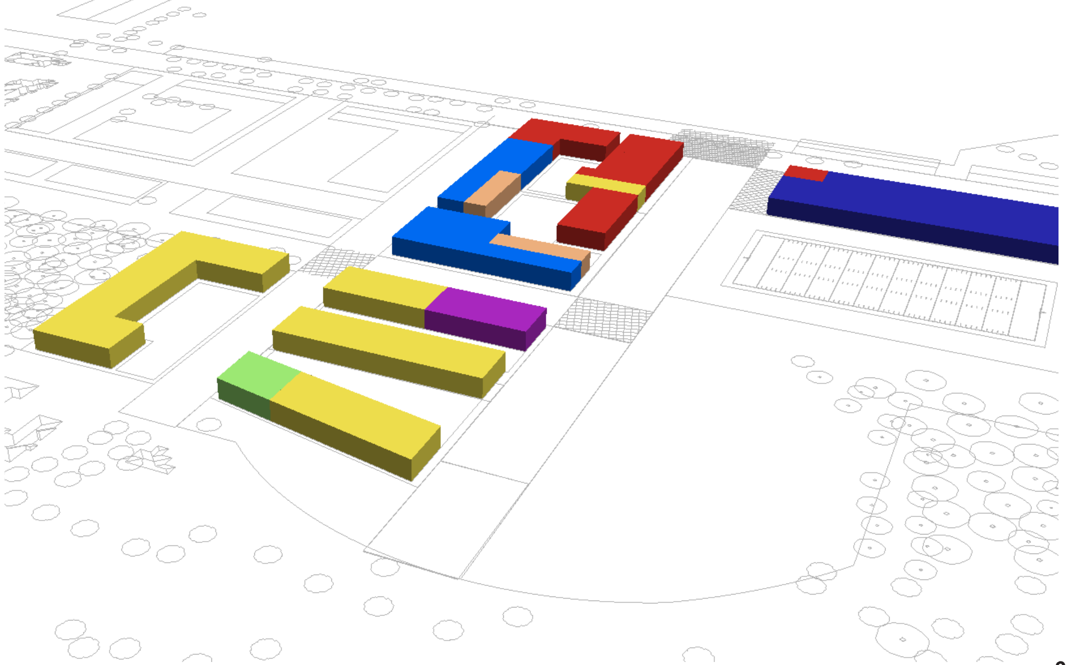
Criteria:
(1) To allocate the maximum number of legal entities. Vibrant facades
(2) Entrance to shops/services from public space
(3) Assigned facade width: 8 m (retail), 10 m (offices and other services)

Density of Legal Entities: **8.9 activities/ha**
Vibrant facades: **27.4 %**
Knowledge activities (estimated): **20.5 %**

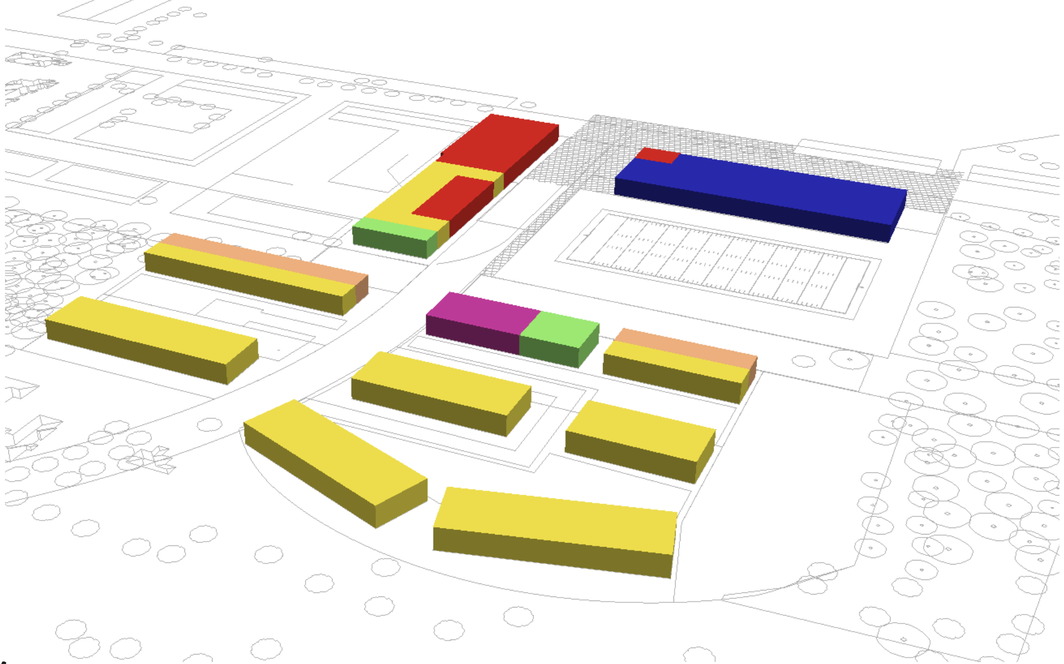
Legal Entities estimated (total)	
Ground floor uses	37
Second floor uses	16
Top uses (community/social space)	8
Stadium building	2 (retail) + 14 Shared space+ 1
TOTAL	**78**

Uses (Ground Floor)
- Residential
- Office/academic
- Retail
- Daycare
- Choice of use
- Amenity /social space
- Stadium

Option 1



Option 2



Urban Diversity Index

Urban Diversity Index: definition

The level of organized information in an urban system according to the abundance and different legal entities types (diversity). The maximum H is obtained with the maximum differentiation of Legal Entities and the maximum equifrequency of each of them.

Calculation parameters

CALCULATION FORMULA

$$-\sum_{i=1}^{n} Pi\ Log2\ Pi$$

Where:
H: urban diversity index:
n: number of different activity types (species richness).
Pi: probability of occurrence (relative abundance of each species).

UNIT

Bits of information (estimation)

Evaluation parameters

MINIMUM OBJECTIVE

> 5 bits of information

DESIRABLE OBJECTIVE

> 6 bits of information

RESULTS	
Option 1	**4.9 bits**
Option 2	**4.6 bits**

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

Urban diversity index, for a given area, will be greater as more activities, facilities, associations and institutions are present, and as more diversity between the various uses is increased.

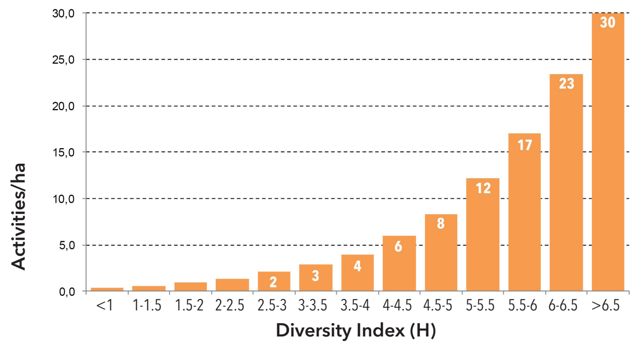
It allows the identification of diversity and mix of urban uses and functions, the degree of centrality and, in some cases, the maturation level of an area and the identification of areas with higher concentration of activity, thus generating a greater number of journeys, among other functions.

In new developments it is not possible to determine the exact result of urban diversity index and to know what type of activities are going to be implemented in the study field.

In urban projects arrangement the urban diversity is estimated from the reservation of non- residential built surface (activities estimation presented in the previous file; Density of Legal Entities) and the interrelation between the number of legal entities and the diversity index for similar fabrics to the one mentioned here.

As the graph shows, a minimum diversity of 5 bits of information is reached with an average of 12 activities per hectare; and a diversity of 6 bits of information (urban fabric with good mix of uses and activities), with 23 activities/ha.

Correlation between the Density of Legal Entities (activities/ha) and the Urban Diversity Index



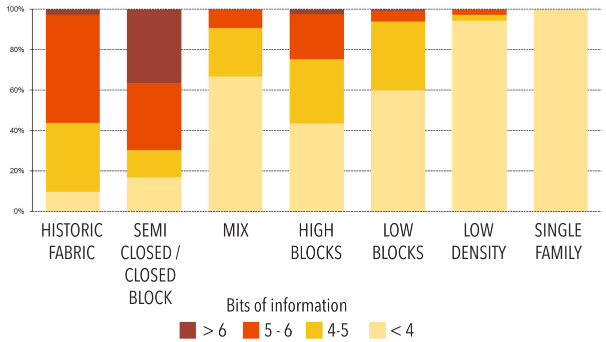
With this translation, the potential urban diversity is estimated in 4.9 of information bits for option 1 and 4.6 bits for option 2. The result approach 5 information bits required as minimum objective but it is far from achieving the desirable goal. The effort to increase 1 bit of information means doubling the density of activities per hectare.

In any case, the density of activities is concentrated in block 1 for both options (SRN 01) leaving the rest of the neighbourhood deserted.

Urban fabrics below the minimum threshold are for mixed urban fabrics in which the types of building are mainly blocks and/or single family homes. In these urban fabrics it is impossible to achieve a satisfactory urban diversity index (H >

5), since the activities in place cover daily needs, but do not play any functional central role in the city.

Distribution of the Urban Diversity Index (%) according to the type of urban fabric



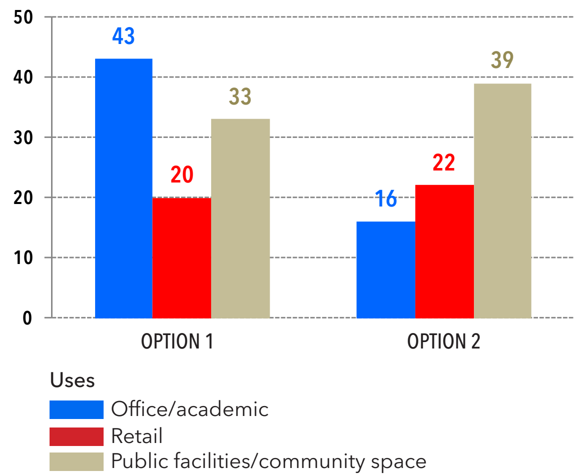
Commercial corridors and street-facing façades on the ground floor should be encouraged as poles attraction, removing gaps or spaces that might create urban "deserts" or "voids". A continuous provision of activities on a ground floor level should attract the public to the public space, while indirectly exercising certain control over it, improving levels of safety. Ecological urbanism aims to implement the longest length of façade possible on ground level, in order to place the greatest number and the greatest diversity of legal persons. Blocks are the morphological solution that manage to achieve this ahead of other shapes. The aim is also to put suitable activities in place underground, and on higher floors, if they are compatible with residences.

