

Conservation and Demand Management Plan

2024



1385 Woodroffe Avenue, Ottawa, ON K2G 1V8, Canada
T 613.727.4723

www.algonquincollege.com

The Algonquin College of Applied Arts
and Technology

10-Jun-24

Signatures

Approved By



Duane McNair

Vice-President, Finance and Administration

Prepared by



Graham Timperon, C.E.T., C.E.M.

Building Performance Analyst

Reviewed by



Ryan Southwood

Executive Director, Facilities Management



1 CONTENTS

- 1 Executive Summary 3
 - 1.1 Conservation & Demand Management Regulation 3
 - 1.2 College Profile & Goals..... 3
 - 1.3 Energy and Emissions Strategy..... 3
- 2 Completed Energy and Sustainability Projects 4
 - 2.1.1 Energy Incentive Programs 8
- 3 Proposed Energy Efficiency and Sustainability Initiatives 8
 - 3.1 Sustainability and College Curriculum 8
 - 3.2 New Constructions and Design..... 9
 - 3.3 Retrofit and Major Renovations..... 9
 - 3.4 Existing Building Systems 9
 - 3.4.1 High-Performance Sequences of Operation 9
 - 3.5 Energy Use Intensity 10
 - 3.6 Benchmarking and Target Setting..... 11
- 4 Facilities and Utility Delivery Description 13
 - 4.1 Facilities and Location Detail 13
 - 4.2 Utility Delivery 13
 - 4.2.1 District Energy 13
 - 4.2.2 Electricity 13
 - 4.2.3 Natural Gas 13
- Appendix A – Broader Public Sector Energy star Portfolio Manager Submissions..... 14
- Appendix B – Gross Floor Areas..... 20



2 EXECUTIVE SUMMARY

2.1 ENERGY AND SUSTAINABILITY

At Algonquin College, energy is fundamental achieving the College's mission: "To transform hopes and dreams into lifelong success." Energy is inextricably connected to quality of life and learning. In support of this goal, the College has developed an Energy and Emissions Strategy, a Water Strategy, and a Transportation Strategy to support its journey towards the College's sustainability targets.

2.2 COLLEGE PROFILE & GOALS

The Algonquin College Executive Team approved an Energy and Emissions Strategy in 2017. The strategy describes the long-term goals of the College associated with sustainability, energy efficiency and greenhouse gas (GHG) emissions reduction.

In 2019, the College developed its first Conservation and Demand Management (CDM) plan which outlined the current energy and emissions and provided a list of upcoming projects and strategies the College is pursuing to meet its targets and goals. The CDM plans are developed every 5 years and provide the current status of the College's energy and GHG emissions.

The College's Energy and Emissions Strategy was the compass by which a direction was set to establish the College's overall goals while the CDM plan is a snapshot of the where the College currently sits in relation to those goals. This report is the updated version of the 2019 CDM plan and describes the actions complete since that report was issued and the plans over the next 5 years.

2.3 ENERGY CONSERVATION & DEMAND MANAGEMENT

This report is designed to meet Algonquin obligations to the Ontario provincial government's regulation 25/23. The report includes energy consumption and greenhouse gas (GHG) emissions, the campus wide benchmarking initiative, and the completed, proposed, and ongoing energy efficiency projects. The 2024 CDM plan was developed in compliance with the regulation and covers the period from 2018-2023 for energy usage and proposed plans for 2024 to 2029. The 2024 CDM plan was reviewed and approved by Algonquin College's Vice President Finance and Administration.



The table below provides an overview of the College’s energy and emissions profiles in specific years starting with the baseline year of 2005. 2023 is set as the current performance year and is compared against the College’s 2030 goals published in the Energy and Emissions Strategy.

