FOR ENDORSEMENT AND FORWARDING **PUBLIC** **CLOSED SESSION**

TO: Executive Committee

SPONSORS: Scott Mabury, Vice President, Operations and Real Estate Partnerships
CONTACT INFO: scott.mabury@utoronto.ca

PRESENTER: As above

DATE: April 30, 2024 for May 7, 2024

AGENDA ITEM: 3 (a)

ITEM IDENTIFICATION:

Capital Project (Level 3): Report of the Project Planning Committee for University of Toronto Mississauga Residence (Phase IX) – Project Scope and Sources of Funding

JURISDICTIONAL INFORMATION:

According to section 1 a and b of the Policy on Capital Planning and Capital Projects, the UTM bodies will recommend approval to the Academic Board.

Pursuant to section 5.1 of the Academic Board's Terms of Reference, the Board considers reports of project planning committees (i.e. space plan, site, overall cost and sources of funds) with a capital cost as specified in the Policy on Capital Planning and Capital Projects.

The Policy on Capital Planning and Capital Projects provides that capital projects with costs in excess of $50 million (Approval Level 3), on the UTM Campus will first be considered by the UTM Campus Affairs Committee and the UTSC Campus Council, which shall recommend approval to Academic Board. Following consideration by the Academic Board and approval for execution by the Business Board, such proposals are then brought forward to the Executive Committee for endorsement, and then forwarded to the Governing Council for approval. [Section 3(b)(ii)(1)(b) and (d)] The Policy further states that "any financing will be approved by the Business Board". [Section 3(c)]

GOVERNANCE PATH:

A. Project Planning Report, Total Project Cost, and Sources of Funding

1. UTM Campus Affairs Committee [For Recommendation] (March 27, 2024)
2. UTM Campus Council [For Recommendation] (April 15, 2024)
3. Academic Board [For Recommendation] (April 18, 2024)
4. Business Board [For Approval, Financing] (April 25, 2024)
5. **Executive Committee [For Endorsement and Forwarding] (May 7, 2024)**
6. Governing Council [For Approval] (May 16, 2024)

B. Execution of the Project:

1. Business Board [For Approval] (April 25, 2024)

PREVIOUS ACTION TAKEN:

The UTM Campus Affairs Committee considered and recommended this project forward at its February 8, 2024 meeting. Subsequently, the total project cost of the project increased due to upgrades in the energy charter, resulting in the project re-starting its governance consideration in Cycle 5.

HIGHLIGHTS:

Previous Action Taken by Administration

At the November 30, 2018, meeting of the Capital Project and Space Allocation (CaPS) Executive Committee, the project was brought forward, and Terms of Reference approved. At the June 8, 2020, CaPS Executive Committee meeting, the project was brought forward, and Request for Consultant Fees was approved to retain Consultants for Schematic Design through to Construction Documentation. At the February 23, 2023, CaPS Executive Committee meeting, the project was brought forward, and Request for Additional Consultant Fees was approved to continue design services and initiate Construction Management Pre-Construction Services required to complete the Construction Documents through to the Tender Phase. At the November 24, 2023, CaPS Executive Committee meeting, the project was brought forward, and the request for Early Works was approved to initiate demolition and site preparation for construction. At the January 26, 2024, CaPS Executive Committee meeting, the project's energy charter targets were reviewed and revised.

Background

The University of Toronto Mississauga (UTM) is a 225-acre campus located within the Regional Municipality of Peel, an area of significant population and economic growth. An increase in campus residential need is a result of a significant increase in student enrolment over the past decade, paired with increased interest in on-campus accommodation among a growing international student cohort. UTM's student population grew by ~4,600 headcount or 42%, with international students accounting for 60% of the growth. While this period saw expansion of physical infrastructure, there has been no new residence construction since the completion of Oscar Peterson Hall (OPH), or Residence Phase VIII, in 2007.

Student Housing & Residence Life (SHRL) at UTM can currently house approximately 10% of UTM's total undergraduate students. While it will remain primarily commuter, the UTM campus' attractiveness to students from beyond traditional commuter boundaries continues to grow, and additional residence capacity is necessary to enroll many of these academically talented students. At the same time, UTM wishes to maintain a healthy mix of first year and upper-years students for the mentorship experiences that strengthen community and facilitate success.

In 2016 Student Housing & Residence Life (SHRL) at UTM completed a Student Housing Master Plan. The Focus 15 Plan details the long-term capital renewal plan for our residence facilities. Consultation for the master plan included SHRL Staff, University of Toronto Mississauga Student Union, residence students, and staff from various departments at UTM which included the Chief Administrative Officer and the Vice-President and Principal. It also details the expected demand for residence spaces long-term and outlines plans for residence expansion. Simultaneously, the University of Toronto Mississauga has been strategically planning for overall campus development through the UTM Campus Master Plan 2021. The Campus Southwest Precinct, as outlined in this master plan, includes lands fronting onto Residence Road between the northern and central access points to campus, with significant frontage along Mississauga Road. The existing precinct contains low-rise townhouse units, low and mid-rise campus housing buildings, and surface parking lots, including notable residences such as Schreiberwood Residence, Roy Ivor Hall, McLuhan Court Residence, Oscar Peterson Hall, and the P6 and P7 parking lots.

The Campus Southwest Precinct, with its potential for increased density and ongoing redevelopment initiatives, aligns seamlessly with our proposal for a new residence building. This strategic location, north of Oscar Peterson

Hall, not only adheres to the Campus Master Plan's vision for increased density but also enhances the streetscape design and open spaces within the precinct. As part of our commitment to meeting the evolving needs of the university community, our proposed residence building contributes to the positive and inclusive living experience for both upper-year and graduate students. By aligning our residence facilities with the broader vision outlined in the Campus Master Plan, we ensure that our campus development integrates seamlessly with the University of Toronto Mississauga's overarching goals and aspirations.

The development of the residence building at UTM serves as an embodiment of the UTM's Strategic Framework, a visionary document crafted between late 2020 and early 2022. This framework underscores UTM's commitment to principled flexibility and clear priorities, emphasizing adaptability in the face of changing circumstances. The proposed residence aligns with the framework's core components, such as fostering student success, as it provides a supportive and enriching living and learning environment. Furthermore, the residence contributes to UTM's dedication to collaboration and belonging, promoting a sense of community among diverse teams and enhancing the campus's inclusive and equitable culture. By incorporating sustainability measures and efficient operations, the residence aligns with the framework's goals of environmental responsibility and resource management. This strategic integration of the new residence within the broader context of UTM's Strategic Framework ensures that the physical infrastructure not only meets the immediate needs of students but also aligns with the institution's enduring values and long-term aspirations.

SHRL has been able to meet the University of Toronto's commitment to a first-year residence guarantee. However, with increasing first-year enrollment there are limited residence spaces available for upper year students and fewer for graduate students.

Residence space at UTM plays a very important role in U of T's internationalization strategy with more than 50% of the residence population being international students. In addition, UTM has approved the enrollment of an additional 100 international students in the 2023-2024 academic year. Historically, UTM was able to offer a 4-year international housing guarantee. This offering is no longer practical given our first-year guarantee commitment.

With the proposed residence construction, UTM anticipates continuing its ability to offer a first-year guarantee for the medium-term. Research has shown that living in residence has a positive impact on grades, better retention to 2nd year, and higher persistence to graduation. Graduation rates for international students at UTM residences 14% higher than their international peers living off-campus.

Highlights

UTM is proposing a new 6-storey 400-resident building (6,538 nasm / 10,088 gsm), adjacent to Oscar Peterson Hall (OPH) to cluster first-year residence housing to make efficient use of the existing cafeteria, residence services desk and staff offices. The style will be traditional, designed around bringing first-year students together in communities. The building will help continue UTM's first-year guarantee and will provide better availability for upper-year students as well. The building is anticipated to have 50% double rooms and 50% single rooms. Student residence dons will occupy single rooms and work in a ratio of one don per 25 students. The space planning for the residence will support SHRL's increased emphasis on living-learning communities, interaction/engagement and supporting student learning outside the classroom.

The project space requires demolition of one row of townhouses consisting of 36 dormitories (Schreiberwood G) for a net gain of 364 beds. This demolition work is planned to begin during an early works phase scheduled for early 2024.

The new dormitories consist of 115 single bedrooms at 14.5 nasm per room, 135 double bedrooms at 12.9 nasm per room as well as 15 don bedrooms which are 14 nasms per room. All single dormitories as well as the don bedrooms will be fully accessible.

Residence floors will include lounge and study areas on every level for a total of 942 nasm. Amenity spaces on the

ground/main floor will include residence support spaces that will be used by residents across UTM's Student Housing & Residence Life system: a 120-person multi-purpose event space for community gatherings, special events, and regular programming, plus a main lobby, a music room, vending and laundry facilities, a modest community kitchen and lounge, and storage for programming materials, recycling, and waste. The main level amenities total 767 nasm.

The University of Toronto is committed to reducing its scope 1 and 2 greenhouse gas (GHG) emissions by at least 37% below its 1990 level of 116,959 tonnes eCO2 by 2030, targeting a climate positive operating model by 2050. The Tri-Campus Energy Modelling & Utility Performance Standard provides project-specific energy and water efficiency targets, used to calculate energy and GHG project budgets (necessary to achieve the 2030 goal) while also introducing a streamlined modelling and documentation submission approach. The tool used to define the targets is called the "Charter" and is completed by U of T staff before design procurement commences.

The project has now reached 100% CD and the consultants have provided an Energy Analysis Report which outlines how the Project Charter targets will be met:

- High performance triple pane glazing with thermally broken frames with insulation assembly U-factor of *0.15 Btu/h-ft-F and SHGC of 0.25. (*This value is incorrectly shown in the memo as 0.2 Btu/h-ft-F)
- High performance exterior walls with an effective R-value of 17.5 Btu/h-ft2-F
- Optimized shading across the entire façade and building massing with long side facing south.
- High performance lighting design (space-by-space lighting power densities 20% lower than those prescribed by ASHRAE 90.1-2013 for all spaces, except bedrooms).
- Advanced occupancy-based lighting controls, daylight dimming, and demand control ventilation in common spaces.
- Decoupled systems to address ventilation and zone sensible loads more efficiently.
- Enthalpy recovery wheels with 85% overall effectiveness.
- Passive House Air Tightness on exterior walls and glazed openings.
- Rooftop Solar Photovoltaic System that will serve to reduce energy use by minimum 49,000kWh/yr and exceed minimum 5% of the building's yearly energy from on-site renewable sources. The system will incorporate additional capacity to allow for a buffer to ensure the minimum requirement is met.

Due to these design decisions, the energy performance of this building will meet/exceed the requirements of the charter targets shown below:

Key Performance Indicator	***Unit***	**Charter Requirements**	**Proposed by Project**
TEUI (Total Energy Use Intensity)	*ekWh/m2*	74.7	*74.7
GHGI (Greenhouse Gas emissions Intensity)	*kg CO2e/m2*	4.9	3.1
TEDI-heating (Thermal Energy Demand Intensity)	*kWh/m2*	30.6	27.5
TEDI-cooling (Cooling Energy Demand Intensity)	*kWh/m2*	20.3	18.5

*The proposed TEUI is based on a 45kW system. The project is currently shifting to a 50kW system which lower the TEUI below the Charter target.

The project delivery method for the residence is Construction Management. Input from the Construction Manager is intended to mitigate some cost and schedule risks.

Currently, the City of Mississauga is reviewing the Site Plan Application.

Schedule

The targeted project schedule is as follows:

CaPS Exec Approval for Consultant Fees	June 8, 2020
RFP & Consultant Selection	July – December 2020
Consultant Award	December 2020
Design & Construction Documents	January – September 2021
Municipal Approval start	December 2022 (Pre-Site Plan Application Submission)
Construction Documents 50% Completion	January 2023
CaPS Exec Approval for additional consultant fees and CM fees	February 23, 2023
Full Governance Approval submission (Cycle 5)	March 8, 2024
Subcontractor and Supplier Tender	February 2024
Early Works / Site Preparation	March 2024
Construction Start	May 2024
Occupancy	August 2026

FINANCIAL IMPLICATIONS:

Discussion of overall costs and sources of funds can be found in the *in-camera* (Item 11(a)) document for this project.

RECOMMENDATION:

Be It Resolved

THAT the following recommendations be endorsed and forwarded to the Governing Council

THAT the project scope of the University of Toronto Mississauga (UTM) Residence (Phase IX), as identified in the Report of the Project Planning Committee for the UTM Residence (Phase IX), dated March 8, 2024, be approved in principle; and,

THAT the project totaling 6,538 net assignable square metres (nasm) and 10,088 gross square metres (gsm), be approved in principle, to be funded by UTM Residence Construction Reserve, UTM Operating Reserve, and Financing.

DOCUMENTATION PROVIDED:

- Report of the Project Planning Committee for the University of Toronto Mississauga Residence (Phase IX) (March 8, 2024)

Report of the Project Planning Committee for
University of Toronto Mississauga Residence (Phase IX)

March 8, 2024

Office of University Planning - University Planning, Design and Construction
UTM Facilities Management & Planning

I.Executive Summary

Student Housing and Residence Life (SHRL) at UTM, has seen an increase in residence demand over the past number of years. While overall demand has slightly fallen due to the COVID-19 pandemic, SHRL saw its highest application numbers to date with 2,444 applications for 1,179 available residence spaces during the 2021-2022 academic year. SHRL is anticipating demand to continue to increase due to the low availability of off-campus housing, UTM enrollment to increase, and a higher percentage of on campus housing inventory that is fully renovated.

The bulk of this growth is from out-of-province and international students that seek on-campus student housing and related supports to help in transitioning to the local community. The University has a first-year residence guarantee that supports students in their transition to university studies by placing them near their academic activities, library resources, support services and engaging programs.

Residence Phase IX (RPHIX) will focus on a first-year residence student population in order to maintain its commitment to UofT's first-year residence guarantee for newly admitted high school students. UTM is anticipated to fall short of meeting UofT's guarantee of on-campus housing for first-year students as of Fall 2024. The 2021-2022 academic year was the first year that students remained on the waitlist into January, at which time SHRL was forced to cancel those outstanding applications. Students indicated they still needed housing as the inventory for off campus housing in Mississauga is limited.

The new 400 bed residence (6,538 nasm, or 10,088 gsm) will consist of 95% first-year students, with a modest number of additional spaces allocated to upper-year students employed by Student Housing & Residence Life in a supervisory, mentoring, and community development capacity, primarily as student dons.

The proposed program consists of 400 beds with a mix of 50% double rooms and 50% single rooms. Student dons will occupy single rooms and work in a ratio of one don per 25 students. In addition, there is one live-in Residence Life professional who oversees the dons and residence programming and will respond to emergencies as they arise. The ground floor includes residence support spaces that will be used by residents across UTM's Student Housing & Residence Life system, including a 120-person multi-purpose event space for community gatherings, special events, and regular programming. It will also include common laundry facilities. The building does not include dining or administrative service spaces as occupants will access these facilities in the adjacent Oscar Peterson Hall.

In 2020, the University retained Brook McIlroy (BMI) to prepare an updated Campus Master Plan, a long-term (10-15 year) vision for the UTM campus. The Master Plan, which was completed in 2021, is a critical resource to help guide capital projects and phasing decisions. The proposed massing studies and location of site included in this report are consistent with the Master Plan.

The proposed site is adjacent to Oscar Peterson Hall (OPH), occupying the existing P6 Parking Lot to the northwest as well as one row of existing townhouses (Shreiberwood Residences Townhouse Complex G), both of which will be demolished for the anticipated project. The main entrance of RPHIX will be off Residence Road. The entry doors are located under the covered passageway which allows for more than one "front door", providing access to a 120 person event space and enables wider-community oriented programs of the building in addition to more academic areas. There is also an existing pedestrian network

around the project that relies heavily on a path that connects Parking Lot #6/OPH with the Campus Core. This pedestrian path gives the proposed residence the potential to act as a gateway to the residential sector of the campus.

