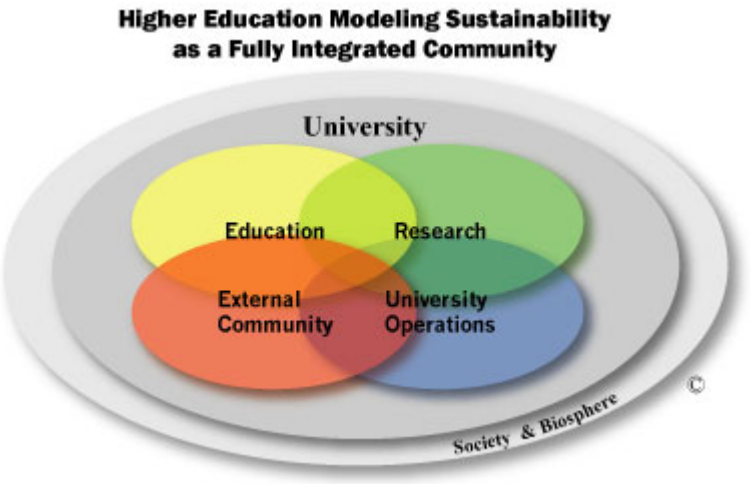
University of South Florida

Sustainable Recycling:

Can it happen?



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1. Executive Summary (Eric)

Our team did research on recycling, methods, facilities, other institutions, and sustainability as a whole. This report is primarily focused on sustainable recycling. We begin with defining what sustainable recycling is, the benefits, and ethical issues here at USF for a recycling business. Eric continues with what the current USF recycling program includes and the income it is generating.

Elissa then defines the other university recycling activities in the US and Canada. Surprisingly many of these programs were started by local students. This is a prime example of what schools do. For example the strongest program at the University of Oregon has the most awards and the strongest student involvement. Here the University has partnered with the students instead of trying to treat them as second-class citizens.

Kathleen then described the Polk County Recycling-Educational facility followed by Eric detailing the proposed GreenHorn Recycling Materials Recovery Facility which Dr. Henley's Entrepreneur class team explored. This leads into the next section 6 with a cost benefit analysis that is detailed in the Appendix.

Kathleen picks it up again talking about how we can "get there" and how it is necessary to take action now. There's another bit about the Industry future of the recycling industry of Florida by Eric with a Conclusion from Kathleen describing what was gained through this report. We have provided significant research and analysis in total to open the way for sustainable recycling at USF.

2. Introduction on Recycling (Eric)

A. What is Sustainable Recycling?

Sustainability is a fundamental concept for maintaining the environment and world to support mankind now and in the future. Sustainability at a university is about functioning as a fully integrated system.[2]

1. Think across boundaries.
2. System thinking => connect info and data.
3. Model on how world works better.
4. What is success? What does it look like?
5. What is a sustainability culture?
6. Make the invisible visible => get the truth into student's mind set.
7. Create positive instead of remove negative.

"Sustainability is a systemic concept, relating to the continuity of economic, social, institutional and environmental aspects of human society. It is intended to be a means of configuring civilization and human activity so that society, its members and its economies are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, and planning and acting for the ability to maintain these ideals indefinitely. Sustainability affects every level of organization, from the local neighborhood to the entire planet."[3]

But how do we do that?

> "It will require that we get our own house in order, which is first and foremost the political task of rebuilding our country's democratic foundations and the atrophied habits of citizenship. The unfinished business of America is to extend and deepen our ideas of equality, positive freedom, decency, nonviolence, and commonwealth–a

[2] SCUP Video notes 1/10/06, GEB 9630 - Societal Law & Issues In Sustainable Enterprises
[3] "Sustainability." Wikipedia, The Free Encyclopedia. 18 Apr 2006, 20:23 UTC. 17:37 http://en.wikipedia.org/w/index.php?title=Sustainability&oldid=49493773

> transformation that will one day temper individualism with the acknowledgement of our obligations and responsibilities; replace the extractive/consumer economy with a truly prosperous economy that protects the natural capital of soils, forests, and biotic diversity; extend and broaden the idea of representation to include future generations and the larger web of life."[4]

When we establish Sustainable Recycling at USF it will require a significant campus wide effort. Waste is produced everywhere. Currently USF runs a complete street sweeping and campus custodial crew each night. Every public inch on campus is checked to insure no trash is left anywhere. Typically trash is arbitrarily dropped everywhere, as we see along the streets and parks of Tampa where a constant staff of people DO NOT clean it up. Most of Tampa does have people picking up trash,[5] including the DUI community service crews directed by the Sheriff's Office.

"A sustainable recycling program must be self-sufficient in its ability to fund and operate highly effective recycling services as part of a comprehensive integrated waste management system. While some funding may come from external sources of support, for it to be a sustainable programs it must be designed to thrive regardless of changes in outside support or municipal budgeting priorities. Ideally, attributes of a sustainable program include:"[6]

- Sufficient and reliable funding;
- Incentives for waste diversion and market development;

[4] Orr, David W. The Last Refuge: Patriotism, Politics, and the Environment in an Age of Terror. 1st ed. New York: Island P, 2004. www.oberlin.edu/news-info/observations/observation_davidOrr3.html
[5] Next year the NEAT Program will remove 4,900 tons of litter, and clean 462 miles of streets. www.tampagov.net/dept_Budget/FY1998_reports_to_the_people/q&a.htm
[6] WR Beck, Inc. "Building Financially Sustainable Recycling Programs." Pennsylvania DEP. Apr. 2005. www.dep.state.pa.us/dep/deputate/airwaste/wm/RECYCLE/document/Sust_Rpt/Sust_Rpt.htm

- Program costs and revenues associated with each program component are known and tracked separately;
- Implementation, administration and enforcement is feasible;
- Public understanding, awareness and support are present;
- Optimization efforts are documented;
- A review and adjustment process is in place; and
- Integrated planning exists for all of the above attributes.

A Sustainable Recycling effort must be mandated by the University President. Staff must be held accountable and resources allocated to make it happen. This could easily function as a division of the Physical Plant or a campus Sustainability Office. When a USF Sustainability Office is established the recycling program could help fund it, augment it or function as an educational research service operated by it. Sustainability is an ideal for operation and the recycling efforts could be the show-case to demonstrate that sustainability works here at USF in Tampa.

B. Benefits to Campus

Significant benefits can be derived from new recycling policies at USF. As the College of Business explores a Sustainable PhD program the development of a truly Sustainable Recycling program could bring the College and University to the forefront of community sustainability efforts internationally. Other benefits to the Tampa Bay community are also apparent:[7]

- Recycling conserves natural resources

[7] The National Recycling Economic Information Study, was a comprehensive compilation of national data on the economic impact of recycling and reuse. The U.S. Recycling Economic Information Project was commissioned by the U.S. Environmental Protection Agency and a number of states through a cooperative agreement with the National Recycling Coalition in association with R.W. Beck, Inc. www.nrc-recycle.org See Appendix A for an excerpt.

- Recycling provides preferred sources of raw materials
- Recycling and reuse add value to the U.S. economy
- Recycling is a diverse industry
- Recycling is competitive with other major industries
- Local recycling and reuse spur "downstream" economic impacts
- Reuse businesses contribute significantly to the U.S. economy
- Recycling saves energy
- Recycling reduces greenhouse gas emissions
- Recycling reduces emissions of air and water pollutants

Table 1 Energy savings[8]

Energy savings and greenhouse-gas effects from recycling In Washington state for 2001 (Relative to energy required for virgin production)*

Material/Grade	Tons Recovered	BTUs Saved (in millions)	Tons Greenhouse Gases Reduced (MTCE)
Aluminum	12,540	1,900,687	49,007
Newsprint	176,392	1,693,021	111,369
Mixed Waste Paper	289,840	3,125,400	273,442
Cardboard	491,230	3,537,507	353,777
Glass	81,632	294,315	8,697
Steel Cans	11,483	256,882	6,426
Ferrous Metals	293,284	6,560,909	164,120
PET	4,661	133,123	3,122
HDPE	4,841	83,215	1,977
LDPE	6,603	161,332	3,553
Other Plastics	4,067	69,914	1,661
Food Scraps	86,226	N/A	1,815
Yard Waste	448,222	N/A	8,978
Other Organics	884,999	N/A	17,788
Total	**2,799,020**	**17,816,305**	**1,005,732**

*Based on the following sources: Department of Ecology 2001 Recycling Survey; the Environmental Benefits of Recycling model, a Northeast Recycling Council project; Energy Information Administration, Washington State Energy Data Report for 1999.

C. Ethical Issues Faced by USF

The recycling policy at USF has to begin with a new sustainability conception of the environment and campus from the top down. The president has to have a sincere and significantly visible attitude and opinion about waste and recycling on campus. Preaching about recycling and sustainability when actions waste resources and consume

[8] "Focus on how recycling benefits the environment," Publication No. 02-07-026, October 2002; www.ecy.wa.gov, http://www.ecy.wa.gov/pubs/0207026.pdf

more will never inspire faculty, staff and students to change anything. Leadership needs to take a stand on what it means to be sustainable instead of being a selfish consumer with bigger, faster and more expensive toys that only waste resources and symbolize arrogance instead of a real concern for creating a sustainable environment. Actions will create change not preaching or mandates.

The U.S. Congress generates about 20 tons of garbage per day (not counting legislation).

Another significant issue regarding recycling efforts on campus and the use of state resources is that the Florida State Statutes mandates that State Board of Education plan reflects a cost-effective use of state resources.[9] State resources can only be used to benefit the state and public in general. Therefore, utilizing recycled resources for a private company would be difficult. The current USF Tampa 2005 Campus Master Plan Update: January 2006 includes some significant sustainability initiatives. However the recycling components have been overlooked, or minimized. These components are included but not significantly. Please see Appendix B for excerpts with important points highlighted.

[9] General powers of State Board of Education, Florida Statutes 1001.02, 2, w, 5, a,

3. Stakeholder Analysis

Implementing a waste reduction and recycling policy at USF will have a positive effect on the environment, the community, and everyone who is involved in some way at the university. In conducting our analysis and exploring the idea of a new recycling program at USF, all applicable stakeholders were considered. The primary stakeholders affected by waste reduction and recycling at USF are as follows:

1. Faculty. This consists of the President, all colleges, college deans, departments & chairmen, the faculty senate, and committees (an organizational chart can be seen in Appendix C).
2. Staff. The staff includes the Administrative & Professional Council and The USPS Senate.
3. Students. Included in this are students on and off campus, the student government, the student union, and other professional and fraternal organizations.
4. The local community. This includes Temple Terrace, the City of Tampa, mayor & city councils, citizens and neighborhood groups, Suitcase City and unincorporated Hillsborough County.
5. The environment. This includes local wetlands, Hillsborough River, and Florida flora and fauna.

Additional stakeholders include the media, suppliers, local businesses, interest groups, future generations, and investors.

4. Overview of Recycling at USF (Eric)

Currently USF has an internal recycling program that primarily collects mixed paper from the main office buildings. The over 500 - 64 gallon green containers are wheeled to the curb 4 days a week by custodial staff. A USF truck collects paper until it is full and then transports it to an offsite recycling company for processing.

Aluminum is collected in about 100 - 25 gallon containers on Campus. These are consolidated into a larger 4 yard Igloo container. Once again when the container becomes full, the driver empties it into a truck and it is transported to an offsite recycling center for processing. Glass and plastics are collected at the USF Community Recycling Site located on Sycamore Dr. This site is used by individuals who live in apartments around campus, where no recycling pickup is available. Tampa removes collected recycling materials at this site as detailed in Table 2.

Table 2 USF recycling components

#	Size (yds)	Material	Collected
4	12	Glass & plastic	twice a week
4	12	Cardboard	twice a week
2	12	Newspaper	as needed
1	30	Newspaper &	once a week
		Magazines	By Tampa
2	4	Aluminum	By USF

All the income derived from USF recycling is listed in Table 3a & 3b[10]. Additionally Scrap-All, an outside contractor, provides a 30 yard container to collect mixed metals at

[10] Monroe, Dot, Program Assistant, Recycling University of South Florida 2006 letter; 813-974-0092 dmonroe@admin.usf.edu

the Physical Plant. Last year it collected generated 91 tons of mixed metal and generated $2,336 from the sale. Each university department is responsible for the proper disposal of their electronic equipment through a company of their choice, which typically is an expense.

Table 3a USF recycling income

		USF Campus				Sycamore Site		
Year		tons	income	$$/ton		tons	income	$$/ton
2002		169	$2,802	$16.58		232	$3,572	$15.40
2003		246	$3,381	$13.74		430	$4,392	$10.21
2004		345	$9,246	$26.80		406	$11,028	$27.16
2005		245	$6,881	$28.09		416	$12,864	$30.92

Table 3b USF Aluminum recycling income

Aluminum			
Year	tons	income	$$/ton
2002	3.5	$2,600	$743
2003	3.3	$2,453	$743
2004	2.5	$2,117	$847
2005	2.1	$2,212	$1,053

Appendix B details the proposed University Objectives and Policy for the solid waste developed on campus. These seem to encourage the continuation of offsite operation with the City and County; however Objective 9D2 recommends improved recycling efforts on campus which opens the door for new ideas.

> Objective 9D.2 : Procedures to reduce University-generated solid waste and increasing recycling and reuse programs shall be defined.[11]

[11] 2005 Tampa Campus Master Plan Update (Draft) (02/08/06)
http://usfweb2.usf.edu/FacilitiesPlan/Campus%20Planning/plan_draft.html
http://usfweb2.usf.edu/FacilitiesPlan/Campus%20Planning/2005TpaMP/ELEM_9.pdf

5. Universities with Recycling Programs (Elissa)

A. University of Florida

University of Florida initiated its campus-wide recycling program in August of 1989 with a target annual recycle rate of 30% or greater per year.[12] The university currently recycles about 40% of its total waste stream, by weight, and currently without external subsidies or added costs to the community.[13] The University Solid Waste Management Office manages the collection and disposal of all solid waste generated throughout university operations and manages the University Recycling Program, which provides collection and recycling services.[14] The school has seven categories of recycled waste that includes: paper, cans, glass, scrap metal, masonry, yard waste, and sludge.