Table 1 – Energy and Emission Annual Comparisons and Targeted Goal

Indicator	Baseline (2005)	2017	2022	Current 2023	2030 Goal	% Reduction to Current Required to Meet 2030 Goal	2050 Goal	% Reduction to Current Required to Meet 2050 Goal
Total Energy Usage (ekWh)	49,319,255	71,637,817	75,088,126	76,741,557	68,000,000	11.4%		
Energy Use Intensity (ekWh/ft ²)	30.3	35.4	27.3	27.9	30.5	-9.4%		
Total (Location-Based) GHG Emissions (Metric Tons CO ₂ e)	9,928	11,875	10,549	11,878	37% (6,250 tCO ₂ e)	47.3%	80% (1,980 tCO ₂ e)	83.3%

The College’s Energy and Emissions Strategy identified a 37% reduction of the 2005 baseline for Total Energy Usage, Energy Use Intensity, and GHG emissions as goals for 2030. The Energy and Emissions Strategy also identified a goal of an 80% reduction of the 2005 baseline GHG emissions with a True North metric of a net zero carbon college, i.e. 100% emission reduction by 2050.

The College’s Total Energy Usage needs to be reduced by 11% to meet the 2030 goal. The College has already surpassed the Energy Use Intensity target for 2030 by 9%.

Currently the GHG emissions per year are 11,878 tCO₂e/year and therefore needs to be reduced by 47% to meet the 2030 goal and is significantly above the 2050 goal. In prioritizing GHG reduction, it's essential to focus on reducing on site natural gas usage since it has a more significant impact on greenhouse gas emissions than electricity in Ontario. A long-term reduction in GHGs is necessary to meet the 2050 target, that strategy is not covered in this CDM plan.

3 COMPLETED ENERGY AND SUSTAINABILITY PROJECTS

The College has actively pursued energy conservation since early 1990 and those efforts are distilled into multiple projects across all 23 of the College’s buildings. More recently, the College has embedded sustainability in its strategic plan and demonstrated leadership by pursuing many green initiatives to achieve its sustainability goals. Through investments in energy conservation, and strategic energy procurement, the College has implemented various technologies and conservation strategies to reduce energy usage and utility costs. While new measures are proposed in this plan, the key elements of the conservation strategy are to maintain and refine the demand management program and continue the financial momentum of retrofit project implementation.

The projects listed below have been completed since the 2019 Energy Conservation and Demand Management Plan was issued. Due to the interactive nature of building systems and previous lack of energy submetering it is difficult to determine the total savings with precision. These projects have resulted in an annual energy use reduction of 5.1 million ekWh since 2019 with an estimated annual financial savings of 10-15%.



1. The implementation of a campus Microgrid control system to monitor, control and improve the campus's energy usage, distributed energy resources and active fuel switching (electricity and natural gas sources). This technology allows the College to control energy distribution more efficiently. The system has full control over each building's domestic hot water systems. Each building can switch between a natural gas fired tank and an electric tank.



Figure 1 Microgrid Geospatial View and Operations Status

The microgrid examines multiple factors and determines which system should operate to reduce GHGs. During the heating season when the thermal output of the COGENs primary heating system, supplied through the Cogeneration engines, is not capable of supplying all the heat required by the campus the Microgrid enables an electric boiler to meet the extra heating load. This strategy reduces the consumption of the tertiary natural gas fired boilers while also preventing excess grid demand at the point of common coupling with Hydro Ottawa. This strategy reduces natural gas consumption and subsequent GHG emissions.



2. Completion of full LED lighting retrofits of the Ottawa, Perth, and Pembroke Campuses in 2019, 2023 and 2024 respectively.
3. Installation of a 500-kilowatt Battery Storage System (BESS) integrated with the Microgrid to reduce demand peak and support load balancing on the campus.



Figure 2 Battery Storage System

4. The College has installed two roof mounted solar photovoltaic (PV) arrays spanning multiple buildings. The current systems are collectively capable of a peak generating capacity of 500 kilowatts (kW). Annually the two existing photovoltaic arrays produce approximately 1000 gigajoules (GJ) of energy per year. The College is in the process of receiving approvals for the installation of a 334 kW PV array on the student residence building and is in the detailed design of 2 new solar PV arrays with an estimated capacity of 100-200 kW.