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II. Project Background

a) Membership

Deborah Brown, Chief Administrative Officer, Office of the Vice President & Principal, UTM
Mark Overton, Dean of Student Affairs & Assistant Principal, Student Services (Co-Chair)
Chad Nuttall, Assistant Dean of Students and International Initiatives, UTM
Brian Cunha, Director, Student Housing & Residence Life, UTM*
Vicky Jezierski, Executive Director, Hospitality & Ancillary Services, UTM
Christine Burke, Assistant Vice-President, University Planning, UPDC
David Sasaki, Managing Director, University Planning, UPDC*
Jordan Breccia, Planner, University Planning, UPDC
Ed Bush, Project Management Consultant, UPDC*
Luke Barber, Executive Director, Digital & Physical Infrastructure, UTM FMP & I&ITS
Ahmed Azhari – Managing Director, Operations, Sustainability, and Asset Management, UTM FMP
Muhanad Sidek, Managing Director, Planning, Design and Construction, UTM FMP*
Jason Kwok, Director, Construction and PMO, UTM FMP*
Monika Farrell, Assistant Director, Planning and Design, UTM FMP
Bernard Hau, Senior Facilities Planner, UTM FMP*
Maria Codispoti, Manager, Project Administration and Technical Services, UTM FMP*

Previous Contributing Members:

Saher Fazilat, Chief Administrative Officer (Co-Chair), Office of the Vice President & Principal, UTM
Tammy Cook, Executive Director, Facilities Management & Planning (FMP), UTM
Susan Senese, Interim Chief Administrative Officer, Office of the Vice President & Principal, UTM
Lorretta Neebar, Registrar, Director of Enrollment Management, UTM
Saba AlSaady, Planning Specialist, UTM FMP
Ashwin Rodrigues, Senior Project Manager, UTM FMP*
Simisolacluwa Ogunsina, Undergraduate Student, UTM
Adam Snyder, Undergraduate Student, UTM
Sarah Hinves, Senior Planner, University Planning, UPDC
Sean O'Molloy, Senior Project Manager, UPDC
Maroun Abou Chacra, Senior Project Manager, UPDC*

* Denotes that the member was added since the initial TOR Approval in 2019 by the CaPS Executive Committee

b) Terms of Reference

1. Make recommendations for a detailed space program and functional layout for the new residence building.

2. Demonstrate that the proposed space program will be consistent with the Council of Ontario Universities' and the University's own space standards and guidelines.
3. Demonstrate that the proposed space program will be consistent with accepted standards in campus housing.
4. Determine the secondary effects of the project, including site elements, space reallocations, and the impact on the delivery of programs, activities, and services during construction.
5. Address campus-wide planning directives as set out in the UTM Campus Master Plan, open space plan, urban design criteria and site conditions.
6. Identify all equipment, furnishing necessary to the project and their related costs.
7. Identify all data, networking, AV and communications requirements and their related costs.
8. Identify all security, occupational health and safety and accessibility requirements and related costs.
9. Project approval will be conditional upon cost of project and financing model. Consider alternative financing structuring options, demonstrating through a cost/benefit analysis the trade-offs of various financial models.
10. Demonstrate a formal comparison of project needs, costs per bed, and projected balance of first and upper year student occupancy.
11. Identify specific sustainability goals, including energy efficiency goals for this project. Recommendations for goals should also be cost effective and incorporate proven best practices.
12. Determine a total project cost estimate [TPC] including costs of implementation in phases if required, identified secondary effects, and any requirements for improvements to services and infrastructure upgrades to the site.
13. Identify all sources of funding for capital and operating costs.
14. Complete Project Planning Report by November 2023.

c) Occupant Profile

UTM's new residence will focus on a first-year residence student population in order to maintain its commitment to UofT's first-year residence guarantee for newly admitted high school students. The new 400 bed residence will house 95% first-year students, with a modest number of additional spaces allocated to upper-year students employed by Student Housing & Residence Life in a supervisory, mentoring, and community development capacity, primarily as student dons. The building will be traditional in style with a mix of 50% double rooms and 50% single rooms. Student dons will occupy single rooms and work in a ratio of one don per 25 students. There will be one live-in Residence Life professional who oversees the dons and residence programming, and will respond to emergencies as they arise.

The ground floor will include residence support spaces that will be used by residents across UTM's Student Housing & Residence Life system, including a 120-person multi-purpose event space for community gatherings, special events, and regular programming. It will also include common laundry facilities. The building does not include dining or administrative service spaces as occupants will access these facilities in the adjacent Oscar Peterson Hall.

The residence will be designed around bringing first-year students together in 25-person communities. The space planning will support SHRL's increased emphasis on living-learning communities, interaction/engagement and supporting student learning outside the classroom.

d) Background Information

The University of Toronto Mississauga (UTM) is a 225-acre campus located within the Regional Municipality of Peel, an area of significant population and economic growth. An increase in campus residential need is a result of a significant increase in student enrolment over the past decade, paired with increased interest in on-campus accommodation among a growing international student cohort. UTM's student population grew by ~4,600 headcount or 42%, with international students accounting for 60% of the growth. While this period saw expansion of physical infrastructure, there has been no new residence construction since the completion of Oscar Peterson Hall (OPH), or Residence Phase VIII, in 2007.

Student Housing & Residence Life (SHRL) at UTM can currently house approximately 10% of UTM's total undergraduate students. While it will remain primarily a commuter campus, the UTM campus' attractiveness to students from beyond traditional commuter boundaries continues to grow, and additional residence capacity is necessary to enrol many of these academically talented students. At the same time, UTM wishes to maintain a healthy mix of first-year and upper-year students for the mentorship experiences that strengthen community and facilitate success.

In 2016 Student Housing & Residence Life (SHRL) at UTM completed a Student Housing Master Plan. The Focus 15 Plan details the long-term capital renewal plan for our residence facilities. It also details the expected demand for residence spaces long-term and outlines plans for residence expansion. SHRL has been able to meet the University of Toronto's commitment to a first-year residence guarantee. However, with increasing first-year enrollment there are limited residence spaces available for upper year students and fewer for graduate students. Studies suggest that upper year students can still benefit from living in residence. The research also shows that they can have positive impacts on the residence community, including peer support, mentorship and modelling positive behaviours.

At the November 30, 2018 meeting of the Capital Project and Space Allocation (CaPS) Executive Committee, the project was brought forward and the Terms of Reference approved.

Student Housing and Residence Life (SHRL) at UTM has seen an increase in residence demand over the past number of years. While the demand fell during the years of 2019-2020 and 2020-2021 due to the COVID-19 pandemic, SHRL is anticipating demand to continue to increase due to the low availability of off campus housing, the increase of UTM student enrollment, and a higher percentage of on campus housing inventory that is fully renovated.

At the June 8, 2020, Capital Project and Space Allocation (CaPS) Executive Committee meeting, the project was brought forward, and Request for Consultant Fees was approved to retain Consultants for Schematic Design through to Construction Documentation.

In January 2021, Montgomery Sisam Architects, Christensen & co. along with sub-consultants were retained to prepare Schematic Design through to Construction Documentation.

At the February 23, 2023, Capital Project and Space Allocation (CaPS) Executive Committee meeting, the project was brought forward, and Request for Additional Consultant Fees was approved to continue design services and initiate Construction Management Pre-Construction Services required to complete the Construction Documents through to the Tender Phase.

At the November 24, 2023, Capital Project and Space Allocation (CaPS) Executive Committee meeting, the project was brought forward, and Request for Early Works Services was approved to maintain a prompt schedule and allow sufficient time to prepare a robust Project Execution Plan, inclusive of a detailed project schedule and construction cost estimate.

Residence space at UTM plays a very important role in UofT's internationalisation strategy, with more than 50% of the residence population being international fee-paying students. Historically, UTM was able to offer a 4-year international housing guarantee. This offering is no longer practical given our first-year guarantee commitment.

UTM is anticipated to fall short of meeting UofT's guarantee of on-campus housing for first-year students as of Fall 2023. Given residence's importance as a positive recruitment factor, particularly for those from out of province or out of country, an inability to meet the guarantee with actual on-campus housing is likely to have significant detrimental recruitment impacts, particularly on prospective new international students. The alternatives of meeting the guarantee through off-campus hotel-based housing and/or buying out students holding a guarantee (to incentivize renting off-campus or remaining in family homes), when used in similar situations elsewhere at UofT, have had negative consequences in enrolment, retention, and engagement.

With the proposed new residence construction, UTM anticipates the continued ability to offer a first-year guarantee for the medium-term. Research has shown that living in residence has a positive impact on grades, better retention to 2nd year, and higher persistence to graduation. Graduation rates for international students at UTM residences are 14% higher than their international peers living off-campus.

III. Project Description

a) Vision Statement

An extensive list of core principles for the building has been developed to help guide this project. These principles have been developed to focus the project on design elements that will best develop student communities. These principles have informed the space program to ensure appropriate spaces for engagement, learning outside the classroom and living in a community.

The principles focus the project on the single function of this building as a student residence. The design should:

- serve first-year students and facilitate the associated supports and services they need
- ensure appropriate community spaces
- leverage the context of the site

- ensure residents feel safe and secure
- incorporate universal design principles to ensure an inclusive environment where students with disabilities have full access to the building amenities and services.

Central to life in the building is the floor lounge. These common rooms and kitchens will be centrally located, on each floor, to encourage interaction and community development.

b) Statement of Academic Plan

"The University's purpose in relation to student housing is to encourage the development of high-quality communities on and off-campus that support the academic and educational aims of the University community. To this end, student housing shall be administered in a manner that promotes safe, secure and stimulating environments that are conducive to students' academic success and personal growth, and foster a sense of community, civic responsibility, and an appreciation of the diversity of the University community."

UofT Policy on Student Housing, Preamble, 2006

There is a significant demand for undergraduate housing at UTM. A recent analysis indicated sufficient demand to build up to 900 beds. The bulk of this demand growth is from out-of-province and international students that seek on-campus student housing and related supports to help in transitioning to the local community. The University also has a first-year residence guarantee that supports students in their transition to university studies by placing them in close proximity to their academic activities, library resources, support services and engaging programs.

UTM currently houses first-year students in all building types – traditional dormitory, apartment or suite style and townhouses. Student Housing & Residence Life aims to house as many first-year students as possible in residence halls, which provide a more appropriate first-time residence experience.

The construction of this residence will increase the number of residence spaces at UTM by 364 beds. The new building will house 400 beds while 36 existing beds will be demolished from the Shreiberwood Townhouses.

c) Space Requirements, Program and Functional Plan

<u>Space Requirements</u>

Precedent studies were conducted and buildings such as Roy Ivor Hall, Erindale Hall, Oscar Peterson Hall and a recent residence completion at the University of Waterloo were analyzed to determine the best ratio of dormitories to dons, as well as the number of supporting spaces per dormitory. Based on the existing UofT residences across the 3 campuses, the analysis found that on average, residence spaces such as dormitories make up 66.31% of a residence building while service spaces take up 6.32%. Common spaces were low at only 0.20% and non assignable spaces taking up another 25.57% on average. The new Waterloo University precedent contained more favorable ratios of common spaces to living spaces as the building provides many opportunities for students to meet, socialize and create communities. Residence

spaces at Waterloo make up 46.87% of the building while common areas are increased to 15.82%. The remaining service spaces and non assignable spaces make up 2.51% and 23.72% respectively.

Space Program

COU

The typology of the spaces and their size for this project was calculated by the number of users and precedent studies of residences across the university campuses. The Council of Ontario Universities (COU) guidelines were not incorporated as dormitories fall under living spaces and do not reside in any academic subheadings. The remainder of the support space nasm was calculated based on precedent studies.

Space

The total project area is 6,538 nasm, or 10,088 gsm with a gross-up factor of 1.54.

Private Dorms & Shared Amenities include; Bedrooms, Accessible Bedrooms, Study Rooms (Quiet & Informal) and Standard and Accessible Washrooms assigned for building users (students use) only. These rooms are located away from common spaces and occupy the upper levels of the building.

Room Description		Nasm per Room	# of Rooms	Total Area (nasm)	Bed Count
Dormitory Bedrooms					
17.1	Single Bedroom (Accessible)	14.5	115	1,668	115
17.1	Don bedroom Single (Accessible)	14	15	210	15
17.1	Double Bedrooms	12.9	135	1,747.2	270
	SUBTOTAL – Dormitory		**266**	**3,971**	**400**
Dormitory Washrooms					
17.2	Standard Bath / Washrooms	6.8	85	576	
17.2	Accessible Bath / Washrooms	11.4	15	171	
	SUBTOTAL – Dorm Washrm		**100**	**747**	
Don's Amenities					
17.1	Living / Meeting Room - Don	7.4	15	111	
	SUBTOTAL – Don Amenity		**15**	**111**	

Common spaces to be used by the residents and student guests will consist of the Main Lobby, an Event Space, two Conference Rooms, a Music Room, and a Laundry Room assigned for building occupants only.

Building Support Spaces, such as Storage and Garbage Rooms, will be located on the first level and will require direct access to the exterior.

Room Description (continued)		Nasm per Room	# of Rooms	Total Area (nasm)	Bed Count
Common Facilities / Communications					
17.2	Common Room	117.6	5	588	
14.2	Study Room - Quiet	18.1	10	181	
14.2	Study Room - Informal	27.2	5	136	
12.1	Communications Closet	7.4	5	37	
	SUBTOTAL – Common Space		**25**	**942**	
Main Level Amenities					
7.1	Vending Machine Area	4	1	4	
11.1	Conference Room	22.5	2	45	
11.2	Student/Event Space	223	1	223	
11.2	Event Space Storage	15	1	15	
12.1	Communications Room	27	1	27	
12.1	Security Closet	15	1	15	
12.2	Storage	84	1	84	
17.1	Staff Apartment	56	1	56	
17.2	Main Lobby - Common Lounge	164	1	164	
17.2	Music Room	42	1	42	
17.2	Laundry Room	46	1	46	
17.2	Garbage Room	46	1	46	
	SUBTOTAL – Main Level		**13**	**767**	
Total Building (NASM)				6,538	
Total Building GSM			1.54	10,088*	

* The GSM does not include the penthouse.

The building is slab on grade and does not contain any below grade spaces. However, due to the sloped topography of the site, a portion of the ground floor which houses the Electrical, Mechanical, and Water Entry Rooms is sunken below the exterior grade.

Non-assignable Space

Included in the project are non-assignable elements that are not specifically described in the Space Program. Non-assignable spaces include: corridors, stairs, elevators, mechanical spaces, etc. These areas are listed in Non-Assignable Space section of this document and included in the gross-up factor of 1.54.

Functional Plan

The building is composed of a ground floor level that houses common spaces, five (5) upper levels of private quarters, and a penthouse for mechanical and electrical utilities. It is preferable to have the high-voltage electrical room placed on the first level for easy connection to the main campus infrastructure.

Placing all the private suites in the levels above provides privacy and security to the residents. The Don's suites, common rooms, study rooms, and kitchens are oriented on each level to maximize interaction and reinforce community. Considerations for quiet spaces provide students the ability to study outside their dormitories.

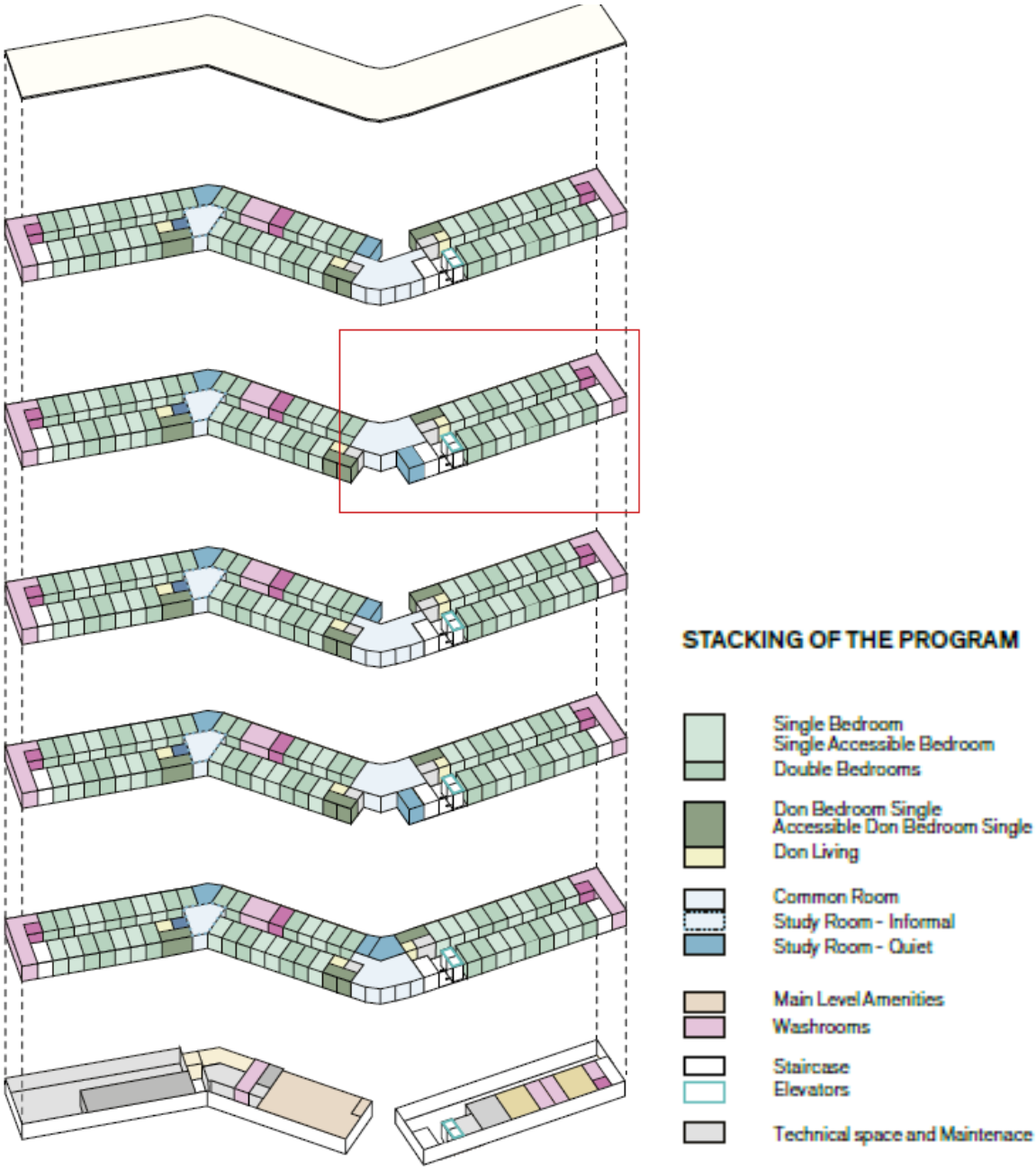

Figure 1.3 Building Stacking Opportunities (Christensen & Co/ Montgomery Sisam)

Washroom facilities are located at the two ends, as well as the middle, of the building and provide stacking opportunities as shown in the stacking diagrams.

