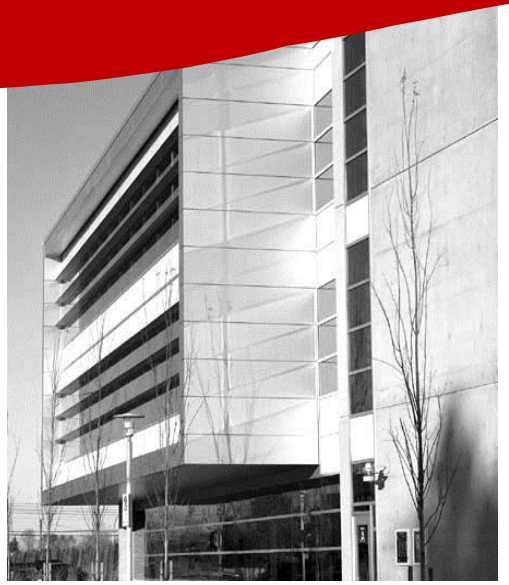
Strategic Energy Management Plan 2013



KWANTLEN POLYTECHNIC UNIVERSITY

Facilities Services

Mar 5 2013 Edition

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1. OUR ORGANIZATION

1.1 Organization Profile

PEOPLE	Sector	➢ Education (University)
	Number of Employees	➢ 1632 (2010)
	Number of Students [1]	➢ 9,863.7 FTE (year ended Mar 31 2009) ➢ 10,576.7 FTE (year ended Mar 31 2010) ➢ 11,013.1 FTE (year ended Mar 31 2011) ➢ 11,382.8 FTE (year ended Mar 31 2012)
SITES	Number of Sites	➢ Cloverdale ➢ Langley ➢ Richmond ➢ Surrey
OPERATIONS	Energy Management Challenges	➢ No funding for an ongoing internal Energy Manager ➢ Increased enrolment ➢ Increased operating hours ➢ Expansion of buildings ➢ Multiple campuses ➢ Having implemented significant energy savings projects for over 10 years new opportunities with a reasonable return on investment are limited.
	Core Business Metrics	➢ Building Size ➢ Operating Hours ➢ Student FTE's
	Business Year	➢ April 1 to Mar 31
	Budget Cycle	➢ April 1 to Mar 31
	Maintenance Cycle	➢ April 1 to Mar 31
	Energy Efficiency Budget	➢ 2010/11 - $163,000 ➢ 2011/12 - $243,000 ➢ 2012/13 - $75,000 ➢ 2013/14 - $150,000 (to be confirmed) ➢ 2014/15 - $150,000 (to be confirmed)
	Utilities Budget Electricity and natural gas	➢ 2009/10 - $1,398,500 ➢ 2010/11 - $1,442,300 ➢ 2011/12 - $1,452,400 ➢ 2012/13 - $1,574,600

[1] **Enrolment statement of Kwantlen Polytechnic University**

1.2 Facilities Energy Profile for 2012

Campus	Size (m2)	kWh	GJ	Total ekWh	Electric $	Gas $	Total $
Surrey	36,935	4,867,200	13,782	8,695,840	$389,419	$109,887	$499,306
Richmond	20,554	2,581,200	8,609	4,972,891	$204,509	$71,370	$275,879
Langley *	18,155	1,906,200	9,170	4,453,737	$160,023	$75,737	$235,761
Horticulture	3,865	449,800	6,021	2,122,434	$40,469	$50,606	$91,176
Cloverdale	18,559	1,499,400	6,878	3,410,081	$129,644	$57,584	$187,228
Totals	**98,068**	**11,303,800**	**44,461**	**23,654,982**	**$924,164**	**$365,185**	**$1,289,349**

* **Addition of CAHS**

1.3 Key Performance Indicators (KPI)

Variable	2000 Kwantlen Base year	2006 PSECA Base year	2007 Bill 44 Base year	2010	2011	2012
Size m2	81,202	82,432	90,304	100,313	97,056	98,068
kWh	12,091,954	9,755,679	10,727,111	10,746,063	10,963,000	11,303,800
GJ	52,492	42,690	49,321	41,447	48,511	44,461
GHG tonnes	2901	2357	2710	2319	2,676	2,513
Total ekWh/m2	328	262	271	222	252	241
Total eGJ/m2	1.18	.94	.97	.80	.91	.87
GHG/m2	.036	.028	.030	.023	.028	.025
kW/Student				1087	1075	993
GJ/Student				38	45	45
GHG/Student				.23	.26	.22

Operating Hours in 2012

	Cloverdale	Langley	Langley – H	Richmond	Surrey
M - F	7:30 – 10:30	7:30 – 10:30	7:30 – 10:30	7:30 – 10:30	7:30 – 10:30
Saturday	*8:00 – 4:00	8:30 – 4:30	8:30 – 4:30	8:00 – 4:00	8:00 – 5:00
Sunday	Closed	Closed	Closed	01:00 – 5:00	01:00 – 5:00
Holidays	Closed	Closed	Closed	Closed	Closed

*Started Sept 2011 for portions of campus

2. OUR COMMITMENT

2.1 Overview

Annually we review our energy consumption data to update our energy consumption records. This document is called "Energy Consumption Records 2013" for this year and the entire document can be downloaded from Kwantlen's website.

Once this is completed we develop our Strategic Energy Management Plan (SEMP) using the following information to assist:

- Benchmarking data from the "Energy Consumption Records".
- Energy savings ideas submitted by employees.
- The capital renewal and maintenance plans to identify projects that may have an energy savings component.
- Evaluate opportunities using new technologies to further reduce energy consumption

2.2 Vision

We are committed to being leaders in environmental sustainability in all aspects of our operations taking measures to minimize the impact of our post-secondary institution on the environment. In our role as leaders we dedicate time and resources to encourage and educate as to the benefits and responsibility to participate in energy conservation and other sustainable initiatives.

2.3 Energy Policy – Alternate Approach

Support and leadership of senior management is a key element of a strategic energy management program and demonstrates energy efficiency is important in an organization.

Our commitment to energy efficiency uses an even higher level approach then an Energy Policy with the requirement included in our "Mission and Mandate" and our "Vision" statements.

"Mission and Mandate" demonstrates senior level and overall organizational commitment.

"Through program delivery, services, and research initiatives, we aspire to inform and transform attitudes and values to reflect our role as a responsible and sustainable educational institution. Our health and our achievements derive from, and depend upon, the health of the Earth and its inhabitants."

"Vision Statement" demonstrates senior level and organizational commitment

"Kwantlen informs and transforms attitudes, values, and practices that confirm its role as an educational institution committed to environmental, social, and economic sustainability."

Kwantlen's Accountability Plan and Report Identifies Goals

In terms of setting our sustainability and energy conservation goals they are embedded in our "Accountability Plan and Report" which is reviewed annually to measure our progress achieving commitments and to set the goal for the coming year. Once this is completed the results are reported by Kwantlen's Board of Governors and President to the Minister of Advanced Education. We believe this process of accountability places a very significant level of accountability on what we do.

The Accountability Plan and Report is available for download from our website which is located at http://www.kwantlen.ca/home.html .

2.4 Why Energy Management is Important to Us

At Kwantlen Energy Management is a core consideration when completing new expansions, renovating buildings, and operating day to day. This has led Kwantlen to consistently address its energy intensity since 1994.

Our motivation for taking such an aggressive stance on energy management is:

- Create a healthy and comfortable learning and work environment
- Reduce energy consumption and greenhouse gas emissions
- Minimize environmental impact and promote environmental sustainability
- Minimize institutional expenditures for utilities

From a global perspective, we recognize that organizations must greatly reduce their impact on the natural environment. To that end, we strive to reduce consumption of electricity and natural gas; so that we can be seen as leaders to others in our sector and the community.

From an internal perspective, we recognize that the cost of energy will increase with time. To that end, we strive to reduce consumption and become more efficient with energy use.

Our goal is to achieve a 7 year or better simple payback on resource management projects. Longer paybacks are considered when there are also reductions in maintenance or other life cycle costs.

Kwantlen has been successful in part due to its partners. Much of the energy efficiency work we have performed has been funded by either avoided energy costs, or by financial assistance from NRCan, BCHydro, and the Province of British Columbia

2.5 Continuous Improvement

Kwantlen is committed to a continuous improvement process for the management of environmental resources. That means when a project is done the program is not complete. Continuous improvement is the commitment to consistent effort in the proper management of our social and natural environment. It is appropriate for any individual, institution or corporation.

As our buildings take different functions, technologies change, the relative cost of energy increases and climate challenges become more important, our obligation to society as a leader and a focus for solutions becomes imperative for the greater global good.

The continuous improvement model ensures previous reductions are maintained and further opportunities are incorporated producing consistent long-term savings for maximum efficiency from both the capital and operating aspect.

3. UNDERSTANDING OUR SITUATION

3.1 Energy Consumption and Costs - Total

The table below illustrates current energy costs and energy use in ekWh units from Jan 2012- Jan 2013. In reviewing this table while electricity represents 48% of our use it represents 72% of our total expense.

Commodity	ekWh	% Consumption	Costs $	% Cost
Electricity	11,303,800	48%	$924,164	72%
Natural gas	12,351,182	52%	$365,185	28%
Totals	**23,654,982**	**100%**	**$1,289,349**	**100%**

3.2 Savings Opportunity Assessment

Using benchmark data when performing savings opportunity analysis helps illustrate opportunties by showing areas with higher than normal energy consumption. When performing assesments it is also important to consider site specific details that may affect the data.

Key site specific details to be considered at Kwantlen:

- Langley – H (Hort) has the highest energy intensity but the floor area is 3% of total area.
- Cloverdale is mostly a trades campus.
- Langley, Richmond and Surrey have similar use.
- Langley horticulture has a new research greenhouse that opened in 2010.
- Langley has the highest energy intensity due to the new ISH research lab which operates 24x7 and has the potential for 14 fresh air changes per hour.

NRCan Benchmark Data – 2005

The table and graph below provides NRCan Benchmark Data from 2005 which we use to evaluate Kwantlen's energy consumption to other similar organizations.

Organization Type	eGJ/M2
University	2.59
Community College	1.42
Kwantlen (2012)	.87

Kwantlen Energy – eGJ/m2

When compared to NRCan benchmark data every campus area is below the benchmark data except Langley – H (Hort). The already low energy intensities are the result of our long term commitment to reduce energy consumption on each campus and complicate finding new ways to save even further energy without significant capital investment.

	Cloverdale	Langley	Langley – H	Richmond	Surrey	Average
2011	.68	.93	2.01	.98	.85	.91
2012	.66	.88	1.98	.87	.85	.87

Kwantlen – GJ/M2

In reviewing the gas consumption there were additions to building area with the ISH research lab added at Langley and the ISH greenhouse added at Langley – H which would increase consumption.

Overall the consumption of gas is up but the weather in 2011 was also colder than in 2010.

	Cloverdale	Langley	Langley – H	Richmond	Surrey
2011	.39	.56	1.64	.53	.39
2012	.37	.51	1.56	.42	.37
% Change	-5%	-9%	-5%	-21%	-5%

Kwantlen – kW/M2

In reviewing the gas consumption there were additions to building area with the ISH research lab added at Langley and the ISH greenhouse added at Langley – H that have come into full operation which would increase consumption.

A significant area at Surrey Campus has geothermal heating which is electric rather than gas and the cold weather would increase consumption.

	Cloverdale	Langley	Langley – H	Richmond	Surrey
2011	80	102	102	127	128
2012	81	105	116	126	132
% Change	+1%	+3%	+14%	-1%	+3%

3.3 Annual Energy Intensity by KPI in ekWh/M2

The table below shows annual energy intensity in ekWh/m2 for each campus compared to Kwantlen's year 2000 base year for our energy projects and to 2006 for PSECA and 2007 for Bill 44.

Year	Cloverdale	Langley	Langley – H	Newton	Richmond	Surrey	Average
2000		280	577	309	368	310	328
2007	179	233	437	278	314	303	271
2008	173	221	427	140	281	270	245
2009	180	241	441	124	259	247	237
2010	168	237	489	37	244	228	222
2011	188	258	558	Closed	273	237	252
2012	184	245	549	Closed	242	235	241

4. PROVINCIAL GOVERNMENT REQUIREMENTS

4.1 PSECA ENERGY SAVINGS GOALS

Executive Summary

The BC government and BCHydro have entered into a new Public Sector Energy Conservation Agreement to decrease electricity consumption in public sector buildings. The agreement is in effect from 2008 through 2020 and applies to provincial government office buildings, Crown corporations, schools, universities, colleges, hospitals and social housing. Approximately $200 million will be invested in new technology, energy innovation and retrofits by the government over the next 12 years.

Overview of Goals

The PSECA goal requirements are summarized as follows:

- Reducing electricity 5% by 2011 from 2006 levels
- Reducing electricity by 14% by 2016 from 2006 levels
- Reducing electricity by 20% by 2020 from 2006 levels

To achieve these requirements we need to reduce our consumption to these levels:

- 2011 Goal – reduce electrical consumption to 9,267,895 kWh per year
- 2016 Goal – reduce electrical consumption to 8,389,884 kWh per year
- 2020 Goal – reduce electrical consumption to 7,804,543 kWh

Progress Achieving PSECA Goals

While we continue to implement energy conservation projects to reduce electrical consumption we have added buildings which increases consumption. We have also added geo-exchange which is a greener and more efficient source of heating energy but increases electrical consumption. And, we continue to increase student enrolment and increase operating hours which increases electrical consumption.

Another issue affecting our ability to reduce our electrical consumption from PSECA's 2006 base year is that we were early adopters of improving energy efficiency and we completed significant work from 2000 to 2006 which resulted in significant reductions in electrical energy use by 2006.

While we have not achieved the PSECA targets for consumption we have improved energy efficiency when we measure it on energy density per square meter basis.

Year	Electric kWh per Year	kWh % Comparison to 2006 levels	Campus total M2	% increase in Camps M2	Energy Density kW/M2	% more efficient from 2006 levels per M2
2006	9,755,679	0%	82,432	0%	118	0%
2007	10,727,111	9% increase	90,304	9% increase	119	-1%
2008	10,180,064	4% increase	95,524	14% increase	107	9%
2009	10,814,359	10% increase	100,313	18% increase	108	9%
2010	10,746,063	9% increase	100,313	18% increase	107	9%
2011	10,963,000	11% increase	97,056	15% increase	113	4%
2012	11,303,800	14% increase	98,068	16% increase	115	3%

4.2 BILL 44 GREENHOUSE GAS REDUCTIONS GOALS

Executive Summary

Bill 44 was introduced by the BC Government to make greenhouse gas reductions a mandatory requirement.

Overview of Goals

We intend to use our energy efficiency work and reductions in energy consumption to support the government to achieve the Bill 44 Greenhouse Gas Reduction Goals which are summarized as follows:

- By 2012 – 6% below 2007 levels
- By 2016 – 18% below 2007 levels
- By 2020 – 33% below 2007 levels
- By 2050 – 8-% below 2007 levels

Carbon Tax and Fee

Carbon reporting is performed by uploading our consumption information to provincial government website "SMARTTool" which records consumption of energy and related consumables which are associated with Greenhouse gas emissions. SMARTTool calculates Kwantlen's carbon emissions which must be offset by purchasing carbon offsets. The purchase of these carbon offsets is defined as a transaction charge currently valued at $25 per tonne of C02e and applies to emissions for 2010 and onward.

In addition to the transaction charge for each tonne of C02e there is also a separate carbon tax which has been added to our invoices as of July 2010 for natural gas purchase.

Progress Supporting These Goals

Year	GHG from Energy per Year	% Comparison to 2007 levels	Campus total M2	% increase in M2	Energy Intensity eGJ/M2	% more efficient per m2 from 2007 levels
2007	2710	0%	90,304	9% increase	.97	0%
2008	2604	4% reduction	95,524	5% increase	.88	9%
2009	2579	5% reduction	100,313	18% increase	.85	13%
2010	2319	14% reduction	100,313	18% increase	.80	17%
2011	2676	1% reduction	97,056	7% increase	.91	8%
2012	2515	7% reduction	98,068	8% increase	.87	10%

Note: data has not been normalized for weather.

5. PROJECT CRITERIA FOR THIS SEMP

Overview

During 2012 and early 2013 we have been evaluating new exterior lighting technology including LED and Induction lighting for the projects we plan to implement in this SEMP. As part of our evaluation process we have set up a test area on the loading dock at the Surrey Campus and installed a variety of light fixture types and wattages. The test area is open to our community and anyone who may benefit from being able to observe the different fixture types we have installed. Signage will be installed indicating the type of technology, the wattage of the light and the lumen output by April 1.

Energy Consumption

Using the test information we have been able to identify exterior light fixtures for retro-fits that use at least 50% and in some instances up to 90% less energy than some of our existing exterior light fixtures.

Light Levels

The pilot project at the Surrey Campus has identified energy efficient light fixtures that significantly reduce the energy consumption and provide an increase in lighting levels.

Maintenance

The lighting systems we are currently evaluating are primarily exterior and use 20 year old metal halide technology. Based on current hours of operation they typically have a 4 year or sooner replacement cycle on the bulb and a 7 year replacement cycle or sooner on the ballast and capacitor. The new replacement technology's we are considering require maintenance as follows:

- LED has no maintenance for over 13 years and is recycled and replaced at the end of its life like a light bulb.
- Induction has no maintenance for over 22 years and is recycled and replaced at the end of its life like a light bulb.

As we continue to implement zero maintenance lighting system technology there will be a significant future benefit in reducing repair and maintenance expenses.

