NATIONAL CAPITAL COMMISSION
COMMISSION DE LA CAPITALE NATIONALE

		No.	2024-P257
		To	Board of Directors
For	DECISION	**Date**	2024-04-18

Subject/Title

Federal Land Use Approval – National Research Council Campus Master Plan – 99% Draft

Summary

- The purpose of this submission is to obtain approval from members of the Board of Directors on the National Research Council Master Plan 99%.
- The Master Plan will guide the Labs Canada initiative to renew aging science and other infrastructure (i.e., buildings, equipment, and information management / technology) to create a modern platform supporting evidence-based policy and enable cost-effective and sustainable scientific program delivery with a planning horizon of 30 years.
- The approval of the Master Plan will enable future construction of the Labs Canada - TSTS and TerraCanada Hubs to proceed in manner that meets current federal government policy and priorities.

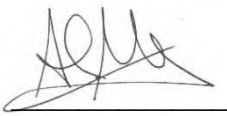
Risk Summary

- No significant risks that could impact the National Capital Commission (NCC) have been identified in relation to this submission's recommendation, however, delay in receiving approval may affect the project schedule and related Public Services and Procurement Canada (PSPC) project agreements.

Recommendation

- That the Federal Land Use Approval (FLUA) for National Research Council – Master Plan 99% be granted, pursuant to section 12 of the *National Capital Act*.
- That the preparation and signature of the FLUA documents be delegated to the Vice-President, Capital Planning Branch.

Submitted by:



Alain Miguelez, Vice-President, Capital Planning Branch

1. Strategic Priorities

The proposal is aligned with the following strategic directions and priorities from the National Capital Commission's (NCC) 2023-2024 to 2027-2028 Corporate Plan.

- Corporate Priority #2: Plan, rehabilitate and revitalize key assets and transportation networks in the National Capital Region
- Corporate Priority #4: Demonstrate national leadership in achieving an environmentally sustainable and climate-resilient National Capital Region.

2. Authority

National Capital Act, section 12.

3. Context

Background:
In 2018, the federal government of Canada created the Laboratories Canada (Labs Canada) initiative, a 25-year strategy focused on achieving scientific excellence through creating a national network of modern, multipurpose, scientific infrastructure. The new laboratories will bring together science-based departments and strengthen their research through enhanced interdisciplinary work, collaboration, and shared facilities and equipment.

Through discussions between the National Research Council Canada (NRC), Labs Canada and PSPC, two new hubs were identified by PSPC for the NRC Montreal Road Campus: the first in the North Campus (Transportation Safety and Technology Science (TSTS Hub – approximately 21,000 m^2) and the second in the South Campus (TerraCanada Hub – approximately 130,000 m^2). These new laboratories will combine groups that are currently subdivided in small buildings throughout the campus to optimize workflow.

The NRC's current Campus Master Plan was completed in 1997, and no longer accounts for evolving needs, site context or current federal and municipal planning principles. In preparation for design development of the two new hubs, the NCC requested a formal update of the NRC Campus Master Plan. The new plan is to include an update on current site context and land uses, current and future functional requirements, buildings to be retained or decommissioned, and a planning proposal for development that responds to the site environmental capacity and character. It should also include sustainability and active mobility strategies.

As a result, the NRC (the custodian of the site) has engaged PSPC to develop a new Campus Master Plan to guide the 30-year vision for the entire campus.

The design development of the two new Labs Canada facilities will follow the final approval of the Campus Master Plan and that they will be subject to separate federal approvals.

Site Description:
Located at 1200 Montreal Road in Ottawa, the NRC Montreal Road Campus is a 1.23 km^2 (123-hectare) property bounded by Blair Road to the east and Enigma Private to the south. The northern boundary is a wooded area south of the Sir George-Étienne Cartier (SGEC) Parkway. The western boundary follows the NRC property line up from Bathgate Drive and excludes the residential development east of the road. Starting at Montreal Road, the western boundary follows Wanaki Road for approximately 300 metres. It then follows a property line 115 metres west of Wanaki Road until the southern boundary. See Appendix A for precise details on the campus boundary. The site is bisected east to west by Montreal Road which splits the site into a “North Campus” and “South Campus”. The site is within the NCC’s Ontario urban lands sector.

The campus was first established in the early 1940’s and is considered the headquarters of the NRC. At the time of acquisition, the campus was surrounded by farmland and was located outside of Ottawa’s urban boundary. The secluded location was deliberate considering the top-secret scientific research taking place within the campus during the Second World War. To streamline and accelerate construction, the original campus buildings adopted an industrial, modernist style with steel and cinderblock construction with a white stucco finish.

The period between 1950 to 1953 saw significant changes and expansion to the campus. In 1953, the first major building was completed south of Montreal Road, marking the beginnings of the South Campus. A new overpass on Montreal Road was also constructed, thereby creating the underpass connection between the North and South Campus. The North Campus was designated as a secure area while the South Campus remained unsecure.

In 1967, the first Master Plan for the Montreal Road Campus was created. At the time, the facilities located in the North Campus were approaching maximum occupancy, so the plan focused on how buildings could be added to the South Campus. The plan prioritized automobile circulation around the site to accommodate the expected higher density of the campus. The 1960s and 1970s also saw the introduction of a new style of larger concrete Brutalist buildings on the South Campus.

An updated Master Plan was prepared in 1997. The new plan gave general recommendations on zones for new development, and delineated areas for intensification based on precincts. Newer buildings added to the campus have been generally compatible with existing buildings, introducing new materials while remaining in the established colour palette.

The 21st century saw a reduction of the campus footprint. In 2008, the NRC disposed of 334,000 m^2 (33.4 hectares) of landholdings at the southwest corner of the site to the Department of National Defence. In 2016, 13,000 m^2 (1.3 hectares) along the northwest border of the site was disposed to Canada Lands Corporation. However, further development continued in accordance with the 1997 Plan and by 2021 the campus contained 102 buildings.

Meanwhile, the surrounding urban context changed significantly. The campus is currently adjacent to residential neighbourhoods on the east and west, to natural areas and to the NCC's SGEC Parkway on the north, and to the Canadian Security Intelligence Service (CSIS) Headquarters to the south. Despite the security requirements of the on-site operations, the campus aspires to improve its integration with the surrounding community and its accessibility and interconnectivity.

Montreal Road continues to divide the campus as a wide arterial road that poses challenges for pedestrians and cyclists accessing the campus due to grade differences. Nonetheless, the City of Ottawa's Official Plan envisions Montreal Road being transformed into a more urban main street, and the City's Transportation Master Plan envisions major capital investments to create a transit priority corridor along Montreal Road to link Montreal Station (on lines 1 and 3 of the O-Train) with St-Laurent Boulevard.

The Master Plan:
The following Vision and Mission statements were developed by PSPC in collaboration with the NRC, and Labs Canada. These statements are intended to guide the overall goals and objectives of the Master Plan.

Vision and Mission

Vision: *Canada's premier hub of innovative research excellence.*

Mission: *NRC Montreal Road Campus will be a premier global research hub that facilitates a culture dedicated to the pursuit of the discovery of leading-edge, innovative solutions that will improve all aspects of Canadian life.*

Design Principles

The design principles provide the strategic directive on how to implement the vision and mission statements and are listed as follows:

1. ***Be the aspiration.*** The implementation of this plan should consider best-in-class design and placemaking that inspires others.
2. ***People-focused design.*** The plan must consider the people who work, live and visit the site first. The Montreal Road Campus should be a campus where workers can thrive.
3. ***We are a Laboratory*****.** The plan must support the core elements of the NRC – facilitating industry-leading research and scientific discovery. Amenities and supportive uses should consider science first.
4. ***Future Flex.*** The plan must be agile enough to accommodate growth and change for the next 30 years.
5. ***Resilient Thinking.*** The plan should consider forward-thinking and implementable approaches for development that consider the holistic resiliency of the campus.
6. ***Nature by Design.*** Natural systems should be integrated throughout the Campus by creating connections to them and enhancing them.
7. ***Secure the future*****.** NRC Montreal Road Campus should be at once a secure place of work and research while also a welcoming site to visitors and neighbours.
8. ***Tell our story.*** NRC Montreal Road Campus should be at once a secure place of work and research while also being a welcoming site for visitors and neighbours.

4. Options Analysis / NCC Staff Analysis

Planning Framework:

The Master Plan is aligned with strategic policies and objectives of the Plan for Canada's Capital, 2017–2067 (2017), particularly the "Inclusive and Meaningful Capital" goals to promote the renewal of National Institutions (scientific), provide space for federal accommodations that require a secure site, and improving integration with the surrounding community. The improved urban integration of federal employment areas is one of the explored goals of the plan.

The campus is located within the Capital Urban Plan (2015) and is designated 'Major Federal Employment Area'. The Master Plan is generally aligned with strategic plans and policies of the Capital Urban Lands Plan. The Capital Urban Lands Plan encourages major federal employment complexes to evolve over time and allows for the retrofit, re-use and/or replacement of older buildings that reach the end of their lifecycle. Lastly, the plan also encourages sustainable and active mobility by prioritizing pedestrian, cycling and transit-supportive improvements.

ACPDR:
The Master Plan Draft – 99%, was presented to the NCC's Advisory Committee on Planning, Design, and Realty (ACPDR) on November 23, 2023, for review and comment. The committee positively supported the direction of the Master Plan vision and guiding principles and made suggestions to consider as the development of the plan progressed including the following:

- The plan should create more opportunities for informal socially interactive spaces for workers and visitors of the campus.
- The campus should have a "heart" that people will use and enjoy.
- Given the low vehicle traffic on the internal roads, the various modes may not need to be overly segregated.
- The campus gateway needs to work well for pedestrians and cyclists as well as vehicles.
- This initiative also presents an opportunity for the federal government to lead by example in protecting mid-century modern buildings.
- Explore innovation in terms of landscape and vegetation. Water management, Phytoremediation, or other innovative initiatives should be included and promoted.
- Connection to adjacent Wateridge Village is very positive and will contribute to integrating with the community.

The ACPDR meeting minutes are available in Appendix D.

Staff Review:
Throughout the development of the Master Plan, decisions have been informed by a variety of studies, analysis, and consultations, as well as NCC guidance (including that provided by the ACPDR) leading to the creation of the preferred plan option. The selected option has combined elements of the various options to establish the optimal plan for the campus, while aligning directly with the NRC's programmatic and operational needs and priorities.

Land Use & Built Form:

- Overall, the plan maintains the campus' land use as scientific and research-based uses. The introduction of a mix of land uses, such as commercial or retail uses, was considered but deemed not suitable for the campus given the NRC's operational requirements, sensitive scientific experiments, and general security concerns.
- The built form for the campus is envisioned to be 3-5 storey buildings that comply with the existing established zoning height limits of 18 metres.
- The Master Plan also proposes redevelopment of existing campus streets to offer a more pedestrian and cyclist friendly travel experience around the campus. Sidewalks, pathways and bike lanes will extend across the campus.

- The Master Plan aims to consolidate the main spine or ‘Greenway’ that connects the north and south of the campus by creating a unifying landscaped corridor. The two streets that form the main spine – Howlett Street and Macallum Street will form a green spine to connect existing open spaces on the campus. Final refinement of the cross-section design and landscaping strategy will be coordinated with PSPC in response to the ACPDR comments.

Labs Canada – Two Hubs:

- The need for a renewal of the NRC Master Plan was triggered by the two Hub projects – TSTS and TerraCanada proposed as part of Labs Canada.
- While the site plan and architectural design of TSTS and TerraCanada hubs will be subject to a separate FLUDTA process, site specific design guidelines provide a framework for architectural integration and layout, landscape architecture and mobility.
- The development of these two hubs will be the first two major projects to be implemented under the new plan’s direction.

Mobility:

- The plan aims to maximize transit use and active transportation. The plan proposes the creation of mobility hubs that consolidate parking areas at select points in the campus and brings together other facilities such as bike parking stations, bike-sharing or scooter sharing points and stops for a potential autonomous shuttle.
- The plan recommends implementation of a transportation demand management program to achieve the targeted modal spilt of 30% on the campus.

Heritage:

- The campus contains two federally designated heritage properties, M-12 and M-20 and one municipally designated property through the City of Ottawa, M1B.
- Given the age of the campus, there are approximately, 55 buildings that are eligible for FHBRO evaluation. The plan includes a table that summarizes the existing buildings on site and whether a FHBRO evaluation is required and has been submitted.
- All inventions on the campus will be compatible with the heritage buildings and heritage character of the site, follow the relevant evaluation processes, *The Standards and Guidelines for the Conservation of Historic Places in Canada* and seek appropriate reviews when required.

Sustainability:

- The NRC has set targets to achieve at least 90% reduction in building greenhouse gas (GHG) emissions by 2040.
- The plan outlines several guidelines and strategies to move the campus towards achieving greater sustainability and reaching the goals established in the Federal Sustainable Development Strategy. These include energy modelling for new buildings, retro-fitting existing buildings, incorporating climate-resilient design,

moving the campus towards electrification, and encouraging urban design, architectural and landscape design that promotes active transportation and sustainable landscapes.

Security:

- A security strategy was developed in consultation with campus stakeholders.
- Physical security measures and access control on the campus are essential to protect sensitive data, maintain compliance, prevent unauthorized access, ensure user safety, safeguard intellectual property and preserve NRC's reputation.
- Security measures, including perimeter fencing, on the campus are concentrated in the northern section of the campus.
- The Master Plan includes guidelines to integrate security features into the streetscape, open spaces and landscape features of the property in a sympathetic manner. These include use of fencing and barriers that are aesthetically pleasing, possible use of different types or styles of fencing to demarcate different security zones, strategic placement of landscaping to maintain sightlines and prevent tree climbing.
- There are a few secured access points that punctuate the fence perimeter to allow access onto the campus.
- The plan proposes a possible access point, subject to further study, to the adjacent Wateridge Plan of Subdivision to the west that is currently under development as a residential neighbourhood. The access point is proposed to connect to Wakani Road and would help integrate the campus with the surrounding community.

Montreal Road:

- The Montreal Road Access has designed to align with the City of Ottawa Council-approved Municipal Class Environmental Assessment (EA) Study for the Montreal-Blair Road Transit Priority Corridor (2022), which recommends mixed traffic travel lanes, segregated cycle tracks, wider sidewalks along the segment of Montreal Road abutting the NRC Campus.
- The Master Plan will provide integrated and landscaped ramps and stairways to connect the transit stops on Montreal Road to the campus.
- The NRC requires a 30-metre setback from Montreal Road for the protection of scientific uses that are particularly sensitive to noise and vibration. This created an opportunity for a linear park on either side of Montreal Road.

GBA+:

- The plan emphasizes the importance of applying a GBA+ analysis to the design of the open spaces in the campus including the greenspaces and roadways. The GBA+ analysis will account for the realities and needs of all population groups, including vulnerable, underrepresented and potentially excluded groups and what their experiences may be when visiting or working on the campus.

5. Financial Details

Not Applicable

6. Opportunities and Expected Results

The NRC Master Plan guides the direction of the campus as the primary research centre over the next 30 years. The plan updates and modernizes the direction in the document and provides guidance for the development of two major Hubs on the site.

The new plan includes an update on current site context and land uses, current and future functional requirements, buildings to be retained or decommissioned, and a planning proposal for development that responds to the site environmental capacity and character. It should also include sustainability and active mobility strategies.

The transformation of the site facilities will upgrade them to meet current sustainability standards, and address considerations related to the GBA Plus and universal accessibility.

The Plan also harmonizes the site with the future design of Montreal Road in alignment with the completed Municipal Class Environmental Assessment and Montreal-Blair Road Transit Priority Corridor planning being undertaken by the City of Ottawa.

7. Alignment with Government and NCC Policies

1. Greening Government Strategy: A Government of Canada Directive (2020)
2. PSPC Real Property Sustainability Handbook (2021)
3. Federal Sustainability Development Strategy (2022–2026)
4. LEED Rating System – Building Design and Construction, Interior Design and Construction, Existing Operations and Maintenance, Neighbourhood Development, and Cities and Communities
5. WELL Building Standard
6. Fitwel Certification System
7. Envision Reference Document
8. SITES Reference Document
9. Universal Accessibility (UA): Universally accessible pathways from Montreal Road access. Seating, signage and interpretation to respect UA guidelines.
10. Gender-based Analysis Plus (GBA Plus)
11. Municipal Class Environmental Assessment (EA) Study for the Montreal-Blair Road Transit Priority Corridor

8. Risks and Mitigation Measures

Risk	Likelihood	Impact	Mitigation Measure
Delay in receiving approval affects project schedule and related PSPC project agreements	Low	Medium/ High	• Minor comments will be resolved at the staff level prior to the issuance of the FLUA letter for the Master Plan. This will allow additional time and flexibility to address the items to the satisfaction of the NCC and to meet project schedule. • Proceeding with the approval of the NRC Master Plan will allow the TSTS and TerraCanada Hub projects to advance under the guidance of the Master Plan.

9. Public Engagement and Communications

- Stakeholder consultations carried out by the proponent have been primarily limited to internal discussions with representatives from the NRC, PSPC and Labs Canada.
- The NRC Campus Master Plan Update was presented by the NRC to Indigenous Partners Algonquin Anishinabeg Nation Tribal Council, Pikwakagan and Kitigan Zibi Anishinabeg on February 15, 2023.
- The NRC has published public information on their website for neighbouring communities to stay informed.
- In August 2023, a meeting was held between PSPC, NRC, NCC, and the City of Ottawa with the focus on aligning the Master Plan vision with the EA for the Montreal-Blair Road Transit Priority Corridor.
- PSPC will continue to consult with the City of Ottawa Planning Division for comment on the designs of TSTS and TerraCanada Hubs.

10. Next Steps

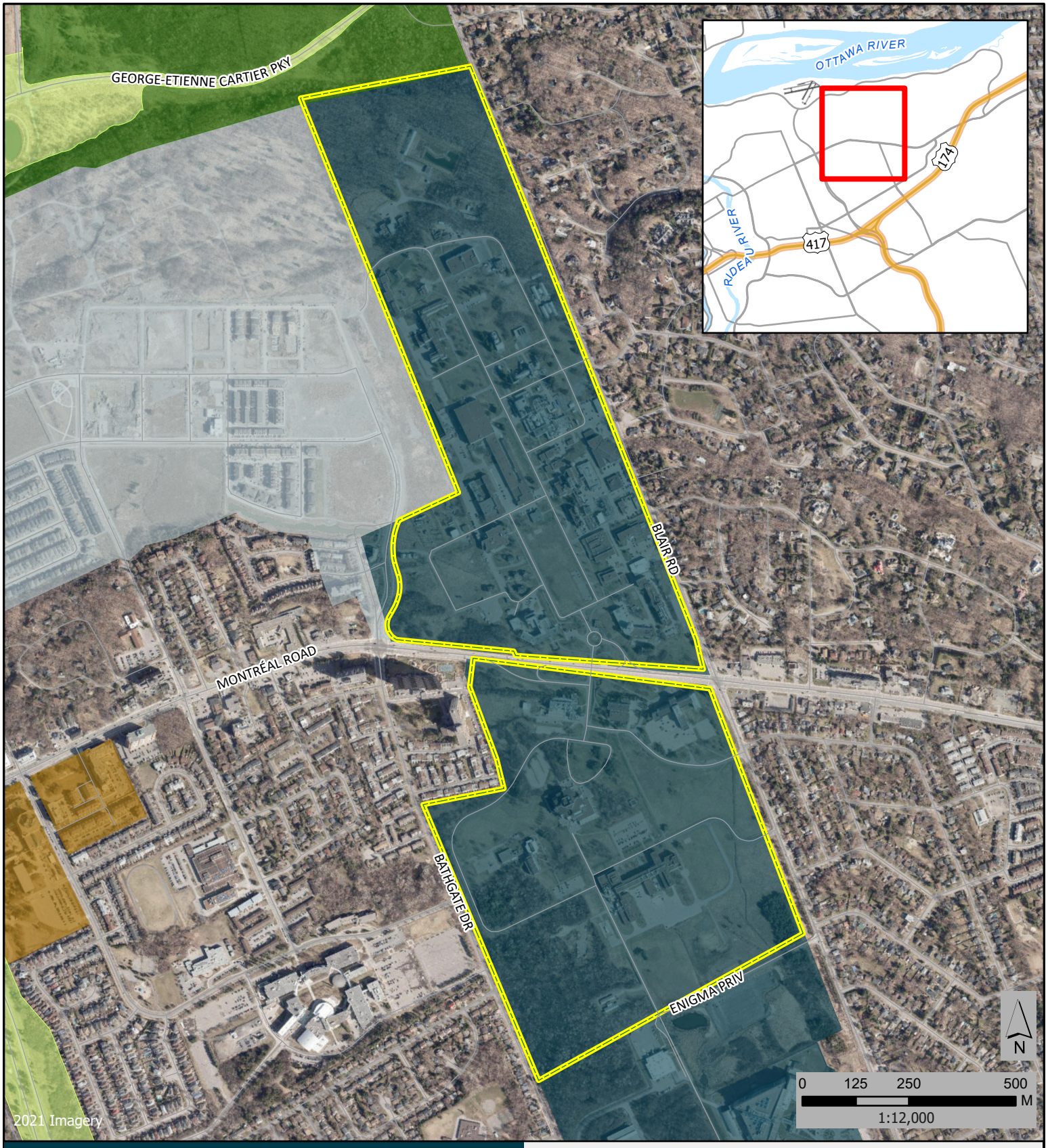
- Preparation of the final approval letter.
- TSTS Hub – Schematic Design 90% ACPDR May 30-31, 2024 (TBC).
- TerraCanada Hub – No scheduled dates. ACPDR appearances planned for 2025.

11. List of Appendices

- Appendix A – Location Map
- Appendix B – Executive Summary
- Appendix C – Master Plan 99% Draft
- Appendix D – Draft ACPDR Meeting Minutes November 2023

12. Authors of the Submission

- Alain Miguelez, Vice-President, Capital Planning Branch (CP)
- Isabel Barrios, Director, Federal Approvals and Heritage, and Archaeology Programs (FAHA), CP
- Kate-Issima Francin, Chief, Federal Land Use and Transaction Approvals, FAHA, CP
- Kate Goslett, Senior Land Use and Transactions Planner, Federal Land Use and Transaction Approvals, FAHA, CP



Location Map: 1200 Montreal Road
Carte de localisation : 1200, chemin de Montréal

National Capital Commission
Commission de la capitale nationale

Préparé par les Services Géomatiques / Prepared by the Geomatics Services

2023-01-19

Property Boundary / Limites de la propriété

Capital Urban Lands Designations (2015) / Désignations des terrains urbains de la capitale (2015)

- Major Federal Employment Area / Principale zone d'emploi fédérale
- Other Federal Facility / Autre installation fédérale
- Valued Natural Habitat / Habitat naturel valorisé
- Capital Urban Greenspace / Espaces verts urbains de la capitale
- Urban Redevelopment / Urban Redevelopment

NRC · CNRC

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

Stantec

NRC MONTREAL ROAD CAMPUS

MASTER PLAN

Executive Summary

February, 2024

01 | INTRODUCTION

The development of a Master Plan and phased implementation strategy for the 1200 Montreal Road Campus (the Campus) provides the National Research Council of Canada (NRC) with a long-term plan and vision for the Campus is approaching completion. The intent is to demonstrate a functional and operational program for the NRC over a 30-year horizon that is representative of a 21st century science campus.

This executive summary highlights the key elements of the preferred option, which was developed through an iterative design process.

This was based on key findings from an in-depth urban analysis conducted during the first phase of the master planning process, the vision and mission statement, and the design principles. During the second phase of the master planning process, three preliminary options were developed. A multi-criteria evaluation of the three options was carried out to identify the consensus-building and structuring components. The preferred option therefore draws on the preferred aspects of all three preliminary options to form a cohesive and functional concept.

The executive summary presents the foundations of the Master Plan, which include the vision, mission, guiding principles, and the major design approaches for the preferred option.

Looking back on the historic development of NRC campus

1916
Creation of NRC

1932
Firt NRC laboratories on Sussex Drive

1939
Acquisition of the Montreal Road campus

1939-1945
Campus Establishment

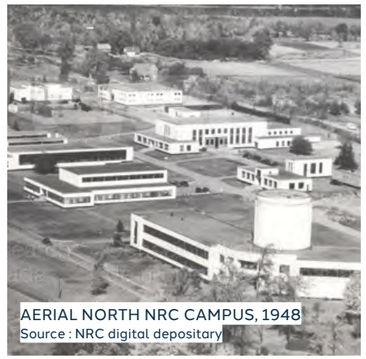
1945-1966
Post-war phase

1967
First master plan

1997
Second master plan

Today

SUSSEX DRIVE, 1930
Source : NRC digital depositary



AERIAL NORTH NRC CAMPUS, 1948
Source : NRC digital depositary

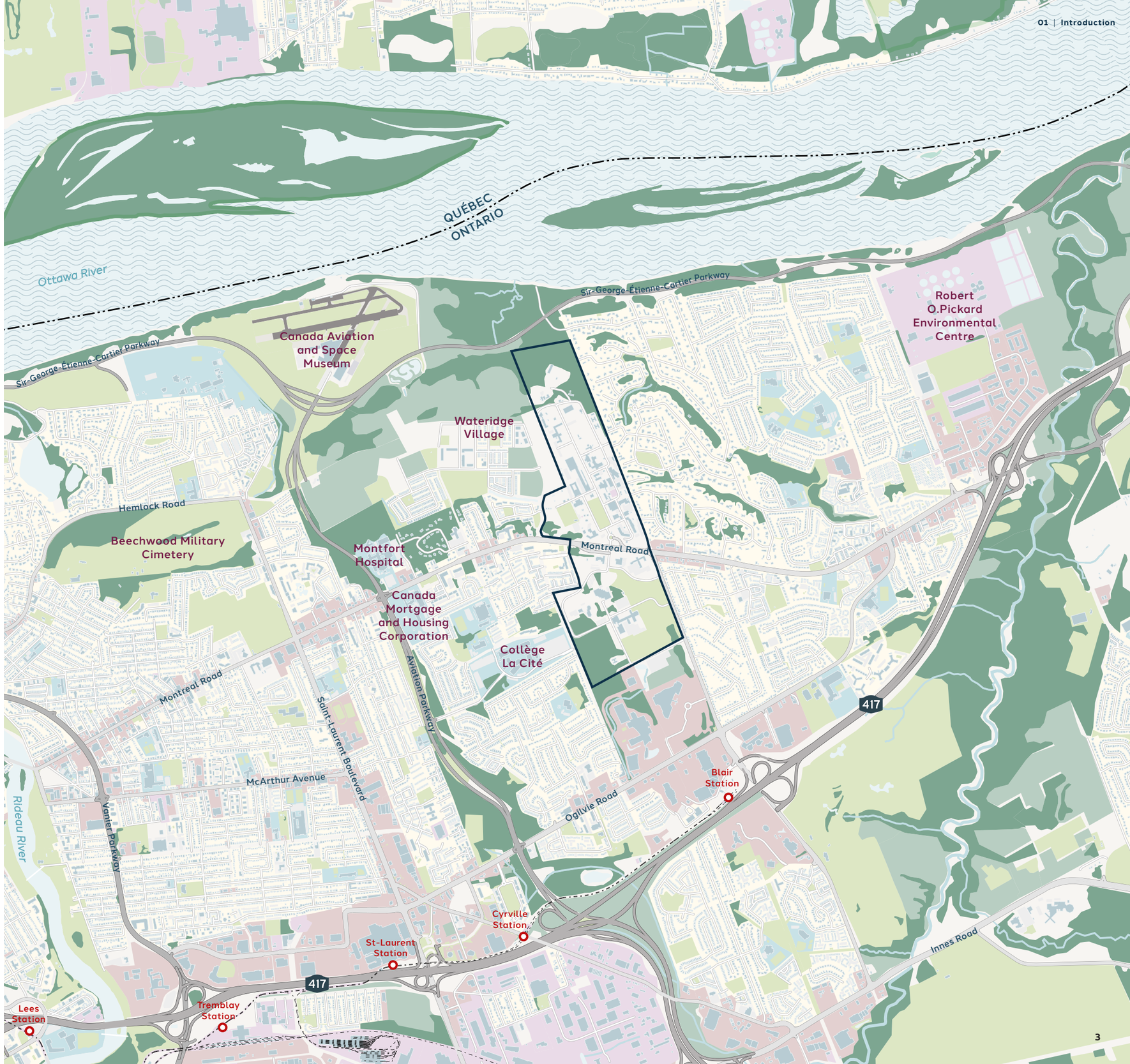
MONTREAL ROAD, 1939
Source : NRC digital depositary

AERIAL PHOTO OF THE SOUTH CAMPUS, 1968
Source : NRC digital repository

Location

The NRC campus is located in the City of Ottawa, approximately 7 km east of downtown. It is accessible from Montreal Road (Route 34) and Ogilvie Road (Route 50).

More specifically, the site is located between the Vanier and Beaconwood neighborhoods. It is surrounded by several institutional sites, such as Collège La Cite, Montfort Hospital and the Canada Aviation Museum. Residential neighbourhoods surround the site, although a commercial development is located on its southern boundary and Rockcliffe Park is located on its northern boundary, followed by the Ottawa River.



Vision

CANADA'S PREMIER HUB OF INNOVATIVE RESEARCH EXCELLENCE.

Mission

NRC Montreal Road Campus is a premier global research hub that facilitates a culture dedicated to the pursuit of the discovery of leading-edge, innovative solutions that will improve all aspects of Canadian life.

Design principles

The design principles provide the strategic directive on how to implement the vision and mission statements and are listed as follows:

BE THE ASPIRATION

The implementation of this plan should consider best-in-class design and placemaking that inspires others.

PEOPLE-FOCUSED DESIGN

The plan must prioritize the people who work and visit the site first.

The Montreal Road Campus should be a campus where workers can thrive.

WE ARE A LABORATORY

The plan must support the core elements of the NRC – facilitating industry-leading research and scientific discovery.

Amenities and supportive uses should consider science first.

FUTURE FLEX

The plan must be agile enough to accommodate growth and change for the next 30 years.

RESILIENT THINKING

The plan should consider forward-thinking and implementable approaches for development that consider the holistic resiliency of the campus.

NATURE BY DESIGN

Natural systems should be integrated throughout the Campus by creating connections to them and enhancing them.

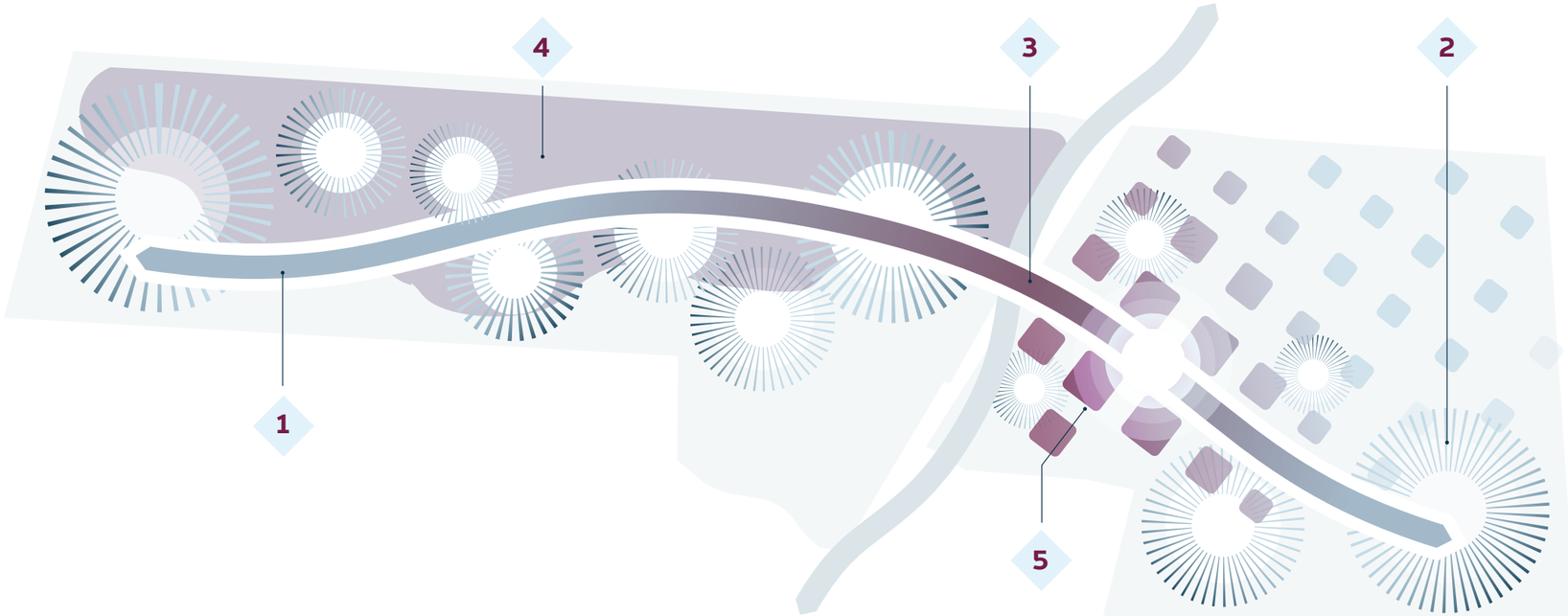
SECURE THE FUTURE

NRC Montreal Road Campus should be at once a secure place of work and research while also being a welcoming site for visitors and neighbours.

TELL OUR STORY

NRC Montreal Road Campusshould be at once a secure place of work and research while also being a welcoming site for visitors and neighbours.

02 | PREFERRED OPTION



◂ "INNOVATION AT THE EDGE" CONCEPT

The preferred option, named **"Innovation at the Edge"**, is based on five major design moves:

1. Consolidation of the Main Spine, consisting of Howlett Street and Macallum Street, to extend across and unify the Campus. These streets have historically played a role in the development of the Campus and consolidate this role as the main axis that physically and visually links the north and south ends of the Campus.

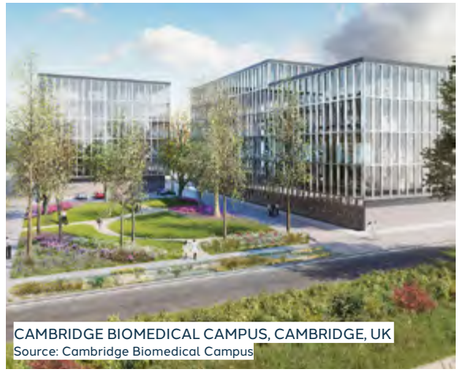
2. Creation of a network of formalized and varied open spaces that connects the wooded areas at the northern and southern edges of the Campus through a green corridor.

3. Enhancement of the Campus along its most visible urban edge, Montreal Road, through the creation of a landscaped corridor forming a linear park and serving as a gateway to the Campus. This corridor showcases and connects the Campus to the surrounding communities. It also creates an integrated edge supportive of the activation of Montreal Road, which will be transformed into a more urban setting.

4. Retention and perpetuation of the unique character of the northern part of the Campus, reflected in buildings of smaller scale, architectural unity, and an orthogonal street grid. This part of the Campus is highly consolidated and offers a few redevelopment opportunities that should fit harmoniously into the characteristic urban fabric.

5. Transformation of the southern part of the Campus towards a more urban character with a compact street pattern, inviting open spaces, and a unifying conference centre that embodies the Campus's past and future.

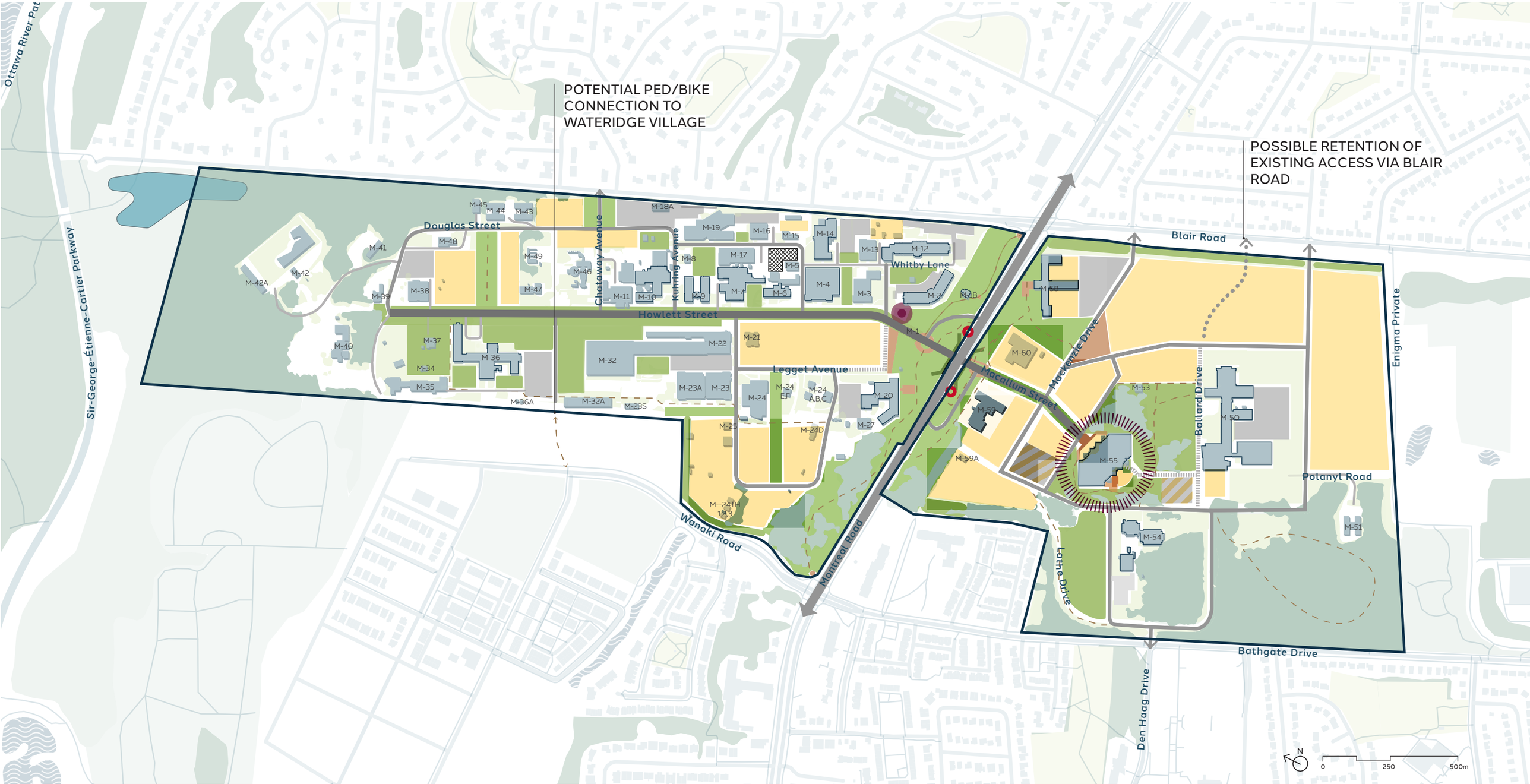
Precedent Images



CAMBRIDGE BIOMEDICAL CAMPUS, CAMBRIDGE, UK
Source: Cambridge Biomedical Campus

EDF CAMPUS, PALAISEAU, FRANCE
Source: Emmanuel Combarel Dominique Marrec architectes

FLINDERS UNIVERSITY, ADELAIDE, AUSTRALIA
Source: Danielsen Architecture, Danielsen Urban Landscape, and Danielsen Spaceplanning



Concept Plan

- Project area
- Existing HONI substation
- Existing buildings
- Significant existing building (Mxx)*
- Potential future guard house
- Potential conference centre
- Future buildable area
- Widened underpass
- Main Spine
- Secondary roadway
- Potential secondary roadway
- Internal roadway
- Shared roadway
- Pathway (off roadway)
- Transit stop
- Future mobility hub / underground/structure
- Formallised open space
- Plaza
- Existing green areas within the project area
- Existing wooded areas
- Existing lowland swamp
- Existing green areas outside of the project area

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

* Significant existing buildings is based on an evaluation including the age of the building, heritage designations, architectural detailing, building presence within the campus and building sizing.

03 | DESIGN APPROACHES

- 1 -
Mobility, Circulation, and Access

OBJECTIVES

A. Seek ways to reduce the number of internal and external vehicle trips generated by existing and new development within the Campus.

B. Continue to collaborate with the City of Ottawa and other partners to improve opportunities for alternative modes of transportation serving the Campus.

C. Serve the Campus by an integrated system of pedestrian, bicycle, and shuttle facilities that enhance neighbourhood and campus connectivity.

DESIGN GUIDELINES

- Improve the universal accessibility conditions outdoors, with gentle slopes (5% or less) and the integration of ramps and tactile surface indicators at strategic points. This will make the Campus accessible to people of all ages and abilities.
- Design efficient mobility networks of services, goods, and freight to meet the needs of the Campus, taking the accommodation of larger vehicles and the impact on neighbouring communities into consideration.
- Promote mobility strategies to reduce parking requirements and promote multimodality.
- Improve the Montreal Road entrance to the Campus. The Campus relies on private access under the viaduct for its operational, security and maintenance needs—therefore, the current configuration will be maintained but improved. Discussions with the City of Ottawa on the proposed widening of Montreal Road to accommodate a transit-priority corridor and offer opportunities to enhance campus access, to improve conditions for active travel through the overpass, to improve access for oversized trucks (e.g. WB-20), and to ultimately bring public transit into the Campus itself.
- Organize the Campus's vehicular and active networks according to a hierarchy that informs the various ways in which existing road sections can be improved, as well as how new streets should be built.
- Maintain significant views of campus landmarks, create new gateways, and organize wayfinding features.
- Design efficient mobility networks of services, goods, and freight to meet the needs of the Campus, taking the accommodation of larger vehicles and the impact on neighbouring communities into consideration.
- Promote mobility strategies to reduce parking requirements and promote multimodality.

Rendering of the Montreal Road overpass, Howlett Street to the south

Rendering of Howlett Street to the North – Street Design Based on a Narrow Front Setback

03 | DESIGN APPROACHES

- 2 -
Landscape, Public Spaces, and Vegetation

OBJECTIVES

A. Tell the story of the Campus through its landscape and into the future, using the landscape as an experimental laboratory supporting the Campus in its primary mission of research and discovery.

B. Create outdoor opportunities for workers to foster collaboration and interaction and contribute to an active and healthy lifestyle.

C. Maintain and enhance the unique landscape features of the Campus and promote sustainability and biodiversity strategies.

DESIGN GUIDELINES

- Organize open spaces across the Campus according to a typology that offers a variety of spaces differing in programming, dimensions, and ambience. Strategies are proposed to stimulate placemaking and thus interaction between campus users.
- Promote active outdoor recreation strategies.
- Provide guidelines for planting and street furniture of the different areas of the Campus.
- Improve the Campus's ecological footprint through landscaping interventions that promote the preservation of natural environments, biodiversity, and the enhancement of vegetation cover.

POCKET PARK AND OUTDOOR LOUNGE AREA, CITYNORTH CORPORATE CAMPUS, HOUSTON, TX, USA

SENSORS INTEGRATED WITH GREEN INFRASTRUCTURE, SMART GREEN INFRASTRUCTURE MONITORING (SGIM) PROJECT, CHICAGO, USA
Source: UI Labs

Rendering of Montreal Road gateway, Howlett Street to the north

Rendering of M-55 Rear Entrance

03 | DESIGN APPROACHES

- 3 -
Built form

OBJECTIVES

A. Provide agile guidance to meet the evolving needs of scientific research. Science informs the physical and equipment needs of the Campus, to which the built form must then be designed to respond and adapt.

B. Respect the unique character of the site and its buildings as the Campus continues to evolve. The Campus is divided into two portions, each with their own distinct character built up over time, and must continue to develop while respecting the opportunities and defining attributes that shape it.

C. Promote sustainable built development that encourages the refurbishment of existing buildings. The Campus is comprised of several facilities, which over time become redundant or obsolete in the face of evolving research needs. The future of these buildings considers their architectural significance, condition, typology, and potential heritage designation.

DESIGN GUIDELINES

- Organize the Campus into vocational areas to orient future research establishments according to their nature in the most appropriate location while considering their security and vibration sensitivity needs.
- Improve universal accessibility conditions for future projects, both for the rehabilitation of existing buildings and for new construction.
- Frame the assessment of building redundancy while prioritizing rehabilitation and additions to existing facilities over new construction and demolition of existing structures.
- Guide the implementation and architectural integration of future buildings depending on whether they are in the northern or southern part of the Campus.
- Advise the transformation of the M-55 building into a conference centre through adaptive re-use, giving new life to this iconic Campus building. This new vocation would be made possible by additions to the building. These will integrate conference, cafeteria, and administrative functions into the building. They are also intended to enhance the building experience through an inviting entrance sequence, the addition of natural light, and fluidity between the building's interior and new outdoor spaces.

Rendering of M-55 Front Entrance

Rendering of Macallum Street to the South

03 | DESIGN APPROACHES

- 4 -
Infrastructure

OBJECTIVES

A. Meet the NRC's security requirements by following the guiding principles of deterrence, detection, delay, and response. Due to the nature of the research activities taking place in the northern part of the Campus, it must be possible to close the Campus off completely under certain circumstances.

B. Plan the maintenance and replacement of infrastructure based on a flexible and resilient approach.

C. Plan for the Campus information technology (IT) and telecommunications network to be at the leading edge of technology.

D. Reduce the Campus's carbon and environmental footprint through a variety of strategies aimed at carbon neutrality, resilience and reducing embodied carbon.

DESIGN GUIDELINES

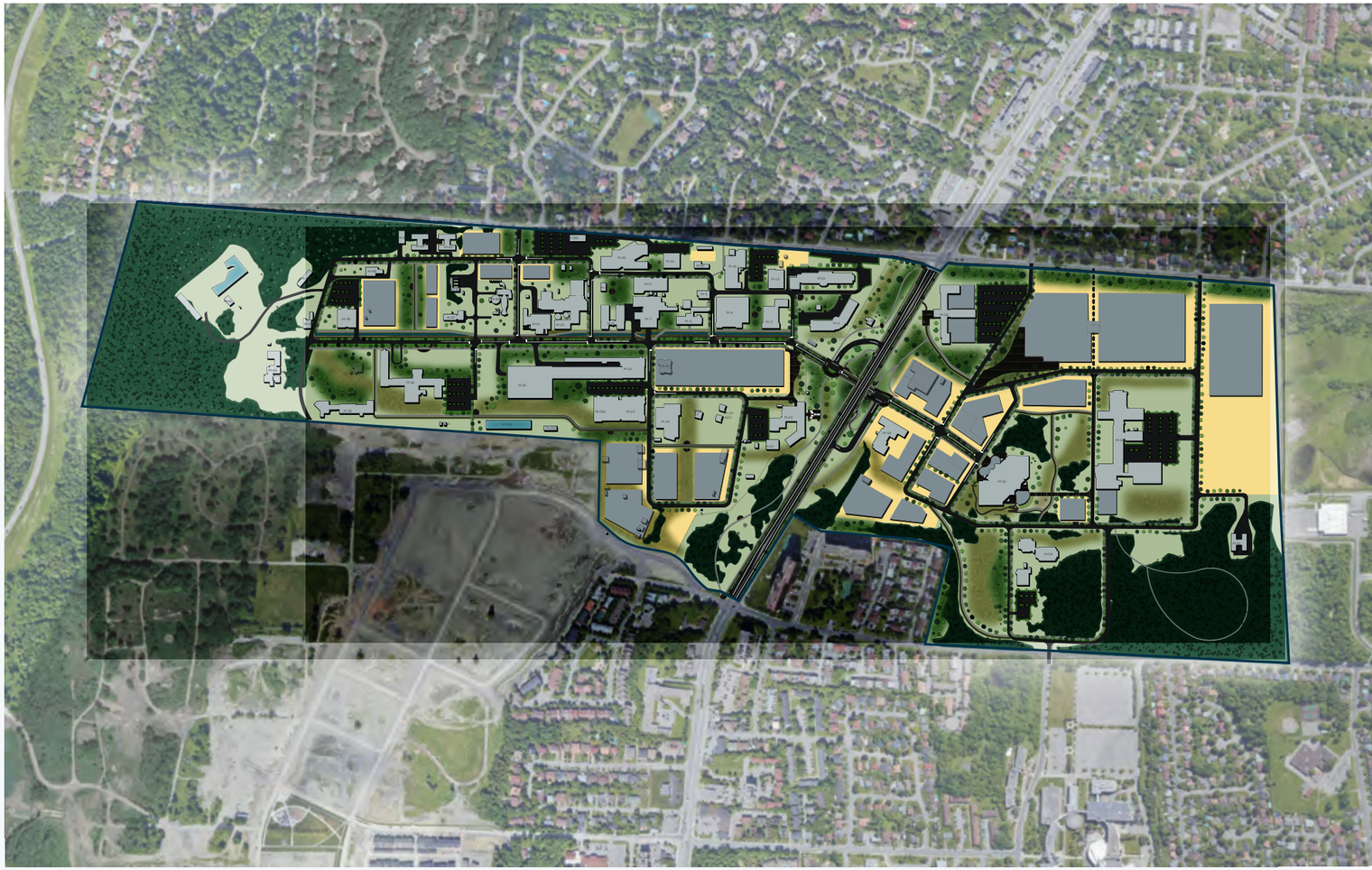
- Meet the NRC's access and security requirements, while taking integration with the landscape and architecture into account.
- Guide the infrastructure renewal, rehabilitation, and replacement of infrastructure works related to sanitary sewers, stormwater sewers, water mains and associated infrastructure.
- Provide guidance on lighting and electrical distribution systems.
- Guide the IT services, including telecommunication entrance services, inter-building communications (tunnels and duct banks), fibre-optic network, and local area network (LAN).
- Plan how the Campus's various energy systems strategies can be implemented to reduce its energy use.
- Provide a framework for reducing greenhouse gas (GHG) emissions, building resilience, reducing embodied carbon, and improving the overall footprint of the Campus for a more sustainable development.

04 | CONCLUSION

The preferred option, ‘’Innovation at the Edge’’, offers a wide range of ideas developed to elicit feedback on the values of the Campus, the constraints, operation considerations, and what elements will ultimately achieve the common vision of being Canada’s premier hub of innovative research excellence.

Science first and foremost guides the future development of the Campus. The Master Plan will be implemented incrementally as opportunities arise over time. The phasing of the plan is detailed more extensively in the Master Plan.

In addition, the Campus site is punctuated by certain additional strategic spaces that require particular attention (such as M-55, which is planned as a future conference centre). The Master Plan examines these spaces and proposes specific design guidelines for these districts.



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NRC · CNRC

Public Services and Procurement Canada | Services publics et Approvisionnement Canada

Stantec

NRC MONTREAL ROAD CAMPUS

MASTER PLAN

February, 2024

PREPARED BY

Stantec Consulting Ltd

In collaboration with
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PREPARED FOR

NRC

PSPC Project nº R.119380.133

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ACRONYMS

ACPDR	Advisory Committee on Planning, Design, and Realty
BRT	Bus Rapid Transit
CoGen	Cogeneration
CPTED	Crime Prevention Through Environmental Design
CRIVA	Climate Risk and Vulnerability Assessment
CSIS	Canadian Security Intelligence Service
DOAS	Dedicated outdoor air systems
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EOL	End of life
EOS	End of sale
ESS	Electronic security system
FHBRO	Federal Heritage Buildings Review Office
GBA+	Gender-based analysis plus
GGS	Greening Government Strategy
GHG	Greenhouse gases
HFCs	Hydrofluorocarbons
HGL	Hydraulic grade line
HONI	Hydro One Networks Inc.
HTRA	Harmonized Threat and Risk Assessment
HVAC-R	Heating, ventilation, and air conditioning and refrigeration
ICI	Industrial Conservation Initiative
IESO	Independent Electricity System Operator
IP	Internet Protocol
IT	Information technology
KPIs	Key performance indicators
kV	Kilovolt
LAN	Local area network
LCA	Life-cycle assessment
LCCA	Life-cycle costing assessment
LEED	Leadership in Energy and Environmental Design
LID	Low-impact development
LRT	Light rail transit
M&E	Mechanical and Electrical
MDF	Main Distribution Facility
MW	Megawatt
MVA	Megavolt-ampere
NCC	National Capital Commission
NBCC	National Building Code of Canada
NRC	National Research Council of Canada
ONAF	Oil Natural Air Forced electrical transformers
ONAN	Oil Natural Air Natural electrical transformers
POTS	Plain Old Telephone Services
PPS	Provincial Policy Statement
PSPC	Public Services and Procurement Canada
PVC	Polyvinyl chloride
PVT	Rooftop photovoltaic thermal collector
RCMP	Royal Canadian Mounted Police
SACC	Strategic Assessment of Climate Change
SSC	Shared Services Canada
TBS	Treasury Board of Canada Secretariat
TDM	Transport Demand Management
TEDI	Thermal energy demand intensity
TMP	Transportation Management Plan
TRA	Threat and Risk Assessment
VoIP	Voice over Internet Protocol
WLAN	Wireless local area network

GLOSSARY

Access points	Specific place to enter the campus.
Arboretum	Arboretums are places where trees, shrubs, and herbaceous plants are cultivated for scientific and educational purposes.
Architectural Significance	Architectural Significance refers to a rating system created to evaluate the existing buildings on the Campus (see Appendix A of the Master Plan). The criteria for the evaluation include the age of the building, heritage designations, architectural detailing, building presence within the Campus, and building sizing. The rating system is set from high (1) to low (3) significance. The use, condition, and scientific or operational significance for the NRC are not considered as part of the Architectural Significance rating.
Bicycle-friendly street	Street that includes cycling dedicated facilities.
Climate-Resilient Groundskeeping	Climate-resilient landscape maintenance methods using native species wherever possible, and practices such as xeriscaping and porous media.
Complete Street Design	Complete Streets incorporate the physical elements that allow a street to offer safety, comfort, and mobility for all users of the street regardless of their age, ability, or mode of transportation. A Complete Streets approach uses every transportation project as a catalyst for improvements within the scope of that project to enable safe, comfortable, and barrier-free access for all users.
Concept of Defensible Space	Designing the built environment and architecture can either increase or decrease crime. A place is safer when users have a sense of responsibility and ownership for a specific area. A defended space has five characteristics: 1. Territoriality: the idea that one's own place of activity is sacred. 2. Natural surveillance: the relationship between an area's physical features and its users' capacity to see what is going on. 3. Image: the ability of a physical design to evoke a sense of security. 4. Milieu: Other elements in the environment, such as proximity to a police station or a bustling business district, may have an impact on security. 5. Safe Adjoining Areas: Users can increase their capacity to monitor the adjacent area through the design of the nearby area for better security.
Ecotone	Ecotone refers to a transition area between two adjacent ecological communities.
Federal Heritage Buildings Review Office (FHBRO)	FHBRO evaluation for Federal heritage designation will significantly impact current assessments of Architectural Significance.
Gateway	An access that can be closed.
Good neighbour policy	A diplomatic policy for the encouragement of friendly relations.
Harmonized Threat and Risk Assessment	Set of tools designed to address all assets, employees, and services at risk. These are ready for integration with project management methodologies and system development life cycles to meet management needs for responsive solutions at both strategic and operational levels.
Hierarchical circulation web	Road network with a hierarchy in the different streets.
High Security Zone (Security Zone Hierarchy)	Area where access is limited to authorized, appropriately screened personnel, and authorized and properly escorted visitors.
High Sensitivity Area	Laboratories that may represent a potential nuisance due to noise and odours and require additional vibration isolation.
Horticulture	Horticulture is the science and art of growing fruits, vegetables, flowers, or ornamental plants.
Landscape Experimental Research Approach	Aims to explore, test, or demonstrate innovative concepts or techniques throughout the landscape. Research can also introduce new ideas, materials, or practices, particularly in relation to biodiversity, greening, or stormwater management. It can take the form of data collection to evaluate the performance of certain design elements or strategies, and to monitor their evolution over time. These designed experiments form both an environment that serves a research function and a welcoming landscape environment for campus users.
Need-to-Know Principle	Access restriction to sensitive information and assets to those whose duties require such access; that is, to those who need to know the information.
Operations Zone (Security Zone Hierarchy)	Area where access is limited to personnel who work there and to properly escorted visitors.
Organic road network	A road network that is not linear.
Portability	Ability for IT systems to move, copy or transfer data easily from one database, storage, or IT environment to another. In Internet Protocol telephony (also known as VoIP), portability means the capacity to keep your phone number or extension with you everywhere in which an internet connection is available.
Public Zone (Security Zone Hierarchy)	Where the public has unimpeded access and generally surrounds or forms part of a government facility.
Reception Zone (Security Zone Hierarchy)	Here the transition from a public zone to a restricted-access area is demarcated and controlled.
Resiliency	Resiliency in urban and campus planning involves planning for mitigation, adaptability, and recovery from change, particularly as it relates to the implications of climate change.
Road Diet	A road diet is a transportation planning technique that involves reducing the number of traffic lanes and/or the effective width of the road in order to make improvements, such as adding or widening footpaths/sidewalks, adding or widening boulevards (landscape lanes), and adding bicycle lanes on one or both sides of the road.
Scalability	Ability for IT systems—such as applications, storage, databases, and networking—to continue to function properly when changed in size or volume. It often refers to increasing or decreasing resources as needed to meet the higher or lower demands of a business.

Security Zone (Security Zone Hierarchy)	Area to which access is limited to authorized personnel and to authorized and properly escorted visitors.
Security Zone Hierarchy	A clearly perceptible hierarchy of zones that determines access to protected and classified assets, as well as measures to protect these assets, depending on the sensitivity of the zone. There are five zones:
	Public Zone
	Reception Zone
	Operations Zone
	Security Zone
	High Security Zone.
Thematic areas	Areas with specific types of research.
Urban grid	Urban organization where streets run at right angles to each other.
Urban fringe	Urban periphery.
Visual buffers	A region around an object with limited obstruction.
Vocational areas	The attribution to an area, or to a part of it, of a specific use, function, or vocation.

01

INTRODUCTION

The preparation of the Master Plan for the National Research Council (NRC) Montreal Road Campus is part of a process aimed to plan the development of this national research hub over a 30-year timeframe and beyond. With its rich history and unique characteristics, the Master Plan establish a concerted vision for its future development in order to consolidate its position as an emblematic employment and knowledge centre.

From an exhaustive urban analysis, to the design of three preliminary options, to the refinement of a preferred option detailed in design and implementation guidelines, the Master Plan is the culmination of an comprehensive planning process.

1.1 MANDATE

Objectives

This mandate is related to the development of a Master Plan and phased implementation strategy for the 1200 Montreal Road Campus (the Campus) that provides the National Research Council (NRC) with a long-term plan and vision for the Campus.

The intent is to demonstrate a functional and operational program for NRC over a 30-year life-cycle horizon that is representative of a state-of-the-art science Campus for the 21st century.

The Master Plan aim to meet the following objectives:

- NRC's program of work as to rehabilitation of its office and lab spaces to undertake continued excellence in science-based research and development.
- Government of Canada's initiatives of sustainability's three pillars, which are social, environmental and economic.
- Meeting and exceeding, where applicable, current base building and site federal requirements and National Capital Commission's (NCC) Plan for Canada's Capital, 2017-2067 goals.
- Providing a phased implementation strategy that demonstrates strategic cost efficiencies and effective investment opportunities.
- Recognizing the need to integrate best practices of 'city building' and aligned with Greening Government Strategy Engagement requirements.

The NRC is expecting to develop, through this exercise:

- A plan that will lead to greater intensification of scientific facilities in thematic districts, adapted to the changing needs of science.
- A visitor and conference centre that welcomes the public and links the North and South Campuses.
- Preserve as many green spaces and wooded areas as possible and create welcoming open spaces conducive to social interaction between different Campus users.
- Prioritizing the improvement of pedestrian and cycling pathways that can be shared with the community.
- Better access to public transportation to encourage the use of the Blair Road Light Rail Transit (LRT) Station as well as consideration of future transit improvements along Montreal Road.
- Leveraging partnerships throughout this Master Plan, including Public Services and Procurement Canada (PSPC), NCC, Laboratories Canada, City of Ottawa, OC Transpo and adjacent neighborhoods.

Stakeholders

To ensure the success of the process leading to the elaboration of the Master Plan, a collaborative process was put in place with the stakeholders involved in the project. Professionals from different fields and with a wide range of expertise contributed to the process, revealing all the challenges to be considered and the opportunities to be explored.

The main stakeholders are listed below, and include both internal and external groups.

TABLE 1 **MAIN STAKEHOLDERS**

Principal	National Research Council (NRC)
Major	Public Services and Procurement Canada's Science and Parliamentary Infrastructure Branch (SPIB) / Laboratories Canada (Labs Canada)
	National Capital Commission (NCC)
Other	City of Ottawa
	OC Transpo
	Community Groups
	Indigenous Peoples

Workshops, presentations and regular follow-up meetings between the work team and key stakeholders punctuated the Master Plan development process. These meetings enabled complex issues to be addressed and targeted solutions to be discussed, at various milestones in the project.

Notably, a presentation was made to the Advisory Committee on Planning, Design and Realty (ACPDR) on February 23, 2023. The purpose of this presentation was to outline the vision, the findings of the urban analysis, the three preliminary options and the initial orientations for the preferred option. A second presentation took place in November 2023 to present the preferred option approaches and guidelines, as well as the implementation strategy.

Additionally, special meetings were planned with Community groups and Indigenous Peoples as needed. It should be noted that a first presentation to the Indigenous communities was held in mid-February 2023.

1.2 APPROACH

THE MASTER PLAN WAS DEVELOPED IN FOUR MAJOR PHASES. EACH OF THESE STAGES BUILDS ON THE PREVIOUS ONE, AND FEEDS THE REFLECTIONS TO PROPOSE AN ULTIMATE MASTER PLAN THAT IS COHERENT AND ADAPTED TO THE UNIQUE CONTEXT OF THE CAMPUS.

THE VARIOUS STAGES WERE MADE UP OF ACTIVITIES AND TASKS, COMBINED WITH STAKEHOLDER WORKSHOPS AND MEETINGS. EACH STEP RESULTED IN A WRITTEN VOLUME, WHICH WERE BUILT UP OVER TIME TO FORM AN EXTENSIVE REPORT.

STEP 1
Urban Analysis and Vision

STEP 2
Options Development

STEP 3
Preferred Option and Implementation Strategy

STEP 4
Final Master Plan

Urban analysis and Vision

This first phase outlined the urban planning framework for the Campus. An exhaustive urban analysis was undertaken on the basis of existing documents and site visits. This presented the historical evolution of the Campus, building form, environmental features and views, traffic patterns and existing infrastructure. Comparative research Campuses were identified for their similarities to the Campus, and studied to inspire the elaboration of the Master Plan.

At the end of this phase, the vision statement, mission statement and design principles were developed with NRC and in collaboration with PSPC.

Options Development

Building on the previous stage, this second phase focused on the design of three distinctive Campus development options. These options were based on a singular rationale and included a series of creative and functional interventions to imagine three totally different ways of transforming the Campus over a 30-year horizon.

Developed to a high level of detail, this stage of the design enabled the work team and stakeholders to think outside the box, comparing the most appropriate and least suitable design solutions. A multi-criteria evaluation of the three options was carried out to identify the consensus-building and structuring components, including preliminary cost estimates for each option.

Preferred Option and Implementation Strategy

The third phase established a preferred development option, drawing on the best aspects of all three options to form a cohesive and functional new concept.

The preferred option describe in greater detail the design approaches and design criteria concerning architecture, landscape architecture, mobility, circulation and access, as well as infrastructure.

In addition, further guidelines address the specific features of districts within the Campus that merit particular attention because of their position and function on the site. Finally, an implementation strategy has been drawn up, considering the various development opportunities to be taken up in the short, medium and long term.

Final Master Plan

The Master Plan represents the final phase of the process, bringing together the iterative work carried out in the previous three phases into a single document that now forms the roadmap for the next 30 years and beyond.

The Master Plan is intended to be an evolving, flexible document that will adapt to the changing context of the city and the needs of science. This means that new avenues of intervention can be added to the document and modify it over time. The projects that are implemented, however, must be consistent with the vision, mission and design principles of the Campus, as well as with the design criteria set out in the document.

1.X

MASTER PLAN CONTENT

Chapter 2 outlines the context of the site in terms of geography, history and the framework of planning documents at various scales of the various planning authorities.

Chapter 3 provides a summary of the urban analysis, with highlights on mobility, traffic and access, landscape, built form and infrastructure. The chapter concludes with a brief review of the opportunities that have emerged from this wide-ranging analysis, available in full detail in Appendix A.

Chapter 4 presents a number of case studies of campuses similar to NRC Montreal Road's, and draws from them urban planning guidelines to inspire the Master Plan process.

Chapter 5 outlines the vision and mission statements, as well as the guiding design principles, that inform the broader design process.

Chapter 6 looks back at the design process in which the options were developed and evaluated, and how this guided the design of the preferred option.

Chapter 7 outlines the approaches proposed by the preferred option in all its components (i.e. architecture, landscape architecture, mobility, circulation and access, and infrastructure). It provides an overview of the transformative vision for the future of the Campus.

Chapters 8, 9, 10, and 11 respectively describe the components of the preferred option in greater detail concerning mobility, circulation and access, landscape architecture, architecture, and infrastructure (including physical security and access, civil engineering, electrical distribution, energy system, sustainability, and information). The approaches and guidelines expressed in these chapters are aimed at the Campus as a whole.

These approaches are presented in a logical order. First, mobility links within the Campus have historically guided its development and continue to structure it today. Secondly, the landscape is reaffirmed within the Campus by formalizing and forming a mosaic of open spaces responding to diverse needs and fostering encounters between campus users. Once the mobility networks and open spaces have been delineated, the main vocations of the site and considerations for future development follow, addressed by the architecture and built form. Finally, the infrastructures supporting all campus functions are presented in all their components.

Chapter 12 looks at districts within the Campus that deserve particular attention, since their position and function within the Campus has a significant impact on the site as a whole. These districts include the future conference centre, campus entrances, and sites that will undergo major transformations in their existing urban form. This chapter brings together the guidelines that will guide the detailed design for the different disciplines (architecture, landscape architecture, and mobility), in order to provide an integrated vision of the anticipated changes.

Chapter 13 details the implementation strategy, indicating the various actions to be taken to achieve the Master Plan. The implementation strategy is guided by an approach based on science as the top priority and the main vector of change. The implementation strategy proposes actions to be taken over the short term (0 to 10 years), mid term (11 to 20 years) and long term (21 years and more).

The report finishes with a brief conclusion in **Chapter 14** and the references used in **Chapter 15**.

02

CONTEXT

This chapter sets the stage for the Master Plan by presenting the location of the Campus at the scale of the City of Ottawa, then at a finer scale by exploring its layout and the buildings it comprises. This chapter unravels the historical evolution and archaeological significance of the Campus. Moreover, it sheds light on the planning framework, encompassing federal, provincial, and local policies that shape its actual and future development.

2.1 LOCATION

THE NRC MONTREAL ROAD CAMPUS IS IN THE CITY OF OTTAWA, APPROXIMATELY 7 KM EAST OF DOWNTOWN. THE SITE IS ACCESSIBLE FROM MONTREAL ROAD (ROUTE 34), BLAIR ROAD, AND BATHGATE DRIVE.

More specifically, the Campus site is located in Carson Grove – Carson Meadows for the South part of the site, and Wateridge Village for the North part of the site. It is surrounded by several institutional sites, such as Collège La Cite, Montfort Hospital, the Canada Mortgage and Housing Corporation, and the Canada Aviation and Space Museum.

Residential neighbourhoods surround the site, although a commercial development is located on its Southern boundary and the Ottawa River is located on its Northern boundary.

