CIRCULATION PLAN FOR THE MONTREAL HIPPODROME SITE

FINAL VERSION

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1. The site

This section summarizes the main challenges and opportunities identified in several reports discussing the redevelopment of the site. Case studies that provide interesting ideas for the creation of an Ecoquartier and that helped us define our vision for the site are also presented.

1.1 Challenges

The Hippodrome site presents several challenges in terms of circulation, including the site's isolation and restricted connectivity with the surroundings and the rest of the city, high levels of congestion, lack of street activity, poor social mixity, poor transit service, and the lack of safe pedestrian and biking infrastructure. Circulation was one of the main concerns raised by the participants during the public consultation organized by the Office de Consultation Publique (OCPM, 2019; OCPM, 2020). Participants expressed their desire to create an inclusive and diverse neighbourhood, to think of the development of the neighbourhood at the larger scale, increasing the interconnection of the different sectors, to reduce nuisances of the highway, to reduce car use.

1.1.1 Poorly connected site

The hippodrome site is bordered by Décarie highway and by railways, which constitute major physical barriers and contribute to the disconnection of the site and decrease its accessibility.

The different uses and functions surrounding the site are physically separated and poorly connected. The site is indeed surrounded by commercial, industrial, and residential enclaves.

Figure 1: Sector fragmentation by highway and railway infrastructure

1.1.2 Car-oriented Sector

The site is mainly surrounded by highways, arterial and collector roads (see Fig. 2). If this facilitates movement through Namur-De La Savane sector, it also contributes to the predominance of cars and creates many nuisances, in terms of noise and air quality, as well as heat island effects. Cars indeed strongly contribute to air pollution, in the form of carbon dioxide, smog and several other toxic chemicals and gases, and thus degrade air quality. This has negative effects both on the environment and on people's health.

Traffic analyses show that the site is highly congested (see Fig. 3). 80% of trips to and from Namur-De la Savane sector are currently made by car. The intensive automobile use creates a dangerous environment for road users: 3900 traffic incidents were reported between 2014 and 2019, some of them involving cyclists and pedestrians (Oroboro, 2019).

Figure 2: Road Hierarchy

Figure 3: Traffic Congestion

Reducing car use is a priority as people fear that adding new residential units to the sector will create even more congestion and nuisances, degrading the residents' quality of life (OCPM, 2020).

1.1.3 Poorly accessible and underused public transit network

The site is served by Namur metro station on the orange line. However, this is one of the least used stations of the metro network. Only 8% of trips to and from Namur-De La Savane sector come from Namur and De la Savane metro stations. Pedestrian access to these stations from the west is

unpleasant and potentially dangerous because of limited opportunities for crossing Décarie Boulevard (Oroboro, 2019). On top of this general underuse of the metro network, there is also a shortage of bus routes in the area, low bus frequency and limited operating hours in the industrial sector (AECOM, 2018).

Addressing this public transit challenge will contribute to reducing car use. Indeed, areas with reduced transit accessibility have higher automobile use (Oroboro, 2019). Public transit use largely depends on the quality and efficiency of the transportation network, as well as its interconnection with important origin-destination points throughout the metropolitan area (OCPM, 2020).

1.1.4 Reduced active mobility infrastructure

The predominance of cars and the presence of major arterial roads around the site discourages travel within the sector, particularly for pedestrians and cyclists (Oroboro, 2019). Wide intersections near the Namur metro station, narrow sidewalks, the lack of trees, noise due to intensive car use, large parking lots, puddles of water and snow, do not enable pedestrians and cyclists to navigate the sector safely and pleasantly (AECOM, 2018). All these elements tend to make pedestrians "second-class citizens" (Johnson and Copps, 2020).

Finally, there is a lack of biking infrastructure on the site and in the surroundings - bike lanes, Bixi stations, bike parkings. Therefore, there are no incentives for people to use the bike.

1.2 Opportunities

There are also opportunities to increase connectivity and enhance user experience, mobility, and security (AECOM, 2018; OCPM, 2020). Increased connectivity, particularly with the surrounding municipalities (Côte-Saint-Luc, Hampstead, Mount-Royal) and with the rest of the borough (OCPM, 2020), is one of the key goals identified in the reports studying the redevelopment of Namur-De la Savane area.

1.2.1 Rethinking mobility

The site's development presents an opportunity to reduce car use through the inclusion of a diverse offer of transport modes and improved parking management. Moreover, having indirect routes will be a way to avoid through traffic and to make car use in the site less attractive to residents and visitors. Reducing car use will be essential to make the area attractive and easier to navigate. Permeable and convivial streets will encourage people to walk. One design principle will be to favour social interactions by reclaiming streets as proper public spaces. Linking the main circulation arteries to public spaces such as community centres, schools and green spaces, will also be key to ensure that the site becomes a social environment.

It is vital to rethink mobility by prioritizing active and public transport to encourage people to use other transport modes than cars. A diverse, mixed-use and inclusive, family-friendly environment has the potential to facilitate the access by active and public transport modes and make travel efficient and user-friendly (AECOM, 2018; OCPM, 2020).

Furthermore, this shift will allow the incorporation of inviting spaces that include vegetation to provide comfort and protect pedestrians from car transit, the addition of urban furniture and human-scale lighting to comfortably transit and gather, and the improvement of the user experience. Therefore, all the interventions represent an opportunity to conceive spaces for everyone, where universal accessibility enables people to be autonomous.

1.2.2 Increase Intermodality

Since the sector already has two metro stations - Namur and De La Savane - this massive transport system can support an intermodal network that links the different public transport options by becoming a transportation node (AECOM, 2018; Groupe de travail Namur-De la Savane, 2020; Oroboro, 2019).

Having a metro line and bus routes also facilitates local and external connectivity. Moreover, there is a chance to connect the future REM (Réseau Express Métropolitain) and EXO2 with bus routes to increase public transport offers (AECOM, 2018; Oroboro, 2019; OCPM, 2020).

Likewise, the Cavendish Boulevard extension favours the development of a transit corridor that prioritizes public transit. This project could link the Cavendish Nord (Saint-Laurent Borough), Cavendish Sud (Côte-Saint-Luc), Jean-Talon Ouest (Côte-des-Neiges–Notre-Dame-de-Grâce) and Royalmount (Mont-Royal). Therefore, it will contribute to better structure the road network of the sector (Groupe de travail Namur-De la Savane, 2020).

Additionally, in terms of active transportation, developing a cycling network that connects with the public transport system would also improve intermodality. The metro stations also contribute to increasing the walkability of the site if strategies are adopted to provide adequate infrastructure that generates safety and comfort.