Figure 3 E Building Solar Photovoltaic

5. The College installed eight Class 2 electric vehicle charging stations in 2023. These charging stations are available for free to everyone who has paid for parking on campus for 3 hours at a time.



6. Beginning in 2024 Algonquin College has started a four-year program of Existing Building Commissioning (EBCx) with the goal to improve the operation of all existing building's operations. The process the College is using is designed to align with the SaveOnEnergy Existing Building Commissioning Program. Typical energy savings from this type of activity are between 5-15% according to Natural Resources Canada.
7. In 2024, the College began installing 25 Variable Speed Drives to improve the operation of the College's hydronic pumping systems. This project will ensure every single pump over 3 horsepower (HP) on the Ottawa campus has a variable speed drive. The hydronic control strategies will be modified to utilize trim and response style control to further reduce energy consumption. This project



was directly funded through the SaveOnEnergy BizEnergySaver Program. Implementation is ongoing, and energy savings cannot be presented at the time of this report.

3.1.1 Energy Incentive Programs

Throughout our sustainability initiatives, the College has applied to various financial incentives from our local utility providers. These include the Independent Electricity Systems Operator’s (IESO) SaveOnEnergy Custom and Prescriptive incentives, Existing Building Commissioning Program, Strategic Energy Management Program, DER Large Solar PV Funding Incentive, BizEnergySaver Program, and the Industrial Energy Efficiency Program. The College works closely with Enbridge to save natural gas wherever possible, receiving funding through their custom incentive program, Hybrid Roof Top Units program, and demand control ventilation program.

4 PROPOSED ENERGY EFFICIENCY AND SUSTAINABILITY INITIATIVES

The College has a multi-faceted approach to sustainability. These strategies are outlined in the Algonquin College Strategic Plan 2022-2025, Energy and Emissions Strategy, Campus Water Strategy, and Transportation Strategy.



Figure 4 Algonquin College Three Pillars of Sustainability

4.1 SUSTAINABILITY AND COLLEGE CURRICULUM

The College has done much more than just offer a handful of ‘green’-focused courses or programs of study. Algonquin College is embedding sustainability in all its Ontario College Credential programs by leveraging existing processes for program renewal or development. The goal to incorporate sustainability into its curriculum came to Algonquin College as it signed its commitment in both the Tailloires Declaration and the Association of Canadian Community Colleges Pan-Canadian Protocol for Sustainability.



4.2 NEW CONSTRUCTIONS AND DESIGN

The Algonquin College embarked on a multi-year campus renewal and expansion initiative involving four new building projects and spanning its three campuses, momentum around sustainability was growing both within the College and in the broader global community. Direction from the College's Board of Governors established the goal of designing all new buildings to the Canada Green Building Council (CaGBC) LEED® (Leadership in Energy and Environmental Design) standard.

4.3 RETROFIT AND MAJOR RENOVATIONS

The College has a detailed review process when approaching any major renovations to ensure the best economic and sustainability systems are integrated with each of the Campus' existing systems. This includes conducting pre-design life cycle costing analysis of proposed retrofit design option strategies. These technologies such as Hybrid fuel Roof Top Units (RTU), implementation and integrations of solar photovoltaic during all roofing reviews and replacements, modernizing zone level controls and review renewable energy sources where available. The longer-term plans of integrating the central heating and cooling system with large air or ground source heat pumps is not part of this report.

4.4 EXISTING BUILDING SYSTEMS

Algonquin College is committed to sustainable building operation and continuous improvement. In collaboration with the College's controls provider, Siemens, College highly trained, on-site controls technicians are implementing controls' strategies to comply with the principles outlined in ASHRAE Guidelines 36-2021. The College has been reviewing the existing Sequence of Operations (SOO) specifically focusing on improving in the following areas of building automation in control strategies:

4.4.1 High-Performance Sequences of Operation

The College emphasizes high-performance sequences of operation for Heating, Ventilation and Air Conditioning (HVAC) systems. These strategies are actively implemented across the College's heating and cooling plants, ventilation, and hydronic pumping loops to improve occupant comfort, reduce energy usage and improve reliability.

