

McMaster University

Campus Capacity Study

Executive Summary

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1 Introduction

1.1 Purpose of the study

In fall 2009, McMaster University began a collaborative campus-wide study to determine the thresholds that limit the University's physical space capacity, and gain a clearer understanding of how spaces are used and what activities are scheduled within them. The Campus Capacity Study will help the University identify current space deficits by space type and quantum; provide suggestions for how space could be better utilized and managed; align projected needs with priority projects and capital improvements; and, support discussions around the potential to increase enrolments.

This report provides a comprehensive snapshot of the University's current physical capacity, as well as potential future space needs. Specifically, the report provides:

- An overview of the planning directions and policies that impact opportunities for growth and related transportation capacity at McMaster;
- A summary of the key messages learned through the consultation events held;
- A physical assessment of McMaster's existing facilities;
- A review of the utilization of all instructional spaces on campus, in order to assess use of current classrooms by weekly room use hours, seat occupancy, and room capacity;
- A comparison of McMaster's quantum of existing space to three scenarios that reflect an increased and "steady-state" enrolment; and,
- A summary of recommendations for how physical capacity issues can be balanced with academic and other university objectives both in the near and longer term.

1.2 Our Team

A number of disciplines were involved to provide the full scope of services for this study. Urban Strategies, Inc. (USI), planners and campus designers, led the project and have been responsible for its overall direction, stakeholder consultation, and the production of final deliverables. Rickes Associates, Inc., higher education facility planners, reviewed facility spaces and standards, defined facility needs and completed the space utilization analysis. MMM Group Ltd (MMM), civil and transportation engineers, provided guidance regarding transportation, transit, parking and other infrastructure.

1.3 Institutional Overview

Located in Hamilton, Ontario, McMaster University is a world-renowned public research university with over 24,000 undergraduate and graduate students and over 13,000 full-time and part-time employees, including faculty, staff, and administrators (all figures current as of 2010).

McMaster University is comprised of six Faculties: the DeGroote School of Business, and the Faculties of Engineering, Health Sciences, Humanities, Science, and Social Sciences. At present, the majority of the Faculties are housed on the McMaster's main campus in Westdale; with the exception of the DeGroote School of Business's graduate program, which recently relocated to a new purpose-built facility in the City of Burlington.

McMaster has experienced rapid growth in recent years, due to population increases in the Greater Toronto Area and Hamilton Region. This institutional growth has been further accelerated due to the rising prominence of many of the University's diverse academic offerings, particularly in the fields of Health Sciences and Engineering. With continued enrolment growth expected, and the ongoing development of new academic programs, McMaster is ideally positioned to become one of North America's most prominent universities.

1.4 Study Oversight

In order to assist the Campus Capacity Study process, a Campus Capacity Steering Committee was formed in September 2009. The Steering Committee was chaired by Karen Menard, Associate Vice-President of Institutional Research and Analysis, and included the Provost, Vice-President Administration and representatives from faculty, senior management and staff. The role of the Steering Committee was to provide strategic direction at key points throughout the study process.

Figure 1. 50 Years of Growth in Space and Undergraduate Enrolment

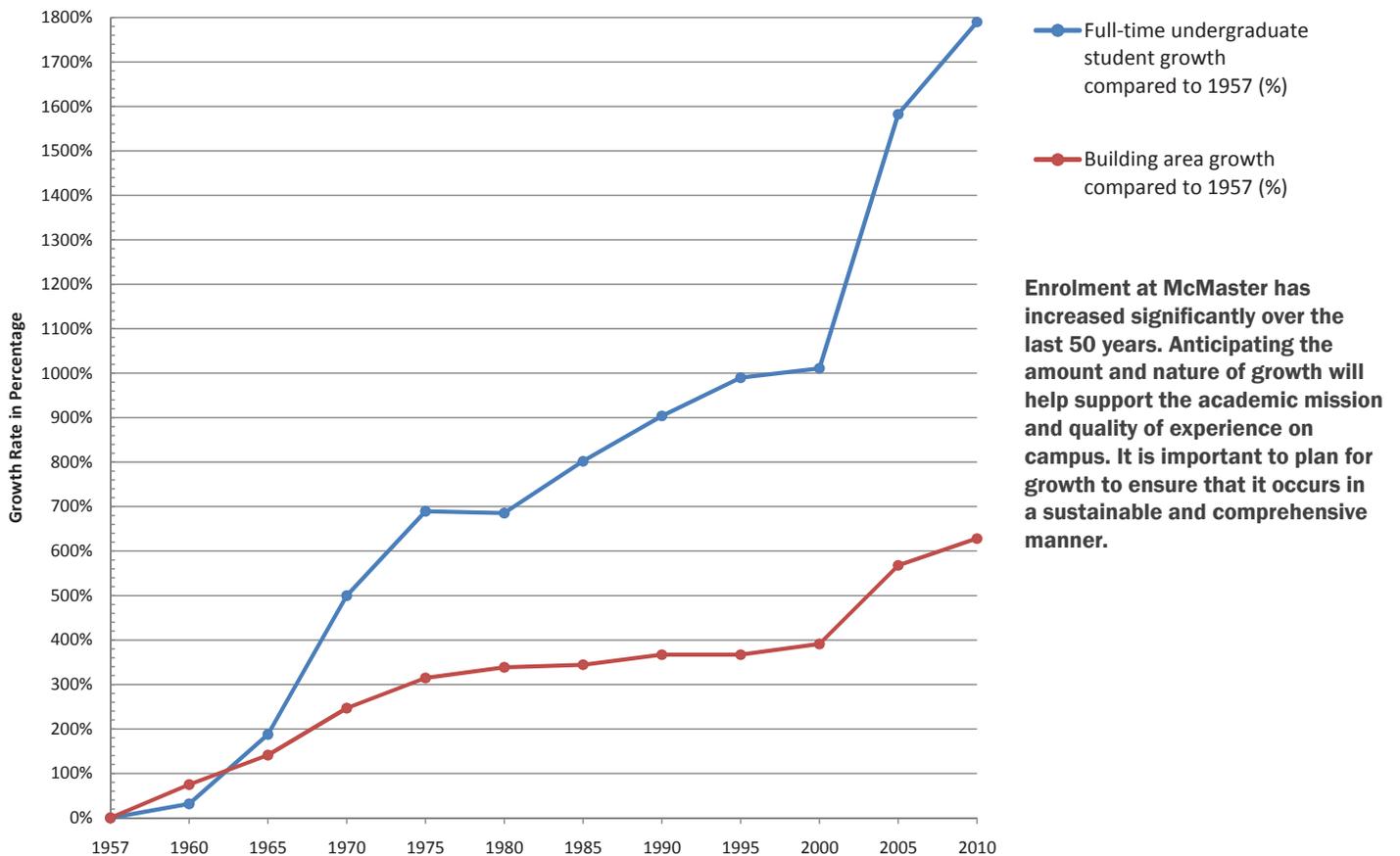


Figure 2. Existing Main Campus



Source: Google Earth

2 Key Messages from the Campus Communities

Consultation with faculty, staff, senior administrators, students, City of Hamilton, the neighbouring community and members of the public was a critical component of the Campus Capacity Study process. Feedback received from the various stakeholders provided a valuable context for identifying perceived space needs across the University, especially “pinch points” where additional space is needed; clarified questions arising from the initial data analysis; and, offered insight into recommendations regarding how physical capacity can be balanced with academic and other university objectives in the short and long term future.

Throughout the course of the Campus Capacity Study, the project team held a series of consultation events, as well as used several campus community engagement tools, in order to gather a wide range of insights and perspectives. Between October 2009 and March 2010, the project team conducted over thirty interviews with representatives from various faculty departments and key University decision makers. An initial open house to introduce the study was held in January 2010 and an open house to share the draft findings of the study took place in October 2010. In addition, on July 15, 2010, the project team engaged approximately fifty students, faculty, staff and senior administrators from across the University in a day-long discussion on space needs and enrolment levels. Further, a project webpage was created in order to easily share information, advertise upcoming consultation events and provide contact information for how/where comments and feedback on the Campus Capacity Study can be directed. Approximately 1,300 people visited the Campus Capacity Study webpage throughout the duration of the study.



courtesy flickr McMaster University Library



The interviews, open houses and day-long workshop provided important information to assessing space-related relationships and demands that are unique to McMaster. Some of the most pressing questions raised by stakeholders included:

- How can McMaster continue to develop its strong undergraduate programs while responding to expanding graduate needs and growth?
- What is the right balance between centralized and decentralized space resources? How can these resources be better managed in an open and comprehensive way?
- Recognizing that McMaster is located in a growing region, what is the appropriate balance between commuter and local student needs?
- How can McMaster support the various spaces required for a balanced university life, including classroom, lab, social and quiet space?



From the consultation events held throughout the course of the Study, the core messages that we heard were:

- All Faculties want and anticipate further growth in programs and facilities.
- There has been significant recent enrolment growth, but it is perceived to have taken place with minimal resources to support this growth.
- New academic and teaching space has been created, but is still perceived to be lacking overall.
- Over time, space assignments have become opportunistic, fragmented and inequitable.
- There is a concern that the quality of experience and life on campus is being compromised.
- “We have learned how to make do.”
- Capacity issues, particularly those related to classrooms, are intrinsically linked to faculty recruitment.
- There is a concern that there has not been enough capital investment, particularly in technology.
- There is a need for a student housing strategy that will address current growth in enrolment while protecting the character of the neighbourhood.
- Growth in enrolment has a significant impact on the surrounding neighbourhood. McMaster needs to maintain a continued dialogue with the community.

3 Campus Location and Physical Setting

The capacity of McMaster University's main campus is not only impacted by the nature of its facilities and increases in enrolment, but it is also influenced by the physical access to the campus, the availability of development sites, and the relationship of the campus to the surrounding context. Furthermore, the University is situated within a growing region, which may have a significant impact on both McMaster's enrolment and how people will commute to campus.