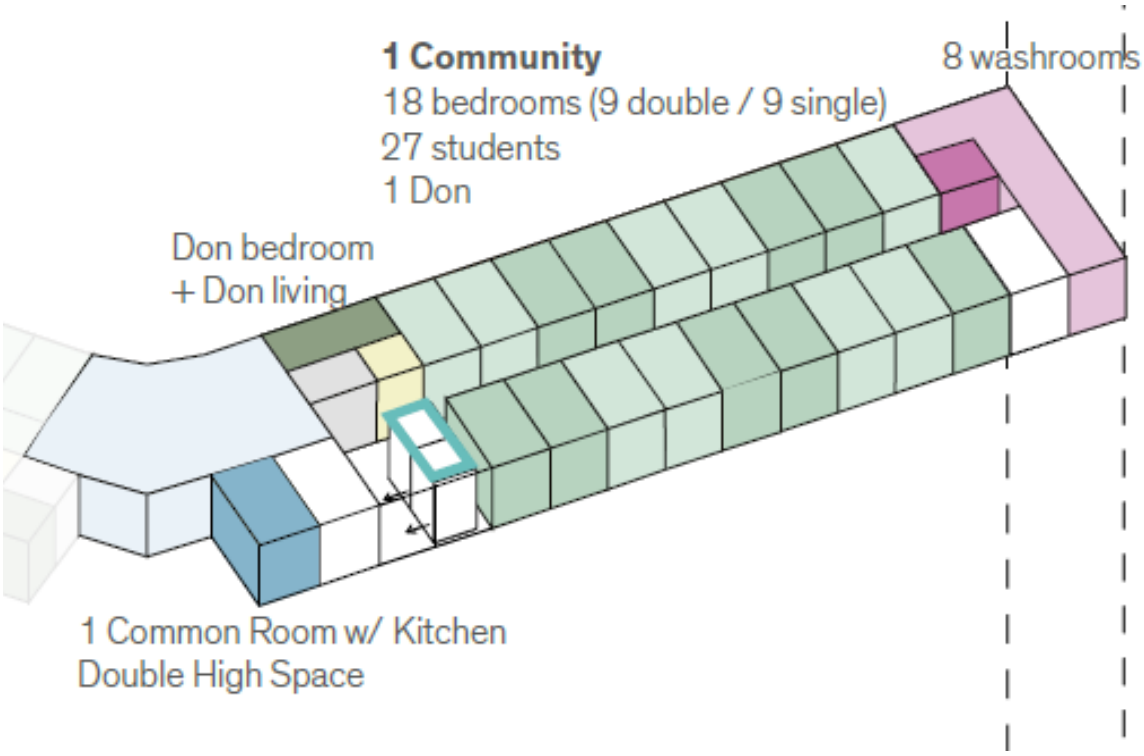

Figure 1.3 Cluster of Common Rooms, Bedrooms and Washrooms on a Typical Floorplate (Christensen & Co/ Montgomery Sisam)

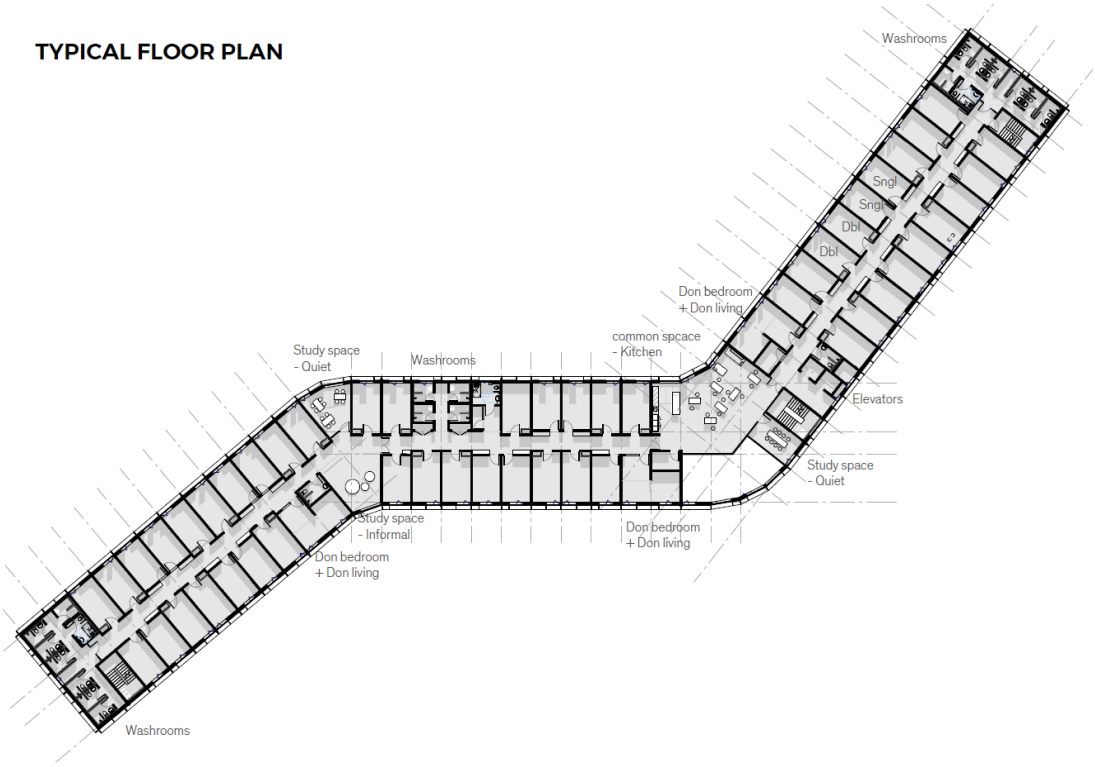

Figure 1.4 Typical Residence Floor Layout (Christensen & Co/ Montgomery Sisam)

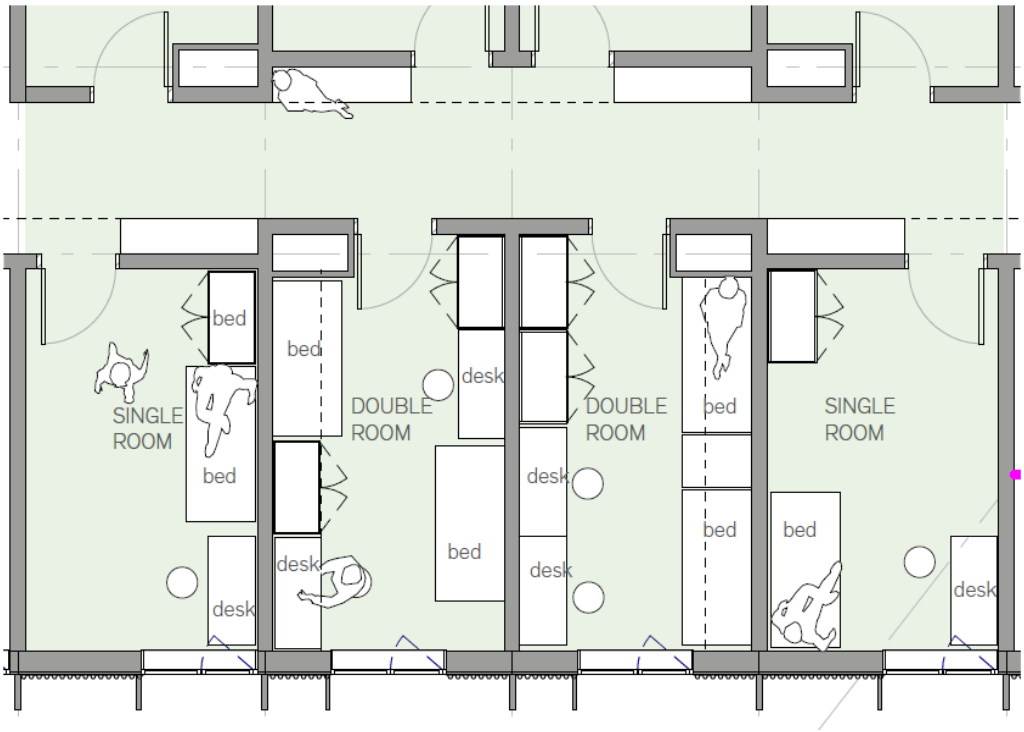

Figure 1.5 Suite Typologies; Single, Double and Accessible Suite Layouts (Christensen & Co/ Montgomery Sisam)

d) Building Considerations

Standards of construction

UTM's recently constructed buildings (the Maanjiwe nendamowinan Building, Deerfield Hall, the Innovation Complex, the Instructional Centre, the Terrence Donnelly Health Sciences Complex, and the Hazel McCallion Academic Learning Centre) and those that are currently in design and construction (the F2 Building and the New Science Building), have evolved from basic, functional forms that are evident in earlier structures, such as the existing William G. Davis Building and the former North Building. These recent buildings consistently demonstrate design excellence and can be considered as not only architectural benchmarks, but also as representative of the general standards of construction quality and level of finish for the New Student Residence building.

Durability and functionality of interior spaces are critical. The Claudette Millar Hall at the University of Waterloo (opened in 2017) served as an example for spatial planning and for construction. Composed of hollow core slab and steel beam structure, the building was built on time and budget. The partitions throughout the building consist mainly of Concrete Masonry Units for durability and acoustics. Note: many student residences built in the Ontario post-secondary system use concrete block construction to reduce sound transmission and add durability. It is the intent of Residence Phase IX (RPHIX) to use a cast-in-place reinforced concrete structural system with concrete block construction as much as possible.

Similarly, exposed ceiling slabs are preferred in areas where minimal services are run in the ceiling spaces. For planning and costing purposes, it was assumed that the New Student Residence will be of a quality similar to that found in the design and finishes of the Claudette Millar Hall.

Key Building Components and Systems

UTM has developed detailed specifications and standards for architectural design, mechanical and electrical design, and building automation systems. As well, UTM's Information and Instructional Technology Services division and Campus Safety maintain standards and specifications for their systems.

These specifications and standards are reviewed and updated on a regular basis. All of UTM's design standards and specifications, and policies and procedures are available through UTM's Facilities Management and Planning and will be made available to all invested parties as required.

Mechanical / Electrical and Data

The project has been designed to connect to the Central Utilities Plant (CUP-1) on opening day for all heating and cooling systems as shown in *Figure 2.0 Central Utilities Plant Connection.* This system allows the project to meet UTM's sustainability design requirements, UTM's design standards, and the requirements of all associated municipal, regional, provincial and federal regulatory agencies.

Upon completion of the F2 Building, the project will connect to CUP-2 which is the expansion of the system along Outer Circle Road.

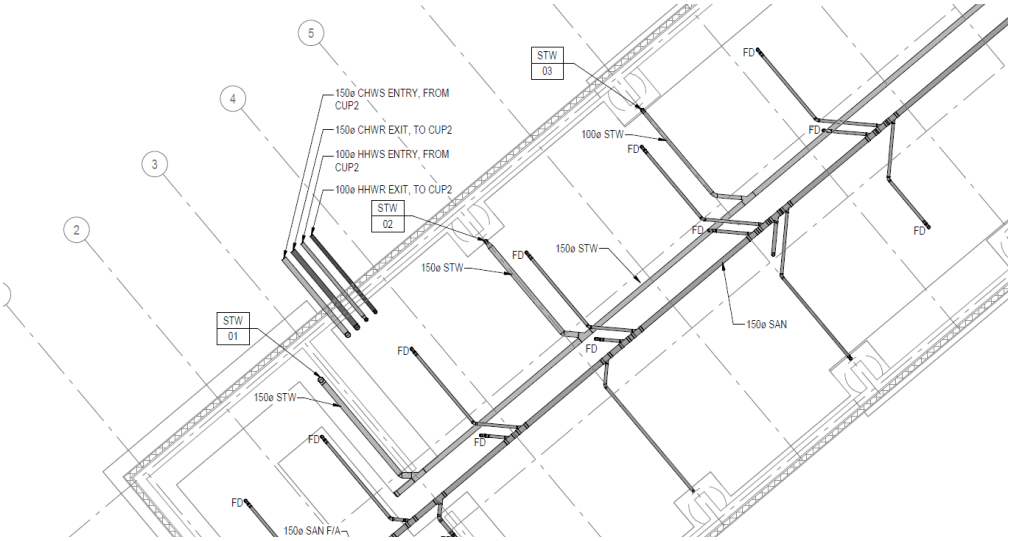

Figure 2.0 Central Utilities Plant Connection

UTM's Facilities Management & Planning has established and regularly updates specifications and standards for architectural design, mechanical and electrical design, and building automation systems. As

well, UTM's Information and Instructional Technology Services division and Campus Safety maintain standards and specifications for their systems.

All of UTM's design standards and specifications, and policies and procedures are available through UTM's Facilities Management and Planning.

Tenants require excellent Wi-Fi coverage based on the latest I&ITS Wi-Fi and structured cabling standards, and Wi-Fi design criteria. This will include a predictive survey based on CAD drawings as part of the project, presuming a fully occupied furniture plan for residence rooms, and common areas, both indoor and outdoor (laundry, lounges, patios, picnic benches, etc.)

This wireless experience will require a true home Internet experience, with Wi-Fi that is capable of supporting consumer IoT devices such as gaming consoles and personal assistants.

Wired Internet connectivity in the common lounge areas to support communal entertainment activities such as gaming or viewing of Smart TV and similar devices.

The building must meet new fiber masterplan specifications – fiber ingress AND egress as "pass through", as well as all design criteria for inter-building fiber specified in the UTM structured cabling standards. Given the centrality of this building at that end of campus, we will require 2x48 strands of fiber via geographically distinct paths.

This building will become the new fiber distribution point for the southwest portion of campus and would therefore require connectivity to nearby consolidation points (yet to be installed), and a demarcation room for fiber distribution, in addition to typical in-building comms rooms. This room must be separate and apart from the communications room on that floor of the building (presumably the ground floor or basement, wherever fiber comes into the building). The specifications of this room would be similar to our communications room standard of a four-rack configuration. The new residence building must also have fiber access back to Oscar Peterson Hall.

For further information see: Section e) Site Considerations and Section g) Campus Infrastructure Considerations.

Sustainability design and energy conservation

The University of Toronto is committed to reducing its scope 1 and 2 greenhouse gas (GHG) emissions by at least 37% below its 1990 level of 116,959 tonnes eCO_2 by 2030, targeting a better than net-zero climate positive) institution by 2050. To accomplish this, the University has retired the previous Energy Performance and Modelling Standard (April 1, 2019) and introduced this now-governing Tri-Campus Energy Modelling & Utility Performance Standard (refer to links listed at the end of this section). This new standard provides project-specific energy and water efficiency targets, used to calculate energy and GHG project budgets, and necessary to achieve the 2030 goal, while also introducing a streamlined modelling and documentation submission approach.

This standard is meant to inspire innovative designs based on energy and GHG targets that are used to

calculate energy and GHG performance budgets according to when the building is going to be constructed and building programming. The targets become more stringent over time as cost-effective technologies and delivery methods improve in conjunction with regulatory compliance changes.

The tool used to define the targets and budgets is called the "Charter" and completed by U of T staff before design procurement commences. The energy and GHG performance targets for new construction are defined for the year that occupancy is scheduled in the project planning reports. The energy modelling procedures defined in the Tri-Campus Energy Modelling and Utilities Performance Standard will be used to calculate the energy and GHG performance for the designs and compared to the Charter targets throughout the design stages.

These Standards and resulting models are not post-occupancy energy or GHG predictions. They are to be used to establish and track the compliance of energy and GHG indices during the design process and as a comparative tool for building baseline and performance evaluation. Post-occupancy evaluation will be completed (12 – 14 months post-occupancy) by the U of T facilities staff and compared to the final performance model results.

All applicable Codes, Guidelines or Standards referenced in the standard are to be applicable to the current regulations within the project timeframe defined in the Charter. Estimates of the impact of any foreseeable future standards, codes and guidelines may be required and shall be presented to the U of T Implementation Team for consideration. In all cases, higher performance targets shall be the preferred targets.

Utility Performance Requirements for Capital Projects

Energy

New construction projects and Major Renovation Projects must meet the project-specific energy performance targets established in the Charter. The requirements will be calculated using the Charter's archetype targets and project information, including: planned building space use, year of occupancy, presence of a connection to the U of T district steam or low temperature heating, and district chilled water energy systems. For buildings with mixed uses, the targets are area-weighted using the Charter to determine a set of performance targets that are representative of the building programming.

The renovation of existing buildings plays a critical part in U of T's plan to achieve its established 2030 GHG emissions reduction target. UofT's Standard also identifies utility performance requirements and targets for renovation projects of varying scopes and complexities through a prescriptive pathway for minor renovations and performance pathway for major renovation projects.