Key Parameters

As may be appreciated we have a wide variety of lighting technology and different fixture types installed at each campus that need to be evaluated with the following considerations in mind:

- Each type of technology and fixture type has different design criteria that must be considered before a successful retro-fit can be determined.
- The technology available is changing rapidly and continues to improve. Some technologies are more refined and cost feasible than others.
- There is a considerable price variance for each technology.
- BCHydro provides incentives that often provides significant financial rebates to help pay for the cost of project work.
- We need to perform life cycle costing to identify the technology with the best value and performance.

6. OUR ACTIONS

6.1 Planned Actions for 2013 and 2014

Projects

Implement a minimum of six areas to be retrofitted with new energy efficient lighting technology.

Energy Manager Funding

A request for energy manager funding will be submitted to BCHydro to follow up on the recommendations in the 2012 Energy Management Assessment (EMA) by BCHydro.

Metering and Monitoring

Interval energy monitoring system will measure electric and gas consumption on buildings and larger equipment. This will help to identify energy savings opportunities and will provide energy intensity information of key areas and equipment as recommended in the last EMA.

Communication, Training and Awareness

Enhance training and awareness for energy conservation to employees in high use energy areas who control the major equipment and systems as recommended in the last EMA.

Capital Renewal and Maintenance Projects

Capital renewal projects will be reviewed for the potential to include improvements to reduce energy consumption.

New Construction and Renovations

Energy efficiency is a key consideration in all construction and renovation projects.

Timeframe

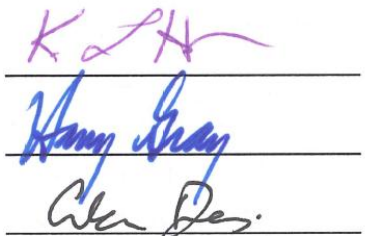
This SEMP is for a two year period from start of fiscal year April 1 2013 and ending Mar 31 2015.

6.2 Project Savings and Cost Estimates

Year	Description	Savings kWh/Yr.	Savings GJ/Yr.	Tonnes GHG/Yr.	Budget Estimate
2013/14	Lighting upgrade projects - using LED and induction light technology	120,000			$150,000
2014/15	Lighting upgrade projects - using LED and induction light technology	120,000			$150,000

6.3 SEMP 2013 Approval

Executive Director	Karen Hearn
Vice President	Harry Gray
President	Alan Davis



7. APPENDIX #1

7.1 List of stakeholders

Our Team

Our people and their commitment to energy conservation are one of our greatest resources in having an effective energy management program succeed.

Name	Title
Alan Davis	President
Harry Gray	Vice-President, Finance and Administration (acting)
Karen Hearn	Executive Director, Facilities Services
Maggie Fung	Executive Director, IET
Sukey Samra	Associate Director, IET
Scott Gowen	Director, Supply and Business Services
Christine Monroe	Manager, Supply and Business Services
Dan Brown	Manager, Physical Plant, Facilities Services
Dan Hall	Facilities Technologist, Facilities Services
Iain Hunter	Operations Manager, Facilities Services
Don Smith	Assistant Operations Manager, Facilities Services
Charles Kincade	Facilities Supervisor, Facilities Services
Shawn Cahill	Facilities Supervisor, Facilities Services
Sam Mann	Facilities Supervisor, Facilities Services
Jag Dosanjh	Power Engineer, Facilities Services
Maurice Bedard	Maintenance Coordinator, Facilities Services
Andy Sayer	Maintenance Coordinator, Facilities Services

BCHydro Support

BCHydro programs provide significant support to Kwantlen achieving reductions in energy usage.

Power Smart Partners Express (PSP) and former Power Smart incentive program (PIP) have provided funding to assist with purchasing more energy efficient products when practical to do so.

The EMA One to Five assessments completed in 2008 and again in 2012 identified potential energy savings that could be achieved if appropriate staffing support is available. Kwantlen received $100,000 for energy manager funding from BCHydro in 2011/12 to advance priorities noted in the 2008 EMA.

Key Funding

External organizations help by providing funding and increasing our knowledge base to implement projects. The table below summarizes funding we have received.

Organization	Description of funding	Year	Value
BCHydro	Added light switch control to 8 - 24 hour light fixtures	2012	$2,200
BCHydro	Funding to hire an Energy Manager	2011	$100,000
BCHydro	PSP and PIP project incentive funding	2010	$23,515
Province of B.C.	Geothermal	2009	$450,000
Province of B.C.	Library mechanical retrofit	2009	$1,200,000
BCHydro	EPoints and other project funding	2003 – 2008	$90,458
PSECA	HVAC/Lighting upgrade Langley/ Surrey	2009	$457,596
BCHydro	Energy Audit	2008	$72,000
CBIP	Cloverdale project	2007	$48,000
NRCan	Efficiency project by Vestar	2002	$263,000
		Total	**$2,706,769**

7.2 Baseline Energy Use – Account Histories

Base Year

Energy reduction goals need to have a stable point of reference so they can be measured which is called a "Base Year". At Kwantlen we selected the year 2000 as a stable base year we reference for our energy reductions goals. New mandatory goals established by the Government to increase energy efficiency and reduce greenhouse gas emissions (GHG) provide our new target base years. The base year for electricity is 2006 and the base year for reducing GHG emissions is 2007.

Historical Consumption Data

The chart below summarizes energy consumption records from 2000 to 2010. The three base years are bolded; 2000 – Kwantlen's original base year, 2006 – PSECA base year, 2007 – Bill 44 base year

Year	Area/M2	kWh	GJ	eGJ/M2	Electric $	Gas $	Total $
2000	**81,202**	**12,091,954**	**52,492**	**1.18**	**$617,873**	**$341,254**	**$959,127**
2006	**82,432**	**9,755,679**	**42,690**	**0.94**	**$593,649**	**$458,089**	**$1,051,737**
2007	**90,304**	**10,727,111**	**49,321**	**0.97**	**$637,223**	**$600,666**	**$1,237,889**
2008	95,524	10,180,064	47,459	0.88	$628,334	$607,595	$1,235,930
2009	100,313	10,814,359	46,642	0.85	$685,518	$565,735	$1,251,253
2010	100,313	10,746,063	41,447	0.80	$746,988	$446,701	$1,193,690
2011	97,056	10,963,000	48,511	0.91	$805,370	$459,742	$1,265,112
2012	98,068	11,303,800	44,461	.87	$924,164	$365,185	$1,289,349

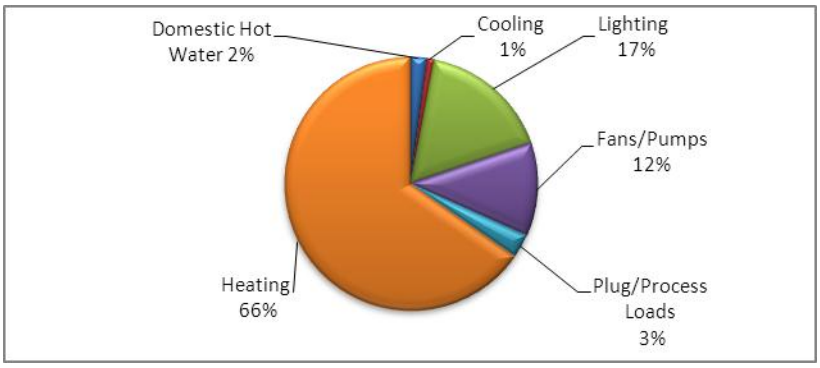
7.3 Studies – Energy Breakdown Tables

Langley Campus

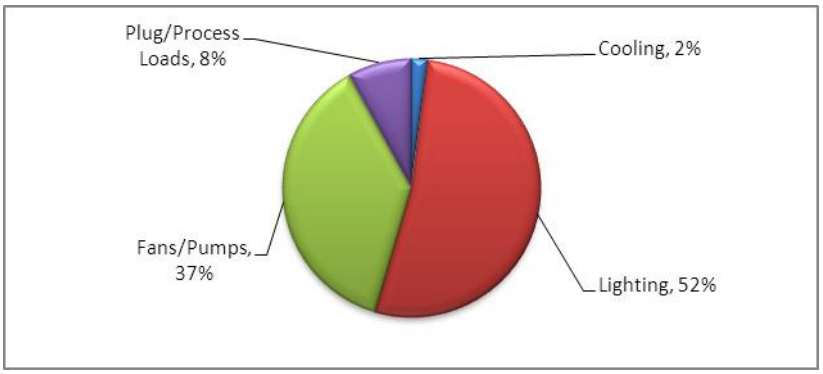
Note: % values rounded to simplify information

System	Total Gas Consumption		Total Electrical Consumption		Overall Energy Consumption		Overall Facility Energy Intensity	
	GJ	%	kWh	%	e-GJ	e-kWh	e-kWh/m2/yr	%
Domestic Hot Water	393	3%	0	0%	393	109,167	6	2%
Cooling	0	0%	35,870	2%	129	35,870	2	1%
Lighting	0	0%	880,042	52%	3168	880,042	50	17%
Fans/Pumps	0	0%	622,941	37%	2243	622,941	35	12%
Plug/Process Loads	0	0%	140,947	8%	507	140,947	8	3%
Heating	12439	97%	0	0%	12439	3,455,278	196	66%
Total	12832	100%	1,679,800	100%	18879	5,244,245	298	100%

Overall Energy Intensity



Electrical Consumption

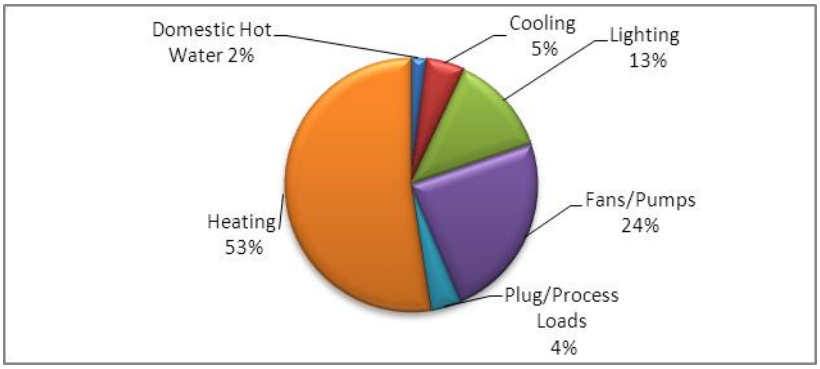


Richmond Campus

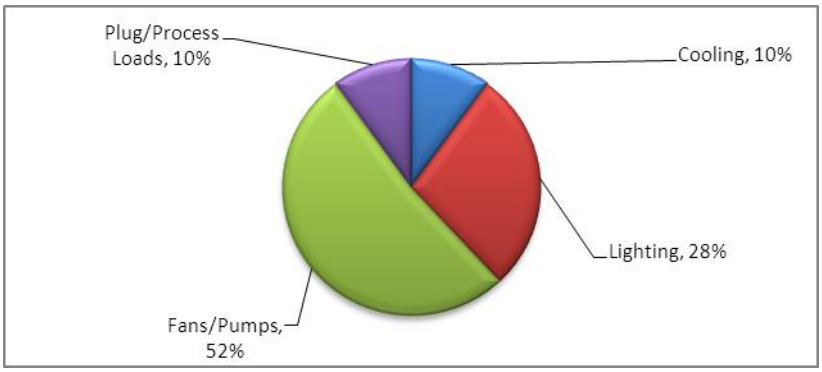
Note: % values rounded to simplify information

System	Total Gas Consumption		Total Electrical Consumption		Overall Energy Consumption		Overall Facility Energy Intensity	
	GJ	%	kWh	%	e-GJ	e-kWh	e-kWh/m2/yr	%
Domestic Hot Water	387	3%	0	0%	387	107,439	6	2%
Cooling	0	0%	305,534	10%	1100	305,534	17	5%
Lighting	0	0%	825,885	28%	2973	825,885	46	13%
Fans/Pumps	0	0%	1,526,877	52%	5497	1,526,877	85	24%
Plug/Process Loads	0	0%	286,504	10%	1031	286,504	16	4%
Heating	12380	97%	0	0%	12380	3,438,950	192	53%
Total	12767	100%	2,944,800	100%	23368	6,491,189	363	100%

Overall Energy Intensity



Electrical Consumption

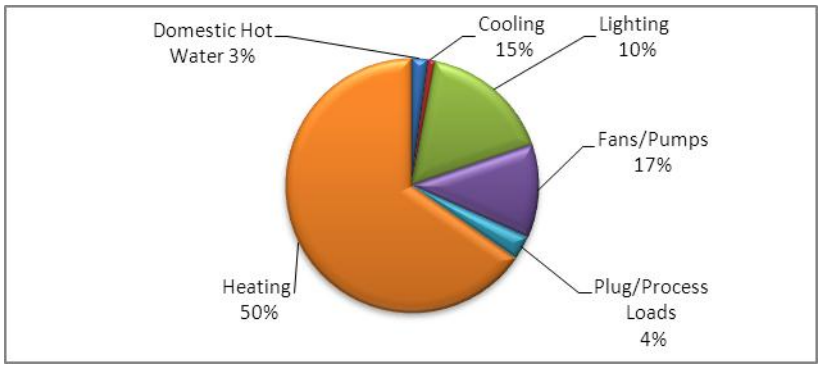


Surrey Campus

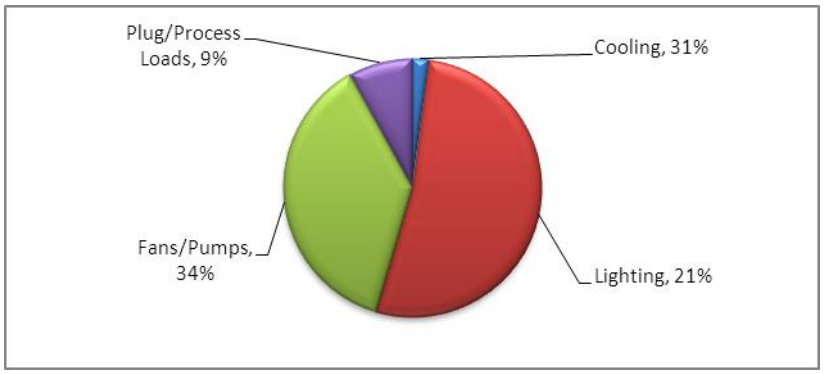
Note: % values rounded to simplify information

System	Total Gas Consumption		Total Electrical Consumption		Overall Energy Consumption		Overall Facility Energy Intensity	
	GJ	%	kWh	%	e-GJ	e-kWh	e-kWh/m2/yr	%
Domestic Hot Water	0	0%	254,958	6%	918	254,958	11	3%
Cooling	0	0%	1,263,136	31%	4547	1,263,136	54	15%
Lighting	0	0%	852,044	21%	3067	852,044	37	10%
Fans/Pumps	0	0%	1,390,013	34%	5004	1,390,013	60	17%
Plug/Process Loads	0	0%	370,848	9%	1336	370,848	16	4%
Heating	15006	0%	0	0%	15006	4,166,361	180	50%
Total	15006	100%	4,131,000	100%	29878	8,299,361	356	100%

Overall Energy Intensity



Electrical Consumption



7.4 Current Business Practice Gaps – EMA cover letter 2012 from Key Account Manager

BC hydro powersmart

reliable power,
at low cost,
for generations

July 13, 2012

Karen Hearn
Executive Director – Facilities Services
Kwantlen Polytechnic University (KPU)
12666 72nd Avenue
Surrey, BC V3W 2M8

Dear Karen,

Thank you for your time and that of your management team on June 26th. I appreciated your input and feedback and trust that you found the Energy Management Assessment (EMA) an informative and worthwhile exercise.

The latest diagnostic session revealed that:

- Your organization has a SEGEMA LR of 1.59 - up 21.4% from the previous EMA; and
- Your current SEGEMA TBR of 0.69 signals some imbalance in your energy management approach and bringing key interrelated energy management business practices into better alignment will work to improve the overall energy performance.

Based on the results of the diagnostic session, it is recommended that you focus on the following elements to continue to improve energy management:

(1) Policy
Incent participation in energy conservation initiatives by providing opportunities for senior management to recognize and reward actions from individuals or teams that contribute toward energy efficiency and/or meet established targets.

(2) Targets / Reporting
Set energy intensity parameters and consumption reduction targets for all key locations that cascade up to an overall annual reduction target. Proactively deliver regular energy intensity reports to department personnel for use in examining variances from established target.

(3) Plans / Actions
Secure senior management approval for a comprehensive, multi-year strategic energy plan for coordinating the implementation of capital projects, operational opportunities, and behavioral initiatives needed to meet long term energy conservation goals.

(4) Teams / Committees
Establish departmental (or area) energy coordinators to improve broader participation in the energy conservation program.

(5) Employee Awareness / Training
Ensure operating and maintenance procedures instruct personnel to make appropriate adjustments in energy-using equipment aimed at maintaining proper conditioned spaced conditions while optimizing consumption patterns.

Included in this package are a detailed Energy Management System Action Plan and Diagnostic Report that outline these recommendations in further detail. Also included is a draft Energy Management Action Plan Timeline that can serve as a starting point for identifying the specific task items necessary for implementation of the recommended actions outlined and provide a template for managing the ongoing progress toward implementation. I will work with you to finalize the draft Action Plan Timeline.

BC Hydro would like to thank KPU for your participation in the EMA diagnostic session, and we look forward to working with you in implementing these recommendations and supporting your energy management activities.

Sincerely,

Ron Mastromonaco
Key Account Manager

British Columbia Hydro & Power Authority, , ,
www.bchydro.com

7.5 Our History

Overview

Since inception Kwantlen has been an active and creative leader in developing a sustainable world and our resource management has always been an integral part of that role.

The energy conservation projects we have implemented have resulted in significant and ongoing cost avoidance for energy expenses and reductions in our greenhouse gas emissions.

Total cost avoidance for energy from 2000 to 2011 is estimated to be $2,712,262.

