

STARS SUSTAINABILITY ANALYSIS FOR THE UNIVERSITY OF VIRGINIA SCHOOL OF ARCHITECTURE

Grounds / Transportation / Waste

Global Sustainability, Fall 2011

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PROJECT STATEMENT

The STARS system was developed by AASHE (The Association for the Advancement of Sustainability in Higher Education). As mentioned in the Executive Summary, the STARS system is broken up into categories that highlight specific areas of focus on college campuses and their impact on the environment and resources. Within the STARS framework, our group will be looking at the areas of transportation, grounds, and waste, all under the 'operations' category. Each of these areas has several subgroups that give more in depth criteria for sustainability.

Kim Tanzer, Dean of Architecture at the University of Virginia, is our community partner. She has long been interested in sustainability at the School of Architecture, but she does not yet have the sort of metric for measuring sustainability the STARS system could provide. She would like to know, based on our results, specific ways we would recommend the school improve sustainability. Those affected by what we are to investigate through STARS are the members of the School of Architecture community, which includes teachers, students, and faculty. By measuring sustainability at the School of Architecture, we will be able to inform these stakeholders about how we can improve sustainability and include them in the process of creating a sustainable community. Our group will specifically inform them about ways they can improve their transportation methods to and from the school, reduce waste, and help improve the grounds.

We have analyzed the annual facility summaries of Campbell hall provided by our community partners to determine consumption trends and identify unsustainable areas that we can improve.

TIMELINE

We included a project timeline for our team to reference and follow in order to keep ourselves organized and on-track for project deadlines.

Task Description	Due Date	Team Participants	Completed/Notes
Project Definition	09/21/11	All	Yes.
Conceptual Design	10/05/11	All	Yes.
Drafted emails to research contacts: Rich Hopkins (grounds), Dana Miller, Jon Monceaux (transportation), Sonny Beale (waste)	10/05/11 – 10/12/11	All	Yes. Drafts approved by Michael Britt.
Sent completed emails to contacts.	10/05/11 – 10/12/11	All	Yes.
Received responses from grounds and transportation contacts	10/12/11 – 10/19/11	Eddie, Samantha, Zach	Yes. Encountered repeated difficulties obtaining a response from waste contact.
Conducted interview with Travis Mawyer and Kevin Beal, sent by Rich Hopkins	10/18/11	Eddie	Yes.
Conducted transportation practices survey of architecture school community	10/20/11 – 10/27/11	Samantha, Zach	Yes.
Received response from waste contact	11/01/11	Laura	Yes.
Conducted waste weighing survey of third floor	10/26/11 – 11/02/11	Laura	Yes.
Identified basic BMP ideas for inclusion in preliminary report	10/26/11 – 11/02/11	All	Yes.
Preliminary Report	11/02/11	All	Yes.
Adopted Indices of Performance scale for BMPs	11/07/11	All	Yes. Index system originally developed by Energy, Water, and Climate group.
Calculate the number of STARS points the A School would get without any intervention.	11/13/11	All	Yes.
Calculate performance indices for BMPs	11/20/11	All	Yes.
Compare the A School's STARS points before and after the (hypothetical) implementation of our BMPs	11/20/11	All	Yes.
Update and adjust the calendar to accurately reflect future planned dates on timeline.	12/7/11	Eddie	Yes.
Plan dissemination	12/6/11	Laura	Yes.
Review/Revise Report	12/7/11	All	Yes.
Final Project Due	12/10/11	All	Yes.
Final Report Presentation	12/12/11	All	Yes.

Budget

There is no budget for our project because it is only a proposal that will be carefully considered by the University of Virginia Architecture School. When the Architecture School evaluates our best management practices and decides to implement some of them in the future, then a budget will have to be created.

RANKING

In this section we determine and explain our indices of performance. See aforementioned Indices of Performance table in Executive Summary for determinants. The following tables detail each BMP, its score for each Index of Performance, and the reasoning behind said scores.

Grounds BMPs

1. Implement policy ensuring that all future landscaping projects use native plants		
Although the school's most recent landscaping project on the south side uses native plants, there is no guarantee that native plants will be used in future projects at the School of Architecture. Given that architecture school faculty have thus far had design authority over all additions to the school, however, it may be possible to get them to agree that all future landscaping projects conducted under the supervision of a faculty member will prioritize native plants.		
Index of Performance	Score	Reasoning
STARS Rating	1	Implementing this policy would earn 0.25 points for the Native Plants tier two subcategory. Although the school would earn these points if it were rated by itself, the university would not be able to earn points just for the architecture school's policy.
Cost	5	Simply implementing the policy will cost no money. Any costs for future plants planted will be folded into the overall project cost.
Feasibility	2	It may be tough to get the entire faculty to agree on such a policy, especially if any of them strongly believe that there should not be limits on the kinds of plants available for a landscaping project. Getting a majority of students to support the policy may influence favorable opinions of the policy among the faculty.
Infrastructure	4	Simply implementing the policy will require no infrastructural changes. Changes to infrastructure may be required in the landscaping projects themselves.
Total Score	12	

