2017 CARBON NEUTRAL ACTION OVERVIEW REPORT

THE UNIVERSITY OF BRITISH COLUMBIA
Okanagan Campus

ENVISIONING A SUSTAINABLE FUTURE

UBC is a recognized leader in sustainability and the Okanagan campus has developed leading policies to support and advance the University's long-term goals and BC Provincial Government's Carbon Neutral mandate.

The UBC Okanagan Sustainability Office, Campus Planning and Development was established to help deliver on the campus' 2050 performance goals and carbon neutral commitments. We aspire to integrate sustainability, build capacity and foster leadership across the campus to broaden the impact of sustainability.

Provincially mandated greenhouse gas (GHG) and sustainability reporting for the Okanagan campus is the responsibility of the Sustainability Office, Campus Planning and Development. The 2017 Carbon Neutral Action Overview Report contributes to the UBC reporting submitted to the Climate Action Secretariat. This report provides an overview of the actions taken by the campus to reduce carbon emissions in 2017 and future planned actions to support British Columbia's commitment to reduce the provincial GHG emissions by 80 per cent below 2007 levels by 2050.

SECTION CONTENTS

EXECUTIVE SUMMARY AND DECLARATION

UBC Okanagan continues to make strides toward the advancement of the BC Provincial Government carbon neutral mandate through the implementation of key sustainability policies and actions within the context of campus planning and development. Ongoing building optimization, district energy system expansion and behaviour change initiatives have contributed to a 16 per cent GHG emission reduction as compared to a 2013 baseline. Unfortunately, in 2017, UBC Okanagan's GHG emissions increased by 25 per cent (619 tCO_2e), compared to 2016. This increase is largely attributable to colder than normal weather, which led to an increase in consumption of natural gas and building operational issues that have since been rectified.

Design and early construction of the Commons (Teaching & Learning Building) in 2017 marked the beginning of a new phase of campus growth and development. Designed to achieve LEED® Gold certification and connected to the campus district energy systems, this facility will address the critical need for additional study, collaborative learning and large group lecture space on campus. Joint Federal, Provincial and University investments have enabled the design and construction of the Commons, and have provided critical funding to support a number of sustainability and infrastructure projects, including expansion of the district energy system (DES), a multi-building LDES optimization project, and the upgrade of legacy building equipment.

Looking ahead, UBC Okanagan will continue to take action on multiple, long-term efficiency measures to reduce energy and emission reductions as guided by the Whole System Infrastructure Plan. Among many planned projects, we will be developing a 20-year Campus Scale District Energy (DE) Expansion Strategy to support campus growth and the achievement of a net positive performance in operational energy and carbon by 2050. We are also undertaking the design of two new student housing facilities, which include a mixed-use facility targeted to achieve LEED® Gold Certification and a student dormitory targeted to achieve Passivhaus Classic Certification. Designing these projects for greater energy performance as well as future climate trends will enable us to respond to campus growth needs while ensuring GHG mitigation and campus resiliency over time.

Rob Einarson

Associate Vice-President, Finance and Operations

University of British Columbia, Okanagan campus

DECLARATION STATEMENT

This carbon Neutral Action Report for the period January 1, 2017 to December 31, 2017 summarizes our emissions profile, the total offsets to reach net-zero emissions, the actions we have taken in 2017 to reduce our greenhouse gas emissions and our plans to continue reducing emissions in 2018 and beyond.

By June 30, 2018 UBC Okanagan campus' final *Carbon Neutral Action Report* will be posted to our website: **sustain.ok.ubc.ca**

EMISSIONS AND OFFSET SUMMARY

EMISSIONS AND OFFSET SUMMARY

UBC Okanagan campus GHG Emissions and Offset for 2017 (tCO_2e)	
GHG Emissions created in Calendar Year 2017:	
Total Emissions (tCO_2e)	3,055
Total Offsets (tCO_2e)	3,053
Adjustments to GHG Emissions Reported in Prior Years:	
Total Emissions (tCO_2e)	0
Total Offsets (tCO_2e)	0
Grand Total Offsets for the 2017 Reporting Year:	
Grand Total Offsets (tCO_2e)	3,053

RETIREMENT OF OFFSETS

In accordance with the requirements of the Greenhouse Gas Reduction Targets Act and Carbon Neutral Government Regulation, UBC's Okanagan campus (the Organization) is responsible for arranging for the retirement of the offsets obligation reported above for the 2017 calendar year, together with any adjustments reported for past calendar years. The Organization hereby agrees that, in exchange for the Ministry of Environment and Climate Change Strategy ensuring that these offsets are retired on the Organization's behalf, the Organization will pay, within 30 days, the associated invoice to be issued by the Ministry in an amount equal to $25 per tonne of offsets retired on its behalf plus GST.

2017 EMISSIONS OVERVIEW

GREENHOUSE GAS EMISSIONS

The following greenhouse gas (GHG) emissions have been quantified using the BC Provincial Government's SMARTTool Reporting Framework.