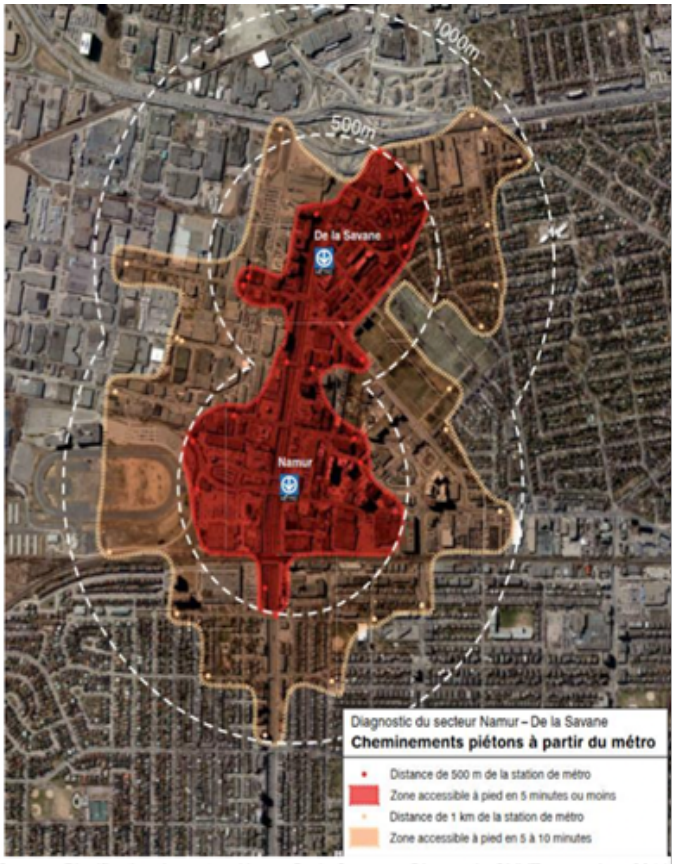

Figure 4: Walking Accessibility from Namur and De la Savane Metro Stations

1.2.3 Re-evaluate parking surface

Concerning the parking infrastructure, a possibility is to develop mobility hubs to encourage the consolidation of alternative transport services by offering several alternative modes to the car (including bicycles, BIXI, and car-sharing vehicles) to complement the existing public transport offer. Furthermore, the Oroboro report suggests the creation of "adaptable infrastructure": while providing parking may still be a necessity, the need for parking is expected to decrease with improved active and public transport. Thus, parking spaces - underground and above-ground - could be repurposed for other uses, such as work and community spaces, apartment units, urban agriculture, storage etc. Another opportunity related to parking is sharing the commercial parking surface with residents, employees, and commuters. This measure would centralize parking at one or more areas and optimize its use for different activities. Sharing existing parking lots reduces heat islands by favouring green spaces and prioritizing public and active transport (AECOM, 2018).

1.2.4 Toward active and public transport

One of the main opportunities for rethinking mobility and connectivity is to reclaim pedestrians as the priority of all transit modes (Johnson & Copps, 2020). The urban environment must provide security, comfort and opportunities for everyone, especially the most vulnerable users (pedestrians). Therefore, the infrastructure needs to support and encourage active and public transportation.
One of the recommendations from the Fahey consultation was to create a pedestrian connection between Namur metro station and the site. In 2018, Fahey carried out a character study of the Namur-De La Savane area in order to inform its future development. Among its most interesting finds, the report notes that the parking found between the hippodrome site and Namur metro station was initially intended as a park (fig. 5 & fig. 6).

Figure 5: Original Intervention Proposal for Parking Area Between Namur Metro Station and the Site

Figure 6: Current Form of the Parking Area Between Namur Metro Station and the Site

In order to rectify the current poor use of these spaces and better connect the future hippodrome site to the metro station, the Fahey study recommends the creation of a designated artery surrounded by commercial storefronts and with wide sidewalks. This would create a safe space to draw pedestrians to the hippodrome site, as well as add cohesion to the area's-built form (see images).

Figure 7: Previous redevelopment proposal for the site

Consequently, the site constitutes an opportunity to reformulate who we are planning for and preserve the connection between the different urban interventions (favouring human scale), the street, and transport alternatives.

2. Our Principles

2.1 Guiding Principles

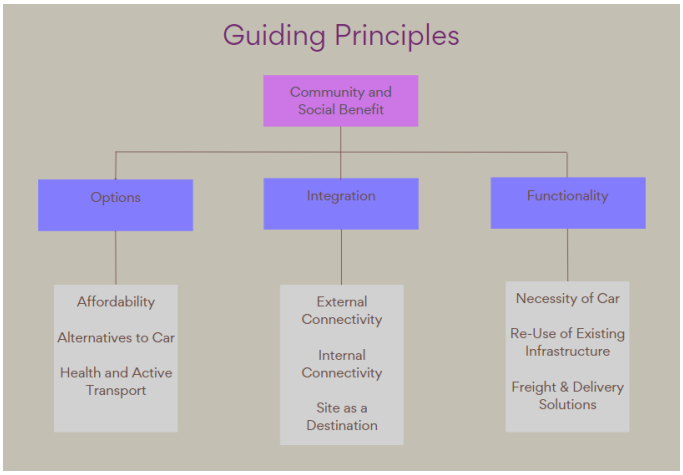

Figure 8: Agreed Upon Group Guiding Principles for the Hippodrome Site

The above framework outlines how we envision approaching the circulation component of the hippodrome redevelopment plan. Notably, our approach to transportation planning is centered around the social benefits to the community. By focusing all our initiatives through this lens, we aim to refine our methodology, achieve a unique perspective, and synergize with the overarching goal of the full project as a counter planning exercise. This can be seen as an ethos, theme, or vision from which the rest of our interventions take inspiration.

For organizational purposes, we have also identified three guiding principles that underscore our common planning values and objectives for the site. These can be briefly referred to as options, integration, and functionality. Put as a statement, we want to provide circulation options for the community and integrate it with its surroundings, while still maintaining functionality with existing needs and constraints. These objectives are elaborated on below:

2.1.1 Providing Options to the Community

Based on community needs for affordability, health, and environmental coexistence, we intend to provide varied transport options for incoming residents in the hippodrome site. In particular, we recognize the importance of reducing car-based path dependencies through the provision of alternatives.

Existing car infrastructure in the area is already operating at maximum capacity. Status quo developments that pursue car-oriented residential developments will, by necessity, mean reinvestments in this type of major car infrastructure. Given the scientific consensus on the need to move away from car-oriented development and the increasing severity of the climate crisis, planners have a responsibility to lead the charge against car-oriented planning and show, concretely, what an alternative 'green' city can look like. These alternatives include both public and active transport. We hope that the former can help to achieve our aims of social equity, while the latter can have positive health externalities, contributing to the overall vibrancy of the community.

2.1.2 Integrate the Community with Surroundings

Addressing and remediating the site's isolation is fundamental. The plan will approach this challenge via three sub-objectives: internal circulation (design and policy), external circulation (design only), and destination appeal (policy only). These three sub-objectives should help us to prioritize our design choices and consider creative policy solutions resulting in a well-integrated community with the resultant social benefit.

2.1.3 Ensure Functionality given Existing Needs and Constraints

In delivering on our other guiding principles for circulation, we need to remain cognizant of current constraints,

necessities, and assets that characterize the site. The car of course remains a persistent reality with associated challenges. However, because it remains an essential component of the area (industrial area, highway, neighbouring car-oriented suburbs), it would be irresponsible not to plan for it. Indeed, comparative case studies suggest that failing to plan for the car results in a continuation of the car-centric status quo; thus (perhaps counter-intuitively) we believe planning for the car is the best way to reduce its impact. Additionally, trends in e-commerce suggest a pervading need for freight and delivery service. Although we intend to examine creative alternatives to the traditional delivery model, we recognize that this inevitably compounds the need for flexible transportation. Finally, given that this requires traditional infrastructure, we aim to reduce costs and environmental impact wherever possible by re-using existing infrastructure such as nearby parking lots and transport networks.

2.1.3 A Project Focused on Affordability

We recognize that the main focus of this project is to provide quality affordability housing to low-income residents at a time when Montreal is experiencing an ever-worsening housing crisis. As transportation planners, we have a responsibility to ensure residents can circulate within and out of the site in an affordable and sustainable manner.

Specifically, the shift away from a car dominated planning culture has enormous equity implications that are in line with the Hippodrome site's core mission. Cars represent an enormous expense to Canadian households. According to a 2017 report from the Canadian Automobile Association, it costs between 8,600$ and 13,000$ on average to own a car, representing 20 percent of after-tax income for middle-class households. As a comparison, the average rent of a two-bedroom apartment in Canada the same year was 11,940$. In other words, reducing car dependency is a housing affordability question, to the same extent as rent. The Hippodrome site, therefore, represents an incredible opportunity to show the affordability benefits of moving away from car-oriented planning on a large scale.