4.4.1.1 Functional Result-Based Approach

There has been an ongoing in-house approach to adopt functional testing into the Facilities Management standard preventative maintenance system. Recognizing that there are multiple ways to achieve energy efficiency without significant cost or investment can support the College's long term efficiency goal.

Whether it is sensors, controllers, or control devices, the College prioritizes solutions that enhance building efficiency and ease of operation.

4.4.1.2 Energy Efficiency and Reliability

Algonquin College emphasizes energy efficiency as a core tenet of building automation. The College continually explores innovative technologies to reduce consumption. The control strategies used in the facilities aim to enhance reliability, minimize downtime, and improve overall system performance.



4.4.1.3 Smart Buildings for Sustainability

The rising awareness of sustainable measures and escalating energy costs drives the College toward smart buildings.

The College is integrating building level analytics for continuous monitoring and fault detections through the building automation systems. By integrating automation, dynamic control is achieved over HVAC, lighting, and other systems. These smart buildings adapt to changing conditions, optimize energy usage, and enhance occupant well-being.

4.5 ENERGY USE INTENSITY (EUI)

The current overall Algonquin College EUI of 27.9 ekWh/ft² is below the 2030 goal of 30.5 ekWh/ft². This shows that the College is already using 9% less energy per ft² than the 2030 target. Through the ongoing efforts of management staff and the facilities team the College has been reducing energy usage in a positive downward trend.

The College installed a 4 MW natural gas fired central cogenerations heating and cooling plant in 2017/18. The plant now (2023) produces 70-80% of the Colleges electricity. The College's Scope 1 and Scope 2 emissions are nearly identical to the 2018 levels. There is a direct correlation between how the College has reduced its energy consumption per ft² although not reducing its overall GHG emissions. This is typical of facilities with a central cogeneration plant where natural gas is the primary fuel source used to generate electricity and thermal energy.



Figure 5 Cogeneration Unit #1

The overall goal to reduce by 37% below the 2005 annual GHG levels has not been directly addressed in the College's Sustainability Plan. The College has not begun a program to track Scope 3 emissions, and these have been omitted from this report.



4.6 BENCHMARKING AND TARGET SETTING

The College undertook a campus wide benchmarking initiative with the baseline energy use intensities for each building in 2022 and 2023. The Energy Star Canadian Median Site Energy Use Intensity (EUI) was used as the comparative benchmarking metric for all each building.