Energy Cost Avoidance

Since our base year of 2000 we have cumulative energy savings of over $3,069,110.

Awards

Award Description	Awarded By	Year
BCHydro Power Smart Excellence Award	BCHydro	2012
BCHydro Power Smart Leader (only 13 in province)	BCHydro	2010
BCHydro Power Smart Leader (only 7 in province)	BCHydro	2009
Excellence in Energy Management	BCHydro	2008
LEED gold achieved for Cloverdale Campus project		2007
Power Smart Certified Energy Efficiency Leader designation (only 9 in the province)	BCHydro	2004
Power Smart Partner Excellence Award	BCHydro	2003
Received Leadership Award as Top Canadian post-secondary Institution in "Going Green" Recognition by Natural Resources Canada's as an Energy Innovator in their 'Energy Innovators Initiative	VCR Inc.	2002
Designated BCHydro Power Smart Partner	BCHydro	2002

Past Key Actions and Achievements

Description	Year
▪ Signed BCHydro “Power Smart Partner – Energy Conservation Pledge Feb 2012	2012
▪ Completed construction of the ISH research greenhouse which is targeted to be LEED Gold.	2011
▪ Completed construction of ISH research lab at Langley which is a LEED building.	2009
▪ Completed construction of additions to Arbutus which is LEED Gold and Surrey Main building is a LEED Silver building	2008
▪ Completed construction of Cloverdale Campus which achieved LEED gold	2007

▪ Completed addition to Fir building which was built to LEED standards and has radiant heating and cooling as well as natural ventilation.	2006
▪ Purchase of Green Power Certificates ▪ EPoints project adoption ▪ Power Smart Certification ▪ Add electrical metering on the Cedar Building at Surrey to monitor electrical loads ▪ Gold Champion Level Reporter with VCR ▪ Begin writing "Success Stories" to share information on energy efficiency projects ▪ Develop training manual for FSG's which includes training on energy conservation ▪ Create web page	2003
▪ Commits to implement a "Sustainable Resource Management Program" ▪ Commits to a program of continuous improvement. ▪ Makes a further commitment to reduce energy and greenhouse gas emissions by 5% from 1994 levels – a further 139 tonnes of CO_2e. ▪ Commits to introduce "green procurement" policies that include greenhouse gas management policies, resource management policies and water conservation.	2002
▪ Signed an Energy Services Agreement with Vestar Ltd. to implement the energy efficiency project at the Langley, Richmond and Surrey Campuses (owned facilities) ▪ Amalgamated 1996 targets into a new target to reduce electricity at its 3 owned campuses by 1.85 million kWh, natural gas by 6,842 GJ and CO_2e by 420 tonnes	2000
▪ Agreed to be a "Pilot Project" to assist the B.C. Government develop the Green Buildings BC – Retrofit Program. ▪ Received permission from the BC Ministry of Finance and Corporate Relations to finance a $2 million Multi-Year Energy Services Contract. ▪ Developed an Eco-Efficiency Action Plan for its three owned campuses (Langley, Richmond and Surrey) ▪ NRCan approved Energy Innovators ^{PLUS} Incentive to support project. ▪ Committed to reporting to VCR and to implement a Community Communications, Employee Awareness and a Facility Manager/Operator Training Program.	1999
▪ Issued an Expression of Interest for an Energy Conservation Project as part of its commitment to reduce energy by 10% by 1999. ▪ Started negotiations with the BC Government for permission to enter into an Energy Conservation Project.	1997
▪ Committed to reduce energy by 10% by 1999	1996
▪ Joined the Energy Innovators Initiative and registered with Canada's Climate Change Voluntary Challenge and Registry (VCR)	1995
▪ Assigned responsibilities for energy management to Physical Plant Manager	1993
▪ Implement "Waste Management/Environment" policy F.13	1991
▪ Implement "Operations: 5-Year Maintenance/Renovations plan" policy F.11	1990

7.6 Training and Awareness

Training and Awareness Activities

A brief summary of key training activities is listed in the table below. Training ensures we use up to date methods to evaluate and implement energy savings opportunities and that there are ongoing reminders of activities necessary to maintain energy savings levels.

Actions	Year	Status
Energy Manager training by BCHydro in Feb – Dan B	2012	Complete
Provided awareness sessions at employee and student events during 2012	2012	Complete
Provided quarterly energy efficiency training at each campus with FSG's	2012	Complete
Participate in BCHydro "EMA" one to five assessment	2012	Complete
Carbon Neutral training for SMARTTool and CNAR – Dan/Maurice	2012	Complete
AHU Log Sheet – implemented new monthly sheet. This is completed monthly to review opportunities for energy conservation by ensure equipment is operating within correct parameters by each Facilities Supervisor: Charles Kincade, Sam Mann, and Shawn Cahill. The completed log sheet is reviewed by our Facilities technologist Dan Hall to identify controls anomalies which could affect energy consumption or user comfort.	2012	Complete
Introduction to Energy Management Program – C-L-R-S	2011	Complete
New Employees fair	2011	Complete
Welcome back booth	2011	Complete
Attend BCHydro Power Smart Forum – Dan/Karen	2010	Complete
Attend BCHydro PSP Express workshop – Dan	2010	Complete
Attend BCHydro lighting redesign workshop – Dan	2009	Complete
Attend BCHydro continuous optimization seminar – Dan	2009	Complete
Attend BCHydro energy manager training seminar – Dan	2009	Complete
Attend BCHydro utility rate design seminar – Dan	2009	Complete
Attend ½ day BCHydro energy manager conference – Dan	2008	Complete
LEED training for Karen	2008	Complete
Participate in BCHydro "EMA" one to five assessment	2008	Complete

Energy efficiency requirements included in security contract	2007	Complete
Turn off the lights reminder sign off sheet to Security	2007	Every 4 Months
Training Facilities employees on new buildings	2007	Complete
Provide energy consumption information to supervisors	2006	Ongoing
Stickers available for delamped fixtures	2005	Ongoing
LEED training for Dan and Craig	2005	Complete
LEED training for Dan/Tom/Craig	2004	Complete
Turn off the lights reminder sign off sheet to cleaners	2003	Every 4 Months
Developed ESCO pilot project case study to share experience	2003	Complete
Development of success stories	2003	Ongoing
Energy efficiency requirements included in cleaning contract	2002	Complete
Energy awareness training for cleaners	2002	Every 4 Months
Training for Kwantlen Facilities FSG's	2002	Ongoing
Energy Efficiency awareness posters/Stickers	2001	Ongoing

Awareness Presentations

Kwantlen takes awareness very seriously and the table below summarizes key presentations related to energy conservation and sustainability which have been primarily presented by Kwantlen's Executive Director of Facilities, Karen Hearn.

Awareness presentations help Kwantlen share energy savings ideas and the results of our project work with others to help them implement successful energy conservation projects.

Description of Presentations	Date	Presenter
WCUPPA Conference – part of presentation shared information from our energy management program and benchmark information.	Sept 2012	Karen Hearn
KPU Senate - part of presentation shared information from our energy management program and benchmark information.	June 2012	Karen Hearn
2011 Lean Facility Lifecycle Conference; "Lifecycle-driven Sustainability Investments Fund Core Business Mission Plan – KPU"	Mar 2011	Karen Hearn
PCAPPA Presentation "How to Create a Successful Partnership with your Service Provider"	Sep 2010	Karen Hearn

Tradeline Presentation in Toronto “Getting Small Specialized Lab Areas Right”	May 2010	Karen Hearn
BC Psychology Articulation "Sustainable University Architectural Design"	May 2010	Karen Hearn
Bunting Coady Architect (BCA) Luncheon Series: "Building Green: An Owner's Experience"	Apr 2010	Karen Hearn
2011 Lean Facility Lifecycle Conference: "Lifecycle-driven Sustainability Investments Fund Core Business Mission - KPU"	Mar 2011	Karen Hearn
IFMA "Building Green: An Owner's Experience"	Mar 2010	Karen Hearn
Presentation at 2009 Power Smart Forum “How to Identify, Quantify & Monitor Energy Conservation Measures within Your Facility”	Oct 2009	Karen Hearn
Presentation at the Facilities Asset Management Conference "Achieving Excellence in Energy Management to Reduce Cost and Protect the Environment"	Sept 2009	Karen Hearn
Presentation "Dare to Lead" at Royal City Builder's Awards	Sept 2009	Karen Hearn
Presentation "Sustainability" to Bill Burgess's GEOG students	Jan 2009	Karen Hearn
Presentation "Continuous Improvement Programs" to Environmental Managers Association of BC	Apr 2008	Tom Knox
Presentation "Master Planning & Environmental Sustainability" to Kwantlen's Board of Governors	Jun 2008	Karen Hearn
Presentation "Master Planning & Environmental Sustainability" to Gordon Lee, Facilities Management Team, Facilities Supervisors	Jul 2008	Karen Hearn
Presentation "Achieving Excellence in Energy Management" to the Environmental Managers Association of BC (EMA)	Nov 2008	Karen Hearn
Presentation "Master Planning & Environmental Sustainability" to Kwantlen's Design Students	Sept 2008	Karen Hearn
Presentation "Green Sustainable Building Controls" to BACnet International Conference	Sept 2008	Karen Hearn & ECS
Presentation "Sustainability for You" to Rotary	Aug 2007	Karen Hearn
Presentation "Sustainability" to Environmental Protection Technology Advisory Committee	Apr 2007	Karen Hearn
Presentation "Trends in Large Educational Buildings: Sustainable Design" at The Campus of the Future, A Meeting of the Minds	Jul 2006	Karen Hearn, BCA &UBC
Presentation "Our 'Sustainability' Vision and the Evolution of Power Smart" to BC Hydro Customer Panel Presentation	Jun 2006	Tom Knox
Presentation "Top 10 Trends in Large Educational Buildings:	Jun 2006	Karen Hearn,

Sustainable Design" to SCUP - Pacific Regional Conference		BCA &UBC
Presentation "Trends in Planning Educational Facilities" to the Society of Colleges & University Planning	Jan 2006	Karen Hearn & ECS
Presentation "Sustainability - Eyes Wide Open" to Facilities Administrators Conference	Nov 2005	Karen Hearn & BCA
Presentation "Experiences in Energy Efficiency"	Feb 2004	Karen Hearn

7.7 Record of Improvements

The following is a summary of energy efficiency work from 2000 to 2013.

Description	Source of Idea	Estimated Annual Savings	Campus	Year
Identified and corrected previously unknown condition affecting the scheduling for the kitchen make up air fan and supply air fan for the building which would not allow them to be operated on separate schedules so the kitchen system could be turned off when not required.	Shawn Cahill		Surrey	2013
Upgraded lighting servicing welding gas storage to LED. This area was identified as needing frequent maintenance and the LED product resolved this issue and provided the added benefit of energy savings	Graham Fuller Charles Kincade		Cloverdale	2013
We have added interval metering connected to our ESC Automation "Building Automation System" (BMS) which was identified as last year's key project in our 2012 SEMP. Rather than install a standalone system we worked closely with ESC Automation to fully integrate the interval metering with our existing BMS. This metering breaks down and monitors each type of energy use by primary equipment for each building, including energy use breakdowns for electrical, gas, and geothermal.	Dan Hall Dan Brown Dave Toynbee – ESC EMA by BCHydro		All	Pending for Mar 2013
Refurbished Arbutus AHU including replacement of 30 HP motor with 15 HP motor and replace 65 Tonne DX cooling with 25 tonne all more suitably sized to reductions in building load due to renovations. New system is also connected to Geo-exchange as part of longer term planning for the campus heating system. The primary purpose of this project is to replace obsolete equipment identified in the VFA audit but energy savings measures opportunities were considered and implemented as part of the project work.	Dan Brown Dan Hall		Surrey	Pending for Mar 2013

Modified boiler bridge piping on each Bldg. to increase temperature differential across the condensing boilers to drop them more aggressively into condensing mode for greater natural gas efficiency. This modification also allows the system pumping to operate at approx. 50% capacity on one 15 HP pump in full heating mode whereas previously we needed to run the 2 - 15 HP pumps at 100% capacity. This provides lead/lag redundancy on the pumping increasing reliability if a pump fails and reduces energy consumption for primary pumping during peak heating periods by about 75%.	Mark Dorini Dan Hall		Surrey	Pending for Mar 2013
Replace obsolete local thermostats in vestibules and stairways (over 20 years old) and at end of life with ones on the BMS network so heaters can be scheduled on TOD and reset to outdoor air temp. This will allow all stairwells to be run at a setback temperature saving electricity and natural gas.	Dan Brown		Rich	Pending for Mar 2013
Replace A/C system in main computer room which was at end of life with more energy efficient system tied to geo-exchange. New system can reject up to 18 tonnes of heat energy into the geo-exchange system for heating to other buildings on campus. The primary purpose of this project is to replace obsolete equipment identified in the VFA audit but energy savings measures opportunities were considered and implemented as part of the project work.	Sukey Samra Dan Hall Dan Brown John Kerti	70,000 kWh	Surrey	Pending for Mar 2013
Forest feature lighting and courtyard flood lights retrofitted with new LED technology.. New system Maintenance free approx. 12 years for LED light units.	Andy Sayer	14026 kWh	Surrey	Feb 2013
“BETA” loading dock lights. This project utilizes a variety of light technologies and wattages for evaluation of various technologies available. The “BETA” area will be left in place for access by the community and others with information signs on each type of technology installed.	Andy Sayer Dan Brown	3126 Kwh	Surrey	Feb 2013

Removed and decommissioned 3 tons A/C system as part of renovation project.	Craig Regan		Rich	July 2012
Remove old heat maintenance tape in crawlspace	Maurice Bedard	6377 kWh	Langley	May 2012
Remove Arbutus air compressor and convert remaining controls to DDC	Dan H Derrick Daley - ESC		Surrey	April 2012
Disconnect two - 2 tube fixtures with 40 watt tubes for road sign	Charles Kincade	700 kWh	Langley	April 2012
Add light switch for ISH greenhouse	Comar Electric		Langley	Feb 2012
Implement AHU log sheet to monitor system performance as it relates to user comfort and system energy performance monthly	Dan Brown		C-L-R-S	Jan 2012
Controls modifications to adjust natural ventilation to change building pressure from negative to neutral for Surrey Main. This reduces operation on air curtain heaters with 35 kW capacities onto the geo-exchange which is more efficient.	Shawn C Dan Hall Dan Brown Derrick D	42,000 kWh		Oct 2011
Add LED lighting to Birch Bldg.	Maurice Bedard	3,966 kWh	S	Sept 2011
Add Earthright Interval metering for electricity and natural gas at main utility meters.	EM Team	214,386 kWh 856 GJ	C-L-R-S	July 2011
Add LED lighting to Grass Roots Cafe	Maurice Bedard	13,441 kWh	S	May 2011
Rebalance laboratory fume hood air volumes to closer tolerances now that air flow alarms have been installed.	Mark Dorini - MDT	49,325 kWh	L-R-S	April 2011
Convert compact fluorescent lights in hallway to 2x4 fluorescent tubes	Charles Kincade	2680 kWh	L	Feb 2011
Add VFD and programming for conference center demand ventilation	Consultant	5,808 kWh 128 GJ	R	Jan 2011
Add kitchen hood controls and VFD's	Energy Audit	49,734 kWh 128 GJ	R	Jan 2011
Removed unnecessary track lights in boardroom	Karen Hearn	5,180 kWh		Aug 2010

Add occupancy sensors to washrooms	Dan Brown	11,718 kWh	R	July 2010
Split automatic lighting control zones in south “hockey stick” hallway to improve control	Derrick Daley		C	June 2010
Pole lamp conversion from 175 watt metal halide to 85 watt compact fluorescent. Avoids deferred maintenance to replace capacitors and ballasts	Dan Brown	76,464 kWh	L	May 2010
Install one additional condensing boiler on spare boiler pad: PSECA project (in progress Dec 2009)	Energy Audit	2425 GJ	L	Feb 2010
Install washroom occupancy sensors	Energy Audit	34,914 kWh	S	Jan 2010
Remove one old 6,000,000 million BTU boiler and replace with two condensing boilers : PSECA project	Energy Audit	4,139 GJ	S	Dec 2009
Replace electric motors on AHU 1E, AHU- 1G (supply, return, exhaust), AHU-2G (supply, return, exhaust) with high efficiency: PSECA project	Energy Audit	32,550 kWh	S	Dec 2009
Replace 52-90 watt flood lights in conference centre with 67 watt lights of comparable light output which also have a longer life reducing maintenance costs.	Maurice Bedard		S	Oct 2009
Retro fit pneumatic VAV box control to DDC, add demand ventilation to large areas with variable occupancy and rebalance.	Dan Brown		R	Sept 2009
Relamp parking below main building to 25 watt tubes.	Sam Mann		R	Aug 2009
Switch to “Daytime Cleaning” and turn off all lights and equipment at closing time.	Karen Hearn		C-L-R-S	Aug 2009
Install “Melink” kitchen exhaust control to reduce kitchen hood exhaust air flow and make up fan air flow. Includes optic sensors to see smoke and heat detectors to sense cooking: PSECA project.	Energy Audit	15,497 kWh 318 GJ	S	Aug 2009
Install “Melink” kitchen exhaust control to reduce kitchen hood exhaust air flow and make up fan air flow. PSECA project.	Energy Audit	20,430 kWh 144 GJ	L	Aug 2009