3. The Plan

3.1 Circulation network

3.1.1 External Connections

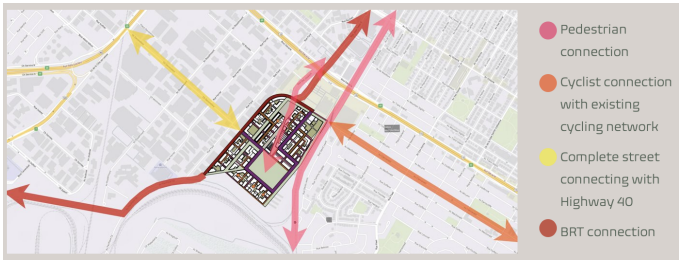

Figure 9: External Connections

The isolation of the site and lack of good connectivity to the rest of the city is one of the major challenges. Achieving a better integration of the site with the surroundings is one of our guiding principles for its redevelopment. For this reason, external connections are particularly important. Our objectives are to improve the connection between Namur metro station and the site - notably for pedestrians - to make it possible and easy to access the site by different modes of transport and to connect the site to existing surrounding amenities. The aim is to enable residents to easily access external destinations as well as to attract visitors to the site. People will be able to access the site from different entry points using different modes:

- on the Eastern side, from Namur metro station using Jockeys Street as a pedestrian or a cyclist (See Fig. 10)
- from Jean-Talon (on the Eastern and Northwestern sides) by bus or car
- on the Northern side, from Devonshire by bike, public transit (bus) or by car
- on the southeastern side, from Clanranald Street (See Fig. 11) as a pedestrian, cyclist or by public transit (bus). This active transit corridor will provide a direct bike connection to the south of the city and downtown.
- on the southwestern side from the active transit corridor, as a pedestrian or a cyclist. Connection with Côte-Saint-Luc could be realised with the creation of a bridge.

Figure 10: Jockeys Street

Figure 11: Claranald Street

Therefore, better connectivity is created with the northern industrial zone, Côte-Saint-Luc to the West, Hampstead to the South, Côte-des-Neiges-Notre-Dame-de-Grâce and Town of Mount-Royal (TMR) to the East. These boroughs offer many amenities that could be used by the residents of the site: health (hospitals in Côte-des-Neiges-Notre-Dame-de-Grâce), educational (Université de Montréal, HEC, secondary school in Côte-Saint-Luc, primary school in Hampstead) and commercial facilities (Quartier Cavendish and Carré Décarie malls).

3.1.2 Internal Network and Street Hierarchy

Figure 12: Proposed Internal Network and Street Hierarchy

One of our design principles is car discouragement. The street network that is proposed aims at de-incentivising people from using their private cars while providing incentives to walk, bike or use public transit.

There are five types of streets. The first one is the arterial street (in red on Fig. 12), Jean-Talon Street, which is the only through street on the site. Since this street is located on the northern periphery of the site, in-between industries, and high-density buildings within the site, it is expected to create limited nuisance for the residents of the site.

The second type of street is a complete street (in purple on Fig. 12) that will be 24 meters wide. It will accommodate many different transportation modes: there will be two bus lanes in the middle where cars can also circulate, two protected bike lanes on the sides and wide sidewalks. Moreover, there will be one lane reserved for parking. On this lane, parking spaces will alternate with other uses such as bike parking or bioswales. Even if this will be the wider and busiest street in the site, it is still expected to be usable by and safe for pedestrians. This is fundamental as this street constitutes one main pedestrian access to the park. This street was designed in a way that controls and limits car circulation (speed limit, curves etc), and so that most blocks have access to this street.

Figure 13: Street Section

Figure 14: Example of a Complete Street Section

The third type of street is low-speed shared streets (in brown on Fig. 12) that are 16 meters wide. Inspired by the woonerf concept[1], this street will allow cars but will have a very low speed limit (15-20 km/h) so that pedestrians and

[1] The woonerf concept was developed in the late 1960s in the city of Delft, Netherlands. The main motivation was to change the way streets are used and to improve the quality of life in residential streets by designing them for people,

cyclists will be able to circulate safely and pleasantly. Speed bumps could be used to force cars to slow down. There will be no public transit serving these low-speed shared streets.

Figure 15: Street Section

Figure 16: Example of a Shared Street

Figure 17: Example of a Shared Street

The fourth type of streets are access alleys (in orange on Fig. 12). These will be 8 meters wide and will be the most common type in the neighbourhood. They are distributed throughout the site as they ensure all buildings are accessible by car. Some of them are cul de sacs. Vehicular traffic will be restricted to emergency and freight access. The access alleys will be primarily used by pedestrians and cyclists. There will be signs indicating where cyclists should bike, but there will be no protected bike lanes. We envision these streets as being pleasant spaces, with green elements.

Figure 18: Section of an Access and Pedestrian Alley

Figure 19: Example of an Access Alley

The fifth type of streets are pedestrian alleys (in pink on Fig. 12). No cars will be allowed in these streets as access alleys will be used for deliveries and emergencies. Since there will be no vehicular traffic on these streets, they present a high potential for greening.

and not for cars. Such streets provide space for cars but are primarily designed for pedestrians. Limiting car speed improves residents' feelings of safety and promotes greater use of the public space.

Figure 20: Example of a Pedestrian Alley

Other active corridors will be created on the site.

Figure 21: Additional Active Corridors

There will be a central pedestrian corridor (in dark pink on Fig. 21) that will be 16 meters wide. It will connect the plaza (also in dark pink on the map) located at the intersection of Jockeys and Jean Talon Streets with the central park. The expected high pedestrian traffic due to mix-use activities will de-incentivise cyclists to use the corridor. However, to ensure pedestrian safety, signs will indicate where bikes can circulate.

Figure 22: Example of Pedestrian Corridor

Figure 23: Example of Pedestrian Corridor

There will be two active transit streets, for pedestrians and cyclists (in light pink on Fig. 21). The first one connects Namur metro station with the site (the current Jockeys Street), the second one runs next to the rail, adjacent to the ecological corridor.

Figure 24: Jockeys Street

3.2 Motorized Traffic

3.2.1 Motorized Vehicle Network

Our focus has been to reduce motorized traffic as much as possible to open the site to livelier and safer possibilities for residents. At the same time, we have also taken careful care to ensure residents will not suffer from any lack of accessibility due to reduced car-use. Cars, while discouraged from doing so, will be able to reach important access points if so needed. At the end of the day, the core difference with our approach to cars is that they are the central aspect of our transportation strategy, but that is not to say that they have been ignored.

As can be seen below, one major street will provide for most of the motorized vehicle access points on the site. These will accommodate for pick-up and drop-off, deliveries, taxis, and reduced mobility vehicles, as well as resident car-sharing services. Street parking (except for car-sharing) will be entirely removed from the site.

We have designed two main routes for cars, shown below in dark purple. The first, the Jean-Talon Street extension along the edge of the site, will be the main through way. Having cars pass through the site along its outside allows for a maximum reduction of their encounters with residents for those not travelling directly to the site. The second, connecting with Jean-Talon Street on both ends, runs through the site and serves as the main access point for any needed car-related services. In light purple are the other streets that cars can access if needed, but where they are not a major design consideration.

