**Data Collection Methods for Categories of Emissions, Choice of Calculator, Data Requirements, and Objectives
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This manual describes the methods used in collecting and entering the data required by the Campus Carbon Calculator™ (CCC), Version 9.0, created and sponsored by the Sustainability Institute at the University of New Hampshire, for the Austin College FY 2016 (July 1, 2015 – June 30, 2016) greenhouse gas emissions inventory. The format, organization, and some of the content of this report (such as directly financed outsourced travel and a couple of other categories that are announced within this document) are based on the report submitted in FY 2012. Revisions and additions have been made in all possible and necessary areas.

The Calculator, originally developed by and named after a non-profit called Clean Air - Cool Planet, is endorsed by Second Nature, and facilitates comparison with other campuses that have used it. The benefits of the CCC calculator include the ability of the user to enter categories of emissions in their original measurement units. For example, purchased electricity is entered in kWh, while natural gas is entered in MMBtu, etc. The calculator then converts these measures and others into their respective Global Warming Potentials (MT-eCO2), measurements of the extent to which a particular greenhouse gas (CO2, CH4, etc.) contributes to anthropogenic climate change.

 Once calculations are complete, the CCC calculator enables users to view all emissions by source as equivalent to CO2, CH4, or N2O in kg or MMBtu. Users may also choose to view all categories of emissions in metric tons of CO2 equivalent (MT-eCO2). This is so that all emissions can be totaled and viewed as a single total amount instead of in measures of different greenhouse gases, each of which has a different global warming potential. The CCC calculator requires minimal input and no manual conversions; data are simply entered into a series of “Input” worksheets, and the calculator makes all the necessary conversions and calculations. Although no manual conversions are required, we have made a few of our own minor adjustments to a few of the calculator’s coefficients; these modifications are listed and explained and the end of this report. Note that greenhouse gas inventories are not comprehensive; while they account for the major categories of the College’s emissions, it would be nearly impossible to track down each and every last emission in a given period of time.

 Though the calculator’s interface looks complex, its required data inputs are simple given Austin College’s infrastructure and small campus. A table at the end of this document shows the data that were entered into the calculator as well the staff member(s) who supplied the data. Some calculator inputs required more advanced procedures other than correspondence with a staff member(s). These procedures are explained below.

*Institutional Data*

*Table 1: Enrolled Student Data*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fiscal Year** | **Full-TimeStudents** | **Part-Time Students** | **Residential Students** | **Summer School Students** |
| **FY 2011** | 1,306 | 8 | N/A | 100 |
| **FY 2012** | **1,338** | **15** | **1,030** | **106** |
| **FY 2013** | 1,253 | 7 | N/A | 58 |
| **FY 2014** | 1,222 | 2 | 947 | 69 |
| **FY 2016** | **1226** | **10** | **990** | **55** |

 With the exception of residential student information, the data in Table 1 were provided via the submission of a Data Request Form on the Registrar’s Office webpage. Gail Gentry of Institutional Research supplied the information via e-mail upon receipt of the Data Request Form. Michael Deen, Dean of Students, provided residential student information. Data for each of these categories was provided for both the Spring and Fall semester of the school year; an average figure for the two semesters was calculated and used for reporting purposes.

*Table 2: Faculty & Staff Data*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fiscal Year** | **Full-Time Faculty** | **Part-Time Faculty** | **Full-Time Staff** | **Part-Time Staff** |
| **FY 2011** | 106 | 18 | 182 | 4 |
| **FY 2012** | **107** | **22** | **178** | **8** |
| **FY 2014** | **105** | **21** | **195** | **15** |
| **FY 2016** | **103** | **23** | **196** | **10** |

The Human Resources Office provided all information regarding faculty and staff; Melanie Oelfke supplied the data above via e-mail. The numbers entered into the calculator are Full-Time equivalent figures which were calculated like so: # Full time staff/faculty + ½ # Part time staff/faculty.

*Table 3: Budget and Square Footage Data*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fiscal Year** | **Operating Budget (Total Expenditures)** | **Energy Budget (Including Water)** | **Energy Budget (Excluding Water)** | **Physical Size of Campus Buildings** | **Physical Size of Research Space** |
| **FY 2011** | $40,037,560 | $1,889,254 | $1,643,189 | 803,474 Square Feet | 21,000 Square Feet |
| **FY 2012** | **$39,966,810** | **$1,839,630** | **$1,529,047** | **803,474 Square Feet** | **21,000 Square Feet** |
| **FY 2014** | **$42,138,102** | **$2,182,751** | **$2,525,469** | **974,054 Square Feet**  | **29,925 Square Feet** |
| **FY 2016** | **$46,645,004** | **$2,552,112** | **$2,141,394** | **974,054 Square Feet** | **29,925 Square Feet** |

David Turk, Director of Facilities, maintains a master spreadsheet of the physical size of all campus facilities. **The previous science building, named Moody Science, was closed to student, staff, or faculty use after the spring semester of FY 2013; there is now only one room (the NMR lab) which is still being used for research purposes, and it has been accounted for in the total square feet of research space.**

 *Table 4: Endowment Size*

|  |  |
| --- | --- |
| **Fiscal Year** | **Austin College Endowment (Value at June 30 – FY End Date)** |
| **FY 2012** | **$119,456,571** |
| **FY 2013** | $124,800,382 |
| **FY 2014** | **$135,768,645** |
| **FY 2016** | **$125,619,987** |

Ellen Miles, Controller in the Business Office, provided all budget information via e-mail. Water expenditures are frequently included in energy budget reporting, however, the CCC calculator specifically requests that water expenditures not be included in energy budget reporting. Thus, Ellen Miles also included the value of the College’s water expenditures for FY 2016 so that they could be deducted from the energy budget for reporting purposes. The FY 2016 Energy Budget, excluding water, was **$2,141,394** while the total operating budget was **$46,645,004.00**. Danita Harston, Investment and Loan Accountant of the Business Office, provided all endowment information via e-mail.