This section provides a summary of the regional growth trends and outlines the physical development opportunities, as defined in the 2008 McMaster Campus Master Plan.

3.1 Regional Growth Trends

McMaster is located in one of North America's fastest growing regions. The University is ideally positioned to take advantage of this new growth and - as a key institution - will be under considerable pressure to do so.

On June 16, 2006 the Government of Ontario released the Growth Plan for the Greater Golden Horseshoe, under the terms of the provincial Places to Grow Act, 2005. A core objective of the Growth Plan policies is accommodating and directing new population and employment growth to built-up areas through intensification. Directing growth in this manner is intended to create complete communities that offer options for living, working, shopping and playing; providing greater choice in housing types; and curbing development sprawl.

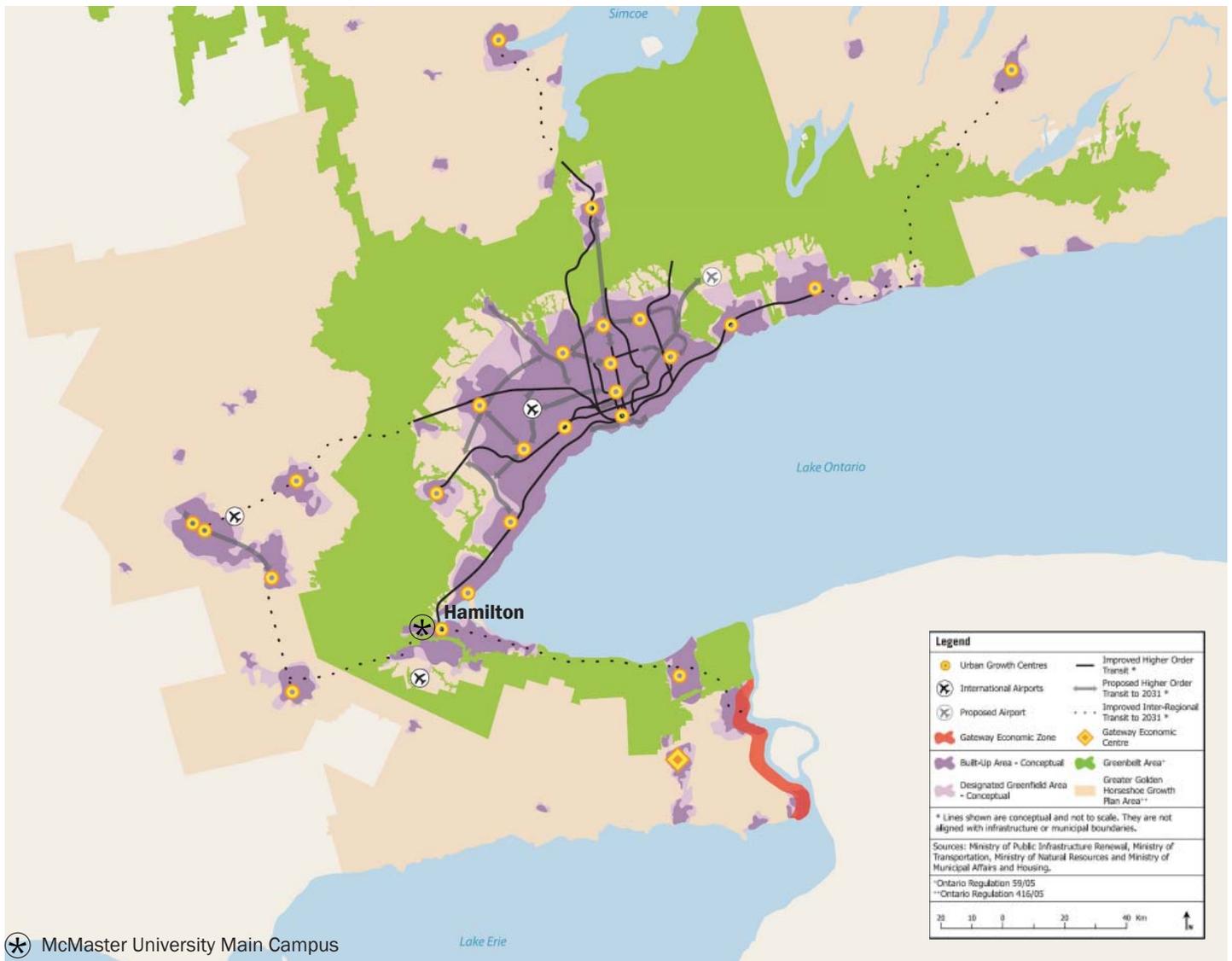
Under the current forecasts prepared in conjunction with the Growth Plan for the Greater Golden Horseshoe, the greater Toronto and Hamilton area is anticipated to grow by 3.7 million more people and 1.8 million more jobs by 2031, accounting for approximately 80 percent of Ontario's population growth. The City of Hamilton has been identified as a built-up area and Downtown Hamilton has been highlighted as an urban growth centre, which are defined as centres that can accommodate intensification and growth.

According to the Growth Plan, the City of Hamilton will grow by approximately 150,000 people and will generate approximately 90,000 employment opportunities over a 30-year period (2001-2031). It is expected that the City of Hamilton will accommodate approximately 8% of the new population growth and 7% of the new employment growth by 2031.

Further, according to the Growth Plan, Halton Region will grow by approximately 780,000 people and will generate approximately 390,000 employment opportunities over a 30-year period (2001-2031). It is expected that Halton Region will accommodate approximately 9% of the new population growth and approximately 9% of the new employment growth expected to take place in the

Greater Golden Horseshoe by 2031. Due to the fact that much of McMaster's new enrolment comes from Halton Region, the anticipated increases in population in this area does impact the University's enrolment considerations. The Growth Plan forecasts that total population growth within a 60 minute commute to campus is 1,230,000 people. Figure 3 illustrates the general location and nature of this growth.

Figure 3. Growth Plan for the Greater Golden Horseshoe



⊗ McMaster University Main Campus

3.2 Physical Growth Opportunities

The McMaster University Campus Master Plan, originally prepared in 2002 and updated in 2008, provides an overall physical framework for campus growth and renewal. The Campus Master Plan outlines a 30-year vision for the campus. Specifically, it establishes a framework for future development that extends the structure of the campus's historic core to its periphery while respecting the surrounding built and open space context. Although it does not advocate for growth, it identifies approximately 140,000 gross square metres of space (93,000 net assignable square metres) for potential new development, with supporting open space amenities and infrastructure initiatives.

As outlined in the Campus Master Plan, physical capacity on McMaster's main campus has been largely determined by its physical structure, which contains a well-established hierarchy of streets and natural features. This clear structure has provided a strong setting and logic for development and infrastructure investments to continue to evolve in an integrated manner.

The Campus Master Plan (Figure 4) is intended to be flexible, to accommodate the changing needs of various departments and Faculties, and to enhance learning by providing the physical environment in which to gain knowledge, live and work. An important component of the implementation of the vision outlined in the Campus Master Plan was the identification of several potential development sites that could support incremental growth throughout the University campus. However, it is understood that some of these sites may not be developed and that McMaster may need to consider further off-campus development in appropriate locations.

Key Messages from the Campus Master Plan:

- The campus's important places, including its historic structures, important building facades, quality of relationships between buildings and open spaces, courtyards and Central Mall, will be preserved. New buildings, additions, landscaping or streetscaping initiatives will support the university's remarkable quality of place.
- The University will be a leader in the management and stewardship of its environment, which includes both landscaped and naturalized places.
- The Main Campus will be home for all Faculties, including graduate and undergraduate students.
- The campus will continue to be a place that serves different communities in different ways and will be a resource for many groups from the local neighbourhoods and the wider city/region.
- A "full service" environment will be provided for learning, working, living and playing, to provide a well-rounded university and community experience.
- The campus transportation system will support the University's future needs, while enhancing the valued pedestrian priority in the heart of the campus and respecting its neighbours.

To view the entire McMaster University Campus Master Plan, please go to:

http://www.mcmaster.ca/opr/html/opr/our_campus/campus_plan/campus_master_plan.html

