

**Zero Waste Planning  
at the University of Illinois at Urbana-Champaign**

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## EXECUTIVE SUMMARY

I drafted these Zero Waste Plan (ZWP) recommendations for the University of Illinois at Urbana-Champaign to help campus meet its Illinois Climate Action Plan (iCAP) goal of becoming carbon neutral by 2050. One of the iCAP strategies addressed Procurement and Waste and identified two primary actions: adopt a Zero Waste Policy by the year 2012 and increase the campus landfill diversion rate to 75% by the year 2020.

Zero Waste community members agree Zero Waste focuses on reducing solid waste and acknowledge that it is a goal an institution is never expected to reach but towards which it continually strives. Zero Waste International Alliance (ZWIA) co-founder Gary Liss asserts: “Businesses and communities that achieve over 90% diversion of waste from landfills and incinerators are considered to be successful in achieving Zero Waste, or darn close.”<sup>1</sup> Throughout this report, I will use the term “landfill” and “landfilling” to include both burying items in a landfill and incinerating items at any type of incineration facility.

### Research Objectives

My research had three purposes:

1. Identify the existing conditions of the campus waste management system including its policies, practices, data management, and to characterize its waste stream.
2. Review other institutions’ waste management systems and Zero Waste programs.
3. Make recommendations on expanding or instituting practices and policies, improving data collection and management, and acquiring the necessary resources.

### Recommended Strategies and Actions

My research yielded four critical strategies needed to realize the iCAP’s goal of Zero Waste and identified seventy unique action items in eighteen areas of campus operations. I prioritized these action items by the number of additional secondary strategies each achieved, the time, staff and financial resources necessary for implementation, the obvious barriers to overcome, and the number of campus units it would impact. Finally, I listed the thirteen highest priority actions and grouped them within their strategy:

- 1. Strengthen the campus culture of sustainability.** Many campus waste reduction and recycling programs are not coordinated with each other or implemented campus-wide. To remedy this, I recommend expanding the existing Sustainability Week theme of “Orange and Blue Go Green” into a campus-wide, year-round sustainability initiative.  
Action items:

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<sup>1</sup> Zero Waste International Alliance (ZWIA). 2012. Definitions, Business Principles, Business Recognition, Community Principles. Accessed November 15, 2012. <http://zwia.org/>.

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- Create recycling stations in common areas. Include garbage and recycling bins with graphic-and-text-based signage above bins on wall similar to current signage in Housing, and/or on the bins themselves, indicating (un)acceptable items. A “Recycling Station” sign should be installed above the bins if on-bin signage is used. At least one station per building should include both types of battery recycling receptacles. Add textbook and clothing recycling bins if approved.
- Implement "tailgate" recycling program. Stencil garbage drums with "LANDFILL." Replace half of garbage drums with recycling drums painted blue and stenciled "RECYCLABLES."
- Implement Pilot Zero Waste Game Day event. Conduct pre-game waste audit; convert waste stations to recycling stations; use Recycling Ambassadors (staff and volunteers) to educate attendees on proper recycling; audit post-game waste and determine diversion rate.
- Initiate special event recycling collections. Promote textbook and other special recyclables collection during key environmental events, e.g., RecycleMania, Earth Day and Week, America Recycles Day, Campus Sustainability Day, etc.
- Reduce number of garbage bins. Remove garbage bins from classrooms and offices and install signs directing users to take garbage and recycling to common-area bins located in all hallways. This will reduce the number of garbage bins needed while increasing the likelihood of recyclables being separated into proper bins.

**2. Integrate communication and coordination of efforts.** Some campus units are successfully reducing waste and landfilling while increasing recycling and reuse.

However, many are unaware of others' actions or of available resources. Additionally, people are often misinformed about campus operations, e.g., whether or not the Waste Transfer Station (WTS) sorts the campus waste stream into garbage and recycling. To remedy this, I recommend having the recommended Zero Waste Coordinator (ZWC) work with Green Teams of students, staff and faculty and facilitate discussion and collaboration about ongoing activities, issues, and solutions. Action items include:

- Create online exchange portal. Campus units can post descriptions and photographs of items; other units could view items online and request they be moved directly to their location.
- Establish Green Teams. Due to their lead roles in campus waste management, the current Sustainability Coordinator, the CSE Assistant Director, the new CSE Associate Director for Sustainable Infrastructure (currently, Jack Dempsey) and the recommended ZWC should participate on the campus Green Team to educate and coordinate unit and topical Green Teams.

**3. Improve data collection and reporting process.** Currently, there is no central repository for waste management data nor are there data collection standards. This makes it difficult to determine the campus' current recycling rate or the impacts of implemented policies and practices. To remedy this, I recommend that all units work with their haulers to collect data on their waste management actions and submit this data on a regular basis to the recommended ZWC. Action items include:

- Collect campus units' waste management data. Collect weight or volume data on garbage and recycling collected by private haulers from Auxiliaries and add this data to WTS collection data; this will increase accuracy of landfill diversion and tonnage rates.
- Conduct annual WTS waste audit. Conduct a waste stream analysis at the WTS for an entire week, using the sorting belt and WTS staff to analyze all of the garbage and recyclables collected by WTS (would not include waste from Auxiliaries using other waste haulers).
- Implement waste audit research plan. Determine buildings' baseline waste management rates from which future actions' impacts can be assessed.

**4. Increase staff dedicated to waste management.** In order to increase waste reduction and recycling efforts, campus must expand the existing waste management system and implement additional programs. This would require additional staff hours to design a program plan, to implement that plan, to monitor results and to adapt the plan in response to successes and failures. To facilitate this expansion, I recommend allocating at least two additional full-time staff for waste reduction and recycling efforts and securing an additional budget line item for equipment and supplies dedicated for these activities. Action items include:

- Increase WTS funding. Hire at least one additional staff member to serve as the campus ZWC; duties would include assessing building recycling resources and working with the CCWM and Facility and Building Managers to optimize recycling collection; additional recycling equipment and supplies (bins, signage, NIR recycling sorter); and additional trucking equipment (trucks, truck scales). This person would be employed by the Center for a Sustainable Environment (CSE) or Facilities and Services (F&S).

**5. General waste management practices.**

- Audit and improve buildings' recycling bins and signage. Facilities should be surveyed for actual locations of all garbage and recycling bins. Via the ZWC working with the CCWM and F&S Building Service Workers (BSW) Ensure all common and individual areas have optimal number and placement of commodity recycling bins and that all garbage bins are paired with a recycling bin, including accurate and consistent signage on bins with acceptable and

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unacceptable items. This action was considered the most important action by sustainability and recycling staff participating in the CURC Zero Waste Workshop at the 2013 AASHE conference: Lin King, Corey Hawkey, and Michelle La.

- Secure additional recyclables markets. Locate additional buyers for currently-landfilled commodity recyclables or collaborate with cities and local haulers on items they currently accept, e.g., glass and plastics, C&D waste.

## Research Metrics

In this research, I determined that campus has already achieved its current landfill waste diversion goal by diverting 84.5% of its waste stream from landfills, exceeding the iCAP commitment of 75% diversion by 2020. However, this has largely been accomplished by the large-scale composting of livestock animal bedding and landscape waste, and land-applying livestock animal manure on agricultural fields. Although laudable, these efforts do not align with the iCAP's Procurement and Waste focus on municipal solid waste (MSW) and distinguishes individual and institutional waste management from Agricultural Emissions management. It also allows large, facility-controlled waste management to overshadow the individual-controlled waste management typically associated with students, faculty and staff. Although it certainly is a function of the context in which campus successfully operates, this exceptionally high diversion rate skews the comparisons between our institutions and other institutions that do not have the opportunity of large-scale agricultural organic waste diversion. A recent survey of forty-six campuses by Duke University produced the following data:<sup>2</sup>

- Recycling rates: averaged 39.7%, ranging from 10% to 71%
- Diversion rates: averaged 52.4%, ranging from 20% to 92%.

A lengthy email discussion between myself, Lin King (Sustainability Coordinator, UC Berkeley) and Roger Guzowski (co-founder of College and University Recycling Coalition, or CURC) revealed an evolution of the Zero Waste community's philosophy (Appendix B: Zero Waste Philosophy Discussion) away from a relative diversion rate goal which facilitates this "shell game" of successful large-scale, institution-level waste diversion (i.e., university-scale) concealing a potentially stagnant or growing individual-level landfill disposition (i.e., an individual student, faculty or staff member). In response to my email inquiring whether or not I should include or exclude campus' land-applied manure and animal bedding as waste diversion, Guzowski agreed that the agricultural wastes could be included but that it would give the inaccurate perception that campus was successfully reaching its Zero Waste goals by

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<sup>2</sup> Buchholz, Arwen, Tavey Capps and John Shepard. 2012. "University Recycling Benchmarking Survey." Duke University. Summer 2012.

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mistakenly focusing on the fact that the university was increasing its reuse while individuals were actually recycling less (Appendix B):<sup>3</sup>

If you don't split the numbers so that they have meaning, I would argue that you could have the most wasteful faculty and student body in history, one that consumed at record rates and never recycled a darn thing and still call yourself a “zero waste campus” if you had enough landscape waste, C&D projects, and coal ash to achieve a 90% diversion rate. Is that what we are going for? Are we looking for slogans like “achieve zero waste, burn more coal”!?

King agreed and stated that the older practice of defining Zero Waste as waste diversion – a relative measure – should be changed to defining it as “Zero Waste to Landfill” – an absolute measure:

I must also agree that the Zero Waste leaders provided Roger [Guzowski] and others with skepticism by defining Zero Waste as “90% (or even 99%) diversion = achieving zero waste” since it could lead to possibilities where you count all your concrete, landscape, manure, etc. but then not have any other diversion programs...**On this point, I bring up the need to define zero waste as zero waste to landfill with an absolute zero** [emphasis added]. One of the main reasons to use an absolute zero waste goal is so that we can start looking more at our waste stream to find what is still in it so we can use our time in finding solutions to get to zero. We need to stop using all of our time trying to get better at counting our diversion rate in order to get to zero waste. We still need to count our diversion for reference but disposal based reporting is much more important.

In keeping with the iCAP's practice of distinguishing between agricultural and non-agricultural waste management and the growing acceptance of absolute “Zero Waste to Landfill” goals over relative landfill diversion rate goals, I recommend that campus track their Zero Waste progress using a set of increasingly-specific metrics, starting with Total Zero Waste Diversion and progressing to Individual Zero Waste Carbon Emissions:

- a. Total Landfill Per Capita: the preferred weighted per capita user landfill rate including both individual- and facilities-scale waste components.
- b. Individual Landfill Per Capita: the preferred weighted per capita user landfill rate including only the individual-scale waste components.
- c. Total Waste Diversion: the landfill diversion rate including both individual-scale waste stream components (paper, plastic, cardboard, aluminum, food, clothing, batteries, etc.) and facilities-scale components (landscape, animal bedding and manure, etc.).

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<sup>3</sup> Guzowski, Roger, Lin King, Marcus Ricci. 2013. Email communication; April 9, 2013.

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- d. Individual Waste Diversion: the landfill diversion rate including only the individual-scale waste stream components.
- e. Total Carbon Emissions: the carbon emissions generated by both individual- and facilities-scale waste components.
- f. Individual Waste Carbon Emissions: the carbon emissions generated by only individual-scale waste components.

## Acknowledgments

I would like to acknowledge certain people and units without whom this research would not have been possible:

- Dr. Brian Deal – Professor, Department of Urban & Regional Planning, and my academic and capstone advisor.
- Ms. Morgan Johnston –Sustainability Coordinator and my guide to the campus' circle of waste management.
- Ms. Stephanie Lage – Center for a Sustainable Environment (CSE) Assistant Director and my capstone client.

## CHAPTER 1: PURPOSE OF STUDY

On February 22, 2008, Dr. Richard Herman, Chancellor of the Urbana-Champaign campus of the University of Illinois, signed the American College and University Presidents' Climate Commitment (ACUPCC), pledging to eliminate greenhouse gas emissions by 2050.<sup>4</sup> The ACUPCC included waste minimization as one of the recommended actions and required campus to develop an institutional action plan within two years. Accordingly, in May of 2010, campus submitted its Climate Action Plan (iCAP) which includes a Procurement and Waste strategy with specific waste-related action items: adopt a Zero Waste Policy by 2012, implement a large-scale food composting project by 2012, and increase the waste diversion rate to 75% by 2020.<sup>5</sup>

Reducing the amounts of landfilled and incinerated waste will benefit the environment by decreasing the amounts of greenhouse gases (GHGs, including carbon dioxide and methane) released to the environment. Every 1,000 tons of municipal solid waste (MSW, or garbage) landfilled produces 597 tons of methane or 14,916 tons of CO<sub>2</sub>-equivalent GHGs. Every 1,000 tons of incinerated garbage produces 40 tons of CO<sub>2</sub>. In 2012, campus landfilled almost 2,800 tons of garbage which had the potential to release over 41,000 tons of CO<sub>2</sub>-equivalent GHGs; this is GHG-emission equivalent of 7,749 cars or 86,499 barrels of oil.<sup>6</sup>

This research will assist campus in achieving its waste management goals by:

1. Assessing the existing conditions of campus waste management activities and characterizing its waste stream. This will lead to a more accurate assessment of the current waste diversion rate based on current activities, and to a more accurate estimate of the 2020 diversion rate based on planned reuse/recycling activities.
2. Researching waste management activities and Zero Waste (ZW) programs at other higher education institutions including garbage, recycle and reuse. This will provide a menu of options that could be applied to campus operations, especially if conditions are similar and the necessary resources are currently or potentially available.
3. Recommending policies and practices that will reduce landfill and incineration tonnages and increase source reduction, reuse, repurpose, recycle and compost.

These steps and this report are Phase I of a three-phase process for developing a Zero Waste Plan (ZWP) for the University of Illinois at Urbana-Champaign. Phase II will assess the

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<sup>4</sup> American College and University Presidents Climate Commitment (ACUPCC). 2008. <http://sustainability.illinois.edu/ACUPCC.html>.

<sup>5</sup> University of Illinois at Urbana-Champaign. 2010. Illinois Climate Action Plan (iCAP).

<sup>6</sup> USEPA. 2013. "Greenhouse Gas Equivalencies Calculator." Accessed: April 8, 2013. <http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results>.

current procurement policies and processes, and Phase III will develop an approved and detailed plan for reaching Zero Waste on campus, including a campus Zero Waste Policy.

## Zero Waste: Definitions, Policies, Plans and Goals

A Zero Waste Plan (ZWP) includes three elements: a vision statement with a Zero Waste Definition; a resolution or Zero Waste Policy; and an implementation plan with policies, practices, and programs for data collection, monitoring, assessment and response. The waste management and ZW communities acknowledge that ZW focuses on reducing solid waste, as defined by the U.S. Environmental Protection Agency (USEPA):

Solid waste means any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or an air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. Solid waste does not include solid or dissolved materials in domestic sewage, solid or dissolved materials in irrigation return flows, industrial discharges that are point sources subject to permit under 33 U.S.C. 1342, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923).<sup>7</sup>

Although this definition includes agricultural waste, the iCAP addressed agricultural animal manure in the “methane recovery mitigation wedge,” distinguishing it from other wastes in the “Zero Waste wedge.” This raises the question as to whether or not the iCAP considered it appropriate to include agricultural animal waste into this ZW analysis. To clarify this ambiguity, campus must first develop its definition of ZW. I recommend campus adopt the definition used by the ZWIA, CURC<sup>8</sup> and the International Solid Waste Alliance<sup>9</sup> (ISWA):

Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to

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<sup>7</sup> U.S. Environmental Protection Agency (USEPA). 2013. “Summary of the EPA Municipal Solid Waste Program.” Accessed February 7, 2013. <http://www.epa.gov/reg3wcmd/solidwastesummary.htm>.

<sup>8</sup> College and University Recycling Coalition (CURC). 2012. Accessed September 3, 2012. <http://curc3r.org/>.

<sup>9</sup> International Solid Waste Alliance (ISWA): Accessed September 3, 2012. <http://www.iswa.org/>. Linked-In discussion forum: <http://www.linkedin.com/groups/ISWA-International-Solid-Waste-Association-4782821?home=&gid=4782821&trk=anet ug hm>.

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planetary, human, animal or plant health.”<sup>10</sup> Zero Waste involves moving from the back end of waste disposal to the front end of resource management. “If a product can’t be reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then it should be restricted, redesigned, or removed from production.”<sup>11</sup>

Additional information on the ZWIA definition of Zero Waste and Zero Waste Business Community Principles can be found in Appendix C. According to ZWIA cofounder Gary Liss: “Businesses and communities that achieve over 90% diversion of waste from landfills and incinerators are considered to be successful in achieving Zero Waste, or darn close.” The majority of CURC and ZWIA members agree with this standard. However, it is the current, relative diversion metric – termed in this study as the Total Zero Waste Diversion metric – which is considered by many members including Guzowski and King to have lead practitioners to be more concerned about categorizing waste components rather than to be focused on reducing landfill deposition. As previously stated, I recommend that campus adopt a set of metrics that focus on campus-wide and individual-scale waste diversion, campus-wide and individual-scale per capita waste reduction, and campus-wide and individual carbon emissions reduction. Highest priority should be given to waste reduction: both diversion and carbon emissions reduction will naturally follow if waste is reduced. Waste to be included in this calculation is listed in “Waste Types Studied” section. As of 2012, no Illinois cities had adopted a Zero Waste Policy. Twelve California counties, cities and jurisdictions have adopted policies, as well as Boulder County, CO; Carrboro, NC; Central Vermont Waste Management District; Seattle, WA; Summit County, CO; Kaua’i, HI; and San Antonio, TX. A Citizens ZWP has been developed but not adopted for New York City, NY. A few colleges and universities have adopted a Zero Waste Policy, including Arizona State University,<sup>12</sup> UC Berkeley and The Ohio State University.<sup>13</sup>

Second, campus must adopt a ZW policy resolution. I recommend that it adopt the standard resolution provided by ZWIA’s partner organization, the GrassRoots Recycling Network (GRRN), found in Appendix D.<sup>14</sup>

## Scope of Study

The University of Illinois at Urbana-Champaign is a very large institution spread out across the Cities of Champaign and Urbana and into Champaign County. There are also properties

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<sup>10</sup> Zero Waste International Alliance (ZWIA). 2012. Definitions, Business Principles, Business Recognition, Community Principles. Accessed November 15, 2012. <http://zwia.org/>.

<sup>11</sup> ZWIA Community Principles. 2012. Bourque, Martin, 2005. Berkeley Ecology Center, April 2005. Accessed November 15, 2012. <http://zwia.org/standards/zw-community-principles>.

<sup>12</sup> Arizona State University. 2013. <http://sustainability.asu.edu/practice/our-commitment/zero-waste.php>.

<sup>13</sup> Ohio State University. 2013. <http://footprint.osu.edu/>.

<sup>14</sup> Grass Roots Recycling Network. 2013. “Model Resolution for Zero Waste.” Accessed November 22, 2012. <http://www.grrn.org/page/model-resolution-zero-waste>.

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and buildings extending throughout east-central Illinois, most notably the Allerton Park and Retreat Center complex. According to one F&S website, there are 1,092 buildings associated with campus.<sup>15</sup> Of these, 921 are considered to constitute the “Champaign-Urbana main campus” and lie in a fifteen square-mile area bounded by Township Road 1100 and University Avenue (five miles north-south) and Neil Street and Philo Road (three miles east-west).<sup>16</sup> Data show that 205 of these are considered “large buildings” over 10,000 square feet and would most likely be those buildings that received individual waste collection.<sup>17</sup>

Most of the large buildings have their waste management services provided by the Waste Transfer Station (WTS) operated by F&S. However, campus Auxiliary units (Auxiliaries) are independent and may select their own providers. In addition, there are also Allied organizations (Allies) including privately-owned certified housing units such as the Newman Center, collaborating entities such as the Army Corps of Engineers Construction and Engineering Research Laboratory (CERL), entities which lease university-owned space, and any Research Park entity (Appendix E: Auxiliary and Allied Organization collections).<sup>18</sup>

The fact that the WTS provides services to units not fully controlled by campus administration, i.e., Auxiliaries and Allies, creates two related research and implementation issues: non-campus entities may see less reason to collect or share their waste management data or may see less reason or have less ability to implement recommended waste management policies and practices. In addition to collecting garbage and/or recycling from campus units, Auxiliaries and Allies, the WTS also collects commodity recyclables from a limited number of businesses in the Champaign-Urbana area.

Considering and discussing all of these factors with CSE Assistant Director Stephanie Lage and F&S Sustainability Coordinator Morgan Johnston, I decided to limit this ZW study to all campus units and Auxiliary units plus Allies that are served by the WTS. This specifically excludes certified housing and Allies that are not served by the WTS.

## Waste Types Studied

This study will characterize the following types of waste that are collected by the WTS and other campus units and programs:

- **Agricultural waste:** including animal bedding, manure, feed waste and carcasses
- **Commodity recyclables (recyclables):** items collected and sold to vendors: aluminum cans, or “cans”; cardboard (old corrugated cardboard or “OCC” and

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<sup>15</sup> University of Illinois at Urbana-Champaign, Facilities & Services. 2001. “Building List.” Accessed November 22, 2012. <http://www.fs.uiuc.edu/admin/buildinglist.cfm?order=N>

<sup>16</sup> Kupferschmid, Chad, F&S. 2011. GIS geospatial mapping data.