*Gasoline Fleet*

 This section includes gasoline consumed by Physical Plant vehicles, Campus Police vehicles, Biology Dept. vans, and other College-owned vehicles. Methods of data collection for these vehicles were as follows:

* The College has a gasoline pump located at the Physical Plant that is used by College-owned vehicles operated by Physical Plant staff, Vice President Heidi Ellis, and the Athletics Dept. (they operate a “Gator” during outdoor athletics events). Physical Plant Office Manager, Linda Welch provided the Physical Plant’s FY 2016 purchased fuel log (gallons of unleaded and diesel fuel).

*Table 5a: Gallons of Gasoline*

|  |  |  |
| --- | --- | --- |
| **Fiscal Year** | **Gallons of Regular Gasoline** | **Gallons of Diesel** |
| **FY 2014** | ​**3,245.1**  | **980.4** |
| **FY 2016** | **2,871.90** | **799.80** |

* Via e-mail, James Perry, Chief of AC Police Department, supplied the FY 2016 Purchased Fuel Log of the campus PD vehicles. Typically, this information would be provided by the Capmus PD Coordinator, but the position was temporarily empty during the months that this report was assembled.

*Table 5b: Gallons of Gasoline for Campus PD*

|  |  |
| --- | --- |
| **Fiscal Year** | **Gallons of Regular Gasoline** |
| **FY 2012** | 248.081 |
| **FY 2013** | 67.754 |
| **FY 2014** | 61.823 |
| **FY 2016** | **156.43** |

* Biology Dept. Support Associate, Caleb Smith, provided copies of the mileage logs from each of the two passenger vans (get year/make/model). From these notes, the total miles driven on each vehicles was calculated and converted to gallons of gasoline using a 15 mpg average. In total, roughly **374.17 gallons** of gas were purchased.
* The Human Resources Office supplied the mileage data for the College-owned vehicles (primarily those operated by Institutional Enrollment and Institutional Advancement personnel). Since these miles are recorded on a calendar year-basis (Dec. 1 – Nov. 30), as opposed to a fiscal year, data for calendar years 2015 and 2016 were averaged, since both calendar years made up nearly equal parts of FY 2016:
	+ Dec. 1, 2014 – Nov. 30, 2015
		- Total: ​247,457 Miles
		- Business: 161,744
	+ Dec. 1, 2015 – Nov. 30, 2016
		- Total: 204,457 Miles
		- Business: 145,499
	+ Averages Used for FY 2014 Reporting
		- Total: 225,876 Miles
		- **Business: 153,622**

In order to calculate total gallons of regular gasoline consumed by other College-owned vehicles, the average FY 2016 business miles value (153,622 miles) was divided by the average MPG of staff vehicles (29 MPG), which is the average MPG of the Chrylser 200s that are driven by the staff. This yielded an estimated value of gallons of regular gasoline consumed (**5,297 gallons**).

 *Refrigerants, Chemicals, and Fertilizer*

 Jade Rutledge (2009) determined that these emissions sources were *de minimus*, or insignificant to the campus’s total emissions; these sources accounted for 1% or less of the College’s total emissions during FY 2008. Second Nature does not require that such minimal categories be tallied for each consecutive inventory. However, since the data for
FY 2016 were readily available, new data were incorporated into this report, which proved to be beneficial. Emissions from refrigerants and chemicals we found to account for more than 1% of the College’s total emissions for FY 2010, FY 2012, and FY 2014.

*Table 6: Chemicals and Refrigerants*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fiscal Year** | **HFC-134a (lbs.)** | **HFC-404a (lbs.)** | **HCFC-22 (lbs.)** | **HFC-410a (lbs.)** | **Other** |
| FY 2011 | 12 lbs., 2 Oz. | N/A | 120 lbs., 15 Oz. | N/A | N/A |
| FY 2012 | 15 lbs., 7 Oz. | 25 lbs., 14 Oz. | 155 lbs., 13 Oz. | 25 lbs., 14 Oz. | 11 lbs., 2 Oz. |
| FY 2012 | 15.40 lbs. | 25.88 lbs. | 155.82 lbs. | 25.88 lbs. | 11.15 lbs. |
| FY 2013 | 9 lbs., 9 Oz. | 28 lbs., 9 Oz. | 128 lbs., 13 Oz. | 28 lbs., 9 Oz. | 14 lbs., 3 Oz. |
| FY 2014 | 41 lbs.  | 60 lbs. | 120 lbs.  | 0 | 0 |
| **FY 2016** | **5 lbs** | **25 lbs** | **120 lbs** | **35 lbs** | **0** |

According to data submitted by John Jennings, the Physical Plant used **5,500 lbs. of fertilizer at 14.3% nitrogen** in FY 2016.