Table 1: GHG Comparison by Source between 2016 - 2017

Source	2016 Emissions (tonnes CO_2e)	2017 Emissions (tonnes CO_2e)	Change from 2016 to 2017
Buildings	2,227	2,842	28%
Fleet	47	49	4%
Paper	64	64	1%
Fugitive	98	99	1%
Total Emissions	2,436	3,055	25%
Total Offsettable emissions	2,434	3,053	25%

**Individual amounts may not sum exactly due to rounding.*

Table 1 demonstrates an absolute campus GHG emission increase of 25 per cent over the 2016 reporting year, which will result in an additional $15,475 in carbon offset costs to the university. As the largest source of in-scope emissions within the UBC Okanagan portfolio, the impacts of this year's emissions increase was largely influenced by the 28 per cent increase in emissions reported by buildings. A combination of environmental and operational factors contribute to this increase, which include building operational systems responding inefficiently to the inclement winter experienced in early-2017. Despite the year-over-year increase, the campus did maintain a reduction trend in comparison to its 2013 baseline. Detailed information on measures implemented to impact emissions over the previous year can be found in the '*Actions to Reduce Emissions*' section of this report.

Carbon Neutral Offsets in 2017

In accordance with the campus SMARTTool reporting and as required by the Greenhouse Gas Reduction Targets Act (GGRTA), offsets required to achieve carbon neutrality in 2017 total 3,053 tCO_2e. As part of the Okanagan campus' 2017 GHG emissions profile, 2 tCO_2e do not require offsets.

[1] *Protocols established in 2016/2017 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions.*

EMISSIONS REDUCTION ACTIVITIES

ACTIONS TAKEN TO REDUCE GREENHOUSE GAS EMISSIONS IN 2017

The following provides an overview of actions and plans reported in the CNAR Actions Form, Section 1.

A. Stationary Fuel Combustion, Electricity (Buildings)

The largest source of in-scope GHG emissions on campus is derived from buildings, which comprised 93 per cent, or generated 2,842 tCO_2e, of in-scope emissions in 2017. The combination of building operational systems working inefficiently during the inclement winter in early-2017 resulted in a higher than normal consumption of natural gas, increasing GHGs by 28 per cent over the previous reporting year. Notwithstanding, UBC Okanagan continued to target emission reduction through the implementation of energy reduction measures including a focus on demand-side energy reduction through ongoing building optimization, routine capital investments, building re-commissioning, and the maintenance and expansion of the district energy system.

ACTIONS:

Academic and Administration Buildings

- In response to the significant increase of natural gas consumption resulting from cold weather affecting building controls in early-2017, staff **completed control sequence upgrades** and began to investigate other actions to avoid this issue in the future. It's anticipated that additional control sequencing upgrades will be completed.
- **Initiated construction of the new Commons building**, which is expected to achieve LEED® Gold certification upon completion.
- **Commenced with the design of two new, sustainable housing developments** which include a mixed-use facility targeted to achieve LEED® Gold certification and a student dormitory targeted to achieve Passivhaus Classic Certification.
- **Installed new Administration Building MUA** - The new kitchen makeup air unit is targeted to reduce natural gas consumption at the expense of increasing electricity by 33,333 kWh; a requirement to support additional cooling due to heat pump use.
- **Upgraded WIFI Occupancy Controls** - This upgrade is expected to save the campus $22,500 per year in heating and cooling costs through the reduction in energy consumption by 850 GJ of natural gas and 170,000 kWh of electricity, resulting in an emission reduction of 43 tCO_2e annually.
- **Completed Supply Air Temperature Reset** - BMS control software was upgraded to set supply-air temperatures based on average heating/cooling valve positions rather than outdoor air temperatures or a fixed setpoint. This upgrade is expected to save $5,800 per year in heating and cooling costs through the reduction of consumed energy by 390 GJ of natural gas and 24,300 kWh of electricity, effectively reducing emissions by 20 tCO_2e annually.
- **Completed Supply Air Pressure Reset** - BMS control software was upgraded to adjust supply-air pressure set points based on the heating/cooling demand in a building. This will allow reduced fan speeds and correspondingly reduced electrical consumption. Savings are expected equal $4,400 in energy through the reduction of electricity consumption by 53,000 kWh per year.
- **Increased Heat Pump Utilization** - Optimization of building supply water temperatures allows existing heat pumps to operate for a larger fraction of the year. Implementation of this strategy is estimated to result in a reduction of natural gas consumption and an increase in electricity use for an annual net energy cost savings of approximately $1,200 and a reduction of 85 tCO_2e in GHG emissions.
- **Completed Lighting Upgrades in Administration and Creative & Critical Studies buildings** – The utilization of combined government funding and FortisBC incentives totaling $247,000 supported the completion of lighting upgrades in the ADM and CCS buildings.
  - **ADM Building** - This lighting upgrade is expected to reduce electricity consumption by 78,000 kWh per year.
  - **CCS Building** - The upgrade completed in the office/classroom wing of the CCS building is expected to reduce this building's energy consumption by 52,000 kWh annually.
- **Continued Campus-wide Fluorescent Tube Lighting Replacement Program** - With approximately 7,000 tube replacements completed to date, the reduction in energy is expected to be over 300,000 kWh of electricity per year, saving the campus an estimated $26,000 in associated costs annually.
- **Completed EME DHW Separation from Main Building Boilers** – To support a more efficient method of heating domestic hot water, a separate dedicated electric water heater was installed in EME. To further increase efficiency, the domestic hot water system was connected to the building's heat pumps to capture waste heat to preheat the domestic water. This system is expected to save $4,000 in energy costs, 1,200 GJ of natural gas, and 60 tCO_2e of GHG emissions per year.
- **Completed construction of cooling plant expansion** – The addition of a cooling tower will increase the air-cooled capacity of the LDES system.
- **Completed upgraded of Science building 3rd floor heating system** – This project is estimated to save the campus $6,000 in energy costs and reduce emissions by 45 tCO_2e per year.
- Replaced the **Mountain Weather Office**'s low-efficient 190kW boiler with two 117kW high-efficiency condensing boilers.
- Implemented Energy Star's Portfolio Manager as a tool for communicating the energy performance of the campus.

