Selkirk College

2009 State of the Environment Report

Derek Marcoux MSc.

Environmental Sustainability Committee

Selkirk College 301 Frank Beinder Way, Castlegar, B.C. V1N 3J1

June 24, 2009

Table of Contents

List of Figures 3
List of Tables 4
Executive summary 5
Introduction 7
Background 7
Methods 8
Indicators 8
Data Collection 9
Summary recommendations and action plan 12
Energy 17
Background 17
Direct energy consumption 17
Indirect energy consumption 19
Renewable energy use 19
Energy conservation 20
Policies and Initiatives 21
Action list 22
Emissions, Effluent, and Waste 23
Background 23
Direct Emissions 23
Indirect emissions 23
Fugitive emissions 24
Effluent discharge 24
Solid Waste and Recycling 25
Action list 26
Transportation 27
Background 27
Energy consumption from logistics related transportation 27
Emissions from logistics related transportation 27
Commuter related transportation 28

College fleet profile 29
Action list 30
Water 31
Background 31
Consumption 31
Impacts 31
Action list 32
Land Management and Biodiversity 33
Background 33
Biological diversity 34
Endangered Species 35
Land Management 36
Protected Areas 36
Action list 37
Products and Services 39
Background 39
Environmental purchasing policies 39
Policies 39
Food procurement 39
Environmental product line purchasing 40
Action list 40
Environmental compliance 41
Background 41
Environmental legislation 41
Compliance 41
Initiatives to exceed legislation 41
Action list 42
Works Cited 43
Appendix I 45
Global Reporting Initiative Indicators 45
Appendix II 47
Sample Interview Questionnaire 47

Appendix III 49
Commuter Survey Questionnaire 49
Appendix IV 52
Commuter survey results 52
Appendix V 95
Land area classification 95

List of Figures

Figure 1. Average natural gas and electricity consumption at the Castlegar campus (2001-2007) 17
Figure 3. Energy consumption per square foot (Joules/sq ft) in owned buildings and facilities in 2008 18
Figure 2. Direct Energy consumption (GJ) at Selkirk College in 2008. 18
Figure 4. Aviation program hangar facility, Castlegar Airport. 18
Figure 5. Average renewable versus non renewable energy consumption at Selkirk College, Castlegar campus for the period 2001-2007. 19
Figure 6. Example of energy loss through the ventilation system at the automotive trades facility, Silver King campus. 21
Figure 7. Direct greenhouse gas emissions (metric tonnes CO_2e) for Selkirk College owned facilities in 2008 calendar year. 23
Figure 8. Effluent treatment centre, Castlegar campus 24
Figure 9. Estimated total recycled materials in 2008 (metric tonnes) 25
Figure 10. Example of recycling of materials through the Trades programs at Silver King campus 25
Figure 11. Total output materials in solid waste and recycling streams in 2008 (metric tonnes) 26
Figure 12. Mobile energy consumption (vehicle travel and aviation program) in 2008 (GJ) 27
Figure 13. Direct greenhouse gas emissions (metric tonnes CO_2) from mobile sources for Selkirk College in the 2008 calendar year 28
Figure 14. Vehicle census data taken from the Castlegar campus parking lot in Winter 2009. 29
Figure 15. Estimated water consumption (m^3) for Selkirk College in 2008. 31
Figure 16. Approximate land area (hectares) by classification for the Castlegar campus. 33
Figure 17. Approximate land area (hectares) by classification for the Silver King campus. 34
Figure 18. Approximate land area (hectares) by classification for the Tenth Street campus. 34

List of Tables

Table 1. Environmental categories used to report for Selkirk College and their relationship to the G3 indicators..... 9
Table 2. Action plan summary for Selkirk College..... 12
Table 3. Historic and planned energy conservation upgrades for Selkirk College. 20
Table 4. Planned energy upgrades at Silver King and Castlegar campuses in 2009..... 21
Table 5. Potential red-listed endangered species that may occur on Selkirk College grounds. 35

Executive summary

The Environmental Sustainability (ES) committee at Selkirk College requested that a report be prepared to benchmark the current status of environmental conditions at the campuses located in Castlegar and Nelson, British Columbia. The Trail campus is included for energy, emissions, waste and general environmental aspects such as transportation. The study at this time does not include Grand Forks, Nakusp and Kaslo locations. This report provides a "state of the environment" benchmark and a list of proposed action items to be followed to the year 2020. A total of seven environmental sustainability indicators were derived based on the Global Reporting Initiative (G3) indicators for the environmental sector. Based on the G3 protocol, environmental indicators and metrics were selected for sectors including: (i) energy, (ii) emissions, effluent, and waste, (iii) transportation, (iv) water, (v) land management and biodiversity, (vi) products and services, and (vii) environmental compliance. Most data were derived based on 2008 calendar year information where possible; however, some data sets were only available as 2007/08 fiscal year.

A total of 56,270 Gigajoules (GJ) of energy were used for stationary heating and air conditioning in 2008. Average consumption per square foot was between 10.5 to 12.5 GJ at the Silver King, Tenth Street, and Castlegar campuses. The highest consumption per square foot was the airport hangar facility located at the Castlegar Regional airport (15.9 GJ). The Mir Centre for Peace is heated by geothermal energy and consequently consumed the lowest level (1.3 GJ). Almost half (44%) of the energy consumed by Selkirk College is derived from hydroelectric energy which is a non-CO_2 emitting source of energy.

Selkirk College disposes of waste water at the Castlegar Campus through its own treatment facility. Waste water is monitored by the Facilities Director and discharges have been within the provincial permit allocation according to records kept at the Ministry of Environment and Selkirk College. Waste water from Nelson and Trail campuses are treated by the City of Nelson and Regional District of Kootenay Boundary respectively.

In 2008, Selkirk College transported 231.5 metric tonnes of solid waste to regional landfills. Almost 18% of the solid waste stream is recycled, including items such as paper, corrugated cardboard, glass, cans, and plastics. Approximately 2.9 tonnes of waste is compost which could potentially be diverted from landfills if a compost recycling program were in place. It is estimated that approximately 45% of the paper purchased in 2008 was recycled.

Greenhouse gas emissions (GHG) from stationary and mobile combustion were approximately 2150 metric tonnes in 2008 from all sources. Stationary emissions primarily from space heating accounted for a total of 2000 metric tonnes. Castlegar Campus emitted the highest amount of GHG at 771 metric tonnes; however, Castlegar Campus also has the largest heated area so this result is not surprising. GHG emissions were almost exclusively from the burning of natural gas in the boiler rooms at each facility.

Mobile GHG emissions include air travel by the fleet of aircraft operated by SelAir in the *School of Business and Aviation*, the college van fleet operated by the *School of Renewable Resources*, and

business-related travel. College aircraft accounted for 55% (82.2 metric tonnes) of CO_2; business travel accounted for 29% (43.7 metric tonnes) of CO_2; and the van fleet accounted for 16% (23.4 metric tonnes) of CO_2. Emissions from commercial aircraft business travel were not included in this study due to difficulties in obtaining data. It was noted that the college fleet of vehicles do not include any vehicles that would be considered fuel efficient such as small cars or electric hybrid.

Water is not monitored at any campus except for the Silver King buildings. Based on per capita water metering from Silver King campus by the City of Nelson, it was estimated that the College consumes over 170,000 cubic meters of water annually throughout its facilities. There are no initiatives for gray water recycling initiatives at Selkirk College.

Selkirk College owns approximately 383 hectares of land in Castlegar, Nelson, and Glade. Most of this land is generally in some sort of native or naturalized vegetation state and is managed by a land use committee comprised of faculty and staff. Invasive plants and all terrain vehicle use are the greatest threats to these lands. Roughly 30% of the land at the Castlegar Campus and 20% of the land at the Silver King campus have been designated as natural and outdoor teaching area according to a recent land use plan adopted in 2007. Several endangered species may potentially inhabit the college grounds; however, no comprehensive surveys have been conducted to date.

There are no specific purchasing policies that take into account environmental sustainability indicators when purchasing products and services. Food purchases form a large portion of the annual products produced and efforts have been made to obtain fair trade food and environmentally sensitive products where economically feasible.

Selkirk College must adhere to one specific waste water disposal permit issued by the Ministry of Environment for effluent disposal at the Castlegar Campus. To date there have been no infractions with the Ministry of Environment, and waste water disposal volumes have been well below the permitted allocation.

While every effort has been made to produce a report with quantitative data, there were many situations where data was estimated based on proxy or per capita values. As such, some inherent errors likely exist which are unavoidable until reliable quantitative data are collected by the Selkirk College using the environmental indicators used in this report.

Introduction

As a leader in post secondary education, Selkirk College is ideally poised to influence a generation of thinking and social behavior related to reducing impact of its operations on the environment. While many explicit outcomes are developed consistently for education purposes, the implicit outcomes such as fostering social change and demonstrating best practices are less difficult to implement and manage. It is imperative, however, that educational institutions not only look after the curriculum content of programs and services but also foster the very best in social behaviour by emulating that behavior throughout the college structure.

Educational institutions in North America and the world are actively pursuing sustainability in all facets of their institutions. The *Association for the Advancement of Sustainability in Higher Education* (AASHE) provides numerous examples of post secondary institutions that are striving to foster sustainability. In western Canada, the University of British Columbia has recently been awarded by the AASHE for their continued improvements in sustainability initiatives. Smaller regional colleges such as Selkirk, have a more difficult time achieving such goals due to less available resources . However these smaller institutions are leveraging off available resources as best they can to follow the leadership of the larger institutions.

This report will benchmark Selkirk College's environmental impacts in areas of energy, emissions, waste, transportation, water, biodiversity, products and services, and environmental compliance. In general the base year of 2008 calendar has been used; however in some situations 2007/08 fiscal year data or 2009 data was needed to complete calculations.

Background

This report was initiated by the *Environmental Sustainability* (ES) Committee at Selkirk College in 2008 as a means to provide a benchmark set of data so that the college can create an action plan to reduce their overall environmental impact. The ES Committee was established in 2007 by Selkirk College to assist with meeting the "Environmental Responsibility" strategic direction listed in the college's mission, vision and values statements. In Spring of 2008, the College Board of Governors also approved the addition of a 6th Strategic Direction: "Sustainability, Towards Selkirk College as a Green College" (Selkirk College, 2009).

The province of British Columbia has taken bold new steps to meeting carbon neutrality through the establishment of the *Greenhouse Gas Reduction Targets Act* (Province of British Columbia, 2007) that requires post secondary institutions to be carbon neutral by 2010 (Province of British Columbia, 2009). As well, the province has set reductions of greenhouse gases to be 33% below 2007 by the year 2020 and 80% below 2007 levels by the year 2050 (Province of British Columbia, 2007). Carbon offsets will be purchased and managed through a new crown corporation called the *Pacific Carbon Trust* which will provide an opportunity for public sector organizations such as Selkirk College to either buy carbon offsets or sell offsets at a rate of $25/tonne (Pacific Carbon Trust, 2009). Carbon offsets are reported as

carbon dioxide equivalent (CO_2e) and includes all or any of carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and any other substance prescribed by regulation (Province of British Columbia, 2007). In the provincial regulations, CO_2e is considered to be the mass of carbon dioxide that would produce the same global warming impact as a given mass of another greenhouse gas (Province of British Columbia, 2007). For example, methane (CH_4) has roughly 20 times the global warming impact as carbon dioxide so one kilogram (kg) of CH_4 would produce approximately 20kg of CO_2e.

In addition to CO_2e, environmental impacts of Selkirk College include many facets of the college operations. Environmental sustainability is just one pillar of sustainability that specifically examines the impacts of goods and services on the environment. This includes energy, emissions, water, materials, solid and liquid waste, and biodiversity. While this environmental report will adequately benchmark the college in order to set goals with respect to the environment, it is anticipated that Selkirk College will also become a leader in reporting all aspects of sustainability and include economic and social indicators in future reports.

Methods

Indicators

The Selkirk College *State of the Environment* report covers environmental performance of the college based on the Global Reporting Initiative (G3) indicators of environmental sustainability for the 2008 calendar year. The G3 environmental guidelines are a globally recognized set of 30 indicators that organizations can use to voluntarily assess their impacts with respect to environmental sustainability (Appendix I). The G3 indicators are one of the most widely used sustainability indicators and have been developed by a group 30,000 stakeholders worldwide.

Since some of the G3 indicators were not necessarily applicable to post secondary institutions the author used them as a template to derive categories for the areas to report on specific to Selkirk College. The categories and their relationship to the G3 indicators are presented in Table 1.

Table 1. Environmental categories used to report for Selkirk College and their relationship to the G3 indicators

Category	G3 Indicator	Specific areas targeted for reporting:
Energy	EN3, EN4, EN5 EN7, EN8	• Direct energy consumption by campus for gas and electric. • Total energy consumption met by renewable energy options (eg hydro versus gas). • Energy conservation efforts that have been achieved by the college and awards that have been received. • College policies to ensure minimal environmental impact with renovations or new buildings (e.g. LEED standards or equivalent). • Initiatives to reduce more overall energy consumption.
Emissions, Effluents, Waste, and Transportation	EN17, EN21, EN22, EN23, EN25, EN29	• Total Greenhouse gas (GHG) emissions • Estimate GHG emissions for commuting by staff and students. • GHG emissions for the college based on logistical related travel. • Total effluent discharge from the college. • College protocol for dealing with environmental spills. • Waste produced by kitchens and cafeterias that can be diverted from landfills (e.g. compost and recyclables). • Potential savings in tipping fees if material can be diverted. • Total impervious surfaces at the campuses and potential impacts on water resources.
Water	EN9, EN10, EN11	• Total water withdrawals in cubic meters by the college. • College initiatives to report on potential environmental impacts of water withdrawals. • Efforts to use recycled or grey water on campuses.
Biodiversity and Land Management	EN12, EN13, EN14, EN15, EN16	• Total fee simple land area owned by the college. • Ecosystem diversity of the college owned lands. • Protected areas managed by the college. • Potential rare or endangered species that may use college owned lands. • Programs used at the college to manage or minimize impacts on biodiversity. • Pesticides currently in use to maintain college grounds and facilities.
Products and Services	EN26, EN27	• Existing purchasing practices at the college to ensure that college resources used have minimal environmental impacts on our supply chain. • Amount of college products that are obtained with minimal environmental impact.
Environmental Compliance	EN28	• Existing environmental legislation to which the college must adhere. • College policies that exist for exceeding the minimal environmental regulation required in the legislation.

Data Collection

Energy data was collected via requests to utility companies for usage reports (Terasen Gas, Fortis BC, and Nelson Hydro) for the 2008 calendar year. All data was calculated in GigJoules (GJ). Natural gas reports provide usage data in GJ and hydroelectric data was converted to GJ by the conversion of 1 GJ = 277.8 kWh (Greenhouse Gas Protocol, 2008).

Site and facility data was collected from key personnel at the various campuses via interviews (Appendix II). Steve Podovennikoff (Director of Facilities) was invaluable in providing information with respect to the past upgrades to the facilities as well as documentation for future upgrades.

Recycling and compost data collection was gathered with the help of two students (Suzanne Fordyce and Jeremy Prahl) both enrolled in the *School of Renewable Resources*. Recycling data was collected in conjunction with recycling staff that sorted and weighed weekly amounts of recycled outputs from the recycling centre at the Castlegar campus. Recycling data was averaged over a three week period to produce a weekly average of recycled materials produced. Data collection for the Nelson campuses was not completed as the collection is much less centralized and therefore it is difficult to obtain adequate sample dates. As such, Castlegar data was used as a proxy and pro-rated based on the headcount statistics provided by Selkirk College (Selkirk College, 2008).

Compost data was collected in conjunction with cafeteria staff at all the campuses. Cafeteria managers directed staff to sort solid waste from compost waste during preparation and students assisted in the cafeterias so that patrons could sort waste for weighing. In general, compost data was collected over a period of about 5 days at each of the main cafeterias. The data collection days were spread out over several weeks and used as proxy for a weekly output of compost from each facility. It was found that five collection days was sufficient as the daily totals were fairly similar for each campus. For both the recycling and compost data, weekly average values were multiplied by the typical instructional weeks in an academic year (28) to derive an approximate metric tonnage of materials produced during peak season use. Future studies will need to take this into account for calculation comparisons.

Direct stationary emissions data was collected from energy reports and empirical conversion formulae provided by the Intergovernmental Panel on Climate Change (IPCC, 2006) and the World Resources Institute, Greenhouse Gas Protocol (Greenhouse Gas Protocol, 2008). Natural gas volumes were converted to Greenhouse gas estimates based on the rate of 56,100 kg GHG/ TJ of natural gas (IPCC, 2006a). Direct mobile emissions data was collected from sources at Selkirk College. Van fleet data for 2008 was gathered by searching in accounts payable files for Shell Canada and tabulating the total litres of gasoline purchased. As well, litres of aviation fuel purchased were gathered from the *School of Business and Aviation*. Staff mileage data was back calculated based on the total payable in mileage to staff for logistics related travel by the Selkirk College finance department in the 2008 fiscal year. To determine total kilometers driven, the mileage payout was divided by $0.49/km. For an estimate of litres of gasoline purchased, an average fuel consumption of 10L/100km was used. All mileage related fuel was assumed to be gasoline for the purposes of estimating emissions. Gasoline emissions were calculated at a rate of 2.34 kg CO_2/litre of fuel and aviation fuel was calculated at a rate of 2.2 kgCO_2/litre of fuel (Greenhouse Gas Protocol, 2008).

In completing the calculations of CO_2e in this report, two assumptions have been made with regard to the combustion of fuel, based on the Intergovernmental Panel on Climate Change (IPCC) recommendations (IPCC, 2006b). Firstly, the combustion of carbon in fuel is assumed to be 100%, which results in roughly a 1% overestimate of the CO_2 emissions from combustion as complete combustion rarely occurs. Secondly, the combustion of non-CO_2 gases (eg CH_4), while having a greater impact as a

greenhouse gas, is so negligible and uncertain that it results in roughly a 1% underestimate of the carbon emissions from combustion. Together, these two assumptions are assumed to negate the need to include non-CO_2 gases in the reporting calculations for fuel combustion such as gasoline (IPCC, 2006b).