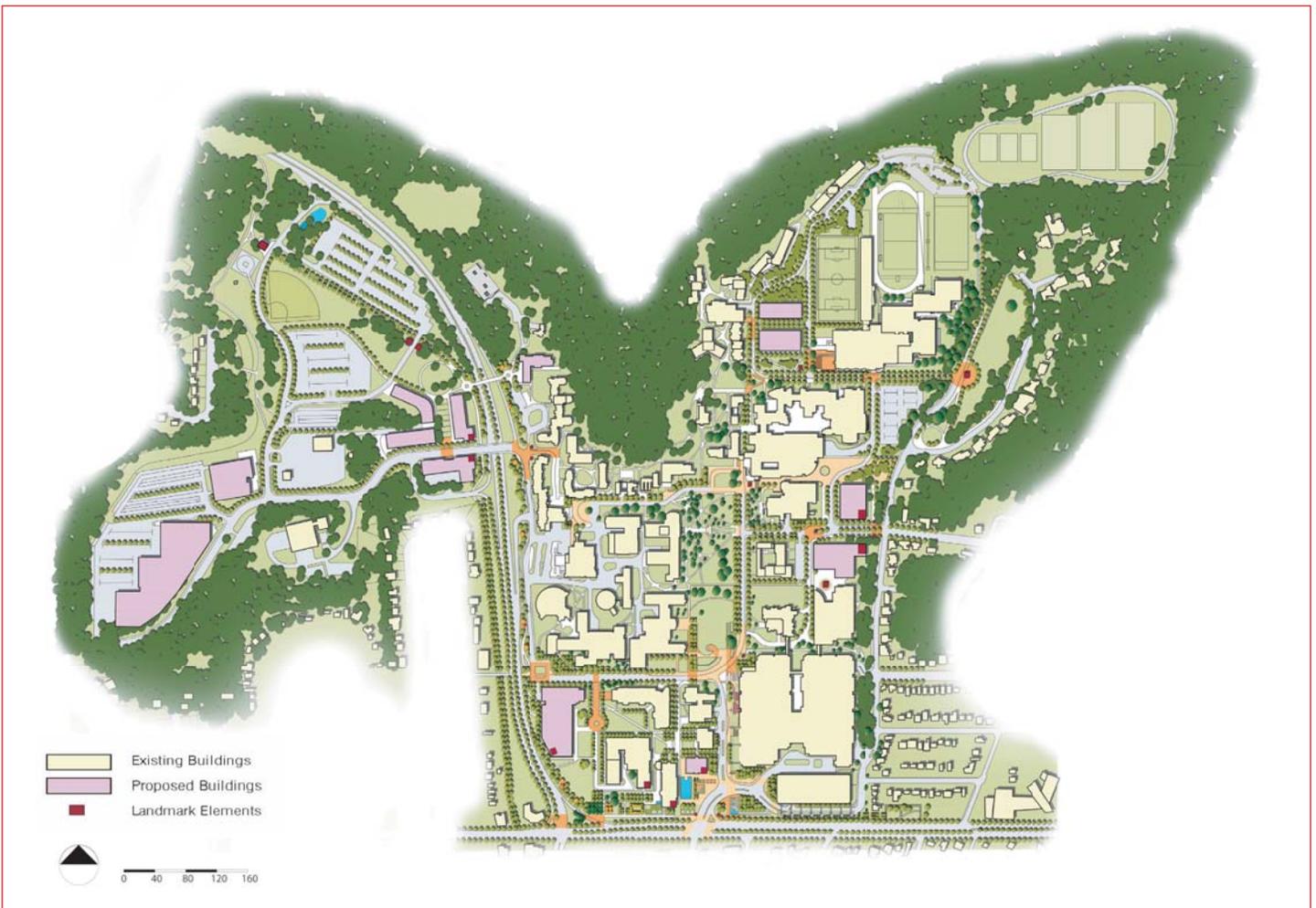
As illustrated in Figure 5, a series of development sites were identified throughout the Campus, primarily within the Core Campus, North Campus, and West Campus.

- Within the Core Campus, there are several opportunities to introduce new buildings and/or building additions: along Scholar’s Road east of Mary E. Keyes Residence; north of Bates Residence beside the President’s Residence; sites along the Cootes Drive, Main Street and Forsyth Avenue frontages; and significant gateway/

landmark development sites at the locations of two existing buildings that are to be removed, T-13 and Wentworth House.

- Even with years of substantial building activity in North Campus (the David Braley Athletic Centre, Stadium and Les Prince Hall), there remains development potential, west of the athletic centre. Future development should line Stearn Drive and the new Marauders Walk adjacent to the football stadium.

Figure 4. Campus Master Plan 30-Year Vision



- West Campus has substantial potential to accommodate new buildings outside of the Ancaster Creek floodplain, subject to more detailed investigations regarding soil bearing capacity. The area within the floodplain is not suitable for most buildings but could potentially accommodate two single-level parking structures.

An important component of the Master Plan was the identification of several potential development sites that can support incremental growth throughout the campus. However, some of these sites may not be developed and McMaster may need to consider further off-campus development in appropriate locations.

Figure 5. Potential Development Sites

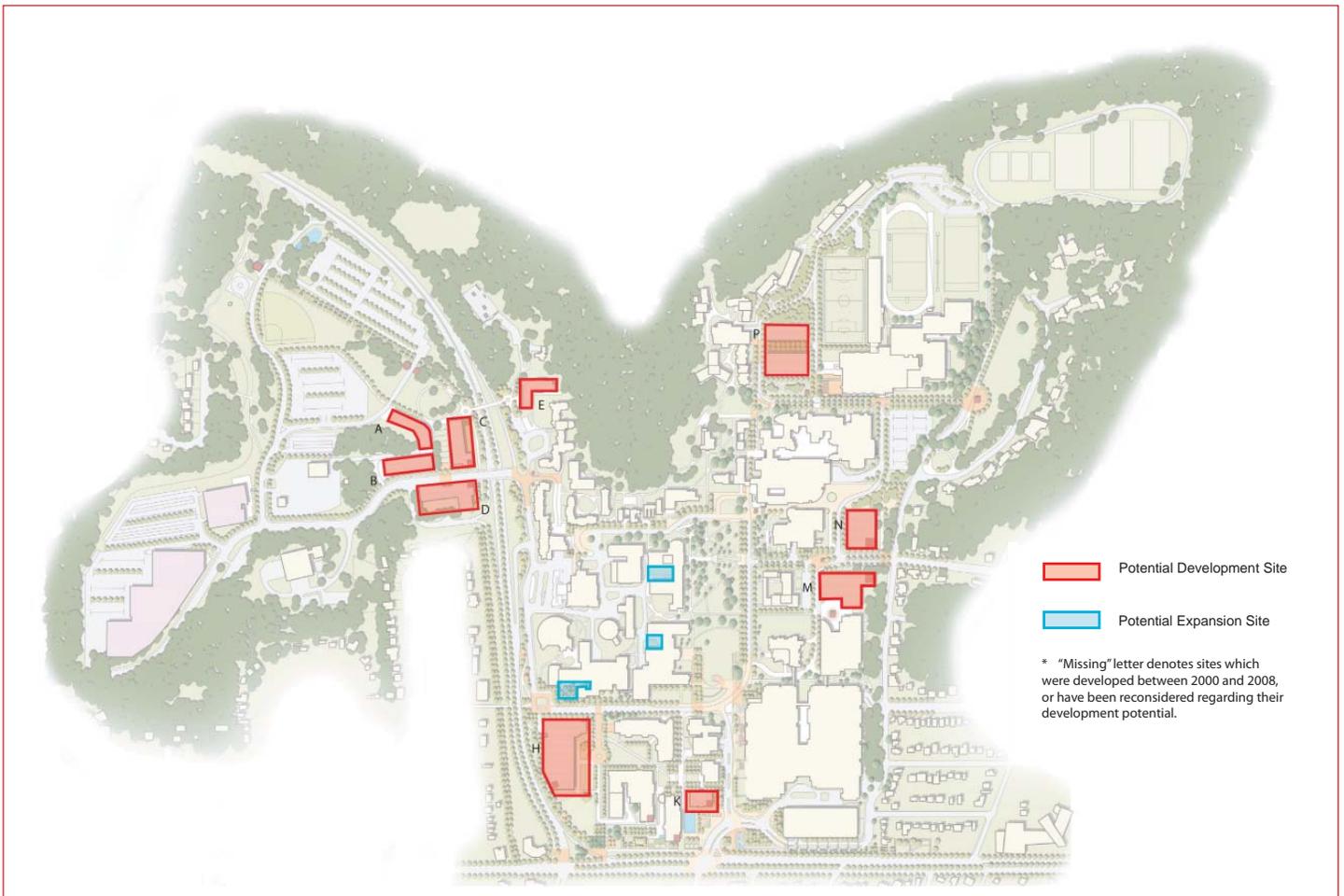


Table 1 : Development Site Statistics

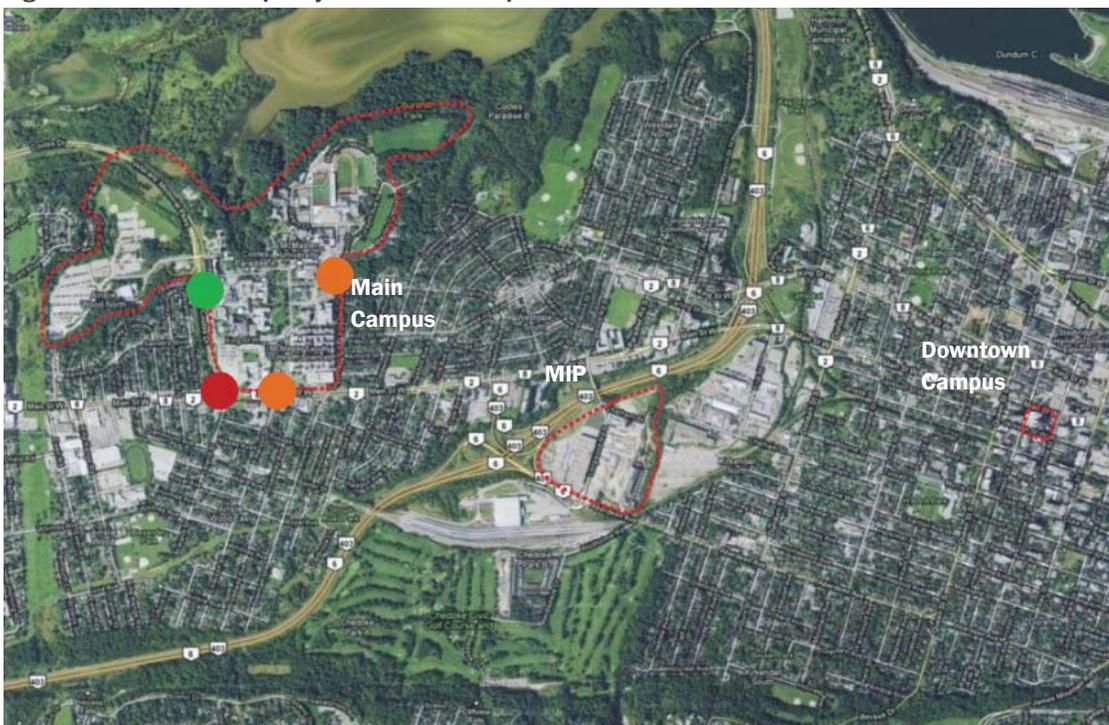
Site (*high profile site)	Site Area	Height (storeys)	Total Gross Development Area	Potential Use
A	21,500 sq. ft. 2,000 sq. m.	4-6	86,000-129,000 sq. ft. 8,000-12,000 sq. m.	<ul style="list-style-type: none"> Academic, research or residence above parking structure
B	20,400 sq. ft. 1,900 sq. m.	4-6	81,600-122,400 sq. ft. 7,600-11,400 sq. m.	<ul style="list-style-type: none"> Academic, research or residence above parking structure
C	18,300 sq. ft. 1,700 sq. m.	4-6	73,100-109,800 sq. ft. 6,800-10,200 sq. m.	<ul style="list-style-type: none"> Academic, research or residence above parking structure
D	25,800 sq. ft. 2,400 sq. m.	4-6	103,200-154,800 sq. ft. 9,600-14,400 sq. m.	<ul style="list-style-type: none"> Academic, research or residence above parking structure
E	16,100 sq. ft. 1,500 sq. m.	4-6	64,400- 96,600 sq. ft. 6,000-9,000 sq. m.	<ul style="list-style-type: none"> Residence, amenity/ conference, research, academic
H	51,100 sq. ft. 4,750 sq. m.	4-6	204,400 - 306,600 sq. ft. 19,000 - 28,500 sq. m.	<ul style="list-style-type: none"> Parking structure
K*	10,750 sq. ft. 1,000 sq. m.	10	43,000 - 64,500 sq. ft. 4,000 - 6,000 sq. m.	<ul style="list-style-type: none"> Welcome Centre, academic, clinic
M*	38,700 sq. ft. 3,600 sq. m.	4-6	154,800-232,200 sq. ft. 14,400-21,600 sq. m.	<ul style="list-style-type: none"> Academic, uses serving the broader community
N*	17,750 sq. ft. 1,650 sq. m.	4-6	71,000 - 106,500 sq. ft. 6,600 - 9,900 sq. m.	<ul style="list-style-type: none"> Academic, uses serving the broader community
P	40,900 sq. ft. 3,800 sq. m.	4-6	163,600 - 245,400 sq. ft. 15,200 - 22,800 sq. m.	<ul style="list-style-type: none"> Academic, research