- **Completed Building/LDES optimization in Fipke, University Centre, and Arts and Sciences Centre** – The optimization focused on an upgrade of the central plant to a 4-pipe glycol system with hot and cold tanks. A reduction in the winter operating temperatures of the LDES has already been observed as result of the completion of these upgrades.
- **Completed Heating Water Temperature Optimization Project** - The heating supply water setpoints in the Science, Library, Admin and Arts buildings have been programmed to be variable in order to increase the operating efficiency of the buildings' heatpumps.
- **Commenced with Science building ventilation upgrade**.
- Initiated project to fully connect all Science building's Strobic fans to a heat recovery system.
- **Commenced with LDES Optimization project in EME**.
- **Initiated evaluation of the ASC Exhaust Heat Recovery system.**
- **Initiated funding application process to upgrade MDES building heat exchangers in Science, Arts and Gym buildings.**
- **Initiated connection of MDES pipeline between the Central Heating Plant and the Geothermal Building.**
- **Recommissioned HVAC Systems in EME and UNC**
  - EME HRV-4 is now scheduled to run during normal building operating hours; estimated annual savings of 260,000 kWh and 212 GJ of Gas, reducing emissions by 11 tCO_2e.
  - UNC AHU-4 rescheduled to run only during utilized hours; estimated annual savings of 29,700 kWh and 27 GJ of natural gas, reducing emissions by 2 tCO_2e.
- **Continued implementation of the Whole Systems Infrastructure Plan**:
  - Adapted UBC Technical Guidelines for the Okanagan Campus

Residence Buildings

- Completed lighting upgrades in Similkameen
- Completed window upgrades in Kalamalka and Valhalla

B. Mobile Fuel Combustion (Standard and Non-Standard Fleet)

In 2017, fleet vehicles accounted for 49 tCO_2e, or two per cent of the campus' total emissions, an increase of 2 tCO_2e from 2016. The increase in this year's fleet emissions is attributed to a higher usage of on-site operations vehicles used by key operational departments.

ACTIONS:

- **Continued to implement measures to reduce reliance on fleet vehicles** and diverted the number of trips taken by encouraging fleet carpooling, walking or cycling, as well as consolidating off-campus trips.
- **Continued stewardship of sustainable mobile fuel combustion** through adherence to Sustainable Fleet Procedures, replacement of retired fleet vehicles with electric and energy efficient models, and ongoing training and education to support sustainable fleet use.

C. Supplies (Paper)

Emissions from paper accounted for 64 tCO_2e, or two per cent of total in-scope campus emissions in 2017. This demonstrates an increase over the previous year and is attributed to an increased consumption of 30 per cent Post-Consumer Recycled (PCR) paper over 2016 by an additional 291 packages.

ACTIONS:

- **Continued program upgrades**, using a phased-in approach, to remove step down transformers and install power sharing with splice. This project is currently 70-80 per cent complete.
- **Completed pilot of Skype™ for Business**, an alternative web-conferencing software.
- **Completed full integration of PaperCut™** print-tracking software to faculty and departments. This program provides a platform that delivers reports to clients on printing volumes, generates user awareness, and promotes alternatives to printing.
- **Completed review of current printing equipment inventory** for improvements. Recommendations include a reduction in inventory size and replacement of old equipment with new, more efficient machines.
- **Continued to promote the purchase of 30 per cent or greater post-consumer recycled content paper.**
- Continued to ensure wheat sheet paper is available to order from the custom list as an alternative source to tree-derived paper.
- Continued to **increase the use of digital signs** and related communications platforms within buildings to share news, activities and events to reduce the reliance on paper-based promotional materials.
- Continued to **replace desktop computers with laptops** and more efficient devices as part of IT, Media and Classroom Services Computer Replacement Program. IT also began to focus on upgrading devices from spinning to hard drives, which will reduce waste production, power consumption and replacement costs to the University.

D. Fugitive Emissions

In 2017, the campus' in-scope HFC emissions accounted for 3 per cent of total campus emissions, producing 99 tCO_2e. The inclusion of the residences air conditioning unit data contributed to the small increase in emission by one per cent over the 2016 reporting year.

ACTIONS:

- Continued to **replace inefficient and older equipment**.
- Continued to **conduct preventative maintenance and upgrades to HVAC system** and associated appliances.

PLANS TO CONTINUE REDUCING GREENHOUSE GAS EMISSIONS IN FUTURE YEARS

This section describes planned actions across buildings, fleet and procurement in the coming years.