Figure 25: Motorized Vehicle Network

3.2.2 Reducing car dependency while making do with current realities

Parking is always a contentious issue, but it has been a particularly challenging aspect of this site's circulation plan due to its unique location, as well as social focus. On the one hand, we recognize that the site is currently dominated by car-oriented infrastructure and neighbourhoods. It would be unfair from a social perspective, for example, to ask lower income residents to endure the nuisances of highways serving the entire metropolitan while denying them the transportation benefits associated to them. Similarly, ignoring the existing car-oriented nature of the surrounding neighbourhoods of Côte Saint-Luc, Hampstead, and Ville Mont-Royal risks enclaving the new hippodrome development.

On the other hand, because of capacity limitations on existing car infrastructure, an environmental need to push for non-car-oriented development, and the major affordability blunder that cars represent, we have a responsibility to ensure that cars are the last transportation consideration—that most trips taken to and from the site are done without a car.

3.3.3 Our Parking Vision

Our site will be open to all circulation forms except through car traffic—which will pass along Jean-Talon in the north. The need to maintain some cars exists because of the inadequacy of existing inter-city transit infrastructure, as well as the difficulty of travelling to Montreal's suburbs without a car. Our solution to these constraints is a site that reduces the amount of privately owned cars. On top of alternative transportation modes, we want to favour car-sharing, which will accessible be in the central shared street.

A reduction in parking is a major way in which the move away from cars can be facilitated. All private cars on our site will need to be parked in designated underground garages—as numbered below—concentrated at the northern end of the site, where they will be connected to Jean-Talon Street.

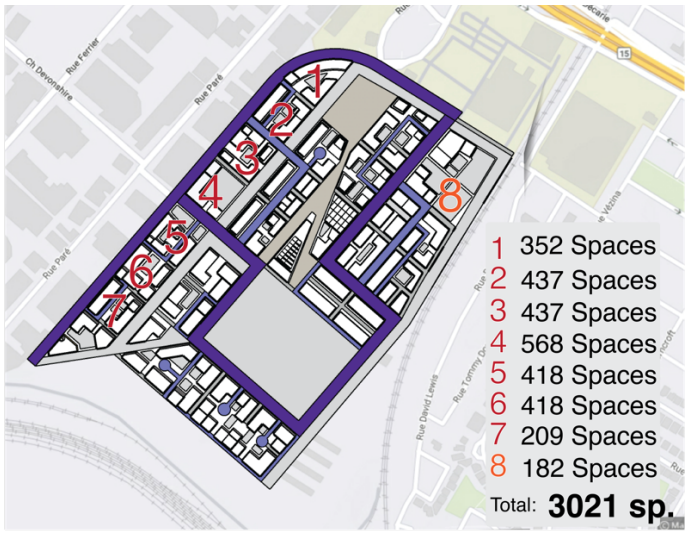

Figure 26: Parking Distribution

The shared street will allow for some on-street parking for shared cars. Our current plan estimates around 217 parking spaces on the shared street for car-sharing, but it this amount could easily be increased or reduced, as needs are assessed by the community.

Car Sharing Scenarios

Scenario	Length of Shared Street (M)	Number of Lanes	Total Car-Sharing Spaces
Current Plan	2169	0.5	217
Small Expansion	2169	1	434
Massive Expansion	2169	1.5	651
Reduced Plan	2169	0.25	108

Figure 27: Car Sharing Scenarios

We have estimated the total car parking need on the site to be 3000 spaces, based on the city's current residential parking projections and an additional consideration for visitor parking. All these spaces will be provided in the 8 car garages on the site (see fig. 26)

This distribution of parking would have several advantages for the community. First, it would immediately give the streets on the site back to pedestrians, even as it maintains current service levels for cars. Second, it would allow the community to have some leverage and flexibility regarding how they use this extra space. While the space may be used for cars for the time being, purpose-built car garages can be phased out and repurposed as the demand for cars decreases. Finally, a pay-per-use car garage that serves an entire site, rather than building, could be owned by the community and used to raise revenue from non-residents (visitors). This could help the community redistribute funds to other sustainable mobility alternatives for residents, and generally provide them more leverage for transition.

3.3 Cycling infrastructure

Considering the plan's focus on limiting car access to the site, cycling will become a key component to reduce car dependency without limiting equitable accessibility while also providing a more sustainable alternative. Based on the guiding principles of options and integration, the cycling infrastructure plan for the Blue Bonnets site is structured around enabling cycling as the most efficient mode of transportation for the community, whether for trips within the site, travel to surrounding neighbourhoods or to access public transit connecting with the rest of the Montreal Island.

The proposed cycling infrastructure for the site is composed of three main elements:

- Circulation infrastructure
- Parking infrastructure
- Bike sharing

The following map outlines a general layout of the cycling infrastructure considered for the site. Some elements are not shown but they are detailed in the corresponding section below.

Figure 28: Proposed Cycling Infrastructure

3.3.1 Cycling Circulation Infrastructure

The internal cycling circulation network aims to provide cyclists direct access to all areas within the site; this is achieved in accordance with the street hierarchy described in previous chapters providing specific cycling infrastructure at different levels of the hierarchy already established, resulting in an internal loop of protected bike lanes complemented by shared streets and green corridors. At the same time, the cycling circulation network is intended to provide external connections enabling regional (cross-neighbourhood) travel, and most importantly, direct connection to mass transit, thus connecting the site to Metro Namur takes center stage.

Specific details of the bike circulation infrastructure design are presented under each corresponding hierarchy, but they are generally drawn from the National Association of City Transportation Officials Urban Bikeway Design Guide (NACTO, 2014) and are centered around providing safe and intuitive use not just for cyclists but to all street users.

Protected Bike Lanes

Figure 29: Proposed Protected Bike Lanes

In general terms, protected bike lanes are one way 1.5m bike lanes located on the right end of the street one per direction and segregated from motorized traffic lanes by concrete dividers. These protected bike lanes are located along the Complete Street hierarchy forming a loop within the Blue Bonnets site, and along the existing portion of Jean Talon Street and the proposed extension west of Devonshire Street. These lanes are also suggested for external connections east along Jean Talon Street, north along Devonshire Street and south along Clanranald avenue.

Additionally, As part of the proposed green space for the site, simple bidirectional cycle paths will be accommodated along the border of the biodiversity reserves and along the green corridors crossing the site. These are intended to be park-like and nature-focused environments segregated from the surrounding urban and residential ones, therefore they are expected to accommodate a higher proportion of recreational cyclists while also allowing commuters to use the infrastructure.

Finally, an additional bike path will be allocated along the pedestrian corridor that connects the park with the northeast corner of the site. This will function as part of a direct cyclist connection with Metro Namur Station.

Signalized intersections along streets allocating this infrastructure will provide specialized signals for cyclists and include cycle boxes in their design to prioritize cyclist movement while reducing potential conflict with motorized traffic (NACTO, 2014), this will effectively restrict right turning during red lights for motorized vehicles.

Cycle lanes and intersection crossings will be marked with colored pavement and/or pavement paint to provide intuitive identification of the infrastructure and denote the exclusive use of it for cyclists (NACTO, 2014). Cycle lanes will be treated with green colouring along lanes and with white and yellow paint to indicate segregations, for more detail on signs and paved markings please refer to the Urban Bikeway Design Guide (NACTO, 2014).

Non-Protected Bike Lanes

Figure 30: Proposed Non-Protected Cycling Infrastructure

Supporting the protected infrastructure, a robust network of shared internal streets enables cyclist access to all areas within the site. This network is composed of the shared streets and the pedestrian and access alleys street hierarchies that use the same signaling strategy and elements but have different space sharing dynamics.

For both the shared streets and access alleys, cyclists will share the circulation space with motorized traffic in 3.5m wide lanes per direction functioning as low-speed streets, where cyclists will have priority over any other transport mode (with the notable exception of pedestrians).