4 Transportation Considerations

As McMaster plans for additional development, it will be important for the University to rethink the structure of circulation routes at the edge campus, and extend the strong system of primary streets and open spaces found in the internal campus to growth areas in the edges. These considerations will not only address the transportation related issues but will present new development opportunities, which can support McMaster’s academic program.

Building on the transportation analysis completed as part of the McMaster Campus Master Plan, MMM conducted a series of interviews with University and City of Hamilton staff, reviewed data collected by the City of Hamilton and the Hamilton Street Railway (HSR), and compiled transportation counts in order to assess the current transportation capacity on the campus and surrounding area.

Figure 6. Intersection Capacity at the Main Campus



- Intersection vehicular movement capacity
- capacity available
 - limited capacity available
 - no capacity available

4.1 Transportation Context and Key Findings

Overall transportation capacity in the surrounding Hamilton Street network is good, but the intersections near the Main Campus are near or at capacity, limiting access for additional private vehicles to campus (Figure 6). McMaster University and the City of Hamilton are working together to overcome transportation congestion and limit traffic infiltration to neighbourhoods through public transit investments. Improved transit will be a significant part of McMaster's and Hamilton's future.

Further to the existing transit supportive infrastructure, significant new transit initiatives are currently being proposed by the City of Hamilton on Main Street. In November 2008, Metrolinx released its final transportation strategy, which identified four rapid transit routes in Hamilton to be implemented consecutively over the next 25 years and beyond. Listed among the top "early implementation" priority projects was the rapid transit expansion from McMaster University to Centennial Parkway – building on the HSR 'B-Line'

bus service. The City of Hamilton recently received \$3 million from the Province of Ontario in order to undertake an extensive design process that will map out exactly what a proposed rapid transit system will look like and how it will impact traffic flow along the B-line corridor. McMaster University is currently working with the City to determine a suitable terminal location for the proposed rapid transit route. (Figure 7)

As McMaster University plans for its future, it will be important for the University to continue to align its transportation needs and initiatives within this larger transportation context. This implies further reliance on public transit and the potential protection of locations for future transit infrastructure, either on or adjacent to campus. This also indicates the need to continue to focus on enhancing pedestrian access. Conversely, the creation of parking facilities and infrastructure that solely supports the movement of private vehicles only be a "medium-term" priority.

Figure 7. Potential Locations for Future Rapid Transit Terminal

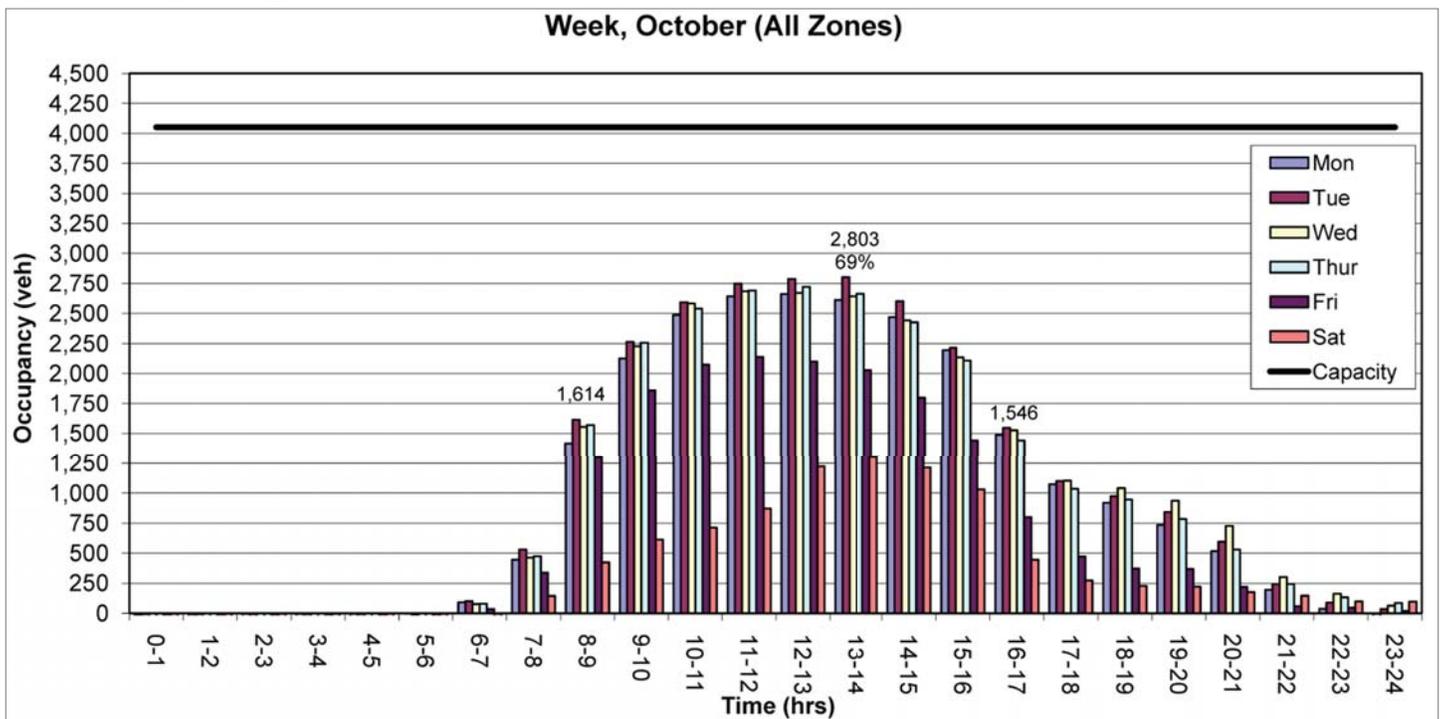


4.2 Parking Analysis

McMaster University currently does not have a parking supply issue. However, McMaster does face some capacity constraints due to class scheduling and peak usage times. According to the data, there is limited unused capacity during weekdays; the weekday evenings offer significant unused parking capacity and Saturdays are increasingly busy during the day. (Figure 8) There is opportunity to manage change and promote sustainable transportation options through the implementation of different policies. Specifically, McMaster University should continue to work with the City of Hamilton to support sustainable mobility choices and should explore introducing a car-sharing program on the campus. McMaster could also implement a Travel Demand Management strategy that shifts vehicle trips away from the morning and afternoon peak hour.



Figure 8. Parking Lot Usage



5 Current Facility Capacity

The most obvious pressures for renewal and the implications of the recent growth in enrolment can be found by reviewing the quantum and use of McMaster's facilities - its offices, classrooms, labs and other spaces. As such, in order to receive an accurate snapshot of McMaster's facility capacity, it is important to review the amount and type of space currently available on the main campus. The results not only identify the pressure points on the various available spaces but will also provide a critical planning tool for the University as it envisions the future configuration of its campus, together with the plans and policies that will continue to shape it.

5.1 Distribution of Existing Space

Existing space at McMaster University was reviewed by building, type, and Faculty in order to understand the current distribution of space on campus (excluding residential space). The consultant team used the 2008/2009 space inventory data submitted by McMaster University as the starting point for an analysis of the distribution of existing space. These data included a code assigned to each space, categorizing it by use. These codes have been established by the Council of Ontario Universities (COU) and are used to compare facilities and institutions in Ontario. The consultant team used these and their own professional expertise to analyze McMaster's existing space. It is important to note that the 2008/2009 space inventory data was also augmented with information on McMaster's off-campus sites.