For Feasibility Studies, the Charter will be developed within the scope of the feasibility study to inform design feasibility decision making. The developed Charter(s) will be calibrated to the predictive timeline(s) of construction included in the project costing and feasibility report.

The Project Consultant Team must complete and submit to UofT all the deliverables listed in the *Project Charter Submissions Checklist* including energy simulation files and report, key performance indicators (e.g. % EUI reduction, TEUI, TEDI, GHGI) with associated documentation at each stage of the design process to demonstrate ongoing compliance with these performance targets. At the completion of the commissioning, the energy model simulation must be updated to reflect the as-constructed building characteristics. This will form the basis of the project's baseline performance.

The targets will be revisited and adjusted regularly to ensure U of T remains in a leadership position. The progression of targets depends on numerous factors, many of which are outside U of T's direct control (e.g., the rate at which new technologies come to market). However, projects should anticipate the adjustments to the targets for 2022-2026 and 2026-2030 for all key performance indicators included in the standard to account for increased capabilities of designers, technologies and industry practices to meet net zero targets by 2030 in many jurisdictions, including the City of Toronto.

Beyond energy, additional performance levels may include:

- 50% reduction in indoor water use over the LEED™ version 4 baseline;
- 60% reduction in outdoor water use over the LEED™ version 4 baseline; and
- Complete whole-building air tightness testing following the US Army Corps of Engineers Air Leakage Test Protocol for Building Envelopes and submit air leakage testing report. (Refer to links listed at the end of this section).

The above targets are combined with project-specific information to establish unique energy and water efficiency targets for every building based on floor area and different space use types. The project-specific goals are established as part of the Project Planning Report (PPR) using the separately enclosed Charter. The Charter outlines key project information, performance targets, and serves as a reference point throughout the project to ensure the performance goals are clearly understood by all involved parties and ultimately achieved.

To further ensure projects are developing in accordance with these performance requirements, documentation must be completed by the Project Consultant Team and/or the U of T Implementation Committee at each project stage. For each documentation item, the expectations and responsible parties are outlined in the Standard.

In addition to the energy performance, utilities performance and water efficiency targets mandated by the University through this standard, other regulatory authorities and certification processes will be included within the planning, design and implementation of all projects. The intent of these additional regulatory processes is to ensure that the high-performance building required by the energy and water performance targets of this standard is part of a holistic approach to sustainable building practices.

The following Certifications and regulations will be mandatory for all New Construction and Renovation projects: LEED™ Silver minimum (non-certified). The minimum requirements for these certifications and regulations are not to supersede the energy, utilities and water efficiency performance targets of this

standard. The consultant is required to provide a memo demonstrating LEED™ Silver minimum (non-certified) shadowing.

On-site renewable energy requirements included in the Charter will be determined on a project-to-project basis in consultation between the Project Planning Committee and the Facilities and Services Sustainability Office. Considerations of the affordances of the capital project (i.e.. roof area, exposure) and campus wide energy planning and utilities master plans may impact the decision for inclusion of photovoltaics, wind turbines, and other on-site renewables. The following is the definition of on-site renewable energy generation included in the Tri-Campus Energy Modelling and Utilities Performance Standard:

> *Site Renewable Energy Generation:*
>
> > *Energy generated on site from renewable sources, such as solar photovoltaics (PV), wind, or solar thermal. Where a site is not able to send energy off-site (e.g. connected to the electricity grid), only energy that can be consumed (or stored and then ultimately consumed) on site shall be counted as Site Renewable Energy Generation. Site Renewable Energy Generation can be used to reduce Site Energy Use before calculating TEUI and GHGI. The U of T is not considering the purchase of renewable energy or other carbon offset packages.*

In the case that excess on-site renewable energy generation (or heat recovery) beyond the building's demand can be exported to surrounding buildings or district energy systems, that exported energy will be counted as a credit to the TEUI and GHGI metrics.

Geo-exchange and other heat exchange strategies and technologies may be considered as on-site renewable if used in conjunction with other on-site renewable energy generating initiatives of the above listed items. **Consultation with the Facilities and Services Sustainability Office on the proposed on-site renewable strategy will be required.**

Other Considerations

New construction will increasingly include multiple uses and occupancies resulting in "mixed use buildings". As indicated, the energy performance targets and resulting budgets will be based on the area weighted aggregate as calculated by the Charter. Care is required when assigning the use areas when completing the Charter. **Coordination between University Planning, the end users and Facilities and Services Sustainability Office is to determine the appropriate assignment of Charter Archetypes to the space program.**

District Energy Systems (DES) includes heating and cooling energy supplied from our central or nodal plants. For networks supplied from low temperature heating sources (heat pumps, heat reclaim energy) the non-district system targets and factors will be used. **The Facilities and Services Sustainability Office (F&S SO) is to inform the PPC and University Planning of the project's connection (or not) to a DES.** The intent of the charter is to determine energy use at time of occupancy. Coordination with the F&S SO is required to ensure that the capital project will meet future energy and carbon planning targets.

The Project Planning Committee is to review the City of Toronto Green Standard and City of Mississauga By-Laws for Electric Vehicle parking requirements for appropriateness and alignment with our vision, use, campus Master Plans, and utilities as well as project capital and operating budgets for the project.

The decision to pursue full certification or higher levels of LEED™ and TGS or additional standards such as WELL™ Building Standard will be at the **discretion of the Project Planning Committee in consultation with University of Toronto Facilities and Services. The decision to include the above is to be included in the Project Planning Report for inclusion in the Capital Project's scope of work and preliminary costing.**

Photovoltaic-ready initiatives are to be considered where possible to allow for the future installation of photovoltaics where current project scope may not allow for the full installation of a photovoltaic array. Considerations of structural loading and provision of electrical conduit and servicing may be included in the capital project scope.

Project Planning, Implementation and Consultant teams are encouraged to address the embodied energy, embodied carbon and other emissions associated with building materials. Reporting of the embodied emissions of the building's structural and envelope materials using life-cycle assessment (LCA) software in compliance with the Canadian Green Building Council's recommended methodology is to be **reviewed in consultation with University of Toronto Facilities and Services on a project to project basis.** The decision to include the above is to be included in the Project Planning Report for inclusion in the Capital Project's scope of work.

The University of Toronto Facilities and Services is to be contacted to provide historical utilities data to the consultant team for the purposes of life cycle costing and energy modelling.

Please refer to the City of Toronto Green Roof Bylaw No. 583-2009, Chapter 492 for specific green roof requirements.

The University of Toronto Sustainability Standards

The University of Toronto Environmental Standard [University of Toronto Design Standards: Part One / Environment / Environment (draft revision)] was developed in 2011 and revised in 2018. A new and expanded University of Toronto Sustainable Building Design Standard is currently under development and targeted for release in the winter of 2023/2024. The new sustainability standard uses several external standards as a baseline from which to take a leadership position in holistic sustainable building design. The Project Planning Committee and consultants are encourage to **consult with the University of Toronto Facilities and Services Sustainability Office** to ensure that longer term project planning is anticipatory and inclusive of the new sustainable building design standard requirements, Tri-Campus Energy Modelling and Utility Performance Standard requirements, and Toronto Green Standard requirements.

The new sustainable design standard will supersede the requirement for LEED™ Silver minimum (non-certified) described above.

Sustainable strategies to be considered during the design phase to achieve the Charter targets may include:

- Envelope
    - High performance envelope and glazing
    - Improved air tightness. For renovations with limited envelope scope, qualitative envelope assessment and targeted sealing and/or aerosolized envelope sealant technology to be considered.
    - Low window to wall ratio at building facades with Low-E triple glazed insulated glazing units

- Water
    - Rainwater harvesting systems for flushing toilets and urinals, and for landscape watering systems
    - Water-efficient fixtures and combined water fountains/bottle-filling stations

- Heat Recovery
    - Exhaust air heat recovery actively using heat pumps (preference for ventilation rates – e.g. lab buildings) or passively
    - Heat recovery chiller for simultaneous heating and cooling loads
    - Heat recovery ventilation
    - Wastewater heat recovery

- Energy efficiency
    - DLC-rated LED lighting with central lighting controls and advanced control strategies including daylight harvesting, occupancy sensing, scheduling, zoning, high-end trim.
    - Energy Star appliances, office equipment, electronics, and commercial food service equipment
    - Building automation systems integrated into the University's EMRS
    - Demand control ventilation based on CO_2 or contaminant sensors in lab spaces
    - Occupancy sensors controlling HVAC and lighting
    - Zoned HVAC control where possible
    - Ultra-low flow, energy efficient fume cabinets in laboratories (with variable volume air flow and automated sashes)
    - Thermal or battery storage for resiliency and peak shaving

- Renewable energy
    - Geothermal
    - Solar thermal, Photovoltaic including Building Integrated Photovoltaics
    - Wind
    - RNG

- Roofs and landscaping
    - Green roofs (to improve rainwater absorption, mitigate local heat island effect, decrease the building's solar heat gain, and to increase the available habitat and help offset the impact of habitat loss associated with the new building)

- Roofs suited to the incorporation of solar thermal water and/or photovoltaic arrays and 'Solar Ready' provisions for future installation if not included in project scope.
- Low maintenance native plantings

- Materials
  - Durable, local materials with renewable and/or recycled content
  - Low-embodied carbon building materials
  - Provision of recycling depots for source-separation of waste throughout the building to meet the needs of the University's recycling and waste reduction programs and vehicular access to these sites
  - life cycle analysis (LCA) and embodied carbon reporting

Other Standards and Certifications to consider

- Passive House
- WELL™ Building Standard Certification / Shadowing
- Toronto Green Standard tiers above minimum requirement
- LEED™ Certification and/or shadowing above minimum requirement
- CAGBC's Zero Carbon Building™ Standard / Shadowing

Other considerations

- Transportation (i.e. support of active and lower carbon commuting (e.g. cycling)
- Location (i.e. Landscaping, Biodiversity, Light Pollution, Trees, Heat Island)
- Indoor Environment (i.e. Air, Lighting, Acoustics)
- Equity, Diversity & Inclusion (i.e. safe spaces, inclusive design)
- Health & Well-Being

UofT Climate Positive Campus

https://climatepositive.utoronto.ca/

UofT Tri-Campus Energy Modelling & Utility Performance Standard:

https://www.fs.utoronto.ca/wp-content/uploads/2022/06/Tri-Campus-Energy-Modelling-Utility Performance-Standard-July-2020.pdf

UofT Overall Design Standards:

https://www.fs.utoronto.ca/projects/design-standards-and-project-forms/

Toronto Green Standard Version 4:

https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/toronto-green-standard-version-4/

Discussion on Project Charter Targets

The project has now reached 100% CD and the consultants have provided an Energy Analysis Report which outlines how the targets will be met. The complete report can be found in the appendix:

- *High performance triple pane glazing with thermally broken frames with insulation assembly U-factor of *0.15 Btu/h-ft-F and SHGC of 0.25. (*This value is incorrectly shown in the memo as 0.2 Btu/h-ft-F)*
- *High performance exterior walls with an effective R-value of 17.5 Btu/h-ft2-F*
- *Optimized shading across the entire façade and building massing with long side facing south.*
- *High performance lighting design (space-by-space lighting power densities 20% lower than those prescribed by ASHRAE 90.1-2013 for all spaces, except bedrooms).*
- *Advanced occupancy-based lighting controls, daylight dimming, and demand control ventilation in common spaces.*
- *Decoupled systems to address ventilation and zone sensible loads more efficiently.*
- *Enthalpy recovery wheels with 85% overall effectiveness.*
- *Passive House Air Tightness on exterior walls and glazed openings.*
- *Rooftop Solar Photovoltaic System that will serve to reduce energy use by minimum 49,000kWh/yr and exceed minimum 5% of the building's yearly energy from on-site renewable sources. The system will incorporate additional capacity to allow for a buffer to ensure the minimum requirement is met.*

Due to these design decisions, the energy performance of this building will meet/exceed the requirements of the charter targets shown below:

Key Performance Indicator	*Unit*	Charter Requirements	Proposed by Project
TEUI (Total Energy Use Intensity)	*ekWh/m2*	74.7	*74.7
GHGI (Greenhouse Gas emissions Intensity)	*kg CO2e/m2*	4.9	3.2
TEDI-heating (Thermal Energy Demand Intensity)	*kWh/m2*	30.6	27.5
TEDI-cooling (Cooling Energy Demand Intensity)	*kWh/m2*	20.3	18.5

*The proposed TEUI is based on a 45kW system. The final system is designed for a 50kW which will lower the TEUI below the Charter target.

Accessibility

The University is committed to equitable access to all building facilities by the whole campus community. New buildings and renovations will incorporate equity, diversity and inclusion as well as the principles of universal design that will allow users with diverse abilities to access and use facilities with dignity.

Projects will meet the design requirements of the University of Toronto Facilities Accessibility Design Standards (FADS) and barrier-free design requirements of various codes and standards, such as the Ontario Human Rights Code (OHRC), Ontario Building Code (OBC), Accessibility for Ontarians with Disabilities Act (AODA), O.Reg. 191/11 Integrated Accessibility Standard Regulation (IASR) under the AODA and CSA B651 “Accessible design for the built environment”.

An achievement in accessibility, the final design of this residence provides barrier free access to all the dormitories and don bedrooms in the building, as well as to all common rooms including study rooms, conference room, event spaces, lobbies, music room, and laundry room. Out of the 100 bathrooms/washrooms in the building, 15 are fully accessible. The accessible washrooms are distributed evenly throughout each of the bathroom clusters.

The entrance of the building is designed to be fully accessible and the signage system follows the latest UTM Exterior Signage and Interior Signage Standards to assist individuals with disabilities with wayfinding and in identifying spaces (e.g. Braille, high contrast, raised tactile). The Director of the Accessibility Resource Centre along with the Universal Design Consultant provided consultation at the appropriate points throughout the design process.

Accessible parking will be provided close to the residence in addition to accessible drop off space along Residence road. Further information has been provided in the Vehicular Access and Vehicular Parking sections of this report.

The exterior, and some interior (i.e. service counters, fixed queuing guides, and waiting areas), public space, comply with Part IV.1, Design of Public Spaces Standards (Accessibility Standards for the Built Environment, Integrated Accessibility Standards of the Integrated Accessibility Standards, O.Reg.

191/11, http://aoda.hrandequity.utoronto.ca/buildings/**)**. Maintenance, environmental mitigation, or environmental restoration has been excluded from this requirement.

Public space projects affecting exterior paths of travel, recreational trails, outdoor play spaces, or accessible on-street parking have included consultation with the public and persons with disabilities pursuant to standards mentioned above.

For additional information contact the University of Toronto's AODA Office.

https://people.utoronto.ca/inclusion/accessibility/

https://teaching.utoronto.ca/resources/universal-design-for-learning/

https://people.utoronto.ca/inclusion/edi-at-u-of-t/

Facility Accessibility Design Standard (June 2023)

Personal safety and security

UTM subscribes to the belief that all members of the UTM community and all visitors to the campus should be able to readily enter the campus, its builidngs, and facilities without any hindrances or encumbrances. While the New Student Residence building is designed to allow its students, staff and visitors' safe and convenient access, it must at the same time be sensitive to the needs of those whose activities require security after hours. Limited areas of this building are operational throughout the week for 24 hours a day, and the residence levels above the main floor will consist of closed elevator lobbies that provide secured card readers for 24-hour resident access.

A detailed security plan of each floor, zone, and room has been developed in collaboration with the user group and UTM Campus Safety, and factored into the design of the building to ensure that accessibility, security and functional objectives are all met simultaneously. Specific security requirements have been identified in the Room Data Sheets.

Building Access Systems

The new residence building will use an electronic card access system. It will be an offline system. Currently, most of UTM's older buildings have exterior doors that are manually unlocked (either standard locksets or panic bars) by Campus Safety. As well, interior facilities that are accessed by students, faculty and staff on a regular basis, such as classrooms, study rooms, lounges, etc., are also unlocked and locked in the same manner as the building's exterior doors. UTM has transitioned to a new hard key system that provides greater control of security to academic and administrative units over their own space. The new Medeco system has been included in recently completed renovations and new buildings, including Deerfield Hall, Innovation Complex, and the Maanjiwe nendamowinan Building, and will be included as part of this project.

Non-public spaces, such as mechanical and electrical areas, custodial rooms and telecommunication closets, will require standard lock sets in addition to electronic card access devices. For TR rooms, card readers with dual-factor authentication must be utilized for added security: hard keys will conform to UTM's approved door hardware (Medeco) specifications and standards. For the New Residence Building (RPHIX); The two main entrance doors (front and back doors), will receive online & offline access control systems, while all other doors (e.g. bedrooms, study rooms, mechanical and electrical rooms and shafts, and communications and security closets, etc) will receive offline access control system only.

CCTV and Related Systems

UTM currently has closed circuit security cameras (CCTV) in critical areas of the campus, buildings and rooms. Wherever there are concerns of personal safety, cameras are strategically located to provide suitable coverage; these cameras are connected to Campus Safety's monitors and recording servers (via the campus' internet) in the William G. Davis Building. As well, Campus Safety may request that some cameras be located outside the building to provide coverage of building entrances/exits and surrounding landscaped areas.