PLAN 1 **SITE LOCATION**

- Campus limits
- Highway
- Primary road
- Secondary road
- Roadway
- Railway
- O-Train Station

Dominant Land Use

- Residential
- Commercial
- Institutional
- Industrial
- Open space
- Wooded space
- Natural area

2.2 SITE AND BUILDINGS

THE CAMPUS IS APPROXIMATELY 1.23 KM² (123 HECTARES) IN SIZE AND IS COMPOSED OF A LARGE NUMBER OF BUILDINGS CONNECTED BY AN INFORMAL ROAD NETWORK ON THE SOUTH CAMPUS AND A MORE RIGID ORTHOGONAL NETWORK ON THE NORTH CAMPUS. PARKING AREAS, GRASSY AREAS AND WOODED AREAS SHARE THE REST OF THE SITE.

Takeaways

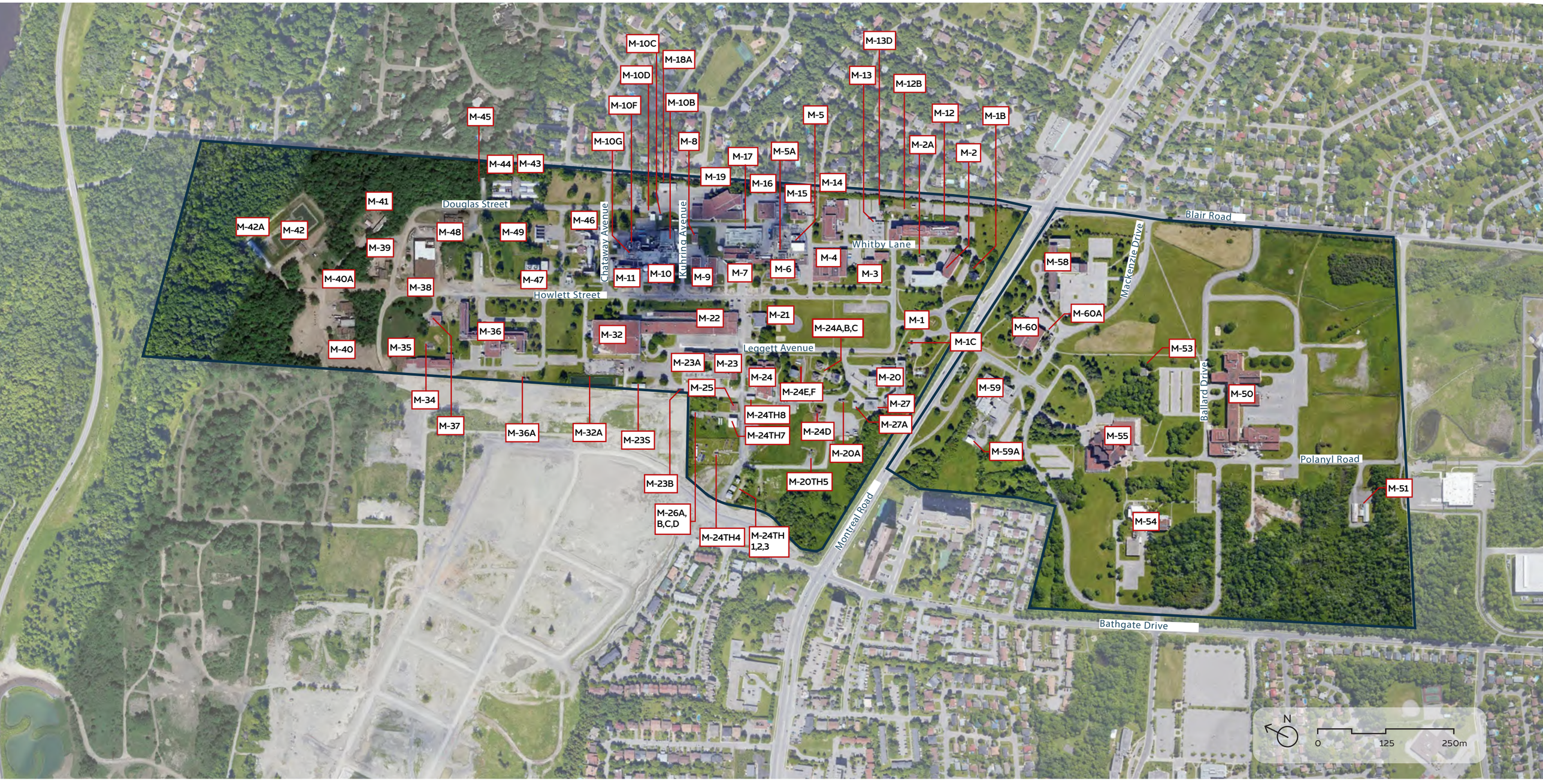
- Montreal Road separates the site in two portions, the North Campus and the South Campus.
- The North Campus contains the majority of the buildings, mostly aligned with Howlett street.
- The South Campus contains bigger buildings, including the library (M-55). It is opened to the public, without any fencing, and has more accesses than the North Campus (four compared to two).
- The only way to go from the North to the South Campus is from an underpass on Montreal Road or using Blair Road on the eastern perimeter of the Campus.

The site is crossed from east to west by Montreal Road, which provides the name of the Campus, and also divides the site in two. To the South, a smaller number of buildings are present, although they are larger in size. These are spread out over the South Campus and connected by a more organic road network. Large expanses of grass and wooded areas are also present. To the North, a series of buildings are located in a linear fashion along Howlett Street and a network of secondary streets.

The size of the buildings varies according to their use, ranging from about 200 m² to 10,000m². With the exception of a few buildings, the modernist architectural style dominates the site's-built landscape, with white cladding, flat roofs, and few openings and ornamentation.

Currently, the main access to the site is located off Montreal Road, although secondary accesses are also present. A passage under this road is the only way to move between the Northern and Southern portions of the Campus. Almost the entire Northern portion of the Campus is surrounded by fences and/or dense woodland, while the Southern portion is easily accessible throughout.

PLAN 2 **AERIAL VIEW OF THE CAMPUS**



PLAN 3 **SITE BUILDINGS**

Campus limits

X Building appellation

2.3 HISTORICAL EVOLUTION AND ARCHAEOLOGY

THE HISTORY OF THE NRC MONTREAL ROAD CAMPUS IS INTERTWINED WITH THE DEVELOPMENT HISTORY OF THE CITY OF OTTAWA, WHICH HAS SHAPED SOME FEATURES THAT MAKE THE SITE WHAT IT IS TODAY, AND EXPLAINS CERTAIN URBAN DYNAMICS. 5 MAJOR PERIODS MARK THE HISTORICAL EVOLUTION. A MORE COMPREHENSIVE OVERVIEW OF THE CAMPUS' HISTORY AND BUILT FORM CAN BE FOUND IN SECTION 3.3.

PRE-CONTACT
- **-4000** Traces of passage on the Ottawa River
- **1613** First appearance of Europeans

BYTOWN
- **1800** Arrival of the first permanent inhabitants of the area
- **1826** Construction of the Rideau Canal and renaming of the city for "Bytown"

NEW CAPITAL
- **1857** Ottawa is named the new capital of Canada
- **1860** Construction of the Parliament

WAR AND RESEARCH
- **1916** Creation of the National Research Council (NRC)
- **1939** Aqcuisition of the present Montreal Road Campus

EXPANSION
- **1950** Development of the area surrounding the Montreal Road Campus
- **1975** Montreal Road area is now fully developped

Pre-contact era potential and Bytown (before 1850)

Prior to their permanent arrival, people who frequented the Ottawa area were generally transient, crossing the Ottawa, Gatineau and Rideau rivers. Traces of passage on the Ottawa River date back to 6,000 years before today.

The first permanent inhabitants of the area date back to the year 1800. At that time, they named the village Wright's Town, now located in the Hull sector of the Ville de Gatineau.

Between 1826 and 1832, the construction of the Rideau Canal facilitated the link between Montreal and the Great Lakes. The city was renamed Bytown. Many Irish settled in the area and helped build the Rideau Canal. With the permanent settlement of the area, lumbering became the economic specialty of Bytown. Several sawmills were established during the 19th century, reaching their peak in 1900. The economic specialty had disappeared by 1930.

Before 1850, the Campus site and its surroundings were entirely wooded. The density of the forest made it rather difficult to cross. The earliest evidence of the site dates from historical plans from the late 19th century, which indicate that farms would have been present on the site.

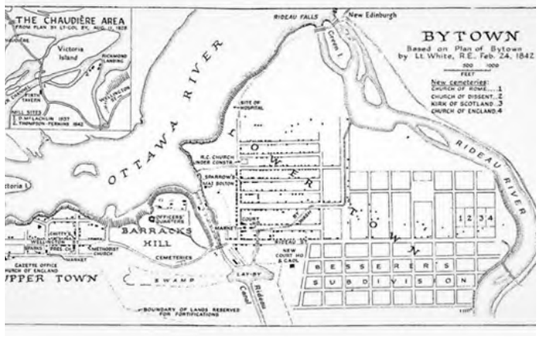


FIGURE 3. MAP OF BYTOWN, 1842
Source : Historical Society of Ottawa

Two zones of medium pre-contact archaeological potential were identified in the Northern portion of the Campus.

These zones present characteristics that, collectively, suggest a moderate possibility that these sites were used by First Nations groups prior to the first appearance of Europeans in the area, generally dated to 1613.

FIGURE 4. PHILEMON WRIGHT MILL AND TAVERN, 1823
Source : Bibliothèques et Archive Canada

FIGURE 1. UPPER CANADA, 1818
Source : Bibliothèques et Archive Canada

FIGURE 2. RIDEAU CANAL ENTRANCE, 1838
Source : Bibliothèques et Archive Canada

2.3

The New Capital (1850-1900)

In 1857, Queen Victoria named Ottawa the capital of the United Province of Canada, followed a few years later by the construction of Parliament. Situated on the border between Quebec and Ontario, Ottawa was between the two economic powers of the colony. Although the city was not easily accessible due to the dense forests that surrounded it, nearby cliffs made it easy for a possible military defense. Between 1855 and 1911, the city's population grew from 7,800 to 87,000.

During this phase, the Montreal Road area is occupied by agricultural activity. The land is divided into straight rows oriented perpendicular to the Ottawa River. The shape of these lots and their orientation influenced future subdivisions, including the Campus site.

War and Research (1900-1950)

The first half of the 20th century consolidated Ottawa as Canada's capital, marked by the significant events of the era: two world wars and the Great Depression. The city experienced a demographic boom between 1920 and 1940, linked to the military presence and the arrival of many women to join the war effort. The industrial boom left its mark on the urban landscape, with the arrival of factories producing bombs, aircraft and other war materiel.

In 1916, during the Word War I, the NRC was created to support the government's war effort in scientific and technological research. The first labs were set up on Sussex Drive in 1932. This large, multi-purpose building quickly became inadequate for the scale and nature of the projects carried out by the NRC. Laboratory safety concerns were also raised. In this context, the Montreal Road Campus was launched in 1939, in a sector of the city that was still agricultural. The NRC chose a different development approach: Smaller buildings, each dedicated to specific research facilities, giving it the flexibility to adjust quickly to changing research needs.

Expansion (after 1950)

After the World War II, Ottawa maintained its role as a public employer, with the number of federal jobs rising from 30,000 in 1945 to 120,000 in 1975. As Ottawa's urban core was mainly developed, urbanization continued in the remaining vacant areas. Post-war urban development took a more suburban form, characterized by a low-density, automobile-oriented urban form.

The area surrounding the Campus, which had previously been farmland, was gradually developed from 1950 onwards, and was fully built out by 1975. The area grew up around the Campus, developing few physical links due to the character of the Campus, which requires a certain level of security for the research activities carried out there. However, over the years, the Campus has opened up to the community, particularly the Southern part, which can now wander around during operating hours and enjoy the peace and quiet.
Since then, the area has continued to evolve, but remains an Ottawa neighbourhood with a fundamentally suburban urban form.

FIGURE 8. MONTREAL ROAD, 1939
Source : NRC digital depositary

FIGURE 9. AERIAL PHOTO OF THE NORTH CAMPUS, 1948
Source : NRC digital depositary

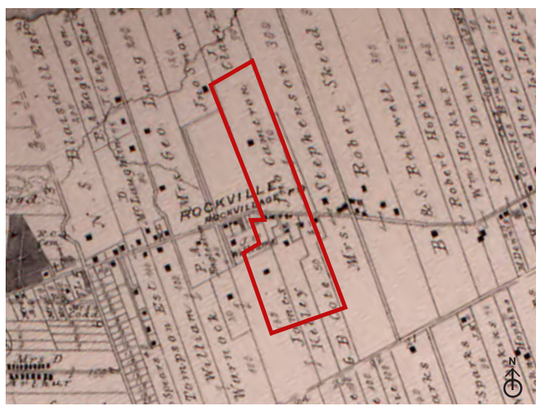


FIGURE 5. CARLETON COUNTY, 1879
Source : Bibliothèques et Archive Canada

FIGURE 6. AERIAL VIEW, 1928
Source : Bibliothèques et Archive Canada

FIGURE 7. AERIAL PHOTO, 1965
Source : GeoOttawa

FIGURE 10. AERIAL PHOTO OF THE SOUTH CAMPUS, 1968
Source : NRC digital repository

2.4 PLANNING FRAMEWORK

SEVERAL PLANNING DOCUMENTS OF VARIOUS SCALES AND SCOPE HELP INFORM THE FUTURE STRUCTURE AND ORIENTATION OF THE SITE.

FEDERAL OWNERSHIP OF THE LAND ANSWERS TO MANY LEVELS OF PLANNING.

The National Research Council (NRC) departemental business plan help guide its future development. Additionally, this Master Plan is a continuation of the planning legacy of the Campus that has evolved over the past two Master Planning exercises.

Planning approvals for federal lands in the National Capital Region are under the jurisdiction of the **National Capital Commission (NCC).**

The **City of Ottawa** and the **province** do not have jurisdiction, but federal departments and agencies apply a good neighbor policy in its relations with local municipal governments. Typically, federal entities apply to the municipality for planning, development and building approvals.

As the site is under **federal jurisdiction**, various federal legislation, policies and key departmental priorities must be considered. Although much of the federal land in the National Capital Region is under the stewardship of PSPC, the NRC has independent jurisdiction over its lands. However, in the event that other federal entities consider development on this Campus, such as Laboratories Canada, their specific vision and design principles should align with the current Master Plan vision.

NRC Planning Framework

NRC'S DEPARTMENTAL BUSINESS PLAN

NRC Strategic Plan 2019-24 | From Dialogue to Action, Excellence to Impact.

The revitalization of facilities is a key initiative that is being conducted with other federal partners through Laboratories Canada. The focus is on offering infrastructure to support research excellence. The Facilities Review will guide investment decisions to renew and modernize NRC's facilities.

In relationship to how we could envision the future development of Campus, the NRC Strategic Plan emphasises the principles of co-location with university and research centres as an opportunity for the site. 14 integrated and consolidated research centres are focused on key industry sectors. Most of them are present on Campus. Assumptions for the future plan should consider this desire to co-locate research in ways that benefit all parties.

National Research Council Canada 2022-23 Departmental Plan

Through the scope of its annual Departmental Plan, the NRC sets key priorities include climate adaptation and mitigation, health innovation and biomanufacturing, development and application of emerging digital technologies, and continued support for Canada's economy.

The National Research Council Act provides the framework for the NRC's custodial authority for their real estate properties. Concerning those properties and research environment, the NRC will continue adapting to the new ways of working that the pandemic forced it to adopt, the NRC will leverage and modernize its common and corporate services to support research and business innovation, collaboration and program execution.

June 2019| NRC Building and Real Estate

The NRC is currently greatly exposed to organizational risks by its long-term financial liabilities. These liabilities are tied intrinsically to building assets that have both a lifecycle-based liability, and operational liabilities from the increasing costs associated with the amount and form of energy its buildings use.

The NRC has decided that its future portfolio plan will include a carbon reduction plan to reduce greenhouse gas emissions by 90% by 2050. The NRC's Zero Carbon Portfolio Plan will ensure the NRC meets federal targets set in the Federal Greening Government Strategy. While the NRC has reduced NRC-wide emissions by 48%, capital and operational costs continue to increase. Further progress will require a comprehensive plan and tough decisions about its real estate footprint.

For the Campus, the findings are even more important and implies the eventual disposal of many buildings. Lowering carbon footprint and adaptive ways of working are two major factors that will influence the future of the Campus. 48 % of NRC's carbon emission comes from the Montreal Road Campus. Therefore, major pressure is now put on existing buildings, which have a heavy carbon footprint and seeking ways to mitigate the existing carbon footprint of existing building inventory if they are to be retained.

2.4

PREVIOUS MASTER PLANS

1967 | A Guide to the Development of the Montreal Road Site Ottawa, prepared by Shore and Moffat and Partners

After more than 25 years of operations of the Campus, a first Master Plan was undertaken to establish a vision for its orderly, unified and efficient future growth to meet foreseeable future needs. At the time, the Southern part of the Campus was starting to develop. The plan understood the importance of integration with the adjacent community that was in the process of urbanizing.

Relying heavily on motorized movement, the Master Plan also recognized the lack of definition between vehicular and pedestrian zones.

From the inside of the Campus, the goal of the plan was to create a community, with a village scale, notably with the creation of a principal central space to give a sense of arrival. The overall Campus feel was structured. Unification for the communities into a total Campus structure created by the spine, unified architecture and landmarks.

The document outlined the following vision:

- Primary zones dedicated to scientific research.
- Secondary zones for supporting uses like testing areas, landscaped open spaces, traffic areas and water areas.
- Primary road axis (the spine) linked to secondary roads (including the ring road).
- Predominant spine linking North and South Campus, wide, spacious avenue for vehicles, terminating in a pleasant focus point.
- Green belt running through the Campus, with landscape elements such as large bodies of water, dominant landforms and rock gardens.
- Explicit, liverly and inviting access points.

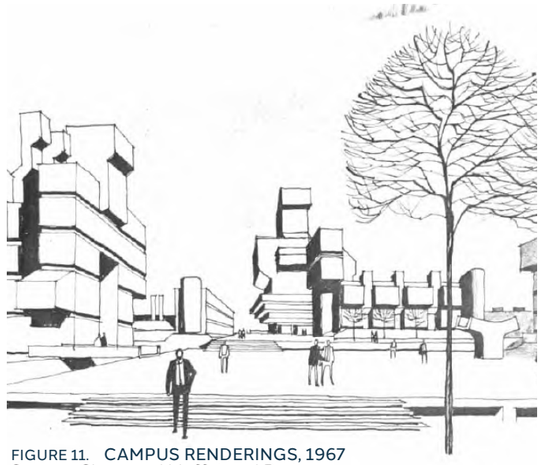


FIGURE 11. CAMPUS RENDERINGS, 1967
Source : Shore and Moffat and Partners

FIGURE 12. CAMPUS RENDERINGS, 1967
Source : Shore and Moffat and Partners

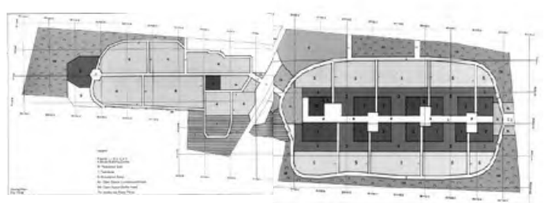


FIGURE 13. CAMPUS ZONING PLAN, 1967
Source : Shore and Moffat and Partners

1997 | Proposed Development Plan, NRC Montreal Road Campus, prepared by Rankin, Cook Architects

Thirthy years after the first Master Plan, a second plan was prepared. This plan was set to be flexible enough to respond to the evolving context. Its scope was more conceptual than previous plans, relying less on zoning and urban design, but more on processes and policies. The document was meant to manage the excess of land and to propose a broader use of the property, notably for partnership with industries.

The document outlined the following vision:

- A 'gateway' along Blair Road to provide a strong visual identity for the Campus.
- Improved pedestrian and cycling pathways that can be shared with the community.
- Development of thematic areas of research that foster collaboration.
- A South Campus situated within green spaces and wooded areas.
- A North Campus that has a village-like atmosphere focused on a central green mall to support collaborative interaction.
- A Campus that gives the impression of a vibrant research and innovation community.

The Campus was divided into four areas for which different development approaches were established:

- Area 1: Retained as a buffer zone and potential recreation area for the local community. Avoid development.
- Area 2: Densification for the next 10 years in construction, manufacturing and technology.
- Area 3: Development in administration, information technology, telecommunications and biotechnology. Blair Road identified as the gateway to the Campus.
- Area 4: No development until sufficient density has been achieved in zone 3.

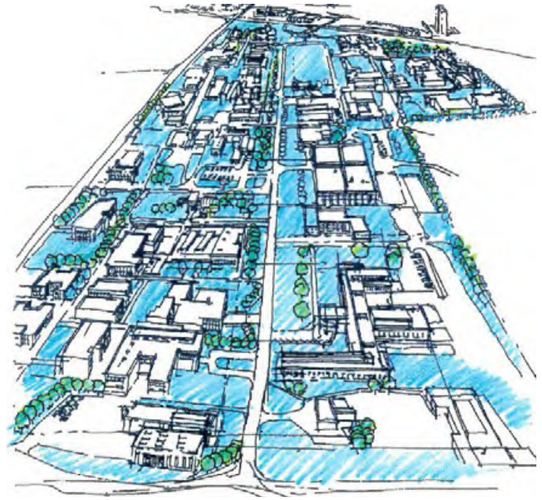


FIGURE 14. CAMPUS RENDERINGS, 1997
Source : Rankin, Cook Architects

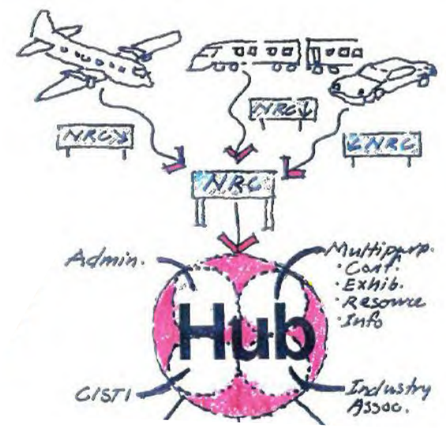


FIGURE 15. CONCEPT SKETCH, 1997
Source : Rankin, Cook Architects

FIGURE 16. PROPOSED AREAS, 1997
Source : Rankin, Cook Architects

2.4

NCC Planning Framework

2017-2067 | PLAN FOR CANADA'S CAPITAL

NCC's Plan for Canada's Capital covers the entire National Capital Region and proposes a vision for the Capital over the next 50 years, leading to the bicentennial of Canada.

The plan is built on a foundation of sustainability and resiliency. It protects past plans and Capital-building projects and carries their legacy forward for future generations of Canadians.

17 milestone projects are identified to frame the Capital in 2067, under three goals:

- **Inclusive and meaningful:** A capital that preserves and cherishes national symbols, while respecting Indigenous heritage;
- **Picturesque and natural:** A capital that values public green space, and promotes environmental sustainability;
- **Thriving and connected:** A capital whose networks extend around the globe.

The portion of the plan covering National Institutions provides key policies for the next 50 years that should be of concern for the Campus. The plan specifically states that: " The NCC will work with federal institutions to promote their renewal, and their ongoing contribution to the region's quality of life, through the approval of updated Master Plans and development strategies." Those policies suggest that future foster exemplary design.

Milestones regarding architecture and landscape design of federal employment areas and illumination are to be considered as they aim to develop more complete neighbourhoods, more lively workplaces that are better integrated with their surroundings.

2021 | CAPITAL URBAN LANDS PLAN

Capital Urban Lands Plan is one of five specific plans that complies with the Plan for Canada's Capital. The document provides an overarching vision and strategic direction and guidance for the use and stewardship of federal lands for which the NCC as jurisdiction pursuant to the National Capital Act .

The Plan designates the Campus as a "Major Federal Employment Area". The designation includes sites that accommodate the federal workforce and other facilities required to carry-out the day-to-day operation of the federal government. The designation offers the flexibility necessary to such sites to evolve through time. Consolidation and intensification are prioritized to ensure efficient use of federal land.

The document also presents urban land policies that propose highly visible flagship Departments, prioritize existing federal employment areas for intensification, develop responsive and context-specific solutions, integrate landscaped areas and recreation spaces into existing and future federal sites and encourage federal custodians to collaborate with municipal partners to improve access to existing federal facilities via walking, cycling and public transit.

TABLE 2 **LAND DESIGNATION (CAPITAL URBAN LANDS PLAN)**

MAJOR FEDERAL EMPLOYMENT AREA	
Description	Major federal government sites on a Campus or in multi-building complexes representing significant concentrations of federal employment uses located outside of the Core Area.
Land Designation Objective	Support the efficient use of federal land holdings by consolidating federal functions at major federal employment areas
Policies	› Support projects that improve the integration of major federal employment areas into their urban context while maintaining their ability to support the needs of the federal government. › Allow the retrofit, re-use and/or replacement of older buildings that reach the end of their lifecycle. › Work cooperatively with custodians to identify and preserve built heritage of significance to the Capital in compliance with the Treasury Board Heritage Buildings Policy. › Foster urban design excellence and encourage improvements to the quality of Capital's public realm. › Encourage actions to establish a welcoming public-facing presence at buildings serving as headquarters or head offices, prioritizing those providing services to the general public. › Communicate government program mandate and achievements through visitor orientation and wayfinding. › Balance physical security requirements with the desire to maintain an open and accessible appearance. › Locate intensification where additional density is best supported by rapid transit infrastructure, wherever possible. › Permit the introduction of additional non-federal uses at major federal employment areas and promote a mixed-use, pedestrian-oriented, and compact urban form. › Encourage sustainable and active mobility by prioritizing pedestrian, cycling and transit-supportive improvements. › Avoid the conspicuous siting of required support infrastructure such as loading bays, maintenance and storage areas, waste processing facilities, emergency generators, etc. Provide visual screening, where appropriate. › Balance the distribution of federal facilities in a manner that is broadly reflective of regional planning objectives.
Complementary Uses	› Non-federal uses: residential, employment (e.g., office), retail, restaurants, hotels, etc. where they support the federal employment base. › Cultural facilities: commemorations, monuments, interpretation, public art, etc.

2.X

Municipal Planning Framework

2022 | OFFICIAL PLAN

In the new Official Plan adopted in 2022, the Campus is identified as within the Inner city policy area, North of Montreal Road, and the Outer city policy area, South of Montreal Road.

Montreal Road in this area is designated as a Mainstreet Corridor. The lands adjacent to Montreal Road by approximately 150 metres in depth are designated Evolving Neighbourhood Overlay.

The whole Campus is identified as a Mixed Industrial areas, which are clusters of economic activity that are less impactful and provide a broader range of non-residential uses than industrial areas.

The new Official Plan characterizes these areas as “a broad mix of uses including small-scale office, light industrial, wholesale, small contractors, small-scale commercial service uses and non-residential sensitive uses such as places of worship, indoor recreational uses and stand-alone licensed care centres that would otherwise not be permitted on lands designated Industrial and Logistics.”

The Official Plan emphasizes the importance of good urban design and quality and innovative architecture to stimulate the creation of lively community places. It also favours sustainable modes of transportation and development must increase the importance allowed to them in new development, and in retrofitting projects. The Plan advocate for the development of Complete streets, active transportation, and transit.

2008-250 CONSOLIDATION | ZONING BY-LAW

The Campus is mostly zoned Light Industrial (IL 249) and is separated by the designation Arterial Main Street (AM10) along Montreal Road.

Light industrial zone permit a wide range of low impact light industrial uses to allow a variety of complementary uses and prohibit retail uses. The development standards should ensure compatibility between uses and minimize the negative impact on adjacent nonindustrial areas.

Arterial Mainstreet zone (AM) accommodate a broad range of commercial, offices, residential and institutional uses. The development standards promote intensification, ensuring compatibility with surrounding uses. The standards promotes construction built close to front lot line, minimal transparency for ground floors and volume and height control. A comprehensive review of the Zoning By-law is expected in line with the revision of the City of Ottawa’s Official Plan.

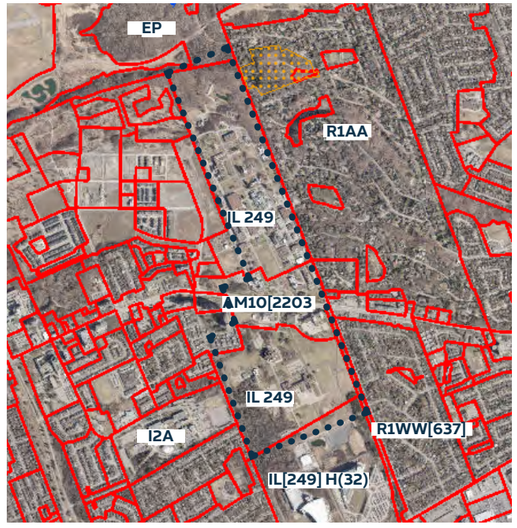


FIGURE 17. ZONING MAP
Source : GeoOttawa

TABLE 3 **ZONE PROVISIONS**

	MAXIMUM BUILDING HEIGHT
Light Industrial (Il)	11 m - Buildings within 20 metres of a residential zone 18 m - in all other cases
Arterial Main Street (AM10)	11 m - Buildings within 20 metres of a R1, R2, or R3 residential zone 15 m - Buildings within 20 metres of a R4 residential zone 20 m - Buildings from 20 metres to 30 metres of a residential zone 15 m - Buildings from that part of a side lot line within 20 metres of a street and abutting a residential zone 30 m - in all other cases

Province Planning Framework

2020 | PROVINCIAL POLICY STATEMENT

The Provincial Policy Statement 2020 (PPS) provides policy a foundation for regulating the development and use of land. It also supports the provincial goal to enhance the quality of life for all Ontarians .

The document establishes a vision for the Land Use Planning system in Ontario and has three main policies:

- Building strong healthy communities;
- Wide use and management of resources;
- Protecting Public Health and Safety.

The first policy orients notably the Employment areas. Those shall provide for separation or mitigation from sensitive areas. Employment areas planned for industrial, or manufacturing uses should include an appropriate transition to adjacent non-employment areas. It also covers theme that should promote healthy active communities such as energy conservation, air quality, climate change, safe street, spaces and facilities.

Regarding Indigenous communities, the 2020 PPS update states that Planning authorities shall engage and coordinate with Indigenous Peoples on matters of land use planning and cultural heritage; and clearly acknowledges the potential benefits a healthy relationship with Indigenous communities could have on the growth and development within Ontario. Indigenous communities and their relationship to land use planning are integral part of the vision for Ontario’s land use planning system. More than just a stakeholder, they hold a unique relationship with the land and its resources.

2.4

Federal Planning Framework

PROPERTY MANAGEMENT

The management of assets and acquired services for the Government of Canada is governed by legislation, regulations and policies, many of which are the responsibility of the Treasury Board.

Legislation, acts, guidelines, and policies are all controlling property management and development through federal land.

For the scope of this project, the following instruments must be taken into consideration :

- **Federal Sustainable Development Strategy (FSDS)**
  - Targets and outlines implementation strategies and short-term milestones for achieving them, from an environmental perspective
- **Directive on the Management of Real Property**
  - Requires that real property is planned, acquired, used, and disposed of in a manner that supports the delivery of programs and services to Canadians while ensuring best value to the Crown
- **Energy efficiency for buildings**
  - Identifies best practices for maximizing energy efficiency for new buildings and improves energy efficiency using a whole-building approach for existing buildings

SUSTAINABILITY REQUIREMENTS

Holistic sustainability considering the triple bottom line: social, environmental and economic is integral to meeting the sustainability, carbon and health and wellbeing requirements.

This approach will provide a Campus that supports the short and long-term carbon goals and provide a place where occupants and visitors to the Campus can thrive. More than 25 acts and regulations set forth by the Federal government may apply to any future projects. The municipal sector that shares responsibility for Environment and sustainability also present other applicable by-laws and policies.

NRC's sustainable development strategy aligns with 6 key long-term goals related to the federal strategy (FSDS) including:

- Greening government communities with actions specific to the NRC
- Effective action on climate change with strengthened research efforts to assist Canadians in reducing carbon emissions
- Clean growth with investments in clean technologies through the Industrial Research Assistance Program (IRAP)
- Modern and resilient infrastructure
- Clean energy with the National Energy Code for Buildings with NRCan to increase the energy efficiency of buildings
- Safe and healthy communities

A workshop focusing on sustainability opportunities was held August 31st, 2022 to review and discuss sustainability requirements with NRC, PSPC, and Labs Canada. Feedback from the workshop prioritized the need to balance the goals with budget, planning for flexibility, densification (consolidation and sharing), efficiency – reducing demand and repurposing (adaptive re-use).

ACCESSIBILITY REQUIREMENTS

There are two main documents that regulate accessibility at federal sites: The Accessible Canada Act and The Accessible Canada Regulations.

The Accessible Canada Act came into force in 2019. The goal is to remove and prevent any kind of physical barrier in sites (buildings and landscapes), that must be accessible to all Canadians. Government of Canada departments and agencies are among the entities specifically covered by this act.

The Accessible Canada Regulations came into force in 2021 and include norms and procedures by which entities must produce an Accessibility Plan. The most current versions of the National Building Code of Canada (NBC) and CSA B-651 – Accessible Design for the Built Environment are examples of other codes and standards that will need to be consulted during the design process for buildings and site work.

The purpose of the current Master Plan is not to indicate the actual requirements for a design project, per the acts and regulations described above. Rather, the intent is to indicate the elements that must be considered in the design process and incorporated with future interventions for the site and buildings, and with new buildings. It can be expected that the current codes, standards, and policies will evolve and expand with time, and the most up to date requirements at the time of the design process should be followed. This applies not only to the accessibility requirements described above, but also to all other applicable requirements, including those related to gender equality, indigenous engagement, etc.

FIGURE 18. THE GLOBAL SUSTAINABLE DEVELOPMENT GOALS OF THE 2030 AGENDA THAT GUIDES THE FSDS
Source : United Nations

FIGURE 19. ACCESSIBLE CANADA ACT VISION
Source : Government of Canada

03

URBAN ANALYSIS

This chapter contains the highlights of a comprehensive urban analysis, which can be found in Appendix A of the Master Plan.

More specifically, the chapter dissects crucial elements shaping the Campus environment.

First, the chapter explores the components of mobility, circulation and access, focusing on vehicular and active mobility, public transport and associated plans.

Secondly, the chapter looks at the Campus landscape, focusing on environmental features, street furniture, orientation and views to and from the Campus.

Thirdly, the chapter deals with the built form, its evolution, architectural significance and future plans.

Finally, the chapter focuses on infrastructure dimensions, encompassing access, security, civil aspects, power distribution, energy systems, information technology and structural components.

3.1 MOBILITY, CIRCULATION AND ACCESS

THE VEHICULAR NETWORK SURROUNDING AND WITHIN THE CAMPUS FAVOURS VEHICULAR TRANSPORT ABOVE ALL ELSE. IT'S EASY FOR CAMPUS USERS TO GET AROUND BY CAR AND TO PARK, AS THE PARKING SUPPLY IS GENEROUS.

HOWEVER, THIS EASE OF TRANSPORT IS QUITE DIFFERENT FOR CAMPUS USERS WHO ACCESS THE CAMPUS BY PUBLIC TRANSPORT, ON FOOT OR BY BICYCLE, AND FOR THOSE WHO CIRCULATE WITHIN THE CAMPUS OTHER THAN BY CAR. CONDITIONS FOR ACTIVE TRAVEL, EITHER NEAR OR WITHIN THE CAMPUS, ARE EITHER ABSENT, UNSAFE OR UNFRIENDLY.

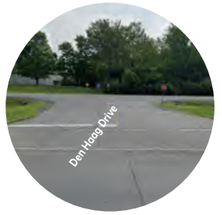
Vehicular Mobility

NEARBY ROADWAYS

Several roadways are located in the vicinity of the study area and connect to the Campus's internal street network.

The Campus takes its name from Montreal Road, which runs east-west through the Campus. However, Montreal Road is considered external to the Campus road network because of its topographical difference with the Campus, and because of the City of Ottawa's ownership of this thoroughfare.

TABLE 4 **MAIN ROADWAYS LOCATED NEARBY THE CAMPUS**

DESCRIPTION	 Montreal Road	 Blair Road	 Bathgate Drive	 Wanaki Road	 Den Haag Drive	 Enigma Private
Roadway type	Four-lane arterial roadway	Two-lane roadway, major collector road North of Montreal Road, and arterial roadway South of Montreal Road	Two-lane collector roadway	Two-lane roadway, newly constructed 'complete street'	Two-lane roadway	Paved private entrance accessible from Blair Road, South of Montreal Road
Posted speed limit	60 km/h	50 km/h	50 km/h and 40 km/h	50 m/h (default)	40 km/h	Unknown
Cross-section	Urban	Urban	Urban	Urban	Rural (within the vicinity of the study area)	Rural
Pedestrian / Cycling facilities	Sidewalks (both sides) Bike lanes interrupted easth of the Campus	Sidewalk (east side) Painted bike lane (east side) and paved shoulders	Sidewalks (both sides)	Sidewalks (both sides) Bike lanes (both sides)	No sidewalks	Gravel shoulders without sidewalks
Designated truck route	Yes	Only South of Montreal Road	No	No	No	No
Designated as a Transit Priority Corridor	Yes	Yes	No	No	No	No
Campus access	Yes	Yes	Yes	No	No	No
Intersection with Montreal Road	All approaches include auxiliary right-turn storage lanes, with the exception of the Southbound right turn movement that features a "pork chop" island with no storage lanes added	Signalized, with auxiliary left turn lanes in all directions	Controlled by a traffic signal, with auxiliary left turn lanes at all approaches	Controlled by a traffic signal, with auxiliary left turn lanes at all approaches	-	-

3.1

INTERNAL ROADWAYS

The streets that make up the Campus road network are privately owned. Most streets are two-way and have a rural cross-section, i.e. wide right-of-way (+7.5 m), no sidewalks and gravel shoulders, particularly in the Southern part of the Campus.

In the Northern part of the Campus, the streets follow a rectilinear pattern organized around the axis of Howlett Street, which is the main spine from which several perpendicular secondary streets intersect.

In the Southern part of the Campus, the streets follow a more curvilinear pattern, with a series of curved streets. These cross large open spaces and offer great views on the landscape.

The Campus integrates few traffic management measures, with the exception of a few stop signs at key intersections.

FIGURE 20. MONTREAL ROAD, TOWARDS NORTH, NEAR BUILDING M-7
Source : Stantec

VEHICULAR ACCESS POINTS

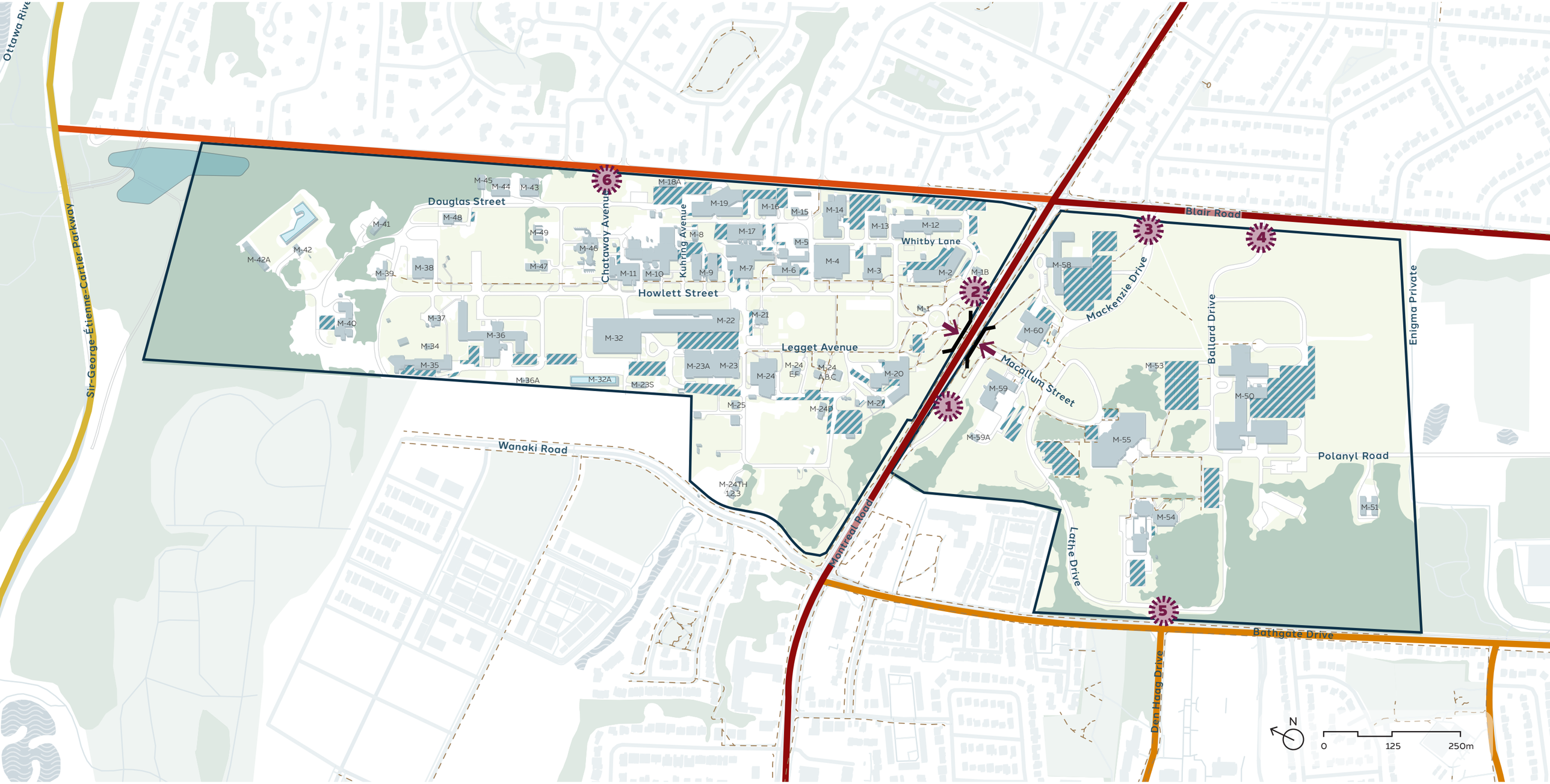
The main vehicular points of access to the Campus are located along Montreal Road. In addition, the Campus has 4 other entrances located along nearby roads.

The Montreal Road underpass is the only crossing point between the Northern and Southern parts of the Campus.

The numbers refer to the access points shown on Plan 4 Vehicular Network And Access Point and Entrances.

TABLE 5 **MAIN VEHICULAR ACCESS ROADS**

DESCRIPTION	1  **Montreal Road ramp to Macallum Street (South of Montreal Road)**	2  **Montreal Road ramp to roundabout (North of Montreal Road)**	3  **Mackenzie Drive / Blair Road**	4  **Ballard Drive / Blair Road**	5  **Lathe Drive / Bathgate Drive**	6  **Chataway Avenue / Blair Road**
Access type	Right-in/right-out ramps with yield-control		T-intersection (three-way intersection) with stop sign along Mackenzie Dr	T-intersection (three-way intersection) with stop sign along Ballard Dr	Cross intersection with 4-way stop	T-intersection (three-way intersection) with stop sign along Chataway Ave
Access location	North and South Middle Campus		South East Campus	South East Campus	South West Campus	North East Campus
Posted speed limit	50 km/h (default)		40 km/h	40 km/h	40 km/h	50 km/h
Cross-section	Urban		Rural	Rural	Rural	Rural
Pedestrian / Cycling facilities	Discontinuous sidewalks along ramps		Gravel shoulders without sidewalks	Gravel shoulders without sidewalks	Gravel shoulders without sidewalks	Gravel shoulders without sidewalks
Security	None	Visitors need to identify\check-in in the M1 guard house	None	None	None	Access is gated and only accessible during business hours
Notes	The Montreal Road underpass clearance is substandard (approximately 4.9 m vs the current bridge design clearance standard of 5.3 m) and does not accommodate taller vehicles/wider loads		-	-	-	



PLAN 4 **VEHICULAR NETWORK AND ACCESS POINT AND ENTRANCES**

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Vehicular access point (Refer to Table 5)
- Montreal Road underpass
- North/South access
- Parking area
- Federal property
- Arterial road
- Major collector
- Collector

3.1

TRUCKS, DELIVERIES AND EMERGENCY ROUTE

The road network is generally robust with wide curves and roadways which can support the movement of large vehicles. The existing Campus road network has been developed with elements similar to an industrial park road network. These roads generally provide access to each side of the buildings with few limitations, enabling flexibility in the delivery of goods and emergency access. This being the case the current central shipping and receiving facility is located at M-19 and redistributed internally by the team following delivery at this location. This pattern accounts for over 90% of daily shipping (approximately 25 shipments received daily), the remainder are directly delivered to buildings based on specific scientific needs.

It is assumed that the fire station / emergency response will primarily be provided by the City of Ottawa Station 51, combined with Ottawa Police Service. They will be accessing through the existing roadway, without the ability to open any closed gates. Primary emergency response arrives at M-1 and is escorted to the incident by the commissionaires from there.

PARKING AREAS

The Campus is dominated by surface parking which is generally associated with a specific building.

Buildings within the site are oriented towards the parking lots and roads concurrently with a split entrance design. In most cases a large parking lot is provided directly adjacent to each building with a centralized lobby entrance. There is an additional pick-up/drop-off design located to facilitate traffic access. Internal circulation is designed to facilitate movement of cars between buildings with a large-scale circuitous road design and large block patterns.

The Campus currently has over 2,100 parking spaces, for the 2,300 staff occupying the site. This provides a current parking rate of 0.9 which is considered significant provision of parking in this environment. Currently, parking utilization is not tracked.

There are fleet vehicles associated with the site that are used for deliveries, site visits and work-related local transportation for employees. Visitors need to identify\check-in at the M-1 guard house.

The Campus is identified in the City's "Inner Urban" parking policy area for calculating parking space requirements, which directs 1 parking space per 100 m^2 of gross floor area (By-law 2016-249, Table 101, Row N59). The City of Ottawa continues to provide a mechanism to account for trip diversions to change parking requirements through their Transportation Demand Management (TDM) mechanism.

TRANSPORTATION DEMAND MANAGEMENT (TDM) TOOLS OPPORTUNITIES

There are opportunities through the Master Plan to incorporate several of the TDM tools. These would include TDM tools / strategies such as:

Shift priority away from driving alone

- Protected bike lanes on Campus and municipal roads leading to Campus.
- Car sharing.
- Bike sharing.

Collaborating with employer(s)

- Employee transit benefits and subsidies.
- Employer-organized and hosted vanpools and carpools.
- Priority parking for carpools.
- Showers, changing rooms and secure bike parking to help employees bike to work.
- Eliminating or reducing free parking.
- Flexible work schedules.
- Telework.
- Accessible parking.
- Incorporating clear and safe pedestrian paths and sidewalks.

Improving public transit

- Accurate real-time arrival information.
- Standardizing wayfinding.
- Subsidized fare structure.
- Campus shuttle\route.
- Optimizing bus routes for the Campus and adjacent facilities (La Cité, high schools, CSIS, etc.).
- Educating people about their transportation options.
- Marketing the benefits of commuting on bicycles.
- Bicycling safety.
- Multimodal awareness events.

FIGURE 21. DIFFERENT PARKING AREAS ACROSS THE CAMPUS
Source : Stantec

3.1

Active Mobility

NEARBY ACTIVE NETWORK

The active transportation network is mainly supported off-Campus, along the vehicular network.

However, based on the standards established in Ontario Traffic Council OTM Book 18 most existing municipal street facilities for cyclists and pedestrians appear to be substandard. Most cycling and pedestrian facilities do not provide a buffer adjacent to the road and have a limited street tree canopy.

The nearby cycling network is not maintained in winter.

FIGURE 22. BLAIR ROAD SIDEWALK AND BIKE LANE, SOUTH OF MONTREAL ROAD
Source : Stantec

FIGURE 23. WANAKI ROAD SIDEWALK AND BIKE LANE
Source : Stantec

TABLE 6 **NEARBY PEDESTRIAN AND CYCLING FACILITIES**

							
DESCRIPTION	**Montreal Road**	**Blair Road**	**Bathgate Drive**	**Wanaki Road**	**Den Haag Drive**	**Sir-George-Étienne-Cartier Parkway**	**Ottawa River Pathway**
Pedestrian facilities	Sidewalks, both sides of the roadway	Sidewalk east side of the roadway	Sidewalks, both sides of the roadway	Sidewalks, both sides of the roadway	Sidewalk, South side of the roadway	No sidewalk	Multimodal pathway
Cycling facilities	Cycle lanes, both sides of the roadway interrupted just west of Bathgate Drive	Painted bike lane east side of the roadway Paved shoulder west side of the roadway	None	Cycle lanes, both sides of the roadway	None	Paved shoulders	
Designated cycling route in the 2013 Transportation Master Plan	Spine route Crosstown Bikeway (2023 MP update)	Spine route	Local cycling route	No Crosstown Bikeway (2023 MP update)	No	No	Major Pathway
Notes	-	-	-	Extensive street trees and maintained boulevard spaces within the right-of-way	-	Operated by NCC Multimodal link to downtown and to east neighborhoods Closed to traffic and dedicated to pedestrians and cyclists on summer weekends	Operated by NCC Multimodal link to downtown and to east neighborhoods via Petrie Island (Orleans).

3.1

INTERNAL ACTIVE NETWORK

Overall, the internal roadway network does not provide sidewalks or dedicated cycling facilities connecting throughout the Campus.

Pathways within the Campus are limited and appear to respond directly to desire lines taking direct lines between buildings or parking lots.

Multi-use pathways are located primarily within the South Campus, are discontinuous and lack clear designation (signage), safe roadway crossings and separation from other transportation modes.

Crossings of the roads, both for multi-use pathway and access to adjacent parking lots are generally provided through unsignalized crossings. In some cases, these crosswalks are painted with the ladder pattern, which is used to differentiate the crosswalk for both drivers and pedestrians. In several cases these crossings are midblock, to serve the path of pedestrians.

FIGURE 24. MACALLUM STREET, HEADING TOWARD M-55
Source : Stantec

PEDESTRIAN AND CYCLING ACCESS POINTS

The main pedestrian and cycling points of access to the Campus are located along Montreal Road. In addition, the Campus has three (3) other entrances located along nearby roads.

The Montreal Road underpass is the only crossing point between the Northern and Southern parts of the Campus. Sidewalks along both sides of the underpass lane allow safe passage from the North to the South of the Campus without having to cross Montreal Road.

Note that Montreal Road offers no safe way for pedestrians to cross from one side of the sidewalk to the other.

The numbers refer to the access points shown in Plan 5 Access Point and Entrances.

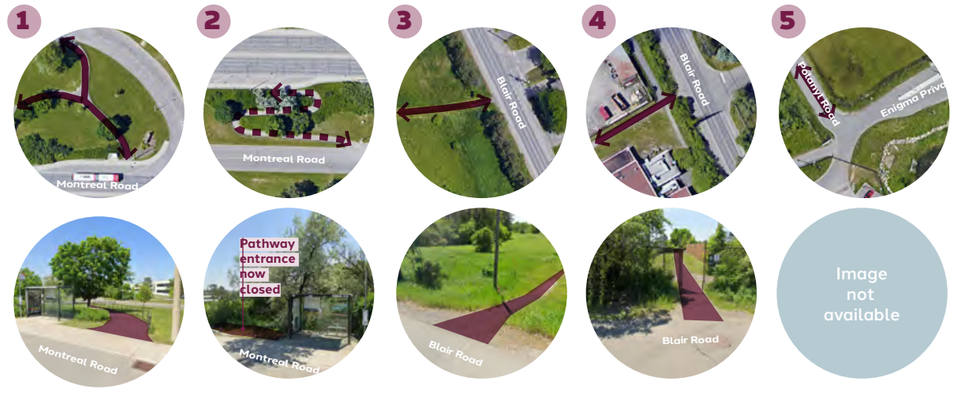
UNIVERSAL ACCESSIBILITY IN THE BUILT ENVIRONMENT

The surrounding pedestrian network has limited standards of universal accessibility with inconsistent treatment.

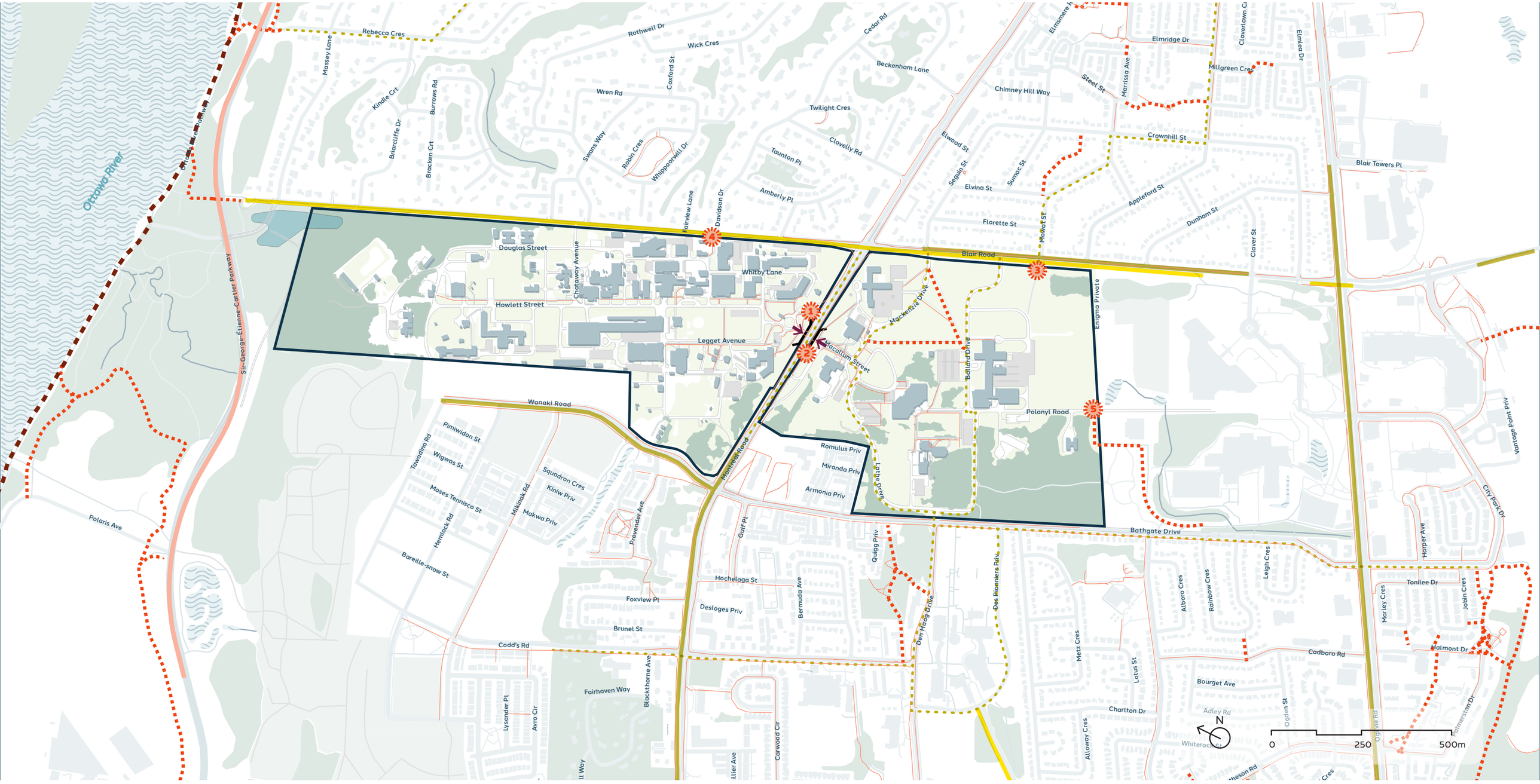
While access to individual buildings from either adjacent drop-off locations or parking lots generally provide a treatment of mobility accessibility access to these sites are generally limited to car. Sidewalks and pathways have inconsistent surface treatments, missing curb-cuts, are poorly lit. Several areas within the Campus would require a wheeled mobility device to operate in the road area and would be challenging to navigate for anyone with a mobility limitation.

This analysis does not include conditions of urban braille or other tools supporting accessibility based on available information and demonstrated low condition within the base network.

TABLE 7 **PEDESTRIAN AND CYCLING ACCESS POINTS**



DESCRIPTION	Montreal Road pathway to roundabout (North of Montreal Road)	Montreal Road pathway to Macallum Street (South of Montreal Road)	Blair Road near M-50	Blair Road near M-14	Enigma Private / Polanyl Road
Access location	North Middle Campus	South Middle Campus	South East Campus	North East Campus	South Middle Campus
Pedestrian / Cycling facilities	Pathway Continuity of the sidewalk network and safe crossings issues	Pathway **Closed** due to maintenance, accessibility and safety issues	Informal pathway Clear access route for both pedestrians and cyclists without any design interventions or support	Private pedestrian / cycling access	Unkown
Security	Visitors need to identify\check-in in the M-1 guard house	None	None	Access is gated and only accessible during business hours	Unkown



PLAN 5 **PEDESTRIAN AND CYCLIST NETWORK AND ACCESS POINT AND ENTRANCES**

- Project area
- Roadway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Pedestrian / cycling access point (Refer to Table 7)
- Montreal Road underpass
- North/South access
- Bike lane
- Paved shoulder
- Multi-use pathways
- Unofficial multi-modal parkway
- Cycling corridor recommended by the City of Ottawa (no existing facilities)
- Pedestrian path / Sidewalk
- NCC recreational pathway

3.1

Public transit

Transit service is currently provided in the immediate vicinity of the site some of which connect to the LRT Blair Station to the South. Blair Station is located over 1 km from the South limit of the Campus (i.e., intersection of Blair Road and Enigma private) (or over 20-minute walk to the site). Bus route schedules have been extracted using the OC Transpo website on November 1, 2022.

It should be noted that the LRT East Line extension (LRT Phase 2) is currently under construction with a completion date of Fall 2025.

The following is a summary of transit routes serving the area:

TABLE 8 **NEARBY TRANSIT ROUTES**

BUS ROUTE	DESCRIPTION
Route 12	Route 12 is a central route that runs between Blair Road and St-Laurent Boulevard all day, seven days per week. During the weekday morning and afternoon peaks, it runs with 15-minute headways.
Route 15	Route 15 is a central route that runs between Blair Road and Parliament Station, seven days per week. During the weekday morning and afternoon peaks, it runs with 15-minute headways. Mid-day service runs between Gatineau and Lyon Station.
Route 25	Route 25 is a local peak-period route that runs between La Cité Collégiale and Millennium Blair and Rothwell Heights at 15-minute headways, Monday to Friday.

Plan 6 identifies nearby transit stops. Bus stops are located on the periphery of the Campus, which puts their distance to almost every building over 200 m walking on inconsistent environment. The shortest walking distance from a bus stop to a building is 195 m.

Bus stops along Montreal Road, near the main access points to the Campus, include small shelters. However, the heavy vehicle traffic along this roadway, combined with sub-standard walking conditions, make it an unsuitable and unwelcoming environment for the use of public transit.

Other bus stops include a signpost on a mixture of surfaces (sidewalk, asphalt or gravel), along the travel lanes.

FIGURE 25. MONTREAL ROAD BUS SHELTER
Source : Google Street View

FIGURE 26. NEARBY BUS STOP
Source : Stantec

PLANNED TRANSIT IMPROVEMENTS

In addition to the extension under construction of the LRT network from Blair Station to Trim Road, there are four major transit improvement projects scheduled to occur within the vicinity of the Campus, as outlined in the City of Ottawa's Transportation Master Plan (TMP). These projects are anticipated to increase the transit modal share to be greater than 25%.

Of these projects, three, under the affordable TMP network are anticipated to be in place by the 2030 horizon year. It should be noted that the city is in the process of creating a new TMP, and as such, priorities for projects and timelines are likely to change.

TABLE 9 **PLANNED TRANSIT IMPROVEMENTS**

PROJECT	DESCRIPTION	TRANSPORTATION MASTER PLAN TIMELINE
Ottawa LRT – Phase 2	Phase 2 expansion of the Ottawa LRT eastward from Blair Station to Trim Road.	Under construction
Blair Road	**Between Blair Station and Montreal Road:** › Exclusive bus lanes and transit signal priority. **North of Ogilvie Road:** › Road widening is anticipated for sections of the roadway and will include segregated cycling lanes and sidewalks on both sides.	2031 Affordable Network
Montreal Road	**Between Cummings Bridge and St. Laurent Boulevard:** › Peak period bus lanes as well as Transit Signal Priority along the corridor (TSP). › Segregated cycling lanes and sidewalks on both sides.	2031 Affordable Network
	Between St. Laurent Boulevard and Blair Road: › Road widening to provide exclusive bus lanes and transit signal priority. › Segregated cycling lanes and sidewalks on both sides.	2031 Affordable Network
	Between Blair Road and Ogilvie Road: › Road widening to provide exclusive bus lanes and transit signal priority. › Segregated cycling lanes and sidewalks on both sides.	2031 Concept Network ** Assumes that road widening to provide exclusive bus lanes and transit signal priority to be in place after 2030, as part of the conceptual network.*

One of those projects is the Montreal-Blair Road Transit Priority Corridor, for which an environmental assessment study (EA) has already been carried out. The EA examines options for improving transit service efficiency and the travel environment for all modes along the corridor, as well as right-of-way requirements for the recommended plan. Connectivity with the Blair Station of the O-Train Confederation line is a key priority to provide seamless mobility options for the community.

PLAN 6 **PUBLIC TRANSIT NETWORK**

- Project area
- Roadway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Pedestrian / cycling access point
- Pedestrian path / Sidewalk

Transit network typology (based on OC Transpo)

- O-Train line
- O-Train station
- Rapid — Station-to-station bus service. Operating 7 days/week in all time periods
- Frequent — Service every 15 minutes or less on weekdays. Operating 7 days/week in all time periods
- Local — Custom routing to local destinations
- Connexion to the O-Train station — Convenient connection to the O-Train. Weekday peak-periods only
- Limited Service — Service does not operate in all time periods. Service does not operate every day
- Occasional trips only
- Bus stop

3.2 LANDSCAPE

THE ANALYSIS OF ENVIRONMENTAL FEATURES AND VIEWS PROVIDE AN UNDERSTANDING OF THE UNDERLYING ENVIRONMENTAL COMPONENTS OF THE SITE, WHILE ACKNOWLEDGING THE IMPACTS GENERATED BY THE CURRENT URBAN DESIGN.

THE ANALYSIS OF VIEWS TO AND FROM THE CAMPUS IS ALSO IMPORTANT TO CONSIDER FOR A BETTER KNOWLEDGE OF THE LANDSCAPE OPPORTUNITIES.

FIGURE 27. OPEN SPACES AND MANICURED LAWN
Source : Stantec

Environmental features

TOPOGRAPHY

The landscape elements and topography enhance the environmental value of the site and increase the diversity of the natural landscape entities found on Campus. The Campus sits at a slightly higher elevation than the surrounding residential developments. Both the North and South parts of the Campus slope towards the site limits.

Most of the North Campus shows very little variation in topography in the developed area except for a few areas such as the Marion Street building surroundings where slopes are perceptible. The topography changes drastically in the Northeastern extremity. A soft slope starts from Douglas Street at the beginning of the forest tract. Beyond the filtration basin, the slope becomes very steep and forms a ridge. The ridge that overlooks the Ottawa river is hidden by the forest canopy. The slope continues beyond the lot limit and forms a flat plateau around the Sir-George-Etienne Cartier Parkway. There is about a 45-meter difference between the built area on top of the ridge and the bottom of the ridge.

The topographic change is not as significant on the South Campus given that there is only about a 10-meter difference in between the high point and low point. Similarly like the North Campus, the ground remains relatively flat around the developed areas except a small slope from Mackenzie and Lathe Drive. The terrain slopes towards the lot limits encompassing a flat drainage creek on the east side and a treed forest on the west side of the property.

SOIL AND BEDROCK

The results of soil characterization reports indicat that the soil typically ranges from a silty sand with gravel to a clayey silty sand. Cobbles and boulders are expected to be present within the fill and glacial till. Limestone bedrock or shale bedrock was hit at varying levels. Small segments of the bedrock are exposed at several places within the Montreal Road Campus. It was observed that the limestone was strong, and the shale was generally weak.

Consequently, the bedrock level variability across Campus illustrates that bedrock could be hit at higher levels than expected near developed areas and will have an impact on construction work. At this point, planting opportunities, surface level construction and varying underground infrastructures should not be limited across Campus. An in-depth analysis should be prioritized further along the project for specific areas since it is hard to isolate local areas that are bound to change at this point.

Different studies and soil and groundwater management plans provided insight on the soil and groundwater contamination levels. The reports target specific sectors of the site in addition to the North Campus future project lot. While most of the South Campus grounds are covered by the reports, there is currently no information available for the overall North Campus. It is particularly important to identify potential areas of concern that show high levels of contaminants in the case of possible construction, excavation, or landscaping work.

FIGURE 28. EXPOSED BEDROCK VISIBLE ON LATHE DRIVE IN A FRAMED VIEW
Source : Bibliothèques et Archive Canada

FIGURE 29. GREENSPACES AND MAJOR VISUAL NODE AT THE OVERPASS, PRESENCE OF EXPOSED BEDROCK
Source : Bibliothèques et Archive Canada

FIGURE 30. SLOPE IN THE DEVELOPED AREA OF NORTH CAMPUS
Source : Stantec

3.2

GREENSPACE AND VEGETATION

The features a diverse distribution of greenspaces, influenced by its historical farmland use. The 34.5 hectares of land that remain in a natural or naturalized state split in between two forest tracts are the main interests of the Campus.

Most of the North Campus is densely developed and consists of expanses of maintained lawn between buildings and road infrastructures. About 18.8 hectares of the land is in a natural or naturalized state. The Northeastern mature forest covers about 13.1 hectares and is part of a larger tract that stretches from the NRC property to the Ottawa River. The Butternut tree, a species at risk (SAR) that thrives in the moist soils of mature woods, was found in this deciduous forested area. Other common species in this area include sugar maples, basswood ashes, and white ashes.

The South Campus covers approximately 54 ha, is sparsely built and much of the land area is currently maintained as manicured lawns. Several small patches of trees are present within the maintained grounds. Roughly 15.7 hectares of the land remains in a natural or naturalized state. The treed forest area in the Southwest corner is a successional riparian forest where the grounds stay relatively wet. Compared to the other forest, that area is young and counts very few mature trees. The forest is characterized by pools of standing water otherwise known as vernal pools.

A 5.7-hectare decomposed woodlot, characteristic of secondary growth forest, is located in the Southeast Campus. Next to it is an open meadow periodically mowed. A small drainage creek runs through the centre and is lined with cattails. The eastern edge of the meadow is lined by a hedgerow of trees which is prolongated across Montreal Road onto the North Campus.

WETLANDS

The lowlands of Ottawa's urban fringe are largely characterized by the presence of swamps. The lowland swamp is located on North Campus; it starts after the ridge and extends beyond the lot limit to the Sir-George-Etienne Cartier Parkway. Ephemeral ponds or vernal pools are present during the wet seasons. Based on the topography of the sector, an accumulation of water would be coming from the highlands and preserved in the swamp. The North Campus dry meadow is periodically mowed which maintains its naturalized meadow state. Tall grasses are very present in the area.

On the South Campus, a naturalized meadow covers about 5.7 hectares. It is seasonally dry and long grasses dominate the overall area as well. Additionally, both native and non-native wildflower species can be found in the meadow and there is presence of wetland vegetation. Moreover, the Ontario Ministry of Natural Resources and Forestry has identified the presence of swamp-type wetlands in the wooded portion of the South Campus. This is reflected in the vernal pools that can be observed and the soggy forest ground throughout the year. Wetlands ecological functions should be assessed and classified prior to it in compliance with the Federal Policy on Wetland Conservation prepared by Environment and Climate Change Canada (ECCC).

FAUNA

The Campus is classified as a property in urban or near urban areas for which the probability of the presence of a natural habitat is low but existent.

A Phase I Species at Risk (SAR) and Wildlife Habitat Assessment was completed in a small portion of the North Campus. It identified 7 SARs to have the potential of occurring on site: barn swallow, monarch, yellow-banded bumble bee, eastern small-footed myotis, little brown myotis, eastern milksnake and the butternut tree. Within the 7 identified SARs, 6 mark a low likelihood of occurrence. Given the limitations of the study, it's possible that other SAR's are found throughout the Campus.

