

Sustainability Assessment

Santa Clara University

2006-07

SANTA CLARA UNIVERSITY

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Executive Summary

The Santa Clara University Sustainability Assessment, completed by SCU undergraduates working with the University sustainability program, was designed to assemble baseline data regarding University fuel use, water consumption, waste production, and use of toxic chemicals. This summary highlights important information in the University's first sustainability review.

Fossil Fuels

- Facilities purchases and distributes roughly 22,000 gallons of gasoline, 1,000 gallons of diesel fuel, 400 gallons of motor oil, and over 1,443,000 Therms of natural gas annually.
- Since 2000, there has been a 27 percent increase in campus building area but only a 3 percent increase in total energy consumption. The new Learning Commons and Library is almost twice the size of Orradre Library but is expected to run on the same amount of energy.
- Roughly 30 percent of University energy savings prior to 2006 were from lighting retrofits since 1997.
- Father Locatelli has signed the American College & University Presidents Climate Commitment, pledging to develop a plan to achieve campus climate neutrality.
- SCU has committed to reduce CO₂ emissions 20 percent below 1997 levels by 2010. In FY 2006, annual CO₂ emissions were 18,551 tons, requiring a 34 percent decrease of present emissions.
- SCU funds 8,040 megawatt-hours of renewable energy—equivalent to the annual output of two and a half large-scale wind turbines.

Waste and Recycling

- In FY 2006, more than 25 percent of all waste was recycled at SCU.
- The University recycles plastic, glass, metal, aluminum cans, mixed paper, and corrugated cardboard.
- Campus move-out in 2005 produced 25.74 tons of waste and two unweighed 40-yard bins provided by the City of Santa Clara. In 2006, waste totaled 29.16 tons and four 40-yard City bins.
- During move-out 2007, a waste diversion campaign collected more than seven tons of items for Goodwill Industries of Silicon Valley. The GREEN Club collected over 100 residence hall carpets for reuse and more than 200 textbooks were donated to Better World Books.
- A team of students will analyze food waste streams in the Benson Cafeteria and will work with Dining Services to develop an effective on-site composting system.
- The Recycling Intern will increase campus efforts to reduce contamination and increase waste diversion.

Chemical

- The biology department minimizes laboratory waste and reuses materials as much as possible. They are the first department to compile a complete inventory of chemicals in their possession.
- The chemistry department has made dramatic changes to their laboratory exercises including waste reduction, minimization of toxics, and use of "greener reagents," resulting in increased student safety, cost savings, and reduced environmental impacts.
- The majority of chemicals used by the janitorial staff are Green Seal-certified.
- Toxic chemicals on campus are disposed of by All Chemical Disposal, a company specializing in the proper disposal of hazardous chemicals.
- It is expected that each department will create a centralized chemical inventory to include all chemicals used by that department. These inventories will allow for better tracking of chemicals to increase efficient use of chemicals.

Water

- SCU draws water from the Santa Clara Valley Water District, the City of Santa Clara, and South Bay Water Recycling.
- More than 75 percent of landscaping is watered with reclaimed water.
- Over 160 Falcon Waterfree Urinals have been installed throughout campus. Falcon Waterfree literature estimates that each urinal saves 40,000 gallons per year.
- About 90 percent of residence hall showers are equipped with low-flow shower heads which use 2.5 gallons of water per minute.

About This Assessment

This assessment, the first of its kind for Santa Clara University, was designed to provide University decision makers and community members with a compilation of baseline data against which to measure the University's progress in future years. As SCU becomes a more sustainable institution, it is important to know where the University stands now, and by how much the University has improved in future years.

An undergraduate student project

Data collection and analysis were conducted by undergraduates Peter Thamer (Environmental Science '08) and Brandon Ridley (Political Science '06) through an internship program funded by University Operations and the College of Arts and Sciences. Data collection and analysis for this report began in the summer of 2006, culminating in the report's release in October 2007.

Size and scope

Ideally, a campus sustainability assessment would include all matters relating to sustainability at the University. Because we wanted to complete the first assessment within one year, we limited the scope of this report to primary impacts the University has direct control over: fuel use, waste production, water consumption, and the use of toxic chemicals.

Future assessments

Future assessments will ultimately expand this scope to quantify the entire footprint of the University including an analysis of campus dining services, for example, and expanding the scope of campus CO₂ emissions to include student, faculty, and staff travel (i.e. commuting to campus and business travel).

On our way towards a culture of sustainability

A related University assessment examining the culture of sustainability at SCU is currently underway. This report will be written by the 2007 Environmental Ethics Fellow with the Markkula Center for Applied Ethics.

Acknowledgements

This assessment would not have been possible without the contributions of many staff, faculty, and students from Santa Clara University

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Comprehensive Policy on Sustainability at Santa Clara University

As a Jesuit and Catholic University, we have the responsibility to provide leadership in developing a more sustainable way of living. By embracing sustainability, the University furthers its mission to act as a voice of reason, conscience, and service to society.

The following statements affirm SCU's commitment to a more sustainable way of living through environmental stewardship, education, and service.

Environmental Stewardship

- We seek ways to reduce our use of non-renewable resources, minimize pollution, and live more lightly on the land.
- We are mindful of the need to share equitably the natural resources on which all life depends.
- We strive to instill a broader awareness of the values of sustainability.
- We consider the economic, social, and environmental consequences of our actions.

Environmental Education

- We seek to prepare our students by integrating sustainability into the goal of educating the whole person.
- We seek to support scholarship that advances our understanding and practice of sustainability.
- We recognize our role in educating the university community about the importance of both individual and institutional environmental responsibility.

Environmental Service

- We assist communities, businesses, governments, and non-profit organizations to develop in sustainable ways.
- We support the efforts of the Centers of Distinction and outreach programs to integrate sustainability into the community.
- We support research that expands the understanding and practice of sustainability.
- We promote public dialogue on sustainability.

In adopting this policy, SCU further acknowledges its leadership and commitment to the practical application of sustainability by:

- Integrating sustainable practices into the daily administration and operation of the university.
- Providing a voice for sustainability in the development of strategic planning and capital expenditures.
- Encouraging the University community to build upon this policy statement by identifying opportunities, formulating strategies, and implementing initiatives to further the move toward a more sustainable future.





Fossil Fuels

The dangers of global warming are well documented, and the release of carbon dioxide via the burning of non-renewable fossil fuels in this generation presents a very real danger to the ability of future generations to live a full, healthy life. In addition to the moral obligation to provide a functioning environment for future generations, SCU is in a position to become less reliant on unpredictable prices and supplies. With the current growth boom in India and China and increasing rates of carbon emissions, the time to make real progress in generating and consuming sustainable energy is now. This portion of the assessment deals with fossil fuel use at SCU; specifically, the direct use of gasoline, diesel, and natural gas, as well as the role of electricity in the consumption of fossil fuels. This section also includes details about SCU's carbon emissions, emission reduction commitments, and reduction strategy.

Gasoline and Diesel

Documenting Fuel Consumption

The Facilities Department documents nearly all fossil fuel use on campus. This includes the consumption of gasoline, diesel fuel, motor oil, natural gas, and by extension, electricity. For gasoline and diesel, records document how many times individual departments use Facilities' pump to fill up, how much is consumed, the average price per gallon, and the total amount spent. (See Fig. 1 on following page.)

Purchasing and Storage

SCU purchases its gasoline and diesel from the Valley Oil Company; these are then stored by Facilities and distributed as needed to the departments listed. Motor oil is also stored and distributed by Facilities as needed.

Details of Distribution

Each year, Facilities purchases and distributes approximately 22,000 gallons of gasoline and around 1,000 gallons of diesel fuel (Fig. 2). Motor oil is consumed at a rate of about 400 gallons per year.