2. Publish list of native plant species in use around the school and their locations		
Native plants are useful because they work well with the existing Virginia climate and ecosystems, but they can also be aesthetically pleasing. Given that the school is design-oriented, it may be useful to educate students on the types of plants around them, for potential incorporation into student landscape designs.		
Index of Performance	Score	Reasoning
STARS Rating	1	Publishing a list would not earn any STARS points directly. However, knowledge of native plant species may encourage students to support a native plant policy like the one suggested in the BMP above.
Cost	5	The cost of publishing the list would depend on where it was published. If it were published somewhere on the architecture school website, there would not be any cost, but few people would see it. If flyers were put up around the school, the only cost would be that of printing and a lot of people would see them, but they would eventually have to come down. If a permanent sign were erected, for instance near the bioretention garden, a lot of people would see it over time, but there would be a relatively high cost to its manufacture. Buying and installing a waterproof frame for the printout could cost between \$100 and \$200.
Feasibility	5	Only one or two people would be required to post signage, no matter its type.
Infrastructure	5	Posting signage would not require any changes to the current infrastructure.
Total Score	16	

Transportation BMPs

1. Implement a bicycle sharing program		
Bicycle sharing programs are useful on college campuses due to the constant transportation between classes. Students often chose not to ride bikes, however due to lack of bicycle parking space, bicycle ownership upkeep work and expenses, etc. This measure should be implemented campus wide and not just on the level of the Architecture School, which should be included as a location for bicycle sharing racks.		
Index of Performance	Score	Reasoning
STARS Rating	1	Would contribute 0.25 credits and also add to the student commute modal split.
Cost	2	Depending on the level of technology used in the bicycle sharing program, it can cost up to \$140,000. Technology can include automated systems which allow students to swipe their identification cards to unlock a bike form a docking station on campus.
Feasibility	2	For the program to be successful, students and faculty should be involved in the program so that there is a community of people sharing the bikes.
Infrastructure	2	Modifications would need to be made to existing bicycle racks as well as the installation of new bicycle racks that potentially have high-tech systems for security and organizational purposes.
Total Score	7	

2. More convenient facilities for bicyclists		
Bicycle racks are not in convenient locations. More bicycle racks should be located above the stairs so bicyclists do not have to worry about carrying their bikes down the stairs.		
Index of Performance	Score	Reasoning
STARS Rating	1	Would contribute to the student commute modal split as well as the employee commute modal split. (Existing facilities already contribute 0.25 points.)
Cost	5	The cost of a bike rack that holds six bikes is about \$50.
Feasibility	2	Students need to show interest in the effort for more bike racks and continue to bike more to make the purchase of more bike racks worth our while.
Infrastructure	3	Small adjustments may be made to clear out open locations to place new bike racks.
Total Score	11	

3. More convenient telecommuting program for employees		
There is a telecommuting program school wide, but the Architecture School should be included in one of the stops that the shuttle from U-Hall takes employees to.		
Index of Performance	Score	Reasoning
STARS Rating	1	Would contribute 0.25 points and also be important to the overall transportation in relation to employee commute modal split.
Cost	5	There would be little cost if any for making a new bus stop location closer to the School of Architecture.
Feasibility	4	Some faculty members need to show interest in the creation of a new bus stop location.
Infrastructure	3	Small adjustments may be made to create a safe and feasible location for a bus stop.
Total Score	13	

4. Carpool matching programs through the School of Architecture		
The School of Architecture can make use of emailing by creating a separate listserv for students who are willing to carpool home from the School late at night.		
Index of Performance	Score	Reasoning
STARS Rating	1	Would contribute 0.25 points and also be important to improving the student commute modal split as well as the employee commute modal split.
Cost	5	The cost of creating a listserv and advertising it would be nothing.
Feasibility	3	Students need to show interest in the effort to coordinate carpooling and be willing to offer rides to other students that they may not know as well to help improve the sustainable transportation practices at the school.
Infrastructure	5	No physical infrastructural changes are necessary.
Total Score	13	

5. Car sharing programs located closer to the School of Architecture		
Zipcar could use the Culbreth garage as a location for Zipcars to be parked.		
Index of Performance	Score	Reasoning
STARS Rating	1	Would contribute 0.25 points and be important to improving the student commute modal split as well as the employee commute modal split.
Cost	5	The cost of reserving a spot for Zipcars would not cost much if anything.
Feasibility	3	Students usage needs to be prevalent for Zipcar to be successful as a company.
Infrastructure	5	No physical infrastructural changes are necessary.
Total Score	14	

Waste BMPs

1. Better Education and Information on what to recycle		
Currently there is very little information on what is recyclable. The most that is structured is the labeling of the recycling barrels. Creating signs or lists of where to recycle materials of all kinds would significantly increase the amount of waste that is diverted from a landfill.		
Index of Performance	Score	Reasoning
STARS Rating	4	This change could lead to gaining the additional 1.15 points through increased recycling
Cost	5	There would be little cost as most of this change would come through informative signs and posted materials.
Feasibility	4	Just a few people would be needed to implement this change. The jobs would be research of what can be recycled and documenting and publishing the results
Infrastructure	5	Would not change the current infrastructure.
Total Score	18	

2. Create a Hazardous Waste Removal Program		
Creating a program that regulates the removal of hazardous waste from the school. Currently disposal of materials such as paints and metal oxidizers, by creating a system that was taught to all the students would lead to a safer environment within the school.		
Index of Performance	Score	Reasoning
STARS Rating	1	Would contribute 0.25 points and be important to safety
Cost	5	Only requires someone to create a system that is feasible and can be implemented within the entire school
Feasibility	4	Few people would be required initially, but once the program was instated there would be no necessary staff
Infrastructure	4	Would not change the infrastructure much, just in a small area that is used by a small amount of students.
Total Score	14	

3. Create a system for trash and material management during move-out period.

There is an informal process to exchange materials within the school. But there is still a vast amount that is thrown away or simply left on table or in cubbies and boxes. Creating a system within the school that would reduce the waste would reduce the amount of trash that is created, which would help other categories receive more points and would reduce the amount of new materials that would have to be purchased.