From this analysis, the consultant team was able to determine that McMaster has a total of 295,979 net assignable square metres (NASM) of space (Figure 9). This total excludes 58,000 NASM on-campus non-institutional spaces, such as Mohawk, Divinity, Hamilton Health Sciences and 102,000 NASM of off-campus institutional spaces, including the McMaster Innovation Park and, the School of Business/Ron Joyce Centre.

Figure 9. Distribution of Existing Space: COU Space Type Codes*

COU Code	Space Type		Total NASM	Percent of Total
1	Classroom Facilities	Lecture rooms, classrooms, seminar rooms, tutorial rooms, and associated support and preparation spaces	24,293	8.2%
2	Laboratory—Undergraduate	Laboratory spaces, computer labs, art and music studios, and associated support and preparation spaces	19,471	6.6%
3	Research Laboratory Space (Graduate and Faculty)	Faculty, graduate and general research facilities, and associated support and preparation spaces	47,117	15.9%
4	Academic Departmental Offices and Related Space	Includes academic offices, research space, graduate student offices, and departmental administrative and support staff spaces	55,227	18.7%
5	Library Facilities and Campus Study Space	Library collection space, office space, and support spaces; study spaces within the library and elsewhere on campus	26,404	8.9%
6	Athletic/Recreation Space	Athletic activity and seating areas, and associated support and preparation spaces	17,224	5.8%
7	Food Service	Food facilities, and associated kitchen, dishwashing, refrigeration, storage, and staff spaces	8,223	2.8%
8	Bookstore and Other Merchandising Facilities	Bookstores and other retail spaces operated by the University or operating in space rented from the University	2,425	0.8%
9	Plant Maintenance	Spaces associated with operations and maintenance of University buildings and grounds	4,348	1.5%
10	Central Administrative Office and Related Space	Offices and associated support spaces for University staff and administrators	14,051	4.7%
11	Audio-Visual / Television Facilities	Radio, TV, sound, photography, and graphic studios and associated support and preparation spaces	818	0.3%
12	Central Services	Central computing and printing facilities, central receiving and storage areas, central laundry facilities, central technical service and repair areas, University mail rooms	1,856	0.6%
13	Health Service Facilities	Spaces devoted to the provision of health services to the University population, and associated service and support spaces	688	0.2%
14	Common Use and Student Activity Space	Student offices, recreational facilities, lounge spaces, and associated service and support spaces	4,307	1.5%
15	Assembly and Exhibition Facilities	Theatres, auditoria, museum and exhibit spaces, and associated service, storage, and support spaces	2,433	0.8%
Subtotal, Academic Space (1-15)			228,884	77.3%
16	Non-Assignable Space	All mechanical spaces, circulation spaces (corridors, stairwells), and loading docks	N/A	N/A
17	Residential Space	Residential living and associated service and support spaces	60,626	20.5%
18	Animal Space	Animal facilities in support of teaching or research	1,650	0.6%
19	Other University Facilities	A wide variety of spaces not included in other categories, such as day care facilities, rifle ranges and military training space, space occupied by non-University agencies, and space that has not yet been assigned a specific use	2,723	0.9%
20	Health Science Clinical Facilities	Health care spaces used in direct support of teaching and research related to clinical instruction, including patient bedrooms and bathrooms, nurses' stations surgery and treatment rooms, and associated service, storage, and support spaces	1,290	0.4%
Other	Not coded		804	0.3%
Subtotal, Non-Academic Space (17-20)			67,095	22.7%
GRAND TOTAL			295,979	100.0%

COU assigns one of 20 space codes to all campus spaces (1-15 = “Academic” space; 16 = unassigned; 17-20 = “Non-academic” space)

5.2 Surpluses and Shortfalls Today

To support existing enrolment, there is a need for approximately 12% more space than what McMaster currently has. The only facilities for which there is an adequate quantum of space are departmentally controlled classrooms and academic, research and staff offices. The library exhibits a surplus of collection space, although this is tempered by a deficit in study space.

Figures 10 and 11 identify variances in campus capacity based on space types. Specifically, Figure 10 illustrates findings based on COU guidelines, while the Figure 11 outlines the resulting space need.

Figure 10. Campus Capacity Analysis*

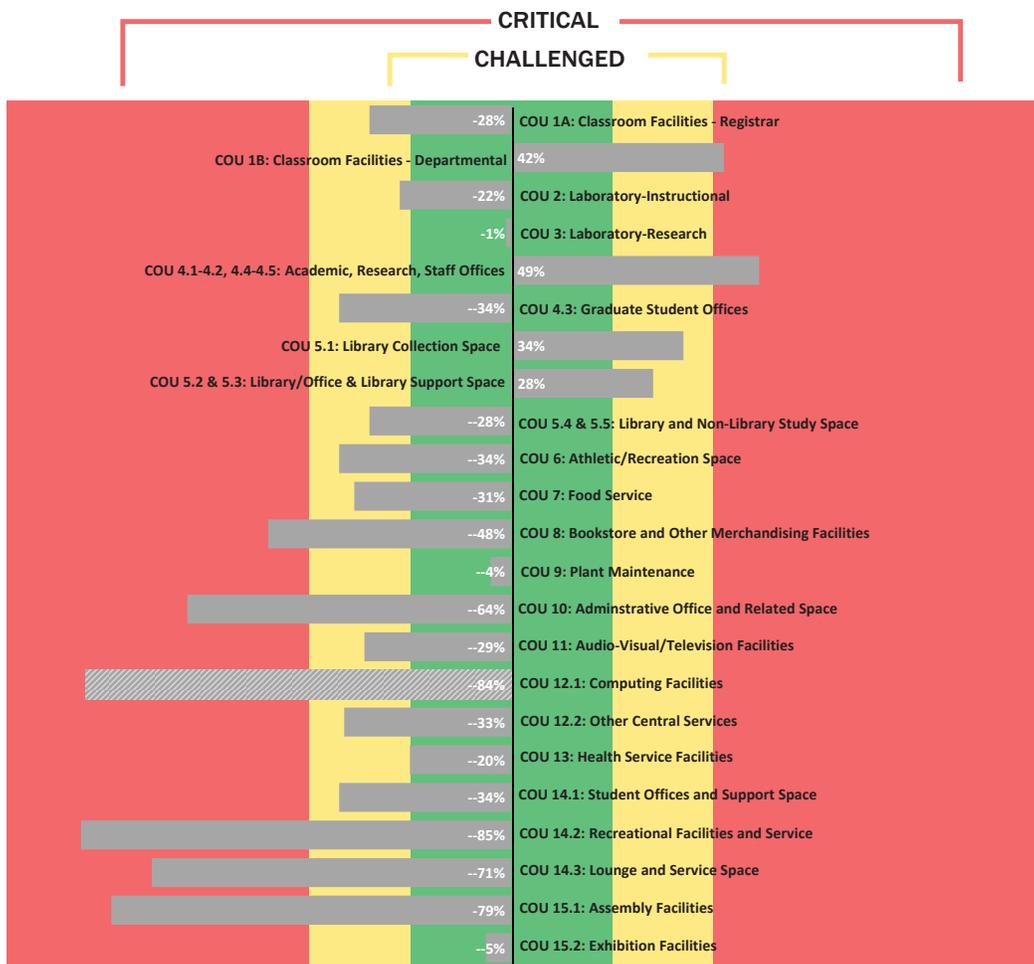


Figure 11. Resulting Space Need

COU Code	Space Deficit/Surplus (NASM)	Total Current Space Need (NASM)
1A	-3,174	14,318
1B	2,357	3,267
2	-2,108	9,583
3	-598	47,715
4.1-4.2, 4.4-4.5	15,537	31,440
4.3	-4,254	12,504
5.1	9,081	6,743
5.2 & 5.3	989	2,548
5.4 & 5.5	-153	7,196
6	-8,753	25,977
7	-3,758	11,981
8	-2,210	4,635
9	-174	4,522
10	-24,551	38,602
11	-341	1,159
12.1	-1,575	1,881
12.2	-768	2,317
13	-250	1,272
14.1	-1,283	3,733
14.2	-2,949	3,476
14.3	-3,305	4,635
15.1	-3,678	5,007
15.2	-54	1,159
Not Analyzed		19,519
Totals, (1-15)	-35,970	264,855

Assumptions for COU 12.1, Computing Spaces, may need to be updated to reflect rapidly changing technological needs. Less space may be required than this analysis suggests.

*** Please note that all analysis and recommendations are based on 08/09 data provided by McMaster University**

Capacities by category are identified as “acceptable,” “challenged,” or “critical” depending on their variance from “equilibrium,” or an ideal state based on current enrolment. Of the 23 COU categories and subcategories evaluated, eight are viewed as “critical,” while 11 are “challenged” and four are “acceptable.” There are capacity deficits in 20 categories, while three show surpluses.

- Application of the COU and project team’s space multipliers result in similar results in many space categories, providing confidence in the surpluses or deficits of certain space types. For example, COU multipliers suggest that the current space need for Bookstore and Other Merchandising Facilities (Category 8) is sized to support a campus with an enrolment 35% smaller, while the project team’s multipliers yield 48% in the same category.
- Plant Maintenance (Category 9) is close to equilibrium, i.e., equivalent to current space need given existing enrolment.
- The most critical space need relative to recommended COU percentages (fig. 10) include:
 - Administrative Office and Related Space (Category 10),
 - Computing Facilities (Category 12.1),
 - Recreational Facilities and Service Space (Category 14.2),
 - Lounge and Service Space (Category 14.3), and
 - Assembly Facilities (Category 15.1).
- The most critical space need relative to overall quantum of space required (fig. 11) include:
 - Administrative Office and Related Space (Category 10),
 - Athletic/recreation space (Category 6),
 - Graduate Student Offices (Category 4.3),
 - Assembly Facilities (Category 15.1), and
 - Lounge and Service Space (Category 14.3)
- Library Office/Support (Categories 5.2 and 5.3) exhibits a surplus, although the latter should be tempered by the deficit in Library study space.