Indirect emissions were estimated based on a questionnaire sent to all staff on March 6, 2009 (Appendix III). Sample data was sorted in spreadsheets and used as a proxy to estimate the emissions based on commuting to the college facilities from various points in the college catchment area. Unfortunately, the survey results were not conclusive, therefore estimates of emissions from commuter traffic were not possible.

Land data was gathered by an Integrated Environmental Planning student as part of a term project in IEP 271 (Computer Application II). Land area owned in fee simple by Selkirk College were projected against an orthophoto layer. Land type by classification (forest, urban, impervious substrate) was then digitized in ArcGIS software.

Solid waste data was gathered from account representatives at Waste Management Canada (DiLullo, 2009). Waste Management Canada was able to provide the cubic meters of solid waste and recycled corrugated cardboard picked up at Selkirk College facilities during the 2008 billing year. Volumes were converted to metric tonnes by converting the volume by an estimated conversion value of 52kg m^{-3} for solid waste and 26 kg m^{-3} for corrugated cardboard (DiLullo, 2009).

Summary recommendations and action plan

Table 2. Action plan summary for Selkirk College

Area	Proposed action plan
General	• *Create a part-time sustainability coordinator position (30-40% workload). The position should be closely aligned with the facilities manager and campus managers for efficiency.*
Energy	• *Reduce energy demand 10% by 2010 and 33% by 2020. Begin by completing planned upgrades to boilers, kitchen, and HVAC. Calculate energy saving from upgrades to guide future progress,* • *Create policy that ensures energy conservation is a key priority in all new facility upgrades,* • *Investigate energy options that utilize renewable resources such as geothermal, wind, and solar,* • *Investigate options to incorporate LEED standard building guidelines (or similar) in all future facility upgrades.*

Emissions, Effluent, and waste	• *Reduce stationary CO_2 emissions by 10% for 2010 and 33% for 2020. Begin by completing planned upgrades to boilers, kitchen, and HVAC. Calculate energy saving from upgrades to guide future progress,*
	• *Investigate options to incorporate non-emitting sources of energy for future upgrades at Selkirk facilities (e.g. geothermal),*
	• *Investigate options for gray water recycling from effluent treatment plant at the Castlegar campus in order to reduce the discharge into the Kootenay River system,*
	• *Monitor effluent discharge where practicable at facilities and ensure that only non-toxic substances are discharged,*
	• *Create a cap of paper usage per faculty/staff to encourage paper conservation by:*
	  ○ *Allow faculty and staff to see personal paper consumption through 'print counters' when submitting print jobs to duplicating centres ,*
	  ○ *Synchronize same print counters on standalone duplicators in college office wings,*

Area	Proposed action plan
	○ *Install default two-sided printing on all copiers,* ○ *Encourage digital scanning rather than paper copying on duplicating machines.* • *Increase recycling awareness and availability by:* ○ *Creating a uniform look and feel for recycling centres at all campuses,* ○ *Increasing the presence of recycling centres in hallways and classrooms at all campuses.* • *Investigate compost programs that provide efficient use of compostable waste while minimizing attractants for bears and other animals.*
Transportation	• *Create a "kilometres per semester" cap system per course or activity for van fleet use. Reduce van fleet usage 10% by 2010 and 33% by 2020.* • *Phase out existing van fleet with low emissions vehicles where and when possible.* • *Initiate a program for faculty/staff to report all travel on commercial airlines to calculate emissions. Reduce commercial airline travel 10% by 2010 and 33% by 2020.* • *Provide alternatives for face-to-face meetings by utilizing web-based conferencing or tele-conferencing wherever possible.* • *Investigate funding opportunities to provide efficient web-based conference rooms for the Kootenay region on a rental basis.* • *Create a "litres of fuel" cap system for staff business travel to provide an incentive to drive fuel efficient vehicles. Reduce business travel 10% by 2010 and 33% by 2020.* • *Investigate options to purchase electric vehicles for maintenance staff to use on campus,* • *Allow for off-campus access to server files via ftp or terminal server to reduce commuter related transportation in off hours.* • *Work diligently with B.C. Transit to influence scheduling that may optimize timing of bus arrivals and departures with classes.* • *Create a web-based tool to enhance accessibility to carpool riders linked to the Selkirk College website.*
Water	• *Install water metering at all campuses where not present already.* • *Install water metering for irrigation systems to estimate the amount of water that may be saved*

Area	Proposed action plan
	by conservation. • *Investigate the costs and benefits of installing motion activated sensors in all public taps.* • *Design xeriscaping and native plant usage in all future lawn and garden maintenance programs.* • *Reduce the area of lawn requiring watering by 20% by creating native plant gardens and xeriscaping.* ○ *Use renewable resources students to design, obtain funding, and implement the gardens each year as part of their field school requirements.*
Land Management	• *Complete an endangered species survey of the College owned lands for species that may occur based on the Conservation Data Centre. Utilize faculty expertise where possible.* • *Finalize and update existing ecosystem mapping to ensure a comprehensive accounting of the ecosystem conditions have been met.* • *Investigate land covenant options with organizations such as The Nature Conservancy or The Land Conservancy to ensure land areas are protected in perpetuity.* • *Investigate options to reduce or eliminate pesticide use on all lawns and gardens where practicable.*

Products and Services	• *Re-draft the purchasing policy at Selkirk College to include wording regarding environmental product line purchasing.*
	• *Investigate paper purchasing options from environmentally certified paper products with post consumer recycled content.*
	• *Encourage individuals to drink potable water from taps rather than purchasing bottled water in vending machines,*
	  ○ *Install taps at drinking water fountains so that people can fill re-usable containers with chilled water,*
	  ○ *Create signage to encourage potable water use rather than bottled water.*

Area	Proposed action plan
Environmental Compliance	• *Investigate areas in which Selkirk College could exceed the minimum statutory requirements such as:* ○ *Total water consumption,* ○ *Grey water recycling to reduce wastewater discharge,* ○ *Pesticide use on lawns and gardens,* ○ *Legally protected lands for conservation,* ○ *Emissions from stationary and mobile combustion of fossil fuels.*

Energy

Background

Direct energy includes all "forms of energy that enter the reporting organizations operational boundaries" (Global Reporting Initiative, 2008). This includes the primary sources of energy such as natural gas and hydroelectric energy. For the purposes of this report, direct energy consumption includes energy that is used directly by Selkirk College for heating, lighting, vehicle travel for logistics, and aircraft use in the Aviation program.

Direct energy consumption

Selkirk College uses energy from natural gas purchased from Terasen Gas and hydro based electricity purchased from Fortis BC and Nelson Hydro. Heating of the facilities at the campus is largely achieved by gas fired boilers that force warm air into the occupied space. Hydro electricity is used primarily for lighting and operating electrical devices such as computers, audio/visual equipment, and some electric base board heaters. Energy consumption was averaged over a several year period and is presented in Figure 1. Since natural gas is mostly used for space heating, the usage peaks during the winter months and is quite low during the summer months. Electricity usage is relatively consistent across the year, however June-September tends to be lower likely because of longer daylight hours and less use of the computing facilities by students.

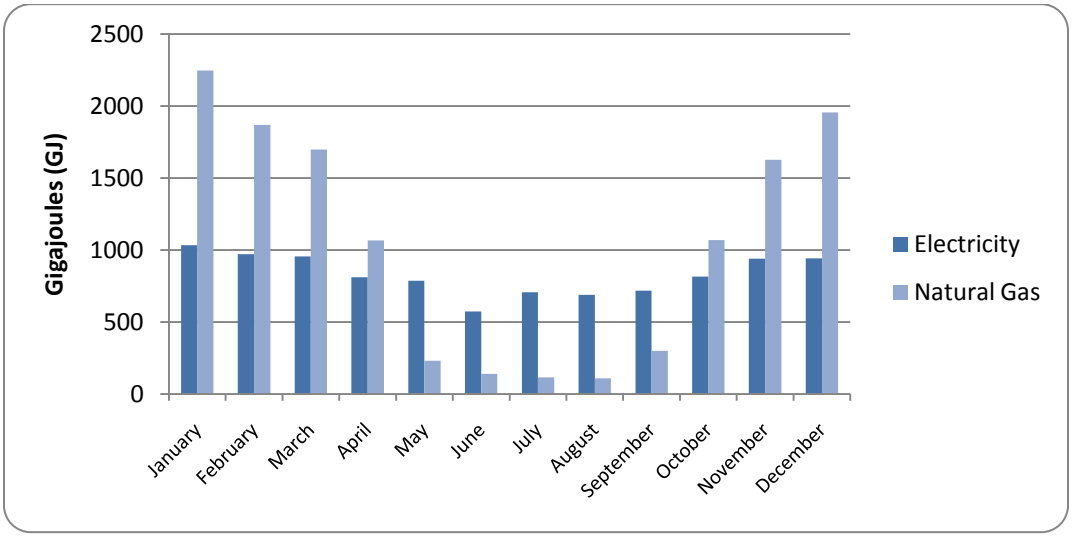


Figure 1. Average natural gas and electricity consumption at the Castlegar campus (2001-2007)

Total energy consumption in all main facilities was approximately 56,270 Gigajoules (GJ) in 2008. The Castlegar campus used the greatest amount of energy for space heating (Figure 2) in 2008 at 23,321 GJ but had relatively similar energy consumption per square foot of building space to the other main campuses (Figure 3). Tenth Street campus, Silver King campus, and the Kootenay School of the Arts (KSA) use relatively similar energy per square foot. The Mir Centre for Peace was renovated in 2007 and geothermal heating is the main heat source for the building. As such, the Mir Centre has the lowest heating usage per square foot compared to the other facilities. However, the Mir Centre has much lower use day to day than other campus facilities so that will play a role in the energy demand as well.

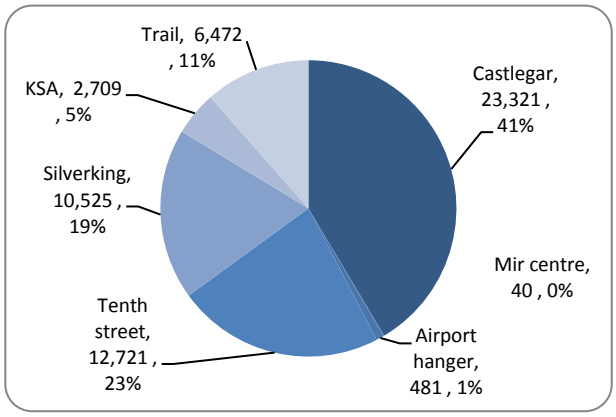


Figure 2. Direct Energy consumption (GJ) at Selkirk College in 2008.

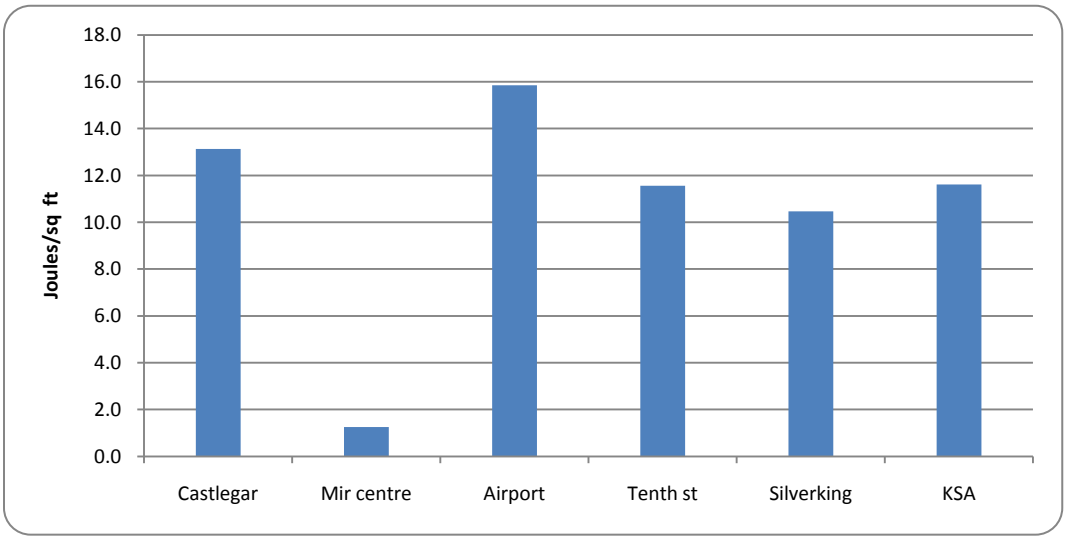


Figure 3. Energy consumption per square foot (Joules/sq ft) in owned buildings and facilities in 2008

Figure 4. Aviation program hangar facility, Castlegar Airport.

The aviation hangar uses a very high proportion of energy per square foot. The aging hangar facility does not have adequate insulation in the ceiling and walls so there is a tremendous amount of energy loss in this building during the winter months (Figure 4). It would be very beneficial to insulate the roof trusses in this structure to minimize heat loss during the winter.

Indirect energy consumption

Indirect energy consumption includes "*the energy required to produce and deliver purchased electricity and any other intermediate energy products that involve significant energy consumption upstream of the organizational reporting boundary*" (Global Reporting Initiative, 2008). The purchased electricity that Selkirk College obtains is solely from hydroelectricity purchased from Fortis BC. Aside from the obvious environmental impacts of large-scale impoundments of water (reservoirs), hydroelectric generation of electricity is obtained with minimal day to day environmental impacts such as emissions.

Fortis BC obtains most of its hydroelectric energy from local sources and may purchase the balance through the BC Hydro Power Authority. There is no practicable way to ascertain how much electricity BC Hydro purchases from sources that would have a significant environmental impact (e.g. coal). Therefore, it is assumed for the purposes of this report that 100% of Selkirk College's indirect energy consumption is from hydroelectricity with negligible day to day environmental impacts.

Renewable energy use

Almost half of the total energy demand for Selkirk College is from renewable energy hydroelectric facilities located on the Kootenay River (Figure 5). In the period 2001-2007 the Castlegar campus used approximately 828 GJ of energy in the form electricity and 1036 GJ of energy in the form of natural gas.

The electricity source is purchased from Fortis BC which uses large-scale river impoundments (reservoirs) to store potential energy behind a hydroelectric turbine system. These systems allow energy providers to "shape" the energy demand by releasing water through the turbines to meet customer requirements. While large scale hydro does have an environmental impact, the main supply of the energy is the water cycle, which is renewable.

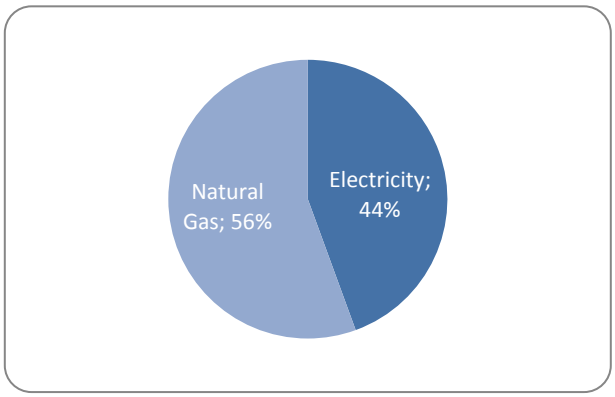


Figure 5. Average renewable versus non renewable energy consumption at Selkirk College, Castlegar campus for the period 2001-2007.
(Source: Terasen Gas, Fortis BC, and Nelson Hydro usage reports)

Renewable energy is also used at the *Mir Centre for Peace* which utilizes geothermal energy from the earth to obtain heating demand for the building. This 3200 square foot building is located about 0.5 kilometers south of the Castlegar campus. Geothermal technology uses a closed loop system buried in the earth to obtain energy from the relative constant temperature in the ground. This energy is converted to heat by a heat pump located above ground.

The non-renewable energy use at Selkirk College is in the form of natural gas which is primarily used to operate the gas-fired boilers to heat the main campuses in Castlegar and Nelson. Selkirk College

purchases their natural gas from Terasen Gas which distributes the product via buried pipelines across British Columbia.

Energy conservation

Since the 1990's Selkirk College's Facilities Department under the direction of Steve Podovennikoff has been proactive with energy conservation at the Castlegar campus and Nelson campuses (Table 3). It is difficult to quantify the amount of savings in energy that these upgrades are responsible for since constant changes in infrastructure, student enrollment, and climate have occurred at the same time. Nevertheless, it is obvious that these upgrades will have substantially saved energy at the college as well as reduced the environmental impacts from greenhouse gas emissions over the past 20 years.

Table 3. Historic and planned energy conservation upgrades for Selkirk College.

Upgrade	Campus	Details
Windows	Castlegar Nelson	• Upgrades to thermal windows at Castlegar campus to save energy loss. • Completed in early 1990's.
Geothermal cooling	Castlegar	• Utilize ground water in a closed loop system to cool the building in the summer • 8°C water comes out of the ground and it goes back at about 11°C. • The water runs through a heat exchanger system and was constructed about 1991.
Geothermal heating	Castlegar	• Mir centre completed in 2006 utilized a closed loop geothermal heat exchange system for all heating requirements.
Data centre air conditioning	Castlegar	• A new installation utilizes a water side economizer that makes use of "free" cooling provided by winter air temperatures below 5°C, • This system saves approximately 60% on the energy consumption when the daily temperature is below 5°C (Oct-April)
Data centre room heat recovery	Castlegar	• Waste heat from the running of multiple computer servers in data centre is redistributed to adjacent offices in the early morning so that the offices are at ambient temperature when the daily heat demand begins for the college
Staff lounge	Castlegar	• Castlegar campus staff lounge renovated and upgraded in 2008. • Renovations included energy efficiency improvements such as removal of an old natural gas fireplace and use of energy efficient lighting.
McCarthy residence	Nelson	• Meetings held in February 2009 to discuss the feasibility of renovating the McCarthy residence building at tenth street campus into a LEED certified building for residence and other uses.
Boiler system	Castlegar Nelson	• Planned upgrades from a provincial grant for the 40 year old boilers in the tenth street, Silver King, and Castlegar campuses
HVAC system	Castlegar	• Current upgrades of 1.7 million dollars to HVAC system in Castlegar will save energy and emissions

Selkirk College has been awarded twice under the Fortis BC *PowerSense Conservation Excellence Award.* In 2007, the college was awarded a $5,000 cash rebate for energy upgrades to the Mir Centre for Peace which included energy efficient lighting, new insulation, and EnergyStar windows. Most importantly, the building utilized geothermal heat pump energy replacing a 100 year old system that had been used in the house since it was originally constructed. In 2008, Selkirk College received another Fortis BC award for energy conservation in the computer facilities data centre room. This initiative makes use of cool winter air to maintain optimal temperatures in the server room. This minimizes the need to run an air

conditioning compressor for as much as 7 months of the year saving roughly $1000 per year on cooling costs.