Index of Performance	Score	Reasoning
STARS Rating	3	Although this category can only receive 0.25 points, it can affect that amount of trash that is disposed of which would affect the amount of points that could be received for the Waste Diversion as well as the Waste Reduction Categories
Cost	5	The costs associated with this would be hiring a temporary staff (or volunteers) to organize and run this program every year and possibly purchase storage materials
Feasibility	4	There would be a few people necessary to the success of this program, they would run the exchange and disposal program. Would require the entire school to be educated on the program as well as be motivated to participate
Infrastructure	4	There would be a change to how the end of the year system works
Total Score	16	

STARS RATINGS

The following information shows the current STARS rating the architecture school would have, calculated based on our surveys, interviews, and other research, and also shows a potential STARS rating assuming the implementation of our BMPs from the section above. We explain here the measures the school and university have already taken that would earn STARS points, and also explain why the school has not already earned other points. Scores in red are 0 due to insufficient data, or lack of applicability to the architecture school. Additionally the potential scores are less than they would be realistically because we cannot gather data for the effect that every BMP would have. For example, we cannot predict with total accuracy what the effect of a new bus stop will be on bus ridership among A School students nor can we evaluate how effective implementing changes that require the participation of students will be.

Grounds				
Credit Number	Credit Title	Points Available	Current Score	Potential Score
OP Credit 9	Integrated Pest Management	2	2	2

The university uses Integrated Pest Management in all of its plant maintenance operations, regardless of the maintenance's locations on grounds. For the purposes of STARS, this would mean the entirety of grounds is covered by an integrated pest management plan. Although Facilities Management divides university grounds into six "zones" for the purposes of organizing its landscaping work, and maintains separate staff for each group, they also maintain an IPM health specialist whose responsibilities cross across all zones. All infestations encountered in the course of general maintenance work are reported to him by the supervisors of individual zones. General policies in use that are in line with the principles of IPM include minimum pesticide use as well as the substitution of beneficial "pests" who are natural predators of the organisms identified as undesirable.

OP T2 Credit 19	Native Plants	0.25	0	0.25
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The university does not have a policy encouraging the use of Virginia native plants in new landscaping projects. Instead, plants are chosen on a project-by-project basis by the project's landscape architects, who may be part of the university's Office of the Architect or hired from outside the university just for that project. The School of Architecture has used native plants in its recent landscaping projects, but action would have to be taken to make their continued use a school policy (Grounds BMP 1).

OP T2 Credit 20	Wildlife Habitat	0.25	0	0
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This category does not apply to the School of Architecture because it does not own its land, the university does. Even if the school did own its land, the area involved would not be large enough to support any appreciable wildlife habitat.

OP T2 Credit 21	Tree Campus USA	0.25	0	0
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The university is not currently recognized by Tree Campus USA, and the School of Architecture would not be able to apply or obtain certification on its own.

OP T2 Credit 22	Snow and Ice Removal	0.25	0.25	0.25
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Snow and ice removal practices at UVA can be generally described as sustainable. Barring exceptions for recent years, the school typically does not receive much snow during the winter, so treatments are generally

light. The school does not pre-treat the roadways before snow, and after snow roads and sidewalks are cleared of the majority of their snow by snowplows and shovels. For roads and parking lots, a thin spread of sand is applied to the last layer of snow the shovels cannot get. This sand is desirable over road salts because it is not harmful to plants when part of runoff from paved areas. Purely pedestrian areas like Campbell's north terrace do not receive sand, and instead rely solely on above-freezing temperatures during the day to melt off the last layer. When ordinary sand does not suffice and melting salts are needed to maintain safe access to buildings, compounds such as potassium chloride and magnesium chloride are used because they melt without leaving residue. The university does not use chemicals that could be described as toxic.

OP T2 Credit 23	Compost	0.25	0.25	0.25
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All yard waste is composted in some way in the course of grounds keeping practices. Leaf collection starts early in the fall and continues throughout, as the university's many large, old deciduous trees are capable of dropping an extraordinary amount of material. Most yard waste is sent to the main compost pile on the back of Observatory Hill, while woody material is sent to a smaller, separate pile on the same site. Grass trimmings are mulched directly into the ground during mowing by lawnmowers with the necessary capability. The university actually produces more compost than it uses, which means that landscapers can use as much as they want for maintaining the health of plants around grounds.

Transportation				
Credit Number	Credit Title	Points Available	Current Score	Potential Score
OP Credit 14	Campus Fleet	2	0	0

This category does not apply to the School of Architecture because it does not have its own campus fleet. If it were to be examined school wide, the transportation department, as per John Monceaux, would have given it a current score of 0.04.

OP Credit 15	Student Commute Modal Split	4	3.81	4
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The School of Architecture's students get to school in various ways. From the survey that we conducted, we concluded that many of the undergraduate students walk to class (85%), and then it subsequently goes biking, taking the bus and driving, each of them coming with 20%, 16% and 8% respectively. Some of the students do a combination of walking, biking and/or taking the bus.

If it were to be examined school wide, the transportation department, as per John Monceaux, would have given it a current score of 3.81, but for the School of Architecture the score would be the same. This area could be further improved based on some of the tier two credits listed below.