A. Stationary Fuel Combustion Electricity (Buildings)

Academic and Administration Buildings

- Finalize a Five-Year Strategic Energy Management Plan.
- Develop a Campus-Wide District Energy Strategy.
- Finalize development of the new Commons building, which is targeted to achieve LEED® Gold certification.
- Continue process to construct two new, sustainable housing developments on campus, , which include a mixed-use facility targeted to achieve LEED® Gold certification and a student dormitory targeted to achieve Passivhaus Classic Certification.
- Complete Science building ventilation upgrade. This project is estimated to reduce energy consumption by 2,600 GJ of natural gas and 415,000 kWh of electricity, saving the campus $52,000 in energy costs and 131 tCO_2e annually.
- Complete full connection of all Science building's Strobic fans to a heat recovery system.
- Complete Engineering/Management/Education LDES optimization project.
- Initiate and complete Arts & Sciences Centre exhaust heat recovery project.
- Implement project that upgrades the heat exchangers in the Science, Arts and Gym buildings. Upon completion, the campus is estimated save 400 GJ in energy and 20 tCO_2e in emissions annually. (subject to funding)
- Complete MDES/LDES Heat Exchanger Connection Project– Complete connection of MDES pipeline between the Central Heating Plant and the Geothermal Building. An opportunity of this pipeline is that the MDES system could be used to provide heat to the LDES system. This mode of operation provides two main benefits:
  - Boiler B-2 in the geothermal plant is a low-efficiency boiler and is in poor condition. A LDES/MDES connection would replace it.
  - Boilers in the CHP can be made to operate more efficiently with a source of colder return water which can be provided using the MDES/LDES heat exchanger.

  A completed energy study of this system indicated expected savings of over 500 GJ of natural gas consumption, effectively reducing emissions by 25 tCO_2e annually. (subject to funding)
- Continue Peak Load Management Project – As electricity costs for the campus are a mixture of charges for energy consumption (kWh) and peak demand (kW), a reduction of electrical demand at peak times can have significant impacts on campus energy costs. This project is reviewing development and implementation of peak load management algorithms and is currently underway with initial control sequences in place. These sequences will be modified as experience indicates is appropriate. (subject to funding)
- Continue to recommission building HVAC Systems with a focus on:
  - Carbon Dioxide Sensor Calibration – Carbon dioxide sensors are used across campus to ensure occupants receive good indoor air quality (IAQ) by increasing ventilation rates on demand and are slated for recalibration or replacement. Recalibration of sensors that have drifted high and are bringing in more outdoor air than necessary will result in substantial energy savings; and,
  - Cold Weather Operation – Continue ongoing control sequencing upgrades and additional measures to avoid the reoccurrence of increased natural gas consumption by building management systems during colder than expected weather.
- Continue to conduct HVAC System Efficiency Maintenance– An Energy Team HVAC efficiency technician will continue to clean heat exchangers and other campus HVAC equipment; improvements to operational efficiencies is expected.
- Continue to implement the Whole Systems Infrastructure Plan recommendations, including:
  - Establishment of the Okanagan campus' Greenhouse Gas and Energy Reduction targets;
  - Continual implementation of re-commissioning efforts on campus that improved existing building operations;
  - Updates to UBCO's Design Guidelines, Technical Guidelines, and Project Design Briefs with guidance for energy performance of new construction and energy efficient systems;
  - Set up and start research for development of strategic Embodied Carbon Framework and include recommendations in UBCO's Design Guidelines;
  - Commission students to conduct background studies: summer/winter occupancy, lab energy reduction opportunities, electrical demand, night/weekend shut-downs; and,
  - Aspire to establish a revolving fund to finance ongoing energy improvements. This fund could be established from savings gained from the implementation of electrical and demand-side savings measures.

Residence Buildings

- Replace makeup air equipment in Similkameen
- Complete a full review of automation in residence buildings
- Review timing and schedule for Monashee building's hot water tank replacement
- Continue to complete lighting upgrades on a failure-based requirement

B. Mobile Fuel Combustion (Standard and Non-Standard Fleet)

- Continue to implement measures to **reduce reliance on fleet vehicles** and divert the number of trips taken by encouraging fleet carpooling, walking or cycling, as well as consolidating off-campus trips.
- Continue **stewardship of sustainable mobile-fuel combustion** through adherence to Sustainable Flee Procedures, replacement of retired fleet vehicles with electric and energy-efficient models, and ongoing training and education to support sustainable fleet use.

C. Supplies (Paper)

- Commence with project to **reduce the printing equipment inventory** and **replace older inventory** with new, more efficient machines.
- **Complete campus-wide launch of Skype™ for Business**, an alternative web-conferencing software.
- Initiate the awareness and **alternative options to printing programs** through the PaperCut™ print-tracking software. The software provides a platform that delivers reports to clients on printing volumes, generating awareness and promoting alternatives to printing.
- Continue to **promote the purchase of 30 per cent or greater post-consumer recycled content paper**.
- Continue to ensure wheat sheet paper is available to order from the custom list as an alternative source to tree-derived paper.
- Continue to **increase the use of digital signs** and related communications platforms within buildings to share news, activities and events to reduce the reliance on paper-based promotional materials.
- Continue to **replace desktop computers with laptops** and more efficient devices as part of IT, Media and Classroom Services Computer Replacement Program. In addition to replacement program, IT is also focusing on upgrading devices from spinning to hard drives, reducing waste production, power consumption and replacement costs to the University.
- **Continue program upgrades**, using a phase-in approach, to remove step down transformers and install power sharing with splice.