Pedestrian alleys will accommodate both pedestrians and cyclists, although no motorized traffic will be allowed except for extraordinary situations in which emergency services or other special vehicles are required to access these streets. Cyclists will be able to use the single central lane but yield to pedestrians in all situations.

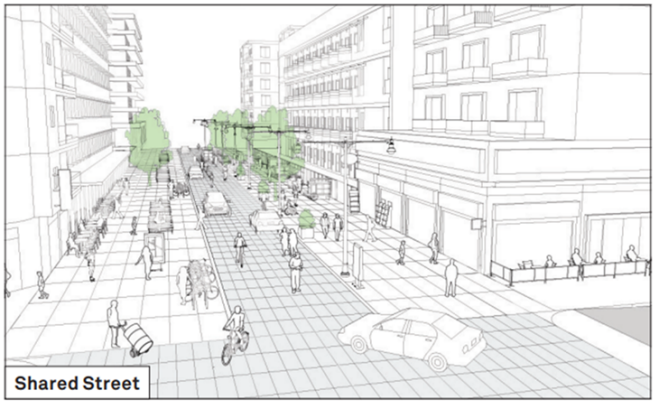

Figure 31: Example of Shared Street (NACTO, 2014)

While no dedicated cycle lane will be provided, in order to maintain adequate safety for cyclists, extensive signaling and pavement markings will be used to denote cyclist priority and/or use along these streets.

Figure 32: Cyclist Pavement Markings on Street (NACTO, 2014)

3.3.2 Bike Parking

The cyclist circulation network infrastructure could be considered the main element that provides cycling accessibility to the site, despite this, its use and effectiveness is in great part dependent on another important infrastructure component that complements and enables the cycling system. This key complementary element is parking infrastructure. Inadequate, insufficient, and inconvenient bike parking infrastructure could severely discourage cycling travel for both residents and visitors. In order to accommodate both of these users, short term and long-term parking infrastructure should be provided.

Long-term Parking

Long-term parking is intended to provide sheltered protection for bikes parked for more than 3 hours (Auckland transport, 2021). Specifically, two distinct types of long-term parking are proposed: Residential bike parking and bike parking garages.

Residential Bike Parking

Parking facilities will be provided by each building in the form of an internal bike room accessible at street level. According to the City of Boston's Bike Parking Guidelines (City of Boston, 2021), "Bike parking should be as convenient—or more convenient—than car parking", in accordance with this, access to bike rooms should be adjacent and at grade with the accessing street and located near the main entrance of the building.

Bike rooms should be located within each building, shielded from the weather, well-lit and ideally with controlled access and security measures that could involve the presence of an attendant depending on the capacity of each bike room. Additional amenities such as bike repairing tools, charging ports for e-bikes are highly recommended.

Cities like Boston or Seattle, with recently updated bike parking requirements, typically require one parking spot per residential unit, considering this, a referential benchmark analysis based on codes from three different cities was developed to estimate the required floor space to be allocated per residential unit to provide this parking space.

	Auckland Transport Cycling Infrastructure 2021	Boston Bike Parking Guidelines 2021	Boston Bike Parking Guidelines 2021	Seattle Bycicle Parking Gidelines 2020	Seattle Bycicle Parking Gidelines 2020	Average
Parking capacity (bikes)	16	32	120	2	2	
Rack type	Inverted U racks	Mixed racks	Mixed racks	Single inverted U racks	Single wide inverted U racks	
Area (Sq ft)	285.0	432.0	2040.0	12.0	36.0	
Area (Sq m)	27.0	41.0	190.0	2.0	4.0	
1 Bike per unit area (Sq m)	1.7	1.3	1.6	1.0	2.0	1.5
2 Bikes per unit area (Sq m)	3.4	2.6	3.2	2.0	4.0	3.0

Figure 33: Estimated Floorspace Required for Long Term Bike Parking

The result shows that approximately 1.5 m2 per unit are required to be destined to a general bike room in each residential building, considering that units are roughly 100m2 on average, this would mean that 1.5% of the residential floorspace should be designated for a bike room. Bike room capacity can be increased with the use of two-tier parking racks and other parking systems, providing potential efficiencies in terms of space. Depending on each building unit density, bike rooms capacities are expected to range from 18 to 239 spots per building and provide over 6,000 residential parking spots in total for the site.

Parking Garage

Considering the key role of intermodality in the mobility vision for the site and in order to encourage access to public transit by cycle, the plan includes the construction of a bike parking facility located in the current parking lot between Jockeys Street and Jean Talon street, at the site's main entrance, placing this infrastructure in close proximity to Namur Metro Station.

While European bike infrastructure include some examples of state-of-the-art bike parking garages such as the The Hague's new bike garage with capacity for 8,000 bikes in the Netherlands or Cambridge's rail station bike parking facility Cycle Point with a capacity of almost 3,000, Montreal already has some infrastructure of this kind in place at some EXO and Metro stations. Recently new parking infrastructure with capacity for 160 bikes was installed

outside Saint Laurent metro station and while Namur metro station has some bike parking infrastructure, capacity only allows for 35 bikes, therefore added capacity will be needed to accommodate demand from the Bluebonnets site.

Figure 34: Example of a Bike Parking Garage

The proposed facility is intended to be used by residents traveling by metro, accessing it through their personal bikes to carry out their first/last mile trips in their commutes, parking their bikes for the duration of their daily activities and accessing them after their return commute.

Capacity for the infrastructure is recommended to be at least a third of the capacity of residential parking, meaning that this facility could accommodate around 2,000 bicycles. This type of facility would maximize space usage by serving most parking with two-tier racks. Based on the case study of ASCOBIKE in Sao Paulo, Brasil (ITDP, 2009) a facility of similar capacity would require a footprint of around 1,130 m2 including sufficient space to allocate a reception, office, restrooms and a repair shop. This building could be easily allocated in the west end of the referred parking lot with a 50m by 25m one floor building and can alternatively be configured in a multilevel layout to reduce its footprint or to increase its capacity.

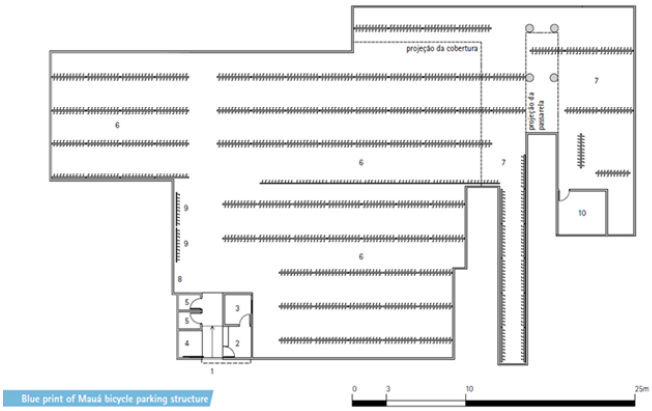

Figure 35: ASCOBIKE Maua bike garage layout (ITDP, 2011)

Figure 36: Estimated Footprint of Proposed Bike Parking Garage

Short-term Parking

Short-term bicycle parking will mostly accommodate visitors but will also serve residents traveling by bike within the site, both for parking no longer than 3 hours. This parking infrastructure will be offered by the allocation of on-street bike racks distributed along the internal street network in relation to the density and uses of each specific building.