Replace weather-stripping on main doors	Tom Knox		S-L-R	July 2009
Relamp all hallway 24 hour tubes to 25 watts	Karen Hearn		S-L-R	July 2009
Relamp hallways (except Arbutus, Birch and Surrey Main and new bldgs. at Surrey) to 30 watt tubes	Karen Hearn		S-L-R	July 2009
Replace 50 Halogen spot lights which highlight the 2nd floor hallway glass tiles with LED	Maurice		L	June 2009
Created program to control lights using occupancy sensor in classrooms Cedar rooms 1040, 1045, 1050, 1055, 1060, 1075, 2045, 2060, 2065 and 2075	Maurice		S	June 2009
Enable washroom occupancy sensors	Charles Kincade	4,425 kWh	L	May 2009
Add time schedule controls to atrium entrance heaters and kitchen hood system	Shawn Cahill		R	May 2009
Add motion sensors to classrooms at in Bldg G	Maurice Bedard		S	Feb 2009
Turn off sprinkler room electric heater	Sandra Hoffman		L	Jan 2009
Upgrade t12 to t8 for misc. lights at Surrey in washrooms C176-C253-C254, mechanical room's c1x1-c2x1 and Britco storage Bldg.	Shawn Cahill		S	Jan 2009
Implement master damper control to separate ventilation control from fan system control. Allows building warm up with no ventilation	Dan Brown		S-L-R	2008
Retro fit pneumatic VAV box controls to DDC	Dan Brown		R	2008
Program night lighting at Cloverdale to shut off in Atrium when cleaners are in by adding 2 light fixtures above stairs and 2 below	Tom Knox		C	Aug 2008
Move out of Newton Campus and set heating systems on Bldg 3 to minimum settings			N	2009
Add piping insulation in greenhouse to improve occupant comfort and improve energy efficiency	Tom Knox		L	2007
Add Geo-exchange to Surrey Campus as part	Karen			2007

of new building additions to Bldg A and C.	Hearn			
Incorporate natural ventilation and radiant heating/cooling and heat recovery to new building additions to Bldg A, C and D	Consultant			2007
Add control (C02) sensor to MP room	Tom Knox		S	2004
Optimize main electrical vault voltage (pilot with BCHydro)	Tom Knox		S	2004
Lower parking lot light wattage	Tom Knox		S-L-R	2004
Convert HID to CF (Marine type Wall lights)	Tom Knox		L	2004
Add light switch to mechanical room 245	Tom Knox		S	2004
Install fan heaters in horticulture labs to avoid replacing buried underground heating line and improve energy performance	Tom Knox		L	2004
Relocate print shop from Newton to Surrey and optimize for energy efficiency	Scott Gowen		S	2003
Install new hot water tank to supply domestic hot water and allow main boilers to be turned in summer months	Dan Brown		R	2003
Turn off incandescent gym lights 100hrs/wk using a key switch	Tom Knox		S	2003
Install new lighting system in Atrium to reduce energy consumption, reduce maintenance costs and increase light levels. Funded 100% by BCHydro	Tom Knox		R	2003
Add CO control for 2 Parkade exhaust fans	Tom Knox		R	2003
Add photo control for Atrium fixtures and north entrance lights	Tom Knox		R	2003
Add control for accent lighting and forest lighting to turn off when closed	Tom Knox		S	2003
Add photo control/keys for 2nd floor lights	Tom Knox		L	2003
Add photo control/keys for the following Bldgs: Birch - upper central, Main – 2nd skylight, Fir – 3rd skylight, Cedar – 1st floor hallway,	Tom Knox		S	2003
Convert exterior lighting from incandescent to compact fluorescent	Tom Knox		S	2002

Change Auditorium lights (incandescent to fluorescent).	Tom Knox		L	2002
Change incandescent to compact fluorescent	Vestar		L-N-R-S	2002
Add vend misers to additional vending machines	Vestar		L-N-R-S	2002
Pilot project (with Vestar) to perform significant retrofit work to improve energy efficiency started in 2000 and completed in 2002. Work included major lighting retrofit and upgrades to HVAC and mechanical systems. Value approx. 1.4 million and savings targets were estimated at $200,000 per year.	Ric Kelm		L-S-R	2000 to 2002

8. APPENDIX #2 – ASSET INVENTORY

An inventory of HVAC Equipment is listed on the pages that follow.

Kwantlen Polytechnic University

Feb 15 2012

Asset Reqistry - All Equipment

Summary of Campus Totals

Note - information not complete and totals only reflect part of actual loads and capacities.
Future plans are to collect more of the data and update this table.

	Hp	EFF	GPM	CFM	KW	BTU
Cloverdale	448		2124	0	191	7142000
Langley	1533		4248	0	517	32352000
Langley ISH	45		108	1485	3	1641
Richmond	954			175	8743	400000
Surrey	697		5101	577637	1463	12000000
Total	3677		11581	579297	10916	51895641

Cloverdale Campus - Equipment List

ID	Serves	Manufacturer	Model	Date	Motor		Size and Capacity			
					Hp	EFF	GPM	CFM	KW	BTU
Air Conditioning, Computer Room										
AC-5.1	Network Server Room 161	Engineered Air	FWA112/C/O	2007	5			3740		
AC-5.2	Network Server Room 161	Engineered Air	FWA112/C/O	2007	5			4086		
Air Conditioning Units, Split Air Cooled										
AC-1	Serves comms room 2802	Mitsubishi	MS15TN	2007				452		
AC-2	Serves comms room 2321	Mitsubishi	MS15TN	2007				452		
AC-3	Serves comms room 1130	Mitsubishi	MS15TN	2007				452		
AC-4	Serves comms room 2118	Mitsubishi	MS15TN	2007				452		
Air Compressors, Shop (Package Unit with VSD and Dryer)										
Rac-1	Shop air supply - This is a package unit complete with VSD on one compressor, air dryer, air receiver	Atlas Copco	GA11C ff	2007						
Rac-2		Atlas Copco	GA11VSD ff	2007						
VSD				2007						
Dryer				2007						
Air Compressor - Sprinkler System										
AC-F1	Welding shop systems 1									
AC-F2	Welding shop systems 2									
AC-F3	Farrier shop									
AC-F4	Main Computer Room Pre-action									
AC-F5	Library Pre-action									
Air Handling Unit										
AHU-1(SF)	Automechanics	Venmar	9620	2007	10			9900		
AHU-1(RF)	Automechanics	Venmar	9620	2007	8			8730		
AHU-2(SF)	Appliance Repair	Venmar	9618	2007	7			6298		
AHU-2(RF)	Appliance Repair	Venmar	9618	2007	5.0			6150		
AHU-3(SF)	Upholstery	Venmar	9618	2007	10			8115		
AHU-3(RF)	Upholstery	Venmar	9618	2007	5.0			4650		
AHU-4(SF)	South Classrooms	McQuay	CAH025GDAC	2007	20			11709		
AHU-4(RF)	South Classrooms	McQuay	CAH025GDAC	2007	10			12402		
AHU-5(SF)	Carpentry, Multipurp, Plum	McQuay	CAH025GDAC	2007	20			22152		
AHU-5(RF)	Carpentry, Multipurp, Plum	McQuay	CAH025GHAC	2007	2			5500		
AHU-6(SF)	South Offices	McQuay	OAHO35FDAC	2007	30			19710		
AHU-6(RF)	South Offices	McQuay	OAHO35FDAC	2007	15			17400		
AHU-7(SF)	North Offices and Library	McQuay	OAHO35FDAC	2007	30			18429		
AHU-7(RF)	North Offices and Library	McQuay	OAHO35FDAC	2007	15			15600		
AHU-8	Kitchen and Dining	McQuay	CAH008FDAC	2007	5			4520		
AHU-9(SF)	North Classrooms	McQuay	CAH008FDAC	2007	5			4421		
AHU-9(RF)	North Classrooms	McQuay	CAH008FDAC	2007	5			4300		

AHU-10(SF)	Millwright	Ason	Energypak H36i	2007	10			7690		
AHU-10(RF	Millwright	Ason	Energypak H36i	2007	8			7350		
AHU-11	Welding Shop	McQuay	CAH0040FHAC	2007	20			21600		
AHU-12	Fabrication and Assembly	McQuay	OAH011GHAM	2007	10			4760		

Boiler - Main Heating

B-1	Main Heating System	Viessmann	VSB-89	2007						3361000
B-2	Main Heating System	Viessmann	VSB-89	2007						3361000

Chiller

CH-1	Campus cooling	McQuay	AGS170C	2007					191	

Dust Collector

DC-1	Carpentry shop	New-Tech	NTS-44-30	2007	30			8000		

Exhaust Fan (roof)

EF-1	Mens W/R 1755 &1756	Greenheck	GB-101	2007	0.250			971		
EF-2	Womens W/R 1757 &1758	Greenheck	GB-101	2007	0.25			820		
EF-3	Mens W/R 1608 &1609	Greenheck	GB-101	2007	0.25			973		
EF-4	Mens/Womens W/R 2310	Greenheck	GB-141	2007	0.33			999		
EF-5	Mens/Womens W/R 1411	Greenheck	GB-180	2007	0.50			1940		
EF-7	Automechanics 1830	Greenheck	SWB-213-50	2007	3.00			2793		
EF-8-1	Welding Shop Booths	Greenheck	CUBE-161-7	2007	0.8			2434		
EF-8-2	Welding Shop Booths	Greenheck	CUBE-161-7	2007	0.75			2399		
EF-9-1	Welding Shop Booths	Greenheck	CUBE-161-7	2007	0.75			1938		
EF-9-2	Welding Shop Booths	Greenheck	CUBE-141-5	2007	0.75			1576		
EF-10-1	Welding Shop Arms	Greenheck	TCB-LE-2-22-75	2007	7.50			4626		
EF-10-2	Welding Shop Arms	Greenheck	TCB-LE-2-22-75	2007	7.5			3756		
EF-11-1	Welding Shop Arms	Greenheck	TCB-LE-2-22-75	2007	7.50			5240		
EF-11-2	Welding Shop Arms	Greenheck	TCB-LE-2-22-75	2007	7.50			5356		
EF-14	Main Electric Room 1420	Greenheck	CUBE-300HP-50	2007	3.00			8320		
EF-15	Chiller Electric Room 2611	Greenheck	CUBE-200-5	2007	0.50			3280		
EF-16	Hockey Stick Electric Roor	Greenheck	RSFP-200-15	2007	0.50			3140		
EF-18	NW Class Elec Room 232	Greenheck	CUBE-200	2007	0.5			3185		
EF-19	Welding Elec Room 2511	Greenheck	CUBE-220-15	2007	2			5784		
EF-20	Elevator Mach Room 1130	Greenheck	CUBE-101-4	2007	0.25			630		
EF-21	Copy Room 1139 &1131	Greenheck	CUBE-101-HP-3	2007	0.3			385		
EF-24	Kitchen Hood Room 1230	Greenheck	CUBE-161-HP-7	2007	0.75			1428		
EF-25	Kitchen Hood Room 1230	Greenheck	CUBE-161-HP-7	2007	0.75			1402		
EF-26	Millwright Hood Room 152	Greenheck	TCB-LE-2-22-75	2007	7.5			7306		
EF-27	Welding Storage 1531	Greenheck	CUBE-101-4	2007	0.25			251		
EF-28	Library Copy Room 1317 &	Greenheck	CUBE-098-HP	2007	0.25			504		
EF-29	Library Washroom 1324	Greenheck	CUBE-180HP-20	2007	0.25			120		
EF-30	Welding Demo Booth Arm	Greenheck	TCB-LE-2-10-20	2007	2			1300		
EF-32	Janitors Closet 1611	Greenheck	CUBE-101-HP	2007	0.25			345		
EF-33	Power Equipment 1740	Greenheck	CUBE-200-5	2007	0.5			2760		
EF-36	Carpentry Paint Booth	Greenheck	TCB-LE-2-36	2007	20			15900		
EF-37	Automotive Hood 1841	Greenheck	CUBE 240xp-20	2007	2			2418		
EF-38	Automotive Hose Reels 18	Greenheck	9-BISW-21	2007	2			530		
EF-39	Farrier	Greenheck	CUBE-300HP-50	2007	5			5511		
EF-40	Farrier Hoods	Greenheck	CUBE-300HP-50	2007	5			8787		
EF-41	Blacksmith Hood	Greenheck	CUBE-240-HP	2007	3			10305		
EF-42	Blacksmith Arms	Greenheck	CUBE-161-XP-1	2007	1.5			1001		
EF-43	Demo Booth Overhead	Greenheck	TCB-LE-2-9-20-X	2007	2			1160		
EF-44	Auto Demo Hose 1855	Greenheck	9-BISW-21	2007	0.75			252		
EF-46	Storage Room 2120	Greenheck	CUBE-101	2007	0.25			450		
EF-48	Gouging #1 Covered Area	Greenheck	TCB-LE-2-13-30	2007	3			3171		
EF-49	Gouging #1 Covered Area	Greenheck	TCB-LE-2-13-30	2007	3			3100		
EF-50	Gouging #1 Covered Area	Greenheck	TCB-LE-2-13-30	2007	3			?		

EF-51	Storage 1141A &1143A	Greenheck	CUBE-098-4	2007	0.25			391		
EF-52	Mechanical Room 2610	Greenheck	CUBE-161-HP	2007	0.75			3010		
EF-53	Drafting Support 2110A	Greenheck	CUBE-101-HP-4	2007	0.25			578		
EF-55	Covered Area 1540	Greenheck	VCR300V7B	2007	1			4920		
EF-56	Cutting Tables in Welding	Greenheck	TCBLE-2-22-50-	2007	5			5375		

Exhaust Fan (direct drive)

EF-47	Dry Storage Room 1231	Greenheck	SPA250	2007	?			165		

Fire and Jockey Pump

FP-1				2007						
FJ-1				2007						

Force Flow Heater (electric)

FF-1	Entrance	Ouellet	OCA05038	2007						
FF-2	Entrance	Ouellet	OCA05038	2007						
FF-3	Entrance	Ouellet	OCA05038	2007						
FF-4	Entrance	Ouellet	OCA05038	2007						

Heat Exchanger

HE-1	Radiant Slab	Sondex	S7-1G16-25-TL	2007						

Hot Water Heater

DHWH-1	Main Domestic Hot Water	A.O. Smith	BTH-300	2007						300,000

Pumps (fractional HP)

P-1	Primary Heating	Bell and Gosset	80	2007	5.00		292			
P-2	Primary Heating	Bell and Gosset	80	2007	5.00		292			
P-3	Standby Heating	Bell and Gosset	80	2007	5.00		292			
P-4	Radiant Circulating	Bell and Gosset	60	2007	0.25		31			
P-5	Standby Radiant	Bell and Gosset	60	2007	0.25		31			
P-6	VAV RHC	Bell and Gosset	60	2007	1		61			
P-7	Standby RHC	Bell and Gosset	60	2007	1.0		61			
P-8	Primary Radiation Heating	Bell and Gosset	60	2007	2		59			
P-9	Standby Radiation Heating	Bell and Gosset	60	2007	2.00		59			
P-10	Primary Cooling	Bell and Gosset	80	2007	5		370			
P-11	Standby Cooling	Bell and Gosset	80	2007	5.00		365			
P-12	Outdoor Pond	Bell and Gosset	80	2007	0.25		?			
P-13	DHW Circulation	Bell and Gosset	36	2007	0.17		11			
P-14	AHU-8 Heating Coil	Bell and Gosset	60	2007	0.50		29			
P-15	AHU-11 Heating Coil	Bell and Gosset	60	2007	1.5		140			
P-16	AHU-16 Heating Coil	Bell and Gosset	60	2007	1		31			

Radiant Slab System

RS-1	Serves Atrium									

Supply Air Fan

SF-12	Main Electrical Room	Greenheck	RSFP-200-50	2007	5			8253		
SF-13	Chiller Electric Room 2611	Greenheck	RSFP-100-10	2007	1.0			2660		
SF-14	Electric Room 2801	Greenheck	RSFP-100-10	2007	1.0			2749		
SF-15	NW Classrooms Elec Rm	Lau	1.44DWDPB	2007	2			2215		
SF-16	NW Classrooms Elec Rm	Lau	1.44DWDPB	2007	1.50			5900		

Sump Pump

SP-1	Loading dock ramp			2007						
SP-2	Water meter sump (south parking)			2007						

Unit Heater (ceiling mounted)

UH-1		Rosemex	Model H	2007	1/6					

UH-2		Rosemex	Model H	2007	1/6					
UH-3		Rosemex	Model H	2007	1/6					
UH-4		Rosemex	Model H	2007	1/6					
UH-5		Rosemex	Model H	2007	1/6					

Unit Heater (ceiling mounted)(electric)

UH-6	Farrier (gas fired)	Rezco	PDP	2007						

Unit Heater (ceiling mounted)(gas fired)

UH-7	Farrier (gas fired)	Rezco	PDP	2007						
UH-8				2007						
UH-9	Future Shop	Lennox	LF24-30A-S	2007	1/10	80%				30,000
UH-10	Future Shop	Lennox	LF24-30A-S	2007	1/10	80%				30,000
UH-11	Future Shop	Lennox	LF24-30A-S	2007	1/10	80%				30,000
UH-12	Future Shop	Lennox	LF24-30A-S	2007	1/10	80%				30,000