D. Fugitive Emissions

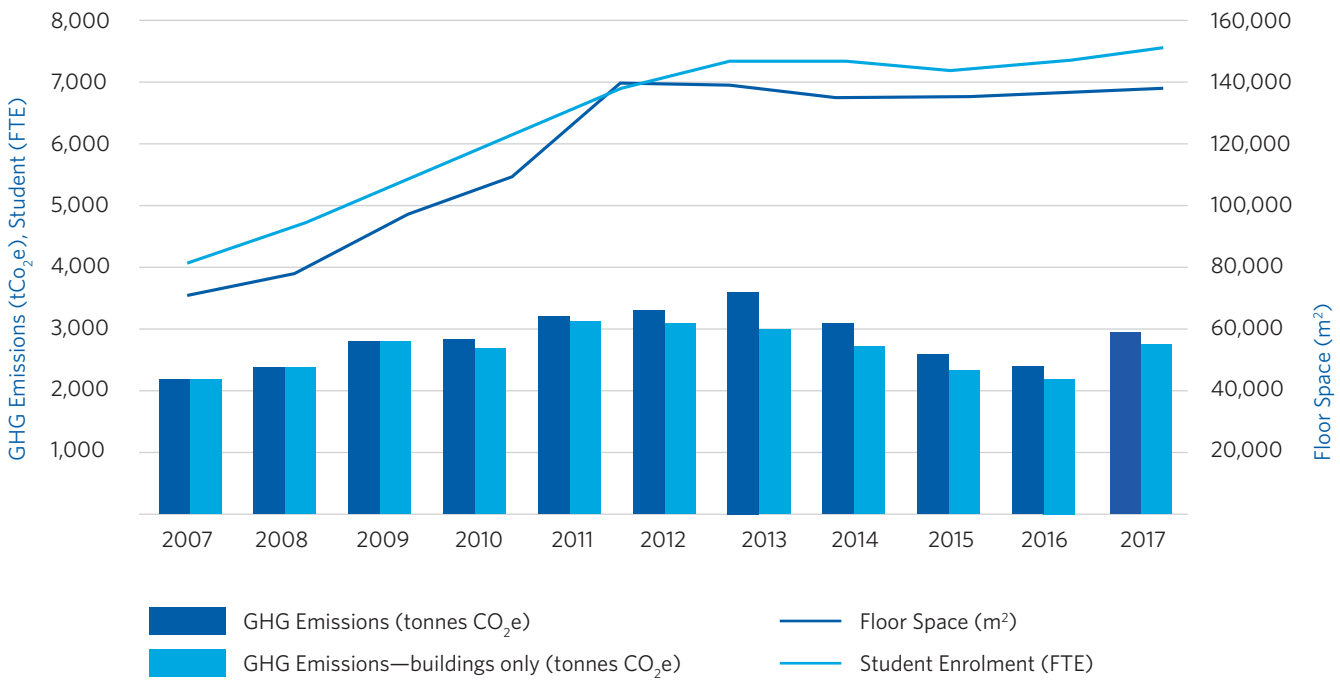
- Continue to **conduct preventative maintenance and upgrades to HVAC system** and associated appliances.

EMISSIONS IN GREATER DETAIL

COMPARISON TO BASELINES

Figure 1 provides a comparison of absolute campus and building emissions since 2007 relative to the growth in floor space by 97 percent and student FTEs by 96 per cent in 2017. Despite the continued growth of the campus and increase in this year's absolute carbon emissions, GHGs have been tempered since the campus' 2013 build-out. Factors contributing to the mitigation of carbon emissions include the successful implementation of energy conservation measures initiated following 2013 that includes building optimization and behaviour change programming and continual investment into the district energy system's infrastructure and operation, which significantly reduces the campus' reliance on gas-fired heating equipment. The deviation from the reduction trend demonstrated over the previous three years is attributed to the adverse reaction building management systems had to the inclement weather in early-2017. A cold weather response project was initiated to address this year's increase in natural gas consumption. Ongoing control sequencing upgrades and additional measure implementation will be conducted to avoid a reoccurrence of this building management systems response to colder than expected weather in the future.

Figure 1 Absolute GHG Emissions Relative to Growth: 2007-2017



ABOVE AND BEYOND:
Promoting a Culture of Sustainability

INTEGRATING SUSTAINABILITY IN CAMPUS PLANNING

Whole Systems Approach to Sustainability Planning

Completed and endorsed by the UBC Okanagan Executive in 2016, the UBC Okanagan Whole Systems Infrastructure Plan (WSIP) was developed in parallel to and in support of the UBC Okanagan Campus Plan (2015). Departing from the traditional system-by-system infrastructure planning approach, the WSIP employs a whole systems approach that views the entire campus as an integrated set of systems. It establishes a long-term roadmap and implementation framework for future infrastructure needs and environmental stewardship to support sustainable campus growth, community well-being and ecological resilience.

In 2017, the Plan's implementation yielded the following achievements:

- Completed an Integrated Rainwater Management Plan (IRMP);
- Optimized District Energy Servicing Infrastructure;
  - Commenced expansion of the District Energy System (DES) loop from geo-exchange building to the Central Housing Plant at the south end of campus
- Continued implementation of the Conservation Awareness and Action Strategy, targeting energy conservation and carbon reduction;
- Updated sections of UBCO Technical Guidelines; and,
- Developed Project Design Briefs for new capital projects with guidance for energy performance of new construction and energy efficient systems.