According to the UF Office of Sustainability, over 30% of all solid waste generated by the university is recovered on campus and recycled through various local and regional brokers and processing firms.[15] Its annual recycling rate in 1988 started at 17% before the recycling initiative started in 1989. From 1990 to date, the rate has steadily met the programs goal of over 30% per year.[16]

The recycling program has a two-tier operation. In the first tier, one would find the common programs aimed at the general campus and focused on the most common and

[12] UF Full Report Appendix, page 5
[13] Overview of Current University Recycling Programs from UF Memorandum Subject- Recycling and Sustainability at the University of Florida.
[14] UF Waste Disposal Guide- Revised August 1, 2005.
[15] Waste Management, Office of Sustainability- University of Florida, www.sustainable.ufl.edu/waste_management.html
[16] Solid Waste Reduction Program- July 1, 2005, University of Florida, Solid Waste Management Office

environmentally sensitive components of their waste stream. This includes: office paper of all kinds, newsprint and phone books, soft-cover books, magazines and junk mail, masonry/concrete, cardboard, cans, glass jars/bottles, plastic containers, scrap metal and white goods, used shipping pallets, computer/electronic equipment, chemicals and solvents, used oil and filters, used antifreeze, heavy/precious metals, florescent tubes, and batteries. The UF Physical Plant Division, Environmental Health and Safety Division, and the Surplus Property Section of UF's Finance and Accounting Division manage tier one recycling. Tier two includes items such as used tires, animal bedding, yard debris, toner and ink-jet cartridges, styrofoam p-nuts, and wastewater solids. Tier two is managed departmentally versus tier one which is institutionally organized. The program is recovering over 95% of this tier one available products and currently recycling over 50% of these products.[17]

Every University building is equipped with standardized industrial-type recycling containers or collection mechanisms.[18] UF's scope of recycling includes on-site support at over 350 major buildings and complexes, over 1800 scheduled services per week at over 1300 locations for paper products and beverage containers solely, dispersed departmental collections of low-density and low-

[17] Recycling Program Organization, page 3-4, Memorandum 10/25/2005 Subject- Recycling and Sustainability at the University of Florida.
[18] Overview of Current University Recycling Programs, page 2, Memorandum 10/25/2005 Subject- Recycling and Sustainability at the University of Florida.

frequency products, and many central drop-off facilities for the various recyclable products.[19] The Department of Housing also encourages residents to recycle and allows them to submit proposals to the Recycling Committee during their monthly meetings for projects that will increase/improve recycling and awareness in Village Housing.[20] Paper and cardboard products are collected by contracted crews in 193 administrative and academic buildings by 858 interior collection bins on a weekly basis. Cans and glass/plastic containers are collected weekly by 275 exterior bins and at the UF central recycling facility. Yard debris is transported directly to the UF Yard Trash Transfer Facility directly from jobsites. Used concrete and masonry is transported by UF construction crews directly from jobsites to local recycling facilities. Scrap metals including large white appliances and used shipping pallets are also delivered to the UF Recycling Facility by maintenance crews. Wastewater solids/sludge from the UF Wastewater Treatment Plant are collected by a contractor and applied to local fields as a soil amendment. Used animal bedding (wood chips) from the Veterinary Medical Hospital is collected internally and contractor- hauled to a state tree farm for use as mulch. The Environmental Health and Safety Division manages the collection and recycling of consumer-type batteries, used oil and filters, precious metals, and used chemicals, solvents, pesticides and fertilizers. Old computers and electronic equipment is delivered by their owners to the UF Surplus Property Warehouse.[21]

[19] Solid Waste Reduction Program- University of Florida, July 1, 2005.
[20] Family and Single Graduate Student Housing: Recycling, http://www.housing.ufl.edu/villages.html
[21] Description of Current Recycling Support, page 4-6, Memorandum 10/25/2005 Subject- Recycling and Sustainability at the University of Florida.

University of Florida has identified their recycling benefits and major recycling problems. Their recycling benefits are as follows: smaller environmental footprint, lower overall disposal costs, smaller custodial workload, secure document destruction, enhanced public image, and improved morale among all. Their major recycling problems include: composite end items, irregular production rates, container placement and space, contamination of products, high collection costs, and lack of local markets.[22]

B. Florida State University

Florida State University developed a comprehensive trash audit through volunteer students over a five-week period that researched types and amounts of trash in different areas on campus via a sample of the dumpsters (1/3 of total on campus). The purpose was to quantify the amount of recyclable material sent to landfills.[23] The study showed that certain investments/actions would increase revenues and expanding current recycling initiatives with little or no additional costs should be explored. The audit suggested that half of the material sent to the landfill could be recycled.[24] Types of recyclables would be white paper, mixed paper, plastic beverage containers, glass, and aluminum cans. According to Florida State's research, bailed white paper sells for $200/ton if it is shredded. However, the machinery to sort the paper is expensive. The school year of 2003-2004 recycled 433 tons of material saving approximately $17,000 in landfill charges. This same school year generated 4100 tons of waste with only 15% recycled.[25]

[22] Solid Waste Reduction Program- University of Florida, July 1, 2005.
[23] Recycling at FSU, page 3.
[24] Ibid, page 7.
[25] Ibid, page 4

In 2000, FSU took over trash collection duties from the City of Tallahassee, which improved reliability and quality of management services and lowered costs for the university. In 2001, FSU initiated a recycling program with a focus on scrap metal, cardboard boxes, and office paper. The waste management staff collects cardboard boxes and office paper within the campus buildings. Targeted programs have been implemented to pickup cardboard and other recyclables during residence hall moving days and key events.[26] The costs of recycling are built into the refuse disposal rate the physical plant charges clients, which allows recycling services to remain free.[27]

According to FSU, there are five basic elements critical to campus recycling. These are equipment costs, personnel and resource investment, educational programs, financing mechanisms, and vendor agreements. As referred to before with the paper sorter, equipment costs can be relatively expensive. In order for personnel and human resource investments to be successful, efforts need to be part of a larger, countywide movement. The university also needs to train and increase coordination among custodial staff, hire a recycling coordinator to work with the physical plant, and pay modest stipends to students who manage recycling in specific dorms. Accountability and responsibility need to be emphasized on an individual level as a percentage of recyclables increased, which will improve social responsibility and public image about sustainability and recycling. Educational programs are to include orientation services, recycling guides

[26] Ibid, page 5
[27] Ibid, page 4-6

(websites/brochures), move-in/move-out recycle days, and placement of bins in strategic locations.[28]

Recommendations to FSU by other campuses were to create a centralized recycling center, collect organic waste, and promote educational activities to increase participation on campus. The biggest challenges and constraints were lack of awareness, need for centralized recycling coordination and program development, contamination of bins from inappropriate use, vandalism, safety and aesthetics, capital costs, lack of support (student groups should be utilized to help with this), or a weak market for recyclable materials.[29]

C. University of California- Berkeley

Berkeley's sustainability initiative was a student led movement. Sustainability was first introduced at Berkeley at a recycling summit in February of 2002. By the 2003 recycling summit, it was decided to establish a Chancellor's Advisory Committee on Sustainability (CACS). A policy was devised to "promulgate green building design and clean energy use." All campuses are required to achieve a "standard equivalent to LEED silver rating and 20% of all energy purchases from renewable sources by 2017." LEED stands for Leadership in Energy and Environmental Design. According to Berkeley, it is the most comprehensive green building and renewable energy policy in the nation.[30]

In August 2003, the UC student association at Berkeley chose to promote sustainability programs for all UC schools as top priority with each program having a CACS

[28] Ibid, pages 5-6
[29] Ibid, page 6
[30] http://sustainability.berkeley.edu/

component. The California Student Sustainability Coalition (CSSC) is currently developing a "transportation demand management" policy. The Residential Recycling Education Coordinators program has been active for three years and managed by the Student Recycling Education Coordinators with supervision by Campus Recycling and Refuse Services.[31]

The Campus Recycling and Refuse Services provides recycling and refuse services at the University of California-Berkeley, in which they manage over 35 tons of solid waste on campus daily. The program is committed towards expanding recycling programs while providing effective refuse collection on campus. CRRS is the campus unit within Berkeley's Physical Plant-Campus Services. Its recycling efforts are for mixed paper, beverage containers, green waste and wood, toner cartridges, and mixed metal. It also provides general information on waste prevention, reuse of materials, purchasing recycled-content products, and recycling other materials that it does not coordinate. Its refuse services include garbage collection, debris box ordering, and portable toilets ordering. CRRS partners with other entities on campus including Custodial Services for indoor collection of paper recycling bins and Grounds Services for collection of green waste and plant debris.[32]

[31] Student Recycling Education Coordinators, University of California-Berkeley, ww.ocf.berkeley.edu/~recycle/ssec/programs/index.html
[32] About Us- Waste Management, University of California-Berkeley, ww.ocf.berkeley.edu/~recycle/aboutus.htm

D. University of Michigan- Ann Arbor

University of Michigan has over 18 environment-related efforts toward sustainability. A large percentage is geared towards physical plant: building, grounds waste, transportation, utilities maintenance, design planning, systems, housing, etc. There are a number of student clubs and organizations that are geared towards environmental problems. A student association, ENACT, organizes a recycled notebook program for students to turn in used notebooks to recycle. UM's sustainability website also lists other universities with sustainability efforts, sustainability coordinators, environmental committees, training for executives on sustainable strategies, greening of curriculum, sustainable food systems, use of renewable energies, green building policies and structures, use of alternative fuels, etc.[33]

The President's Office Master Plan was developed to consider issues in sustainability in the management of UM properties. The school has also organized many pilot programs on natural vegetation and policies on rainwater retention ponds for new parking lots to avoid irrigation. They have initiated an Energy Conservation Measures fund, a Pollution Prevention Program, an Environmental Task Force, and their Department of Occupational Safety and Environmental Health manages air pollution, soil erosion, storm water management, and contaminated property clean up.[34]

Campus recycling and waste collection services are provided by UM Grounds and Waste Management Services. The recycling program was first implemented for the Housing

[33] The "Sustainable University of Michigan" www.umich.edu/~ususTain/sustain.html
[34] Ibid

Division in 1989, when UM hired its first Recycling Coordinator. By 1990, it became a campus-wide collection program due to a grant given by the State of Michigan. The program currently operates two vehicles for trash collection and two for recyclables collection, five days weekly. In 1996-97, 2200 tons of paper and 124 tons of containers were collected for recycling. Also in 1997, Grounds and Waste Management along with Housing used grant monies to begin a trial food waste-composting program for three residence hall kitchens. This is also the year the Recycling website debuted. In 1998, UM sponsored a competition between residence halls called Ecolympics that rewarded conservation efforts.[35]

Michigan State recycles containers, paper, and special items, each with its own specific bin or can strategically placed around campus. Containers include glass bottles and jars, ceramics, milk cartons and juice boxes, plastic bottles, and steel cans, aluminum and metals. All Container recycling bins and cans are located in lounges and lunchrooms. Paper includes corrugated cardboard and paper bags, newspapers, magazines and catalogs, office paper, junk mail, paperboard and boxboard, shredded paper, telephone books, and paperback books. Paper and cardboard are collected together. There are over 3000 recycle containers across campus for paper products alone. Paper recycle bins are located throughout university buildings; some include a sidesaddle for office area for collection of trash in the sidesaddle and paper in the bin. There are also various other bins and boxes for collection of other goods. Special Items include batteries and hazardous material, electronic media, laser toner and ink-jet cartridges, overhead transparencies,

[35] History of Recycling- University of Michigan-Ann Arbor, www.recycle.umich.edu/grounds/recycle/history_of _recycling

polystyrene or foam, scrap wood and pallets, and small electronics. Textiles and clothing are collected from residence halls during move-out.[36]

The Recycling Education at the University (RedU) forum is a newly formed educational forum that meets bi-monthly to provide an opportunity for members to voice questions, concerns, and suggestions to improve recycling efficiency and effectiveness on campus. RedU members include staff and faculty from departments and buildings all over campus who serve as liaisons to distribute recycling information to their departments. Each meeting consists of the Waste Management Services presentation on recycling education, question and concerns by group members, and discussion/response to ongoing issues.[37]

E. University of Pennsylvania State

Penn State began recycling program in 1990 and is currently the number one institutional recycler in the Commonwealth of Pennsylvania. "Institutions of higher education in Pennsylvania are required to recycle where buildings are located in mandated municipalities as defined by the Municipal Waste Planning, Recycling, and Waste Reduction Act of 1988." [38] All state owned institutions of learning must implement waste reduction and recycling programs in compliance with this act. Penalties for noncompliance can amount to $300 per day per violation.[39]

Solid waste management is organized through the University of Pennsylvania Physical Plant Department. It provides an infrastructure to dispose of wastes through trash

[36] www.recycle.umich.edu/grounds/recycle/
[37] RedU, University of Michigan State- Ann Arbor, www.recycle.umich.edu/grounds/recycle/redu
[38] Recycling Guideline, 2005 Penn State Berks www.bk.psu.edu/recycling/WhatToRecycle.html
[39] Environmental Audit 1995, http://dolphin.upenn.edu/~pennenv/audit/waste/index.html#The%20Audit

receptacles and recycling bins to collect and manage all wastes produced by the university including all campus buildings and residences.[40] The types of recyclables collected by containers and bins include the categories of paper, glass and plastic, and special items. Mixed paper includes: office paper, green bar paper, colored paper, newspapers, junk mail, envelopes, phonebooks, file folders, text books and paper back books, corrugated cardboard and paper bags, magazines and catalogs, and glossy-coated paper.[41] Paper is collected from all buildings on campus and is collected together with corrugated cardboard. Mixed paper represents an average of 96% (by weight, not tracked by paper grade) of recycled waste. Food and beverage containers include: glass bottles and jars, plastic bottles, steel cans, aluminum, and metals. These are collected at selected academic and administrative buildings and many outdoor locations. Special items makes up only a few select items to include computer equipment, bulk waste, and batteries.[42] A student organization called SCROUNGE accepts used computers and equipment from companies and individuals, tests and refurbishes it, then places them in schools, underprivileged homes, community groups, and non-profit organizations in Pennsylvania.[43] Penn State also composts all yard wastes and shreds woody wastes in mulch.[44]

Penn State established an environmental waste audit that calculated 6,925 tons of waste produced in 1995. This included waste from dumpsters and compactors, in which the

[40] Environmental Audit 1995, http://dolphin.upenn.edu/~pennenv/audit/waste/index.html#The%20Audit
[41] Office of Physical Plant, Recycling, Pennsylvania State University http://php.scripts.psu.edu/dept/iit/hbg/BusinessServices/Recycling.php
[42] Recycling Guideline, 2005 Penn State Berks www.bk.psu.edu/recycling/WhatToRecycle.html
[43] SCROUNGE "Students for Computer Recycling to Offer Underrepresented Groups in Education," The Pennsylvania State University in University Park, PA. www.psu.edu/spacegrant/scrounge.html
[44] Office of Physical Plant, Recycling , Pennsylvania State University http://php.scripts.psu.edu/dept/iit/hbg/BusinessServices/Recycling.php

past compilations did not account for compactors in their analysis. The costs of waste disposal were $357,325, excluding labor costs, which averaged $51.59 per ton. Overall, Penn State recycled 27.5% of its solid waste in 1995. Waste construction and debris waste is not handled by the university and was excluded from the calculations. A 1991 study on waste composition conducted in academic and administrative buildings revealed a break down of waste to be 60% paper, 10% cardboard, and 30% mixed food and other waste.