The pictures attached to this indicator show different strategies followed in street revitalization projects as an example of creating an attractive, safety and lively public space.

The future implementation of large urban attractors is key to increasing the number (n) and diversity (H) of legal persons, creating new central areas. The new centres are, in turn, attractive poles for new activities and they radiate this power, not only in the new centre, but also in the connecting roads. In this sense, option 1 has more strength to create a small area of centrality around block 1.

The provision of spaces for offices and academic uses (with a total number of 43 estimated activities for option 1 and 16 for option 2) is satisfactory in reference to a possible achievement of a dense pole of knowledge activities: spaces for innovation, creativity and knowledge, reinforcing relationships between the local production, the education and the social activities.

Number of estimated activities by uses



The increase of knowledge-intensive legal persons means that a city can improve its competitive position within a region. It also means increasing creativity and attracting better talent, which increases, in turn, the number of better-paid jobs and communities and collectives that tend towards producing creativity and urban dynamism.

Lateral densification: *Sant Joan promedade, Barcelona*

Shared use: *Bell Street Park, Seattle*

Shared use: *New Road, Brighton*

Pedestrian street: *16th Street Mall, Denver*

Green space per inhabitant and proximity to green spaces

Green space per inhabitant: definition

Vegetation cover of the urban environment in relation to population. Parks, gardens, green roof walkable and other public areas with >50% green area are included.

Calculation parameters

CALCULATION FORMULA
[public green surface m^2 / total population]

UNIT
m^2 / inhabitant

Evaluation parameters

MINIMUM OBJECTIVE
>5 m^2 public green surface / innhabitant

DESIRABLE OBJECTIVE
>10 m^2 public green surface / innhabitant

RESULTS	
Option 1	9.2 m^2/inh (public)(10,3 total)
Option 2	12.4 m^2/inh (public)(13,6 total)

0 1 2 3 4 5 6 7 8 9 10

Proximity to green spaces: definition

Percentage of population with simultaneous coverage to three categories of green space considered according to their surface and distance of access on foot.

Calculation parameters

CALCULATION FORMULA
Population with simultaneous coverage by 3 of the specified categories of green space / total population] x 100

UNIT
% inhabitants

Evaluation parameters

MINIMUM OBJECTIVE
>75% population with access to the 3 categories of green space

DESIRABLE OBJECTIVE
100% population with access to the 3 categories of green space

RESULTS	
Option 1	100 %
Option 2	100 %

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

The Green Space per inhabitant indicator aims to represent the public green provision for each inhabitant. The results in both, option 1 (9.2) and option 2 (12.4), describe an acceptable provision (>5.0 m^2/inh), and very close or above to the 10 square metres per inhabitant defined as a desirable goal (value recommended by the World Health Organization).

The proximity of the population to the green spaces is guaranteed for 100 % of the residents according to to these parameters:

- Categories of green space considered:

Green space ≥ 1.000 m^2, at less than 300 metres
These spaces correspond to landscaped areas, such as squares, local staying areas that offer a function of daily contact between the citizen and the green one. These spaces cover the daily needs of recreation, specially to those citizens who have reduced mobility: elderly, children. ***Example: Public Courtyards planned in the project.***

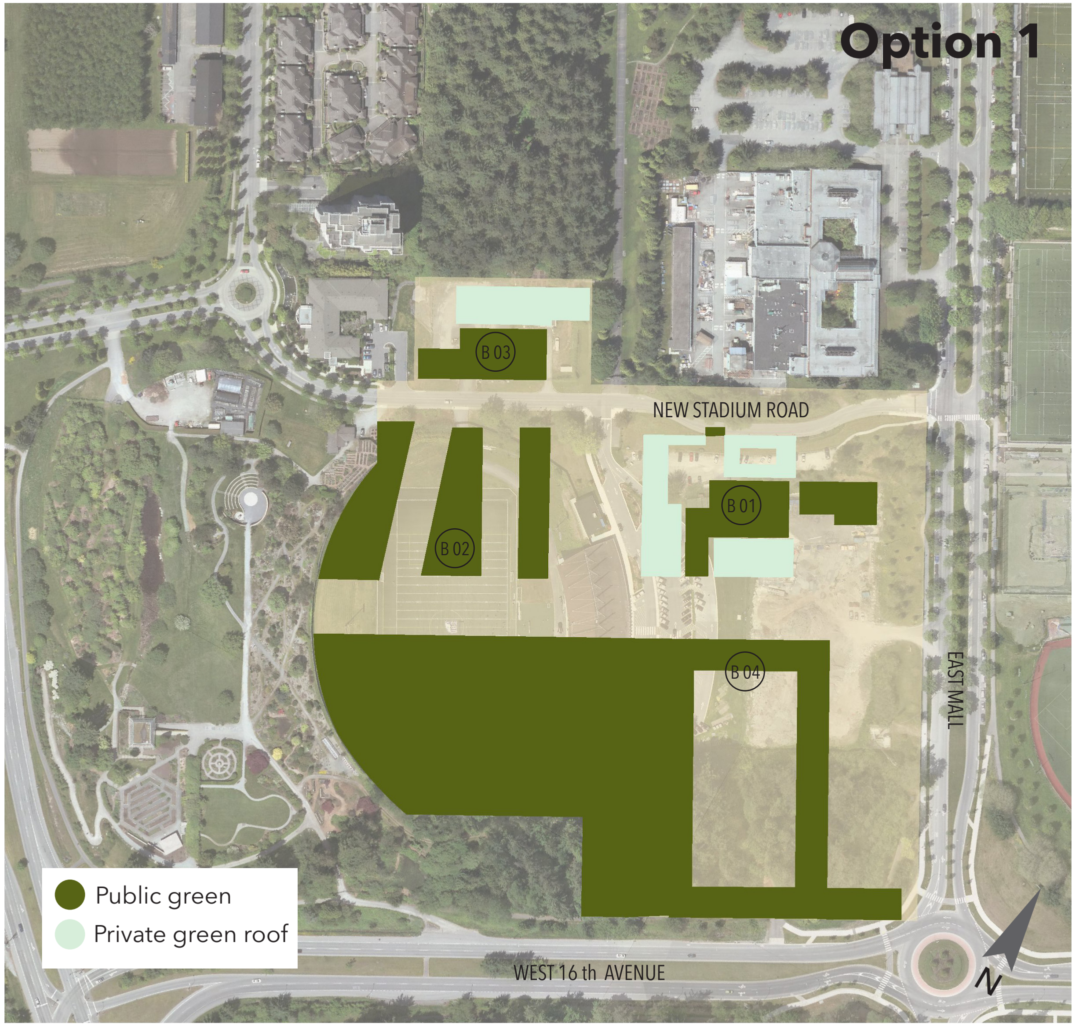
Green space ≥ 3.5 ha, at less than 750 metres.
These spaces correspond to the urban parks that guarantee different possibilities of recreation and present a certain singularity. ***Example: Carolinian Forest Garden and the new park planned in the project.***

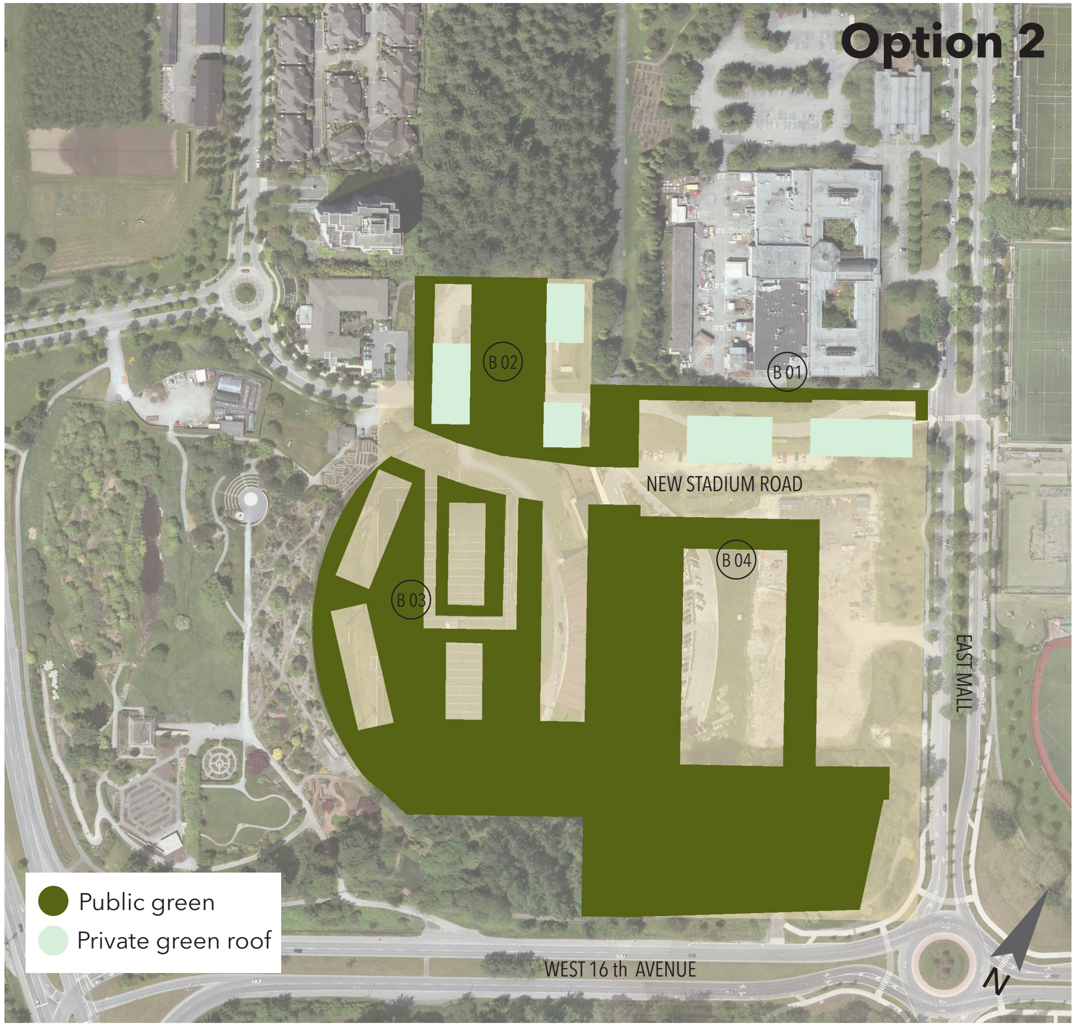
Green space ≥ 10 ha, at less than 4 km.
These spaces correspond, in their majority, to the parks or green rings of the cities. They are free areas integrated in the natural environment to which they are assigned a restorative and landscape purpose. ***Example: Pacific Spirit park.***

Green space per inhabitant and proximity to green spaces

	PUBLIC	PRIVATE	TOTAL
sq.m. open space	*57,316.0*	*22,797.2*	*80,113.2*
sq.m. green	35,960.0	4,324.5	40,284.5
% green	*62.7 %*	*19.0 %*	*50.3 %*
sq.m. / inh	**9.20**	**1.11**	**10.31**

	PUBLIC	PRIVATE	TOTAL
sq.m. open space	*56,701.6*	*19,971.7*	*76,673.3*
sq.m. green	45,253.4	4,185.8	49,439.2
% green	*79.8 %*	*21.0 %*	*64.5 %*
sq.m. / inh	**12.45**	**1.15**	**13.60**





Soil Biotic Index

Soil Biotic Index: definition

Percentage of area that is functionally significant to the natural soil cycle. A factor is assigned to each piece of land according to the degree of naturalness and permeability.