2050 WHOLE SYSTEMS SUSTAINABILITY GOALS

1. Achieve a net positive performance in operational energy and carbon
2. Implement a framework that supports low embodied carbon in future development
3. Optimize water quality, supply and security
4. 100 per cent diversion of stormwater from municipal systems
5. Strive towards full waste recovery/reuse
6. Enhance and/or restore the site's ecology

ENERGY CONSERVATION

Building Optimization and Energy Management

In response to the WSIP's objectives, a *Strategic Energy Management Plan* (SEMP), was developed and implemented in 2016. The SEMP provides a suite of energy conservation measures targeted to reduce energy consumption and GHG's in alignment with established campus plans and strategies.

Successful projects implemented to-date, as detailed in the Actions section of this report, have started to yield positive results in both energy and carbon reduction. A key project demonstrating significant reductions to the campus' natural gas consumption was the Building/Low Temperature District Energy System (LDES) Optimization project completed in the Charles E. Fipke Centre for Innovative Research (Fipke), Arts and Sciences Centre (ASII) and University Centre (UNC) in late-2017. The optimization focused on an upgrade of the central plant to a 4-pipe glycol system with hot and cold tanks. This project has lowered the fuel consumption by 97 per cent in the Fipke building and 22 per cent in the UNC when comparing Q4 of 2016 to 2017. At a glance, the first quarter of 2018 is projected to report additional reductions of 2,163.2 GJ, or 51 per cent less fuel consumed across all three buildings, reducing emissions by approximately 108 tCO_2e.

An update to the SEMP is currently under development. It will provide recommended measures for implementation to 2023. This update proposes projects that aim to reduce electricity consumption by 500,000 kWh per year and natural gas consumption by 3,000 GJ per year to 2020, then by 2,000 GJ per year from 2021 and beyond.

Campus-Wide Behaviour Change through The Power of You

Implemented in 2017, the *UBC Okanagan Campus-Wide Three-Year Conservation Awareness and Action Strategy* (Strategy) responded the WSIP's recommendation to "[establish] engagement and awareness programs necessary to facilitate conservation-based behaviour on campus by all (faculty, staff, and students)." *The Strategy* evolved from the successful foundation established by the inaugural phase of **Power of You** program. Broadening the scope of the **Power of You** program to include active initiatives and communication-based campaigns, *the Strategy* was designed to impact all performance areas—energy, carbon, waste, water and ecology—and intends to build capacity and encourage voluntary actions by all campus constituents, campus-wide.

Campaigns targeting a broad range of performance areas in 2017 included the 3rd Annual **Campus Lights Out Challenge**, **Carbon 101: Better in a Sweater**, 2nd Annual **Labs: Sort It Out and Power Down**, and **Recycling 101: Recycle Your Empty Coffee Cup**. As a result, these events collected 412 sustainable behaviour implementation pledges from event participants, recorded a 67 per cent reduction in energy consumption by a residential building during Earth Hour, and reported an increase of lab recycling report submissions by 579 per cent and the use of re-usable cups and dishware by 14 per cent over the previous year.

In addition to the above campus-wide initiatives, actions taken by key operational departments in 2017 in response to the **Power of You Lights Out and Power Down** campaigns involved a staff-led audit across academic and administration buildings. As a direct result of the nightly audits, over 5,100 lights and 127 projectors/screens were turned off or powered down and 173 windows were closed at night, contributing to campus energy saving.

In 2018, campaigns will continue to target energy, water and waste performance through a variety of focused communication and engagement activities designed to bring awareness, build capacity and drive action to impact the campus' operational and environmental performance.

ACTIONS TO SUPPORT CAMPUS SUSTAINABILITY PERFORMANCE

Rainwater Managed on Campus

Viewing rainwater as a resource that should be managed at the source, the Okanagan campus completed and achieved executive endorsement of an integrated campus-scale rainwater management plan in 2017. The plan will achieve the continued diversion of 100 per cent of the rainwater from the municipal system through capture, re-use, infiltration and storage. Through responsible management, the plan also sustainably accommodates the future growth of the campus in a way that respects natural hydrological processes, protects existing environmental values, and manages risk.

The IRMP provides a technical guide to manage rainwater on campus through:

- site control and retention storage
- peak flows and volumes for development sites
- planning for future climate impacts
- co-benefits to campus ecology and biodiversity

The IRMP is currently being implemented across major capital projects on campus. Examples include low impact development (LID) measures such as the incorporation of bioswales into the Transit Exchange and Mountain Weather Office parking lot projects. These projects are designed to manage runoff, filter pollutants, offer a degree of temporary water storage and increase rainwater infiltration. Additional LID measures that offer other techniques to filter, store, infiltrate and use rainfall were it lands are under consideration for implementation in future campus projects, including dry ponds and infiltration planters.