<sup>17</sup> Nagy, Renee, F&S. 2011. Illinois building data.

<sup>18</sup> Rasmus, Brent, OBFS. 2013. Director of Accounting Services. Email communication. January 10, 2013. Auxiliaries are formally known as “auxiliaries under indenture.” List and definition provided by Rasmus.

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paperboard, excluding waxed); #1 PETE and #2 HDPE bottle-shaped plastic, or “bottles” or “plastic”; steel and tin cans; mixed paper, or “paper” (books, mixed office paper, shredded paper, junk mail, magazines, folders, newsprint); mixed metal (brass, copper, iron, stainless steel, steel); truck and car tires; wood pallets

- **Food waste:** including but not limited to pre- and post-consumer dining hall food scraps and used food oils
- **Landfill waste (garbage):** including but not limited to undiverted C&D waste, food waste and recyclables; contaminated recyclable items; and non-recyclable items such as glass, non-bottle-shaped #1 and #2 plastics and #3-#7 plastics
- **Landscape waste:** including but not limited to grass clippings, leaves, and woody plant brush, limbs and stumps
- **Special recyclables:** including but not limited to C&D waste from projects completed by F&S and third-party contractors only if recycling data was reported; and surplus or scrap electronic equipment, batteries, cellular telephones, lamps, bicycles, clothing, and textbooks
- **Special waste:** including but not limited to hazardous chemical and radioactive waste, unwanted hazardous research products and surplus hazardous materials
- **Surplus equipment:** including but not limited to electronic equipment, furniture, machinery

There are other waste types generated on campus that will be excluded from this study because they are not managed by the WTS or the Auxiliaries, or because they fall outside the solid waste definition, including but not limited to: coal fly ash produced from campus power generation plants; C&D waste generated by F&S and third-party contractors that is not reported as either garbage or C&D recycling; garbage and recycling produced by third-party vendors such as food vendors and other tenants that is not reported; and domestic sewage. Although still the campus’ responsibility, amounts of these wastes are currently unknown and outside of campus control. The consensus of the CURC and ZWIA, as well as that of the general waste management industry is that ZW addresses only solid waste. Exclusions include but are not limited to liquid and solid manure flushed into a sanitary sewage system and food scraps or other solid wastes reduced to a liquid state in an in-sink garbage disposal unit or in an aerobic or anaerobic digester. The ZW community also agrees that all landfilled or incinerated solid waste – mandated or voluntary – should be included in the landfill and incineration diversion rate calculation.<sup>19, 20, 21</sup>

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<sup>19</sup> CURC listserv. 2013. [recyc-l@listserv.brown.edu](mailto:recyc-l@listserv.brown.edu). <http://www.curc3r.org>.

<sup>20</sup> ZWIA listserv. 2013. [zwia@googlegroups.com](mailto:zwia@googlegroups.com). <http://zwia.org/>.

<sup>21</sup> Grams, Brad, Illinois EPA. 2013. Personal communication. February 25, 2013. Grams stated that environmental authorities would typically omit wastes that are mandated to be landfilled or incinerated by law (RCRA, TSCA) such as PCB-containing lamp ballasts, hazardous chemicals and animal carcasses.

## CHAPTER 2: BACKGROUND INFORMATION

### Waste Management History

Campus has taken on increasing responsibility for its waste management over the last seventy years, starting central collection in the 1940s. Operations and Maintenance (O&M, the predecessor to Facilities & Services) installed garbage compactors at the WTS in the 1960s.<sup>22</sup> Recycling activities started on campus in 1978 with the opening of the Community Recycling Center (CRC), a local not-for-profit started by Steve Apotheker, an Illinois physics alum. Apotheker ran the CRC from 1978 to 1986 when he closed the business. When it opened, the CRC was the only area recycling facility and it offered both curbside and drop-off services. CRC collected paper and cardboard at a hundred buildings on campus. Eventually, however, the CRC was no longer able to continue operation and O&M took over recycling collection.

Interest in recycling was fairly light in the early years because residents had access to two landfills: one in Champaign (located at Bloomington Road/USR 150 and Mattis Road) and one in Urbana (at the site of the present Landscape Recycling Center (LRC) on East University Avenue). Interest increased when the Champaign landfill closed in 1978 and the Urbana landfill was predicted to close in 1981. Landfill tonnage reductions allowed the Urbana landfill to postpone its closing until 1987 which then required garbage to be trucked forty-six miles to Clinton Landfill in Clinton or thirty-six miles to Brickyard Disposal and Recycling in Danville. Although CRC collected corrugated cardboard and glass, paper constituted the major component of the recycling stream: campus purchased seven hundred tons of copy paper in one year during the 1980s.<sup>23</sup> CRC did not charge campus a fee for paper collection, but campus did pay for cardboard, glass and can collection. Recycling efforts increased significantly in 1986 when the State of Illinois passed the Solid Waste Management Act (415 ILCS 20) which set procurement and waste management standards for state agencies. These included mandated waste reductions of 25% of existing levels by December 31, 1995, and 50% by December 31, 2000.<sup>24</sup> In response to this act, municipal curbside recycling activities started in Champaign and Urbana in 1986, the year that the CRC ceased operations.

In 1987, the Students for Environmental Concerns (SECS) collected over two thousand signatures in one day to petition campus administration to implement a large-scale, integrated, campus-funded recycling program. In response, administration formed a

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<sup>22</sup> Hoss, Tim, F&S. 2013. Personal interview. January 10, 2013 and various emails.

<sup>23</sup> Hoss, Tim, F&S. 2013. Personal interview. January 10, 2013 and various emails...

<sup>24</sup> Legislative Information System. 2013. "Illinois Compile Statutes: Environmental Safety (415 ILCS 20/) Illinois Solid Waste Management." Accessed January 20, 2013. Act.<http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1588&ChapterID=36>.

## Chapter 2: Background Information

Recycling Committee to help guide the program's design.<sup>25</sup> A five-year budget of \$650,000 was approved and state and other grants were secured to cover the \$1 million startup costs of the WTS. Tim Hoss helped design the waste management program and became the first Coordinator of Campus Waste Management, starting WTS operations in 1989 and serving as its sole staff, not including waste sorting and collection personnel. The program began at a small scale by collecting paper (mixed office paper, newsprint) and corrugated cardboard from a few buildings and then expanded campus-wide by 1992. Because there was no viable replacement to the CRC, the WTS started collecting recyclables from large businesses in Champaign and Urbana and began generating monthly revenue of around \$50,000 that supported WTS operations and collection of additional types of recyclables. By the 1990s, F&S was collecting approximately thirty semi-trailer loads of total waste every month. Hoss brokered the recyclables as commodities and sold them to the highest bidder. As the waste stream composition and commodity markets shifted, the WTS expanded its operations to include #1 and #2 plastic bottles – easily sorted and the most valuable plastic type – but stopped recycling glass due to its high collection costs (c. \$7,500/year), low landfill savings (c. \$200/year) and low commodity value.<sup>26</sup> In 1995, the administration spent \$1.3 million to expand the capabilities of the WTS by adding a Materials Recovery Facility (MRF) which allowed the large-scale processing of garbage and sorting of recyclables, including baling paper, cardboard and plastics. A grant from the State of Illinois' Department of Commerce and Community Affairs (now the Department of Commerce and Economic Opportunity, or DCEO) funded the mezzanine and conveyor belt portions of the MRF. These improvements allowed for greater sorting accuracy and shipping efficiency and increased the recyclables' marketability.<sup>27</sup> The MRF began operating in 1997. In 2010, Tim Hoss retired from the WTS and Tracy Osby became Coordinator of Campus Waste Management.

In addition to handling garbage and brokering the standard commodity recyclables, the WTS also handles special commodity recyclables: scrap ferrous metal, copper and brass, tires and wooden pallets. Other campus units including Housing, Grounds, Property Accounting, Division of Research Safety, and agricultural departments also handle special recyclables and waste including animal manure and bedding, batteries, clothing, electronics, equipment, food waste, landscape waste, and textbooks.

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<sup>25</sup> Center for a Sustainable Environment. 2011. "Green Heroes." Accessed September 3, 2012. <http://sustainability.illinois.edu/greenheroes.html>.

<sup>26</sup> Hoss, Tim, F&S. 2013. Personal interview. January 10, 2013 and various emails.

<sup>27</sup> Facilities & Services. 2001. "Recovery Facility Tour." Accessed September 3, 2012. <http://www.fs.uiuc.edu/maintenance/wastemanagement/recoverytour.cfm>.

## Campus Timeline

- 1940s:** earliest recollection of centralized garbage management
- 1960s:** garbage compactors added at WTS
- 1978:** Champaign landfill closes
- 1978:** CRC begins collecting paper and cardboard recycling from campus
- 1986:** State of Illinois passes SWMA with mandated waste reduction goals
- 1986:** CRC ends their recycling activities and closes facility
- 1986:** Champaign and Urbana start curbside recycling activities
- 1987:** Urbana landfill closes
- 1987:** SECS petitions to start campus recycling program; budget approved and grants secured; Hoss helps start program
- 1989:** campus recycling program begins with limited coverage; Hoss starts as Coordinator of Campus Waste Management
- 1990s:** WTS begins collecting recyclables from Champaign and Urbana businesses
- 1992:** campus recycling program expands to cover campus
- 1995:** \$1.3 million spent to begin constructing the MRF at the WTS
- 1997, November:** The MRF begins operation
- 2008, February:** campus signs ACUPCC
- 2010, January:** Tim Hoss retires; Tracy Osby becomes Coordinator of Campus Waste Management
- 2010, May:** campus submits the iCAP
- 2012, August:** campus begins Zero Waste Planning, led by Marcus Ricci

## CHAPTER 3: PRIMARY WASTE MANAGEMENT

The campus waste management system reflects the campus' large size and decentralized nature, filled with many individuals working on various related subjects. The vast majority of waste handling is run through the WTS; however, there are numerous special programs and unique circumstances that occur throughout campus. This section is based on interviews with current and former WTS staff members Tracy Osby, Tim Hoss, and F&S driver James Quinlan. Questions asked in all unit interviews are provided in Appendix F. Most information is attributed to Tracy Osby, Coordinator of Campus Waste Management since 2010, unless otherwise cited. He has experience in several levels of campus waste management, having started as a Building Service Worker (BSW) in 1997. Both Hoss and Osby have been recognized for their waste management achievements: Hoss was named the campus' first Green Hero<sup>28</sup> and Osby earned the Chancellor's Distinguished Staff Award in 2012.<sup>29</sup> Two F&S drivers were accompanied during recycling routes on September 6, 2013. This chapter describes the primary waste handling process through the WTS and campus buildings and an overview of the special programs and circumstances.

### Waste Transfer Station Operations

The Division of Waste Management (DWM) of F&S manages the majority of campus waste with a complex process of collecting, sorting, brokering recyclables to recycling vendors, and shipping garbage to landfills. This process is centered at the Waste Transfer Station (WTS) and its Materials Recovery Facility (MRF). In most cases, the WTS manages its waste according to three primary inputs: a garbage stream, a cardboard/paper stream and a #1 & #2 plastic bottle/aluminum can (bottle/can) stream. A "Clean MRF" focuses on sorting the recyclables because the consumer or building staff had already separated the garbage from the recyclables before collection. A "Dirty MRF" accepts fully commingled waste – unsorted garbage and recyclables – separates the garbage from the recyclables and then sorts the recyclables. The WTS shifts between operating as a Dirty MRF and a Clean MRF throughout the day. In the early mornings, the WTS separates the first loads of waste into garbage and recyclables and then sorts the recyclables – Dirty MRF. In the late mornings, sorting is focused only on the recyclables that were already separated by the consumer – Clean MRF. In the early afternoon, Grounds brings the mixed-waste bins from the main Quad to the WTS and they are separated and sorted – Dirty MRF. Details on these exceptions are provided in the "Do we sort the garbage?" section.

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<sup>28</sup> Center for a Sustainable Environment. 2011. "Green Heroes." Accessed September 3, 2012. <http://sustainability.illinois.edu/greenheroes.html>

<sup>29</sup> University of Illinois News Bureau. 2012. "Eight honored with distinguished staff award." Accessed September 3, 2012. <http://news.illinois.edu/ii/12/0419/cdsa.html>. April 19, 2012.

### Chapter 3: Primary Waste Management

The MRF is a state-of-the-art facility for campus waste management systems which includes two enclosed dumping bays – “North Bay” and “South Bay” – connected by an indoor conveyor belt for sorting recyclables and garbage. The garbage and commodity recyclables are trucked to the WTS by F&S vehicles.<sup>30</sup> F&S’s vehicle fleet includes three front-load-dumping trucks, one rear-load-lugging truck, two roll-off-hauling trucks, and a smaller tote-dumping compacting truck known as the “Green Weenie”. The regular garbage run includes one front-load-dumping truck, one rear-load-lugging truck and one roll-off hauler. The regular recycling run includes one front-load-dumping truck and the Green Weenie. The Green Weenie collects toters of paper and bottles/cans, and a front-load-dumping truck and rear-load-lugging truck collect cardboard and paper recycling dumpsters and garbage dumpsters. This leaves two trucks for back-up. The WTS also has two skid steerers and one backhoe for moving material piles and bales around the facility.

The majority of buildings served by the WTS are instructional, administrative and research facilities. WTS also collects from some Auxiliaries and Allies on, near or off-campus, including in the Research Park, plus recyclables from some community businesses. Many Auxiliaries and few Allies receive services. A detailed list of units and services provided is given in [Appendix E](#); a summary is given below:

Auxiliaries:

- Assembly Hall
- Division of Campus Recreation: Activities and Recreation Center (ARC) and Campus Recreation Center East (CRCE)
- Conference Center in the iHotel: campus-owned, privately operated
- Division of Housing (Housing) dining and residence halls
- Division of Intercollegiate Athletics (DIA)
- Illini Union
- McKinley Health Center
- Parking Services
- Student Services Building

### Collection and processing procedures

The collection schedule is complex but flexible, specifying the buildings to be serviced but not a particular route. Daily collection sheets list the buildings serviced and the truck type required. If a dumpster is blocked by vehicles or access is otherwise not available, the driver can return later or skip the stop altogether if s/he believes the dumpster is empty enough to allow for another day’s worth of collection. The daily recycling route sheets list the buildings scheduled for two paper dumpster collection routes and the two cardboard dumpster

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<sup>30</sup> Osby, Tracy, F&S. 2012. Personal interviews; email communications. August 21 and 30, 2012, and January 15, 2013; various dates.

### Chapter 3: Primary Waste Management

collection routes for each weekday. Drivers do not submit daily logs listing which buildings from which they have collected but they do log the truck weights for the incoming paper recycling trucks. To meet Illinois EPA requirements, Osby conducts and logs a weekly visual inspection of one incoming garbage load and estimates its waste components. To minimize traffic conflicts, garbage hauling begins each weekday at 3:00 a.m. and a second garbage route begins at 5:00 a.m. using one front-loader, one rear-loader and one roll-off truck. Later in the morning, three other trucks run various recycling routes. All hauling is usually completed by 3:00 p.m.

F&S vehicles collect garbage from 189 campus locations on a scheduled or call-in basis. Units may have their own dumpster or share a dumpster with another unit in the same building or with another building. DWM vehicles collect recyclables from 178 campus locations on a scheduled or call-in basis. As with garbage, different buildings have different items collected in various dumpsters or totes at various frequencies. Incoming garbage trucks are not weighed.

At the WTS, there are three possible processing points for the collected waste: the North Bay, the South Bay, and the Sorting Floor. In the North Bay, garbage is dumped onto the floor allowing large commodity recyclables to be recovered before the remaining garbage is sent to the landfill. In the South Bay, garbage or recyclables are fed onto a conveyor belt where recyclables are manually recovered by staff from the Developmental Services Center (DSC); the remaining garbage is dumped into the North Bay. The Sorting Floor is accessed on the west side of the WTS and handles pre-sorted recyclables which are dumped onto the floor and then scooped into the baler.

#### North Bay process

When a garbage truck is dumped in the North Bay, large pieces of cardboard are extracted, collected in a pile at the side of the bay and moved by skid steer to the South Bay for recycling. Any blue can liners of bottles/cans in the pile are extracted, put in a large rolling cart and rolled to the South Bay for recycling. Any loose recyclables are not captured; bottles/cans in clear can liners may or may not get extracted. The remaining garbage is pushed to the west end of the bay and dropped through holes in the floor into roll-off trailers parked under the bay (Figure 1).



Figure 1. North Bay, WTS

When full, these trailers are hauled by landfill staff to the Clinton landfill; one trailer is filled almost every day. There are additional trailers in the WTS parking lot for large items destined for the landfill such as C&D waste and scrapped furniture.

### Chapter 3: Primary Waste Management

Outgoing garbage trailers are not weighed by the WTS staff; they are weighed by landfill staff when they reach the landfill. Campus has used two garbage companies in recent years. Allied Waste (formerly Central Waste) hauls to Brickyard Landfill and Recycling in Danville; both hauler and landfill are owned by Republic Services. Area Disposal Services (ADS) hauls to the Clinton Landfill, Inc., landfill in Clinton; both hauler and landfill are owned by Peoria Disposal Company (PDC). Historically, campus has alternated the primary contract between the two companies approximately every five years; currently, the primary hauler is ADS.<sup>31</sup> However, approximately five percent of garbage loads are taken by the other hauler to the other landfill. This creates a data management problem: because the WTS does not weigh the outgoing garbage trailers, it relies on the landfills' reported weights to provide the tonnages generated. Therefore, both companies must be contacted to obtain this tonnage data, unless F&S Accounting is able to provide it from the bills submitted by the two landfills. Campus is currently charged \$36 per ton of garbage landfilled plus a \$225 transportation fee for each trailer.

#### South Bay process

Incoming recycling trucks of paper are weighed; incoming cardboard trucks and mixed bottles/cans are not weighed. Cardboard and paper trucks are driven directly to the South Bay or directly onto the Sorting Floor. In the South Bay, loads of bottles/cans, cardboard and paper are pushed by skid steerer onto the sorting belt's infeed belt (Figure 2). The cardboard and full blue can liners recovered from the North Bay are also processed. The can liners are broken open and the cardboard and loose bottles and cans are pushed by skid steerer onto the infeed belt. The infeed belt moves the recyclables into the MRF to the sorting platform where DSC employees drop selected items through slots on the sides of the belt into bays on the MRF's main floor designated for bottles, cans, cardboard, paper, or mixed metals. When these bays are full, contents are pushed onto the Sorting Floor. All of the remaining garbage is conveyed to the North Bay where it falls through the bay floor holes into the landfill



Figure 2. South Bay, WTS

<sup>31</sup> Hoss, Tim, F&S. 2013. Personal interview. January 10, 2013 and various emails.

trailers.

### Sorting Floor process

When a recycling truck is dumped directly onto the Sorting Floor, any cardboard in the paper load is removed; paper in the cardboard load is acceptable. Recyclables are then pushed by skid steerer into the baling machine and bundled into 60-ft<sup>3</sup> bales (Figure 3). Because they are more immune to weather conditions, bales of bottles, cans and mixed metals are placed in semi-trailers in the parking lot. A trailer with an allowed Gross Vehicle Weight of 80,000 pounds can carry a 40,000-pound load equating to 29-33 1,400-pound paper or cardboard bales and fifty-six 600-800-pound bottle or can bales. Because their condition and market value are more sensitive to dampness, cardboard and paper bales are stacked on the Sorting Floor until a trailer-load has accumulated.

Osby waits until commodity prices reach an acceptable level before selling them. For example, some bales of aluminum were kept over two years. At sale time, the buyer then sends a driver with a truck for the trailer. Paper is sold to multiple buyers through a broker.

Aluminum cans are sold directly to Anheiser-Busch. Bottles are sold directly to various buyers. All outgoing commodity recyclable trailers are weighed before they leave the WTS and then weighed again by the buyer when the trailer reaches the buyer. Commodity rates fluctuate; in 2012, rates were approximately \$0.08/lb. for paper, \$0.28/lb. for bottles, \$0.035/lb. for cardboard, and \$0.84/lb. for cans.



Figure 3. Sorting floor, WTS (F&S)

### Other procedures

As previously stated, the WTS also collects and processes the standard commodity recyclables (bottles, cans, cardboard, paper) from some businesses in the Champaign-Urbana community. Revenue generated is shared with these businesses after deducting a \$120 collection fee and a \$25 per ton handling fee. The WTS also collects other commodity recyclables not sorted in the MRF. Roll-off trailers for scrap metal including non-can aluminum, brass, copper, iron, stainless steel, steel and tin (food cans, metal furniture, old pipes and other structural and construction material) are sent to Marco Recycling, a local subsidiary of Mervis Industries. Wood pallets are collected: heavy-duty “shipping pallets” meeting Commonwealth Handling Equipment Pool (CHEP) international construction standards are collected by back-hauling shippers, “good” pallets are sold to Michael’s Enterprises for \$1 per pallet, and “non-reusable” pallets are given to Michael’s or other interested parties for non-shipping purposes. Used F&S vehicle tires are recycled through

Branna, LLC.<sup>32</sup> Both Hoss and Osby have been instrumental in establishing pilot and planned food scrap composting programs.