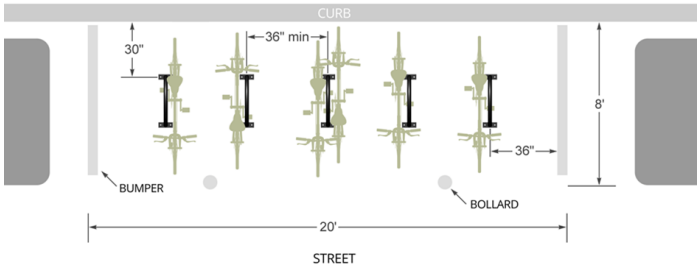

Figure 37: Cycle parking layout for 10 bikes (Cyclesafe, 2018)

Usually, parking for 10 bikes requires a similar footing as a standard on-street car parking spot, considering this, each building with a parking requirement of less than 10 bikes for visitor parking will accommodate at least space for 10 bikes using on-street parking, and increasing by this unit if additional parking is required. Based on a minimum parking ratio of 1 to 20 (one parking spot per 20 residential units), similar to what's required in cities like Seattle, this upscaling will add up to a total of 710 short term parking spots in the entire site.

In total, 8,000 long term parking spaces and 710 short term parking spaces will be offered in the site. It's worth noting that long term parking can be also used for short term parking in some cases with minimal adjustments in operation.

	Long term parking		Short term parking
Parking type	Residential bike rooms	Bike parking garage	On-street parking racks
Location	Residential buildings	"Poisson" parking lot	Distributed across the site
Users	Residents & Employees	Residents (commuters)	Visitors & Residents
Capacity	6,000	2,000	710

Table 1: Total Proposed Bike Parking

3.3.3 Bike sharing

Bikeshare systems as travel demand management strategy can minimize traffic impact generated by new developments by lowering access barriers such as capital investment to purchase a bicycle and providing flexibility for users, enabling them to use intermodal travel for daily commutes. In the long run, the Institute for Transportation and Development Policy sees them as "a key component of transportation plans that include a long-term vision for cycling" (ITDP, 2018), as these systems have an influence on travel behaviour and in some cases, function as a gateway into the full adoption of cycling as the primary mode of transport.

Montreal already has one of the largest bike sharing systems in North America. With over 9,000 bikes and more than 700 stations Bixi users generated more than 5.8 million trips in 2021, a record-breaking year for the system. The current Bixi coverage area extends in close proximity with the site's perimeter, with the closest Bixi station located no more than 300 meters away on Jockeys street between Jean Louis Levesque street and Decarie Blvd. Considering this, the plan proposes the expansion of the Bixi system into the site with the installation of 8 new stations.

Figure 38: Proposed Location and Coverage of New Bixi Stations

According to NACTO (2015), a high station density and even distribution is key, thus recommending a spacing of no more than 300 meters between stations. In terms of location, stations are proposed close to important transit infrastructure and high density and demand areas, while maintaining access for service vehicles. In order to comply with the bike density target of between 10 and 30 bikes per 1,000 residents recommended by ITDP (2018), all proposed stations should allocate at least 20 bikes per station, resulting in a minimum total of 160 bikes available on site.

Alternatively, if BIXI Montreal is not able to expand operations, a local sharing system targeted specifically for the site's residents could be implemented following the same station location, spacing and capacity criteria explained before.

3.4 Public transit

3.4.1 Overview

Provision of accessible and efficient public transit options is critical to our objectives of reduced car ownership, equality of opportunity, and affordable commute options. Currently, the site is minimally accessible by public transit means, as the Namur metro station to the East is an unpleasant 10 minute walk away, and the route-115 bus that serves the industrial lands to the north is infrequent and indirect. Through the external connection interventions detailed in earlier chapters, our plan aims to shorten the perceived walk to the metro through beautification and safety efforts. However, with the orange line metro already near maximum capacity and falling outside the distance a typical person is expected to walk, our plan must incorporate additional public transit options to both access the metro and connect to destinations beyond. Service improvements and realignment of the 115 bus route, the addition of BRT along the Jean-Talon-Cavendish extension, an exo commuter train station, and a community shuttle option are the four such public transit interventions we propose.

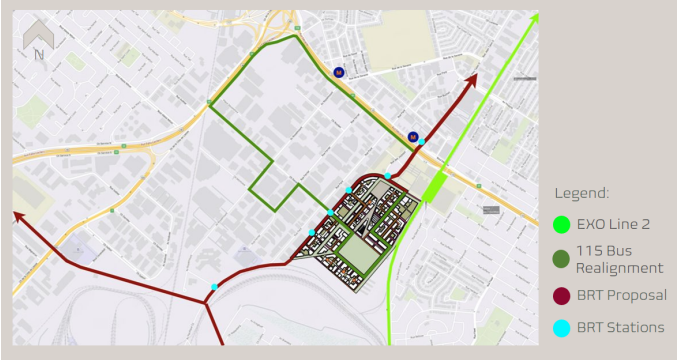

Figure 39: Public Transit Interventions Overview

3.4.2 A Revamped 115 Bus Route

Currently, the 115 bus runs a meandering route from the Namur metro station to the northern end of Devonshire street beneath autoroute 40. The alignment detours back and forth down Royalmount Ave to serve some very isolated but influential industrial sites such as the National Research Council's Biotechnology Institute and the Dollarama headquarters. Although servicing these sites with transit is

important, their location forces the 115 to make an extended spur in the middle of its route, adding many minutes of travel time for other users of the route. Additionally, the 115 has limited operational hours and is infrequent. The first bus leaves Namur station at 6:00am, but there is a gap between 9:30am and 4:00pm during which there is no service, and the last bus is at 6:30pm. Those periods of service are also less frequent than the recommended 10 minutes or less that enable users the freedom from scheduling stress. Therefore, our proposal is to realign and increase both the frequency and duration of service runs.

6h	16	48								
7h	19	52								
8h	22	53								
14h	22									
15h	00	33	54							
16h	02	10	21	35	51					
17h	00	09	42							
18h	12	42								

Figure 40: Current 115 Weekday Schedule at North Terminus

The realignment of the 115 bus should make use of the central shared street of our site, with a short spur down Clanranald Street to the proposed Exo station during connection times. This will allow the greatest accessibility, as this street is never further than two blocks from any one residence: a distance of less than 200m. The service will still connect to the industrial land to the North and the Metro to the East, but will no longer run along Pare Street to get there. We believe this an acceptable trade-off considering the automotive-centric focus of the industries along this street and the less than 500m distance to either the Namur station or Devonshire cross street still served by our realigned public transit. Additionally, when the Jean-Talon-Cavendish extension is completed, we propose that the Royalmount spur of the route be removed, as the BRT along what is currently Pacific Ave will be proximate enough to those industries currently served by it. Meanwhile, when the Royalmount development is complete, the 115 can be extended to the De la Savane Metro, or even create a complete loop back to Namur. In either case this realignment should provide greater integration of our site with the industrial employment lands to the North, justifying other service improvements.

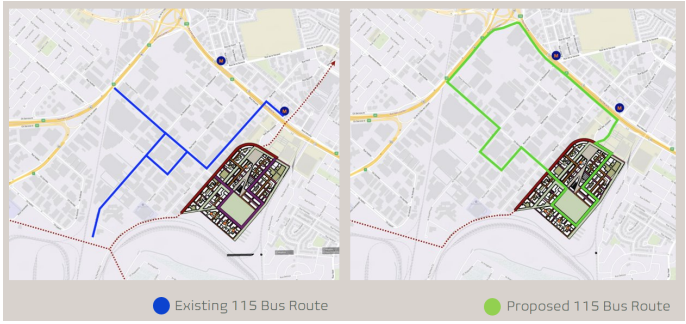

Figure 41: Existing and Proposed 115 Bus Route

Along with this integration, the functionality of the route is expected to increase. A much greater ridership will allow for more frequent service levels, and we propose a 10 minute-or-less service interval for the new route. The current STM 10-minute network underserves the area, with no connections to Namur station. An increased frequency, enabled by greater ridership levels, will further result in better integration with the industrial lands to the north, allowing for important employment opportunities for residents of our site.