Bioswales into the Transit Exchange

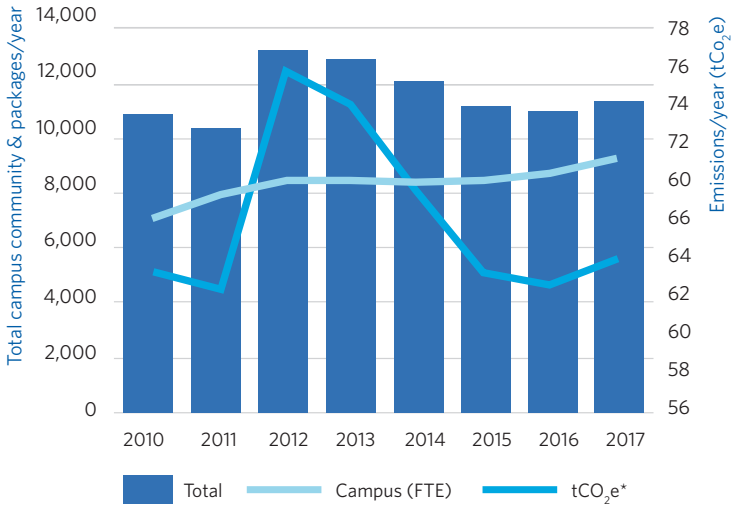
Bioswales into the Mountain Weather Office parking lot

Paper Reduction... At the users' fingertips

The amount of paper purchased by the campus has continued to vary subtly since 2010 despite the continued growth. Through a continued focus to integrate sustainability into all levels of performance areas, the university is committed to taking stronger actions that support the reduction of Scopes 1, 2 and Scope 3 emissions, which includes waste production. In 2017, a full integration of the PaperCut™ software program continued to provide student users with the ability to monitor and measure printing, while permitting faculty and staff the ability to hold printing jobs securely for up to four hours—secure printing requires users to release jobs with a password or tap-to-release function within a set number of hours or the job is deleted. The implementation of this tap-to-release feature enabled the campus to save over 130,000 sheets (260 packages) of paper from printing, effectively decreasing campus printing costs by $18,000.

A full rollout of the PaperCut™ software program's user awareness features are currently under review for implementation in 2018. These features offer user's real-time access to their total amount of paper consumed and the associated costs for all jobs and will provide pop-up printing prompts that can remind users to print double-sided, as well as offer environmental information, such as "Did you know" messaging.

Paper Purchases and GHG Emissions Relative to Growth



By Foot, By Bike, By Bus - Commuting Options to UBC Okanagan Abound

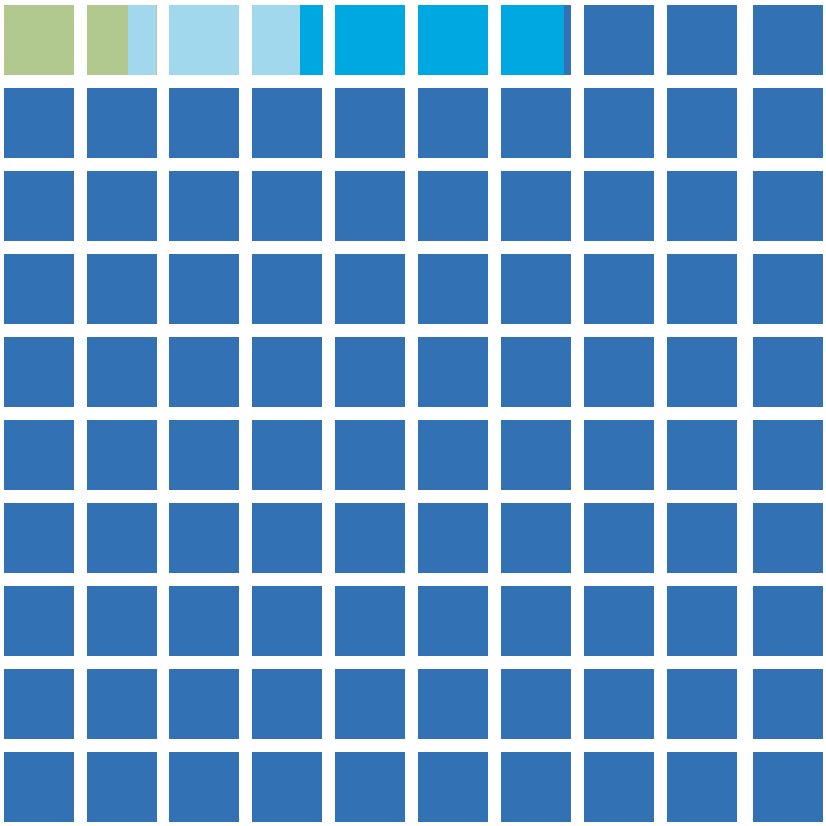
A variety of infrastructure projects initiated in 2017 are part of the exciting development of the Okanagan campus. Projects include the completion of the Transit Exchange, initialization of the John Hindle Drive expansion, and, through the City of Kelowna, access to the Bulman Road cycling and pedestrian route, which intersects with the future Okanagan Rail Trail corridor, planned for 2018 completion.

These projects are expected to increase access to public transit and the campus from the west; support the expansion of the campus' district energy system and implementation of the Integrated Rainwater Management Plan; and, provide additional opportunities to safely and sustainably commute to campus.

Moving ahead, the campus will be initializing the pedestrianization of University Way. Upon completion, this project will provide UBC Okanagan with a welcoming point of arrival, enhance community life and safety, and offer universal accessibility across campus.