The number of cameras that will be needed in this project will depend on the building's design and layout. Most of the cameras that have been supplied are fixed and are specified and located to provide the best coverage possible; where required pan-tilt-zoom (PTZ) cameras have been installed to optimize coverage.

UTM currently has emergency call stations located throughout the campus grounds and in some building locations; these stations are located in either high-risk areas or convenient locations (for example, readily visible in pedestrian travel routes or building entrances). The most recent building project has included the requirement for the camera closest to a call station to be able to pan, tilt and zoom onto the call station when the emergency function is activated.

Barrier-free washroom emergency call strips must be connected to the building electronic access control system and dial out to UTM Campus Safety via BELL Centrex line for redundancy.

As with all recently completed buildings on campus, public address (PA) systems for emergency communication and notification have been included in the budget. The PA system will cover the main hallways and any high occupancy locations; in the past, PA systems have been locally operated by Campus Safety or emergency personnel, but for this project, the system should also have the capability to be operated remotely from the Campus Safety office.

Environmental Health and Safety

The University of Toronto's Environmental Health and Safety office, including an Environmental Protection Services team, provides a broad range of health and safety services to the University community and whose responsibility it is to ensure environmentally responsible, safe and healthy work, research and study environments on campus. Please refer to their website for information, https://ehs.utoronto.ca/.

As per EHS requirements, emergency eyewash stations will be provided in all caretaking closets and mechanical areas, including the rooftop mechanical penthouse, where chemical dispensing may occur.

Additionally, EHS will be purchasing and installing an Automated External Defibrillator (AED) at the ground floor elevator lobby, a highly visible and publicly accessible space.

Key considerations for healthy environments included: student space design, use of materials, air quality, access to natural light, and overall space and furniture design.

Pre-engineering reports and feasibility studies on existing conditions and constraints were conducted to assess the following:

- Safety design for receiving areas
- Ergonomic design of mechanical rooms
- Code and environmental requirements
- Environmental health and safety (supply ventilation, specialized equipment and venting requirements, chemical hazard quantity – if any)
- Noise and vibration (insulation or amelioration of sound sources from the building such as air handling equipment in the mechanical penthouse)
- Hazardous materials disposal

Servicing (including Garbage, Recycling and Deliveries)

The RPHIX proposal includes waste management for building wastes (waste and recycling bins) and short- and medium-term storage space.

The Garbage Room is designed to have exterior doors to allow bins to easily roll to and from the designated waste collection area.

The storage area will also need an exterior door for easy loading/unloading.

Acoustics

The acoustical quality of the built environment is important in several areas of the building', and requires additional attention in several areas of the building's design:

- Between dormitory rooms;
- Between common spaces (such as public corridors, common rooms, and open study areas) and private spaces (dormitory rooms);
- Between floors;
- Between the Music Room and adjacent spaces;
- And between the Mechanical Penthouse and dormitory rooms located directly underneath

In any large common areas, such as the suggested central circulation lobby, study and conference rooms, and common and/or study open spaces, it is critical that noises created in these spaces are not unduly transmitted into adjacent bedroom areas. The areas previously mentioned may require both passive and active sound treatments to ensure that any noise or sound generation within the room is kept to an acceptable level.

Appropriate STC ratings for all wall, floor, and ceiling assemblies were applied as per the recommendations of an appointed acoustic consultant. The acoustic consultant worked closely with the architect in assessing the locations of building components, such as elevator shafts, mechanical rooms, the event space, the music room, conference rooms, the laundry room, etc and to provide advice on managing the sound and vibrations of these different spaces in order to optimize the acoustic design. Involvement of the acoustic consultant began in the design phase of the project and will extend to the construction and commissioning stage to verify the required STC ratings.

(SLR Consulting Ltd) was retained as a sub by Montgomery Sisam. They were involved during early design. Concrete block wall construction (floor to under slab) has been selected to achieve good acoustical properties of bedroom and adjacent spaces.

Signage, donor recognition

This project will need to provide all necessary signage, wayfinding and donor recognition associated with the building. Interior signage includes not only those signs mandated by the Ontario Building Code but also departmental identifications, room names and numbers, room schedules (as required) and interior wayfinding. Exterior signage includes municipal building address, updating existing campus wide vehicular and pedestrian signage, adding pedestrian signage on the site fire route identification signage, and other site-specific signage (e.g. accessible parking spaces across from the project site, loading dock instructions, etc.). Additionally, the new building will utilize digital signage by the main floor elevator lobby for the cycling of campus information, events, student services, etc.

UTM has specifications and standards for both interior, exterior and digital signage that the design team will be required to implement on this project.

Non-Assignable Space

The proposed non-assignable spaces can be found in the tables below.

Ground Floor	
Name	**Area m2**
Universal WR	10
WR	2
WR	2
Janitor Room	4
Electrical Closet	5
Vestibule	11
Security	15
Communications Room	27
Electrical	54
Water Entry Room	57
Mechanical Room	177
BF WR	8
House Keeping	4

Second Floor	
Name	**Area m2**
WR Corridor	18
WR Corridor	17
WR Corridor	5
Electrical Closet	4
Electrical Closet	4
Janitor Room	2
Corridor	60
Corridor	53
Corridor	79
Stair C	13
Stair B	27
Stair A	12
Total	**294.00**

Third Floor	
Name	**Area m2**
WR Corridor	18
WR Corridor	17
WR Corridor	5
Electrical Closet	4
Electrical Closet	4
Janitor Room	2
Corridor	60
Corridor	53
Corridor	79
Stair C	13
Stair B	27
Stair A	13
Total	**295**

WR Corridor	8
WR	3
WR	3
WR	3
Kitchen Event Space	18
Vestibule	15
Corridor	60
WR Corridor	7
IT Closet	3
Elevator 1	6
Elevator 2	6
Stair C	29
Stair B	19
Stair A	16
Stair A	2
Total	**574.00**

Fourth Floor	
Name	**Area m2**
WR Corridor	18
WR Corridor	17
WR Corridor	5
Electrical Closet	4
Electrical Closet	4
Janitor Room	2
Corridor	60
Corridor	53
Corridor	79
Stair C	13
Stair B	27
Stair A	13
Total	**295**

Fifth Floor	
Name	**Area m2**
WR Corridor	18
WR Corridor	17
WR Corridor	5
Electrical Closet	4
Electrical Closet	4
Janitor Room	2
Corridor	60
Corridor	54
Corridor	79
Stair C	13
Stair B	28
Stair A	12
Total	**296**

Sixth Floor	
Name	**Area m2**
WR Corridor	18
WR Corridor	17
WR Corridor	5
Electrical Closet	4
Electrical Closet	4
Janitor Room	2
Corridor	60
Corridor	53
Corridor	79
Stair C	13
Stair B	27
Stair A	12
Total	**294**

Penthouse	
Name	**Area m2**
Vestibule	4
Penthouse West	471
Elevator Machine Room	6

Vestibule	7
Penthouse East	202
Vestibule Room	27
Stair B	11
Stair A	12
Total	**740**
Building Total	**2788.00**

All of the building's assignable and non-assignable areas are accommodated within the recommended building gross up factor of 1.54 times the net assignable area (nasm) outlined in the space program.

Each of the rooms identified in the space program has been described in detail in the Room Data Sheets. However, most of the non-assignable areas typically are not described with Room Data Sheets, and instead rely on best design and engineering practices, and UTM's design standards and specifications. In addition to the list above, the following non-assignable areas include:

Ground Floor:

1. Building entry facility (BEF) for domestic water & gas. Heating and Cooling handled as a standalone system (Not connected to the central system); as well, this mechanical room will accommodate the equipment associated the system above, fire suppression system, compressors & booster pumps (if required), and flow/consumption meters.

2. Building entry facility (BEF) for line voltage & emergency/back up electrical power; this main electrical room will accommodate the main electrical panel, consumption meter & emergency power switchgear.

3. Building entry facility (BEF) for telecommunications to accommodate voice and data lines.

Each Assignable Floor:

1. Elevators – number and location will depend on the design developed. Typical passenger elevators installed elsewhere at UTM are electric gearless traction elevators with one large enough to accommodate systems furniture, furniture, equipment, etc. The larger elevator must serve all floor levels including the mechanical penthouse.

2. Stairs – number and location will depend on the design developed and O.B.C; one set of stairs will need to extend to the mechanical penthouse.

3. Electrical rooms are to be provided as per efficient building distribution.

4. Security closet(s) per efficient building distribution.

5. Telecommunications closet(s) with boards (for voice) and racks (for data, security & AV systems) in each are to be suitably located for proper coverage on each floor. These rooms will be stacked on top of each other. Wireless access points (WAPs) will be provided throughout the building to ensure the

coverage specified in I&ITS' standards. Note: the dimensional size of the building may require more than one stack of communications rooms.

6. Each floor to have caretaking closet that will allow for efficient storage of small amount of supplies plus floor designated cleaning equipment. Additional space might be required on the lower level to accommodate building wide storage and larger ride-on equipment. These closets should be near washrooms.

7. Washrooms are integral part of the residence design and have their own designated Room Data Sheets. As with custodial closets, washrooms are stacked on top of each other.

Mechanical Penthouse:

1. Primary function of this area is to accommodate the building's air handling equipment but will likely accommodate other mechanical equipment, such as, a workstation for the Building Automation System (BAS).

2. Elevator machine rooms may need to be provided as separate rooms within the penthouse for related equipment and/or controls.

Other considerations for building design that are not typically or may not be shown in Room Data Sheets or UTM design standards:

1. All custodial, campus services & waste management equipment, safety & security systems (including emergency phones, CCTV cameras & intrusion alarms, public address, card access, and Medeco hard key hardware), audio-visual equipment & infrastructure (instructional & digital wayfinding/information), IT systems equipment & infrastructure, and building, room & wayfinding signage will be included in the main construction contract.

2. All building entrances and roof areas will be supplied with outside hose bibs (non-freeze wall hydrants) & GFI electrical outlets; additional hydrants & GFI outlets will be needed to be provided along grade level building elevation & roof areas (especially green roofs). All main entrances will also have power-operated doors.

3. Each stair landing will need to be supplied with standard, wall electrical outlets for housekeeping & maintenance purposes; also, standards outlets will need to be provided along all corridors & public areas.

4. Standard water fountain/bottle filling stations will need to be provided on all floors of the building; no less than two stations on each of the lower three floors, and at least one station on each of the upper three floors.

e) Site Considerations

Site context

Located at 3387 Residence Road, the New Student Residence building lies within the Campus Southwest (CSW) precinct, fronting onto Residence Road between the northern and central access points to the UTM campus. The precinct currently contains low-rise townhouse units, low and mid-rise campus housing buildings, and surface parking lots. A mature tree buffer exists along Mississauga Road, and the precinct increases in topography towards the north end of Outer Circle Road.

The New Student Residence building is bounded by the existing Oscar Peterson Hall, a six-storey traditional style dormitory, to the southeast, Schreiberwood Townhouse Complexes E and F to the northwest and southwest, respectively, and a vegetated area to the northeast.

Several factors shape the building's siting, massing and layout, including the following:

- efficiency of stacking and massing
- scale and setback relative to other buildings including adjacent neighborhood
- preservation of trees and natural open space including wetland area
- critical adjacencies to, and separation from, other buildings and program areas
- desire for natural light and views to the outside
- appropriate ceiling heights and volumes
- clustering of space according to hours of operation and desire to create social hub
- need for security
- direct access to outside at the ground level
- proximity of service entrance to existing OPH loading area
- maintenance of through-connections on the site for pedestrians, cyclists, and UTM service vehicles
- minimized disruption of below-grade infrastructure
- preservation of adjacent lands for future development including potential realignment of Residence Road.

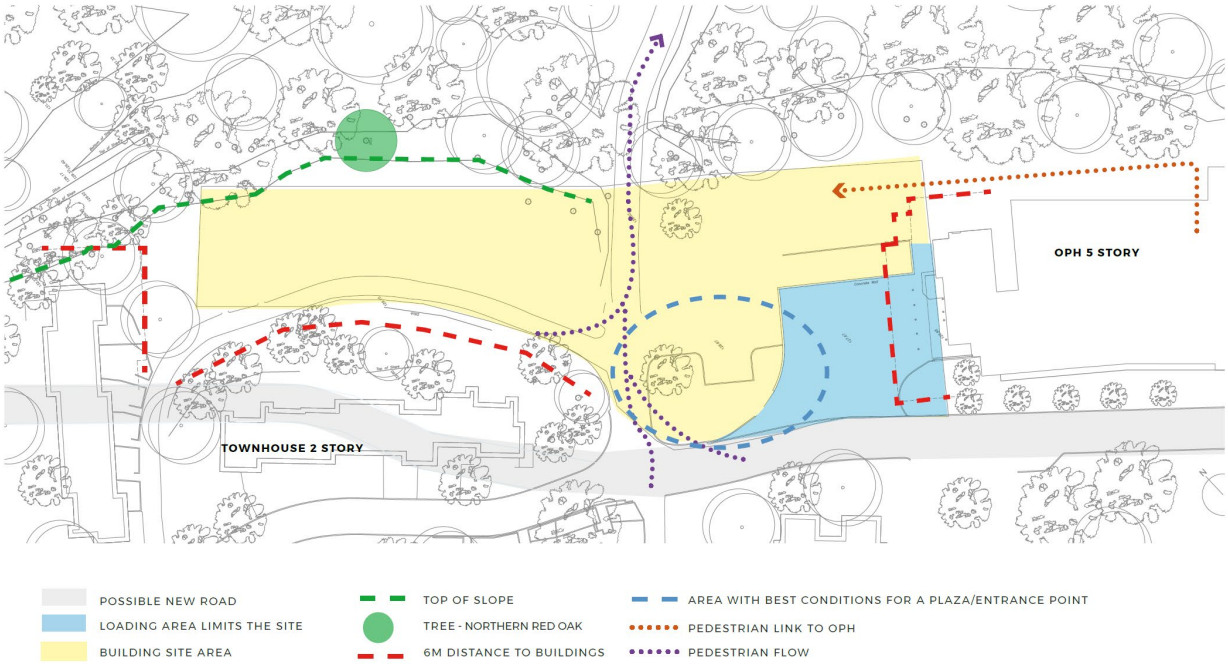

Figure 2.1 Context Plan (Christensen & Co/ Montgomery Sisam)

Figure 2.2 Massing Evolution (Christensen & Co/ Montgomery Sisam)

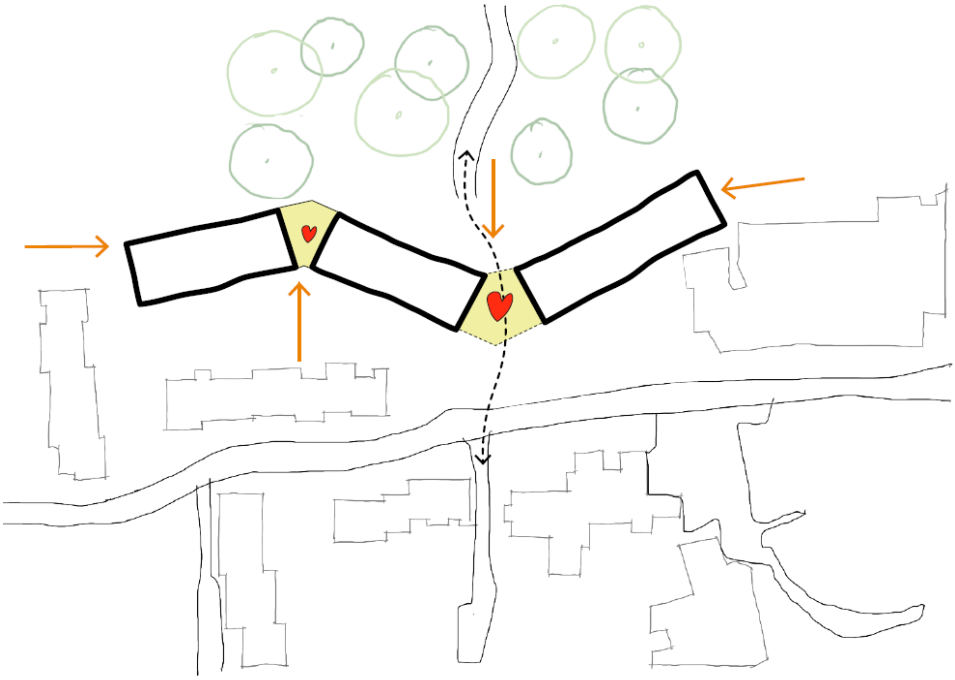

Figure 2.3 Site Opportunities (Christensen & Co/ Montgomery Sisam)

Figure 2.4 Site Concept Plan (Christensen & Co/ Montgomery Sisam)

The proposed landscape ensures accessibility and safety, and natural features are respected and enhanced. The existing pathway through the ravine will be maintained as a main source of connection for pedestrians and service vehicles to and from the Campus Core, while the primary vehicular access will remain on Residence Road. A lay-by near the main entrance has been incorporated as part of the project to provide a pick-up and drop-off area for students, as well as a space for short-term use by service vehicles. Residence Road will continue to remain a fire route throughout and post-construction.