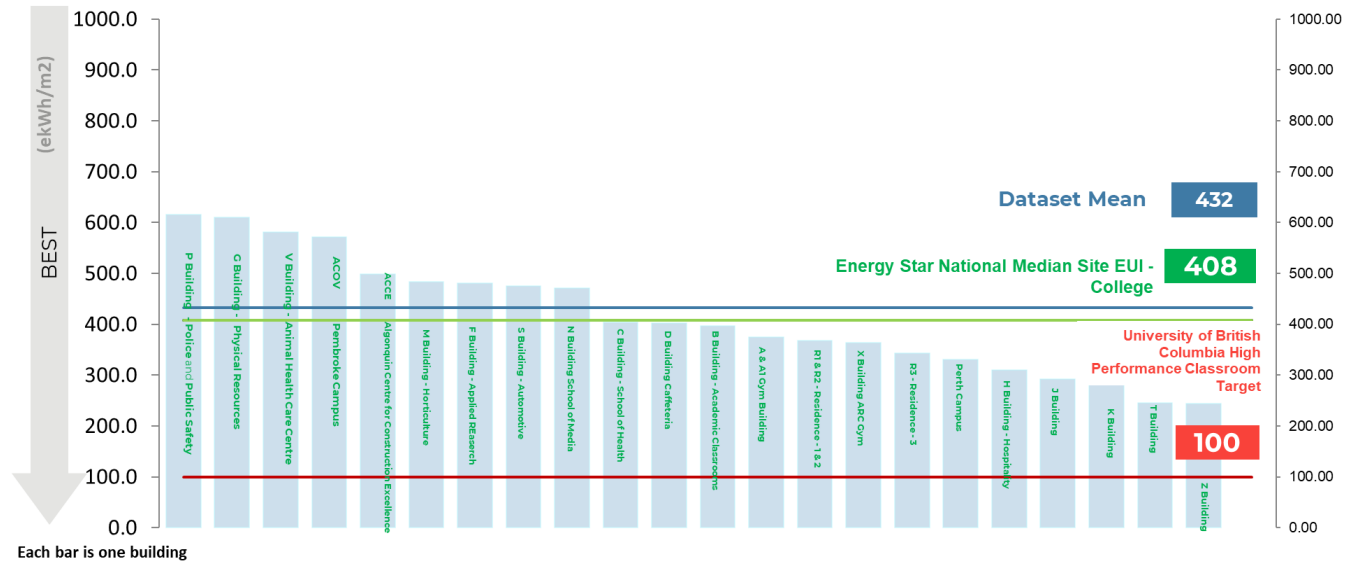
The purpose of this exercise was to compare each building's weather normalized site EUI against the other buildings in Algonquin Colleges inventory and to the industry standard for each building based on its usage type (example: College/University). Assessing the building based on a single primary use type, which closely resembles how it's categorized in reference data surveys will provide the strongest benchmarking comparison. All the buildings in this report were compared using single use type. However, some buildings serve multiple distinct purposes, like a building that contain both an office and a hotel. In such mixed-use scenarios, it's suitable to input multiple use types for accurate benchmarking.



The following figure summarizes the Algonquin College inventory of buildings Source Energy Use Intensity compared to Energy Star Canadian National Median based on building type for 2022. The % Difference from National Median Site EUI – Colleges shows the variation each building has from the Energy Star median based on building usage type. A negative value means it performs better and a positive value means it performs worse than the median.

Figure 6 Algonquin College Total 2022 Energy Use Intensity Benchmark Comparison to Energy Star Canadian Median – College

Algonquin College -Weather Normalized Site Energy Use Intensity



1 eKWh – equivalent kilowatt hour. A unit of energy equal to a load of one kilowatt over the duration of one hour. The "e" in eKWh, short for "equivalent", signifies conversion of other units of energy into kWh. The energy consumption from the COGEN units was allocated between properties using an area weighted average methodology proportional to each building's consumption of electricity and/or thermal BTUs.
 2. The National Median Site EUI are developed by building type by Energy Star.

The summary benchmarking comparisons outlined in Figure 6 are the best available benchmarking summaries currently available. These building level benchmarks should be considered a preliminary benchmarking activity with a second iteration to be developed in August 2024. The purpose of the second iteration is to adapt the building level energy use intensities based on sub-metered data from the recently implemented submetering system at the Ottawa campus.



5 FACILITIES AND UTILITY DELIVERY DESCRIPTION

5.1 FACILITIES AND LOCATION DETAIL

Algonquin’s three owned and active Ontario locations are Ottawa, Perth, and Pembroke.

Location	Address
The Algonquin College of Applied Arts and Technology Ottawa Campus	1385 Woodroffe Avenue, Ottawa ON K2G 1V8.
Algonquin College Heritage Institute – Perth Campus	7 Craig Street, Perth, ON K7H 1X7
Algonquin College in the Ottawa Valley – Pembroke Campus	1 College Way, Pembroke, ON K8A 0C8

5.2 UTILITY DELIVERY

5.2.1 District Energy

The College has a central heating and cooling plant that supplies the Ottawa Campus. This project was completed as part of a collaboration between Siemens and Algonquin College and led to the creation of district energy systems that leveraged a large, centralized plant to distribute heating and cooling to many buildings across the Ottawa Campus. The College produced approximately 14,800 MWh of electricity in 2023. This generation is below the expected annual average due to some component failures during this period and the expected annual production for 2024 is 18-19,000 MWh.