*Purchased Electricity, Purchased Natural Gas, and Custom Fuel Mix*

* Total purchased electricity (all 14 campus meters) was obtained via Executive Director of Facilities, John Jennings**: 14,262,113** **kWh**. However, this figure does not include the electricity that is used by the college-owned Villages (student housing). The exact amount of energy used by these facilities could not be determined since each unit receives an individual electricity bill that is paid by the student occupants. Instead, the electricity used was estimated based on square footage and the average kWh/square foot usage that is provided by the EPA (14.9 kWh/sq. ft., per year). Anthony Amato from the Eastern Research Group (contractor to the EPA’s Green Power Partnership), supplied this conversion factor via email conversation with Peter Schulze. Since the total square footage of the Villages is 36,100 square feet, it has been estimated that they used, in total, 537,890 kWh during FY 2016. This addition brings the total electricity consumed during FY 2016 to **14,800,003 kWh**.
* The college also owns and operates a small building at the Sneed Prairie Research Center, but the electricity used by this facility is assumed to be completely offset by the electricity that it generates by use of solar panels. Based on a history report given by Grayson Collin Electric Cooperative, we can see that there is surely more electricity generated than used. Between July 1, 2015 and June 30, 2016, only the following three months show record of any electricity consumption: January (5 kWh), February (20 kWh), and June (4 kWh). During the other months, the solar panels are converting and adding energy into the local grid source. Because the building is in a rural electric district, the utility records cannot show what would be a negative consumption for these 8-10 months when energy production is exceeding consumption. With confidence, we assume that, over the course of one year, the solar panels converted and added to the electric grid more equivalent kWh than were used during the 3-4 months exemplified above. The net electricity used by the facility is equal to 0 kWh, at most.
* Total natural gas consumption was also obtained via David Turk: **55,307 mmBTU.**
* Custom fuel mix considers the sources of a campus’s purchased electricity. As per the College’s contract with its electricity provider, 15% of the College’s purchased electricity is generated by renewable sources. This is accounted for in the Green Power Certificates entry, as the College purchases REC’s in addition to the 15% of purchased electricity in the contractual agreement. In order to report this accurately, 15% of total purchased electricity kWh was calculated (**2,227,067 kWh**) and added to the additional purchased REC’s (**10,384,000 kWh)**; this sum was rounded to the nearest thousand, as REC’s are measured by megawatts rather than by kilowatts: **(12,611,067 kWh)** of Green Power Certificates. In all, **85.0%** (15% from the electricity contract and 70% from separately purchased RECs) of the College’s purchased electricity was offset with a combination of REC’s from the contractual agreement and the additional purchased REC’s (see *Offsets and Renewable Energy Credits* section below). Thus, renewable sources were not entered on the custom fuel mix input page (in order to avoid double-counting). The custom fuel mix for FY 2014 was reported as follows.

*Table 7: Custom Fuel Mix*

|  |  |
| --- | --- |
| **FY 2014 Purchased Electricity Generation Source** | **% of Total** |
| Coal | **​​38%** |
| Natural Gas | **​45%** |
| Nuclear | **​13%** |
| “Other” | **4%** |

Entering a custom fuel mix is optional. Should an analyst choose to enter a custom fuel mix, their NERC region within the calculator must be selected; Texas’s eGRID sub region is called **“ERCT.”** A box on the eGrid Region Page can be selected in order to turn the fuel mix on or off. A Custom fuel mix was entered into the FY 2014 Calculator, and is being “used”.

*Commuting*

The CCC calculator requires data regarding the commuting habits of students, faculty, and staff. These data are used to compute emissions (MT-eCO2)due to commuting. In order to collect this data, a survey was designed on Surveymonkey.com and sent via email to all faculty, staff, and students that live off campus. Since Austin College students are required to live on campus for three years, we sent the survey specifically only to those who live off campus and must commute. Cyndi Gilliam in the Student Life office provided a list of these students. Respondents were asked several simple questions about their commuting habits. The questions were as follows:

1. What is your one-way commute distance to campus in miles?
2. How many weeks of the year do you commute to campus?
3. In a typical week, how many emission free trips to you make? (e.g. bike, walk)
4. How many times do you drive alone?
5. How many times to you carpool?
6. What is the make/model/year of your vehicle?

In the future, question three should be re-worded in a way that does not allow for emission-free vehicles to be counted in both the “drive alone” section as well as the “emission free” and perhaps even the “carpool” category. Question five should also be clarified so that responders understand ‘carpooling’ to mean that they are the passenger in someone else’s vehicle, as opposed to driving others in their own vehicle. Perhaps a follow-up question is needed to verify how many passengers are in the carpooling vehicle, so there is no double counting of carpoolers.

 When the survey was last administered in 2012, a separate procedure was completed to calculate the MPG of each surveyed vehicle to come up with an overall average. Since the average MPG calculated in 2012 differed from that provided by the CC Calculator by less than 2.0 miles, we did not take the time to complete this extra analysis again. Instead, we used the average MPG provided by the calculator.

Based on information provided by respondents, the following statistics were entered into the CCC calculator’s commuting worksheet for students, faculty, and staff, respectively: average trips per week, average weeks per year, and average miles per trip (varies based on mode), percent of people that used a personal vehicle to travel to campus, percent of people that carpooled, percentage of people that walked/biked to campus,.