The new building site includes the existing Parking Lot P6 adjacent to Oscar Peterson Hall (OPH) as well as one row of Shreiberwood residences (townhouse complex G). The relocation of parking spaces will be determined at a future date, outside of the scope of this project. Two of the existing accessible spaces will be relocated south of Residence Road in front of Roy Ivor Hall. Any new spaces required by the new building will be relocated to a future campus parking location. The new building will use the existing loading and garbage area adjacent to OPH for required services, and should not impede on the existing area.

The existing Schreiberwood Residence building that will be demolished consists of a two-storey wood-stud townhouse with exterior brick cladding. As noted in the Hazardous Waste Disposal section of this report, these existing structures contain asbestos as per the reports found in the appendix.

Figure 2.5 North Section; Grade evolution (Christensen & Co/ Montgomery Sisam)

The proposed building is situated along the edge of the ravine, creating a new gateway into the Campus Southwest precinct, where most of the housing resides at the UTM campus. The existing pathways, especially through the ravine, will be maintained in order to provide a seamless transition into this area of the campus. Pathways around the proposed site which provide access to the existing residences will also remain until future development in line with the 2021 UTM Campus Master Plan is implemented.

Master Plan

In 2020, the University retained Brook McIlroy (BMI) to prepare an updated master plan, a long-term (10-15 year) vision for the campus. The Master Plan addresses current needs and accommodates anticipated future needs, including academic, university housing and other ancillary uses. The new UTM MP has validated campus planning principles; identified strategic development sites; developed design guidelines to ensure flexibility for the University to adapt to evolving needs and parameters, while ensuring an overarching vision and cohesive campus over time. The new Master Plan is a resource to help guide capital projects and phasing decisions.

The proposed massing studies included in this report are consistent with the studies of this site by BMI as illustrated in *Figure 2.6 Master Plan analysis with New Residence with road realignment.*

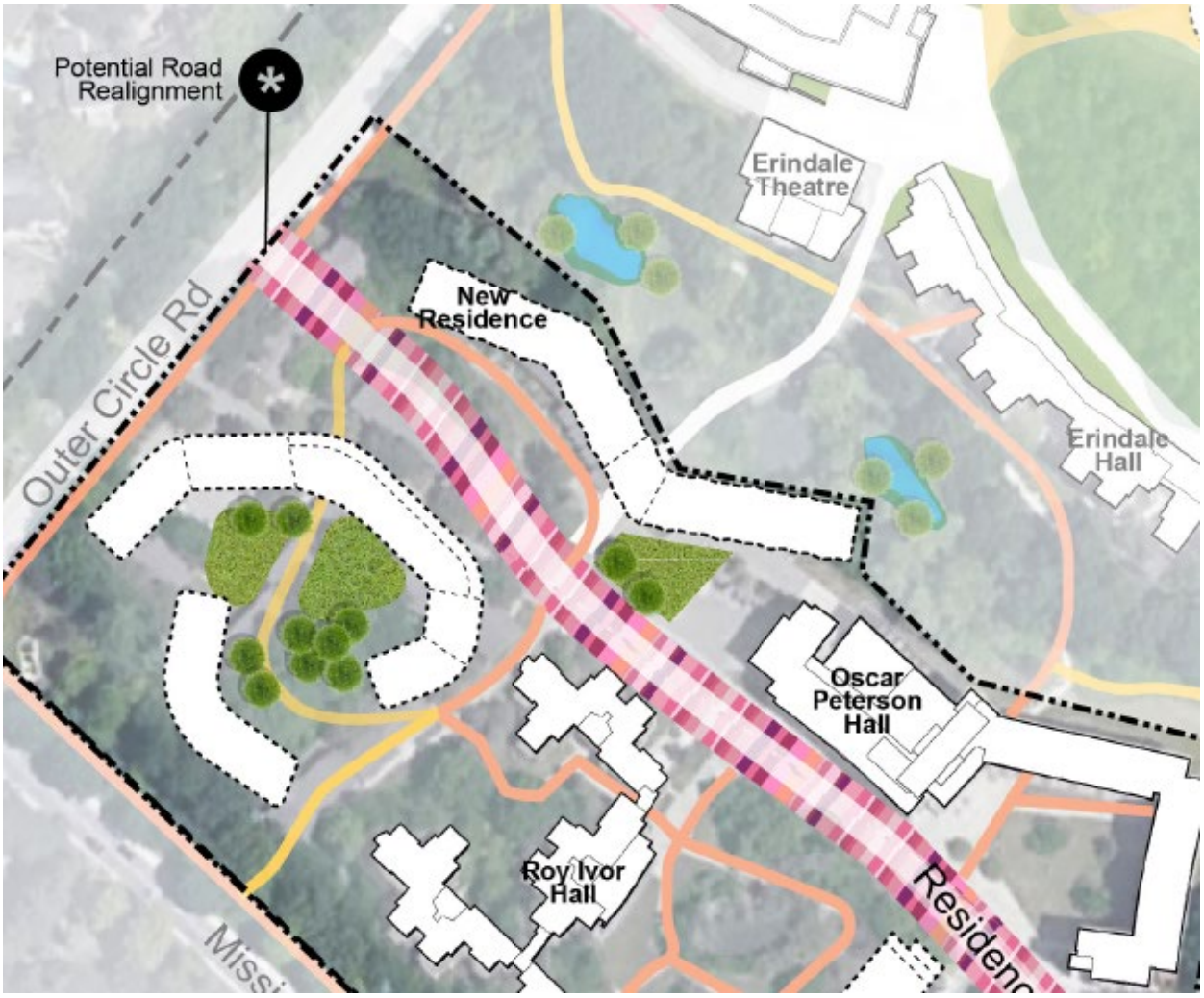

Figure 2.6 Master Plan analysis with New Residence with road realignment

This recent Master plan has included an approach to development for current low-rise student residence building sites along Mississauga Road. The updated Master Plan brings forward an overall framework that sets the stage for UTM to continue to grow and evolve in a way that positively contributes to the character of the area.

As detailed in the new Master Plan, proposed development on campus must continue to consider scale within the surrounding context; accentuate the natural setting of the campus; invite broader thinking about the campus as an integral part of the environment and the city; improve the cohesiveness of buildings and open spaces within the campus setting; expand pedestrian links within and at the periphery of campus; carefully consider vehicular routes and transit locations; provide amenities for and support a variety of formal and informal outdoor activities and public art initiatives that enliven the campus experience; improve accessibility around the campus through consistent signage and wayfinding elements; removal of physical barriers, and improved safety. Definition of future open space, development parcels, road

realignment and the introduction of ancillary uses on campus including a future transit hub will be pivotal in the evolution of the campus.

Zoning Regulations

The Mississauga City Council passed the Mississauga Zoning By-Law 0255-2007 on June 20, 2007 which regulates the use of land, buildings and structures, and implements the Mississauga Official Plan (2011). The By-law has designated three zones within the UTM property including: Institutional (I-5), Greenbelt – Natural Hazard (G1), and Parkway Belt – Passive Recreation Use or Conservation Use (PB1). Note: The By-law does not include height-restrictions on the campus.

This project's boundaries are included in the I-5 zoning, a classification that permits most uses related to the operation of a university.

The City of Mississauga's 2010 Official Plan identifies the UTM campus as the "University of Toronto at Mississauga Special Purpose Area". The Plan addresses the campus' relation to the surrounding Residential Land Use context, calling out the desire for development to be located and designed with sensitivity toward adjacent residential areas, and also in the context of Mississauga Road Scenic Route policies.

The project has submitted a Site Plan Application with the City of Mississauga and is currently under review. Currently, no zoning variances have been identified for this project.

Environmental Considerations, Natural Heritage Features

Environmental stewardship continues to be a high priority, given the campus' naturalized context and the institution's emphasis on environmental sciences, sustainability, biodiversity, and climate in programs such as geography, chemical and physical sciences, and management.

One of the main regulating bodies affecting development on campus is the Credit Valley Conservation Authority (CVC). The CVC and Peel Region regulation and legislation boundaries surround the developed campus on all sides; each having specific implications on future growth not just within the boundaries, but in some cases, include setback requirements as well. According to Dougan & Associates, subconsultants for the campus 2021 Master Plan, alterations within 120m of the wetland area adjacent to the proposed site are subject to a permit issued by the CVC. Permits are obtained on the basis of consistency with CVC regulation and overall ecological/hydrological benefit.

Dougan & Associates classified the wetland area as:

> *…a Meadow Marsh community, dominated by Reed Canary Grass which is a common, native grass species that often forms monocultures in open marshy areas. [They] did not note any rare plants or wildlife while in this area, although it is a bit early in the spring to complete a detailed botanical inventory. [They] also completed a frog survey at this location and did not hear any individuals calling, although we did observe several American Toads nearby on Outer Circle Road…*

The wetland itself did not appear to be of very high quality and is supported by drainage infrastructure… However, it should be noted that from an eco-hydrology perspective, maintaining drainage & water balance through this area will be important if the wetland is impacted as there were more diverse, high functioning forest communities to the southeast which seemed to have adapted to the wetter conditions.

While environmental regulations pose unique challenges, at UTM those limitations are viewed as opportunities to plan more intelligently, creatively, and in a sensitive manner to preclude interventions that would be detrimental to the ecosystems of interest. Carefully considered development can also seek to make connections with the surrounding natural areas, thus ensuring the natural assets are appreciated and accessible to the campus community.

The proposed development site for the proposed residence building is zoned by the City of Mississauga as Institutional (I-5) and is located outside of the Environmentally Significant Areas (ESA) and outside the boundaries of the Area of Natural and Scientific Interest (ANSI).

However, the site is adjacent to and encroaching on the ecological no-build zone, the proposed design needs to be environmentally sensitive.

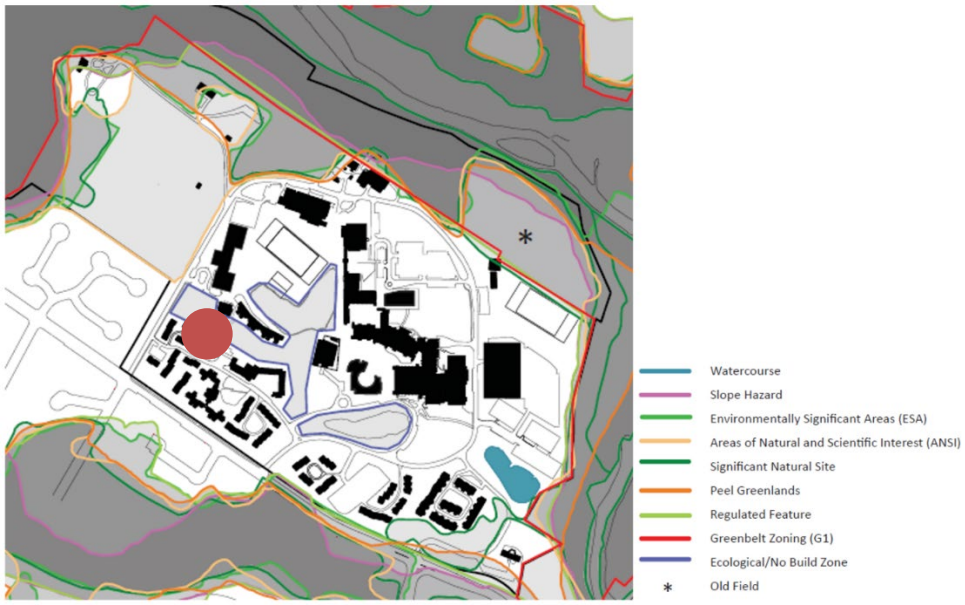

Figure 2.7 Map showing regulation of environmental features and Dot indicating Proposed Site

A tree inventory was conducted and an arborist report has been prepared to address the current condition of all trees with a diameter at breast height (DBH) measuring equal to and greater than 10cm located within the area of work and up to 6m of the adjacent lands. A tree preservation plan identifying trees to be removed and preserved/protected was included in the report, as well as general recommendations for compensation, fertilization, irrigation, monitoring, pruning, root zone aeration, transplant, tree preservation, and tree removal.

The tree inventory included 71 trees, comprising both urban landscape and naturally occurring individuals. Six trees were assessed as hazardous, of which four have been recommended for immediate removal, and two have been recommended for immediate pruning, due to their hazardous condition in relation to the existing conditions. No Species at Risk trees were encountered in the inventoried area. A total of 27 trees measuring equal to or greater than 15 cm are recommended for removal, of which 23 are located in or near the proposed limit of disturbance. In accordance with municipal requirements, 46 compensation trees are required to offset the tree loss. Furthermore, an additional 394 trees are required for the replacement of trees disturbed, which will be planted in areas located at the northern extent of the UTM Campus property in an area situated in low-lying cultural woodland ecosites divided by tributaries and drainage features of the Credit River.

All of the trees recommended for preservation are to be protected during the undertaking of the proposed development, while one of the inventoried trees is recommended for transplant.

A topographical survey was undertaken during Fall 2019 and updated in the spring of 2023.

Building Site Specific Heritage & Archeological Assessments

The site is located within the University of Toronto Mississauga in which in its entirety is designated a cultural landscape as per the City of Mississauga's Cultural Landscape Inventory. The inventory states "this site is recognized as a unique cultural landscape within the City of Mississauga and one which is expected to demonstrate leadership balancing development requirements with the protection and enhancement of the natural environment."

A final Heritage Impact Statement was prepared on August 18, 2023, which concluded that the existing Schreiberwood Townhouse Complex G is not worthy of heritage designation in accordance with the heritage designation criteria per Regulation 9/06, Ontario Heritage Act. The New Student Residence will be an attractive addition to the UTM Campus, meets the intent of the Mississauga Road Scenic Route Cultural Landscape and the UTM Cultural Landscape, and will have no detrimental effect on the heritage character of the campus.

Landscape and Open Space Requirements

The natural environment is intrinsic to the UTM campus identity. Conservation of important existing open space networks and a vision for future open space opportunities continues to be pivotal in shaping proposed future development and campus evolution. This proposed residence considers scale within the surrounding context (natural, institutional, and the adjacent suburban residential neighbourhood) and invites broader thinking about the campus as an integral part of the environment and the city.

The proposed plaza including the outdoor seating, new vegetation, and new lighting design fulfill UTM's goals and set a benchmark for future development on the university campus.

Soil Condition

A Geotechnical Investigation and Engineering Design Report was prepared by Terraprobe Inc, following a geotechnical investigation conducted in September 2021. The report encompasses the results of the investigation done for the proposed development to determine the prevailing subsurface soil and ground

water conditions, and provides geotechnical engineering design recommendations for the foundations, earth pressure and seismic design parameters, slab on grade and pavements:

- The relative weak overburden soil is not suitable to support the foundations, and the foundations must be extended to be founded on the partially weathered shale bedrock or sound, unweathered shale bedrock if a high bearing pressure is required. Given the bedrock is about 4.6 m to 8.2 m depth below the existing grade, the new building is supported by caisson foundations bearing in the bedrock
- The underside of footing/grade beam/pile cap elevations must be designed to provide a minimum of 1.2 m of soil cover or equivalent insulation to the foundation subgrade for frost protection considerations in unheated areas
- The earth fill materials may remain to support the slab-on-grade provided they are approved by the geotechnical engineer at the time of construction

Terraprobe Inc. also prepared a Hydrogeological Assessment following ground water level monitoring conducted in October to November of 2021, with the following findings:

- Underlying shallow fill deposits or weathered soil, native soil deposits consist of sandy silt to silty sand and silt and glacial till (clayey silt till) overlying bedrock (Georgian Bay Formation – weathered shale with intermittent limestone) to borehold termination depths of investigation at elevation 120.3 ± m above sea level (masl)
- The water table for design purposes should be considered at elevation 128.4 ± masl (this is the highest shallow groundwater level observed)
- A slab-on-grade building is proposed for the development with a Finished Floor Elevation (FFE) of 125.8 ± masl. The base of the grade beam for caisson foundation is considered 1.7m below the FFE (126.8 masl) including 500 mm of granular base. The proposed grade beam does not require a drained subgrade, thus, a discharge plan for long-term foundation drainage is not required for the post-development structure
- Short-term dewatering requirements for construction must include a dewatering system designed to take into account removal of rainfall from the excavation. Anticipated precipitation should be collected from the excavation trench that will be developed for construction of the proposed grade beams for caisson foundations

Noise and Vibration Restrictions

Construction activities are a major sources of dust, dirt, noise and vibration. Although UTM's campus community has demonstrated significant tolerance to these inconveniences during normal hours of campus operations, the Construction Manager and its trades must still provide sufficient notifications in advance for any activities that may be potentially disruptive or bothersome to the campus and surrounding communities. Disruptions and annoyances are especially important to avoid during examination periods and after hours.

Campus-wide and user-specific notifications will need to be sent out in a timely fashion, and UTM requires a moving two-week look ahead construction schedule with noise/vibration/dust ratings.

Fibre Connectivity

This construction will have significant input on fiber connectivity for existing buildings in the area.

- The townhouse block proposed for demolition is “upstream” of the adjacent block, and connectivity will be disrupted if that block is removed.

- The shallow trenching and unknown location of fiber in and around Schreiberwood poses a risk of construction, staging, or even site deliveries and access vehicles crushing existing fiber, and taking out service to parts or all of Schreiberwood.

- Existing fiber transition point (around southwest corner of lot 6 but not exactly) that feeds all of Schreiberwood may or may not be within the demolition or staging area, demolishing or accidentally disrupting this would disrupt service to all of Schreiberwood.