Calculation parameters

CALCULATION FORMULA

[Σ (soil permeability factor x area of each element) / total area] x 100

UNIT

%

Evaluation parameters

MINIMUM OBJECTIVE

30% permeable soil surface

DESIRABLE OBJECTIVE

35% permeable soil surface

RESULTS		
Option 1	47.7 %	●
Option 2	53.4 %	●

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

The soil biotic index (SBI) indicates the ratio between the areas functionally significant in the natural cycle of the soil and the total area of the study area. A permeability factor is assigned to each piece of land according to the degree of permeability: permeable soils, semi-permeable soils, green roofs, and impermeable soils.

The method of calculation of this indicator is based on the different permeability factors defined for each type of space. Thus, the park and the field will adopt a coefficient of 1.0; the private and public green open space, 0.85; the green roofs (both extensive and intensive), 0.35; and plazas and promenades, 0.25.

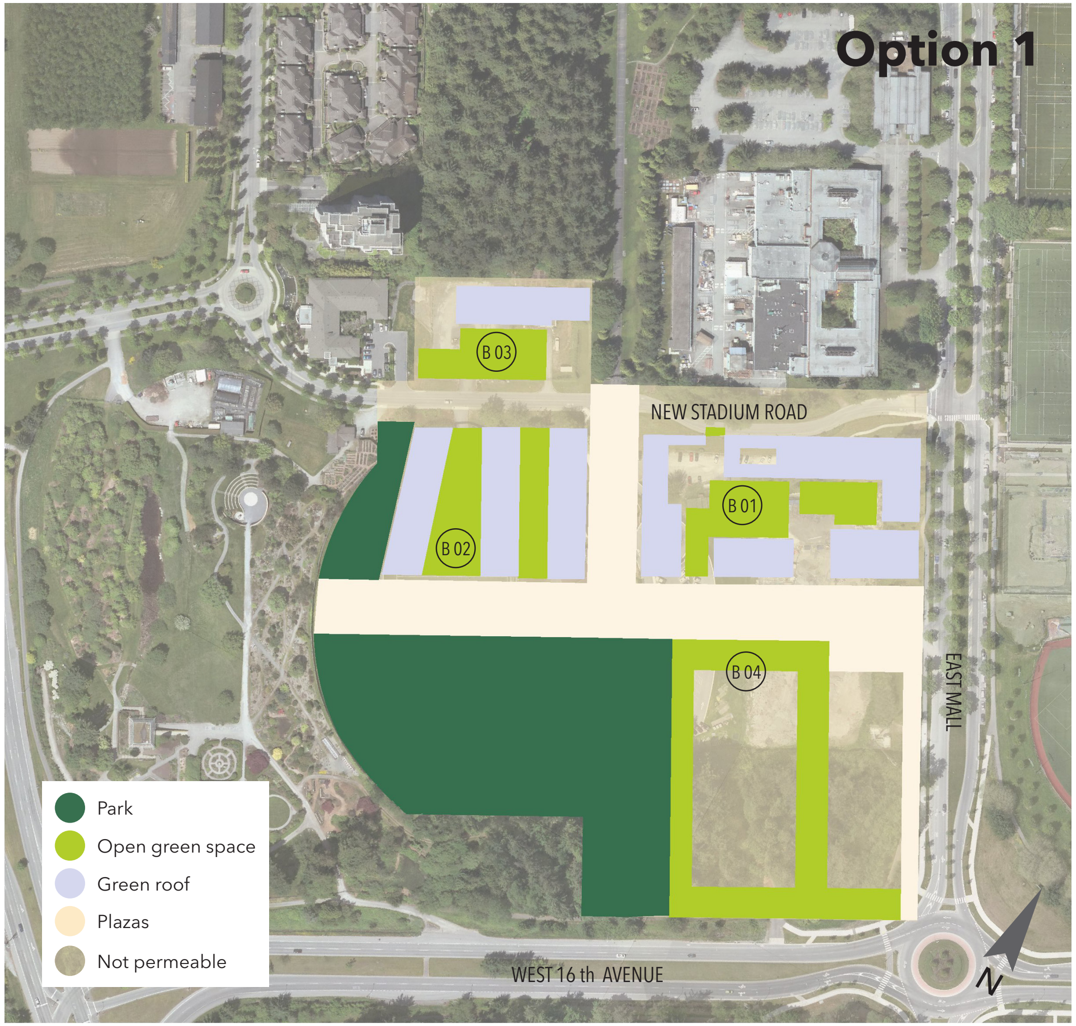
The presence of soil with a vegetation cover (parks, gardens, urban gardens, etc.) promotes biodiversity at the urban level, by creating areas for feeding, shelter and reproduction of many species. The presence of permeable soils rebalances the water cycle increasing the possibility that water filters into the ground, thus reducing the risk of flooding. Vegetated surfaces are potential absorbers of pollutant particles and help promote thermal comfort, cushioning the heat island effect. Furthermore, areas with trees help provide mechanical and acoustic comfort, cushioning the effect of noise and the wind in the urban environment.

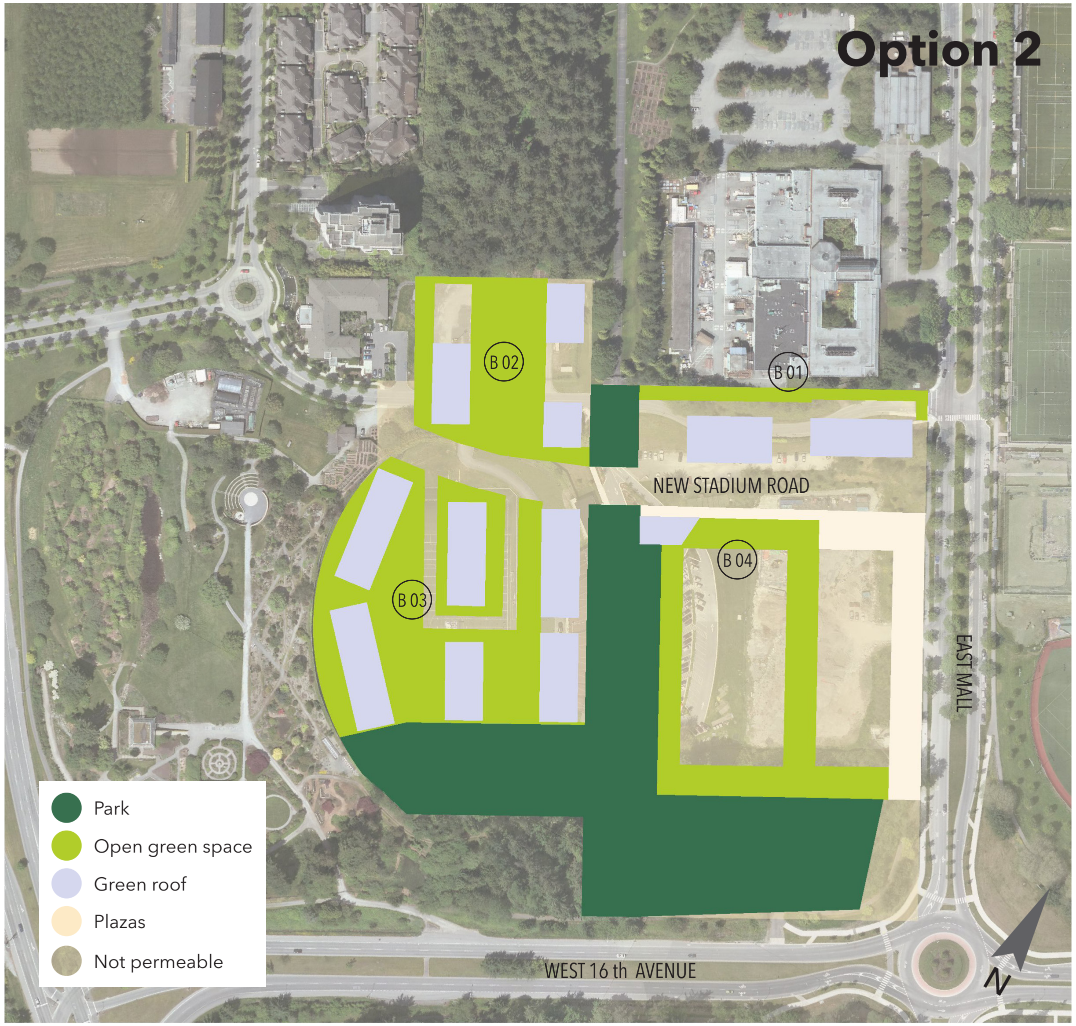
In relation to the SBI, both Option 1 and Option 2 propose highly permeable solutions. The proposed large green areas (public or private), plus the impressive green roofs designed; reflect results that are well above the optimum values described in the Indicator (35%). Thus, we find a 47.7 % in option 1, and a 53.4 % in option 2.