Additional energy conservation measures could be realized with upgrades at facilities at the Silver King campus. For instance, in the *School of Industry and Trades* buildings staff members noted that energy savings from a heat ventilation recovery system in areas such as the automotive trades and welding areas would be beneficial (Figure 6). Currently, ventilation systems result in heat is being lost through the building and not recovered. A heat recovery ventilation recovery system would allow cool air to be reheated by the outgoing air resulting in less energy loss from the buildings.

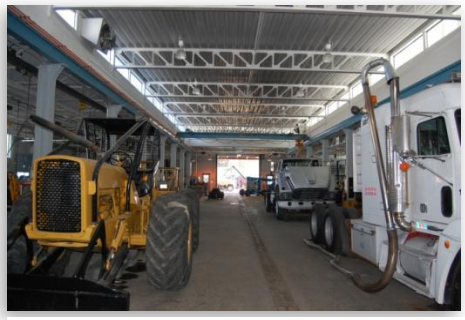


Figure 6. Example of energy loss through the ventilation system at the automotive trades facility, Silver King campus.

Policies and Initiatives

There is no explicit policy at Selkirk College regarding energy conservation. However, the Environmental Sustainability policy makes reference to "incorporate sustainability as a significant priority" and to "seek alternative practices and procedures to minimize the negative impacts of operations" (Selkirk College, 2008). There has been a clear move toward these goals with the initiation of the Environmental Sustainability Committee in 2008 and requesting that the current report be conducted.

In addition, the Director of Facilities has sought out low energy demand lighting during recent upgrades to the Castlegar campus staff lounge and also removed an older high energy demand gas fireplace and replaced with a low energy demand simulated electric fireplace. This addition was mostly done to maintain an ambience in the room for staff and external functions. Overall the recent upgrades to the staff lounge will reduce the energy demand of the college for that facility.

Table 4. Planned energy upgrades at Silver King and Castlegar campuses in 2009

Planned upgrade	GJ saved
Main campus lighting	70.1
Boiler upgrades (Silver King)	2677.9
Castlegar fan upgrades	369.1
% of total (2008) GJ saved	**6.6%**

The college recently received a grant from the Province of British Columbia to conduct energy retrofits with respect to lighting, heat recovery, boiler upgrades, and fan systems at the Silver King and Castlegar campuses (Table 4). The total energy saving is anticipated to be around 3,140 GJ which is about 6.6% of the total energy consumed in 2008.

In February 2009, Selkirk College hosted a brainstorming meeting with a variety of stakeholders in the Nelson area regarding renovations of a 40 year old student residence building located at the Tenth Street campus. Although the recent proposal did not obtain the funding required, it is anticipated that

the renovations could be done to LEED standards in the future and provide a demonstration project for the *Renewable Energy Technology* program and the community.

Action list

- *Reduce energy demand 10% by 2010 and 33% by 2020. Begin by completing planned upgrades to boilers, kitchen, and HVAC. Calculate energy saving from upgrades to guide future progress,*
- *Create policy that ensures energy conservation is a key priority in all new facility upgrades,*
- *Investigate energy options that utilize renewable resources such as geothermal, wind, and solar,*
- *Investigate options to incorporate LEED standard building guidelines (or similar) in all future facility upgrades.*

Emissions, Effluent, and Waste

Background

Direct emissions include "*sources that are owned and controlled by the reporting organization*" (Global Reporting Initiative, 2008). In this context, direct emissions at Selkirk College will include the burning of natural gas for space heating, cooking, science laboratories, and activities in the trades programs. Effluent discharge includes volume estimates for treated effluent from Selkirk College facilities.

Waste includes solid and liquid waste currently land filled as well as total recycled materials outputs based in sampled weights.

Direct Emissions

In the 2008 calendar year, it is estimated that Selkirk College emitted 2000 metric tonnes of greenhouse gases (CO_2e) mostly through space heating. The largest contributor to the emissions of the college was the Castlegar campus with approximately 39% of the total emissions (Figure 7). The Kootenay School of the Arts (KSA) and the airport hangar produced the least amount of emissions; however these two facilities are also the smallest buildings.

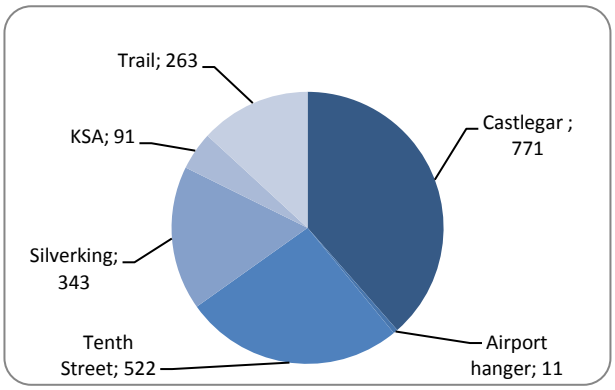


Figure 7. Direct greenhouse gas emissions (metric tonnes CO_2e) for Selkirk College owned facilities in 2008 calendar year.

Heating at the Castlegar campus is completed by burning of natural gas in boilers. These boilers date back to the original construction of the college 42 years ago and are in need of upgrading to improve efficiency. Energy audits completed in 2008 recommended upgrades to these aging boilers to increase efficiency and reduce greenhouse gas emissions (Hennesy, B., 2008). It is anticipated that some of these energy upgrades will be completed soon saving an estimated 190 metric tonnes of CO_2e.

Indirect emissions

Indirect emissions include "*emissions that result from the activities of the organization but are generated at sources owned or controlled by another organization*" and "*includes the greenhouse gas emissions from the generation of electricity, steam, or heat that is imported and consumed by the reporting organization*" (Global Reporting Initiative, 2008).

The purchased electricity that Selkirk College obtains is solely from hydroelectricity purchased from *Fortis BC*. Fortis BC obtains most of its hydroelectric energy from local sources and may purchase the balance through the *B.C. Hydro Power Authority*. There is no practicable way to ascertain how much electricity that BC Hydro purchases from sources that would have significant emissions (e.g. coal). Therefore, it is assumed for the purposes of this report that Selkirk has no indirect emissions as a result of electricity purchased.

Fugitive emissions

Fugitive emissions are defined by the Intergovernmental Panel on Climate Change (IPCC, 2006b) as "*Emissions that are not emitted through an intentional release through stack or vent. This can include leaks from industrial plant and pipelines*." Some reports for greenhouse gas emissions will include an estimate of fugitive emission based on the definition above. There may be some loss through pipelines that transport natural gas to the college, however there is no practicable way to quantify this source. Thus for the purposes of this report, the author decided that this calculation was too uncertain to produce meaningful results.

Effluent discharge

Treated effluent is discharged into the Kootenay and Columbia River system from the college facilities in Castlegar, Nelson, and Trail. The Castlegar campus operates a private effluent treatment centre below the main campus (Figure 8). Effluent is treated in a rotating biological contactor and piped to a settling pond prior to discharge. The sludge from the settling pond is pumped out and taken to the regional landfill every several years. The treated effluent is discharged directly into the Kootenay River near the confluence with the Columbia River. Discharge monitoring devices at the treatment plant have recorded a total or 313,890 m^3 of effluent discharge since 1991 (Podovennikoff, 2009) or an average of 17,438m^3 per year from the Castlegar campus. The existing permit (PE #141) with the Ministry of Environment in Nelson allows 233 m^3 per day discharge with Biochemical Oxygen Demand (BOD) - 45 mg/L and Total Suspended Solids - 60 mg / L.

Figure 8. Effluent treatment centre, Castlegar campus

Effluent treatment in Nelson is completed by the City of Nelson at the Wastewater Treatment Plant located about 10 km west of Nelson. This treatment facility completes secondary treatment which involves am initial screening followed by biological activation and disinfection. The treated effluent is discharged into the Kootenay River. Effluent discharged by the Trail campus follows similar protocols. The treatment of wastewater discharge for both Nelson and Trail are beyond the scope the Selkirk College organization.

Solid Waste and Recycling

Selkirk College contracts two main companies to deal with solid waste and recycling. Solid waste removal is contracted to *Waste Management Canada* (www.wmcanada.com). Waste Management is a proactive company that has an environmental stewardship policy as well as several initiatives in areas such as renewable energy and bioreactor landfills. *New Alta* (www.newalta.com) is responsible for collecting solid and liquid waste primarily from the trades program at the Silver King campus in Nelson. *New Alta* is a leader in recycling nationwide and is able to recycling most petroleum waste into new products that can be re-sold. At the Silver King campus, all liquid petroleum wastes are picked up by New Alta and recycled in their Calgary manufacturing plant in Calgary. The Kootenay School of the Arts also very active in recycling metals and other art supplies in all of its programs.

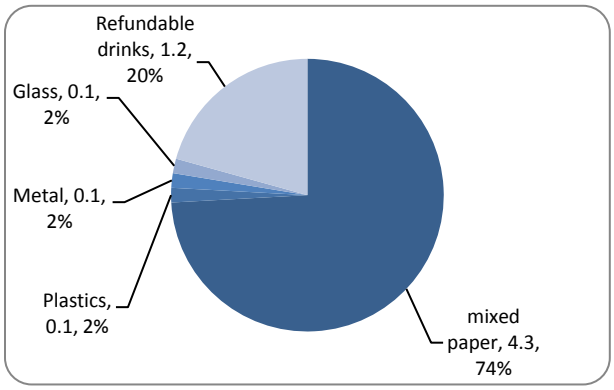


Figure 9. Estimated total recycled materials in 2008 (metric tonnes)

Based on weekly average recycling data collected in 2009, it is estimated that college recycles approximately 5.7 tonnes of goods annually (Figure 9). Mixed paper was by far the greatest amount of weight recycled at 4.3 metric tonnes (74%). It is estimated that the college used about 1.9 million sheets of paper (letter, legal, ledger, and cardstock) in 2008 which equates to about 9.5 metric tonnes based on average ream weight of 2.5 kilograms (500 sheets). With this in mind the college is recycling about 45% of the paper that is purchased.

The college has been recycling drink containers for several years and that amount averages about 20% of total recycled materials. In 2009, the Castlegar campus started to recycle numbered plastics (#1, 2, 4, 5, and 7).

It is important to note that the totals provided do not account for recycled materials the Trades program (Figure 10). Anecdotal observations indicate that a significant amount of solid waste is recycled at Silver King which is not included in the estimates above because weighing the amount of material was not practical.

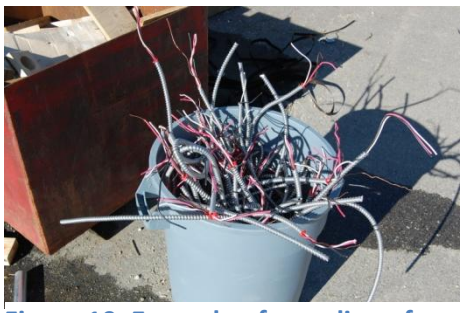


Figure 10. Example of recycling of materials through the Trades programs at Silver King campus

It is difficult to know for certain how much recycled good are being output from the college since there is no standard method for obtaining weekly results. In this study, sample weeks were chosen at the Castlegar campus and average values were pro-rated based on head counts at the Tenth Street, Silver King and Trail campuses (Selkirk College, 2008). The weekly averages were multiplied by a 28 week

academic year since that is when the college produces the greatest amount of waste and recycled materials. This obviously has some error in the data since there is waste produced during the summer months; however, it likely provides a realistic picture of the college output annually.

Solid and liquid waste data was obtained from Sales representatives at Waste Management Canada and New Alta for the 2008 calendar year (Figure 11). Waste Management data is based on the number of site visits to pick up a full dumpster. The estimate provided by Waste Management Canada is that the average weight per cubic yard of solid waste is approximately 52 kilograms (DiLullo, 2009). New Alta recycled approximately 100kg of solid waste (oil filters) and 1,326 litres of waste oil, lubricants, and cleaners from the trades program in Nelson.

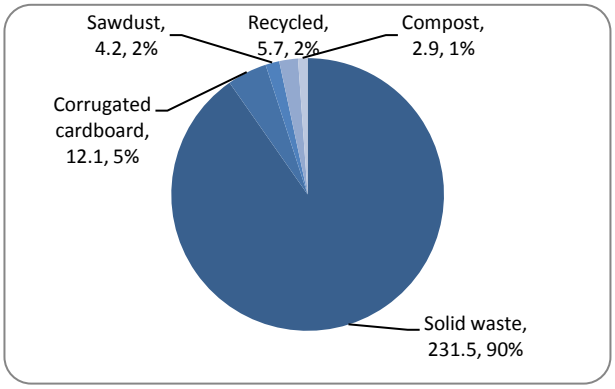


Figure 11. Total output materials in solid waste and recycling streams in 2008 (metric tonnes)

Action list

- *Reduce stationary CO_2 emissions by 10% for 2010 and 33% for 2020. Begin by completing planned upgrades to boilers, kitchen, and HVAC. Calculate energy saving from upgrades to guide future progress,*
- *Investigate options to incorporate non-emitting sources of energy for future upgrades at Selkirk facilities (e.g. geothermal),*
- *Investigate options for gray water recycling from effluent treatment plant at the Castlegar campus in order to reduce the discharge into the Kootenay river system,*
- *Monitor effluent discharge where practicable at facilities and ensure that only non-toxic substances are discharged,*
- *Create a cap of paper usage per faculty/staff to encourage paper conservation by:*
    - *Allow faculty and staff to see personal paper consumption through 'print counters' when submitting print jobs to duplicating centres ,*
    - *Synchronize same print counters on standalone duplicators in college office wings,*
    - *Install default two-sided printing on all copiers,*
    - *Encourage digital scanning rather than paper copying on duplicating machines.*
- *Increase recycling awareness and availability by:*
    - *Creating a uniform look and feel for recycling centres at all campuses*
    - *Increasing the presence of recycling centres in hallways and classrooms at all campuses.*
- *Investigate compost programs that provide efficient use of compostable waste while minimizing attractants for bears and other animals.*

Transportation

Background

In the context of this report, direct transportation involves the use of private or college owned vehicles for business travel, the use of the college van fleet to transport students or staff to events, and the use of the aircraft fleet operated by SelAir in the Aviation program. Transport of staff on commercial airlines was not included in this report due to logistical issues obtaining data.

Energy consumption from logistics related transportation

The Aviation program operates five Cessna 172 Skyhawk and two Beech Travel Aire aircraft. The college van fleet consists of ten-15 passenger vans. In 2008, the aviation program purchased 37,319 litres of aviation fuel and the college van fleet purchased 9,995 litres of gasoline. Business travel consumption was estimated at 18,655 litres of gasoline. Business travel volumes were estimated based on mileage payouts and converted at a rate of \$0.49 km^{-1} and an average fuel consumption of 10L/100km.

Total energy consumed from mobile sources was 2245 GJ (Figure 12) with the dominant energy consumption coming from the aviation program (57%) followed by business related travel (28%).

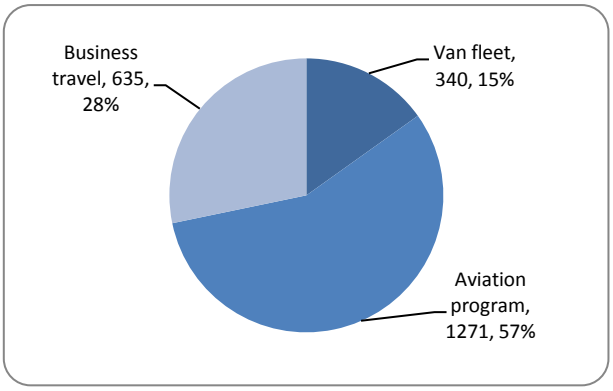


Figure 12. Mobile energy consumption (vehicle travel and aviation program) in 2008 (GJ)

While the Aviation program may be limited in its ability to reduce fuel consumption due to training requirements, it is very possible to reduce the energy consumed by the college van fleet and business travel. Van fleet usage could be reduced by providing a cap per course whereby instructors have mileage limits they are able to use for field related activities. Business travel could be reduced by using web-based video conferencing technology in the future allowing individuals to attend meetings from remote campuses in the area.

Emissions from logistics related transportation

Based on conversion rates for fuel provided by the Greenhouse Gas Protocol (Greenhouse Gas Protocol, 2008), the total college emissions from mobile sources was 149 metric tonnes of CO_2e (Figure 13). Of that total, the aviation program contributed about 55% or 82.2 metric tonnes CO_2e, followed by business related travel (43.7 metric tonnes CO_2e) and the college van fleet (23.4 metric tonnes CO_2e).

The Aviation program is likely quite limited in its ability to reduce emissions due to training requirements for commercial pilots and the specific fuel requirements for aircraft. However, both the

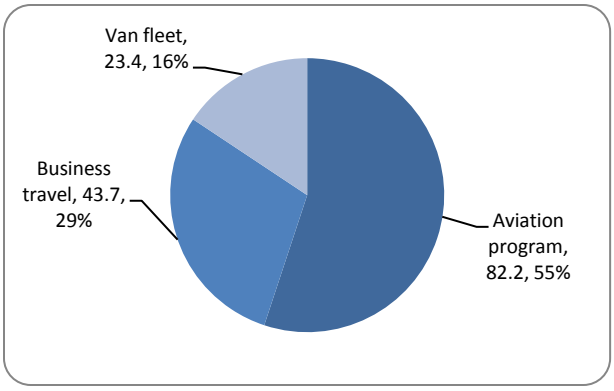


Figure 13. Direct greenhouse gas emissions (metric tonnes CO_2) from mobile sources for Selkirk College in the 2008 calendar year

van fleet emissions and business travel could easily be reduced by conservation and fuel choices. For the van fleet, it is reasonable to consider a greenhouse gas emissions cap based on fuel consumption. This could be organized such that courses or instructors are permitted a certain number of kilometers per year for field activities. As well, the existing van fleet could be phased out and replaced with newer low emission diesel vans when available.