Currently, the university has two primary reduction efforts beyond recycling by collection bins strategically placed around campus. They are as follows:

1) Penn Environmental Group administers a program called CUPPS, which stands for Can't Use Paper Plastic Styrofoam. It distributes reusable mugs to all freshmen. Over 80% of the community encourages this initiative by giving discounts for using Penn CUPPS mugs.
2) Penn State requires under city ordinance that all dining services and food suppliers remove food waste through food disposals. This ensures that recycling bins will not be contaminated by wet waste.[45]

F. University of Oregon

The Campus Recycling Program was officially institutionalized in March 1991. The program was initiated from a student movement through Survival Center, which is a student environmental action and education group at the University of Oregon. Through

[45]Environmental Audit 1995, http://dolphin.upenn.edu/~pennenv/audit/waste/index.html#The%20Audit

student volunteers, successful responses to surveys, and positive publicity, the students created enough excitement to get the university facilities involved. The program is now a multi-funded project by the Facilities Services, the Associated Students of the University of Oregon, University Housing, and Paper Revenue.[46] It has a contractual agreement, coined the Student Fee Budget Agreement, between these parties that is reviewed annually. Because of this partnership program, UOregon believes everyone has a vested interest and people take ownership to keep the program efficient and consistent.[47] Since 1990, over 600 students have worked in the recycling program. Since then, numerous academic internships and volunteer opportunities have also been created.[48]

UOregon has been awarded numerous accolades for their efforts and program for recycling and sustainability. Their most recent recycling awards include:

2005- EPA's University Partnership of the Year Award

2004- AOR Waste Partnership Award

2002- National Recycling Coalition Recycler of the Year Innovative Process for Zero-Waste Events

1997- National Recycling Coalition Outstanding School Recycling Program

1996- State of Oregon Recycler of the Year Waste Reduction[49]

Applying for these awards was believed to build good public relations and awareness for the University. The recognition could also help when looking for funding for projects. The Campus Recycling Program forms alliances and partnerships to attain funding.

[46] About Us- University of Oregon, http://darkwing.uoregon.edu/~recycle/aboutus.htm
[47] Ibid.
[48] Ibid.
[49] Awards and Kudos- University of Oregon, http://darkwing.uoregon.edu/~recycle/PrgmStru.htm

Private donors help but usually more funding is needed. Grant funding is burdensome, so UOregon partners with the city and county to attain government grants not available to colleges, but only available to municipalities. So, the government writes the grant and the university can utilize its advantageous relationship for funding without doing any of the legwork.[50]

According to UOregon, viewing the waste stream and tracking recyclable materials, the recycling program can be more efficient and note waste reduction, which is highly important to the success of the program. Keeping material tracking records has proven relevant and useful in attaining increased funding as well as validating existing funding.[51] Types of materials recycled include glass, metals, plastics, drink boxes, deposit cans, paper, and cardboard.[52] The university implements many various environmental audits and actively reviews them for completion of recommendations and reduction in waste. These audits include solid waste audits, food waste audits, and napkin use audits. The waste study revealed the breakdown of waste to be 29.4% paper, 12.9% wood, 10.5% yard debris, 8.2% metals, 8% miscellaneous inorganic, 7.7% textiles, 7.2% plastics, 6.7% miscellaneous organic, 6.6% food waste, and 2.8% glass.[53]

UOregon recommended practices to consider for implementation of a university recycling program:[54]

1. Encourage food services to sell reusable mugs, allowing discounts.

[50] Ibid., Program Structure- University of Oregon
[51] Ibid., Material Tracking-University of Oregon
[52] Ibid., Material Tracking Data- Univ. of Oregon
[53] Waste Audit- Univ. of Oregon, http://darkwing.uoregon.edu/~recycle/waste_audit.htm
[54] Ibid., Recommendations to Consider- Univ. of Oregon

2. Use permanent ware or reusable plastics in food services.
3. Offices should reuse corrugated cardboard, file folders, interdepartmental envelopes, and other office supplies.
4. Establish photocopy guidelines to encourage half-sheets and double-sided copies.
5. Campus-wide recycling program with support from administration and students, to include an extensive system of source separation for a variety of materials.
6. The program must target students, staff, faculty, visitors, and should not rely solely on voluntary labor.
7. Yard waste and some kitchen wastes can be composted and used as mulch on campus or sold to landscaping businesses.[55]

[55] Ibid., Recommendations to Consider- Univ. of Oregon

6. Canadian Recycling Model (Elissa)

University of British Columbia believes they are Canada's leader in campus sustainability. In 1997, the college was named "Canada's first university to adopt a sustainable development policy" and one year later became Canada's "first university to open a campus sustainability office." [56] The office of sustainability website shows a real-time chart which calculates where the UBC-Vancouver campus is at in terms of consumption and resources saved. It calculates its consumption variables to be: sheets of copy paper used, kWh of electricity used, and liters of water used. It also reveals the resources saved to include: sheets of copy paper/printing paper saved, kWh of electricity saved, liters of water saved, tons of greenhouse gas emissions reduced, and dollars saved. Since September 1, 2005, UBC has saved a total of $11, 718, 269. OVER $11 MILLION DOLLARS IN EIGHT MONTHS![57]

UBC saves 15,000 tons of CO2 emissions, reduces water consumption by 30%, and decreases energy use by 20%, each annually. From 1998 through 2005, the student body increased by 27%. In that same time period, UBC's waste management diverted over 2000 tons of waste from the landfills, recycling almost half its waste at 42%.[58] In paper consumption, the university has reduced its use of virgin white, recycled white, and recycled color paper by 19%. On per capita basis, it has reduced paper use by 37%, and on total paper expenditure, it has reduced it by 21%.[59]

[56] UBC Office of Sustainability- http://www.sustain.ubc.ca/
[57] Ibid
[58] UBC Office of Sustainability-Annual Report 2006, http://www.sustain.ubc.ca/pdfs/ar/2006sust_ar.pdf
[59] UBC Office of Sustainability- Annual Report 2006, http://www.sustain.ubc.ca/pdfs/ar/2006sust_ar.pdf

Another university with great sustainability initiatives includes Mount Allison University. This is a completely pedestrian campus, where all vehicles except maintenance vehicles are prohibited. Bike racks were installed to promote alternative transportation. Even MT.A Facilities Management purchased a "go around" bike for employees to get around campus and use for small deliveries. The university purchased and installed soot blowers in boiler rooms to reduce soot build-up and improve energy efficiency. Some of MT.A's sustainable common practices include: fixing leaks promptly, replacing light bulbs with compact fluorescent lighting instead of incandescent bulbs, installing "watt-stopper" light sensors in new buildings, using "Integrated Pest Management" on the grounds instead of pesticides, landscaping for drought resistance, composting of yard waste as mulch and fertilizers for grounds, using natural solutions versus chemicals, and using biodegradable cleaning products.[60]

[60] Mount Allison University, http://www.mta.ca/environment/initiatives.html

7. **Polk County Recycling Facility** (Kathleen)

In our search for current and prospering recycling models, we not only looked at other universities but nationally and locally at public facilities. We traveled to Winter Haven, Florida where we observed the Polk County Recycled Materials Processing Facility (RMPF). Recyclables from the surrounding area arrive at the facility either by curb side pick-up or through its drop-off center. The materials come into the facility mixed up and are then sorted on a conveyor belt where they fall into the appropriate bins to be bundled later. After the materials are bundled, they are then sold to local companies who will in turn sell them to the appropriate people where they will be turned back into raw materials. The facilities most profitable items are 1) cardboard, 2) white paper 3) color mix paper, 4) aluminum, 5) steel, 6) plastic, and 7) glass.

The importance of the facility is not what they do (many facilities operate like this); the importance is the facilities teaching aspect. Polk County Landfill gives tours and educates others about its recycling facility and landfill. "Recycling Services offers informational handouts, classroom and project materials, and tours of Solid Waste's Recovered Materials Processing Facility to all Polk County schools and other interested groups. The tours, which occur at their largest disposal facility, enable those who participate, a glimpse into the many efforts that go into maintaining an effective solid waste operation."[61]

[61] "Recycling Services." Board of County Commissioners- Polk County Florida (par.8) www.polk-county.net/county_offices/solid_waste/recycle.aspx

When touring the recycling facility, one can view the whole process in a second story glass observation deck which overlooks where the recycled materials are brought in, sorted, and bailed. Those who tour the facility are able to see the entire operation and learn about the process. The landfill there is also used by students in Florida for research purposes. Right now, the University of Florida is currently working on a solid waste study there.

After visiting the facility, our group was very eager to see some type of facility like the one at Polk County on the USF Tampa Campus, a facility that could process its own recyclables. Also, it could be a place where students and others in the community could learn and benefit from its development. And in the process, raise awareness and educate faculty, staff, students, and the community about the importance of recycling and the rising concerns that we may very soon deplete our natural resources. There is a strong need to motivate those on campus and administration that we must recycle more and we must have a means by which this can happen.

8. Recycling Facility Construction (Eric)

The development of a Materials Recovery Facilities (MRF) at USF has been explored by the GreenHorn Recycling Team (GHR) in Dr. Henley's class: Business Plan Development (GEB 6115-6935) and New Venture Formation (GEB 6116-6324). This team explored privatizing recycling at USF, where many roadblocks were found pertaining to how a profit could be earned from student recyclables. GHR will establish a sustainable recycling program through a Non-Profit educational company to partner with USF's administration, Physical Plant, and businesses in the community to operate a 18,000sq ft. MRF. GHR will operate the MRF and provide the coordination, education and collection of recyclable items on the USF campus, with plans to expand to Temple Terrace, MOSI and Busch Gardens to become more sustainable. GHR will develop a contract with USF to take all "scrap" generated by the campus. GHR will sell or dispose of the material once it is processed at the MRF.

GHR will work with the campus administration, facilities, and student organizations to provide a comprehensive collection process. Every building will be included in the program. The program will include:

- An established recycling office that manages recycling staff and administrative functions
- Containers for separating and storing materials
- A vehicles for transport
- A warehouse to process and stage materials
- Partnership with the University of South Florida
- Partnership with area material processors

This will include several stages:

1. Community marketing – The USF area will be saturated with recycle speak and clearly marked and attended containers where everyone can easily separate recyclable materials.
2. Coordination – Colleges and community building will have their recycle containers emptied regularly and materials taken to MRF.
3. Densification - MRF facilities will separate, consolidate and compact each material for sale to bulk shippers.
4. Research – MRF income will be used for further technology innovation and testing to develop new procedures and patentable products which utilize waste materials.
5. Education – MRF facility will provide training to operations staff.

MRF design and details are included in Appendix D from the GHR plans.

A. Research of Alternative Methods

After reviewing and studying the many universities that have been successful in recycling and sustainability efforts it can be seen how often this is a student initiated effort. Of course student participation is critical, but also student initiatives are often central for the success of these programs. When we examine the costs and benefits (Section IX) we see that these programs are usually only a savings to the sponsoring institutions. Many programs must pursue grant funding or other organization support to remain in operation (as defined in Section V). Developing research efforts are another viable option to create sustainability.

As the MRF operations get more established materials will be separated into purer components. Additionally new resources from the waste stream can be recycled as well. New techniques and methods will be developed including review and specification or more refined operation procedures.

The USF MRF or GHR MRF is designed to include space and facilities for faculty and students to research new innovations in recycling and reuse technologies. Research grants will help support the MRF operations. New innovations can utilize the recycled raw materials to create unique products or technologies which can develop spin-out companies to enhance the University's research missions.[62] The research facilities can also be contracted to businesses that are exploring utilizing this new source of raw materials or development of other sustainability operations.

For Example, here's an idea: Build a company that provides Alternative Fuel (see Appendix E)

Step 1 Build an Alternative Fuels Distribution Facility of BioDiesel (B20) at USF

1. Create a management team with USF's Fleet Management Services to build the Alternative Fuel Vehicle Project.
2. Build a $60,000 state-of-the-art on-campus fueling station
3. Contract to UFS fleet to provide BioDiesel to all USF vehicles (buses, cars, trucks that move solid waste, mail, and food and dining supplies, as well as facilities maintenance vehicles). Even look at lawn care devices. If it uses fuel to run - convert to BioDiesel.

Step 2 Create a partnership with Alternative Fuels Vehicle Manufactures

1. Have them offer huge incentives to USF students and staff to purchase Alternative Fuel Vehicles

Step 3 Create Alternative Fuels Infrastructure

1. Multiple Fueling stations
2. Mechanical Shop
3. Education

[62] Center for Technology Commercialization, www.ctc.org

Step 4 Provide a research facility for USF students

Step 5 Create a coalition to encourage Alternative Fuels in the city of Temple Terrace and beyond

B. Education and Teaching Model

Increase efficiencies with more refined operation procedures will allow the MRF to begin teaching other operators across the country. Additional techniques and methods will enable the MRF to be the teaching model for other MRF operations. Conducting tours and OHSA training will also provide needed skills to other MRF operators.

Finally, local schools will be encouraged to visit the facilities to help instruct students about the benefits of recycling. As students learn about the resources and materials that can be recovered more sustainable ideals will be brought home. Students have a significant impact on the family and community response to recycling education efforts. Seeing the costs and problems that excessive packaging and wasted materials bring to the environment will change people's habits and idea about waste and recycling. Educational efforts will include other sustainability ideas. The use and waste of a soda can or bottle is a very simple concept that students can easily get a grip of. Using the recycling center to bring sustainability concepts home to students will be a very workable and simple process. Far reaching sustainability operations and issues such as Global Warming and the Water Wars or Oil Crisis are too far off for a student to consider their own impact significant. However, the soda bottle in the trash or the recycling bin is a viable alternative that can bring these far reaching ideals into context for understanding and creating an impact on the community and the environment.