5.2.2 Electricity

Hydro Ottawa provides the Ottawa campus electricity as a Class A customer. The Perth campus is served by Hydro One and the Pembroke campus by Ottawa River Power.

5.2.3 Natural Gas

For the Ottawa campus, natural gas is partially procured through bulk purchase agreements with suppliers by locking up to 80% of the natural gas requirements through long-term contracts while the balance is purchased on the market. Perth and Pembroke are not part of the consortium and purchase natural gas at the market price. *Enbridge Distribution Inc.* owns and maintains the underground distribution lines.



6 APPENDIX A – BROADER PUBLIC SECTOR ENERGY STAR PORTFOLIO MANAGER SUBMISSIONS



Data Request Name:	Data Request: BPS Energy Report Request Template 2022
Response sent:	05/10/2024 04:01 PM EDT
Response includes:	23 properties (see below for property names)
Response sent to:	Ontario Ministry of Energy Ontario Public Service Ontario Ministry of Energy 77 Grenville Street Toronto, ON M7A 2C1
Response sent by:	Graham Timperon Algonquin College 1385 Woodroffe Ave Ottawa, ON K2G 1V8

I Graham Timperon (print name) verify that the properties enumerated below were submitted on the above date to this data request.

Signature: Graham Timperon, CET, CEM Date: 5/28/2024



Properties included in this Response (23)*

Portfolio Manager Property ID	Property Name & Address	Other Property IDs
25046598	ACOV Pembroke Campus 1 College Way Pembroke K8A 0C8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046616	T Building - Advanced Technology Centre 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046625	ACCE - Algonquin Centre for Construction Excellence 1408 Woodroffe Ave Ottawa K2G 0B5	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046635	Algonquin Heritage Institute - Perth Campus 7A Craig Street Perth K7H 1X7	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046639	V Building Animal Health Care Centre 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046655	A & A1 Gym Building 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046666	B Building - Academic Classrooms 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046675	C Building - School of Health and Community Studies 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046679	D Building Cafeteria 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046680	E Building Student Commons 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046686	F Building - Applied Research & Innovation 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046693	J Building - Career & Academic Access Centre 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046699	M Building - Horticulture 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046703	N Building School of Media and Design 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046731	K Building - Early Learning Centre 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75



25046778	H Building - Philip Killeen Hospitality Centre 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046788	G Building - Physical Resources 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046793	P Building - Police and Public Safety Institute 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046803	R1 & R2 - Residence - Phase 1 & 2 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046813	R3 - Residence - Phase 3 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046847	Z Building SA Athletics Sports Field Complex 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
25046855	S Building - Automotive / Transportation Technology Centre 1385 Woodroffe Avenue Ottawa K2G 1V8	Organization: Algonquin College SubSector: College Weekly Average Hours: 75
28995423	X Building ARC Gym 1385 Woodroffe Ave Ottawa K2G 1V8	

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7 APPENDIX B – GROSS FLOOR AREAS

Building	Gross Floor Area ft² (GFA)
CA (ACCE)	206,663
A	336,286
A1 Student Association	20,044
B	209,561
C	234,881
D	40,138
E	150,236
F	13,427
G	14,774
H	70,175
J	63,206
K	11,636
M	15,173
N	57,871
P	99,172
S	54,081
T	130,162
V	10,140
Z	328,245
X	179,133
R1 (Residence 1)	119,676
R2 (Residence 2)	114,060
R3 (Residence 3)	123,877
Pembroke Campus	121,374
Perth Campus	51,405





**The Algonquin College of Applied Arts and Technology
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