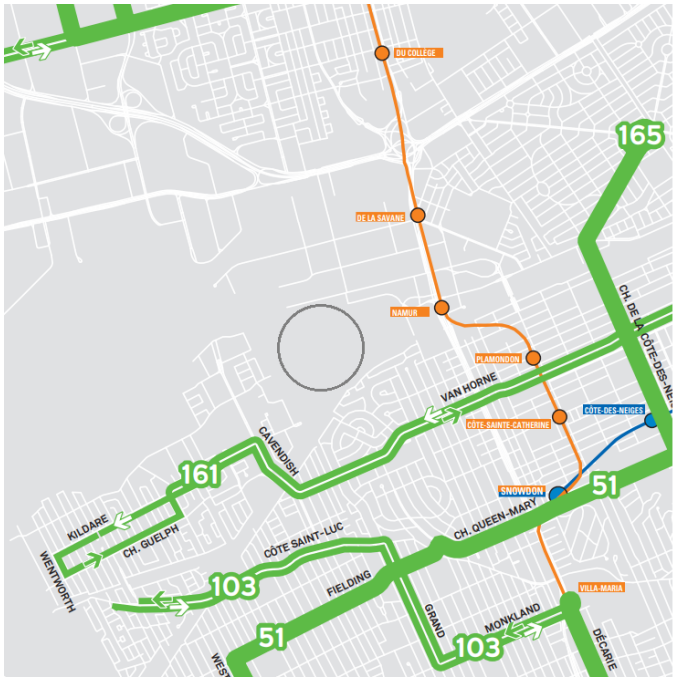

Figure 42: Gaps in 10-minute Service Routes

Additionally, we propose all-day service, with the max 10-minute interval lasting from 6am to 9pm, and slightly greater intervals continuing until midnight. We also believe there is the potential for the STM to add a night bus line once the Cavendish extension is complete. A suggested route would run from downtown up Cavendish until the intersection with Jean Talon, where it would turn East and run through the shared street of our site to terminate at Namur station. This alignment option would fulfill a significant nighttime service gap in NDG and our site, without needlessly traversing industrial lands in the middle of the night. Alternatively, the 372-night bus along Jean-Talon could be extended through our site and follow a similar suggested route down Cavendish, potentially terminating at Atwater or Dorval. The advantage of this option is no new route need be created, and seamless inter-suburban service connections are created. In either case, given the car-free nature of the site, consistent bus service is necessary to give residents the freedom to choose transit.

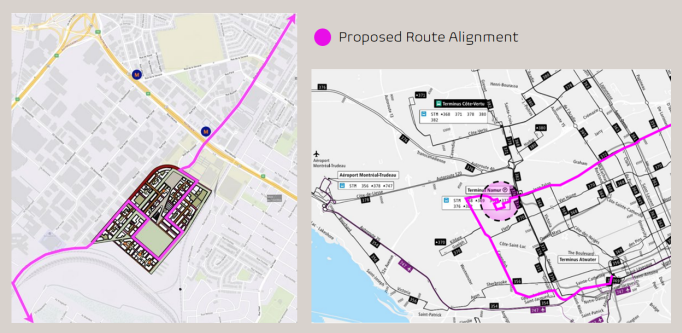

Figure 43: Nightbus Service Addition

3.4.3 Bus Rapid Transit Along Cavendish-Jean-Talon

While conventional buses are a key component of public transit on our site, we also recognize the need for faster transit options along key corridors that connect to neighborhoods beyond the immediate industrial lands and Namur station vicinity. The city recently announced commencement of an environmental impact assessment for the Cavendish extension, connecting Cavendish to the North and South as well as Royalmount and/or Pacific Ave. This extension will include space for a Bus Rapid Transit (BRT), which will be accommodated along the Northern arterial of our site. As the northern section of our site is the highest density, provision of dedicated rapid transit route will attract high ridership. Trends in transit also point to an increasing need for inter-suburban travel, as the importance of the central business district diminishes. A BRT connecting the length of Jean-Talon would not only achieve this, but would also connect with the impending Blue line extension and Canora REM station. From here, connections to the rest of Montreal's major destinations are easily facilitated.

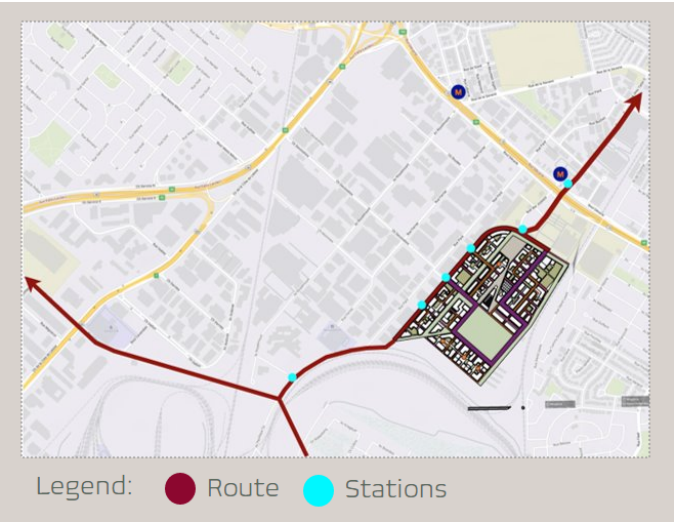

Figure 44: BRT Alignment and Stations

Suggestions for BRT infrastructure along our site include exclusive transit lanes, all-door boarding, and covered, elevated, and comfortable stations. The space for exclusive transit lanes is readily available both within our site and along the 6-lane wide Jean-Talon and Cavendish boulevards. These exclusive transit lanes complimented by all-door boarding will ensure express-level service times and minimal conflicts with auto traffic. Meanwhile, well-designed station infrastructure should increase the real and perceived comfort of riders. Shaded, covered stations of modern design will shield riders from Montreal's harsh winters and uncomfortable summers, while elevated curbs will increase accessibility for disabled persons and save time-consuming bus-kneeling. It is expected that the space between stations be balanced with street-side tree canopy and natural beautification efforts to further ameliorate the commuter experience.

Figure 45: Example of STM BRT

Figure 46: Night Lighting and BRT Station Design

3.4.4 Exo Commuter Rail Station Addition

With the site surrounded on two sides by railways, it would be a wasted opportunity not to consider a commuter rail option. The line to the south is already in use by the STM as the Exo green line, running from Lucien-L'Allier all the way to Saint-Jerome to the north. Weekday service levels are already quite good for a commuter rail, with bi-directional travel at both peak periods and into the evening. Frequencies during this time range from 30 minutes to just over an hour and a half. Although this leaves room for improvement (especially for weekend service), the current levels are enough that residents stand to benefit from a local station. First of all, considering the already-stressed demand on the orange line, a separate rail option to access downtown could be appreciated. Second, the line provides direct access to peripheral areas of the Montreal CMA, affording increased employment and recreation opportunities. Third, with the federal government's

commitment to high-frequency inter-city rail, a direct connection to the VIA intercity network is an increasingly carbon-friendly and convenient option. Lastly, the extra space on commuter rail tends to make it more bicycle-friendly when compared to the bus or metro. The combination of active and public transit is increasingly recognized as synergetic to both, effectively nullifying the problem of 'last-mile travel'.