> “The significant problems we face cannot be solved at the same level of thinking we were at when we created them." – Albert Einstein

The GHR MFR conceptions can provide the stepping stone for educating the public and making “sustainability” and practical applied program at USF instead of some ideal argued about over big oak desk in fancy glass air conditioned offices by overpaid white folks who have underpaid minorities workers picking up after them like in the big southern plantations from centuries ago.

9. Costs/ Benefit Analysis (Eric)

The benefits of a sustainable recycling program is best understood by a triple bottom line concept (Figure 1) when evaluating their business operations. The triple bottom line concept considers all business decisions from three perspectives: Environment, Economic, and Social.

1. Environment (Is the decision profitable to our Environment?)
2. Economic (Is the decision profitable to our Business?)
3. Social (Is the decision profitable to our People?)

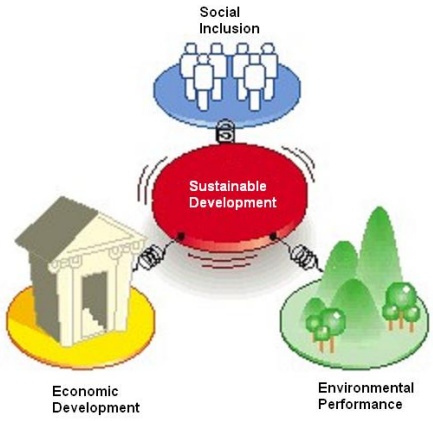


Figure 1 Triple Bottom Line

As a Non-Profit Company in the "Green" and Sustainability industry we consider this triple bottom line concept a key to our success. We will endeavor to make all decisions considering all three of these bottom lines.

The Ecology Bottom Line ensures we consider Mother Nature. Mother Nature is the ultimate stakeholder in our analysis. The Ecology Bottom Line may often times be difficult or impossible to quantify. Business decisions of GHR will use a common sense approach to consider the ecological impact of its decisions. The Economy Bottom Line ensures we consider our organization. GHR will seek to generate positive revenue streams to reinvest in improving our operational processes. The Economic Bottom Line is the focus of this Business Plan. The Equity Bottom Line ensures we consider our people. All of our stakeholders will be considered in our business decisions. GHR will

adhere to an appropriate organizational ethics program to ensure all employees understand this essential ethic.

Considering all three of these perspectives simultaneously when making business decisions will assist in steering a sustainable recycling program. To this effect the National Recycling Coalition has developed a new resources for use in promoting recycling "The Environmental Benefits Calculator." Based on material recovery and disposal data inputted by the user, the calculator will provide detailed information on recycling's environmental benefits in four key areas[63]:

- Energy Savings (Table 3 Appendix F)
- Reduction in greenhouse gas emissions (Table 2 Appendix F)
- Reduction in emissions of air and water pollutants (Table 5 Appendix F)
- Conservation of natural resources (Table 6 & 7 Appendix F)

[63] NATIONAL RECYCLING COALITION INC.; 1727 King Street, Suite 105; Alexandria, VA 22314-2720 www.crra.com

10. How Do We Get There? (Kathleen)

How do we improve recycling at USF? This is a very important question. There are many different ways this can be accomplished. Universities have done various things to cut down on waste, such as reusing cups, composting, computer recycling, using double sided printing, or events recycling. These are the things that our campus should be doing. We must no longer recycle the bare minimum, but find new ways to recycle and reuse in many different areas on campus. There is no sound or set way to get our campus to recycle more; rather this move is made up of many little steps. We must take these steps in order to lower our ecological footprint and take responsibility for our actions.

In order for this to be a success, we must get faculty, staff, and students to recycle more, and spark an interest and desire among these key stakeholders to change their old habits into new ones. Getting everyone on board is very important to the success of this initiative. There are already many groups and individuals on campus who are concerned and trying to develop their own initiatives to make USF more sustainable. In order for things to change we must unite everyone; after all, a thousand voices are louder than one. By bringing these groups together, changes can be made much faster.

Many universities that have implemented initiatives towards becoming more sustainable have developed offices on their campuses dedicated to this cause. These sustainability offices serve to research, develop, and coordinate new sustainable practices on campuses and to reduce wastes in areas such as recycling or energy consumption. Having an office of sustainability on campus would move USF forward and aid in our cause.

Education is a major component which will help USF reduce, reuse and recycle our wastes. We must educate the faculty, staff, students, and the community, emphasizing the importance, urgency, and the effects of not recycling or taking care of our planet. Students and staff need to speak out to others and change attitudes and mindsets.

Education and awareness can be accomplished through marketing. Flyers and bulletins could be used along with articles in the Oracle or community newspapers. Activities and contests such as recycling gatherings can be used to educate and to compete among one another. This could be used by competitions among buildings or student groups. RecycleMania is another contest, held by Waste Wise.[64] It is a competition between universities to see who can raise the most recycled material. Promoting and selling reusable cups is another step that should be taken to help in reducing and reusing. Carleton University in Ontario, Canada was very successful with their "Lug-A-Mug" initiative, which they implemented to cut down on waste. Those students who used their cups or mugs were then offered a discount on beverages as an incentive.[65] Universities often use a combination of marketing activities in order to send a message and educate people on campus about recycling.

There are more specific steps besides the ones described above that can be taken in order for us to arrive at our goal. The following list details steps that should be done in order for our campus to implement a successful recycling program.

[64] RecycleMania (par. 1) www.recyclemaniacs.org
[65] Robinson, Cindy. "Mug lugging reduces waste at Carleton." (par. 2-3) http://syc-cjs.org/sustainable/article/11

C. Gain support

As mentioned earlier, all groups with similar interests on campus should be united together. There should also be support from faculty, staff, and students. "The most successful campus recycling programs have emerged from collaborations among all levels of college administration, academics, and operations. An ideal planning committee would include student leaders, faculty, operations staff, and administrators. The purpose of this group will be to identify program goals, resources, hurdles, and possible solutions from their various perspectives."[66] To have a successful program we must receive valuable input and approval from our stakeholders.[67] Through our efforts thus far, we have gained support in this area, but more support for this program is needed for it to be a success.

D. Research

When implementing a recycling program, this step is crucial to the success of our efforts. This is the step we have spent most of our efforts on, looking at various elements that have been discussed thus far. However, research should be ongoing and we should always be continually improving our operations.[68]

E. Conduct a waste audit

A waste audit was not conducted this semester but it is essential that this happen. A waste audit is used to identifying our wastes, to see what we are throwing out and the amounts of each material. "The point of a waste audit is to learn from our mistakes (what

[66] Office of Waste Management: University of Missouri. (par. 2) http://outreach.missouri.edu/owm/greencampus/recycling.htm
[67] Ch.5: "From Theory to Practice: Getting Started and Strategizing." (par. 2) www.syc-cjs.org/tiki-index.php
[68] University of Oregon www.uoregon.edu/~recycle/HowTo.htm

we shouldn't be throwing out), and make the future waste better."[69] By completing this, it will give us a better picture as to how much recyclable material we could be recycling instead of throwing away.

F. Decide on the program

Through our research, we feel USF would benefit greatly from a self-run facility on campus. However in going forward with this idea, many things must be decided on such as location of bins, materials that will be collected, collection systems, equipment needed, staffing, funding, and all of the specifics pertaining to its setup.[70] Also, once the processing center is implementing, we will need to hire a "full-time paid recycling coordinator to keep the program running smoothly. Programs operating on volunteers or short-time student coordinators only have a low success rate and also provide little security for program longevity and development."[71] "If volunteers are used we will still need a coordinator for the program to keep things running smoothly and to contact if something goes wrong."[72]

G. Generate funding

If we are to collect, sort, and bundle our recyclables on campus, which will require a facility and staff to perform this function, we will need adequate funding and support for this. This will require any budgets that are allocated towards this and available grants for our cause. According to the University of Oregon, "At a minimum, college recycling programs require: containers for separating and storing materials; a vehicle for transport

[69] "Ecos' Waste Audit" (par. 3) www.su-ecos.ca/content/WasteAudit.htm
[70] Office of Waste Management: University of Missouri. (par. 1) http://outreach.missouri.edu/owm/greencampus/recycling2.htm
[71] University of Oregon (par. 23) www.uoregon.edu/~recycle/HowTo.htm
[72] Office of Waste Management: University of Missouri. (par. 4) http://outreach.missouri.edu/owm/greencampus/recycling2.htm

(either borrowed from college facilities or purchased solely for recycling use); a warehouse to process and stage materials; an established recycling office that manages recycling staff and administrative functions; and labor of course!"

H. Implementation

Finally, we must implement the program. It is best to begin with a pilot program of a smaller scale, with less materials involved, to ensure any quirks are worked out. According to the University of Oregon, "It may be easiest to concentrate on one or two materials at first to get the university community accustomed to the idea of recycling. The pilot program is often used to work out problems and streamline the collection and transportation process."[73] After the successful launch of the program, more recyclable materials should be included in what we recycle at USF. Lastly, the process must be continually monitored and improved after implementation.

By starting a recycling program, we are beginning to take steps in the right direction. However, the mindset of becoming more sustainable should be applied in all areas of what we do and how we live. Not only should we take steps to recycle, but we should also buy recycled goods. By purchasing things like recycled paper, we will further be promoting this cause and this will also "strengthen the market for recyclable goods."[74] It is very important that this happens because "by purchasing recycled content products we are doing our part to help maintain market demand for recyclables and to ensure the continuation of recycling programs everywhere. If consumers purchase more products

[73] "How to set up a recycling program." University of Oregon. (par.29) www.uoregon.edu/~recycle/HowTo.htm
[74] Ibid., par.20

with recycled content, manufacturers will continue to incorporate recyclables into their products and expand the usage to even more products."[75] By doing this we are closing the loop. "Each arrow in the recycling logo represents one step in the three-step process that completes the recycling loop. The first step is collection. The manufacturing process is the second arrow in the recycling symbol. The third step is where you, the consumer, purchase products made with recycled content. When you "Buy Recycled," you complete the recycling loop."[76]

By implementing new recycling initiatives and taking these steps, we can insure a successful recycling program on campus. We have only just begun our journey towards making USF more sustainable. So, if we start now by creating a vision and taking positive steps, we can help USF to become like so many other institutions that have successfully implemented recycling initiatives, which have benefited their campuses, communities, and the environment.

[75] "Closing the loop, buy recycled." (par. 1) http://www.co.tompkins.ny.us/solidwaste/ctl.html
[76] Ibid., par. 3

11. Take Action Now (Kathleen)

It is imperative that we take recycling and other environmental issues seriously. USF needs to do its part in preserving our natural environment. It used to be that global warming and El Niño were just buzz words. The melting of the polar icecaps and extinction of species was something that environmentalists have been warning us about for years. Today, with increasing ocean temperatures, the icecaps are melting faster than anyone ever thought and native species, like the polar bear, are forced out of their habitat.[77] With extreme weather conditions and new facts about the seriousness of this issue, people are finally catching on. Because of our lack of concern for the environment, the warnings once heard about are now becoming a reality.

USF has a large impact on the environment due to its size. We generate large amounts of waste, use significant amounts of energy, and release various pollutants through our use of chemicals and automobile admissions. According to the Environmental Protection Agency (EPA), "in 2003, U.S. residents, businesses, and institutions produced more than 236 million tons of municipal solid waste (MSW), which is approximately 4.5 pounds of wastes per person per day."[78] Around 40,000 students attend USF, and while most live off campus and only spend a portion of their time on campus, this is still a large amount of trash. Most of this MSW is composed of recyclable material.

[77] Kluger, Jeffrey. "By Any Measure, Earth Is at…The Tipping Point." TIME 3 Apr. 2006 http://proquest.umi.com.ezproxy.lib.usf.edu
[78] "Basic Facts: Municipal Solid Waste." EPA (par. 2) www.epa.gov/epaoswer/non-hw/muncpl/facts.htm

The "EPA has ranked the most environmentally sound strategies for MSW. Source reduction (including reuse) is the most preferred method, followed by recycling and composting, and, lastly, disposal in combustion facilities and landfills."[79] We must first try to reduce and reuse, after this, recycling must take place. It is important to reduce and reuse first, because recycling using resources and energy as well. It takes vehicles to pick up and transport the recyclable material and significant energy is used in the manufacturing process to turn the goods back into raw materials. Therefore, reducing and reusing are the most environmentally preferred options. However, recycling is still very beneficial and we must remember to close the loop by purchasing recycled materials. By reducing, reusing, and recycling, USF can help divert many of our wastes away from landfills and save valuable resources in the process

Many colleges throughout the US, Canada, and internationally have created recycling programs on campus with great success. USF needs to do the same and bring itself up to par with the rest of the universities in this country. Many of these universities have gained a valuable image as a result of their efforts towards sustainability. By initiating efforts towards waste reduction and sustainability, USF could gain a positive reputation as a university that is equipped with the most recent advancements and one that is on the forefront of this cause. The teaching aspect of the recycling processing facility could create a competitive advantage for USF. This would enable us to research and find new and improved ways in resource reduction. As well as provide programs for OSHA training, student projects, and general education to interested parties.

[79] Ibid., par. 5

If USF continues on the path it is now, our school will be loosing out on potential cost savings. It is true that there is an initial capital investment, but this can be offset by savings done the road, from less generated waste and decreased disposal fees.[80] Although not much money can be gained through recycling alone, income could be generated through training at the recycling processing center, which would help support the costs of operating the facility.

Recycling also stimulates the economy as well, through job creation. "On a per-ton basis, sorting and processing recyclables alone sustains ten times more jobs than landfilling or incineration."[81] An increase of jobs was seen in Humboldt County California, after a recycling center was built. The county had "a high unemployment rate and low median income due to the dislocation from the demise of the timber and fishing industries. The presence of the recycling center has created a ripple effect in the local economy."[82] The proposed recycling facility at USF will create jobs as well, and benefit the local community through its services. Unpaid volunteer work would not have this benefit, but it would still benefit students through the education and experience that the processing center could offer.

It is crucial that USF implement a better recycling program. USF has a duty to help in preserving the environment and to set an example as a caring and responsible university.