GHG EMISSIONS BY SOURCE

UBC OKANAGAN GREENHOUSE GAS EMISSIONS BY SOURCE FOR THE 2017 CALENDAR YEAR (tCO_2e*)



The following greenhouse gas emissions have been quantified using the BC Provincial Government's SMARTTool Reporting Framework.

1.6% 49	Mobile (fleet and other mobile equipment)
2.1% 64	Supplies (Paper)
3.2% 99	Fugitive Sources
93.1% 2,842	Stationary (Building Heating and Generators) and Electricity

TOTAL EMISSIONS: 3,055

OFFSETS APPLIED TO BECOME CARBON NEUTRAL IN 2017

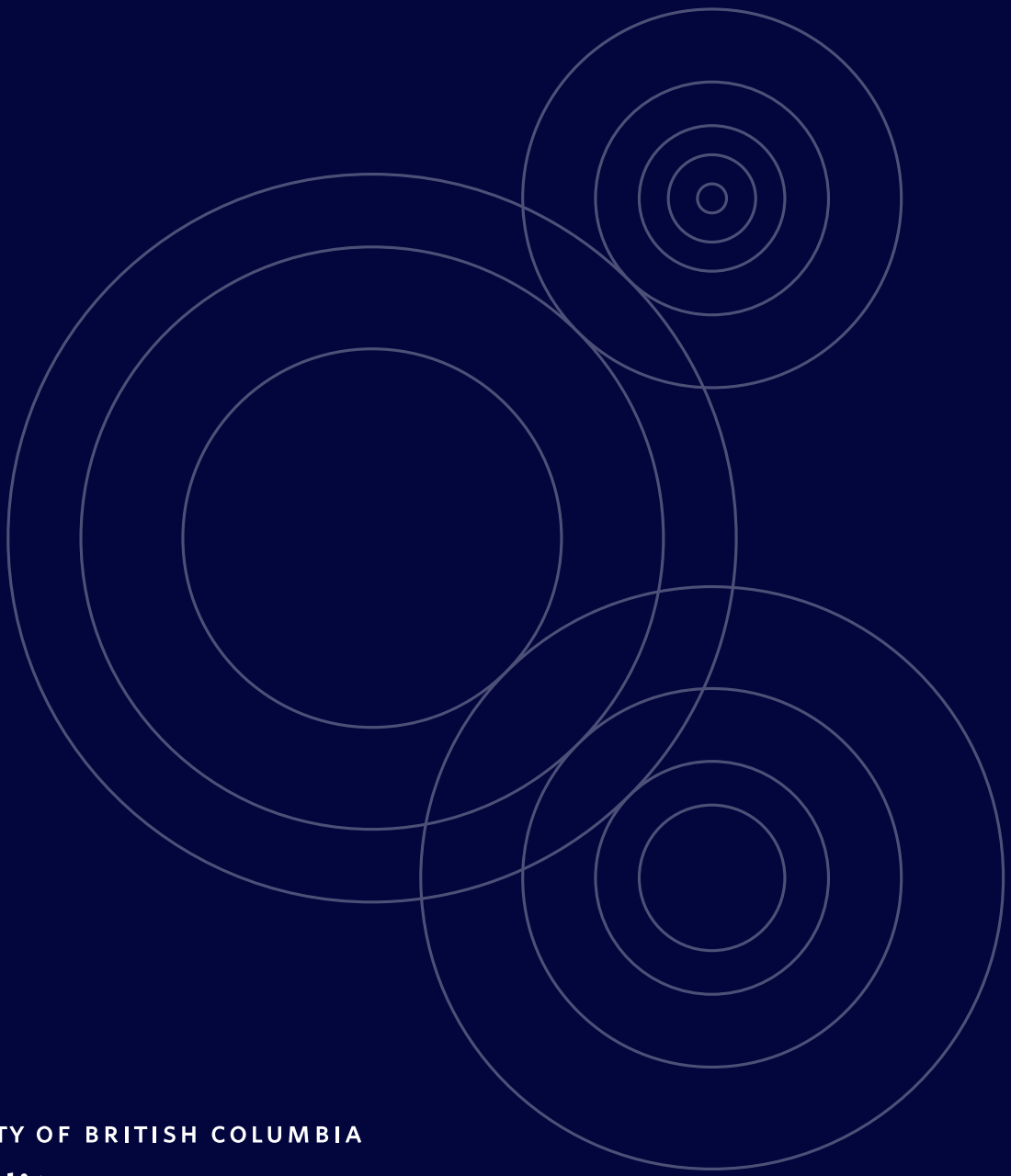
(Generated April 17, 2018 12:28 p.m.)

Total offsets required: 3,053. Total offset investment: $76,325.
Emissions which do not require offsets: 2. **

*Tonnes of carbon dioxide equivalent (tCO_2e) is a standard unit of measure in which all types of greenhouse gases are expressed based on their global warming potential relative to carbon dioxide.

** Under the Carbon *Neutral Government Regulation of the Greenhouse Gas Reduction Targets Act*, all emissions from the sources listed above must be reported. As outlined in the regulation, some emissions do not require offsets.

2017 CARBON NEUTRAL ACTION OVERVIEW REPORT FOR UBC'S OKANAGAN CAMPUS



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