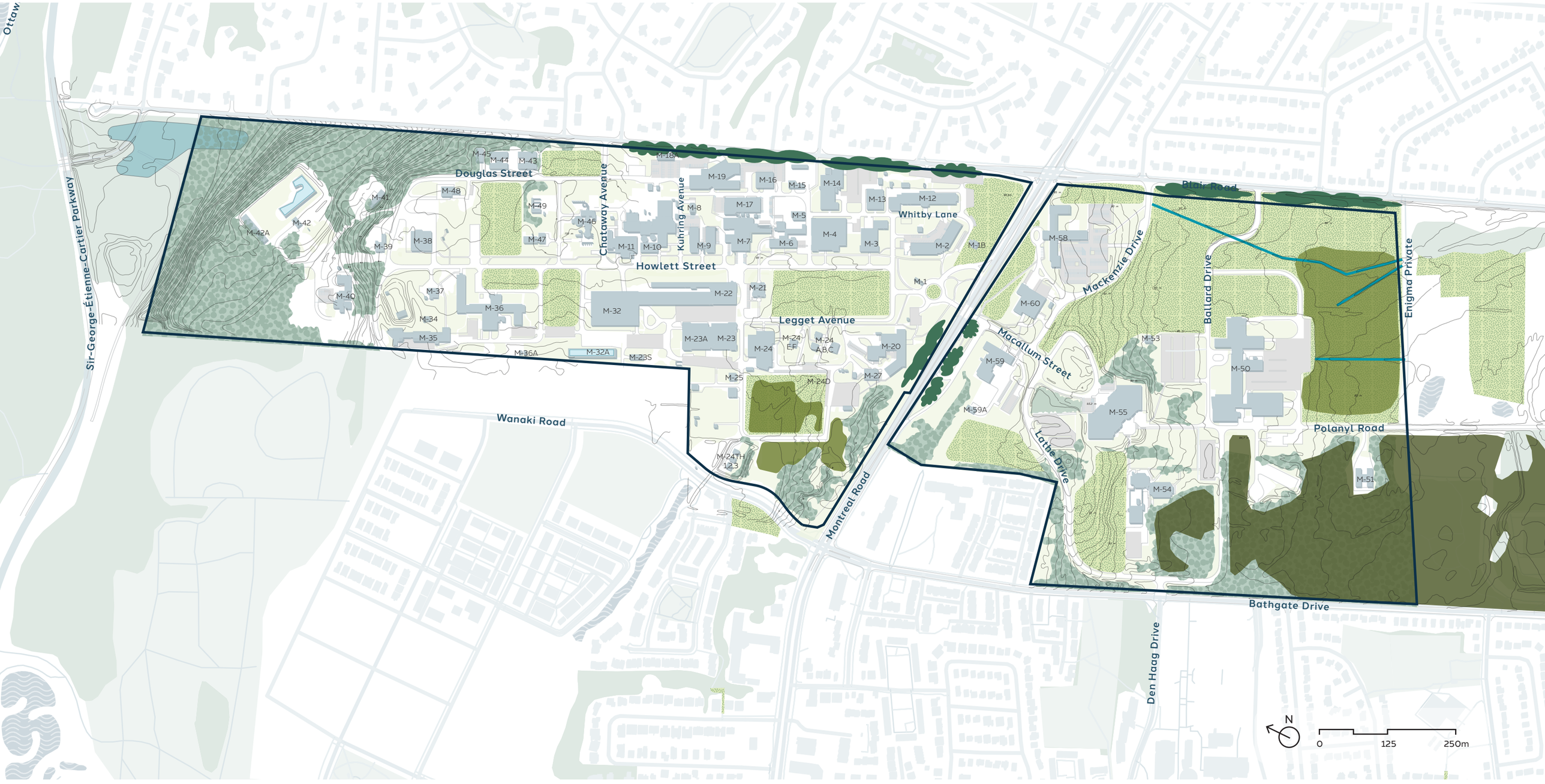
The migratory birds and bats have a moderate suitable nesting habitat and specifically for mature planted trees which can be found sporadically around the buildings.

The Butternut SAR survey, concentrated on the entire Campus, revealed additional wildlife observations. Threatened birds included the wood-pewee and bobolink, with potential sightings of other avian SARs. Common birds like red-eyed vireo and American robin were observed. Amphibians, such as wood frogs and Northern leopard frogs, found suitable habitats in wetlands and forests. No reptiles were detected, and large mammal sightings were unlikely due to urbanization and fencing, but small mammals were present. Insects, including the potential host for monarch butterflies, were common, with abundant Common Milkweed in South Campus meadows.

FIGURE 31. WOODED AREA ON THE NORTH CAMPUS
Source : Stantec

FIGURE 32. OPEN SPACES AND MANICURED LAWN
Source : Stantec

FIGURE 33. GREEN SPACES AND RETENTION POND NEAR M-42
Source : Stantec



PLAN 7 **ENVIRONMENTAL FEATURES**

- Project area
- Roadway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Wooded area
- Grassed area
- Meadow
- Swamp
- Hedgerows
- Drainage creeks
- Topography

3.2

Urban furniture and wayfinding

Urban furniture is located near many buildings and roads, including an old bus shelter, picnic tables, benches, and bike racks that are distributed across the Campus. Many benches and tables are typically collected and stored near M-41 during the winter months. They have no specific style and are very basic. However, they are typical of Federal site furniture: standardized, of durable quality and repairable. These are operational components that can be easily maintained.

Different types of signage and wayfinding are located near the main vehicular access points on the North and South sides of the Campus, including NRC identification panel along Montreal, Bathgate, and Blair roads as well as a couple of maps. Building M-58 itself is an element of wayfinding at the intersection Blair and Montreal Road with its big blue letters on the exterior wall that are visible from Elwood Street. Directional panels and signage for dog, speed limit and other restrictions are also found on site close to the access points.

FIGURE 34. EXISTING BIKE RACKS
Source : Stantec

FIGURE 35. GOVERNMENT OF CANADA SIGN, LOCATED NEAR MANY ACCESS POINTS

FIGURE 36. LITTER RECEPTACLE AND INTERNATIONAL SYMBOL OF ACCESS NEAR M-1 (GUARD HOUSE)
Source : Stantec

FIGURE 37. TABLES AND BENCHES STORES STORED NEAR M-41
Source : Stantec

FIGURE 38. SITE MAP ON MACKENZIE DRIVE
Source : Stantec

FIGURE 39. ELEMENT OF WAYFINDING AT INTERSECTION MONTREAL ROAD / BLAIR ROAD
Source : Stantec

FIGURE 40. EXISTING BUS SHELTER ON HOWLETT STREET
Source : Stantec

FIGURE 41. DIRECTIONAL PANEL NEAR LATHE DRIVE
Source : Stantec

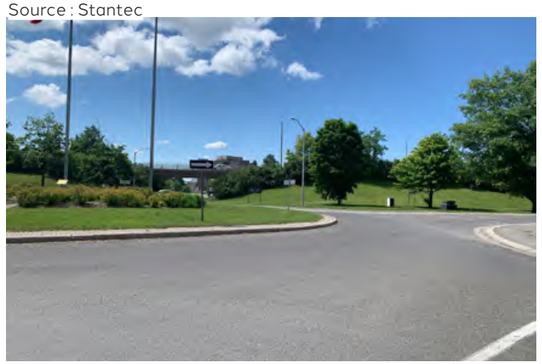
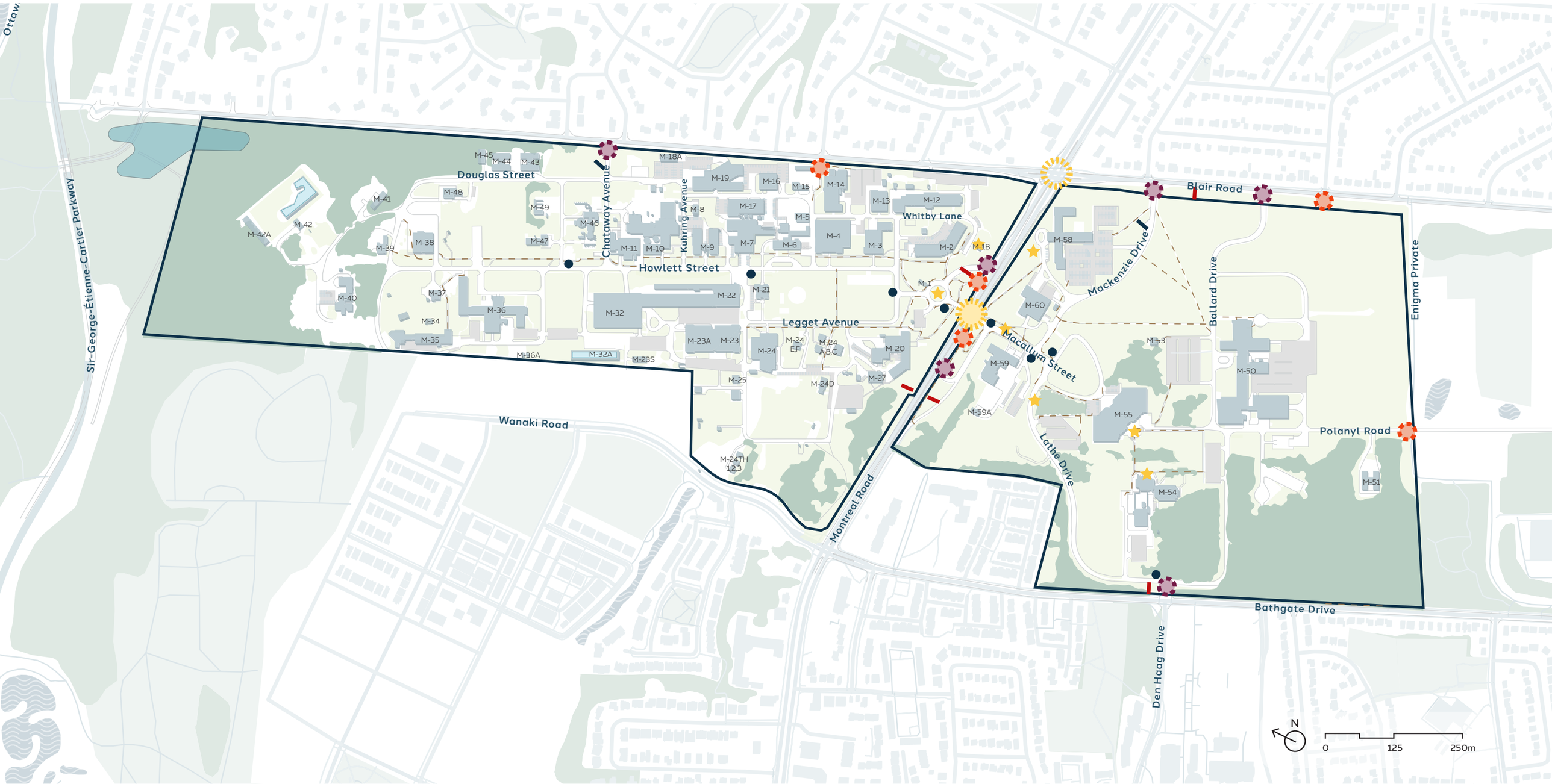


FIGURE 42. IMPORTANT VISUAL NODE AT THE UNDERPASS
Source : Stantec



PLAN 8 **WAYFINDING**

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Government sign of site
- Site map
- Directional signs
- Visual node
- Visual node/overpass
- Element of interest
- Vehicular access point
- Pedestrian/cycling access point

3.2

Views

VIEWS TO THE CAMPUS

Most views to the Campus are limited because of the existing vegetation along Montreal and Blair roads (Views C, D), except near the main access point on Montreal Road via the North side where it is possible to see the heritage Building M-1B (View B). On the east side on Montreal Road, Building M-58 is visible from Elwood Street (View A). On the west side, views to the Campus are possible from Wanaki Road (new residential development) and the apartment's buildings at the intersection Bathgate/Montreal Road (Views E and F). Refer to Plan 9 for the positions of the views.

FIGURE 43. CAMPUS VISIBLE FROM ELWOOD STREET AND MONTREAL ROAD INTERSECTION
Source : Stantec

FIGURE 44. OPEN VIEW ON MAIN ENTRANCE AT MONTREAL ROAD / NORTH CAMPUS
Source : Stantec

FIGURE 45. LIMITED VIEW ON BLAIR ROAD ON THE NORTH OF THE CAMPUS
Source : Stantec

FIGURE 46. LIMITED VIEW ON BLAIR ROAD, ON THE SOUTH OF THE CAMPUS
Source : Stantec

FIGURE 47. VIEW TO THE CAMPUS ON WANAKI ROAD
Source : Stantec

FIGURE 48. VIEW TO THE CAMPUS FROM THE NEW RESIDENTIAL DEVELOPMENT
Source : Stantec

VIEWS FROM THE CAMPUS

The Montreal Road Campus offers different types of views for the users, visitors, and employees. Each type of views tends to follow a certain type of space. The sport fields and grassed meadows create open views. In some areas on the Campus, the buildings and the landscape and create linear views. Vegetation also contributes to closed views in the existing wooded areas and filtered views in the planted grassed areas. Topography contributes to the interest of the landscape with high and low angle views. A few special features are also found on site. Per example, rock near M-60 and M-55, the architectural globe near M-58, and the flag posts on the North side. Note that the framed view on M-55 with big conifers and lighting posts is one of the best views creating a great and welcoming sense of place (View L). Refer to Plan 9 for the positions of the views.

FIGURE 49. OPEN VIEW ON GREENSPACES AND SPORT FIELDS NEAR M-50
Source : Stantec

FIGURE 50. TYPICAL OPEN VIEW ON GREENSPACE NEAR THE VEHICULAR ACCESS ON CHATAWAY AVE
Source : Stantec

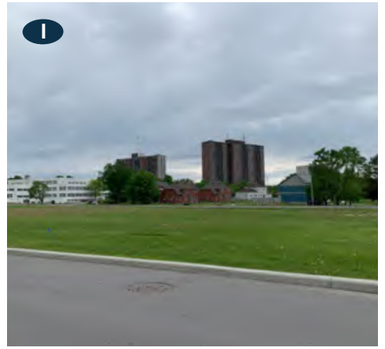
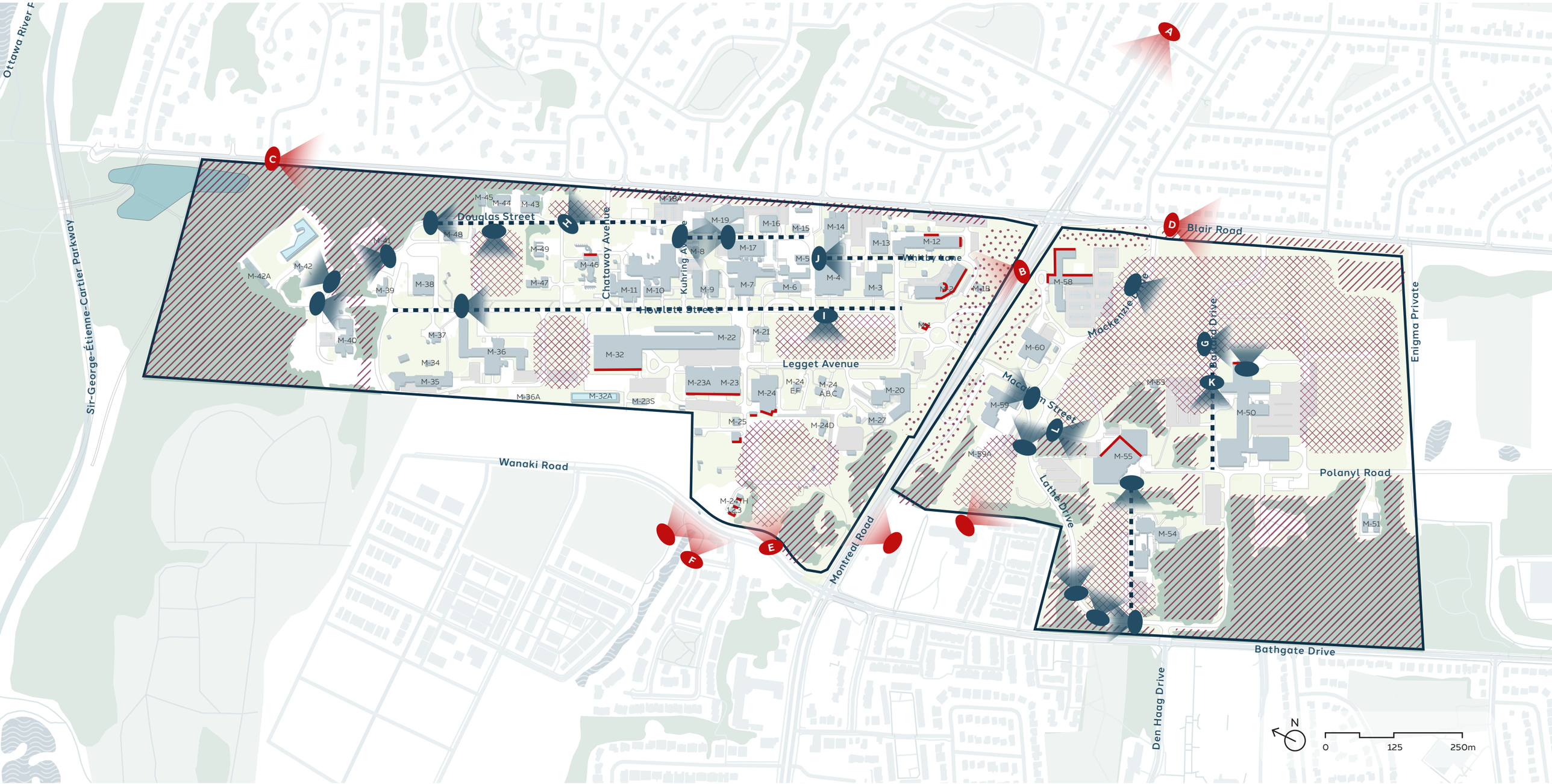


FIGURE 51. OPEN VIEW ON ON NORTH CAMPUS
Source : Stantec

FIGURE 52. BUILT ENVIRONMENT, LINEAR VIEW ON WHITBY LANE FRAMED BY THE BUILDINGS
Source : Stantec

FIGURE 53. LINEAR VIEW ON BALLARD DRIVE WITH VEGETATION ALONG THE ROAD
Source : Stantec

FIGURE 54. FRAMED VIEW ON M-55 WITH BIG TREES AND LIGHTING POSTS ALONG THE ROAD CREATING A WELCOMING SENSE OF PLACE
Source : Stantec

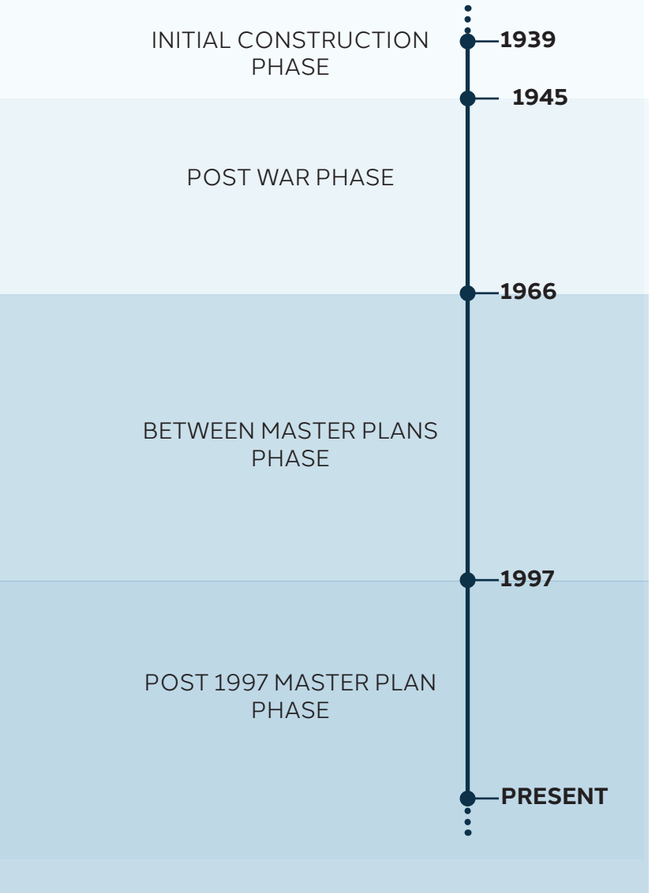


PLAN 9 **VIEWS TO THE CAMPUS AND FROM THE CAMPUS**

- Project area
- Roadway
- Buildings
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Filtered views
- Closed views
- Open Views
- Viewpoint to the site
- Buildings visible from the street
- Viewpoint from the site
- Visual corridor

3.3 BUILT FORM

THE ANALYSIS AND PRESENTATION OF THE INFRASTRUCTURES ALLOWS US TO UNDERSTAND THE CURRENT DEVELOPMENT LIMITS OF THE SITE, AND TO FORESEE THE IMPROVEMENTS THAT WILL BE NECESSARY IN THE FUTURE.



Built Evolution

In 1939, 52.60 hectares of agricultural land on Montreal Road were acquired for the construction of a new NRC campus, a second campus in addition to the Central Laboratory at 100 Sussex Drive inaugurated in 1932.

Located outside of Ottawa, the Campus positioning was deliberate considering the top-secret research taking place within it. The Campus remained largely unknown to the public until well after the war. The original farmhouse, known as building M-1B, is still present on the North Campus and currently sits vacant. With its combination of rural vernacular and classical revival inspired architecture, it differs greatly from the other buildings on the site.

Unlike the 100 Sussex laboratories, which accommodated all divisions within one large building, the approach for the Montreal Road Campus used smaller individual buildings, each dedicated to a specific research function. To streamline and accelerate construction, the original Campus buildings adopted a more industrial, modernist style with steel and cinderblock construction and a white stucco finish. This was a significant deviation from the Beaux-Arts architectural style of the Sussex Drive building, which reflected the changing architectural sentiment and influence of the European Bauhaus movement in Canada.

The Campus is a strong example of how European movements such as Internationalism and Streamline Moderne could be utilized in the Canadian context to optimize user flexibility and efficiency.

To provide organization for the Campus, all buildings were given names that began with the letter ‘M’ to signify their location on the Montreal Road Campus, followed by a number.

1939 TO 1945 – CAMPUS ESTABLISHMENT

1939 to 1941 – Initial Construction

Work on the Campus began in October 1939, with the first building, M-2, opening in 1941. The original footprint of the Campus was limited to North of Montreal Road. The west property line originally cut through the current “quad” area and was bordered with a security fence, as was the entire perimeter of the site. The entrance to the site was by a road off Montreal Road, in alignment with the entrance to the M-2 building. The original gate house, which has been demolished, was located along this entrance road.

The original buildings on the Campus, as part of this first construction phase, included M-2, M-4, M-5, M-6, M-7, M-14, M-22, and part of M-9. The buildings were implemented primarily lining the east side of the now Howlett Street, which acted as the “spine” for the Campus.

The buildings were constructed using quick construction methods, primarily utilizing cinder block, or steel with cinderblock or brick, with white stucco. The architecture of the buildings was in line with the modernist architectural styles of the time: Bauhaus, International Style, and Streamline Moderne. Notable elements included the white stucco exterior finish, the dark-trimmed ribbon windows, the flat roofs and horizontal profiles, the lack of ornamentations, and the streamlined curves (as noted on M-2, M-4, and M-9). These elements would also start to define the distinct architectural style of the Campus.

1941 to 1945 – Wartime Construction

Due to the urgency of wartime demands for research, the construction of buildings followed each other rapidly. The period between the opening of the Campus in 1941 and the end of the war saw continued construction to complete the original plans and new buildings to further the war efforts. By 1945, nine buildings on the Campus were open.

In this period, new buildings, such as the M-21, which house the Campus cafeteria, and M-23, were added to the west portion of site, thus continuing the development to the west of the central “spine” (now Howlett Street). A new addition was also added to M-9, showcasing the rapidly growing needs of the time.

The architectural styles of the buildings and fast construction methods continued throughout this second phase. For example, one can note the flat roofs and low profiles, the streamlined curves, the dark window bands, and the white stucco finish, as seen on earlier buildings on the site.

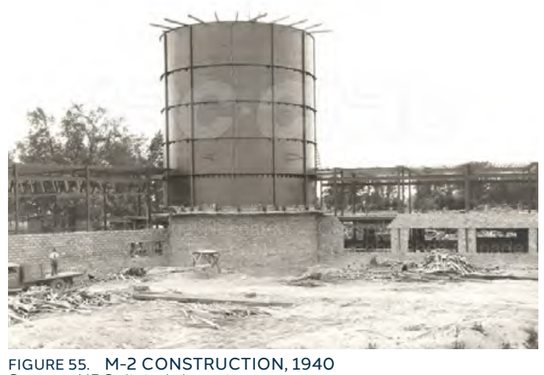


FIGURE 55. M-2 CONSTRUCTION, 1940
Source : NRC digital depositary

3.3

1939 TO 1945 – CAMPUS ESTABLISHMENT

Following the war, the Campus continued to expand as the NRC embarked on new research projects. The 1940's and 1950's were an important period for the NRC as it gained international renown and attracted scientists from across the world who came to use the modern research facilities. This resulted in a large construction boom across the Campus with many new buildings being constructed, each with highly specialized individual research purposes.

1945 to 1950

In the years immediately following the war, additional buildings were added to the site. These new buildings were generally of a smaller scale, located behind the first row of buildings east of the central "spine", including M-16 and M-17. The exception was the M-3 building, constructed around 1946 and located along the central "spine". The architectural elements from the wartime buildings, including the white exterior, dark ribbon windows, and low flat roof profiles, continued to be used during this period.

FIGURE 56. M-14 CONSTRUCTION, 1941
Source : NRC digital depositary

1950 to 1953

The period of 1950 to 1953 saw more significant changes and expansion to the Campus. On the North Campus, the perimeter security fence was relocated, and the site was expanded to the South-west corner along Montreal Road.

Major buildings were built on the site, including M-12, M-20, and M-50. With their flat rooflines, dark ribbon windows and white stucco exterior, M-12 and M-20 continued to follow the International Style seen throughout the North Campus. These two buildings would later become federally designated heritage buildings through the Federal Heritage Buildings Review Office (FHBRO).

A new overpass at Montreal Road was constructed, allowing for a new underpass connection between the North and South Campus. A new gate house (M-1) was constructed at the same time, in line with the underpass at the entrance to the North Campus. Work on this significant modification to the Campus was completed in 1958. The North Campus remained secure while the South Campus was unsecure.

M-50, completed in 1953, was the first major building South of Montreal Road, marking the beginnings of the South Campus. The building also deviated from the uniform style of the Campus, utilizing a buff face brick in its façade instead of the white stucco finish seen on other buildings. Other buildings during this period include M-10 and M-40.

1953 TO 1966 – PRE MASTER PLAN

In the period of 1953 to 1966, before the first Master Plan for the site was created, new construction continued. This period saw the addition of new buildings on the South Campus, including M-58, M-59, and M-60 along Montreal Road. As previously seen with M-50, M-58 deviated from the uniform style and materiality of the site by utilizing white and coloured precast concrete and stone in its facades.

On the North Campus, previous worker housing on the North end of the site were demolished, as development of the site extended Northwards, in line with the central "spine". Larger buildings, such as M-19, M-35 and M-36, were built in this period. The architecture of these buildings remained generally in line with the modernist International Style and characteristic elements seen throughout the North Campus. Several other smaller buildings and accessory structures were also added throughout the North Campus.

FIGURE 57. OVERPASS, 1953
Source : NRC digital depositary

FIGURE 58. NEW GATE, 1955
Source : NRC digital depositary

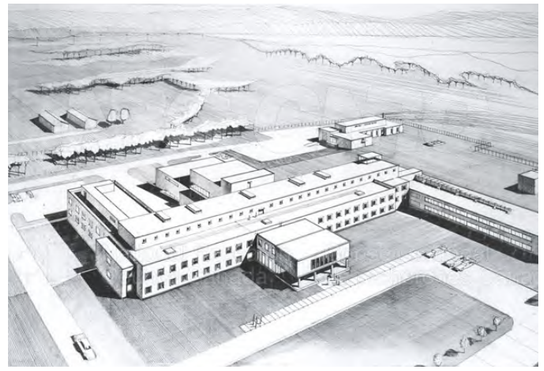


FIGURE 59. M-36 SKETCH, APPROX. 1955
Source : NRC digital depositary

FIGURE 60. SOUTH CAMPUS VIEW, 1966
Source : NRC digital depositary

3.3

1967 TO 1996 – BETWEEN MASTER PLANS

In 1967, a Master Plan for the Campus was prepared by Shore & Moffat and Partners, as mentioned in Section 2.4. At the time, the North Campus was approaching maximum occupancy, so a comprehensive planning effort began to explore how buildings could be added to the South Campus. On an urban scale, the Master Plan prioritized automobile circulation around the site to better accommodate the expected higher density of the Campus. This notably included a free-flowing interchange on Montreal Road constructed during road expansion from 2 to 4 lanes, to permit easier turning movements.

For the North Campus, the large spacious avenue created by the central spine was noted as a defining characteristic of the Campus. To create a focal point at the end of the vista, it was recommended to add a building on the axis of the spine. It was also recommended to make the outer road on the Campus a ring road with exits to the surrounding city road to ease vehicular traffic on the central spine.

For the South Campus, a ring road around the Campus was proposed to connect with surrounding city roads while allowing for a non-vehicular central core. A 'mall' composed of community squares was also recommended to run from the North end of the South Campus to the South end. The future National Science Library (M-55) was suggested as a logical landmark at the North extremity of the mall, as part of the first community encountered upon entrance to the South Campus.

While the North side of the Campus continued construction in the modernist International style, the late 1960's and 1970's saw the introduction of a new style of concrete buildings on the South side of the Campus, with M-54 and M-55. These buildings represent the evolution of the site as the style shifted away from the original small-scale streamlined buildings and towards much larger concrete Brutalist architecture, which was the popular style for institutional buildings at the time.

Sometime during the late 1970's or the 1980's, the roundabout at the entrance of the North Campus was implemented, assumed to be in conjunction with the widening of Montreal Road. This new roundabout led to the relocation of the 1953 gate house (M-1) to its current location, as well as changes to the entry and approach to both North and South Campus. This modification to the entry sequence continued to deemphasize the prominence of building M-2, which was directly aligned with the original entry road for the Campus.

Several new buildings were also added to the Campus during this period. However, the remaining South Campus and proposed mall was not developed accordingly. Overall, the Master Plan was not fully implemented, as the ring roads and the extensive development of the South Campus were never realized. However, the influence of the Master Plan can be seen in the development of the site in the 30 years that followed.

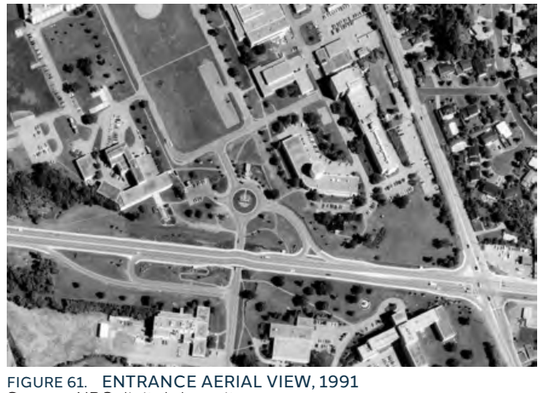


FIGURE 61. ENTRANCE AERIAL VIEW, 1991
Source : NRC digital depositary

1997 TO PRESENT – POST 1997 MASTER PLAN

In 1997, an updated Campus Master Plan was prepared by Griffiths, Rankin, Cook Architects. The Master Plan gave general recommendations on zones for new development, as identified in Section 2.4. The Master Plan also recommended reinforcing the "mall" and "quad" on the North Campus and creating a visual identity and entrance for the South Campus on Blair Road.

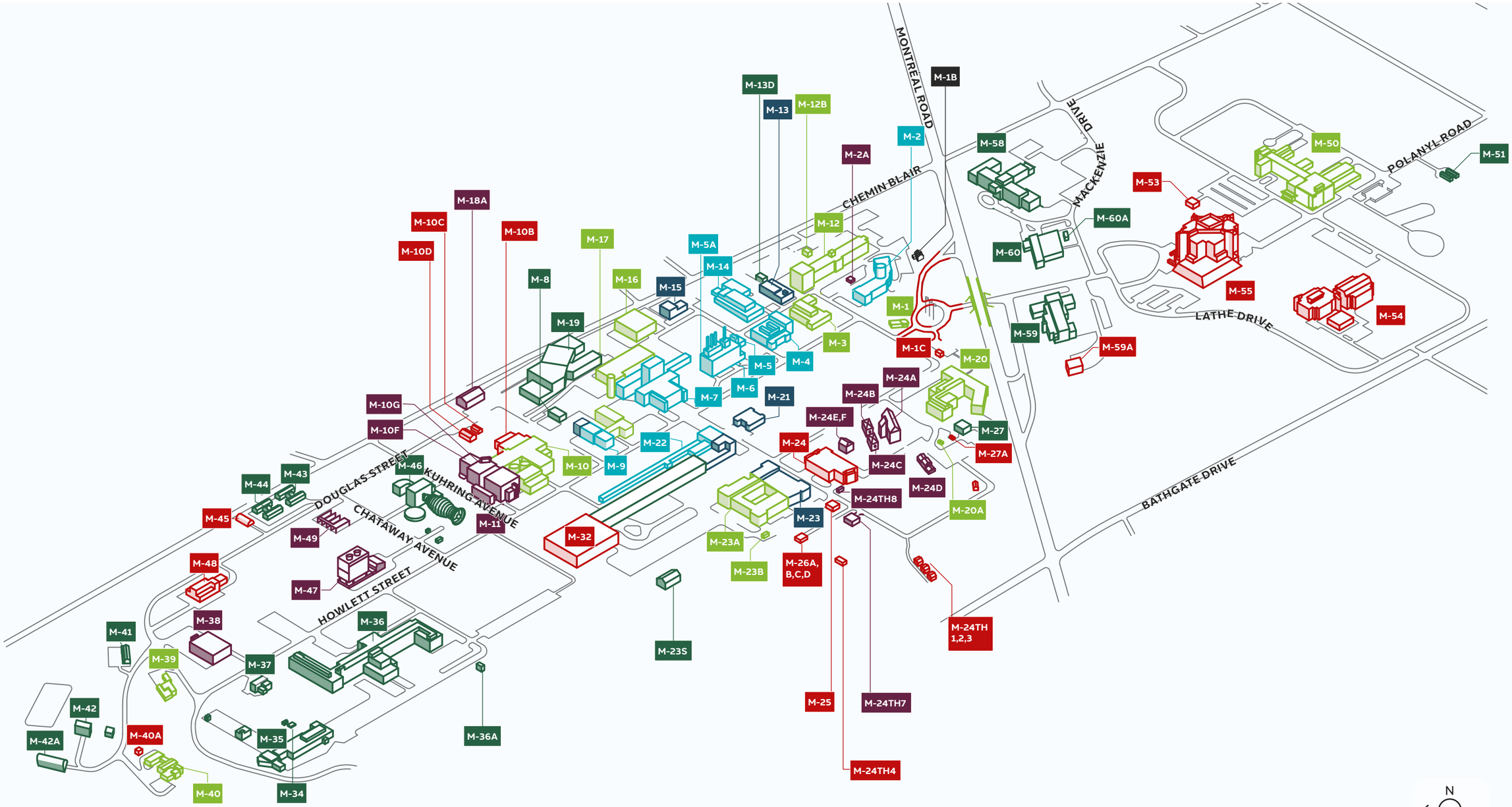
From an architectural perspective, the Master Plan called for the compatibility of new construction with the early Modern architecture of the Campus, while avoiding reproduction. The recommendations for the zones of development were mostly followed, and the Campus continued to increase its density. By 1997, there were 93 buildings located on the site. This would grow to 102 buildings by 2021. Following the plan NRC has added 14,917 m^2 of new space, mostly for science, through nine new buildings and four expansions of existing buildings. NRC has also divested itself of 34.7 hectares of land and become a more densified Campus.

The new buildings are generally compatible with the buildings on the Campus, introducing new materials while remaining in the colour palette. For example, the main façade of M-38 features a curtain wall and white metal panel envelope, where the glazing openings recall the ribbon windows of the original building. Smaller buildings utilize corrugated metal cladding with a white finish.

This period also saw the reduction of the Campus footprint. In 2008, the NRC disposed of 33.4 hectares of landholdings at the Southwest corner of the site to Department of National Defence. In 2016, 1.3 hectares along the Northwest border or the site was disposed to Canada Lands Corporation for the Wateridge development project.

FIGURE 62. M-38 BUILDING
Source : Stantec

FIGURE 63. M-11 BUILDING
Source : Stantec



PLAN 10 **CONSTRUCTION PHASES (REFER TO TABLE 11)**

Pre-1900
Prior to Campus

INITIAL CONSTRUCTION PHASE – 1939-1945

1939-1941
Campus opening

1941-1945
Campus opening

POST WAR PHASE – 1945-1966

1945-1953
Post war

1953-1966
Pre-masterplan

BETWEEN MASTER PLANS – 1967-1997
1967-1997
Between Master Plans

POST 1997 MASTER PLAN – 1997-PRESENT
1997-Present
Post 1997 Master Plan

3.3

Architectural Significance

CURRENT CONDITION OF BUILDINGS

NOTE: *While this section relays information presented in building condition reports from 2008 onwards, additional work must be completed to determine their current condition and suitability for future uses. The information presented in this section forms a baseline understanding but does not complete the review of each building.*

The condition information has been correlated with the available Building Condition Reports (BCR) and Facility Condition Index (FCI) information provided. Based on this information, condition assessment has been carried out for many buildings in 'fair' or 'poor' condition, while buildings in 'good' condition have generally not been assessed. There may be additional condition assessments for buildings where condition is not currently listed. It is also understood that the NRC continues to update files on building conditions and costs (FCIs).

Based on condition information provided by the NRC from 2008 onwards and the NRC Real Property Portfolio Plan, there are 26 buildings in 'good' condition (green – 23% of area), 24 buildings in 'fair' condition (yellow – 64% of area), and 18 buildings in 'poor' condition (red – 13% of area). A few buildings have not yet been assessed, and their condition is unknown. Refer to Plan 11 for the building condition map and Table 10 for the criteria for each condition, per the NRC Real Property Portfolio Plan.

The BCRs generally offer a high-level review of the buildings, including the structure, exterior envelope, interior finishes, and mechanical and electrical services. Recommendations are generally made for a 30-year span based on found conditions and the expected useful life of the elements.

The two federally designated heritage properties, M-12 and M-20, are noted as being in "fair" condition in the BCRs, prepared in 2018 and which are high-level assessments (Level 1) of the facilities.

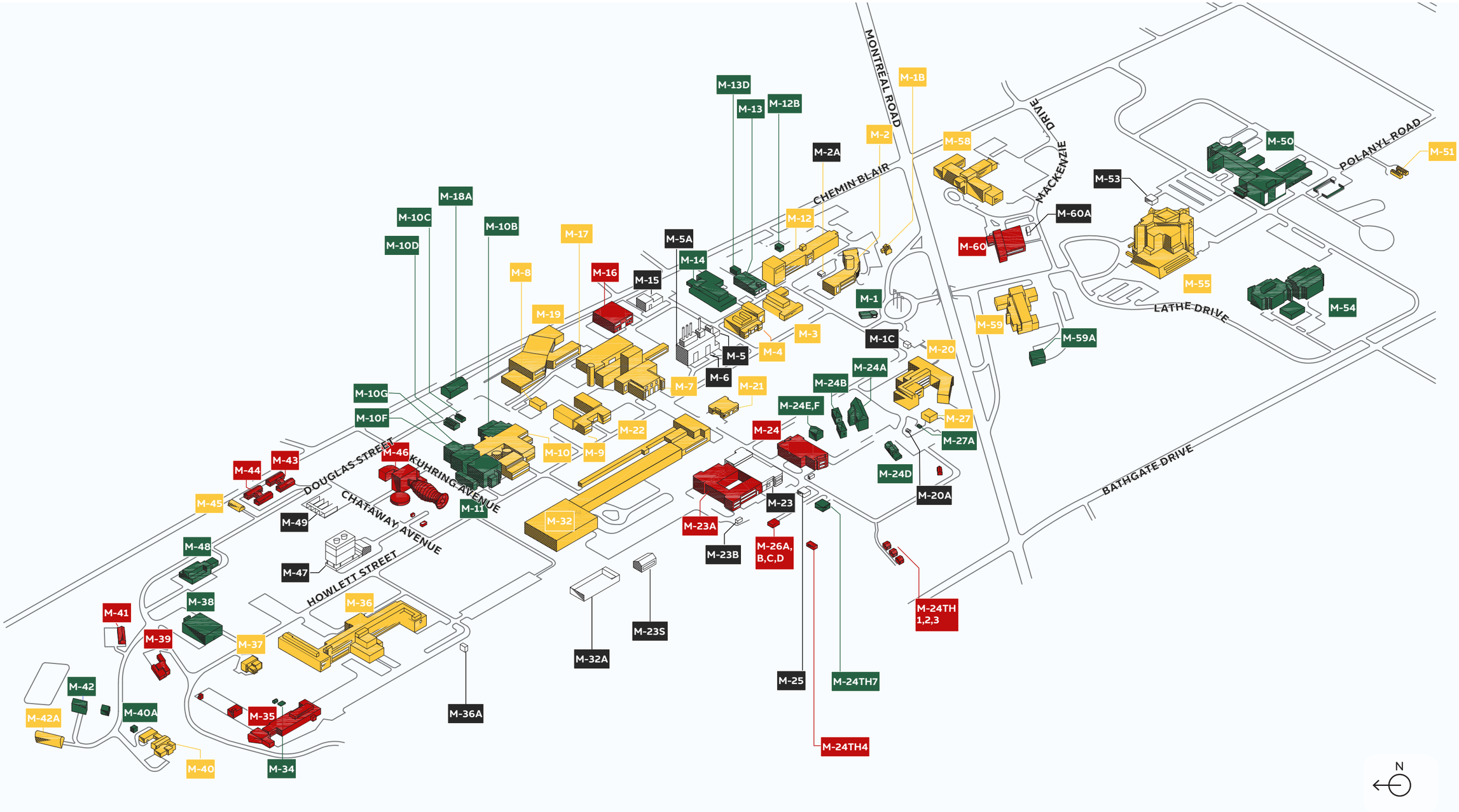
A broader overview of the condition of the buildings is needed. It is recommended to develop and implement a framework to properly assess and classify the buildings and their conditions. This new framework should be applied throughout the Campus, to ensure a consistent level of assessment of all buildings.

In deciding the recommended approach for buildings that could be vacated in the future, the condition and cost of remediation should be considered along side with the heritage value, contextual value, and tenant requirements, rather than a simple dollar outlay value per year.

TABLE 10 **CONDITION CRITERIA**

GOOD <15%	Risk of Failure	Unplanned component failure is highly unlikely
	Impact on Operations	Operational and maintenance costs will be predictable
	Impact on Functionality	The building will provide a clean and functional environment
FAIR 15% TO 25%	Risk of Failure	Unplanned component failure in building is unlikely
	Impact on Operations	There may be some variability in operational costs
	Impact on Functionality	The building will meet most operational needs with minor complaints
POOR >25%	Risk of Failure	Unplanned component failure is likely
	Impact on Operations	Operational costs, including unplanned repair and maintenance will be high
	Impact on Functionality	Facility will look worn with serious signs of deterioration

Source: NRC Real Property Plan – October 25, 2021



PLAN 11 **CURRENT CONDITION OF BUILDINGS**

Source: NRC Real Property Plan – October 25, 2021

- Good
- Fair
- Poor
- Unknown

3.3

HERITAGE CONSIDERATIONS

The Montreal Road Campus has a unique history and character, as it has been in continual use and development since 1941, has highly specialized functions and generally cohesive architectural styles. As such, although the Campus as a whole is not currently designated as a heritage site or district, the Campus and its buildings and landscapes should be looked at holistically as a historic place with unique heritage values and character-defining elements that will require careful consideration during all future developments throughout the Campus.

Three of the buildings on the Campus currently have heritage designations. M-12 and M-20 are both federally designated heritage buildings through FHBRO, and M-1B is a municipally designated heritage building through the City of Ottawa. In addition, there are currently approximately 55 buildings that are eligible for FHBRO review due to their age and heritage character. It is also expected that additional buildings will require FHBRO review through the lifespan of this Master Plan as they reach their 50 years of age mark.

FHBRO Designated Buildings

Buildings M-12 and M-20, on the Campus, are federally designated heritage properties. Their original designations were as 'Recognized' Federal Heritage Buildings by the FHBRO under the previous Treasury Board Policy on the Management of Real Property. They were grandfathered as Federally Designated Properties under the new Policy on the Planning and Management of Investments and the Directive on the Management of Real Property, which were fully adopted in May 2022. Some conservation terminology has changed under the new federal policy instruments, but key expectations for protection and review of interventions to federal heritage properties remain valid.

As part of the mandatory procedures under the Treasury Board Directive on the Management of Real Property, Parks Canada Agency must be consulted before undertaking any intervention that may impact the heritage value of a federal heritage property or an archaeological site on federal land, to ensure that appropriate heritage conservation advice is obtained. Additionally, best efforts are to be made to identify and facilitate alternative uses, including rehabilitation for adaptive reuse, before identifying a federal heritage property as surplus; if, after this, a building is categorized as surplus, it could be either demolished or divested, following the appropriate processes and procedures in place at the time.

The Heritage Character Statements of the buildings should be consulted whenever any changes to the buildings are anticipated and should serve as the key reference documents for future reviews of interventions.

Municipally Designated Buildings

Building M-1B (the farmhouse), which pre-dates the original purchase of the land that is now known as the Montreal Road Campus, is designated municipally under Part V of the Ontario Heritage Act. This act gives municipalities such as the City of Ottawa the authority to designate individual properties that have cultural heritage value, and heritage conservation districts.

According to the City of Ottawa Heritage Register, the farmhouse was originally constructed circa 1860. The 1.5 storey stone farmhouse is a good example of an early Ontario farmhouse and encapsulates both vernacular rural architecture and the classical revival style. Notable features that should be respected include the twin chimneys, central gable, and classically inspired portico and balcony. Building M-1B serves as a physical reminder of the rural roots of the Campus and surrounding area, which is a testament to the evolution of the site since it was purchased by the NRC.

Currently, the site as a whole does not have a heritage district designation.

Additional Buildings for FHBRO Evaluation

Real property practitioners must seek a heritage evaluation of any building 50 years of age or older from the FHBRO at Parks Canada Agency when the building is crown-owned or planned for acquisition by purchase. In addition to the two buildings that were previously designated by FHBRO, there are currently 55 buildings on the Campus that meet these qualifications and are to be evaluated for heritage designation. Additional buildings will also reach the 50-year milestone during the lifespan of this Master Plan and should be evaluated at that time. If any of these additional buildings are determined to merit heritage designation, they must follow the same procedures discussed with best efforts being made to identify and facilitate alternative uses, including rehabilitation for adaptive reuse, before identification as surplus.

Many of these buildings that are to be evaluated are constructed in the same modernist international style as the previously designated buildings and reflect the overall style of the Campus as a whole. Their value is strengthened by their close proximity and collective design intent on the North side of the Campus. Two of the newer Brutalist style buildings on the South side of the Campus (M-54 and M-55) are also within the period of evaluation. These buildings evidence the evolution and expansion of the Campus in the late 60's and 70's, as well as the shift to larger concrete superstructures on the South Campus. A current list of all the Montreal Road Campus buildings and their FHBRO evaluation requirements is included in Table 11 (minus the original Municipal designated farmhouse (M-1B)). It is understood that submissions for evaluation for heritage designations are being prepared for all relevant buildings. The evaluation submission for M-21 was submitted in 2022.

3.3

TABLE 11 **CONSTRUCTION PHASES & HERITAGE EVALUATION REQUIREMENTS (REFER TO PLAN 10)**

CONSTRUCTION PHASE	BUILDING NAME	FHBRO REVIEW REQUIRED
1939 – 1941 Original Construction	M-2	Yes
	M-4	Yes
	M-5	Yes
	M-6	Yes
	M-7	Yes
	M-9	Yes
	M-14	Yes
	M-22	Yes
1941 -1945 Wartime Construction	M-13	Yes
	M-15	Yes
	M-21	Yes
	M-23 / 23A	Yes
	M-32A	Yes
1945 – 1953 Post-War Construction	M-1	Yes
	M-3	Yes
	M-10	Yes
	M-12	Already designated
	M-12B	Yes
	M-12W	Yes
	M-15A	Yes
	M-16	Yes
	M-17	Yes
	M-20	Already designated
	M-23B	Yes
	M-39	Yes
	M-40	Yes
	M-50	Yes

CONSTRUCTION PHASE	BUILDING NAME	FHBRO REVIEW REQUIRED
1953 – 1966 Pre Master Plan	M-5A	Yes
	M-8	Yes
	M-13D	Yes
	M-19	Yes
	M-20A	Yes
	M-23S	Yes
	M-27	Yes
	M-34	Yes
	M-35	Yes
	M-36	Yes
	M-36A	Yes
	M-37	Yes
	M-41	Yes
	M-42	Yes
	M-42A	Yes
	M-43	Yes
	M-44	Yes
	M-46	Yes
	M-46A	Yes
	M-46B	Yes
	M-51	Yes
	M-58	Yes
	M-59	Yes
	M-60	Yes
	M-60A	Yes

CONSTRUCTION PHASE	BUILDING NAME	FHBRO REVIEW REQUIRED
1967 – 1996 Between Master Plans	M-1C	No
	M-2A	No
	M-10B	Yes
	M-10C	No
	M-10D	No
	M-10E	Yes
	M-12A	No
	M-14A	Yes
	M-17A	Yes
	M-24	Recommended (c. 1965 – 1976)
	M-24TH1	No
	M-24TH2	No
	M-24TH3	No
	M-24TH4	No
	M-24TH5	No
	M-25	No
	M-26A, B, C, D	No
	M-27A	No
	M-32	Recommended (c. 1967 – 1976)
	M-40A	No
	M-45	Yes
	M-48	No
	M-53	No
	M-54	Recommended (c. early 1970s)
	M-54W	No
	M-55	Recommended (c. 1965 – 1976)
	M-59A	No

CONSTRUCTION PHASE	BUILDING NAME	FHBRO REVIEW REQUIRED
1997 – Present (2024) Post Master Plan	M-10F	No
	M-10G	No
	M-11	No
	M-18A	No
	M-24A	No
	M-24B	No
	M-24C	No
	M-24D	No
	M-24E	No
	M-24F	No
	M-24TH7	No
	M-24TH8	No
	M-38	No
	M-46C	No
	M-47	No
	M-49	No

3.3

Future Plans for the Site

OVERVIEW

While this section outlines a number of potential programs, no definitive work program, location, use or sizing of buildings/users has been finalized at this time. This section is for informational purposes and is a consideration of the Master Planning process only.

There are several projects being developed on the Campus in the next few years:

1. M-50 additions, including M-50 RAFF project
2. Phase 4 of sewer separation located on North Campus
3. Water redundancy piping from Bathgate;
4. Office consolidation at M-55
5. Two Upcoming Labs Canada Research Hubs

ENABLING SCIENCE PROGRAM THROUGH EXISTING PARTNERSHIPS

In 2018, Federal Government created the Laboratories Canada (LC) initiative, a 25-year plan that focuses on achieving science excellence through new federal laboratories . A preliminary agreement between NRC, Labs Canada and PSPC for new hubs has been proposed for the North and South Campus. The goal is to combine departments that are currently subdivided in small buildings throughout the Campus to optimize workflow. It is proposed to build new science facilities that will support universal accessibility and environmental sustainability, while also ensuring federal scientists have access to modern scientific equipment and Information Technology (IT), enabling them to better collaborate with partners and achieve science excellence.

3.4 INFRASTRUCTURE

THE ANALYSIS AND PRESENTATION OF THE INFRASTRUCTURES ALLOWS US TO UNDERSTAND THE CURRENT DEVELOPMENT LIMITS OF THE SITE, AND TO FORESEE THE IMPROVEMENTS THAT WILL BE NECESSARY IN THE FUTURE.

Site Physical Security and Access

The Master Plan shall provide options to enhanced security 24/7 with an eye towards maintaining reasonable access for the public to the Campus in an effort to maintain a sense of openness and transparency with the neighbouring communities.

The current site physical security posture is provided by the following components:

- Security guards on site 24/7, 365 days a year.
- Security guards patrol the site (numerous patrols per 24-hour period).
- Guardhouse equipped with video surveillance system and numerous monitors allowing monitoring the overall site.
- The numerous video surveillance cameras implemented across the site provide a good overall coverage of the interior of the site.
- The perimeter of the North part of the Campus is completely fenced with a 2.13-m-high fence with a 305-mm barbed wire at the top.
- Two vehicular gates and one pedestrian gate on Blair Road. Those gates are closed and locked outside of site regular business hours.
- One vehicular gate accessible from Montreal Road.
- One vehicular entrance (not equipped with a gate), right next to the guardhouse, from Montreal Road.
- Proper lighting at each site entrances;
- Access to buildings is generally controlled by an electronic access control system.

INFORMATION GATHERED

Based on the information provided during the initial phase (gap analysis), it has been determined that the overall condition of the fence needs to be assessed. During this phase, all security requirements were collected through a security workshop and requests for information.

The Table 12 presents the security requirements that have been confirmed and required to be addressed by the Master Plan during the gap analysis.

More information about the security requirements is provided at Appendix A.

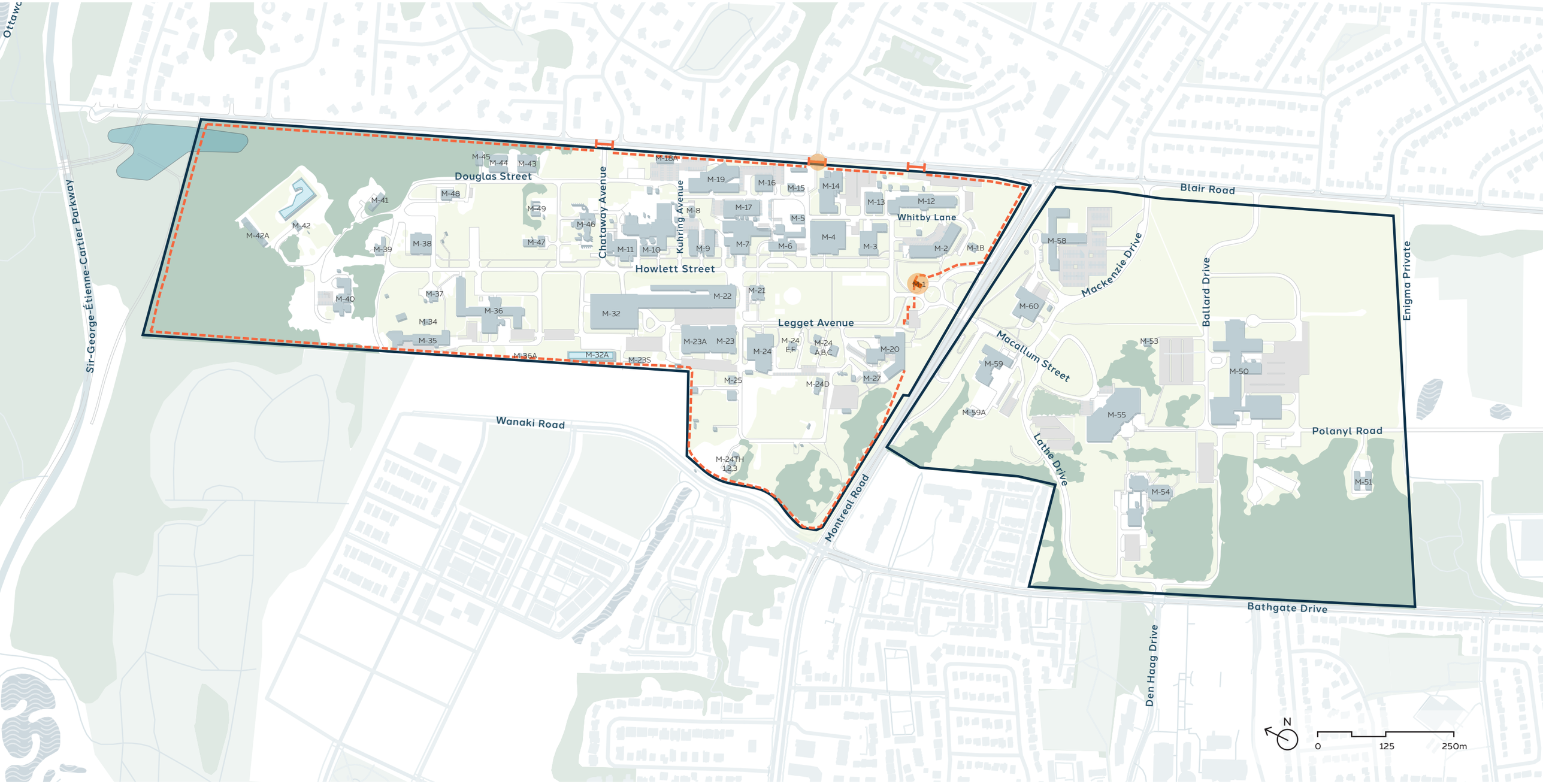
The following are findings resulting from the site security survey. The fence assessment revealed the following:

- Numerous sections of the fence on Blair Road and within the woodland area (towards Sir George-Étienne Cartier Parkway) are either:
  - Damaged (missing chain link parts, top post disconnected, and others).
  - Have vegetation and tree's branches growing through the fence chain link and barbed wired section.
  - Clear distance of more than 200 mm between finish ground and the fence bottom section.
- An Unknown unlocked manual gate has also been discovered (Position aligned with Blair and the continuity of Bracken Ct). A portion of this gate is cut where the Padlock could be used to lock the gate. This gate is noted as unknown as it was never mentioned to be present at this location over the security workshop with stakeholders and is not on any document provided
- The East portion of the fence (towards Wanaki and Montreal Roads) is generally in good condition. However, some sections are:
  - Lower than the required 2.13 m height and does not include barbed wired.
  - Clear distance of more than 200 mm between finish ground and the fence bottom section.
  - Have vegetation and tree's branches growing through the fence chain link and barbed wired section.

3.4

TABLE 12 **SECURITY REQUIREMENTS**

	SECURITY REQUIREMENTS	APPLICABILITY
1	Repair and upgrade the existing fence including installing outriggers and barbed wire on missing sections of fence and removing all vegetation up to 3 m from of either side of the fence in order to significantly reduce the need for continuous vegetation maintenance.	Overall Campus (North part)
2	Repair and upgrade the existing vehicle gates to make the level of security commensurate with the fence. Consider extending the ESS to the gates (e.g., access control, video surveillance).	Campus (North part)
3	Install vehicular anti-ramming measures such as bollards or landscaping elements, typically planters, walls or berms at the front and sides of the facility. Particular attention should be directed to the primary access points such as the main entrances, employee entrance and loading dock if located on an axis of attack. The following NRC buildings require (as per TRA's) vehicle ramming prevention measure: › M-1 for employee and pedestrian safety because of the roundabout. › M-6 Heating plant direct access to plant. › M-20 because lobby is even with ground and vehicles coming off of Montreal Road could accidentally enter building. › M-54 main entrance is even with ground.	Overall Campus (North part)
4	Provide adequate lighting at the primary access points, loading docks, facility perimeter, vehicular and pedestrian pathways and surface parking lots. The lighting must be compatible with video surveillance lighting requirements.	Overall Campus (North part)
5	Ensure that trees and shrubs are sufficiently distant from the perimeter walls (at least 3 m) to minimize concealment opportunities and trees cannot be used to climb onto nearby structure to reach a window access point or roof.	Overall Campus (North part)
6	Call for assistance exterior emergency station connected to M-01 guard post, implementation at the following locations: › Near M-50 › U-61 parking areas › U-72 parking areas	Campus (North part)
7	Master Plan shall include the option to add monitoring of vehicular and pedestrian gate status (gate status open/closed status contacts) by the ESS (Electronic Security System).	Overall Campus (North part)
8	The Master Plan may bring additional potential pedestrian/bike connection. Stantec understands that if the Master Plan is considering adding such connection to the North site perimeter. The developed options shall consider adding gates that can be locked at night and to be monitored by the ESS.	Overall Campus (North part)
9	Apply Crime Prevention Through Environmental Design (CPTED) principles to implement mitigation measures to the extent possible around the facility such as ha-ha walls, landscaping features, bollards and planters.	Overall Campus (North part)



PLAN 12 **EXISTING PERIMETER FENCES AND GATES**

- Project area
- Roadway
- Buildings
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Existing fence
- Guard house (M-1)
- Existing vehicular gate
- Existing pedestrian / cycling gate

3.4

Watermains, Sanitary Sewer, and Stormwater Infrastructure

NORTH CAMPUS

Existing Water Service

Water supply is provided via (2) separate connections and 305 mm watermains connecting at Wanaki Road and Blair Road.

Sanitary Sewer Servicing

Buildings on the North side of Montreal Road are serviced by private, partially separated sewers. Recent upgrades to the combined sewers were undertaken with three phases under a sewer separation program. We understand that the three phases have been completed. However, as discovered in a recent CCTV site review it became apparent that there remains both storm and sanitary connections to the sanitary sewer. The extent of the sewer separation phase and expected flows remains to be confirmed.

Stormwater management

Stormwater is collected and directed to a storm outlet to the North discharging into an on-site stormwater management pond, and two storm outfalls to the west ultimately discharge into a stormwater management pond South of Thornecliffe Park.

SOUTH CAMPUS

Existing Water Service

Water supply is provided through one connection to the North and a 305 mm connection on Blair Road. Water service through the Campus, similar to the North, is through private water servicing.

Sanitary Sewer Servicing

Buildings M-50, M-54, and M-55 are serviced by private, partially separated sewers. We understand that the remaining buildings South of Montreal Road currently discharge to septic tanks. A pump station adjacent to M-50 is no longer in service. At time of writing, we were not able to ascertain why the pump station was decommissioned, the sizing of the pump station and the potential capacity to reuse the existing infrastructure.

Stormwater management

Stormwater is conveyed overland to the South via ditches and drainage channels that outlet to the Blair Road storm sewer South of Dunham Street. Stormwater is conveyed for the facilities South of Enigma Private outlet to Ogilvie Road.

INFORMATION AND DATA GAPS

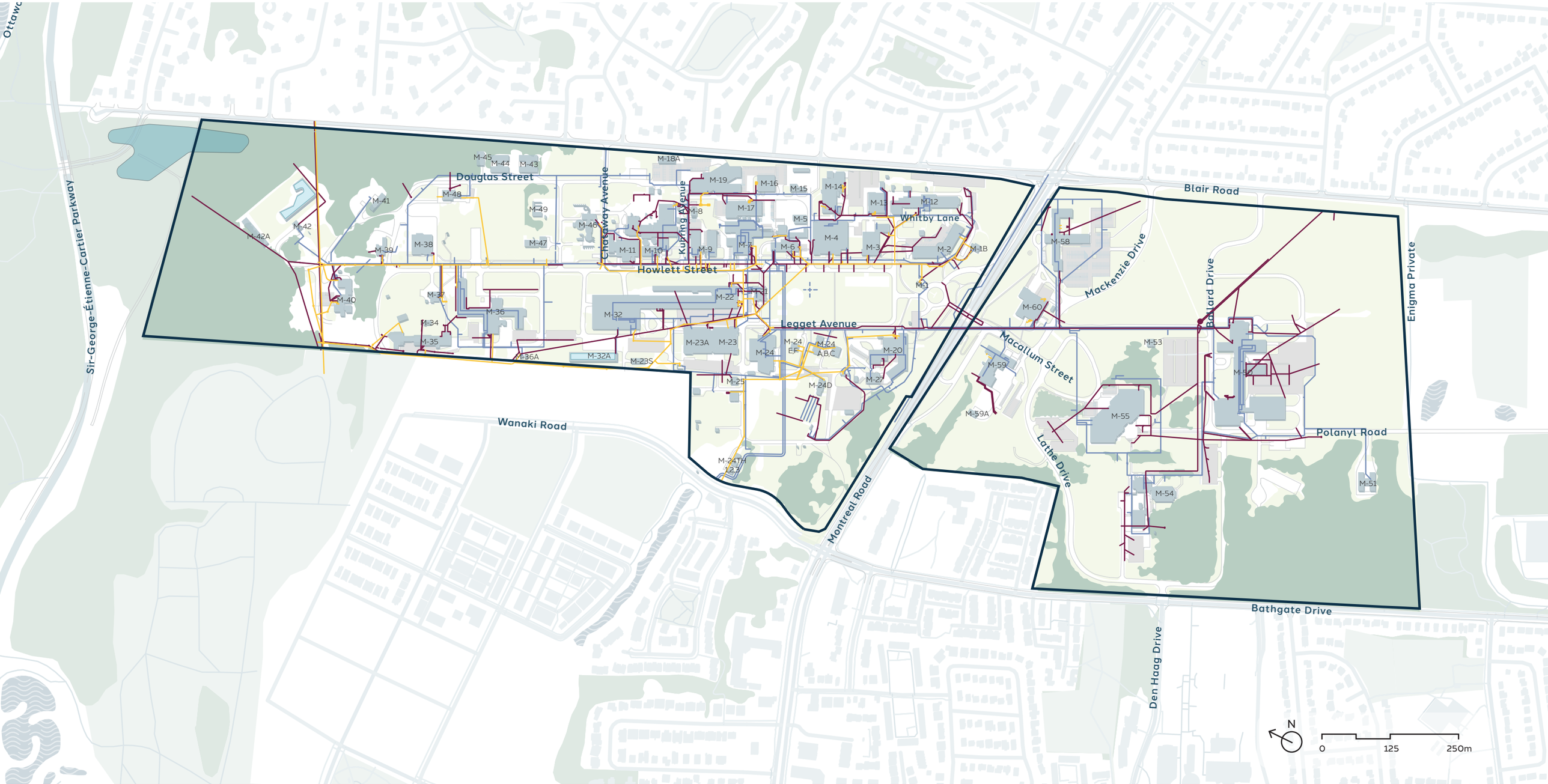
During the investigation and review of historical records it is apparent there is an opportunity to reduce the quantity and size of the underground infrastructure, particularly on the North Campus where a series of sewer separation phases have taken place and the upcoming Labs Canada research hub is to be located. Replacing 'like for like' related to collection and distribution (sewers and watermains) will result in increased capital costs, maintenance and operational costs, increased excess soils removal and the size of the service corridor. It is strongly recommended that a site servicing study be completed.

To advance the project further, the project team recommends obtaining information and background documentation on existing conditions for water, wastewater, and stormwater. An assessment of existing and projected (all scenarios considered) flow demands and generation rates will be required to complete a full evaluation of future infrastructure upgrades required across the Campus for the Master Plan. Lastly, an update of the existing sanitary system assessment is needed. Stormwater and sanitary hydraulic analyses and a water hydraulic analysis are proposed as part of the master servicing study for the overall site to confirm HGL elevations, fire flow requirements and water pressure requirements.

Coordination and review of the flow demands, and generated flows will be required with the City of Ottawa. Reviews with the City will establish if the City's systems can accommodate existing or proposed flows.

In order to advance implementation of the proposed Master Plan, a full master servicing study is required to affirm future development, feasibility of infrastructure work and potential cost implications. We have been advised that direction on further studies, site investigation and in particular the recommendations of a master servicing study will not be completed.

Plan 13 details the different infrastructure available on the site.