6 Instructional Space Utilization Analysis

The most pressing issue regarding instructional space is the range of room sizes and types currently available relative to pedagogical and scheduling needs. In other words, the issue is not the overall quantum of this space but rather the quality and distribution of instructional space. While greater centralization of space management and scheduling would help improve instructional space utilization and availability, changes will be required to resize and enhance the classroom inventory.

6.1 Overview

Instructional space utilization looks at the coordination of room size, type, and station (seat) areas with class size and scheduling to find an optimal alignment of space with demand. The primary purpose of this analysis is to inform facilities planning decisions and support the allocation of capital resources within a broader planning context. The outcome of this detailed analysis of instructional space – general-purpose classrooms as well as specialized instructional areas – is aimed at ensuring the availability of the right type of core mission space, in the right amount, in the right location, and at the right time.

The following defines the key terminology used in the Instructional Space Utilization Analysis:

- Station size refers to the average amount of NASM available per student station (i.e., seat). Dividing the total NASM per instructional room by the total station count yields the average station size. Compared to a guideline of 2.0 NASM per station in classrooms, McMaster provides 1.6 NASM in Registrar-controlled general-purpose classrooms (based on 2008/2009 data), suggesting that rooms are generally overcrowded and/or do not contain contemporary instructional furniture.
- The weekly room hour utilization rate refers to the proportion of time that instructional spaces are actually scheduled relative to the scheduling window, the total time that those spaces are technically available for formal scheduling. The scheduling window is the designated period in which it is desirable to schedule the majority of (daytime) courses. After discussion with appropriate MU personnel, MU's scheduling window was defined as 45 hours, a duration common to many other urban research institutions across North America. Compared to a guideline of 67%, McMaster's Registrar-controlled general-purpose classrooms are utilized at an average rate of 64%, or just below the target guideline.

6.2 Process

To analyze the utilization of instructional spaces on the McMaster campus, data must be examined in two ways: as an evaluation of general-use classrooms and specialized instructional spaces; and as a comparison of classrooms controlled by the Registrar versus those that are departmentally held. Further, a detailed analysis of hours of use, seat or station occupancy rates, and assignable area per station identifies shifts in utilization that occur across the campus and throughout McMaster’s scheduling window. Space planning guidelines are then applied, and the gap between Existing Space (the actual space available now on campus) and Current Space Needs (the space required to adequately accommodate the current population) can be identified.

Figure 12. General-Purpose, Registrar-Controlled Classrooms*

Target Measure	Actual	Recommended
Square Metres per Seat: Classrooms	1.6	2.0
Square Metres per Seat: Lecture Halls	1.1	1.7
Square Metres per Seat: Auditoriums	.7	1.4
Weekly Room Hour Utilization Rate	64%	67%
Average Seat Occupancy Rate	70%	67%
Number of Stations	9,911	9,367
Number of Classrooms	105	101
Assignable Square Metres	11,144	14,318

Figure 13. General-Purpose, Departmentally-Controlled Classrooms*

Target Measure	Actual	Recommended
Square Metres per Seat: Classrooms	1.6	2.0
Square Metres per Seat: Lecture Halls	1.5	1.7
Weekly Room Hour Utilization Rate	28%	50%
Average Seat Occupancy Rate	63%	67%
Number of Stations	3,821	1,685
Number of Classrooms	103	57
Assignable Square Metres	5,624	4,315

6.3 Key recommendations

While the findings represent a snapshot in time, the instructional space utilization analysis recommends 158 general-purpose classrooms (101 Registrar-controlled and 57 Departmentally-controlled classrooms) to support the near-term space need. (Figures 12,13) Currently, there are 208 general purpose classrooms (105 Registrar-controlled and 103 Departmentally-controlled classrooms). The challenge is to ensure that the right type of classrooms are available, especially those with larger capacities. It is not simply a matter of having a sufficient quantity of instructional spaces. They must be of an acceptable quality if they are to be well utilized. This analysis recommends that a phasing and implementation space plan be developed in order to identify the classrooms that are candidates for ‘right-sizing’, maintenance, and other upgrades. This plan would also consider the enrolment, course schedule, and potential need for expanded facilities to support new programs, adjusting as the institution grows. Ultimately, this plan will assist McMaster determine the appropriate array of classrooms, both now and in the future.

Figure 14. Specialized Instructional Spaces*

Target Measure	Actual	Recommended
Square Metres per Seat	3.1	3.0-10.0
Weekly Room Hour Utilization Rate	34%	50%
Average Seat Occupancy Rate	67%	80%
Number of Stations	2,416	1,881
Number of Spaces	71	71
Assignable Square Metres	7,475	9,642

*** Please note that all analysis and recommendations are based on 08/09 data provided by McMaster University**

6.4 What is 'right-sizing'?

'Right-sizing' is the process of changing the seating capacity of existing rooms by adding or removing classroom stations to attain a desired number of assignable square metres per station. For example, McMaster classrooms seating fewer than 75 average 1.6 NASM per station versus the recommended target of 2.0 NASM per station.

Figures 15 and 16 compares the number of rooms in each capacity category before and after right-sizing against the total number of rooms proposed. The intent of this exercise is not to suggest that all rooms be right-sized on this basis, but to indicate some near-term, non-capital approaches to meeting instructional space needs with appropriate room capacities. The comparative items are:

- Existing Number of Rooms: This reflects the actual distribution of the combined 208 general-purpose classrooms by current station capacity.
- Right-Sized Rooms: This shows the actual distribution of the 208 general-purpose classrooms after theoretically right-sizing them to provide the appropriate amount of space per station, on average.

- Existing Need: This is the proposed number of rooms (158) needed to accommodate current course offerings, by room capacity.

Right-sizing would substantially shift the distribution of classroom capacities downwards in both Registrar- and departmentally-controlled classrooms. This exercise permits the optimization of rooms by allowing the campus to selectively right-size rooms, especially those currently overcrowded.

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Figure 15. Existing Departmentally-Controlled Classrooms Compared to Right- Sized Classrooms and Current Need by Room Capacity*

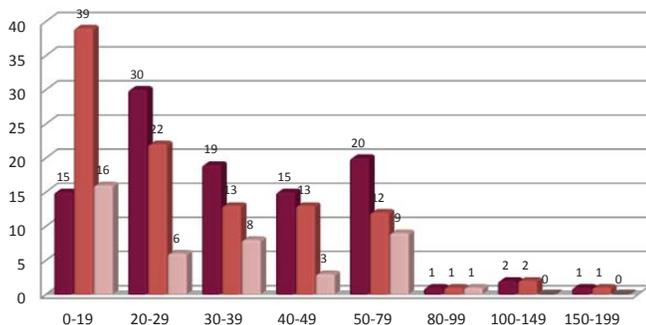
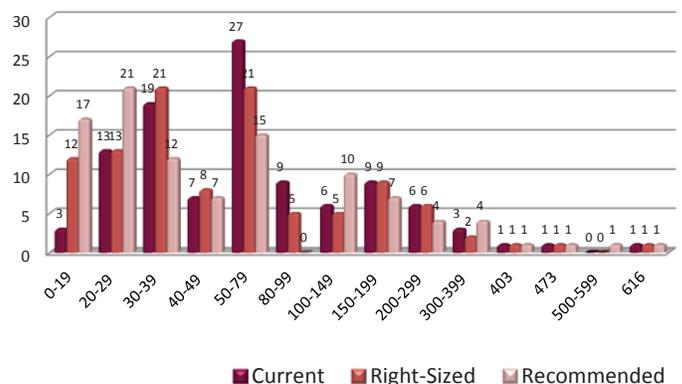
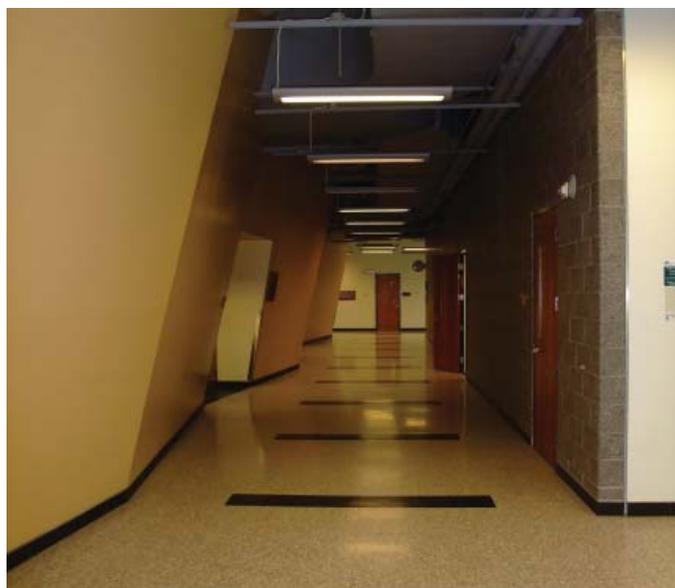


Figure 16. Existing Registrar-Controlled Classrooms Compared to Right-Sized Classrooms and Current Need by Room Capacity*



7 Potential Space Projections

In order to clearly understand the implications of McMaster's campus capacity analysis, McMaster's Campus Capacity Study compared the University's quantum of existing space to three projected space scenarios, which considered "steady-state" and increased enrolments. The space projections data was then augmented by benchmarking current and projected space per FTE (conventional space standards) at McMaster against other G-13 institutions. This review is meant to identify potential opportunities and constraints as McMaster plans for the immediate and long term space needs.