### WTS services to campus units

According to Osby, for those units it provides cleaning services, F&S will provide a reasonable level of garbage and recycling collection at no charge, including supplies such as dumpsters, common-area bins, totes, and blue can liners for recycling bins. If the unit requests a higher level of garbage collection, they are charged an additional fee. Hoss could not elaborate on the difference between basic and extra service levels or why some campus units were charged while others were not, e.g., the College of Veterinary Medicine (VetMed) and Agricultural Engineering are charged but Animal Sciences and Soybean Research are not charged. In the past, service rates were set by F&S administration, not by the DWM.<sup>33</sup> When units are charged, partially-full dumpsters are charged the same rate as a full dumpster.<sup>34</sup> All revenue from recycling commodities is retained by WTS for operating and program expenses. I agree with Hoss that charging units for garbage collection while providing recycling collection at no or reduced charge could be a significant incentive for units to increase their recycling efforts.

Auxiliary units are charged for any and all services rendered because they are, by definition, self-supporting units which do not receive financial operating support from the state or from campus, must generate their own operational funds and must pay for any services rendered to them by campus. Increases in rates may be one factor in Auxiliaries shifting services from WTS to private contractors, including the recent proposed increase in Housing's collection rates from \$350,000 to over \$700,000.<sup>35,36</sup> I agree with Hoss and Ed Slazinik, Associate Vice Chancellor for Student Affairs and Director of Auxiliary Units, that charging Auxiliaries reasonable rates for garbage collection while providing recycling collection at reduced or no charge could result in keeping the Auxiliaries as clients and an incentive to increase their recycling efforts.

### Do we sort the garbage?

All garbage compacting dumpsters from the residence and dining halls (FAR, ISR, LAR, PAR, SDRP) and from Assembly Hall go to the North Bay. This is a standard practice because these compacting dumpsters have large amounts of food scraps high in liquid and would create an unsanitary and unsafe environment on the sorting line and floor. Garbage

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<sup>32</sup> Varney, Pete, F&S. 2013. Email communication. February 22, 2013. Branna, LLC, contact information: 2500 E. 800 North Road, Pana, IL, 62557-6458, phone 217-226-4095, license #T8849.

<sup>33</sup> Hoss, Tim, F&S. 2013. Personal interview. January 10, 2013 and various emails.

<sup>34</sup> Osby, Tracy, F&S. 2012. Personal interviews; email communications. August 21 and 30, 2012, and January 15, 2013; various dates.

<sup>35</sup> Hoss, Tim, F&S. 2013. Personal interview, January 10, 2013.

<sup>36</sup> Slazinik, Ed. 2012. Personal interview. October 19, 2012.

### Chapter 3: Primary Waste Management

trucks can go to the North Bay or South Bay; research personnel have been given multiple explanations of how they are processed.

Prior to this study, our understanding was that all waste on campus was sorted through the MRF to maximize recovery of recyclables, even if an individual put their empty bottle or can in their office garbage bin. This perception was reinforced by the online MRF tour of the Waste Management website.<sup>37</sup> At the start of the study, Osby told research personnel that all garbage trucks go to the North Bay and were not separated and sorted through the MRF because of the relatively high



Figure 4. Grounds mixed-waste bin

percentage of food scraps and other non-recyclable items that would damage or soil the sorting conveyor belt, and the relatively low percentage of recyclable items in the garbage. Then, after we were told no waste gets separated and sorted, we were told that some of the commingled-waste (garbage plus recyclables) bins maintained by the Grounds Department are sorted in the South Bay.<sup>38</sup> Every weekday afternoon, Grounds staff collects waste from the outdoor commingled-waste bins on the Quad and brings it to the WTS's South Bay and sent onto the infeed belt. This is permitted because these bins have a relatively low percentage of food waste and a relatively high percentage of recyclables. These cans are stenciled "Refuse + Trash" and "Recyclables," although they do not specify which recyclables are acceptable (Figure 4).

Most recently, we were told that early-arriving garbage trucks go to the South Bay and their waste is separated and sorted through the MRF.<sup>39</sup> One possible reason is that sorting staff can separate and sort the garbage until the recycling trucks start arriving and need to be sorted. Additionally, only a certain amount of garbage can be stockpiled in the North Bay for later processing in the South Bay; additional garbage stockpiling would require approval from the Illinois EPA. The actual official process for garbage handling should be clarified and additional processing capacity options should be explored.

### Analysis of Waste Transfer Station operations

Overall, the WTS is providing an amazing level of service given the relatively few resources it has at its disposal. Its strengths are in Osby's competence to professionally handle multiple

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<sup>37</sup> Facilities & Services. 2001. "Recovery Facility Tour." Accessed September 3, 2012. <http://www.fs.uiuc.edu/maintenance/wastemanagement/recoverytour.cfm>.

<sup>38</sup> Osby, Tracy. 2012. Email communication. November 26, 2012

<sup>39</sup> Osby, Tracy. 2012. Email communication. February 15, 2013.

### Chapter 3: Primary Waste Management

tasks, the staff's dedication to conscientiously complete their dirty and tedious tasks, and the WTS' ability to handle a variety of commodity and special recyclables. The weaknesses of the system are in those same areas: minimal staff, low levels of funding for equipment and supplies, and the ability to process only a basic slate of commodity recyclables.

First, Osby is the only full-time staff member and manages the entire garbage and recycling program for a university of over 50,000 students, faculty and staff spread over six hundred buildings. He dispatches drivers, finds and manages vendor accounts and answers email and phone requests for collections and route modifications. He is on-call twenty-four hours a day, seven days a week, 365 days a year; he even answers his work mobile phone while on vacation. Although Osby does supervise the truck drivers, they are technically employees of F&S and he has limited control over their assigned duties and performance expectations. Additionally, because the MRF sorting crew are high-functioning clients from the DSC, they require more supervision and guidance than they would otherwise, further reducing Osby's available time to enhance the waste management program.

If the MRF had more full-time staff, the CCWM could work with campus units to expand recycling programs and find markets for additional undiverted landfill and recyclable items. The low number of staff means little importance can be placed on data management and, therefore, very little garbage or recyclables data is being collected. Garbage weights are dependent on reports from the landfill vendor. Incoming bottles and cans are not weighed. Most importantly, Auxiliaries' garbage and recyclables not handled by the WTS are not reported to campus and, therefore, are not calculated into the diversion rate and, consequently, are not being reported to the state or federal agencies. Surplus equipment, C&D waste, landscape waste, animal waste and bedding, tires and pallets are not weighed. Most of these items are not the WTS's responsibility but it does have the only on-campus truck scale available. All of these individual factors greatly reduce the confidence that can be placed in the reported recycling diversion rate or landfill weights.



Figure 5. KCPA mixed-waste bin with mixed-waste stenciling

Finally, the lack of staff means little time can be spent on communicating the services and programs available to campus, including maintaining the list of un-/acceptable items, proactively advertising those items and where they should be deposited, and educating the public about how the WTS and MRF operate. I encountered this last issue multiple times: high-level staff in F&S believed that all campus waste was separated and sorted in the

### Chapter 3: Primary Waste Management

MRF.<sup>40</sup> A Senior Director and the Facilities Manager of the Krannert Center for Performing Arts (KCPA) were told the same, going so far as to advertise to KCPA patrons they did not have to separate their waste because it was separated at the WTS (Figure 5).<sup>41</sup> This belief was echoed by other research staff, as well as by Ed Slazinik, Associate Vice Chancellor for Student Affairs and Director of Auxiliary Services.<sup>42</sup>

Second, the relatively low level of funding results in the few number of trucks, drivers and sorters resulting in a longer run schedule and lower sorting capacity. Higher funding would pay for more trucks and drivers to get the waste to the MRF faster, and more sorters would create a faster sort and the ability to separate and sort more of the unsorted waste, diverting more recyclables from the landfill. Additional funding could fund the installation of an automated Near-Infrared (NIR) sorting unit that would increase the number of items able to be sorted and their recovery rate.<sup>43</sup>

Third, the MRF does not sort and collect the following items: #1 and #2 non-bottle plastics, #3-#7 non-Styrofoam plastics, or glass, all of which are accepted in both the Cities of Champaign and Urbana, and are likely a significant portion of the campus waste stream (plastic – 5.4% glass – 0.6%).<sup>44</sup> A NIR sorting unit would separate and collect these currently-landfilled plastics and serve as a secondary sorter/collector following DSC staff. According to Osby, only 70-80% of the #1/#2 plastic is bottle-shaped, indicating that another 18,000 pounds of #1/#2 plastic could be recovered, based on the 40% and 8% recovery rates listed in the 2010 Waste Reduction Plan. The NIR sorter would certainly increase those recovery rates, however, markets would need to be identified for these items. Alternatively, campus could collaborate with the cities to accept these items into their recycling streams. A final option would be to work with the Illinois Sustainable Technology Center (ISTC) which is currently researching organics-to-energy alternatives including pyrolyzing organics – including plastics and food waste – into crude oil.

In summation, I conclude that Osby is able to manage the waste management program, responding to requests for service in a timely manner. However, he does not have the time, staff or other resources necessary to make substantial improvements to the system, including data management, researching markets and uses for garbage and recyclables, and ensuring that all buildings have the optimal mix of waste containers. As the WTS is the crux of the campus waste management process, additional investments of staff, equipment and funding would have significant positive impacts on not only the WTS's operation, but also upstream

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<sup>40</sup> Johnston, Morgan. 2012. Personal communication. August, 2012.

<sup>41</sup> Williams, John. 2013. Personal interview. January 24, 2013.

<sup>42</sup> Slazinik, Ed. 2012. Personal interview. October 19, 2012.

<sup>43</sup> Science Daily. 2007. "Recycling Without Sorting: Engineers Create Recycling Plant That Removes The Need To Sort. Accessed February 9, 2013. [http://www.sciencedaily.com/videos/2007/1002-recycling\\_without\\_sorting.htm](http://www.sciencedaily.com/videos/2007/1002-recycling_without_sorting.htm)

<sup>44</sup> Hoss, Tim. 2010. Waste Reduction Plan – 2010. University of Illinois.

benefits in the buildings and downstream benefits at the landfill, vendors, students, faculty, staff, and the surrounding community.

Osby has said that he is willing to improve data management but his time is limited. Additional staff would be needed to design the data management system; to educate and train drivers and facility and program managers; and to collect, process and monitor the data. Additional funding would pay for trucks or dumpsters to be outfitted with scales or other data collection devices, bringing a certain level of automation and certainty to the data collection process.

### Ideas to improve Waste Transfer Station waste management

- WTSI 1: Increase WTS funding. Hire at least one additional staff member to assess building recycling resources and work with facility and building managers to optimize recycling collection; additional recycling equipment and supplies (bins, signage, NIR recycling sorter); and additional trucking equipment (trucks, truck scales).
- WTSI 2: Institute “initial purchase disposal fee.” This fee would be assessed on major/all items purchased for campus; these funds would subsidize the eventual landfilling, incinerating, repurposing or recycling of these items, including funding the operations of the WTS and other campus recycling programming.
- WTSI 3: Audit and improve building recycling bins and signage. Facilities should be surveyed for actual locations of all garbage and recycling bins. Ensure all common and individual areas have optimal number and placement of commodity recycling bins and that all garbage bins are paired with a recycling bin, including accurate and consistent signage on bins with acceptable and unacceptable items. (Figure 15 shows lack of paired recycling).<sup>45</sup>
- WTSI 4: Mandate recycling service provision. Require all campus units, Auxiliaries, Allies, and tenants provide recycling services to their residents.<sup>46</sup> This would comply with General Services Administration (GSA) guidelines.<sup>47</sup>
- WTSI 5: Improve hauling equipment. Consider equipping trucks and/or dumpsters with weight scales, truck scales may cost around \$10,000 each.<sup>48</sup> Data could be taken manually or with data loggers.

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<sup>45</sup> Cooley, Christine von Kolnitz. 2012. CURC Board member. Personal communication. October 16, 2012.

<sup>46</sup> Beale, Sonny. 2013. Email communication. February 11, 2013.

<sup>47</sup> Guzowski, Roger. 2013. Email communication. February 11, 2013. GSA guidelines found at <http://www.gsa.gov/portal/ext/public/site/FMR/file/Part102-74.html/category/21859/>.

<sup>48</sup> Cooley, Christine von Kolnitz. 2013. Email communication. February 11, 2013.

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- WTSI 6: Improve MRF operations. Research options for increasing MRF handling and sorting capacity and recycling recovery rates: increasing bay size to allow for increased garbage stockpiling to increase garbage sorting capacity; query the Illinois EPA regarding requirements to increase stockpiling; install a NIR sorter to allow for the sorting and collecting of plastics, glass and other recyclables.
- WTSI 7: Map dumpsters and common-area bins. Field-locate existing garbage and recycling dumpsters and indoor bins using Geographic Position Systems (GPS) and map them. Analysis will reveal areas which may need dumpsters. Dumpster maps will enable drivers and other staff to easily locate dumpsters and bin maps can be posted in buildings, allowing users to quickly locate bins.
- WTSI 8: Establish Green Teams. Due to its lead role in campus waste management, the Recycling Coordinator should co-lead the campus Green Team with the Sustainability Coordinator to educate and coordinate unit and topical Green Teams.
- WTSI 9: Confirm pallet recycling data. Osby's reported pallet sales do not reflect donated pallets and conflicts with 2005 and 2010 Waste Reduction Plan (WRP) numbers.
- WTSI 10: Secure additional recyclables markets. Locate additional buyers for currently-landfilled commodity recyclables or collaborate with cities and local haulers on items they currently accept, e.g., glass and plastics.
- WTSI 11: Conduct annual WTS waste audit. Conduct a waste stream analysis for an entire week using the sorting belt and staff to analyze all of the garbage and recyclables collected from all units at the WTS.



Figure 6. Bevier Hall bins



Figure 7. Temple Buell Hall bins



Figure 8. Clark Hall bins



Figure 9. Kinley Hall bins

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- WTSI 12: Implement campus waste management standards. Design, implement and enforce minimum waste reduction, recycling, and energy conservation standards that would also apply to campus units, Auxiliaries, vendors and contractors.
- WTSI 13: Improve bottle/can recycling. Ensure that all bottle/can recycling bins use blue can liners. In addition, bottle/can totes should be used for collecting liners of bottles/cans to reduce loss due to bags tearing in dumpsters or liners being completely missed at the WTS.
- WTSI 14: Establish Interagency Waste Management Task Force. Provide a forum for regional state, city, county, private, not-for-profit and community members to discuss waste management issues.
- WTSI 15: Establish bottle fee. Collect a fee (not a deposit) on all bottles and cans – aluminum, glass, plastic – sold on campus. Collected funds would be used to support recycling operations and programming.

## Building Waste Management Operations

### Building garbage collection and processing

Although the WTS is the central collection and processing location for campus waste, the initial collection and sorting begins at the campus units in their buildings. Faculty and staff may have garbage and/or recycling bins in their individual office. BSWs are responsible for emptying the individual garbage bins in offices and rooms into the common building garbage collection bin.<sup>49</sup> Conversely, building residents are responsible for emptying their individual recycling bin into a common recycling bin in their department, on their floor, or a main building bin. Not all



Figure 10. Art & Design bins



Figure 11. Law Building dumpsters, double-parked



Figure 12. Blue bags of bottles/cans extracted from garbage at WTS



Figure 13. Blue bags in garbage dumpster

<sup>49</sup> Osby, Tracy, F&S. 2012. Personal interviews; email communications. August 21 and 30, 2012, and January 15, 2013; various dates.

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individual offices or residence rooms have individual recycling bins. Additionally, many people are not aware of where or what items they can recycle in their building. Some student residents have even asked CSE staff where they can recycle items in their residence hall.<sup>50</sup>

At the floor or hall scale, garbage is collected in common-area bins of varying sizes, shapes and colors (Figures 6-10). Bins were observed that were unmarked or stenciled with “Trash” or “Waste.” BSWs are required to use clear plastic can liners in garbage bins so that WTS staff can quickly identify it as garbage and direct it to the landfill dumpsters. At the building scale, garbage is emptied into front-load dumpsters, rear-load dumpsters and/or roll-off trailers. The amount of garbage generated by the building’s users determines both the dumpster type and size, as well as the frequency of collection. Many buildings have multiple dumpsters. Collection frequency ranges from daily to weekly or on a call-in basis. As previously stated, some Auxiliaries are served by ADS rather than the WTS due to cost and service concerns, e.g., “Are the recyclables really being recycled?”

#### Building recyclables collection and processing

At the floor or hall scale, recyclables are collected in common-area bins of varying sizes, shapes and colors (Figures 6-10). They are usually stenciled with the recyclable item but designations are not consistent within or between departments or buildings. For example, some bins are labeled “bottles,” “cans,” or “bottles and cans” but are not labeled “plastic” or “aluminum,” confusing people about how to dispose of the items not listed, e.g., bottles when a bin is labeled for cans, or is it only plastic bottles and not glass bottles. Other bins are labeled “plastic” but not “aluminum” or “cans” or “bottles”, confusing people regarding what forms of plastic can be accepted or what to do with aluminum or other cans. Some bins have fairly extensive lists detailing what types of recyclables are accepted in the bin; some lists are accurate and some are inaccurate and/or out-of-date. Document Services provides bins for both acceptable and unacceptable paper products with a detailed list for each. Most lists are text-based, a few are graphic-based; fewer still are text-and-graphic-based. In addition to the lists’ inconsistency and inaccuracy, some are just confusing: CRCE bins’ text-graphics have both a “plastic/can” option and a “plastic” option but do not explain what each option includes.

To further confuse building users, some recyclables are permitted in other recyclables’ bins. For example, if no cardboard bin is nearby, flattened cardboard can be placed in the paper recycling bin. However, paper should not be placed in cardboard bins: this is because large pieces of cardboard are pulled out of the paper dumpsters at the WTS, but they do not pull out paper from the cardboard dumpsters. The amount of recyclables generated and the space available for dumpsters or 90-gallon rolling totes determine the size of the recycling collection receptacles provided. After users empty their individual recycling bins into the

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<sup>50</sup> Lage, Stephanie. 2012. Personal communication. 2012.

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common-area bins, BSWs then dump these bins into recycling dumpsters for paper or cardboard located outside the building (Figure 11) or bottle/can or paper totes located outside the building or near outside entrances. Buildings which generate large amounts of paper or bottles/cans may also use the rolling totes as common-area bins.

Front-loader trucks empty the front-load dumpster and the totes are collected by the Green Weenie, which uses a hydraulic lift to dump the totes into its bay.<sup>51</sup> Roll-off trailers can be either single-item or dual-item. The latter have a hinged door inside the dumpster which is latched until it reaches the WTS where it is tipped, allowing the rear-most items to spill out. The trailer is then lowered, the door is unlatched and the dumpster is tipped a second time, allowing the items in the front half of the dumpster to fall past the now-open door out the back of the dumpster. There are no recycling dumpsters for bottles/cans. For this reason, BSWs are required to use translucent blue plastic can liners in the common-area bottle/can bins because the blue liners are then placed in paper or cardboard recycling dumpsters outside the building.

The blue liners are highly visible in the dumpsters and trucks and enable WTS staff to quickly spot and extract them from the garbage or recycling trucks (Figure 12). If rolling totes are used to collect bottles/cans, no blue can liner is required. If there is no recycling dumpster, the blue liners are placed in the garbage dumpster (Figure 13). This is why it is crucial that the BSWs properly utilize the blue can liners: if they collect the recyclables in a clear liner (Figure 14) and then throw the liner into the garbage dumpster, that clear liner of recyclables is then allowed to be dropped into the landfill dumpster and never recovered, resulting in reduced landfill diversion, increased landfill costs and lost commodity revenue.

There are often no recycling bins near or within sight line of the garbage bins, making it less convenient for people to recycle as often as they could, resulting in disposal of the recyclables in the garbage and reduced recovery of recyclables (Figure 15). Osby provides blue can liners to campus units at no charge; he does not provide



Figure 14. Bottle/can bin without blue liner

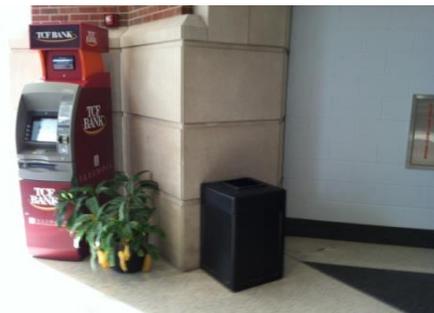


Figure 15. CRCE garbage without any recycling bin

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<sup>51</sup> Quinlan, James. Personal interview. September 6, 2013.

them free to Auxiliary Units. However, one Auxiliary staff member told me that Osby provided the contact information for his vendor so that they could purchase the same blue can liners. Because Auxiliaries usually do not use the blue can liners, it is necessary for them to use the 90-gallon totes for their bottles/cans to be collected.