Soil biotic index

	parks, fields	open green space	green roof	plazas, promenades
area (m^2)	21,659.1	14,300.9	12,332.2	14,567.9
permeability factor	*1.00*	*0.85*	*0.35*	*0.25*
permeable area (m^2)	21,659.1	12,155.8	4,316.3	3,642.0
TOTAL	**41,773.1**			

	parks, fields	open green space	green roof	plazas, promenades
area (m^2)	22,727.4	22,526.0	11,281.2	3,960.8
permeability factor	*1.00*	*0.85*	*0.35*	*0.25*
permeable area (m^2)	22,727.4	19,147.1	3,948.4	990.2
TOTAL	**46,813.1**			





Green roof ratio

Green roof ratio: definition

Green roofs area in relation to the total potential roofs area. Only flat roofs with a potential and an acceptable structural capacity to implant vegetation in the terrace will be considered.

Calculation parameters

CALCULATION FORMULA

[green roof surface (m^2) / total roof surface (m^2)]

UNIT

%

Evaluation parameters

MINIMUM OBJECTIVE

>15 % of total area registered

DESIRABLE OBJECTIVE

>30 % of total area registered

RESULTS		
Option 1	62.3 %	●
Option 2	56.7 %	●

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

According to the Centre for Architectural Ecology at British Columbia Institute of Technology, 'planting the rooftops of urbanized areas brings many benefits to public, private, economic and social sectors, as well as to the local and global environments.'

Some of the main benefits would be:

- Green roofs reduce stormwater runoff.
- Green roofs are energy efficient.
- Green roofs can serve as habitat.

Extensive green roofs have low management requirements and do not usually require artificial irrigation. Based on thin soil or substrate layers, planting styles are naturalistic with the object of establishing a self-sustaining plant community.

Intensive green roofs need similar management to a ground level garden, usually comprise a deep soil or growing medium and require artificial irrigation.They can be adapted to accommodate virtually any type of plant and often include hard surfaces for access. The main reason for installing an intensive green roof is to provide amenity space.

In the first option, there are 8,007.7 (40.4%) square metres of extensive green roofs and 4,324.5 (21.8%) square metres of intensive green roofs.

62.3 % of the rooftops in the first proposal, are covered with nature based solutions, achieving the highest rating.

In any way, the Stadium rooftop seems to be a great opportunity to add as a extensive solution, in order to provide an extra 4681.7 square metres to the proposal.

In the second option, there are 7,095.4 (35.6%) square metres of extensive green roofs and 4,185.8 (21.0%) square metres of intensive green roofs.

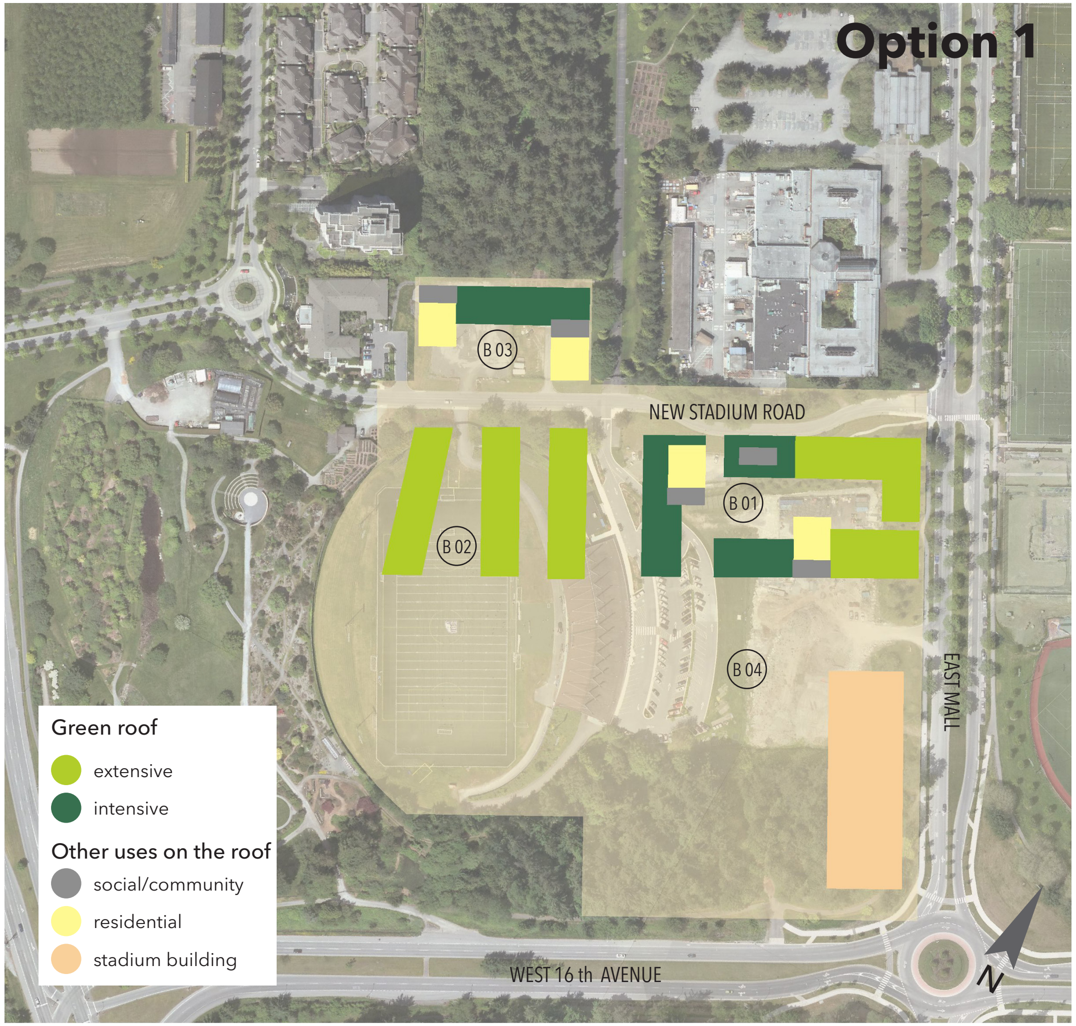
56.7% of the rooftops in the second proposal, are covered with nature based solutions, achieving the highest rating too.

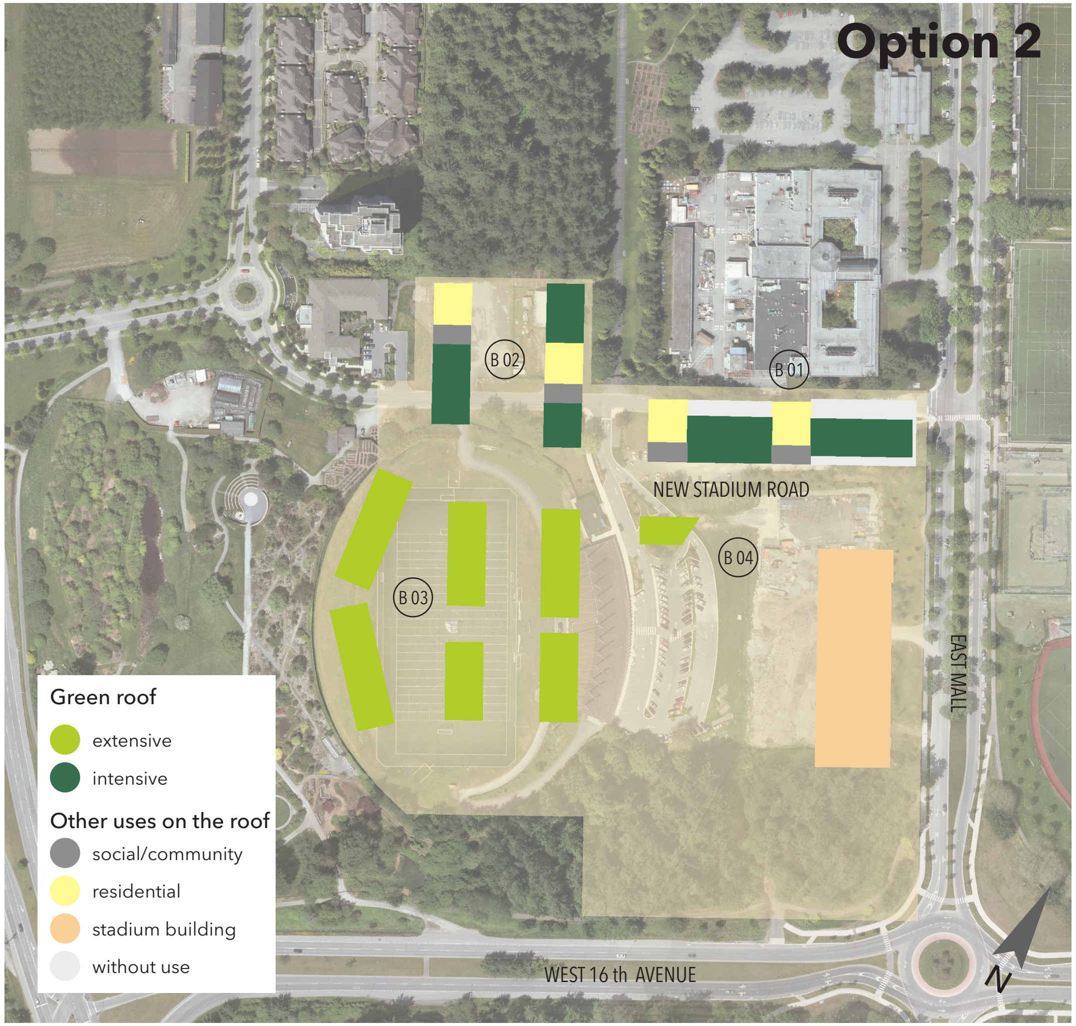
In the same way, the Stadium Building rooftop seems to be a great opportunity to add as a extensive solution, in order to provide an extra 4,647.9 square metres to the proposal.

Green roof ratio

	extensive green	intensive green	social/community	residential	without-use
typology M2	8,007.7	4,324.5	907.7	1,875.7	4,681.7
total M2	19,796.7				
% green roof	**62.3 %**				

	extensive green	intensive green	social/community	residential	without-use
typology M2	7,095.4	4,185.8	815.2	1,881.3	5,928.7
total M2	19,906.4				
% green roof	**56.7 %**				





Sunlight

Indicator definition

Direct sunlinght that reaches the main façades during the core hours of the day.