Water Feature System

P-12	Outdoor Pond	Bell and Gosset	80	2007	0.25					

	Hp	EFF	GPM	CFM	KW	BTU
Cloverdale Totals	448		2124		191	7142000

Langley Campus - Equipment List

ID	Serves	Manufacturer	Model	Date	Motor		Size and Capacity			
					Hp	EFF	GPM	CFM	KW	BTU
Air Conditioning, Computer Room										
AC-1	Computer room	Airflow	CCT-SW-UD	1993						
Air Conditioning - Split Air Cooled										
SAC-1	Computer Room	LG	NEG Plasma	2009						
Air Compressors, Shop/Sprinkler/Controls										
Comp-1	Shops (shared air reciever	Quicy	QT-15	1993	15					
Comp-2	Shops (shared air reciever	Quicy	QT-15	1993	15	86%				
Comp-3	Controls	Devilbiss		1993	0.5	60%				
Comp-4	Merc Marine				5	82%				
Comp-5	Sprinkler sytem			2003						
Air Dryer										
AD-1	Comp-1	Phneumatic	AD-100	1993				100		
AD-2	Comp-2	Phneumatic	AD-100	1993				100		
AD-3	Comp-3	Devilbiss	1-AODC	1993				100		
Air Handling Unit										
AHU-1	Theater	Haakon Ind	TC30AFPF	1993	15	86%				
AHU-2	NWSW	Haakon Ind	TC44AFPF	1993	40	89%			30	
AHU-3	NWSW	Haakon Ind	TC44AFPF	1993	40	89%			30	
AHU-4	Library	Haakon Ind	TC18AFPF	1993	7.5	84%			5.6	
AHU-5	Dining	Haakon Ind	LAUA10-10AF	1993	5	82%			3.7	
AHU-6	Kitchen	Haakon Ind	TC22AFPF	1993	7.5	84%			5.59	
AHU-7	NESE	Haakon Ind	TC49AFPF	1993	50	89%			37.3	
AHU-8	Shop Corr	Haakon Ind	LAVA9-8AFCDW	1993	2	79%				
AHU-9	Auto Shop	Haakon Ind	TC27AFPF	1993	15	86%				
AHU-10	Welding Shop (100% FA)	Haakon Ind	TC36AFPF	1993	15	86%				
AHU-11	Electric Shop	Haakon Ind	TC18AFPF	1993	3	81%			2.24	
AHU-12	Boiler Room	Haakon Ind	TC27AFPF	1993	8	84%			5.59	
AHU-26	Header House	Haakon Ind	TC20AFPF	1993	3	81%			2.24	
Boiler - Main Heating										
B-1	Main Campus Heating	Bryan	RV450-W-FDG	1993	54					4500000
B-2	Main Campus Heating	Bryan	RV450-W-FDG	1993	54					4500000
B-3	Main Campus Heating	Bryan	RV450-W-FDG	1993	54					4500000
B-4	Horticulture	Bryan	RV350-W-FDG	1993	42					3500000
B-5	Main Campus Heating	Viesmann		2010						
Cooling Tower										
CT-1	Main Campus									
Exhaust Fan (with heat recovery)										
GE-30	Welding	Leeson	170118	1993	25	88%				
Exhaust Fans (crawlspace)(operate 24x7)										
GE-20	Crawlspace	Carnes	LJDA-20-K3	1993	0.16	35%				
GE-21	Crawlspace	Carnes	LJDA-20-K3	1993	0.16	35%				
GE-22	Crawlspace	Carnes	LJDA-20-K3	1993	0.16	35%				
GE-22	Crawlspace	Carnes	LJDA-20-K3	1993	0.16	35%				
GE-23	Crawlspace	Carnes	LJDA-20-K3	1993	0.16	35%				
GE-24	Crawlspace	Carnes	LJDA-20-K3	1993	0.16	35%				
Exhaust Fans (belt drive)										
GE-2	Roof West, Chemical Lab	Carnes	VEBK-15-L1	1993	0.25	54%				

GE-3	Roof West, Chemical Prep	Carnes	VEBK-10-K2	1993	0.16	35%				
GE-4	Elevator Mechanical	Carnes	V1BK-06-K4	1993	0.16	35%				
GE-6	Roof West - Biology Prep	Carnes	VEBK-15-L1	1993	0.25	54%				
GE-7	Roof West - Rm 1335	Carnes	VEBK-12-L1	1993	0.25	54%				
GE-8	Roof West - Rm 1335	Carnes	VEBK-06-K5	1993	0.16	35%				
GE-9	Roof West - Biology Lab	Carnes	VEBK-18-M1	1993	0.3	56%				
GE10	Room 1330 - Biology Gree	Carnes	LJDA-16-M4	1993	0.16	35%				
GE-11	Room 1271 - Project Rm 1	Carnes	V1BK-06-K3	1993	0.16	35%				
GE-12	Room 2591 - Elevator Mac	Carnes	V1BK-06-K4	1993	0.16	35%				
GE-13	Roof - Autoclave B	Carnes	VEBK-12-L1	1993	0.25	54%				
GE14	Roof - Botany Lab	Carnes	VEBK-18-M1	1993	0.3	56%				
GE16	Roof - Room 1622 (roof by	Carnes		1993	0.16	35%				
GE19	Chemical Lab	Carnes	VEBK-06-L1	1993	0.25	54%				
GE-25	Dishwasher	Carnes	D134 Size 15	1993	0.25	54%				
GE-26	Roof Common	Carnes	VEBK-10-L1	1993	0.25	54%				
GE-27	Engine Exhaust Room 180	Chicago Blower	SQ1-11-L51	1993	3	81%				
GE-28	Shop	Carnes	V2BK-06-K4	1993	0.16	35%				
GE-29	Roof - Welding	Carnes	VEBK-15-M1	1993	0.3	56%				
GE-31	Roof W - Rm 1325	Carnes	VEBK-06-L1	1993	0.25					
TE-1		Carnes								
TE-2	Washroom Exhaust Room	Carnes	V1BK-15-P1	1993		60%			0.37	
TE-3	Washroom Exhaust Room	Carnes	V1BK-21-S1	1993		75%			0.75	
TE-4	Washroom Exhaust Room	Carnes	V1BK-21-S1	1993		75%			0.75	
TE-5	Roof Common - Shops We	Carnes	VEBK-10-L1	1993	0.250	54%				
TE-6	Shop Fan Room - Shops B	Carnes	V1BK-06-K3	1993	0.160	35%				
TE-7	Washroom Exhaust	Carnes	VEBK-06-K3	1993	0.160	35%				
TE-8	Locker Room Exhaust	Carnes	VEBK-12-L1	1993	0.250	54%				

Exhaust Fans (direct drive)

GE-17	Recycle Room	Carnes	LJDA-12-K4	1993	0.16	35%				
GE-18	Electric Room 1153	Carnes	LJDA-20-K3	1993	0.16	35%				
GE-32	SE wall hort bldg	Carnes	LJDA-20-M4	1993	0.30	56%				
GE-33	N143	Carnes	LJDA-12-23	1993	0.16	54%				
GE-34	N141	Carnes	LJDA-12-K6	1993	0.16	35%				

Fan Coil Unit and Fan Terminal Unit

FCU-1	Bunker	Magic aire	24 BHW-4	1993	0.25	54%		600		
FTU-1	Bridge	E. H. Price	FDV-S020	1993	0.5	60%				
FTU-2	Bridge	E. H. Price	FDV-S020	1993	0.5	60%				
FTU-3	Sec Room 1026	E. H. Price	FDV-S020	1993	0.125	35%				
FTU-4	Room 1025 Entry	E. H. Price	FDV-S020	1993	0.125	35%				

Force Flow Heaters

FF-1	Rm 1355	Trane		1993	0.05	35%				
FF-2	Stair 1	Trane	F11A03	1993	0.05	35%				
FF-3	Hall by 1041	Trane	D34A03	1993	0.05	35%				
FF-4	Hall by 1005	Trane	H46A03	1993	0.05	35%				
FF-5	Stair 7	Trane	H46A03	1993	0.05	35%				
FF-6	Vestibule 1140	Trane	H46A03	1993	0.05	35%				
FF-7	Stair 4	Trane	B42A03	1993	0.05	35%				
FF-8	Hall by room 1221	Trane	H46A03	1993	0.05	35%				
FF-9	Stair 2	Trane	B42A03	1993	0.05	35%				
FF-10	Stair 5	Trane	B42A03	1993	0.05	35%				
FF-11	Hall 1501	Trane	H46A03	1993	0.05	35%				
FF-12	Lobby 1500	Trane	D34A03	1993	0.05	35%				
FF-13	Hall 1600	Trane	D34A03	1993	0.05	35%				
FF-14	Stair 8	Trane	B42A03	1993	0.05	35%				
FF-15	Hall by Room 1640	Trane	H46A03	1993	0.05	35%				
FF-16	Stair 9	Trane	B42A03	1993	0.05	35%				

FF-17	Kitchen 1575	Trane	H46A03	1993	0.05	35%				
FF-18	Hall 1700	Trane	H46A03	1993	0.05	35%				
FF-19	Shops 1800	Trane	D46A03	1993	0.05	35%				
FF-20	Shops 1800	Trane	D46A03	1993	0.05	35%				
FF-21	Shops 1900	Trane	B42A03	1993	0.05	35%				
FF-22	Shops 1710	Trane	D46A03	1993	0.05	35%				

Fume Hood Exhaust Fans (not in service)

FE-1	Fume hood room 1345	Chicago Blower	AVS135ABD	1993	0.75	72%				
FE-2	Fume hood room 1345	Chicago Blower	AVS135ADB	1993	0.75	72%				
FE-3	Fume hood room 1345	Chicago Blower	AVS135ADB	1993	0.75	72%				
FE-4	Fume hood room 1345	Chicago Blower	AVS135ADB	1993	0.75	72%				
FE-5	Fume hood room 1345	Chicago Blower	AVS135ABD	1993	0.75	72%				
FE-6	Fume hood room 1348	Chicago Blower	AVS135ABD	1993	0.75	72%				
FE-7	Bio Hood Room 1355	Chicago Blower	AVS87ABF	1993	0.50	60%				
FE-8	Fume hood room 1325	Chicago Blower	AVS135ADB	1993	0.75	72%				
FE-9	Fume hood room 1325	Chicago Blower	AVS135ABD	1993	0.75	72%				
FE-10	Fume hood room 1345	Chicago Blower	AVS135ADB	1993	0.75	72%				
FE-11	Fume hood room 1660	Chicago Blower	AVS87ABF	1993	0.75	72%				
FE-12	Fume hood room 1662	Chicago Blower		1993	0.75	72%				
FE-13	Fume hood room 1662	Chicago Blower		1993	0.75	72%				
FE-14	Fume hood room 1662	Chicago Blower		1993	0.75	72%				

Hot Water Heater

HW-1	Campus	A.O. Smith	HW-399 SW	1993						399000
HW-2	Campus	A.O. Smith	HW-399 SW	1993						399000
HW-3	Header House	A.O. Smith	BT270-860s	1993						270000
HW-4	Horticulture (seasonal heat)			2004						

Kitchen Exhaust Fan

KE-1	Kitchen Hood	Chicago Blower	AVS270ABF	1993	3.00	81%				

Pump

P-5	Primary Heating circulation	Armstrong	4300	1993	15	86%				
P-6	Primary Heating circulation	Armstrong	4300	1993	15	86%				
P-18										
P-20										
P-18	Cooling Tower (vertical)	Armstrong	4300	1993	30	89%				
P-20	Chiller Water (vertical)	Armstrong	4300	1993	40	89%				

Pump (fractional HP)

HW-1	Boiler Room	Armstrong	E6312	1993	0.16	35%				
HW-2	Boiler Room	Armstrong	E6312	1993	0.16	35%				
P-1	Serves boiler B-1	Armstrong	1050	1993	0.5	60%				
P-2	Serves boiler B-2	Armstrong	1050	1993	0.5	60%				
P-3	Serves boiler B-3	Armstrong	1050	1993	0.5	60%				
P-8	NW Wing	Armstrong	4380	1993	3	81%				
P-9	NW Wing	Armstrong	1.25b 4360B-00	1993	1.5	77%				
P-10	NE Wing	Armstrong	4380	1993	3	81%				
P-11	Serves boiler AHU-6	Armstrong	H32	1993	0.16	35%				
P-12	Hall by Room - Shop Units	Armstrong	4380	1993	1	75%				
P-13	Serves AHU-8	Armstrong	S25	1993	0.08	35%				
P-14	Serves AHU-9/10	Armstrong	H22	1993	0.16	35%				
P-15	Welding AHU	Armstrong	S-35	1993	0.16	35%				
P-16	Serves heating AHU-2	Armstrong	S-25	1993	0.08	35%				
P-17	Serves heating AHU-10	Armstrong	4380	1993	1.5	77%				
P-23	Poly Greenhouse	Armstrong	H65	1993	1	75%				
P-24	Serves AHU-28	Armstrong	H53	1993	0.50	60%				
P-25	Header House	Armstrong	H64	1993	0.75	72%				

P-26	Bldg #4	Armstrong	H63	1993	0.5	60%				
P-27	Greenhouse	Armstrong	3D-4360	1993	2	79%				
P-28	Boiler Circulation	Armstrong	1050	1993	0.5	60%				

Return Air Fan

RF-1	AHU-5	LAU	AHU-5	1993	1	75%			0.19	
RF-2	Shops West	Chicago Blower	D47-3000-A6-17	1993	5	82%			3.73	
RF-3	Bunker	Carnes	V1BK-10-L1	1993	0.25	54%			1.49	

Sump Pump

SMP-1	East Shop wing			1993						
SMP-2	Outside Generator room (controller 1625)			1993						
SMP-3	Outside Library (controller 1080)			1993						

Supply Fan (belt drive)

SF-13	Serves Electrical Room	Carnes	VFBA-20-W2	1993					2.24	
SF-14	Room 1915 (Trades S Mec	Carnes	V1BK-15-S1	1993	1	75%			0.75	
SF-15	Room 1910 (Trades S Elec	Carnes	V1BK-12-P1	1993	0.5	60%			0.37	
SF-16	Electric Room 1080 (admi	Carnes	V1BK-12-P1	1993	0.5	60%			0.37	
SF-17	Electric Room 1153	Carnes	V1BK-15-S1	1993	1	75%			0.75	
SF-18	Electric Room 1545	Carnes	V1BK-15-S1	1993	0.75	72%			0.56	
SF-27	N104	Carnes	DVA-7	1993	0.33	56%			0.25	

Supply Fan (crawlspace)(direct drive)

SF-19	Crawlspace	Carnes	LJDA-12-23	1993					0.05	
SF-20	Crawlspace	Carnes	LJDA-12-23	1993					0.05	
SF-21	Crawlspace	Carnes	LJDA-12-K4	1993					0.12	
SF-22	Crawlspace	Carnes	LJDA-12-K4	1993					0.12	
SF-23	Crawlspace	Carnes	LJDA-12-K4	1993					0.12	

Unit Heater

UH-1	Crawlspace	Trane	100S	1993	0.125	35%				
UH-2	Crawlspace	Trane	100S	1993	0.125	35%				
UH-3	Crawlspace	Trane	100S	1993	0.125	35%				
UH-4	Crawlspace	Trane	100S	1993	0.125	35%				
UH-5	Crawlspace	Trane	100S	1993	0.125	35%				
UH-6	Crawlspace	Trane	100S	1993	0.125	35%				
UH-7	Crawlspace	Trane	100S	1993	0.125	35%				
UH-8	Generator Room	Trane	100S	1993	0.125	35%				
UH-9	Crawlspace	Trane	100S	1993	0.125	35%				
UH-10	Crawlspace	Trane	100S	1993	0.125	35%				
UH-11	Crawlspace	Trane	100S	1993	0.125	35%				
UH-12	Crawlspace	Trane	100S	1993	0.125	35%				
UH-13	Crawlspace	Trane	100S	1993	0.125	35%				
UH-14	Crawlspace	Trane	100S	1993	0.125	35%				
UH-15	Crawlspace	Trane	100S	1993	0.125	35%				
UH-16	Crawlspace	Trane	100S	1993	0.125	35%				
UH-17	Crawlspace	Trane	100S	1993	0.125	35%				
UH-18	Crawlspace	Trane	100S	1993	0.125	35%				
UH-19	Crawlspace	Trane	100S	1993	0.125	35%				
UH-20	Crawlspace	Trane	100S	1993	0.125	35%				
UH-21	Crawlspace	Trane	100S	1993	0.125	35%				
UH-22	Crawlspace	Trane	100S	1993	0.125	35%				
UH-23	Crawlspace	Trane	100S	1993	0.125	35%				
UH-25	Crawlspace	Trane	100S	1993	0.125	35%				
UH-25	Crawlspace	Trane	100S	1993	0.125	35%				
UH-26	Crawlspace	Trane	100S	1993	0.125	35%				
UH-27	Crawlspace	Trane	100S	1993	0.125	35%				
UH-28	Crawlspace	Trane	100S	1993	0.125	35%				

UH-29	Crawlspace	Trane	100S	1993	0.125	35%				
UH-30	Crawlspace	Trane	100S	1993	0.125	35%				
UH-31	Electric Vault Room 1626	Trane	100S	1993	0.125	35%				
UH-32	Crawlspace	Trane	100S	1993	0.125	35%				
UH-33	Crawlspace	Trane	100S	1993	0.125	35%				
UH-34	Crawlspace	Trane	100S	1993	0.125	35%				
UH-35	Greenhouse	Trane	100S	1993	0.125	35%				
UH-36	Audit Storage	Trane	70S	1993	0.125	35%				
UH-37	Loadind Dock	Trane	100S	1993	0.125	35%				
UH-38	Room 1710	Trane	100S	1993	0.125	35%				
UH-39	Room 1800	Trane	100S	1993	0.125	35%				
UH-40	Room 1800	Trane	100S	1993	0.125	35%				
UH-41	Room 1900	Trane	100S	1993	0.125	35%				
UH-42	Room 1955	Trane	100S	1993	0.125	35%				
UH-43	Room 1910	Trane	100S	1993	0.125	35%				
UH-44	Room 1915	Trane	100S	1993	0.125	35%				
UH-45	Room 1808	Trane	100S	1993	0.125	35%				
UH-46	Room 1809	Trane	100S	1993	0.125	35%				
UH-47	Mechanical Room	Trane	100S	1993	0.125	35%				
UH-48	Hallway by Room	Trane	100S	1993	0.125	35%				
UH-101	Electric Room	Trane	100S	1993	0.125	35%				
UH-102	Shop	Trane	42S	1993	0.125	35%				
UH-103	Shop	Trane	70S	1993	0.125	35%				
UH-104	Shop	Trane	70S	1993	0.125	35%				
UH-105	N104	Trane	70S	1993	0.040	35%				
UH-106	N105	Trane	18S	1993	0.040	35%				
UH-108	North	Trane	18S	1993	0.040	35%				
UH-109	North	Trane	90S	1993	0.040	35%				
UH-110	Shop	Trane	42S	1993	0.125	35%				
UH-111	Shop	Trane	42S	1993	0.125	35%				