OP Credit 16	Employee Commute Modal Split	3	0.69	3
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The School of Architecture's teachers get to school in various ways. Many of the professors commute to grounds via car. Once they are on grounds they have several different options. Some of the professors park in the Culbreth garage and then walk to the School of Architecture. Some of the other professors park by University Hall and then they take the bus to their designated stop and then walk. If employee commute modal split were to be examined school wide, the transportation department, as per John Monceaux, would have given it a current score of 0.69. The School of Architecture has the same modal split as the University,

but after the split employees reach the same rather than different ones. Improvement of the STARS rating for this credit can be examined through improvements of tier two credits listed below.

Tier Two Credit 1	Bicycle Sharing	0.25	0	0.25
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This category does not apply to the School of Architecture because it does not have a bicycle sharing program implemented. There is also no bicycle sharing program at the University of Virginia. John Monceaux stated in his report to us that the University is not yet pursuing any bicycle sharing programs. This program could be pursued at the School of Architecture. (Transportation BMP 1)

Tier Two Credit 2	Facilities for Bicyclists	0.25	0.1	0.25
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The School of Architecture does not have all of the criteria necessary for bicycle facilities. For full points, an institution must have indoor and secure bike storage, shower facilities, and lockers for bicycle commuters. The School of Architecture provides outdoor bike racks in several locations around the building. As indicated by research in our survey, these facilities are not up to par as some bicyclist cannot always find convenient parking and often have to secure their bike to a nearby tree or railing. According to John Monceaux's ratings, the University earns a 0.25. (Transportation BMP 2)

Tier Two Credit 3	Bicycle Plan	0.25	0.25	0.25
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The School of Architecture has a bike plan that is identical to the University as a whole. The University allows for specialized lanes for bicyclists, and they have certain rules and regulations that allow for bicyclist. The bicycle plan for the School of Architecture works and is successful, but as indicated by the survey, that we conducted, the facilities for the bicyclist are not up to par.

Tier Two Credit 4	Mass Transit	0.25	0.25	0.25
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The School of Architecture is a part of the University as a whole, and the University as a whole has an effective mass transit system. The University has a set time schedule for when each buses come, and online at <http://www.virginia.edu/parking/uts/index.html> all of the bus and mass transit information can be found.

Tier Two Credit 5	Condensed Work Week	0.25	0.25	0.25
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The School of Architecture offers classes on alternating days, so an employee is not required to come in to work every day. They have the choice to come in Monday, Wednesday, and Friday or on Tuesday and Thursday. The professors' classes, schedules, and course descriptions can be found on the website for the School of Architecture. The website is <http://www.arch.virginia.edu/> .

Tier Two Credit 6	Telecommuting	0.25	0	0.25
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This category does not apply to the School of Architecture because it does not have its own telecommuting program. If it were to be examined school wide, the transportation department, as per John Monceaux, would have given it a current score of 0.25. There is currently a program for teachers to take a shuttle from U-Hall where they are able to park their cars off Central Grounds. They are then dropped off at various bus stops around grounds. However, this does not benefit employees who work at the School of Architecture because the closest bus stop is at the chapel. (Transportation BMP 3)

Tier Two Credit 7	Carpool Matching	0.25	0.125	0.25
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This category does not apply directly to the School of Architecture, but there are many programs in place at the University for ride sharing. Programs include: Cavpool, Zimride, RideShare, Vanpool, and NuRide. School of Architecture students, staff, and employees have access to these programs, which can be found at <http://www.virginia.edu/parking/TDM/involved/index.html>. According to John Monceaux, the University should receive a score of 0.25 in this category. However, there are other programs, which we can implement among students especially at the School of Architecture. (Transportation BMP 4)

Tier Two Credit 8	Cash-out of Parking	0.25	0	0.25
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This category does not apply to the School of Architecture because it does not offer payment incentives for employees who do not drive to work. According to John Monceaux, from the university wide transportation department, the university is not currently pursuing this.

Tier Two Credit 9	Carpool Discount	0.25	0.25	0.25
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The School of Architecture receives points for this category. There is a Cavpool program which offers a 25% discount for 2 riders, a 40% discount for 3 riders, and a 100% discount for 4 or more riders. Discounts are on parking permits. Carpoolers must register to receive discounts through the program. There are four reserved spaces for Cavpool in the Culbreth Road Garage. Further program information can be found at <http://www.virginia.edu/parking/TMD/CAVPOOL/index.html>.

Tier Two Credit 10	Local Housing	0.25	0	0.25
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This category does not apply to the School of Architecture because it does not have its own local housing. If it were to be examined school wide, the transportation department, as per John Monceaux, would have given it a current score of 0.25.

Tier Two Credit 11	Prohibiting Idling	0.25	0	0.25
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This category does not apply to the School of Architecture and is not being pursued at the University as a whole, as per John Monceaux.