Departments using the Facilities pump are the Arrupe Center, Athletics, Building Maintenance, Campus Safety, Custodial Services, Facilities Administration, Facilities Services, Heating Ventilation and Air Conditioning (HVAC), the Jesuit Community, Landscaping, Santa Clara Community Action Program (SCCAP), University Administration, University Support Services, and the Utilities Department; a detailed breakdown of these totals by department can be found in Fig. 1. Of all departments using fossil fuels,

the following were able to provide additional information beyond the gasoline and diesel consumption documented by Facilities.

Mailing Services

The Mailing Services Department, a component of University Support Services, operates five vehicles on any given day: a 2½-ton truck, a ½-ton van, two electric THINK cargo vehicles, and a four seat THINK vehicle. Combined, these vehicles drive about 10 miles each day.



The Arrupe Center

The Arrupe Center provides transportation for students who need to get to their community placements but have no means of transportation. They use one van and 14 cars at varying times.

Campus Safety

Campus Safety operates five vehicles; two Toyota pickups and three THINK electric service vehicles. Campus Safety is also deals with indirect use of fossil fuels, as they are responsible for monitoring parking on

campus. Commuters to SCU who park on campus are required to buy parking permits. In the 2005-06 school year, 5,514 permits were sold, allowing faculty and staff, as well as undergraduate, graduate, and law students to park on or near campus. SCU is therefore indirectly responsible for commuter fuel use.

Landscaping

Landscaping relies on gasoline and motor oil on a daily basis. Diesel is also used, but to a much lesser degree. The landscaping equipment used to maintain school grounds consumes far more fuel than the transportation vehicles. Through August 2006, 1,394.2 gallons were used for equipment and 438.7 gallons for transportation vehicles. Currently, Landscaping uses 12 electric-powered vehicles, four gasoline-powered, and one small diesel skid loader that used approximately 20-25 gallons of diesel per month.



Commuter Survey

A survey of Santa Clara faculty and staff was distributed via the Internet and returned 251 responses from all types of commuters. The average daily commute for people who took the survey was 23.24 miles. This

average includes commuters who walked a few blocks to campus as well as people who commuted over 200 miles. The average number of days faculty and staff who commuted in summer 2006 was just over four.

While we were happy to receive so many responses, potential errors in the collection process tempered our enthusiasm and we realize we cannot put much faith in the responses. Nonetheless, it was encouraging to have so many responses within a few days, especially during the summer.

Field trips

During the beginning stages of the assessment, an e-mail was sent using the Essential staff and faculty lists asking for details about field trips taken by classes. Because there were only 15 responses to the e-mail, no conclusions can be drawn from the data. For those that did report, the average vehicle miles per class (total vehicles x total miles traveled) was 514 miles. More information about the vehicles driven during field trips is needed to determine how much gasoline and diesel was consumed.

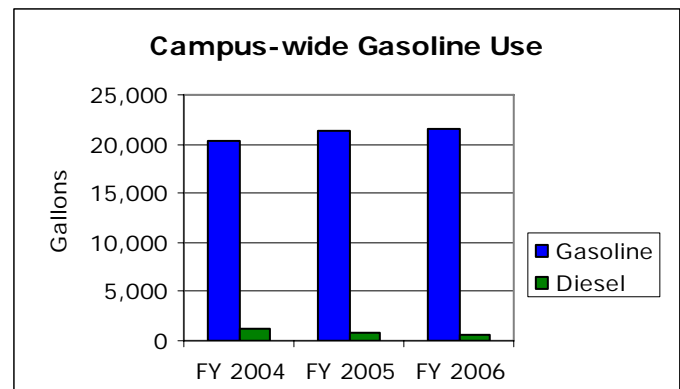


Figure 1: Total campus-wide gasoline and diesel for FY '04, '05 and '06.

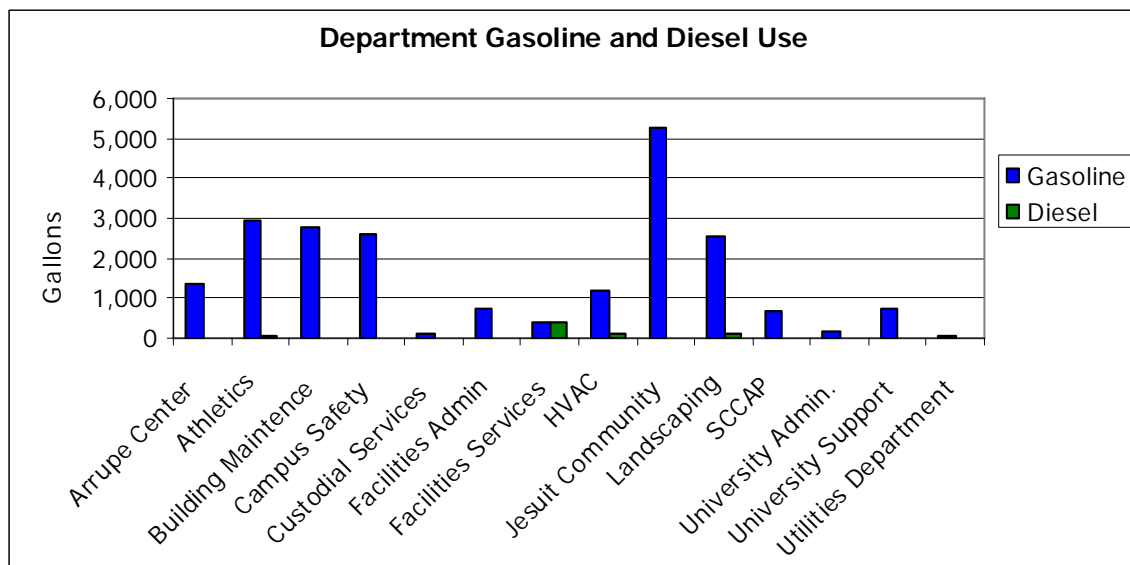


Figure 2: Gasoline and diesel consumption by department for FY '06.

Personal Vehicles

SCU owns six vehicles that are driven as personal vehicles: a 2006 Toyota Corolla, a 2004 VW Jetta, a 2006 Toyota Camry, a 2003 VW Jetta, and a Toyota Camry of an undetermined year. The mileage and fuel-use records for these vehicles are not available and as such, no determinations can be made about their use of fossil fuels.

Natural Gas

SCU purchases natural gas from two companies, PG&E and New Constellation Energy. Natural gas is used for building heaters, clothes dryers, ovens and ranges, Bunsen burners, and water heaters. Natural gas usage is documented by Facilities. In FY 2006, SCU used a total of 1,443,796 Therms of natural gas (1 Therm = 100,000 BTUs). This represented an approximate 120,000 Therm increase from FY 2005 and a 350,000 Therm increase from FY 2004 (Fig. 3).

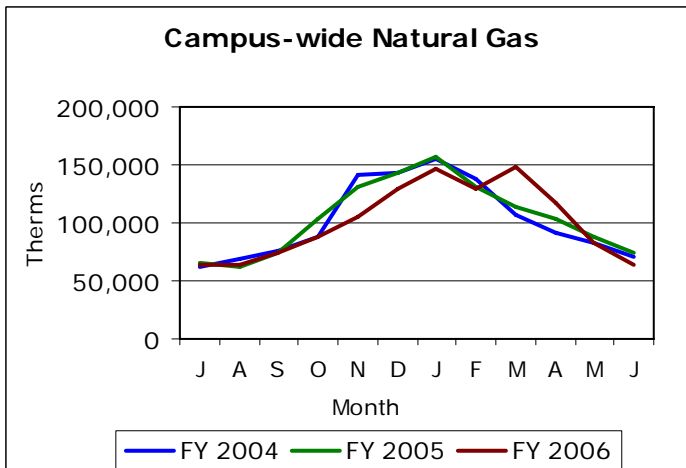


Figure 3: Total campus-wide natural gas consumption for FY '04, '05, and '06.