Business related travel could also be reduced by conservation whereby staff would have access to teleconference or video conference technology so that committee and staff meetings travel could be reduced. Choice of fuel is less easy to change since many individuals use their private vehicles for business travel and so there is little direct influence of their personal vehicle choices. However, if staff were given a "litres of fuel" cap per year, this would be an incentive to drive fuel efficient vehicles for college related activities.

Commuter related transportation

A commuter questionnaire was provided to all staff in early March 2009 via college email addresses (Appendix III). No hardcopies of the questionnaire were provided and the questionnaire was voluntary to complete. The complete results from the questionnaire are provided in Appendix IV. It was anticipated that the survey could be used to generate a greenhouse gas emissions profile of the college based on commuter traffic. However, after carefully going through the results it became clear that some questions were answered ambiguously and therefore, the results could not be relied upon to provide a quantifiable result for emissions. Nevertheless, the results provide an interesting benchmark with respect to social trends and vehicle versus public transit usage.

Some key points that the survey results indicated are:

- Over 40% of respondents commute 5 days per week to a college campus and 17% commute 6 or more days per week,
- Twenty-eight percent of respondents commute less than 5 km, 65% commute between 6-50km, and 7% commute over 50km one way,
- Fifty-three percent use a vehicle everyday to commute while less than 1% use the bus every day to commute,
- Over two thirds (65%) use a car to commute to the college; whereas, 26% use a truck or SUV,

- One-third of respondents commute with at least one other passenger, 25% have two passengers, and <4% have 4-5 passengers,
- Roughly two-thirds of respondents indicated that they would prefer to take public transit; however, schedule conflicts, convenience, and mobility were cited as major barriers to the use of busses,
- Respondents indicated that improved access to carpool information would be beneficial,

As well, questions were asked to determine the commuter traffic related to computer usage. Ten percent of respondents indicated that they commute to a college between 5-20 times per semester specifically to access a computer file. It could be assumed that this number would decline if students and staff had remote access to the college computer drives from homes.

Parking lot census data at the Castlegar campus were taken over a ten day period in the winter semester of 2009. Although this does not give a fully accurate sample of vehicle use over the year at all campuses, it does give a good indicator of the typical vehicle usage during peak use on a typical site. The sample period was in late winter and so does not include the amount of people that may commute to the college by bicycle during better weather in the fall and early spring.

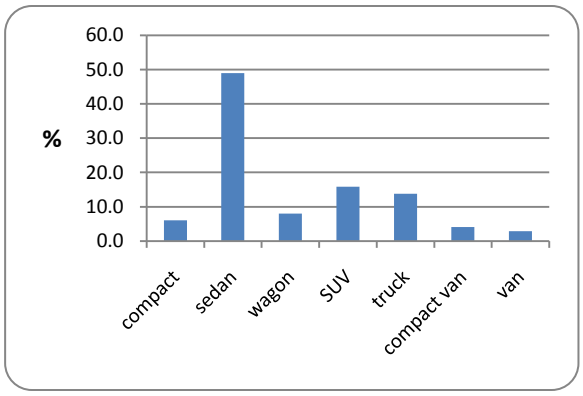


Figure 14. Vehicle census data taken from the Castlegar campus parking lot in Winter 2009.

Mid size sedan type vehicles were the dominant vehicle counted in the parking lots reaching almost 50% the total (Figure 14). Compact vehicles such as Toyota Yaris which generally have the highest fuel economy only made up 6% of the tally. Less fuel efficient trucks and Sport Utility Vehicles (SUV) comprised about 30% of the total. The vehicle demographics presented indicated that the majority of consumers have a preference for smaller vehicles with reasonable fuel economy. It will be interesting to note how this demographic changes over the next several years in response to increasing fuel costs.

College fleet profile

Selkirk College owns approximately 85 vehicles for a variety of purposes. A number of the vehicles are unlicensed and are used solely for training in the automotive program. As well, others are used only on the college grounds and so they are not licensed. Of the 40 licensed vehicles, few would fit the category of fuel efficiency that would indicate a trend toward less environmental impact. Many of the vehicles are used for transporting people such as the van fleet or for moving cargo in which case trucks or vans are needed. However as the fleet ages it is advisable to phase in fuel efficient vehicles such as low emissions diesel. As well, some vehicles are used by maintenance

staff to conduct work within the campus. It may be possible to look at electric vehicles for use on college grounds in order to reduce emissions.

Action list

- *Create a "kilometres per semester" cap system per course or activity for van fleet use. Reduce van fleet usage 10% by 2010 and 33% by 2020.*
- *Phase out existing van fleet with low emissions vehicles where and when possible,*
- *Initiate a monitoring program for faculty/staff to report all travel on commercial airlines to calculate emissions. Reduce commercial airline travel 33% by 2020,*
- *Provide alternatives for face-to-face meetings by utilizing web-based conferencing or tele-conferencing wherever possible,*
- *Investigate funding opportunities to provide efficient web-based conference rooms for the Kootenay region on a rental basis,*
- *Create a "litres of fuel" cap system for staff business travel to provide an incentive to drive fuel efficient vehicles. Reduce business travel 10% by 2010 and 33% by 2020,*
- *Investigate options to purchase electric vehicles for maintenance staff to use on campus,*
- *Allow for off-campus access to server files via ftp or terminal server to reduce commuter related transportation in off hours,*
- *Work diligently with B.C. Transit to influence scheduling that may optimize timing of bus arrivals and departures with classes,*
- *Create a web-based tool to enhance accessibility to carpool riders linked to the Selkirk College website.*

Water

Background

Water consumption in Canada is ranked as being 65% above the average consumption rates provided by the *Organization for Economic Cooperation and Development* (Boyd, 2001). The average daily Canadian water allocation for goods and services is estimated at 1600m^3 per person which places Canada 28th out of 29 countries for water consumption. Given this information, it is very important that Selkirk College be cognizant of our water consumption and makes every attempt to reduce water use where possible. As well, the City of Castlegar is taking an active role in trying to reduce water consumption by the public. Therefore, it is imperative that Selkirk College lead the way by making strong efforts to reduce consumption.

Consumption

Water consumption is not metered at each campus therefore direct measurements of consumption were not available. However, the City of Nelson meters the water consumption at the Silver King campus and so that data was used on a per capita basis to estimate water consumption values for Selkirk College as a whole. The 2008 metered water consumption for Silver King campus was 34,692m^3 in total. Based on the 2008 headcount reports (Selkirk College, 2008), this equates to an average consumption per student of 108m^3 for the year. With this in mind, the pro-rated water consumption for each campus is presented in Figure 15. The total water consumption for all campuses in 2008 is estimated at roughly 170,526m^3. Castlegar campus is estimated to have consumed the greatest amount of water at roughly 90,288m^3.

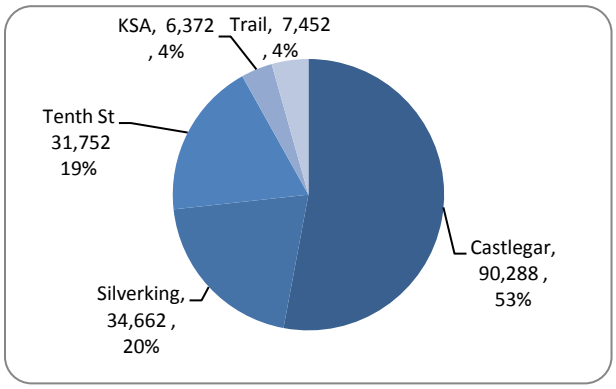


Figure 15. Estimated water consumption (m^3) for Selkirk College in 2008.

Impacts

With increasing effects of climate change potentially altering the snowpack depths in the mountains each year, water storage and capacity issues are becoming a reality even in the wetter climates such as the west Kootenay. It is difficult to know where potable water is used the most at the college and hence where reductions could be made to decrease impacts. Suffice to say that watering of lawns and gardens with potable water is not the best use of that resource when options such as gray water recycling would be better suited. Xeriscaping (use of dry plants) and native plant usage are all potential ways that the college could begin to decrease the reliance on water to maintain lawns and gardens.

Groundwater recharge has become an issue with the Interior Health Authority particularly where the college uses well water at the Castlegar campus. A professional geoscientist will be examining the potential impacts of groundwater re-charge from the wells at the Castlegar campus in 2009 (Podovennikoff, 2009).

Action list

- *Install water metering at all campuses where not present already,*
- *Install water metering for irrigation systems to estimate the amount of water that may be saved by conservation,*
- *Investigate the costs and benefits of installing motion activated sensors in all public taps,*
- *Design xeriscaping and native plant usage in all future lawn and garden maintenance programs*
- *Reduce the area of lawn requiring watering by 20% by creating native plant gardens and xeriscaping.*
    - *Use renewable resources students to design, obtain funding, and implement the gardens each year as part of their field school requirements.*

Land Management and Biodiversity

Background

Selkirk College owns approximately 383 hectares of fee-simple lands in the west Kootenay between Nelson and Castlegar. The largest land holdings are the Castlegar campus (80 ha) and the Skattebo Reach Educational Forest (283 ha) located south of Glade, B.C. Other fee simple land holding include the Silver King campus in Nelson. The college leases land from the City of Nelson at the Tenth Street campus and Kootenay School or the Arts. As well, campus facilities in Trail B.C. are leased from the Regional District of Kootenay Boundary.

The college also operates approximately 600 hectares of forest land through a forest tenure agreement between the *School of Renewable Resources* (RRS) and the *Ministry of Forests and Range* (MOFR). The woodlot is operated on an annual allowable cut allocated by MOFR of approximately 1000 cubic meters per year of fiber. The woodlot also serves as an educational field site for students enrolled in the School of RRS.

The woodlot is divided into two blocks located around the city of Castlegar. The blueberry creek block is located about 8km west of Castlegar adjacent to highway #3. This block is comprised mostly of continuous forest cover in varying age classes as a result of past natural fire history and forest harvesting operations. The second block is located at the headwaters of McPhee creek above the Castlegar Golf course. This woodlot is also mostly continuous forest cover; however a hydroelectric transmission corridor and a permanent Long Term Soil Productivity research installation are used on this block.

Less than 7% of the Castlegar campus land area is occupied by impervious substrates such as pavement and buildings (Figure 16). The remainder of the campus is in a semi-natural state and mostly comprised of different land cover such as meadow, shrub land, and plantation forests.

The Sinixt people lived along the Kootenay and Columbia River before European settlers occupied the land area in the mid to late 1800's. Meadow areas at Castlegar are likely a result of Doukhobor settlers that may have cleared land in the early 1900's for agriculture.

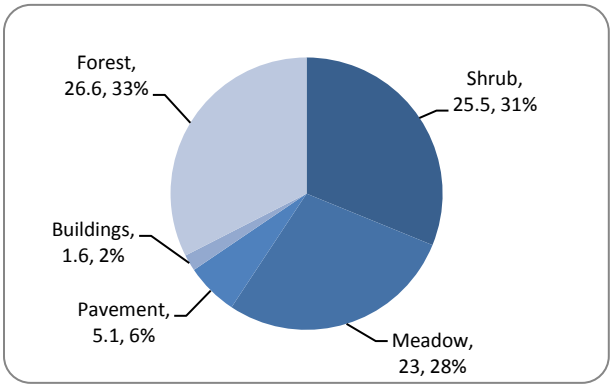


Figure 16. Approximate land area (hectares) by classification for the Castlegar campus.

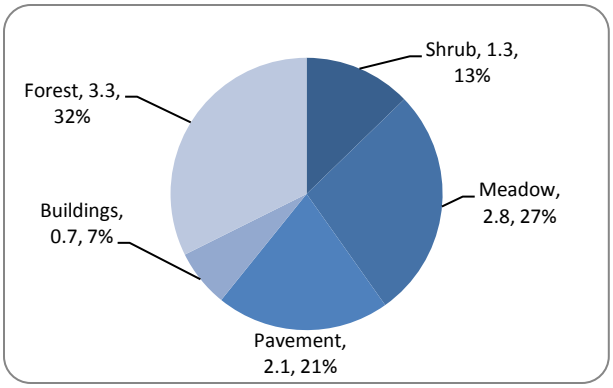


Figure 17. Approximate land area (hectares) by classification for the Silver King campus.

The Silver King campus is located in the Rosemont area of southwest Nelson. Land holdings at the Silver King campus are much smaller than in Castlegar and occupy about 10 hectares (Figure 17). Of that total, roughly 28% of the area is under impervious substrates such as building and pavement. The remaining land is small isolated forest land, shrub land, or maintained lawn.

The Tenth Street campus is leased from the city of Nelson and occupies about 8 hectares in total. Forest, shrub, and meadow occupy about 71% of the land area with the remainder classed impervious substrates (pavement and buildings).

A comprehensive land classification of the Selkirk College lands can be found in Appendix V.

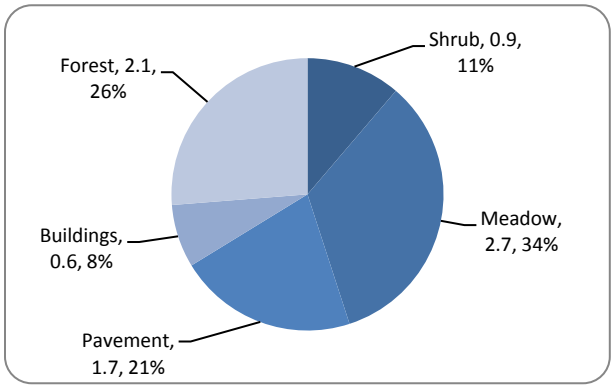


Figure 18. Approximate land area (hectares) by classification for the Tenth Street campus.

Biological diversity

Ecological mapping has only been completed for the Castlegar campus and so no detailed accounts of diversity can be used for a comprehensive analysis. A detailed inventory (Stotzka, 2006) of ecosystems at the Castlegar campus mapped 36 different ecosystem types as occurring on the property. Ecosystems ranged from dry Douglas-fir open grasslands to riparian ecosystems. On the eastern boundary the land is mosaic of riparian cottonwood ecosystems interspersed with open meadows and Douglas-fir plantations. On the north and west boundaries, the land is somewhat under the influence of the Columbia and Kootenay rivers and periodic flooding during wet years results in localized inundation. Ecosystems here are generally a mixture of black cottonwood riparian communities and mixtures of lodgepole pine. In the southern end of the land, the School of Renewable Resources manages several plantation forests and uses the areas as a training ground in the spring field school. These forests are dominated by Douglas-fir and lodgepole pine with lesser amounts of ponderosa pine.

Endangered Species

There are no documented occurrences of rare or endangered species on Selkirk College grounds. However, many species may potentially occur based on the habitat conditions of the area. The Conservation Data Centre (CDC) in Victoria, B.C. provides lists of species that may occur in a given regional area using a web-based search engine. Based on the CDC search engine and professional biologist expertise, the potential red listed species that may occur on Selkirk College grounds are presented in Table 5. According to the CDC, red-listed species "includes any ecological community, and indigenous species and subspecies that is extirpated, endangered, or threatened in British Columbia" (Conservation Data Centre, 2009). At a global level, these species are generally ranked as G5 to G4 which means they are considered to be apparently secure. However, at a provincial ranking level, most of the species are considered to imperiled or critically imperiled with as few as five known occurrences.

Considering that no known surveys have been conducted on the college grounds, it would be advisable to conduct a professional rare or endangered species survey across the lands as a whole and also prior to any proposed development.

Table 5. Potential red-listed endangered species that may occur on Selkirk College grounds.

Scientific Name	English Name
Animals	
Icteria virens	Yellow-breasted Chat
Kootenaia burkei	Pygmy Slug
Megascops kennicottii macfarlanei	Western Screech-Owl, *macfarlanei* subspecies
Melanerpes lewis	Lewis's Woodpecker
Taxidea taxus	Badger
Plants	
Aster ascendens	long-leaved aster
Brickellia grandiflora	large-flowered brickellia
Castilleja tenuis	hairy owl-clover
Clarkia rhomboidea	common clarkia
Erysimum asperum	prairie rocket
Lappula occidentalis var. *cupulata*	western stickseed
Mimulus breviflorus	short-flowered monkey-flower
Senecio hydrophiloides	sweet-marsh butterweed
Solidago gigantea ssp. *serotina*	smooth goldenrod
Sphyrapicus thyroideus thyroideus	Williamson's Sapsucker, *thyroideus* subspecies
Trifolium cyathiferum	cup clover
Viola septentrionalis	northern violet

Land Management

The most recent comprehensive land use plan for college owned lands was completed in 2007 by *Urban Systems* (Urban Systems, 2007). This land use plan involved public participation and focus groups to develop land use classes for the Castlegar and Silver King campuses. The college does not own the Tenth Street campus land and so it was not included in the study. As well, the Skattebo Reach land in Glade was not included in the study although the reasons are not clear why it was omitted.

The Land Use Plan was adopted by Selkirk College in 2007. The land owned by the college is guided by the Selkirk College Grounds Committee made up of members of the staff at the Castlegar campus. This committee should be consulted when land uses such as dumping and excavation work are completed; however there does not appear to be a direct policy with that wording. Instead land use decisions are made on an ad hoc basis that may or may not always involve the land use committee.

Since most of the land holdings are at the Castlegar campus, the committees' prime focus is on those lands. As well, the *School of Renewable Resources* conducts most of its field school operations and some forest management training in plantations around the campus. The Skattebo reach land is managed by faculty members in the *School of Renewable Resources* and field studies are regularly completed on those lands as part of course work during the academic year. There does not appear to be any land use committee for the Silver King campus and the decisions on day to day use of those lands tend to rest with the Director of Facilities.

There is currently no policy related to the use of pesticides on College lands. In some situations, pesticides have been use to control the growth of noxious weeds on lawns. As well, fertilizers have been used in the past to enhance growth and robustness of the lawns and gardens. This has an effect of assisting the manicured landscapes avoid pest infestation; however there are obvious environmental related effects that need to be considered as well. It is advisable to consider alternative treatments for lawn and garden care where practicable to minimize the use of pesticides and commercial fertilizers.