Tier Two Credit 12	Car Sharing	0.25	0	0.25
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This category does not apply to the School of Architecture because it does not have its own cars to share. If it were to be examined school wide, the transportation department, as per John Monceaux, would have given it a current score of 0.25. The University receives this score because of the use of Zipcars, which is basically a car sharing program. The Zipcar use at the University has steadily increased since the year 2009. The cars are being used by roughly 35% of the people who are registered to use them, which is the goal set. The website for this program is <http://www.virginia.edu/parking/TDM/involved/carshare.html>. The School of Architecture receives 0 points for this category because there is nowhere for the people who have Zipcars to park around the School of Architecture. (GMP 5)

Waste				
Credit Number	Credit Title	Points Available	Current Score	Potential Score
OP Credit 17	Waste Reduction	5	5	5

The total weight of trash created with the School of Architecture in 2005 was 95,384 lbs. and was created by 582 people who have a weighted campus user amount of 525.25. In 2010 42,607 lbs. of trash was created by 591 people who have a weighted campus user amount of 537.75. The total amount of waste was reduced in 2010 to less than half of what was created in 2005 while the population of the school remained mostly stable. The amount of waste that was reduced was substantial enough for Campbell Hall to receive all points for this category. If there were no maximum amount of points, then the school would have received 5.6 points.

OP Credit 18	Waste Diversion	3	1.875	3
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This category has a significant area for improvement. Much of what is used is recycled, but still over $\frac{2}{3}$ of the waste generated within the school is trash that is landfilled. When sorting through the trash we discovered that there were materials discarded in the waste bins that could have been recycled, but were not. Through education of what materials can be recycled and better knowledge of where the bins are, the School of Architecture could gain more points with little manpower effort or capital. From the previous category we have seen that the amount of trash generated has vastly decreased and we suggest using the methods and education that were used to create that change and focus on increased recycling.

OP Credit 19	Construction Waste Diversion	0.25	0	0
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Campbell Hall could not be evaluated for this credit because there is no specific construction data simply for the school, it is compiled into statistics that span the whole university.

OP Credit 20	E-Waste Recycling Program	0.25	0.25	0.25
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The School of Architecture participates in the University wide electronic waste recycling program. This program meets the standards outlined in STARS and thus the points are received.

OP Credit 21	Hazardous Waste Management	0.25	0	0.25
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Currently there is no Hazardous Waste Management Program within the School of Architecture. The reason being is that there are almost no materials used within the school that would qualify as hazardous. Those that are, though, such as cleaning supplies, batteries, etc. are sent to the waste and recycling plant on the main campus. If a system could be created that would regulate the disposal and use of these materials then the school would receive credit.

Tier Two Credit 38	Materials Exchange	0.25	0	0.25
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Campbell Hall has not received credit for this requirement as there is no formal system to sharing and reusing materials. While exchange does take place between students, in order to receive the points there must be a written system outlining the process. The woodshop currently has a materials reuse and exchange system that meets these standards.

Tier Two Credit 39	Limiting Printing	0.25	0.25	0.25
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As the School of Architecture charges students for each paper they print out, the school has effectively limited the amount of free printing within the school.

Tier Two Credit 40	Materials Online	0.25	0.25	0.25
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The School of Architecture receives credit for this credit. The staff and students participate in reducing the amount of paper printed by sharing materials and information online. Course syllabuses and calendars are placed on Collab and information is shared school-wide through the use of architecture list-servs.

Tier Two Credit 42	Move-in Waste Reduction	0.25	0	0
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This credit does not apply to the School of Architecture as it is aimed toward the moving in of students to dorm rooms where they will be storing all of their belongings. While students do move in materials to their desks at the beginning of the year, it is not at the same scale as students moving in to their living spaces. An interview with the janitorial staff confirmed that at the beginning of the year the influx of trash was only slightly larger than normal, it was similar to the amount of trash accumulated after a busy week during studio.

Tier Two Credit 43	Move-out Waste Reduction	0.25	0	0.25
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We have identified that though move-in waste reduction does not apply to the School of Architecture, move-out waste reduction does. There is a lot of waste and materials currently that are left behind and discarded. If there was a system implemented to share these materials and reuse them then the school would get the full points for this category.

FUTURE WORK / DISSEMINATION

We have calculated that Campbell Hall would receive 15.85 points in the categories of waste, transportation and grounds. Through the implementation of the changes that we have outlined we conclude that we could gain 6.35 points. This would bring the total to an almost perfect rating minus the categories that we cannot evaluate the school on.

We expect that the results of our research will be disseminated along with the rest of the STARS rating results. However, there are still things the school can do to raise awareness of current (or planned) programs that contribute to STARS and sustainability at the school on an individual basis.

The school's largest strengths in publicizing its commitment to sustainability are its highly visible built elements that are designed explicitly according to sustainable practices, such as the bioretention garden or the south façade. The sustainability of these elements is highlighted in classes that incorporate sustainability into their curriculum, such as the required third year systems class. However, the maintenance required for the upkeep of these elements and other areas of the school is often overlooked, in spite of the just-as-sustainable, low key practices often incorporated into this maintenance. That grounds keepers are able to compost every leaf they collect, or that most of the waste generated from the kitchen in the Fine Arts Cafe is recycled by the staff there is potentially a cause for celebration. The occupants of Campbell Hall benefit immensely from the work that is done by these staff members and they could also benefit from highlighting the fact that the journey of what we throw away and recycle does not end once it leaves our hands and enters the waste receptacle. Therefore we'd like to propose a Staff Appreciation Day for the architecture school, recognizing both staff directly affiliated with the school and staff hired for it by the university, to highlight both their hard work and the sustainability of their maintenance practices. The upkeep and success of all the BMPs suggested in this report would depend on the work done on them 'behind the scenes' every day by staff, and therefore the BMPs would benefit from the attention of more people being educated about the staff's work.