Housing

Natural gas is used for water heating, building heating, and clothes dryers in residence halls. These buildings account for a sizeable portion of the natural gas usage. In FY 2006, 475,579 Therms of natural gas were used by housing which is about 33% of the University's total usage. This was up from the FY 2005 total of 465,323 Therms and the FY 2004 total of 380,717 Therms (Fig. 4 and 5).

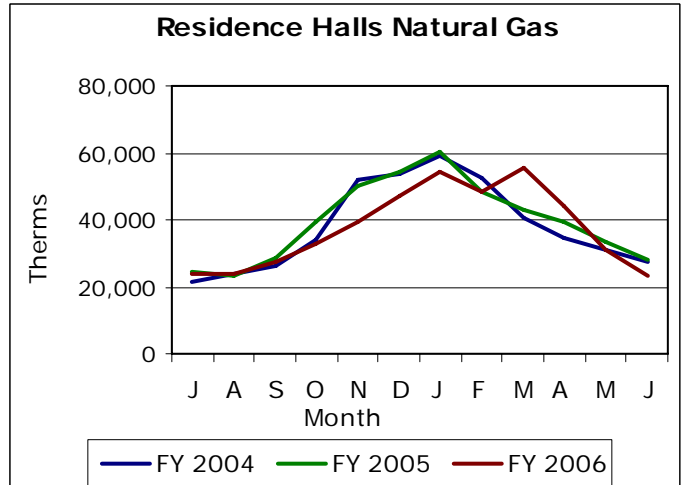


Figure 4: Natural gas consumption for all on-campus housing for FY '04, '05, and '06.

Electricity

While electricity itself is not a fossil fuel, the means of its production are often driven by fossil fuels. Santa Clara University buys its electricity from Silicon Valley Power (SVP), the utility for the City of Santa Clara. As a progressive power company, SVP provides a much higher proportion of renewable energy than state averages. The certified green power mixture SVP's customers received in 2005 was five times higher than the 2004 state average (Fig. 6).

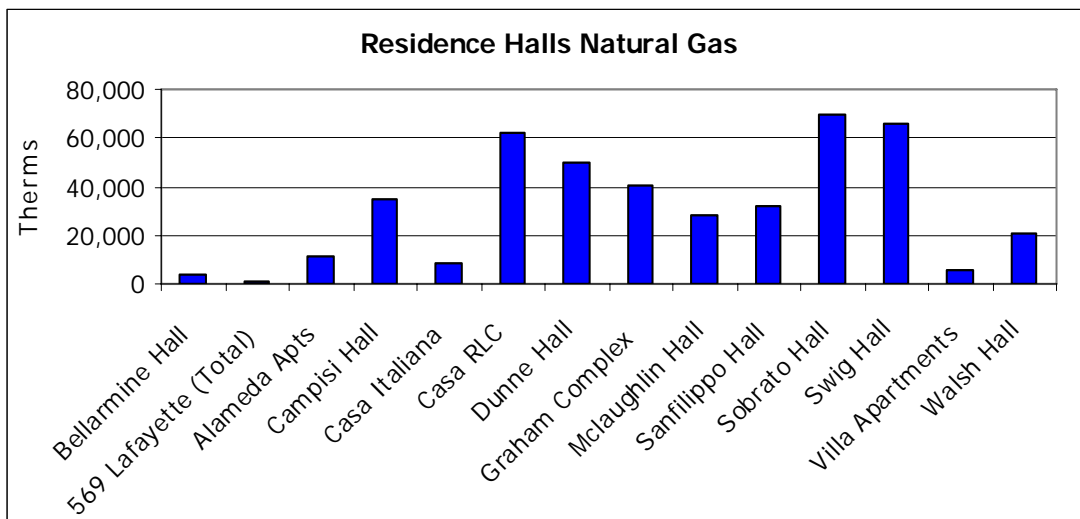


Figure 5: Individual residence halls' natural gas consumption for FY 2006.

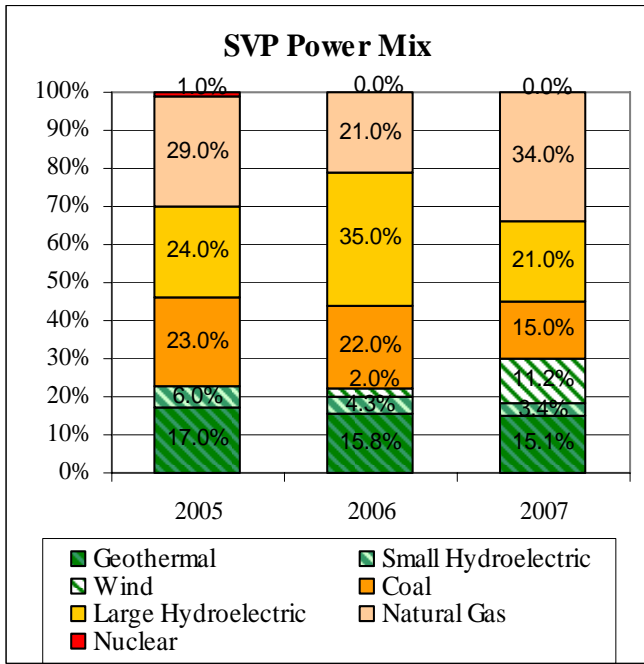


Figure 6: The power mixture provided by SVP for 2005, 2006, and the projected mix for 2007. All energy sources in green crosshatch are considered to be renewable.

Resource	Unit Conversion	Conversion Factor
Electricity	kWh to lbs CO ₂	0.75
Natural Gas	Therms to lbs CO ₂	11.64
Gasoline	Gallons to lbs CO ₂	19.43
Diesel	Gallons to lbs CO ₂	21.05

Table 1: Conversion factors used to convert resource quantities into CO₂ emissions. Conversion factors were obtained from Sustainable Silicon Valley Web site.

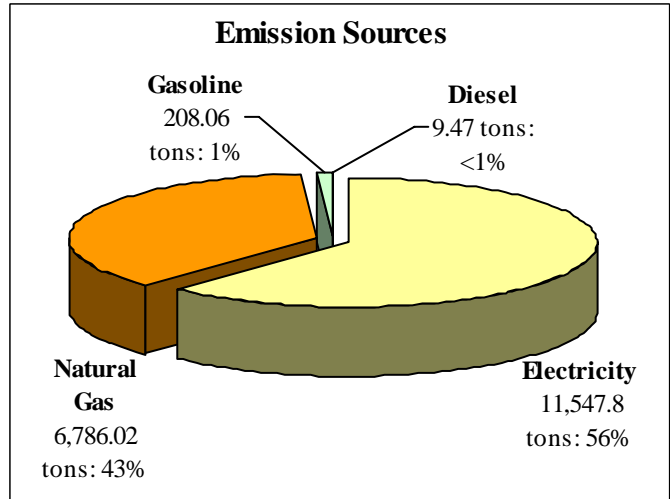


Figure 7: CO₂ emissions released during the consumption of resources during FY 2006.

Carbon Emissions

To quantify the global and environmental impact of fossil fuel consumption, it is important to consider the quantity of carbon dioxide (CO₂) that is emitted into the atmosphere during the consumption of resources. Conversion factors from Sustainable Silicon Valley (SSV) were used to convert fossil fuels into equivalent tons of CO₂. Each type of fossil fuel has a different conversion factor, as their carbon densities and emissions vary. Historic records of University resource consumption, figures 7 and 8, were created using the conversions listed in Table 1.