[80] "Tidbits and Facts." Ecocycle (par. 18) www.ecocycle.org/tidbits/index.cfm#savings
[81] "Zero Waste." Ecocycle (par. 6) Brenda A. Platt and David Morris, "The Economic Benefits of Recycling" (Washington, DC: Institute for Local Self-Reliance, February 1993), p. 9. www.ecocycle.org/zero/index.cfm
[82] Ruben, Barbara. "Reusing, Recycling, Revitalizing." Natural Life Magazine. www.life.ca/nl/41/reuse.html

We must start now in doing our part and try to reverse the effects of pollution before it is too late.

12. Future of the Industry (Eric)

This industry is growing strongly. Americans spend over $30 billion a year to manage the disposal of a single year's eight billion tons of waste. Approximately 232 million tons[83] are labeled as municipal solid waste (MSW Figure 2). Hillsborough County MSW typical recycling components are shown in Figure 3.[84] Currently USF uses the Hillsborough County waste to energy facility and will continue to as defined in Appendix B Item 9D1. This future is missing a great opportunity to develop in the recycling and reuse industry where a number of other universities are succeeding.

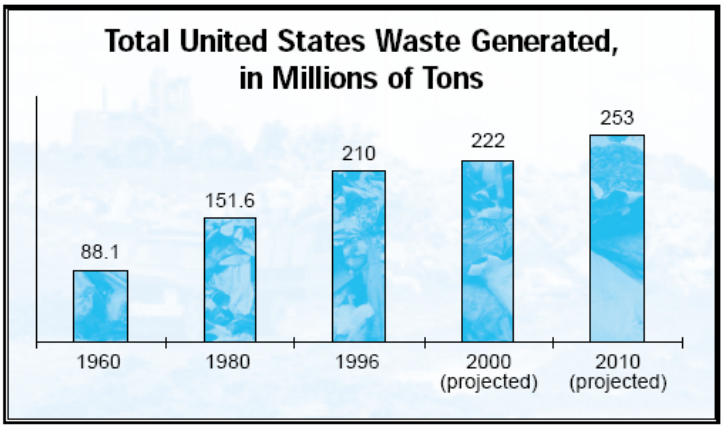
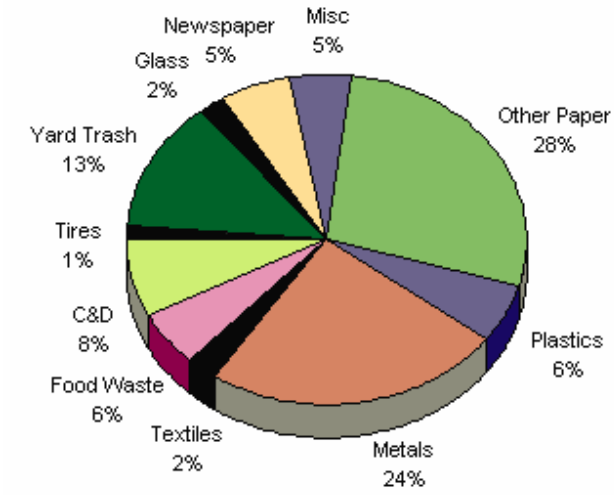


Figure 2 MSW Generation and Distribution

Figure 3 MSW Hillsborough County



Florida hosts nearly 3,700 recycling and reuse establishments employing approximately 32,000 people generating an annual payroll of $765 million and $4.4 billion in annual revenues.[85] Recovering materials from the waste stream must be profitable simply by the number of businesses in Florida operating. Further if we look at the cost of using raw materials vs. recovered materials,

[83] Recycling Works! State and Local Solutions to Solid Waste Management Problems, April 1999; Environmental Protection Agency www.epa.gov
[84] Recycling -2002 Solid Waste Annual Report Data www.dep.state.fl.us/waste/categories/recycling/pages/02_data.htm
[85] *Final Report U.S. Recycling Economic Information Study;* Prepared for The National Recycling Coalition by R. W. Beck, Inc. July 2001

there are significant energy savings (Figure 4). These two statistics alone are something to consider in pursue the opportunity of privatizing recycling on campus.

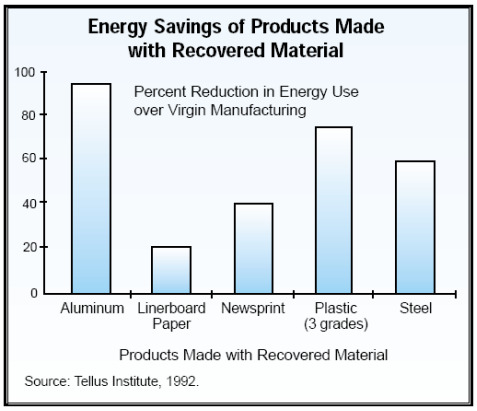


Figure 4 Energy Savings for recovery.[86]

[86] Recycling Works! State and Local Solutions to Solid Waste Management Problems, April 1999; Environmental Protection Agency www.epa.gov

13. What Was Gained From Analysis (Kathleen)

Throughout our work, we have learned many things about recycling and sustainability in general. We take away from this analysis, knowledge and appreciation of all the new developments that have been made towards keeping our planet alive and thriving. But more needs to be done; the best technology has yet to be developed. Alternatives to our current processes must be found, ones that no longer degrade our environment, like our strong reliance on petroleum.

We have learned many valuable aspects of waste management, recycling, and sustainable practices. Through our research of different recycling models, domestically and internationally, we have gained an understanding of how they can operate efficiently and how recycling has benefited these different institutions. We know that our college, like so many others, can benefit enormously from an improved recycling program and can experience cost savings as a result.

This analysis also has shown us the importance of sustainable actions in business. Companies have a duty, to do their part in preserving the environment since it is these businesses that do the greatest amount of damages through their operations. By becoming more sustainable, companies can benefit through the costs savings too. By doing simple things, such as switching light bulbs to more energy efficient ones or using double sided paper for printing, companies can save substantial amounts of money. We have seen that there are businesses out there that do care and are finding ways to lower

their ecological footprint. With the rising concerns about the environment, more businesses will most likely follow suit.

We now have a better understanding of the importance of recycling and sustainability that is felt among faculty, staff, and students. With the amount of interest on campus for more sustainable practices, this is only the beginning to something great. We can make a difference. The problem is that each person believes that their actions alone will not matter. We can change this mindset by implementing a recycling center with strong educational components. Balancing our lives and technology with the environment to maintain harmony is going to be one of the biggest challenges, but it is a challenge that is conquerable.

14. Appendices

Appendix A Recycling and Reuse Value

Recycling and Reuse Add Value to the U.S. Economy

According to the study, the recycling and reuse industry consists of approximately 56,000 establishments that employ over 1.1 million people, generate an annual payroll of nearly $37 billion, and gross over $236 billion in annual revenues. This represents a significant force in the U.S. economy and makes a vital contribution to job creation and economic development.

Estimates of Direct Economic Activity
Annual Payroll and Estimated Receipts are in $1,000. Throughput is in Thousands of Tons.

Data Type	Recycling Collection	Recycling Processing	Recycling Manufacturing	Reuse and Remanufacturing	Industry Total
Establishments	9,247	12,051	8,047	26,716	56,061
Employment	32,010	160,865	759,746	169,183	1,121,804
Annual Payroll	956,875	3,826,360	29,181,749	2,747,498	36,712,482
Estimated Receipts	1,974,516	41,753,902	178,390,423	14,182,531	236,301,371
Estimated Throughput[1]	191,082	191,082	157,545	N/A	N/A

[1] Throughput is amount of recovered material recycled and includes manufacturing scrap sent for recycling. It excludes materials prepared for fuel use and in-house process scrap returned to the manufacturing process. Throughput estimates are summed to avoid triple counting at collection, processing, and manufacturing stages.

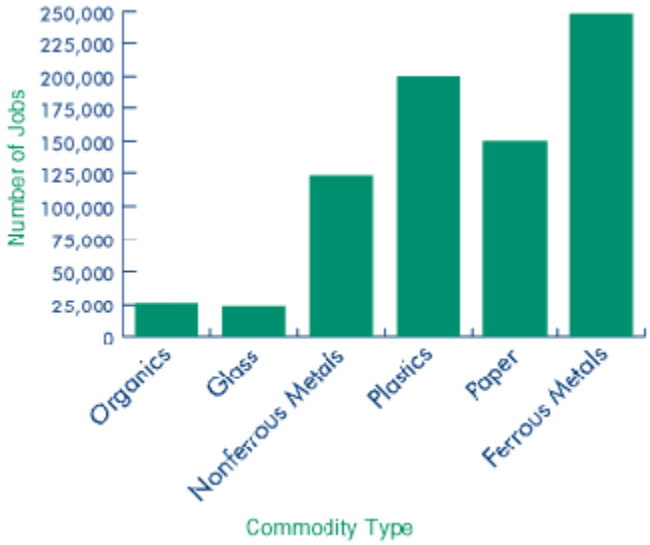
Recycling is a Diverse Industry

Recycling is an integrated system that starts with curbside collection of materials by municipalities, involves processing of recycled materials, and leads to manufacturing of new products with recycled content. The study identified 26 different types of recycling organizations. The recycling sector includes long-established sectors like paper and steel making, as well as new entrepreneurial ventures such as composting and plastic and rubber product manufacturers. Four major manufacturing industries account for over half of the economic activity of the recycling and reuse industry:

- Recycled paper and paperboard mills, which employ 139,375 people and gross nearly $49 billion in estimated annual receipts;
- Steel mills, which employ 118,544 people and gross $46 billion in estimated annual receipts;
- Recycled plastics converters, which employ 178,700 people and gross nearly $28 billion in estimated annual receipts; and
- Iron and steel foundries, which employ 126,313 people and gross over $16 billion in annual estimated receipts.

The recycling industry also includes companies that are quickly finding a market niche, including computer demanufacturing, organics composters, and plastic lumber manufacturers.

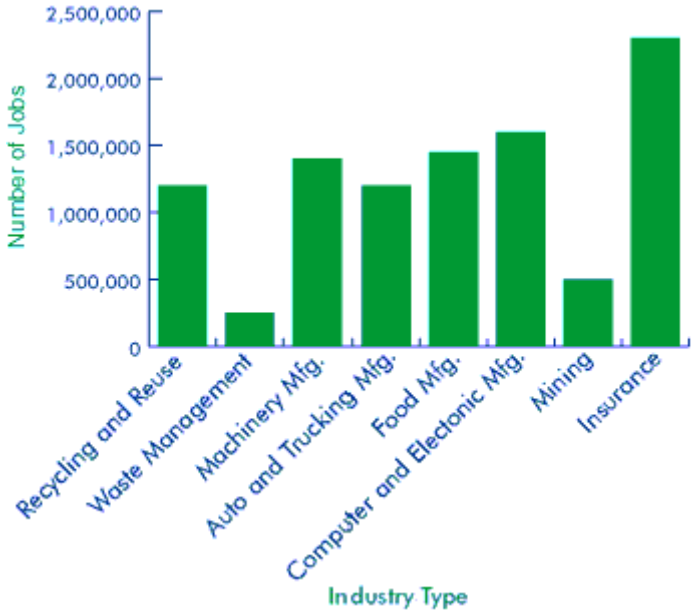
Recycling Manufacturing Industry Employment by Major Material Group



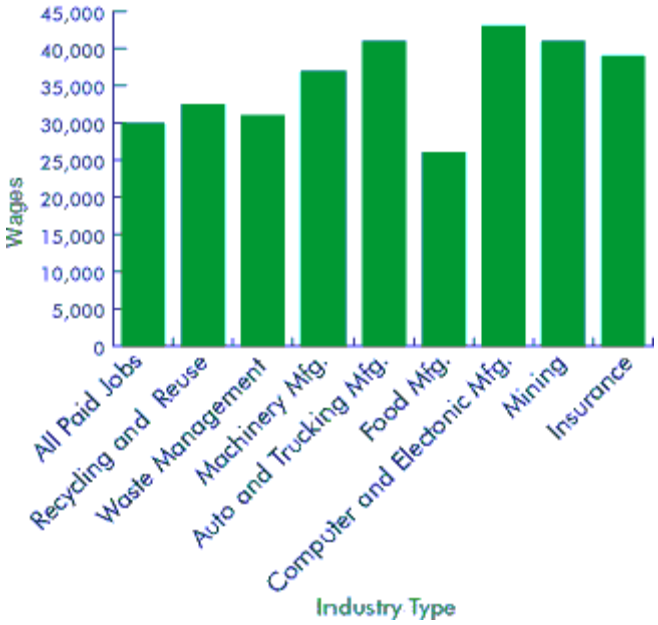
Recycling is Competitive with Other Major Industries

As a driver of economic activity, the recycling industry compares favorably to other key industries, such as automobile manufacturing and mining. Especially significant is the finding that recycling far outpaces the waste management industry because recycling adds value to materials, contributing to a growing labor force. Recycling also provides a large number of jobs that generally pay above the average national wage.

Comparison of Industry Employment



Comparison of Annual Wages per Job



Local Recycling and Reuse Spur "Downstream" Economic Impacts

Investment in local recycling collection and processing, as well as strong government policies, spurs significant private sector investment in recycling manufacturing and promotes economic growth. The study tallied this "indirect" impact of recycling on support industries, such as accounting firms and office supply companies, for a total of 1.4 million jobs supported by the recycling and reuse industry. These jobs have a payroll of $52 billion and produce $173 billion in receipts.

Spending by employees of the recycling and reuse industry also contributes indirectly and adds another 1.5 million jobs with a payroll of $41 billion and produces receipts of $146 billion. The recycling and reuse industry also generated roughly $12.9 billion in federal, state, and local tax revenues, with 80 percent going to federal and state government.

Contribution of Recycling and Reuse to Government Revenues - Direct Effects Revenues (in $ millions)

Industry Sector	Federal	State	Local	Total
Recycling Collection	200	100	100	400
Recycling Processing	700	400	300	1,400
Recycling Manufacturing	5,400	2,600	2,100	10,000
Reuse/ Remanufacturing	600	300	200	1,200
Total	6,900	3,400	2,600	12,900

Contribution of Recycling and Reuse to Government Revenues - Total Effects Revenues (in $ millions)

Industry Sector	Federal	State	Local	Total
Recycling Collection	300	200	100	600
Recycling Processing	1,700	800	600	3,200
Recycling Manufacturing	20,500	9,900	7,800	38,200
Reuse/ Remanufacturing	2,100	1,000	800	3,900
Total	24,600	11,900	9,400	45,800

Reuse Businesses Contribute Significantly

The reuse industry is widespread and ranges from more traditional establishments such as local thrift stores and antique shops to more recent, dynamic operations such as computer demanufacturers, pallet rebuilders, and materials exchanges. As a whole, the reuse industry employs nearly 170,000 workers in more than 26,000 establishments nationwide. The reuse industry also supports an annual payroll of $2.7 billion and generates revenues of approximately $14.1 billion.