PLAN 13 **WATERMAINS, SANITARY SEWER, AND STORMWATER INFRASTRUCTURE NETWORK**

- Project area
- Roadway
- Buildings
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Potable water
- Stormwater
- Sewers and wastewater

3.4

Site Electrical Distribution

The Campus is supplied electrically from a Hydro One Networks Inc. (HONI) 115 kilovolt (kV) overhead line that terminates at a HONI substation located on the Campus. This substation consists of the following equipment:

- Single incoming 115 kV feeder from the HONI network.
- Two redundant dual winding 115 kV-13.2 kV, 45/60/75 MegaVolt-Ampere (MVA) transformers.
- Double ended 13.2 kV switchgear.
- Station Services transformers and associated distribution.

The incoming feeder from HONI is rated for 230 amperes (A), or 48 MVA, or 43.2 megawatts (MW) assuming a load Power Factor of 0.9. The peak electricity use on Campus in recent years was 21.3 MW, leaving around 22 MW of spare capacity, which is the main restriction on the supply into the Campus. This would be sufficient spare capacity to supply the upcoming Labs Canada research hubs.

However, the eventual electrification of the Campus may require additional peak loads, ranging from an estimated 10 MW to 25 MW, depending on the final mix of loads such as ground source heat pumps, electric boilers, and electric vehicle charging, among other loads. If required, upgrades in the transmission line for approximately 2.5 km may be needed. This would involve a study by HONI to assess the limitations and methods required for the upgrade, potentially involving a line reconductor/rebuild. If the demand exceeds the capacity of the 115 kV circuit, an upgrade to a 230 kV circuit near Russell Transmission Station may be necessary, possibly involving an underground cable section. This change would demand approval from the Ontario Energy Board and the construction of a new NRC substation to handle the increased load.

The existing substation's capacity is limited by the 115 kV transformers. The substation is limited to 75 MVA of loading during the loss of one transformer (full N+1 redundancy). For short-term emergency duty, the transformers can provide up to 86 MVA of loading. If total loading goes past 86 MVA, a capacity upgrade of the substation may be required.

The NRC-owned and -operated electrical distribution starts where the 13.2 kV feeder cables connect to the HONI pad-mounted switchgears. The switchgear and distribution are configured with 100% redundancy, if one component fails, switching can be done to isolate the failed component while supplying downstream loads. There are currently three spare breakers for future NRC feeders. There is no possibility of adding further spare breakers or extending the switchgear to add further spare breakers.

Power is distributed throughout the Campus by way of three NRC loop feeders and two 13.2 kV radial feeds. One radial feed supplies both M-11A and M-46D (the Aeronautical buildings). The other radial feed supplies equipment such as a large compressor used for testing. The substations located throughout the site progressively lower voltages for use in buildings. The buildings supplied by each feeder are listed in Table 13.

Any new buildings will either be added to existing loops depending on current load levels and the loading of the new building, or a new loop will be constructed to supply the new building(s).

TABLE 13 **BUILDINGS SUPPLIED BY FEEDER**

LOOP OR RADIAL SUPPLY POINT	BUILDINGS SUPPLIED
Loop M3CA2-M5CA2	M-50, M-51, M-53, M-54, M-55, M-58, M-59, M-60
Loop M1CA2-M10CA2	M-10G, M-11, M-20, M-22, M-23, M-23A, M 24, M-25, M-32, M-36, M-46A, M-47
Loop M2CA2-M9CA2M9CA2	M-02, M-03, M-04, M-05, M-5A, M-06, M-07, M-09, M 10, M-12, M-13, M-14, M-15, M-16, M-17, M-19
Radial M8CA2	M-11A, M-46D, M-10G CMP3 Compressor
Radial M7CA2	M-06 CoGen
Radial M4CA2	M-10 Compressor (10,000HP)

Note that the main HONI substation is located in the North Campus and is used to supply buildings in both the North and South Campus areas.

There is a 4.5MW CoGeneration Turbine that produces both electrical and thermal energy for the Campus. The 4.5 MW CoGen is a major part of the NRC's electrical curtailment strategy and will remain so for the foreseeable future. It is almost 30 years old, but in 2020, investments in modern CoGen controls were made to maintain the CoGen's reliability. As a class-A customer with the Independent Electricity System Operator (IESO) participating in the Industrial Conservation Initiative (ICI) program, the NRC receives preferential utility rates depending on their curtailment performance during the Ontario system's top five hours. The NRC curtails about 20 days a year to cover the top five peaks. This unit should receive regular maintenance for reliable operation into the future.

3.4

Campus Energy Systems

Several buildings on the Campus are connected to a centralized energy Centre (M-6) that supplies steam (55,000 lbs/hr), compressed air, and electrical power from a cogeneration system. The cogeneration system is a gas turbine with heat recovery steam generator that can produce up to 4.5 MW of electricity. Historically, the cogeneration system operated continuously as a baseload for producing electricity, heat for the central steam service, and chilled water through an absorption chiller (absorption chiller is no longer in service). Over the last number of years, the cogeneration system now only runs approximately 20 days a year for electrical curtailment purposes.

Steam services are currently being distributed either through below grade service tunnels or trenches. A service tunnel delivering steam passes below Montreal Road to service the South Campus. Buildings connected to the steam service include: M-1, M-2, M-3, M-4, M-7, M-9, M-10, M-12, M-13, M-14, M-15, M-16, M-17, M-19, M-20, M-21, M-22, M-23, M-24, M-27, M-32, M-35, M-36, M-37, M-38, M-46, M-47, M-50, M-55, M-58, M-59, and M-60.

Some chilled water energy sharing is also occurring where M-55 provides cooling to buildings M-55, M-54 and partially to M-50. A review and summary of data provided through a halocarbon inventory highlighted that buildings M-11, M-12, and M-36 may also have large, chilled water production capabilities.

The Government of Canada is committed to achieving at least a 90% reduction in GHG emissions from buildings and conventional fleet by 2050, with an aspiration to attain carbon neutral operations.

INFORMATION GATHERED

A carbon neutral study for several South Campus buildings (M-50, M-54, M-55 and M-59) has become available as of February 2023. It is noted that the strategies documented could be replicated to support decarbonization of the North Campus. The following are recommended key strategies:

- **Minimizing thermal demands** (envelope, ventilation energy recovery, demand control ventilation).
- **Low-carbon heat sources** through the conversion of heating systems to low temperature hot water/glycol (Replacing heating coils and terminal heaters or Repurposing cooling coils as dual temperature heating/cooling coils with seasonal switch-over).
- **Employing a hybrid heating energy centre** that prioritizes use of “free” heat sources:
  - Primary: heat recovery chillers to reclaim waste heat.
  - Secondary: ground-source (preferred) or air-source heat pumps.
  - Supplemental: Electric boilers for peak loads, or process steam applications.
  - Back-up: high-efficiency, condensing gas-fired boilers for resiliency, IESO curtailment and as interim supplemental heat source (depending on phasing of electric boilers).
  - Disconnect from central steam service.
- **Replacing humidification systems with adiabatic humidifiers or electric isothermal humidification** where space allows, and electric humidifiers elsewhere.
- **Replacing domestic hot water systems with electric storage tank heaters with pre-heat** via the low temperature hot water loop.

Structural

The structural design of the proposed future buildings shall be conducted in accordance with the most recent national building code at the time of design and will take into account the soil conditions.

In the absence of available geotechnical investigations at all project sites, and with reference to geotechnical boreholes data available from the Ontario Ministry of Mines for nearby published borehole data, the soil conditions of the site located South of Montreal Road encountered boulders, sand, gravel, and shale bedrock that were located at a shallower level from the ground level than the area located North of Montreal Road. To avoid unnecessary excavation of the shale bedrock, it is favourable that future projects with basements be built on the North side of Montreal Road rather than the South side.

The foundation system of any potential buildings may be supported by conventional spread and strip footings built on native glacial till and clay. If the shallow foundation is insufficient to support the proposed buildings, pile foundations driven to bedrock may be used as needed.

Further, If the shallow foundation is insufficient to resist uplift and sliding forces imposed by lateral forces acting on the building, rock anchors may be utilized as a second option.

Geotechnical investigations are required for each specific site and shall provide appropriate information such as soil bearing capacity and site classification for seismic design. The most recent National Building Code of Canada (NBCC) 2020 code is now in effect, with significant changes such as updated climatic, seismic data and seismic design which has a significant seismic demand than NBCC 2015 code.

Proposed future buildings shall be at least 5 m away from all adjacent existing buildings in order to avoid snow accumulation on the existing buildings (if applicable) due to differences in heights and, as a result, avoid roof strengthening and foundation underpinning for existing buildings.

3.4

Information Technology Services

TELECOMMUNICATION ENTRANCE SERVICES

Telecommunication services/circuits are provided by Bell Canada, and preliminary understanding is the services route from Montreal Road to building M-60. Both ISP/High Capacity (Internet Service Provider/HICAP) circuits and traditional Analog/Plain Old Telephone Services (POTS) service is provided. M-60 is the Main Distribution Facility (MDF) for the Campus with M-3 serving as a secondary.

Both serve the NRC headquarters Campus, and all NRC facilities. However, NRC has plans to decommission M-60 and move everything to another building. The first candidate to host the MDF is the M-55, but it must be considered that some building infrastructure at M-55 may need to be upgraded if that is to take place (particularly the electrical and the emergency power supply system).

M-60 not only hosts the MDF but several IT infrastructures, so the required area of the new MDF is to be determined considering also that some of the IT infrastructure in M-60 could be moved to the cloud or to an SSC data centre.

Regarding the secondary MDF in M-3, the room seems to be an improvised IT room and it may need a re-configuration to make it an IT room (climatization, cable shelves, cable manager, electrical panels). There are only two racks/ cabinets on it, but there is enough space to add new racks to accommodate further increases in fibre cores. It is also important to note that Bell has a demarcation room at M-59, and they are the only service provider that never transfer their fibre optics cables back to the junction boxes in the tunnel, then they have multiple fibre optic cables and copper cables going from their demarcation point through the tunnel and up to M-60.

TUNNELS

A remarkable network of tunnels and duct-banks are available to access most of the principal buildings. Tunnels are mainly to carry climatization to buildings, but they also carry electricity and telecommunications (fiber optic and telephony copper cables). Between the many ducts and cables into the tunnels, only one duct is available to transport fiber optic cables, while telephony copper cables are installed without conduits (directly hung on the walls).

Even if some sections of the duct seem to be 100% full, there is still enough capacity into the tunnel to install new ducts if needed; but the 53 mm conduits installed within the duct banks connecting the building to the tunnel could be a limitation for future expansion. However, old cables (dead cables) like cooper multi-pairs, are still present in ducts and could be uninstalled to free up space and facilitate maintenance.

FIGURE 65. TYPICAL TUNNEL SECTION
Source : Stantec

FIBER OPTIC NETWORK

The communication between most of the buildings is ensured by fiber optic cables running through the tunnels and duct-banks. Almost all buildings are connected via the underground fiber optic network because there are almost no poles on the Campus, except for the lamppost. If other existing buildings should be connected, the preferred solution is the underground infrastructure (new trench if needed) to avoid weather events.

Some fiber patch panels (also called junction boxes) are installed directly into the tunnel to facilitate distribution by avoiding going into the building and returning to the tunnel. Nevertheless, that is not the best environment for this kind of infrastructure, exposing the fiber connectors and boxes to a lot of dust.

LOCAL AREA NETWORK (LAN)

From M-60, Local Area Network infrastructure is distributed to the various buildings on Campus through the existing utility tunnel systems and subsequent telecommunication duct-banks. All network systems are operated and maintained by Shared Services Canada (SSC). There are presently three primary networks on Campus:

- Corporate
- Research
- Legacy

Due to a security incident in 2014, all corporate activities and services have been transitioned to the corporate network. Eventually, the Legacy network will be decommissioned, with only two networks remaining at NRC. Although M-60 originally served as the primary Data Centre for the Campus, due to security requirements, these services were migrated to a Data Centre facility located in Gatineau.

FIGURE 64. SERVER ROOM, STRUCTURED CABLING SYSTEM
Source : Stantec

3.4

WIRELESS NETWORKS (WLAN & RADIO SYSTEMS)

A minority of the facilities have updated their Wireless Local Area Networks (WLAN), most of WLAN were installed almost 10 years ago. The existing WLAN systems are limited to internal (building) distribution. There is no site or Campus WLAN distribution. WLAN services is somewhat limited, and coverage is not ubiquitous throughout the Campus, but it is important to mention that newer WLAN technologies will allow researchers moving/ sharing large amounts of data in real time, as well as provide mobility between laboratories and office space. In addition, there is no Emergency Responder Radio System or Cellular Radio systems enhancement on the Campus. However, an RFP is to be issued for improving the cellular coverage in M-55 (approximately 50% of the building); there is no intention for issuing one for other buildings, although the requirement likely exists. Regarding ERRS, presently Stantec is not aware of any regulation requiring ERRS coverage within a commercial structure.

TELEPHONY NETWORKS

Presently there is limited Voice over IP (VoIP) telephony systems on Campus. The majority of voice systems are delivered by traditional Digital or Analog voice systems using copper cables in tunnels and duct-banks. There is an initiative to reduce the amount of wired voice services and utilize wireless voice systems (WLAN and or Cellular) and limit the traditional wired voice services to critical spaces that are considered hazardous locations. IP telephony systems and new mobile applications can also facilitate mobility and reduce the amount of cable in tunnels, but there are currently no initiatives to migrate toward an IP solution.

INFORMATION AND DATA GAPS

Assessment of potential entrances redundancy requirements and throughput capacities is needed. According to the SSC strategy recommendation, several IT infrastructures will be moved to the cloud or SSC data centre; clarifications about how much space could be freed up from the actual server room are needed. There is also a need to estimate the actual and future requirements for fibre-to-the-buildings.

3.5 SYNTHESIS AND OPPORTUNITIES

Numerous considerations from operations to heritage conservation influences the Master Plan. However, the analysis concludes that there are many constraints on site that will require thoughtful consideration. Servicing of the site for future growth may present its biggest challenge, which would require significant investment both federally and locally to improve sewer and water capacity. Transportation networks will require significant investment both on and off-site with respects to pedestrian, bicycle and transit infrastructure in order to reduce the dependency of automobile trips in and around the site. How the future bus rapid transit line integrates onto Montreal Road will significantly influence the opportunities to further reduce single-car trips. This will require thought on where future buildings should be located, the public realm strategy, incremental approaches to infrastructure upgrades and the delicate balance of doing all these improvements without impeding on existing facilities that are conducting research in often sensitive environments that cannot risk interruption. Lastly, competing elements such as the desire to densify the site, but also retain a maximum amount of open space presents both a challenge and an opportunity.

The Campus has significant opportunity to become a premier hub for scientific research and discovery, but to do so will require numerous infrastructure and organizational considerations to ensure the desired outcomes are achievable. Consideration should be given to these infrastructure improvements in measured manner, as well as the need to collaborate with the City of Ottawa on numerous aspects – from transportation to sewer and stormwater improvements.

Importantly, as scientific research advances, the facilities in which to conduct lead-edge innovative research and discoveries must also to adapt, or change.

FIVE KEY INSIGHTS FROM THE URBAN ANALYSIS INFORM THE ELABORATION OF THE MASTER PLAN

The Campus future development must present a unifying identity while allowing for the flexibility for building development over time.

This is to achieve a "science-first" approach which would give greater agility to execute as funding becomes available as well the NRC can seek out partnership opportunities by highlighting areas of the plan that would be suitable for cross-department collaboration.

Amenity on site is a top factor of consideration for talent attraction and retention.

If researchers have amenities that meet their needs and provide for a well-balanced work environment, they are likely to stay longer at the NRC and will ensure their work can go unimpeded over time. Amenity can include – but is not limited to – items such as:

- Roadways, pathways and open spaces.
- Wellness facilities.
- Restaurants/cafeteria.
- Conference facility to present findings.
- Recreation facilities.

As sustainability is a key component to the various mandates influencing this plan, consideration must be given to adaptively reuse buildings.

Mobility must be taken into account at all levels of the planning effort.

The site, although initially focused on the automobile, has already attempted to correct this idea. Investment in attractive outdoor spaces, a well-designed mobility infrastructure and a collaborative approach to the implementation of Montreal Road's Bus Rapid Transit (BRT) system should be a top priority for implementation.

Given the importance of a "Campus identity" and the challenges of maintaining a coherent look and feel, identifying site-specific landscape values on which to rely in the future proves essential.

A clear understanding of the layers of evolution that contribute to the site's character and, more specifically, the character-defining elements unique to the site should be used as a valuable tool in maintaining cohesion over the long-term phased development of the site.

04

CASE STUDIES

This chapter presents four case studies of Master Planning exercises for other research campuses. Campuses were selected for their programming, architecture or development that would resonate with the aspirations of the NRC's Campus in the future or would be analogous to it. The key takeways of these approaches, particularly in terms of urban planning, landscaping and architecture, are highlighted to provide ideas for the planning process of the NRC Montreal Road Campus.

4.1 METHODOLOGY

As part of his background research, Stantec looked at comparable case studies for inspiration for a future campus plan. The methodology process for selecting the case studies is based on a criteria-based elimination approach. Initially, 11 Campuses were selected for their programming, architecture or development that would resonate with the aspirations of the NRC's Campus in the future or would be analogous to Montreal Road Campus.

Eight selection criteria were used to evaluate the relevance of each site. For each criterion, the Campuses evaluated were given a score ranging from 0 to 1. The three sites with the highest scores were selected.The criteria are as follows:

- Research Centre primarily funded by government entity;
- Over 100 ha Campus and more than 5 buildings;
- Innovative buildings and/or planning and/or landscaping;
- Relatable layout / built form;
- Integrated in urban setting;
- Integrated complimentary uses;
- Connection with residential areas;
- Relatable climate.

Table 14 shows the 11 sites reviewed and their scores. The three selected for further review are as follows:

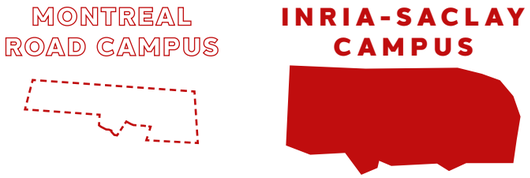
- Paris-Saclay Campus
- Campus Albano
- Wu Campus

In addition to the three selected sites, the German Institute of Technology site was selected. Although the site did not receive a high score compared to those selected, its similarity to the NRC site and the presence of particularly interesting technologies makes it relevant to this study.

TABLE 14 **CASE STUDY EVALUATION GRID**

CRITERIAS	 **Inria-Saclay Campus** Saclay, France	 **Los Alamos National Laboratory** New Mexico, USA	 **Korea Institute of Science and Technology** Seoul, Korea	 **Campus Albano** Stockholm, Sweden	 **German National Metrology Institute** Braunschweig, Germany	 **Astrazeneca Campus** Cambridge, England	 **Argonne National Laboratory** Illinois, USA	 **Lego Campus** Billund, Denmark	 **Adobe Campus** Utah, USA	 **Wu Campus** Vienna, Austria	 **Dyson Institute of Engineering and Tehnology** Malmesbury, England
Research Centre primarily founded by gouvernement entity	1	1	1	0,5	1	0	1	0	0	0,5	0,5
Over 100 ha Campus (more than 5 buildings)	1	1	0	0	1	0,5	1	0	0	0,5	0
Innovative buildings and/or planning and/or landscaping	1	0	0	1	0	1	0	1	1	1	1
Relatable layout / built form	1	1	1	0,5	1	0	1	0	0	0,5	0
Integrated in urban setting	0,5	0	1	1	0,5	1	0,5	1	0,5	1	0
Integrated complimentary uses	1	0	0	1	0	1	0	1	0,5	1	1
Connection with residential areas	0,5	0	0,5	1	0,5	1	0	1	0	1	1
Relatable climate	1	0	0,5	1	1	1	1	1	0	1	1
TOTAL	**7**	**3**	**4**	**6**	**5**	**5,5**	**4,5**	**5**	**2**	**6,5**	**4,5**

4.2 INRIA-SACLAY CAMPUS - SACLAY, FRANCE



Location	Saclay, France
Size	About 200 ha
Construction date	2008
Specialties	Computer science, agricultural science
Insertion context	Suburban context, surrounded by residential neighbourhoods and agricultural land

The Inria Saclay Centre is a partnership between the University of Paris-Saclay and the Polytechnic Institute of Paris. Although associated with two universities, the research centre is currently in partnership with public research actors, organizations as well as private companies, such as Airbus, Boeing, Google, etc.

The site is composed of several research buildings of various architectural styles, but also of residences. The parking lots are spread evenly across the site, although the landscaping of the site and the presence of a large canopy allow them to be well camouflaged in the urban landscape.

The Inria centre is the site studied that is most similar to the NRC site in terms of its size. However, its spatial organization, with an urban grid and dense constructions, allows the site to accommodate a larger number of buildings and landscaped spaces.

FIGURE 66. INRIA-SACLAY CAMPUS
Source : Google Earth

FIGURE 67. NATIONAL INSTITUTE OF AGRICULTURAL RESEARCH
Source : Architecture studio

TAKEAWAYS

- Variety of buildings of different architecture and functions. Each building meets specific technological needs, while respecting the cohesion of the site as a whole.
- Presence of complementary functions to a research centre, such as residences, shops, sports fields, an amphitheater, etc.
- Creation of public spaces with varied landscaping, creating a variety of atmospheres throughout the campus provides visual interest and a continual ecosystem that encourages exploration and curiosity.
- Clear and effective road hierarchy consisting of automobile, bicycle and pedestrian routes.
- Spatial organization allows for optimization of space, thus denser construction, without neglecting the presence of quality outdoor spaces.
- Abundant vegetation connects the different architectural and landscaping styles. Planted strips also separate users on the public road throughout the campus.

FIGURE 68. NATIONAL INSTITUTE FOR RESEARCH IN DIGITAL SCIENCE AND TECHNOLOGY (INRIA)
Source : J.M. Ramès

FIGURE 69. NATIONAL INSTITUTE FOR RESEARCH IN DIGITAL SCIENCE AND TECHNOLOGY (INRIA)
Source : INRIA

FIGURE 70. ECOLE NATIONALE SUPÉRIEUR DES TECHNIQUES AVANCÉES
Source :JB LACOUDRE ARCHITECTURES

4.3 CAMPUS ALBANO – STOCKHOLM, SWEDEN

Location	Stockholm, Sweden
Size	15 ha
Construction date	2015 - 2022
Specialties	Mathematics, physics, public health, psychology, business, social work and others
Insertion context	Urban limits of the downtown area with unlimited access to the site

Campus Albano is part of the Stockholm University campus and is the result of a five-year planning and design process. With complete and mixed-use programming and approximately 1,000 residences, the site is composed of buildings of varying densities that are centralized around a large terrace area and park.

The project is significant for its planning process and for the importance put around social exchanges and ecology.

FIGURE 71. CAMPUS ALBANO
Source : Google Earth

FIGURE 72. CAMPUS ALBANO
Source : Q book, Albano 4

TAKEAWAYS

- Campus design is a result of a collaborative approach between ecology and architecture researchers, practicing planners and architects and non-governmental organizations.
- Site completely open to the public,and a variety of recreational activities, such as commercial spaces, gymnasiums, visitor center, restaurants, etc., foreseen in the Master Plan.
- Consideration in the Master Plan about the creation of spaces that provide opportunities for knowledge sharing. The research center represents a reliable place for knowledge exchange, with database centers, libraries and archives open to the public.
- Innovative spatial planning centered around ecology and social interactions.
- Design and integration of a proposed train station in the campus.
- Ecological approach composed of 6 design components: Green arteries, Active ground, Performative buildings, Property rights/rules, Social networks and Local culture.

FIGURE 73. CAMPUS ALBANO
Source : BSK Arkitekter

FIGURE 74. CAMPUS ALBANO
Source : ChristensenandCo Arkitekter

FIGURE 75. CAMPUS ALBANO
Source : Ingmarie Andersson

4.4 WU CAMPUS - VIENNA, AUSTRIA

Location	Vienna, Austria
Size	about 10 ha
Construction date	2013
Specialties	Economics and Business
Insertion context	In city centre with unlimited access to the site

The Wu campus is part of the Vienna University of Economics and Business. Although it is not a government operated research centre, the Master Plan's interpretation of public spaces and the solutions regarding winter design stand out and is innovative and sustainable. To that effect, the project has earned the first prize in the International Competition for Master Plan and Executive Project.

The Master Plan concept is a Walk along the park, with a path that brings the visitor into different open spaces, adapted to their use and each season's climate.

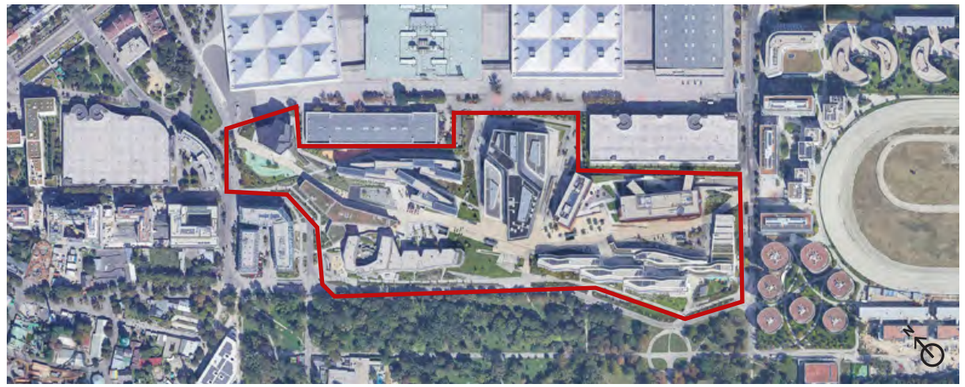


FIGURE 76. WU CAMPUS
Source : Google Earth

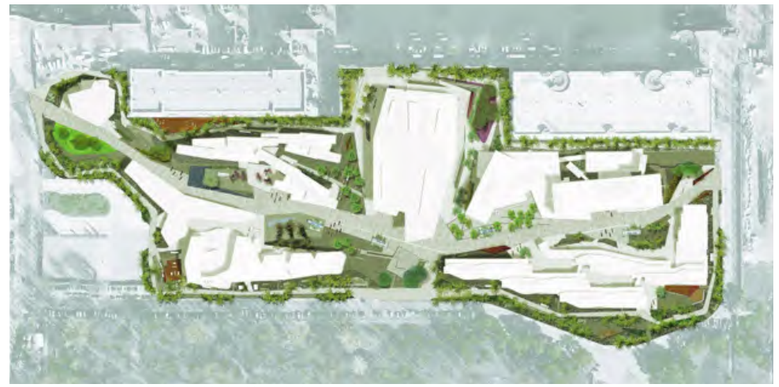


FIGURE 77. WU CAMPUS MASTER PLAN
Source : BUSarchitektur

TAKEAWAYS

- Winter city design which focusses on creating exterior spaces that are protected from the elements, as well as interior public spaces.
- Designed as a "Walk along the park", with lounge, relax, expose, stage, patio and forum as themes and purposes.
- Intersections defined with neighbouring lots to insure the creation of a harmonious neighbourhood.
- Campus is surrounded by a natural border and has 6 specific access points. The access points are always open to the public.
- Bicycle routes and bicycle facilities are spread on the campus.
- Amenities are dispersed around the campus, such as an outside lecture hall, sport fields, coffee shops, a stage, a food court and a beer garden.
- Large variety of housing, and a hotel, are available around the Wu campus space.

FIGURE 78. WU CAMPUS
Source : BOAnet.at

FIGURE 79. WU CAMPUS
Source : BOAnet.at

FIGURE 80. WU CAMPUS
Source : BUSarchitektur

4.5 GERMAN NATIONAL METROLOGY INSTITUTE - BREAUNSCHWEIG, GERMANY

Location	Breaunschweig, Germany
Size	about 100 ha
Construction date	Information not available
Specialties	Metrology
Insertion context	Suburban context, surrounded by residential neighbourhoods and agricultural land

The Physikalisch-Technische Bundesanstalt campus consists of several buildings spread across a wooded area. Similar to the Montreal Road Campus, the structure of the campus seems to have formed around a main axis and then developed in a more heterogeneous way.

A current development project is planned throughout the campus with the goal of increasing its capacity and facilitating orientation within the space. Traffic flow through the campus will also be reviewed to encourage active transportation and reduce automobile impact.

It is important to note that the current development project is more of an improvement project than a complete rethinking of the campus organization. According to the information received, the construction of buildings and the redevelopment of a few roadways constitute the overall project.

FIGURE 81. PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB) CAMPUS
Source : Google Earth

FIGURE 82. PTB ENTRANCE
Source : CC BY-SA 3.0

TAKEAWAYS

- Revitalization project around a Campus of a similar form than NRC.
- Changes in the circulation prioritizes pedestrians over car drivers.

FIGURE 83. PLANCK BUILDING OF PTB CAMPUS
Source : Christian Drescher

FIGURE 84. PTB ENTRANCE BUILDING
Source : Staatliches Baumanagement

FIGURE 85. PTB CAMPUS
Source : German Research Institutions

4.6 LESSONS LEARNED

Overall, the analysis of the case studies has allowed us to learn about the main development trends in campuses dedicated to research. Although a few sites do not have the exact same vocation as the NRC site, planning lessons can be drawn from them. Indeed, given the current willingness of stakeholders to open the site to a wider public, the study of urban public sites, such as university campuses with a scientific vocation, is relevant. Regardless of the scale and precise vocation of the project, lessons can be drawn from it and transposed to the context of the Montreal Road Campus.

WU CAMPUS

Source : BOAnet.at

ASTRAZENECA CAMPUS

Source : Hufton + Crow

LESSON 1

Site cohesion is important, but every building and public space should adapt to their vocation, public and context.

The Inria and Wu campuses are good examples of this lesson. With structuring axes and an overall vision, a common ambiance shares the whole site. However, in terms of the architectural and landscape treatment of each space, a variety of styles and vocations are presented. This makes it possible to reach a larger audience, who may be looking for different environments based on their needs. It also allows for the unique needs of each building to be met, for example in terms of light, room size, common areas, ventilation, etc.

LEGO CAMPUS

Source : Lego/C.F. Møller

LESSON 2

Complementary functions make a site complete.

In order to create a complete campus where it is possible to work, play, move and even reside (in the short, medium or long term), it is necessary to propose a varied offer of complementary uses to research. These uses must also be located in strategic places on the site. For example, instead of proposing a single cafeteria for the entire site, several cafés and restaurants could be distributed. In the case studies, in addition to restaurants and cafés, residences, amphitheaters, gyms, visitor centres and several other facilities are proposed.

The outdoor spaces can also be used for different complementary functions. The Wu campus as a whole offers different functions for public places: lounge, relax, expose, stage, patio and forum. All campuses also offer a variety of sports fields.

DYSON INSTITUTE OF ENGINEERING AND TEHNOLOGY

Source : Wilkinson Eyre Architects

LESSON 3

A structured mobility network opens the site and facilitates active transportation.

Overall, the study sites offer a hierarchical mobility network that provides safe travel for all users. Pedestrians and cyclists have dedicated spaces and can access the entire campus efficiently and safely. The presence of a structured mobility network also facilitates access to the site and makes it possible to control access points.

ALBANO CAMPUS

Source : Christensen and Co

LESSON 4

Sustainability is a priority.

In all of the case studies, the emphasis on the ecology and sustainability of the facilities is not incidental to the Master Plans; but is a structuring concept of them. All users of the site benefit from a healthier, more pleasant and resilient environment.

INRIA-SACLAY CAMPUS

Source : Inria Saclay Centre

LOS ALAMOS NATION LABORATORY

Source : Los Alamos National Laboratory

05

VISION, MISSION, AND DESIGN PRINCIPLES

The vision and mission statements represent the desired end state for the Campus. The vision and mission statements reflect the desire to be the primary hub of research for many institutions and the significance of the work conducted on the site, combined with the desire to be a top-tier workplace for researchers and scientists.

5.1 VISION AND MISSION

VISION

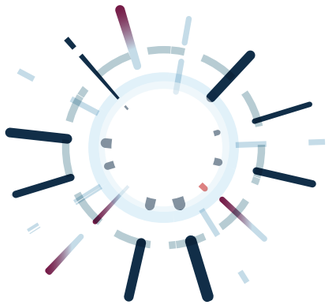
CANADA'S PREMIER HUB OF INNOVATIVE RESEARCH EXCELLENCE.

MISSION

NRC MONTREAL ROAD CAMPUS IS A PREMIER GLOBAL RESEARCH HUB THAT FACILITATES A CULTURE DEDICATED TO THE PURSUIT OF THE DISCOVERY OF LEADING-EDGE, INNOVATIVE SOLUTIONS THAT WILL IMPROVE ALL ASPECTS OF CANADIAN LIFE.

5.2 DESIGN PRINCIPLES

THE DESIGN PRINCIPLES PROVIDE THE STRATEGIC DIRECTIVE ON HOW TO IMPLEMENT THE VISION AND MISSION STATEMENTS AND ARE LISTED AS FOLLOWS.



1 BE THE ASPIRATION

The implementation of this plan should consider best-in-class design and placemaking that inspires others.

2 PEOPLE-FOCUSED DESIGN

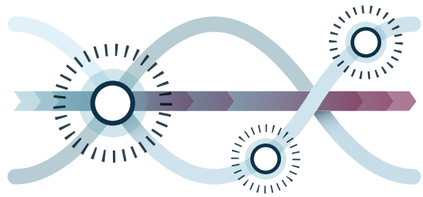
The plan must prioritize the people who work and visit the site first.

The Montreal Road Campus should be a campus where workers can thrive.

3 WE ARE A LABORATORY

The plan must support the core elements of the NRC – facilitating industry-leading research and scientific discovery.

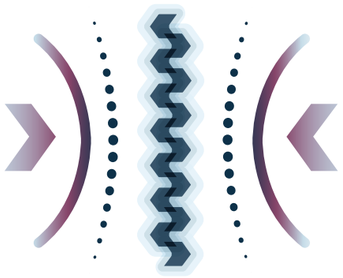
Amenities and supportive uses should consider science first.



4 FUTURE FLEX

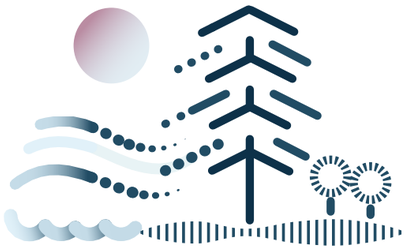
The plan must be agile enough to accommodate growth and change for the next 30 years.

5.2



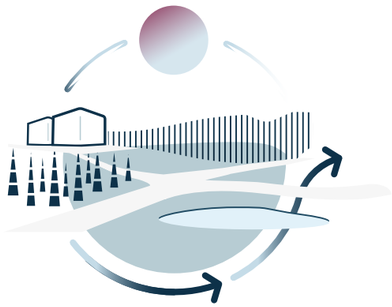
5 RESILIENT THINKING

The plan should consider forward-thinking and implementable approaches for development that consider the holistic resiliency of the campus.



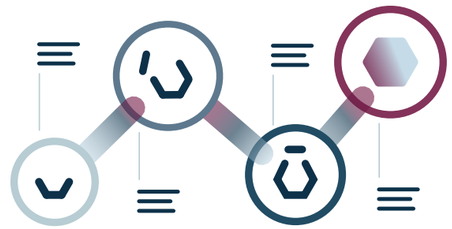
6 NATURE BY DESIGN

Natural systems should be integrated throughout the Campus by creating connections to them and enhancing them.



7 SECURE THE FUTURE

NRC Montreal Road Campus should be at once a secure place of work and research while also being a welcoming site for visitors and neighbours.



8 TELL OUR STORY

Commemoration and storytelling of the important people and work of NRC should be woven throughout the campus and considered at every implementation phase.

06

OVERVIEW OF THE DESIGN PROCESS

The preferred option detailed in the Master Plan is the result of an iterative conceptual design process, the various stages of which are described in the following section.

6.1 PROCESS LEADING TO THE THREE PRELIMINARY OPTIONS

The preliminary options were developed on the basis of the urban analysis (Appendix A), which highlighted the findings of existing reports and analysis of existing conditions which set forth the grounded understanding of advancing ideas.

The design process is also anchored in the Campus's vision and mission statements, as well as its guiding principles, which will guide development over the next 30 years.

Based on a unique emphasis for each development option, a series of coherent, creative, and functional interventions were proposed to imagine three different ways of transforming the Campus over a 30-year horizon. This design exercise enabled all participants to think outside the box, evaluating the most appropriate and least suitable design solutions.

The three options were presented to the NCC Advisory Committee on Planning, Design, and Realty (ACPDR) on February 23, 2023, including the analysis and the vision.

Three distinct options were developed in preliminary stages, each based on its own thematic premise:

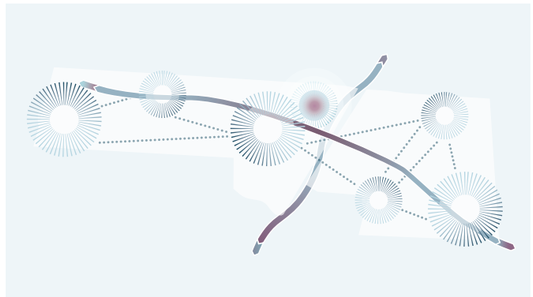


FIGURE 86. "CAMPUS 2.0" CONCEPT

Campus 2.0

- A campus design guided by the creation of districts within the Campus itself, consisting of groups of buildings and open spaces operating in synergy, and connected by a Main Spine.

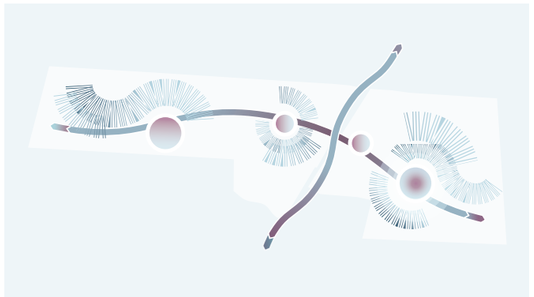


FIGURE 87. "LEADING WITH LANDSCAPE" CONCEPT

Leading with Landscape

- A campus integrated into the dominant landscape, with an emphasis on biodiversity and ecological connectivity.

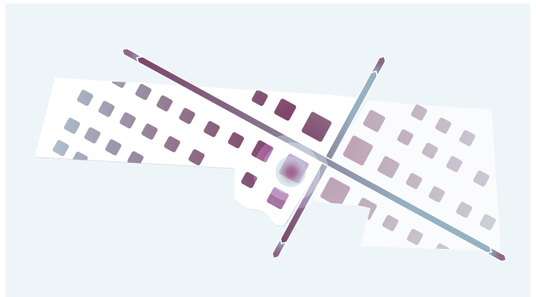


FIGURE 88. "COMPACT VILLAGE" CONCEPT

Compact Village

- A campus oriented around a central, unifying core, taking a more urban, compact, and integrated design between the Northern and Southern parts of the Campus.

6.2 STEPS TOWARD THE PREFERRED OPTION

The evaluation of the three options went through several stages marked by the different workshops. A first workshop was held on November 16, 2022, with the NRC, PSPC, and the NCC to gather first impressions on the three options.

A second workshop, held on December 12, 2022, presented the criteria grid for the evaluation of the options. The definitions and ranking system of key criteria for the evaluation include nine categories, with a total of nineteen assessed criteria. The criteria are based on the eight design principles plus an additional category: constructability. However, it should be noted that only the NRC has assessed the criteria associated to the constructability category, based on the preliminary cost estimates conducted for the three options.

A third workshop, held on January 11, 2023, presented the compilation of these assessments, by option and by stakeholder. All three stakeholder groups evaluated the options: 1) the NRC; 2) PSPC and NCC; and 3) Stantec and RMA+SH Architects. During this workshop, a discussion was held to target key components to be included in the preferred option.

The preferred option is therefore not one of the three preliminary options, but rather a blended and harmonized composition of the most functional components from the preliminary options.

07

OVERVIEW OF THE PREFERRED OPTION

This overview of the preferred option provides an overall understanding of the proposal as a whole, before addressing the various specific components in greater detail.

7.1 NARRATIVE

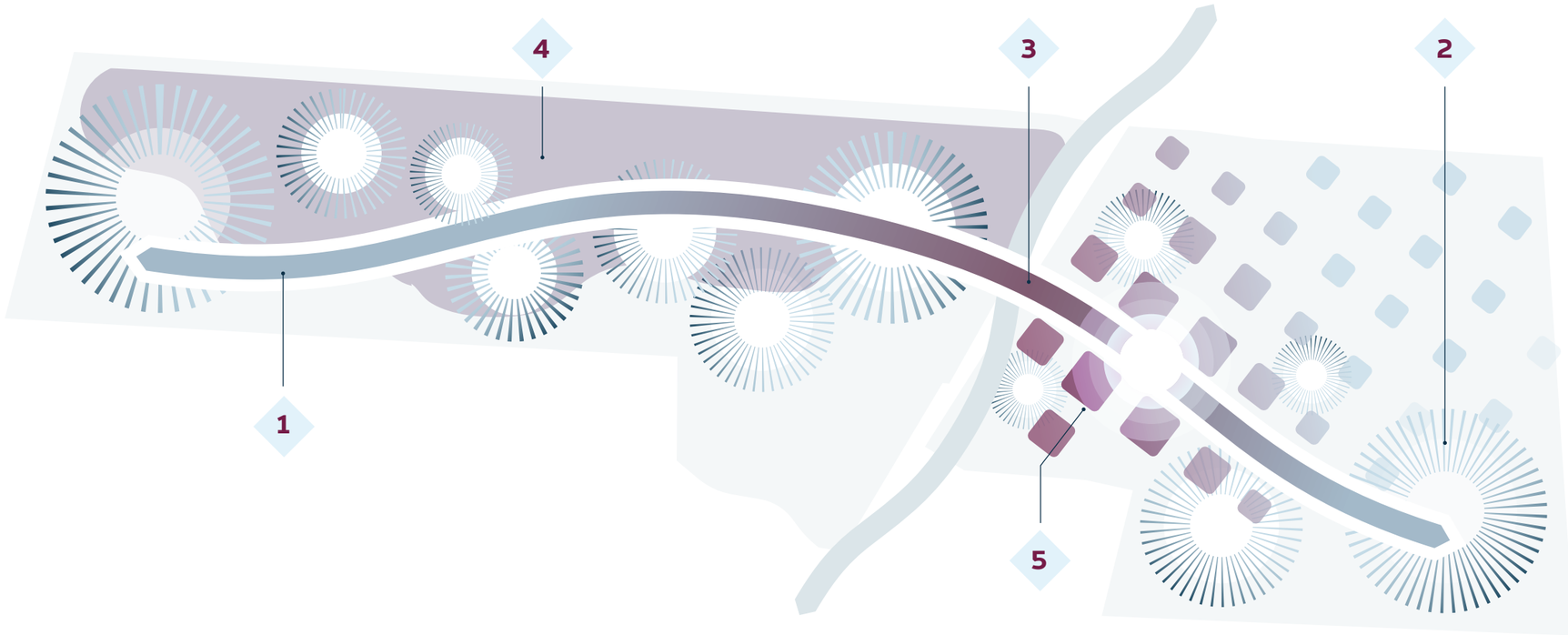


FIGURE 89. "INNOVATION AT THE EDGE" CONCEPT

THE PREFERRED OPTION, NAMED "INNOVATION AT THE EDGE", IS BASED ON FIVE MAJOR DESIGN MOVES:

1. Consolidation of the Main Spine, consisting of Howlett Street and Macallum Street, to extend across and unify the Campus. These streets have historically played a role in the development of the Campus and consolidate this role as the main axis that physically and visually links the North and South ends of the Campus.

2. Creation of a network of formalized and varied open spaces that connects the wooded areas at the Northern and Southern edges of the Campus through a green corridor.

3. Enhancement of the Campus along its most visible urban edge, Montreal Road, through the creation of a landscaped corridor forming a linear park and serving as a gateway to the Campus. This corridor showcases and connects the Campus to the surrounding communities. It also creates an integrated edge supportive of the activation of Montreal Road, which will be transformed into a more urban setting.

4. Retention and perpetuation of the unique character of the Northern part of the Campus, reflected in buildings of smaller scale, architectural unity, and an orthogonal street grid. This part of the Campus is highly consolidated and offers a few redevelopment opportunities that should fit harmoniously into the characteristic urban fabric.

5. Transformation of the Southern part of the Campus towards a more urban character with a compact street pattern, inviting open spaces, and a unifying conference centre that embodies the Campus's past and future.

FIGURE 90. CAMBRIDGE BIOMEDICAL CAMPUS, CAMBRIDGE, UK
Source: Cambridge Biomedical Campus

FIGURE 91. EDF CAMPUS, PALAISEAU, FRANCE
Source: Emmanuel Combarel Dominique Marrec architectes

FIGURE 92. FLINDERS UNIVERSITY, ADELAIDE, AUSTRALIA
Source: Danielsen Architecture, Danielsen Urban Landscape, and Danielsen Spaceplanning

7.2 HOW THE PREFERRED OPTION SUPPORTS THE DESIGN PRINCIPLES

BE THE ASPIRATION

The preferred option enhances the original campus concept and allows for new designs, building retrofits, and open spaces reflecting the innovative nature of the Campus's research activities.

PEOPLE-FOCUSED DESIGN

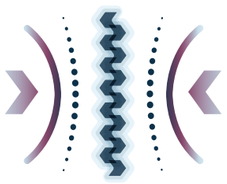
The preferred option enhances the working environment for users with significant improvements in active mobility and universal access, improved open spaces conducive to social interaction, and the creation of a new conference centre that is the core of the Campus.

WE ARE A LABORATORY

The preferred option supports the pillars of the NRC, facilitating research and scientific discovery at the cutting edge of industry. Areas make way for a multitude of opportunities for upcoming research, and facilities support the vocation of the Campus to serve as a place of discovery.

FUTURE FLEX

The preferred option leaves room for agility in implementation to meet evolving research needs, as well as changes in mobility patterns or climate conditions. The preferred option can therefore be implemented incrementally as opportunities arise.

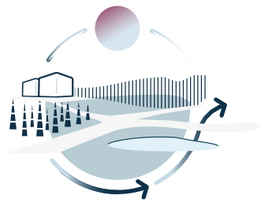


RESILIENT THINKING

The preferred option includes measures for mitigation, adaptability, and recovery in the event of disruptive change. Resilience is holistic and is considered in the development of infrastructure, sustainable stormwater management measures, diversification of means of travel within the Campus, and varied building opportunities.

NATURE BY DESIGN

The preferred option preserves existing wooded areas and enhances the supply of open spaces, connecting them along a central green corridor.



SECURE THE FUTURE

The preferred option achieves the delicate balance between a secure and inviting campus. Safety requirements are met while considering the thoughtful integration of security measures into the urban landscape.

TELL OUR STORY

The history of the Campus is highlighted throughout the preferred option by the new conference centre reusing a landmark campus building. This new core is a showcase of campus history for visitors and users. Storytelling is also deployed through the landscape by the creation of open spaces that recall the phases of the Campus's development.

7.3 BROAD DESIGN APPROACHES

THE NEXT CHAPTERS PRESENT THE GUIDELINES AND APPROACHES APPLICABLE TO THE ENTIRE CAMPUS IN A LOGICAL ORDER. FIRST, MOBILITY LINKS WITHIN THE CAMPUS HAVE HISTORICALLY GUIDED ITS DEVELOPMENT AND CONTINUE TO STRUCTURE IT TODAY. SECONDLY, THE LANDSCAPE IS REAFFIRMED WITHIN THE CAMPUS BY FORMALIZING THE OPEN SPACES THAT WILL FORM A MOSAIC OF SPACES RESPONDING TO DIVERSE NEEDS AND FOSTERING ENCOUNTERS BETWEEN CAMPUS USERS. ONCE THE MOBILITY NETWORKS AND OPEN SPACES HAVE BEEN DELINEATED, THE MAIN VOCATIONS OF THE SITE AND CONSIDERATIONS FOR FUTURE DEVELOPMENT FOLLOW, ADDRESSED BY THE ARCHITECTURE AND BUILT FORM. FINALLY, THE INFRASTRUCTURE SUPPORTING ALL CAMPUS FUNCTIONS ARE PRESENTED IN ALL THEIR COMPONENTS.

BEFORE CONSIDERING THESE VARIOUS COMPONENTS, THE FOLLOWING BROAD DESIGN APPROACHES SHOULD BE CONSIDERED FOR THE COMPLETE OVERALL VIEW.

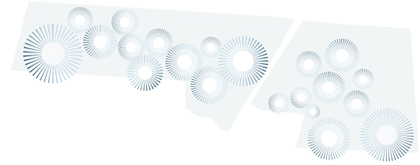
Mobility, circulation and access

The design approach for mobility, circulation and access aims to achieve the following objectives:

- Seek ways to reduce the number of internal and external vehicle trips generated by existing and new development within the Campus.
- Continue to collaborate with the City of Ottawa and other partners to improve opportunities for alternative modes of transportation serving the Campus.
- Attempt to serve the Campus with an integrated system of pedestrian, bicycle and transit/shuttle facilities that enhance neighbourhood and campus connectivity.

Design guidelines for mobility, circulation, and access address the following themes:

- Improve the universal accessibility conditions outdoors, with gentle slopes (5% or less) and the integration of ramps and tactile surface indicators at strategic points.
- Improve the Montreal Road entrance to the Campus. The Campus relies on a private road under the Montreal Road overpass for its operational, security, and maintenance needs—therefore, the current configuration will be maintained but improved. Discussions with the City of Ottawa on the proposed widening of Montreal Road aim to:
  - Accommodate a transit-priority corridor offering opportunities to enhance access to the Campus.
  - Improve conditions for active travel to and from Montreal Road, through the overpass, and throughout the Campus.
  - Improve access for oversized trucks (e.g. WB-20).
  - Bring public transit options into the Campus itself.
- Organize the Campus vehicular and active mobility network according to a hierarchy that informs the various ways in which existing road sections can be improved, as well as how new streets should be built.
- Maintain significant views of campus landmarks, create new gateways, and organize wayfinding features.
- Design efficient mobility networks of services, goods, and freight to meet the needs of the Campus, considering the accommodation of larger vehicles and the impact on neighbouring communities.
- Promote mobility strategies to attain mobility split goals including the reduction of parking requirements, promotion of safe and efficient movement of people with high levels of pedestrian priority, and promotion of multimodality (e.g. car share services, transit / shuttle stops, microtransit, etc.). These will include the development of short-term and long-term area parking strategies, and the implementation of mobility hubs which will be attractive and safe environments for pedestrians and cyclists.
- Promote the use of active transportation by including short-term and long-term bicycle storage directly related to full-time occupants and visitors. Additionally, provide appropriately located on-site or campus-accessible showers and changing facilities within the existing or new buildings.



Landscape, public spaces, and vegetation

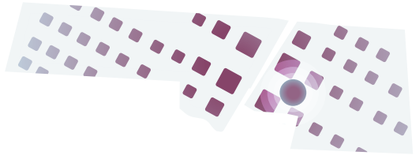
The design approach for landscape, public spaces, and vegetation aims to achieve the following objectives:

- Tell the present and future story of the Campus through its landscape, using the landscape as an experimental laboratory supporting the Campus in its primary mission of research and discovery.
- Create outdoor opportunities for workers to foster collaboration and interaction and contributing to an active and healthy lifestyle.
- Maintain and enhance the unique landscape features of the Campus and promote sustainability and biodiversity strategies.

Design guidelines for landscape, public spaces, and vegetation address the following themes:

- Organize open spaces across the Campus according to typologies that offer a variety of spaces differing in programming, dimensions, and ambience. Strategies are proposed to stimulate placemaking and thus interaction between campus users.
- Promote active outdoor recreation strategies.
- Provide guidelines for planting and street furniture of the different areas of the Campus.
- Improve the Campus's ecological footprint through landscaping interventions that promote the preservation of natural environments, biodiversity, and the enhancement of vegetation cover.

7.3



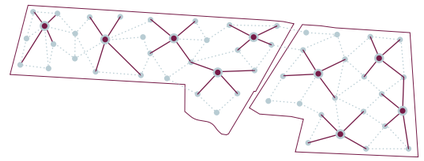
Built Form

The design approach for the built form aims to achieve the following objectives:

- Provide agile guidance to meet the evolving needs of scientific research. Science informs the physical and equipment needs of the Campus, to which the built form must then be designed to respond and adapt.
- Respect the unique character of the site and its buildings as the Campus continues to evolve. The Campus is divided into two portions with distinct characters built up over time, and must continue to develop while respecting the opportunities and defining attributes that shape it.
- Promote sustainable built development that encourages the refurbishment of existing buildings. The Campus is comprised of several facilities, which over time become redundant or obsolete in the face of evolving research needs. The future of these buildings considers their architectural significance, condition, typology, and potential heritage designation. Refer to Appendix A for more information on the approach to these buildings.

Design guidelines for the built form address the following themes:

- Organize the Campus into vocational areas to orient future research establishments according to their nature in the most appropriate location considering their security, vibration sensitivity needs, among other things.
- Improve universal accessibility conditions for future projects, both for the rehabilitation of existing buildings and for new construction.
- Frame the assessment of building redundancy, while prioritizing rehabilitation and additions to existing facilities over new construction and demolition of existing structures.
- Guide the implementation and architectural integration of future buildings depending on whether they are in the Northern or Southern part of the Campus.
- Transform the M-55 building into a conference centre through adaptive re-use, giving new life to this iconic campus building. This new vocation would be made possible by additions to and adaptive reuse of portions of the building. These will integrate conference, cafeteria, and administrative functions into the building. They are also intended to enhance the building experience through an inviting entrance sequence, the addition of natural light, and fluidity between the building's interior and new outdoor spaces.
  - See Section 12.5 for more information related to the Federal Heritage Buildings Review Office (FHBRO) and heritage conservation requirements related to the proposed development of M-55 as a conference centre.



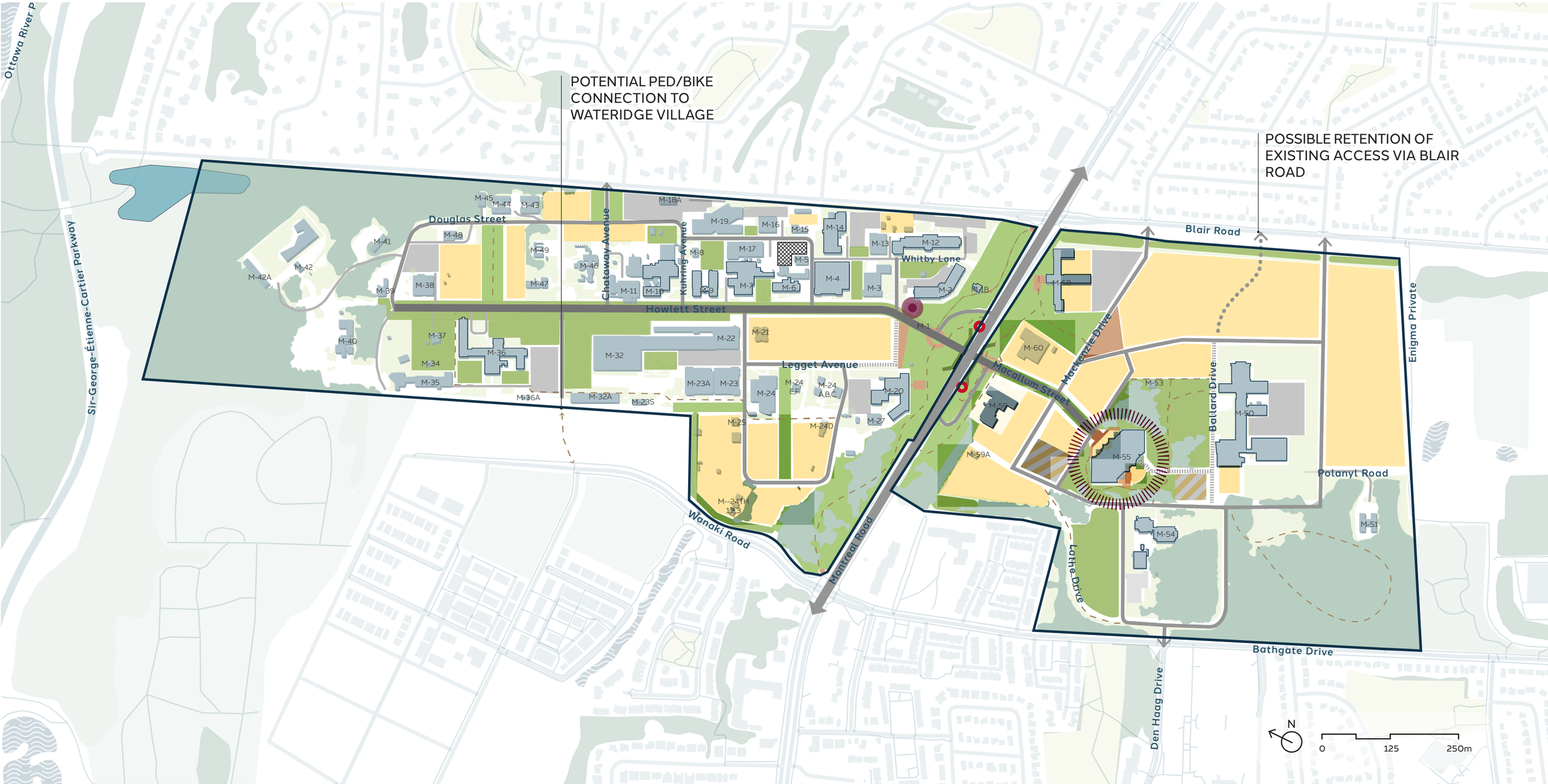
Infrastructure

The design approach for infrastructure aims to achieve the following objectives:

- Meet the NRC's security requirements by following the guiding principles of deterrence, detection, delay, and response. Due to the nature of the research activities taking place in the Northern part of the Campus, it must be possible to close the Campus off completely under certain circumstances.
- Plan the maintenance and replacement of infrastructure based on a flexible and resilient approach.
- Plan for the campus information technology (IT) and telecommunications network to be at the leading edge of technology.
- Reduce the Campus's carbon and environmental footprint through a variety of strategies aimed at carbon neutrality, resilience, and reducing embodied carbon.

Design guidelines for infrastructure address the following themes:

- Meet the NRC's access and security requirements, taking the integration with the landscape and architecture into account.
- Guide the infrastructure renewal, rehabilitation, and replacement of infrastructure works related to sanitary sewers, stormwater sewers, water mains, and associated infrastructure.
- Provide guidance on lighting and electrical distribution systems.
- Guide the IT services, including telecommunication entrance services, inter-building communications (tunnels and duct banks), fibre-optic network, and local area network (LAN).
- Plan how the various campus energy systems strategies can be implemented on campus to reduce its energy use.
- Provide a framework for reducing greenhouse gas (GHG) emissions, building resilience, reducing embodied carbon, and improving the overall footprint of the Campus for a more sustainable development.

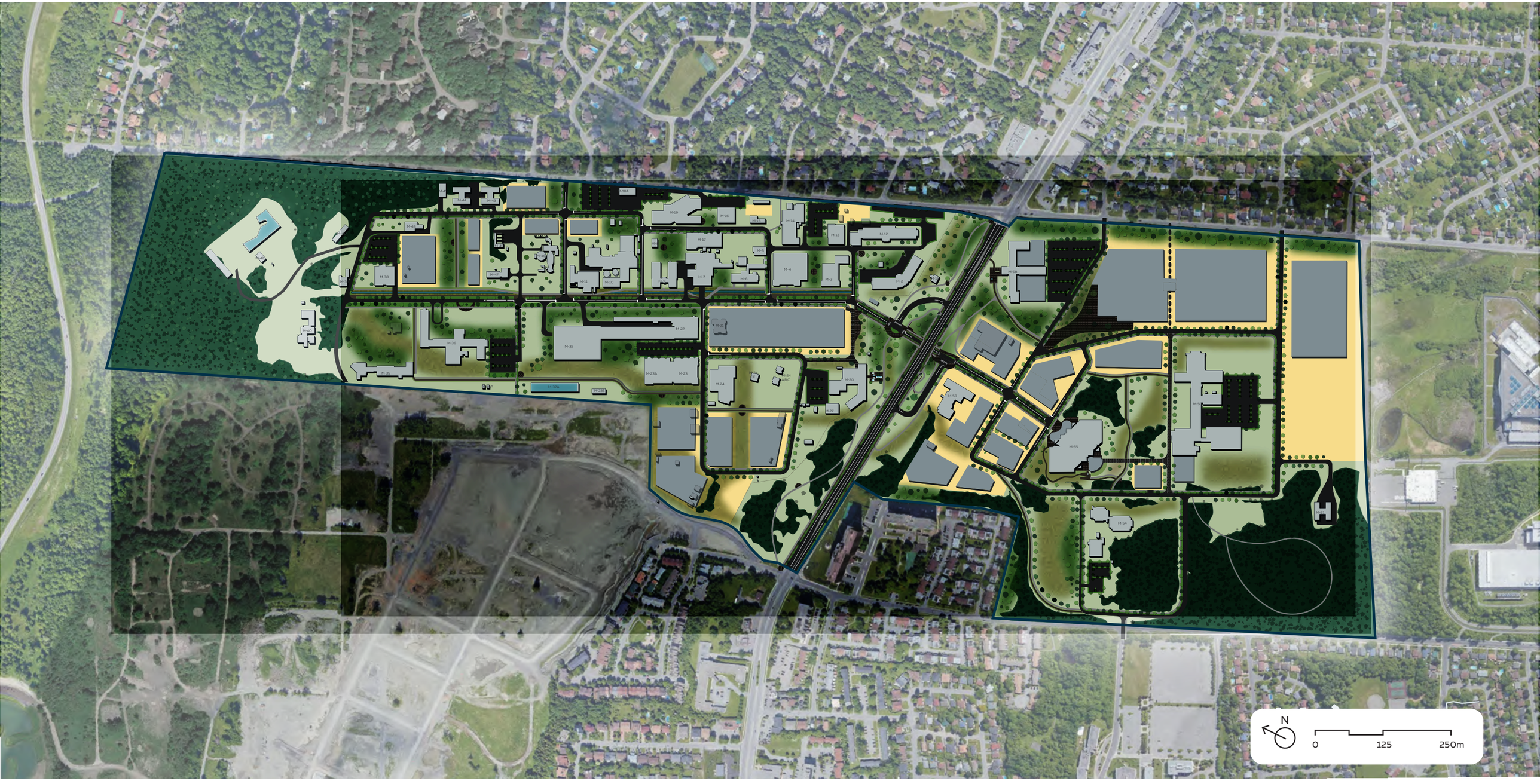


PLAN 14
CONCEPT PLAN

- Project area
- Existing HONI substation
- Existing buildings
- Significant existing building (Mxx)*
- Potential future guard house
- Potential conference centre
- Future buildable area
- Widened underpass
- Main Spine
- Secondary roadway
- Potential secondary roadway
- Internal roadway
- Shared roadway
- Pathway (off roadway)
- Transit stop
- Future mobility hub / underground/structure
- Formallised open space
- Plaza
- Existing green areas within the project area
- Existing wooded areas
- Existing lowland swamp
- Existing green areas outside of the project area

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

* Significant existing buildings is based on an evaluation including the age of the building, heritage designations, architectural detailing, building presence within the campus and building sizing.



PLAN 15
SITE PLAN

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

FIGURE 93.
OVERALL MASSING

Note : This image expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

08

MOBILITY, CIRCULATION, AND ACCESS

This chapter covers the different approaches to mobility, circulation and access, and provides design guidelines for further consideration.

8.1 MOBILITY, CIRCULATION, AND ACCESS APPROACH

THE APPROACH TO MOBILITY, CIRCULATION, AND ACCESS FOR THE CAMPUS CONSIDERS ALL TRIPS MADE BY DIFFERENT MODES (E.G. BY VEHICLE, ON FOOT, BY BICYCLE, BY PUBLIC TRANSIT, BY TRUCK) AND DIFFERENT USERS (E.G. EMPLOYEES AND WORKERS, VISITORS, MAINTENANCE AND OPERATIONS PERSONNEL).

THE MASTER PLAN SETS OUT KEY OBJECTIVES THAT PROVIDE A COMPREHENSIVE FRAMEWORK FOR THE FORMULATION OF THE STRATEGIES AND RECOMMENDATIONS PRESENTED IN THE FOLLOWING SECTIONS, ORGANIZED ACCORDING TO THE MOBILITY TYPE:

- Increase / improve connectivity to Montreal Road, Blair Road, and the adjacent neighbourhoods.
- Create a safe and walkable campus.
- Build a comprehensive and well-used bicycle network.
- Provide convenient and direct connections to transit that serve the needs of all users.
- Provide and manage adequate parking.
- Highlight enhanced mobility conditions and accesses as a tool to attract and retain staff.
- Enhance Campus accessibility for people of all abilities.
- Integrate technology and emerging mobility options into Transportation Management Plan (TMP) solutions, such as autonomous shuttles.

8.2 VEHICULAR MOBILITY

The Master Plan recommends establishing a circulation hierarchy that prioritizes flow optimization while improving and/or reducing road sections. The aim is to plan an efficient road network that takes into account trucking and operational needs, while providing access to high quality alternatives to vehicular transport that supports the energy transition to low-carbon mobility. Various types of roads, pathways, trails, pedestrian and cycling facilities, delivery routes, transit routes, and emergency routes have been developed to meet the Campus' user needs. Plan 17 provides an overview of the Master Plan's proposed vehicular network.

The Campus is bound by Blair Road to the east, Bathgate Drive / Wanaki Road to the west, Sir George Etienne-Cartier Parkway to the North, and Enigma Private to the South. Montreal Road (a City of Ottawa arterial road) cuts through the centre of the Campus and includes a grade separation over Macallum Street. Vehicular access to and from the Campus is primarily via Montreal Road, Blair Road, and Bathgate Drive.

The primary transportation goals are to:

- Seek ways to reduce the number of internal and external vehicle trips generated by existing and new development within the Campus.
- Collaborate with the City of Ottawa, the NCC, and other partners to increase opportunities for alternative modes of transportation serving the Campus.

The Master Plan focuses on several key objectives and development concepts to achieve these goals:

- Contribute to the City's planned street system improvements along Montreal Road and Blair Road (i.e. the Montreal-Blair Road Transit Priority Corridor) to enhance and improve the Campus entrances along these two roadways.
- Implement a Travel Demand Management (TDM) program, which targets a 30% share of alternative modes for campus arrivals—including new options that may further reduce single-occupant vehicle trips—and increases employees' travel choices and improves the overall user experience of the Campus. Provide a multimodal campus network that functions as a prominent feature in the campus-wide open space and circulation network. Enhance safe and welcoming multimodal connections along Montreal Road, Blair Road, and Bathgate Drive.
- Develop collaboration between the NRC, the City of Ottawa and OC Transpo to consider enhancements to area-wide public transit service including improving the accessibility and connectivity to the service. Such enhancements should seek to reduce vehicle traffic and single-occupant vehicle trips, encourage transit use, improve transit user's accessibility to the service, improve overall road safety for all users, and reduce overall vehicle kilometres travelled along the Campus's major transportation corridors.

Road network and vehicular access

A grid network of North-South and east-west city and campus streets, as well as its proximity to transit benefits the Campus' integration to its surroundings.

This allows the Campus to be accessed by all modes of transportation from every direction. Once one reaches the periphery of the Campus, vehicular circulation is primarily for the purpose of accessing parking and servicing corridors or connecting to the adjacent neighbourhoods.

The proposed network in the Master Plan includes enhancements to all vehicular accesses to the Campus as well as enhancements to the internal road network. This network is defined by a system of external city streets, internal campus streets (both main and secondary roadways), and internal and shared roads. The Master Plan includes recommendations for connectivity to the external city streets. The character of these streets plays a key role in defining the character and identity of the Campus.

8.2

Montreal Road, Blair Road, and Den Haag Road Accesses

The City of Ottawa's planned Montreal– Blair Road Transit Priority Corridor improvements include a number of modifications to road and transit infrastructure to accommodate future travel demand and meet modal share objectives, as well as provide improved connectivity to the Ottawa light rail transit (LRT) stations at Blair Road and Montreal Road.