### Analysis of building operations

I visually surveyed approximately twenty buildings of administrative, academic, dining, operation and residential functions, including Allen Hall, ARC, Bevier Hall, CRCE, Clark Hall, Document Services, Illini Union, David Kinley Hall, Law, McKinley Health Center, Main Library, Memorial Stadium, Nugent Hall, PPSB, Psychology, Temple Buell Hall, and Undergraduate Library. Admittedly not a scientific survey, it was apparent that buildings had a range of “good” to “poor” in the following waste management areas:

- infrequent pairing of recycling bins with garbage bins
- low availability of recycling bins within a reasonable distance
- sporadic use of blue can liners in bottle/can recycling bins
- very low participation in battery recycling programs
- many buildings without cardboard or paper dumpsters or bottle/can totes

### Ideas to improve building waste management

- BWMI 1: Improve bottle/can recycling: see WTS improvements.
- BWMI 2: Audit and improve building recycling bins and signage: see WTS improvements.
- BWMI 3: Create recycling stations in common areas: Include garbage and recycling bins with graphic-and-text-based signage above bins on wall similar to current signage in Housing, and/or on the bins themselves, indicating (un)acceptable items. A “Recycling Station” sign should be installed above the bins if on-bin signage is used. At least one station per building should include both types of battery recycling receptacles. Add textbook and clothing recycling bins if approved.
- BWMI 4: Expand battery recycling. Implement both battery recycling programs in at least one recycling station in each building. Stations without battery recycling should direct building users to the closest station with battery recycling.
- BWMI 5: Reduce number of garbage bins. Remove garbage bins from classrooms and offices and install signs directing users to take garbage and recycling to common-area bins located in all hallways. This will reduce the number of garbage bins needed while increasing the likelihood of recyclables being separated into proper bins.

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- BWMI 6: Brand and detail dumpsters, toters and bins. Paint and stencil existing and new dumpsters, toters and bins to quickly indicate what items are accepted, e.g. Housing and other units have white-painted dumpsters for cardboard.  
Recommendations:
  - create a new recycling graphic to be included on all recycling receptacles; stencil name of recycling item or “LANDFILL” for garbage on receptacles
  - paint dumpster and toters the following colors: orange (recommended) or white (current) for cardboard; blue for bottles/cans; green for food scraps
  - provide signage on paper, cardboard or garbage dumpster that cardboard and blue bottle/can liners may be placed in that dumpster and will be removed and processed at the MRF, if separate cardboard dumpsters or bottle/can toters are not available
  - provide a painted or laminated list of (un)acceptable items on each receptacle.
- BWMI 7: Establish Green Teams. Due to the large number of transient student building users in addition to resident faculty and staff, each building should have its own Green Team with member(s) from each unit including a Facility Management member and a student member. See WTS improvements.
- BWMI 8: Implement waste audit research plan. Determine buildings’ baseline waste management rates from which future actions’ impacts can be assessed:
  - select at least two index buildings from a variety of building types (administrative, classroom, dining, laboratory, residence, support): audit them monthly to determine year-round index levels;
  - conduct “spot” waste audits every month at two to three other campus buildings; this would take several years to conduct audits at all campus buildings; and
  - use index buildings’ monthly data and trends to extrapolate spot-audits to an annual projected waste cycle
- BWMI 9: Map dumpsters and common-area bins: see WTS improvements.
- BWMI 10: Implement campus waste management standards: see WTS improvements.
- BWMI 11: Expand sustainability initiative campus-wide: Expand existing Illinois “Orange and Blue Go Green” Sustainability Week theme into a campus-wide, year-round sustainability initiative, including a Zero Waste program.

## CHAPTER 4: AUXILIARY UNIT WASTE MANAGEMENT

This section is based on personal and phone interviews and email correspondence with Auxiliary staff and research on Auxiliary websites and literature. As “auxiliaries under indenture,” Auxiliaries are considered self-supporting units by the State of Illinois, retaining a high level of autonomy over daily operations including the ability to select their own garbage and recycling haulers.<sup>52</sup> They are not permitted to receive state or campus funding and must pay for all services rendered to them by campus units. However, they are still required to follow university and campus policies.

### General Auxiliary Unit Waste Management Operations

I interviewed Ed Slazinik, Associate Vice Chancellor of Student Affairs and Director of Auxiliary Services, to get an overview of the campus guidelines governing Auxiliaries.<sup>53</sup> As Director, Slazinik is responsible for the “operations and facilities of the Auxiliary departments in Student Affairs, including Assembly Hall, Division of Campus Recreation, Illini Union and Bookstore, McKinley Health Center and University Housing and Dining Services.” Slazinik said that he was not aware of any campus “sustainability” or “waste reduction” policies or practices currently in place regarding procurement or waste management. Later discussions with Lage and Johnston, as well as with Dan Szajna of University Sourcing, revealed there are actually several policies both mandating and encouraging sustainable purchasing and waste management.<sup>54</sup> These include the campus Sustainable Purchasing Policy which addresses items such as the requirement to use soy-based ink in all printing orders, and state policies such as the Illinois Procurement Code (30 ILCS 500/).<sup>55</sup>

Slazinik said that the Auxiliaries are interested in reducing waste production and increasing recycling. He also believed they were concerned about the effect of F&S’s centralization of waste management on the provision of costs and services: F&S planned to double the rate for managing Housing’s waste, prompting them to consider moving their hauling service to a private hauler. Auxiliaries were also concerned about recyclables’ final disposition, i.e., “are materials actually being recycled?” He stated garbage bins should be paired with recycling bins. Slazinik stated that Auxiliaries’ greatest contribution to the waste stream was food scraps; to mitigate this, Housing had been working with the SSF and pursuing food scrap

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<sup>52</sup> Slazinik, Ed. 2012. Personal interview. October 19, 2012

<sup>53</sup> Slazinik, Ed. 2012. Personal interview. October 19, 2012.

<sup>54</sup> Szajna, Dan. 2012. Personal interview. October 1, 2012.

<sup>55</sup> Legislative Information System. 2013. “Illinois Compiled Statutes: FINANCE (30 ILCS 500/) Illinois Procurement Code.” Accessed January 20, 2013.

<http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=532&ChapterID=7>.

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composting. When asked about reducing the use of plastic bottles on campus, Slazinik stated that this would raise issues with campus' contract with Coca-Cola Company. We discussed a bottle fee which would generate funds that could be returned to campus to fund recycling programs. Slazinik provided contact information for the Auxiliary Building Managers as well as incomplete information on which Auxiliaries used the WTS and which used private haulers; he recommended contacting those Managers for definitive answers. One important note: while Slazinik knew that the Illini Union and other Auxiliaries separated their garbage and recycling streams at the building, he echoed the belief expressed by KCPA administrators and some F&S staff that the rest of campus used a mixed-waste stream process and that garbage and recyclables are not separated until they reach the MRF.

Slazinik did not believe that the campus or Auxiliaries' waste management systems had any significant strengths or weaknesses. He did state that the biggest obstacle to improving the system was working with outside vendors such as the Illini Union and DIA food court vendors on their waste management. Two areas for potential improvement were in Ballroom and Catering operations, units of Housing's University Dining Services.

### Analysis of Auxiliary Unit operations

After visiting several of the Auxiliaries – residence and dining halls, the Illini Union, McKinley Health Center – it appeared that most of them were doing an exceptional job of collecting several types of recyclables. However, not all Auxiliaries were recycling all possible items. Many were not using the blue can liners for bottle/can recycling bins, necessitating determination of their use of totes for collecting bottles/cans. Due to the extraordinarily large amount of garbage and recyclables produced in housing, dining, recreation and athletic activities, efforts must be made to ensure that all possible recycling programs are implemented at all facilities. This would require site visits to all Auxiliary buildings to determine which practices are implemented, and to inform Building Managers on available programs and educate them about the importance of waste reduction and recycling, and helping them expand existing and implement new programs. This outreach and education would require additional staff and equipment: GPS units for mapping garbage and recycling dumpsters and bins, additional recycling dumpsters and bins, and staff time to site and service bins. The staff member should be housed in the CSE or F&S. Equipment costs would be borne by the Auxiliaries.

### Ideas to improve general Auxiliary Unit waste management

- AUI 1: Map dumpsters and common-area bins: see WTS improvements.
- AUI 2: Audit and improve building recycling bins and signage: see WTS improvements.

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- AUI 3: Collect campus units' waste management data. Collect weight or volume data on garbage and recycling collected by private haulers from Auxiliaries and add this data to WTS collection data; this will increase accuracy of landfill diversion and tonnage rates.
- AUI 4: Establish Green Teams: see WTS improvements. Teams should be established in each Auxiliary as well as a Director-level Green Team to promote discussion amongst Auxiliaries. Suggested members include Dawn Aubrey, Brandon Boyd, David Guth, John Humlicek, Rosalie Lard, Gary Miller, Vonne Ortiz and Kevin Ulestad.
- AUI 5: Implement campus waste management standards: see WTS improvements.
- AUI 6: Mandate recycling service provision: see WTS improvements. Mandate would apply to private vendors, dining, certified housing facilities and haulers.
- AUI 7: Encourage/mandate sustainable purchasing. Expand campus iBuy purchasing website and change the current "green alternative" items to the default item, requiring buyer to actively select a less sustainable option.
- AUI 8: Establish Interagency Waste Management Task Force: see WTS improvements.
- AUI 9: Establish bottle fee: see WTS improvements.
- AUI 10: Improve bottle/can recycling: see WTS improvements.
- AUI 11: Reduce number of garbage bins: see Building improvements.
- AUI 12: Expand battery recycling: see Building improvements.
- AUI 13: Research remaining Auxiliaries. Interview staff and audit facilities of remaining Auxiliaries: Assembly Hall, Division of Campus Recreation (ARC and CRCE), Conference Center, Parking Department, and Student Services.
- AUI 14: Create recycling station in common areas: see Building improvements.
- AUI 15: Brand and detail dumpsters, toters and bins: see WTS improvements.
- AUI 16: Implement waste audit research plan: see WTS improvements.

## Illini Union

This section is based on a personal interview with Ed Slazinik and emails with David Guth, Assistant Director of Facilities for the Illini Union (Union).<sup>56, 57</sup>

### Illini Union operations

- Waste processing – collection, separation and sorting: building users separate and sort their waste into garbage and the dual-stream recycling streams. All but three offices have desktide paper recycling bins. The Union uses combination bins in most areas (Figure 16) but uses larger, separated bins in the main floor Food Court (Figure 17). BSWs do not use blue can liners in its bottle/can bins because they transfer full bags into toters. BSWs at the Union transfer the paper and cardboard into separate dumpsters.
- Garbage collection: Union contracts with private hauler ADS to collect garbage.
- Garbage volume: no data collected; monthly hauling bill averages \$1,600.
- Recyclables collection: Union contracts with WTS to collect bottles/cans, cardboard, paper. The Union receives no revenue from recyclables.
- Recyclables volume: estimated at 600 yds<sup>3</sup> of paper and 2,000 yds<sup>3</sup> of cardboard per year.



Figure 16. Illini Union garbage and recycling bin



Figure 17. Illini Union Food Court bins

### Analysis of Illini Union operations

The Illini Union is doing a good job managing waste. Utilizing the three- and four-compartment waste bins for garbage and bottle, can, and paper recycling likely reduces the MRF sort labor and increases its recovery rate. The Union also provides recycling for rechargeable batteries but not for disposable batteries.

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<sup>56</sup> Slazinik, Ed. 2012. Personal interview. October 19, 2012.

<sup>57</sup> Guth, David. 2013. Email communication. March 11, 2013.

## Ideas to improve Illini Union waste management

- IUI 1: Explore composting options. Begin discussions with Housing and food vendors to institute food waste composting once campus implements composting program.
- IUI 2: Audit and improve buildings' recycling bins and signage: see WTS improvements.
- IUI 3: Create recycling stations in common areas: see Building improvements.
- IUI 4: Reduce prepared food waste. Encourage private food vendors to participate in Zero Percent program.<sup>58</sup> This program is designed to reduce end-of-day food surpluses by: coordinating with local charities and other not-for-profit organizations that accept end-of-day food donations; and notifying consumers via a mobile phone application which sends text messages to subscribers about end-of-day food specials and discounts to reduce food waste.
- IUI 5: Improve bottle/can recycling: see WTS improvements.
- IUI 6: Establish Green Teams: see WTS improvements.
- IUI 7: Mandate recycling service provision: see WTS improvements.
- IUI 8: Implement campus waste management standards: see WTS improvements.
- IUI 9: Expand battery recycling programs: add second battery recycling program.
- IUI 10: Reduce number of garbage bins: see Building improvements.
- IUI 11: Implement waste audit research plan: see Building improvements.

## Division of Intercollegiate Athletics

This section is based on an interview with Rosalie Lard, Administrative Clerk for Sports Facilities.<sup>59</sup> The Division of Intercollegiate Athletics (DIA) is an Auxiliary that operates several athletic performance and training facilities and includes administrative offices and academic and support facilities for athletes.

### DIA procedures

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<sup>58</sup> Karmeni, Rajesh. 2013. "Zero Percent Program." Illinois Green Business Association. IGBA Summit. September 17, 2012.

<sup>59</sup> Lard, Rosalie. 2013. Personal interview. January 23, 2013.

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- Garbage collection: DIA contracts with WTS, Allied Waste and ADS to collect garbage. Billing questions may be directed to Jeane Murray, Staff Clerk for DIA (jmurray1@illinois.edu. 217-333-5722).
- Administrative area recyclables collection: Any reported recycling collection is performed by the WTS, although private haulers may be collecting recyclables from buildings they service. Many, but not all, of the administrative facilities recycle cardboard and paper using office bins which are emptied into on-site recycling dumpsters; bottles/cans are collected in blue-lined bins; liners are then placed in the garbage or recycling dumpsters which are taken to the WTS. Most of the training facilities do not have recycling dumpsters. In these cases, the liners are brought back to the Memorial Stadium dumpsters for collection by WTS. DIA receives no revenue from these recyclables.
- Game area recyclables collection: bottle/can recycling was initiated in spectator seating areas in Memorial Stadium in August of 2012 using eighty bottle-shaped plastic recycling bins donated by Coca-Cola. This program may be expanded to the softball and baseball spectator seating areas in future years. Unfortunately, these recycling bins are very lightweight, rendering them impractical for use in the “tailgating” areas. Tailgate areas use 55-gallon steel drums for waste collection: none of the recyclables are recovered from this significant waste generator.
- Athletic facilities:
  - Atkins Tennis Center: garbage and recycling collected by ADS.
  - Bielfeldt Athletic Administration: garbage by ADS; cardboard and paper by WTS.
  - Demirjian Indoor Golf Facility: garbage is brought to Memorial Stadium for collection by WTS; no recycling known to be collected.
  - Eichelberger Softball Field and Facilities: garbage by ADS; no recycling; will soon start recycling bottles/cans in spectator seating area.
  - Huff Hall (only the athletic areas used for wrestling, gymnastics, volleyball): garbage by WTS; no recycling known to be collected.
  - Illinois Baseball Field: garbage by Allied Waste; no recycling; will soon start recycling bottles/cans in spectator seating area.
  - Irwin Academic Service Center: garbage brought to Memorial Stadium for collection by WTS; no recycling known to be collected.
  - Irwin Indoor Football Facility: garbage brought to Memorial Stadium for collection by WTS; no recycling known to be collected.
  - Memorial Stadium:

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- administrative areas: garbage by WTS; bottles/cans, cardboard, paper by WTS; not all offices collect all items;
  - spectator seating areas: garbage and bottles/cans by WTS;
  - tailgating areas: garbage by WTS using F&S drivers and trucks and DIA staff; no recycling collected;
  - Varsity Room (dining area for athletes run by DIA): garbage by Allied; recycling is unknown; and
  - Housing-catered events: garbage and recycling disposition is unknown.
- Ubben Basketball Practice Facility: garbage by ADS; recycling by WTS.

### Analysis of DIA operations

DIA has basic recycling at some of its facilities, primarily at Memorial Stadium. Both Lard and her supervisor, Leonard Willis, Director of Facilities, are willing to increase recycling efforts at DIA facilities but admit that staff need to be educated about the importance of recycling as well as ways to increase recycling at the facilities. We discussed options for recycling in the tailgating areas, conducting a pilot zero waste Game Day Event – a potential future event earlier mentioned by Tracy Osby – and expanding existing recycling programs throughout the administrative and training facilities. Because they are an Auxiliary, DIA would have to pay for any bins and collection services provided by the WTS.

### Ideas to improve DIA waste management

- DIAI 1: Explore composting options: see Union improvements.
- DIAI 2: Audit and improve building recycling bins and signage: see WTS improvements.
- DIAI 3: Create recycling stations in common areas: see WTS improvements.
- DIAI 4: Reduce prepared food waste: see Union improvements.
- DIAI 5: Implement “tailgate” recycling program:
  - reduce number of garbage drums, paint them black and label them “LANDFILL”
  - pair each garbage drum with a recycling drum painted blue, a weighted Coca-Cola-bottle-shaped or other appropriate recycling bin and label it “recyclable plastic bottles and aluminum cans”; if possible, secure or tether to garbage drum
- DIAI 6: Implement Pilot Zero Waste Game Day event:

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- prior to event, conduct a baseline audit of waste components: garbage, and recovered and missed recyclables
  - select a special day: Homecoming, historical rival team, near Earth Day or Sustainability Week
  - use highly-visible recycling stations with designated volunteers and/or staff wearing “Green Team” clothing to show attendees how to properly recycle
  - after game, audit garbage and recycling to determine waste diversion rate
  - model events after Ohio State University (Buckeye Stadium), UC Davis (Aggie Stadium) and University of Colorado – Boulder (Folsom Field)<sup>60, 61</sup>
- DIAI 7: Establish Green Team: include members from each facility and sport/team.
  - DIAI 8: Improve bottle/can recycling: see WTS improvements.
  - DIAI 9: Mandate recycling service provision: see WTS improvements.
  - DIAI 10: Implement campus waste management standards: see WTS improvements.
  - DIAI 11: Expand battery recycling programs: see Building improvements.
  - DIAI 12: Implement waste audit research plan: see Building improvements.

## University Housing

This section is based on personal interviews with several staff members from the Residential Life and Dining Services departments of University Housing (Housing) and tours of several facilities. Housing is an Auxiliary that reports to the Vice Chancellor of Student Affairs and is a self-supporting operation. It currently pays the WTS to collect and process both garbage and recycling at all of its residential and dining halls. However, according to Carol Strohbeck, Food Services Administrator, a proposed 83% rate increase may result in Housing choosing to contract with a private hauler.<sup>62</sup> This rate increase and/or speculation on private contractors was reiterated by Associate Vice Chancellor Slazinik, Associate Director of Housing Dawn Aubrey, Recycling Coordinator Tracy Osby, and former Campus Waste Management Coordinator Tim Hoss. Housing also pays its own utilities (water, sewer, gas, electricity, etc.). Reduction of garbage – including food waste – would reduce its operating

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<sup>60</sup> Addison, Donny, Corey Hawkey, Lin Kin, Michelle La. 2013. Campus Recycling and Zero Waste Workshop. AASHE 2012 Conference. October 14, 2013. Los Angeles, CA.

<sup>61</sup> Hawkey, Corey, Michelle La, Edward von Bleichert. “Zero Waste Stadiums: Don’t Be Scared (Or Maybe A Little).” AASHE 2012 Conference. October 14, 2013. Los Angeles, CA.

<sup>62</sup> Strohbeck, Carol. 2013. Personal interview. January 24, 2013.

costs. In January of 2011, Housing established the Housing Sustainability Council (HSC) which is comprised of eight Housing staff members and a member of the Student Sustainability Committee. The HSC meets biweekly and is:

[C]harged with reviewing internal operations to identify and recommend solutions to help Housing operate in a more financially and environmentally sustainable way, and to create and distribute educational materials that build awareness around sustainability issues and encourage employees to take action. The Council supports the current strategic plan of University Housing and aims to establish sustainability practices that will endure beyond the current strategic plan.<sup>63</sup>

### Residence Halls

This section is based on an interview and email communications with Benita Vonne Ortiz, Assistant Director of Facilities Operations for Housing. Ortiz gave me a guided tour of Lincoln Avenue Residence's Allen Hall.<sup>64</sup> Ortiz has been recycling at Illinois for twenty-two years in various capacities; she was Recycling Coordinator for Housing before her current position as Assistant Director. She made it very clear that researchers should be careful when they compare Illinois to other institutions which may do things differently and may have different resources, capabilities and authorities, e.g., establishing bottle fees or disposing of surplus equipment. There are 3.4 million square feet of residence hall facilities managed by Housing. Ortiz believes that only about ten percent of students are regularly recycling: two years ago, she visually surveyed all of the garbage and recycling bins at a Champaign residence hall to determine recycling activity and proper use of the bins.

### Residence Hall procedures

- Renovations:
  - Forbes Hall will be demolished in the summer of 2013, disposing of 1,500 sets of furniture (bed, dresser, desk, and chair) in 482 rooms.
  - Allen Hall is currently being renovated, replacing 20-year-old beds and 28-year-old original furniture.
  - LAR itself has the original 1949 furniture: all attempts are made to refurbish furniture before replacing, e.g., replacing desktops on desks.
  - Melissa Marriott has data on replacement furniture and works diligently to maximize use of furniture before it is landfilled or surplus.
  - Newer Urbana halls are larger, enabling recycling bins in individual rooms.
- Salvage Drives:

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<sup>63</sup> Division of Housing. 2011. "Housing Sustainability Report." May, 2011.

<sup>64</sup> Ortiz, Benita Vonne. 2013. Personal interview. February 6, 2013.