Protected Areas

The land use plan identifies land classes as *potential development areas*, *natural and outdoor teaching areas*, and *recreation* areas. As well, land is also classed as *campus core* areas and *floodplain* areas. Although not legally protected, the classification of "natural and outdoor recreation" is defined as "*those lands identified as Natural Area are protected due to their inherent value as ecosystems, outdoor research/teaching facilities and passive recreation areas. These Natural Areas are not generally suitable for future development, and are to remain in their existing natural state*" (Urban Systems, 2007). At the Castlegar campus roughly 30% of the landscape is designated as a natural and outdoor teaching area and at the Silver King campus 20% of the landscape was designated the same classification. The Skattebo reach land is all forested and the land title designates the land for "educational purposes". As such, it can be assumed that a minimal amount of large scale development will occur on those lands.

Land conservation covenants with groups such as the *Nature Conservancy of Canada* and The *Land Conservancy* offer long-term protection for lands as well as tax benefits for donations. Land conservation covenants may be an area the Selkirk College should investigate to provide long term protection while also benefiting from tax credits and reduction of liabilities associated with land ownership.

Action list

- *Complete an endangered species survey of the College owned lands for species that may occur based on the Conservation Data Centre. Utilize faculty expertise where possible,*
- *Finalize and update existing ecosystem mapping to ensure a comprehensive accounting of the ecosystem conditions have been met,*
- *Investigate land covenant options with organizations such as The Nature Conservancy or The Land Conservancy to ensure land areas are protected in perpetuity.*
- *Investigate options to reduce or eliminate pesticide use on all lawns and gardens where practicable.*

Products and Services

Background

Products and services include items such as bookstore and cafeteria sales. For the most part, the bookstore sales have a low environmental impact. Packages are limited and there has been a move in the bookstore to uses less plastic bags for patrons to carry purchases. The cafeteria sales are likely the biggest impact of the college with respect to products and services. Food choices and packaging of food for take-out can have high environmental impacts depending on choices made.

Environmental purchasing policies

Policies

There are no specific policies regarding environmental product purchasing. The existing purchasing policy # 9200 – Acquisition of Goods and Services (Selkirk College, 2006) states "*The goal of the Purchasing Department is to obtain all supplies, equipment and services at the lowest cost to the College consistent with acceptable quality, quantity and availability*." As such, there is no explicit guarantee that environmental considerations will be taken into account when considering vendors at the "lowest cost". This being said, there are many situations where the staff at the college staff have stated that they have given discretionary preference to a vendor if they are local or produce a high quality product with a lower environmental impact. For instance, the campus manager has purchased office furniture from second hand suppliers when possible this reducing the environmental impacts of buying new furniture.

Food procurement

The cafeteria managers at the different campuses take great pride in attempting to reduce the environmental impacts of their food services while also balancing the financial realities of operating a low overhead food program. For instance, Chef Mark Enns at the Castlegar campus is constantly trying new products that have lower environmental impacts in the cafeteria at the Castlegar campus. As well, the college purchases fair trade coffee from *Van Haute Coffee Inc*. and offers discounts to patrons that purchase coffee in a re-usable drink container. Patrons are also given the choice of using stainless steel cutlery and porcelain or glass drink containers when purchasing food. However, the cost of some products have made it difficult to maintain a product line that has a lower environmental impact

Selkirk College operates three cafeterias at the main campuses in Castlegar and Nelson. *Neptune Foods Services Inc.* (www.neptunefoodservice.com) is the sole provider of food services to the college. This organization has an environmental policy in place to reduce environmental impacts. For instance, the company recently approached Selkirk College with a plan to offer 1% discounts on delivery orders if they can be amalgamated into one order. This is an initiative set by Neptune Foods to reduces the fuel consumption and hence GHG emissions in their own delivery fleet. Indirectly, this initiative benefits the college since they are a part of the college's product line. Neptune does not appear to have any policies in place to guide their own food procurement so the origins and environmental impacts of food purchased are not known with certainty. Suffice to say that there are likely significant impacts of

emissions from the transport of food to the dispatch centre in the lower mainland of B.C. and then to Selkirk College.

Food products are also purchased for sale in vending machines located around the different campuses. One of the biggest product lines is bottled water. While there are obvious health benefits to drinking bottled water versus soft drinks, the sale of bottled water has come under increasing scrutiny in the past years due to environmental impacts. The production of the plastic bottles and some health concerns regarding hydrocarbon leaching from the plastics are a big concern. In addition the production and transport of the bottled water to the college would result in significant greenhouse gas emissions and energy production.

With some of the best drinking water available in the region, it seems obvious that the sale of bottled water is an easy change to reduce the environmental impact of Selkirk College. Taps could be installed on existing water fountains at the campuses to provided chilled water that can be easy filled in a re-usable container. Water fountains installed at the Castlegar and Silver King campuses can be retrofit with suitable devices from the manufacturer.

Environmental product line purchasing

Some paper products purchased will have post consumer recycled content, however there is no explicit policy requiring that paper be purchased with recycled content. As well, there is no policy requiring that paper be certified by the Forest Stewardship Council (FSC) or similar bodies. As such, paper products cannot be guaranteed to be derived from environmentally responsible sources.

Cafeteria staff has periodically purchased recycled or low impact products for take-out food containers and utensils. Again, this has happened in an ad hoc manner due to the desire for the kitchen chef to minimize environmental impacts. Generally, purchasing environmental products has declined when prices become prohibitive compared to costs.

Action list

- *Re-draft the purchasing policy at Selkirk College to include wording regarding environmental product line purchasing.*
- *Investigate paper purchasing options from environmentally certified paper products with post consumer recycled content.*
- *Encourage individuals to drink potable water from taps rather than purchasing bottled water in vending machines,*
    - *Install taps at drinking water fountains so that people can fill re-usable containers with chilled water,*
    - *Create signage to encourage potable water use rather than bottled water.*

Environmental compliance

Background

The college must adhere to environmental legislation with respect to all of its activities. Environmental legislation sets out the minimum requirement by law that must be followed to avoid penalties or fines.

Environmental legislation

A survey of existing statutes and regulations in British Columbia indicates that the following Acts may pertain to the College depending on what type of development or land use occurs on their land.

- Drinking Water Protection Act [SBC 2001] c. 9
- Environmental Assessment Act [SBC 2002] c. 43
- Environmental Management Act [SBC 2003] c. 53
- Forest and Range Practices Act [SBC 2002] c. 69
- Greenhouse Gas Reduction (Cap and Trade) Act [SBC 2008] c. 32
- Greenhouse Gas Reduction Targets Act [SBC 2007] c. 42
- Integrated Pest Management Act [SBC 2003] c. 58
- Land Act [RSBC 1996] c. 245
- Water Act [RSBC 1996] c. 483

Compliance

There have been no environmental infractions by Selkirk College noted by the Ministry of Environment.

Selkirk College currently has one environmental discharge permit for the wastewater treatment facility in Castlegar. To date, the average daily discharge from the facility has been well below the maximum allowable as stated in the permit (233m^3 allowable versus 50m^3 average daily discharge).

Initiatives to exceed legislation

Organizations often set goals to exceed the minimum statutory requirements when developing Environmental Management Systems such as using ISO 140001 and other similar self reporting mechanisms. Although there are no stated goals to exceed the minimal statutory requirements at Selkirk College, it would be wise to investigate where feasible options exist for the future.

Action list

- *Investigate areas in which Selkirk College could exceed the minimum statutory requirements such as:*
    - *Total water consumption,*
    - *Grey water recycling to reduce wastewater discharge,*
    - *Pesticide use on lawns and gardens,*
    - *Legally protected lands for conservation,*
    - *Emissions from stationary and mobile combustion of fossil fuels.*

Works Cited

Boyd, D. (2001). *Canada versus the OECD: An Environmental Comparison.* Retrieved March 26, 2009, from http://www.environmentalindicators.org/htdocs/execsum.htm

Conservation Data Centre. (2009). *Provincial red and blue lists*. Retrieved April 1, 2009, from Endangered Species and Ecosystems: http://www.env.gov.bc.ca/atrisk/red-blue.htm

DiLullo, K. (2009 , March 11). Account Manager, Waste Management Canada. (D. Marcoux, Interviewer)

G. Way. (2008, May 28). Selkirk College Castlegar, Natural Gas Consumption History. Surrey, B.C., Canada: Terasen Gas.

Global Reporting Initiative. (2008). *Indicator Protocols, Environment. Version 3.0.* Retrieved December 15, 2008, from Reporting Framework Downloads: http://www.globalreporting.org/ReportingFramework/ReportingFrameworkDownloads/

Greenhouse Gas Protocol. (2008). *The Greenhouse Gas Protocol Initiative*. Retrieved December 10, 2008, from http://www.ghgprotocol.org/

Hennesy, B. (2008). *Energy Assessment Report - Selkirk College.* Castlegar, B.C.: Terasen Gas.

IPCC. (2006a). *Guidelines for National Greenhouse Gas Inventories Volume 2 Energy.* Retrieved January 19, 2008, from National Greenhouse Gas Inventories Programme: http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

IPCC. (2006b). *Guidelines for National Greenhouse Gas Inventories Volume 2 Energy.* Retrieved January 19, 2008, from National Greenhouse Gas Inventories Programme: http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

IPCC. (2006c). *Guidelines for National Greenhouse Gas Inventories Volume 4 Forestry, Agriculture, and other Land Uses.* Retrieved January 19, 2009, from Greenhouse Gas Inventories Programme: http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

IPCC. (2006b). *Guidlines for National Greenhouse Gas Inventory Volume 1 Genneral Guidance and Reporting.* Retrieved January 20, 2009, from http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

IPCC. (2006). *Intergovernmental Panel on Climate Change*. Retrieved December 15, 2008, from Greenhouse Gas Inventory programme: http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

Pacific Carbon Trust. (2009). *Pacific Carbon Trust home page.* Retrieved March 9, 2009, from http://www.pacificcarbontrust.ca/Home/tabid/36/Default.aspx

Podovennikoff, S. (2009, January 30). Director of Facilities, Selkirk College. (D. Marcoux, Interviewer)

Province of British Columbia. (2009). *Carbon Neutral Government.* Retrieved March 6, 2009, from http://www.gov.bc.ca/yourbc/carbon_neutral/cn_environment.html

Province of British Columbia. (2008). *Greenhouse Gas Reduction (cap and trade) Act.* Retrieved March 6, 2009, from http://www.leg.bc.ca/38th4th/3rd_read/gov18-3.htm

Province of British Columbia. (2007). *Greenhouse Gas Reduction Target Act.* Retrieved March 9, 2009, from http://www.leg.bc.ca/38th3rd/3rd_read/gov44-3.htm

Selkirk College. (2006). *9200 Aquisition of Goods and Services.* Retrieved March 30, 2009, from Selkirk College Policies: http://selkirk.ca/about/governance/policies/

Selkirk College. (2009). *Accountability Plan and Report 2008/09-2010/11.* Castlegar, B.C.: Selkirk College.

Selkirk College. (2008). *Environmental Sustainability Policy #4300.* Retrieved March 19, 2009, from http://selkirk.ca/about/governance/policies/

Selkirk College. (2008). *Student Headcount Report.* Retrieved March 11, 2009, from http://www.selkirk.ca/about/departments/ir/externalreports/headcounts/

Stotzka, C. (2006). *Ecosystems of Selkirk College, Castlegar Campus.* Castlegar B.C.: School of Renewable Resources.

Urban Systems. (2007). *Selkirk College Land Use Plan.* Nelson, B.C.: Urban Systems.

Appendix I

Global Reporting Initiative Indicators

GRI Indicator	
Performance Indicators	
	Environmental Indicators
	Aspect: Materials
EN1	Weight of materials used (core)
EN2	Percentage of materials used that are recycled input materials (core)
	Aspect: Energy
EN3	Direct energy consumption broken down by primary energy source (core)
EN4	Indirect energy consumption broken down by primary source (core)
EN5	Percentage of total energy consumption met by renewable resources (additional)
EN6	Total energy saved due to conservation and efficiency improvements (additional)
EN7	Initiatives to provide energy-efficient products and services (additional)
EN8	Initiatives to reduce indirect energy consumption (additional)
	Aspect: Water
EN9	Total water withdrawal by source (core)
EN10	Water sources and related habitats significantly affected by withdrawal of water (additional)
EN11	Percentage and total volume of water recycled and reused (additional)
	Aspect: Biodiversity
EN12	Location and size of land owned, leased, or managed in, or adjacent to, protected areas (core)
EN13	Description of significant impacts of activities on protected areas (core)
EN14	Area of habitats protected or restored (additional)
EN15	Programs for managing impacts on biodiversity (additional)
EN16	Number of IUCN Red List species with habitats in areas affected by operations broken down by level of extinction risk (additional)

	Aspect: Emissions, Effluents, and Waste
EN17	Greenhouse gas emissions (core)
EN18	Emissions of ozone-depleting substances (core)
EN19	NOx, SOx, and other significant air emissions by weight (core)
EN20	Total amount of waste by type and destination (core)
EN21	Total water discharge and quality (core)
EN22	Total number and volume of significant spills (core)
EN23	Other relevant indirect greenhouse gas emissions (core)
EN24	Weight of transported, imported, or exported waste deemed hazardous under the terms of the Basel Convention Annex I, II, III and VIII
EN25	Water sources and related habitats significantly affected, by discharges of water and runoff (additional)
	Aspect: Products and Services
EN26	Initiatives to manage the environmental impacts of products and services and extent of impact reduction (core)
EN27	Percentage of products sold that is reclaimed at the end of the products' useful life by product category (core)
	Aspect: Compliance
EN28	Incidents of, and fines or non-monetary sanctions for, non-compliance with applicable environmental regulations (core)
	Aspect: Transport
EN29	Significant environmental impacts of transportation used for logistical purposes (additional)
	Aspect: Overall
EN30	Total environmental protection expenditures by type (additional)

Appendix II

Sample Interview Questionnaire

Environmental Report checklist

Location:_____ Date: _____

Contact:_____

Energy/Emissions:

- ☐ Heating source(s)_____
- ☐ Lighting_____
- ☐ Upgrades_____
- ☐ Obvious inefficiencies (windows, doors)_____
- ☐ Other notes:_____

Waste/ Recycling:

- ☐ Recycling program_____
- ☐ Waste diversion_____

- ☐ Other notes:_____
  _____
  _____
  _____

Biodiversity/Land:

- ☐ Land area in different vegetation classes_____
  _____
  _____
  _____
- ☐ Impervious substrates_____
  _____
  _____
  _____
- ☐ Other notes:_____
  _____
  _____
  _____

Products/Services:

- ☐ Products needed
  - Paints/dyes _____
  - Thinners _____
  - Solvents _____
  - Other products _____
    _____
    _____
    _____
- ☐ System for reducing landfilling:_____
  _____
  _____
  _____
- ☐ Other notes:_____
  _____
  _____
  _____

Appendix III

Commuter Survey Questionnaire

Student and Staff Commuter Survey

As part of establishing a baseline for the Selkirk College sustainability initiative, we are interested in knowing about travel to and from the College. This information will help us determine ways to make it easier and less expensive for you to commute to the College as well as assist us in establishing our environmental impact?. Please answer these questions as completely as possible.

1. Are you currently a:

   - Student (either full time or part time)
   - Staff

2. Where do you live?
   - Nelson area
   - Castlegar area
   - Trail area
   - Rossland area
   - Salmo area
   - Fruitvale area
   - Slocan valley
   - South Slocan area
   - Other_____

3. Where do you study and/or work?
   - Castlegar
   - Nelson
   - Other

4. Approximately how many times per week do you travel back and forth to the college for class, work or otherwise
   - 0
   - 1
   - 2
   - 3
   - 4
   - 5
   - >5

5. Approximately how many kilometers do you travel one way to the college?
   - <5
   - 6-10
   - 11-20
   - 21-30
   - 31-40
   - 41-50
   - 51-60
   - >60

6. What percent of each travel method do you use throughout the year to get to the college?

(If you only bus, walk, or bike, go to question 9)

   - Vehicle _____%
   - Bus _____%
   - Walk _____%
   - Bike _____%
   - Other(specify)_____ _____%

7. If you travel by vehicle, what percentage are you a:
   - Passenger _____%
   - driver _____%

8. If you travel by vehicle, what kind of vehicle do you travel in usually?
   - Car
   - Truck
   - SUV
   - Other _____(specify)
   - Does not apply

9. The fuel used in the vehicle I commute to the college is:
   - Gasoline
   - Diesel
   - Biodiesel
   - Does not apply

10. If you carpool or drive, how many people are usually in the vehicle?
    - 1
    - 2
    - 3
    - 4
    - 5
    - >5
    - Does not apply

11. Which would you prefer for alternate methods travel if it were convenient? (check all that apply)
    - Bus
    - Walk
    - Bike
    - Carpool
    - Other_____(specify)

12. Are there any barriers to using alternative methods of travel identified in the question above?
    - None
    - Improved bus schedules/routes
    - Improved access to carpool information
    - Other (fill in below)

_____
_____
_____

13. Periodically students need to commute to the college for events that are not specifically a lecture of lab. What type of activities and about how often per semester do you commute to the college to:

    - Access the gym/fitness facility _____
    - Access a computer file _____
    - Access software only available in the computer labs.
    - Complete library research/work _____
    - General homework _____
    - Socialize _____
    - Meetings
    - Other (please specify) _____

_____
_____

One limitation that has been known for some time has been the lack of suitable walking access to the Castlegar campus over the Columbia River. Some discussions have been held regarding the feasibility of walking/biking bridge over the river to access the college from the city of Castlegar.

14. If you attend the Castlegar campus, would you regularly use a walking/biking bridge from Castlegar to the college?

    - Yes
    - No
    - Does not apply

15. If you live elsewhere, would you have considered living in North Castlegar or in Residence if there were a walking bridge across the river? (circle)

    - Yes
    - No
    - Does not apply

Thank you very much for your time.