7.1 Overview

The preliminary space projections were based on three scenarios in order to begin to illustrate the magnitude of facilities growth required to accommodate increased and "steady-state" enrolment. These scenarios were developed by the project team to highlight potential opportunities and constraints on McMaster's facilities. **The scenarios do not reflect University policy or direction from senior administration.**

Space projections have been developed for three scenarios that are driven by McMaster's strong recent and projected enrolment growth:

- Current Space Need Scenario - addresses the space needed to meet the current requirements (approximately 25,000 FTE). This translates into an approximate increase of 12% (36,000 NASM) over current totals.
- Demand Scenario- assumes a constant rate of growth based on the recent history of McMaster's enrolment trends and regional demographic projections (approximately 31,000 FTE by 2020). This translates into an approximate increase of 38% (112,089 NASM) over current totals.
- Faculty Scenario- assumes a constant rate of growth based on Faculty enrolment plans submitted solely for this exercise (approximately 33,000 FTE by 2020). This translates into an approximate increase of 46% (136,784 NASM) over current totals.

In the absence of detailed personnel and enrolment projections for each of McMaster University's many administrative units and academic departments, these projections provide an order of magnitude of McMaster's future aggregate space need. They should be considered as space planning tools, rather than as specifications for particular building programs. Future detailed programming by unit and department will quantify McMaster's additional space needs in much greater specificity, which can then form the basis for individual building programs.

7.2 Process

Whereas the campus capacity analysis described the number of people that could be accommodated within existing space, the space projections quantify the space needed to accommodate both current and projected enrolments.

Using the capacity analysis as a base, the current space need for the 2008-09 student population of almost 25,000 FTE was calculated using planning guidelines, organized by COU space type category. Variances between existing space totals and current space need in each category were also calculated.

Space need projections were then calculated based on the Demand Scenario of 31,000 FTE and the Faculty Scenario of 33,000 FTE. In those categories where space needs are not typically calculated based on student enrolment, Current Space Need totals were escalated proportionally based on existing space allocations.

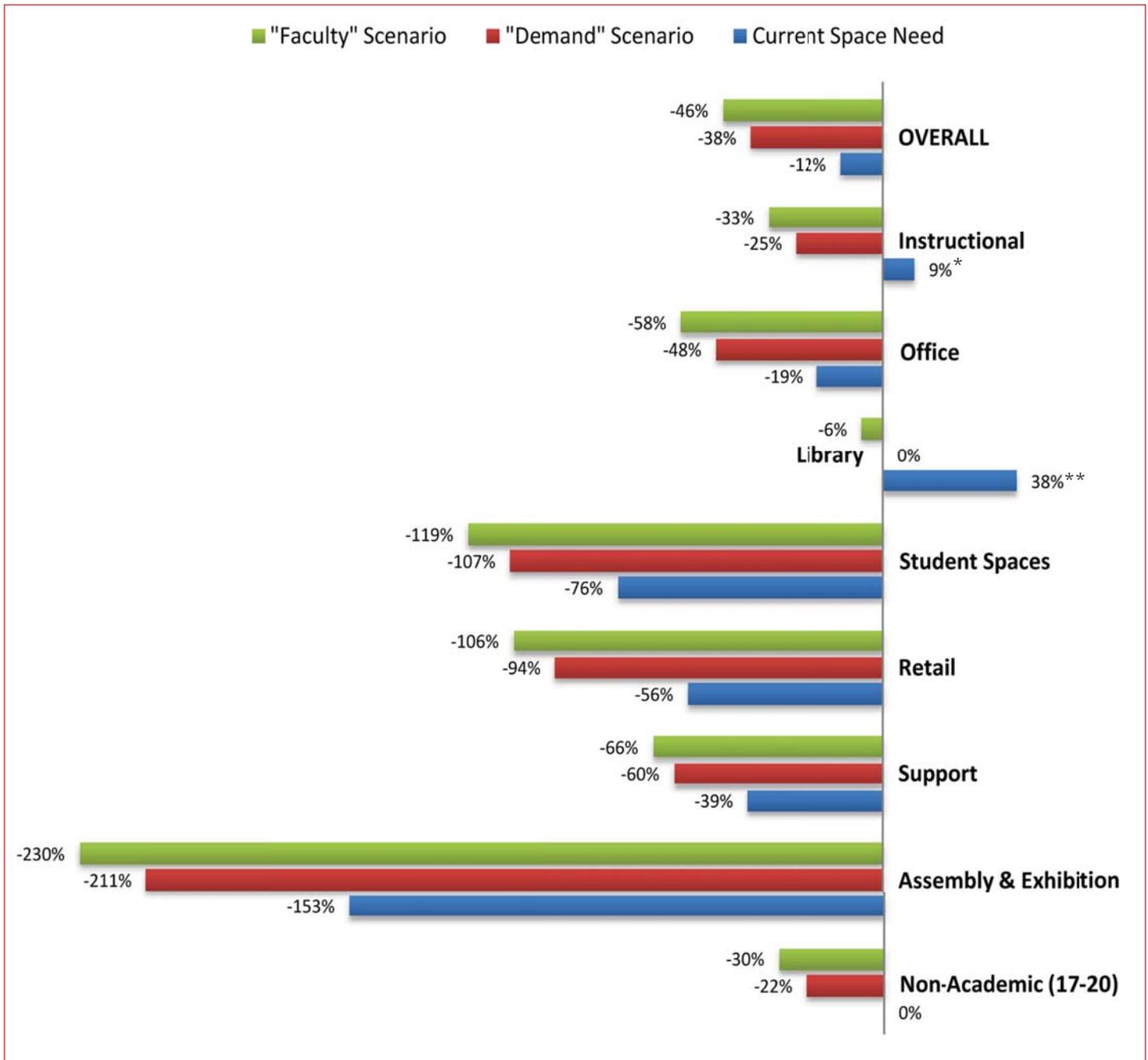


7.3 Current and Projected Space Needs

Figure 17 summarizes space needs for the eight “clusters” according to the three scenarios. Specifically, the figure illustrates the impact of Current Space Need along with the Demand and Faculty Scenarios on the various types of spaces available at McMaster University. Space types are clustered into groups of similar functions, including Instructional, Office, Library, Student Spaces, Retail, Support, Assembly and Exhibition and Non-Academic Spaces. It is important to note that percentage growth foreseen for each space cluster is relative to the total existing area of that cluster, and that current space totals for McMaster’s space clusters vary widely.



Figure 17. This graph illustrates space shortages by COU category for each of the Scenarios.



* Reflects current surplus in departmental instructional space, not all types of instructional space.

**Reflects current surplus in library collection and support space, not study space.

See Fig. 10 (pg 17) for more detail

Based on the analysis of the current and projected space needs, the following conclusions can be drawn:

- McMaster will require significant additional space in every space category in order to accommodate its current enrolment and its anticipated growth in either the Demand or Faculty Scenarios.
- There is a Current Space Need for 12% more space than exists now on the McMaster campus, or a total of approximately 36,000 NASM. This increases to 38% (112,089 NASM) with the Demand Scenario and 46% (136,784 NASM) with the Faculty Scenario.
- On a per-student basis, the three scenarios project a need for additional space ranging from 17.9 NASM/student in the Faculty Scenario to 18.3 NASM/student in the Demand Scenario. Put another way, to be adequately accommodated on the McMaster campus, every additional “unit” of 1,000 FTE students will require adding approximately 18,000 NASM.
- The largest percentage increase occurs in Assembly & Exhibition, with an additional 153% of space necessary to meet Current Space Need. This increases to 211% and 230% in the Demand and Faculty Scenarios, respectively.
- Instructional and Library are the only clusters that have a decreased Current Space Need. Though less Library space is currently needed than exists now, the need for Library-related spaces increases dramatically as enrolment increases.
- The Current Space Need for Instructional appears slightly lower than that which exists now, due to the lower utilization rates in departmentally-held classrooms. Other opportunities to optimize current classroom use may exist and should be evaluated in more detail.
- The Campus Master Plan identifies approximately 93,000 NASM of development potential remaining on McMaster’s main campus. This suggests that there are inadequate existing development opportunities on the campus to support the Demand or Faculty Scenarios. Therefore, McMaster may need to consider creating new space or rehabilitating existing space on the campus or exploring additional satellite locations for its programs and offices (such as the Downtown Centre and the new DeGroote School of Business facility in Burlington) in order to accommodate projected enrolment increases.

7.4 Benchmarking

Benchmarking McMaster’s Existing Space in gross square metres (GSM) to other G-13 institutions provides a rough indicator of how the campus compares to similar schools. While benchmarking is useful, it is important to remember that space benchmarks are:

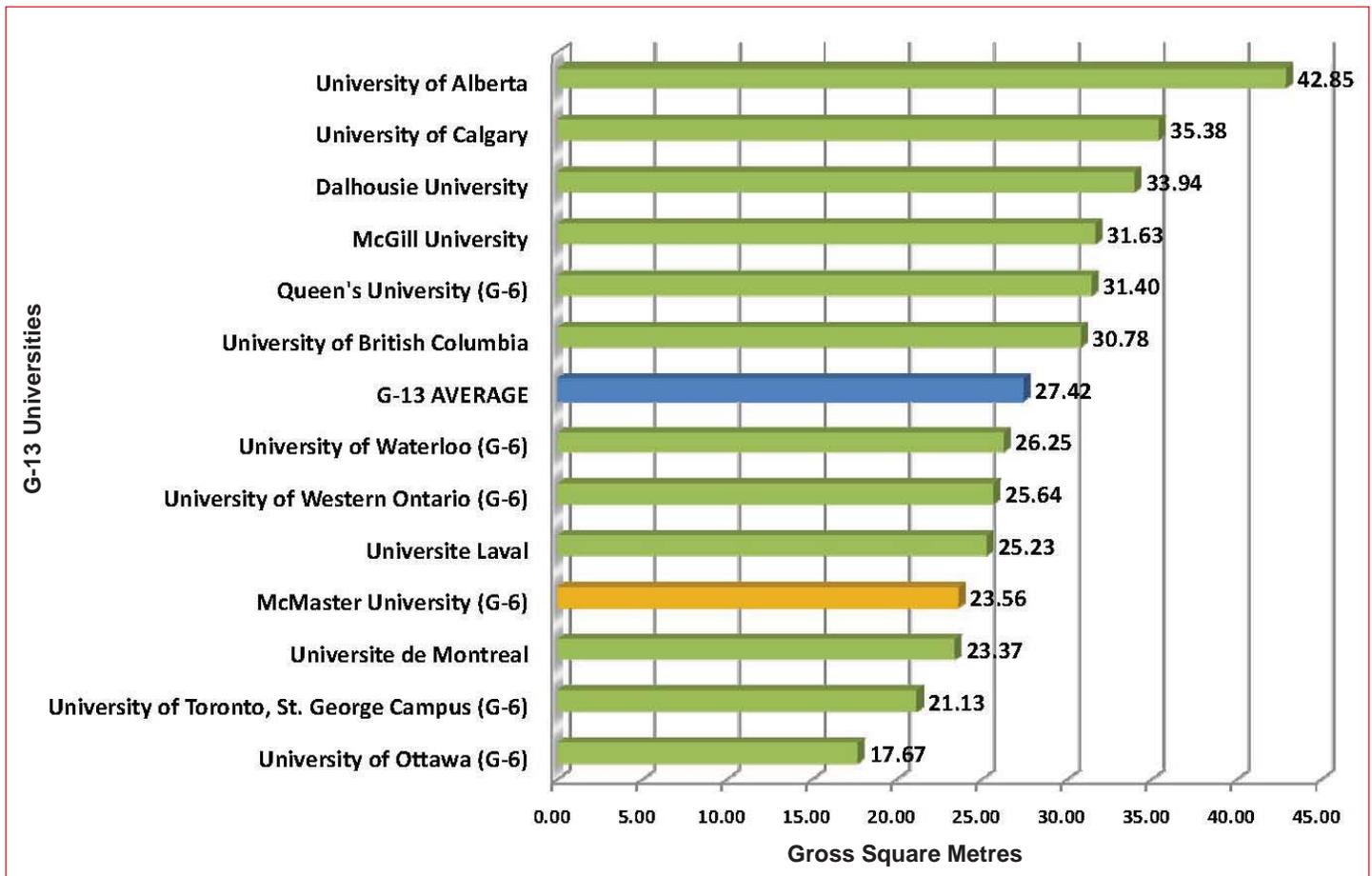
- a basis of comparison with peer institutions;
- one of many factors to consider when planning the amount of space to be allocated to a given function;
- a means of establishing broad “industry” guidelines; and
- reflective of “what is,” rather than “what should be.”

Equally important, space benchmarks are not:

- a true comparison of like institutions and functions, their space coding and aggregating practices, or the time periods they report; or
- prescriptive requirements or programming guidelines.

Figure 18 compares McMaster’s GSM/FTE against that of the other G-13 institutions, as well as to the average GSM/FTE for all G-13 institutions.

Figure 18. Benchmarking: Gross Square Metres of Space per FTE at G-13 Universities



8 Recommendations and Opportunities

There are a number of opportunities to align McMaster's facility needs with the evolving enrolment and growth directions. Some of these actions can be implemented relatively quickly, such as changes to how instructional space is managed. Others are longer term actions, such as the continued investment in the Downtown Campus, which are ultimately subject to available resources. Continuing to respond to academic priorities and pedagogical evolution will also inform decisions and facility investment priorities.

Generally, there are four types of potential actions that have come forward in the discussion to date. The following is a summary of recommendations regarding how physical capacity issues can be balanced with academic and other university objectives, both in the near and longer term.



Reconfigure and manage the space McMaster currently has differently

Physical changes:

- Continue the repurposing of library space and the creation of more shared study and learning spaces.
- Convert computer labs to other uses and expand wireless and on-line labs.
- Improve maintenance of instructional space and ensure that it occurs in a timely matter.
- “Right-size” instructional space to better reflect required classrooms and scheduling.
- “Right-size” and improve office space quality and location.
- Create both small seminar rooms and one additional large lecture facility.
- Ensure that existing classrooms meet modern technological standards.



courtesy flickr McMaster University Library

Policy changes:

- Extend the teaching week/schedule e.g. include more weekend and summer classes – this may provide more choices to faculty and respond to a more diverse enrolment, such as mature students. It should be noted, however, that extending the teaching week/schedule will require additional resources and services (i.e. custodial).
- Explore opportunities of maintaining access to classrooms during off-periods for student meeting and study space.
- Investigate new models of how space is managed and “charged for”. This includes more transparency in managing department controlled space. The management of this space could also be centralized under the Registrar.
- Explore opportunities for multi-purpose space, as well as “flex” space. Flexible spaces may also promote interdisciplinary research and learning.
- Review policies regarding what needs to be stored on campus.
- Review the process of allocating classroom space to departments to ensure equity of both assignment and use.
- Explore opportunities to promote sharing of capital-intensive specialized instructional space
- Enforce consistent scheduling practices. Options would include mandating a percentage of each department’s courses to be scheduled in the “shoulder” periods (early morning/late afternoon). Required courses are typical candidates for these time periods.

Align facility needs with emerging pedagogical trends

- Continue to explore IT for at-home or on-campus teaching and other virtual education opportunities.
- As new instructional spaces are developed, consider exploring alternative models, such as studio classrooms.



courtesy flickr Jay Lu



Consider new facilities on Main Campus

- A large lecture hall (with approximately 600 seats) is required.
- Reserve space for a potential transit hub/facility and continue working with the City of Hamilton and the neighbouring communities to position this investment relative to other transit initiatives.
- Explore ways of providing additional student centre-type space for interaction outside the classroom.
- Consider the construction of a central shared teaching facility. This presents the opportunity for the creation of new “state of the art” spaces and the replacement/repurposing of existing classrooms that are outdated or poorly located.
- Consider opportunities to expand student housing, including graduate and family housing, on-campus.

Plan for the expansion of the Downtown Campus and other off-campus locations

- Invest in student housing, including graduate and family housing, off-campus.
- Invest in administrative offices off-campus. Main Street may offer locations for proximate off-campus locations.
- Expand the role of the Downtown Campus, ensuring the staff and student experience remains integrated with that of the Main Campus.
- Investigate potential off campus locations, such as an expansion of the Burlington Campus, or partner with other institutions.
- Invest in transit and communication technologies as a key component of any satellite campus strategy.

9 Conclusion

The capacity of McMaster University is impacted by a number of factors, including the nature of its facilities, potential increases in enrolment, the physical access to the campus, the available development sites, and the relationship of the campus to the surrounding context. The aim of the Campus Capacity Study is to provide critical information to support McMaster's ongoing discussion regarding facility growth and renewal and the relationship between physical capacity and enrolment levels.

Collectively, the individual components of the Campus Capacity Study constitute a useful tool that equips McMaster to respond to the likely continuation of strong enrolment growth for the foreseeable future. However, if McMaster campus grows beyond its current enrolment, the campus will require expanded and renovated space to accommodate new faculty members, evolving academic programs, expanded program offerings, and additional services. These directions will need to be led by the McMaster administration, building on the findings of this study which provide a comprehensive snapshot of the University's current capacity, as well as projected future space needs.

Based on a current enrolment of approximately 25,000 FTE, the following facility space types are required. These numbers reflect COU space standards. The most critical space needs, based on total NASM required include:

- Administrative Office and Related Space (Category 10),
- Athletic/recreation space (Category 6),
- Graduate Student Offices (Category 4.3),
- Assembly Facilities (Category 15.1), and
- Lounge and Service Space (Category 14.3).

In addition to facility space constraints, private vehicle access to the Main Campus is severely congested. Although parking capacity is adequate, the proximity of this parking remains an issue for some. The University, surrounding neighbourhoods and the City of Hamilton should continue to work together to promote and realize improved transit service and alternatives to the private automobile. Subject to available resources, there are a number of initiatives, both physical and policy based, that the University may pursue to improve space utilization. These initiatives may include the "right-sizing" of classrooms and more transparent space management procedures.

The current capacity available for new development is estimated to be 140,000 GSM, or 93,000 NASM, on the Main Campus. Should the University choose to increase enrolment, as the result of external demographic pressures and/or to accommodate internal changes in faculty programs, space needs would likely increase beyond this threshold in approximately 10-15 years, with all other factors remaining constant. Off-campus facilities, in appropriate locations, such as downtown, should continue to be considered.

The housing of students remains a priority for McMaster. Should enrolments increase, housing strategies will continue to align housing demand with appropriate housing sites and formats, protecting and enhancing McMaster's host communities and the quality of life for students and neighbours alike.

The Campus Capacity Study also provides input to, and sets the stage for, the next round of campus planning, which may include:

- **A Phasing and Implementation Space Plan** – This plan will identify the classrooms that are candidates for right-sizing, maintenance, and other upgrades. It would consider the enrolment, course schedule, and potential need for expanded facilities to support new programs, adjusting as the institution grows. Ultimately, this plan will provide McMaster with the appropriate array of classrooms, both now and in the future.
- **Off-Campus Land Management Strategies** – This study would identify the potential of existing off - campus lands to support further university growth. It may also include a real estate strategy for the acquisition of new sites for McMaster.
- **A Student Housing Plan** – This plan would explore opportunities and constraints for the expansion of student housing on and off-campus. It may also include potential site locations for student housing, as well as potential partnership and funding options.
- **A Facility Master Plan** – This plan would integrate the findings from the Campus Capacity Study with the other proposed plans to provide detailed programming and locations for the renovation of existing facilities and the creation of new facilities.