See Appendix B (Data) - Local Fiber Considerations for more information.

This location is a critical component of our fiber masterplan to complete southwest section of campus loop:

- Fibre would need to be brought in from DH through Theatre access road into the new residence building to a larger demarc room, which will serve as router/distribution point for all residence (and other structures in this part of campus, should that arise). The path would need to pass-through to south side of building and out to new consolidation point via conduiting.

- On the other side of the loop, consolidation points linked by conduit (one south of Schreiberwood, one north of Leacock, running back to the flagpole via existing conduit) would need to be installed, then connected.
- Exact location of current conduiting should be available, please consult as-builts from Meeting Place project.

- This may be the most reliable way to provide fiber connectivity in advance – do this work prior, install the consolidation points including one south of the new residence building that is outside of the staging/construction area, and not likely to be damaged. The building could be commissioned from this side, then the project would only need to provide pass-through, and a path back to Deerfield (this could also be done in advance!)

See Appendix A (Data) - Campus Fibre Map for more information.

f) Site Access

Pedestrian and vehicular routes, parking, and service areas are essential to the function of the campus, and must be carefully designed to minimize negative impacts on the campus experience. The following guidelines provide direction on how to support these essential functions while maintaining a high-quality public realm:

Main Entry and Pedestrian Routes

The proposed main entrance to the Residence Building will be off Residence Road. The entrance is located under the open passage space which provides access to the student event space along the north set of doors, while the south set of doors provide access to the main lobby.

The existing pedestrian network in the area of the project relies heavily on the paved pedestrian path that connects Parking Lot #6/OPH with Deerfield Hall/Erindale Theatre/Erindale Hall. It is essential that this path, potentially reconfigured as part of the project, is reopened once the project is completed.

Figure 3.0, Site Access and Main Entry. (Christensen & Co/ Montgomery Sisam)

Vehicular Access

Fire access and frequent deliveries have been considered and are integrated into the urban plaza space off the existing Residence Road. The project also utilizes and maintains the existing loading area.

The new Master Plan of the campus considers the realignment of Residence Road to improve intercampus vehicular movement. While this realignment will not be part of this project, it has been considered and designed for the future alignment.

Servicing and Fire Access

The RPHIX does not require a loading dock, but an easy access to a Storage/Garbage Room with exterior door (overhead door), similar to Erindale Hall Building, for the purpose of moving-in/out and through UTM Campus items. The storage room requires exterior loading unloading doors.

OPH front desk will have to be expanded (renovated) to accommodate other deliveries for the RPHIX such as mail. This expansion is not part of the RPHIX project.

Fire access for the New Residence Building has been considered carefully in the design process, especially given that the site is densely used by other residential buildings, and facilities (Parking Lot # 6 & OPH Loading Dock)

Hazardous Waste Disposal

In 2016, the University engaged Golder Associates to examine and provide an Asbestos Inventory Report for the Schreiberwood Residences. Subsequent annual re-assessments were done in 2017, 2018, 2019, 2022, and most recently in 2023. These reports, which are included in the appendix, all indicate the presence of asbestos in all the Schreiberwood Townhouse complexes.

An Environmental Consultant is currently being retained to conduct intrusive sampling as well as to provide a Designated Substances Survey Report (DSSR) and Hazardous Building Materials Removal Specifications, in order to support the collection, disposal, and removal of hazardous waste safely, efficiently, and in compliance with the University's environmental health and safety guidelines.

g) Campus Infrastructure Considerations

Utilities (district energy system, gas, electrical service, emergency power, water)

UTM's campus is effectively serviced by a central utilities system with most of its services centered in the Central Utilities Plant (CUP) and distributed to the campus' central building by a service tunnel. The campus' infrastructure and building systems are continually being upgraded. At the present time, CUP1 will initially serve the RPHIX Bldg until CUP2 (F2 Bldg.) is ready to serve the RPHIX Building.

District Energy System (Heating and Cooling)

There is sufficient floor space within the Central Utilities Plant to accommodate the proposed new boilers and chillers. The 1000 Tons of Cooling is planned to be added at CUP1 and will come online at the end of 2025. There is sufficient heating capacity to temporarily feed the NRB until the final connection to the new CUP2.

UTM has completed the replacement of the original cooling tower with a new state-of-the-art modular installation, and to upgrade the internal circulation within the CUP to meet the existing needs of the UTM campus. As well, the Maanjiwe nendamowinan Building installed a new 1000-ton (two stage) chiller to meet the DES needs of that building. This new chiller has been placed beside the two existing 1000-ton chiller. Even with these additions and upgrades, there is likely insufficient capacity to meet the incremental needs of the RPHIX Building (and any other growth in that sector).

Gas Service

There will be no natural gas distribution to the new residence building. However, the Construction Manager is considering propane set up for temporary heating while the building is under construction.
Electrical Service

The electrical service will be derived by modifications to the current loop serving the residence on opening day. Once the F2 Building is completed, electrical service will be provided from the CUP2.

Emergency and Back-up Power

Currently, UTM has two central diesel-powered generators in the CUP1 with a total output of 1.5 MW. By December 2025, UTM will be adding an additional 750KW generator to the current 1.5MW. RPHIX will get emergency power from CUP2 which has generators once ready. On day 1 there will be no emergency power to this building.

The New Science Building currently under construction is equipped with a new generator that is installed in a location adjacent to the Science Building. The New Residence Building will not use a new generator. Refer to the Electrical Section for more information.

Domestic Water

A 150-mm-diameter watermain originating on Outer Circle Road enters the site from the west at the intersection with Residence Road. The watermain becomes a 200-mm-diameter watermain at the entrance to Parking Lot P6 and proceeds east, aligned just south of Residence Road. From these watermains, both domestic demand and fire protection is provided to all the existing residence buildings in the vicinity of the site with, the exception of Oscar Peterson Hall, which is serviced from a second 200-mm-diameter watermain off a tee, which follows the existing pedestrian path north to Erindale Studio Theatre. The new residence building will be serviced via a realigned 200-mm-diameter watermain running through the building's walkway opening. The proposed water service will generally follow the alignment of the northeast side of the building along the wooded area before connecting at the northwest face of the building. The water service for Oscar Peterson Hall will be diverted around the proposed residence building before reconnecting at each respective meter location. A Servicing and Stormwater Management Report prepared by WalterFedy in April 2022 confirms that the existing water networks within the UTM campus can provide adequate domestic and fire protection to the building.

Sanitary Lines:

An existing 300-mm-diameter sanitary sewer is located beneath Residence Road, servicing all the surrounding buildings in addition to the residences within the Schreiberwood complex. The sewer drains towards the southeast connecting with the remainder of the campus' sanitary sewer network along Outer Circle Road, and eventually leaves the University's land on the east side of the campus. The existing sanity service for Schreiberwood Townhouse Complex G will be removed back to the 300-mm-diameter mainline sanitary sewer in Residence Road. The proposed sanitary service will run beneath the existing asphalt roadway and outlet to the existing sanitary mainline within Residence Road.

Stormwater Pond

The campus has been identified as having a high-water table, estimated between 1-3 metres below the surface at any given point. The UTM campus is serviced by a stormwater pond (adjacent to the P4 Parking Lot area). Constructed in 2008, the Stormwater Pond's capacity was designed to accommodate the expected campus growth through to the full build out as was published in the Master Plan (circa 2000). The proposed development project conforms with the Master Drainage Plan developed for the University of Toronto Mississauga. This plan was approved by the City of Mississauga and the Credit Valley Conservation Authority. The UTM Pond, constructed in accordance with the Master Drainage Plan, was designed to accommodate a full build out of the UTM campus to an overall imperviousness of 40% for the 54.2 ha catchment draining to the facility. Various building expansions and planned redevelopment was accounted for when determining the ultimate overall imperviousness in the Master Drainage Plan for this facility.

The proposed new student residence is comprised of approximately 0.38 ha of impervious area, resulting in an increase of 825 sqm of impervious area. It is noted that the scope of work also includes changes to the existing servicing infrastructure in the vicinity of the proposed building. However, these works are not anticipated to increase the area of imperviousness. A Servicing and Stormwater Management Report prepared by WalterFedy in April 2022 has concluded that the existing stormwater management facilities and infrastructure are adequately sized to accommodate this development.

Vehicular Parking

Though founded as a suburban, automobile-oriented campus, the University of Toronto Mississauga has evolved to become a more urban and accessible campus. With the integration of public transit, the growing popularity of ride-sharing, and autonomous vehicle technology on the horizon, a major shift in travel patterns is occurring and will continue to grow at UTM. This shift will support the continued decrease in parking demand. However, over the long term, the campus will continue to rely on a large supply of parking, which will increasingly be provided in parking structures (above or below-grade) rather than surface parking lots.

A portion of the proposed development lies on top of the existing P6 Surface Parking Lot, which will be demolished in full to accommodate the new student residence building. This impacts 21 parking spaces, including two barrier-free spots. The two accessible parking spots will be relocated on Residence Road within the vicinity of Roy Ivor and Oscar Peterson Halls. No other parking is planned for this development. Since the entire UTM Campus is treated as one deed of property and parking is calculated for the entire campus, the proposed development will reduce the total number of surplus parking spots by 19. Visitor, short-term, and other accessible parking will need to be accessed in other lots located throughout the campus. The project will, however, incorporate a layby area for drop-off, food delivery (such as DoorDash and Uber), as well as student move in/out. This is also in response to current challenges faced by OPH to manage food and package delivery to the residence complex.

Bicycle parking

The City of Mississauga has developed a Transportation Demand Management (TDM) Strategy and Implementation Plan that emphasizes the importance of TDM for an urbanizing city. It recommends actions for decreasing vehicle use by increasing the attractiveness of sustainable modes of transportation such as cycling. The city amended its Zoning Bylaw 0225-2007 on January 31, 2023, requiring residential developments with more than 20 dwelling units as well as non-residential uses with more than 1,000 sqm to provide both indoor bicycle parking spaces in an enclosed area with controlled access (Class A) and outdoor bicycle parking spaces in a publicly accessible location (Class B).

Although the City has not requested the project to provide any Class A bicycle parking spaces, the proposed development includes 8 Class B bicycle parking spaces located in proximity to the building's main entrance and in a highly visible area, which benefits from the building's security features.

h) Secondary Effects

- Demolition of existing structures

The Student Housing & Residence Life is carefully managing the operation of existing buildings. The Schreiberwood residences are the oldest requiring the most improvements and renovations. Demolition of Complex G as well as the P6 Parking Lot are required in order to make room for the new proposed student residence, and follows long-term planning and asset management strategies. 36 existing beds will be removed as a result of demolishing Complex G, while reducing the impact on financial flow of Residence Operation.

- Staging requirements

The project will need to account for staging and changes in the Food Services area to accommodate addition of storage spaces allowing to provide food for additional 400 students.

- Impact on other buildings or projects in the sector (noise, access etc.)

  The area of this project is adjacent to UTM residence complexes and relatively close the private non-UTM residences. It will be imperative to control noise and light pollution and comply with various city regulations.

- Parking loss

UTM has carefully analyzed its parking inventory. Parking in P6 if affected will not be replaced as part of this project understanding site restrictions. Note: a large underground parking garage is planned in the new F2 building that is currently in design.

The project must maintain 2 existing Barrier-Free parking spots in the area.

- Impact on Infrastructure Underground Services

During construction, trucks and heavy vehicle movements will affect the Infrastructure Underground Services due to these services are buried close to road surface. The rerouting of the service road will also require services to be investigated and relocated.

- Fire Route

The fire route that serves the Schreiberwood complex needs to be maintained as per Mississauga Fire Department Standards, during and after construction.

i) Schedule

Please refer to the open cover letter for further schedule details.

IV. Resource Implications

a) Total Project Cost Estimate

The total estimated cost for the project includes but not limited to estimates or allowances for:

- construction costs (assuming a lump sum type of tender to qualified general contractors in the month of (date)
- contingencies

- taxes
- hazardous waste removal

    decommission of hazardous substances

    disposal costs for hazardous materials

    release of area (hazardous materials) for unrestricted re-use

- site service relocates (specify)
- infrastructure upgrades in the sector (specify)
- secondary effects
- demolition
- landscaping
- permits and insurance
- Professional fees, architect, engineer, misc consultants (ie. LEED etc.), project management.
- computer and telephone terminations
- furniture and equipment
- miscellaneous costs [signage, security, other]
- commissioning
- donor recognition
- escalation
- Financing costs during design & construction

b) Operating Costs

Please refer to the in-camera cover letter for further details on operating cost estimates.

c) Funding Sources

Please refer to the cover letters for further details on funding sources.

I. Appendices

1) University of Toronto Policy Statement of Energy Efficiency PPR New Project Charter
    a) Charter
    b) 100% CD Energy Report

New Construction Project Charter

Input Cells

PPR Form

Project Characteristics

Project Name	UTM New Student Residence (2019)
Proposed Occupancy Date	2022-2026

Programming Breakdown

Categorize the project's programmed areas as net assignable floor area ("NASM") into the appropriate use-types, following the descriptions provided below. Apply multipliers as appropriate to reach the total anticipated gross floor area ("GSM") of the project. When all space uses have been assigned, the total NASM and GSM should align with the PPR.

Space Use Types	NASM (m2)	Multiplier	GSM (m2)	Notes
Residence Space - including living quarters, amenity and common spaces, laundry rooms, etc.	5,622.9	1.7	9,558.9	Residential Space; Common Rooms; Vending Machine
Retail Space - including sales area, kitchen, dining/seating area, servery, etc.	0.0	2.0	0.0	
Athletic Space - including exercise rooms, gymnasiums, change rooms, lockers, multi-purpose rooms, etc.	0.0	2.0	0.0	
Wet Laboratory Space - laboratory and lab support/storage spaces that have high ventilation exhaust requirements and high equipment power density.	0.0	2.0	0.0	
Dry Laboratory Space - laboratory and lab support/storage spaces that have high equipment power density but no ventilation exhaust requirements.	0.0	2.0	0.0	
Office Space - including staff, faculty & grad offices, and associated areas	192.0	1.7	326.4	Office and support areas: Server & Communications
Academic Space - including classroom and lecture, meeting rooms, multipurpose academic spaces, etc.	555.0	1.7	943.5	Academic and support areas; Student Space; Study Space
All Other Areas - any space not attributed above	0.0	2.0	0.0	
Total (m2)	6,369.9		10,828.8	

Connected to District Energy?	No

Performance Targets

Total Energy Use Intensity	74.7	ekWh/m2/yr
Greenhouse Gas Intensity	4.9	kg CO2e/m2/yr
Heating Thermal Energy Demand Intensity	30.6	kWh/m2/yr
Cooling Thermal Energy Demand Intensity	20.3	kWh/m2/yr
Indoor Water Use Reduction	50%	
Outdoor Water Use Reduction	60%	
On-Site Renewable Requirements	if any	

Charter Agreement

Name	Role	Initials	Date

University of Toronto Mississauga
South Residence Hall

Project Charter Compliance
Recommendations Memo

Prepared by:

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February 13, 2024

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LIMITING CONDITIONS

This report has been prepared for Montgomery Sisam Architects to provide estimated energy performance of the proposed building design for Construction Documentation stage. The analysis and the results present the estimated, annual energy use for the proposed building design. The proposed design calculations are applicable only for determining compliance with the targets set by the University of Toronto. Energy performance results are not predictions of actual energy use or costs of the proposed design after construction. Actual experience will differ from these calculations due to the variations such as occupancy, building operation and maintenance, weather, process loads estimations, and precision of the calculation tool.

1. PROJECT OVERVIEW

A new residence hall is being built at the University of Toronto Mississauga campus. The building with a gross floor area of about 11,300 m^2 includes single and double occupancy dorm rooms, study rooms and common areas, conference rooms, a music room, and an event space.

The intent of this modelling exercise is to present the results from the energy model along with the input assumptions for the model to determine pathways for the building to meet the performance targets set by the project charter with recommendations for interventions to the current design. The energy model was used to study the thermal heating energy demand and the total energy use of the building, and the impact of various design parameters such as air tightness, wall insulation, and glazing specifications. In addition to this, the energy model was used to study a rooftop photovoltaic system and its impact on the total energy use intensity (TEUI) and greenhouse gas intensity (GHGI) of the building.

The energy performance thresholds set by the university for this building typology and configuration are as follows:

- Total Energy Use Intensity (TEUI): 74.7 $kWh/m^2/yr$
- Greenhouse Gas emissions Intensity (GHGI): 4.9 $kgCO_{2e}/m^2/yr$
- Thermal Energy Demand Intensity (TEDI): 30.6 $kWh/m^2/yr$
- Cooling Energy Demand Intensity (CEDI): 20.3 $kWh/m^2/yr$

2. BUILDING FORM

For reference purposes, a 3D rendering of the building in the eQuest 3.65 software is shown in the figure below. The grey portions depict exterior walls, the blue portions depict exterior glazing.