If you have any questions please email: selkirksurvey@gmail.com

Appendix IV

Commuter survey results

Survey Results & Analysis

for

Student and Staff Commuter Survey

Monday, March 16, 2009
Powered by Vovici EFM
www.vovici.com

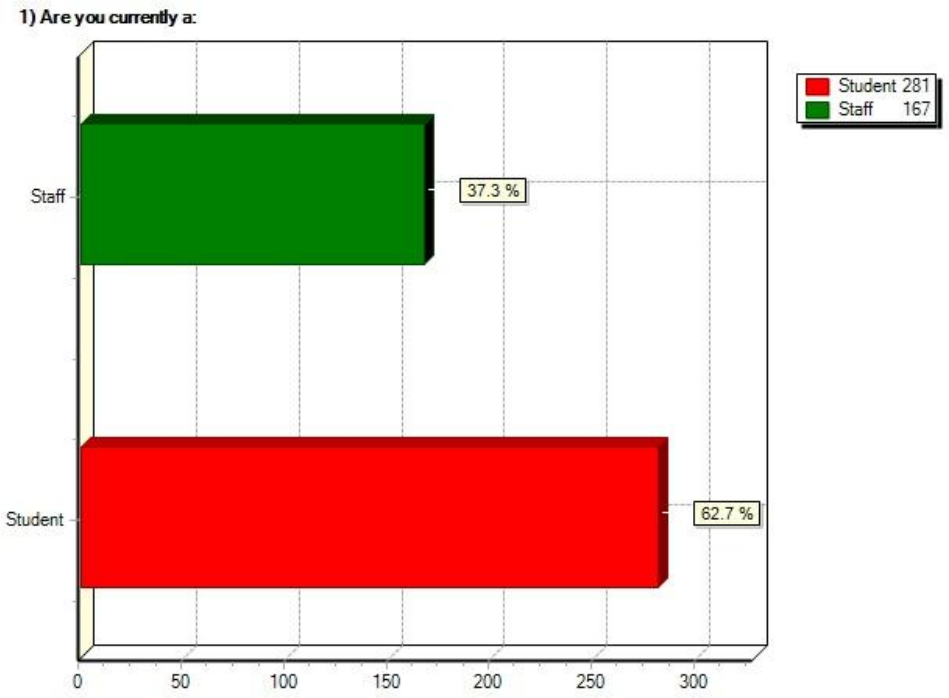
Executive Summary

This report contains a detailed statistical analysis of the results to the survey titled ***Student and Staff Commuter Survey.*** The results analysis includes answers from all respondents who took the survey in the **10 day period from Friday, March 06, 2009 to Monday, March 16, 2009**. 460 completed responses were received to the survey during this time.

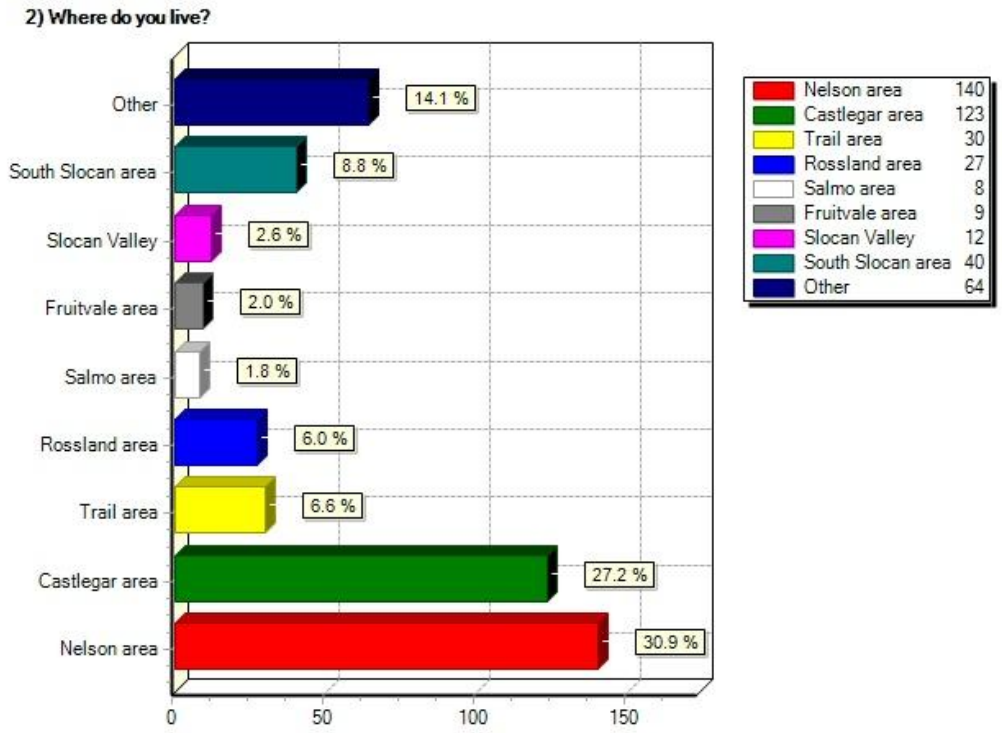
Responses Received: 460

---

1) Are you currently a:



2) Where do you live?



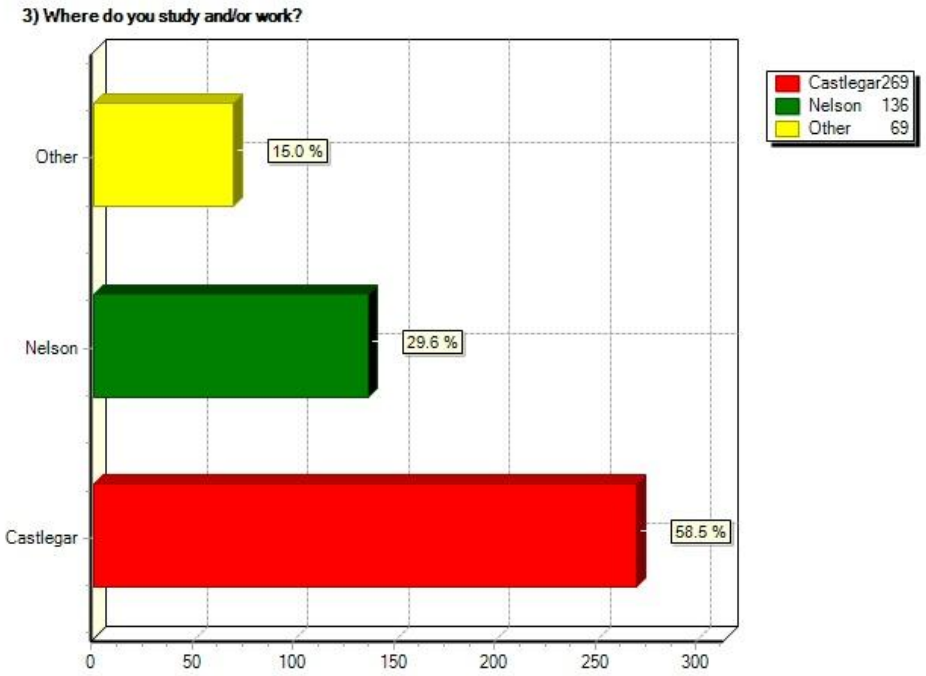
Other Responses:

	Number
Grand Forks	*11*
Kaslo	*10*
Nakusp	*6*
Thrums	*4*
Balfour	*3*
Glade	*3*
Pass Creek	*3*
Calgary, AB	
Christina Lake	
Courtenay	
Cranbrook, BC	

Cumberland, Vancouver Island	
Drumheller,AB	
East Shore- Riondel	
Fernie BC	
Fraser Valley Abbotsford	
Fredericton NB	
Golden area	
Greater Vancouver area	
Harrop, BC	
HOUSTON, BC	
Kamloops, BC	
Kekuli House residence	
Kinnaird (South Castlegar)	
Manning Park, BC	
meadow creek	
New Denver	
Niagara	
Queens Bay	
Robson	
Shoreacres	
Sidney BC	
South Slocan	
Surrey	
Tarrys	
Terrace	
Vancouver	

Vancouver Island, Sooke	
Victoria, BC	
Williams Lake	

3) Where do you study and/or work?



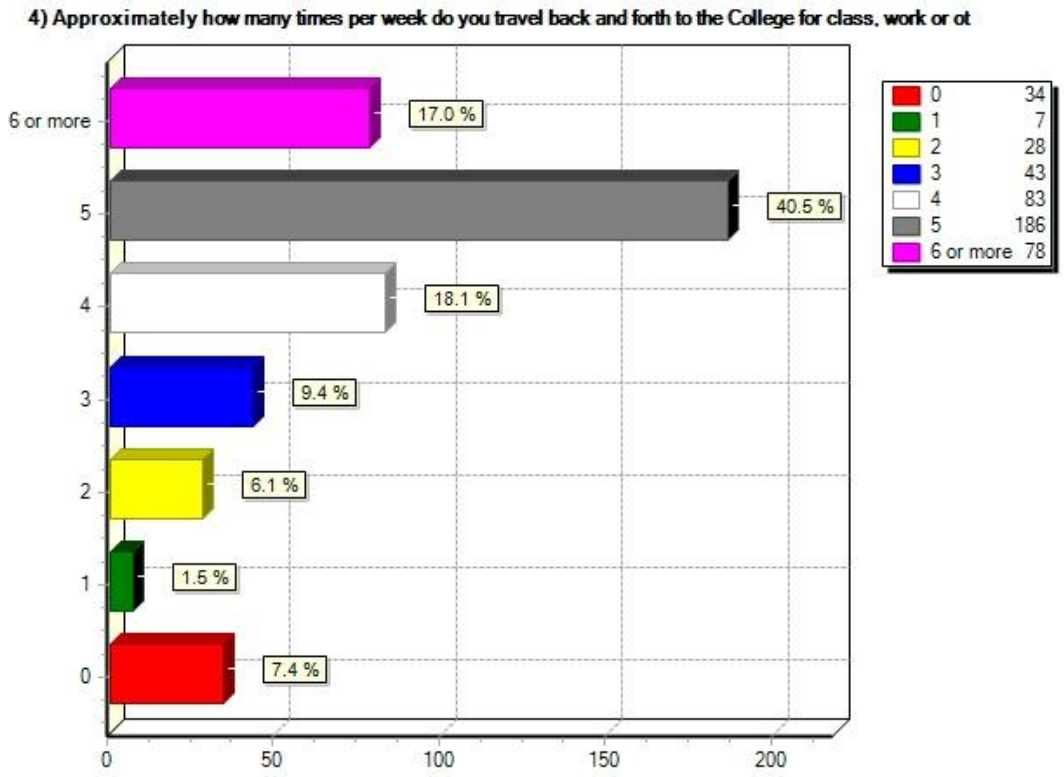
Other Responses:

	Number
Trail	*17*
Kaslo	*11*
Online	*10*

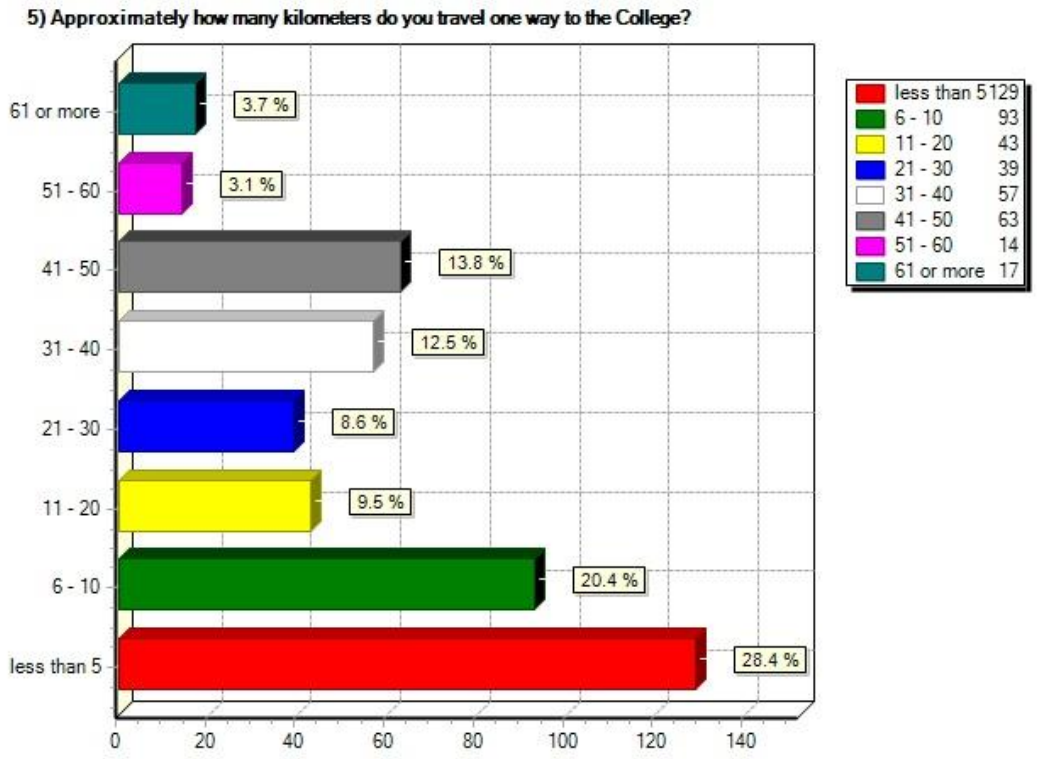
Grand Forks	*10*
Nakusp	*6*
Nelson and Castlegar Campuses	*3*
all campuses	
also KBRH 2 days a week	
but travel throughout the region	
Calgary, AB	
Cranbrook, BC	
Golden	
HOUSTON, BC	
Kwantlen Polytechnic University	
Nakusp, New Denver	
On Work Term	
Rossland	
Rossland, and Chilliwack, and work all over the Province.	
Russia	
Sidney	
Sooke BC	
South Slocan	
Terrace	
Trail and the whole region	
Vancouver	

Victoria	
Work in Kaslo and Nelson	

4) Approximately how many times per week do you travel back and forth to the College for class, work or otherwise?



5) Approximately how many kilometers do you travel one way to the College?



6) What percent of each travel method do you use throughout the year to get to the College?

Vehicle	Bus	Walk	Bike	Other (please specify)	*Number*
100					*246*
		100			*19*
90	10				*8*
99	1				*7*
95	5				*7*
90		10			*7*

50	50				*7*
80	20				*6*
10	90				*5*
5	95				*5*
	100				*5*
99			1		*4*
98			2		*4*
95			5		*4*
90			10		*4*
	50	50			*4*
99		1			*3*
98	2				*3*
95		5			*3*
50			50		*3*
20	80				*3*
90		5	5		*2*
60	40				*2*
25	75				*2*
10		90			*2*
1		99			*2*
	50				*2*
		50	50		*2*

		100			*2*
99.5	.5				
99		.5	.5		
95	4		1		
95	2			Hitchhike 3	
94	1		5		
90	2	3	5		
90				hitch-hike 10	
85	5	5	5		
85	5		10		
85	15				
85			15		
80	5			15; Hitchhike	
80	15		5		
80	10	10			
80	10		10		
80	0	20	0		
80			20		
80					
75	25				
75		25			
75				hitch-hike --25%	

70	30				
70	28		2		
70		25	5		
70			30		
66	33				
65	35				
65	25	10			
60	48	2			
60				Motorcycle 40	
50	50				
50	30	15	5		
50	15	25	10		
50	15	20	15		
50	10			hitchhiking 40	
50		50			
50		25	25		
45	1	25	29		
40	60				
40	20	40			
40		15	45		
33	66				
30	70				

30	60	5	5		
30	60	10			
30			70		
25		50	25		
20	60		20		
20		80			
15	60	25			
15	5	40	40		
15		75	10		
10	30		30	30 - carpool	
10	10	100			
10			90		
5		95			
5			95		
2	90		8		
2		98			
	99				
	95				
	90	10			
	90				
	80	20			
	50	25	25		

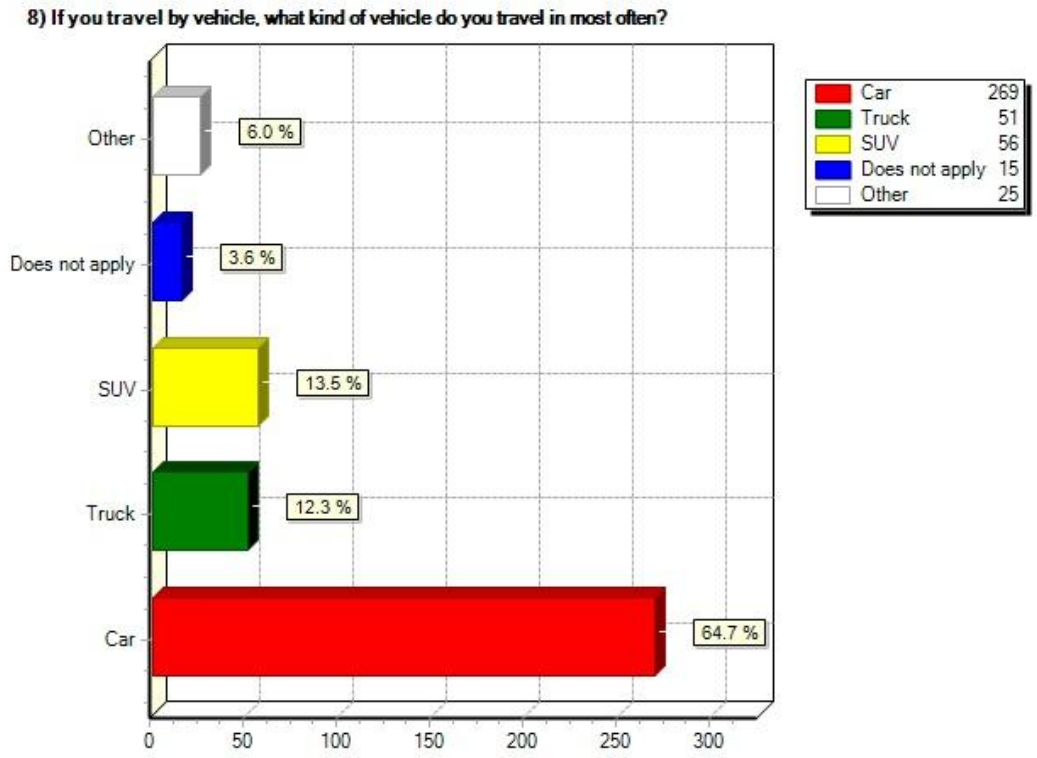
	10	90			
	10		90		
		90	10		
		80	20		
		70	30		
		25		75 hitchhike or get a ride	
		20		carpool 80 %	

7) If you travel by vehicle, what percentage are you a:

Driver	**Passenger**	***Number***
100		*249*
	100	*37*
50	50	*21*
90	10	*17*
95	5	*12*
80	20	*11*
75	25	*8*
25	75	*7*
20	80	*5*
98	2	*4*
40	60	*4*
10	90	*4*
65	35	*3*
33	67	*3*
5	95	*3*
60	40	*2*
99	1	
97	3	

96	4	
85	15	
70	30	
1	99	
3	97	

8) If you travel by vehicle, what kind of vehicle do you travel in most often?