Calculation parameters

CALCULATION FORMULA

[Hours/ day between 10am to 2pm on the main facade during all year]

UNIT

hours/day

Evaluation parameters

MINIMUM OBJECTIVE

1 hour/day of direct sunlight in 100 % of the buildings (main facade).

DESIRABLE OBJECTIVE

2 hours/day of direct sunlight in 100 % of the buildings (main facade).

RESULTS	
Option 1	100 % (> 1h) / 88 % (>2 h)
Option 2	100 % (> 1h) / 100 % (>2 h)

0 1 2 3 4 5 6 7 8 9 10

Results

To reduce the energy dependence of the buildings it is important to take advantage of the natural resources that can give us energy, as the sunlight. Solar gains in winter time are very important to reduce energy demand inside the buildings.

In order to evaluate the sunlight we analyze the two options from different approaches:

One of the aspects to look at is the amount of direct sunlight that reaches the main facade during the main hours of the day (between 10.00h to 14.00h solar time). It has been calculate for each façade how many hours it gets during all year in a height of 8m, which would be the third floor of the building, where the uses are all residential.

In Option 2 all buildings reach 3 or 4 hours of direct sunlight, while in Option 1, some buildings only get 1 hour of direct sunlight in this day period.
This analysis should be completed once the building distribution it is defined, in order to see if there are residential or commercial units without direct sunlight.

Another approach to analyze the sunlight has been to calculate the amount of energy that reaches each building during winter time (from October 1st to April 30th) when it is more needed.
The buildings facades in Option 1 , during winter time, receive 11.924.473 kwh that means 169kWh/m2. In Option 2, the energy received in the buildings facades is 13.558.459 kWh and 186 kWh/m2. Buildings in the Option 1 receive less sunlight that those in Option 2, because of other buildings shadows.

Reasons for these shadows are the closeness of some of the buildings (in SRN 01 and 02) and also the towers position, especially the one in SRN 01 Building 1, that covers the south orientation of the building 3.
Another thing to mention is that the big residential towers will shadow the area where is future academic development potential.

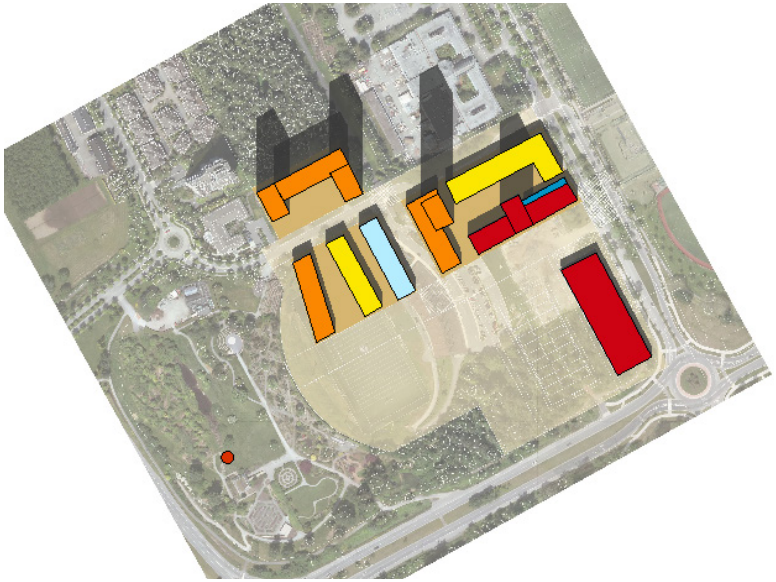
The third approach is to analyze the solar orientation of the buildings. How many buildings have the east to west axis orientation (plus/ minus 30º), so the main façade looks towards south. Having the main facade to south allows passive strategies in buildings such as taking the maximum advantage of the sun when it is needed for warmth and easily excluding it when it is not needed, in summer time.

According to this, Option 1 has better orientation, having 3 buildings (33%) oriented in the east to west axis. In Option 2 there is only one building (18%) with this orientation.

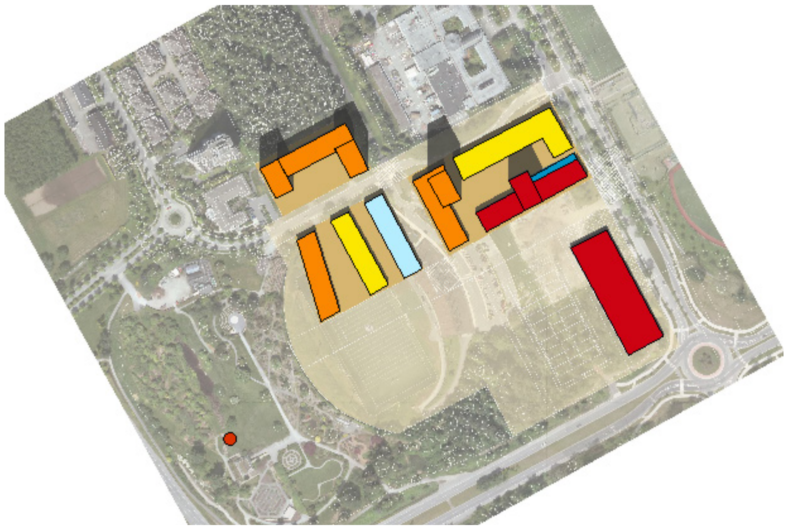
Sunlight

Option 1

Shadows on Mar 21st / Sept 21st

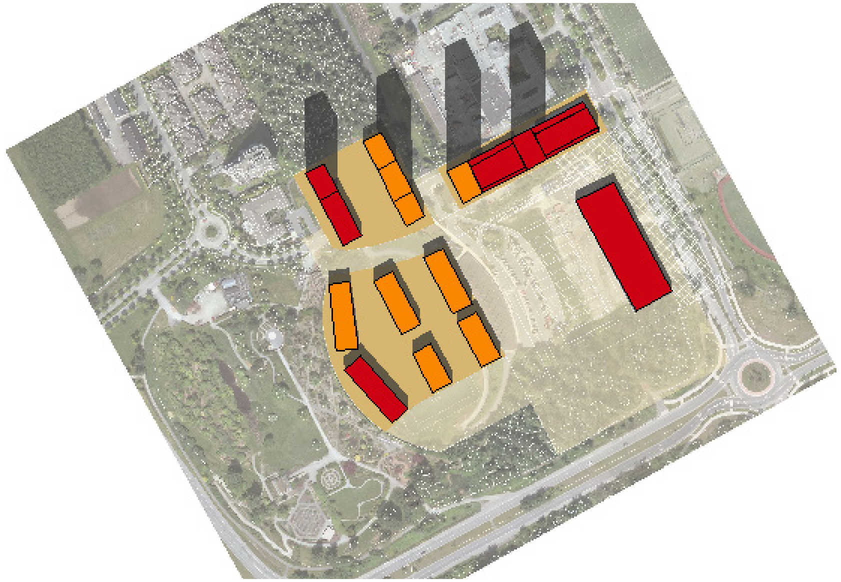


Shadows on Jun 21st

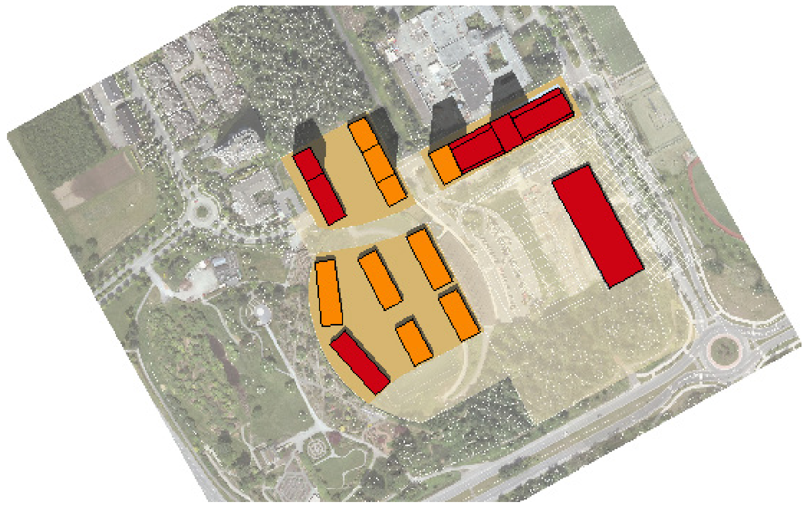


Option 2

Shadows on Mar 21st / Sept 21st



Shadows on Jun 21st



h/day between 10-14h in the main facade during all year

- 0
- 1
- 2
- 3
- 4

Energy Demand

Indicator definition

Relationsheep between residential energy demand according to the usage (heating and cooling) and net built surface area of the building.

Calculation parameters

CALCULATION FORMULA

Energy demand (heating and cooling uses)/built net surface area

UNIT

kWh/square meters

Evaluation parameters

MINIMUM OBJECTIVE

50 kWh/m^2 (heating and cooling uses)

DESIRABLE OBJECTIVE

15 kWh/m^2 (heating and cooling uses)
(Passivhaus criteria)

RESULTS	
Option 1	**48,5 kWh/m^2**
Option 2	**49,1 kWh/m^2**

0 1 2 3 4 5 6 7 8 9 10

Results

The objective is to reduce the energy dependence of the built space by fostering energy savings and efficiency. Savings implies waiving the use of energy resources that are not strictly needed to cover certain basic functions and acquire standard comfort levels and efficiency implies maximizing the provision of a service (heating, cooling, lighting, etc.) with the minimum possible consumption.

The building type, its orientation, the passive elements and the number of residents or users are factors that impact the energy demand. The demand will vary based on the construction standards.

At this stage of the plan development, the Energy Demand analysis is focused mainly on heating and cooling uses, because are the ones which are influenced by the urban development. The other uses (DHW and electrical uses depend on the user and the efficiency of the equipment used, so they are not considered at this stage of the analysis.

Also, the Energy demand has been calculated taking into account the transmission and ventilation losses but not the solar or the internal gains, which are important but are very dificult to incorporate in the analysis without more data and they could disturb the reading of the results.

Some assumptions have been made in aim to compare the 2 options:

– The thermal transmittances proposed as a starting point for the analysis are the ones in NCEB regulations: windows U=2,4W/m2K, outer facade U= 0.31W/m2K. and ground and rooftop 0.23W/m2K.