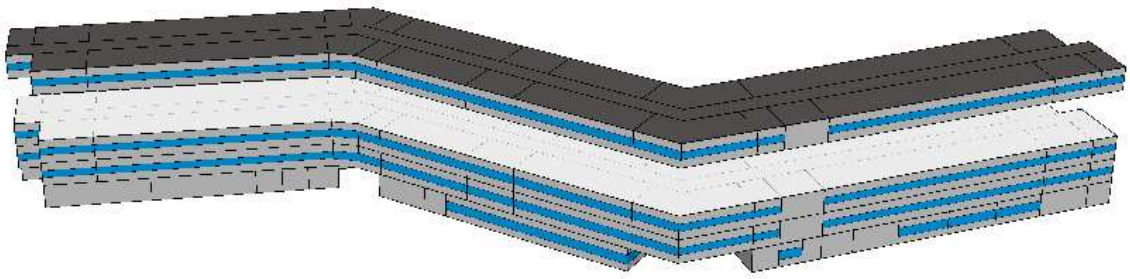

Figure-2.1: 3D Rendering of Energy Model

3. ENERGY MODEL INPUTS

The inputs of the energy model are presented in the appendix.

4. ENERGY MODELING RESULTS

Figure 1 below shows an energy end-use breakdown for the building. Energy in this case has been calculated for the proposed design using as-designed envelope parameters, lighting values, and HVAC systems. The primary energy use metrics for this design case are as follows:

- TEUI: 80.6 kWh/m^2/yr
- GHGI: 3.1 kgCO_2e/m^2/yr
- TEDI: 35.8 kWh/m^2/yr
- CEDI: 18.5 kWh/m^2/yr

These results are based on 100% occupancy from January to April and September to December, with 67% occupancy during the summer (double rooms to be used as single rooms). Energy use is very sensitive to the building's usage patterns, the design team is encouraged to review the energy model input assumptions outlined in Appendix A.

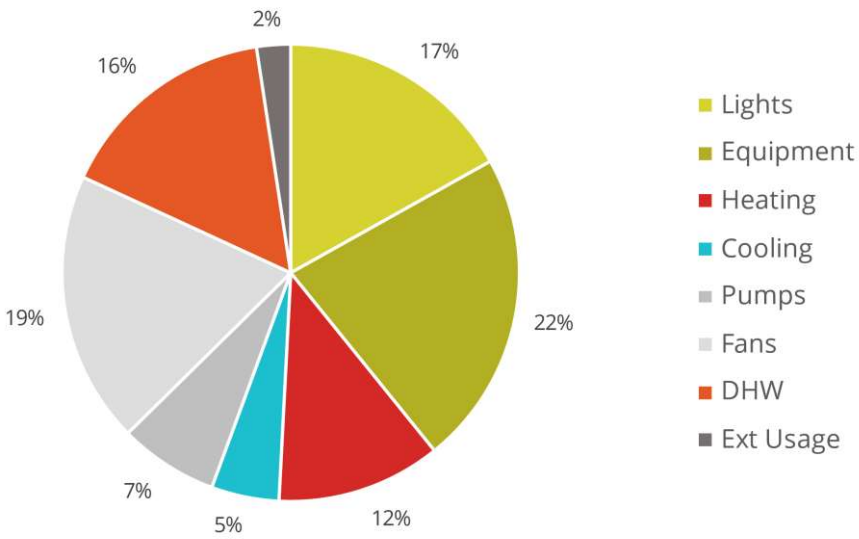

Figure-5.1: Annual building TEUI by end use

Figure-5.1 depicts the primary drivers of energy use in the building. Of the total EUI of 81 kWh/m^2/yr, about 36% is attributable to HVAC energy (heating, cooling, fan energy), 16% is attributable to service (DHW) water heating energy, 22% to equipment energy, and 17% to lighting energy.

5. RECOMMENDATIONS FOR TEDI-H

Introba tested design alternates so that the building can comply with the TEDI-heating target set by the project charter. The following is a list of all the design configurations that meet the threshold along with their respective impact on TEDI-H:

- Passive House air-tightness + R-17.5 (effective) exterior walls: **29.2 kWh/m^2/yr**
    - Whole building infiltration rate of 0.6 ACH as per Passive House standards
    - Exterior walls with an effective R-value of 17.5 (Btu/h- ft^2-°F)$^{-1}$

- R-17.5 (effective) exterior walls + U-0.20 (assembly) glazing: **28.0 kWh/m^2/yr**
    - Exterior walls with an effective R-value of 17.5 (Btu/h- ft^2-°F)$^{-1}$
    - Triple pane glazing with thermally broken frames with an assembly U-factor of 0.20 Btu/h- ft^2-°F and SHGC of 0.25
- Passive House air-tightness + U-0.20 (assembly) glazing: **27.6 kWh/m²/yr**
    - Whole building infiltration rate of 0.6 ACH as per Passive House standards
    - Triple pane operable windows with thermally broken frames with an assembly U-factor of 0.20 Btu/h- ft^2-°F and SHGC of 0.25
- U-0.15 glazing: **27.5 kWh/m²/yr**
    - Triple pane fixed windows with thermally broken frames with an assembly U-factor of 0.20 Btu/h- ft^2-°F and SHGC of 0.25

Additionally, the current design includes non-condensing dryers in the laundry room that require a makeup air unit which contributes to the building's overall TEDI-Heating. Switching to heat pump condensing dyers would eliminate the need for a makeup air unit and allow for a reduction of 1.3 kWh/m²/yr. Selection of heat pump dryers can provide a buffer for TEDI-H in case the targets for envelope upgrades shown above are not entirely feasible from a cost or implementation standpoint.

6. RECOMMENDATIONS FOR TEUI

The design interventions described above provide savings in heating demand and therefore result in savings in TEUI as well. The TEUI that can be achieved by implementing one of the aforementioned measures results in an overall TEUI of approximately 79 kWh/m²/yr. This means that the project requires an intervention that can provide savings equivalent to 79 kWh/m²/yr and the target of 74.7 kWh/m²/yr i.e. 4.3 kWh/m²/yr. This corresponds to about 49,000 kWh/yr.

Introba recommends a rooftop photovoltaic system that can serve to reduce energy use by 49,000 kWh/yr as well as meet the charter's renewable energy requirements of 5% from on-site sources. To generate 49,000 kWh, a rooftop PV system would have to be sized to about 45 kW. This would result in a TEUI of 74.7 kWh/m²/yr and would provide 5.5% of the building's yearly energy from on-site renewable sources.

An array of 45 kW would require about 3,800 ft² of roof area based on preliminary calculations of typical PV throughput and estimations of area required. A more thorough PV study would be required to finetune the estimated array size and area covered. Moreover, of the entire penthouse roof about 5,600 ft² is available for installing a rooftop solar PV system, resulting in a 66 kW system with an annual throughput of about 71,900 kWh/yr. Incorporating additional capacity allows for a buffer to ensure the project charter requirements for TEUI and onsite renewable energy are met.

7. CONCLUSION

The South Residence Hall has a total energy use intensity of 80.6 kWh/m²/yr, a thermal energy demand intensity of 35.8 kWh/m²/yr, and a greenhouse gas intensity of 3.22 kgCO_{2e}/m²/yr. While this does not

entirely meet the thresholds set by the University of Toronto Project Charter, upgrading the building's envelope and installing a rooftop photovoltaic system allow the building to meet the charter's targets.

We trust the foregoing provides the information required at this time. Please do not hesitate to contact the undersigned with any questions or comments.

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8. APPENDIX

The table below provides a summary of the building characteristics for the proposed design that are used as key input parameters for the energy model.

GENERAL PARAMETERS

Location	Mississauga, ON; Canada
Building Type	Residential Dorm | Common Rooms | Community Spaces
Conditioned Area	11,300 m^2
Modelling Software	eQuest v3.65 | DOE 2.3

ENVELOPE PARAMETERS

	Proposed Design
Exterior Walls	Assembly U: 0.071 Btu/h- ft^2-°F [R-14][1]
Roof Construction	Assembly U:0.025 Btu/h- ft^2-°F [R-40]
Windows	Assembly U:0.20-0.28 Btu/h- ft^2-°F; [2] | SHGC: 0.275
Window to Wall Ratio	South: 31%; Southwest: 36%; North: 35%; Northeast: 26%
Slab-on-grade	Vertical exterior R-10 insulation at the perimeter going 4 ft deep
Infiltration Rates	1.0 L/s-m^2 at 75Pa i.e. 0.034 cfm/ ft^2-above grade envelope area at 5Pa

[1] Assuming R-30 nominal insulation.

[2] Double pane glazing performance as per email conversation with MSA dated April 4, 2022.

SPACE LOAD PARAMETERS

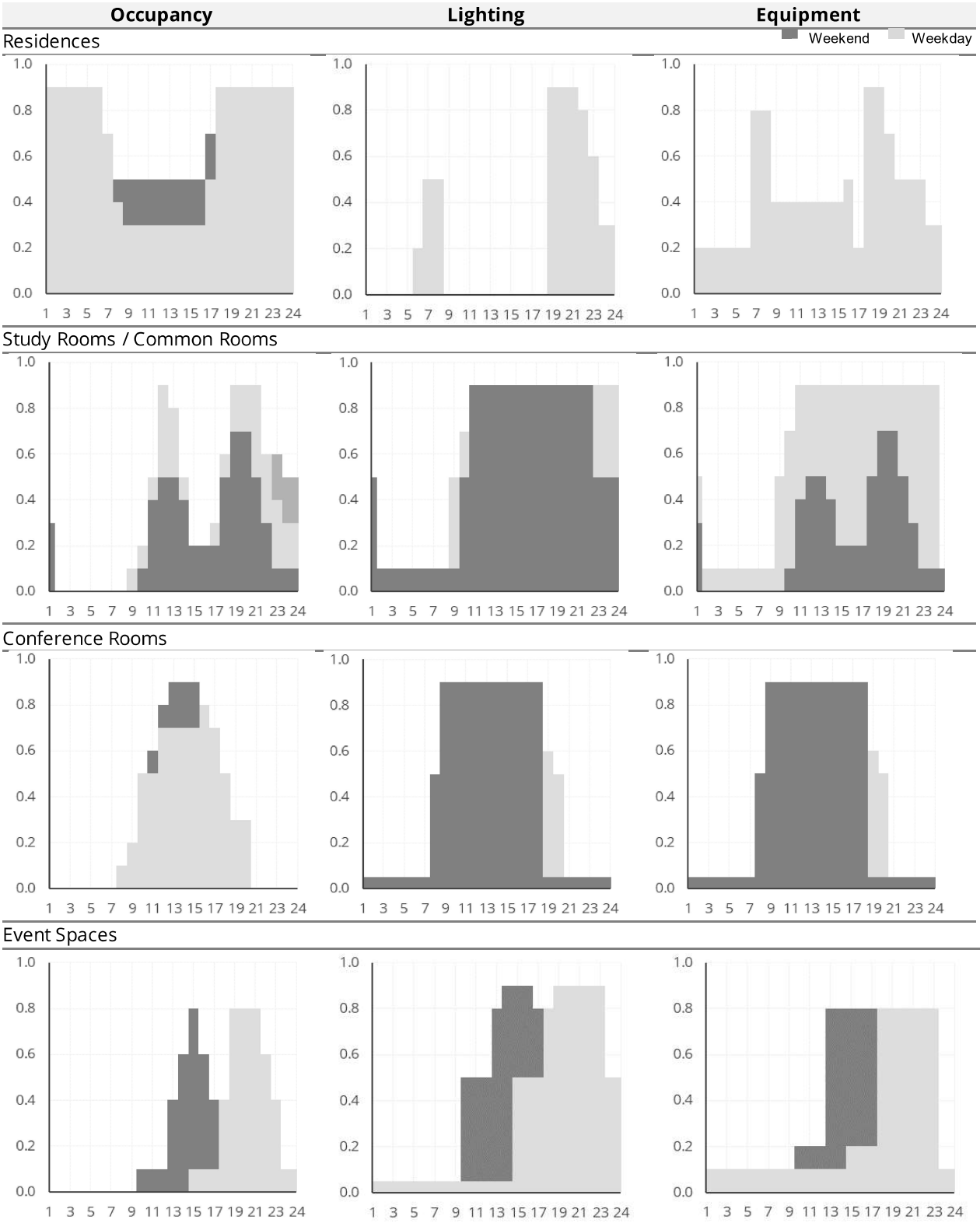
Space Type	Baseline Lighting	Proposed Lighting [1]	Equipment	Occupants[3]	Outside Air
Bedroom	0.36 W/ft^2	0.36 W/ft^2	0.5 W/ ft^2	150 ft^2/pp	18-25 cfm/room
Study Room [2]	1.23 W/ft^2	0.98 W/ft^2	0.5 W/ ft^2	150 ft^2/pp	7.1 cfm/pp + 0.086 cfm/ft^2
Commons [2]	0.92 W/ft^2	0.74 W/ft^2	0.5 W/ft^2	75 ft^2/pp	7.1 cfm/pp + 0.086 cfm/ft^2
Conference Room [2]	1.23 W/ft^2	0.98 W/ft^2	0.5 W/ft^2	25 ft^2/pp	7.1 cfm/pp + 0.086 cfm/ft^2
Event Space [2]	1.23 W/ft^2	0.98 W/ft^2	0.5 W/ft^2	45 ft^2/pp	14.3 cfm/pp + 0.086 cfm/ft^2
Circulation [2]	0.69 W/ft^2	0.55 W/ft^2	-	500 ft^2/pp	0.086 cfm/ft^2
Restrooms	1.21 W/ft^2	0.97 W/ft^2	-	-	0.286 cfm/ft^2
Laundry [2]	0.60 W/ft^2	0.48 W/ft^2	5.0 W/ft^2	215 ft^2/pp	6.3 cfm/pp + 0.150 cfm/ft^2
Music [2]	1.23 W/ft^2	0.99 W/ft^2	0.5 W/ft^2	150 ft^2/pp	6.3 cfm/pp + 0.086 cfm/ft^2
Kitchen [2]	0.92 W/ft^2	0.74 W/ft^2	1.5 W/ft^2	75 ft^2/pp	10.7 cfm/pp + 0.257 cfm/ft^2 | 0.43 cfm/ft^2 KX
Elec/Mech [2]	0.42 W/ft^2	0.42 W/ft^2	-	-	-
Storage [2]	0.63 W/ft^2	0.50 W/ft^2	0.1 W/ft^2	500 ft^2/pp	0.171 cfm/ft^2
IT [2]	0.42 W/ft^2	0.42 W/ft^2	3.0 W/ft^2	-	-

[1] Proposed lighting assumed to be at-least 20% lower than ASHRAE 90.1-2013 LPD values

[2] Ventilation rates based on ASHRAE 62.1-2013 and a ventilation effectiveness of 70%

3 Occupancy assumed to drop to 65% during the summer (double occupancy rooms used as single rooms)

OPERATING SCHEDULES [1]



[1] Occupancy assumed to drop to 65% during the summer - May to August (double occupancy rooms used as single rooms)

HVAC SYSTEM

Zone Conditions	Retail/Amenity: Cooling 75°F (Setback 81°F), Heating 70°F (Setback 64°F) Residences: Cooling 75°F, Heating 70°F Corridors: Cooling 81°F, Heating 64°F
System Type	Decentralized ERVs with CHW and HW coils providing ventilation air to all spaces; Zone four-pipe fan coil units with EC motors for space conditioning; Makeup Air Unit for laundry with electric preheat, CHW and HW coils
Supply Air Temperature	DOA AHUs: 65°F DBT reset up to 70°F | 37-64°F WBT; Humidifier integrated into ERVs Laundry MAU: 75°F Cooling, 65°F Heating
Fan System	Air handling units: VAV, 2.5" TSP Supply, 2.0" TSP Return FCUs: EC motors, 0.5" TSP Laundry MAU: 0.33 W/cfm (30% min flow, Off when unused)
Outside Airflow	ERV 1-8: 19,200 cfm; ERV 9-14: 5,070 cfm; DOAS-1: 2.600 cfm
Outside Air Controls	Economizer: 100% OA economizing up to DOAS capacity based on differential DBT; Energy recovery: Enthalpy wheels, 81% sensible effectiveness, 66% latent effectiveness; Demand controlled ventilation: Zone CO_2 sensors in all common areas
Cooling Source	Chilled water from central utility plant connected to geo-exchange wells; COP: 4.8 (annual average); 42°F Supply | 56°F Return; Reset based on load
Heating Source	Hot water from central utility plant connected to geo-exchange wells; COP: 4.0 (annual average); 120°F Supply | 100°F Return; Reset based on load
Pumps	Hot water pumps (building-level) - 22 W/gpm, Variable speed; Chilled water pumps (building-level) - 22 W/gpm, Variable speed
DHW Source	Hot water from central utility plant connected to geo-exchange wells up to 123°F + Electric boiler top-up to 140°F; COP: 4.0 (annual average) COP | 1.0 Electric boiler top-up

DHW Demand

Number of residents	400
Annual days of operation	365 [1]

Fixture type	Duration (sec)	Flow rate (lpm)	Uses/day	Total Usage (L/yr)
Residential lavatory faucet	60	1.9	5	1,154,000
Residential showerhead	480	6.6	1	6,410,000

Fixture type	Litres per load (L)	Frequency of laundry	Total Usage (L/yr)
Central laundry	53	Biweekly	572,000

[1] Occupancy assumed to drop to 65% during the summer - May to August (double occupancy rooms used as single rooms)

EVALUATION METRICS

GHG Emissions Factor	Electricity: 40 gCO_2/kWh