Emission Reduction Commitments

Following the theme of the international Kyoto Protocol, SSV is a collaboration of local businesses, governments, and non-governmental organizations that are identifying and addressing environmental and resource pressures in the Silicon Valley. Some partners of SSV include Cisco Systems, Ebay, Hewlett Packard Company, Sierra Club: Loma Prieta chapter, Symantec, and Webcor Builders. By joining SSV, SCU has agreed to reduce CO₂

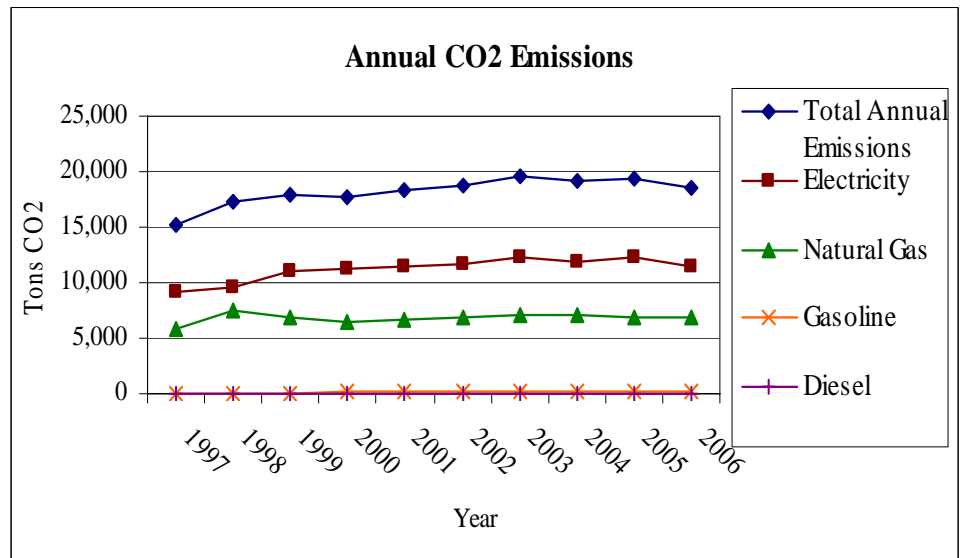


Figure 8: Total annual CO₂ emissions (blue) as well as contributions from major sources of emissions.

emissions 20 percent below 1997 levels by 2010. SCU is also cooperating at a national level with other universities in the U.S. President Paul Locatelli recently signed the American College & University Presidents Climate Commitment, joining over 400 college and university presidents in a commitment to develop comprehensive plans for achieving campus climate neutrality.

Emission Reduction Details

SSV allows participants to choose a year between 1990 and 2000 as the baseline for their emission reduction goal. Each year is assigned a certain emission reduction percentage, which is adjusted to reflect 1990 emissions and valley-wide emission trends. The oldest complete set of data at SCU was for FY 1997; this most likely reflects 1990 emissions because very few buildings or projects occurred between 1990 and 1997. Total CO₂ emissions for FY 1997 were 13,853,271 tons. The emission reduction goal is to reduce current emissions to 20 percent below 1997 emissions, or by 12,217 tons. In FY 2006, annual CO₂ emissions were 18,551 tons and must decrease by 34 percent, or 6,335 tons, to reach emission goal by 2010.

Emission Reduction Strategy

SCU has begun an aggressive CO₂ emission reduction campaign in order to reach the target by 2010. As indicated by figures 7 and 8, the biggest contributors to SCU's CO₂ emissions are electricity and natural gas, contributing more than 98 percent of emissions. These resources will be the most targeted resources for reduction. Some key points in the emission reduction strategy include: acquiring two additional wind turbines through SVP green energy program, implementing an aggressive energy awareness program, pursuing third-party grant or gift funding to acquire 1000 kWh of on-campus solar power generation, and implementing cost-effective equipment, lighting, and building retrofit projects that will significantly reduce CO₂ emissions.

Green Energy

SCU has increased its investment in renewable energy fivefold by funding 8,040 megawatt-hours (MWhs) and is now SVP's second-largest clean energy supporter—8,040 MWhs is equivalent to the annual output of two and a half large-scale wind turbines. This prevents more than 3,206 tons of CO₂ and is the equivalent of planting 2,671 acres of trees or removing 694 cars from the road per year.

On June 30, 2007, 50 kWhs of solar panels were installed on the roof of the Facilities Department that will generate an estimated 89,000 kWhs per year and reduce annual CO₂ emissions by 40 tons. Another 950

Since 2000, there has been a 27 percent increase in building area and only a 3 percent increase in energy consumption.

kWh of solar are expected to be installed by 2010, which would reduce CO₂ emissions by 6,437 tons.

Dunne, Walsh, and McLaughlin residence halls have a portion of their hot water needs supplemented by solar water heaters owned and maintained by Alten Energy. In FY 2005, these solar water heaters captured solar energy equivalent to burning 20,854 Therms of natural gas, which reduced carbon emissions by .90 tons. In FY 2006, the solar water heaters captured 19,716 Therms and reduced emissions by .85 tons. In FY 2007, the solar water heaters captured 16,670 Therms, reducing emissions by .72 tons.

Sustainable Building Design

Another way that SCU can reduce emissions is with efficient building design. Since 2000, there has been a 27 percent increase in building area and only a 3 percent increase in energy consumption. The Commons at Kennedy Mall and the new Jesuit Residence were built with sustainability in mind and incorporate energy efficient design characteristics. The new Learning Commons and Library is almost twice the size of the old library and is



expected to run on the same amount of energy, thanks to a more efficient design. Plans for the new business school building also incorporate sustainable design and increased efficiency.

Building and System Upgrades

SCU has been increasing its energy efficiency by retrofitting old buildings with new technologies for more than 10 years. It is estimated that 30 percent of our energy savings prior to 2006 were from lighting retrofits in the form of new sensors, controls, and a switch to compact fluorescent bulbs. No specific energy saving records of these retrofits were kept; they were only assessed in terms of their economic savings and impact. As the emission reduction campaign begins, detailed records of all energy saving activities will be

kept. (New energy-efficient Parker Premix Low NO_x Boilers have been installed at the Energy Center, located behind the Mechanical Engineering building, which will emit 3 percent less CO₂ than old boilers.)

In the Future

A future assessment will hopefully include more specific records of gasoline use from all areas of campus: mailing services, commuters, on-campus vehicles, etc. There are also plans to install meters in each building that will have live displays showing details of electricity consumption. These meters will allow us to quantify the beneficial effects of the emission reduction campaign and help target specific areas that need improvement. As mentioned in other areas of the Fossil Fuel Section, there are many plans for CO₂ emission reductions which will also be documented in future assessments.

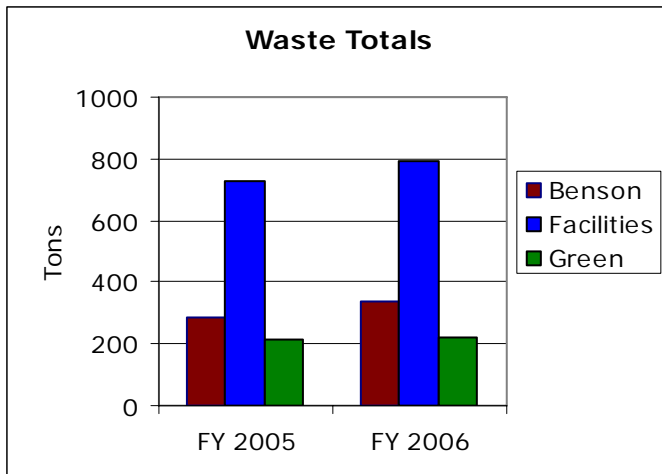


Figure 9: Total weight of waste collected from the two major compactors, Benson and Facilities, as well as annual green waste totals.