Water Feature System

WF-1	Pump located in sump			1993	0.250					

	Hp	EFF	GPM	CFM	KW	BTU
Langley Totals	1533		4248		517.3	32352000

Langley Campus ISH - Equipment List

ID	Serves	Manufacturer	Model	Date	Motor		Size and Capacity			
					Hp	EFF	GPM	CFM	KW	BTU
Air Handling Unit										
AHU-30	Serves Lab	McQuay	OAH014GDAC	2009	15					15
Chiller (Air Cooling Water Chiller)										
CH-30	Serves lab	Drake	PACT70S6-T5-Z	2009						
Exhaust Fans (direct drive)										
EF-32	Washroom Exhaust	Carnes	VCDK009C							
Exhaust Fans (strobic)										
EF-30		Tri-stack	TS1L50B18	2009	15					15
EF-31		Tri-stack	TS1L50B18	2009	15					15
Expansion Tank										
ET-1	Extrol	AX40V		2009						
ET-2	Extrol	AX40V		2009						
ET-3	Extrol	AX40V		2009						
Heat Exchangers										
HX-1	Heating	Sondex Inc	SB1G44	2009						
HX-2	Cooling	Sondex Inc	S4A1G11	2009						
HX-3	Heating	Sondex Inc	S81G25	2009						
HX-4	Cooling	Sondex Inc	S4A1G11	2009						
HX-5	AHU-30	Sondex Inc	S8A1G34	2009						
Heat Pumps - Water to Water										
HP-1	McQuay	EW030R	EW030R304SSE	2009						
HP-2	McQuay	EW030R	EW030R304SSE	2009						
Heat Recovery Unit										
HRV-1	Serves EF-30 and EF-31	Scott Springfield	HQ-60-AHU-690	2009						
Pumps (Sealed Units)										
P-30	Hex 3/4 (3 Speed)	Grundfos	UPS 26-99FC	2009			11		0.197	11.197
P-31	Hex 3/4 (3 Speed)	Grundfos	UPS 26-99FC	2009			11		0.197	11.197
P-32	Heat Pump Primary (load s	Grundfos	UPS 26-99FC	2009			24		0.6	24.600
P-38	Heat Pump Source HRV-1	Grundfos	UPS 26-99FC	2009			13.9		0.28	14.180
P-39	AHU-1 Coil (3 speed) HEX	Grundfos	UPS 32-80-F	2009			27		0.8	27.800
P-40	Growth Chambers	Grundfos	UPS 32-80-F	2009			8.3		0.197	8.497
P-41	Chiller Cooling Coils	Grundfos	UPS 32-80-F	2009			13.1		0.28	13.380
Supply Fans (belt drive)										
SF-30	Serves Room 1726	Delhi	F210AL	2009				1485		1485.00

	Hp	EFF	GPM	CFM	KW	BTU
Langley ISH Totals	45		108	1485	3	1641

Richmond Campus - Equipment List

ID	Serves	Manufacturer	Model	Date	Motor		Size and Capacity			
					Hp	EFF	GPM	CFM	KW	BTU
Air Conditioning - Computer Room										
ACU-1	Computer room	Liebert	CU 42A	1992					11.3	
ACU-2	Room 3460	Liebert	CU 42A	1992					11.3	
ACCU-1	ACU-1	Liebert	DCSF083LP	1992	0.75					
ACCU-2	ACU-2	Liebert	DCSF083LP	1992	0.75					
Air Conditioning Unit - Split Air Cooled										
AC-1	West Classroom									
Air Compressors, Controls										
CAD-1	Controls	Ingersol Rand	253	1992	5					
CAD-2	Controls	Ingersol Rand	253	1992	5					
PF-3	Sprinkler System	Swan	SU-202	1992	1.5	77				
Air Compressors, Laboratory/Sprinkler										
PUMP-1	Lab (same air receiver Pur	Pearless	PE30C-70A	1992	10	85				
PUMP-2	Lab (same air receiver Pur	Pearless	PE30C-70A	1992	25	88				
Air Dryers										
DC-1	AC-1&2	Hankison	PR150	1992				150		
DC-2	AC-1&2	Devilibiss	1A01DC	1992				25		
Air Handling Units(package units)(SF=supply fan)(RF=return fan)										
RTU-1(SF)	North Wing	Tri-Metal Fab	P-40	1992	30	89				
RTU-1(RF)	North Wing	Tri-Metal Fab	P-40	1992	7.5	84				
RTU-2(SF)	3rd Floor North West	Tri-Metal Fab		1992	30	89				
RTU-2(RF)	3rd Floor North West	Tri-Metal Fab		1992	10	85				
RTU-3(SF)	Main & 2nd Floor	Tri-Metal Fab		1992	30	89				
RTU-3(RF)	Main & 2nd Floor	Tri-Metal Fab		1992	7.5	84				
RTU-4(SF)	Main & 2nd Floor	Tri-Metal Fab		1992	30	89				
RTU-4(RF)	Main & 2nd Floor	Tri-Metal Fab		1992	10	85				
RTU-5(SF)	3rd Floor East side	Tri-Metal Fab		1992	30	89				
RTU-5(RF)	3rd Floor East side			1992	7.5	85				
RTU-6(SF)	Main & 2nd Floor	Tri-Metal Fab		1992	28	89				
RTU-6(RF)	Main & 2nd Floor	Tri-Metal Fab		1992	8	85				
RTU-7(SF)	Main West Wing	Tri-Metal Fab		1992	40	89				
RTU-7(RF)	Main & 2nd Floor			1992	10	85				
RTU-8(SF)	Main West Wing	Tri-Metal Fab		1992	40	89				
RTU-8(RF)	2nd West Wing			1992	7.5	84				
RTU-9(SF)	2nd East Wing	Tri-Metal Fab		1992	30	89				
RTU-9(RF)	2nd East Wing			1992	7.5	84				
RTU-10(SF)	Main Floor East	Tri-Metal Fab		1992	40	89				
RTU-10(RF)	Main Floor East			1992	10	85				
RTU-11(SF)	3rd Floor East Wing	Tri-Metal Fab		1992	40	89				
RTU-11(RF)	Main Floor East			1992	10	85				
RTU-12	3rd Floor East Wing	Pace	P27	1992	5	82				
Boilers										MBTU
B-1	Campus	Unilux	2F-700W	1992					1744	
B-2	Campus	Unilux	2F-700W	1992					1744	
Cabinet Fan (fan coil entry heater)										MBTU
FC-1	Campus	Unilux	2F-700W	1992					1744	
FC-2	Campus	Unilux	2F-700W	1992					1744	
FC-2	Campus	Unilux	2F-700W	1992					1744	

Cooling Tower

CH-1										

Domestic Water Pump System (not in service)

PDW-4	Domestic Water booster			1992	15	86				
PDW-5	Domestic Water booster			1992	7.5	84				

Exhaust Fans (belt drive)

EF-1	Parkade Exhaust	Cames	LABA-54-X1	1992	5	82				
EF-2	Parkade Exhaust	Cames	LABA-54-X1	1992	5	82				
EF-5	Main Electric Room	Cames	LABA-24-52	1992	5	82				
EF-6	Rotunda - West Roof	Cames	VEBK-18-P1	1992	0.5	60				
EF-7	Rotunda - East Roof	Cames	VEBK-24-V1	1992	0.5	60				
EF-8	NE Roof - Main E Gen Ex	Cames	VEBK-24-V1	1992	2	79				
EF-9	NW Roof - Washroom	Cames	VEBK-10-M1	1992	0.3	56				
EF-10	NW Roof - Washroom	Cames	VEBK-12-L1	1992	0.25	54				
EF-11	NW Roof - Washroom	Cames	VEBK-12-L1	1992	0.25	54				
EF-12	Receiving Storage	Cames	V1BK-15-R1	1992	0.75	72				
EF-17	East Roof - General Exhau	Cames	BIRM-182	1992	5	82				
EF-18	SW Pen - Autoclave	Cames	V1BK-10-P1	1992	0.5	60				
EF-19	SW Pen - Autoclave	Cames	V1BK-10-P1	1992	0.5	60				
EF-22	N Roof	Lau	B1-22	1992	1	75				
EF-23	Chiller Room	Cames	LWBA-24-S2	1992	1	75				
EF-24	General Exhaust RTU-10	Pell	P-24	1992	5	82				
EF-25	W Wing Roof - Dishwashe	Lau	B1-22	1992	0.5					
EF-26	Washroom - RTU-9	Cames	V1BK-15-R1	1992	5	72				
EF-27	3rd Floor East - General E	Cames	VCDB-045	1992	0.25	54				
EF-28	W Wing Roof - Washroom	Cames	BIRM-150	1992	1.5					
EF-30	E Wing - General Exhaust	Cames	BIRM-182	1992	1.5	77				
EF-35	E Roof - Spray Booth	Lau	B1-122	1992	0.5	60				

Exhaust Fans (direct drive)

EF-13	P575	Cames	VCBD-045	1992	0.25	54				
EF-14		Cames	BCDB-030	1992	0.25	54				
EF-20	P850	Cames	VWDK-06-F2	1992	0.05	35				
EF-21	Acid Tank Room	Cames	VWDK-06-F2	1992	0.05	35				
EF-29	Roof - Bunker	Cames	VEDK-06-F2	1992	0.05	35				
EF-31	NW Pen - General Exhaus	Cames	LIDA-16-K3	1992	0.16	35				
EF-32	SW Pen - General Exhuas	Cames	LJTA-16-K3	1992	0.16	35				
EF-33	NE Pent - General Exhuas	Cames	LJTA-16-K3	1992	0.16	35				
EF-34	NW Pen - General Exhaus	Cames	LIDA-16-K3	1992	0.16	35				
EF-36	3rd Floor N - Greenhouse	Cames	LIDA-16-KB	1992	0.16	35				

Fire and Jockey Pump

FP-1	Sprinkler Room	Aurora	453A	1992	50					
PD-2	Sprinkler Room	Aurora	92-03991	1992	1.5	77				

Force Flow Heaters

FF-1	Stair 7 - Parking	Dunham Bush	CUH-100	1992	0.3	56				
FF-2	Stair 6 - Parking	Dunham Bush	CUH-100	1992	0.3	56				
FF-3	Stair 5 - Parking	Dunham Bush	CUH-100	1992	0.3	56				
FF-4	Stair 3 - Parking	Dunham Bush	CUH-100	1992	0.3	56				
FF-5	Stair 4 - Parking	Dunham Bush	CUH-100	1992	0.3	56				
FF-6	E Vestibule - Parking	Dunham Bush	CUH-100	1992	0.3					
FF-7	E Vestibule - Parking	Dunham Bush	CUH-100	1992	0.3					
FF-8	Stair 8 - Main Floor	Dunham Bush	CUH-100	1992	0.3					
FF-9	Stair 6 - Main Floor	Dunham Bush	CUH-100	1992	0.3	56				
FF-10	Stair 1 - Main Vestibule	Dunham Bush	CUH-100	1992	0.3	56				
FF-11	Stair 2 - Main Vestibule	Dunham Bush	CUH-100	1992	0.3	56				

FF-12	Stair 1 - Main Floor	Dunham Bush	CUH-100	1992	0.3	56				
FF-13		Dunham Bush	CUH-100	1992	0.3					
FF-14	S Entry	Dunham Bush	CUH-100	1992	0.3					
FF-14A	S Entry	Dunham Bush	CUH-100	1992	0.3					

Fuel Transfer Pump (Generator)(gear pump)

PD-1	Generator fuel transfer	WEG	Gear	1992	0.25	54				

Fume and Bio Hood Exhaust Fans (belt drive)

FEF-1	NW Pen - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-2	NW Pen - Fume Hood Roo	Prolite	MU-10	1992	2	77				
FEF-3	SW Pen - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-4	SW Pen - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-5	SW Pen - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-6	SW Pen - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-7	SW Pen - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-8	SW Pen - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-9	NE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-10	NE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-11	NE Pent - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-12	NE Pent - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-13	NE Pent - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-14	NE Pent - Fume Hood Roo	Prolite	MU-10	1992	1.5	77				
FEF-15	SE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-16	SE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-17	SE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-18	SE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-19	SE Pent - Fume Hood Roo	Prolite	MU-10	1992	2	79				
FEF-20	NE Pent - Fume Hood Ver	Prolite	MU-10	1992	0.75	72				
FEF-21	NW Pen - Fume Hood Ver	Prolite	MU-10	1992	1.5	77				
BEF-1	NW Pen - Bio Hood Room	Prolite	MV-8	1992	1.5	77				
BEF-2	NW Pen - Bio Hood Room	Prolite	MV-8	1992	1.5	77				
BEF-3	SW Pen - Bio Hood Room	Prolite	MV-8	1992	1.5	77				
BEF-4	NW Pen - Bio Hood Room	Prolite	MV-8	1992	1.5	77				
BEF-5	NW Pen - Bio Hood Room	Prolite	MV-8	1992	1.5	77				

Hot Water Heater (seasonal)

HE-1	Boiler room									400,000

Kitchen Exhaust Fan

EF-3	Kitchen Exhaust	Cames	BIRM-200	1992	50	82				
EF-4	Kitchen Exhaust	Cames	BIRM-150	1992	30	81				

Pumps

PC-1	Chiller Room - Condensor	Armstrong	4300	1992	20	87				
PC-2	Chiller Room - Chilled Wat	Armstrong	4300	1992	25	88				
PC-3	Chiller Room - Chilled Wat	Armstrong	4300	1992	25	88				
PDW-1	Boiler Room - HX-1	Armstrong	5553-STD	1992	1.5	60				
PDW-2	Boiler Room - HX-2	Armstrong	5553-STD	1992	5	60				
PDW-3	Boiler Room - HTW	Wilron	A4S114AAB	1992	0.75	72				
PDW-4	Sprinkler Room	Plad	03-5705-130001	1992	15					
PDW-5	Sprinkler Room	Plad	03-10705-13000	1992	7.5					
PH-1	Boiler Room - Boiler-1	Armstrong	4300	1992	5	82				
PH-2	Boiler Room - Boiler-2	Armstrong	4300	1992	5	82				
PH-3	Boiler Room - Heating to R	Armstrong	4300	1992	15	86				
PH-4	Boiler Room - Heating to R	Armstrong	4300	1992	15	86				
PH-5	Boiler Room - Radiant Hea	Armstrong	4300	1992	7.5	84				
PH-6	Boiler Room - Radiant Hea	Armstrong	4300	1992	7.5	84				
PH-7	RTU-1	Armstrong	S55	1992	0.5	60				

PH-8	RTU-2	Armstrong	4380	1992	1	75				
PH-9	RTU-3	Armstrong	S55	1992	0.75	60				
PH-10	RTU-4	Armstrong	S55	1992	0.5	60				
PH-11	RTU-5	Armstrong	4380	1992	1	75				
PH-12	RTU-6	Armstrong	S55	1992	0.5	60				
PH-13	RTU-7	Armstrong	S55	1992	0.5	72				
PH-14	RTU-8	Armstrong	S55	1992	0.5	60				
PH-15	RTU-9	Armstrong	S55	1992	0.75	60				
PH-16	RTU-10	Armstrong	S57	1992	0.5	72				
PH-17	RTU-11	Armstrong	S57	1992	0.75	72				
PB-1	By E elevator serves N Wing									
PB-2	By stall 132 serves E Wing									
PB-3	By stall 172 serves W Wing									

Supply Fans(Belt Drive)

SF-12	Combustion air for boilers	LAU	DUA-40-18	1992	2	79				
SF-13	Generator Room	Cames	LCBA-48WZ	1992	3	81				
SF-14	NE Roof - Stair 2	Cames	VSBA-12-T2	1992	1.5	77				
SF-15	NW Roof - Stair 2	Cames	VSBA-18-W2	1992	3	81				
SF-16	NE Roof - Stair 4	Cames	VSBA-20-W2	1992	3	81				
SF-17	E Roof - Stair 7	Cames	VSBA-12-T2	1992	1.5	77				
SF-18	E Elevator Roof - Parking	LAU	DVA-10	1992	0.5	60				
SF-19	W Elevator M	LAU	DVA-10	1992	0.5	60				
SF-20	Room P200	LAU	DVA-9	1992	0.5	60				
SF-21	SW Stair	Cames	VSBA-12-T2	1992	1.5	77				
SF-22	Elevator Machine Room	LAU	DVA-10	1992	0.5	60				
SF-23	NW Entrance - Vestibule F	Cames	V1BK-10-P!	1992	0.5	60				
SF-24	NW Entrance - Vestibule F	Cames	V1BK-10-P!	1992	0.5	60				
SF-25	W Roof - Stair 3	Cames	VCDB045	1992	0.16	35				
SF-26										
SF-27										
SF-28										
SF-29										