* **Students**
	+ Students who received survey/live off campus: **272**
	+ Students who responded: **101 only 96 valid answer sets**
	+ Avg. trips per week: **9.69**
	+ Avg. weeks per year: **35.42**
	+ Avg. miles per trip (walking): **1.23**
	+ Avg. miles per trip (driving/carpooling): **5.93**
	+ Percentage who drive alone: **55.72%**
	+ Percentage who carpool: **15.78%**
	+ Percentage who bike/walk: **28.48%**
* **Faculty**
	+ Total number of faculty: **115 Full-time equivalent**
	+ Faculty that responded: **42**
	+ Avg. trips per week: **5.16**
	+ Avg. weeks per year: **42.26**
	+ Avg. miles per trip (walking): **1.31**
	+ Avg. miles per trip (driving/carpooling): **17.98**
	+ Percentage who drive alone: **76.03%**
	+ Percentage who carpool: **12.90%**
	+ Percentage who bike/walk: **11.06%**
* **Staff**
	+ Total number of staff: **201 Full-time equivalent**
	+ Staff that responded: **78**
	+ Avg. trips per week: **5.06**
	+ Avg. weeks per year: **49.62**
	+ Avg. miles per trip (walking): **1.11**
	+ Avg. miles per trip (driving alone): **17.17**
	+ Avg. miles per trip (carpooling: **19.32**
	+ Percentage who drive alone: **86.0%**
	+ Percentage who carpool: **6.0%**
	+ Percentage who bike/walk: **8.0%**

The following is a summary of survey responses including full-time and part-time students, faculty, and staff:

* Students: 101 Responses/272 Total = 37.1% of Students Responded
* Faculty: 42 Responses/115 Total = 36.5% of Faculty Responded
* Staff: 78 Responses/201 Staff = 38.8% of Staff Responded

 *Directly Financed Outsourced Travel*

* According to VP of Business Affairs Heidi Ellis, faculty/staff air travel data are difficult to tally from College records; a new tracking system is necessary. Ellis suggested that all VP’s be given a form that allows them to easily record air travel information (dates, destination(s), airports used, etc.) for faculty/staff within their respective departments. Ellis suggested that the completion of such a form be mandated by President Hass. In the meantime, the value of faculty/staff air miles reported for FY 2010, which was also largely based on estimation, was used (see Katie Masucci (2011) for methods): **907,457 miles** **(Value A).**
* Julie Travis, Athletics Office Coordinator, provided student and staff air miles accrued through athletics events. Directly financed student air miles consist only of flights taken by athletic teams. Flights were assumed to have departed from DFW Airport; based on the destination of each flight, the number of miles traveled in a round-trip was calculated and then multiplied by the number of staff/student travelers. The FY 2014 value for athletics air travel is **396,732** miles. **16,192 (value B)** were attributed to athletics staff travel and **380,540 miles** to students’ travel.

* Based on the data above, total faculty/staff directly financed outsourced travel is equal to the sum of Values A and B: **923,649.**

*Bus Travel*

 Although this emissions source was determined to be *de minimus* by Jade Rutledge (2009), and the FY 2008 bus travel data were used for the FY 2010 and FY 2012 inventories, the figure was recalculated for the FY 2014 inventory. Buses were used by athletic teams to travel to and from events. Julie Travis provided a list of destinations so that the total miles could be calculated. In total, there were **33,200 miles** traveled by bus.

*Personal Mileage Reimbursement*

Likewise, Jade Rutledge (2009) determined that this emissions source was *de minimus*, or largely insignificant in terms of the campus’s total emissions. According to VP of Business Affairs Heidi Ellis, these data are not easy to pull and/or tally from College records; a new tracking system is necessary.Data on reimbursement for work-related travel in personal vehicles were not readily available for the FY 2014 inventory; thus data from FY 2010 were used: **97,694 miles**. Should future analysts pursue up-to-date data, they’ll need to consider two values: 1) when employees are reimbursed for miles and 2) when employees are reimbursed for fuel purchases. Somehow, these two values – a value of miles and a value of dollars or gallons, respectively – will have to be summed.

*Study Abroad Air Travel*

* Amy Parsons of the Center for Global Learning provided lists of students who studied abroad and their respective destinations for FY 2016 (Summer 2015, Fall 2015, Spring 2016, and Summer 2016). The website www.airmilescalculator.com was used to calculate mileage from DFW International Airport to each student’s destination. If only a destination nation was provided, the nation’s capital city was assumed as the student’s destination. For Summer Study Abroad programs, mileage is calculated for one-way trips only (unless otherwise noted), as only the departure or return flight typically falls within a given fiscal year.
* Amy Parsons also provided a list of Janterm classes for 2016. This list included the number of faculty/students enrolled and their flight destinations. From the spreadsheet, round-trip miles to the destination city/cities were multiplied by the number of travelers (students + faculty + alumni) who participated in each trip. Faculty travelled a total of 148,236 miles, and students 1,730,343 miles, which comes to a grand total of **1,878,579 miles.**
* Similarly, January Term 2016 Career Study Off Campus and “Other” FY 2016 CSOC course miles were added. A separate spreadsheet was obtained from Viki Reeder, Assistant Director of Career Services & Internship Coordinator, which listed the dates and destinations of students who participated in CSOC courses. In this category there were 73,273 air miles (and 484 vehicle miles which were counted in the \_\_\_\_\_\_\_\_\_\_\_ section of the calculator)
* Finally, Viki Reeder, Assistant Director of Career Services and Internship Coordinator, provided a spreadsheet of travel information concerning FY 2016 GO (Global Outreach) Fellows. The recorded information did not always include destination airports or cities, so the capital city of each given country was used as a general destination to calculate air travel miles. For some GO Fellow trips, both the departure and return trip fell within FY 2016, but for others only the departure or return trip was counted. (Leave GO Miles in SA section or moved to directly financed??)