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- These drives collect clothing and household goods from residence halls at the end of fall and spring semesters
  - 17,000 pounds were collected in the most recent drive, comparable to previous years.
  - Ortiz created the idea and shared it with University YMCA for its own annual “Dump-n-Run” event, started around 2004.
  - Salvage Drive donation boxes are placed in residence hall lobbies and collected by Housing staff in their box truck during finals week.
  - Abandoned items are collected from rooms ninety days after Move-Out and redistributed to local charities.
- Waste processing: building users separate their waste into garbage and the dual-stream bottle/can and paper streams using the bottle/can bins and paper bins. Housing does not use the blue can liners in its bottle/can bins because the full bags are transferred into bottle/can totes. Depending on the hall, totes are also used for cardboard. Housing offices have daily waste collection on Monday-Friday; student floors are serviced up to twice per day on Monday-Friday. Ortiz directed Housing to reuse old recycling bins and modify/re-label them because new fire-retardant plastic trash-cans cost \$30 each (5,000 student room bins would cost \$150,000); she recommends not buying seat-height bins so that people do not sit on them. Ortiz cited journalist John McCarthy who stated that recycling needs to be as convenient as possible with garbage and recycling bins next to each other.
  - All trash rooms, laundry rooms, public areas, computer rooms, and libraries have recycling bins paired with garbage bins.
  - Cardboard dumpsters at residence halls are painted white to “brand” them as recycling; Ortiz gets additional cardboard recycling bins for Move-In times.
  - Garbage collection: Housing contracts with the WTS for garbage collection
  - Recyclables collection: Housing contracts with the WTS for recyclables collection. Housing receives no revenue from the recyclables.
  - Textbook collection: Ortiz is working with the campus library which works with Better World Books to collect textbooks, as well as with a personal friend who collects for the Books for Prisoners program.

### Analysis of Residence Hall operations

Housing is lucky to have staff that are dedicated to promoting sustainability. Ortiz is passionate about sustainability, particularly recycling and has done everything in her power to increase recycling in the Residence Halls, from starting semesterly Salvage Drives to ensuring recycling bins in all common areas. She acknowledges there are sustainability-

mindful individuals and “pockets” of sustainability on campus such as the Sustainability Living Learning Community (SLLC) whose mission is for students to “live and learn about diverse aspects of sustainability in a variety of ways: academically, organically, and experientially.”<sup>65</sup> SLLC activities include a recent plastic recycling competition sponsored by the TerraCycle Company.<sup>66</sup> Overall, though, she is disappointed in the general lack of recycling culture in both campus students and staff, including her own staff, and sees their low prioritization of recycling as the main hurdle in increasing recycling both in Housing and on campus in general.

Ortiz is reluctant to add recycling bins in residence rooms for two reasons: there are over 5,000 rooms and, more significantly, students are already inundated with recycling opportunities of which they are not taking advantage. According to her, it was not a lack of signage or program information, it was about changing the culture and instilling the values of recycling and sustainability. She is willing to try new pilot projects including the UsAgain clothing donation bins and Better World Books donation bins. However, she sees a more critical need to create a campus culture of sustainability from the President’s House to the Alice Campbell Alumni Center, with a commitment from campus administration and a university-wide level of investment.

Overall, I was very impressed with the waste management and reduction activities in practice in Housing residence halls: the saturation of common-area recycling bins; the level of bin labeling, even if it was not consistent or standardized; the activism of the SLLC; and the various collection drives (textbook, clothing and household goods). Additional collections of used batteries and electric/electronic waste (e-waste) could be instituted as well as a household non-/hazardous waste exchange/collection. I believe that the residence halls are probably at a plateau of waste management that could be surpassed only by a campus culture shift which would include Green Teams at all residence halls and successful room-scale recycling.

### Ideas to improve Residence Hall waste management

- HRHI 1: Expand sustainability initiative campus-wide: see Buildings improvements.
- HRHI 2: Implement waste audit research plan: see Buildings improvements.
- HRHI 3: Standardized garbage and recycling bin signage: use graphics and text detailing acceptable and unacceptable items; provide signage to direct people to common recycling areas.

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<sup>65</sup> University Housing. 2013. “Sustainability LLC.” Accessed February 13, 2013.  
<http://www.housing.illinois.edu/Housing/Current/Living-Learning/Sustainability.aspx>

<sup>66</sup> TerraCycle. 2013. “Eliminate the Idea of Waste.” Accessed February 24, 2013.  
<http://www.terracycle.com/en-US/>

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- HRHI 4: Audit and improve building recycling bins and signage: see WTS improvements.
- HRHI 5: Create recycling station in common areas: see Buildings improvements.
- HRHI 6: Offer recycling bins for resident students' rooms: inform residents they may request a room recycling bin and that it is their responsibility to sort recyclables into common-area recycling bins located in the hallway outside their room.
- HRHI 7: Establish Green Teams: Establish a Team in each hall that includes staff and resident students. SLLC residents could serve as Green Team coordinators for the other residence halls. The Housing Sustainability Council should serve as the Green Team for Housing and should include student residents in addition to the Student Sustainability Committee (SSC) student representative.
- HRHI 8: Expand battery recycling: see Buildings improvements...
- HRHI 9: Implement electronic waste recycling: provide a drop-off point for students and employees to donate used electronics for donation to local organizations. Providing opportunities to donate electronics will extend their useful life and reduce the amount that is thrown in the garbage.
- HRHI 10: Implement household non-/hazardous waste exchange: provide a space where students can bring unused/unwanted cleaning supplies, household chemicals, etc.; other students can take these items as desired; investigate if DRS can collect items left at end of semester and dispose of properly, or divert to county household hazardous waste collection events.
- HRHI 11: Improve bottle/can recycling: see WTS improvements.
- HRHI 12: Implement campus waste management standards: see WTS improvements.
- HRHI 13: Map dumpsters and common-area bins: see WTS improvements.
- HRHI 14: Improve Surplus/Property Accounting surplus materials disposition: work with campus Legal and Procurement departments to change campus and university regulations and state administrative regulations to allow donation of food scraps, as long as there was no cost to campus.
- HRHI 15: Create online exchange portal: see Surplus improvements.

### Dining Halls

This section is based on personal and group interviews and email communications with Housing staff members Dawn Aubrey (Associate Director of Housing, Dining Services), Christopher Henning (Assistant Director of Menu Management & Procurement, Dining Services), and Carol Strohbeck (Administrator IV, Food Services).<sup>67,68,69</sup> Strohbeck gave me a guided tour of the Ikenberry Commons Dining Hall facility on January 14, 2013. Dining Services (Dining) provides approximately 10,000 meals/day and has instituted several initiatives to reduce food waste at the pre-consumer (“back of the house”) and post-consumer (“front of the house”) ends of the dining process. Pre-consumer efforts have been more successful due to having more control over employees’ activities than students’ activities. Waste reduction programs include donating used food-oils to a student biodiesel research group, donating surplus food to food banks and using aerobic digesters for food waste disposal.

### Dining Hall procedures

- Garbage collection: Dining contracts with the WTS for garbage collection and uses compacting garbage dumpsters at the halls. This garbage is never sorted at the MRF because of the relatively high percentage of food scraps and other non-recyclable items that would damage or soil the sorting conveyor belt.
- Recycling collection: Dining contracts with the WTS for recyclables collection. The WTS collects #10 steel cans and wooden pallets in addition to bottles/cans, cardboard and paper. The halls use totes to collect the bottles/cans due to high volumes. Dining receives no revenue from the recyclables.
- Reusable cups/dishware/cutlery: melamine plastic dishware and metal cutlery is used in main dining halls.
- Non-reusable cups/lids/dishware/cutlery: provided for “to go” meals and are composed of biodegradable/compostable materials.
- Single-use plastic bags: Dining eliminated use of bags in dining halls and convenience stores; it now sells reusable bags.
- Paper napkins: Dining switched from 3-ply napkins made of new fiber to 1-ply napkins made of recycled content and, based on purchases, has estimated a fifty percent reduction usage in napkin usage.

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<sup>67</sup> Aubrey, Dawn. 2012-2013. Personal interview, November 15, 2012. Email communications, 2012-2013.

<sup>68</sup> Henning, Christopher. 2012-2013. Personal interviews, November 15, 2012, and January 24, 2013. Email communications, 2012-2013.

<sup>69</sup> Strohbeck, Carol. 2013. Personal interviews, January 14, 2013 and January 24, 2013. Email communications, 2013.

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- Ala carte meals to go: containers are cookable, biodegradable and compostable.
- Reusable mugs and containers: Dining gives discounts to customers using reusable mugs. Dining used to provide reusable mugs but now makes mugs available for purchase. The Department of Public Health requires containers to be sterile, which may necessitate trading a customer's mug or container for a sterilized one, and then sterilizing the customer's container and providing it to a later customer in exchange for their unsterilized item.
- MenuManagement: a new food management program logs the number of pans of unserved prepared food to help cooks regulate future meal preps.
- LeanPath: a future food management program weighs and monetizes unserved prepared food and will raise staff awareness to help regulate future meal preps.
- Food waste audits: post-consumer audits were conducted in 2010 and 2012; pre- and post-consumer audits were conducted in January, 2013; the most recent audit helped establish a baseline for assessing impacts of the future LeanPath program.
- Trayless dining: was instituted in all seven dining hall facilities in August of 2010 and reduced per capita post-consumer food waste from 23.8 ounces/day to 4.0 ounces/day (annual food waste reduced from an estimated 1,282 tons/yr to an estimated 259 tons/yr).<sup>70</sup> Old trays are now used on the accumulator systems to carry used plates into dishrooms.
- Aerobic digesters (AD): three facilities (LAR, Ikenberry, and Housing Food Stores) installed EnviroPure ADs in March, 2013; these units "puree" pre-consumer food waste (food prep scraps and some unserved food) and post-consumer food waste (served but uneaten) into liquid waste which is washed down dishroom drains. ISR is scheduled to install one.
- Proposed an aerobic composting program: dining halls will donate pre-consumer food waste to the future compost program and continue to send post-consumer food waste to the ADs. A pilot program was conducted in August of 2010 which collected pre-consumer food waste, transported it to the loading dock via grey plastic "gondola" carts, and was trucked to the SSF for composting; this program worked well during its duration.
- Pre-consumer food waste processing: some unserved prepared food is donated to the Eastern Illinois Food Bank and to Salvation Army; some unserved, prepared

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<sup>70</sup> Aubrey, Dawn. 2012-2013. Personal interview, November 15, 2012.

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foods are frozen and re-served, or repurposed for future meals, e.g., cooked hamburgers are used for meat-based sauces.

- Post-consumer food waste processing:
  - Newer dining halls have no recycling or garbage bins in dining areas; diners place used plates with waste onto “accumulator” conveyor system and kitchen workers separate waste into garbage, food waste and recyclables.
  - Older dining halls: Still have recycling and garbage bins; diners place used plates with food waste onto “accumulator” conveyor system.
  - Post-compost program: After a campus-wide composting program is implemented, there will be no garbage or recycling bins in dining areas: diners will place used plates onto “accumulator” system and kitchen workers will separate waste into garbage, compostables and recyclables.
- Waste food oils and fats: rendered fats, roast fats and bacon grease are separated from oils and sent to a rendering vendor.<sup>71</sup> Waste food oils are collected and donated to the registered student organization (RSO) Illinois Biodiesel Initiative and converted to biodiesel which is sold back to campus for use in its vehicle fleet. The capacity of the collection system is 353 gallons and the oil is collected once per week.<sup>72</sup>

### Analysis of Dining Hall operations

Dining Services has a progressive sustainability philosophy and aggressively pursues practices which reduce waste while improving services to students and staff. It is making great strides using, essentially, a mixed-waste operation: dishroom staff, not diners, handle the waste separating, sorting and disposal activities. While this has the potential to maximize recovery, it also eliminates diners’ personal responsibility to recycle and the associated behavioral reinforcement afforded by repeated dining experiences. This desired behavior shift could be reinforced by including signage at the accumulator and nearby recycling stations that informs diners that the dining hall experience is a unique situation and they are expected to continue recycling throughout the rest of campus. I was very impressed by the waste management signage in the backroom areas, the used-food-oil-to-biodiesel program, and the elimination of single-use plastic bags. I am concerned about the installation of Enviropures which cuts into the availability of feedstock for future composting and AD projects.

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<sup>71</sup> Darling International, Inc, aka National By-Products. 2013. Accessed: April 19, 2013. <http://darlingii.com/aboutdarling.aspx>.

<sup>72</sup> Illinois Biodiesel Initiative. 2013. Illinois Biodiesel. Accessed April 19, 2013. <http://biodiesel.illinois.edu/>.

## Ideas to improve Dining Hall waste management

- HDHI 1: Reduce prepared food waste: see Union improvements. Henning and Strohecker feel this would be more feasible in the retail operations (cafes, GoodToGo shops) than the “all you care to eat” residential dining halls.
- HDHI 2: Provide a “sustainable dining kit.” Provide all new students and staff a reusable clamshell, mug, glass and shopping bag; offer diners a discount for using the mug and glass such as the programs at Rhodes College and Brigham Young University (Figure 18). Require diners to use clamshell for dining carry-outs: Ohio State University has a similar meal container exchange program: if diners don’t bring a clamshell, they must purchase a new one; returned clamshells get washed and reused.
- HDHI 3: Install accumulator signage: in order to reduce unintended recycling behavior shifts, install prominent signage at dish accumulator explaining that the mixed-waste stream handling at the accumulator is a unique situation and thanking diners for continuing to recycle throughout campus.
- HDHI 4: Collect campus units’ waste management data: see Auxiliaries improvements.
- HDHI 5: Create recycling stations in common areas: see Building improvements. Although recycling bins are not provided in the serving or dining areas, a recycling station could be established in the foyer or other common area.
- HDHI 6: Audit and improve building recycling bins and signage: see WTS improvements.
- HDHI 7: Encourage/mandate sustainable purchasing: see Auxiliaries improvements. Dining could create a significant impact on sustainability if it expanded its “local food” and “green item” purchasing practices.
- HDHI 8: Expand battery recycling: see Buildings improvements. Dining could collect a significant number of batteries because resident students are typically in at least one dining hall at least three times per day.



Figure 18. Reusable dining kit.

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- HDHI 9: Expand sustainability initiative campus-wide: see Building improvements.
- HDHI 10: Establish Green Teams: see WTS improvements.
- HDHI 11: Improve bottle/can recycling: see WTS improvements.
- HDHI 12: Explore composting options: see Union improvements. Dining will significantly impact, and be impacted by, any future composting programs; it should participate in all discussions.
- HDHI 13: Implement campus waste management standards: see WTS improvements.
- HDHI 14: Implement waste audit research plan: see Buildings' improvements.
- HDHI 15: Improve Surplus/Property Accounting surplus materials disposition: see Residence Hall improvements. Confirm permission to donate/sell food scraps for compost and used waste oil to biodiesel RSO.

## McKinley Health Center

This section is based on email communications with Brandon Boyd, Facilities Manager at McKinley Health Center (MHC).<sup>73</sup> MHC is a self-supporting Auxiliary and must pay for any services provided by campus. Judy Rubenacker, Director of Budget and Resource Planning, participated in the now-disbanded Student Affairs Green Team.

### McKinley Health Center procedures

- Garbage collection: MHC contracts with the WTS to collect garbage
- Recycling collection: MHC contracts with the WTS to collect bottles, cardboard and paper.
- Recycling sorting and collection: building users separate their waste into garbage and the dual-stream bottle and paper streams using the bottle/can bins and paper bins. MHC does not use the blue can liners because the full bags are transferred into bottle/can totes. Totes are also used for cardboard and there are separate dumpsters for cardboard and paper. According to Boyd, "aluminum is handled by the building not by the WTS." I presume this means that MHC is collecting and redeeming the cans themselves.

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<sup>73</sup> Boyd, Brandon. 2013. Email communication, March, 20, 2013.

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- Recycling bin usage: there are approximately 300 deskside paper recycling bins, one in each exam room and office. However, there are only approximately thirteen common-area bottle recycling bins, one located in each department.

### Analysis of McKinley Health Center Hall operations

Based on Boyd's information, MHC appears to be conducting a basic level of recycling: collecting paper in all rooms, a minimal level of bottle recycling and an unknown level of can and cardboard recycling. Research shows no indication of special recycling: they are not a listed battery recycling station nor is there is clothing or textbook recycling. MHC is participating in a surplus pharmaceutical collection program that was proposed to the SSC in the Spring, 2013 funding cycle.<sup>74</sup>

### Ideas to improve McKinley Health Center waste management

- MHCI 1: Audit and improve building recycling bins and signage: see WTS improvements.
- MHCI 2: Create recycling stations in common areas: see Building improvements.
- MHCI 3: Collect campus units' waste management data: see Auxiliaries improvements.
- MHCI 4: Establish Green Teams: see WTS improvements.
- MHCI 5: Improve bottle/can recycling: see WTS improvements.
- MHCI 6: Expand battery recycling: see Buildings improvements. MHC could collect a significant number of batteries due to the amount of battery-operated equipment used at the facility.
- MHCI 7: Expand sustainability initiative campus-wide: see Building improvements.
- MHCI 8: Implement campus waste management standards: see WTS improvements.
- MHCI 9: Implement waste audit research plan: see Building improvements.
- MHCI 10: Implement a disposable glove recycling program: the Illinois Sustainable Technology Center is researching the possibility to convert from using gloves that can only be landfilled to using gloves manufactured by Kimberly-Clark that can be recycled through TerraCycle.

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<sup>74</sup> Kammin, Laura. 2013. "Medicine Take-Back Program." Funding Proposal to Student Sustainability committee. February, 2013.

## CHAPTER 5: OUTDOOR FACILITIES WASTE MANAGEMENT

This section is based on a group interview and email communications with campus faculty and staff involved with agricultural operations and landscape operations:

- **Bruce Branham** – Professor, Department of Crop Sciences, College of Agricultural, Consumer and Environmental Sciences (ACES).<sup>75</sup>
- **Glenn Bressner** – Agricultural Research Specialist, Department of Animal Sciences, ACES.<sup>76</sup>
- **Michael Katterhenry** – Agricultural Research Specialist, Department of Animal Sciences, ACES.<sup>77</sup>
- **Joseph Kunkel** – Director of Operations, College of Veterinary Medicine (VetMed).<sup>78</sup>
- **Michelle Wander**, Professor and Director of Agroecology and Sustainable Agriculture Program (ASAP), Department of Natural Resources and Environmental Sciences, ACES<sup>79</sup>
- **Ryan Welch** – Supervisor, Grounds Division , F&S.<sup>80</sup>
- **Doug Wolters** – Director of Operations, Facilities Planning and Management, ACES.<sup>81</sup>

### Agricultural Operations

The primary research questions for the outdoor facility managers addressed the types and quantities of reusable and compostable materials: animal bedding, animal manure and animal feed waste. I reviewed various studies including the 2004 and 2009 Waste Reduction Plans and several composting feasibility studies (Foth 2011; Cooperband & Biehl 2008; Turnlund 2007) and composting-related food scrap data from Housing.

### Agroecology and Sustainable Agriculture Program procedures

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<sup>75</sup> Branham, Bruce. 2012. Personal interview; email communications. November 13, 2012; various dates.

<sup>76</sup> Bressner, Glenn. 2012. Personal interview; email communications. November 13, 2012; various dates.

<sup>77</sup> Katterhenry, Michael. 2012. Personal interview; email communications. November 13, 2012; various dates.

<sup>78</sup> Kunkel, Joe. 2012. Personal interview; email communications. November 13, 2012; various dates.

<sup>79</sup> Wander, Michelle. 2012. Personal interview; email communications. November 13, 2012; various dates.

<sup>80</sup> Welch, Ryan. 2012. Email communications, various dates.

<sup>81</sup> Wolters, Doug. 2012. Personal interview; email communications. November 13, 2012; various dates.

## Chapter 5: Outdoor Facilities Waste Management

- Responsible party: Wander.
- Department does not generate any agricultural waste.
- Food scraps generated on campus could be mixed with landscape waste and animal bedding and manure to create compost; could apply to ten acres at the SSF.
- Agroecology and Sustainable Agriculture Program (ASAP) is conducting a project to create compost by mixing food scraps and animal manure with excess *Miscanthus*.

### College of Veterinary Medicine procedures

- Responsible party: Kunkel.
- Garbage and recycling: the WTS collects VetMed's garbage, bottles/cans and paper.
- Animal bedding and feed: VetMed gives its used bedding and waste feed to a local farmer; the farmer pays half of the transportation charges to haul the materials to his facility. University administration directed VetMed to send this disposal activity out for bid, presumably to try and recover more revenue than VetMed is currently collecting when they give it away. When VetMed announced this new requirement to a prospective recipient, that person then lost interest in taking the materials.
- Animal manure: animal barns use a flush-system with a tank separator; liquids are injected into campus agricultural fields; solids are land-applied to agricultural fields.
- Animal carcasses: some non-research animal carcasses are rendered;<sup>82</sup> research animal carcasses are incinerated at the Research Farm on Race Street, in order to meet agricultural regulations.

### Dairy and Beef Facilities procedures

- Responsible parties: Katterhenry and Wolters.
- Composting agricultural waste: units are currently composting all dairy manure on the farm by mixing animal bedding with manure and giving it to a local farmer.
- Animal manure: dairy unit produces solid manure; beef unit produces solid and liquid manures; 150-200 breeding cows; 1000 trial animals used for feed stock

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<sup>82</sup> Rendering is the general term referring to the conversion of waste animal tissue into value-added materials. Sources of animal tissue range from slaughterhouses to butcher shops to restaurant waste grease; materials include fatty tissue, bones and offal, as well as entire carcasses. The process involves simultaneously drying the material and separating the fat from the bone and protein, yielding a fat commodity (e.g., yellow or white grease, tallow) and a protein meal (e.g., meat and bone meal, poultry byproduct meal).