The City of Ottawa's project(s) will provide the following improvements / benefits:

- Provide transit priority measures on Montreal Road and Blair Road.
  - Implement sections of bus-only lanes and queue jump lanes
  - Support new bus routes and services
  - Improve bus stop locations and amenities
- Implement the Complete Streets design, considering the physical elements that contribute to the safety, comfort, and mobility of all street users, regardless of age, ability, or mode of transport, and improve active transportation facilities by providing new segregated cycle tracks and improved sidewalks.
- Improve road safety for all users.
- Encourage reduction in operating speeds throughout the corridors.
- Encourage transit-oriented development and regeneration.

Plan 17 identifies the proposed transportation network including the North-South Main Spine roadway, secondary roads, internal roads, shared streets, and pathways.

Den Haag Road also provides an access to the campus that requires review in light of the changes to Campus mobility.

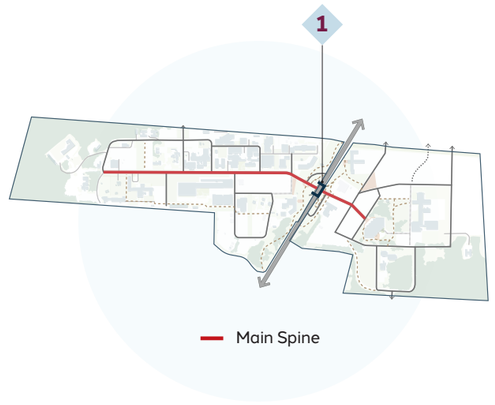
MONTREAL ROAD

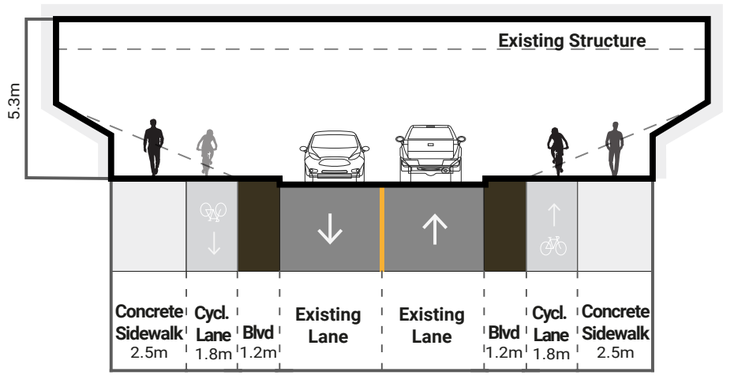
Various options for accessing the Campus from Montreal Road were explored in previous design phases leading to the preferred design. The preferred option maintains the overpass according to the preferences of the City of Ottawa and the NRC. This choice is in line with the City of Ottawa's plan to widen or replace the structure as part of its plan to make Montreal Road a transit priority corridor, as laid out in the approved Environmental Assessment (EA). The City of Ottawa has identified that the Montreal Road bridge will likely be widened instead of replaced under the Montreal Road Transit Priority project given that it still has considerable service life remaining.

The choice to maintain the overpass also respects the NRC's need to maintain exclusive access between the North and South sides of the Campus for operational reasons (e.g. safety, emergency, maintenance, and connectivity). In addition, it considers the concerns expressed by surrounding residential communities about the externalities caused by the flow of trucks on Blair Road. The reconfiguration of campus access is an opportunity to redirect the flow of truck traffic, which becomes more complex with oversized trucks, to Montreal Road, where the negative impact will be less perceptible.

Widening or replacing the structure of the overpass is an opportunity to make it an inviting and creative gateway for the Campus, and to improve conditions for walking and cycling. At ground level, the overpass is a threshold between the North and South of the Campus that can be marked by lighting, landscaping, and public art. At the Montreal Road level, the overpass offers unobstructed views of the Campus, which can be highlighted by an artistic or sculptural parapet symbolizing the innovation taking place on campus as well as safely accommodating designated cyclist and pedestrian facilities.

The cross-section shown in Figure 94 illustrates the intentions behind the redevelopment of the overpass in relation to its widening or replacement. The section under the Montreal Road bridge would be widened with the removal of the slope protection walls, creating space for sidewalks and cycle tracks.





1 FIGURE 94. OVERPASS TYPICAL CROSS SECTION

8.2

The Master Plan presents a preliminary solution for reconfiguring access to the Campus from Montreal Road. This solution needs to be explored in greater detail through in-depth studies and analysis, which will inform the decision-making process. In addition, discussions and partnerships with the City of Ottawa and OC Transpo will be essential in order to develop the most fitting solution.

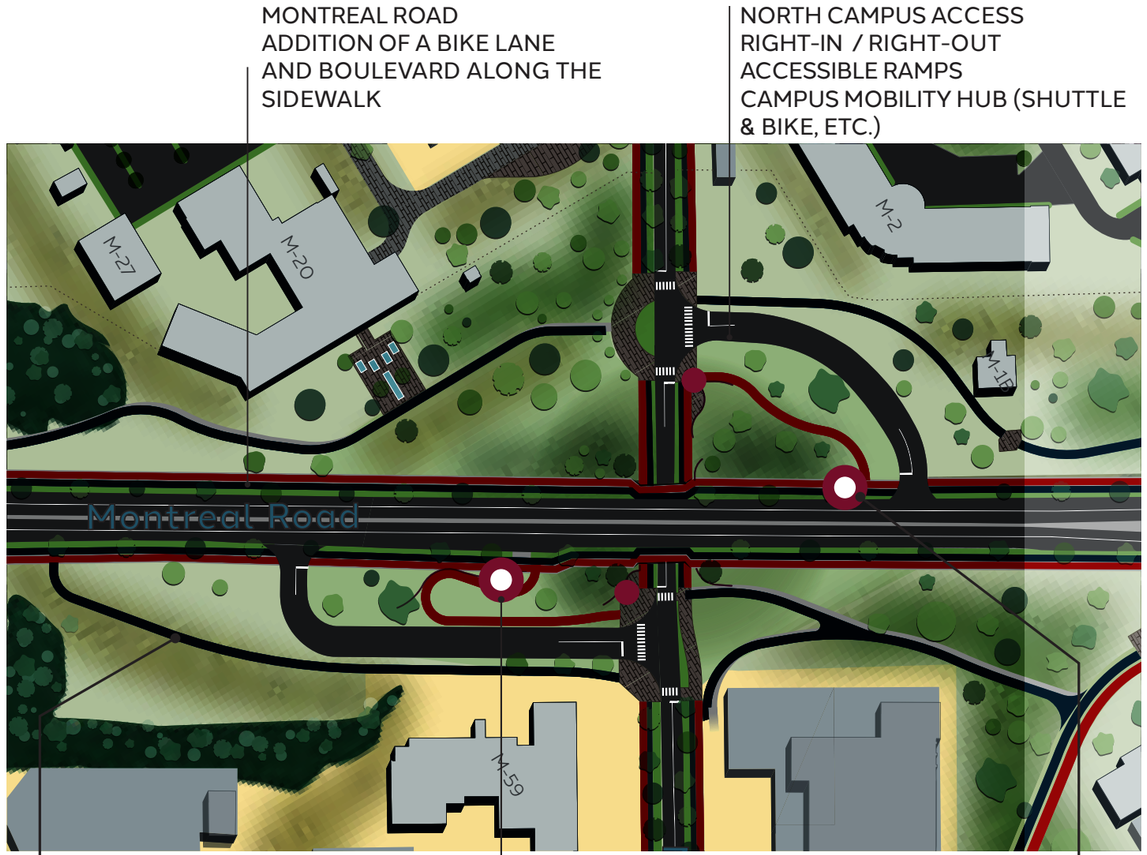
The Master Plan, as shown in Plan 16, considers an option that follows the City of Ottawa's Recommended Plan set out in its EA approved as part of its Montreal – Blair Road Transit Priority Corridor project. This configuration includes two-way access from Montreal Road to the Northern and Southern sections of the Campus, as well as improved connectivity to new active transportation infrastructure on Montreal Road and new transit shelters on Montreal Road.

The Campus will support the City in the preliminary and detailed design phase to optimize the design to improve conditions of universal accessibility, transit access for campus users, and access for oversize trucks (e.g. WB-20). The passage of oversized trucks, at an average frequency of one per day, can lead to vehicular traffic issues that need to be resolved (e.g. trucks travelling in the opposite lane, trucks out of the traffic lanes when manoeuvring). Without modifying the geometry of the accesses, urban design solutions may be explored in future detailed design phases to resolve and mitigate potential traffic problems that could be generated by the occasional passage of oversized trucks. These urban design solutions must also prioritize the most vulnerable street user to ensure his or her safety.

As shown in Figure 95, connexion between Montreal Road's active transportation infrastructure and the Campus active transportation network would be made with segregated cycle tracks and improved sidewalks along the Montreal Road access leading to the Campus Main Spine, Macallum Street / Howlett Street. The intersection within the Campus connecting the accesses from Montreal Road and the Main Spine should be a controlled all-way stop.

The final design of Montreal Road access should give priority to the following elements:

- Put the user at the forefront of design choices and significantly improve access to transit along Montreal Road and reduce transit user walking distance.
- Improve multimodal connectivity to Campus with enhanced access to internal Campus mobility hubs, including bicycle and pedestrian amenities.
- Improve the Campus's universal accessibility and provide barrier-free access for all users.
- Improve safety with sidewalks and cycle tracks physically separated from the roadway.
- Enable safe and functional oversized truck access.



PLAN 16
MONTREAL ROAD CAMPUS ACCESS

- Bike lane
- Sidewalk / pathway
- Potential Transit stop
- Potential Transit stop

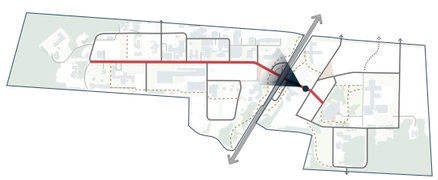
N

0 50 100m

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

8.2

FIGURE 95. RENDERING OF THE MONTREAL ROAD OVERPASS, HOWLETT STREET TO THE SOUTH



Note : This rendering expresses the general intentions pursued by the concept. The design of the proposed streets, open spaces, buidling (position, volume and appearance) are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

8.2

BLAIR ROAD

A total of three campus entrances will be located along Blair Road: one North of Montreal Road and two South of Montreal Road.

The entrances South of Montreal Road will intersect Blair Road at Seguin Street and at Mowat Street resulting in a shift from their current locations (Ballard Drive and Mackenzie Drive). The intersection at Blair / Mowat will eventually be signalized. Complete Street design will be implemented along this section of Blair Road and the intersection configuration on the campus side will accommodate oversized trucks (e.g. WB-20).

The entrance North of Blair Road is located at Chataway Avenue. This entrance is currently accessible during business hours Monday to Friday and will continue to operate under that schedule. The entrance will be modified to accommodate oversized vehicles (e.g. WB-20) on an as-required basis.

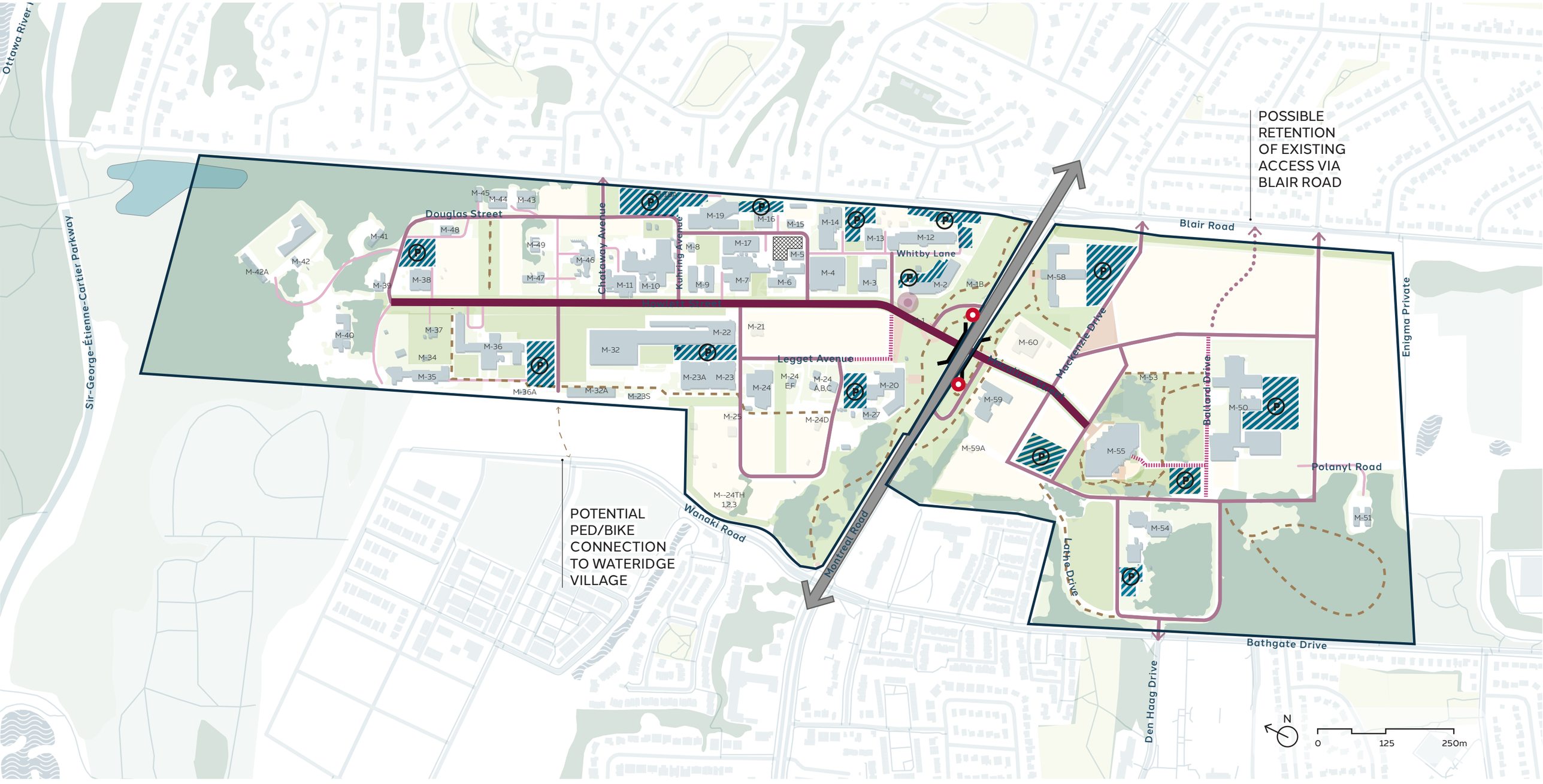
DEN HAAG ROAD

The Den Haag Road access will be used by vehicular traffic, pedestrians, and cyclists. To improve accessibility and user safety, the intersection will be upgraded to a protected intersection, separating pedestrian and cyclist flows from those of cars by using setbacks, queuing zones, pedestrian refuges or waiting zones.

GUIDELINES

The guidelines for the Montreal Road, Blair Road, and Den Haag Road accesses are as follows:

- Enhance active transportation features with the widening or replacement of the overpass structure.
- Create a gateway representative of the innovation of the Campus through the integration of artistic installations making the experience friendly, playful, and inviting.
- Enhance active transportation features connecting Montreal Road to the Campus's main street.
- Improve multimodal connectivity to Blair Road, Montreal Road, and Bathgate Drive.
- Improved road safety via segregated active transportation infrastructure.
- Implement Complete Streets design and improve active transportation facilities.



PLAN 17
VEHICULAR NETWORK

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Widened underpass
- Potential Transit stop
- Main Spine
- Secondary roadway
- Internal roadway
- Shared street (accessible to ped/bike and emergency, deliveries and maintenance vehicles)
- Pathway (off-road)
- Mobility Hub

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan..

8.2

Main spine

The Main Spine is composed of Howlett and Macallum streets, which provide interconnectivity between the North and South of the Campus, notably with the crossing of the overpass.

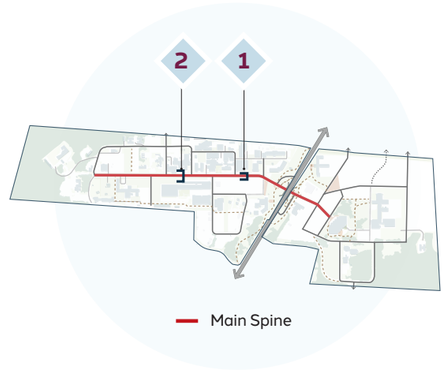
This vast mobility corridor is a structuring feature of the Campus. Its importance is both mobility-related and landscape-related. The following guidelines should be read in conjunction with those described in Section 9.4 – Streetscape, which is more oriented to the streetscape design.

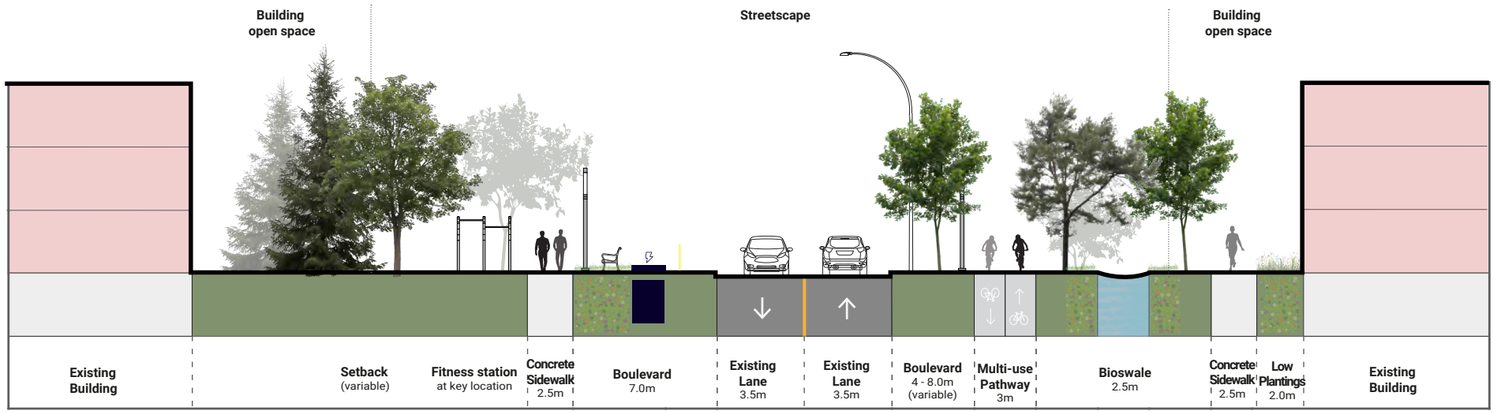
The Main Spine is intended to be the central axis for vehicular circulation and active mobility, with the addition of a multi-use path or separated bike lanes and widened sidewalks that will allow direct, uninterrupted circulation of cyclists and pedestrians from the Northern end of the campus to the Southern end ending at building M-55. There will be no on-street parking along the Main Spine. This urban landscape will be designed to provide a safe and accessible infrastructure linking the North and South parts of the Campus and facilitating inter-campus travel.

To ensure functionality, safety and user-friendliness for vehicular, truck, pedestrian and cyclist circulation, a unique approach must be taken for the detailed design of the Main Spine.

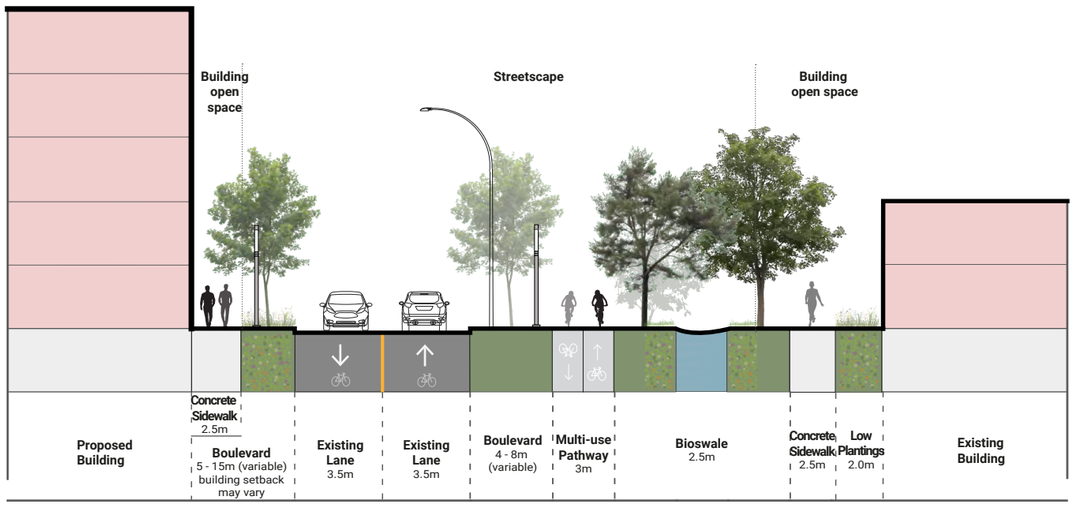
HOWLETT STREET

The campus transportation network is being developed and strengthened around a main North-South spine. Howlett Street and Macallum Street will connect to form this Main Spine roadway. This main corridor will include a multi-use pathway and improved sidewalks and boulevards. The streetscape will develop into a more urban atmosphere near the Campus entrance and incorporate landscaped features including bioswales and recreation spaces and amenity area places throughout the corridor. This corridor includes a large building setback and a narrow building setback as identified in Figures 96 and 97. Existing on-street parking and laybys will be removed.





1 FIGURE 96. HOWLETT STREET - LARGE BUILDING SETBACK



2 FIGURE 97. HOWLETT STREET - NARROW BUILDING SETBACK

GUIDELINES

- Maintain and strengthen Howlett Street as the Northern spine of the Campus by improving pedestrian and bicycle conditions.
- Improve multimodal connectivity to Montreal Road.
- Implement Complete Street designs within the built area of the Campus to reduce vehicular speeds while providing safe and accessible crossings for pedestrians and cyclists.

8.2

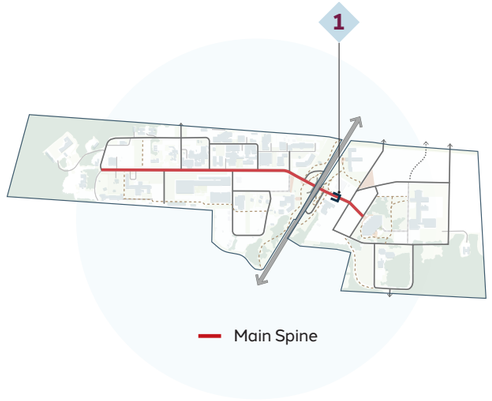
MACALLUM STREET

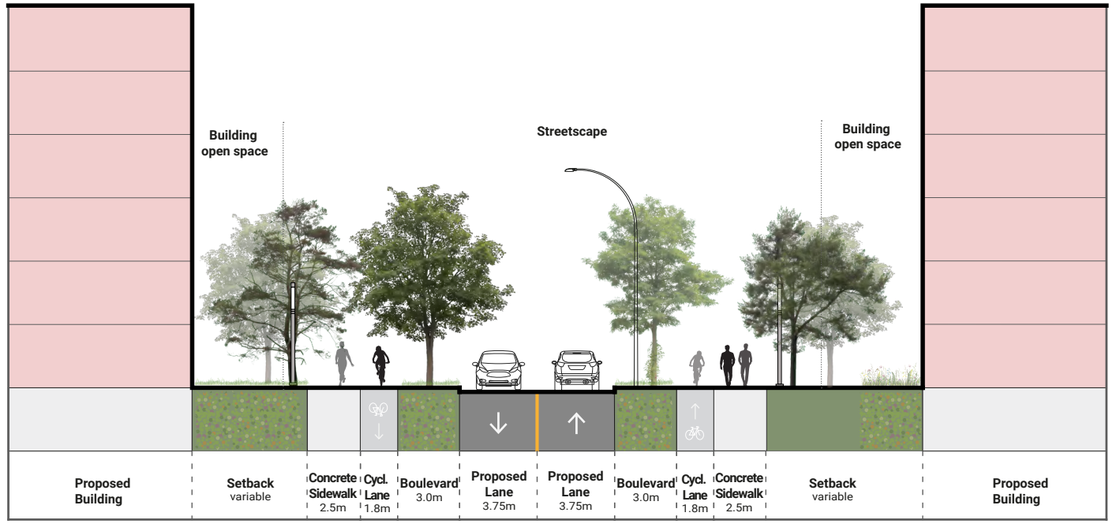
Macallum Street will form the Southern portion of the main North-South spine of the Campus. The street will be realigned to connect with Howlett Street. This main corridor will include a multi-use pathway and improved sidewalks and boulevards. The streetscape will redesigned to create a more urban condition near the Campus entrance and incorporate landscaped features including recreation and amenity area places throughout the corridor.

Figure 98 provides a cross section of Macallum Street in the vicinity of M-55.

GUIDELINES

- Create an urban landscape where the animation of the street frontage encourages a relationship and interaction between inner and outer space.
- Realign the street to emphasize the view corridor to the M-55 building.
- Create a landscaped corridor with bioswales and strategically placed recreation and amenity areas.
- Maintain existing vegetation.
- Improve multimodal connectivity to Montreal Road.
- Implement road safety measures to reduce traffic speeds and enhance safe crossing of the Main Spine for pedestrians and cyclists.
- Implement Complete Street designs within the built area of the Campus to reduce vehicular speed while providing safe and accessible crossing for pedestrians and cyclists.





1 FIGURE 98. MACALLUM STREET TYPICAL CROSS SECTION

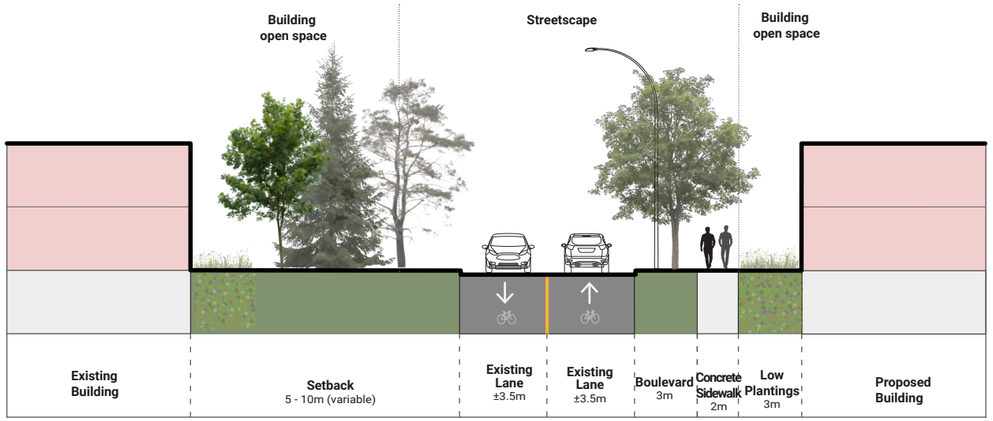
8.2

Secondary Roadways

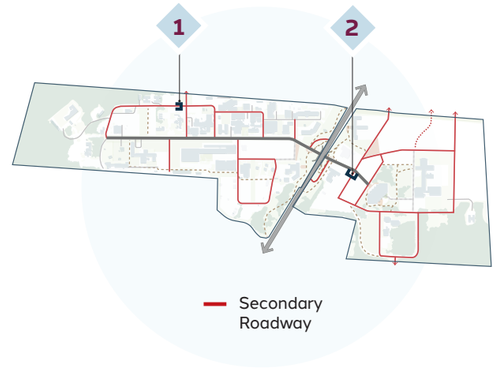
Figures 99 and 100 identifies the cross-sectional elements for the Campus's secondary roads. The cross-sectional elements include a 2 m cycling lane (which may be a segregated cycling lane), landscaped boulevards, and sidewalks. These new or improved secondary roadways provide improved transportation conditions for pedestrians and cyclists while providing multimodal connectivity to the Campus's Main Spine.

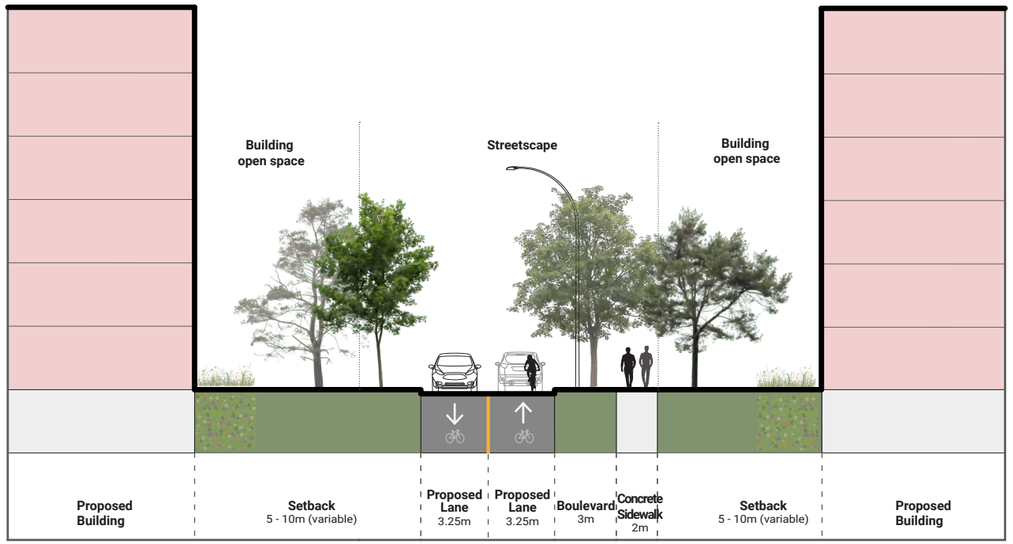
GUIDELINES

- Improve transportation conditions for pedestrians and cyclists.
- Improve multimodal connectivity to main campus roads.
- Implement Complete Street designs and road safety measures within the built area of the Campus to reduce vehicular speed while providing safe and accessible crossing for pedestrians and cyclists.



1 FIGURE 99. SECONDARY STREET TYPICAL CROSS SECTION | IMPROVEMENT





2 FIGURE 100. SECONDARY STREET TYPICAL CROSS SECTION | NEW ROADWAY

8.3 ACTIVE TRANSPORTATION

THE GOAL OF THE ACTIVE TRANSPORTATION PLAN IS TO PROVIDE SAFE AND ACCESSIBLE CONNECTIONS BETWEEN MAJOR DESTINATIONS WITHIN THE CAMPUS, AND LINK FACILITIES AND DESTINATIONS ABUTTING THE CAMPUS (E.G. CITY OF OTTAWA ROADWAY NETWORK AND TRANSIT SERVICES, NEIGHBOURHOODS, AND NCC-OWNED LANDS).

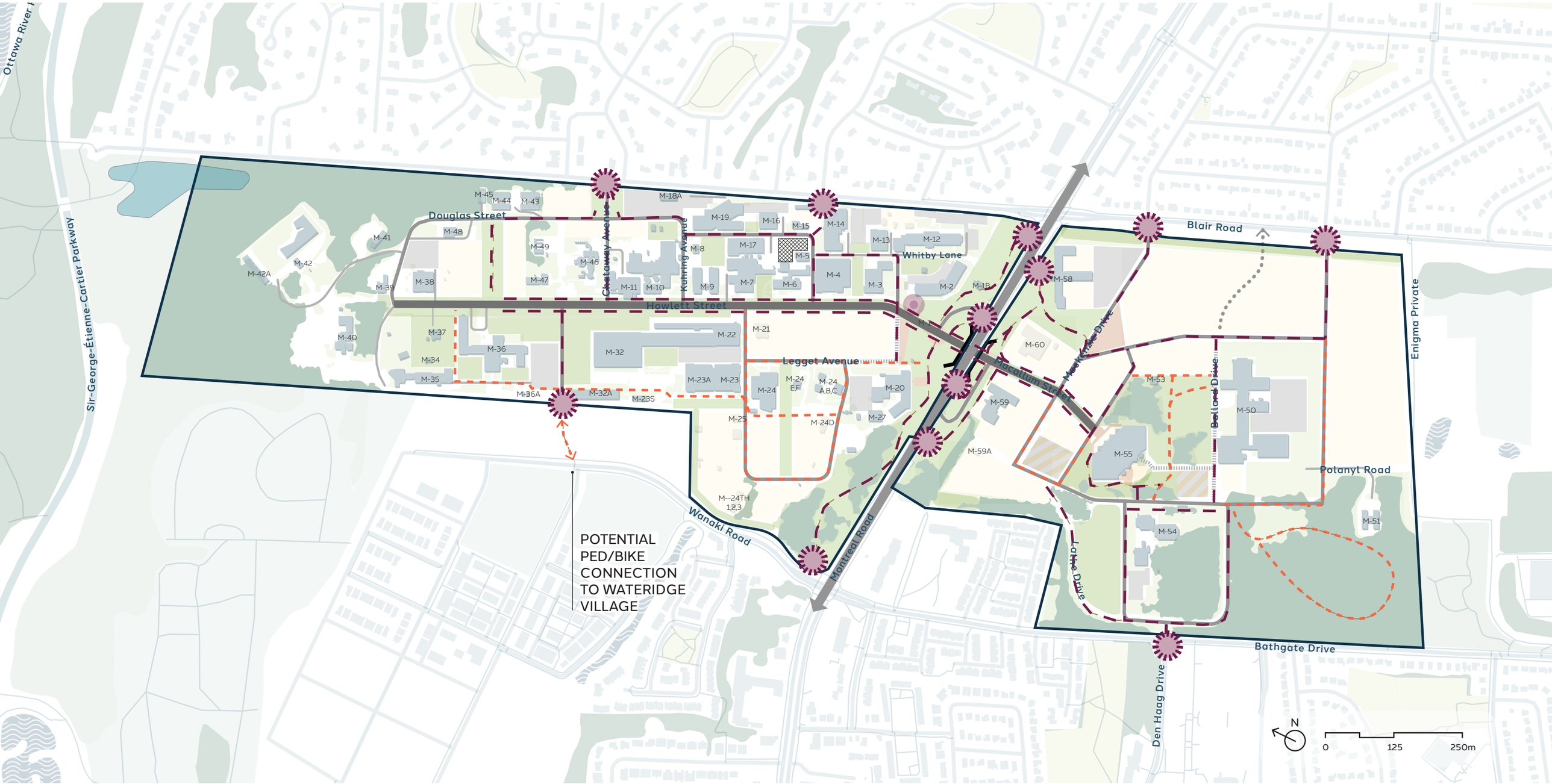
THE MASTER PLAN INCLUDES A PLANNED CYCLING AND PEDESTRIAN NETWORK THAT IS CONTIGUOUS AND INTEGRATED WITH THE LOCAL MUNICIPAL NETWORK WHEREBY ACCESSIBILITY MEETS THE NEEDS OF THE CAMPUS COMMUNITY AND PROVIDES A SAFE AND WELCOMING EXPERIENCE FOR STAFF AND VISITORS. PLAN 18 IDENTIFIES THE MASTER PLAN ACTIVE TRANSPORTATION NETWORK.

Pedestrian And Cyclist Networks and Access

The pedestrian and cycling network includes access points along Montreal Road, Blair Road, and Bathgate Drive. A potential secondary access point could be found along the North-west section of the Campus abutting the Wateridge Village development (refer to Plan 18), subject to further studies and discussion with stakeholders involved in the development of this new neighbourhood.

GUIDELINES

- Serve the Campus by an integrated, continuous and safe system of pedestrian, bicycle, and shuttle facilities that enhance neighbourhood and campus connectivity.
- Improve safety and connectivity through the design and year-round maintenance of sidewalks, pathways, streets, intersections, and supporting programs and services. Designated pedestrian and cycling facilities will provide safer and shorter distances between transit, parking, and campus facilities.
- Create an integrated and walkable campus and coordinate pedestrian facilities with potential future transit / shuttle stops to enhance neighbourhood and campus connectivity as well as to the Ottawa River Pathway system.
- Raise awareness and promote sustainable transportation options by engaging the Campus community and inspiring action.
- Optimize connections between on-campus and off-campus networks.
- Expand and improve bike parking.
- Maintain all stairs, sidewalks, and pathways for year-round access.
- Create fully accessible footpaths that follow the Accessible Canada Act and Treasury Board of Canada Secretariat (TBS) regulations.
- Provide incentives and rewards for travel choices that support alternative transportation goals for the Campus, such as shower facilities, bike repair workshop or cash incentives.
- Install high-visibility crosswalks, pavement markings and signage to provide greater visibility of crossings.
- Implement road diets and curb extensions at intersections and along key corridors to calm traffic and shorten crossing distances.
- Provide passenger amenities, including benches, shelters, bike racks, and information at key mobility locations on Campus.
- Pursue opportunities to bring shared bikes and scooters to campus.



PLAN 18
ACTIVE TRANSPORTATION NETWORK

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Potential Transit stop
- Main pathway (ped/bike)
- Secondary pathway (ped/bike)

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

8.3

Multi-Use Pathways

The Master Plan recommends the implementation of multi-use pathways throughout the Campus that improve connectivity while reducing the crossing distances of the large lots. These pathways will also connect to open spaces, amenity and recreation areas. Figure 101 provides a view of a typical multi-use pathway. Additional guidelines for pathways are provided in Section 9.4 – Walkways, Pathways, and Recreation from a landscape architecture perspective.

GUIDELINES

- Promote active connectivity across the Campus.
- Connect multi-use pathways to open spaces.
- Optimize connections between on-campus and off-campus networks.
- Maintain all stairs, sidewalks, and pathways for year-round access.
- Create fully accessible footpaths that follow the Accessible Canada Act and TBS regulations.
- Improve safety and connectivity through the design and maintenance of sidewalks, pathways, and intersections, and supporting programs and services.

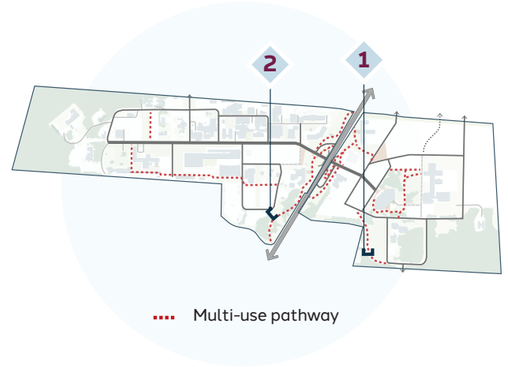
Shared Streets

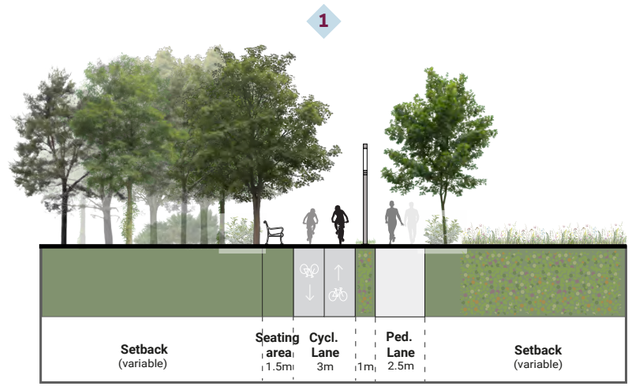
The Master Plan includes the implementation of shared streets both in the North Campus and South Campus. Shared streets (often referred to as 'pedestrian priority streets') are roadways designed for slow travel speeds where pedestrians, cyclists, and motorists all use the road. These streets typically have low vehicle volumes and high pedestrian volumes. The posted speed limit is typically 10 kilometres per hour or less and the roadway may be flush from building line to building line, separated by bollards or pedestrian amenities rather than a typical curb. Figure 102 identifies a shared street typical cross-section.

On the North Campus a street segment between Legget Avenue and Howlett Street, just east of Building M-20, will develop into a shared street. Shared streets will be constructed on the South Campus, just South of Building M-55, connecting the building to the parking lot and extending to Building M-50.

GUIDELINES

- Promote a shared use of roadways with pedestrians and cyclists where regular traffic is not required and desired.
- Allow only delivery and emergency vehicles on shared roadways.
- Use distinctive surface treatment and signage to reduce vehicular speeds and highlight the unique and shared character of the roadway.
- Improve safety and connectivity through the design and maintenance of sidewalks, pathways, streets, intersections, and supporting programs and services.





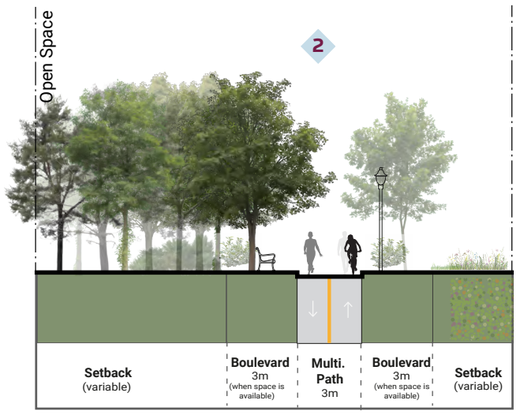
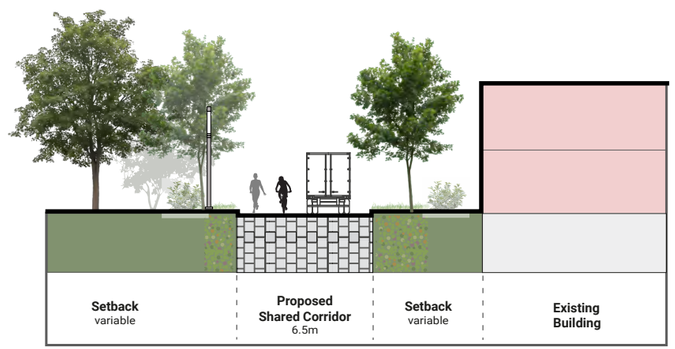
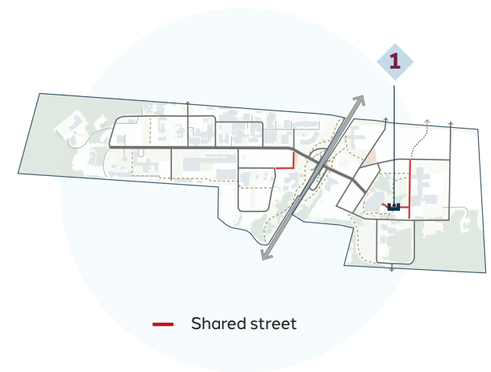


FIGURE 101. MULTI-USE PATHWAY TYPICAL CROSS SECTIONS





1 FIGURE 102. SHARED STREET CROSS SECTION

8.4 TRUCKS, DELIVERY AND EMERGENCY ROUTES

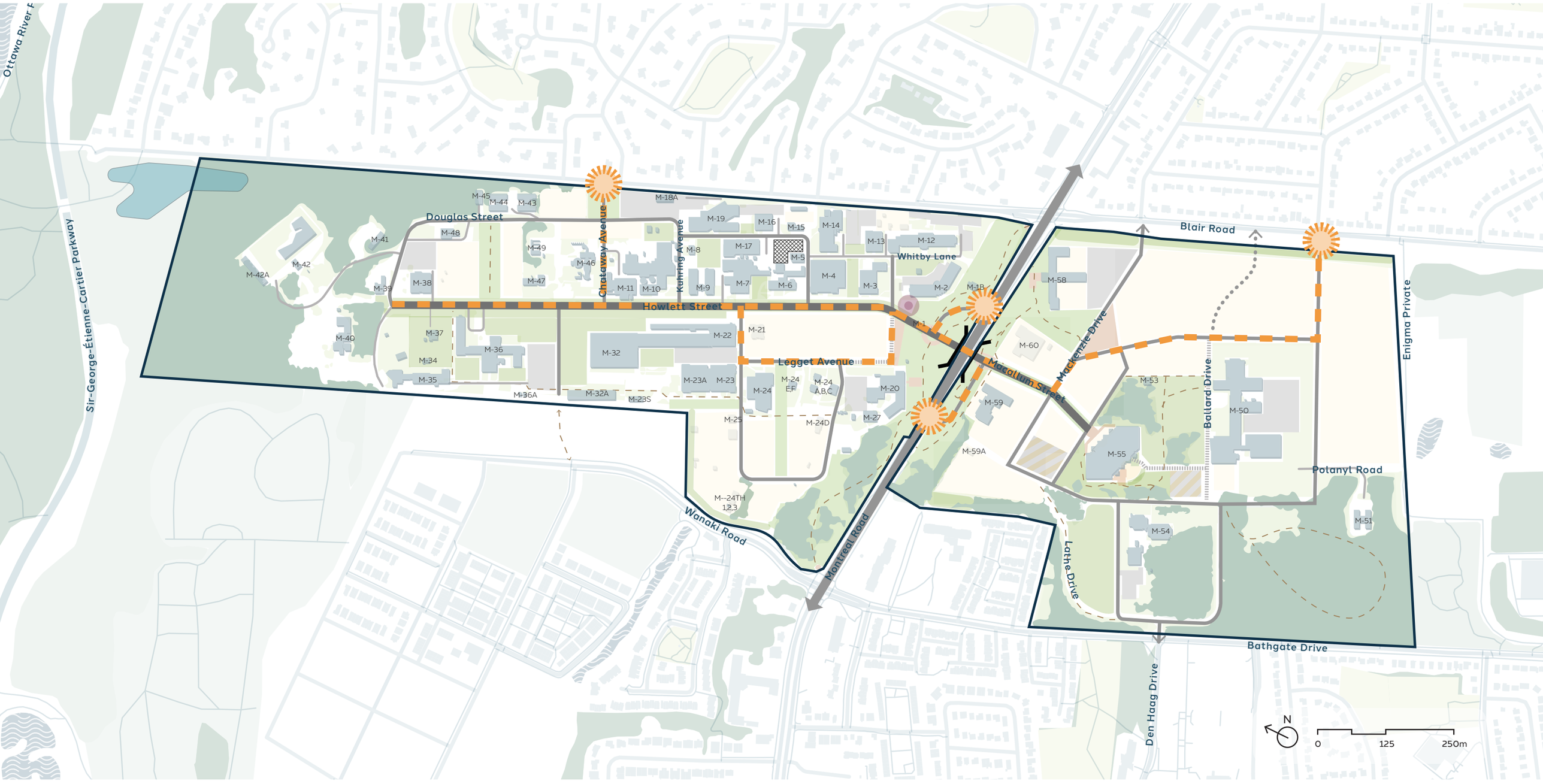
THE MASTER PLAN RECOMMENDS DESIGNATING AND MAINTAINING EFFICIENT SERVICE, GOODS AND FREIGHT MOBILITY TO SERVE CAMPUS NEEDS, WHILE CONTINUING TO RELY ON ADJACENT ARTERIAL ROADWAYS TO THE EXTENT POSSIBLE. OVERSIZED VEHICLES (E.G. WB-20) WILL HAVE ON-CAMPUS ACCESS THAT ALLOWS FOR DELIVERIES AND SERVICE ACCESS BUT LIMITS CONFLICTS WITH PEDESTRIANS AND CYCLISTS.

In order to meet security regulations, the Campus's route for emergency vehicles must be approved by local municipal authorities. As a minimum, these requirements should address the following:

- Turning radii minimum for fire trucks of 7.6 metres (m) inside, and 13.7 m outside.
- Height clearance for fire trucks of 6.0 m.
- Route and vehicular movement clearance of 3.5 m to 6.0 m wide road surface.
- Maximal distance from buildings to vehicle/ paved surfaces of no more than 15.0 m.

GUIDELINES

- Prioritize truck entry via Montreal Road and Blair Road (South of Montreal Road), which are existing City of Ottawa truck routes.
- Adapt the internal trucking network of the Campus for the movement of oversized trucks (e.g. WB-20).
- Promote the use of the City of Ottawa designated truck routes (Montreal Road and Blair) for deliveries from outside the campus to access the North and South campus and discourage these outside deliveries from using the Main Spine to travel between the North and South campus.
- Plan Campus internal truck network to reduce the travel distance for trucks within the Campus and reduce interactions with other modes of transportation.
- Support safe and timely movement of goods and services while implementing road safety measures for all users.
- Recognize and limit the impacts of truck traffic and the interests of the greater campus community such as safety, congestion, noise, and air quality.
- Protect the Campus's road infrastructure that cannot bear heavy loads or roads where truck traffic would be prohibited.
- Develop and implement Campus wayfinding and signage.



PLAN 19
TRUCK NETWORK

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Truck access
- Truck route

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan..

8.5 PARKING AREAS AND MOBILITY HUBS

PARKING FOR EMPLOYEES AND VISITORS AT THE CAMPUS IS VITAL TO THE CAMPUS'S OPERATIONS. HOWEVER, AN OVERSUPPLY OF ON-CAMPUS VEHICLE PARKING CAN BE COUNTERPRODUCTIVE TO TDM EFFORTS TO FOSTER ALTERNATIVE (E.G. MULTIPLE VEHICLE OCCUPANCY, TRANSIT) MODES OF TRAVEL. PARKING ALSO OCCUPIES VALUABLE REAL ESTATE THAT OFTEN HAS A BETTER USE ON THE CAMPUS. ESTABLISHING MAXIMUM PARKING RATIOS IS NECESSARY TO SUPPORT TDM GOALS.

Currently there is an oversupply of parking, with multiple underutilized parking lots scattered throughout the Campus. Targeting a 30% share of alternative modes for campus arrivals will be key in reducing car use within the Campus and repurposing parking lots.

There is a limited but on-going need for fleet vehicles at the Campus. There are currently a total of 59 fleet vehicles (consisting primarily of maintenance vans and pickup trucks) associated with buildings scattered throughout the Campus. According to the TBS Greening Government Strategy (GGS), this fleet vehicles will be converted to electrical vehicles, thus driving the need for electric vehicle charging stations. Parking lots will need to accommodate these fleet vehicles near their designated buildings.

Techniques will aim to reduce car use per person using tools such as incentives for multiple vehicle occupancy, parking charges, and reduced availability. Investments in Complete Street infrastructure will support improved bicycle access and storage, walking, and improved transit.

Despite the current over-supply of parking, the Campus will still require parking areas for future buildings at align with projected modal split goals. Finding innovative and proactive approaches to parking will be required to meet the needs of staff, visitors, and various stakeholders, and must include infrastructure for vehicle and micro mobility charging. Long-term parking strategies will include consolidating parking using mobility hubs in key area on the North Campus and the South Campus which will free up space around the Campus. Mobility hubs adopt a park-once approach where it's possible to park and complete the journey by means other than the car. Developing a full understanding of the parking utilization (current and future) based on the transformation of the Campus will drive this component. Some small parking areas adjacent to individual buildings might be maintained to accommodate accessible parking, some fleet vehicles, and visitor parking.

FIGURE 103. MOBILITY HUB RENDERING
Source : CoMo

FIGURE 104. AUTONOMOUS SHUTTLE
Source : Navly

FIGURE 105. MOBILITY HUB RENDERING
Source : CoMo

8.5

Mobility hubs are places of connectivity where different modes of transportation (e.g. parking, walking, biking, and transit) converge and where there is a concentration of employment/facilities. They can ultimately provide an integrated suite of mobility services, amenities, and technologies to bridge the distance between sustainable transportation modes and an individual's origin or destination. These services can include transit services, shuttle services, electric vehicle facilities, autonomous vehicle, bike sharing, bicycle and e-bike facilities, ride-hailing, and pedestrian priority facilities. For example, a driver of an electric vehicle could drive onto campus to a mobility hub, leave their car to charge and complete their journey using an internal campus shuttle with a stop at the mobility hub. Another example could be a user who commutes by bus to the Campus and then accesses a mobility hub strategically located near their transit stop to complete their journey with a bike share.

Recommended elements of mobility hubs include:

- Wayfinding (including dynamic wayfinding such as digital interactive maps)
- Transit / shuttle stops
- Microtransit
- Car share services and parking
- Ride share drop offs
- Electric charging infrastructure
- Secure parking for shared micromobility devices (like e-scooters or bike share) and bikes
- Bike share systems
- Shelter/seating/amenities
- Emergency phones/USB
- Public space
- Pedestrian connections
- Designated pick-up and drop-off areas

These guidelines complement those set out in Section 9.4 – Parking Areas and Mobility Hubs for parking lot landscape architecture. In addition, innovative and proactive strategies for the development of the Campus's transportation network will be needed to meet the needs of staff, visitors, and various stakeholders.

GUIDELINES

- Develop a park-once approach to driving and parking on campus.
- Implement the TDM program, targeting 30% alternative mode share for campus arrivals.
- Consolidation of parking into mobility hubs that reduce the amount of total parking spaces and bring together other facilities (e.g. bicycle, autonomous shuttle, and bicycle parking).
- Work with OC Transpo to improve access to the Campus with the future Montreal Road BRT and with Ottawa LRT Blair station.
- Support opportunities to implement transit closer to Campus or within the Campus, e.g. with an autonomous campus shuttle service.
- Pursue opportunities to utilize emerging technologies that can improve service and increase safety and accessibility to all users (e.g. Campus parking app).
- Aim to comply with universal accessibility standards for the various alternative mobility strategies by offering accessible itineraries at all stops, on-board vehicles and through applications and other services.
- Evaluate existing parking lots based on accessibility requirements and update accordingly. Consider provision of courtesy or limited mobility parking spaces to accommodate people who require easy access to the Campus (e.g. people who are unable to walk long distances due to a medical condition or temporary injury).
- Develop a parking strategy for transition to the target 30% alternative mode share for campus arrivals.
- Define priorities for allocation of parking supply throughout the North and South Campus.
- Distribute parking reduction strategically based on staff use and future campus development.
- Integrate electric car charging stations according to Leadership in Energy and Environmental Design (LEED) requirements and/or city bylaws.
- Organize clear and safe pedestrian paths and sidewalks through parking areas and leading to buildings.
- Expand secure bike parking supply.
- Offer incentives to choose non-drive-alone modes and provide visitors and staff more affordable options to travel to and from the Campus via new services and apps (such as ride-sharing services and carpooling) to reduce the demand on parking.
- Consider implementing a pay for parking program to achieve the desired active transportation outcomes and fund multimodal travel.

09

DESIGN OF CAMPUS LANDSCAPES

This chapter explores the different approaches to the design of the landscape on the Campus and specifies the design guidelines to be considered.

9.1 LANDSCAPE APPROACH, LANDSCAPE AS EXPERIMENTAL LABORATORY

THE GENERAL INTENT FOR THE CAMPUS IS TO VIEW THE LANDSCAPE AS AN EXPERIMENTAL LABORATORY. THE INSPIRATION FOR THIS VIEW COMES FROM THE BOOK 100 YEARS OF INNOVATION FOR CANADA / 100 ANS D'INNOVATION POUR LE CANADA ISSUED BY THE NRC IN 2016. THIS BOOK PROVIDES A LIST OF 100 RESEARCH CONTRIBUTIONS BY THE NRC BETWEEN 1916 AND 2016.

OVER THE PAST 100 YEARS, THE NRC'S RESEARCH PROGRAMS HAVE LED TO MANY DISCOVERIES, INCLUDING STUDIES RELATED TO LANDSCAPES AND HOW EXTERIOR SPACES HAVE EVOLVED OVER TIME AND ARE USED. CONSIDERATIONS AND COMMEMORATION OF THE NRC'S EVOLVING RESEARCH PROGRAMS, COMBINED WITH THE OVERALL LANDSCAPE OF THE CAMPUS, CREATE A UNIQUE OPPORTUNITY TO REDEFINE HOW THE SITE IS USED AND WILL BE ENHANCED NOW AND IN THE FUTURE.

THE FOLLOWING SECTIONS DETAIL HOW SCIENCE AND RESEARCH ARE LINKED TO THE LANDSCAPES OF THE CAMPUS.

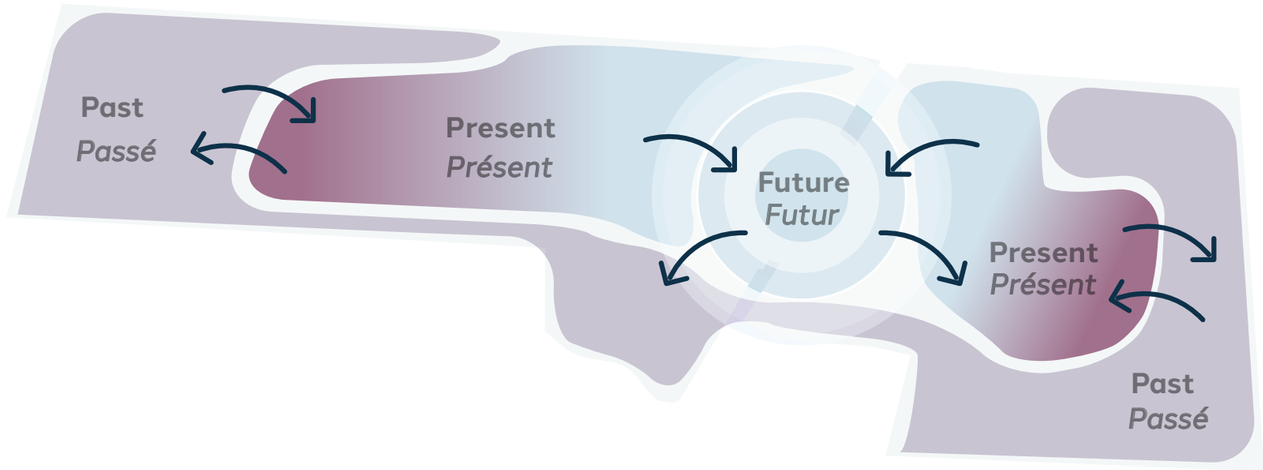


FIGURE 106. LANDSCAPE APPROACH DIAGRAM

PAST

Form Follows Process

FIGURE 107. REMNANT OF FORMER ANCIENT SEMI-NATURAL WOODLAND
Source: Ralph Harmer and Richard Thompson

PRESENT

Form Follows Function

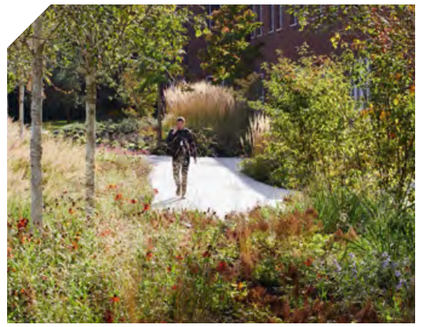


FIGURE 108. FIDELITY HEART ZONE
Source: bd Architects

FUTURE

Form Informs Function and **Function Informs Form**

FIGURE 109. 3D PRINTED URBAN MICELIUM REEF FOR BIODIVERSITY
Source : Pierre Oskam and Max Latour

9.1

Past - When Form Follows Process

Between 1915 and 1985, research at the NRC influenced the Canadian landscapes by developing technologies and methods to build infrastructure in Northern conditions where permafrost is present (NRC achievement 46 (NRC, 2016)). During the same period, the NRC supported agricultural research to adapt plant varieties and build new equipment and devices to improve crop production and the processing of grains (NRC achievements 2, 39, 47 (NRC, 2016)).

A portion of the Campus will feature vegetation similar to plants found in arboretums and ecotones, illustrating NRC's past contributions to landscape design. In the field of Canadian landscape and environmental experimental research, arboretums were developed between 1930 and 1960. Arboretums are planted following a scientific arrangement or aesthetic principles; they display a variety of native plants or are composed of a particular genus like maples or pines. Overall, arboretums advanced and promoted scientific diversity and education through gardens and parks; pathways in arboretums are often meandering between trees and groupings of vegetation.

In the same period, the concept of ecotones emerged and was at the forefront of plant research. Ecotones are formed naturally between two landscapes (such as valley land and forest) or constructed (such as what is found in parks) and create a transitional zone between two ecological communities, ecosystems, or ecological regions along an environmental gradient. Ecotones occur at multiple spatial scales and range from natural boundaries to human-generated ecotones.

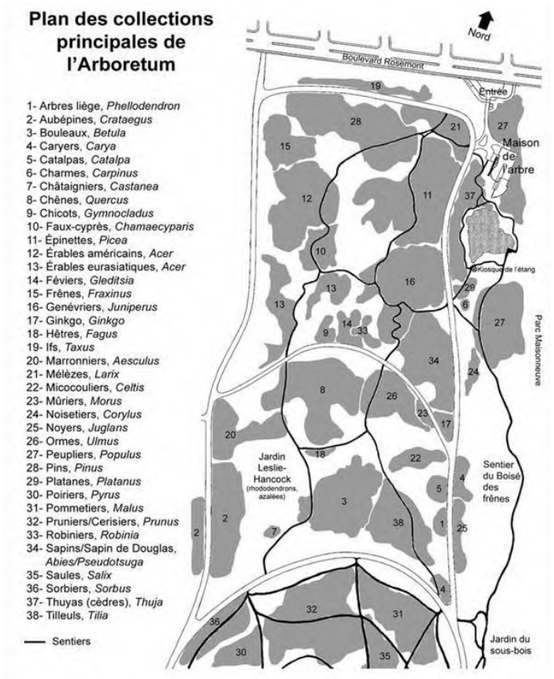


FIGURE 110. EXAMPLE OF AN ARBORETUM – BOTANICAL GARDEN OF MONTRÉAL
Source: Jardin botanique de Montréal, Espace pour la vie

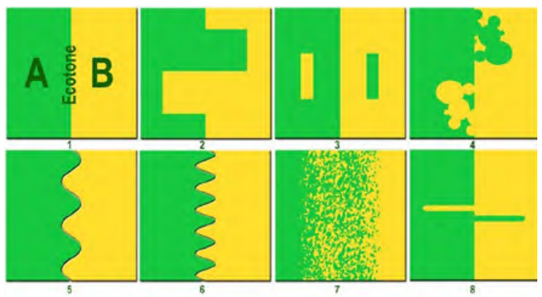


FIGURE 111. SCHEMATIC REPRESENTATION OF THE CONCEPT OF ECOTONES, TYPES OF ECOTONES (YELLOW AND GREEN REPRESENTS DIFFERENT ECOLOGICAL HABITATS)
Source: Creative commons

Present- When Form Follows Function

Between 1985 and 2015, the NRC research on landscapes and built environments focused on flood prevention along creeks and rivers (NRC achievement 70 (NRC, 2016)), environmental remediation following fuel spills (NRC achievement 96 (NRC, 2016)), and air quality improvements to reduce the presence of pollutants and biogases (NRC achievement 97 (NRC, 2016)).

A portion of the Campus will feature vegetation commonly examined in horticulture, reflecting NRC's contributions to research in recent decades. In the landscape and the plant industry, the science of horticulture expanded as an evolution from the development of arboretums. Horticulture examines the structure and uniformity of plants focusing on the production of diverse and adapted plants. In the landscape, horticulture looks at massing and cultivation of plants in gardens as opposed to grids and specimen trees found in arboretums; it is also different from the mass production of agricultural crops.

FIGURE 112. GARDENS IN NIAGARA PARKS' BOTANICAL GARDENS
Source: Niagara Parks

9.1

Future - When Form Informs Function and Function Informs Form

The NRC continues to pursue research that will have an impact on Canadian landscapes and exterior spaces for decades to come; the research aspirations target the development of a greener Canada for the future.

The contemporary approach in developing open spaces views the landscape as a combination of the past scientific approach with new environmental gestures. There is an opportunity for landscape form to influence function (and vice versa) through design experimentation. These designed experiments form both an environment that serves a research function and creates a welcoming landscape environment for campus users.

Designed experiments aim to explore, test or demonstrate innovative concepts or techniques throughout the landscape and can take a variety of forms. For example, they can combine ecological research with planting design focusing on the relationships between plants, layout, and topography. They can feature constructed ecosystems such as bio-retention swales, rain gardens, and other low-impact development (LID) landscapes where landscape architecture and science are combined to create features of the exterior open spaces. They may also look at new design and construction techniques or materials used in open spaces. Some of the Campus's research centres focus on themes such as transportation or construction and could be locations to test pilot projects.

Design experiments are therefore an opportunity to reflect the Campus's present and future identity and role.

TABLE 15 **EXAMPLES OF RESEARCH FIELDS EXPLORED BY CAMPUS RESEARCH GROUPS**

Construction Research Centre - NRC	**Automotive and Surface Transportation Research Centre Automotive and Surface Transportation Research Centre - NRC**
The Construction Research Centre's R&D expertise supports industry to develop new products and services, while providing impartial information needed by governments and standards organizations, in key areas: › Integrated building performance › Lighting and ventilation quality › Civil engineering and infrastructure › Infrastructure rehabilitation › Materials, durability and environment › Seismic resilience › Urban infrastructure	Opportunities for pilot projects through the Campus Master Plan could be through the Automotive and Surface Transportation Research Centre. The Automotive and Surface Transportation Research Centre capabilities are: › Converging technologies: › Lightweight materials; › Digital manufacturing; › Automation; › Electrification; › Connectivity; and › Autonomous vehicles.

FIGURE 113. LANDSCAPE EXPERIMENT EXAMPLE, VEGETATED PARKING STRUCTURE, HIGH-TECH CAMPUS, EINDHOVEN, NETHERLANDS
Source: Juurlink [+] Geluk

FIGURE 114. LANDSCAPE EXPERIMENT EXAMPLE, SENSORS INTEGRATED WITH GREEN INFRASTRUCTURE, SMART GREEN INFRASTRUCTURE MONITORING (SGIM) PROJECT, CHICAGO, USA
Source: UI Labs

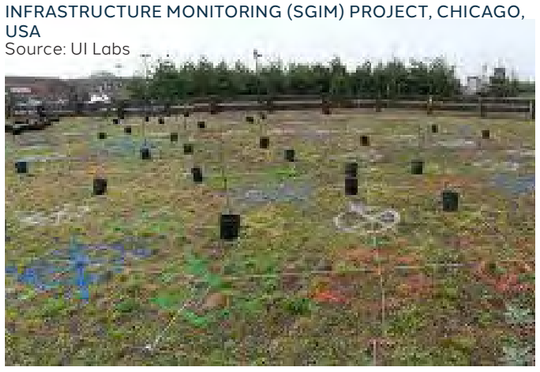


FIGURE 115. LANDSCAPE EXPERIMENT EXAMPLE, NEW YORK CITY AFFORESTATION PROJECT, USA
Source: Alexander Felson

Landscape Experimental Research on the Campus

The evolution of research at the NRC in the last 100 years and the development of how plantings and vegetation have been integrated and used in Canadian landscapes influence the landscape approach defined for the Master Plan. The existing landscapes of the Campus include naturally-vegetated areas at the Northern and Southern portions of the site with the built environment concentrating in the centre of the Campus.

As such, a reference to Past, Present, and Future landscapes on the Campus will be introduced, considering the core of the site as the Future, and transitioning through Present and Past landscape design concepts towards the Southern and Northern edges of the Campus. General landscape principles and character for each zone of landscape experimental research are described in the following sections.

9.2 LANDSCAPE PRINCIPLES AND CHARACTER

Principles

The exterior spaces of the Campus should meet the requirements for the NRC to function as a research and laboratory facility. The exterior spaces should allow opportunities for workers to collaborate while providing an environment that supports and encourages healthy lifestyles. In developing the exterior spaces throughout the Campus and surrounding each building, the following key objectives and principles form the basis of the Campus Landscape Design:

GUIDELINES

Create Lines and Provide Hierarchy

- Provide legible paths of travel for all users navigating the Campus.
- Create a hierarchy of roadways incorporating street trees, planting beds, walkways, and cycling lanes where appropriate.
- Create a safe and secure environment and use Crime Prevention Through Environmental Design (CPTED) principles.
- Provide universal accessibility throughout the Campus.

Create Unity

- Proportion landscape features to create balance and scale with built elements.
- Create building frontages that are visually appealing through landscape features and site development.
- Create exterior spaces that support and enhance each building's functions and operations.
- Screen undesirable views of back-of-house areas (i.e. loading areas and maintenance yards) using vegetation and fencing.

Promote Health and Well-Being

- Provide opportunities to contribute to an active and healthy lifestyle through welcoming communal outdoor spaces and fitness circuits.
- Provide open-grassed areas for spontaneous recreation such as temporary nets for volleyball and badminton at lunch time.
- Promote and create spaces that are inclusive for all visitors and users of diverse gender, culture, and physical abilities.