Transfer Fans

TF-1		Cames	V1BK-12-L1	1992	0.25	54				
TF-2		Cames	VCDB-095	1992	0.5	60				
TF-3		Cames	V3DB-030	1992	0.25	54				
TF-4		Cames	VCDB-095	1992	0.5	60				
TF-5		Cames	VCDB-095	1992	0.5	60				
TF-6		Cames	VCDB-095	1992	0.5	60				
TF-7		Cames	VCDB-095	1992	0.5	60				
TF-8		Cames	VCDB-095	1992	0.5	60				
TF-9		Cames	VCDB-095	1992	0.5	60				
TF-10	Phone Room	Cames	VCDB-095	1992	0.5	60				
TF-11	Electric Room	Cames	VCDB-095	1992	0.5	60				
TF-12	Electric Room	Cames	VCDB-095	1992	0.5	60				
TF-13	Electric Room	Cames	VCDB-095	1992	0.5	60				
TF-14	Phone Room	Cames	VCDB-095	1992	0.5	60				
TF-15	Phone Room	Cames	VCDB-095	1992	0.5	60				
TF-16	Phone Room	Cames	VCDB-095	1992	0.5	60				
TF-17		Cames	VCDB-095	1992	0.5	60				
TF-18		Cames	VCDB-095	1992	0.25	54				
TF-19		Cames	VCDB-095	1992	0.5	54				
TF-20	2nd Floor Electric	Greenheck		1992		75				
TF-20	Conference Centre - ceilin	Cames		1992	1	75				

Unit Heater

UH-1	Loading Dock	Dunham Bush	H500C	1992	0.75					

UH-1	NW Penthouse	Dunham Bush	H175C	1992	0.05					
UH-3	SW Penthouse	Dunham Bush	H175C	1992	0.05					
UH-4	NE Penthouse	Dunham Bush	H175C	1992	0.05					
UH-5	SE Penthouse	Dunham Bush	H175C	1992	0.05					
UH-6	Generator Room	Dunham Bush	H500C	1992	0.75					
UH-7	Sprinkler Room	Dunham Bush	H175C	1992	0.05	35				
UH-8	Chiller Room	Dunham Bush	H250C	1992	0.05					
UH-9	Greenhouse	Dunham Bush	H175C	1992	0.05					

	Hp	EFF	GPM	CFM	KW	BTU
Richmond Totals	954			175	8743	400000

Surrey Campus - Equipment List

ID	Serves	Manufacturer	Model	Date	Motor		Size and Capacity			
					Hp	EFF	GPM	CFM	KW	BTU
Air Conditioning - Computer Room										
ACU-3A	Main computer room A318	York	DM150C00n5AA	2004	5			4980		
ACU-4A	Main computer room A318	York	DM150C00n5AA	2004	5			4735		
Air Conditioning - Condensing Unit (air cooled)										
ACCU-1A	Serves bldg A and AHU-1A	McQuay	ALP070C	1990					65	
ACCU-1B1	Serves bldg B (date install	McQuay	ALP070C	1994					65	
ACCU-1B2	Serves bldg B (date install	McQuay	ALP070C	1994					65	
ACCU-1C1	Serves bldg C (date install	McQuay	ALP070C	1994					65	
ACCU-1D1	Serves bldg D (date install	Trane	RAVC-C80	1996					275	
ACCU-1D2	Serves bldg D (date install	Trane	RAVC-C80	1996					275	
Air Conditioning Unit - Split Air Cooled										
SAC-1A	Condenser in Room 1005	Mitsubishi	MS12NN	1999					0.8	
SAC-2B	Condenser on NE corner o	Mitsubishi	MS12NN	1999					0.8	
SAC-3C	Condenser on NE corner o	Mitsubishi	MS12NN	1999					0.8	
SAC-4D	Condenser on NE corner o	Mitsubishi	MS12NN	1999					0.8	
Air Compressor - Control (duplex on common air receiver)(and sprinkler unit)										
CZ-1A	Controls(Unit A - duplex co	Devilbiss	BUDK5544A	1990	1	75				
CZ-2A	Controls(Unit A - duplex co	Devilbiss	BUDK5544A	1990	1	75				
CZ-1B	Controls(Unit B - duplex co	Devilbiss	BUDK5544A	1990	0.75	72				
CZ-2B	Controls(Unit B - duplex co	Devilbiss	BUDK5544A	1990	0.75	72				
CZ-1C	Controls(Unit C - duplex co	Devilbiss	BUDK5544A	1990	0.75	72				
CZ-2C	Controls(Unit C - duplex co	Devilbiss	BUDK5544A	1990	0.75	72				
CZ-1D	Controls(Unit D - duplex co	Devilbiss	BUDK5544A	1990	1.5	77				
CZ-2D	Controls(Unit D - duplex co	Devilbiss	BUDK5544A	1990	1.5	77				
CZ-2E	Controls(Unit E - duplex co	Devilbiss	BUDK5544A	1990	2	79				
CZ-3E	Controls(Unit E - duplex co	Devilbiss	BUDK5544A	1990	2	79				
AC-1A	Sprinkler system compress	Swan		2007	0.75					
Air Compressor - Laboratory										
CA-1A	Lab	Quincy	332523	1990	5	82				
CA-1D	Lab	Quincy	332523	1990	2	79				
CA-1E	Lab	Quincy	33254	1990	5	82				
CA-2E	Outside under stairs	Quincy	33254	1990	5	82				
Air Dryer										
AD-1A	Laboratory compressor	Van Air	R30	1990	0.17	35				
ADF-1A	Serves CZ-1A &2A				0.17	35				
ADF-1B	Serves CZ-1B &2B	Devilbiss	8010-1-A01DC	1990	0.17	35				
ADF-1C	Serves CZ-1C &2C	Devilbiss	8010-1-A01DC	1990	0.17	35				
AD-1D	Laboratory compressor	Devilbiss	8010-1-A01DC	1990	0.17	35				
ADF-1D	Serves Med air CA-1D	Johnson Controls	A-4412-2	1990	0.17	35				
AD-1E	Laboratory compressor	Van Air	R30	1990	0.17	35				
ADF-1E	CA-1E	Van Air	R30	1990	0.17	35				
ADF-2E	Laboratory compressor	Devilbiss	8010-1-A01DC	1990	0.17	35				
Air Handling Unit - Serve Bldg A-B-C-D-E										
AHU-1A	Bldg A	Pace	P-40SWS1	1990	25	88		20650		
AHU-1B	Bldg B - Ground Floor	Pace	A-20 DIDW	1990	10	85		9869		
AHU-2B	Bldg B	Pace	A-20 DIDW	1990	13			8904		
AHU-1C	Bldg C	Pace	P-40 SISW	1990	25	88		23852		
AHU-1D	Bldg D - East	Pace	P-40	1990	30	89		27720		
AHU-2D	Bldg D	Pace	P-40	1990	25			27180		

AHU-1E	Bldg E - South	Pace	P-49-SWS1	1990	40	89		42540		
AHU-2E	Bldg E	Pace	P33-SWS1AF	1990	20			17870		

Air Handling Unit - Serve Bldg B (kitchen), Bldg E (addition 1999)

MAU-1B	Kitchen make up air	Artisan	BC Special #2	1990	3	81		6030		
RTU-E1	Over roof of Lab extension	Carrier	48HJF004	1999	0.3			1200		

Air Handling Unit - Serve Bldg G

AHU-1(SF1/	Classroom block hot deck	Engineered Air	Part of AHU-1	1999	40	89		26000		
AHU-1(SF1(	Classroom block cold deck	Engineered Air	Part of AHU-1	1999	40	89		36000		
AHU-1(RF1)	Classroom block return fan	Engineered Air	Part of AHU-1	1999	20	87		30500		
AHU-2(SF2/	Classroom block hot deck	Engineered Air	Part of AHU-2	1999	20			17914		
AHU-2(SF2(	Classroom block cold deck	Engineered Air	Part of AHU-2	1999	20			17914		
AHU-2(RF2)	Classroom block return fan	Engineered Air	Part of AHU-2	1999	10			13589		
AHU-3	Multipurpose	Engineered Air	FWA-173/DJ40-(	1999	7.5	84		5936		
AHU-4	Gym	Engineered Air	FWB-403/DJ100	1999	20	87		16006		
AHU-5	Recreation offices	Engineered Air	FWA-92/DJ20	1999	3	81		2670		
AHU-6	Weight room	Engineered Air	FWA-92/DJ20	1999	5	82		3535		
AHU-7	Cafeteria	Engineered Air	FWA-112/DJ40-(	1999	5	82		4239		

Boiler - Main Heating

B-1B	Main heating Bldgs A-B-C-	Bryant	RV600WFDGLH	1990						6000000
B-2B	Main heating Bldgs A-B-C-	Bryant	RV600WFDGLH	1990						6000000
B-3B	Main heating Bldgs A-B-C-	Cleaver Brooks		2009						
B-4B	Main heating Bldgs A-B-C-	Cleaver Brooks		2009						

Cabinet Fan (floor or ceiling mounted)

UH-1A	Located north entrance do	Engineered Air	CUH-6	2007	0.02			600	12	
UH-2A	Located north entrance do	Engineered Air	CUH-6	2007	0.02			600	12	
UH-1C	Located north entrance do	Engineered Air	CUH-6	2007	1/20			600	11.6	
UH-2C	Located north entrance do	Engineered Air	CUH-6	2007	1/20			600	11.6	

Cabinet Exhaust and Transfer Fan (Direct Drive)

FE-1A	Bldg A electric room	Penn	Z10	1990	0.5	35				
FE-6A	Bldg A elevator room	Penn	Z10	1990	0.5	35				
FE-1B(2B)	Bldg B elevator room(man	Penn	Z10	1990	0.25	81				
EF-B2	Serves copy centre room 1	Greenheck	CSP-255	1999				510	0.18	
FE-7B	Bldg B cleaning room	Penn	Z10	1990	0.3	56				
EF-C1	Serves comm room 103	Cook	GC-420	1999	0.13	35		199		
EF-C2	Serves comm room 209	Cook	GC-420	1999	0.13	35		170		
EF-C3	serves room 255 (removes	Cook	GC-420	1999	0.13	35		170		
FE-2C	Bldg B electrical room	Penn	Z10	1990	0.5	35				
FE-3C	Bldg C elevator room	Penn	Z10	1990	0.25	54				
EF-22C	2nd Floor transfer fan (S b	Greenheck	CSP-A410	2007	1/19			392		
EF-23C	2nd Floor transfer fan (S b	Greenheck	CSP-A410	2007	1/19			390		
EF-24C	2nd Floor transfer fan (S b	Greenheck	CSP-A410	2007	1/19			400		
EF-25C	2nd Floor transfer fan (S b	Greenheck	CSP-A410	2007	1/19			412		
EF-26C	2nd Floor transfer fan (S b	Greenheck	CSP-A410	2007	1/19			400		
EF-27C	2nd Floor transfer fan (S b	Greenheck	CSP-A410	2007	1/19			413		
EF-28C	Lobby transfer fan (N bulkh	Greenheck	CSP-A410	2007	1/19			252		
EF-29C	Mech room exhaust	Greenheck	SQ-75-G	2007	1/10			225		
EF-30C	Harvest pump room	Greenheck	SP-A510-QD	2007	1/10			450		
EF-31C	Geo pump room	Greenheck	SP-A510-QD	2007	1/10			290		
EF-33C	Serves Meeting Room 187	Greenheck	SP-A200	2007				145	0.048	
EF-34C	Serves Copy Room 1889	Greenheck	SP-A110	2007				52	0.049	
FE-2D	Bldg D washrooms 139 an	Penn	Z10	1990	0.1	35				
FE-3D	Bldg D electrical room	Penn	Z10	1990	0.1	35				
EF1.1	Classroom 1364 (3 speed)	Cook	GN-822	2006	0.4			805	0.26	
EF1.2	Classroom 1364 (3 speed)	Cook	GN-822	2006	0.4			818	0.26	

EF2.1	Classroom D2424 (3 spee	Cook	GN-822	2006	0.4			818	0.26	
EF2.2	Classroom D2424 (3 spee	Cook	GN-822	2006	0.4			833	0.26	
EF3.1	Classroom 3412 (3 speed)	Cook	GN-822	2006	0.4			788	0.26	
EF3.2	Classroom 3412 (3 speed)	Cook	GN-822	2006	0.4			830	0.26	
SF-1	Recreation block lobby 12(	Greenheck	CSP-260	1999				848	0.328	

Domestic Booster Pump System

BP-1	Bldg G domestic water boo	Bell and Gosset	70M	1999	3	81				
BP-2	Bldg G domestic water boo	Bell and Gosset	70M	1999	5	81				

Dust Collector

DE-1	Serves fine arts carpentry	Murphy		2001	3					

Electric Duct Heater

EDH-1	Room 1282/1284	Thermolec		1999				1059	5	
EDH-2	Room 1288	Thermolec		1999				445	2	
EDH-3	room installed/adjacent	Thermolec		1999				847	4	
EDH-4	room installed/adjacent	Thermolec		1999				1695	8	
EDH-5	room installed/adjacent	Thermolec		1999				1695	8	
EDH-6	room installed/adjacent	Thermolec		1999				800	8	
EDH-7	room installed/adjacent	Thermolec		1999				593	3	
EDH-8	room installed/adjacent	Thermolec		1999				530	2.5	
EDH-9	room installed/adjacent	Thermolec		1999				1547	8	
EDH-10	Weight Room	Thermolec		1999					10	
EDH-11	Offices	Thermolec		1999				2034	3	

Exhaust Fan (roof mounted)

FE-2A	Bldg A washrooms	Penn	BB531 - Domex	1990	0.5	60				
FE-3A	Bldg A dust room A-310a	Penn	AB-10 Domex	1990	0.17	35				
FE-4A	not in service	not in service		1990	0.33	56				
FE-5A	Building A314 studio dimm	Penn	C878-Domex	1990	0.5	60				
FE-1B	Kitchen hood fan	Delhi	BI-20	1990	5	82		2370		
FE-3B	Bldg B washrooms	Penn	BB531-Domex	1990	0.5	60				
FE-6B	Bldg B dishwasher	Penn	BB531	1990	0.5	60				
EF-B1	Serves room comm room :	Loren Cook	80C3B	1999	0.25	54		424		
EF-B2	Copy room 114	Loren Cook	GN-740	1999	0.13	35		678	0.18	
FE-1C	Bldg C washrooms (C147	Penn	AB-35-Domex	1990	0.13	35		199		
FE-5C	Bldg C washrooms (C218	Penn	AB-35-Domex	1990	0.17	35				
FE-1D	Bldg D East wing washroo	Penn	BB-531-Domex	1990	0.5	60				
FE-4D	Bldg D elevator machine r	Penn	XT94-Domex	1990	0.33	56				
FE-5D	Bldg D South wing washro	Penn	BB531-Domex	1990	0.5	60				
FE-1E	Bldg D welding hood (E-14	Penn	18B-Domex	1990	0.33	56				
FE-2E	Welding arms E-146a	Can Blower	245-BL	1990	0.1	35				
FE-3E	Bldg E laboratories (E-128	Penn	BB-45-Domex	1990	0.17	35				
FE-4E	Bldg E exhaust hoods (E-1	Penn	RB30-Domex	1990	1.5	77				
FE-5E	Washrooms (E-103 - E-10	Penn	RB45	1990	0.25	54				
FE-6E	Bldg E laboratory (E-110)	Penn	CB-18	1990	0.75	72				
FE-9E	Fume cupboards (E-211, E	Centrimaster	PUB245KU	1990	0.17	35				
FE-15E	Bldg E Room 138B	Penn	WXQ82	1990	0.13	35		228		
FE-16E	Bldg E	Greenheck		1990	0.13	35				
FE-17E	Bldg E Room 214	Penn	FX-138		0.25					
FE-13E	Blge F (bunker)	Penn	AB-10	1990	0.13	35				
FE-14E	Blge F (bunker)	Penn	AB-10	1990	0.13	35				
EF-1	West Washrooms	Greenheck	GB-160	1999	0.5	60		2353		
EF-2	East Washrooms	Greenheck	GB-160	1999	0.3	56		2353		
EF-3	Admin Washrooms	Greenheck	GB-100-4X-QD-2	1999	0.25	54		848		
EF-4	Gym Change rooms	Greenheck	Cube-140	1999	0.3	56		1378		
EF-5	Weight room	Greenheck	Cube-140	1999	0.25	54		1378		
EF-7	Cafeteria Kitchen area	Greenheck	Cube-140	1999	0.33	56		1526		

EF-8	Cafeteria Washrooms	Greenheck	GB-120	1999	0.25	54		636		
EF-9	Office area copier	Greenheck	GB-90	1999	0.25	54		636		
EF-10	North Electrical room	Greenheck	Cube-160-5	1999	0.5	60		1802		
EF-11	Multi-purpose washrooms	Greenheck	Cube-120-4	1999	0.25	54		975		
EF-12	Multi-purpose gym/store	Greenheck	Cube-100-4	1999	0.25	54		827		
EF-13	1st and 2nd floor general e	Greenheck	GB-130	1999	0.33	56		1230		
EF-14	1st floor copy and coffee r	Greenheck	GB-90	1999	0.25	54		318		
EF-15	Electrical rooom 1010	Greenheck	GB-160-5	1999	0.05	54		1802		
EF-16	Elevator machine room	Greenheck	GB-90-4X-OD-R	1999	0.25	54		466		
EF-1A	Washroom exhaust	Greenheck	GB-121-LMDX-C	2007	0.5			2200		
EF-2A	Janitor room exhaust	Greenheck	GB-101-4X-QD-I	2007	0.25			556		
EF-3A	Elevator machine room	Greenheck	GB-121-LMDX-C	2007	0.25			1438		
EF-20C	Washroom exhaust	Greenheck	GB-131-LMDX-C	2007	0.5			1540		
EF-21C	Janitor room exhaust	Greenheck	GB-081-4X-QD-I	2007	0.25			392		
EF-32C	Elevator machine room	Greenheck	GB-121-LMDX-C	2007	0.25			980		
EF3.3	Classroom 3416 (located i	Cook	120 ACE B50	2007	0.08			415		
EF3.4	Level 2 &3 hall (located in	Cook	150AQIB	2007	1			6300		
EF3.5	Level 2 &3 hall (located in	Cook	14CVB	2007	1			6400		