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research; units previously land-applied all manure, then ran out of land and ACES transportation staff to do hauling; units still land-apply some manure.

- Animal carcasses: some non-research animal carcasses are rendered; research animal carcasses are incinerated at the Research Farm on Race Street, in order to meet agricultural regulations.

### Swine Farms procedures

- Includes Imported Swine Research Laboratory (ISRL) and Swine Research Center (SRC).
- Responsible party: Bressner.
- Composting agricultural waste: only minimal animal feed waste is produced; any would be included in either field-application or landfilled; neither the ISRL nor the SRC use animal bedding.
- Animal manure: units produce 8,000-10,000 gallons/day of liquid manure (24.2-30.3 million pounds/year or 12,118-15,148 tons/year); liquid manure goes to waste lagoons; after agitation, manure is field-applied through soil-injection or aeration.
- Animal carcasses: approximately 480 of the 505 swine carcasses produced per year (95%) are rendered.

### Sustainable Student Farm procedures

- Responsible parties: Branham and Zack Grant, Sustainable Student Farm (SSF) Manager/Coordinator.
- Food crop waste: composted and used on-site.
- Composting agricultural waste: SSF uses 15-20 cy<sup>3</sup>/yr of compost for 6-10 acres of crops. According to Grant, his attempts to secure landscape waste (to make compost) from Grounds have been unsuccessful, so he acquires it from the LRC.<sup>83</sup>

### Grounds Operations

- Responsible party: Welch.
- Landscape waste volumes: extremely variable; all data are currently estimated;
  - wood: 5,000-8,000 yd<sup>3</sup>/yr is chipped into landscape wood chips.

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<sup>83</sup> Grant, Zachary “Zack”. 2013. Personal communication. April 22, 2013.

## Chapter 5: Outdoor Facilities Waste Management

- leaves and brush: 4,000-5,000 yd<sup>3</sup>/yr; leaves are mulched into compost, brush is chipped into landscape wood chips.
- Disposition of landscape waste is questionable: according to Welch, all of the compost produced is used on campus. However, according to a composting feasibility study conducted by SSC member Kevin Wolz, Grounds “currently [has] an ‘overflowing’ pile of high-carbon waste in the arboretum that is collected from campus. Currently they just pile everything there, harvest some ‘mulch’ for their own planting uses, and then let the C-U community take what they want for free.”<sup>84</sup>

### Analysis of Outdoor Facilities operations

Agriculture staff are composting most of their animal bedding and manure and are either applying it to campus agricultural fields or providing it at reduced rates (1/2 of hauling expenses) to a local farmer. This latter mode is not advertised because agricultural staff are concerned with state property guidelines which specify that all campus property is state property and must be returned to the state when no longer being used. The agricultural and landscape facilities should participate in the multiple aerobic composting and aerobic/anaerobic digestion (AD/AAD) projects due to the inordinately high percentage of campus waste that is made up of agricultural and landscape wastes. Finally, in order to keep the animal manure from going to the sanitary district sewers – which has the potential to tax the wastewater treatment plant’s facilities, as well as to unnecessarily increase water and electricity consumption and waste a valuable nutrient-rich soil amendment – the facilities need to maximize land application.

### Ideas to improve Outdoor Facilities waste management

- OFI 1: Seek additional land for manure application: ACES should inventory land acreage currently available to apply manure or compost – Animal Science currently has 1,200 acres available – and solicit additional land and/or manure application agreements from all campus units (Pollinatorium, 606 West Windsor Road, Urbana; Fruit Research Farm, Lincoln Avenue and Windsor Road, Urbana; etc.) and local farmers.
- OFI 2: Optimize composting options – AD/AAD, vermicomposting, wind-row composting: AAD is simpler, easier to maintain and produces renewable energy; an estimated ½ megawatt of electricity could be produced from the animal manure produced on campus. Consider installing an AD which would guarantee the ability to process future maintained or increased animal manure quantities. Implement vermicomposting. Synergize composting activities: optimize aerobic composting and

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<sup>84</sup> Wolz, Kevin. 2011. “UIUC Campus Composting Project – SSC Research.” University of Illinois at Urbana-Champaign.

## Chapter 5: Outdoor Facilities Waste Management

digesting: animal waste/manure + food waste + *Miscanthus* + bedding + landscape waste.

- OFI 3: Improve Surplus/Property Accounting surplus materials disposition: see Residence Hall improvements. Obtain necessary permission – or confirm existing permission – to donate/sell compost and any other “value-added materials or byproducts” e.g., meat and eggs at the Meat Store or biodiesel produced by the Illinois Biodiesel Initiative RSO from the Dining Halls’ waste grease.
- OFI 4: Collect campus units’ waste management data: see Auxiliaries’ improvements. Use WTS truck scale to weigh agricultural and landscape waste produced and/or collected and composted whenever possible; when impossible or infeasible, establish baseline weights and densities and log volumes and weights. Determine bedding and waste feed weights at procurement and/or at disposition and confirm disposition methods of all bedding and waste feed, e.g., composted, landfilled, incinerated, etc.
- OFI 5: Maximize research animal bedding and manure composting/rendering: determine if bedding, manure, and carcasses from research animals can be composted and/or rendered versus landfilled and incinerated.
- OFI 6: Secure animal and landscape waste stockpiling options: confirm there is enough land and proper facilities to stockpile agricultural and landscape waste for times when land application is not possible.
- OFI 7: Establish Green Teams: see WTS improvements. Teams should include members from each unit and experts from manure management and research.
- OFI 8: Expand sustainability initiative campus-wide: see Building improvements.
- OFI 9: Implement campus waste management standards: see WTS improvements.
- OFI 10: Implement waste audit research plan: see Buildings’ improvements.

## CHAPTER 6: CAMPUS-WIDE PROGRAMS

This chapter addresses campus-led and third-party programs targeting special recyclables, surplus equipment and special waste including but not limited to surplus property, hazardous waste, universal waste (lamps, ballasts, batteries), construction and demolition waste (C&D waste), textbooks, and building trades management.

### Property Accounting and Surplus

This section is based on a group interview and email communications with Property Accounting staff members Jeff Weaver (Senior Associate Director, Office of Business and Financial Services (OBFS)) and Cameron Fear (Staff Clerk, OBFS).<sup>85,86</sup> In addition, I toured the Surplus Warehouse on October 30, 2012. Surplus operations are handled by Property Accounting and Reporting. Property Accounting also handles the accounting for new acquisitions of equipment and buildings; reconciles between operating ledgers, general ledgers, and Banner Fixed Assets to ensure all Property expenditures are accounted for and asset tags are generated; completes State-mandated reporting related to Property; generates audit schedules and reports for the various annual external audits; and provides audit assistance. The campus property disposition process is mandated by state legislation – most importantly, the State Property Control Act (30 ILCS 605) – and considers any campus equipment – durable items and not perishable supplies – as state property and requires return of unused property to the state.<sup>87</sup> The equipment disposal process follows these stages:

1. Campus reuse: redistribute unused equipment on the Illinois (Champaign-Urbana) campus.
2. State return: send unused equipment that the State wants back to Central Management Services (CMS) in Springfield.
3. Local recycle: equipment that is not wanted by CMS, is non-usable and is recyclable can be recycled locally, e.g., e-waste, scrap metal; Surplus determines whether items are recyclable or non-usable; any funds are turned over to CMS.
4. Local scrap: any scrap equipment that is not wanted by CMS, is non-usable and is not recyclable may be scrapped locally, e.g., unusable wood furniture; any funds are turned over to CMS.

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<sup>85</sup> Weaver, Jeffrey. 2012. Personal interview; email communications. October 30, 2012; various dates.

<sup>86</sup> Fear, Cameron. 2012. Personal interview, October 30, 2012.

<sup>87</sup> Legislative Information System. 2013. "Illinois Compiled Statutes: FINANCE (30 ILCS 605/) State Property Control Act." Accessed January 20, 2013.  
<http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=555&ChapterID=7>

5. Exchange with other state units: Surplus communicates with CMS which then looks for other State agencies, governmental units, not-for-profits or the public who may want the equipment; any funds are turned over to CMS.

Weaver stated that the surplus process is efficient for two reasons: at the state-level, it is centralized with few people involved in handling the equipment; and at the campus-level, there is little duplication of effort. The greatest weakness in the system is the constraint the state administrative legislation imposes on disposing of surplus when trying to sell or donate items outside of campus. Weaver stated that the greatest contributor to the waste stream are electronics because people upgrade computers more frequently than other types of equipment.

Weaver stated that the biggest obstacles to improving the system are limited Surplus staff time, generally minimal level of campus staff's knowledge about the "who, what, where and how" of equipment disposition, the complicated State Administrative code regarding property disposition, and the case-by-case exemption process required to donate or sell equipment. Weaver believed that the greatest potential for increasing waste reduction and diversion was by reducing the amount of e-waste and electronic recycling, stating:

It is a shame about how much e-waste there is. Surplus doesn't have the resources to find recipients for surplus equipment (not-for-profits and other agencies) but would donate equipment if it could. The State's Administrative code and the case-by-case exemption process is also a hindrance. Ultimately, my understanding is that the State-contracted electronics recyclers are supposed to work with the State to make the best use of these machines – whether that's scrapping for metal, sending computers to the State for re-use or auction, or salvaging useful parts. As that's a State process, the University is outside of this process to truly understand the amount of waste and diversion on the State's behalf.<sup>88</sup>

### Surplus waste management procedures

- Scope: Surplus deals only with non-perishable equipment (items designed to last more than one year) and helps manage equipment life cycle in accordance with state policies. Surplus does not manage perishable equipment or supplies. Campus units can come to Surplus and request equipment for faculty, staff or assigned graduate student assistants.
- Informal office supplies exchange: Surplus does accept some supplies although it is not the most appropriate place for handling these items as they are supposed to handle only equipment. There is a small area of higher-dollar office supplies

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<sup>88</sup> Weaver, Jeffrey. 2012. Personal interview; email communications. October 30, 2012; various dates.

## Chapter 6: Campus-Wide Programs

(computer peripherals, toner cartridges) and perishable supplies (binders, computer diskettes) in one corner of the Surplus Warehouse; these are available for university faculty and staff to take according to their need.

- Ownership: equipment ultimately belongs to the State of Illinois, regardless of funding source; most federal granting agencies require that equipment is actually titled to either the State or the grantee itself, not to the campus or university.
- Definition of surplus: campus keeps computer equipment less than three years old; anything older than five years goes to recycler. The refresh rate (frequency of replacement) is set by individual departments, units and CITES for common labs. Surplus uses BANNER to tag and track all equipment.
- Tonnages: trailers full of surplus equipment or e-waste are not weighed either when it leaves Surplus or when it arrives at CMS Springfield. If requested, Weaver can provide numbers and types of items surplussed. One full semi-trailer of e-waste is sent every three weeks, approximately 190,000 lbs. /yr or 95 tons/yr. Surplus sends CMS Springfield two semi-trailers of assorted equipment and furniture every year.
- Surplus equipment exchange mechanisms: FABWeb is the current online tool that allows campus units to manage information on their equipment but it does not function as an “exchange site,” i.e., departments cannot use it to advertise that they have equipment available for transfer to another department.
- Abandoned property, e.g., bicycles: becomes campus property and, therefore, becomes state property. This should be confirmed with campus legal representatives.
- Electronic waste recycling (e-recycling): CMS has contracted with two state-approved electronics recyclers who take items five years and older; Surplus requires all hard drives be erased.
- Transport: Surplus has two trailers on site: one for CMS-destined Surplus Warehouse and one for e-recycling.

### Analysis of Property Accounting and Surplus operations

Given the constraints placed upon it by the Illinois Administrative Code, primarily the State Property Control Act (30 ILCS 605), Surplus and Property Accounting are doing a great job managing the massive amounts of surplus equipment. Weaver is willing to work with campus units that produce waste that CMS is not interested in receiving from campus, e.g., agricultural and landscape waste, food scraps and used food oil; future endeavors should capitalize on his expertise. Weaver is supportive of amending State legislation to help streamline the equipment disposal process. Meanwhile, he is willing to field case-by-case exemption requests for specific items and is even willing to apply for a permanent

exemption in particular circumstances; two instances might be for landscape waste compost and for used food waste oil. Similarly, Brian Bell, DEI Program Director for Volo, is currently working with CMS to streamline the transfer of surplus “educationally-useful electronics” equipment from campus to a local group of not-for profits.<sup>89</sup>

Weaver and Fear are willing to provide data on the number and type of items returned to the state and to the e-recycling vendors. Weaver is also willing to discuss having trailers of surplus items weighed prior to leaving campus to provide weight data; Osby said he is also willing to allow other units to use the WTS truck scale. Weaver is very interested in an online, interactive surplus equipment and supply exchange portal.

### Ideas to improve Surplus and Property Accounting waste management

- SPAI 1: Improve Surplus/Property Accounting surplus materials disposition: see Residence Hall improvements. Collaborate with Weaver, Bell, Daniel Szajna and relevant campus units (agricultural, Housing, Document Services, Grounds, ISTC) to draft model legislation to allow the sale or donation of waste items (compost, waste food oil) and items not desired by CMS (older electronics, mattresses, residential furniture, etc.) to RSOs and local not-for-profits and charitable organizations.
- SPAI 2: Create online exchange portal: According to Weaver, this portal would be “...a great tool to have on-campus.” He discussed this with Lage and Johnston and others in 2011 but progress has been slow due to staff availability and departmental priorities. Campus units can post descriptions and photographs of items; other units could view items online and request they be moved directly to their location. The portal could be designed by the Office of Math, Science, Technology and Engineering (MSTE) or by a Learning IN Community (LINC) class. Good models include Michigan State University’s Surplus Store,<sup>90</sup> the University of North Carolina at Chapel Hill’s Asset Management Trading Post,<sup>91</sup> and Northwestern University’s system.<sup>92</sup> Reuse Marketplace is a regional exchange program in New England: it covers ten states, including Connecticut which, like Illinois, is normally required to send all property back to the state government. It is open to the public to create accounts, post and receive items.<sup>93</sup>

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<sup>89</sup> Bell, Brian. 2013. Email communications, various dates, 2013.

<sup>90</sup> Michigan State University. 2012. “Surplus Store.” Accessed March 24, 2013. <http://www.msusurplusstore.com/servlet/StoreFront>.

<sup>91</sup> University of North Carolina at Chapel Hill. 2013. “Asset Management Trading Post.” Accessed March 24, 2013. <http://finance.unc.edu/procurement/logistics/>.

<sup>92</sup> Northwestern University. 2013. “Surplus Property.” Accessed March 24, 2013. <http://www.northwestern.edu/uservices/office/surplusproperty/index.html>.

<sup>93</sup> Northeast Recycling Council. 2013. “The Reuse Marketplace. Accessed February 10, 2013. <http://www.reusemarketplace.org/>.

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- SPAI 3: Hire Surplus Intern: An intern could assist with daily tracking of surplus equipment, staff the office supplies exchange, manage the Surplus Exchange Portal and find recipients for surplus equipment. Weaver would be willing to evaluate and discuss the potential of using an intern.
- SPAI 4: Collect campus units' waste management data: see Auxiliaries improvements. Trailer drivers should weigh trailers at the WTS before and after filling with e-recycling and surplus equipment to determine weights of potentially-landfillable materials being sent to vendors and CMS. Equipment transferred between campus units should also be weighed and reported as material diverted from potential landfilling. Osby stated that he would be willing to allow other drivers to use WTS truck scales.
- SPAI 5: Establish Office ReStore: Establish a drop-off/pick-up site for surplus office supplies that would be managed by Surplus or some other office (CSE, F&S, or some unit with space and staffed on regular daily basis. Model programs include University of Michigan, Eastern Illinois University and Bowling Green State University.
- SPAI 6: Decrease electronics refresh rate: Determine how Illinois compares to other campuses in its computer equipment upgrade rate and increase retention time if appropriate.
- SPAI 7: Implement electronic waste recycling: see Residence Hall improvements. Allowing Surplus to accept personal electronics for exchange in the ReStore would reduce the amount of e-waste that is improperly landfilled by students, faculty and/or staff.
- SPAI 8: Implement waste audit research plan: see Building improvements. Surplus should report how much of the equipment and supplies it receives is reallocated on campus, is sent to CMS Springfield, is scrapped, is recycled by e-waste vendors and is landfilled.
- SPAI 9: Establish Green Teams: see WTS improvements. The Surplus Manager should participate in an upper-level Waste Green Team due to the amount of equipment, recycling and scrap that is managed by Surplus and Property Accounting.
- SPAI 10: Expand sustainability initiative campus-wide: see Building improvements.
- SPAI 11: Implement campus waste management standards: see WTS improvements.

## Division of Research Safety

This section is based on a group interview and email communications with Division of Research Safety (DRS) staff members Peter Ashbrook (Director), Landon Hill (Chemical Waste Professional) and Jamie Richardson (Chemical Waste Professional).<sup>94,95,96</sup> DRS handles campus waste that cannot be landfilled or disposed in the various drain systems, including medical sharps and infectious waste, radioactive waste (from a decommissioned campus nuclear facility and 200+ radioactive waste-generating labs), and research waste (solvents, experiments' inputs and outputs). Hazardous waste generally accounts for less than 1% of the campus landfilled waste; however, amounts are increasing annually due to an increase in research. Hazardous waste composition is approximately 70% research, 3% teaching, 5% from Allies (CERL, US Geological Survey, Illinois State Police, etc.) and 22% other (BSW/F&S). Ashbrook stated that the greatest waste management challenge is the fact that DRS has no control over the front-end of the process, either qualitatively or quantitatively: purchasing and use of inputs, solvents, and eventual outputs is all driven by research objectives. DRS staff did not have any recommendations for changes to the waste management system.

### Hazardous waste management procedures

- Hazardous waste regulation: disposition is controlled by federal and state regulations including the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA).
- Disposition methods: include landfilling and incineration at approved hazardous waste facilities. Due to safety issues with waste-to-energy incineration, current disposal contracts require that vendors do **not** incinerate hazardous waste to produce energy.
- Staff training: online training on how to handle hazardous waste is available for campus staff.
- Staff education: a 1980s-vintage printed comprehensive “waste guide” provided information on how to dispose of most hazardous and non-hazardous wastes. A 1990s grant funded a waste minimization project entitled “Pollution Prevention and Waste Minimization in Labs.” This includes the current online waste management guide, training, forms and FAQ sheets.<sup>97</sup>

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<sup>94</sup> Ashbrook, Peter. 2012. Personal interview and email communications, September 17, 2012 and various dates.

<sup>95</sup> Hill, Landon. 2012. Personal interview and email communications, September 17, 2012 and various dates.

<sup>96</sup> Richardson, Jamie. 2012. Personal interview, September 17, 2012.

<sup>97</sup> Division of Research Safety. 2013. Accessed February 10, 2013. <http://www.drs.illinois.edu/index.aspx>. “Waste Disposal Decision Guide.” <http://www.drs.illinois.edu/regwaste/pdf/WasteDisposalGuide.pdf>.

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- Communication: DRS gets 1-2 inquiries per day regarding how to deal with non-hazardous waste.
- Decentralized waste management: there is no campus “waste czar” or committee that oversees hazardous and non-hazardous waste management.
- Reporting: DRS files an annual report with Illinois EPA of types, volumes and disposition of hazardous waste.<sup>98</sup>
- Waste stream composition shifts: changes in waste components are often caused by industry waste stream shifts, e.g., shift in photography from film developing to digital all but eliminated photographic processing waste; F&S paint shop waste has dropped significantly; reduced lab reagent consumption and waste are due to automated technology.
- ChemCycle: the School of Chemistry participates in DRS’ online exchange service to redistribute excess chemicals in original sealed containers.<sup>99</sup>
- Battery recycling programs: alkaline and most rechargeable batteries are not regulated waste; some rechargeable batteries are regulated non-hazardous waste; lead-acid batteries are regulated hazardous waste; DRS does not monitor the battery collection sites.
- Service charges: hazardous waste management services are provided to campus units at no charge because fees may create an incentive to bypass the system and improperly discard the waste in the regular waste disposal stream.

### Analysis of Division of Research Safety operations

DRS is doing a good job reducing the amount of hazardous waste generated and an excellent job managing the landfilled and incinerated hazardous waste, through their many education and training resources, efficient collection and processing, and a breadth of management programs targeting hazardous waste. DRS’ assistance in educating and collaborating on collecting non-hazardous waste such as batteries is also critical to those programs’ success: my discussions with Hill and Amelia Neptune, Sustainability Specialist, led to an expansion of the battery recycling program to allow collection of button cell and lithium batteries.<sup>100</sup> The ChemCycle program appears to work well but has a limited scope of one campus School. I believe there are great opportunities for using DRS to increase the recycling of special waste and recyclables on campus. It has an excellent communication and education

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<sup>98</sup> Division of Research Safety. 2011. “Division of Research Safety 2011 Annual Report.” Urbana, IL, 61801.

<sup>99</sup> Division of Research Safety. 2012. “ChemCycle.” Accessed: November 25, 2012.