Enhance the Environment

- Protect existing forested areas at the South and North edges of the Campus. These woodlands are natural assets for the Campus and support transition to the surrounding areas.
- Preserve existing wetlands, wetland functions and wildlife habitats, particularly for species at risk.
- Favour natural landscape surfaces and components over impervious hard surfaces where possible.
- Maximize opportunities for LID site features and integrate a sustainable design approach, including minimal maintenance operations and life-cycle costs.
- Promote biodiversity in the selection of native plant material and through providing varying environments (i.e. shade trees and shaded resting areas) that evolve throughout the year, with distinctive visual and physical characteristics.
- Reuse excavated materials where possible to create site features. The re-use of the excavated materials will reduce the need to haul material off-site.

9.2

Sense of Place

The character of a place or sense of place is created when interior spaces are connected to and create balance between the exterior spaces. Creating a strong sense of place also involves creating attractive spaces that fulfill functional uses in the most aesthetically pleasing ways such as the following:

- Attractive and welcoming gateway and campus boundaries with the surrounding neighbourhoods.
- Appealing exterior spaces supporting each building and day-to-day activities.
- Tree-lined roadways and walkways.

As a result, the sense of place is directly connected to the experience of the place by the users and visitors but should also celebrate the history of the land and the culture of the people who used the site before it was a research centre. Indigenous culture and Canadian diversity should be celebrated in the different exterior spaces; these aspects of exterior design will be further developed during the detailed design of each space.

User input must be at the heart of design choices during the detailed design of open spaces. A gender-based approach (GBA+) should be considered for the design of open spaces. GBA+ analysis aims to account for the realities and needs of all population groups, including vulnerable, underrepresented, and potentially excluded groups. It also encompasses the notion of intersectionality, accounting for all those who may suffer other forms of discrimination, based on gender, age, socio-economic status, ethnocultural origin, disability, or sexual orientation.

CHARACTER OF THE LANDSCAPE EXPERIMENTAL RESEARCH APPROACH

The Landscape Experimental Research Approach aims to explore, test, or demonstrate innovative concepts, techniques, materials, and practices throughout the landscape. The approach should be integrated into the Campus by the placement and selection of plant material and exterior amenities. The components of the landscape design should be influenced by their location within the Campus as shown in Figure 106. The following guidelines provide the general character for each zone:

GUIDELINES

Past (areas of the Campus with existing large forests)
Arboriculture as for the Basis of Experimental Research

- Plant diversity in the form of grids and specimen trees; diversity is promoting plant species using mostly native plants.
- Meandering pathways and trails using crushed stone or mulch (or both) for trails that extend into existing wooded areas.
- Natural elements / features as site amenities with limited pedestrian lighting provided in natural areas (i.e. armour stones as benches).

Present (areas transitioning between the natural zones and the core)
Horticulture as Science and Art

- Plant massing promoting horticultural varieties of plant species.
- Structured layouts of seating areas, gathering spaces and travel paths.
- Formal benches and site furniture / amenities using contemporary lines.

Future (core area of the Campus; concentrated around the Montreal Road intersection)
Landscape Designed Experimentations

- Planting relationships are emphasized between different plant species.
- Structured layouts of seating areas, gathering spaces and travel paths incorporating the ecology of the site.
- Formal and contemporary shapes for benches and site furniture / amenities; consider modular furniture using different shapes and sizes.

9.3

WAYFINDING AND VISUAL CUES

Wayfinding through orientation will be fundamental to the functionality of outdoor spaces. Building features, such as the architectural detailing of entrances and building envelopes combined with building layouts and site configurations, will provide general orientation and wayfinding cues to staff and visitors.

Amenities and buildings will be identified using legible signage to provide directions to staff and visitors. Although wayfinding and orientation sometimes require the use of signage in key locations to reduce confusion, other site features such as pavement markings, rows of trees, shrub beds, and fencing will help differentiate accessible spaces from secured zones.

Wayfinding will begin at the street level, where staff and visitors will arrive at the Campus. The Campus will be organized in a hierarchy of uses and exterior spaces from the Linear Gateway that will demarcate the presence of the Campus on Montreal Road to the Main Spine roadway for interior circulation within the Campus to urban plazas and open spaces. Descriptions of these integral outdoor spaces and other landscape programming spaces are provided in the following section.

It is recommended that the overall wayfinding approach for the Campus be further defined prior to detailed design of new development at the Campus, establishing a consistent hierarchy of branding and on-site communication.

Key landscape programming for the exterior spaces includes the following elements, as shown in Plan 22.

9.4 OPEN SPACE PROGRAMMING

Linear Gateway

The Linear Gateway is located on both edges of Montreal Road and is a product of the NRC's need for a 30 m setback along the road. This setback is essential to provide a buffer for future scientific research, which may be sensitive to the noise and vibrations caused by the busy thoroughfare.

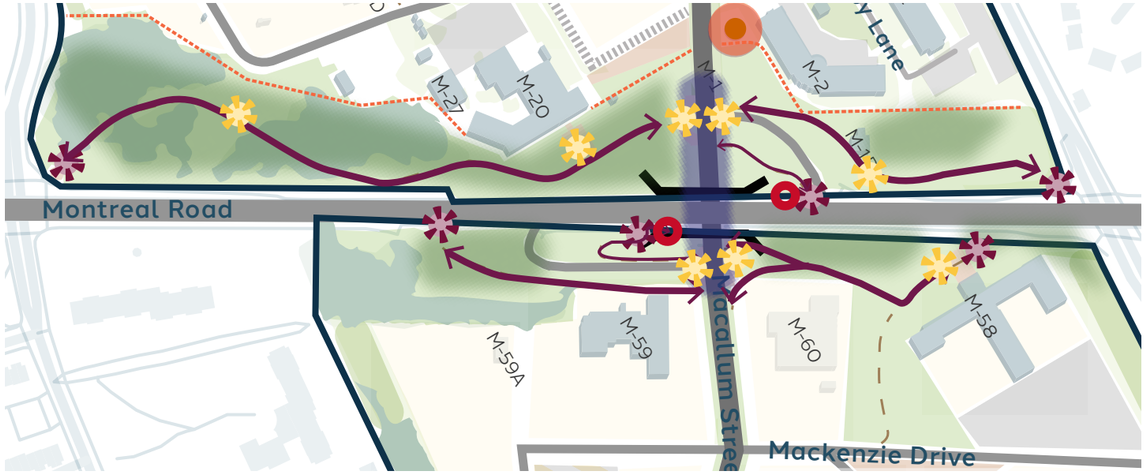
This park is intended to provide a natural, vegetated setting along Montreal Road, which will likely urbanize over the next few years.

The Linear Gateway runs along both sides of Montreal Road like a Mobius strip, a concept which will influence the detailed design. The Mobius strip is a concept derived from the mathematical sciences; it knows no limits and evokes continuity. It encompasses artistic, sensitive and scientific notions. As such, the Mobius strip could be reflected in the form of a pathway, a ramp, a bench, a signage element, or various other possible elements (Figure 116).

As shown on Plans 20 and 21, the Linear Gateway Park also includes trails and bike paths that offer campus users and visitors a more user-friendly alternative route to Montreal Road, while also connecting the Campus to the surrounding communities. The park is integrated into the universally accessible pathways that link the campus mobility hubs and Montreal Road transit stops. It is an opportunity to tell the story of the past campus by highlighting its landmarks. The M-1B Heritage House and the sphere in front of Building M-58 are highlighted and integrated into the landscape concept. During the detailed design phases, it will also be possible to develop ideas for the integration of Indigenous design and commemoration, based on discussions with the stakeholders, while drawing inspiration from discoveries and explorations associated with Indigenous history.

GUIDELINES

- Treat the landscape gateway as a softscape space primarily consisting of well-maintained lawns to provide outdoor green spaces that can be used as sitting areas and for spillage from public or special events (or both) and recreation. Mow these lawns regularly.
- Treat the Mobius strip as an entity that connects the North Campus and South Campus through the Montreal Road overpass.
- Draw inspiration for Indigenous design elements from discoveries and explorations associated with Indigenous history.
- Integrate the Linear Gateway to the pathways connecting the Campus and the edges of the site.
- Maintain vegetated slopes and provide a diversity of deciduous and coniferous trees and shrubs. Retain existing vegetation and complement it with additional plantings. Keep vegetation cover natural and organic, with specimen trees and groupings of trees and shrubs.



PLAN 20
LINEAR GATEWAY CONCEPT PLAN

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

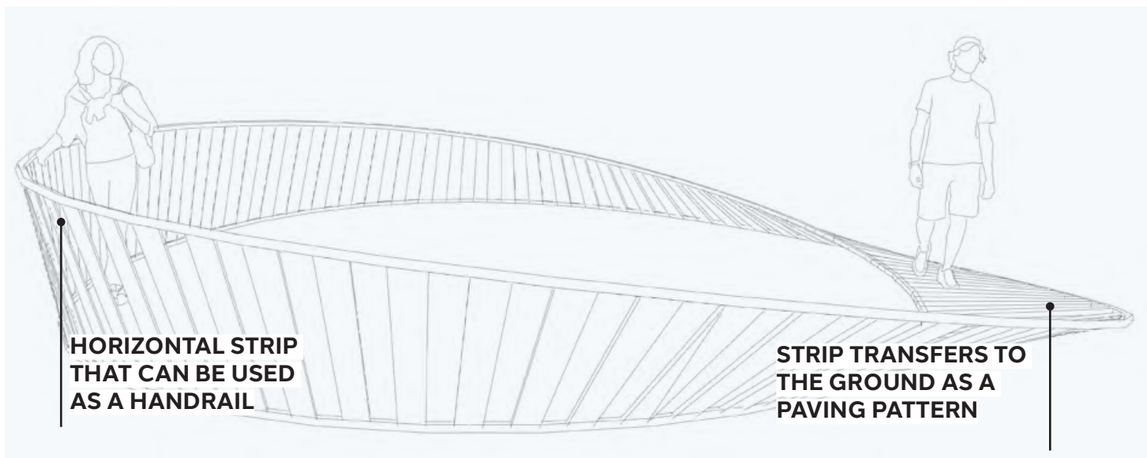
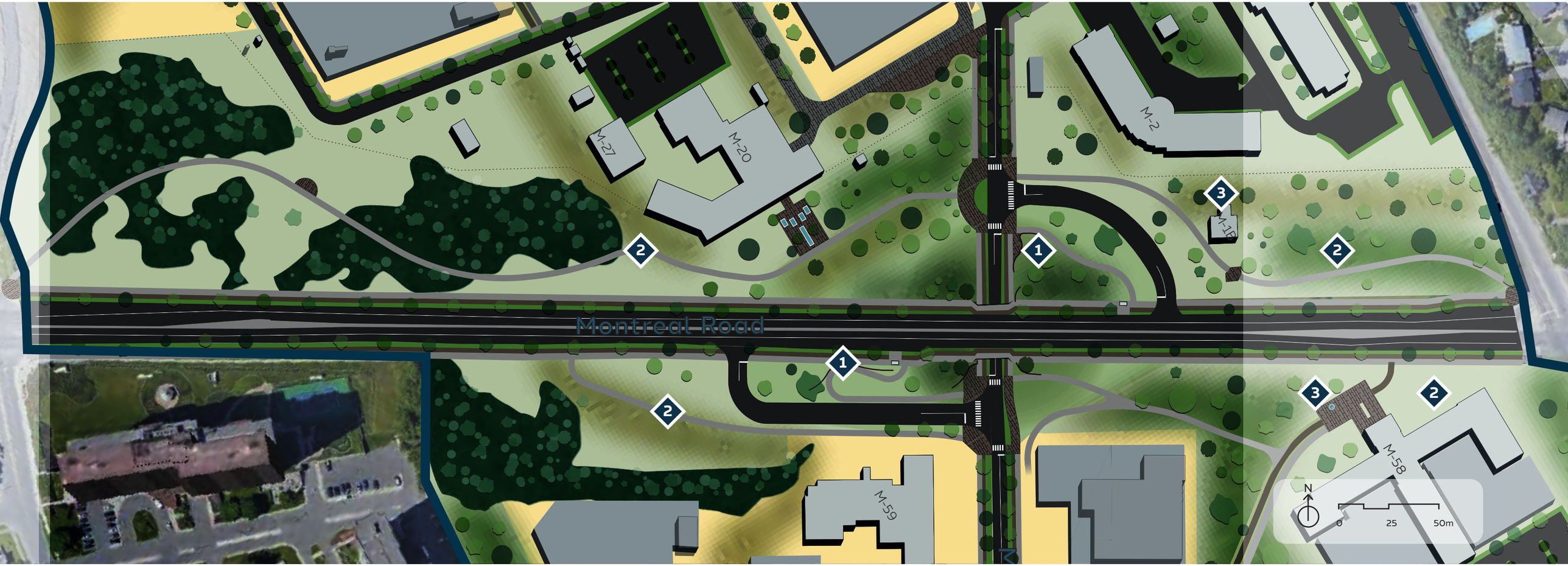


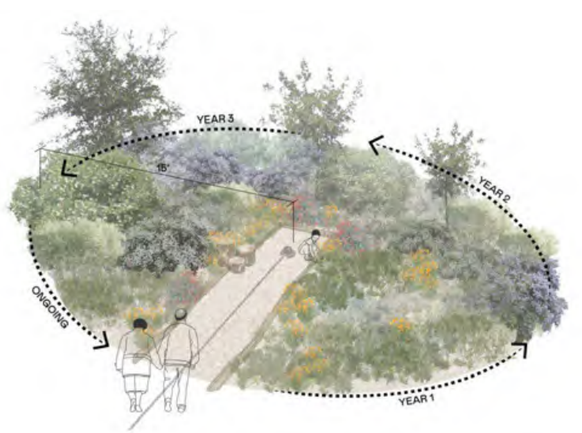
FIGURE 116. MULTIPLE APPLICATIONS OF THE MOBIUS STRIP
Source : Stantec



PLAN 21

LINEAR GATEWAY SITE PLAN

1 FIGURE 117. ARTISTIC INSTALLATION EVOKING THE MOBIUS STRIP
Source : Mado Architekci + Marcin Gierbienis



2 FIGURE 118. LANDSCAPE EXPERIMENTS SHOWCASING THE CAMPUS ACTIVITIES, TEST PLOT FOR PLANT RESILIENCE TO DIFFERENT MICROCLIMATIC CONDITIONS, LOS ANGELES
Source : University of Southern California

3 FIGURE 119. INTEGRATION OF LANDMARKS, SMALL PLAZA HIGHLIGHTING A HERITAGE BUILDING
Source : Stantec

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

9.4

Greenway and Linear Park

Building on the industrial character of some of the roadways travelling the Campus North-South, in particular the Main Spine roadway, the wide building setback from roadways should be enhanced to become part of the network of open spaces throughout the Campus. The greenway distinguishes itself from other linear parks and refers to the Main Spine, which plays a structuring role for the Campus in terms of both mobility and landscape, connecting several open spaces across the entire Campus.

GUIDELINES

- Treat the greenway and linear park as softscape space primarily consisting of well-maintained lawns to provide outdoor green spaces that can be used as sitting areas and for spillage from public or special events (or both) and recreation. Mow these lawns regularly.
- Plant trees along this greenway and linear park, offering a diversity of deciduous and coniferous trees. Retain existing vegetation and complement it with additional plantings. Maintain a natural, organic tree layout, with a mix of specimens and tree groupings.
- Provide active transportation options including walkways and cycling paths.
- Provide seating opportunities that are accessible for all users. Locate seating areas under the canopy of trees where possible.
- Provide a walkway connecting each building entrance fronting onto Howlett Street with a building entrance plaza highlighting the entrance. Highlight entrances using alternate pavement surfaces (i.e. unit pavers), plantings or planters (or both), and site furniture.

STREETSCAPE

Being part of the greenway and linear park, the streetscape structures and defines the interactions between pedestrians, cyclists, and vehicles. The Campus does not include property lines defining the public (roadway) area from the private (building) space. A portion of the Main Spine should be defined to determine the extent of open or public space versus facility or building open space; it is suggested to assign one third of the softscape adjacent to the buildings as building open space with the remaining area accounting as streetscape or public space.

The streetscape design is divided into two forms: the Main Spine including Howlett Street and Macallum Street, and the Secondary roadways. The components of the streetscapes are interconnected to create the overall sense of place for the Campus.

Main Spine – Howlett Street and Macallum Street

The Main Spine roadway is proposed to include Howlett Street which will be realigned to connect to Macallum Street and terminate at the Conference Centre or Building M-55. As described in Section 8.2 – Main Spine, this treed Main Spine should also function as a main cycling and pedestrian route, and as a connector for the open space network. The Main Spine is intended to be a space where users and visitors to the Campus will converge and meet spontaneously. Meeting places, rest areas and points of interest, both recreational and commemorative, will enhance the corridor. A unique approach must be imagined for this corridor, combining vehicular, truck, pedestrian and bicycle traffic to make it a unifying and inviting setting.

FIGURE 121. MAIN SPINE PRECEDENT IMAGE, CAVENDISH BOULEVARD CONNECTION RENDERING, MONTREAL, QC
Source: City of Montreal

FIGURE 120. MAIN SPINE PRECEDENT IMAGE, HUANHU SOUTH ROAD RENDERING, GANJIAN NEW DISTRICT CHINESE MEDICINE TECH-CITY, NANCHANG, CHINA
Source: PLAT Studio

GUIDELINES

- Provide trees 2 m from back of the roadway curb where possible. Plant trees every 8 to 10 m to create rhythm.
- Use grass as the softscape surface treatment in the boulevards where building setbacks from the roadway curbs are 15 m or wider.
- Consider planting beds as the softscape surface treatment in the boulevards where building setbacks from the roadway curbs are less than 15 m. Frame planting beds by a low curb (minimum 15 cm high) to limit the migration of de-icing salts into the beds. Plant low shrubs, perennials or ornamental grasses in those planting beds. Provide hardscape openings 2 m in width between the active transportation corridor (i.e. sidewalk or pathway) approximately every 15 m to accentuate the streetscape and create interest. Coordinate the frequency and locations of the hardscape openings with tree plantings.
- Limit culverts with preference for daylight drainage facilities including bioswales. Use bioswales to capture drainage from parking areas and drive aisles and be planted with a variety of low shrubs, perennials, and grasses tolerant of both wet and dry conditions.
- Consider a meandering alignment of the pathways and bioswales (where possible) along the Main Spine to add more interest or protect existing vegetation.
- Distribute recreational points of interest, such as outdoor gyms, commemorative points of interest, such as interpretive panels or art installations, and rest areas along the Main Spine.
- Add signage and wayfinding elements clearly distributed along the Main Spine to facilitate movements and circulation.

9.4

Energy Corridor

The Northern section of Howlett Street includes the Energy Corridor where underground pipes travel west of Howlett Street approximately 4 m from the roadway. The Energy Corridor loses heat and melts all snow within the corridor during the winter months. The above-ground infrastructure for the Energy Corridor includes hatch covers with access stairs and railings in a bright yellow every 5 to 10 m (shown in Figure 122). To reduce the visual presence and integrate the energy hatch covers and associated infrastructure to the streetscape, the following guidelines should be applied to the streetscape:

GUIDELINES

- Place low metal screening in matching yellow approximately 2 m from the roadway between each hatch cover. Allow a length of about 10 meters for these self-supporting screens.
- Use yellow accents as a signature colour for waste, recycling or organic receptacles (or both), and metal screening between the hatch covers. These vertical elements will help to create a cohesive and unique space for the Campus.

FIGURE 122. PHOTO OF THE HATCH COVERS WITH ACCESS STAIRS AND RAILINGS OF THE ENERGY CORRIDOR
Source: Stantec

Secondary Circulation Routes

Secondary roadways should extend some components of the Main Spine roadway, including active transportation, to improve transportation conditions for pedestrians and cyclists. The secondary roads should provide street trees every 8 to 10 m on both sides of the roads.

GUIDELINES

- Trees should be provided 2 m from back of roadway curb where possible; trees should be planted every 8 to 10 m to create rhythm.
- Beyond the street trees aligned with the roadways, the space between roadway and buildings should be treed where possible and offer a diversity of deciduous and coniferous trees. Tree placement should be natural and organic, mixing specimen trees and groupings.
- Grass should be used as the softscape surface treatment in the boulevards.
- A walkway connecting each building entrance to fronting secondary roadways should be provided with a building entrance plaza highlighting the entrance; entrances may be highlighted using alternate pavement surfaces (i.e. unit pavers), plantings or planters (or both), and site furniture.

9.4

Plazas

Plazas should be central to the Campus and adjacent to open green spaces offering a variety of opportunities for gatherings.

FIGURE 123. OUTDOOR LOUNGE AREA, SMITH COLLEGE, NORTHAMPTON, MA, USA
Source: Smith College

FIGURE 124. JAMES SQUARE, MCGILL UNIVERSITY, MONTREAL, QC
Source: WAA Inc.

GUIDELINES

- Prefer hardscape surfacing for plazas and provide seating and eating opportunities in a mix of shaded and non-shaded conditions. Use predominantly light materials and colors to reduce heat absorption in summer.
- Locate a central plaza at the main entry point of the Northern portion of the Campus. This central plaza act as an arrival plaza and a main gathering space.
- Provide plaza spaces at each of the main entrances to the Conference Centre.
- Provide small plazas fronting on Montreal Road (where the slope allows) that will act as thresholds to the Campus and connect it to the surrounding community. Animate plazas should be animated with vertical elements, such as planted walls, to create unity and balance with the surrounding buildings.

FIGURE 125. ARTHINGTON MALL PLAZA, UNIVERSITY OF ILLINOIS CHICAGO, CHICAGO, IL, USA
Source: University of Illinois Chicago

Open Spaces and Parks

Contributing to the main greenway, open spaces should be distributed along the Main Spine, emphasizing the presence of buildings along the corridor.

FIGURE 126. POCKET PARK AND OUTDOOR LOUNGE AREA, CITYNORTH CORPORATE CAMPUS, HOUSTON, TX, USA
Source : Lincoln Property CO

FIGURE 127. UNIVERSITY OF UTAH, SALT LAKE CITY, UT, USA
Source: University of Utah

GUIDELINES

- Prefer softscape surfacing for open spaces and parks, primarily consisting of well-maintained lawns. Provide outdoor green spaces that can be used as sitting areas and for spillage from public or special events (or both) and recreation. Mow regularly these lawns.
- Consider grassed open spaces near existing wooded areas as natural meadows. Natural meadows are transition spaces towards the natural wooded areas. Mow these areas once or twice a year. Plant specimen trees in natural meadows where possible.
- Offer seating opportunities that are accessible for all users. Provide seating opportunities under the canopy of trees where possible.
- Provide Pocket Parks for each building or grouping of buildings. Pocket Parks are courtyards or open spaces providing shade and shelter with seating and outdoor eating areas for staff.

FIGURE 128. ATLANTA DAIRIES COURTYARD, ATLANTA, GA, USA
Source : Perkins+Will

9.4

Walkways, Pathways, and Recreation

Active outdoor recreation should be promoted on campus, where possible, through wide walkways, cycling lanes and facilities, and pathways to promote active living and non-vehicular movements between buildings. These guidelines complement those set out in Section 8.3 – Active Transportation from the mobility perspective.

FIGURE 129. WASHINGTON AVENUE, ST. PAUL, MN, USA
Source: Stantec

GUIDELINES

- Distribute active outdoor recreation features such as jogging pathways and fitness stations or circuits on the Campus along the greenway and in the different parks and open spaces.
- Use heavy-duty materials for walkways and pathways to allow for maintenance equipment to access.
- Provide walkways, sidewalks, and cycling facilities along roadways, with setbacks from the road where possible.
- Design pathways as meandering and curved paths when traversing green spaces.
- Provide universally accessible walkways, sidewalks, and pathways or include accessible ramps in combination to stairs where grades require stairs.
- Provide seating areas along walkways, sidewalks, and pathways.
- Plant trees adjacent to walkways, sidewalks, pathways, and active recreation features to provide shade to users.
- Consider the development of new formal pathways in the wooded area South of the Campus, which would enable users to appreciate the natural features of the campus. As this part of the Campus is identified as a wetland by the Ministry of Natural Resources and Forestry, the development of pathways is conditional on a thorough wetland ecological functions assessment and a minimal environmental footprint design that ensures compliance with the following commitment:
  - No net loss of wetland functions on all federal lands and waters, and avoiding the potential destruction of habitat / residence of Species at Risk. If the latter cannot be avoided, identify whether a permit from the Canadian Wildlife Service of Environment and Climate Change Canada (ECCC) under the Species at Risk Act would be required. Avoiding the permanent loss of existing wetlands and wetland ecological functions shall be done in accordance with ECCC's Federal Policy on Wetland Conservation.

FIGURE 130. MEANDERING PATHWAY, PARTNERS HEALTHCARE CORPORATE CAMPUS, SOMERVILLE, MA, USA
Source: OJB Landscape Architecture

FIGURE 131. ADULT FITNESS AREA, ROUNCEY PARK, OTTAWA, ON
Source: Stantec

FIGURE 132. ACCESSIBLE RAMPS, LOWER SPROUL PLAZA, BERKELEY, CA, USA
Source: Moore Ruble Yudell Architects

9.4

Parking Areas and Mobility Hubs

Parking areas and mobility hubs must be integrated into the Campus to provide parking opportunities throughout the property. These guidelines complement those set out in Section 8.5 – Parking Areas and Mobility Hubs from the mobility perspective.

GUIDELINES

- Parking lots should be visually screened with vegetation and planted islands should be integrated into larger parking areas to reduce heat island effects.
- Integrate rain gardens and bioswales for surface stormwater management.
- Small parking areas should be provided near buildings providing barrier-free spaces and to allow for deliveries and movement of goods.

FIGURE 133. PLANTED ISLANDS AND PEDESTRIAN PATHS SEPARATED FROM THE PARKING AREA, MAISON SIMONS HQ, QUÉBEC CITY, QC
Source: Nvira

FIGURE 134. GREENING THE PARKING LOT, RODRIGUE-GILBERT ARENA, MONTREAL, QC
Source: IDU

Site Security

The requirements of the Campus consider the high security of some facilities located on the Campus; Section 11.1 Site Physical Security abd Access describes these requirements. Although site security is an important aspect of the Campus, it should be integrated to the streetscape, open spaces, and landscape features of the property.

These guidelines complement those given in Section 11.1, which deal specifically with security and access measures.

GUIDELINES

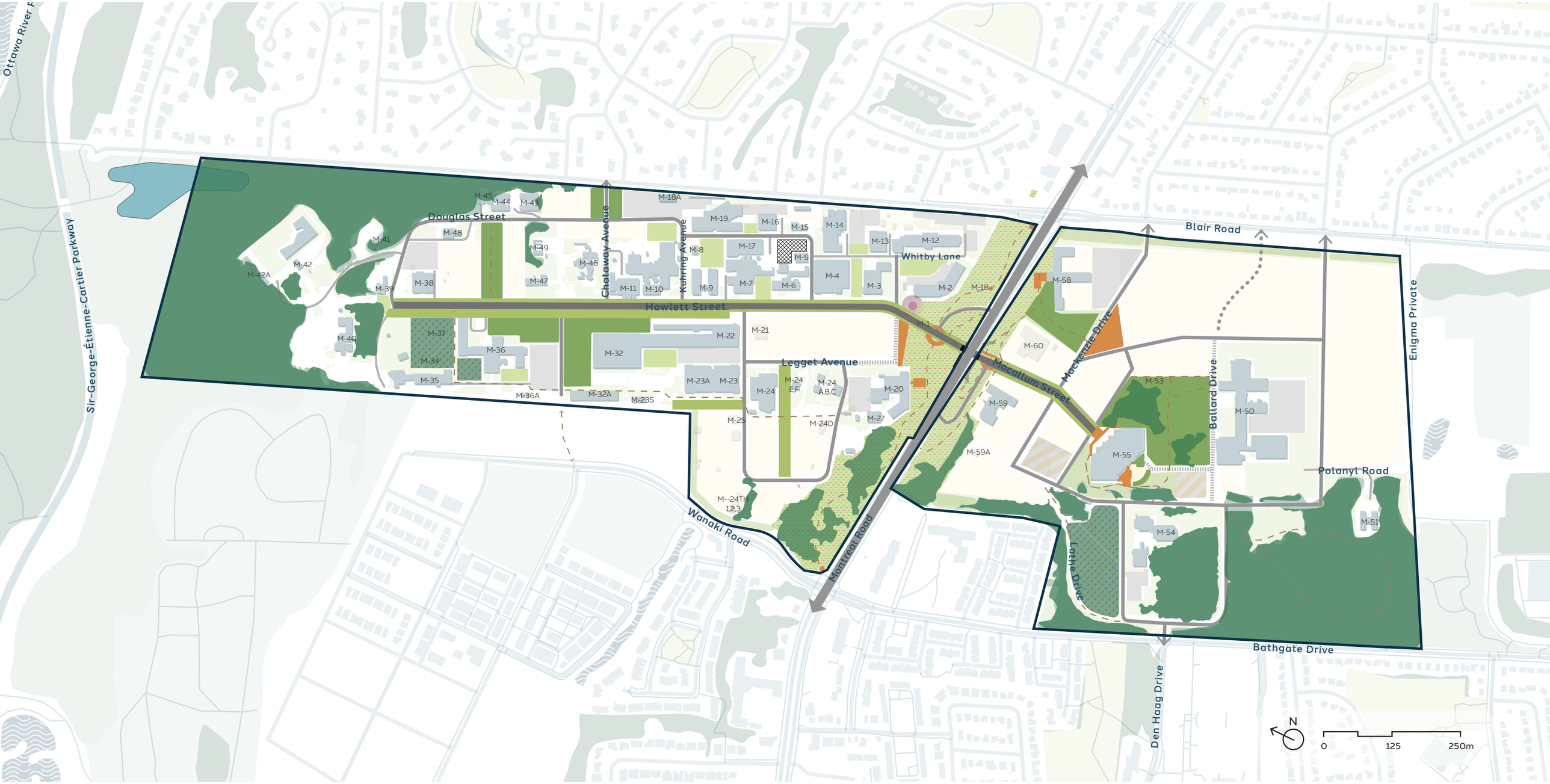
- Visually integrate the security features including access gates and ramming devices, as part of the overall landscape design of the site and each building, to create a safe and secure environment using the CPTED principles.
- Design fences and physical barriers, such as anti-ram devices, to fit and integrate with the overall language and character of the campus. Ensure that they are aesthetically pleasing.
- Use different fences as visual cues to demarcate various security zones.
- Use landscape features as anti-ramming devices. Use landscape elements as anti-ramming devices. Avoid jersey fences or elements lacking any architectural detail.
- Plant trees with a setback from any fencing to limit branches overhanging any portions of the fence.
- Plant low vegetation at a distance of at least 3 m from security fences.

Commemoration

Components of commemoration should be integrated along the greenway of the Campus, in open spaces, in plazas, and at the Conference Centre to tell the story of the important people and work of the NRC.

GUIDELINES

- Distribute commemoration stories across the Campus and link to important sites.
- Locate commemoration stories related to important discoveries within large open spaces and plazas.
- Locate commemoration stories related to important individuals along the Main Spine.
- Develop a list of commemoration stories, along with recommended locations, to facilitate their incorporation into campus open spaces as development occurs over time.



PLAN 22
OPEN SPACE PROGRAMMING

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Existing wooded areas
- Existing lowland swamp
- Park | Parc
- Greenway / Linear park
- Plaza
- Pocket park
- Linear gateway
- Natural open space
- Existing green areas within the project area (e.g. grass areas)

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

9.4

Clarification regarding proximity to the Sir-George-Etienne-Cartier Parkway and nearby pathways

The Master Plan preserves the existing wooded areas at the Northern and Southern ends of the Campus. Access to the natural components of the North wooded area through recreational trails, as well as its connectivity to the Sir-George-Etienne-Cartier Parkway, is compromised by several factors:

- The drop in elevation at the Northern edge of the Campus is the most severe across the entire site. The slopes are steep, creating a rocky ridge with a slope of approximately 10.8%. Designing universally accessible pathways, as well as maintaining and monitoring them, is a considerable challenge.
- Remote from other Campus activities and neighboring communities, the Northern portion of the Campus is planned to include highly sensitive buildings. A controlled pedestrian entrance would be difficult to monitor in the context of a remote location In the past, the NRC has also observed illegal encampments and informal fires on its land in the Northern wooded area. The NRC must rely on security measures that aims to deter and delay risk.

PLAN 23
CHALLENGES OF CONNECTING THE CAMPUS TO THE SIR-GEORGE-ETIENNE-CARTIER PARKWAY

Ridge line
Existing fence
High sensitivy area
NCC pathway

N
0 50 100m

9.5

SITE FURNISHING

Site furniture should offer a consistent language of shapes, lines, and colours throughout the Campus. Site furniture includes benches, waste, recycling or organic receptacles (or both), bike racks, picnic tables, and shade shelters. Refer to the different outdoor programming areas for details on site-specific elements.

9.6 TREES, SHRUBS, AND GROUND COVERS

Existing Vegetation

Existing wooded areas, groupings of trees, and vegetation should be integrated into the Campus to offer greenery in support of the architecture and to structure the Campus.

GUIDELINES

- Complete a detailed tree surveys and Species at Risk assessments to support the development of the Campus.
- Protect existing forested areas at the Northern and Southern ends of the Campus. These woodlands are natural assets for the Campus and support transitions to the surrounding areas.
- Reduce impact to existing trees and vegetation growing throughout the Campus where possible.
- Retain and protect healthy mature trees where possible. Mature trees are desirable environmental and aesthetic features and their retention avoids compensation for tree removal.
- Plan for Tree Preservation Plans as part of every development project. Tree protection mitigation measures should be provided to enable the survival of plants to remain.

Proposed Vegetation

Natural groupings of trees should be used and distributed to soften the architectural massing and complement it. Throughout the Campus, plantings should be employed to:

- Beautify the streetscape.
- Shade seating and eating areas.
- Frame gathering spaces.
- Direct site users to entrances or exterior rooms.
- Protect site users from undesirable weather or conditions (i.e. winds and ultraviolet rays).
- Connect wildlife areas through natural corridors.
- Improve wildlife habitat.
- Screen undesirable views of parking areas, loading zones, and back of house areas.

Plantings should be planned to follow CPTED principles including selecting trees with a branch structure elevated from the ground in combination with low shrubs and perennials that are approximately equal to or lzess than 60 cm high. These general criteria will promote the natural surveillance of outdoor spaces. In addition, exterior spaces or rooms should be accessible from multiple access points with limited barriers.

GUIDELINES

- Aim for an overall healthy vegetation cover of 40% at 40 years, to provide shade and screening for site users and wildlife.
- Increase the use of large deciduous trees where possible.
- In parking lots, provide at a minimum one new tree for every five parking spaces.
- Provide for each tree access to a minimum of 30 cubic metres (m3) of healthy horticultural soil made up of 45–70% sand and 4–10% organic matter, with a pH value between 5.5 and 7.5. Based on scientific research in the landscape and forestry industry, it is understood that about 80% of the root system of a tree is located in the top 450–600 mm of soil. As such, at least 1 m of depth is recommended for all trees. When planted in a shared trench, soil volumes per tree should be 15–18 m3.
- As trees should work in symbiosis; limit invasive species with existing invasive ground covers removed where possible as part of the development of the lot and replaced with native species promoting biodiversity.
- As biodiversity is at the forefront of landscape planning, provide a mix of sizes and types of plants, including deciduous and coniferous trees and shrubs, grasses, perennials, mown lawns, and naturalized areas.
- Use a variety of native plants to reduce the need for irrigation and avoid any invasive species.
- Use hardy plant material demonstrated to tolerate factors such as cold, heat, drought, flooding, and salt:
  - Plant salt-tolerant varieties adjacent to roadways, drive aisles, parking areas, and walkways.
  - Plant drought and heat-tolerant varieties throughout the Campus to reduce the requirement for irrigation. When irrigation is determined as required, an effort should be made to increase the use of non-potable water.
  - Plant varieties that tolerate wet and dry conditions adjacent to ponds and bioswales.
- In large softscape areas, provide a mix of native trees in groupings to create visual interest through combining textures, colours, sizes, and shapes of trees. Plant trees to aesthetically enhance areas, shade walkways, and parking areas, guide pedestrians throughout the site, and provide wind protection.
- Plant resting and eating areas with not only shade trees but also coniferous trees to act as a windbreak.
- Provide four-season interesting planting beds.
- When planted in hardscape areas, provide continuous tree pits below ground level, framed by low curbs to demarcate the planting area and reduce the direct spreading of de-icing salts.
- Increase sustainable ground treatment using appropriate ground covers to reduce maintenance and grass cutting while still achieving high quality spaces.

9.6 FIGURE 135. RECOMMENDED TREE SPECIES

DECIUOUS TREES

Acer rubrum
Red maple

Acer saccharum
Sugar maple

Amelanchier canadensis
Serviceberry

Amelanchier laevis
Allegheny serviceberry

Betula alleghaniensis
Yellow birch

Betula papyrifera
White birch

Carpinus caroliniana
American hornbeam

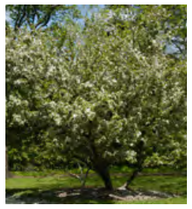
Carya cordiformis
Bitternut hickory

Catalpa speciosa
Northern catalpa

Celtis occidentalis
Common hackberry

Ginkgo biloba
Maidenhair tree

Gleditsia triacanthos
Honeylocust



Malus spp
Crabapple

Ostrya virginiana
Ironwood

Quercus alba
White oak

Quercus macrocarpa
Burr oak

Quercus rubra
Red oak

Tilia americana
Basswood

CONIFEROUS TREES

Abies balsamea
Balsam fir

Larix laricina
American larch

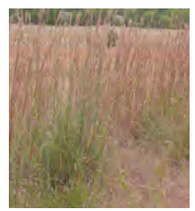
Picea glauca
White spruce

Picea mariana
Black spruce

Pinus strobus
White pine

Thuja occidentalis
White cedar

UNDERSTORY



Andropogon gerardii
Big bluestem

Anemonastrum canadense
Canadian anemone

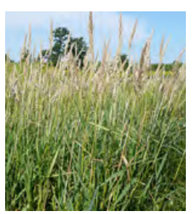
Aronia melanocarpa
Black chokeberry

Asclepias syriaca
Common milkweed

Aster macrophyllus
Large-leaved aster

Diervilla lonicera
Honeybush

Dryopteris goldiana
Goldie's wood-fern



Calamagrostis canadensis
Canada bluejoint

Cornus sericea
Red osier dogwood

Onoclea sensibilis
Sensitive-fern

Osmunda claytoniana
Interrupted-fern

Physocarpus opulifolius
Common ninebark

Rhus typhina
Staghorn sumac

Rubus odoratus
Flowering raspberry

Sambucus canadensis
American elder

10

BUILT FORM

This chapter discusses the different approaches to built form and details the design guidelines to be considered.

10.1 VOCATIONAL AREAS

THE DESIGN APPROACHES SEEK TO RESPECT THE UNIQUE CHARACTER OF THE SITE AND ITS BUILDINGS AS THE CAMPUS CONTINUES TO EVOLVE. AS THE NORTH CAMPUS AND SOUTH CAMPUS WERE PRIMARILY DEVELOPED AT SEPARATE TIMES AND CONTAIN UNIQUE CHARACTERISTICS, IT IS ANTICIPATED THAT THE ARCHITECTURAL DESIGN APPROACH THAT APPLIES TO EACH CAMPUS WILL VARY FROM ONE ANOTHER. CONSULT APPENDIX A FOR MORE INFORMATION ON THE EVOLUTION OF THE CAMPUS AND ITS ARCHITECTURAL STYLES INCLUDING INFORMATION ON THE ARCHITECTURAL SIGNIFICANCE RATINGS.

Plan 24 illustrates the different vocational areas of the Campus. It is anticipated that the North side of the Campus will focus on research and development and will generally be more secure and less public. A small area for delivery and maintenance is also planned on the North Campus.

The South side of the Campus is expected to be more public-oriented, although research and development will still be a major part of the area. The South side would tend towards a less overt security posture in terms of buildings and its architecture and site features. Some mixed scientific and administrative uses are planned in a quadrant leading to the future conference centre located at the heart of the South Campus. Among these uses involving research and administrative activities, partnerships with universities or other partner organizations are envisaged.

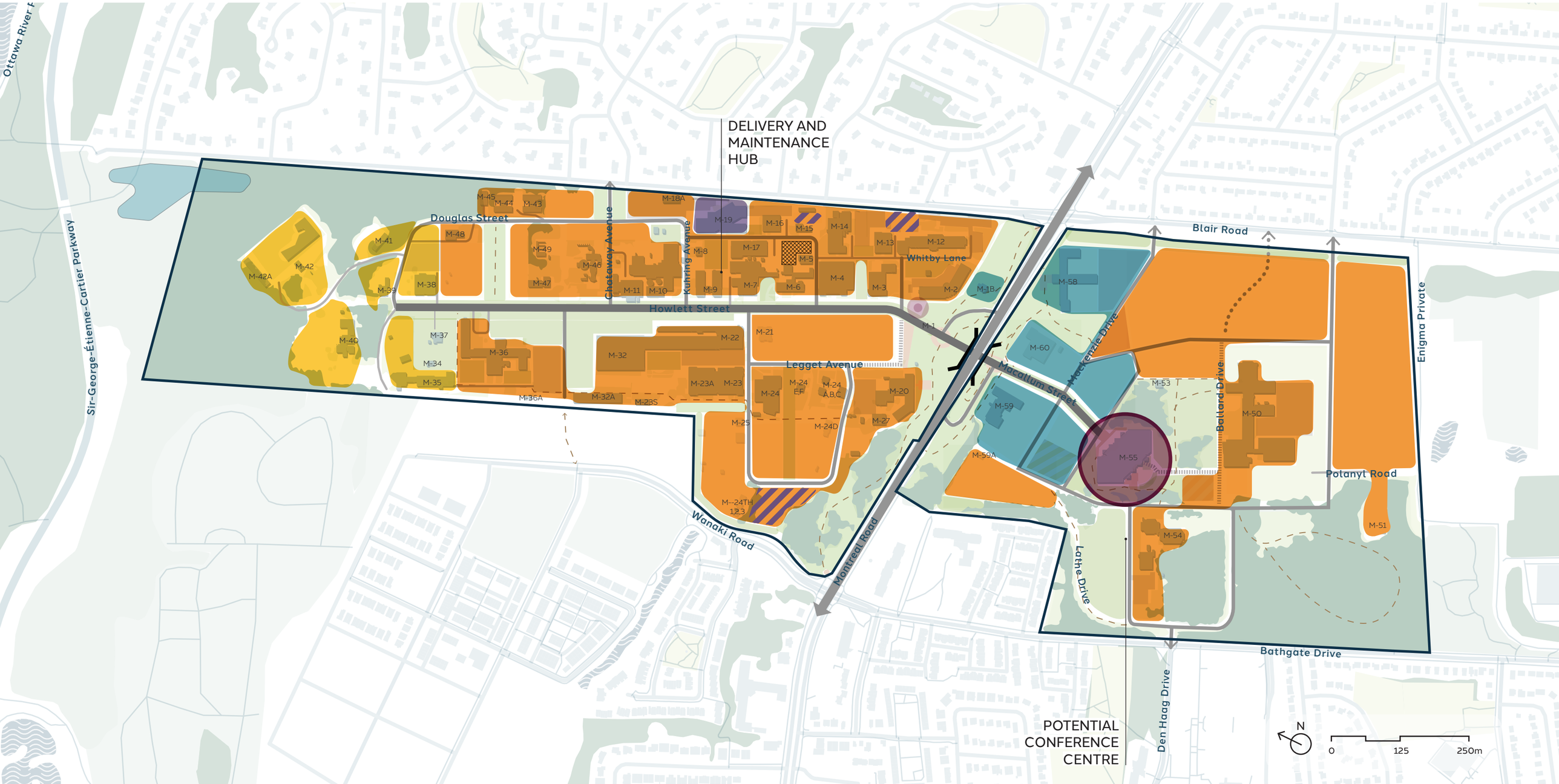
It should be noted that no commercial or residential activities are planned for the Campus, apart from supporting commercial activities (e.g. cafés and cafeteria). The Campus stands out from other research campuses which are more suited to an urban character and mixed use. Due to security requirements and the nature of the research carried out on the premises, which makes it a place with limited public access, the Campus remains a site that does not allow for the full realization of an integrated, mixed-use urban environment. The plan envisions high-quality open space and mobility infrastructure in order to connect to the existing urban context seamlessly.

Although some areas are better suited to being more open to the public, setbacks between buildings and the public domain shall be included on the Campus to preserve the integrity of research activities that may be sensitive to noise or vibration. The NRC requires a 30 m setback along Montreal Road to provide some buffer for future scientific research, which may be sensitive to the noise and vibrations caused by this busy vehicular thoroughfare.

Regarding the laboratories, the preferred option segregates laboratory facilities that would require additional security, those that may represent a potential nuisance due to noise and odours on the North side of the Campus, or laboratories that may require additional vibration isolation. Those facilities would occupy sites in the area noted for Research and Development / High Sensitivity (Secure).

GUIDELINES

- Prioritize locating highly sensitive facilities in the Northern part of the Campus.
- Consolidate Building M-19 as a delivery and maintenance hub which should accommodate small and medium-sized trucks on a regular basis. These can access the Campus via the Blair Road/ Chataway Avenue access, as although this portion of Blair Road is not a City of Ottawa designated truck route, trucks of these sizes can circulate. Oversized trucks (e.g. WB-20) will access their destination via Montreal Road without using the delivery and maintenance hub.
- Prioritize locating public facing facilities (mixed scientific and administrative uses) along Montreal Road and within the urban quadrant around Macallum Street.
- Maintain the vocation of research and development throughout the whole campus.



PLAN 24
VOCATIONAL AREAS

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Research and development (Secure)
- Conference centre area (Public facing)
- Research and development / High sensitivity (Secure)
  Laboratories that may represent a potential nuisance due to noise and odors and those that may require additional vibration isolation
- Mixed scientific and administrative uses (Public facing)
- Delivery and maintenance area
- Potential maintenance and storage area

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

10.2 FUTURE BUILDABLE AREAS / BUILDINGS TO KEEP AND REMOVE

Approach to Heritage

Although the Campus as a whole is not currently designated as a heritage site or district, the Campus and its buildings and landscapes must be examined holistically as a historic place. They have unique heritage values and character-defining elements that will require careful consideration during all future developments. Throughout the life of this Master Plan, all projects on the Campus (whether they involve new buildings, additions or renovations to existing buildings, or modifications to the site) shall consider its unique character and will be developed in accordance with the Standards and Guidelines for the Conservation of Historic Places in Canada, Second Edition. Refer to Section 3.3 and Appendix A for more information on the history of the Campus and its buildings, and the applicable heritage considerations.

For this Master Plan, the decision-making process identified in the Standards and Guidelines for the Conservation of Historic Places in Canada, Second Edition should be followed, the appropriate treatment(s) for a particular project should be established as defined below, and the applicable standards and guidelines should then be applied.

Preservation

- The action or process of protecting, maintaining, and/or stabilizing the existing materials, form, and integrity of an historic place, or of an individual component, while protecting its heritage value.

Rehabilitation

- The action or process of making possible a continuing or compatible contemporary use of an historic place, or an individual component, while protecting its heritage value.

Restoration

- The action or process of accurately revealing, recovering or representing the state of an historic place, or of an individual component, as it appeared at a particular period in its history, while protecting its heritage value.

As a step further, it is suggested that the Campus as a whole, along with the individual buildings that meet the review requirements (see Appendix A for more details), be evaluated by the FHBRO for heritage designation. It is also suggested that a Heritage Conservation Approach be developed and adopted, to further guide and inform future developments and interventions on the site. This Heritage Conservation Approach should align with the Standards and Guidelines for the Conservation of Historic Places in Canada. If implemented, this could be incorporated as a future volume to this Master Plan or an additional reference document.

What is a Heritage Conservation Approach?

A Heritage Conservation Approach establishes goals and approaches relating to the conservation of a heritage site. It is meant to help plan and guide appropriate interventions on the site as well as ongoing maintenance. The approach is based on the Standards and Guidelines for the Conservation of Historic Places in Canada. It should follow the conservation decision-making process as defined in the Standards and Guidelines, which calls for a full understanding of the heritage property, followed by planning interventions and subsequently intervening. It should include discussions on the heritage values and the character-defining elements of the site, on the selected primary and secondary treatments, as well as on specific related standards and guidelines and their application to the project. Other documents, including any FHBRO Heritage Character Statement for federally designated sites, as well as other applicable codes, standards, guidelines, and policies, should also be integrated as applicable.

Over the 30-year lifespan of the Master Plan, it is anticipated that the Campus will continue to evolve, which could include additions to existing facilities, new facilities, and changes to the uses of its various buildings. In some cases, certain buildings may become vacated.

10.2

Approach to Vacated Buildings

Where a building becomes vacated, it will be subject to one of the following approaches:

Minor Rehabilitation / Fit-up

- This approach is best suited for buildings that are in 'good' to 'fair' condition, with strong heritage values and character-defining elements. This approach involves conducting minor repairs and/or an interior fit-up to allow the building to serve a new use.

Major Rehabilitation

- This approach is best suited for buildings that are in 'good' to 'poor' condition. Major rehabilitation should be reserved for the most significant buildings with the strongest heritage values and character-defining elements, that are most in need of preservation. This approach involves conducting significant repairs and/or fit-ups to allow the building to serve a new use.

Demolition / Divestment

- This approach is best suited for buildings that are in 'poor' condition without heritage designation or architectural significance. This approach should be reserved for smaller outbuildings, more recent additions to the master plan, or other non-original additions. In general, this would normally be considered as a last resort for heritage buildings, if all other viable options have been explored. However, this does not necessarily preclude the possibility of demolishing a heritage building.

  Divestment, either to another governmental entity or to an outside entity, could be an option in limited situations, depending on the building and its location on the campus.

To determine the appropriate strategy, vacated buildings should be evaluated for their architectural significance, condition, and typology.

Potential FHBRO heritage designation will also impact plans for alterations, demolitions, or divestment, and will need to be considered, as most buildings are currently requiring or will require evaluation over the life of this Master Plan.

Generally, rehabilitation and additions to existing facilities should be prioritized over new construction and demolition whenever possible. However, new facilities can and will be required to better serve and further the science and research that is central to the mandate of the Campus. When demolition or divestment of a building is deemed appropriate, the procedures for the disposal of surplus federal heritage properties that are in place at the time should be followed.

Architectural Significance

For the purpose of the Master Plan, each building was assigned an 'Architectural Significance' shown on Plan 25, based on the following rating system.

- The "1" rating is the highest rating and refers to the most architecturally significant buildings. "1A" primarily encompasses buildings that are already designated. "1B" includes older and/or original buildings, or buildings that have more importance as it relates to scale or design significance. In general, larger buildings were considered more significant than smaller, utilitarian buildings.
- The "2" rating is the middle rating and refers to buildings with some architectural significance. The buildings included in "2A" are generally older than those included in "2B". Some buildings in the "2A" category are of a similar time period as "1B" buildings, but are of a smaller scale or architectural importance, relegating them to a lower rating.
- The "3" rating is the lowest rating and generally encompasses utilitarian buildings with no real significance. The buildings included in "3A" and "3B" are differentiated by their quality and age.

Several buildings will also need to be evaluated by the FHBRO for potential designation before an approach can be selected, as this will impact plans for alterations, demolition, or divestment.

Condition

The condition of a building should be considered when deciding on the appropriate intervention. For example, it may not be feasible to retain some buildings that are in poorer condition, while buildings in good condition may be more easily adapted to new uses. Further investigations on the condition of each building are required in order to determine their overall condition and potential for reuse.

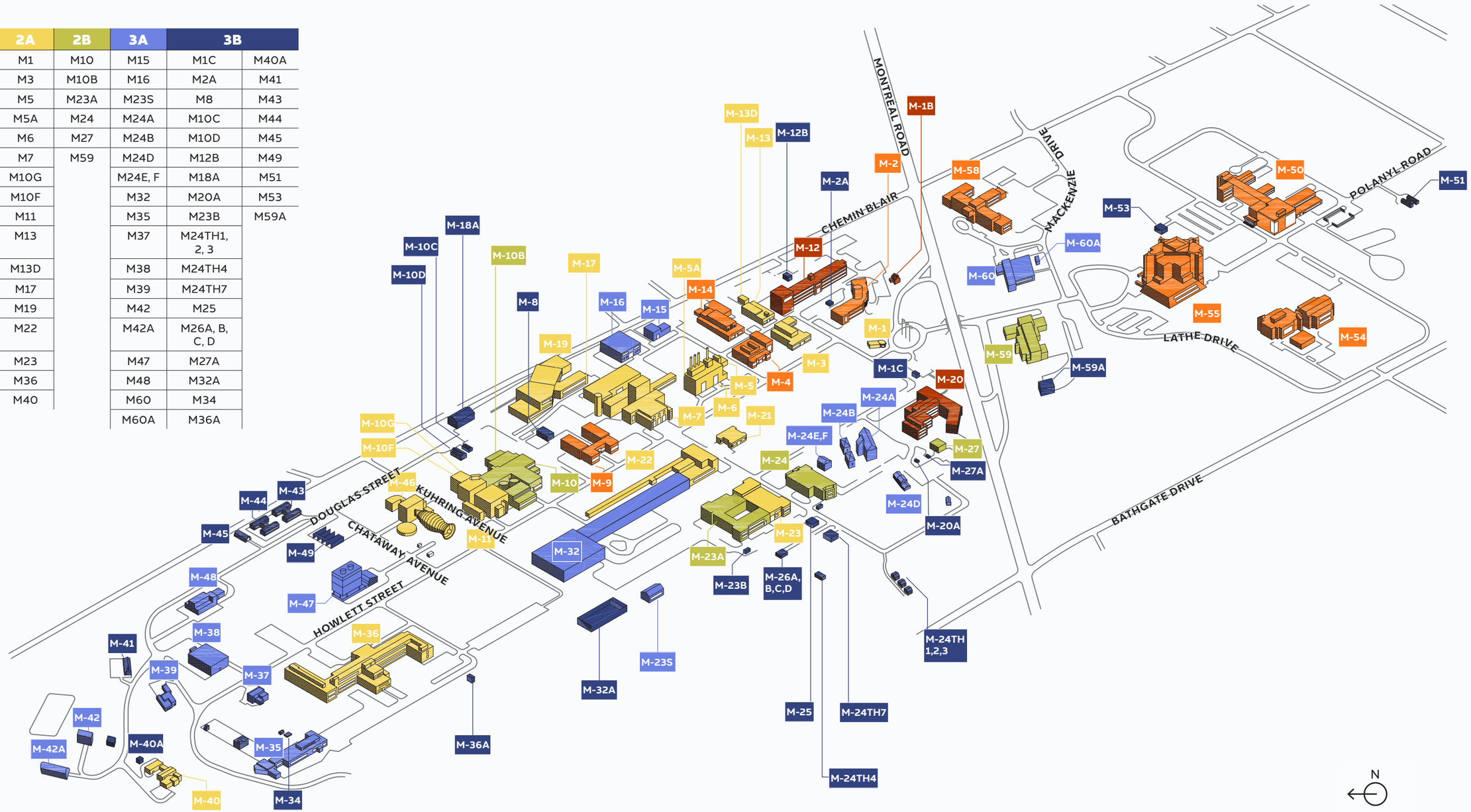
Typology

In addition to the architectural significance and condition of a building, one must also consider its typology, occupancy, and location, which could impact how easily a building can be modified, upgraded or moved.

Some buildings on the campus have highly specialized and unique uses that cannot easily be moved or whose form and layout cannot easily be adapted to a new use. For example, M-46, with its wind tunnel structure, may have limited refit or rehabilitation options. Some buildings and uses are also located in areas that are crucial to their purpose (e.g., M-40) but may not be suitable for other uses.

In other cases, the occupancy of a particular building could be of high importance, even though its architectural significance could be low. Given their importance, these buildings would likely not be moved to a different location. For example, buildings related to building infrastructure are unlikely to become vacated given their use.
The above-noted considerations, along with the condition and architectural significance of the building, should be weighed together to determine the most appropriate strategy for a building. While there should be a consistent methodology that is applied to all buildings and follows an overall vision for the campus, each building should be subject to its own individual assessment, based on its specific characteristics.

1A	1B	2A	2B	3A	3B	
M1B	M2	M1	M10	M15	M1C	M40A
M12	M4	M3	M10B	M16	M2A	M41
M20	M9	M5	M23A	M23S	M8	M43
	M14	M5A	M24	M24A	M10C	M44
	M50	M6	M27	M24B	M10D	M45
	M54	M7	M59	M24D	M12B	M49
	M55	M10G		M24E, F	M18A	M51
	M58	M10F		M32	M20A	M53
		M11		M35	M23B	M59A
		M13		M37	M24TH1, 2, 3	
		M13D		M38	M24TH4	
		M17		M39	M24TH7	
		M19		M42	M25	
		M22		M42A	M26A, B, C, D	
		M23		M47	M27A	
		M36		M48	M32A	
		M40		M60	M34	
				M60A	M36A	



PLAN 25

ARCHITECTURAL SIGNIFICANCE

The "1" rating is the highest rating and refers to the most architectural significant buildings.

1A primarily encompasses buildings that are already designated.

1B includes older and/or original buildings, or buildings that have more importance as it relates to scale or design significance. In general, larger buildings were considered more significant than smaller, utilitarian buildings.

The "2" rating is the middle rating and refers to buildings with some architectural significance.

2A The buildings included in "2A" are generally older than those included in "2B". Some buildings in the "2A" category are of a similar time period as "1B" buildings, but are of a smaller scale or architectural importance, relegating them to a lower rating.

2B

The "3" rating is the lowest rating and generally encompasses utilitarian buildings with no real significance.

3A The buildings included in "3A" and "3B" are differentiated by their quality and age.

3B

Note : The Architectural Significance rating does not take into account if a building may have a scientific or operational significance for the campus.

10.2

Approach to New Buildings

Where new facilities are required, their location and architectural style should be compatible with the unique character of the Campus and the intended vocational use of each portion of the Campus. Refer to Section 10.3 – Future Architectural Style for more information on the architecture style guidelines for new buildings and additions for the overall Campus, as well as for its Northern and Southern parts.

The North Campus has historically developed with smaller buildings on a denser orthogonal grid. Identified future buildable areas aim to integrate new buildings into the existing orthogonal grid and quadrant system and to contribute to the campus feel of the North Campus.

Existing buildings on the South Campus are generally larger in a lower-density urban environment. Future buildable areas aim to contribute to the public-facing character of the South Campus, with more compact street patterns and inviting open spaces with an emphasis on placemaking. Densification around the Main Spine between Building M-55 (the intended conference centre) and Montreal Road is also prioritized.

The new buildings planned across the Campus are expected to range from three to five storeys, consistent with current development. They must comply with the height standards of the City of Ottawa zoning by-law, which currently limits the maximum height to 18 m.

GUIDELINES

- Where feasible, prioritize rehabilitation and additions to existing facilities over new construction and demolition of existing structures.
- Determine the approach to redundant buildings based on their architectural significance, condition, typology, and potential heritage designation.
- Follow the procedures in place for the disposal of surplus federal heritage assets when demolition or divestment is deemed appropriate.
- North Campus – Integrate new buildings into existing orthogonal grid systems.
- South Campus – Densify the Campus in a more urban form around the Main Spine roadway between Building M-55 and Montreal Road.

10.3 FUTURE ARCHITECTURAL STYLE

The original Campus buildings were built swiftly and adopted a modernist, industrial style, with steel and cinderblock construction and a white stucco finish. The existing architecture of the North Campus is generally uniform in its architectural expression and remains in line with the European Modernist style of the original wartime buildings remaining on the site, with notable Bauhaus and International Style influences. The North Campus is noted for its low-profiled buildings, white or lighter coloured exteriors, dark ribbon windows, and flat roofs. Existing buildings on the South Campus are generally larger and showcase more variety in architectural expression and materiality than those found on the North Campus.

As it concerns new buildings and additions, in keeping with the existing character of each portion of the Campus, lower-profile buildings of one to four storeys should be located on the North Campus, while higher stacked buildings of up to six storeys should be focused on the South Campus. Future buildings must be compatible with the height standards of the zoning bylaw.

New buildings and additions on the North Campus should play on horizontality in their design, to accentuate the horizontality of the existing buildings on the Campus.

This should be achieved with new architectural styles that complement, without mimicking, the Modernist styles of the historic buildings. Refer to Figures 136 to 138 for examples related to how new buildings could take a variety of forms, styles and sizes while maintaining a sense of the horizontal.

FIGURE 136. ARCHITECTURAL PRECEDENTS FOR THE NORTHERN PORTION OF THE CAMPUS, ADIDAS LACES, HERZOGENAURACH, GERMANY
Source: kadawittfeldarchitektur

FIGURE 137. ARCHITECTURAL PRECEDENTS FOR THE NORTHERN PORTION OF THE CAMPUS, GREEN CLIMATE FUND HEADQUARTERS, BONN, GERMANY
Source: LAVA Architects

FIGURE 138. ARCHITECTURAL PRECEDENTS FOR THE NORTHERN PORTION OF THE CAMPUS, STATOIL REGIONAL AND INTERNATIONAL OFFICES, BÆRUM, NORWAY
Source: A-Lab

10.3

Buildings on the South Campus should be more public-oriented to reflect the proposed uses of the site. Architectural features that allow the buildings to interact with exterior public spaces shall be integrated with an emphasis on the sense of placemaking for both buildings and site features. Refer to Figures 139 to 141 for examples related to how new buildings could integrate with the public realm.

In addition to the discussion on general architectural style for new construction on the Campus, the applicable heritage standards, guidelines, and procedures should also be reviewed and implemented on an individual project basis. Interventions and additions to—as well as any new building in proximity to—current or future FHBRO designated buildings shall be compatible with the heritage buildings.

The most recent version of the Standards and Guidelines for the Conservation of Historic Places in Canada is to be consulted for additional guidance. Any potential interventions on or impacting existing federally-designated heritage buildings will need to be submitted to and reviewed by the FHBRO. Refer to Section 3.3 and Appendix A for more information on current or potential designated buildings, as well as other heritage considerations.

From a sustainability perspective, interventions to existing buildings should consider strategies to improve holistic sustainability and carbon reduction through energy performance and life-cycle analysis. New additions and facilities should also focus on operation and embodied carbon reductions and apply best sustainability practices employing the most recent federal government regulations and commitments including certification.

GUIDELINES

- Accentuate, without mimicking, the horizontality of the existing buildings with new architectural styles for new buildings and additions.
- Implement new lower height buildings on the North Campus, and higher stacked buildings on the South Campus.
- Employ a dynamic facade treatment for new buildings on the South Campus, promoting interaction between interior and exterior. Consult the most current version of the Standards and Guidelines for the Conservation of Historic Places in Canada as it affects FHBRO designated buildings.
- Reduce nuisances associated with building activities by integrating programmatic and architectural strategies (e.g. concealment of delivery or storage spaces, positioning of community spaces away from noise- or vibration-generating areas, soundproofing of mechanical equipment).

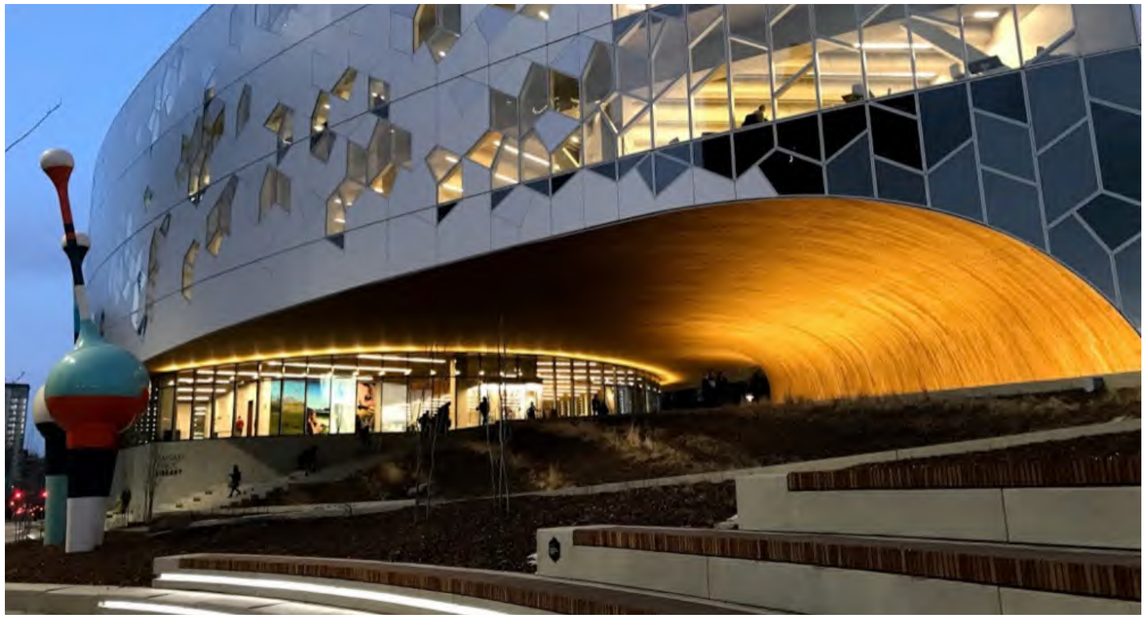


FIGURE 139. ARCHITECTURAL PRECEDENTS FOR THE SOUTHERN PORTION OF THE CAMPUS, CALGARY CENTRAL LIBRARY, CALGARY, AB
Source: Snøhetta

FIGURE 140. ARCHITECTURAL PRECEDENTS FOR THE SOUTHERN PORTION OF THE CAMPUS , FLINDERS UNIVERSITY, ADELAIDE, AUSTRALIA
Source: Danielsen Architecture, Danielsen Urban Landscape, and Danielsen Spaceplanning

FIGURE 141. ARCHITECTURAL PRECEDENTS FOR THE SOUTHERN PORTION OF THE CAMPUS, ATLANTA DAIRIES, ATLANTA, GA, USA
Source: Perkins+Will

10.4 UNIVERSAL ACCESSIBILITY

THE ENHANCEMENTS OF THE ACCESS POINTS AND CONNECTIVITY TO THE ACTIVE TRANSPORTATION MODES WILL IMPROVE THE OVERALL CAMPUS ACCESSIBILITY. THE DEVELOPMENT OF CONSISTENT SURFACE TREATMENTS FOR ACTIVE TRANSPORTATION MODES, AS WELL AS THE ADDITION OF MOBILITY ACCESSIBILITY ACCESS AT INDIVIDUAL BUILDINGS, WILL SUPPORT A BARRIER-FREE CAMPUS.

Some areas of the site are relatively flat, while other areas (notably on the South Campus and on the Northern portion of the North Campus) are more sloped. Pathways and site circulation will need to consider slopes and topographical changes on the site, as well as requirements concerning widths and dimensions of pathways, ramps, guards and handrails, tactile surface indicators, lighting levels, and additional seating options.

Universal accessibility for existing and new buildings will be evaluated on a case-by-case basis. Some existing buildings may require more significant interventions to meet universal accessibility requirements. New buildings should be designed with the most current universal accessibility requirements in mind.

Universal accessibility (also known as barrier-free accessibility) continues to be an important element whose codes, standards and policies are continually re-evaluated and updated, on federal, provincial, and institutional levels. Therefore, whenever work on the site or on buildings (or both) is being contemplated, the most up-to-date standards shall be referenced and followed.

GUIDELINES

- Prefer gentle slopes for pathways and walkways (ideally 3%, at most 5%).
- Provide wide and accessible pedestrian routes with consistent surfaces, guards and handrails where required, tactile surface indicators, lighting levels, and additional seating options.
- Provide universally accessible and understandable signage.
- Aim to improve universal accessibility requirements for all projects, notably significant rehabilitation of existing buildings and new buildings.