– It has been considered a ventilation of 0.33 renewals per hour with heat recovery and a window to wall ratio of 0.4 for the residential spaces and 0.5 for the tertiary uses.

With these hypothetical data, heating and cooling demand has been calculated for the 2 options. The total result is very similar for the two of them, with an energy demand of 48.5 kWh/m^2 for the option 1 and 49.1 kWh/m^2 for option 2 (Heating and cooling uses). If we look in more detail by types of building, the one with less energy demand is SRN03 Building 2 in option 1, with 34.5 kWh/m^2 or the SRN01 building 1 in option 2 with 39.7 kWh/m^2.

On the other side, the one with more energy demand is SRN02 Building 2 in option 2 with 67.5 kWh/m^2 and SRN03 Building 1 in option 1, with 66.3 kWh/m^2.

Buildings in height have less envelope per built square meter so they have less losses. Smaller and lower buildings are the opposite. The window to wall ratio also have a lot of influence because the higher transmittance of windows.

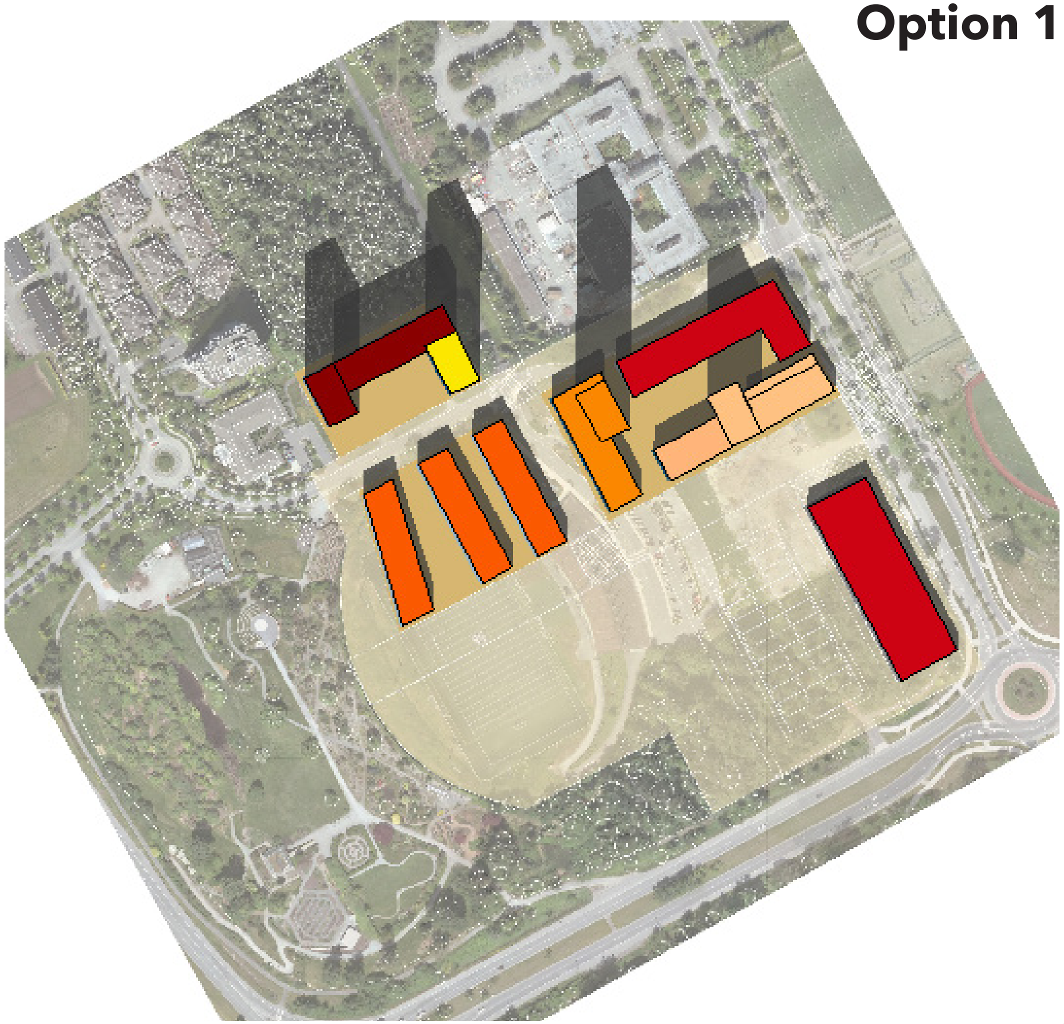
URBAN METABOLISM

Energy Demand

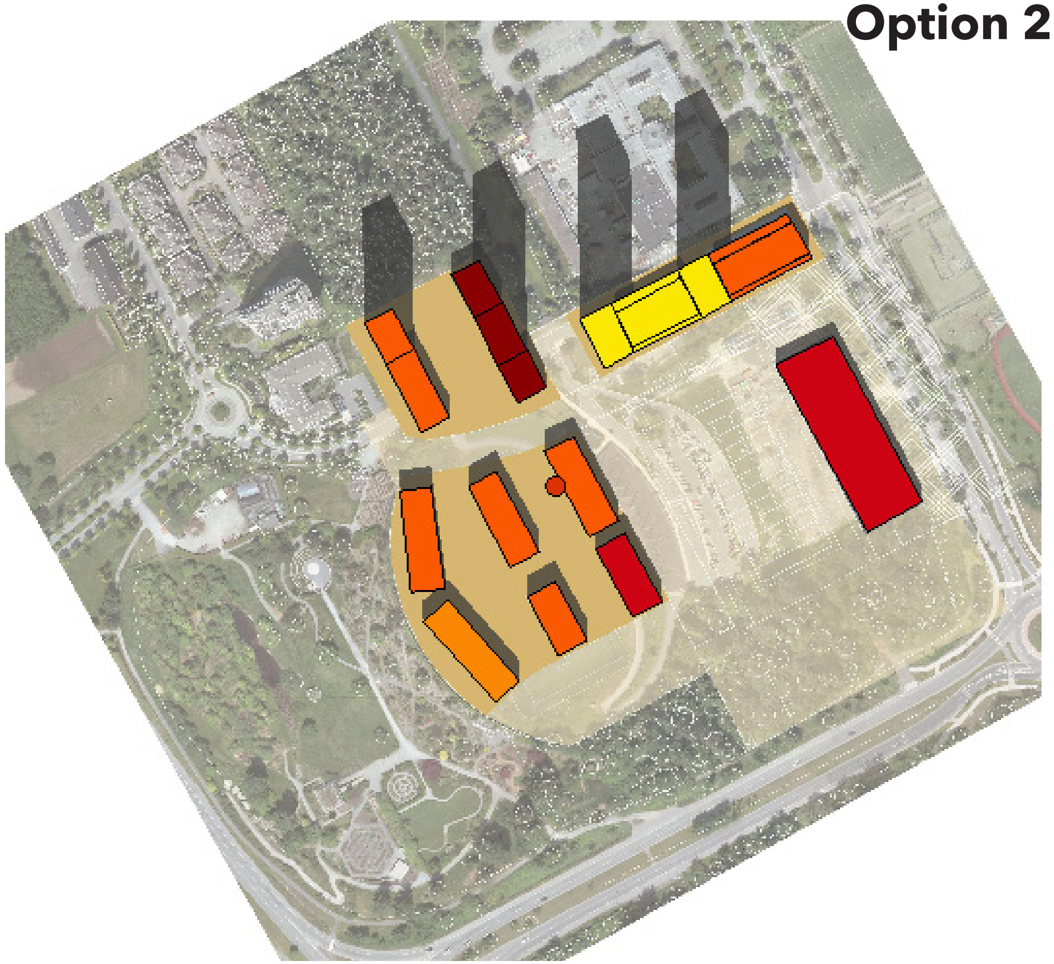
kWh/m² year

- < 40
- 40-45
- 45-50
- 50-55
- 55-60
- > 60

Option 1



Option 2



SOCIAL COHESION

Provision of affordable housing

Provision of affordable housing: definition

The percentage of affordable housing (GFA sq.m) in relation to the total residential area.

Calculation parameters

CALCULATION FORMULA

[Total afforable housing (sq.m) / Total residential area (total sq.m)] x 100

UNIT

% (GFA sq.m)

Evaluation parameters

MINIMUM OBJECTIVE

> 30 %

DESIRABLE OBJECTIVE

30 - 50 % (This range may vary depending on the deficit or surplus in the neighboring neighborhoods).

RESULTS

Option 1	29.8 %
Option 2	27.2 %

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

Taking action on housing is a strategic point, and intervention is required to ensure the social cohesion of a given area. Providing enough affordable housing for the income of all social groups in the city is an essential factor to avoid social exclusion. The proposal is to allocate between 30% and 50% of new houses to subsidised housing, and to do this by balancing different property types (owned or rented). A diverse citizenship is a guarantee that avoids a tendency towards ghettos being created, in which homogeneous groups of inhabitants live together.

The two options present a similar result, very close to the minimum objective: 29.8 % in option 1 and 27.2 in option 2. 75% of the residential rental surface is expected to be used for affordable housing.

In addition to providing sufficient affordable housing, there must be a balance of real estate to obtain an adequate mix between different types of housing. Therefore, a mixture of different types of housing would be indispensable: large and small, for ownership or rental, and preferably in the same building, or otherwise in the same block. Measures such as these aim to counteract the trend to concentrate available subsidised housing in certain area or neighbourhoods. Ensuring that different population groups have their housing needs covered, in the same space, is a starting point for establishing positive interactions between them, if appropriate measures are taken.