Analysis of Economic Activity for the Reuse Industry	
Establishments	26,716
Employment	169,183
Annual Payroll	$2,747,498,000
Estimated Revenue	$14,182,531,000

Appendix B Campus Master Plan

Excerpts of sustainable & recycling highlights
USF Tampa 2005 Campus Master Plan Update
Final Report: January 2006
http://usfweb2.usf.edu/FacilitiesPlan/Campus%20Planning/plan_draft.html

According to The Lombardi Program on Measuring University Performance, "[the] work that defines a research university's level of competitive performance appears in the accumulated total productivity of its individual faculty, staff, and students." The conclusion was also made that "high-quality faculty become more productive when they work in contexts with significant numbers of other high-quality faculty…" and "University quality, once established at a high level and substantial scale, becomes self–sustaining." Based on this information and the USF Strategic Plan and the 2005-2006 Legislative Budget Request, some suggestions to help develop an enrollment profile consistent with top research universities are as follows:

Recommendations
Update policies and Plan Framework guidelines to reflect architectural design changes, including building size and massing criteria that address the growing need for land efficiency and the distinctive character of each land use district; Refine policies to support the increased use of standards of energy efficiency based on state-of-the-art "green" design and sustainable design methods and technologies. As necessity dictates larger building volumes, the importance of maintaining a human scale also increases. The use of architectural details and forms, especially applied to large masses, should be a decisive element in the creation of comfortable and functional spaces. A clearer set of standards would be helpful to ensure/increase compatibility of architectural image in the community of buildings, yet to allow for enough variation so that facilities are individually recognizable for wayfinding purposes.

C. Inventory of Existing Architectural Elements
The university is encouraging novel approaches to architectural style and had built a number of buildings with "neo-traditional" elements. Curvilinear forms building massing had been used in some of the more recent buildings on the Tampa campus. The use of color in the glasswork has been encouraged for both style and energy savings. The university has mandated increasingly energy efficient building envelops and encouraged the use of the many other "green", or sustainable, design and construction techniques. New construction for parking has been in the form of parking structures to provide for the use of existing lots for future building projects.

Consultant services for design expertise unique to student unions/student centers, etc. may be provided by specialty design consultants or joint venture partners. Firm submittals should include descriptions of experience and knowledge of sustainable design.

Summary of Objectives and Policies

Objective 9D.1 : Coordinate with the City of Tampa and Hillsborough County in establishing an appropriate level of service for solid waste collection.

Policy 9D.1.1 : The University shall continue to assist in providing solid waste collection services for the residential and non-residential uses on campus.

Policy 9D.1.2 : The University shall establish a level of service standard for solid waste collection consistent with the Hillsborough County provision of two years of permitted landfill space at the current fill rate, plus 10 years of land under county control for purposes of solid waste.

Policy 9D.1.3 : The University shall coordinate the provision of on and off-campus solid waste collection and disposal facilities required to meet future University needs with the host community or appropriate service provider as outlined in

Policy 9D.1.4 : Specific training shall be developed and administered to all employees who handle solid waste.

Objective 9D.2 : Procedures to reduce University-generated solid waste and increasing recycling and reuse programs shall be defined.

Policy 9D.2.1 : The University shall continue to take steps to reduce the quantity of solid waste generated by expanding its recycling program to include additional interior and exterior, easily accessible drop-off locations. These drop-off facilities shall be installed in the individual buildings, residential areas or in other convenient locations. The University will strive to provide, at a minimum, for the recycling of paper, corrugated cardboard, glass, plastics, and metals. Awareness programs directed toward students, faculty and staff shall be included in this recycling program.

Policy 9D.2.2 The University shall recycle and / or salvage construction, demolition and land clearing waste as practical and possible.

Objective 9D.3 : Establish a program to modify existing solid waste collection locations for convenient service while avoiding potential pedestrian conflicts and visual impacts.

Policy 9D.3.1 : The University shall establish a unified screening program for solid waste collection locations. Included will be the implementation of aesthetic coordination as well as standardized solid waste containers.

Policy 9D.3.2 : The University shall, during the design of specific building programs, evaluate the relationship of the proposed buildings with the existing buildings, and identify opportunities to reconfigure, enhance or screen solid waste collection facilities from pedestrian corridors.

Current Conditions: Solid Waste Sub-Element
The Solid Waste goal for the Tampa campus plan is to provide for future University solid waste collection and disposal requirements in a safe, cost-effective, environmentally sound and an aesthetically satisfactory manner. The University has contracted with private operators for responsibility of removing solid waste. Burnable solid waste is hauled to a County-operated incinerator located on Faulkenburg Road in Hillsborough County. This facility will be able to accommodate any expansion requirements of the University. Non-burnable or recycled material is recycled at the contracted operator's plant at 7th Avenue and 34th Street in the City of Tampa. Solid waste that is either non-burnable or non-recyclable, such as tires, is taken to a landfill located in eastern Hillsborough County which is operated by the County. The amount of Solid Waste and Hazardous Waste Generated by the University has not been provided.

Analysis of Future Needs: Solid Waste Sub-Element
Concepts that can be considered to address future solid and hazardous waste needs of the USF Tampa Campus include:
• Recycling efficacy analysis and improvements in program; Developing bioreactor technology for bioedegradation and recycling of highly putrescible food wastestreams from the Marshall center or on-campus housing;
• Construction of a hazardous waste management facility.

10. UTILITIES ELEMENT
Steam and Chilled Water
Since 1995, the chillers at Health Sciences and FMHI have been interconnected to form a new Northwest satellite plant, creating more diversity of service. The hot water distribution system will require systematic upgrading to remediate deteriorating conditions in the system. Additional chilled water plant capacity will be required to serve the program growth projected in the update. In order to support the University's policy to maintain 75% firm capacity, the addition of a 1,200 ton chiller at the main central plant will only handle current central campus loads. The University should maintain the plan to expand total chilled water capacity to 16,900 tons which will serve existing and projected program demands. Additionally, a new policy will identify procedures for metering of chilled water loads in order to facilitate load management and conservation measures. Also, the next phasing of chiller and cooling tower additions to the Northwest plant should be implemented within the next five years since much of the growth will occur in this section of campus.

There is sufficient boiler capacity to serve the ten-year growth demand for steam and hot water. However, the age of the existing system causes waste energy expenditure for pumping and heating of feedwater and pressure reduction. New policy recommendations included in the update call for (a) the development of hydraulic models for modification and expansion of the piping system; and (b) development of non-destructive testing procedures to evaluate the status of the system. A policy for metering hot water loads to facilitate load management and conservation measures is also included.

Electrical
The existing campus electrical distribution system will not be adequate

STEAM/HOT WATER SUB-ELEMENT
Goal
The Steam/Hot Water sub-element goal of the Tampa campus is to provide adequate heating in the most cost effective manner while providing for flexibility in the growth of the campus.

Summary of Objectives and Policies
Objective 10A.1 : Based on Life Cycle Cost Analysis, and if cost effective, phase out the existing central plant heating equipment and underground hot water pipe distribution system as existing facilities are renovated.

Policy 10A.1.1: The University shall evaluate methods to use waste heat recovery to reduce consumption of hot water. If any of these are demonstrated to be cost effective or otherwise feasible, the adopted campus master plan shall be amended as needed to reflect their implementation.

Policy 10A.1.2: The University shall prepare a study that evaluates the possible benefits of decentralizing the hot water system.
Policy 10A.1.3: Implement energy conservation measures to reduce the hot water load demand and use of high efficiency heating gas-fired equipment.

Policy 10A.1.4: Continue to pursue the possibility of heat waste recovery program from placing a electric utilities co-generation plant in the campus to supplement heating plant load demand. A study to assess the feasibility of this has been completed, and was recently submitted to the University.

Objective 10A.2 : Provide hot water, steam or electric resistance heating plants and/or components for each new or renovated facility.

Policy 10A.2.1: The University's Facilities Planning and Physical Plant Department will be responsible for reviewing all proposed development projects to ensure that adequate hot water capacity exists.

Policy 10A.2.2: Proposed increases in hot water use, whether residential or nonresidential, shall be approved only after a finding that existing hot water distribution capacity is already on-line to accommodate the increased need, or that additional capacity will be funded and on-line at the forecasted future time of need.

Policy 10A.2.3: The University shall extend the new NW satellite plant to integrate the complete heating hot water system for the HSC and FMHI to provide heating load demand requirement in the northwest quadrant of the campus.

Objective 10A.3 : Provide sufficient steam and hot water to correct existing deficiencies and to meet the future needs of the University.

Policy 10A.3.1: The University shall implement hot water improvements as identified on Figure 10-a. The timing and phasing requirements for these improvements are established in the Capital Improvements Element.

Policy 10A.3.2: The University shall establish and adopt a level of service standard for hot water which provides and maintains a range of 140-180 degrees (F) hot water supply temperature to meet building heating demands. The guideline has been set to establish a 30°F temperature differential. Plant leaving heating hot water temperatures may be reduced down to 160°F during the off season and reduce temperature differential down to 20°F.

Policy 10A.3.3: Hot water facility improvements shall be implemented based on the following priorities: Elimination of existing system deficiencies; Maintaining the existing system; and Expanding the system to accommodate new hot water needs. Develop and plan a program to replace aging Rickwell hot water piping with non-corrosive material in the northeast quadrant and the center core of the campus.

Policy 10A.3.4: Refurbish and add isolation shut off valves and service valves in the heating hot water distribution loop to allow a continuous supply of hot water in other areas of the campus when piping leakages occur.

Policy 10A.3.5: Evaluate possible ways to preserve the life service of existing heating hot water piping by providing corrosion protection to all underground heating hot water piping distribution systems.

Policy 10A.3.6: Develop heating hot water hydraulic piping modeling to simulate the actual hot water flow rate condition of the existing distribution system and identify the present and future pumping deficiencies.

Policy 10A.3.7: Update and maintain complete verified hydraulic models for the modifications and expansions of the piping system throughout the campus.

Policy 10A.3.8: Develop and implement non-destructive testing procedures and practices to evaluate the status of existing underground piping systems.

Policy 10A.3.9: Meter hot water loads to implement load management and load history for planning and conservation measures.

Policy 10A.3.10: Implement energy conservation measures to reduce the hot water load demand and use of high efficiency gas fired heating equipment.

Policy 10A.3.11: Continue to pursue the possibility of implementing a heat waste recovery program by placing an electric utilities cogeneration plant in the campus to supplement heating plant load demand.

Policy 10A.3.12: The University shall develop a plan to provide LEED based projects to promote less energy uses reducing the electric and fossil fuel demand.

12. Intergovernmental Coordination.
USF shall pursue any interlocal agreements or memoranda of understanding necessary to ensure that solid waste collection and disposal services will be supplied to the campus to meet the future needs of the University.

13. CONSERVATION ELEMENT
Conservation policies in the 2005 Master Plan Update remain largely the same as in the 2005 plan, addressing conservation of land, habitat, vegetative resources, soil, endangered species, waste monitoring and disposition, and recycling. The Plan Update also preserves the existing Ecological Research Area (north of Fletcher Avenue), the wetland and natural area at the southwest corner of Flether Avenue and 50th Street, and the Lake Behnke/Botanical Garden area (adjacent to Bruce B. Downs Boulevard). A recent report by the Florida Natural Areas Inventory (FNAI) categorized the entire USF Ecological Research Area as a Potential Habitat for Rare Species. FNAI lists several recorded occurrences for the USF Eco Area of rare, endangered, and threatened globally, federally, and State listed plant and animal species. An inventory of the vascular plants revealed that 94% are native to Florida, of which 13 are endemic. Nine are listed as endangered, threatened, or commercially exploited and five are first time recorded occurrences for Hillsborough County. An inventory of birds found in USF Botanical Gardens revealed 59 species of permanent residents with the remainder classified as transient, winter and summer birds. The mix of integrated, viable ecosystems in the USF Ecological Research Area and Lake Behnke/Botanical Garden Areas provide USF with an excellent resource for both education and research. In addition, there are several locations of archeological value.

In general, the University shall continue on a path of identifying opportunities to manage growth with sustainability. Principles shall be incorporated that follow the path of Florida's new Energy Plan adopted by the Florida Department of Environmental Protection. Some of the recommended policies include U.S. Green Building Council's Leadership in Environmental Design Standards.

Sustainability
USF embraces the concepts of sustainable building and site design. The University also recognizes that the techniques, technology and costs of sustainable design are continuously evolving and improving. Therefore, it is the intention of the University to build the most sustainable, efficient, and healthy buildings practical and financially feasible at the time of their construction.

Goal
The Architectural Design Guidelines goal of the Tampa Campus Plan is to create a functional and attractive architectural ensemble that provides variety and interest within an overall consistent vocabulary of shapes, colors, and details that has been developed on campus over the past 10 years, and defines and creates a coherent series of interconnected and pedestrian-scaled campus open spaces designed to encourage and enhance interaction among the campus community.

Summary of Objectives and Policies
Policy 15.1.4: The University shall encourage all future buildings to be designed in accordance with LEED (Leadership in Energy and Environmental Design) design criteria established by the United States Green Building Council as much as practical, possible and financially feasible.

Policy 15.1.5: To the extent practicable, the University shall use the expertise of faculty, staff and students to address sustainability issues, to plan for, monitor and evaluate campus sustainability initiatives.

Landscape Standards
Plantings
New plantings and husbandry of significant existing plantings will be an important component of the future campus landscape. Plantings should be both functional and attractive and should achieve the following broad guidelines: Tree, shrub, and hedge plantings should be appropriate to the scale, uses, and microclimate of the University setting. Within the naturalistic greenways, the use of native plants should be the highest priority in plantings, and where possible, community associations should be established to promote attractive and sustainable plantings. In the more formal open spaces, a native plant palette should be augmented with colorful 'Florida friendly' non-natives – species that are non-invasive and historically associated with a Florida landscape.