We also suggest making some of the practices that are happening within the school in a small and informal way much more formal and widespread in their implementation. We have noticed that many good sustainable ideas are created by students or within studios and are not continued. The process of carpooling during late nights happens sometimes within studios and between friends but there currently is no process to extend this community wide. Similarly, we see that materials are often thrown away that still have use for some students. There is potential to create permanent practices from the activities already happening that would increase the sustainability of the school and benefit the students and faculty on grounds.

LESSONS LEARNED

The most important lesson to take away from this research, both for us as researchers and for readers, is the “latency” of many of the sustainability measures covered here. Many things that can be done are already being done in a small or underrepresented way, and just as these latent measures can help the school do well on an assessment, so can being included in the assessment help the measures perform better. This is ultimately the purpose of projects like the STARS rating system as a whole- to document and assess, so as to celebrate and improve.

APPENDIX 1: SUMMARY OF INTERVIEW WITH TRAVIS MAWYER AND KEVIN BEAL ON GROUNDS CARE

The information acquired in the interview with Mr. Mawyer and Mr. Beal was enough to determine on a preliminary basis how the university, and by extension the school of architecture, would perform in this category under the STARS rating system.

The university uses Integrated Pest Management in all of its plant maintenance operations, regardless of the maintenance's locations on grounds. For the purposes of STARS, this would mean the entirety of grounds is covered by an integrated pest management plan. Although Facilities Management divides university grounds into six "zones" for the purposes of organizing its landscaping work, and maintains separate staff for each group, they also maintain an IPM health specialist whose responsibilities cross across all zones. All infestations encountered in the course of general maintenance work are reported to him by the supervisors of individual zones. General policies in use that are in line with the principles of IPM include minimum pesticide use as well as the substitution of beneficial "pests" who are natural predators of the organisms identified as undesirable.

The university unfortunately does not have a policy encouraging the use of Virginia native plants in new landscaping projects. Instead, plants are chosen on a project-by-project basis by the project's landscape architects, who may be part of the university's Office of the Architect or hired from outside the university just for that project. Fortunately, because of its concentration of faculty design skills and qualifications, the school of architecture has the potential to strongly influence all future landscape projects in its immediate vicinity, as indeed it already has in the past. As an example, the bio-retention garden on the south side of the building was designed by professor emeritus Warren Byrd, and is entirely populated with native plants. Given the school's research interest in sustainable design practices, all future landscaping projects in the school's vicinity could potentially use native plants, so long as faculty are able to maintain responsibility over the designs.

All yard waste is composted in some way in the course of grounds keeping practices. Leaf collection starts early in the fall and continues throughout, as the university's many large, old deciduous trees are capable of dropping an extraordinary amount of material. Most yard waste is sent to the main compost pile on the back of Observatory Hill, while woody material is sent to a smaller, separate pile on the same site. Grass trimmings are mulched directly into the ground during mowing by lawnmowers with the necessary capability. The university actually produces more compost than it uses, which means that landscapers can use as much as they want for maintaining the health of plants around grounds.

Finally, snow and ice removal practices at UVA can be generally described as sustainable. Barring exceptions for recent years, the school typically does not receive much snow during the winter, so treatments are generally light. The school does not pre-treat the roadways before snow, and after snow roads and sidewalks are cleared of the majority of their snow by snowplows and shovels. For roads and parking lots, a thin spread of sand is applied to the last layer of snow the shovels cannot get. This sand is desirable over road salts because it is not harmful to plants when part of runoff from paved areas. Purely pedestrian areas like Campbell's north terrace do not receive sand, and instead rely solely above-freezing temperatures during the day to melt off the last layer. When ordinary sand does not suffice and melting salts are needed to maintain safe access to buildings, compounds such as potassium chloride and magnesium chloride are used because they melt without leaving residue. The university does not use chemicals that could be described as toxic.

APPENDIX 2: TRANSPORTATION SURVEY RESULTS

The survey that was conducted among the Architecture School community included the following questions and answer choices:

1. How do you get to the A-School when going to class during the day? (You may choose more than one answer)
 - Bike
 - Bus
 - Car
 - Walk
 - Other (please specify)

2. How do you get to the A-School in the evening? (you may choose more than one answer)
 - Bike
 - Bus
 - Car
 - Walk

3. How long does it take you to travel to the A-School on average?
 - 5-10 mins
 - 10-15 mins
 - 15-20 mins
 - 20-25 mins
 - 25-30 mins
 - 30+ mins

4. Where are you typically coming from when you are traveling to the A-School during the day? (you may choose more than one answer)
 - Class (Central Grounds)
 - Downtown
 - Off Grounds Housing (Corner Area)
 - Off Grounds Housing (JPA)
 - Off Grounds Housing (Rugby Area)
 - On Grounds Housing (Hereford)
 - On Grounds Housing (New Dorms)
 - On Grounds Housing (Old Dorms)
 - On Grounds Housing (Upper Classman)
 - Work
 - Other (please specify)

5. Where are you typically coming from when you are traveling to the A-School in the evening? (you may choose more than one answer)

- Class (Central Grounds)
- Downtown
- Off Grounds Housing (Corner Area)
- Off Grounds Housing (JPA)
- Off Grounds Housing (Rugby Area)
- On Grounds Housing (Hereford)
- On Grounds Housing (New Dorms)
- On Grounds Housing (Old Dorms)
- On Grounds Housing (Upper Classman)
- Work
- Other (please specify)

6. If there was a bus stop outside the A-School perhaps by the art museum or by the parking garage, would you ride the bus? (You may choose more than one answer)

- Yes, for the U-Loop
- Yes, for the North Line
- Yes, for the Central Grounds Shuttle
- No