<http://www.drs.illinois.edu/css/programareas/chemcycle/>. Currently collecting only from the School of Chemical Sciences; 29 items registered for total of 62 liters.

<sup>100</sup> Hill, Landon. 2013. Email communication, February 27, 2013.

network, e.g., its website addressing proper lamp disposal is comprehensive and understandable.

### **Ideas to improve Division of Research Safety hazardous waste management**

- DRSI 1: Establish Green Teams: see WTS improvements. The DRS Director should participate in the Campus Green Team. In addition, DRS should establish its own Green Team; members would work throughout campus to continue actively educating other units on the proper methods of handling non-/hazardous wastes.
- DRSI 2: Expand education on Special Waste and Recyclables: Ashbrook volunteered to write an article for the CSE E-newsletter. Update the 1990s waste guide which addressed management of both non- and hazardous wastes, using graphics to clearly explain (un)acceptable items and direct readers to additional resources and managers.
- DRSI 3: Expand ChemCycle program: Expand program to all campus units – including Auxiliaries – which use chemicals and other hazardous materials including but not limited to physics, biology, geology, art, theatre, natural resources, agriculture, etc. Allow for submission of opened and partially-used containers for those units that are less concerned about chain-of-custody and purity issues.
- DRSI 4: Implement household non-/hazardous waste exchange: see Residence Hall improvements.
- DRS 5: Collect campus units' waste management data: see Auxiliaries improvements. Campus units should ensure that all hazardous waste is properly turned over to DRS. DRS should record and report units' individual hazardous waste collections.

## **Facilities & Services operations**

This section is based on interviews and email communications with F&S staff involved with Universal Waste and other special waste and special recyclables including lamps, lamp ballasts, batteries and electronic devices, construction and demolition (C&D) waste, bicycles, and trades waste.

### **Fluorescent and special lamps**

This section is based on information from Sharon Ball (Electrician Foreman, F&S) and Amelia Neptune (Sustainability Specialist, F&S); Ball is responsible for the lamp recycling program.<sup>101, 102</sup> Many lamps contain a small amount of mercury, a toxic metal regulated under

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<sup>101</sup> Ball, Sharon. 2012. Email communications, various dates, 2012-2013.

the federal Resource Conservation and Recovery Act of 1976 (RCRA), some in a high enough concentration to classify them as “hazardous waste.” The IEPA adopted the amended Universal Waste Rule in 1998 as an alternate management method for certain hazardous waste that would otherwise be subject to full RCRA regulation. This allows campus to utilize a less cumbersome collection system including lower storage and record-keeping requirements which save money and reduce campus liability while maintaining practices that protect campus personnel and the environment.<sup>103</sup>

Campus recycles fluorescent lamps (tube and compact) and “special” lamps including High-Intensity Discharge (HID) metal halide and high-pressure sodium lamps, ultraviolet (UV) lamps, projector lamps, and any other mercury-containing lamps. It does not recycle incandescent lamps. All fluorescent lamps must be collected and recycled. The largest source of recycled lamps are retro-commissioning and lighting retrofit projects, resulting in waves of lamps being recycled.

Campus began collecting lamps in the 1990s using United Parcel Service (UPS) to ship dead lamps to Mercury Waste Solutions. In 2004, campus began collecting lamps at the Universal Waste Recycling Center (UWRC), Building 244, 1386 South Oak Street, Champaign. DRS then contacts Veolia Waste Management which collects the lamps from the UWRC and ships them to the Veolia Port Washington, Wisconsin Treatment Storage and Disposal Facility (TSDF).<sup>104</sup> According to Ball, F&S pays a per-lamp processing fee which varies depending on the lamp type, plus \$160 for each collection. Collection and processing of lamps are free of charge for campus units maintained by F&S; due to their self-support mandate, Auxiliaries are charged a small fee that covers Ball’s staff time and the fees charged by Veolia.<sup>105</sup> Campus units not utilizing F&S building services must collect their own lamps and recycle them, either through F&S or another approved service.

### Lamp ballasts

This section is based on email communications with Mark Henry (Electrician Sub-Foreman, F&S) who is responsible for lamp ballast management.<sup>106</sup> Ballasts are found in fluorescent and other lamp fixtures. Lamp ballasts are collected by building or F&S staff electricians. Older ballasts containing polychlorinated biphenyls (PCB) are regulated hazardous waste and must be incinerated at approved facilities; non-PCB-containing ballasts are considered non-hazardous waste and their metal may be recycled and the remaining materials landfilled. A ballast’s composition is not known until it has been examined by recycling processing facility

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<sup>102</sup> Neptune, Amelia. 2012. Personal interview and email communications; September 17, 2012, various dates 2012-2013.

<sup>103</sup> Division of Research Safety. 2013. “Chemical Safety: Used Fluorescent and High-Intensity-Discharge Lamp Program.” Accessed: February 23, 2013.

<sup>104</sup> Hill, Landon. 2013. Email communication, February 12, 2013.

<sup>105</sup> Ball, Sharon. 2013. Email communication, March 11, 2013.

<sup>106</sup> Henry, Mark. 2013. Email communication, February 4, 2013.

staff at the Veolia TSDf in Wisconsin. According to Landon Hill, DRS, the older PCB ballasts are incinerated at Veolia Port Arthur, Texas TSDf and non-PCB ballasts are recycled or landfilled. Campus does not track the number or volume of ballasts recycled, relying on Veolia's itemized shipment reports for the PCB ballasts which list the weights of barrels of PCB-containing ballasts.<sup>107</sup> However, there is no report provided for the non-PCB ballasts that are recycled or landfilled. Henry did not know the fees charged by Veolia for shipping and/or processing the ballasts. As with lamps, collection and processing of lamp ballasts are free of charge for campus units maintained by F&S. Auxiliaries are charged a small fee that covers Henry's staff time and the fees charged by Veolia.

### Batteries and cell phones

This section is based on information from Amelia Neptune and Betsy Liggett Boehm (Special Programs Coordinator, Environmental Compliance Department, Division of Safety and Compliance, F&S). Boehm is responsible for the battery recycling program.<sup>108, 109</sup> Campus has two battery recycling programs: one through Battery Solutions (BS) for alkaline batteries and one through Call2Recycle (C2R) for rechargeable batteries and select battery-powered electronic devices.<sup>110, 111</sup> Four campus units offer both battery recycling programs: ARC, CRCE, the Union (no C2R shipments to date), and the Physical Plant Service Building (PPSB).

The alkaline battery recycling program started in the spring of 2012. BS charges campus \$84 per pre-paid 55-lb. shipping bucket and accepts many other items including cellular phones and rechargeable batteries. Because campus pays for BS's processing, rechargeable batteries and cellular phones should go to C2R, restricting the BS receptacles to collecting only alkaline batteries. This program is a per-bucket program funded by F&S up to \$10,000 annually and is provided free of charge to campus units. When a bucket is full, the designated campus staffperson or volunteer calls FedEx to pick up the bucket. BS automatically sends a new empty bucket when they receive a full bucket and sends a "Confirmation of Reclamation" receipt with collection data including numbers and weights of specific items recycled. Three campus units use only the BS recycling program: Bevier Hall, the Illinois State Geological Survey field office (ISGS), and VetMed.

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<sup>107</sup> Hill, Landon. 2013. "Veolia Environmental Services: Certificate of Receipt/Recycling, January 29, 2013." Receipt listed over 6,500 pounds of ballasts received.

<sup>108</sup> Neptune, Amelia. 2012. Personal interview and email communications; September 17, 2012, various dates 2012-2013.

<sup>109</sup> Boehm, Betsy Liggett. 2013. Email communications, various dates 2012-2013.

<sup>110</sup> Battery Solutions. 2012. "We recycle all battery types, anywhere in the U.S." Accessed: September 15, 2012. <http://www.batteryrecycling.com/>.

<sup>111</sup> Rechargeable Battery Recycling Corporation. 2012. "Call 2 Recycle." Accessed: September 15, 2012. <http://www.call2recycle.org>.

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The rechargeable battery recycling program has been operating for several years. C2R accepts all rechargeable batteries weighing less than 11 lbs., including Nickel-Cadmium (Ni-Cd), Nickel Metal Hydride (Ni-MH), Lithium Ion (Li-Ion), Nickel Zinc (Ni-Zn), and Small Sealed Lead Acid (SSLA/Pb) batteries, as well as all cell phones and their batteries. C2R does not charge for their program and provides pre-paid free shipping containers; therefore, users should maximize using the C2R receptacles (boxes and buckets) and minimize using the BS buckets. Full C2R receptacles should be dropped off at a regular UPS collection point for free shipping; otherwise, users will be charged for shipment if they schedule a building pickup. C2R provides a “Site Summary Report” which lists the numbers and weights of types of rechargeable and non-rechargeable batteries and cell phones collected. The C2R program is provided to campus free of charge. Seven campus units offer only the C2R recycling program: the Police Department, the Institute for Genomic Biology, Orchard Downs Housing (employees only), DRS, the Central Receiving Building (no shipments to date), Lincoln Hall (no shipments to date), and the Agricultural Engineering Sciences Building (no shipments to date). Other locations that have considered collection programs include the Main Library and Beckman Institute.

When collection buckets are full, a designated campus staffperson or volunteer confirms that no unacceptable materials (leaking batteries) have been collected, seals the container, ships and logs and tracks the information. DRS previously considered sealed lead-acid batteries (automotive, motorcycle, boat, etc.) and rechargeable Hg, Pb and Ni-Cd batteries as regulated waste. As a result of this research discussion, DRS has amended the list of batteries acceptable for recycling to now include button cell and lithium primary batteries. This leaves only leaking lead-acid batteries that must be handled through DRS.<sup>112</sup>

### Analysis of Facilities & Services operations

F&S has an impressive set of programs to reduce landfilling and increase proper recycling of lamps, lamp ballasts, batteries and battery-powered electronic devices. Those that are administered by F&S staff – lamps and lamp ballasts – are well-utilized. Those that are dependent on initiation by campus units – battery and electronic devices – are less utilized. For example, the Parking Department – which generates thousands of used batteries every year from parking meters – has been offered the buckets but is not interested in recycling their batteries.

### Ideas to improve Facilities & Services waste management

- FSI 1: Expand special recycling programs: Work with unit Green Teams and Facility Managers to determine need for and implement recycling programs (lamp, ballast, battery, etc.)

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<sup>112</sup> Hill, Landon. 2013. Email communication, March 4, 2013.

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- FSI 2: Increase funding for special recycling programs: Secure SSC and other funding to increase number/area of battery collection sites and to secure funding for a new truck for collecting batteries, lamps and ballasts, as suggested by Neptune.
- FSI 3: Mandate use of rechargeable batteries: Establish a campus policy to require use of rechargeable batteries whenever possible.
- FSI 4: Collect campus units' waste management data: see Auxiliaries improvements. F&S should weigh the outgoing barrels of ballasts and lamps prior to release to Veolia because Veolia reports back on neither the weight of non-PCB ballasts it landfills/recycles nor the weight of lamps that it recycles.
- FSI 5: Create recycling stations in common areas: see Building improvements. Stations should include both battery recycling receptacles and a receptacle for used CFLs.
- FSI 6: Establish Green Teams: see WTS improvements. F&S recycling program managers should be on the Campus Green Team.
- FSI 7: Expand battery recycling: see Building improvements.
- FSI 8: Expand sustainability initiative campus-wide: see Residence Hall improvements.
- FSI 9: Implement campus waste management standards: see WTS improvements.
- FSI 10: Implement waste audit research plan: see Building improvements.
- FSI 11: Secure additional recyclables markets: see WTS improvements. Locate vendors who will pay for used lamps, ballasts and/or batteries, or will provide collection at no charge to campus, provided they are properly handling/disposing of the items.

## Construction and Demolition waste management operations

### C&D waste management procedures

Construction and demolition (C&D) waste is the result of both new construction and renovation activities throughout campus. F&S Operations, Maintenance and Alterations units typically perform only alteration, restoration and renovation projects. According to several Illinois staff, most construction on campus is handled by private contractors; Tracy Osby opined that “99.9%” of the C&D waste is handled by private contractors. All projects must follow Campus Facilities Standards. Currently, there is no general requirement that campus units or private contractors report C&D waste amounts to the Sustainability Coordinator. If the project exceeds a \$500,000 threshold, the project must meet campus’

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LEED construction standards which include mandatory and optional criteria. One optional criterion is “waste management” which requires the Capital Program Unit’s Project Manager to report the amounts of C&D waste landfilled and recycled to the Sustainability Coordinator.

C&D waste handled by F&S and WTS drivers is taken to Mid America Recycling (MAR) in Champaign; it is not weighed before it leaves campus or when it reaches MAR. According to MAR employee Tammy Bragg, incoming trucks are not weighed or logged in because businesses are not charged for drop-offs. MAR accepts concrete, limestone and asphalt, and crushes and retails the material for aggregate; the website does not list brick, wood or gypsum wallboard as eligible items.<sup>113</sup> There is no information on where private contractors take their C&D waste for recycling or what percentage of it is recycled or landfilled. I have also observed ADS roll-off trailers that were filled with scrap brick in the area of the WTS that is designated for landfill-bound trailers, indicating either that brick is not recyclable at MAR or that – even if it is acceptable – it is being landfilled rather than recycled.

### Analysis of C&D waste management operations

Much of the construction that takes place on campus is done by private contractors and, therefore, is monitored and controlled less than if it were conducted by campus units. However, it could be monitored and controlled if those activities were stipulated in the project contract. C&D waste is currently not being weighed and, therefore, is impossible to include into the waste stream calculations for existing special or annual reporting requirements such as AASHE Sustainability Tracking Assessment & Rating System (STARS) or the State of Illinois Governor’s report. Although there are estimates given in the 2005 and 2010 Waste Reduction Plans, these are gross estimates, not actual landfill or recycling center weights, and cannot be extrapolated to annual construction activities.<sup>114, 115</sup> In summary, no one really has any idea how much C&D waste is being generated and even less idea about how much is being recycled. Increases in recycling – which is provided at no charge by MAR – would decrease landfill costs.

### Ideas to improve C&D waste management

- CDDI 1: Collect campus units' waste management data: see Auxiliaries improvements. Require all campus units and/or their contractors to weigh any C&D waste prior to hauling it to MAR or any other recycling facility and report data to the appropriate campus unit.

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<sup>113</sup> MAAC Capital Holdings LLC. 2013. “Mid America Sand & Gravel: Concrete and Asphalt Recycling Sites.” Accessed: March 4, 2013. <http://www.masgagg.com/illinois/concrete/recycling/>

<sup>114</sup> Hoss, Tim. 2005. Waste Reduction Plan – 2005. University of Illinois.

<sup>115</sup> Hoss, Tim. 2010. Waste Reduction Plan – 2010. University of Illinois.

## Chapter 6: Campus-Wide Programs

- CDDI 2: Implement campus waste management standards: see WTS improvements. Add contract stipulations requiring private contractors to weigh all C&D waste prior to hauling it to MAR or any other recycling facility and report it to the Sustainability Coordinator. Because recycling is free and landfilling is fee-based, consider offering a financial incentive or bid preference to those private contractors that will guarantee a threshold percentage of recycling.
- CDDI 3: Expand education on Special Waste and Recyclables: see DRS improvements. Inform all campus units and private contractors of the need to recycle any and all eligible C&D waste and notify them of the acceptable items.
- CDDI 4: Secure additional recyclables markets: see WTS improvements. Locate markets or recyclers for C&D waste that is not accepted at MAR including scrap wood, brick, glass, drywall, etc.
- CDDI 5: Expand sustainability initiative campus-wide: see Residence Hall improvements.
- CDDI 6: Implement waste audit research plan: see Building improvements.
- CDDI 7: Conduct annual WTS waste audit: see WTS improvements. This audit would estimate how much C&D debris is being landfilled.

## Bicycle Management Operations

### Bicycle management procedures

This section is based on interviews and email communications with Amelia Neptune and Morgan Johnston. There are several thousand bicycles on campus at any given time. Every year, hundreds of these are abandoned on campus and are collected by the Parking Department. Bicycle collection numbers ranged from an estimated 350 bicycles in 2010 to 600 bicycles in 2012.<sup>116</sup> Diversion weight is based on an average of 30 lbs. per bicycle, based on an analysis of over 352 recent bicycle models.<sup>117</sup> Collection data is provided in Chapter 8. After sixty days, Parking transfers them to F&S which turns them over to The Bike Project (TBP) of Urbana-Champaign, a local bicycle cooperative.<sup>118, 119</sup> TBP then transfers some of them to the Campus Bicycle Shop (CBS), a member-supported campus initiative and to

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<sup>116</sup> Johnston, Morgan. 2013. Telephone communication. December 16, 2012.

<sup>117</sup> Rinker, Thomas. 2013. "Bike Weight Index." The Bicycle Escape. Accessed: April 10, 2013. <http://www.thebicycleeescape.com/bicycleweights.html>

<sup>118</sup> The Bike Project of Urbana-Champaign. 2012. "The Bike Project." Accessed: November 15, 2012. <http://www.thebikeproject.org/index.html>.

<sup>119</sup> The Bike Project of Urbana-Champaign. 2012. "The Campus Bike Shop." Accessed: November 15, 2012. <http://www.thebikeproject.org/campus.html>.

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Working Bikes, a charitable organization which “rescues discarded bicycles and gives them new life by redistributing them as tools of empowerment in local and global communities.”<sup>120</sup> The Bike Project sent 400 of the 600 bicycles collected in FY12 to Working Bikes, and 350 of the 450 bicycles collected in FY11 (Figure 19).<sup>121</sup> The Campus Bicycle Shop uses their portion as the base of bicycles and bicycle parts which are available for rebuilding and sale or sweat equity acquisition by members of the CBS. Abandoned bicycles and any parts that are not repairable or salvageable are recycled including tires, innertubes and frames. Broken, non-recyclable parts are landfilled.

### Analysis of bicycle management operations

The Parking Department is to be commended for their collaboration with F&S, CBS and TBP to put a valuable resource that would normally be landfilled or scrapped back into useful circulation. The system could be improved by providing resources that would reduce the abandonment of bicycles due to weather exposure damage, increase the return of stolen and abandoned bicycles, and speed the recovery of abandoned bicycles to the Parking Department, increasing the percentage of bicycles that can be reused.



Figure 19. Trailer of bicycles sent to Working Bikes (Neptune)

### Ideas to improve bicycle waste management

- BMI 1: Decrease number of abandoned bicycles: Install covered bicycle parking, install parking in sheltered areas and establish short- and long-term bicycle storage to decrease damage due to weather exposure and associated abandonment. Michigan State University provides short- and long-term bicycle storage for \$35/semester.<sup>122</sup>
- BMI 2: Increase return of abandoned bicycles: Institute a sticker-based registration process to more easily identify unregistered bicycles and return abandoned bicycles; enforce bicycle registration regulations to decrease numbers of abandoned bicycles unable to be returned.

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<sup>120</sup> Working Bikes. 2012. “Giving old bikes new homes.” Accessed: November 15, 2012.

<http://www.workingbikes.org/>

<sup>121</sup> Neptune, Amelia. 2012. Email communication. December 10, 2012.

<sup>122</sup> Michigan State University. 2013. “Storage Services: have things to go into storage?” Accessed: April 25, 2012. <http://www.msustorageservices.com/servlet/StoreFront>

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- BMI 3: Speed recovery of abandoned bicycles: Institute more frequent tagging and removal of abandoned bicycles to reduce damage due to exposure and increase reusability of salvaged bicycles. Consider using volunteers provided by student RSOs and bicycle advocacy groups.
- BMI 4: Collect campus units' waste management data: see Auxiliaries improvements. Weigh incoming and outgoing bicycles or track numbers and determine an average weight. Use this number for bicycle weights and use with scrapped frame weight data to estimate amount of materials diverted from landfill.
- BMI 5: Establish Green Teams: see WTS improvements. Establish a topical Transportation Green Team that focuses on how to increase the campus bicycle mode share.
- BMI 6: Expand sustainability initiative campus-wide: see Residence Hall improvements.
- BMI 7: Improve Surplus/Property Accounting surplus materials disposition: see Surplus improvements. Confirm with campus legal representatives that campus can legally donate abandoned bicycles to TBP and other entities.

## CHAPTER 7: EXEMPLARY CAMPUS PROGRAMS

### Krannert Center for Performing Arts

This section is based on an interview and email communications with John Williams, Facility Manager of the Krannert Center for Performing Arts (KCPA).<sup>123</sup> In addition, I toured KCPA on January 24, 2013. According to Williams, KCPA is a “partially-self-supporting unit,” although neither Rasmus nor Slazinik listed it as a designated Auxiliary.