Below is a summary table of all Study Abroad miles traveled.

|  |  |
| --- | --- |
| **Program** | **Miles Traveled** |
| Summer 2015 Study Abroad | 4509 |
| Fall 2015 Study Abroad | 190,070 |
| Spring 2016 Study Abroad | 100,154 |
| Summer 2016 Study Abroad | 0 |
| January Term 2014 Travel Courses | 1,878,579 |
| January Term or other 2016 CSOC | 73,273 |
| GO Fellows FY 2016 |  |
| **Total Study Abroad Miles for FY 2012** |  |

*Solid Waste*

The solid waste calculations included assumptions made when estimating weight. Trash quantities were calculated from averages, since there are no meters on the equipment to measure the actual tons of waste. Thus, an average weight of 90 lbs. per cubic yard of un-compacted solid waste and 300 lbs. of solid waste per cubic yard of compacted waste was used to calculate trash based on the size of our receptacles and the frequency of pickup (CURC Campus Refuse Profile, 1997: http://recyclemaniacs.org/sites/default/files/documents/Volume-weight-conversions.pdf); note that this is the same source from which Jade Rutledge (2009) pulled a conversion factor from volume to weight of solid waste.

The fullness of the receptacles is not known in detail; calculations are based on information provided by Linda Welch (is her position already mentioned elsewhere?), who reports that receptacles are full 95% of the time. A sensitivity test was performed to determine the extent that the results differ depending on the fullness of the receptacles. The 100% full figure was used in the final calculations: a conservative overestimate considering Welch’s statement.

|  |  |  |  |
| --- | --- | --- | --- |
| **Containers of Landfill-Bound Waste** | **Container Size (Cubic Yards)** | **Pick-Up Frequency (# / Week)**  | **Estimated Pick-Ups / Year** |
| Flats - 916 E. Brockett | 8 | 3 | 156 |
| Bryan Apts. - 1114 E. Brockett | 6 | 3 | 156 |
| Physical Plant - 603 N. Porter | 30 | 1\* | 52 |
| Physical Plant - 603 N. Porter \*Compactor\* | 30 | 1\* | 52 |
| WCC - 1301 E. Brockett | 4 | 6 | 312 |
| WCC - 1301 E. Brockett | 4 | 6 | 312 |
|  |  |  |  |
| **Containers of Landfill-Bound Waste** | **Cubic Yards / Year** | **Conversion Factors\*** | **Tons / Year** |
| Flats - 916 E. Brockett | 1248 | Uncompacted: 90 Lbs. / CY | 56.16 |
| Bryan Apts. - 1114 E. Brockett | 936 | Uncompacted: 90 Lbs. / CY | 42.12 |
| Physical Plant - 603 N. Porter | 1560 | Uncompacted: 90 Lbs. / CY | 70.20 |
| Physical Plant - 603 N. Porter \*Compactor\* | 1560 | Compacted: 300 Lbs. / CY | 234.00 |
| WCC - 1301 E. Brockett | 1248 | Uncompacted: 90 Lbs. / CY | 56.16 |
| WCC - 1301 E. Brockett | 1248 | Uncompacted: 90 Lbs. / CY | 56.16 |
|  |  |  |  |
| **Notes** |  | **Total Estimated Tons MSW / Year** | **514.80** |
| **1\*** - Pick-Ups occur "on-call," however, |  | **100 % Full** |  |
| Linda Welch estimated that pick-ups |  | **Total Estimated Tons MSW / Year** | 463.32 |
| actually occur once per week. |  | **90 % Full** |   |
| **Conversion Factors\*** - These are found in |  | **Total Estimated Tons MSW / Year** | 411.84 |
| CURC's Campus Refuse Profile, 1997. |  | **80 % Full** |   |

As noted by Jade Rutledge (2009), the methane gas (CH4) associated with landfilled waste from Austin College (and other landfill users) is not recovered at the landfill site. Thus, the measure of landfilled solid waste is entered into the calculator under the column titled, “No CH4 recovery.”

*Wastewater*

 David Turk supplied the figures for amount of water use. Note that these figures differ drastically in comparison with the FY 2012 data; likely, there was a mistake in the recording of FY 2012 data. In FY 2016, the College purchased **32,727,547 gallons** for domestic use as well as **12,448,760 gallons** for irrigation use. The number of gallons used for domestic use is significantly higher than the figure reported in the FY 2014 report (insert figure), because there were leaks in the college’s water system in 2016, which led to excess water used. Since the latter is used on grounds and, evaporates, and does not enter the wastewater treatment system, it was not counted as “wastewater” for reporting purposes; only water purchased for domestic use, which ultimately goes to the city treatment facility, was counted as “wastewater” for reporting purposes.

*Paper*

 According to Purchasing Representative, Debra Reed, the College purchased 400 cases (change to 200 in FY 2014) (**20,000 lbs**.) of uncoated freesheet paper during FY 2014; each case contains ten reams, which each weigh 10 lbs. The paper is composed of 0% post-consumer waste.

*Offsets and Renewable Energy Credits*

The College purchased retail offsets for renewable energy credits for the college’s purchased electricity during FY 2014.

REC's must be accounted for from two sources. 1) The College’s electricity contract includes RECs for 15% of its electricity consumption (**2,227,066.50 kWh**), and 2) the College buys additional RECs to reach its annual target for electricity from green sources. Of the **total (12,611,067 kWh)** **REC’s**, 15% were included with the electricity contract and 70% were purchased separately. Effectively, 85.0% of total *purchased* electricity was mitigated through the purchase of REC’s.