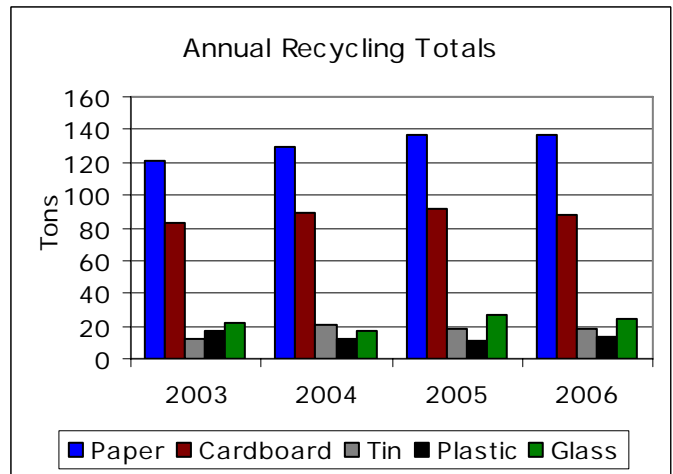


Figure 11: Annual recycling totals for recyclables collected from all areas of campus.

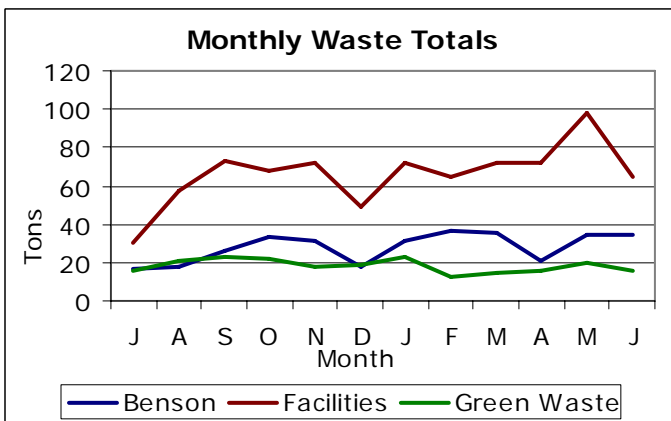


Figure 10: Campus-wide monthly waste totals for FY 2006.

Non-Recyclable Waste

Of the 1,000-plus tons of non-recyclable waste disposed of in FY 2005, 288.9 tons were disposed of via the Benson Memorial Center compactor and 730 tons via the Facilities compactor. In FY 2006, the numbers rose to 336.5 tons for the Benson Memorial Center compactor, 793.88 tons for the Facilities compactor. The majority of green waste is picked up by Mission Trails, though some of the green waste, such as trimming from trees and shrubs, is put in a wood chipper and turned into mulch or ground cover. Using green waste as ground cover reduces weed propagation and evaporation, which in turn reduce the use of herbicides and decrease landscaping watering needs.

Facilities keeps less specific records of non-recyclable waste than recyclable waste. Facilities is in the process of installing smaller scales to obtain more detailed records about the quantity and specific origins of waste. This will provide better information for strategies aimed at reducing waste in targeted areas. Currently, there is some data from specific locations but it is too intermittent to be of analytical use. (See Fig. 9 and 10)

Types of Recyclables

Facilities recycles plastic, glass, metal (including tin cans), aluminum cans, mixed paper (including shoe boxes, magazines, junk mail, white/colored paper, snack/cereal boxes and other materials that don't have wet strength), and corrugated cardboard. These categories of recyclables are documented in either pounds or tons (Fig. 11). Aluminum is not included in this chart because no historical records were available at the time of this assessment. Currently, it is estimated that SCU recycled 2,136 pounds of aluminum in 2006.

Some conclusions drawn from SCU's rate of recycling may be misleading because recycling-to-consumption ratios for specific materials cannot be determined. For instance, a rise in the quantity of paper recycled seems positive, but at the same time, there may have been an increase in overall paper use and a decrease in the overall percent of paper recycled. Just because we recycle a higher quantity of material does not exactly mean our recycling habits are improving.

Recycling practices and records are expected to improve in all areas with the help of a new Recycling Intern, who will analyze and suggest improvements to our current recycling methods.

Waste Reduction Campaigns

Move-Out Recycling

During the 2005 move-out, 25.74 tons of waste were disposed of, in addition to two unweighed 40-yard bins provided by the City of Santa Clara. In 2006, that number jumped to 29.16 tons of waste and four 40-yard bins provided by the City.

During the move-out of 2007, "2 Legit 2 Trash it" began a successful waste reduction campaign by

collecting more than seven tons of clothing, shoes, plastic storage containers, microwaves, televisions, stereos, and more, which would have otherwise been thrown away. All collected items were donated to Goodwill Industries of Silicon Valley. The GREEN Club (GrassRoots Environmental Efforts Now!) collected roughly 100 residence hall carpets, which were steam-cleaned and stored for the summer to be sold to incoming students during Welcome Weekend. More than 200 used textbooks were collected and shipped to Better World Books for reuse, bringing the total weight of recycled items over 10 tons. The recycling and waste diversion efforts of 2 Legit 2 Trash it and The GREEN Club reduced the amount of waste by 2.1 tons compared to the previous year. Even with the efforts of the Move-Out Recycling campaigns, 27 tons and four 40 yard bins of waste were generated during the move-out of 2007.

RecycleMania

On Jan. 28, 2007, Santa Clara University joined 200 colleges and universities across the United States in a competition to be the campus with the best waste reduction efforts. RecycleMania, a 10-week competition during winter quarter and part of spring quarter, included contests to see which school could collect the largest amount of recyclables per capita and the largest amount of total recyclables, generate the least amount of trash per capita, or have the highest recycling rate. The SCU Recycling and Waste Management team, with the help of volunteers, tracked all paper, corrugated cardboard, bottles, and cans that were recycled. (Fig. 12, 13, and 14)

By the end of the 10-week competition, more than 41 million pounds of recyclables were collected nationally by participating colleges and universities. SCU's greatest success was finishing 12 of 66 schools in the Waste Minimization section with a cumulative result of 59.1 lbs. of waste per person.

To give an idea of the range of competitors, in first place in Waste Minimization was University of Texas at Austin with 31.97 lbs. per person; and in 66th place, Medical University of South Carolina with 200.11 lbs. per person. Other successes for SCU include 36 of 112 in Bottles and Cans Recycling; 83 of 178 in Gorilla

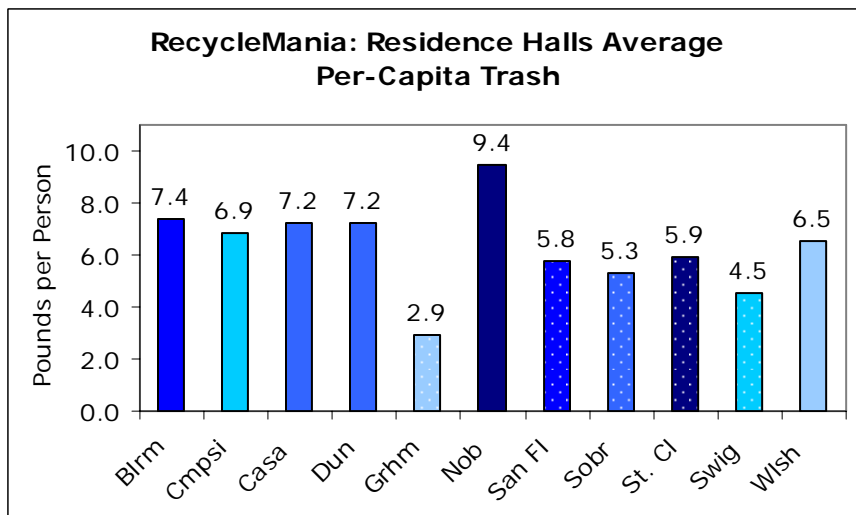


Figure 12: Average weekly per-capita trash produced during the 10 weeks of RecycleMania 2007.