FIGURE 142. UNIVERSALLY ACCESSIBLE ACCESS TO BUILDINGS
Source: Seventyfour

FIGURE 143. UNIVERSALLY ACCESSIBLE RESEARCH FACILITIES
Source: Thermo Fisher Scientific

FIGURE 144. OUTDOOR ACCESSIBILITY SOLUTIONS
Source: Fonderie Laroche

11

INFRASTRUCTURE

This chapter explores the different approaches to site infrastructure: access and security, civil infrastructure, electrical distribution, energy systems, sustainability, and information technology (IT), and sets out guidelines for each of these disciplines to be considered.

11.1 SITE PHYSICAL SECURITY AND ACCESS

THE CAMPUS FACILITIES AND INFRASTRUCTURE WILL UNDERGO RENEWAL, NEW BUILDS, AND REHABILITATION OVER TIME. AT EACH OF THOSE PHASES, THE SECURITY POSTURE WILL NEED TO BE RE-EVALUATED IN CONSIDERATION OF ANY CHANGE IN THE THREAT REFERENCE, ASSETS POSITION AND ATTRACTIONS AND VULNERABILITY CAUSED BY THE CONSTRUCTION WORKSITE, AND/OR NEW SITE LAYOUT(S). CONSIDERING THE NRC AS AN ORGANIZATION WITHIN THE GOVERNMENT OF CANADA, A CONTINUOUS RISK MANAGEMENT APPROACH BASED ON A THREAT AND RISK ASSESSMENT (TRA) IN ADDITION TO THE SITE SECURITY BASELINE, TO PROVIDE ADEQUATE PROTECTION FOR EMPLOYEES, ASSETS AND SERVICES AT RISK WOULD BE REQUIRED.

THIS SECTION SHALL BE READ IN CONJUNCTION WITH SECTION 9.4 - SITE SECURITY.

The security posture of the site, facilities, and buildings must continually be adjusted in consideration of the growth and changes proposed and the phasing and implementation plan for the preferred vision of the study area. This growth must be adjusted in accordance with the findings from the Harmonized Threat and Risk Assessment (HTRA) process.

The strategy would consist of the following steps:

1. Completing a campus-wide HTRA, identifying critical assets, their position, and their value in the continuity of operation of the NRC.
2. Documenting a Gap Analysis that would identify if the current and proposed site layout contributes negatively or positively to the protection of the assets and risk posture.
3. Development of adjustment to the overall security plan with an Alternatives & Options Analysis, providing a security posture within acceptable risk level to the NRC.
4. Presentation of findings.
5. Recommending a preferred security plan strategy.

The security plan strategy must be developed in close collaboration with the NRC security department considering that a proper security plan is composed of the following components:

FIGURE 145. COMPONENTS GUIDING THE ELABORATION OF A SECURITY PLAN

The proposed site layout and security posture should be supported by the site infrastructure renewal, rehabilitation and replacement of infrastructure works related to telecommunication network, electrical network supporting the electronic security system (ESS), and associated infrastructure should align with the Master Plan Design Principles, including Future Flex, Resilient Thinking, Nature by Design and Secure the Future. These principles should guide and be reflective in the approach and methodology of works that are carried out.

Plan 26 expresses an overview of the Campus's proposed site layout, perimeter fence, vehicular, pedestrian and bike gates, potential guard house relocation, and other security features like vehicle ramming prevention measures. This plan has been developed in consideration of the currently identified security requirements.

FIGURE 146. SECURITY FEATURE, HIGH SECURITY STEEL PALISADE FENCE
Source: Ameristar Assa Abloy

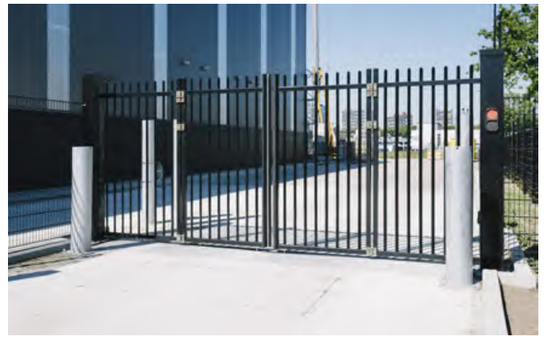


FIGURE 147. SECURITY FEATURE, BI-FOLD GATES
Source: Heras

FIGURE 148. ANTI-RAMMING MEASURES INTEGRATED TO LANDSCAPE FEATURES, HOMEPLANTERS
Source: Securiscape

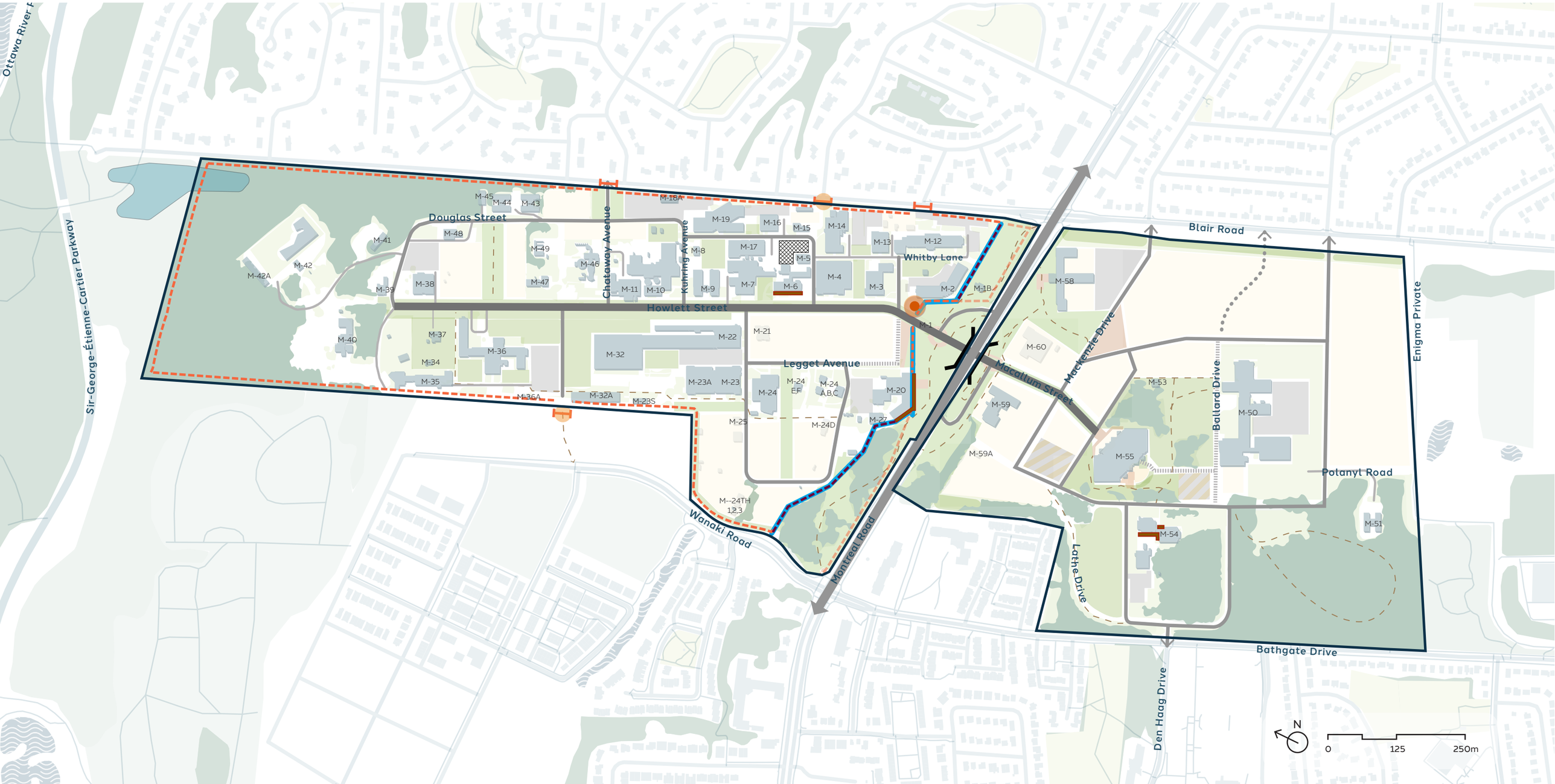
11.1

GUIDELINES

The adjustment to the overall campus security plan as a whole is encouraged to align with the following guiding principles.

- Confirm that security layers begin at features contributing positively to the Deter, Detect, Delay and Respond approach in accordance with the required level of protection of each building perimeter and later by critical assets[1].
- Apply the concept of defensible space[2] where opportunistic and accidental threats are expected to occur.
- Confirm in the campus-wide security plan that access and asset protection measures are based on a series of clearly discernible spaces that allow access to be progressively controlled (hierarchy of zones[3]). These areas, commonly referred to as zones, are defined as follows: Public Zone, Reception Zone, Operations Zone, Security Zone and High-security Zone. The last three zones are referred to as Restricted Access Zones. In the context of the Campus, these zones can be defined as a preliminary to the campus-wide security plan, as follows:
  - The South Campus is considered a Public Zone. Each building of the South Campus includes at least one Reception area, an Operating area and, in some cases, one or more Security or High-security Zones.
  - The North Campus's zoning is variable.
    - The area exterior to the fenced and gated zone is a Public Zone.
    - When the pedestrian and bike gates (other than the main gate next to the guard house) are open, the North Campus within each the fence and the gates is considered a Public Zone.
    - When the gates are closed (i.e. in the evening and at night, or during increased threat events), the North Campus within the fence and the gates is considered an Operation Zone. The area leading to the guard house is then a Reception Zone.
    - Each building of the North Campus includes at least one Reception area, an Operating area and, in some cases, one or more Security or High-security Zones.
- Control access to restricted areas in the campus-wide security plan, using safeguards that will only grant access to authorized personnel. The control of access supports the objective of providing access to restricted information on a need-to-know basis only (which may include accidental or deliberate overhearing and viewing).
- Apply the need-to-know concept in the campus-wide security plan (i.e. the need for a person to access and know information in order to perform their duties). The application of the need-to-know principle limits access to certain sensitive items, areas, assets, or information.
- Review and adjust (if necessary) the performance of the video surveillance system to meet the required objectives, whether this involves providing general observation in a real situation, being part of the detection process to some extent, and providing additional information or the ability to recognize or identify a person, vehicle, or activity.
- Monitor the gates on the Northern perimeter of the Campus from the electronic security system.
- Control pedestrians, bikes, and vehicular access into the Campus from the North Campus perimeter.
- Adapt video surveillance coverage to meet the expected objectives of identification, recognition, detection, and general observation of new gates and access points.
- Integrate proper access for emergency response vehicles in the overall site layout and security plan.
- Consider additional safety measures in the campus-wide security plan such as Emergency Call Stations in the light of a thorough assessment of their necessity.
- Consider additional safety measures in the campus-wide security plan such as autonomous robots in support to the security guards to roam and monitor the Campus around the clock in the light of a thorough assessment of their necessity.
- Consider additional safety measures in the campus-wide security plan such as a check in/out system solution (video analytics possibly or voluntarily-worn tracking tags with panic buttons) for public or employee pedestrian pathway system in the light of a thorough assessment of their necessity.
- Consider additional tenants' specific security requirements in the campus-wide security plan.
- Provide campus-wide lighting that contributes positively to the security objectives.
- Enhance the North Campus perimeter to meet the security requirements such as:
  - Fence integrity must be continuous on all perimeter length (including installing outriggers and barbed wire on missing sections of fence)
  - Both sides of the fence shall be clear of vegetation or any objects (3 m on each side)
- Repair and upgrade the existing vehicle gates to make the level of security commensurate with the perimeter fence.

1 https://www.asisonline.org/publications--resources/protection-of-assets-poa/
2 https://en.wikipedia.org/wiki/Defensible_space_theory
3 RCMP, G1-026 Guide to the Application of Physical Security Zones



PLAN 26

PHYSICAL SECURITY AND ACCESS

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Existing fence *
- Existing fence potentially removed *
- Potential alternative access perimeter *
- Access perimeter integrated to the landscape design *
- Potential future guard house
- Existing vehicular gate
- Potential ped/bike gate
- Anti-ramming measure
  - M-06 heating plant direct access to plant
  - M-20 because lobby is even with ground and vehicles coming off of Montreal Road could accidentally enter building
  - M-54 main entrance is even with ground

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

* The NRC requires flexibility to place the fence line where required operationally. Exact location of the fence would be determined at detailed design.

11.2 CIVIL

The Campus facilities and infrastructure will undergo renewal, new builds, and rehabilitation over time. To meet the growth and changes proposed, a determination of infrastructure requirements necessary to meet current and future system needs is required, including a phasing and implementation plan for the preferred vision of the study area is required for potable water, stormwater, and wastewater.

The strategy would consist of:

1. Completing an Existing Conditions Assessment.
2. Documenting a Servicing Needs Assessment.
3. Development of Servicing Alternatives & Options Analysis.
4. Presentation of findings.
5. Recommending a preferred servicing strategy.

Proposed infrastructure renewal, rehabilitation and replacement of infrastructure works related to sanitary sewers, stormwater sewers, water mains, and associated infrastructure should align with the Master Plan Design Principles, including Future Flex, Resilient Thinking, Nature by Design and Secure the Future. These principles should guide and reflect the approach and methodology of works that are carried out.

The implementation of the approach in support of the principles would follow a methodology similar to the following:

1. Existing Conditions Assessment

- Documents how the Campus interacts and the influence of completed sewer separation phases and potable water studies:
  - Internally North and South of Montreal Road.
  - Externally with the City of Ottawa's water distribution and wastewater and stormwater collection systems.
  - Understanding how the collection and distribution systems are able to service the existing campus.
- Establishes the foundation for servicing options for future growth.
- Analyzes building-to-building considerations via hydraulic and hydrological modelling.

2. Servicing Needs Assessment

- Considers a range of scenarios:
  - Existing infrastructure and existing development/building use
  - Existing infrastructure and Growth Plan

The progression of this stage aligning with the principles will inform whether the existing infrastructure can accommodate the future vision for the Campus. The implementation of this strategy will also identify the opportunities and constraints.

3. Development of Servicing Alternatives and Options Analysis

- Includes the development of various alternatives that would address identified issues or benefit from opportunities (or both).

4.a Evaluation and Selection of Preferred Alternatives

- The advantages and disadvantages of the developed alternatives are compared. The evaluation can consider several factors, such as:
  - Technical feasibility
  - Environmental impacts
  - The operation and functioning of the Campus
  - Cost

4.b Phasing and Integration Plan

- This stage will align the civil infrastructure subsurface requirements with the guiding principles and ongoing projects.

GUIDELINES

The Campus as a whole, with planned civil works, is encouraged to align with these guiding principles.

- Align civil infrastructure renewal, rehabilitation and replacement of infrastructure works related to sanitary sewers, stormwater sewers, and water mains with design principles of the Master Plan.
- Consider future expansion and building infrastructure changes. Planned works will require an understanding of sewer sizing to receive flows or for water mains to provide additional flows. The South Campus (which has compact streets) will require provision of new sewers to receive flows from buildings that are currently on septic tanks.
- Plan for redundancy and security in the supply of water for the North and South parts of the Campus. Facilities and buildings deemed sensitive or critical water users should plan for an increased level of redundancy in supplied water through either multiple connections, looping of water mains, or separate feeds. Also consider the aging and condition of the infrastructure. Events such as breaks in water mains, loss of water supply, and disruption to service should be anticipated and planned for. Condition assessments, rehabilitation, spot repairs, and replacement of sewers are part of the approach and planning measures.
- Embrace recent civil infrastructure approaches that mitigate environmental impacts and reduce excess soil removal and carbon footprint. Incorporation of innovative design elements working closely with the landscape and transportation including inlet control devices, bioswales, alternative material selection, and construction approaches such as trenchless rehabilitation and replacement.
- Design redundancy and building infrastructure that reduces maintenance requirements, increases material durability, and resilience.
- As meetings with the City of Ottawa Asset Management Group indicated significant challenges and restrictions on future proposed works, conduct further site investigations and a master servicing study for the Campus and to support new facilities, buildings, and infrastructure.
- Implement a master servicing study that will confirm the allowance of future development and building infrastructure changes.

11.3 ELECTRICAL

Lighting

All existing and proposed new access points, roadways, pedestrian paths, and parking lots will be fitted with new LED lighting fixtures. Roughly 90% of existing primary roadways and 10% of secondary roadways are already provided with lighting fixtures, with about 25% of pathways being currently lit. Therefore, existing fixtures along these roadways and pathways will be retrofitted with new lighting fixtures with photocells (replacing the existing fixtures) to provide better lighting dispersion and appropriate lighting levels.

A uniform illumination plan is recommended for the Campus for all new outdoor lighting. All outdoor fixtures are to be dark sky-compliant and bird-friendly (per NCC design guidelines) to reduce backlight, uplight, glare, and trespass on all fixtures.

The electrical design will target for the following average lighting levels per the higher of the RCMP Security Lighting Considerations Guide GCPSG-004 (2020) or the Canada Occupational Health and Safety Regulations SOR/86-304 (September 19, 2023):

- Access points: 100 Lux
- Vehicular and pedestrian pathways: 20 Lux
- Pedestrian pathways at vehicular intersections: 30 Lux
- Surface open parking lots: 25 Lux
- All new primary and secondary roadways will receive new lighting fixtures, typically:
- 10 m steel poles spaced at 30 m.
- Typical cobra head-style fixture with photocell.
- Precast concrete lighting base.
- 3 m ground rod.
- Trench with direct buried 25 mm rigid PVC conduit with 2x#4 conductor and ground daisy chained to 3–5 poles and back to the nearest building.

All new multi-use pathways will receive new lighting fixtures, typically:

- 5 m steel poles spaced at 10 m.
- Typical cobra head-style fixture with photocell.
- Precast concrete lighting base.
- 3 m ground rod.
- Trench with direct buried 25 mm rigid PVC conduit with 2x#4 conductor and ground daisy chained to 5–10 poles and back to the nearest building.

All new parking lots will receive new lighting fixtures, typically:

- 10 m steel poles spaced at 20 m.
- Typical parking lot style fixture with photocell.
- Precast concrete lighting base.
- 3 m ground rod.
- Trench with direct buried 25 mm rigid PVC conduit with 2x#4 conductor and ground daisy chained to 3–5 poles and back to the nearest building.

GUIDELINES

- Target the average lighting levels per the higher of the RCMP Security Lighting Considerations Guide GCPSG-004 (2020) or the Canada Occupational Health and Safety Regulations SOR/86-304 (September 19, 2023).
- Install new lighting fixtures on all new primary and secondary roadways, shared streets, multi-use pathways (except in natural wooded areas) and parking lots.
- Develop a uniform illumination plan for the Campus for all new outdoor lighting that considers dark sky compliance, bird-friendly, backlight, uplight, glare, and trespass.

11.3

Electrical Distribution

Refer to Appendix A for extended details of the existing Campus electrical distribution network.

Any modifications to the site's electrical distribution should consider implementing the following changes to maintain the system's existing redundancies and replace obsolete and aging equipment:

- The 2.4kV supply voltage is obsolete and should be phased out as electrical distribution changes and upgrades are made;
- All new site loads should be incorporated into the existing 15kV loop distribution;
- New duct banks should be installed to remove all 15kV loop feeder cables from tunnels. This will free up space in tunnels and eliminate the risk of a cable failure causing injury;
- All 347V loads should be eliminated or supplied from 600V-600/347V isolation transformers to eliminate the need to run neutral conductors with 600V feeders;
- Implement the recommendations stated within Stantec report titled "NRC Montreal Road, Short Circuit, Device Evaluation, Coordination, Arc Flash and 10000HP motor starting Studies", dated January 2, 2018;
- The main supply voltage to all buildings should be 15kV and stepped down to 600V. Power should be distributed throughout a building at 600V to minimize cabling sizes and voltage drops, and 600V-120/208V transformers should be located in proximity to smaller equipment loads;
- There are currently significant voltage dips occurring on the 13.2kV bus that supplies the 8MW motor when it starts, this should be resolved before sensitive loads are expanded on that bus;
- Double-end switchgears should be installed at critical buildings to achieve redundancy for critical loads.

All new campus electrical distributions to each new building should be installed within underground, concrete-encased duct banks. These ducts banks will also be used to relocate existing high-voltage feeders out of the existing tunnel. All new buildings will be supplied at 13.2 kV and stepped down to 600 V for internal distribution. This equipment can be located in the basement of the building or, if there are issues with internal space constraints, in outdoor pad-mounted equipment which can be placed in an inconspicuous location near each building.

GUIDELINES

- Implement a master electrical distribution study to confirm capacity and requirements for future development.
- Review system loading before any large new loads are added to the distribution system. Plan for upgrading the main 115 kV substation before a capacity breakpoint is reached.
- All new distribution within the Campus to be at 13.2 kV within underground concrete-encased duct banks. No 13.2 kV cables should be run through existing tunnels.
- All 13.2 kV electrical distribution to buildings will be looped (i.e. have two redundant paths to each building in case of a single point failure).
- Each new building will have a local 13.2 kV looping switchgear and a 13.2 kV to 600 V transformer for their service entrance.
- The new switchgear within each building can be located in basement electrical rooms or, if the space is constrained, in exterior pad mounted equipment.
- Power should be distributed throughout a building at 600 V to minimize cabling sizes and voltage drops, and 600 V-120/208 V transformers should be located in proximity to smaller equipment loads. All 347 V loads should be eliminated or supplied from 600 V-600/347 V isolation transformers to eliminate the need to run neutral conductors with 600 V feeders.
- Double-end switchgears should be installed at critical buildings to achieve redundancy for critical loads.

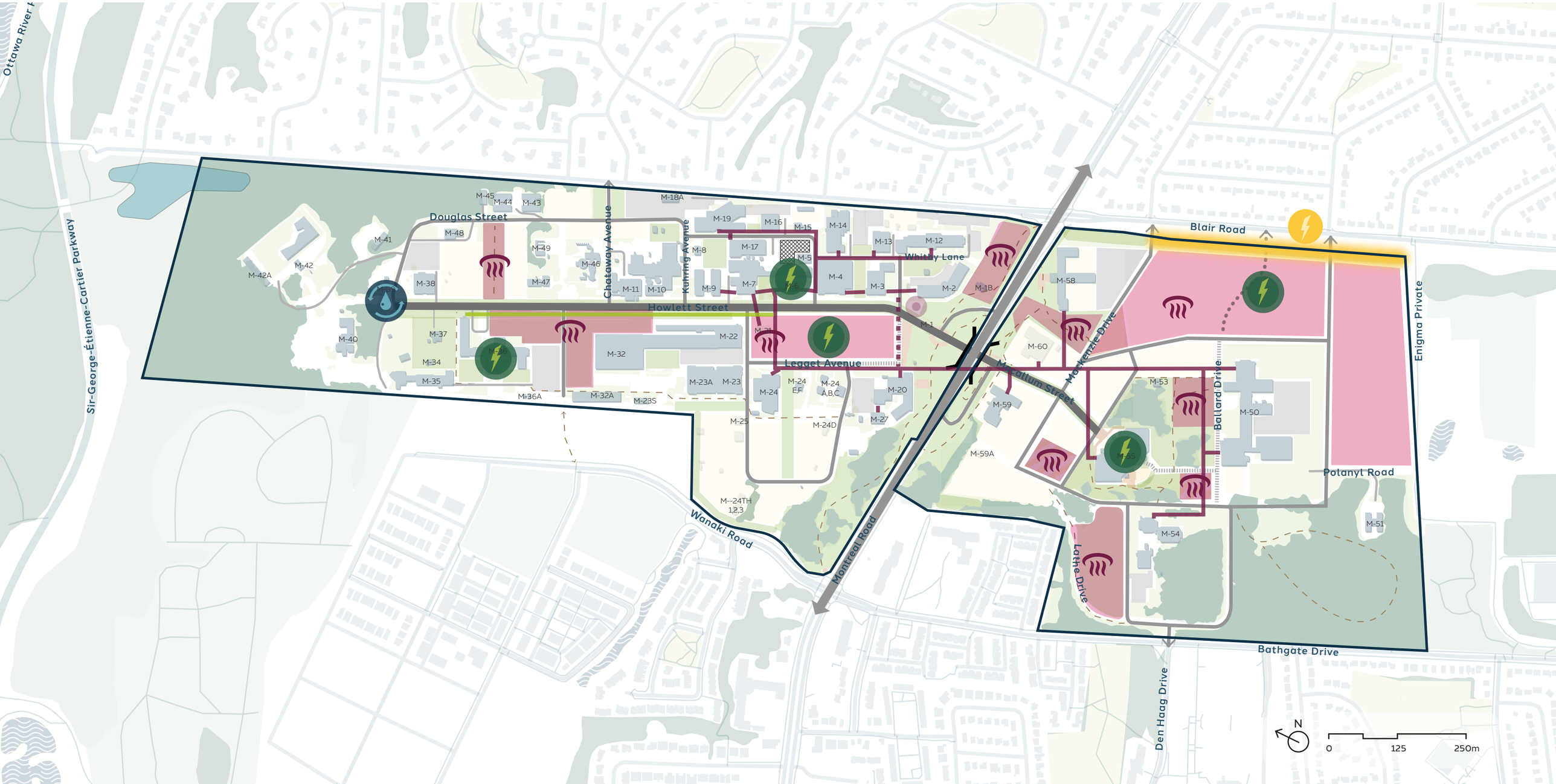
11.4 ENERGY SYSTEM

The Government of Canada is committed to achieving at least a 90% reduction in GHG emissions from buildings and conventional vehicle fleet by 2050, with an aspiration to attain carbon neutral operations. Low carbon energy generation strategies at a campus level that can be integrated into planning in a phased approach will include a selection of the following:

- Geo-exchange closed loop systems paired with ground-source heat pumps. As the climate is heating dominated, consideration of a hybrid geo-exchange system with rooftop photovoltaic thermal (PVT) system can be used to recharge the ground. Additionally, an air source heat pump used whenever ambient temperatures are agreeable allows heat to remain in the geo-exchange system to be utilized during periods of peak heating as well as reducing the overall bore hole field size. By using a PVT system, mechanical systems can be designed to be operationally net-zero energy by also generating electricity as required to operate the mechanical systems. However, PVT would not provide sufficient capacity to offset the entire electrical load. PVT systems are available in the market and utilized. Geo-exchange fields could be organized to support a particular building or could be interconnected to support a larger block of buildings as part of a district energy system.
- District energy system ambient water loops. These are a good consideration for the single-owner Campus as they have the ability to connect and share low carbon energy generation from different physical locations for campus use as well as the ability to integrate new low-carbon energy generation systems when there are new technological advancements. The NRC has a network of utility tunnels which were reviewed and are in good condition; the tunnels could be transitioned to house an ambient loop network. An ambient loop does not require separate piping for heating and cooling (four pipes) but rather only needs two pipes (similar to how steam is currently being distributed at the Campus). A district energy ambient water loop would supply energy to building-level heat pumps throughout the Campus. Using an ambient loop district design, individual building-level heat pumps could be designed to operate at a variety of different hydronic heating temperatures, potentially reducing building level modifications.
- Wastewater heat recovery through a connection to the large trunk sewer main on the North side of the Campus. This sewer main is approximately 45 m below grade. However, due to its size and capacity, the energy potential would be significant and could offset the challenges of the significant geo-exchange field area required to support the existing buildings. Wastewater heat recovery could be used to balance geo-exchange use and would connect to a campus ambient loop to share thermal energy to buildings throughout the Campus.
- Several buildings on campus are currently connected to a centralized energy centre (building M-06) either supplying heating (steam), compressed air, electrical power, or chilled water through below grade service tunnels or trenches. Based on an evaluation of data provided through a halocarbon inventory, buildings M-11, M-12, M-36, and M-55 have potentially significant thermal cooling production capabilities. These existing and potential energy nodes could be considered as part of a district energy system ambient water loop or as hubs serving adjacent buildings. Creating nodal style energy centres supports implementation phasing of building decarbonization where groups of buildings could be decarbonized at one time.
- Employ thermal storage to provide for short duration load imbalances and shave peak loads.
- Consideration of no fossil fuels for backup systems. Instead, backup systems could include:
- Thermal storage and battery storage for critical process backup as a result of electrification of systems.
- Electric backup systems (where applicable and electrical infrastructure can accommodate).
- Fossil fuels can be considered for backup and peak load curtailment conditions based on a life-cycle cost benefit analysis where net-zero carbon ready design could be utilized.
- Building-level low carbon strategies that can be integrated in a phased approach will include a selection of the following:
- Increase on-site heat recovery where possible.
- Utilize demand control ventilation and hydronic system types (e.g. variable volume, variable flow, reset schedules).
- Use of low temperature heating systems.
- Use of dedicated outdoor air systems (DOAS) that would decouple ventilation from sensible heating and cooling systems.
- Use of heat recovery chillers that connect to low temperature heating systems.
- Adiabatic or electric isothermal humidification.
- Wastewater heat recovery heat pumps for domestic heating water use.
- Research lab equipment may require specialty infrastructure such as steam generation. This equipment should be self-contained and electrically energized.
- Building envelope upgrades as part of a renewal cycle.

GUIDELINES

- Phase out the existing central heating steam plant with natural gas-fired boilers from primary operation and, based on a life-cycle analysis, use as a backup heating system.
- Phase out the existing steam distribution network. The tunnel system should be reused to accommodate a new district energy system ambient temperature distribution loop.
- Buildings on the Campus should be connected to the district energy system ambient loop.
- Low-carbon energy generation such as geo-exchange and wastewater heat recovery should be implemented, and the energy shared throughout the Campus using the district energy system ambient loop.
- All new buildings and renovations must be capable of sharing energy to the district energy system ambient loop campus network.
- Large new buildings must be considered in the decarbonization phasing approach as new energy centres sharing energy to the district energy system ambient loop network.
- Geo-exchange systems can be located both in open land areas as well as below new buildings where possible.
- Thermal energy storage should form part of the ambient loop network.
- Building level decarbonization renovations should be completed in a phased approach that aligns with the implementation of the district energy system ambient loop.



PLAN 27
ENERGY SYSTEM

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Potential energy centre location
- Potential wastewater energy location
- Potential geoexchange energy location
- Potential electrical substation location

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

11.5 SUSTAINABILITY

THE NRC HAS SET TARGETS TO ACHIEVE AT LEAST 90% REDUCTION IN THE BUILDING'S GHG EMISSIONS BY 2040 AND FEDERALLY BY 2050, AS INDICATED IN THE GGS . NEW COMMITMENTS AND TARGETS IN THE FEDERAL SUSTAINABLE DEVELOPMENT STRATEGY (FSDS) 2022 TO 2026 HAVE NOT ONLY EMPHASIZED REDUCTIONS IN GHG EMISSIONS ENERGY, BUT ALSO SET GOALS TO BUILD RESILIENCY AND REDUCE EMBODIED CARBON THROUGH THE INCREASED ADOPTION OF CLEAN ENERGY TECHNOLOGY, INCREASED RESOURCE EFFICIENCY, AND INCREASED DEMAND FOR LOW-CARBON MATERIALS.

THE MASTER PLAN MUST CONSIDER THE CURRENT CARBON REDUCTION GOALS DURING REDEVELOPMENT OF EXISTING BUILDINGS OR DESIGN OF NEW BUILDINGS. AN APPROACH TO ACHIEVING THESE TARGETS AND ALIGNING THE NEEDS OF NRC AND OTHER POLICY DIRECTIVES IS OUTLINED IN THIS SECTION.

There are multiple documents with consistent yet varying goals that are required to achieve the NRC goals including the GGS. This is the directive that shapes the NRC's real property sustainability vision and provides the following overarching mandate to achieve the following:

Emissions

- Achieve net-zero emissions by 2050, reducing absolute Scope 1 and Scope 2 GHG emissions by 40% by 2025 and at least 90% below 2005 levels by 2050.

Real Property

- All new buildings and major building retrofits prioritize low-carbon and climate resilience. Investment decisions will be based on total cost of ownership.
- All new federal buildings (including build-to-lease and public-private partnerships) will be net-zero carbon unless a life-cycle cost-benefit analysis indicates net-zero-carbon-ready construction.
- Reduce the environmental impact of structural construction materials, including by 30% for embodied carbon by 2025. Divert 90% of construction and demolition waste, and 75% of operational waste and plastics from landfill by 2030. Aid in the transition to a net-zero, circular economy.
- All major building retrofits, including significant energy performance contracts, require a GHG reduction life-cycle cost analysis to determine the suitable GHG savings (the life-cycle cost approach will use a period of 40 years and a carbon shadow price of $300 per tonne and be maintained at all project stages).

Low Carbon Operations

- Using 100% clean electricity by 2022, where available, and by 2025, at the latest, by producing or purchasing renewable electricity.
- Recommissioning large energy-intensive buildings on a regular cycle or implementing smart building technology (or both).
- Incorporating all facilities in the RETScreen Clean Energy Management Software by 2025.
- Metering energy use by 2022 for government-owned buildings of no less than 1,000 square metres (m2) with significant energy consumption.
- Existing heating, ventilation, and air conditioning and refrigeration (HVAC-R) systems using high global warming potential refrigerants, ozone depleting refrigerants and hydrofluorocarbons (HFCs) will be converted or replaced by 2030.

Water

- Reduce water consumption and the load on municipal systems through best-in-class practices and effective stormwater management.
- Eliminate irrigation beyond establishment period. If irrigation is deemed necessary, utilize non-potable sources.

Climate Resilient Service and Operations

- Achieve climate-resilient operations, taking action to assess and reduce climate change risks to assets, services, and operations.
- Manage real property holdings and operations to retain and restore biodiversity and mitigate and adapt to climate change through increased use of natural infrastructure, adoption of low GHG-emitting ecosystem-sensitive land use practices, and climate-resilient groundskeeping.
- Focus on the well-being of employees and communities in which the project is located.
- All new federal buildings, infrastructure, and major building retrofits (including significant energy performance contracts) require a climate change risk assessment that incorporates both current and future climate conditions in the analysis.

11.5

The plan to achieve net zero emissions by 2050 and meeting climate change resiliency is to be reviewed and validated by ECCC, the author and regulator of the Strategic Assessment of Climate Change (SACC).

Laboratories like those present at the Campus vary significantly in GHG emissions and energy use, much more than typical building types. Significant process loads can be found in conducting labs that use more energy and emit more GHG than the building itself. It is recommended that all new construction and existing building projects refer to the PSPC Real Property Sustainability Framework and the Technical Reference for Office Building Design.

The following process outlines a proposed comprehensive methodology to achieve the net zero goals identified by the NRC. A comprehensive methodology relies heavily on three priority strategies for the Campus:

1. Energy modelling
2. Life-cycle assessment (LCA) for embodied carbon impacts
3. Life-cycle costing analysis (LCCA)

A building can be considered as a complete system composed of elements that interact with one another. These elements include building envelope, mechanical systems, lighting, people, plug and other equipment and process loads, and the external environment, including weather and site. Energy modelling of a building considers the interaction of the building elements and the building as a whole system. It considers the energy, and the air and moisture flows into and out of the building and between the building elements, thus predicting the building's energy requirements in a holistic manner.

The building energy modelling and simulation not only quantifies the operational carbon of a facility, but also outputs critical key performance indicators (KPIs), such as envelope heat loss, thermal energy demand intensity (TEDI), energy consumption, utility costs, and renewable energy generation.

Labs are more complex than a typical building, often with extensive fresh air requirements, and high equipment process-plug loads. Labs often use more energy and emit more operational GHG than typical building types by a sizeable margin. Therefore, achieving the goal of net-zero carbon for labs will be challenging. Energy modelling and simulations will be required to meet the goals and targets of the project. They promote the application of an integrated design process among building professionals, architects designing the building envelope, mechanical and electrical engineers designing the HVAC, lighting, receptacles, and renewable energy systems, and other members of the design and project teams.

The LCA quantifies the embodied carbon of the key building components, including the structural and envelope materials, and outputs critical KPIs, such as global warming potential, acidification, and ozone depletion. As the electrical grid becomes cleaner, the operational carbon burden will reduce, whereas the embodied carbon will play a much larger role in the whole-life carbon emissions and will need to be equally reduced.

Finally, the LCCA bundles all critical cost information of a proposed design and outputs its total financial burden over a 40-year analysis period. This enables designers to choose and balance between energy/whole-life carbon optimization and financial considerations.

11.5

Only approved energy simulation software and approved LCA software shall be used to model the Reference Design and the Options.

As a result of the workshops held in July 2022 and August 2022, the primary sustainability objectives for the Campus are decarbonization through fiscally responsible energy efficiency of existing buildings and low carbon solutions for new construction (refer to Section 11.4 – Energy System for solutions). The described methodology must also be applied to major renovations with the primary goal of achieving carbon neutrality and cost neutrality.

The secondary objective includes further life-cycle carbon considerations for the existing infrastructure utilizing strategies such as programming densification (consolidation and sharing), and repurposing and adaptive re-use.

Finally, the final strategy includes consideration for the needs to fully electrify the site, with the assumption that an ongoing grid transition will result in a low/no carbon footprint.

All three priority strategies align with the goals of the NRC and the commitment to the LEED rating system. Future considerations for more recent standards and rating systems (e.g. Canada Green Building Council Zero Carbon Design Standard) should be considered as an alternative for all future projects. Note the Zero Carbon Design Standard prioritizes carbon reduction whereas LEED includes carbon impacts as well as other holistic sustainability impacts.

However, these three priorities do not negate the need to consider more holistic sustainability strategies for the Campus, including multi-modal transportation on campus, the need to enhance the natural environment and consider more green space over hardscape, and the need for amenities to encourage active engagement within the Campus.

The need to consider the natural environment synergistically with the built environment enables future campus development opportunities to be thoughtful about health and wellbeing, aligning with the commitments to the WELL certification rating system. WELL is an environmental accreditation focused on the well being of the users.

The South Campus Carbon Neutral Study prepared by WSP Global Inc. demonstrates an 85–90% reduction in GHG emissions anticipating an approximate $88 million cost to achieve these results for buildings M-50, M-54, M-55 and M-59. The capital investment required will have to be integrated into the Campus planning in a phased approach.

GUIDELINES

- Perform energy modelling and simulations for new construction projects and major retrofits of existing buildings to achieve carbon neutrality and cost neutrality.
  - Position new buildings around potential or new energy centres, incorporating whole building energy modelling to support carbon outcomes and life-cycle costing.
- Conduct climate risk and vulnerability assessment (CRIVA) in advance of site selection to identify climate hazards (e.g. geological faults) for all new construction and for major retrofit projects and incorporate adaptation measures into a climate-resilient design.
- Optimize the life-cycle carbon of existing infrastructure using strategies such as program densification (consolidation and sharing), reallocation, and adaptive reuse.
  - Increase the building density and compactness on the South side of the Campus, supporting Campus interconnectivity, shared service buildings, and human-powered transport.
- Work towards an energy transition based on complete electrification of the Campus.
  - Support geo-exchange with fields in green space adjacent to existing buildings and under new builds where possible.
- Develop holistic sustainability strategies such as:
  - Promote bioclimatic design to take advantage of the site's specific climatic conditions.
  - Prioritize energy-efficient building envelope design.
  - Incorporate passive heating, cooling, and ventilation strategies.
  - Integrate energy-efficient technologies to produce, store and redistribute energy at peak periods or in the event of power outages.
  - Choose materials that are low in inherent carbon emissions, non-toxic, non-polluting, and conducive to a long life cycle.
  - Make design and construction choices that promote a longer building life cycle.
  - Promote urban design and architectural strategies that encourage a physically active lifestyle and facilitate healthy choices (e.g. outdoor and indoor fitness spaces, changing rooms with showers, etc.).

Note that many of the guidelines relevant to sustainable development are transversal to several of the other themes previously covered.

11.6 INFORMATION TECHNOLOGY

THE CAMPUS MUST BE A POINT OF REFERENCE FOR THE DEVELOPMENT AND RESEARCH INDUSTRIES. THEREFORE, THE IT AND TELECOMMUNICATIONS NETWORK ON CAMPUS SHOULD BE AT THE FOREFRONT OF TECHNOLOGY. OTTAWA, AND PARTICULARLY THE CAMPUS, IS AN IDEAL LOCATION FOR COMMUNICATIONS TECHNOLOGY AND NETWORK LEADERS; THE CAMPUS MUST PROMOTE THE IMPLEMENTATION OF NEW TECHNOLOGIES BY USING AND EXHIBITING THEM ON ITS OWN PREMISES.

Telecommunication Entrance Services

Historically, building M-60 served as the primary data centre for the Campus, but these services were migrated to a data centre facility located in Gatineau. However, M-60 continues to host a local data centre and the Main Distribution Facility (MDF) for the Campus. Considering that the MDF and data centre (currently in M-60) must be moved to another building, the infrastructure in the selected building needs to be upgraded (particularly the electrical and the emergency power supply system) because M-60 hosts other IT infrastructure in addition to the MDF.

The required area for the new MDF will consider that some of the IT infrastructure in M-60 could be moved to the cloud or to a Shared Services Canada (SSC) data centre. Building M-55 is considered the best candidate to host the new data centre.

This transfer should be the opportunity to create or update agreements with carriers (service providers) and add the following requirements:

- Carriers should be required to terminate all their cables and install any equipment they own in a single shared area near the data centre. A demarcation room or point must also be added to the new data centre, typically located near the loading dock for easy access with equipment. This demarcation room or point allows IT contractors to manage equipment without accessing the building unnecessarily, which could be a security risk.
- Carriers should not be allowed to run their cables to other locations within the Campus.
- Carriers should be required to remove their equipment when it is no longer needed.
- Carriers must be responsible for protecting their equipment within this shared area by providing their own caged-off area or locked cabinets.

Building M-03 hosts a secondary MDF. The MDF room in this building must be renovated, adding at least a climate control system, cable shelves, cable managers, electrical panels, and a new grounding system. There are currently only two racks/cabinets in this secondary MDF, but there is enough space to add new racks to accommodate future increases in fibre cores.

Inter-Building Communications (Tunnels and Duct Banks)

Inter-building communications cabling on the Campus must be installed underground using both existing and new tunnels and duct banks. Tunnels and duct systems must follow the Master Plan and must be placed in designated utility corridors. During the design process for new buildings, the route and building entrance tunnel locations or duct banks must be clearly specified.

To anticipate ultimate requirements for service and future needs, the proposed size and number of conduits for each new building shall be a minimum of four conduits (100 mm) extending from the tunnel and terminated in a building's main entry telecommunications closets. Conduits distribution shall be two for fibre-optic cables, one for copper and coaxial cables, and one spare conduit.

Ideally, the building selected to accommodate the new data centre and MDF must have direct access to the tunnels. Note that existing tunnels already have a branch reaching the M-55 building (a candidate for the new MDF and data centre). As mentioned, the proposed size and number of ducts to reach the tunnels should be a minimum of four conduits (100 mm) if required.

Some sections of the single telecommunications duct in the tunnel are already 100% full and a new plan must be put in place to add at least one other 100 mm conduit duct where necessary, and to uninstall old dead cables.

11.6

Fibre-Optic Network

The communication between buildings occurs by fibre-optic cables running through the tunnels and duct banks. All new telecommunication links between buildings (either new or existing) must be via single-mode, fibre-optic cables. Multimode fibre will only be used for local connections (i.e. inside buildings).

As previously noted, the current MDF and Data Centre in M-60 will be moved to another building, and a strategy must be developed to allow this move without causing a loss of services.

One of the following options must be considered:

- Install at least one single-mode cable (192 fibres) and one multimode cable (192 fibres) between the new data centre building and the tunnel (near the M-60 building) in order to intercept all existing cables arriving at M-60. To correctly intercept existing cables, splicing boxes adapted to the environment must be installed in the tunnel; patch panels are not recommended to be installed in the tunnel (due to the harsh environment). This option would create a long downtime period when transferring services to the new building.
- Install new cables with enough spare fibres from the new data centre building directly to the concerned buildings (M-03, M-24, M-20, M-36, M-50, M-51, M-54, M-55, M-58), all using a new separated duct in the tunnel, and separated patch panels in each building.

Service providers must also transfer all fibre and copper cables termination to the new data centre. No path panels or junction boxes must be permitted inside the tunnel; only splicing enclosures adapted to a harsh environment shall be accepted.

Considering also that the current fibre plant is nearing 30 years of age, a plan to eventually undergo testing on all the fibre optics should be developed in order to identify degradations and replace deficient cables before a breakdown occurs.

Local Area Network

The current structured cabling system on each building (LAN Ethernet network) uses a legacy 110 Wiring Block patch panel system. This type of patch panel takes up much more space than actual RJ-45 patch panels (Cat 5e or Cat 6a) and it makes difficult troubleshooting and patch cords management.

The NRC should put a plan in place to update all buildings' structured cable systems, and to anticipate ultimate requirements for service and future needs. The new structured cable system must be designed considering a capacity of at least 10 Gb/s to the desktop, replacing the current 100 Mb/s and 1 Gb/s capacity. To facilitate this approach, a minimum of one room for the fibre patch must be reserved in each building.

Additional Items to Consider

The most important element to be considered within the Master Plan were previously mentioned. However, the following items are also strongly recommended for implementation.

WIRELESS NETWORKS

An outdoor campus wireless local area network (WLAN) should be installed, making WLAN services ubiquitous throughout the Campus. Newer WLAN technologies will allow researchers to move/share large amounts of data in real time, as well as provide flexibility for Campus users to move between labs and offices.

Installing a secure campus-wide public WLAN network to provide internet and private network access will encourage portability and collaboration. WLAN will also facilitate internet access for visitors and business partners.

TELEPHONE NETWORKS

Most of voice systems inside the Campus are currently delivered by traditional digital or analog telephone systems using copper cables in tunnels and duct banks. Traditional digital or analog telephone systems will become expensive to maintain, because many of these systems are nearing end-of-sale (EOS) or end-of-life (EOL) status.

The current digital telephone system must be changed for a new and innovative Internet Protocol (IP) telephone system, providing more features and portability to users. Using IP telephone systems will also reduce the amount of wired voice services (i.e. copper cables) installed in tunnels and duct banks, because new connections will use fibre-optic links already installed between buildings.

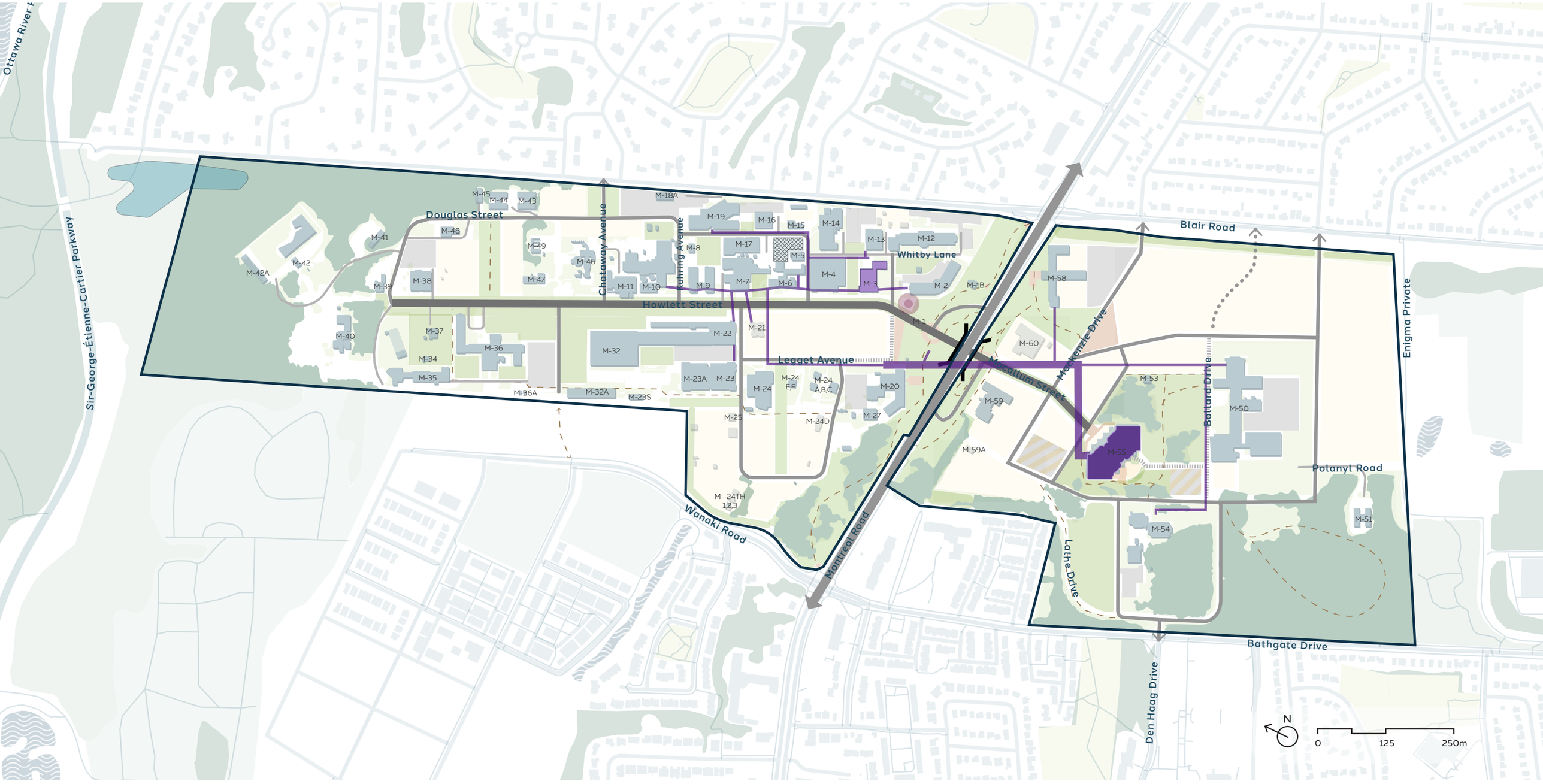
A new IP telephone system will provide:

- Flexibility of the workplace, which is especially useful for remote or highly mobile teams, because users can access their phone systems from anywhere with a working internet connection.
- Advanced features.
- Greater accessibility so that users do not need a physical phone; a "softphone" in their laptop or tablet should offer the ability to make calls from anywhere.
- Increased security.
- Easy scalability.

GUIDELINES

Guidelines for the local area network are as follows:

- Transfer existing data centre to another building (M-55 is considered the preferred location).
- Transfer fibre-optic network to the new data centres and install new MDF.
- Upgrade MDF in M-03 building (secondary MDF).
- All new buildings must have direct connections to the tunnels, or at least duct bank connections to the tunnels for telecommunication purposes.
- Upgrade agreements with carriers (service providers).
- Upgrade structured cable systems, keeping 10G to the desktop in mind.
- Install new wireless network (WLAN) to facilitate portability of access across the entire Campus, even outdoors.
- Install a new IP telephone system.



PLAN 28
INFORMATION TECHNOLOGY

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Candidate for the new data centre (M55)
- Secondary MDF to keep (M3)
- Existing tunnels
- Existing main tunnel between North and South Campus

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12

DISTRICT DESIGN GUIDELINES

While previous chapters have approached the Campus as a whole, the Master Plan recognizes the presence of certain areas of significant importance to the development of the Campus and its character. These are areas that will undergo significant transformation over the next 30 years, changing the urban form of the Campus. The development of these areas requires a finer level of guidance to shape the vision of the Master Plan in the most fitting way.

This chapter aims to present five different districts that have been chosen for their strategic location or architectural significance, because they cover strategic areas within the Campus, large plots of land whose redevelopment will change the face of the Campus or require sensitivity for successful integration. The guidelines presented in this section are specific to these strategic locations and are brought together by addressing architectural, mobility, and landscape components in one overview.

As it concerns potential impacts and interventions to or affecting heritage components of the Campus, Section 10.2 and 10.3 of this report should be consulted alongside these design guidelines. All interventions on the Campus should be compatible with the heritage buildings and heritage character of the site, follow the relevant evaluation processes, standards, and guidelines, and seek appropriate reviews when required.

12.1

FIVE DISTRICTS HAVE BEEN IDENTIFIED IN PLAN 29 AND ARE CHARACTERIZED AS FOLLOWS:

District 1 – North Campus / Main Spine

District 1 corresponds to the main lot that is programmed to be redeveloped on this side of the Campus. It is the first building of the North Campus and the principal entrance to the site. This area is currently in the planning stages for a future Labs Canada research hub.

District 2 – Montreal Road Linear Gateway

District 2 includes the Linear Gateway Park along Montreal Road. As such, it incorporates a string of open spaces that offer a discovery and history route, the main entrances to both the North and South Campus areas, the Montreal Road overpass (which is expected to be rebuilt or enlarged in the future), and the buildings fronting onto Montreal Road. This district focuses on the campus entry sequence, with the discovery trail taking shape in open spaces, the interface with the buildings, and respecting safety measures.

District 3 – Urban Quadrant

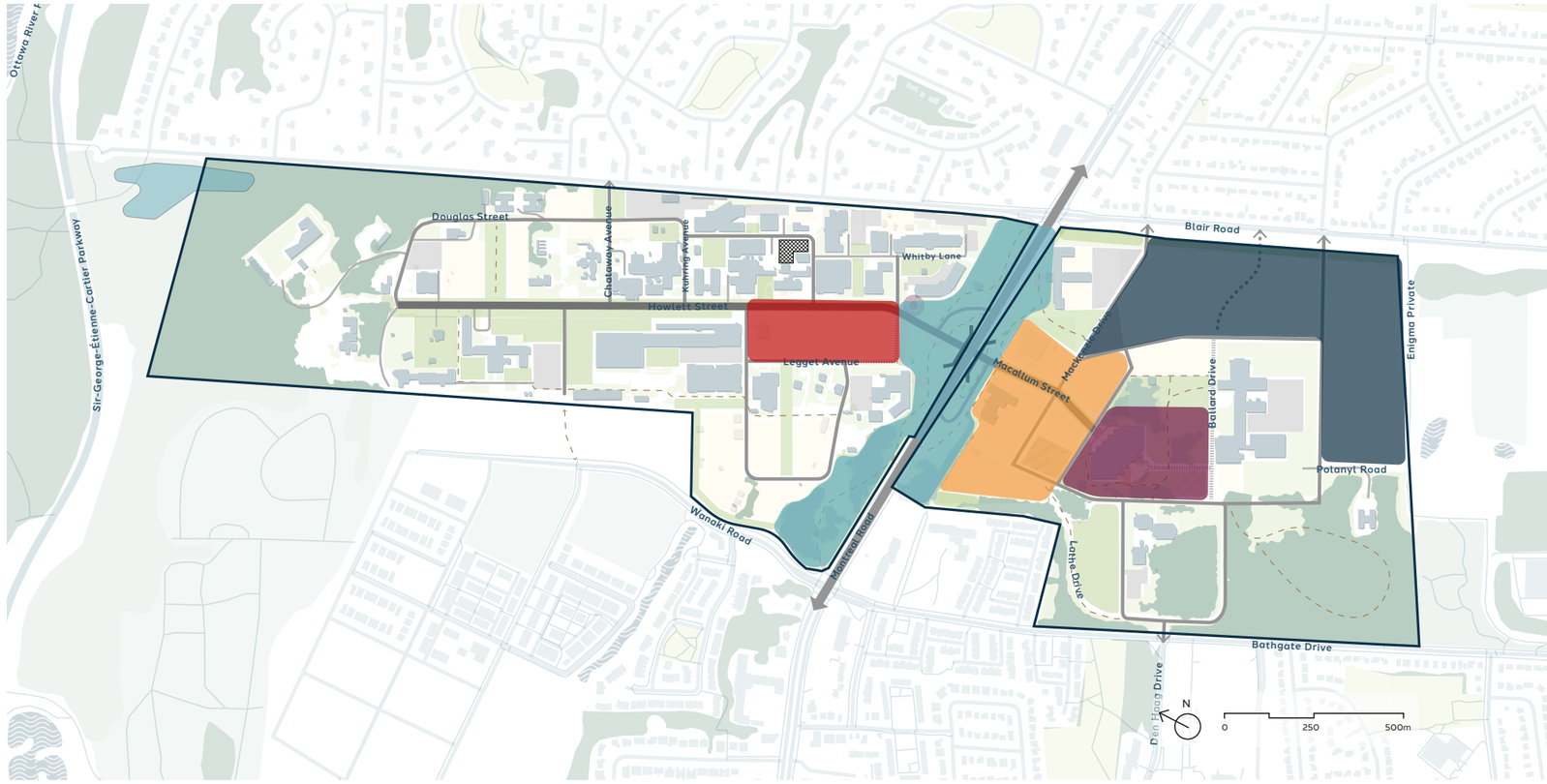
District 3 is the projected redevelopment of the Southern quadrant that is aimed to be more urban in character with a more compact pattern of development and a denser built form. This district leads directly to the future conference centre M-55.

District 4 – Potential Conference Centre

District 4 corresponds to the future conference centre to be located in M-55. This district also encompasses the vicinity of M-55, consisting of open spaces and plazas.

District 5 – Southeastern Edge

District 5 is located near the Southeastern exit on Blair Road. These lands are intended to be developed as a future Labs Canada research hub. This district establishes guidelines for this large soon to be developed area.



PLAN 29
DISTRICT DESIGN LIMITS

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp

- District 1 | North Campus / Howlett Street
- District 2 | Montreal Road gateway
- District 3 | Urban quadrant
- District 4 | Conference centre
- District 5 | Southeastern edge

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12.2 DISTRICT 1 – NORTH CAMPUS / HOWLETT STREET

GUIDELINES | BUILT FORM

1. Activate the façade along Howlett Street with a transparent treatment, playing with volumes, textures and architectural details that draw the eye of pedestrians

   Modulate building volumes to reduce mass effect

   Distinctive treatment of the building's front façade, as it signals the Northern entrance to the campus, with a transparent treatment that promotes interaction with the plaza and adjacent shared street

GUIDELINES | LANDSCAPE

2. Provide for continuity of landscaping in the lateral setback along Howlett Street

GUIDELINES | MOBILITY

3. Provide pedestrian entrances along the front façade and the façade along Howlett Street
4. Allow oversized trucks to pass through the shared street in front of the building to facilitate building operations

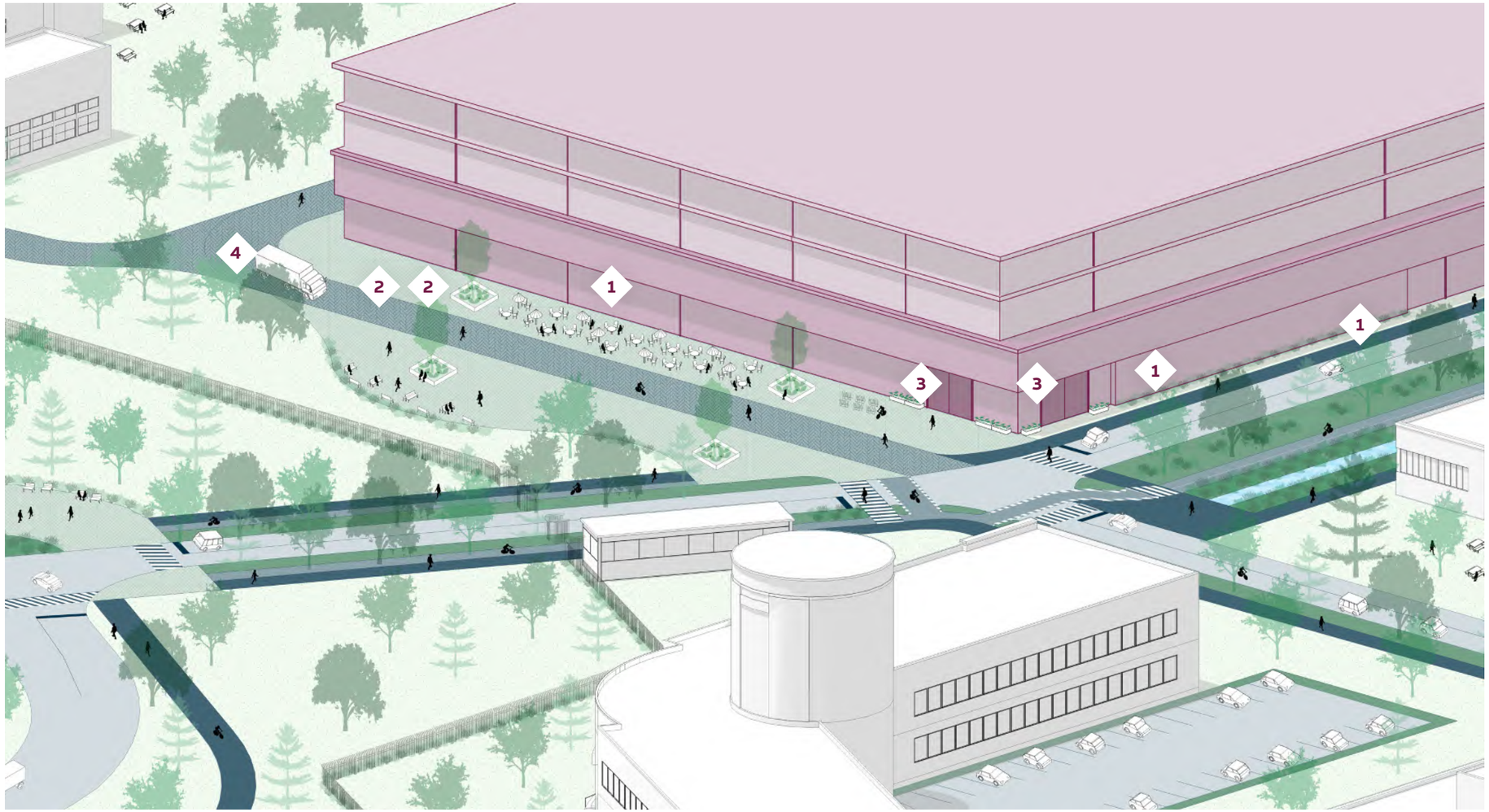
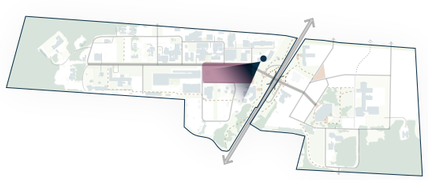
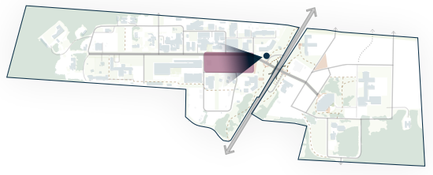


FIGURE 149. DISTRICT 1 | NORTH CAMPUS / HOWLETT STREET SKETCH AND GUIDELINES



Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

FIGURE 150. RENDERING OF HOWLETT STREET TO THE NORTH – STREET DESIGN BASED ON A NARROW FRONT SETBACK



Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12.3 DISTRICT 2 – MONTREAL ROAD GATEWAY

GUIDELINES | BUILT FORM

1. Mark the entrance to the campus with a potential future guard house whose architecture is representative of the overall campus architectural quality
2. Ensure that potential M-1B heritage building are physically and visually compatible with the historic building

GUIDELINES | LANDSCAPE

3. Mark the overpass with an art installation that links the North and South sides of the campus and makes it the principal gateway
4. Create landscaping experiments that are visually appealing and signal the entrance to the campus
5. Visually integrate the security features including access gates and ramming devices, as part of the overall landscape design of the site and each building
6. Create campus thresholds that act as gathering points, landmarks and connecting points between the inner and outer campus

GUIDELINES | MOBILITY

7. Create universally accessible and easy-to-maintain pathways between the exterior and interior of the campus
8. Physically separate vehicular access from pedestrian and cyclist access for greater safety
9. Enable oversized trucks to access the campus smoothly and safely, in harmony with other modes of transport

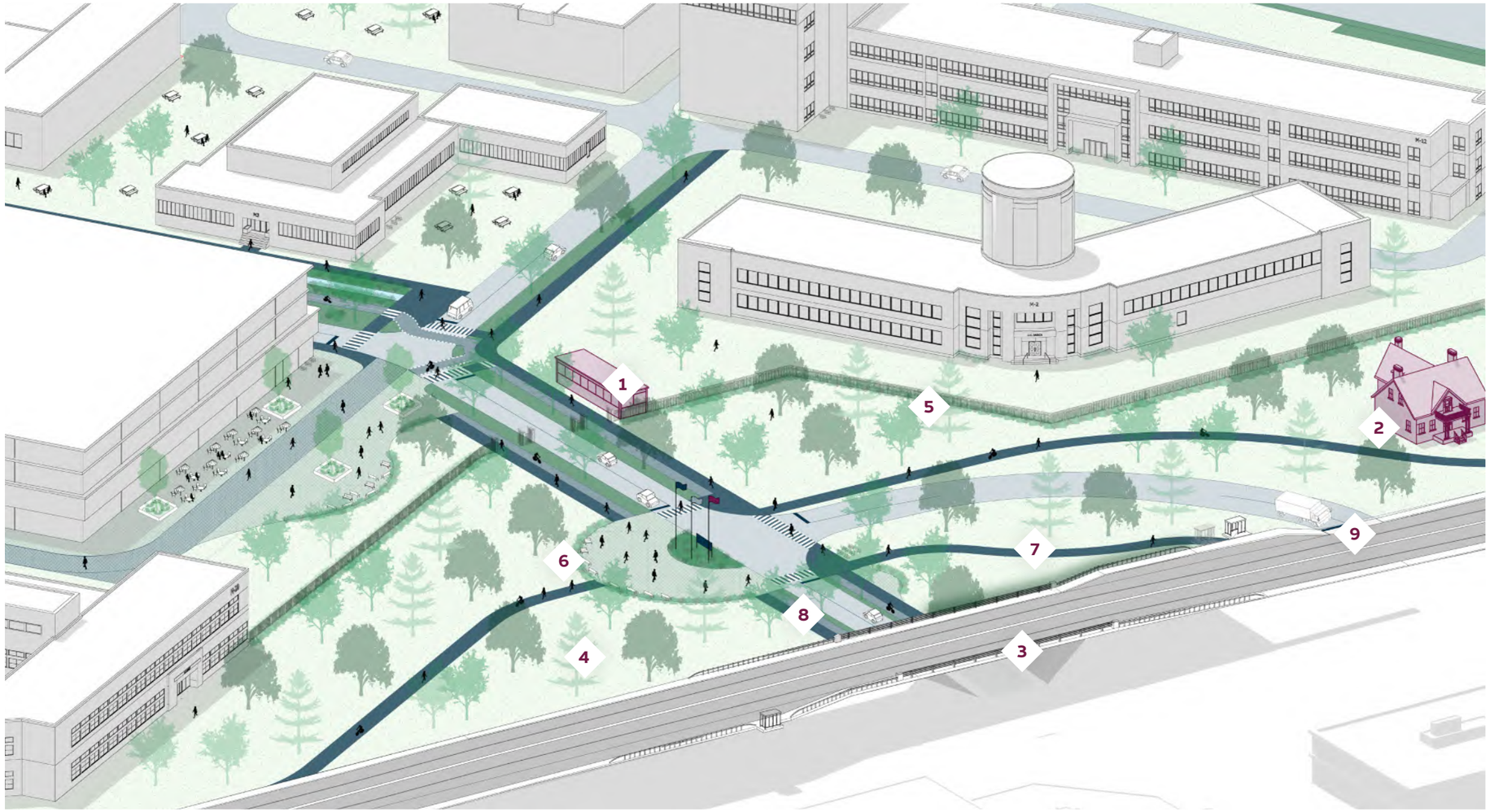
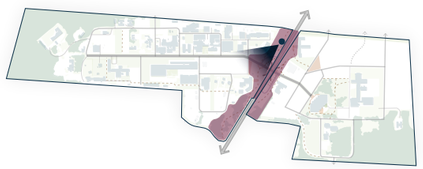
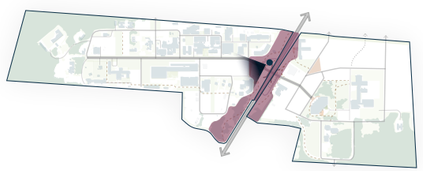


FIGURE 151. DISTRICT 2 | MONTREAL ROAD GATEWAY SKETCH AND GUIDELINES



Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

FIGURE 152. RENDERING OF MONTREAL ROAD GATEWAY, HOWLETT STREET TO THE NORTH



Note : This rendering expresses the general intentions pursued by the concept. The design of the proposed streets, open spaces, buidling (position, volume and appearance) are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12.4 DISTRICT 3 – URBAN QUADRANT

GUIDELINES | BUILT FORM

1. Modulate building volumes to reduce mass effect
2. Distinctive treatment of the building's front façade with efforts to integrate to the streetscape

GUIDELINES | LANDSCAPE

3. Provide for continuity of landscaping in the setback along Macallum Street to enhance interactivity with the streetscape and placemaking opportunities
4. Enhance views towards M-55 building

GUIDELINES | MOBILITY

5. Promote the creation of passages that allow to cross blocks

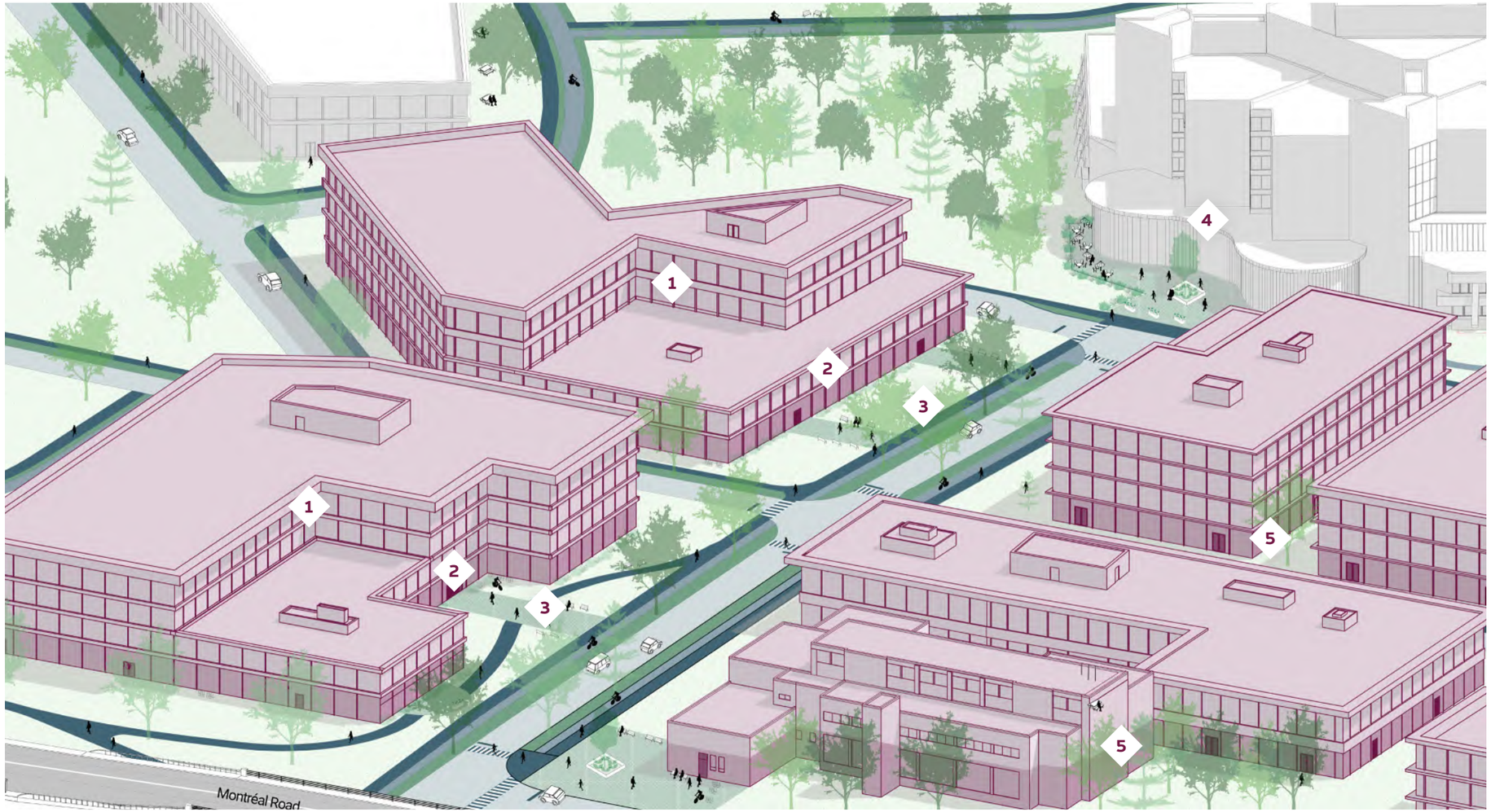
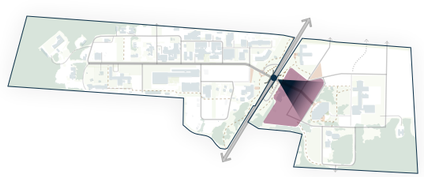


FIGURE 153. DISTRICT 3 | URBAN QUADRANT SKETCH AND GUIDELINES

Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

FIGURE 154. RENDERING OF MACALLUM STREET TO THE SOUTH



Note : This rendering expresses the general intentions pursued by the concept. The design of the proposed streets, open spaces, buidling (position, volume and appearance) are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12.5 DISTRICT 4 – POTENTIAL CONFERENCE CENTRE (M-55)

Building M-55 was designed by Shore and Moffatt and Partners and constructed in the early 1970s. The architectural styling is representative of 1960s Brutalist design, which can be defined by the heavy materials (typically concrete), hard edges, massive forms, and the expression of structure. The nearly 50-year-old design still admirably reflects the sensibilities and inspirations of the era.