The College specifies 100% wind power REC’s for the additional REC purchase but has less control over the REC’s included with the electricity contract. Prior to the 2012 report, analysts effectively entered the 15% included in the energy contract as 15% of the energy the College was supplied having been generated by renewable sources (on the Custom Fuel Mix Input page). For this report, all of the REC’s were entered into the calculator as REC’s (in the “Green Power Certificates” column).

The REC vendor for the additional 70% was 3Degrees, and the Renewable Energy Certificate Product Content Label lists "National" as the "Generation Location." These are U.S. Wind Power REC's; the Applicable Standard is "Green-e Energy National Standard Version 2.3."

If exact sources of the REC’s for the contractual 15% renewable energy can be determined, this document will be updated appropriately. It’s assumed that the REC’s included in the electricity contract are Green-e-certified; this, too, will be confirmed if possible.

**Alterations to the CCC Calculator**

Three alterations were made to the calculator, as per Jade Rutledge’s (2009) procedure. First, because study abroad flights are largely international, the emissions calculator’s coefficient for the kilograms of CO2 per mile of study abroad air travel was multiplied by 0.64 to reflect the lower emissions per mile for longer, international flights, as opposed to higher emissions per mile for shorter, domestic flights. Since takeoff and landing cause the highest amount of emissions per mile traveled, longer flights yield fewer emissions: the longer the flight the smaller the proportion of emissions used in takeoff and landing. When the calculator determines air travel emissions, it assumes short, domestic flights. Multiplying this coefficient by 0.64, according to DEFRA (2008), corrects for this difference in efficiency of domestic and international flights. This alteration applies only to study abroad flights; it was assumed that all directly financed air travel flights were domestic, and the efficiency of these flights was not adjusted.

Second, a radiative forcing index (RFI) is used in the calculator to account for the cirrus clouds that form from the exhaust emitted by airplanes. Radiative forcing is any change in the balance between radiation coming into the atmosphere and radiation going out. Positive radiative forcing warms the surface of the earth, and negative radiative forcing cools it (Imperial College, 2005). According to Dr. David Baker (2011), these clouds can increase the earth’s average surface temperature, contributing to global climate change. The default RFI for air travel in the calculator is 2.7, which reflects 1992 IPCC measurements; another IPCC study indicated an RFI of 1. Because various sources indicate that radiative forcing data are inconclusive, an estimated RFI of 2 was used in the calculator based on the data available; this procedure is consistent with procedures for the FY 2008, 2010, and FY 2012 inventories. If more conclusive data are released in the near future, the RFI used in the calculator can be altered once again for specificity.

Finally, the given heating and cooling degree days for Texas were changed to reflect the degree days of Sherman, TX, as opposed to the calculator’s default values for Texas in general.. The heating and cooling degree days were calculated using degreedays.net, which uses weather data from a local Sherman weather station. During FY 2016 there were 3235 heating degree days and 2731 cooling degree days.

**Summary of Emissions Data**

|  |  |  |
| --- | --- | --- |
| **Emissions Source** | **MT-eCO2**  | **% of Total** |
| On-Campus Stationary (Natural Gas) | 2853 | 17.86% |
| Direct Transportation (Fleet Vehicles) | 93 | 0.58% |
| Refrigerants/Chemicals | 232 | 1.45% |
| Agriculture (Fertilizer Application) | 13 | 0.08% |
| Purchased Electricity | 8652 | 54.15% |
| Faculty/Staff Commuting | 629 | 3.94% |
| Student Commuting | 215 | 1.35% |
| Directly Financed Air Travel | 467 | 2.92% |
| Other Directly Financed (Personal Mileage Reimbursement/Bus Miles) | 51 | 0.32% |
| Study Abroad Air Travel | 580 | 3.63% |
| Solid Waste | 1596 | 9.99% |
| Wastewater | 12 | 0.08% |
| Paper Purchasing | 14 | 0.09% |
| Scope 2 T & D Losses | 570 | 3.57% |
| Offsets (Additional) | 0 | 0.00% |
| Offsets (Non-Additional) | -7093 | -44.40% |
| **Net Emissions (Subtract Offsets)** | **8885** | **56%** |
|  |  |  |
| **Emissions Category** | **MT-eCO2**  | **% of Total** |
| Total Scope 1  | 3191 | 19.97% |
| Total Scope 2 | 8652 | 54.15% |
| Total Scope 3 | 4135 | 25.88% |
| Total Emissions | 15977 |   |
| **Net Emissions (Subtract Offsets)** | **8887** | **100%** |

Emission Sources highlighted in blue weredetermined to be *de minimus,* as they accounted for less than 1% of net emissions.