7. If you ride your bike to the A-School, what are your thoughts on bike parking? (you may choose more than one answer choice)

- There is plenty of parking and I never park my bike outside of a bike rack
- There is plenty of parking, but I wish that the bike racks are located in a more convenient place
- There is sometimes enough parking, but I often have to park my bike on a nearby lamp post, railing, etc.
- There is never enough parking

8. If you drive to the A-School, what time do you usually arrive? (You may choose more than one)

- 7:00-9:00 AM
- 9:00-11:00 AM
- 11:00-1:00 PM
- 1:00-3:00 PM
- 3:00-5:00 PM
- 5:00-7:00 PM
- 7:00-9:00 PM
- 9:00-11:00 PM
- 11:00 PM-1:00 AM
- Other (please specify)

9. If you drive to the A-School, what time do you usually leave? (You may choose more than one)

7:00-9:00 AM

9:00-11:00 AM

11:00-1:00 PM

1:00-3:00 PM

3:00-5:00 PM

5:00-7:00 PM

7:00-9:00 PM

9:00-11:00 PM

11:00 PM-1:00 AM

Other (please specify)

10. What are your carpooling practices like? (You may choose more than one answer)

I carpool to the A-School during the day

I carpool from the A-School during the day

I carpool to the A-School at night

I carpool home from the A-School at night

I take Safe Ride to the A-School at night

I take Safe Ride home from the A-School at night

I do not carpool ever

Based on Questions 1 and 2, we learned that the majority of people walk to the A-School during the day (85 percent) and at nighttime (75.5 percent). During the day, 20 percent of people bike, 16 percent of people take the bus, and 8 percent of people drive. At night, 16 percent of people bike, 12.8 percent of people take the bus, and 29.8 percent of people drive. It seems like the big difference is that people drive more at night and bike more during the day.

Based on Question 3, the average amount of time it takes for people to travel to the A-School is 5 to 15 minutes. 42 percent of people answered that it takes them 5 to 10 minutes and 41 percent of people answered that it takes them 10 to 15 minutes to travel to the A-School.

The results from questions 4 and 5 are not completely significant and are spread out among all locations. However, the most common location from which people travel to the A-School during the day is Class (Central Grounds) and Off Grounds Housing (Corner Area). In the evening, the most common location from which people travel is Off Grounds Housing (Corner Area) and Off Grounds Housing (Rugby Area). The results of this question may be influenced by the types of people who took the survey and may not have provided us with the most accurate representation of the A-School community as a whole.

The majority of people who took the survey answered that they would not want a bus stop outside of the A-School. 46 percent answered no, but 32 percent answered yes, for the U-Loop. The results of this question may also have been influenced by the types of people who took the survey in terms of where the people live and how old they are (undergrad, graduate, or faculty).

The results of Question 7 are spread out quite evenly among three answers: 29.3 percent saying that there is plenty of parking and they never park their bike outside of a bike rack; 34.1 percent saying that there is plenty of parking, but they wish that the bike racks were located in a more convenient place; and 36.6 percent saying that there is sometimes enough parking, but often they have to park their bike on a nearby lamp post, railing, etc. Based on these results it may be important to look into the location of bike racks around the A-School in order to convenience bicycle riders and hopefully encourage biking practices to and from the A-School to increase.

Based on Question 8, the majority of people arrive at the A-School between 7:00 and 9:00 PM if they are driving, but only 34 percent of the people who took the survey answered this question. This question may have been influenced by the people who took the survey because the second most picked option for this question was between 9:00 and 11:00 AM (26.5 percent).

Based on Question 9, the majority of people who drive to the A-School leave between 11:00 PM and 1:00 AM. This question many responses about even later than the last time listed or just "late".

Question 10 showed that 60.3 percent of people who answered the question never carpool. We think that it is important to consider the results of this question. It would be much more sustainable to implement a better carpooling program throughout the School of Architecture.

We have contacted Mr. Monceaux and he has shared some vital information with us. Of the information that he has shared we have determined that the Zipcar usage is not as prominent we would like it to be. That usage however has grown from the 2009-2010 school year to the 2010-2011 school year. Over the last year the goal of having 35% usage from its members has met its goal 6 months out of the year, with its busiest months being clustered around the time of the holidays and breaks; November 2010- 41.78% usage , December 2010- 36.30 % usage, January 2011- 41.67% usage, February 201- 41.28% usage, April 39.54% usage and August 35.23% usage.

APPENDIX 3: WASTE SURVEY RESULTS

Upon contacting the Department of Waste and Recycling at UVA to obtain the total weight of waste and recycling accumulated by the university in 2010 and 2005 we discovered that they do not keep individual records for each school. Thus, as the information was much broader than we needed, we were not able to obtain the necessary information and data to fully assess the School of Architecture on the STARS rating. Because the classification system calls for the most current years total weight of waste and recycled products as well as that same information for the 2005 school year we could not complete the algorithm to assess the waste reduction and diversion of the school currently.

The method that we devised to gather the information was to weigh the trash and recycling barrels within the school at several set points during the day for a time period of at least two weeks. From there we would be able to make a more accurate average of the weight per day and apply that to a school year. The information gathered thus far has led to the raw data of the weight of waste per floor and per day. The weight of trash and recycling was measured each day at 10:30 am and at 6:30 pm and was done on the third floor which houses the second, third and fourth year studios as well as faculty offices and classroom spaces.