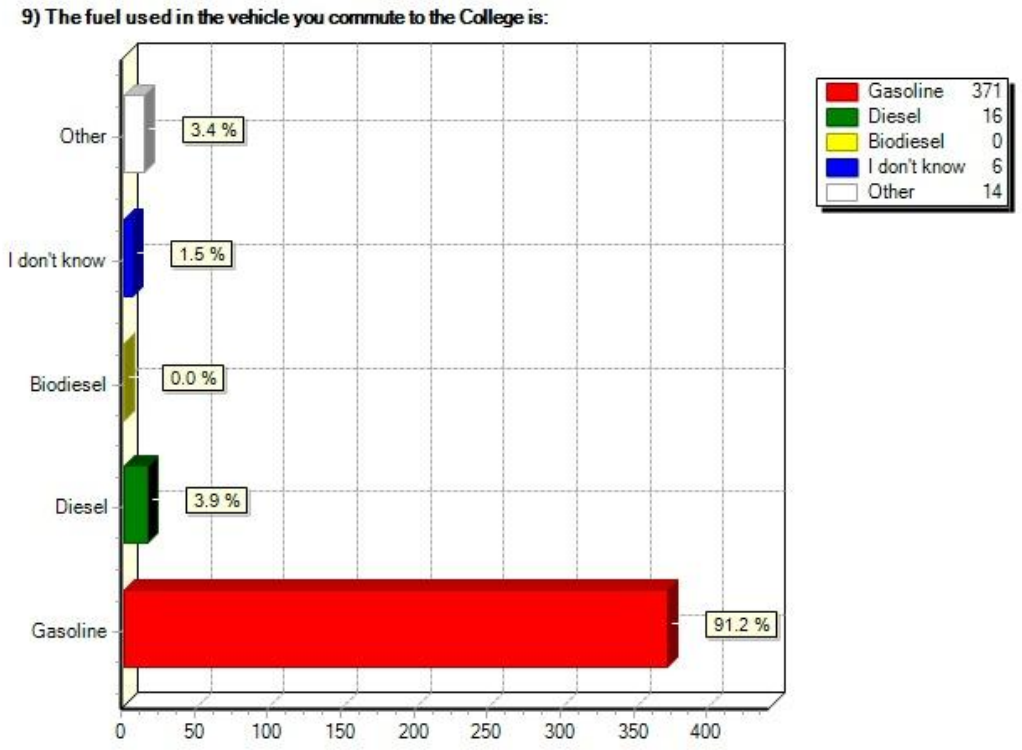


Other Responses:

	Number
Mini-van or Van	*11*
4 mo. truck/8 mo. car	
CUV (Cross-over)	
Medi-chair scooter (considered a vehicle)	
Minivan or car	
Motorcycle 25% of the time	
Motorcycle 40% of the time	
SUV - small	

SUV (50%) motorcycle (50%)	
SUV Hybrid	

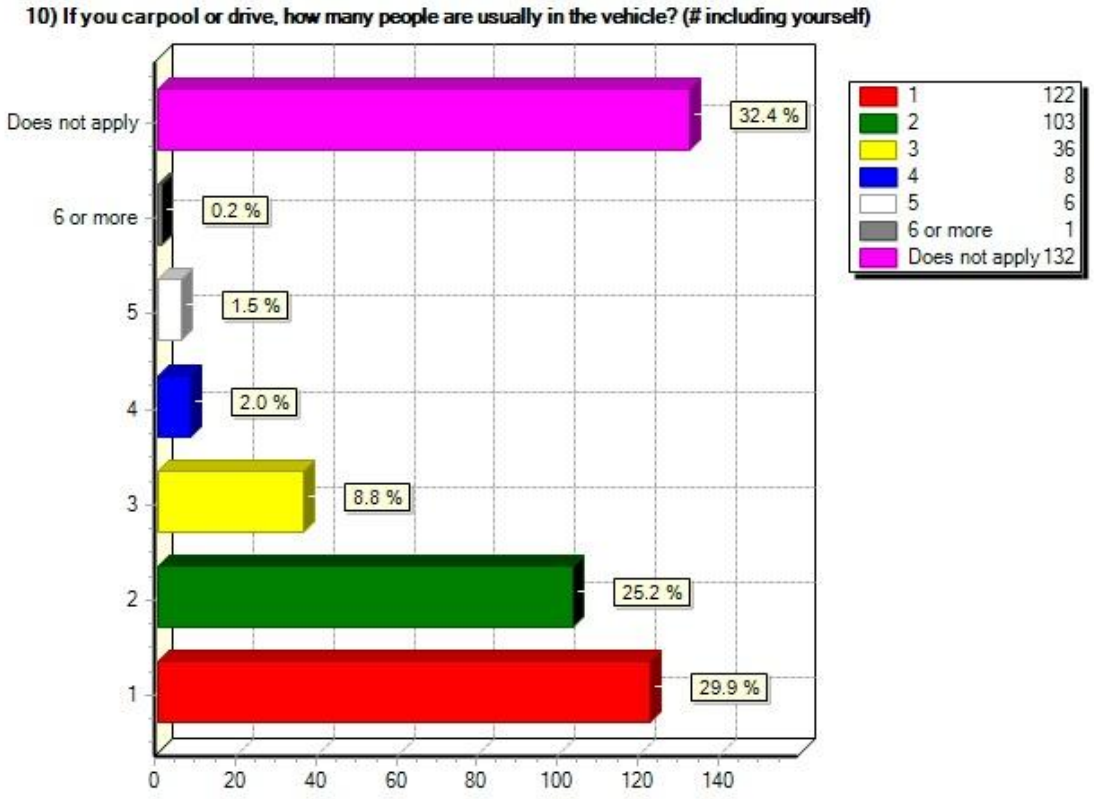
9) The fuel used in the vehicle you commute to the College is:



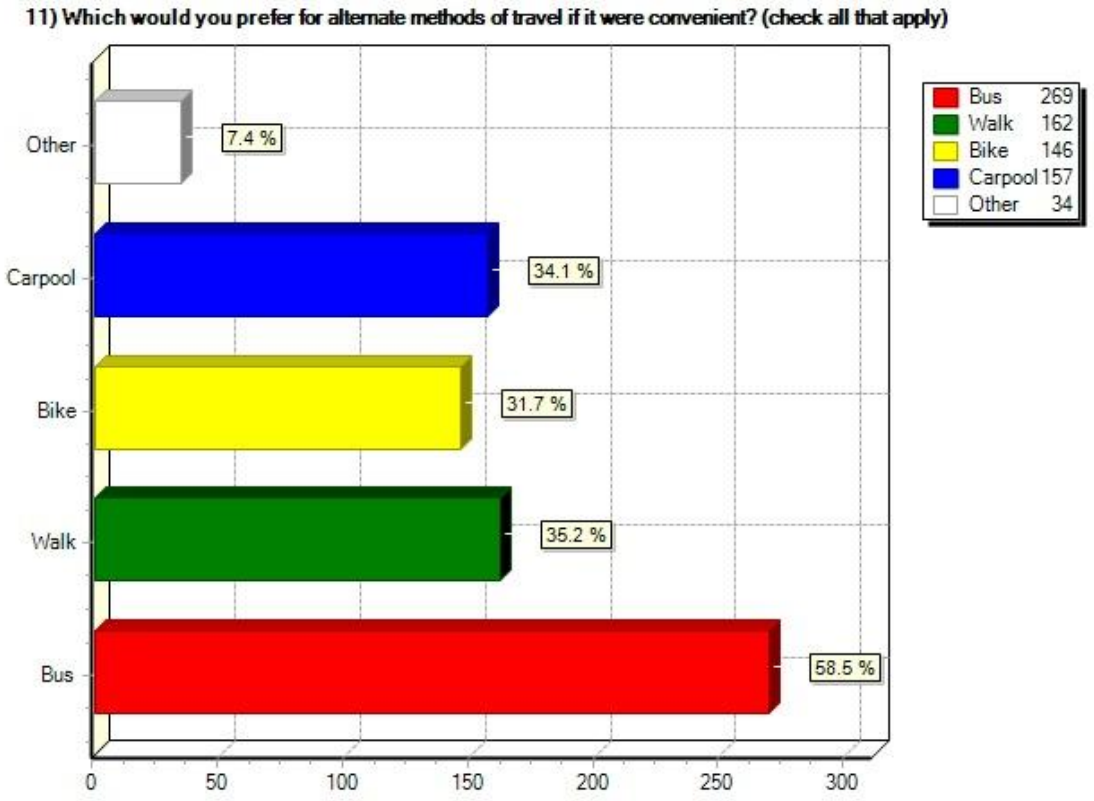
Other Responses:

and Gasoline - Different cars
Electricity
Gasoline and diesel in 2 different vehicles
Hybrid (gasoline / electric)
Hybrid gasoline
Uranium
Whatever the bus uses

10) If you carpool or drive, how many people are usually in the vehicle? (# including yourself)



11) Which would you prefer for alternate methods of travel if it were convenient? (check all that apply)

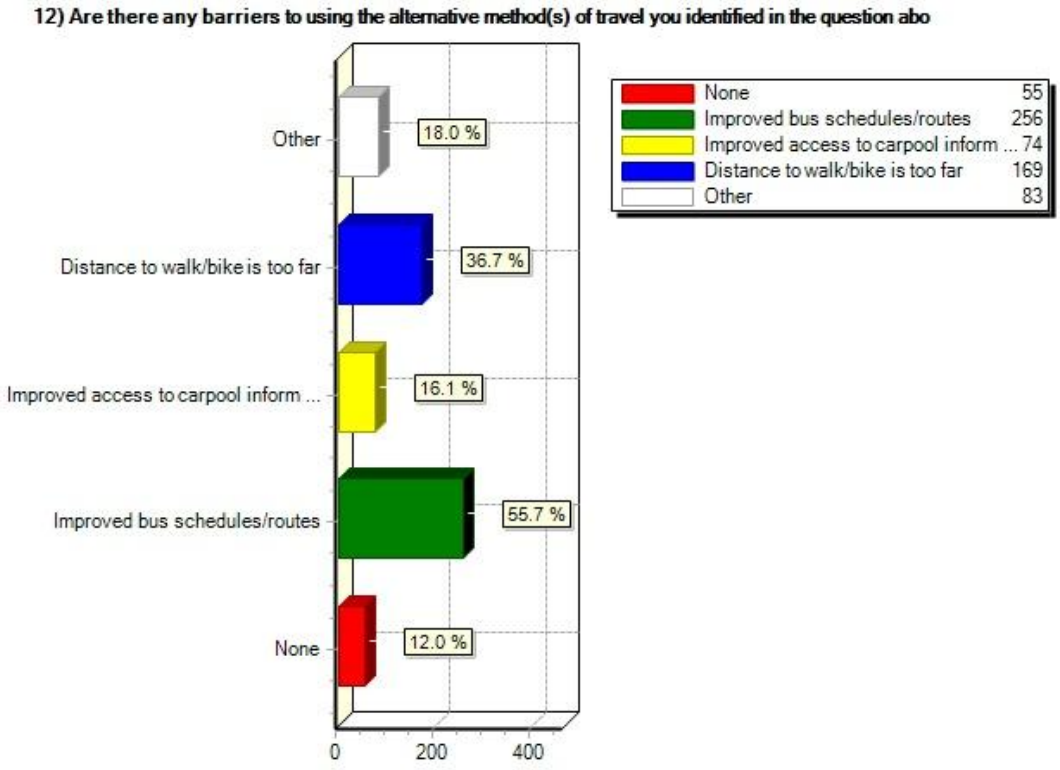


Other Responses:

	Number
Train / Rapid transit between the tri-cities	*10*
Fly	*2*
The bus service is limited and there are no buses from Kaslo. I f I lived locally I would be appalled at the busy highway if I wanted to walk or bike. There needs to be a bike/pedestrian path that is accessible all winter from Castlegar to the college	
Tele-commute	
Roller Blade	

Riding my bike over the Brilliant Bridge is a nightmare; an accident waiting to happen.	
My methods of walking and sometimes driving is most convenient.	
If the bus had a later run in the morning and in the evening I would definitely take the bus more often. I hate getting up at 5:30 a.m. to get the bus	
I would not use an alternate method.	
I need to come and go to other campuses often so need a car.	
I need the flexibility to travel between 3 campuses on short notice	
Horse	
Fuel-cell electric	
Free Transit	

12) Are there any barriers to using the alternative method(s) of travel you identified in the question above?



Summary of Other Barriers:

	Number
Schedules (Bus, Work etc)	*23*
Convenience/Need Mobility	*23*
Safety	*15*
No Service Available	*11*
Weather	*8*
Distance	*6*
No Opportunity to Carpool	*5*
Lack of Time	*4*
No Bike	*4*
Health	*4*

Need Bridge	*4*
Terrain	*2*

All Responses:

Weather (8)
Can't ride a bike in winter
can't bike in the winter as easy
I will start walking now that the weather is getting better
Weather
weather
weather
weather
Weather conditions - snow, ice
Lack of Time (4)
lack of time
time
time
The fact that I work full time and go to school during work hours limits the time I have available to travel.
Terrain (2)
IT IS ALL UPHILL HOME;
Steep hill
Schedules (23)

schedules
scheduling that allowed carpooling
1. Recently the morning bus has been too full and has not been stopping in South Slocan. A later bus (past 4:00) would be great.
8 months of the yr I work till 12:00am
Alternate schedules
A-time of day 530am
Bus is too infrequent, as well as at wrong times
bus schedule is sporadic
Different time schedules than other Nelson RRS students.
does not run early enough in my region)north shore) to get to the Nelson-Castlegar bus
evening schedule for work - sub instructor
Hours don't seem to match any one else's
Hours of work
hours of work
Late shift - 30 minutes by bus rather than 4 minutes by car!!
more frequent access from Rossland to Trail/Castlegar in the mornings
no bus route to and from Pass Creek
The buses are not frequent
Work Start & End Time Schedule Varies
Travel schedule
Very unpredictable schedule, usually working much longer hours than other people who live near me.

work hours don't allow for car pooling
I have taken the bus but the sched is too limited.
Safety (15)
Roads are unsafe for pedestrians
It is not safe to walk or take a bus in my area.
No bike path, very narrow dangerous road
Secure and convenient place to park bike
snow on the paths
Streets are too icy
Pass Creek Rd is dangerous to bike on
Safe travel (walking/biking along highway can be frightening at times)
2. An impediment to biking is that the bridges (esp. South Slocan and Slocan River) do not have a bike lane/sidewalk.
easy access bike route
Or having the railway bridge useable again in Brilliant to avoid that nasty narrow bridge in the winter months for cycling.
better bike lanes (on bridges, and in town)
bike lanes are too dangerous
Brilliant Bridge and truck drivers
No Service Available (11)
NO BUS SERVICE AT ALL IN BLEWETT
There is no bus
no buses in Salmo

no opportunities to take a bus
no passenger service
no place to hitch horses also city bylaws and campus rules on animals
No public transport avail, work long erratic hrs so no carpool found
No train service.
no trains
Unavailable
There is no train system
No opportunity to carpool (5)
limited # of carpooling passengers
no one lives in my area close enough to carpool with
people to carpool with
students from my area on the same schedule
students not receptive, I'm a much older student
No bike (4)
don’t have a good bike
don't own a bike
Lots of hills for me, I still intend to do it if I can get a road bike.
money for bike
Health (4)
Age and Health
back problems

Can't take the heat in summer due to health issues
injury
Distance (6)
Distance
late shift - not able to car pool, distance too far to walk late at night
Walking is too far on a daily basis
I live too far away to walk or bike
The distance to walk or bike is not too far if school was the only consideration.
Too far to walk if I don't get up on time!
Convenience/Need Mobility (23)
I work at 3 different campus's
Meetings to attend during the day elsewhere. The need to get out of here sometimes.
Need vehicle for work
My schedule does not work to carpool. I have children to pick up after work.
At times I run errand during my lunch break. Also, during the school year my child is involved in after school sports. I must pick my child up after these events.
carpools make it difficult to align to a 'mutual' schedule
Grocery shopping etc in town before travelling home
Hard to do some with a 3year old
Have a young child. Need to be able to come and go at anytime of the day.
have child at Selkirk daycare so sometimes don't have option of alternative
I need to drop my child off at daycare at different times each day

I need to run errands during lunch most days.
I often am carrying equipment
I sometimes need my vehicle for work.
I tend to carry a lot with me so walking &/or biking maybe problematic at this time
I tried carpooling but had too many conflicts with the other person.
limited room on the bus for my bike (holds only 2 bikes)
Mobility
My schedule is not entirely standardized each day. Sometimes I have meetings or activities after work that keep me in town longer.
need to bring lot of equip, makes carpool difficult
no great place to lock bike, too sweaty after
Wouldn't be able to carry a load of books!
Require my vehicle to travel to other places for meetings, also a very irregular work schedule prohibits carpooling , early start and late end to my workday
Need Bridge (4)
Bridges over the Columbia for pedestrian traffic from downtown would be wonderful.
footbridge to downtown would help
need a bridge across the river from downtown Castlegar
no bridge between town and the college
Misc (5)
social issues - "losers" take the bus, have to communicate re car pool
Cheaper to drive an SUV than take the bus
N Rule

Only motivation to be here is the lab. Need more amenities (i.e. food after 2 pm would prevent me from driving home for supper).
political will
poverty

13) Periodically students and staff need to commute to the College for events that are not specifically a class, lecture, lab or work related. <u>About how many days per semester do you commute to the College specifically to?</u>

Access the gym/fitness facility	*Number*
2	*10*
20	*8*
10	*7*
5	*6*
1	*5*
30	*4*
12	*3*
8	*2*
4	*2*
32	*2*
3	*2*
15	*2*
daily	

64	
6 per week	
50	
4-5	
45	
25	
2 times a week	
16	

Access a computer file	*Number*
5	*29*
2	*22*
10	*14*
1	*11*
4	*7*
3	*5*
20	*5*
15	*3*
daily	*2*
8	*2*
6	*2*