**CCC Calculator Input Data and Sources of Data**

|  |  |
| --- | --- |
| **Institutional Data** | **Sources** |
| *Budgets* |
| Operating Budget | Total expenditures for fiscal year (dollars). | Ellen Miles |
| Energy Budget | Monetary sum the school spends on providing energy (electricity and natural gas) to on-campus buildings (dollars). | Ellen Miles |
| *Population Size* |
| Full Time Students | Population of full time students. | Registrar’s Office (Must Complete Online Data Request Form) – Gail Gentry |
| Part-Time Students | Population of part-time students. | Registrar’s Office (Must Complete Online Data Request Form) – Gail Gentry |
| Summer School Students | Population of summer school students. | Registrar’s Office (Must Complete Online Data Request Form) – Gail Gentry |
| Faculty | Faculty population. | Melanie Oelfke |
| Staff | Staff population. | Melanie Oelfke |
| *Physical Size* |
| Physical Size of Campus Buildings | Size of all on campus buildings (ft2). | John Jennings – Keeps a Master Spreadsheet |
| Physical Size of Research Space | Size of research space (ft2). | Steve Goldsmith & John Jennings |
| **Scope 1 Emissions** |
| *Fuels Used on Campus* |
| Natural Gas | Fuel used for fdeg, hot water, and cooking (MMBtu). | John Jennings |
| Gasoline Fleet | Gasoline used for college-owned vehicles including physical plant, police, biology vans, and staff vehicles (gallons). Personal miles put on fleet vehicles not included. | * Linda Welch (Physical Plant Purchased Fuel)
* Melanie Oelfke (Business/Personal Miles on College Vehicles by Calendar Year),
* Caleb Smith (Mileage of Biology Vans)
* Rhonda Duckworth (Campus Police Purchased Fuel)
 |
| *Refrigerants and Chemicals* |
| Various Refrigerants | Refrigerants that escaped when maintaining equipment (lbs). | John Jennings |
| *Fertilizer* |
| Amount of Fertilizer | Amount of Fertilizer (lbs). | John Jennings |
| % Nitrogen | % nitrogen in fertilizer. If different % nitrogen for different fertilizer types, take weighted average of % nitrogen. | John Jennings |
| **Scope 2 Emissions** |
| Purchased Electricity | Amount of electricity and the fuel mix (coal, natural gas, nuclear, and renewable energy sources) used by on-campus buildings (kWh). | John Jennings |
| Custom Fuel Mix | Exact fuel mix of electric utility. % coal, natural gas, nuclear, renewable, and purchased by unknown grid sources. | John Jennings & Peter Schulze |
| **Scope 3 Emissions** |
| *Commuting* | Commuting behavior was used to calculate gallons of gasoline used by commuters per year. |
| Student Automobile Fuel Efficiency | Average mpg of student vehicles driven to campus. Average from car year, make and model. EPA mpg averages were used (www.fueleconomy.gov). | Online Survey of Students |
| % Students Drive Personal Vehicle | % of students that drive personal vehicles to campus. | Online Survey of Students |
| % Students that Carpool | % of students that drive personal vehicles that carpool to campus. Carpooling is defined as two or more passengers. | Online Survey of Students |
| Student Trips per Week | Average trips per week students commuted. | Online Survey of Students |
| Student Weeks per Year | Average weeks per year students commuted. | Online Survey of Students |
| Student Miles per Trip | Average distance per round trip that students commuted (miles). | Online Survey of Students |
| Faculty Automobile Fuel Efficiency | Average mpg of faculty vehicles driven to campus. Average from car year, make and model. EPA mpg averages were used (www.fueleconomy.gov). | Online Survey of Faculty |
| % Faculty Drive Personal Vehicle | % of faculty that drive personal vehicles to campus. | Online Survey of Faculty |
| % Faculty that Carpool | % of faculty that drive personal vehicles that carpool to campus. Carpooling is defined as two or more passengers. | Online Survey of Faculty |
| Faculty Trips per Week | Average trips per week faculty commuted. | Online Survey of Faculty |
| Faculty Weeks per Year | Average weeks per year faculty commuted. | Online Survey of Faculty |
| Faculty Miles per Trip | Average distance per round trip that faculty commuted (miles). | Online Survey of Faculty |
| Staff Automobile Fuel Efficiency | Average mpg of staff vehicles driven to campus. Average from car year, make and model. EPA mpg averages were used (www.fueleconomy.gov). | Online Survey of Staff |
| % Staff Drive Personal Vehicle | % of staff that drive personal vehicles to campus. | Online Survey of Staff |
| % Staff that Carpool | % of staff that drive personal vehicles that carpool to campus. Carpooling is defined as two or more passengers. | Online Survey of Staff |
| Staff Trips per Week | Average trips per week staff commuted. | Online Survey of Staff |
| Staff Weeks per Year | Average weeks per year staff commuted. | Online Survey of Staff |
| Staff Miles per Trip | Average distance per round trip that staff commuted (miles). | Online Survey of Staff |
| *Directly Financed Air Travel* |
| Faculty/Staff Directly Financed Air Travel | Total distance of faculty/staff plane travel that the school wholly or partially finances in the fiscal year (miles).\*\* Cassie Ensminger collected coaching staff air travel data. | * **\*\* New Technique Needed for Faculty & Staff Air Travel; Data Not Readily Available in Business Office or HR**
* Julie Travis (Coaching Staff Air Travel)
 |
| Student Directly Financed Air Travel | Total distance of student plane travel that the school wholly or partially finances in the fiscal year (miles). Only athletic teams in this figure. | Julie Travis (Student Athletic Flights) |
| *Other Directly Financed Travel* |
| Bus Travel | Charter bus distance from fiscal year (miles). Only athletic teams in this figure. | Julie Travis |
| Mileage Reimbursements for Personal Vehicle Use | Distance driven on personal vehicles that the college reimbursed (miles). The IRS mileage rates were used to calculate mileage (IRS Standard Mileage Rates, 2008). | **\*\* New Technique Needed; Data Not Readily Available in Business Office or HR** |
| *Study Abroad Travel* |
| Study Abroad Air Travel | Total distance of semester and yearlong study abroad flights and January term flights per fiscal year (miles).. | * Jade Fernberg of Center for Global Learning (Semester and Year-Long Study Abroad, Janterm)
* Viki Reeder (CSOC, and NSOC)
 |
| *Waste* |
| Solid Waste | Solid waste sent to the landfill from Austin College trash receptacles. Measured in short tons (2,000 lbs). | * Linda Welch (Number of Receptacles and Frequency of Pick-Up)
* Jade Rutledge (Use Same Calculations as FY 2008)
 |
| Wastewater | Water sent to the city wastewater treatment plant (gallons). | John Jennings |
| *Purchased Materials* |
| Office Paper | Amount of office paper used per year (lbs). | Debra Reed |
| *Offsets* |  |  |
| Offsets With Additionality: High end Retail Offsets | Purchased offsets for January Term air miles; enter only total offset miles into “Study Abroad Air Miles” to determine total MT-eCO2 offset; enter MT-eCO2 offset into “High End Retail Offsets” (Additionality). | January Term Air Travel Miles from Jade Fernberg & Margie Norman; Discuss with Peter Schulze |