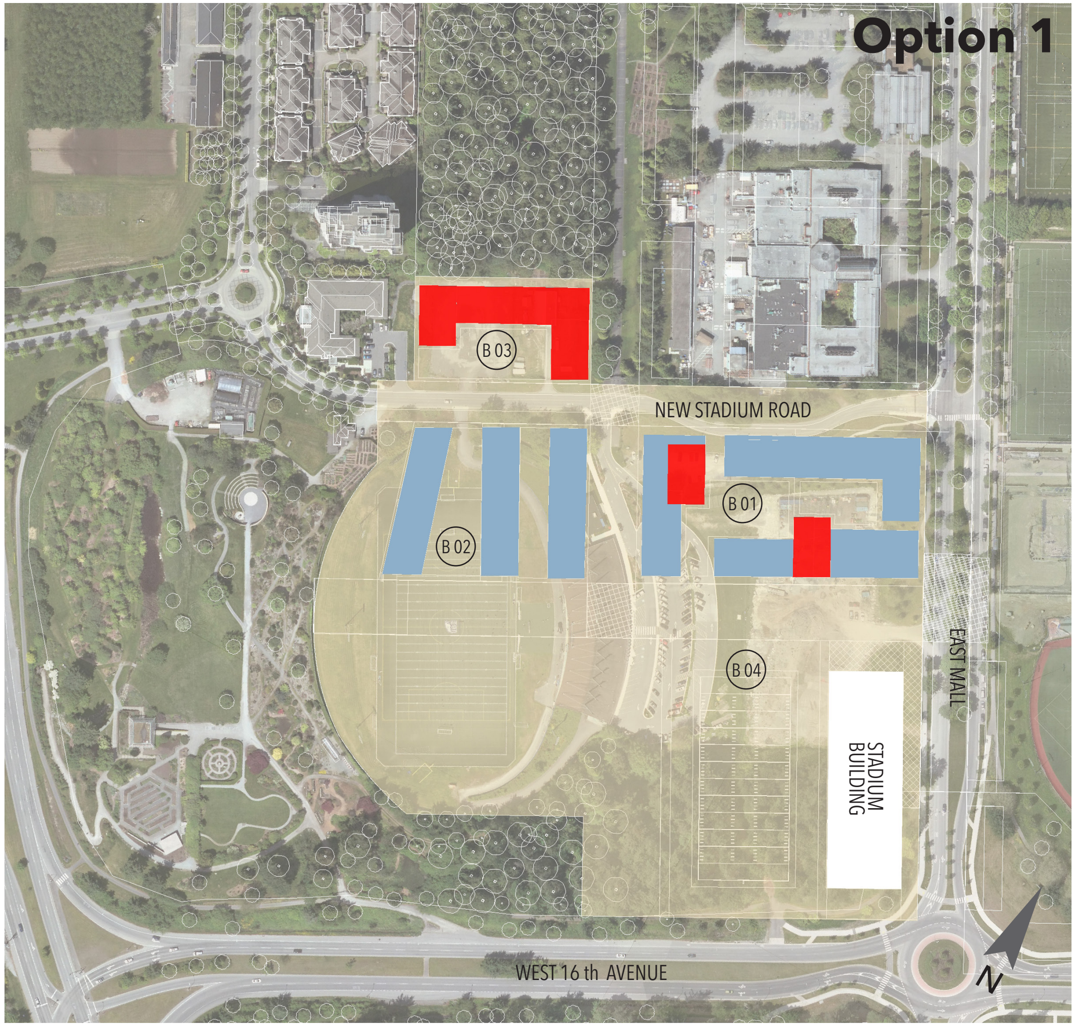
In this regard it should be noted that both options choose to mix the residential ownership between buildings of the same block.

Provision of affordable housing

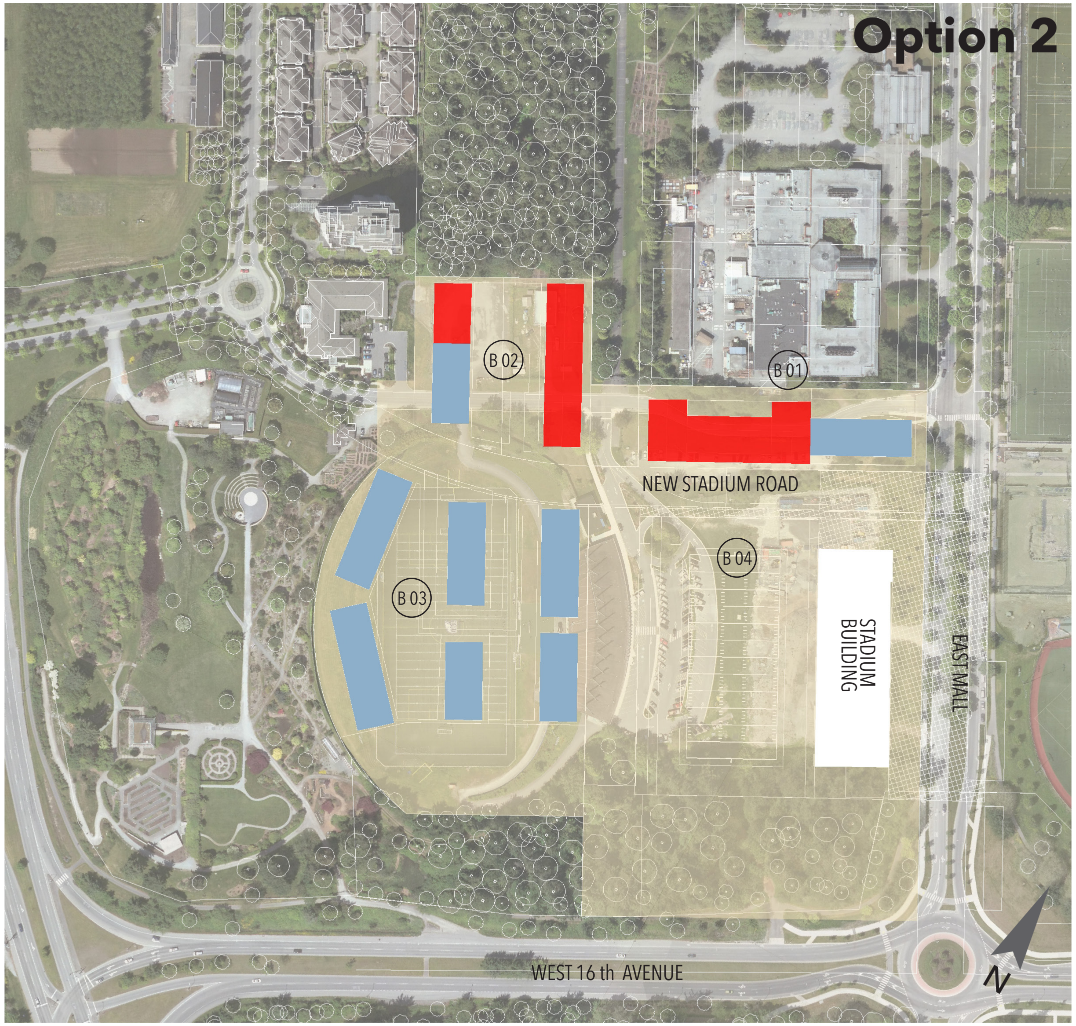
Residential Ownership

- Market
- Rental

Afforable housing: **29.8 % (39,525 sq.m)**
Rental Residential: **38 % (52,700 sq.m)**



Afforable housing: **27.2 % (36,450 sq.m)**
Rental Residential: **39 % (48,600 sq.m)**



Provision of public facilities

Provision of public facilities: definition

The relation, in percentage, between the existing land designated to proximity facilities (m^2/inhabitant for each type of facility) and the optimal facilities demand (m^2/inhabitant) according to type of fabric, population scale and its demographic characterization (young, balanced/sustainable or aged population).

Calculation parameters

CALCULATION FORMULA

[Provision m^2 current facilities / m^2 facilities optimal demand] x 100

UNIT

%

Evaluation parameters

MINIMUM OBJECTIVE

> 75 % (global and for each type of facility)

DESIRABLE OBJECTIVE

100 % (global and for each type of facility)

RESULTS

Option 1	143.0 %
Option 2	159.1 %

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

Facilities are understood as the series of resources that the community considers essential for its social structure to function, especially those facilities that require a public nature. The aim is to ensure that the entire population, regardless of sociodemographic characteristics, has access to optimal facilities.

The current provision is adequate in absolute terms because it exceeds the required provision (m^2/inhabitant) according to the type of fabric and the number of inhabitants for both options.

In option 1 it exceeds by 3,265 sq.m and in option 2 by 4,182 sq.m.

However, in this first proposal, there is evidence of a shortage of educational facilities. The needs of the child and youth population are not covered in both options.

Stadium Road Neighbourhood - Option 1 — **Population: 3,907**

Public facilities (daily use)	Current provision (m^2 land)	Standard Parameters (Neighbourhood)	Required provision (m^2)	Coverage %
Cultural *(Shared community space)*	1,840	0.098	382.9	480.6
Education *(Choice of use)*	840	1.39	5,430.7	15.5
Health *(Amenity/social space)*	780	0.033	128.9	605.0
Social Welfare *(Daycare)*	840	0.04	156.3	537.5
Sports	6,654	0.384	1,500.3	437.5
TOTAL	**10,864**	**1.945**	**7,599.1**	**143 %**

Stadium Road Neighbourhood - Option 2 — **Population: 3,636**

Public facilities (daily use)	Current provision (m^2 land)	Standard Parameters (Neighbourhood)	Required provision (m^2)	Coverage %
Cultural *(Shared community space)*	1,840	0.098	382.9	516.4
Education *(Choice of use)*	1,400	1.39	5,430.7	27.7
Health *(Amenity/social space)*	700	0.033	128.9	583.4
Social Welfare *(Daycare)*	750	0.04	156.3	515.7
Sports	6,654	0.384	1,500.3	470.1
TOTAL	**11,254**	**1.945**	**7,599.1**	**159.1 %**