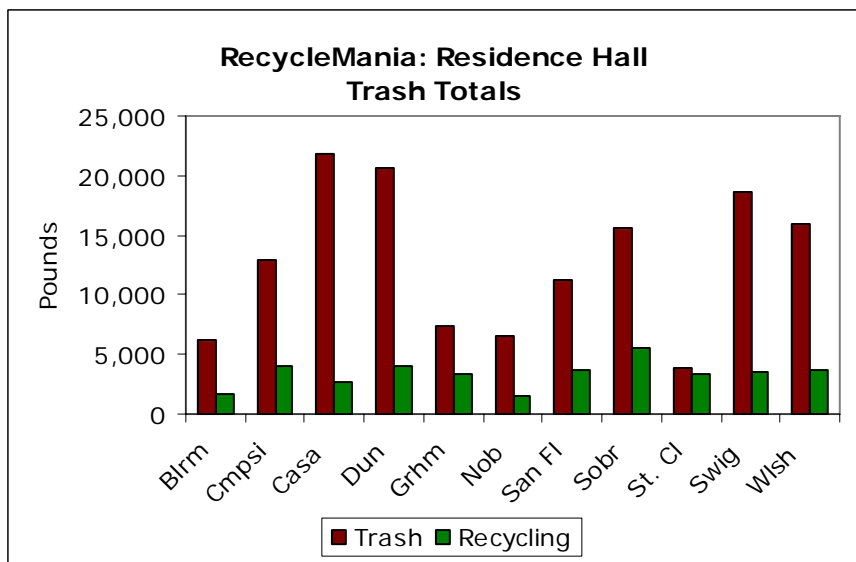


Figure 13: Total trash produced by each residence hall during RecycleMania 2007

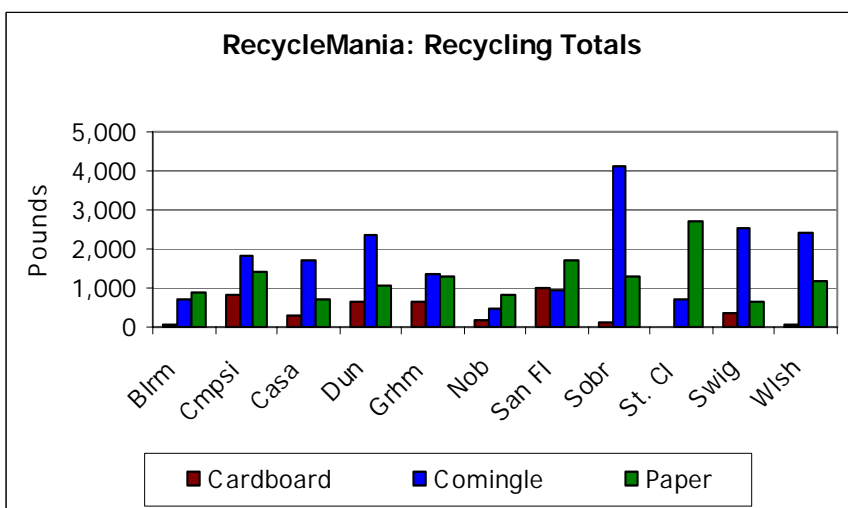


Figure 14: Ten-week recycling totals for all residence halls collected during RecycleMania 2007.

Prize; 43 of 77 in Grand Champion; 107 of 175 in Per Capita Classic, 64 of 104 in Cardboard Recycling and 78 of 111 in Paper Recycling.

In the Future

Location Specific Data

Currently, SCU only weighs full bins that are ready to be picked up. New scales will allow SCU to track specific data on waste production and collection of data on waste producers. This will provide better data for future Sustainability Assessments. A steady collection of generated waste weights from all locations will provide a clearer picture of SCU's waste stream.

Food Waste Data

There are plans to reassess composting at SCU. A team of students will analyze food waste streams in the Benson Cafeteria and will work with Dining Services to develop the most effective on-site composting strategy.

Recyclable Material Data

The recycling team in the Facilities Department is relatively small, with only three crew members. They make concerted efforts to document waste and recycling records at SCU. Contamination is one of the key limiting factors to recycling; when materials are put in the wrong recycling bins, they must be sorted before they can be recycled. The relatively small recycling team does not have the time to sort all of SCU's recycling by hand.

The new Recycling Intern will analyze current recycling methods and find ways to expand and increase efficiency of the recycling system at SCU. The first goal of the Recycling Intern is to initiate an aggressive awareness campaign to inform the campus community of the proper recycling bins and locations.



Chemicals

In 1986, voters in California approved Proposition 65 to address a growing concern about exposure to toxic chemicals. As a requirement of Prop 65, each year the state of California must update a list of chemicals that are known to cause cancer, birth defects, or other reproductive harm. SCU, as required by Prop 65, must notify students, faculty, staff, and visitors about significant amounts of these chemicals in the products the University purchases, uses in the workplace, or releases into the environment. This section of the assessment reports on the state of chemical inventory at SCU and the chemicals that were documented on campus.

This section of the assessment, chemical use on campus, pays particular attention to toxic, hazardous, and environmentally significant chemicals. Information about specific types and quantities was difficult to obtain, as few departments have yet successfully compiled a comprehensive list of the chemicals in their possession. In most cases, Professors independently order and maintain chemicals used in a course. Currently, Environmental Health and Safety Manager Bill Buckman is helping departments develop a method to tag and track each chemical in their department's possession. Not only will the new chemical inventories increase efficiency of chemical use and storage, they are also necessary to inform the Santa Clara Fire Department of any chemical hazard they might encounter during fire suppression.

Departments or offices using toxic, hazardous, or environmentally significant chemicals are: anthropology, biology, chemistry, Cowell Health Center, custodial, de Saisset Museum, fine arts, landscaping, and theatre. Significant chemicals are also used by janitorial staff and landscaping. The following departments were able to meet or converse via e-mail or phone about chemicals in their storage areas.

Biology Department

The biology department practices sustainability principles in lab by minimizing waste and reusing materials as much as possible, which can be difficult because labs must be sterile. When working with radioactive substances, professors choose materials with shorter half lives whenever possible. They also try to maintain communication between labs so materials thrown out in one lab can be reused in another. The biology department has been the first depart-

ment to compile a complete inventory of the chemicals in their possession. The inventory listed more than 885 different chemical containers, with the chemical's name, quantity, location, and hazard code. For any chemical known to be toxic, corrosive, oxidizing, flammable, or reactive, Materials Safety Data Sheets were obtained to determine the environmental implications or hazardous nature of the chemical. Seven chemicals in the Biology Department's possession are listed on Proposition 65 and are cancer causing: acrylamide, cobalt sulfate, lead nitrate, mercury, mercuric chloride, nickel sulfate, and sulfuric acid.

Most of the chemicals listed in the Biology Department's inventory were harmless, but of the chemicals listed as moderately to extremely hazardous to human health, 64 were either non-biodegradable, or known to be toxic to aquatic life, negatively affect reproduction, leach into ground water, expected to significantly bioaccumulate, and sometimes a combination of effects. It is also scary to note that many of the chemicals that are hazardous to human health have not yet been tested to determine their ecological effects. For the biology department's complete Chemical Inventory, please contact Environmental Health and Safety Manager Bill Buckman.