We have gotten a rough average of the raw weight on both studio days (Monday, Wednesday and Friday) as well as the days that do not have a studio section (Tuesday, Thursday, Saturday and Sunday). The results below show the average of 5 days of data collection.

	Mixed Paper	White Paper	Plastic/Glass	Trash
Studio Days 10:30	13.2 lbs.	2.6 lbs.	30 lbs.	10.6 lbs.
Studio 6:30	22.7 lbs.	2.9 lbs.	48.6 lbs.	26.4 lbs.
Total Gain	9.5 lbs.	0.3 lbs.	18.6 lbs.	15.8 lbs.
"Off" Days 10:30	18.6 lbs.	2.1 lbs.	28 lbs.	9 lbs.
"Off" Days 6:30	22.3 lbs.	2.1 lbs.	34 lbs.	16.7 lbs.
Total Gain	3.7 lbs.	0.0 lbs.	6 lbs.	7.7 lbs.
Weekly average	46.3	1.2	81.6	78.6
<i>Weekly Total</i>	207.7 lbs.			

When the days evaluated it is evident that studio days produce almost 3 times as much waste as days when the "off" days. The amount of waste disposed of in an eight hour time period for one floor is vast. The two categories where it is most evident are in the plastic and glass recycling and in the trash that cannot be recycled. This measurement did not account for the personal trash bins within the offices on the third floor.

The trash is usually taken out in the evenings after studio or the mornings just before it. This allows for a regularized schedule to weigh the bins. It was initially intended to weigh the trash that was disposed of in the Fine Arts Cafe but the schedule for removing that waste is on a need based schedule and it is difficult to plan when that will be to obtain meaningful measurements. The second and first floors produce less trash

than the studio based upper floors, but as the second floor is mainly offices it is difficult to measure the waste produced without interfering with the work being done there.

The algorithm within STARS calls for the information to be divided by the amount of weighted campus users. The categories for campus users are as follows: On-campus residents, Non-residential full time students and employees, and Non-residential part time students and employees. Because the rating system was designed for entire universities, including students who live in dorms, the categories have different implications within a more intimate community and an isolated building study. We treated Campbell hall as if it were a university within itself and thus applied the categorization of on-campus residents to all students second year through graduate school. We came to this based upon the fact that at a minimum 14 hours a week are spent within the building during which meals are eaten and disposed of and much trash and recycling is generated through the act of making. We rated first year students as non-residential part time because the amount of time spent within Campbell Hall is mostly restricted to simply 2-3 classes a week and not a lot of opportunity is available to generate waste (e.g. no studio section). Faculty members were categorized as Non-residential full time employees.

There are currently 356 students in the undergraduate school, of which 85 are first years. There are 188 graduate students and 47 faculty members. This total brings the amount of weighted campus users to 537.75 $[(459 \times 1) + (47 \times .75) + (85 \times .5)]$. With this number we can divide the amount of waste we have estimated would be produced throughout the year at the school. In 2005 there were 354 undergraduate students, of which 81 were first years. There were 163 graduate students and 65 faculty members. The weighted campus users for 2005 was 525.25 $[(436 \times 1) + (65 \times .75) + (81 \times .5)]$. Because we have no waste information from the year 2005 we cannot complete the algorithm to evaluate how many points we would receive. We can encourage others to keep up the measuring and data process so that in years to come we could compare results.

We do have to results for the university as a whole which does help us evaluate the architecture school's current standing within the university. In 2005 UVA produced 13,603.15 tons of waste that was discarded and recovered 5,642.79 tons that was recycled for a diversion rate of 41.48%. In the 2010 calendar year 21,234.06 tons of waste was discarded and 14,109.57 was recovered for a diversion rate of 66.45%.

- **2005 Population**

- On-campus students = 6,708
- Non-residential full-time students = 13,691
- Weighted Campus Students = 16,976.25

- **2010 Population**

- On-campus students = 6,889
- Non-residential full-time students = 14,160
- Weighted campus users = 17,509

- **Calculation of Points Earned**

- $10 \times \{[(16,603.15 / 16.976.25) - (21,234.06 / 17,509)] / (16,603.15 / 16.976.25)\}$
- $10 \times \{[.978 - 1.213] / .978\}$

In the current STARS rating the university as a whole would not receive any points in the waste reduction category as waste has continually increased.

- **Waste Diversion Algorithm**

- $3 \times (\text{waste recycled}) \div (\text{wasted generated}) = \text{points received}$
- $3 \times (14,109.57) \div (21,234.06) =$

The university would receive 1.99 points for waste diversion. There are three total points for this category so the university is doing well here, whereas the waste reduction category has a possibility of five points and we have received none.

The architecture school does participate in the university wide electronic recycling program and it also purchases or leases Energy Star-rated appliances and equipment for all classifications for which an Energy Star designation is available. The electronic waste is handled by the Facilities Management Division who collect it and transport it to AERC Recycling of Richmond, which abides by the E-Stewards' e-waste recycling guidelines, currently the highest standard in the industry.

Printing is both limited in student use as well as classroom and faculty use. Most professors use Collab or some other online resource sharing method which reduces the amount of paper that needs to be distributed to students. All printing done within the school is charged to student accounts so no print is free. While the architecture school would receive points for both categories of materials online and limiting printing, we did observe that printing is charged for the amount of ink used, not the amount of paper that was used. In the roll-fed plotters there is a lot of paper wasted due to inefficient plot layouts. We propose informing all students on how to best use the printers to reduce the amount of paper waste that is generated from the prints.