Sustainability
USF embraces the concepts of sustainable site planning and landscape design. The University also recognizes that the techniques, technology and costs of sustainable design are continuously evolving and improving. Therefore, it is the intention of the University to build the most sustainable and efficient site improvements and landscape treatments practical and financially feasible at the time of their construction.

Policy 16.8.3: The University shall use high-efficiency irrigation technology and consider use of captured rainwater or recycled site water to reduce potable water consumption.

Policy 16.8.4: The University shall reduce stormwater pollution from the use of pesticides and fertilizers by using only the safest and least polluting fertilizers and pesticides to maintain landscapes.

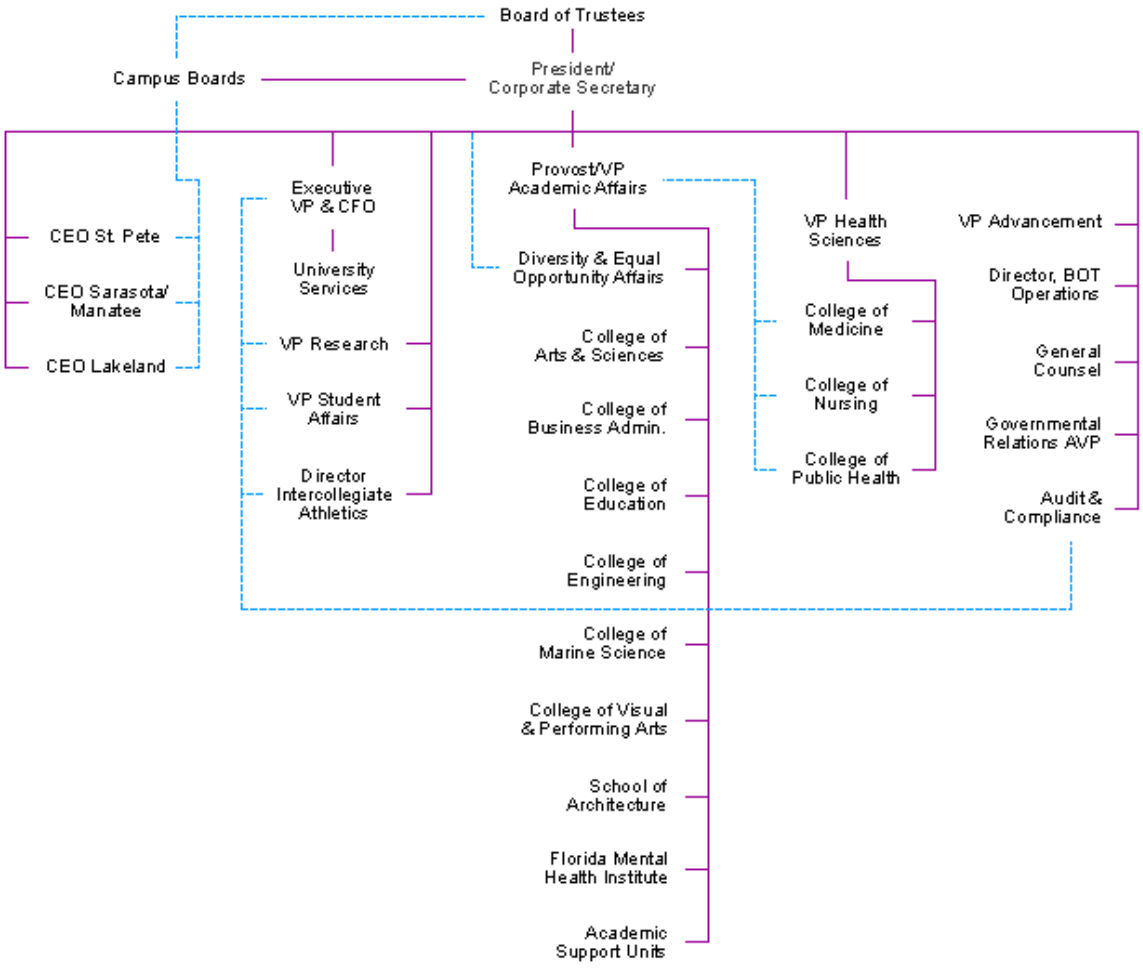
Policy 16.8.5: For common and public infrastructure such as roads, sidewalks, grading, sub base, paving, curbs and sewers, USF shall encourage the use of materials with

recycled content such that recycled materials constitute at least 5 percent of the total value of materials used.

(12) REQUIREMENTS FOR SOLID WASTE GOALS, OBJECTIVES AND POLICIES.
(a) The sub-element shall contain one or more goal statements for accommodating future university solid waste collection and disposal requirements.
(b) The sub-element shall contain one or more objectives for each goal which address:
1. Correcting existing solid waste collection and disposal facility deficiencies; and
2. Coordinating the provision of increased facility capacity to meet future needs of the university.
(c) The element shall contain one or more policy statements for each objective which:
1. Establish the levels of service to be used by the university in establishing solid waste collection and disposal facility requirements;
2. Establish priorities for replacement, correcting existing solid waste collection and disposal facility deficiencies, and providing for future facility needs;
3. Coordinate the provision of on and off-campus solid waste collection and disposal facilities required to meet future university needs with the local government or appropriate service provider;
4. Ensure that future solid waste collection and disposal facility service capacity and capital improvements required to meet future university needs are provided when required, based on needs identified in other master plan elements; and
5. Establish the timing or phasing requirements for solid waste collection and disposal facility improvements to meet future university needs.
(d) The Solid Waste Sub-Element shall be described, at a minimum, in the General Infrastructure Element Map(s) and explanatory text. This map, along with the companion narrative shall identify the location and size of the proposed general infrastructure distribution and collection system lines, treatment facilities and generation facilities. The map and text shall be accompanied by explanatory tabular information as required.
Specific Authority 240.209(1), (3)(q), 240.155(22) FS. Law Implemented 240.155(3) FS. History–New 2-15-94.

Appendix C Organizational Chart

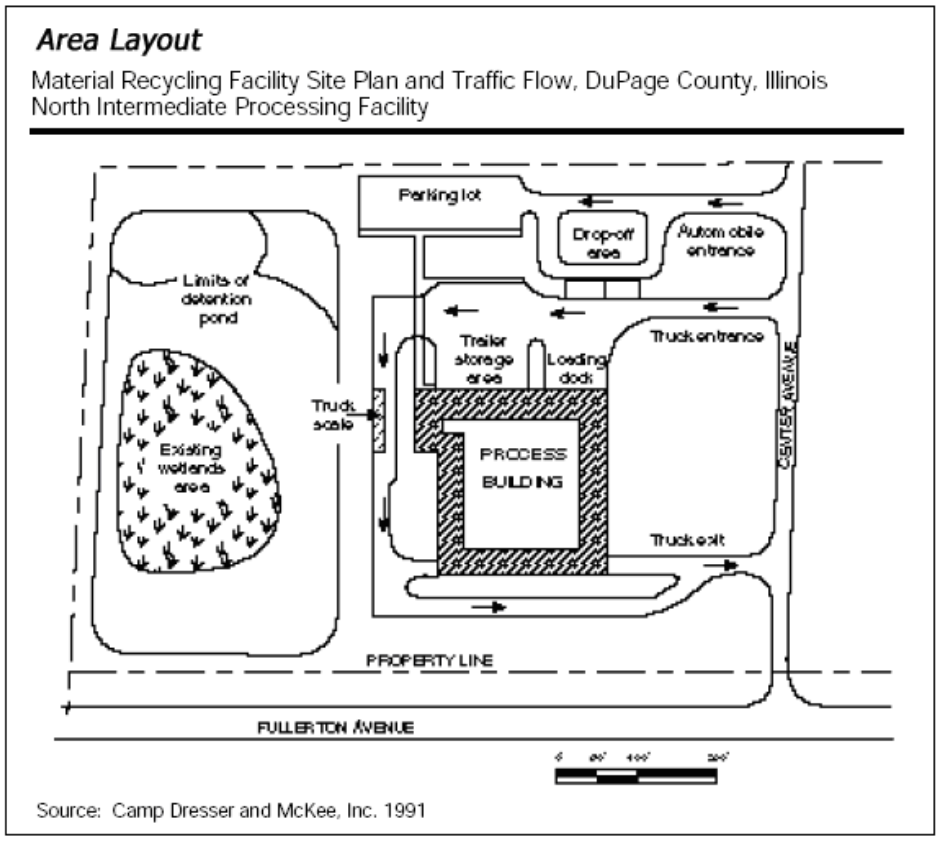
The following is the organizational chart of the administration at USF, which are key stakeholders.



Appendix D MRF Layout and Design

Area

The site will be large enough to accommodate the recycling building, safe and efficient traffic flow for several vehicles, and have buffer space for fencing, landscaping, signs, and other incidentals entrances and exits for trucks will be separate from those used by automobiles.



There will be enough room for tractor/trailers of 55 feet and over to park and turn safely and easily. Also outdoor storage needs for revetments, pallets, baled materials, or appliances will be available. Included will be an area for expansion.

Local land use regulations will be consulted to meet setback regulations. Likewise, some space will be set aside for fencing, signs, and landscaping. Adding trees or shrubs to the site design can will provide a buffer zone, cut down on noise, and provide an aesthetically pleasing appearance to neighbors and to citizens using the site's drop-off center.

Scale

The site will have a scale that can be used to weigh both incoming and outgoing materials. Typical scale lengths are from 60 to 70 feet. The site will also accommodate a queuing area for trucks from the entrance to the scale and from the scale to the recycling facility. To determine the queuing area, some predictions will be made of the peak vehicle traffic times, as well as the time necessary to weigh and unload an incoming vehicle.

GreenHorn will try to minimize the number of intersections and amount of cross traffic in the site design.

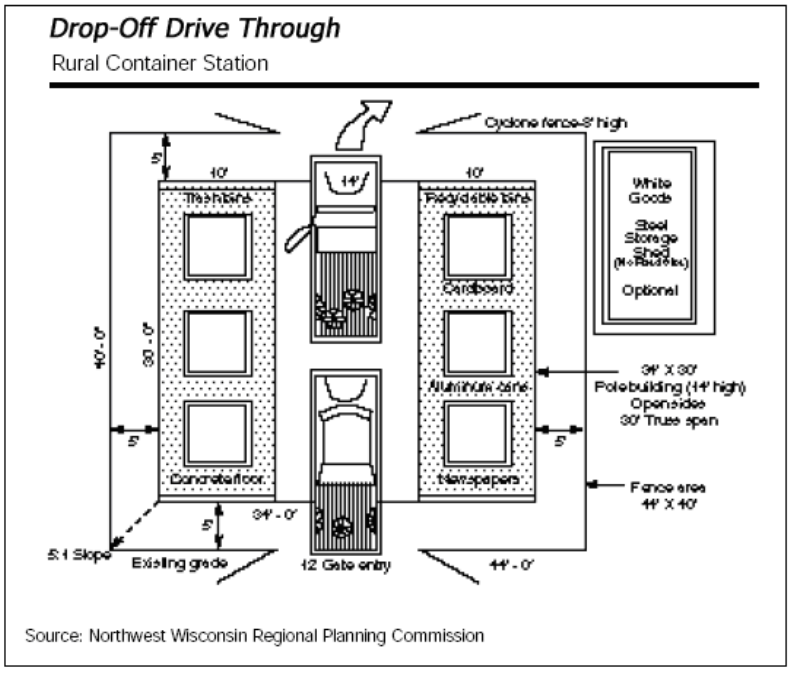
Building Design

The facilities' outside walls will be designed to allow safe and easy access for incoming and outgoing vehicles. It is important to design doors wide and high enough to accommodate vehicles unloading inside the building. Door damage has been a problem at many MRFs because of collisions caused by empty, but still open, trucks backing out. There will be enough doors to accommodate the expected number of trucks at normal peak times. The same is true for areas where materials will be loaded onto trailers for transport to markets.

Tipping or Unloading Area

The tipping or unloading area will be designed to accommodate at least two days' expected volume of material, although even more space would be preferable because insufficient area to handle incoming waste is a common problem for MRFs. The tipping floor will be unheated, but the design will ensure that cold air does not infiltrate the processing area. GreenHorn's MRF is expected to accept both source-separated and commingled materials. Although all recyclable material could be accommodated on one large tipping floor, designing the facility with separate areas for separated and commingled recyclables will be best. Signs will clearly indicate to each driver the proper location for material delivery.

GreenHorn's MRF will be designed to run more than one shift. With this option, sufficient storage space on the tipping floor is essential to allow for processing during the second shift. GreenHorn will process all separated material during the first shift and all commingled material during the second shift. Using multiple shifts will allow for an overall smaller facility design, although the tipping floor may need to be larger.



Source: Northwest Wisconsin Regional Planning Commission

The tipping or unloading floor will be designed to handle heavy weights, withstand the wear caused by pushing and moving recyclables, and to provide efficient drainage for liquids brought in by trucks. Wet floors pose safety hazards for employees and create difficult working conditions. The design must also minimize glass breakage, which poses safety hazards and creates a large percentage of nonrecyclable volume. The MRF will use a sloped tipping pit or ramp to minimize jarring. Corrugated cardboard can also be placed on the tipping floor as a cushion. Reducing the number of times each load must be handled also reduces breakage. The area needed for the tipping or unloading floor can be estimated by using the material characterization data collected and converting the anticipated recyclable weights to loose volumes. Remember to account for slopes at the ends of stored material piles. By adding up the expected daily volumes of the commodities to be processed, the daily throughput for the facility can be estimated.

After determining the types of equipment that will be used to process and compact the recyclables, a general estimate can be made of space requirements to store this material. It is that important that GreenHorn does not underestimate storage space needs. Enough storage space will be available to store materials for sufficient periods to gain high-volume prices or to account for the inability to sell some materials during market downturns. Some materials can be stored outside or in trailers, depending on market specifications.