Originally programmed to house the NRC's National Science Library, Building M-55 has an inward-focused design. Glazing is typically limited to the lower floors and circulation spaces of the upper floors. As the building was not originally intended for public use as a gathering or assembly space, the entrances are not well defined, nor welcoming to visitors that may not be familiar with the building.

FIGURE 155. MODEL FOR M-55
Source: NRC digital depositary

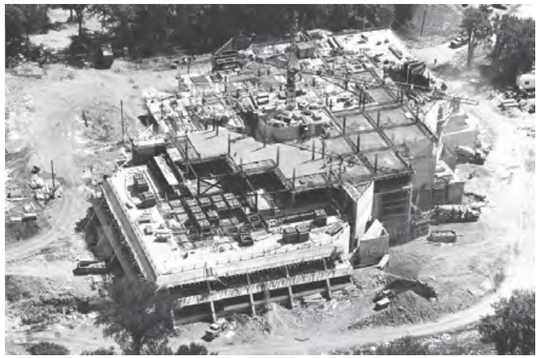


FIGURE 156. M-55 CONSTRUCTION
Source: NRC digital depositary

FIGURE 157. M-55 REAR VIEW
Source: NRC digital depositary

FIGURE 158. M-55
Source: NRC digital depositary

FIGURE 159. M-55 SIDE VIEW, 1973
Source: NRC digital depositary

FIGURE 160. M-55 CAFETERIA SPACES
Source: NRC digital depositary

FIGURE 161. M-55 INTERIOR SPACE
Source: NRC digital depositary

FIGURE 162. M-55 OFFICE SPACES
Source: NRC digital depositary

FIGURE 163. M-55 OPENING, SPEAKERS AND GUESTS, 1974
Source: NRC digital depositary

12.5

Program

The original functionality of Building M-55 no longer suits the evolving programmatic needs of the NRC. As a functional program has yet to be fully developed for a new conference facility, some assumptions have been made for the Master Plan.

- Opportunity for the conference space(s) to be rentable areas
- Separate addition for a 500-person multi-use conference / convention centre space
- Exhibition / museum area
- Cafeteria – flowing to exterior space
- Cafe with exterior space
- Inviting front entry addition
- Breakout meeting room functions
- Outdoor plaza areas around conference area
- Office space conversion of the majority of the building not designated for conference spaces

Heritage Consideration

Evaluation by the FHBRO for potential heritage designation will be required for M-55 prior to any design interventions; refer to Section 3.3 and Appendix A for more details on the FHBRO evaluation requirements. See Sections 10.2 and 10.3 for further discussion on the application of the Standards and Guidelines for the Conservation of Historic Places in Canada, the development of a Heritage Conservation Approach, and further items to consider in the planning of interventions.

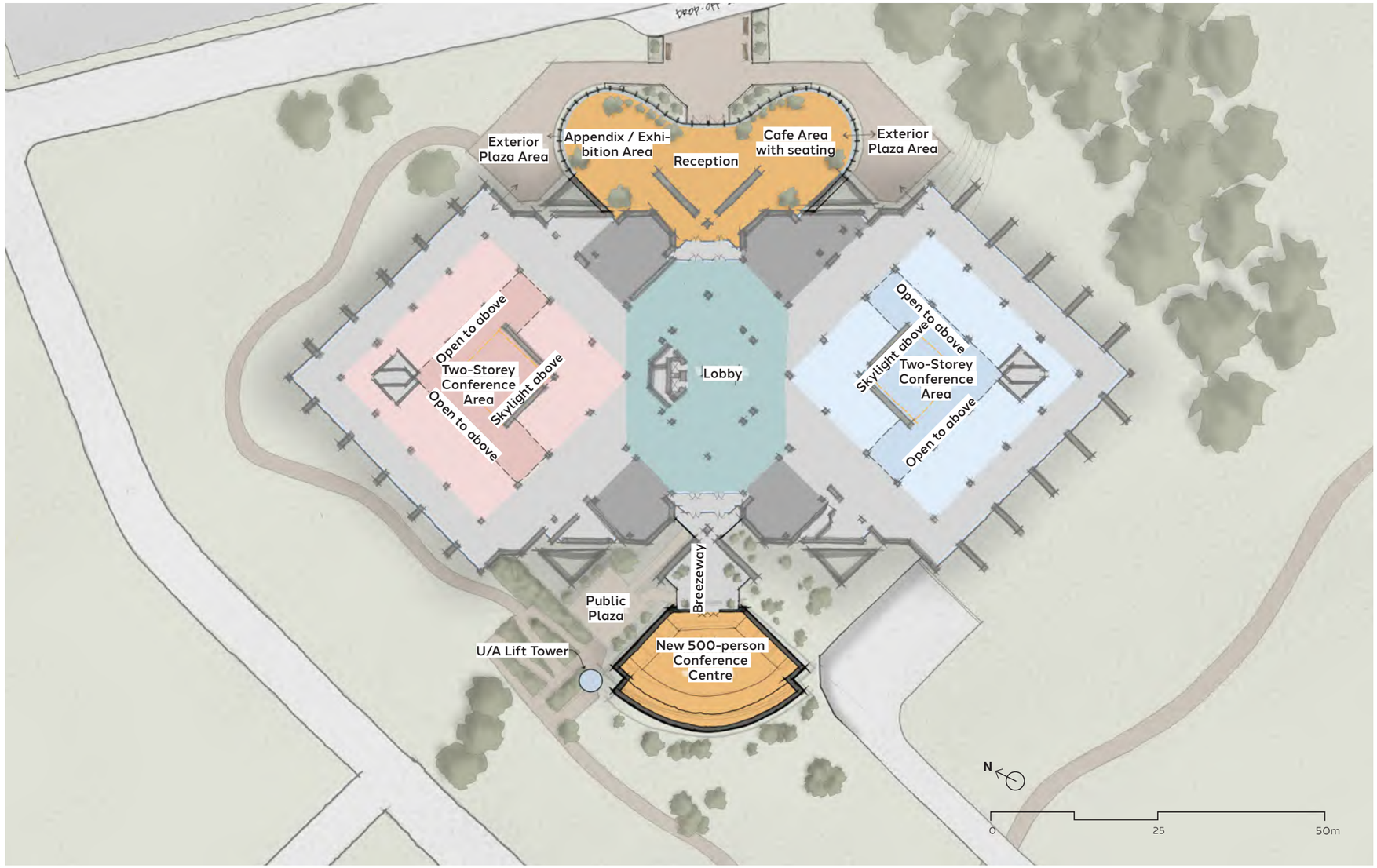


FIGURE 164. POTENTIAL CONFERENCE CENTRE (M-55) SITE PLAN

Note : This site plan expresses the general intentions pursued by the concept. The design of the proposed streets, open spaces, buidling (position, volume and appearance) are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12.5

Vision

To achieve this new program, the intent is to re-envision Building M-55 through the adaptive reuse of the historic building into a flagship conference facility for the updated Campus. Adaptive reuse addresses the sustainability concerns surrounding demolition of existing building stock, effectively extending the life cycle of the structure's original embodied energy. This direction is also an effective means of mitigating urban sprawl and provides an opportunity to bring new life to heritage buildings. The objective would be to lighten up the facade with a contemporary layer at the North and South, which would aid in the definition of the entrances, and to introduce these voluminous conference-type elements; an informal gathering space, and a formal one, respectively.

The conference centre should be an icon for the Campus and be located in a central location to provide easy access to all staff and visitors; it should be located on the Main Spine roadway for the Campus and offer a drop-off zone with adjacent and alternative mobility facilities.

For the main entrance to the North, an amorphic pavilion-type entryway would be proposed, constructed of a visually light material, such as glazing, to contrast the hard edges and heavy materials of the existing Brutalist architecture. The incorporation of greenery inside the space, visible through the transparent skin, would further soften the entrance and aid in creating an approachable facility. This new area would be an informal gathering area, with a cafe, seating, and an artifact exhibition area, which can provide a storytelling opportunity to showcase the rich history of the NRC.

As the layout of the original floor plate is not conducive to a conference area over 200 persons, it is proposed that an addition be added to the South to house a 500-person, multi-use conference facility.

This program generates the opportunity for the space to be used efficiently as a convention centre, reception space or theatre usable by the NRC, and as a rentable space for public use.

To create a healthy work environment for offices on the upper floors, natural light would be invited through the surgical insertion of punched glazing through the existing concrete panel cladding system.

Overall, the proposed design should use a different visual language, which will distinguish between new and existing while respecting the original character of the building. The additions should maintain the axial order of symmetry, which is an important character-defining design element of the existing building.

For outdoor spaces, the site would benefit from the extension of plazas, strong fluidity between spaces, and native vegetation to balance the concrete structure. Universal access, including a lift at the rear of the building due to the steep slope, should be provided.

FIGURE 165. PRECEDENT IMAGE OF A CONTEMPORARY ADDITION TO A BRUTALIST-STYLE BUILDING
Source: Diamond-Schmitt Architects

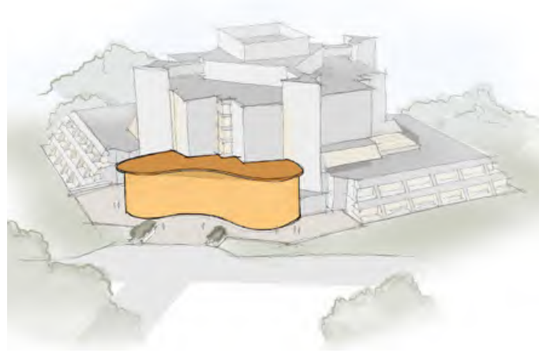


FIGURE 166. VOLUMETRIC DIAGRAM FOR M-55 FRONT ADDITION
Source: RMA + SH Architects

FIGURE 167. PRECEDENT IMAGE FOR THE FRONT ADDITION TO M-55, BOTANICAL GARDENS, PRAGUE, CZECH REPUBLIC
Source: Fránek Architects

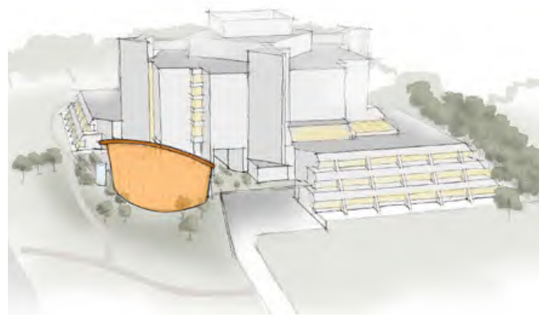


FIGURE 168. VOLUMETRIC DIAGRAM FOR M-55 REAR ADDITION
Source: RMA + SH Architects

FIGURE 169. PRECEDENT IMAGE FOR THE REAR ADDITION TO M-55, AYLESBURY WATERSIDE THEATRE, LONDON, UK
Source: Suzie Bridges Architects

12.5

GUIDELINES | BUILT FORM

1. Create a welcoming entrance sequence that ensures integration, and visual and physical continuity between the front plaza and an interior pavilion
2. Enhance visibility of entrances

   Create building additions that are physically and visually compatible with the historic building, subordinate to it and distinct from it, that can enhance natural light and balance brutalist style

GUIDELINES | LANDSCAPE

3. Provide patio spaces to extend the eating and sitting experience to the outdoor
4. Provide universal access to the building in multiple locations
5. Convert sloped grassed areas into planting beds or leave them to naturalize

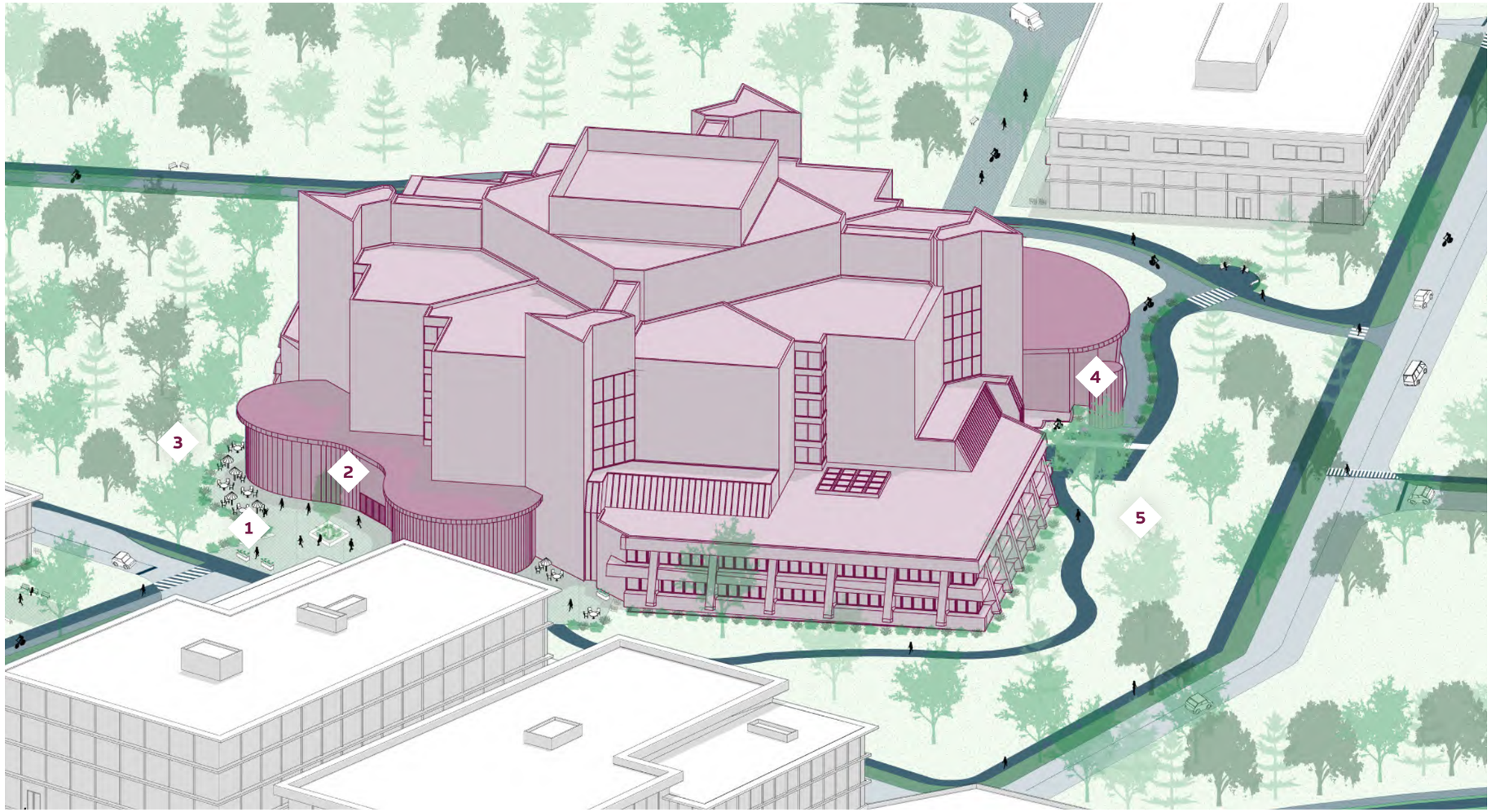
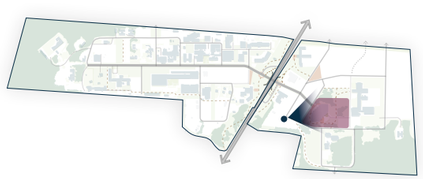
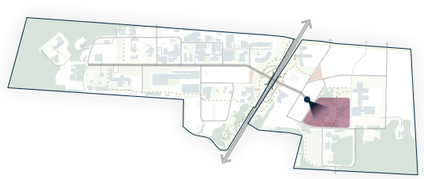


FIGURE 170. DISTRICT 4 | POTENTIAL CONFERENCE CENTRE (M-55) SKETCH AND GUIDELINES



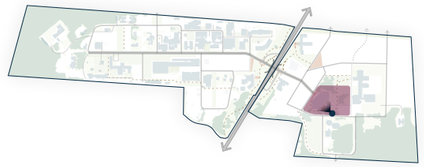
Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

FIGURE 171. RENDERING OF M-55 FRONT ENTRANCE



Note : This rendering expresses the general intentions pursued by the concept. The design of the proposed streets, open spaces, buidling (position, volume and appearance) are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

FIGURE 172. RENDERING OF M-55 REAR ENTRANCE



Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

12.6 DISTRICT 5 – SOUTHEASTERN EDGE

GUIDELINES | BUILT FORM

1. Activate the front façade with a transparent treatment, playing with volumes, textures and architectural details that draw the eye of pedestrians

   Modulate building volumes to reduce mass effect

GUIDELINES | LANDSCAPE

2. Provide a green buffer at the edge of the campus for a harmonious transition with adjacent neighbors
3. Provide an open space at the front of the building that balances the building's massing and connects with the network of open spaces

GUIDELINES | MOBILITY

4. Promote the creation of passages that allow to cross the block considering its scale
5. Prioritize delivery and maintenance areas at the heart of the lot to serve several phases that will be built up

   Consider maintaining existing accesses along Blair Street

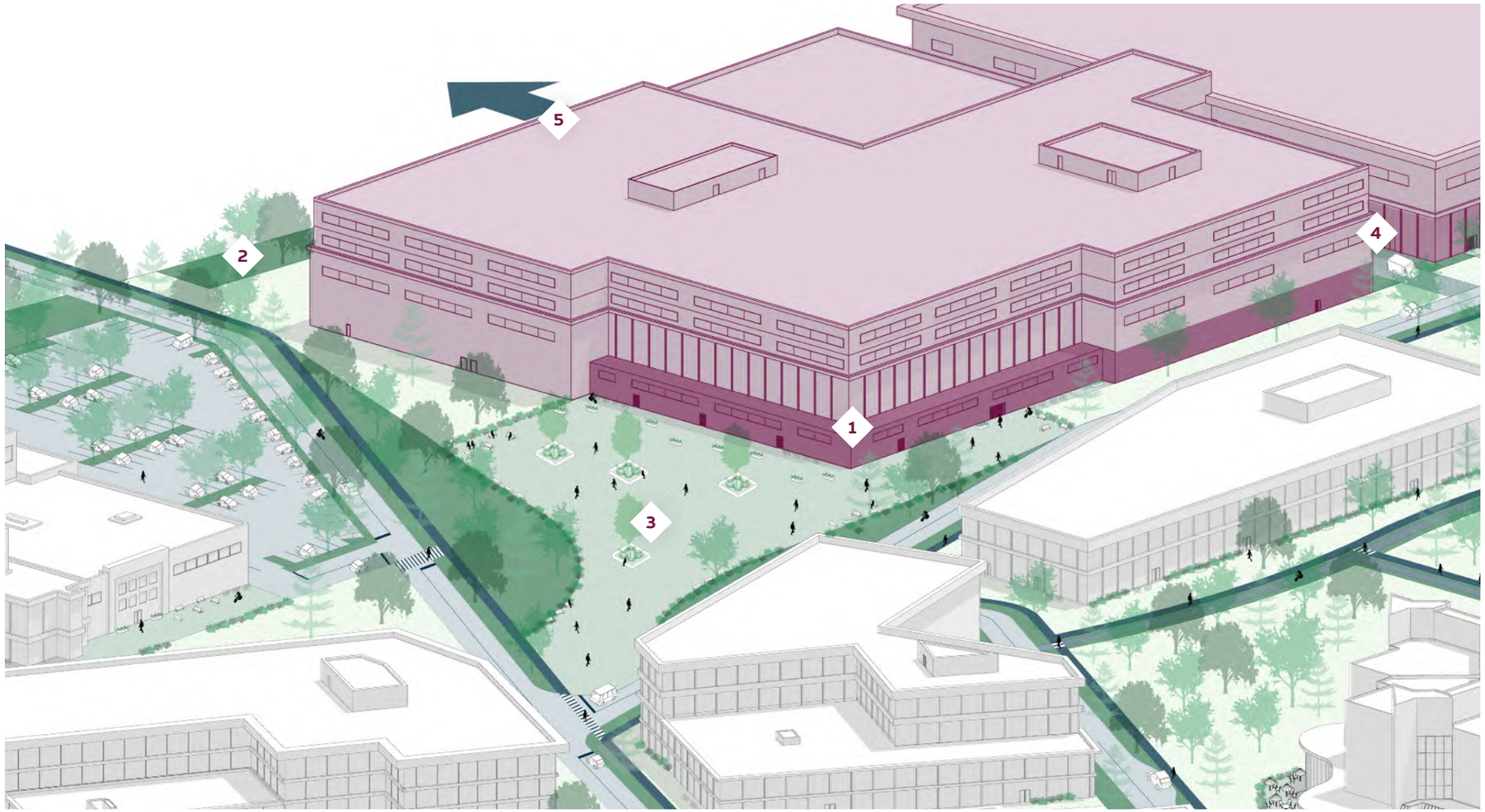
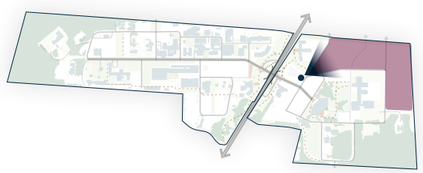


FIGURE 173. DISTRICT 5 | SOUTHEASTERN EDGE SKETCH AND GUIDELINE



Note : This image expresses the general intentions pursued by the concept. The design is not definitive and is indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

13

IMPLEMENTATION STRATEGY

Science first and foremost guides the future development of the Campus. The Master Plan will be implemented incrementally as opportunities arise over time. The implementation strategy has three main dimensions described in this chapter.

13.1 PHASING APPROACH

THE PHASING PLAN SPATIALLY IDENTIFIES PACKAGES OF INTERVENTIONS ANTICIPATED TO BE UNDERTAKEN OVER THE THREE-DECADE LIFE OF THE MASTER PLAN, BASED ON THE FOLLOWING STAGES:

1. Short term (0 to 10 years)

The interventions identified relate to Labs Canada research hub projects that are already known to exist and are expected to be completed within the next decade. These projects raise the opportunity to realize certain nearby street improvements or open space development initiatives. Some projects are also linked to City of Ottawa projects already in the planning stage, such as the Montreal Road transit priority project, the timing of which has yet to be specified in the upcoming TMP. This document will establish the order of transportation priorities, but the realization of an EA and the importance of the Montreal Road corridor in the transit network suggest that the project could realistically take place within 0 to 20 years.

2. Mid term (11 to 20 years)

The interventions identified aim to improve the working environment for campus users, notably through the transformation of M-55 into a conference centre, the redesign of other campus streets, and the improvement of open spaces across the Campus.

3. Long term (21+ years)

The interventions identified are conditional on laboratory projects whose existence is not yet known. They could come sooner, depending on investment opportunities. However, it is suggested that these projects be used as an opportunity to undertake the development of adjacent open spaces that would benefit from integrated design.

In addition to these three layers of information, an overlay indicates areas within the Campus where interventions should be prioritized, as the development of these areas has a structuring effect on the whole campus due to their positioning (e.g. campus entrance) or function (e.g. Building M-55).

It is envisioned that the spatial interventions will be sequenced in the order shown in Table 16. This phasing is flexible, and it is intended to evolve with the progression of the Master Plan, adapting to any changes that may occur.

Several additional studies or analyses may be required to fill in the gaps leading up to the detailed spatial intervention. These can be found in Section 13.2, Table 17.

13.1 TABLE 16 **PHASING OF SPATIAL INTERVENTIONS**

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Mobility, circulation, and access	
Redesign of the Montreal Road underpass and access roads associated with the bridge widening or replacement under the Montreal Road Transit Priority project. *Subject to the prior development of a detailed design and an analysis of urban design strategies for the Montreal Road campus access*	Short term
Construction of pathways connecting the Campus to Montreal Road. *Subject to the prior development of an overall campus mobility plan.*	Short term
Construction of a portion of the Main Spine roadway: › Demolition of Howlett Street roundabout › Reconstruction of Howlett Street in its entirety with an innovative street design that takes into account the available space, the integration of pedestrian and cycling infrastructure, planted open spaces, rest areas, recreative and commemorative opportunities, and stormwater bioswales. › Reconstruction of Macallum Street (from the underpass to Mackenzie Drive) with an innovative street design offering a more urban character, integrated pedestrian and cycling infrastructure, plantings, rest areas and recreational and commemorative opportunities. *Subject to prior detailed design and an overall campus mobility plan and detailed open spaces and streets strategy.*	Short term
Construction and improvement of the road network to support the future Labs Canada research hubs planned for the same period: › Mackenzie Drive, with connection to Macallum Street and Blair Road › Legget Avenue › Internal roadways and shared street *Subject to the prior development of an overall campus mobility plan and a detailed open spaces and streets strategy.*	Short term
Creation of mobility hubs near campus entrances, including amenities conducive to active transportation. *Subject to the prior development of an overall campus mobility plan.*	Short term

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Mobility, circulation, and access	
Construction of final part of the Main Spine: Macallum between Mackenzie Drive and M-55. *Subject to prior detailed design and an overall campus mobility plan and detailed open spaces and streets strategy.*	Mid term
Improvements to the secondary roadway network: › Redesign and reconstruction of existing roadways (Douglas Street, Chataway Avenue, Kuhring Avenue, Whitby Lane, Marion Street, Lathe Drive) *Subject to the prior development of an overall campus mobility plan and a detailed open spaces and streets strategy.*	Mid term
Construction of new secondary roads (South portion of the Campus) *Subject to the prior development of an overall campus mobility plan and a detailed open spaces and streets strategy.*	Mid term
Construction of shared streets (leading to M-55 and transformation of Ballard Drive) *Subject to the prior development of an overall campus mobility plan and a detailed open spaces and streets strategy.*	Mid term
Consolidation of some parking areas to create mobility hubs distributed across the Campus, including some to serve the adaptive reuse of M-55 as a conference centre. *Subject to the prior development of an overall campus mobility plan.*	Mid term
Construction and improvement of the road network to support the future research projects and facilities. *Subject to the prior development of an overall campus mobility plan and a detailed open spaces and streets strategy.*	Long term and ongoing

13.1

TABLE 16 **PHASING OF SPATIAL INTERVENTIONS**

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Design of Campus Landscapes	
Design part of a portion of the Linear Gateway park: › Construction of the park core surrounding the underpass, including entry plazas and pilot projects of landscape experiments. › Improvements and reconstruction of pathways connecting the Campus to Montreal Road. › Improvement of the experience of crossing the underpass. *Subject to the prior development of a detailed concept and design of the Linear Gateway park, an overall detailed open spaces and streets strategy, detailed wayfinding and signage strategy, landscape experiments potential study, commemoration study and strategy, etc.*	Short term
Design of several pocket parks along the Main Spine. *Subject to the prior development of an overall detailed open spaces and streets strategy.*	Short term
Design of open spaces adjacent to future Labs Canada research hubs planned for the same period. *Subject to the prior development of an overall detailed open spaces and streets strategy.*	Short term
Design in part of the Linear Gateway park: › Design of the peripheral portions of the Linear Gateway park, including pedestrian paths connecting the Campus to Blair and Wanaki roads, seating areas, planted areas and landscape experiments. *Subject to the prior development of a detailed concept and design of the Linear Gateway park, an overall detailed open spaces and streets strategy, detailed wayfinding and signage strategy, landscape experiments potential study, commemoration study and strategy, etc.*	Mid term
Design of open spaces adjacent to M-55 and associated with its transformation. *Subject to the prior development of an overall detailed open spaces and streets strategy.*	Mid term
Redesign of open spaces distributed across the Campus, including: › Open spaces at the Blair Road entrance (Northern part of the Campus) › Pocket parks across the Campus › Larger open spaces in the Northern part of the Campus › Areas to be renaturalized near Lathe Drive *Subject to the prior development of an overall detailed open spaces and streets strategy.*	Mid term
Completion of the off-street pathway network. *Subject to the prior development of an overall detailed open spaces and streets strategy, an overall campus mobility plan, detailed wayfinding and signage strategy and an ecological assessment of the wooded areas.*	Long term
Design of the open spaces adjacent to the future research projects and facilities. *Subject to the prior development of a detailed open spaces and streets strategy.*	Long term and ongoing

13.1 TABLE 16 **PHASING OF SPATIAL INTERVENTIONS**

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Built form	
Building maintenance on a cyclical basis.	Ongoing
Review of buildings for code and accessibility upgrades where interventions are planned. Use the latest codes, standards and policies.	Ongoing
Envelope upgrades where interventions are planned or when components reach the end of their expected service life.	Ongoing
Mechanical and electrical (M&E) upgrades when necessary, when campus-wide or building-specific interventions are planned, or when systems reach the end of their expected service life.	Ongoing
Energy efficiency upgrades when campus-wide or building specific interventions are planned.	Ongoing
Construction of the two upcoming Labs Canada research hubs.	Short term
M-50 Building extension.	Short term
Construction of a new guard house.	Short term
M-55 Building interventions: › Office conversion › Interior / conference centre conversion › Front entrance addition › Rear 500-person conference addition	Mid term
Future research projects and facilities: for all other building-related interventions, such as rehabilitation, major renovation, construction of new facilities or demolition, refer to section 9.3 Roadmap for Building Interventions.	Long term and ongoing

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Insfrastructure — **Access and Security**	
Construction of anti ramming measures. *Subject to the prior development of a series of studies: overall campus-wide Harmonized Threat and Risk Assessment (HTRA), gap analysis of current and proposed site protection of the assets and risk posture, security plan with alternatives and options analysis, Preferred Security Plan Strategy.*	Short term and ongoing (as related projects are realized)
Fence clearance (3 m) and improvements. *Subject to the prior development of a series of studies: Overall campus-wide Harmonized Threat and Risk Assessment (HTRA), Gap analysis of current and proposed site protection of the assets and risk posture, Security plan with alternatives and options analysis, Preferred Security Plan Strategy.*	Mid term
Video surveillance (must be performed simultaneously with any fence line modification).	Mid term
Review of the North fence position. *Subject to the prior development of a study related to this question.*	Long term

13.1 TABLE 16 **PHASING OF SPATIAL INTERVENTIONS**

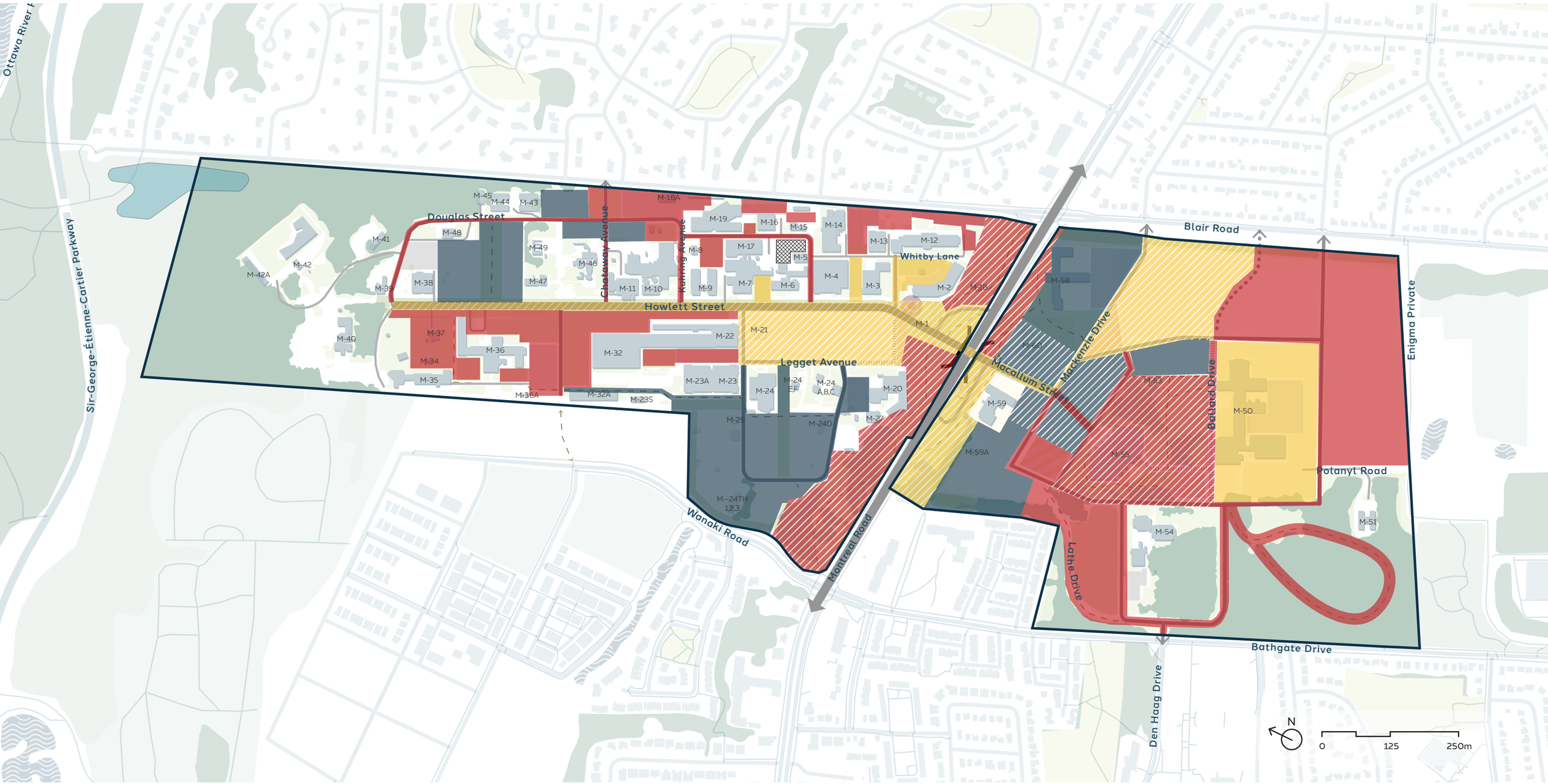
ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Insfrastructure **Civil**	
Civil improvements with work on the underpass. *Subject to the prior development of a series of studies: Existing Infrastructure Conditions Assessment, Servicing Needs Assessment, Servicing Alternatives & Options Analysis, presentation of findings, Preferred Servicing Strategy.*	Short term
Civil upgrades related to roadways improvements and construction. *Subject to the prior development of a series of studies: Existing Infrastructure Conditions Assessment, Servicing Needs Assessment, Servicing Alternatives & Options Analysis, presentation of findings, Preferred Servicing Strategy.*	Ongoing (as projects are realized)

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Insfrastructure **Electrical distribution**	
Relocation of a portion of the 13.2 kV cabling running through the existing tunnel to a new underground duct bank.	Short term
Gradual conversion of facilities still supplied with 2.4 kV (an obsolete supply voltage), and improvements to electrical distribution.	Ongoing (as upgrades to existing 2.4 kV systems are made)
Resolution of the significant voltage drops occurring on the 13.2 kV bus supplying the 8 MW motor when it starts up. This problem must be solved before sensitive loads are increased on this bus.	Short term (before any further sensitive loads are added to that bus)
Regular maintenance of the 4.5 MW CoGen power plant (a major component of NRC's strategy to reduce electricity consumption) to ensure reliable operation in the future.	Ongoing
Assessment and confirmation that any significant increase in load within the campus is carried out in the context of a load and capacity assessment of a 115 kV substation and 13.2 kV switchgear and loops.	Ongoing (as projects are realized)
Implementation of the recommendations listed within the Stantec report titled NRC Montreal Road, Short Circuit, Device Evaluation, Coordination, Arc Flash and 10000 HP Motor Starting Studies, dated January 2, 2018.	Short term
Lighting improvements. *Subject to the prior development of an illumination master plan.*	Ongoing (as projects are realized)

13.1 TABLE 16 **PHASING OF SPATIAL INTERVENTIONS**

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Insfrastructure **Energy system**	
Energy sharing for all new buildings and renovations in a campus ambient loop network. *Subject to the prior development of an ambient loop district energy feasibility study and a waster water recovery feasibility study.*	Ongoing (as projects are realized)
Consideration of the progressive approach to decarbonization of all new buildings as new energy centres sharing energy with an ambient loop network. *Subject to the prior development of an ambient loop district energy feasibility study and a waster water recovery feasibility study.*	Short term and Mid term

ACTION	TIMEFRAME • Short term – 0 to 10 years • Mid term – 11 to 20 years • Long term – 21+ years
Insfrastructure **IT**	
Selection of a new data centre location (the M-55 building is considered a good candidate).	Short term
Transfer of existing data centre to new data centre, including the transfer of fibre-optic network.	Short term
Upgrade of the MDF in M-03 building (secondary MDF).	Short term
Upgrade of the network and telecommunications standards of the Campus (e.g. duct bank, fibre optic, and cabling requirement).	Short term
Update agreement with carriers.	Short term
Installation of a new IP telephone system.	Short term
Upgrade structured cable system, keeping 10G to the desktop in mind.	Mid term
Installation of a new wireless LAN (WLAN) with campus-wide coverage to facilitate portability.	Mid term
Insfrastructure **Sustainability**	
No specific spatial intervention.	



PLAN 30
PHASING STRATEGY

- Project area
- Roadway
- Pathway
- Building
- Existing green areas
- Existing wooded areas
- Existing lowland swamp
- Implementation projects with campus-wide structuring impact
- Short term (0 to 10 years) - Linked to known future projects
- Mid term (11 to 20 years) - User-oriented campus improvements (M55, streets and open spaces)
- Long term (21 to 30+ years) - Implementation areas conditional upon currently-undefined laboratory projects

Note : This plan expresses schematically the general intentions pursued by the concept. The location of the streets, open spaces and redevelopment areas are not definitive and are indicative of possible interventions that could be imagined within the 30-year period foreseen by the Master Plan.

13.2 ACTION MATRIX

THE ACTION MATRIX IN TABLE 17 SETS OUT THE VARIOUS PLANS, STUDIES, ANALYSES, PROGRAMS, OR PARTNERSHIPS THAT CAN BE IMPLEMENTED IN THE SHORT (0–10 YEARS), MID (11–20 YEARS), OR LONG TERM (21–30 YEARS). THESE ACTIONS CAN INFORM DECISION-MAKING ON MORE SPECIFIC ASPECTS OF THE MASTER PLAN THAT ARE UNKNOWN AT THE TIME OR REQUIRE SPECIAL ATTENTION. THE ACTION MATRIX IS INTENDED TO EVOLVE WITH THE NATURE OF THE MASTER PLAN, ADAPTING TO ANY CHANGES THAT MAY OCCUR.

TABLE 17 **ACTION MATRIX**

ACTION	TYPE (Study, Program, Partnership)	TIMEFRAME • Short term - 0 to 10 years • Mid term - 11 to 20 years • Long term - 21+ years
Mobility, circulation, and access		
Campus user mobility survey (track changes throughout the campus development).	Study	Short, Mid, and Long term
Montreal Road access urban design strategies.	Study	Short term
Campus mobility plan (bike/ped/internal transit/parking).	Study	Short term
Collaboration with OC Transpo and City of Ottawa to improve campus transit access.	Partnership	Short, Mid, and Long term
Travel Demand Management (TDM) program and administration by a TDM manager to oversee its goal of 30% share of alternative modes for campus arrivals	Program	Short, Mid, and Long term
Design of Campus Landscapes		
Detailed wayfinding and signage strategy.	Study	Short term
Detailed open spaces and streets strategy.	Study	Short term
Landscape experiments potential study.	Study	Short term
Commemoration study and strategy.	Study	Short term
Detailed tree surveys and Species at Risk assessments.	Study	Short term
Cultural heritage landscape assessment.	Study	Short term
Tree preservation plans.	Study	As projects are realized
Ecological Assessment of the wooded areas.	Study	Mid term

13.2 TABLE 17 **ACTION MATRIX**

ACTION	TYPE (Study, Program, Partnership)	TIMEFRAME • Short term - 0 to 10 years • Mid term - 11 to 20 years • Long term - 21+ years
Built Form		
Buildings and overall Campus evaluation for FHBRO designation (when buildings reach the 50-year age milestone required for evaluation). Refer to Appendix A for more information.	Study	Short term and as projects are realized
Assessment of the condition of campus buildings and preparation or updating of their building condition report on a cyclical basis.	Study	Short term and as projects are realized
Insfrastructure **Access and Security**		
Overall campus-wide Harmonized Threat and Risk Assessment (HTRA).	Study	Short term
Gap analysis of current and proposed site protection of the assets and risk posture.	Study	Short term
Preferred Security Plan Strategy.	Study	Short term
Study of the potential positioning of the fence in the Northern wooded area.	Study	Mid term
Insfrastructure **Civil**		
Existing Infrastructure Conditions Assessment	Study	Short term
Servicing Needs Assessment	Study	Short term
Servicing Alternatives & Options Analysis	Study	Short term
Presentation of findings	Study	Short term
Preferred Servicing Strategy	Study	Short term

ACTION	TYPE (Study, Program, Partnership)	TIMEFRAME • Short term - 0 to 10 years • Mid term - 11 to 20 years • Long term - 21+ years
Insfrastructure **Electrical Distribution**		
Illumination Master Plan	Study	Short term
Master Electrical Distribution Study	Study	Short term
Insfrastructure **Energy System**		
Ambient loop district energy feasibility study. This will support phasing planning and having this system available early for use by buildings while steam is also still available.	Study	Short term
Wastewater heat recovery feasibility study in collaboration with the City of Ottawa as an option for low-carbon energy generation.	Study	Short term
Insfrastructure **IT**		
No specific plans, studies, analyses, programs, or partnerships		
Insfrastructure **Sustainability**		
Climate risk and vulnerability assessment (CRIVA) to identify climate hazards, guide site selection of new buildings, and identify adaptation measures.	Study	As projects are realized
Analysis of the climate change resiliency of proposed interventions.	Study	As projects are realized
Analysis of the cumulative environmental effects of the short (0 to 10 years), medium (11 to 20 years), and long term (21+ years) campus development.	Study	Short term
Comprehensive strategy to achieve net zero emissions by 2050 (effectively quantify, monitor, and reduce GHG), including Zero carbon energy study for buildings that will remain occupied (especially FHBRO designated buildings).	Study	Short term

13.3 ROADMAP FOR BUILDING INTERVENTIONS

AS RESEARCH PROJECTS CAN BE SPREAD OVER TIME, SEVERAL TYPES OF INTERVENTION ARE ENVISAGED. TABLE 18 PRESENTS A FEW IMPLEMENTATION STRATEGIES RELATING TO BUILT FORM, ARCHITECTURAL AND CONSTRUCTION-RELATED ACTIVITIES THROUGHOUT THE LIFE OF THE MASTER PLAN.

All elements must consider the most recent requirements for sustainability, federal government programs and policies, codes and standards, and all other relevant future requirements, programs, and codes that come into effect throughout the life of the Master Plan. Refer to Sections 10.2 and 10.3, and Appendix A for more information on the heritage considerations and requirements.

The items listed in Table 18 do not address facility and cost-benefit analysis. The items included in the implementation strategy are meant to present the types of work that are expected to be encountered throughout the life of the Master Plan. The appropriate scope of work / intervention will be building-specific and should be based on an overall analysis of the Campus and buildings, including a building's architectural significance, condition, and typology (refer to Section 3.3 and Appendix A). This decision-making process may include a cost-benefit analysis (if required).

TABLE 18 **ROADMAPS FOR BUILDING INTERVENTIONS**

INTERVENTION	CONSIDERATIONS
Maintenance	Generally, all buildings will require maintenance on a regular basis from an efficiency and safety perspective. Some buildings will require greater maintenance than others due to their age or current condition.
Building Condition Assessments and Energy Audits	Continued assessments and audits of the campus building stock will be utilized to evaluate the areas or systems requiring maintenance, renovation, or replacement, categorized by levels of priority. Ultimately, these assessments should increase the lifespan of a building and simultaneously protect the owner's assets.
Exterior envelope upgrades to improve efficiency of existing building systems (not full-building rehabilitation)	During the 30-year span of this Master Plan, upgrades to existing facilities in the form of larger scale exterior renovations can be expected. Upgrades to their exterior envelopes should be coordinated with improvements to the building systems. Where these upgrades relate to buildings that are deemed to be architecturally significant for the Campus, they should follow the appropriate review processes (e.g. review of intervention by the FHBRO for designated buildings. Refer to Appendix A.
Site improvements / security upgrades adjacent to buildings	All the latest universal accessibility requirements are to be implemented and considered in the design of spaces surrounding the buildings. Security related upgrades must incorporate these universal accessibility requirements.
Site improvements not related to buildings	As the Campus is developed, all new roadway, pedestrian and mobility pathways and systems need to incorporate latest universal accessibility requirements into their design and planning.
Building additions and minor rehabilitation projects (i.e. fit ups)	New additions and minor rehabilitation projects to existing buildings offer opportunities to upgrade building services and building efficiency, communal spaces and amenities, and universal access and facilities within new designs. Where these projects impact buildings that are deemed to be architecturally significant for the Campus, they should follow the appropriate review processes (e.g. review of intervention by the FHBRO for designated buildings. Refer to Appendix A. Refer to Section 10.3 for guidelines on the architectural style for new additions.
Major building rehabilitation	Existing buildings may be subject to major rehabilitation, whether it concerns building condition upgrades for a similar use or an adaptive reuse. As with minor rehabilitation projects, major rehabilitation should look at upgrading building services and efficiency, and universal access. Where these projects impact buildings that are deemed to be architecturally significant for the Campus, they should follow the appropriate review processes (e.g. review of intervention by the FHBRO for designated buildings. Refer to Appendix A for more details).
New facility construction	Where new facilities are required, they should follow the most up-to-date requirements concerning sustainability, universal accessibility, security, and other applicable codes, standards, and policies. Refer to Section 10.3 for guidelines on the architectural style for new buildings.
Building facility divestments or demolition	Where a building is slated for demolition or divestment, the procedures in place at the time for the disposal of the asset should be followed. In the case where the building would hold a designation by the FHBRO, best efforts are to be made to identify and facilitate alternative uses before being identified as surplus. The procedures for the disposal of surplus federal heritage properties that are in place at the time should be followed.

14

CONCLUSION

The preferred option presented offers a wide range of ideas developed to elicit feedback on the values of the Campus, the constraints, operation considerations, and what elements will ultimately achieve the common vision of being Canada's premier hub of innovative research excellence.

Science first and foremost guides the future development of the Campus. The Master Plan will be implemented incrementally as opportunities arise over time and without impeding existing operations.

Due to the unique role of this site in providing key scientific research and testing—with some areas requiring more secure spaces that are also sensitive to vibration or other impacts—the site needs to consider these requirements while also evolving to offer a more walkable and collaborative environment throughout. The preferred option looks extensively at the full range of components to be considered for a 30-year horizon, including how future growth of the Campus should take place in the light of changing scientific needs, which areas are best suited to be oriented towards public access and use, and how to reflect the innovative character of the Campus in the landscape to make it a complete place of discovery.

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REFERENCES

ARCHITECTURE AND HERITAGE

- Alcaide Webster. 25 March 2022. Building M46 – Building Condition Report (Final).
- Alcaide Webster. 25 March 2022. Building M59 – Building Condition Report (Final).
- Alcaide Webster. 25 March 2022. Building M59 – BCR – Criticality Assessment – Appendix D.
- City of Ottawa. No date. Heritage properties. Consulted on https://ottawa.ca/en/planning-development-and-construction/heritage-conservation/heritage-properties#section-4891517e-6226-431e-98f0-101a9c99cf91
- Federal Heritage Building Review Office. No date. Montreal Road DFRP Building List.
- Federal Heritage Building Review Office. 1990. Building Report 90–245: Institute for Environmental Chemistry Laboratories, Building M-12, and Institute for Research in Construction, Building M-20, National Research Council Montreal Road Campus, Ottawa.
- Federal Heritage Building Review Office. 3 March 1994. Heritage Character Statement – National Research Council Building M-12, Montreal Road Campus.
- Federal Heritage Building Review Office. 3 March 1994. Heritage Character Statement – National Research Council Building M-20, Montreal Road Campus.
- Federal Heritage Building Review Office. 25 April 1995. Heritage Character Statement – National Research Council Laboratories, 100 Sussex Drive.
- Framework. 15 March 2022. TerraCanada Hub – National Capital Area Site Evaluation and Siting Options Analysis – Addendum TSTS & TC NCA Site Integration Study (30%).
- GeoOttawa. Aerial photos. Consulted on https://maps.ottawa.ca/geoottawa/
- Government of Canada. NRC Archives Photographs. Consulted on https://nrc-digital-repository.canada.ca/eng/home/collection/nrc-archives-photographs/
- Julien Lacroix. December 2014. Streamlining Science: NRC Montreal Road Campus. Consulted on https://scalar.usc.edu/works/julien-lacroix/index
- Nadine Consulting Eng. 10 October 2018. Building M9 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M9 – Level I Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M12 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M12 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M19 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M19 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M20 – Criticality Assessment (Final Draft).
- Nadine Consulting Eng. 10 October 2018. Building M20 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M22 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M22 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M23A – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M23A – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M24 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M24 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M27 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M27 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M37 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M37 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M58 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M58 – Level 1 Building Condition Report (Final).
- Nadine Consulting Eng. 10 October 2018. Building M60 – Criticality Assessment (Final).
- Nadine Consulting Eng. 10 October 2018. Building M60 – Level 1 Building Condition Report (Final).
- National Research Council. July 1997. Proposed Development Plan, NRC Montreal Road Campus.
- National Research Council. December 2016. Montreal Road Campus – Portfolios and Laboratories.
- National Research Council. 12 June 2019. Enabling the Work of Researchers – NRC Buildings and Real Estate.
- National Research Council. September 2021. How NRC's campus has changed since 1997 Master Campus plan. [PowerPoint Presentation]
- National Research Council. November 2019. MRL Campus Condition Plan.
- National Research Council. 25 October 2021. NRC Real Property Portfolio Plan (Draft).
- National Research Council. 18 January 2022. NRC Real Property Portfolio Plan (Footprint Reduction).
- National Research Council. 2008. Condition Assessment: M-16.
- National Research Council. 2008. Condition Assessment: M-21.
- National Research Council. August 2022. Master Plan Building Sensitivities.
- Nicole St-Onge & Jeff Keshen. 2001. Ottawa: Making a Capital – Construire une capitale.
- No author. 2022. Executive Summary for the Building Condition Report for M-13.
- No author. 2022. Executive Summary for the Building Condition Report for M-14.
- PSPC. July 2017. Référence technique pour la conception des immeubles de bureaux de SPAC.
- Seabrooke Leckie. July 2015. Documentation of Butternut & other Species at Risk at NRC-IRC headquarters.
- Shore & Moffat and Partners. 1967. A Guide to the Development of the Montreal Road Site.
- Treasury Board of Canada. 13 May 2021. Directive on the Management of Real Property.
- UOttawa NAPL Index. Aerial photos. Consulted on https://gsguo.maps.arcgis.com/apps/MapSeries/index
- WSP. February 2021. Building M2 – Building Condition Report.
- WSP. February 2021. Building M3 – Building Condition Report.
- WSP. February 2021. Building M4 – Building Condition Report.
- WSP. February 2021. Building M6 – Building Condition Report.

URBAN DESIGN, PLANNING AND LANDSCAPE ARCHITECTURE

- City of Ottawa. 2008 (with amendments). Zoning By-law.
- City of Ottawa. 2021. City of Ottawa Official Plan.
- Danielle Dube. 2015. Ottawa was a village that became the heart of the nation during World War II.
- Frank Jefferies. 2019. Enabling the Work of Researchers.
- Frank Jefferies. 2021. NRC Real Property Portfolio Plan.
- Framework. October 2022. TC NCA Complex Functional Program Lite.
- Government of Canada. 2011. Guide to Real Property Management: Aboriginal Context.
- Government of Canada. 2021. Directive on the Management of Real Property.
- Government of Canada. 2021. The Federal Sustainable Development Strategy.
- Government of Canada. 2022. A modern workplace for the new public service.
- Government of Canada. 2022. Energy efficiency for buildings.
- Laboratories Canada. 2019. Long-Term Vision and Plan.
- Laboratories Canada. 2019. 2019–2020 Annual Report.
- Library of Parliament. Unknown date. Uncover the reason why Queen Victoria chose Ottawa as the Canadian capital.Consulted on: Britannica | Know the reason why Queen Victoria chose Ottawa as the Canadian capital
- National Capital Commission. 2017. The Plan for Canada's Capital.
- National Capital Commission. 2017. Capital Urban Lands Plan.
- National Research Council. 2016. 100 years of Innovation for Canada / 100 ans d'innovation pour le Canada.
- National Research Council. 2022. National Research Council Canada 2022–23 Departmental Plan.
- Public Service and Procurement Canada. 2022. 2022–2023 Departmental Plan.
- Public Works and Government Services Canada. 2011. Commissioning Policy.
- TPSGC. 2021. Greener federal buildings.
- Trevor Pritchard, CBC. 2019. 7 Maps that tell the story of Ottawa. Consulted on: 7 maps that tell the story of Ottawa | CBC News

ENVIRONMENT

- EXP. October 31 2022. Phase II Environmental Site Assessment Terra Canada – National Research Council Canada (NRC) Campus 1200 Montreal Road, Ottawa, Ontario.
- EXP. April 4 2022. Phase II Environmental Site Assessment TSTS Facility – National Research Council Canada (NRC) Campus 1200 Montreal Road, Ottawa, Ontario.
- EXP. May 2022. Soil and Groundwater Management Plan – TSTS Facility – NRC Campus – Draft.
- EXP. May 2022. Geotechnical Investigation – Terra Canada Science and Innovation Hub Facility – NRC Campus (South Side) – Draft no.2 (GDR).
- EXP. May 2022. Geotechnical Investigation – TSTS Hub Facility – NRC Campus (North Side) – Draft no.2 (GDR).
- EXP. May 2022. Geotechnical Investigation – TSTS Hub Facility – NRC Campus (North Side) – Draft (GDM).
- EXP. April 2022. Geotechnical Investigation – TSTS Hub Facility – NRC Campus (North Side) – Draft (GDR).
- Kilgour & Associates Ltd. 13 February 2023. NRC 1510 Tree Conservation Report 1200 Montreal Road, Ottawa, Ontario.
- Seabrooke Leckie. July 2015. Documentation of Butternut (Juglans cinerea) and other Species at Risk at NRC-IRC Headquarters.
- Stantec. 30 March 2012. Limited Supplemental Phase II Environmental Site Assessment Montreal Road Campus 1200 Montreal Road Ottawa, Ontario.
- Stantec. 28 March 2013. Limited Supplemental Phase II ESA to Support the HHERA Montreal Road Campus 1200 Montreal Road Ottawa, Ontario.
- Stantec. 2 March 2022. Species at Risk PHASE I and Wildlife Habitat Assessment for the Transportation Safety and Technology Science Hub at the NRC Montreal Road Campus, Ottawa.
- SNC-Lavalin. 29 March 2018. Supplemental Phase II Environmental Site Assessment – 1200 Montreal Road, Ottawa, Ontario – NRC Canada.

TRANSPORT

- City of Ottawa. October 2015. Complete Streets Implementation Framework.
- City of Ottawa. November 2013. Transportation Master Plan.
- City of Ottawa. December 2021. Transportation Master Plan Update.
- City of Ottawa. January 2008. Cycling plan.
- ITE. February 2020. Institute of Transportation (ITE) Trip Generation Manual (10th edition).
- Ontario Traffic Council. June 2021. OTM Book 18 – Cycling facilities.
- Transportation Association of Canada. 2017-2020. TAC Geometric Design Guide for Canadian Roads.

INFRASTRUCTURE

- Cima+. 2016. OGB17-25 NRC As-Builts.
- Cima+. 2017. 17208 Design Brief Memo (Stormwater Management Parameters for Future. Development following Sewer Separation Project NRC – Montreal Road Campus – City of Ottawa – Ontario.
- Cima+. 2017-2018. 5097 Phase 3 North Sewer Separation As-Builts.
- Cima+. 2019. NRC Campus Sanitary Calculation.
- NRC. DATE? RPPM Guideline: Decarbonizing Heating Systems (Draft).
- NRC. February 2022. RPPM Retrofit Playbook.
- NRC. No date. Campus Steam Load.
- NRC. 2020. Montreal Road Campus Energy Summary.
- NRC. 21 July 2022. Montreal Road Campus – Utility Structures and Curtailment.
- NRC. No date. NRC Heating Plant Description.
- Pageau Morel. No date. Secondary Municipal Water Connection – Montreal Road South Campus – NRC – Conceptual Design Report.
- Stantec. 2 January 2018. NRC Montreal Road, Short Circuit, Device Evaluation, Coordination, Arc Flash and 10000 HP motor starting Studies.
- WSP. Date to come. South Campus Decarbonization Output M54 (Draft).
- WSP. 2 February 2023. Montreal Road South Campus Carbon Neutral Study (Final Report).

SUSTAINABILITY

- Government of Canada. 2020. Greening Government Strategy: A Government of Canada Directive.
- Government of Canada. 2021. Federal Sustainability Development Strategy (FSDS).
- Public Services and Procurement Canada. April 2021. Real Property Sustainability Handbook.

IT/SECURITY

- Government of Canada. 2019. Policy on Government Security
- Government of Canada. 2019. Directive on Security Management
- Laboratories Canada. April 2022. Threat and Risk Assessment (Recommendations Extract) – Hub E, Site V (version 2).
- Laboratories Canada. February 2021. TRA extract – Recommendations – Hub B (EFGH) & HP06 Head Office, Site D (Draft).
- Working Group. January 2021. BRIEFING NOTE – Hub B (EFGH) & HP06A Head Office Security Space Requirements – updated.

APPENDIX A

NATIONAL CAPITAL COMMISSION
COMMISSION DE LA CAPITALE NATIONALE

Advisory Committee on Planning, Design and Realty

Thursday, November 23, 2023

IN CAMERA MEETING
40 Elgin Street, Ottawa, Room 324

MINUTES

The committee approved these minutes on March 21, 2024.

Comité consultatif de l'urbanisme, du design et de l'immobilier

Le jeudi 23 novembre 2023

SÉANCE À HUIS CLOS
40, rue Elgin, Ottawa, pièce 324

PROCÈS-VERBAL

Le comité a approuvé ce procès-verbal le 21 mars 2024.

National Research Council Canada Campus

Master Plan 99%

Overall Comments

- This initiative presents an opportunity to create an exemplary research hub. More thinking and development are needed to reach that level.
- Research has changed from something done in secluded and isolated spaces to in more engaging and socially interactive spaces. The success will be as a social place.
- The plans need to push the envelope in developing Third Places (not home, not work) where researchers can come together informally within this secure area.
- Modelling of social interactions would be very beneficial.

Campus du Conseil national de recherches Canada

Plan directeur achevée à 99 %

Commentaires généraux

- Cette initiative offre une opportunité de créer un pôle de recherche exemplaire. Une réflexion et un développement plus poussés sont nécessaires pour atteindre ce niveau.
- La recherche n'est plus menée dans des espaces isolés, mais dans des espaces plus engageants et socialement interactifs. Le succès sera celui d'un lieu social.
- Les plans doivent aller plus loin en développant de tiers lieux (pas à la maison, pas au travail) ou les chercheurs peuvent se réunir de manière informelle dans une zone sécurisée.
- La modélisation des interactions sociales serait très utile.

Layout

- More thinking is needed to create a heart of the campus that people will use and enjoy, promoting that social interaction.
- Trees lining both sides of the central walking path would make it more pleasant than just having them near the road.
- The current layers of multimodal transportation could lead to over-segregation. Think less about making sure each mode is in its own channel following its rules and more about effectively mixing modes.
- Managing the East-West and North/South axes will be difficult. Managing the interface with Montreal Road is a challenge given the grade differences.
- The Campus Gateway also needs to be thought through more. It needs to work well for pedestrians as well as vehicles, but also tie into the overall plan.

Disposition

- Il faut réfléchir davantage à la création d'un cœur de campus que les gens utiliseront et apprécieront, favorisant ainsi l'interaction sociale.
- Des arbres bordant les deux côtés du sentier central le rendraient plus agréable que s'ils se trouvaient près de la route.
- Les couches actuelles de transport multimodal pourraient conduire à une ségrégation excessive. Il faut moins veiller à ce que chaque mode de transport soit dans son propre canal et suive ses propres règles qu'à ce que les modes de transport se mélangent efficacement.
- La gestion des axes est-ouest et nord-sud sera difficile. La gestion de l'interface avec le chemin Montréal est un défi compte tenu des différences de niveau.
- La porte d'entrée du campus doit également faire l'objet d'une réflexion plus approfondie. Elle doit bien fonctionner pour les piétons et les véhicules, tout en s'intégrant dans le plan d'ensemble.

Heritage

- This initiative also presents an opportunity for the federal government to lead by example in protecting mid-century modern buildings.
- The designation and protection of the mid-century modern buildings across the campus should be a priority. They were praised by Greber and a full FHBRO assessment of remaining buildings needs to be done promptly.

Patrimoine

- Cette initiative est également l'occasion pour le gouvernement fédéral de montrer l'exemple en protégeant les bâtiments modernes du milieu du siècle.
- La désignation et la protection des bâtiments modernes du milieu du siècle sur le campus devraient être une priorité. Ils ont été loués par Gréber et une évaluation complète des bâtiments restants par le PEHFP doit être réalisée rapidement.

- A balanced strategy that considers adaptive reuse of existing buildings is needed.

- Une stratégie équilibrée prenant en compte la réutilisation adaptative des bâtiments existants est nécessaire.

Environmental

- This initiative also provides an opportunity to demonstrate innovation in terms of landscape and vegetation. Water management, phytoremediation, or other innovative initiatives should be included and promoted.

- The current norther boundary between the NRCC and SGEC parkway arbitrarily cuts through a wetland. It would make sense to shift it south, but if security is an issue, then the boundary should be moved north so that the full area is managed by one entity.

Environnement

- Cette initiative offre également l'occasion de faire preuve d'innovation en termes de paysage et de végétation. La gestion de l'eau, la phytoremédiation ou d'autres initiatives innovantes devraient être incluses et encouragées.
- La limite nord actuelle entre le CNRC et la promenade SGEC traverse arbitrairement une zone humide. Il serait logique de la déplacer vers le sud, mais si la sécurité est un problème, la frontière devrait être déplacée vers le nord afin que la totalité de la zone soit gérée par une seule entité.

Other Comments

- It could be beneficial to proactively reach out to other departments like Health Canada and look at bringing them in as well to expand this campus and gain more efficiencies.

- The direct pedestrian access to Wateridge Village is a very positive feature and will contribute to integrating with the community.

Autres commentaires

- Il pourrait être bénéfique de tendre la main de manière proactive à d'autres ministères, comme Santé Canada, et d'envisager de les intégrer également pour développer ce campus et gagner en efficacité.
- L'accès piétonnier direct au village de Wateridge est une caractéristique très positive qui contribuera à l'intégration dans la communauté.