Chemistry Department

As part of their commitment to environmental sustainability, the chemistry department has made dramatic changes to their laboratory exercises. Changes include: waste reduction, minimization of toxics, and use of "greener reagents," resulting in increased student safety, cost savings, and reduced environmental impacts. In 2000, the chemistry department began to write their own lab manuals for

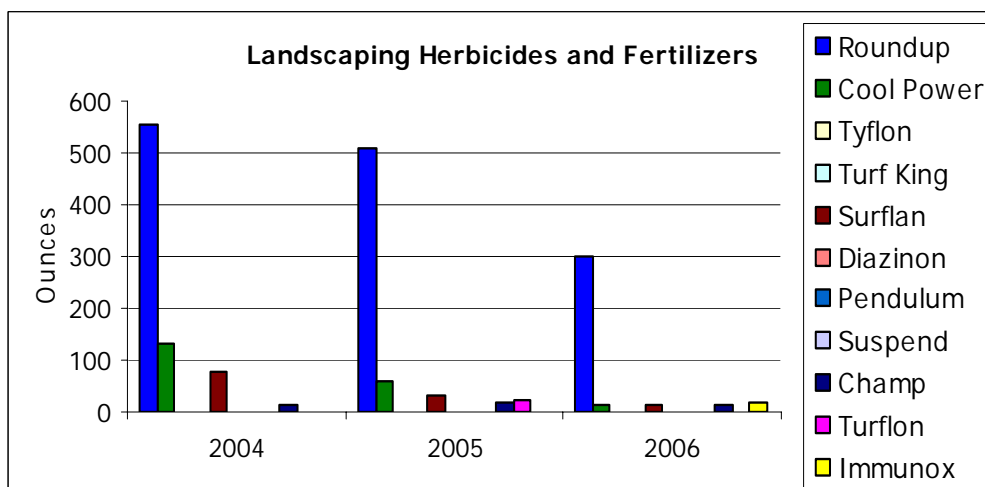


Figure 15: Chemicals used by landscaping during FY '04, FY '05, and FY '06.

courses CHEM 11, 12, and 13 to create labs that minimized waste. This has made it easier to change and manipulate lab exercises to ensure efficient use of materials. In the early 1990s, organic chemistry labs were converted to microscale experiments. Today students typically use just a milliliter or less of reagents, instead of 50 or 100 milliliters, which dramatically reduces waste. In upper-division inorganic labs, some wet chemical experiments have been replaced with computer modeling, which also helps minimize waste.

The chemistry department provided a large list of the chemicals present in chemistry storage, and purchasing records for the past year were also provided. Unfortunately, the decentralized process of inventory and the numerous names for the same chemicals made it difficult to get an idea of what is present and being used in the chemistry department. Most chemistry researchers keep their own inventories, and determining the department's chemical footprint would require talking to each individual about their chemical inventory.

Facilities

Landscaping records show a variety of chemicals used for insect and plant control. Roundup is the primary herbicide used because of its relatively low toxicity in relation to its effectiveness. The same is true for the insecticides Merit and Manage. Figures 15 and 16 show the chemicals used by Landscaping.

The majority of chemicals used by the janitorial staff are Green Seal-certified, though no specific records were available at the time of this assessment.

Theatre Department

The theatre department includes the costume and set shops, both of which keep MSDS on the products they have currently or have had at one point. There are no usage or inventory records, so there is currently no

way, short of a manual count, to determine what is present. Ventilation hoods and respirators are required during the use of toxic products.

de Saisset Museum

The de Saisset Museum uses toxic chemicals to preserve and restore art pieces. The quantities of chemicals are relatively low. The museum currently stores approximately one liter of each of the following: acryloid B-72, denatured alcohol, methanol alcohol, Brilliance, turpentine, non-

flammable cleaning duster, polyvinyl acetate varnish, mineral spirits, Soluvar, and Wykamol Plus (two liters). These chemicals are used in small quantities except the Wykamol Plus, of which one half-liter is used every several years.

Cowell Health Center

Cowell keeps MSDS for all of their chemicals. Due to time constraints, this assessment does not include chemicals present in the Health Center.

Others

The mechanical engineering, anthropology, civil engineering, and fine arts departments were not visited, nor did we get a chance to converse with them via e-mail. It is hoped that in the future, when each department compiles a central chemical inventory, holes in the data will be filled.

Inventory Systems

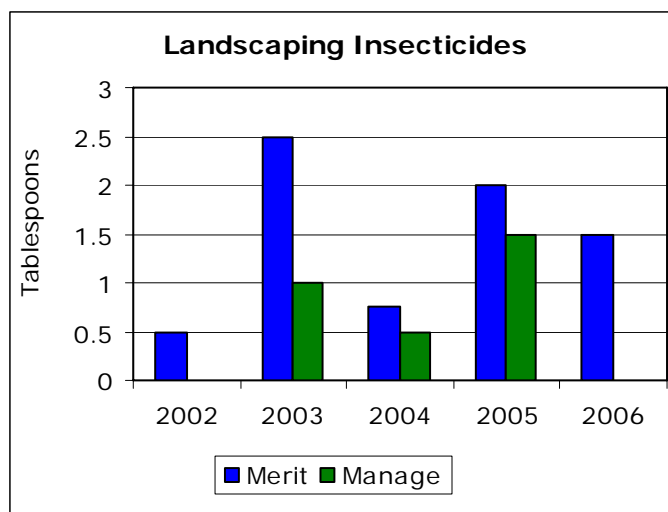


Figure 15: Quantities of insecticides used by Landscaping.

Environmental Health and Safety at SCU is currently looking into a chemical inventory system that would allow for the tracking of chemicals on campus. The biology department currently owns a program called CIS (Chemical Inventory System) Pro, put out by ChemSW. According to Daryn Baker, biology stockroom supervisor, "It allows bar code tracking by package and location, generates barcode labels, has an MSDS component, and is network capable." However, the system has not yet been put into place due to a lack of manpower.

Disposal of Chemicals

Toxic chemicals on campus are disposed of by All Chemical Disposal, a company specializing in the proper disposal of hazardous chemicals. SCU uses All Chemical Disposal for the proper handling and disposal of hazardous waste, universal waste, and biological waste. Numbers for the amount or type of waste taken away were not available at the time of this assessment.

In the Future

It is expected that each department will eventually create a centralized chemical inventory that will include all chemicals used by that department. These inventories will allow for better tracking of chemicals to reduce double orders and increase efficient use of chemicals. Many of the chemicals already used by the janitorial staff are considered green, and it is expected that many toxic chemicals will be substituted with green ones wherever possible.



Water

Water is one of our most precious resources. Almost all living things require water for survival. Though close to three quarters of our planet's surface is covered in water, 97 percent is salt water. Of the remaining three percent of fresh water, two and a half percent is frozen in glaciers and ice caps, leaving only one half of a percent of our planet's water that is potable, drinkable water. The average American consumes 100 gallons per day; the average water consumption in developing nations is 26 gallons per day. The University is actively reducing water consumption in all areas. This section of the report describes all areas of water use on campus and SCU's water reducing practices. The increment used in auditing water use in this assessment is CCF, which is 100 cubic feet or 748 gallons.

Origins of SCU Water

SCU draws water from three utilities: the Santa Clara Valley Water District, the City of Santa Clara, and South Bay Water Recycling. Bottled water is another source of drinking water at SCU, and is provided by Arrowhead and Private Spring Water.

Santa Clara Valley Water District (SCVWD)

SCVWD water has two sources. The first of these is the Guadalupe Watershed. Water is brought into SCU via an aqueduct stretching from the Sacramento-San Joaquin River Delta to Santa Clara. Groundwater is the second source of fresh water in the SCVWD mix. Water from both sources is treated with ozone to kill bacteria without leaving an odor or taste. Ozone dissipates from the water after a relatively short period of time, so chlorine is sometimes added to prevent bacterial growth during transportation to homes and businesses.