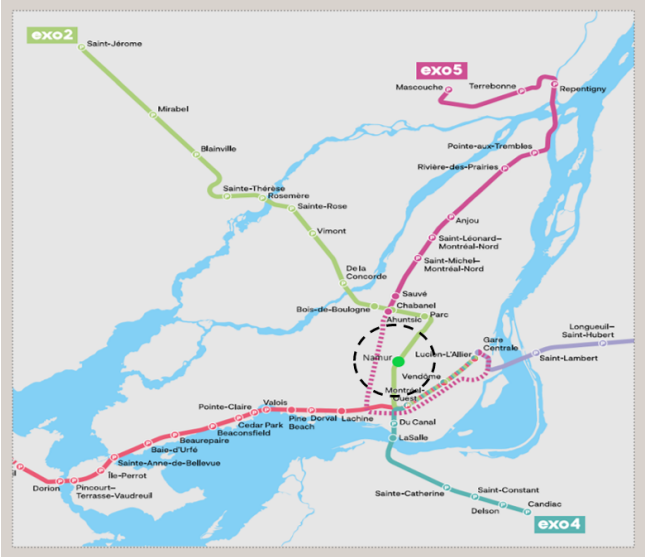

Figure 47: Exo Network with Line 2 Namur Station Added

This combination of active and public transit is also the reasoning for the proposed Exo station location. By placing the station at the currently disconnected intersection of Clanranald Ave and the railroad, we can dually achieve both an external bike connection and well-used transit node. The idea is to incorporate an active transit passage into the station design, allowing cyclists and pedestrians to cross above or below the railroad unimpeded, while making the station itself a safe and vibrant place. In this way, the exo station becomes a well-used stop for not only the residents of our site, but Hampstead and Côte des Neiges cyclists as well. Lastly, this location provides good connectivity to the nearby commercial spaces, is proximate to the highest density on our site, is less than a 10-minute walk to the metro and has adequate space on either side for station infrastructure thanks to the existence of Aaron Hart Park.

Figure 48: Exo Station Location

Figure 49: Example of Exo Station Design

3.4.5 Optional Shuttle Service for Hippodrome Residents

To further increase inner-site accessibility without over-leveraging the proposed 115 bus route modifications, we propose a hippodrome-specific shuttle service for residents. Although the public transit internal circulation is significantly enabled by the 115, BRT, and exo station provisions, a local shuttle designed specifically for intra-site connectivity and Namur connections would further benefit those with mobility issues and potentially the local economy of the site.

A shuttle could provide very high frequency and consistent connections to the metro and exo stations in the event that the STM is unwilling to adopt some or all of the proposed 115 service changes and may also function as a temporary stop-gap compensation for the BRT until such point as the Cavendish-Jean-Talon extension passes environmental review and completes. This service could be run by the STM itself, as they already have experience with shuttle buses including the recently cancelled 919 Namur-TMR rail replacement service. Alternatively, a local governing structure could organize the service for specific resident needs. Routing would be flexible but should make use of shared streets in addition to the main arteries internal to the site. Recommended vehicle dimensions would be less than conventional buses to allow for easy navigation of these streets, and it is expected that 1-3 vehicles would be sufficient for community needs.

Figure 50: Example of Shuttle Bus

5. Phasing and Next Steps

5.1 Phasing

Achieving these interventions will take time. Stop-gap measures interventions like the shuttle bus are good measures to maintain the continued functioning of the site, but other connectivity and serviceability interventions are also important. Additionally, retrofitting considerations may be extra beneficial to allow the most efficient use of space in the future. Parking garages are one such example.

Parking itself is the chief phasing consideration. The development of parking should follow the development of residences based on one of two philosophies. The first is to maintain a consistent ratio throughout, the second is to decrease with time. We expect a 20-year project with construction of housing starting on year 2, ramping up on year 3, being consistently high from years 4-12, before decreasing at years 13 and 16. Therefore, the first philosophy would require a similar timing of parking construction, whereas the second would be largely accomplished between years 3-10. The benefit of the first is consistency, promotability, and perception of fairness, whereas the benefits of the second are less initial controversy from the low ratio, more conducive to high density construction, and better possibility for retrofits in the future. Ultimately, there are pros and cons to both approaches, so phasing should be carefully considered from other perspectives in addition to circulation.

5.2 Next Steps

This concludes the circulation contribution to the Blue Bonnets report. Significant next steps are not expected, but the possibility of residual or unexpected challenges, be they economic, social, or environmental, is recognized as a possibility. Implementation should be careful, feasibility constantly re-assessed, and preparations made for any foreseeable uncertainties that the future may hold. Overall, however, it is believed that our guiding principles of options, integration, and functionality, complimented by a focus on car discouragement, social interactions, active mobility promotion, and enhanced safety, will result in a circulation plan for community and social benefit.

References

AECOM (2018). Etude des besoins en transport et identification de pistes de solution pour améliorer les déplacements dans le secteur Namur-De la Savane et ses abords. Ville de Montréal. https://ocpm.qc.ca/sites/ocpm.qc.ca/files/pdf/P107/3-6_besoins_en_transport_identification-pistes_solution_amclioration_deplacements.pdf

Michael Johnson & Kevin Copps. Association of Pedestrians & Cyclists of NDG (2020). Namur Hippodrome Consultation. https://ocpm.qc.ca/sites/ocpm.qc.ca/files/pdf/P107/8-69-1_pietons_cyclistes_ndg.pdf

Office de consultation publique de Montréal (2020). Rapport de consultation publique: Quartier Namur-Hippodrome. https://ocpm.qc.ca/sites/ocpm.qc.ca/files/pdf/P107/rapport-namur-hippodrome.pdf

Oroboro (2019). Namur-De la Savane: Envisioning change for the heart of the island.

Fahey (2018). Caractérisation fonctionnelle et paysagère du secteur de planification: Namur-De La Savane. https://ocpm.qc.ca/sites/ocpm.qc.ca/files/pdf/P107/3-7_caracterisation_fonctionnelle_paysagere.pdf

KCAP. GWL-Terrein, Amsterdam. https://www.kcap.eu/projects/25/gwl-terrein-amsterdam-nl

Guide Perrier. Vauban: L'écoquartier le plus célèbre au monde. https://guideperrier.ca/vauban/

David Thorpe. The world's most successful model for sustainable urban development? Smart Cities Dive. https://www.smartcitiesdive.com/ex/sustainablecitiescollective/words-most-successful-model-sustainable-urban-development/229316/

Ville de Montréal (2019). Quartier Namur-Hippodrome: Document d'information.

Rapport du groupe de travail Namur-De la Savane (2019).

Natalia Collarte (2012). The Woonerf Concept: "Rethinking a Residential Street in Somerville". https://nacto.org/docs/usdg/woonerf_concept_collarte.pdf

National Association of City Transportation Officials. (2014). Urban bikeway design guide (Second). National Association of City Transportation Officials. https://doi.org/10.5822/978-1-61091-582-3

Auckland Transport. (n.d.). (tech.). Engineering Design Code: Cycling Infrastructure. Auckland: Auckland Transport.

City of Boston. (2021). (tech.). Bike Parking Guidelines (January 2021, Vol. 2.1). Boston, MA: City of Boston.

Institute for Transportation and Development Policy. (2009). (rep.). Bicycle Parking Facility Manual ASCOBIKE: Mauá model. ITDP. https://itdpdotorg.wpengine.com/wp-content/uploads/2014/07/ASCOBIKEmanual_english_ITDP_20110316.pdf

Institute for Transportation and Development Policy. (2018). (rep.). The Bikeshare Planning Guide (2018th ed.). ITDP. https://www.itdp.org/wp-content/uploads/2021/05/2018-Bikeshare-Planning-Guide.pdf

National Association of City Transportation Officials. (2015). (rep.). Walkable Station Spacing is Key to Successful, Equitable Bike Share (2015th ed., Vol. 1, Ser. NACTO Bike Share Equity Practitioners' Paper). NACTO. https://nacto.org/wp-content/uploads/2015/09/NACTO_Walkable-Station-Spacing-Is-Key-For-Bike-Share_Sc.pdf