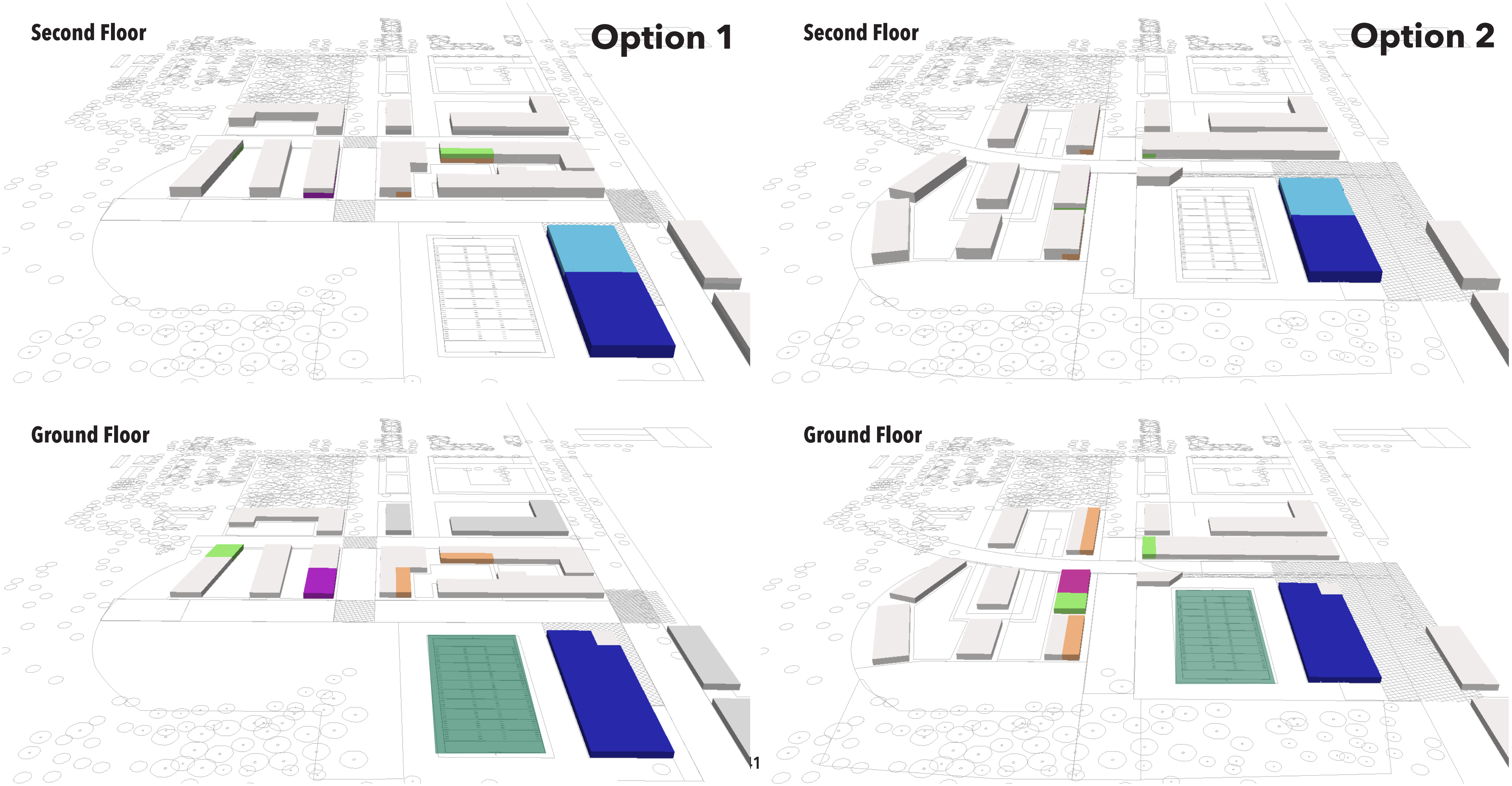
The distribution of facilities in the standard categories is approximate. It is simply used to show surface required.

SOCIAL COHESION

Provision of public facilities

Uses

- Shared community space
- Daycare
- Choice of use
- Amenity /social space
- Sports
- Stadium (not considered)



SOCIAL COHESION

Proximity to public facilities

Proximity to public facilities: definition

The percentage of population which has simultaneous cover with the different basic and public facilities considered (5 types in total) within walking distance (between 5 and 10 minutes).

Calculation parameters

CALCULATION FORMULA

[Simultaneous population covered by 5 types of public facilities / total population] x 100]

UNIT

%

Evaluation parameters

MINIMUM OBJECTIVE

> 75 % population

DESIRABLE OBJECTIVE

100 % population

RESULTS

Option 1	100 %	●
Option 2	100 %	●

0 1 2 3 4 5 6 7 8 9 10

Assessment of results

Once analysed whether the provision of land for facilities is sufficient to meet the basic needs of all social groups, it is necessary to analyze their spatial distribution. Simultaneous proximity measures how much the population is close at the same time to different types of facilities.

The distribution of urban facilities in an area must be carried out in such a way that anyone can access them on foot within a radius of 5 to 10 minutes walk. This is a requirement to guarantee access for all social groups. A balanced distribution in the area encourages a number of different urban facilities to be placed in a local area, which increases how often they are used.

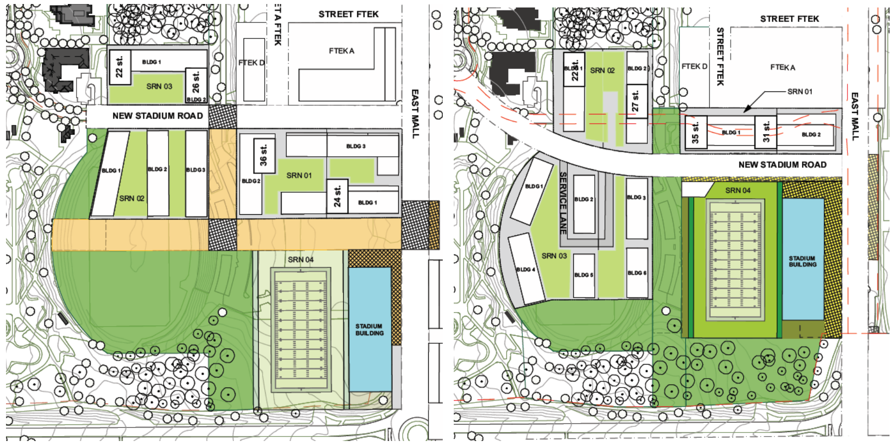
These are the type of public facilities and parameters (distance in metres) considered:

The two options plan a good distribution of public facilities; the dimension of the project allow configuring an area with nearby services.

Urban facilities should be understood as meeting places, as nodes of social complexity, which is derived from the fact that a very diverse range of people use them. If the facilities also meet the demands of several population groups, this characteristic is enhanced still further.

As a consequence of this power to attract the population, these facilities, and by extension the public space that surrounds them, are key pieces in traffic flows around the city. The quality of use of a given facility also relates to how privileged a position it has within the urban fabric, and the quality of the public space where it is located. This means that an appropriate placement of the existing spaces around public facilities will increase their value as a meeting place.

Urban facility	***proximity < 300 meters***	***proximity < 600 meters***
Social care	Elderly people social center Elderly people day center	Elderly people care home Social services center
Cultural	Civic/associative centers, local libraries, Monofunctional Cultural Center	
Sport	Outdoor sports courts Small covered / uncovered complex	Sports Center Extensive sports fields
Education	Pre-school (0-6 years) Primary (6-12 years)	Compulsory secondary (12-16 years) Non-compulsory secondary (16-18 +)
Health		Health center / emergency center Specialized health centers without admission



SUMMARY OF THE RESULTS ACHIEVED
OPTIONS 1 & 2

SUMMARY OF THE RESULTS ACHIEVED

OPTIONS 1 & 2

		RESULTS			OBJETIVES		POINTS ACHIEVED	
AXES	**INDICATORS**	**OPTION 1**	**OPTION 2**	UNIT	MINIMUM	DESIRABLE	**OPTION 1**	**OPTION 2**
URBAN MORPHOLOGY AND STRUCTURE	Residential density	**185.7**	**172.8**	dwell./ha	> 80	> 100	**10**	**10**
	Absolute compactness	**8.3**	**8.0**	meters	> 5	> 5	**10**	**10**
	Corrected compactness	**11.5**	**12.2**	meters	10 - 50	10 - 25	**10**	**10**
	Public Social space per inhabitant	**13.8**	**13.9**	m^2/inhab.	> 10	> 15	**8.8**	**8.9**
HABITABILITY IN PUBLIC SPACE	Thermal comfort - Summer	**27.4**	**30.4**	°C	< 30	< 26	**6.9**	**4.7**
	Thermal comfort - Winter	**11.7**	**7.5**	°C	> 5	> 10	**10**	**7.5**
	Road accessibility	**100**	**100**	%	100	100	**10**	**10**
SUSTAINABLE MOBILITY	Motorized road space	**6.1**	**8.9**	%	< 40	< 25	**10**	**10**
	Proximity to bike line network (< 300 metres)	**100**	**100**	% population	> 75	100	**10**	**10**
	Proximity to bus network (< 300 metres)	**100**	**100**	% population	> 75	100	**10**	**10**
	Proximity to bicycle parking (< 100 metres)	**100**	**100**	% population	> 75	100	**10**	**10**
	Off-road parking spaces	**> 90**	**> 90**	%	> 80	> 90	**10**	**10**
	Provision of parking spaces	**0.77**	**0.69**	spaces/dwell.	< 1	< 1	**10**	**10**
	Provision of distribution logistic platform	NO INFORMATION	NO INFORMATION		-	-	**-**	**-**
URBAN COMPLEXITY	Density of legal entities	**11.1**	**8.9**	activ./ha	> 15	> 25	**3.7**	**3.0**
	Urban diversity index	**4.9**	**4.6**	bits	> 5	> 6	**4.9**	**4.6**
	Mix of uses (non-residential GFA sq.m.)	**10.4**	**7.7**	%	> 25	25 - 35	**2.6**	**1.9**
	Activities dense in knowledge	**44.3**	**20.5**	%	> 10	> 25	**10**	**8.5**
	Vibrant facades	**30.5**	**27.4**	%	> 50	> 75	**3.1**	**2.7**
GREEN SPACES AND BIODIVERSITY	Public Green space per inhabitant	**9.2**	**12.4**	m^2/inhab.	> 5	> 10	**9.2**	**10**
	Proximity to green spaces	**100**	**100**	% population	>75	100	**10**	**10**
	Soil biotic index	**47.7**	**53.4**	%	> 30	35	**10**	**10**
	Green roof ratio	**62.3**	**56.7**	%	> 15	> 30	**10**	**10**
URBAN METABOLISM	Sunlight	**88**	**100**	% buildings	100 (1h)	100 (2 h)	**8.8**	**10**
	Energy Demand	**48.5**	**49.1**	kWh/m^2	< 50	< 15	**5.2**	**5.1**
SOCIAL COHESION	Provision of affordable housing	**29.8**	**27.2**	% sq.m	> 30	30 - 50	**5**	**4.5**
	Provision of public facilities	**143.0**	**159.1**	%	> 75	100	**10**	**10**
	Proximity to public facilities	**100**	**100**	%	> 75	100	**10**	**10**

10
9
8
7
6
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4
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