50	*2*
30	*2*
12	*2*
over 100	
64	
25	
24	
1 or 2	

Access software only available in the computer labs	*Number*
10	*18*
5	*15*
2	*8*
30	*5*
20	*5*
3	*5*
1	*5*
4	*4*
15	*3*
6	*2*
daily	*2*

over 100	
64	
52	
50	
25	
24	
16	
12	
7	
3-5	
2-5	
5 - 10	
20-30	

Complete library research/work	*Number*
10	*8*
4	*4*
20	*3*
15	*3*
3	*3*
5	*21*

2	*17*
1	*10*
50	
35	
30	
24	
16	
9	
7	
6	
7-8	
1-2	
3-4	
3-5	
once a week	
Everyday	

General homework	*Number*
5	*17*
10	*16*
2	*11*

4	*5*
3	*5*
1	*5*
Everyday	*3*
20	*3*
15	*3*
50	*2*
40	*2*
sometimes	
over 100	
90	
75	
6	
5-10	
3-5	
35	
30	
24	
18	
14	
12	
100	

Socialize	*Number*
2	*7*
5	*6*
10	*6*
1	*5*
4	*3*
3	*2*
20	*2*
most of the time	
Everyday	
almost every day	
90	
7	

Attend meetings	*Number*
5	*24*
2	*24*
4	*15*

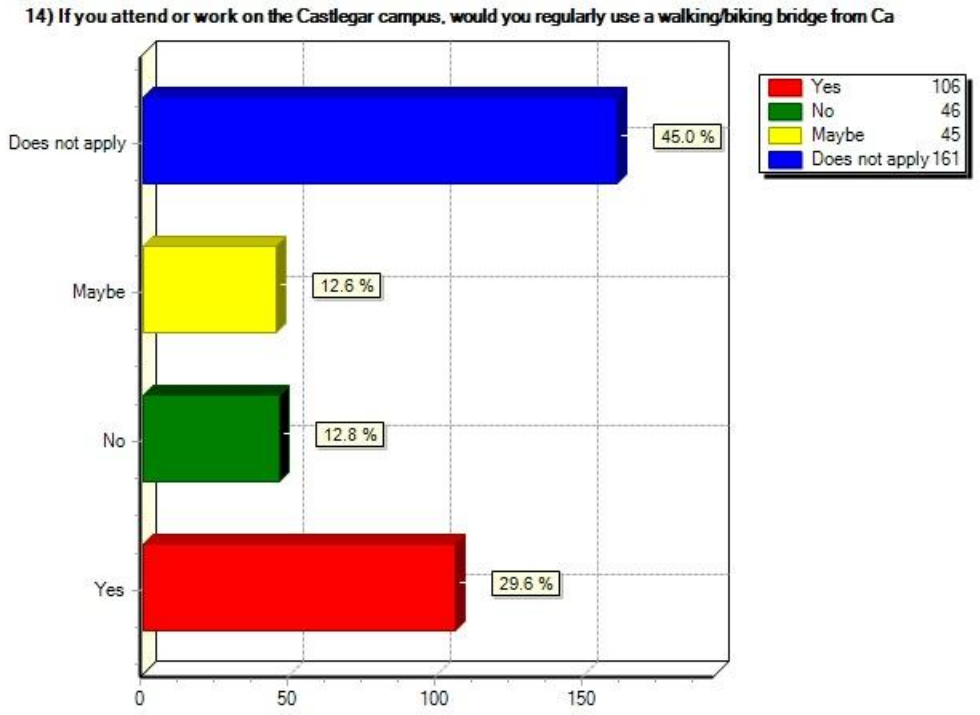
10	*12*
3	*12*
6	*5*
8	*4*
12	*3*
Everyday	*2*
75	
30	
20	
8 TO 10	
15	
15	
4-5	
1-2	
2-4	
4-6 per month	
at least twice a month	
Bi-weekly	
occasionally - once	

13.8) Other (please specify) (Periodically students and staff need to commute to the College for events that are not specifically a class, lecture, lab or work related. About how many days per semester do you commute to the College specifically to:

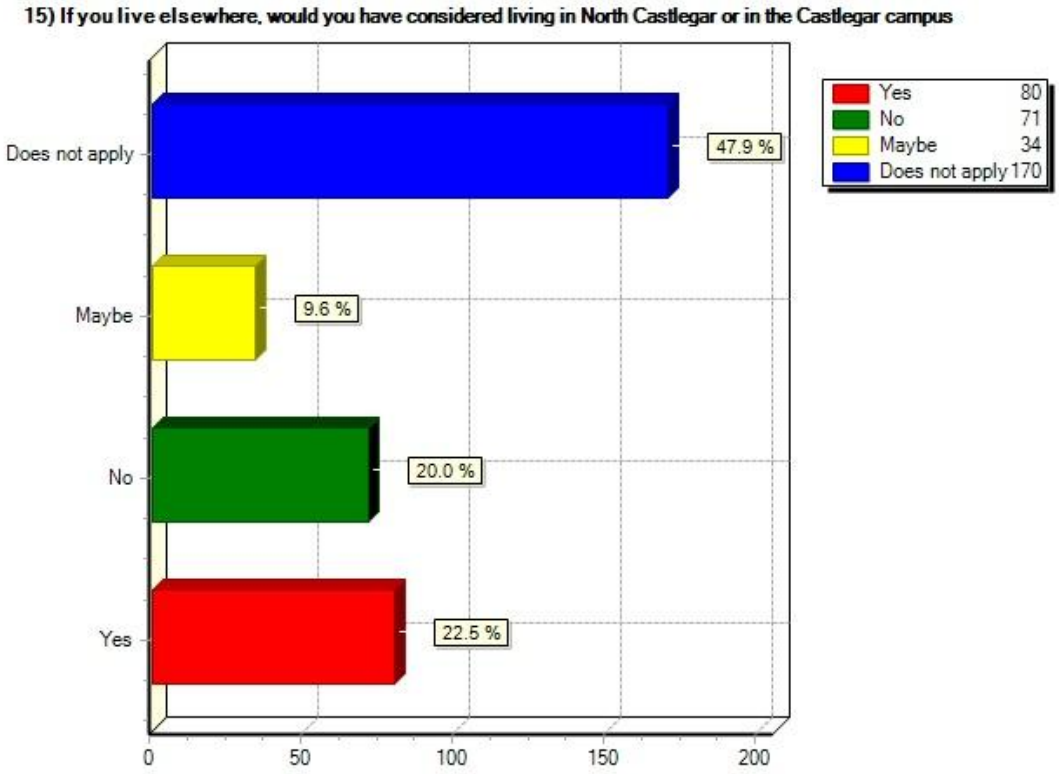
Other (please specify)
1 day training session - Unit Clerk
10
2-3 days English class
3 - 5 days per semester/invigilation
3 (walk the college trails)
8 - group projects
8 - seminars / events
access a computer and internet to do my schoolwork
access software not on home computer 1
attend events 2 times
Catch up on work - 3
Catch up on work. 4-5 days per semester
catering 15
Conferences/lectures/events
Department functions 5X per semester
drop off assignments about 2 (these are all averages)
Group school work (10 days)
guest speakers 1-3

I have no home computer so I have to come to school whenever I have computer stuff to do. probably 10 times per semester
Labs on weekends with RFW 1-3
no times except for what I am studying
obtain information and advice
Once a semester - bookstore
posting information once a week
Practicing instrument
prep for teaching 6
prep work
Rehearsals: 15
rehearse: approx 20
school events, 15
school events, 6
speaker series, wkshops --3 or 4 max
speakers 1
speakers...2-3
teach CE 15 times
use printer
work above normal work week - approximately 6 extra trips per semester - minimum
Work on programs with help from teaching staff.
work weekends/evenings

14) If you attend or work on the Castlegar campus, would you regularly use a walking/biking bridge from Castlegar to the College?



15) If you live elsewhere, would you have considered living in North Castlegar or in the Castlegar campus residence if there were a walking bridge across the river?


15) If you live elsewhere, would you have considered living in North Castlegar or in the Castlegar campus
Does not apply
Maybe
No
Yes
47.9 %
9.6 %
20.0 %
22.5 %
0
50
100
150
200
Yes 80
No 71
Maybe 34
Does not apply 170

Appendix V

Land area classification

Numeric Results and Thematic content

Selkirk Land Stratification

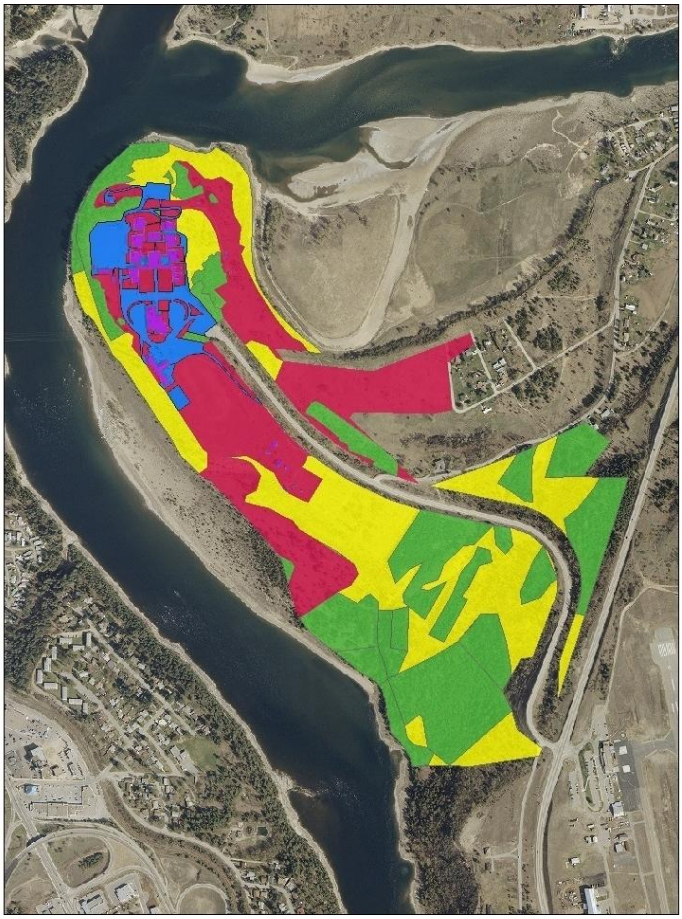
By: Alex Cole

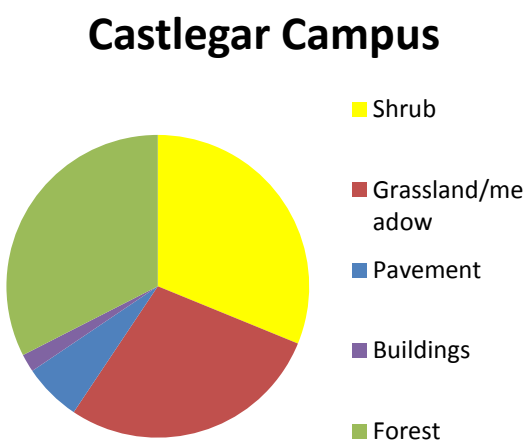
March 20, 2009

Client: Selkirk College, Derek Marcoux

Castlegar Campus

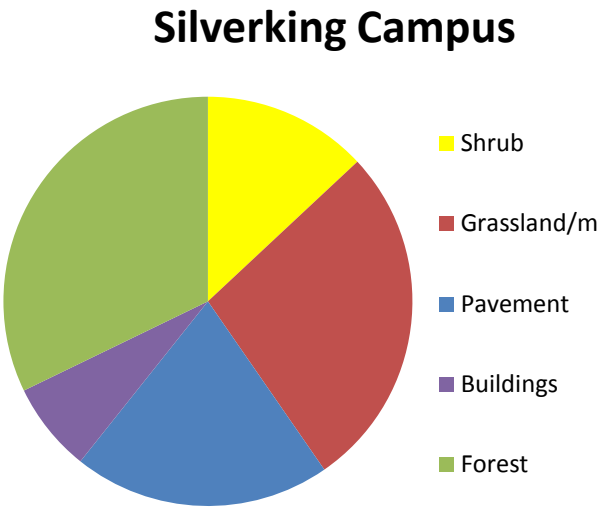
Castlegar Campus	hectare	(m^2)
Shrub	25.47	254672
Grassland/meadow	23.03	230336
Pavement	5.06	50556
Buildings	1.58	15762
Forest	26.56	265571
Total	81.69	816897





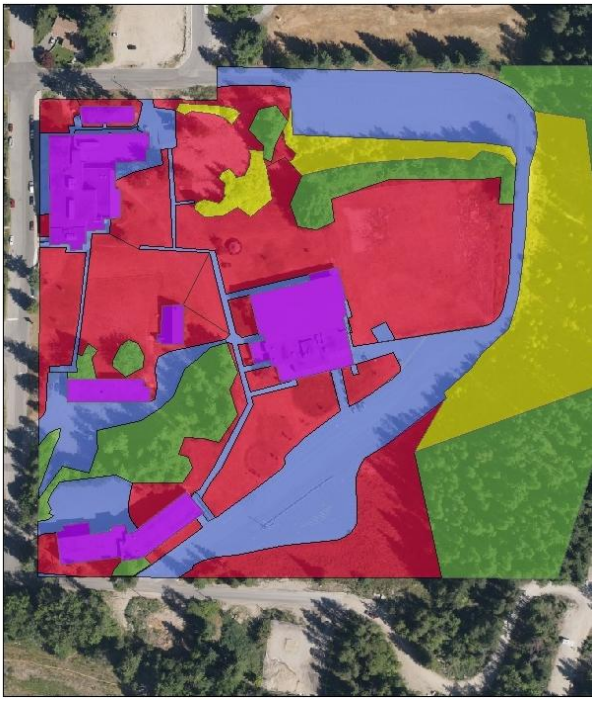
Silver King Campus

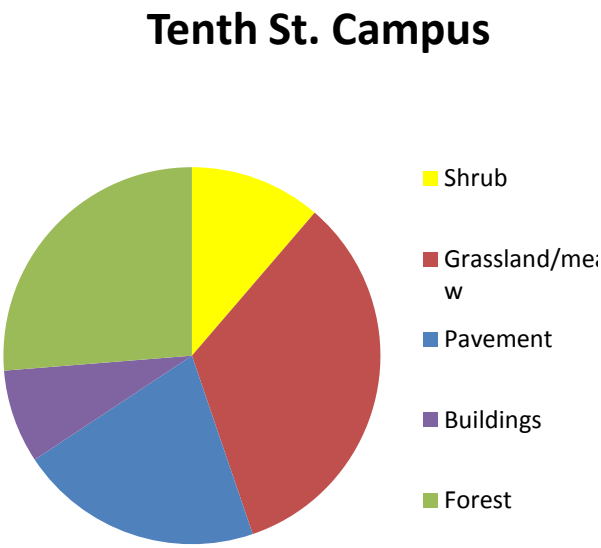
Silver King Campus	hectare	(m^2)
Shrub	1.32	13212
Grassland/meadow	2.77	27684
Pavement	2.06	20613
Buildings	0.72	7198
Forest	3.26	32607
Total	10.13	101314

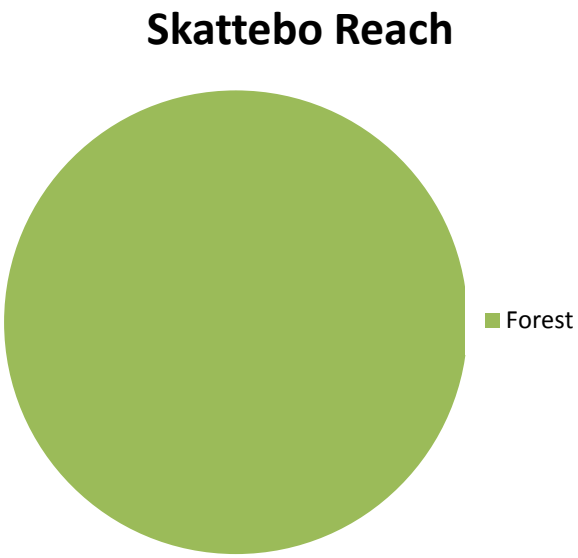
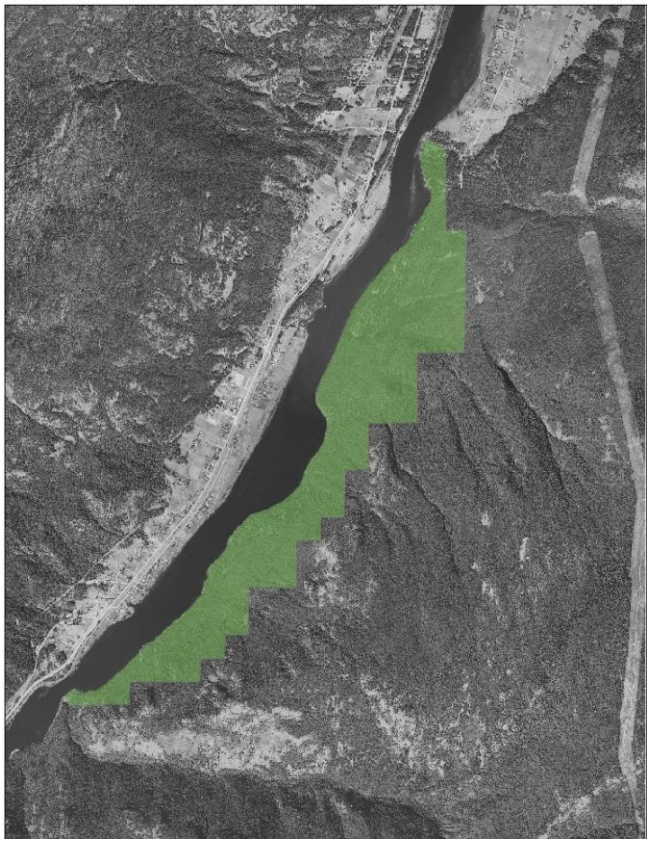


Tenth St. Campus

Tenth St.	hectare	(m^2)
Shrub	0.91	9136
Grassland/meadow	2.71	27095
Pavement	1.69	16934
Buildings	0.65	6500
Forest	2.13	21256
Total	8.09	80921





Skattebo Reach

Skattebo Reach	hectare	(m^2)
Shrub	0.00	0
Grassland/meadow	0.00	0
Pavement	0.00	0
Buildings	0.00	0
Forest	283.52	2835179
Total	283.52	2835179