Sample Weight to Volume Conversion Factors for Recyclables

Material	Volume	Weight in pounds
Newsprint, loose	one cubic yard	360-800
Newsprint, compacted	one cubic yard	720-1,000
Newsprint	12" stack	35
Glass, whole bottles	one cubic yard	600-1,000
Glass, semi crushed	one cubic yard	1,000-1,800
Glass, crushed (mechanically)	one cubic yard	800-2,700
Glass, whole bottles	one full grocery bag	16
Glass, uncrushed to manually broken	55 gallon drum	125-500
PET, soda bottles, whole, loose	one cubic yard	30-40
PET, soda bottles, whole, loose	gaylord	40-53
PET, soda bottles, baled	30" x 62"	500
PET, soda bottles, granulated	gaylord	700-750
PET, soda bottles, granulated	semi-load	30,000
Film, baled	30" x 42" x 48"	1,100
Film, baled	semi-load	44,000
HPDE (dairy only), whole, loose	one cubic yard	24
HPDE (dairy only), baled	32" x 60"	400-500
HPDE (mixed), baled	32" x 60"	900
HPDE (mixed), granulated	gaylord	800-1,000
HPDE (mixed), granulated	semi-load	42,000
Mixed PET and dairy, whole, loose	one cubic yard	average 32
Mixed PET, dairy and other rigid, whole, loose	one cubic yard	average 38
Mixed rigid, no film or dairy, whole, loose	one cubic yard	average 49
Mixed rigid, no film, granulated	gaylord	500-1,000
Mixed rigid and film, densified by mixed plastic mold technology	one cubic foot	average 60
Aluminum cans, whole	one cubic yard	50-74
Aluminum cans, flattened	one cubic yard	250
Aluminum cans	one full grocery bag	1.5
Aluminum cans	one large plastic grocery bag	300-500
Ferrous cans, whole	one cubic yard	150
Ferrous cans, flattened	one cubic yard	850
Corrugated cardboard, loose	one cubic yard	300
Corrugated cardboard, baled	one cubic yard	1,000-1,200
Leaves, uncompacted	one cubic yard	250-500
Leaves, compacted	one cubic yard	320-450
Leaves, vacuumed	one cubic yard	350
Wood chips	one cubic yard	500
Grass clippings	one cubic yard	400-1,500
Used motor oil	one gallon	7
Tire — passenger car	one	12
Tire — truck	one	60
Food waste, solid and liquid fats	55 gallon drum	412

Source: *DRAFT National Recycling Coalition Measurement Standards and Reporting Guidelines*, presented to the NRC Membership, (October 31, 1989)

Building Structure

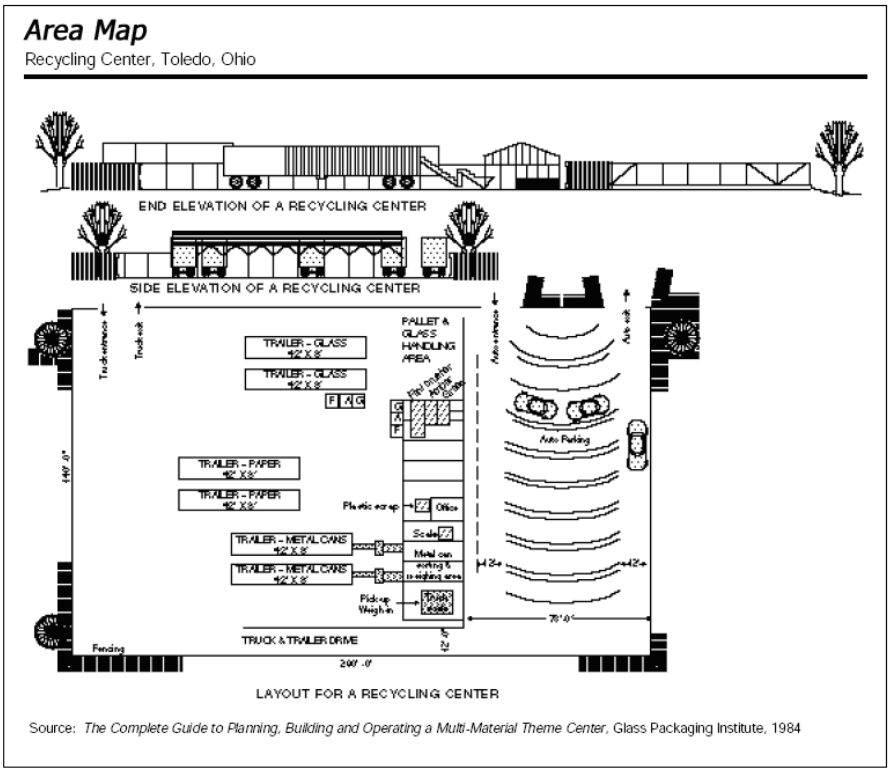
The building will have as few interior columns as possible. This will allow the maximum flexibility for placing equipment and accommodating future needs to rearrange the layout. The floor will be strong enough in all places to accommodate both vehicles and heavy, stationary processing

equipment. The floor will also be designed to allow for anchoring equipment. Although there may be a need to design in some recyclable pits to hold various materials, keeping a flat floor space will allow for easier moving or changing of equipment.

The ceiling will also be high enough to accommodate equipment specifications. Conveying lines, air classifiers, shredders, and other processing equipment can be as tall as forty feet. For flexibility, it is just as important to have enough space vertically as horizontally.

Building Layout and Equipment Choices: Manpower versus Machines
Manual sorting is the best way to get high-quality, low-contamination loads of recyclables and experience less downtime. However, manual sorting can also be dirty, dusty, dangerous, and expensive, especially when large volumes of material must be handled. Increasingly, mechanized sorting equipment is becoming available, which may provide improved handling efficiency at an acceptable quality. This equipment is designed to receive commingled recyclables and separate the total volume into its component parts, such as aluminum cans, plastics, glass, and ferrous metals. Classifiers, using air or mechanical methods, separate light materials from heavier. Eddy currents separate aluminum cans. Magnetic belts or drums can pick off ferrous metals. Proprietary technology, such as the BRINI system, is available. New techniques include the Bezner system, which uses moving chain curtains to trap light materials like plastic and aluminum cans, while allowing denser materials, such as glass, to move through the hanging chains. Optical scanners are also being developed to sort glass by color. More technology for sorting recyclables is expected to come on the market in the near future.

Manual sorting or mechanical sorting will be based on the volume and types of materials to be handled; the economics of purchasing, operating, and maintaining the equipment versus the cost of hiring additional employees; and market requirements concerning the degree of acceptable contamination. GreenHorn's MRF will be designed to use mechanical sorting if efficient equipment is available, supplemented with manual sorting for quality control. A primary design goal will be minimizing the number of times that material must be handled as it moves through the facility.



Source: *The Complete Guide to Planning, Building and Operating a Multi-Material Theme Center*, Glass Packaging Institute, 1984

Employee and Education Facilities

In addition to estimating space for material drop off, processing, and storage, the design must include space for employee facilities. Locker rooms, bathrooms, showers, a first aid station, an administrative office, and a weighing station will all be considered. GreenHorn's facilities will have rooms where the operation can be explained to public tour groups or for use as a lunch room. The rooms have windows overlooking the processing floor, and educational programs will be conducted safely and quietly.

Local building codes will be consulted to determine work place minimum environmental standards. If employees are to be drawn from a specialized work force, such as developmentally disabled individuals or the handicapped, special regulations may apply. A shop for housing tools and maintaining equipment will also be part of the design.

Hazardous Materials Area

GreenHorn's MRF will be designed to accept household hazardous waste or waste oil but will phase in the acceptance of the material after certain milestones have been achieved. To accept household hazardous waste or waste oil, a special area will be designed according to local, state, and federal requirements. Hazardous waste, medical waste, low-level radioactive waste, and other hazardous chemicals may be found in incoming loads. A protocol for handling this material will be established.

Conveyor Line

Handling efficiency for a MRF is greatly enhanced by using conveyor lines to move waste from the tipping area through processing. Conveyor lines will be used for transporting materials to mechanical equipment and act as moving lines that allow workers to separate various commodities. A conveyor line will be designed to allow an employee to be standing upright or seated while separating materials. If an employee must bend over or stand in an uncomfortable position, injuries will result. Likewise, the line should be designed to keep employees from snagging clothes or receiving injuries while sorting. Emergency shut-off cords and palm-size panic buttons should be included with conveyor systems. A positive sorting line will be used due to low contamination levels accepted by markets. In a positive sorting, recyclables are picked from the conveyor and placed in storage containers allowing for nonrecycled materials to fall into a bin at the end of the conveyor belt for disposal.

Processing and Densifying Equipment

For small operations, collected recyclables can be stored loose in Gaylord boxes and sent to market. Gaylord Boxes are reusable tri-wall corrugated cardboard shipping and storage boxes that are typically open to approximately 48" x 48" 48". The feasibility of this option depends on local markets and transportation costs. Greenhorn Recycling will use processing and densification equipment in order to increase the price paid by a market or to lower unit transportation costs by maximizing the volume in each load. Decisions about buying processing equipment depend on the volume of material that will be handled and especially on the requirements of the markets. Some markets want to receive material baled, some shredded, others loose. Some markets will accept waste in a variety of forms, but will pay different prices for each. Processing equipment will be selected carefully for the facility to meet its particular processing requirements. The capital and operating costs, along with space requirements, must be balanced against the improved marketability and revenue that processing will bring. Balers are usually the most versatile piece of processing equipment that recycling centers use. Balers will be used to densify many types of materials including paper, cardboard, plastic, and cans. Using a baler facilitates stacking bales, which improves space utilization and reduces material transportation costs. Balers come in a variety of sizes and prices. For industrial markets, large bales (600- 1200 pounds, 30-40 inches wide) are the norm. GreenHorn have one heavy-duty baler for all paper materials and one or more medium-duty baler for cans and plastics. A baler to be used for PET bottles can be fitted with a perforator, thereby eliminating the need to manually remove caps from the bottles before baling. Balers for paper materials will be equipped with a swing-out ruffler that can be engaged when baling newspapers to increase bale density. Shredders and chippers can be used for newsprint (for animal bedding), mixed paper, plastic bottles, and confidential documents. The market will determine whether a shredder is needed or, in the case of plastics, acceptable. Shredders and chippers should be equipped with safety protections, including dust control.

Other specialty equipment like can flatteners can also provide improved densification.

Handling Equipment

GreenHorn Recycling's MRF will need methods of moving materials from the tipping area to storage and from storage to transport vehicles. Fork-lift trucks to move baled material will be a must. Front-end loaders are also used to move loose materials such as paper, glass, and cans. For air quality purposes, propane or electric fork-lift models will be used through out the whole facility. The MRF design will allow sufficient aisle space for efficient and safe movement of materials. Handling equipment must have sufficient room to move from processing to storage areas, without the need to make tight turns or to cross flow paths used for moving other materials. The traffic pattern will also allow for rapid loading and unloading of vehicles.

When making decisions about processing, handling, and densification equipment, it will be important to consider the life cycle cost for this equipment. In addition, factors such as the capacity of the machine, whether it is continuous feed or batch feed, its reliability record or servicing needs, and energy requirements are all important. Likewise, the space needed for equipment and the required loading and unloading areas will be considered.

Redundancy

It will be important to include redundancy in equipment processing capability where possible. Equipment failure in one area of the GreenHorn MRF should not cause the entire operation to shut down. Although cost and space requirements will prevent having two of everything, developing multiple sorting lines and alternative handling methods will make the system less prone to shut down. The equipment will be placed so that both routine and special maintenance can be performed easily and without disruption to other MRF functions.

Appendix E Biodiesel Research

Biodiesel is a renewable, biodegradable, alternative fuel or fuel additive used in diesel engines or fuel oil generators. It can be used in its pure form or it can be mixed with a petroleum-based diesel (distillate). Biodiesel is usually described based on its concentration in distillate diesel fuel as B100 (pure biodiesel - 0% distillate diesel & 100% biodiesel), B20 (80% distillate diesel & 20% biodiesel) or B2 (98% distillate diesel & 2% biodiesel). Biodiesel can be made from a variety of biological products, including animal fats and virgin and recycled vegetable oils and even certain yeasts and molds. The majority of biodiesel production and consumption is in Europe, but biodiesel is in the early stages of development in the U.S. and Canada.

Biodiesel is composed of monoalkyl esters (most commonly referred to as methyl/ethyl esters), which is a long chain of fatty acids and a methyl or ethyl alcohol. The ester based biological products, which have had their viscosity reduced using a process called transesterification, produces biodiesel and glycerin (thick component of vegetable oil). Glycerol or glycerin is the primary byproduct of methyl ester production. Biodiesel is biodegradable, non-toxic, and usually free of sulfur and aromatics. Originally biodiesel was considered a by-product of glycerin soap production.

The primary process of making biodiesel, referred to above, is chemistry called transesterification. At a simple level, you take 10 parts oil, 1 part methyl or ethyl alcohol, (methanol is most commonly used), and 1/10th part catalyst, (most commonly a base catalyst like sodium hydroxide), and combine them under a certain pressure and temperature. From this you get about 10 parts biodiesel and 1 part crude glycerin. The figure below describes the basic transesterification reaction.

The most important factor in creating methyl esters is the oil feedstock. The oil feedstock accounts for 20% - 80% of the cost of production (on average). The reason for the cost variation is the wide range of possible feedstock materials. If a plant intended to use the cheapest input, trap grease, the feedstock can be very cheap ranging from $-0.05 to $0.05 per pound. The challenge with this feedstock is quality and composition of the oil. Trap grease is a dirty, smelly waste product of food preparation. It would be a cheap input, but would entail additional equipment, (acid esterification), processing costs, processing steps, and different conversions. The ability to make regular quantities of biodiesel that could meet quality standards is unlikely.

The other extreme is using very clean refined oil, also called refined, bleached and deodorized (RBD) oil. In this case, the oil cost is high, ($0.255 per pound on average), but transesterification is the only activity that needs to be done to create a clean and consistent biodiesel and glycerin byproduct. One of the key characteristics that affect the type of processing of the oils into methyl esters, is the percentage of triglycerides. This is the predominant structure of most fats and oils. Triglycerides are a combination of 3 fatty acid chains combined with a glycerol backbone. These fatty acid chains are combinations

of carbon and hydrogen atoms. The number of carbons and the type bonds typically describes the difference between different fatty acids

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(Research compiled by Jack E. Mendell 6716 Hatcher Rd ♦ Lakeland, FL 33811(C) 863-559-6027 ♦ (H) 863-647-9930 jmendell@tampabay.rr.com)

Appendix F Environmental Benefits Calculator

Appendix G Permits for Reproductions

Waste/ Recycling Team

April 25, 2006

Kathleen Tougas
Elisa Truman
Eric Weaver

I, Kathleen Tougas, permit the reproduction of our analysis

X_____

I, Elisa Truman, permit the reproduction of our analysis

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I, Eric Weaver, permit the reproduction of our analysis

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