**Summary of Alterations to the Calculator**

|  |  |  |
| --- | --- | --- |
| **Alteration to CCC Calculator** | **Input Page on CCC Calculator** | **Column(s) in CCC Calculator** |
| Student, faculty, and staff personal vehicle mileage | Input\_Commuter | V, BG, CR |
| altered to represent campus commuting |  |  |
| habits based on |  |  |
| survey results; vehicle |  |  |
| mileages averaged and |  |  |
| entered for FY 2010; same procedure |  |  |
| used in Rutledge’s |  |  |
| FY 2008 inventory |  |  |
| Study abroad air miles | EF\_CO2 | BF |
| kg CO2/mile multiplied by 0.64 to represent |  | Note: must double-click into equation and add “\*0.64” to end |
| smaller proportion of |  |  |
| emissions for long (overseas) flights as |  |  |
| opposed to domestic |  |  |
| flights; take-off and landing portions of |  |  |
| flights yield highest |  |  |
| emissions; directly financed faculty/staff |  |  |
| air travel not multiplied |  |  |
| by 0.64; majority of these |  |  |
| flights assumed to be domestic |  |  |
| kg CO2/mile for all air miles multiplied by | EF\_Transportation | BNNote: must double-click into equation and delete “.7” from end |
| 2 (instead of 2.7) to reflect best estimate of radiative forcing index (RFI) |  |  |
| Heating and Cooling Degree Days were changed based on calculations completed through degreedays.net. This data was specific to Sherman, TX as opposed to the whole of Texas assumed in the calculator. | Degree Days | AS |

**Calculator Data and Corresponding Input Page/Column(s)**

|  |  |  |
| --- | --- | --- |
| **Input Page** | **Data to Input** | **Column in CCC Calculator** |
| Input\_InflAdj | Operating budget | C |
|  | Energy budget | E |
| CustFuelMix | % Coal | E |
|  | % Natural Gas | F |
|  | % Nuclear | I |
| Input\_Commuter | Students Commuters | C |
|  | Students One-Way Trips / Week | D |
|  | Students Weeks / Year | F |
|  | Students Drive Alone % | I |
|  | Students Carpool % | J |
|  | Students Drive Alone Miles | Q |
|  | Students Carpool Miles | R |
|  | Faculty Commuters | AN |
|  | Faculty One-Way Trips / Week | AO |
|  | Faculty Weeks / Year | AQ |
|  | Faculty Drive Alone % | AT |
|  | Faculty Carpool % | AU |
|  | Faculty Drive Alone Miles | BB |
|  | Faculty Carpool Miles | BC |
|  | Staff Commuters | BY |
|  | Staff One-Way Trips / Week | BZ |
|  | Staff Weeks / Year | CB |
|  | Staff Drive Alone % | CE |
|  | Staff Carpool % | CF |
|  | Staff Drive Alone Miles | CM |
|  | Staff Carpool Miles | CN |
| Input | Full-time students | G |
|  | Part-time students | H |
|  | Summerschool students | I |
|  | Faculty | J |
|  | Staff | K |
|  | Total building (sq. ft.) | L |
|  | Total research building (sq. ft.) | M |
|  | Natural gas (MMBtu) | AI |
|  | Gasoline fleet (gallons) | AV |
|  | Diesel fleet (gallons) | AW |
|  | HFC-134a (lbs.) | BF |
|  | HFC-404a (lbs.) | BG |
|  | HCFC-22 (lbs.) | BH |
|  | Other refrigerants (lbs.) | BK |
|  | Synthetic fertilizer (lbs.) | BL |
|  | % Nitrogen | BM |
|  | Purchased electricity (kWh) | BX |
|  | Directly financed faculty/staff air miles | CK |
|  | Directly financed student air miles | CL |
|  | Directly financed bus miles | CO |
|  | Personal mileage reimbursement | CQ |
|  | Study abroad air miles | CR |
|  | Solid waste no CH4 recovery (short tons) | CZ |
|  | Wastewater aerobic (gallons) | DD |
|  | Paper 0% recycled (lbs.) | DG |
|  | Paper 100% recycled (lbs.) | DK |
|  | Offsets (high end retail offsets with additionality) | DN |
|  | Green power certificates (non-additional) | DQ |