Exhaust Fans (wall mounted)

EF-17	Generator room exhaust	Greenheck	GW-95-G	1990	0.25	72		770		
FE-7E	Serves laboratory E-108	Penn	WCB-81	1990	0.75			2410		
FE-8E	Bldg E 110 cupboards (Ex	Penn	WXR94	1990	0.5	60		225		
FE-10E	Serves autoclave room	Penn	WAQ10	1990	0.5	60		829		
FE-11E	Serves laboratory room 21	Penn	WXQ82	1990	0.13	35		199		
FE-12E	Serves rooms E106 and E	Penn	WAQ20	1990	0.5	60		923		
FE-19E	Serves ovens E108 &E110	Greenheck	GW-120B	1990	0.13	35				
WF-1	Serves fine arts paint dryin	Carnes	VWDK-12	2002	0.125			700		
WF-2	Serves fine arts paint dryin	Carnes	VWDK-12	2002	0.125			700		
EF-6	Mech room 1005	Greenheck	SE1-16-428-B6	1999	0.25	35		1840		

Expansion Tank

ET-1	Main Boilers (52"x102")			1990						
ET-1	Capacity 44 gallons	Bell and Gosset	D-80V	2008						
ET-2C		Extrol	90	2008						
TK-1	Capacity 34 gallons	Amtrol	WX-205	2008						
ET-1Z	Geo Wells - Capacity 86 g	Extrol	SX-160V	2008						
ET-1	Capacity 4 gallons	Extrol	30	2005						
ET-2	Capacity 4 gallons	Extrol	30	2005						
ET-1	Capacity 34 gallons	Amtrol	WX-250	1999						

Fan Coil Unit

FC-1	2840			2009						
FC-2	2830			2009						
FC-3	2820			2009						
FC-4	2810			2009						
FC-5	2801			2009						
FC-6	2850			2009						
FC-7	3840			2009						
FC-8	3830			2009						
FC-9	3820			2009						
FC-10	3910			2009						
FC-11	3801			2009						
FC-12	3850			2009						

Fire and Jockey Pump

FJ-1	(not in service)			1990	3	81				
FJ-2	Entire campus			1999	0.5	81				
FP-1	(not in service)			1990	30	81				

FP-2	Entire campus	Plad	50-IL-7	1999	30	81	500			

Force Flow Heater (wall mounted cabinet)

FFH-1B	Bldg B lobby by bookstore	Dunham Bush		1990	0.1	35			15.5	
FFH-3B	Main floor northeast entry	Dunham Bush		1990	0.05	35			6.9	
FFH-4B	Faculty lounge	Dunham Bush		1990	0.05	35			8.7	
FFH-5B	Faculty dining	Dunham Bush		1990	0.05	35			8.7	
FFH-6B	Meeting room	Dunham Bush		1990	0.33	35			10.3	
FFH-8B	Cafeteria east entry	Dunham Bush		1990	0.1	35			11.9	
FFH-9B	Cafeteria west entry	Dunham Bush		1990	0.1	35			11.9	
FFH-1C	Main floor foyer south entr	Dunham Bush		1990	0.05	35			8.7	
FFH-2C	Main floor foyer north entry	Dunham Bush		1990	0.05	35			8.7	
FFH-3C	Main floor foyer south entr	Dunham Bush		1990	0.05	0.5			8.7	
FFH-1D	Main floor lobby north entr	Dunham Bush		1990	0.05	35			8.7	
FFH-3E	East wing south entry	Dunham Bush		1990	0.1	35			11.9	
FF-1	Stairs beside Room 1081	Chromalox	CH4DO4	1999	0.1			500	4.5	
FF-2	Lobby 1033	Chromalox	CH4DO4	1999	0.1			500	4.5	
FF-3	SW Entrance beside 1035	Chromalox	CH4DO4	1999	0.1			500	4.5	
FF-4	SW Stairs beside 1035	Chromalox	CH4DO4	1999	0.1			500	4.5	
FF-5	Lobby 1000	Chromalox	CH4DO6	1999	0.1			500	4.5	
FF-6	NW Entrance beside 1288	Chromalox	CH4DO4	1999	0.1			500	4.5	

Fume and Biological Hood Exhaust Fan (roof fans)

FFE-1E	Serves FH-9 and FH-10	Plastic-Air		1990	1.5	77				
FFE-2E	Serves FH-6 and FH-8	Plastic-Air		1990	2	79				
FFE-3E	Serves FH-11 and FH-12	Plastic-Air		1990	1.5	77				
FFE-5E	Serves FH-15	Plastic-Air		1990	0.5	60				
FFE-6E	Serves FH-16	Plastic-Air		1990	0.5	60				
FFE-7E	Serves LFH-2	Plastic-Air		1990	0.5	60				
FFE-8E	Serves FH-25	Plastic-Air		1990	0.5	60				
FFE-9E	Serves LFH-1	Plastic-Air		1990	0.5	60				
FFE-10E	Serves FH-24	Plastic-Air		1990	0.5	60				
FFE-11E	Serves FH-23	Plastic-Air		1990	0.5	60				
FFE-12E	Serves FH-22	Plastic-Air		1990	0.5	60				
FFE-13E	Serves FH-17 and FH-18	Plastic-Air		1990	1.5	77				
FFE-14E	Serves FH-4 and FH-5	Plastic-Air		1990	1.5	77				
FFE-15E	Serves FH-19 and FH-20	Plastic-Air		1990	0.5	60				
FFE-16E	Serves FH-21	Plastic-Air		1990	1.5	77				
FFE-17E	Serves FH-2 and FH-3	Plastic-Air		1990	1.5	77				
FFE-18E	Serves FH-1	Plastic-Air		1990	0.5	60				
FFE-19E	Serves fume hood in biology by main entrance			2000						

Heat Exchanger

HE-1A	Interconnection heat excha	Bell and Gosset	P7A-21-TKT1L7	2007			38			
HE-2A	Bldg A - Backup heat from	Bell and Gosset	P7A-21-TKT1L7	2007			38			
HE-2C	Bldg C - Backup Heat from	Bell and Gosset	P14-21-TK	2007			65			
HE-4C	Interconnection heat excha	Bell and Gosset	Series 80	2007			55			
HX-3	Bldg D2 - Primary Heat	Sondex	S20A-ST16-35-T	2005			35			

Heat Pump (primary heating/cooling)

WSHP-01	Heating/Cooling Bldg A (54	WaterFurnace	EW540Full	2007					151	
WSHP-02	Heating/Cooling Bldg A (54	WaterFurnace	EW540Full	2007					151	
WSHP-01	Heating/Cooling Bldg C	WaterFurnace	EW540Full	2007						
WSHP-02	Heating/Cooling Bldg C	WaterFurnace	EW540Full	2007						
WSHP-1	Cooling only new bldg D (s	Walterfurnace	EW360R3NF8S	2007			68			

Heat Pump (water to air)

HP-1A	2nd floor comm room	McQuay	WCRW1012	2007	1/8			400		
HP-2A	3rd floor comm room	McQuay	WCRW1012	2007	1/8			400		

HP-1C	Level one comms room	McQuay	W-CCH-019	2007	1/3			630		
HP-2C	Level two comms room	McQuay	W-CCH-019	2007	1/3			630		
HP-3C	Level three comms room	McQuay	W-CCH-019	2007	1/3			630		
HP-4C	Level one electric room	McQuay	W-CCH-042	2007	1/2			1620		

Heat Pump - Water to Water

WSHP-01										
WSHP-02										
WSHP-01										
WSHP-02										
WSPH-1										

Heat Reclaim Unit

HRU-1A	1st and 2nd floors (locate -	Aaon	RM-008-8-OWO	2007	2		24	3919		
HRU-2A	1st and 2nd floors (locate -	Aaon	RM-008-8-OWO	2007	2		24	3919		
HRU-3A	3rd floor (locate - NE Roof	Aaon	RM-008-5-OWO	2007	1		24	875		
HRU-4A	3rd floor (locate - SW Roo	Aaon	RM-008-5-OWO	2007	2		24	1699		
HRU-1C	Heat Reclaim Units	Aaon	RM-008-8	2007	2	79		3760		
HRU-2C	Heat Reclaim Units	Aaon	RM-008-8	2007	2	79		3820		
HRU-3C	Heat Reclaim Units	Aaon	RM-A05-8-0-OW	2007	1	75		2100		
HRU-4C	Heat Reclaim Units	Aaon	RM-A05-8-0-OW	2007	1	75		2170		

Hot Water Heater

DWH-1A	Serves bldg A		Electric	2008					5	
DWH-1B	Serves bldg B (date approx)		Gas	1998						399k
DWH-1C	Serves bldg C old bldg		Electric	1990					9	
DWH-1D	Serves bldg D		Gas	1990						365k
HWT A	Recreation block		Gas	1999						399k
HWT B	Washrooms 1-2-3 classroom block east		Electric	1999					9	
HWT B	Washrooms 2nd fl, coffee rm, exam, WC adr		Electric	1999					9	
HWT C	Washrooms level 1-2-3 classroom block wes		Electric	1999					6	
HWT C	Washrooms multipurpose area and recreatic		Electric	1999					6	
HWT-1C	Bldg C2		Electric	2007					9	

Hot Water Storage Tank

DHWH-1	Located in boiler room (storage tanks only)		1990						
DHWH-2	Located in boiler room (storage tanks only)		1990						
HW-399	Serves Bldg G north (storage tank only)		1999						

Humidifier

HUM-1	Main computer room	Nortec		2004						

Pump

P-1B	Primary boiler loop heating	Bell and Gosset	Series 1510	1990	10	85			7.5	
P-2B	Primary boiler loop heating	Bell and Gosset	Series 1510	1990	10	85			7.5	
P-1	Primary 1 HP/serve heat p	Bell and Gosset	Series 1510	2006	1.5		64			
P-2	Condenser 1 HP/serve hea	Bell and Gosset	Series 1510	2006	1		55			
P-3	Boiler pump			2010						
P-4	Boiler pump			2010						

Pump (inline mounted)

P-1A	AHU-1 Recirc pump	Bell and Gosset	Series 60	1990	0.5	54				
P-2A		Bell and Gosset	Series 60	1990	0.25	54				
P-3A	Domestic hot water recirc	Bell and Gosset	Series HV	1990	1/16	35				
P-CB1	Boiler circulation CB boiler									
P-CB2	Boiler circulation CB boiler									
P-4B	Domestic hot water recirc	Bell and Gosset	Series 100	1990	1/16	35				
P-5B	Bldg B heating secondary	Bell and Gosset	Series 60	1990	1/16	35				
P-6B	Domestic hot water recirc	Bell and Gosset	Series HV	1990	1/16	35				

P-7B	Bldg B heating secondary	Bell and Gosset	Series HV	1990	0.5	60				
P-1C	Bldg C heating secondary	Bell and Gosset	Series 60	1990	0.75					
P-2C		Bell and Gosset	Series 60	1990	0.25					
P-3C	Domestic hot water recirc	Bell and Gosset	Series 100	1990	1/3	56				
P-1D	Bldg D east wing heating s	Bell and Gosset	Series 60	1990	0.5	60				
P-2D	Bldg D heating	Bell and Gosset	Series 60	1990	0.25	54				
P-3D	Bldg D west wing heating s	Bell and Gosset	Series 60	1990	0.5	60				
P-4D	Bldg D heating	Bell and Gosset	Series 60	1990	0.25	54				
P-5D	Domestic hot water recirc	Bell and Gosset	Series HV	1990	1/16	35				
P-6D	Domestic hot water recirc	Bell and Gosset	Series HV	1990	1/16	35				
P-1E	Bldg E south wing heating	Bell and Gosset	PD-35T		0.5	54				
P-2E	Bldg E east wing fine arts heating secondary	Bell and Gosset	Series 80		0.75	60				
P-3E		Bell and Gosset	Series 60		0.5	60				
P-4E	Bldg E heating	Bell and Gosset	Series 60		0.5	60			0.19	
P-1	Recirculating	Bell and Gosset	Series PR	1999	1/6					
P-2	Recirculating	Bell and Gosset	Series PR	1999	1/6					
P-5A	Primary circulation	Bell and Gosset	Series 60	2007	2		114			
P-6A	Primary circulation	Bell and Gosset	Series 60	2007	2		113			
P-7A	Cooling	Bell and Gosset	Series 60	2007	0.75		74			
P-8A	Heat recovery units	Bell and Gosset	Series 60-BF	2007	0.75		66			
P-25A	Interconnection pump (HE	Bell and Gosset	Series 90	2007	0.75		54			
P-26A	Interconnection pump (HE	Bell and Gosset	Series 90	2007	0.75		34			
P-27A	Heating Ventilation	Bell and Gosset	Series 60-BF	2007	0.75		27			
P-28A	Domestic hot water recircu	Bell and Gosset	SSF	2007	0.08					
P-30A	Condenser water	Bell and Gosset	2X7 6bf	2007	1.5		126			
P-31A	Condenser water	Bell and Gosset	2X7 6bf	2007	1.5		127			
P-32A	UPS Rm Cooling - to roof	Grundfos	TP-40-240/2	2007	1.5		60			
P-33A	UPS Rm Cooling - to roof	Grundfos	TP-40-240/2	2007	1.5		60			
P-1C	Geo Lead	Bell and Gosset	Series 80-BF	2007	2		190			
P-2C	Geo Lag	Bell and Gosset	Series 80-BF	2007	2		190			
P-3C	Manifolds/slab WSHP1C/V	Bell and Gosset	Series 80-BF	2007	5		170			
P-4C	Manifolds/slab WSHP1C/V	Bell and Gosset	Series 80-BF	2007	5		170			
P-5C	HRU's (Heat recovery units	Bell and Gosset	Series 90	2007	1		58			
P-6C	Heat pumps	Bell and Gosset	Series 60	2007	1/3		25			
P-32C	Backup heat from central p	Bell and Gosset	Series 80-BF	2007	3		52			
P-33C	HE-4C Load side (Main bo	Bell and Gosset	Series 80	2007	1.5		55			
P-34C	HE-4C - Source side of he	Bell and Gosset	Series 80	2007	1.5		55			
P-1Z	Geothermal Circulate betw	Bell and Gosset	Series 80-TC-BF	2007	3		650			
P-2Z	Geothermal Circulate betw	Bell and Gosset	Series 80-TC-BF	2007	3		650			
P-3Z	Primary Geothermal field c	Bell and Gosset	Series 80-BF	2007	5		260			
P-4Z	Primary Geothermal field c	Bell and Gosset	Series 80-BF	2007	5		260			
P-3	RZ-1-2 1st Floor Classroor	Bell and Gosset	Series 90	2007	0.5		24			
P-4	RZ-1-1 1st Floor Offices	Bell and Gosset	Series 90	2007	0.75		14			
P-5	RZ-2-2 2nd Floor Classroo	Bell and Gosset	Series 90	2007	0.75		12			
P-6	RZ-2-1 2nd Floor Offices	Bell and Gosset	Series 90	2007	0.3		8			
P-7	RZ-3-2 3rd Floor Classroo	Bell and Gosset	Series 90	2007	0.75		12			
P-8	RZ-3-3 3rd Floor Lobby	Bell and Gosset	Series 90	2007	0.75		15			
P-9	RZ-3-1 3rd Floor Offices	Bell and Gosset	Series 90	2007	0.5		8			

Radiant Slab (heating and cooling system)

RS-1	Serves Bldg A (new)			2007						
RS-2	Serves Bldg C (new)			2007						
RS-3	Serves Bldg D (new)			2007						

Return Air Fan (direct drive)

RAF-1A	Return air room 340	Woods	38J1/2	1999	1.5	77				
FE-5B	Main electrical room ventil	Woods	30JR-Electr	1990	3.5			9042		
RAF-1C	Return air	Woods	38J1/2	1990	7.5	84		23225		
RAF-1D	Return air Bldg D east	Woods	38J1/2	1990	7.5	84		22578		

RAF-2D	Return air Room 351	Woods	38J1/2	1990	7.5	84		22578		
RAF-1E	Return air Bldg E east	Woods	30J	1990	3	81		11000		
RAF-2E	Return air Bldg E east	Woods	38J	1990	5	82		14310		

Sump Pump

P-1	West Parking Lot Manhole	Barnes	EH331	1990	3	81				
P-2	NW Bldg B Manhole	Barnes	EH331	1990	3	81				
P-3	SW Courtyard Manhole	Barnes	EH331	1990	3	81				
P-4	NW Courtyard	Barnes	EH331	1990	3	81				
P-1	Pull Pit	Barnes	SP-33	2007						
P-2	Pull Pit	Barnes	SP-33	2007						

Unit Heater (hot water)

UH-1A	Loading area	Dunham Bush		1990	0.5	35			4.3	
UH-1B	Loading area	Dunham Bush		1990	0.5	35			8.1	
UH-1	Generator	Dunham Bush		1999	0.25	84				
UH-1E	Greenhouse	Dunham Bush		1990	0.5	35			8.1	
UH-2E	Bunker (electric)	Chromalox		1990	0.25	54				
UH-1	Quenset storage behind bldg E									

Vacuum Pump

VACP-1D	Medical vacuum pump	Peerless	PE-195-2-E-S	1990	1.5	77				

Water Feature System

FMP-1	Main fountain pump	Bell and Gosset	Series 1510	2007	2		150			
P-8C	Grey water harvest (pumps	Bell and Gosset	Series 90	2007	1.5		80			
UV-1	UV lamp (Rated 9000 hou	Delta	ES-40	2007			124		0.09	

	Hp	EFF	GPM	CFM	KW	BTU
Surrey Totals	697		5101	577637	1463	12000000