City of Santa Clara's Water Utility

The City of Santa Clara imports its water from the Hetch-Hetchy reservoir in the Yosemite Valley. Water from Hetch-Hetchy is fluoridated and treated with Chloramine, which is used as an alternative to chlorine for disinfecting water. Chloraminated water is safe for most people and animals to drink and for all other general uses.

Bottled Water

There are two primary sources of bottled water on campus, Bon Appetit and Arrowhead. Bon Appetit sells bottled water at various locations on campus and sold more

than 158,534 liters (5,598 CCF) during FY 2006. They offer small half-liter bottles and large one-liter bottles. Their total sales and distribution for FY 2006 can be found in the following table:

	Mssn Bkry	Mkt Sqr	Clir Mkt	Jmp Strt	Total
Sm (.5L)	18,502	98,943	23,729	3,370	144,544
Lg (1L)	9,298	58,049	16,523	2,382	86,252

Bottled water from Arrowhead is offered in five-gallon dispensers in Benson as well as in most department buildings. In FY 2006 3,417 five-gallon jugs were purchased and consumed, equal to 2,284 CCF.

South Bay Water Recycling

South Bay Water Recycling is a partnership of the cities of San Jose, Santa Clara, and Milpitas. Reclaimed water is purchased exclusively for landscaping. By using reclaimed water for landscaping, SCU greatly reduces the consumption of potable water.

SCU Water Metering

There are three different types of water metering systems at SCU. The first type, consisting of two main campus meters on the east and west sides of campus, monitors incoming potable water.

In FY 2006, 66,082 CCF were metered, accounting for 46 percent of SCU's water usage. This covers usage for most of the buildings on campus, including some of

**“How inappropriate to call this planet Earth when it is clearly Ocean.”
—Arthur C. Clark**

campus housing, and other uses such as the pool, drinking fountains, and restrooms.

A second metering system measures auxiliary potable water usage. These meters measure a variety of buildings including some on-campus residence halls and off-campus buildings. Auxiliary meters counted 18,491 CCF of water used in FY 2006, roughly 14 percent of the school's total water usage.

A separate metering system measures the amount of reclaimed water used by SCU. In FY 2006, 132,848 CCF of reclaimed water were used, amounting to 40 percent of SCU's total water usage. (See Fig. 17 for details)

Lack of Specific Metering

This assessment accounts for all water usage that is metered on campus, including water used for landscaping, restrooms, fountains, pools, housing, etc. SCU's metering system only documents overall University use of water, which makes it difficult to determine water usage at specific locations for units other than residence halls. For example, it is not possible to determine the amount of water used at the Malley pool each month. The only buildings that are individually metered are ones used for housing.

Residence Halls

Residence halls were responsible for the combined use of 37,519 CCF in FY 2006; see Fig. 19 for a breakdown of water consumption by building.

Water Reduction

SCU has reduced water consumption in many areas, primarily through landscaping and bathroom use. More than 75 percent of landscaping is watered with reclaimed water, and efforts continue to increase the use of reclaimed water. Many traditional urinals have been replaced with water-free urinals, which greatly impacts potable water usage. To date, 161 Falcon Waterfree Urinals have been installed; that number will increase by 23 when the new business school and library buildings are completed. Falcon Waterfree literature estimates that each urinal saves 40,000 gallons per year.

Another technology that reduces water consumption in the bathroom is low flow shower-heads. About 90 percent of residence hall showers are equipped with low-flow shower heads which use 2.5 gallons per minute; Fig. 18 shows annual trends of decreasing water use.

In The Future

In the future, SCU plans to continue efforts to reduce water consumption. Toilets in new buildings will be flushed with reclaimed water. Landscaping use of reclaimed water is expected to increase, as well as the use of water reducing technologies and sensors which will all increase efficiency of water use.

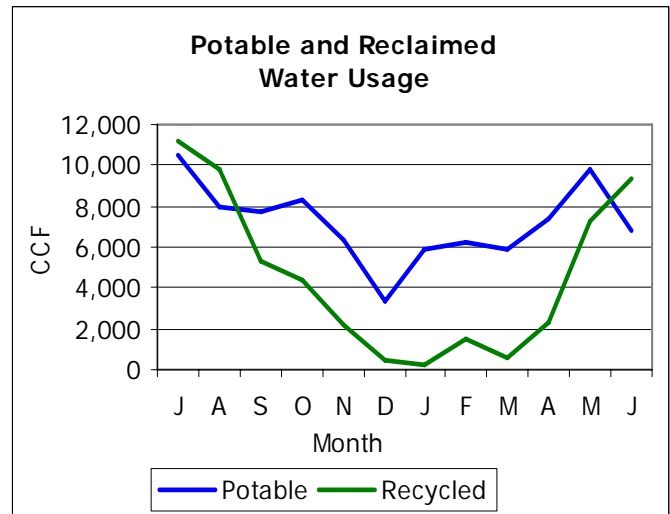


Figure 17: Campus-wide water usage of recycled and potable water for FY 2006.

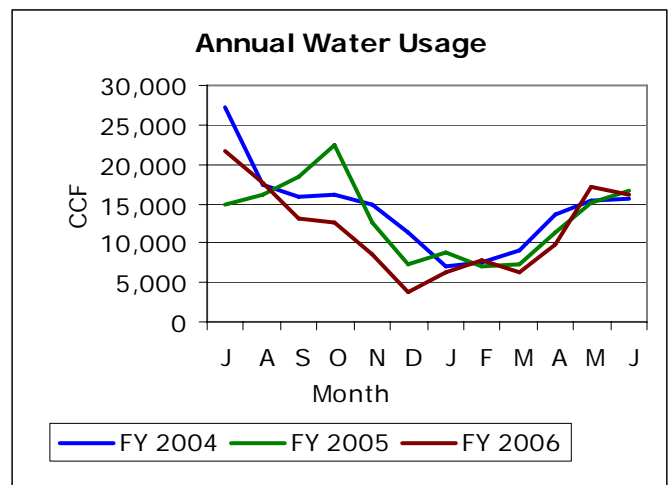


Figure 18: Total annual water use trends for FY 2004, FY 2005 and FY 2006.

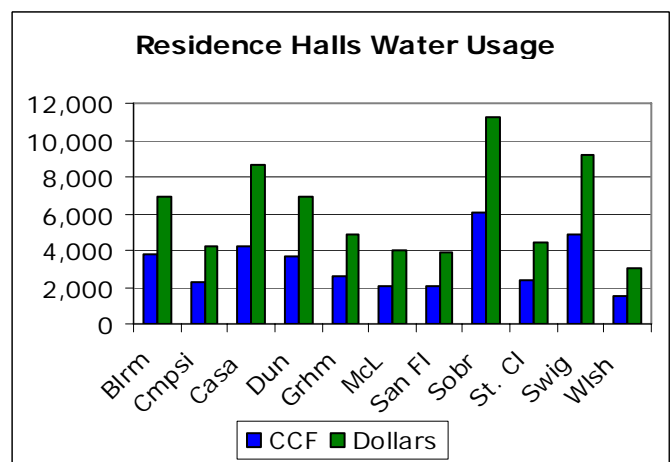


Figure 19: Residence halls water consumption and cost for FY 2006.

About SCU

Santa Clara University, a comprehensive Jesuit, Catholic university located in California's Silicon Valley, offers its 8,377 students rigorous undergraduate curricula in arts and sciences, business, and engineering, plus master's, Ph.D., and law degrees. Distinguished nationally by the fourth-highest graduation rate among all U.S. master's universities, California's oldest operating higher-education institution demonstrates faith-inspired values of ethics and social justice.



Sustainability at SCU

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