#### KCPA management procedures

During the tour of KCPA, Williams showed me an impressive array of waste reduction and recycling programs:

- Garbage and recycling collection: the WTS collects garbage on a call-in basis and cardboard and paper, as well as “confidential” paper in padlocked totes. Williams stated they do not have bottle/can recycling; plastic bottles are placed into the garbage bins and some employees “pick” the aluminum cans. Williams believes the KCPA pays for their WTS services, at least for weekend and overtime collections.
- Lamps and ballasts: KCPA has collection bins for fluorescent and special lamps, as well as incandescent lamps. I notified Williams that F&S does not recycle incandescent lamps. KCPA’s staff electricians collect the lamp ballasts and F&S collects a 50-gallon barrel of ballasts 2-3 times per year. To minimize environmental impacts, the KCPA is switching to electronic ballasts.
- Aerosol cans: KCPA also collects spent or partially-used aerosol cans which are collected by Christina Paints once per month (90-gallon barrel).
- Batteries: KCPA is recycling batteries but is not using the BS or C2R programs. Future research should determine what program is being used and whether alkaline and/or rechargeable batteries are being collected. Contact: Tom Blake.
- Metal recycling: KCPA contacts Twin-City Recycling to collect scrap metal from set construction and other activities approximately 1-2 times per month.
- Wood recycling: during large set strikes, approximately 4-6 times per year, KCPA will contact Osby and request a dumpster to collect scrap wood which they will separate from the rest of the waste. Its final disposition is unknown; Williams believed it was previously being provided to the Fire Institute for training purposes.

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<sup>123</sup> Williams, John. 2013. Personal interview and email communications. January 24, 2013; various dates.

- Electronics recycling: KCPA has a load of surplus electronics and electrical equipment collected by F&S and transferred to the Surplus Warehouse 4-6 times per year.

### Analysis of KCPA management operations

With some critical exceptions, KCPA is doing an exceptional job of collecting waste and recycling standard and special recyclables. The biggest issue is that KCPA was advertising that the WTS was a “mixed-waste” facility: patrons and users did not have to separate their waste into garbage and recycling because it was being done by campus (Figure 20). Upon inquiry, Williams stated that Rebecca McBride (KCPA Senior Associate Director) and Robert Goss (KCPA Director’s Office staff) had been told during a tour of the WTS that the garbage was sorted for recyclables at the MRF. KCPA staff then took the initiative to advertise this to patrons as evidence of the campus’ commitment to reducing landfill waste through maximizing recycling. Unfortunately, this miscommunication helped reinforce the impression across campus – and the Champaign-Urbana community – that campus was a mixed-waste, full-sort facility.<sup>124</sup> Associated with this miscommunication is the current lack of bottle/can recycling at the KCPA. Because they believed it was being sorted at the WTS, staff saw no need to place additional bins throughout the building.



Figure 20. KCPA mixed-waste collection bin

### Ideas to improve KCPA waste management

- KCPAI 1: Advertise waste management improvements: Immediately discontinue the “mixed-waste” collection process; re-label the existing bins for landfill waste and provide office and common-area collection bins for bottles/cans and paper. Provide common-area bins for cardboard. Install prominent signage informing patrons and users of the “new green recycling program” and ask them to initiate separating and sorting their own waste and directing them to recycling stations.

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<sup>124</sup> Adams, Angela. 2013. Recycling Coordinator, City of Champaign. Personal communication; April 30, 2013.

## Chapter 7: Exemplary Campus Programs

- KCPAI 2: Audit and improve building recycling bins and signage: see WTS improvements.
- KCPAI 3: Create recycling stations in common areas: see Building improvements.
- KCPAI 4: Collect campus units' waste management data: see Auxiliaries improvements.
- KCPAI 5: Establish Green Teams: see WTS improvements.
- KCPAI 6: Improve bottle/can recycling: see WTS improvements. Institute bottle/can recycling throughout performance and academic areas of KCPA.
- KCPAI 7: Expand battery recycling: see Buildings improvements. KCPA should utilize both the BS and C2R programs to maximize battery recycling; it could collect a significant number of batteries due to the amount of battery-operated equipment used at the facility.
- KCPAI 8: Expand sustainability initiative campus-wide: see Building improvements.
- KCPAI 9: Implement campus waste management standards: see WTS improvements.
- KCPAI 10: Implement waste audit research plan: see Building improvements.
- KCPAI 11: Brand and detail dumpsters, totes and bins: see Building improvements.
- KCPAI 12: Explore composting options: see Union improvements. The Intermezzo Café and catered events generate substantial amounts of food scraps.
- KCPAI 12: Implement Pilot Zero Waste Game Day event: see DIA improvements. During our interview, Samuel Smith (KCPA Engagement Director) stated that they currently host a concert during Sustainability Week which would be an ideal opportunity to convert an existing event to a Zero Waste event.

## Document Services

This section is based on an interview and email communications with Barbara Childers, Associate Director of Document Services, F&S.<sup>125</sup> Document Services (DS) is part of F&S, along with Engineering and Campus Services, Stores, Transportation & Automotive

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<sup>125</sup> Childers, Barb. 2012. Personal interview and email communications. October 19, 2012; various dates.

Services, Engineering/Design/Review, Parking, and Campus Mail. Childers knew of no specific policies or practices in place at DS regarding sustainable procurement or waste management.

### Document Services operations

- Garbage and recycling collection: WTS collects both garbage and bottle/can, cardboard and paper recyclables.
- Printing practices: prints course packets on 100% recycled paper; exchanges packets with Follett's and the TIS Bookstore to reduce waste; uses 30% post-consumer-waste textured and colored papers.
- Reduced water consumption: by 90% due to termination of film processing.
- Reuse: reuses non-recycled boxes for shipping jobs.
- Toner cartridge recycling: DS prefers using the few vendors that accept used cartridges, e.g., Hewlett-Packard.
- Pallets: DS donates them to DSC and sometimes to Habitat for Humanity rather than discarding them; Childers may be unaware that Osby sells or otherwise disposes of pallets via the WTS.
- Surplus chemicals: DS has few items to contribute to ChemCycle; the best solution would be to be able to purchase in containers smaller than a 55-gallon drum.
- Hazardous materials: changes in printing processes has greatly reduced the amount of hazardous materials including volatile organic compounds (VOCs); DS had been approaching amounts that would require a quarterly report.

### Analysis of Document Services management operations

Childers is dedicated to increasing the sustainability of DS as much as possible. Some of the major hurdles she sees are the state regulations regarding surplus disposition; she feels that an online, interactive surplus exchange would be very useful. She also believes that providing more bottle/can recycling bins and starting a food scrap composting program would reduce the most significant contributors not already being addressed at DS. Childers likes the multiple-item collection bins found at highway rest areas and in certain areas of campus. She noted that some staff are mixing garbage and recycling in bins even when both bins are provided in the same area. She has noted multiple instances of personal and institutional resistance to recycling: one BSW would not deal with any of the office recycling bins other than the rolling ones; one common-area bottle/can bin was kept in a locked BSW closet. She also felt that not charging campus units for garbage collection was one example of the lack of incentives for waste reduction and recycling on campus. Charging for garbage collection

might provide administration the impetus and/or an avenue to provide staff incentives for waste reduction.

### Ideas to improve Document Services waste management

- DSI 1: Audit and improve building recycling bins and signage: see WTS improvements.
- DSI 2: Create recycling stations in common areas: see Building improvements.
- DSI 3: Collect campus units' waste management data: see Auxiliaries improvements.
- DSI 4: Establish Green Teams: see WTS improvements.
- DSI 5: Improve bottle/can recycling: see WTS improvements.
- DSI 6: Expand battery recycling: see Buildings improvements.
- DSI 7: Expand sustainability initiative campus-wide: see Building improvements.
- DSI 8: Implement campus waste management standards: see WTS improvements.
- DSI 9: Implement waste audit research plan: see Building improvements.
- DSI 10: Brand and detail dumpsters, totes and bins: see Building improvements.
- DSI 11: Explore composting options: see Union improvements. The DS breakroom generates food scraps.
- DSI 12: Improve bottle/can recycling: see WTS improvements.
- DSI 13: Confirm pallet recycling data: see WTS improvements. Log and report the number or weights of pallets recycled and landfilled.
- DSI 14: Encourage/mandate sustainable purchasing: see Auxiliaries improvements. DS purchases substantial amounts of paper and printing supplies.
- DSI 15: Improve Surplus/Property Accounting surplus materials disposition: see Residence Hall improvements. DS purchases and disposes of large printing equipment on a regular basis; being able to donate or sell them locally would reduce shipping charges to CMS Springfield.
- DSI 16: Create online exchange portal: see Surplus improvements. DS would be interested in knowing what surplus items other campus units have to offer.
- DSI 17: Set default duplex printer setting: have CITES and departments set computers to default duplex (two-sided) printing and require Administrator authority

to change default, but allow for manual set to one-sided printing for individual printouts.

- DSI 18: Require or give purchasing preference recycled toner cartridge purchase and recycling: encourage or require the purchase, use and recycling of recycled/refurbished toner cartridges – through promotion or defaulting to these items on purchasing portals and catalogs – unless the unit is granted a waiver.
- DSI 19: Locate vendors of smaller-sized supplies: find vendors that sell solvents and other chemicals in containers smaller than 55 gallons.
- DSI 20: Expand ChemCycle program: allow units to post partially-used containers of chemicals available to share with other units.
- DSI 21: Incentivize waste reduction and recycling increase: instead of providing garbage and recycling services at no charge to campus units, charge all campus units – not just Auxiliaries and those requiring extraordinary service – for garbage collection; charge less or nothing for recycling collection. To make this operational change cost-neutral, provide campus units with additional budget line-item funding equal to the amount they would be charged for their current level of garbage collection service. Reductions in garbage hauling would result in the unit having additional funds to spend on other goods and services.

### Better World Books

This section is based on an interview and email conversations with Stacey Bolnik, Campus Account Executive, Better World Books (BWB).<sup>126</sup> Founded in 2002, BWB is a “self-sustaining, for-profit social venture whose mission is to capitalize on the value of the book to fund literacy initiatives locally, nationally and around the world.”<sup>127</sup> It partners with 3,100 libraries and over 1,800 college campuses across North America, collecting unwanted textbooks and library discards to support not-for-profit literacy programs. BWB has raised over \$13 million in its Raised for Literacy & Libraries programs, donated over eight million books and reused or recycled over 99 million books, saving 1.5 million trees. The most important aspects of the BWB program are its zero-landfill policy and the benefits it provides campuses. BWB first attempts to sell all collected books through an online resale program; unsold books are then donated to various global and national programs. Any remaining books are then recycled so nothing ever reaches a landfill or incinerator. In addition to helping campus reduce its environmental impacts by diverting unwanted textbooks to new homes or for recycling, BWB returns a 15% portion of the sales proceeds

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<sup>126</sup> Bolnik, Stacey. 2012. Personal interview and email communications. December 7, 2012; various dates.

<sup>127</sup> Better World Books. 2013. “Better World Books.” Accessed: December 7, 2012.  
<http://www.betterworldbooks.com/>.

## Chapter 7: Exemplary Campus Programs

of those books to campus. These funds can be used in any manner desired by the collecting entity: scholarships, recycling programming or equipment, student activities or events, etc.

Bolnik has been working on campus since 2011 with the Main Library; her library contacts are Melanie Rusk and Tom Teper. She has also been working with the TIS College Bookstore and several student organizations including the Hillel Foundation, Circle K, Golden Key, ALA Student Chapter, and Vis-à-Vis. According to Bolnik, the campus programs' current gap is the lack of textbook collection at residence halls. New programs and collection sites usually take an academic year to really catch on and, as textbooks are not university property, there would be no issues with State procurement restrictions. To date, BWB has collected 39,665 books on campus, totaling an estimated 54,282 pounds.

In order to provide some idea of the potential for expanding the collection program, Bolnik provided summary data for similarly-sized universities with which she works (schools were only identified by their state):

- A school in Ontario: 15-20,000 students; collection sites at library, bookstores; coordinated by Sustainability department; 22,710 books collected (31,079 pounds).
- A school in Illinois: 10-15,000 students; collection sites at library; coordinated by recycling department; had a bookstore pilot program; 4,775 books collected (6,533 pounds).
- A school in Wyoming: 5-10,000 students; collection sites at student organizations, library coordinated by recycling department; 32,407 books collected (44,353 pounds).

### Textbook management procedures

- BWB pays for all collection and marketing materials and shipping and handling; campuses pay for nothing.
- Indoor Cardboard collection bins are the only current option (2' x 2' x 3'), although BWB is designing outdoor bins for other Illinois sites. BWB is hoping to expand the outdoor bin program to all of Illinois eventually, depending on demand in outlying areas.
- Marketing materials on bin; 2x3 posters are provided (three per bin – environmental messaging, partner-specific; editable fliers available)
- The collection process is as follows: campus collects books from bins, packages them in boxes, uses online client portal to print off prepaid UPS shipping labels or freight pickup, arranges shipment, orders supplies, and books are picked up.

Collected books can get logged separately by pickup account, allowing competitions between residence halls and organizations.

- Data collection: all collected books are quantified in environmental metrics according to their status: resold, donated, or recycled; books pending sale are not included until they are finally disposed; metrics include gallons of water saved, electricity saved, GHGs not produced; unsold resalable books are listed as “in inventory.”

### Analysis of textbook management operations

The BWB collection site organizers are doing a good job collecting books at selected locations. The biggest hurdle – initial acceptance by campus administration – has already been overcome by having already established the program at the Main Library. There is amazing potential for increasing collection volumes by expanding to the additional bookstores, residence halls and at other special locations and events, especially at the end of each semester.

### Ideas to improve textbook waste management

- TMI 1: Create recycling stations in common areas: see Building improvements. Include textbook collection bins at recycling stations throughout campus: libraries, bookstores, residence halls, student-focused buildings, e.g., Illini Union, Student Services, large academic buildings. Increase the number of bins at end of academic terms. Have a building representative manage the bin(s), or a CSE staff member, volunteer or designee.
- TMI 2: Initiate special event recycling collections: Promote textbook and other special recyclables collection during key environmental events, e.g., RecycleMania, Earth Day and Week, America Recycles Day, Campus Sustainability Day, etc.

## Illinois Sustainable Technology Center

This section is based on interviews and email communications with Seth Rients, Academic Hourly.<sup>128</sup> The Illinois Sustainable Technology Center (ISTC) is part of the Prairie Research Institute, along with the Illinois State Archeological, Geological, Natural History, and Water Surveys. It was formerly known as the Waste Management and Research Center. Its mission is “to be at the forefront of environmental and energy research and innovative technological advances that protect natural resources and reduce wastes.”<sup>129</sup> ISTC strives to research and model new processes and technology while also modeling sustainability. To this end, Rients

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<sup>128</sup> Rients, Seth. 2012. Personal interviews; email communications. December 14, 2012, and January 15, 2013; various dates.

<sup>129</sup> Illinois Sustainable Technology Center. 2013. Accessed: April 18, 2013. <http://www.istc.illinois.edu/>.

is drafting a Zero Waste Plan for ISTC which includes conducting a four-week waste audit of the facility. Based on the initial audit findings, Rients has proposed policies and practices, some of which will be implemented at the ISTC. After implementation, Rients will conduct a follow-up audit to determine the impacts of the changes. Discussions with Rients yielded several ideas which are listed in the following section.

### ISTC management procedures

Some details and important findings from the waste audit include:

- Audit waste components: mixed paper, PETE/HDPE plastic, other plastic, aluminum, metal, compost/organics, cardboard, glass, disposable nitrile lab gloves, plastic can liners, electronic waste, and other waste.
- Interesting contributors to the waste stream: plastic can liners (3% of stream), lab plastics (75% of “other plastics”), and disposable nitrile lab gloves (9% of stream).
- Reasons for low diversion rate: very few recycling containers, most containers hidden or obstructed from view, WTS sorts only blue can liners, lack of recycling knowledge of building users.
- Proposals for improvements: educate staff and visitors, create an intranet webpage for the ISTC ZW Project including the ISTC ZW Plan, a map of the locations of recycling containers, and detailed information about what can be recycled.
- Action items: many are identical to those found in this draft of the campus ZWP:
  - optimize recycling bin placement with appropriate signage and blue can liners
  - increase recovery of commodity recyclables,
  - compost food waste and install campus anaerobic digester, and
  - reduce number of garbage cans
- Other action items are specific to ISTC and similar research facilities: switch to new disposable gloves that are acceptable to TerraCycle recycling program.

### Analysis of ISTC management operations

Rients has done an excellent job drafting a ZWP for the ISTC. The process of writing a research plan, baseline audit, policy and practice recommendations, implementation and post-audit are the same steps that should be replicated for every campus unit. Several of my recommendations are directly or indirectly due to my collaboration with Rients; he will be a valuable asset for the campus to reach its Zero Waste goals.

### Ideas to capitalize on ISTC waste management research

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- ISTCI 1: Collaborate on creating Zero Waste Plans: Rients and Ricci created a Zero Waste Plan Box.net account for research and reference materials and a Zero Waste UIUC Google Group for group communications.
- ISTCI 2: Increase types of plastics collected: Campus should be able to recycle all #1 and #2 plastics, regardless of form, as long as it is “rigid” and not “soft”; soft is anything that melts under 200°F. This may require upgrading of the sorting equipment and process at the WTS.
- ISTCI 3: Secure additional recyclables markets: see WTS improvements. Kishore Rajagopalan, Associate Director for ARIES at ISTC, is conducting Plastics-to-Fuel research and could use #3-#6 plastics for his conversion research/production. A second alternative is to collect the “other plastics” and transfer them to a local recycling company at no charge. This would increase campus diversion and reduce landfill disposition at little cost.
- ISTCI 4: Improve MRF operations: see WTS improvements. The WTS could install a robotic NIR recyclable sorter on the MRF sorting belt that optically recognizes different recyclables and uses compressed-air to sort items into appropriate recycling bunkers, increasing the recovery rate for commodity recyclables.
- ISTCI 5: Implement a disposable glove recycling program: see MHC improvements. ISTC generates a significant number of gloves and is investigating switching to Kimberly-Clark gloves which can be collected and sent to TerraCycle for recycling.
- ISTCI 6: Implement waste audit research plan: see Building improvements. The ISTC waste audit reinforced my belief that individual campus units should and could audit their waste stream.
- ISTCI 7: Audit and improve building recycling bins and signage: see WTS improvements.
- ISTCI 8: Create recycling stations in common areas: see Building improvements.
- ISTCI 9: Collect campus units’ waste management data: see Auxiliaries improvements.
- ISTCI 10: Establish Green Teams: see WTS improvements. Campus should capitalize on ISTC’s mission and expertise in promoting the use of technology for sustainability and its initiative in developing a ZWP.
- ISTCI 11: Improve bottle/can recycling: see WTS improvements.

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- ISTCI 12: Expand battery recycling: see Buildings improvements.
- ISTCI 13: Expand sustainability initiative campus-wide: see Building improvements.
- ISTCI 14: Implement campus waste management standards: see WTS improvements.
- ISTCI 15: Implement waste audit research plan: see Building improvements.
- ISTCI 16: Brand and detail dumpsters, totes and bins: see Building improvements.
- ISTCI 17: Explore composting options: see Union improvements. ISTC wants to initiate a composting program to handle breakroom food scraps.
- ISTCI 18: Improve bottle/can recycling: see WTS improvements.
- ISTCI 19: Expand ChemCycle program: see DRS improvements. ISTC manages substantial amounts of chemicals.
- ISTCI 20: Advertise waste management improvements: see KCPA improvements. ISTC should advertise its recent waste audit, new ZWP and new adopted ZW policies and practices.

## CHAPTER 8: ASSESSMENT OF CURRENT CONDITIONS

The first step in drafting the Zero Waste Plan was to collect the current and historical data on the amount of garbage and recycling collected, document its timeframe, currency, and reliability (Table 1). Frankly, I believed this would be the most straightforward phase of the research and originally allocated two to three months for data collection. Although I knew that sustainability operations were decentralized on campus, I had no idea of the extent to which units and individuals were not gathering data on their own waste management activities or sharing that data with other relevant units including the CSE and/or F&S.

Due to new and follow-up questions, I was collecting data up until the end of the research period. This lack of data and coordination also led to several reductions in research scope and reliability: the preponderance of estimates rather than measurements reduced the level of confidence in ascribing causality between factors and prohibited me from making predictions on impacts of implementing Action Items. However, this should not give the impression that improvements are not needed, nor should it deter campus from taking actions to increase recycling and reduce landfilling.

Table 1. Waste data sources, dates and reliability

Item	Data years	Final source	Units of measure	Reliability
aluminum	FY04-FY12	Osby, WTS	pounds	buyer-reported weights
animal bedding	FY04, FY09	Hoss, WTS	cubic yards & tons	WMP-estimated & equated, then extrapolated
animal carcasses	FY12	Bressner, ISRL and SRC	animal head	source-estimated, then equated and extrapolated
animal manure	FY12	Bressner & Wolters, ACES	gallons & head	source-estimated, then equated and extrapolated
ballasts	n/a	Henry, F&S	pounds	partial weights should be available from recycler
batteries	2011-2013	Boehm, F&S	weights	recycler-reported weights, then extrapolated
bicycles	2010-2012	Johnston, F&S	numbers	source-estimated, then equated
C&D waste, landfilled or recycled	FY04, FY09	Hoss, WTS	pounds	not used due to unreliability of estimate
cardboard	FY04-FY12	Osby, WTS	pounds	buyer-reported weights
clothing & household goods	FY12	Ortiz, Housing; Nunn, YMCA	pounds & trailers	source-estimated, then equated and extrapolated
electronic waste	FY12	Weaver, Surplus	trailers	source-estimated, equated and extrapolated
food waste, post-consumer	2010	Strohbeck, Housing	waste ounces &	source-weighed and estimated, then extrapolated
garbage, 2004-2008	FY04-FY08	Republic Services	tons	hauler-billed weights
garbage, 2008-2012	FY08-FY12	Area Disposal Service	tons	hauler-billed weights
hazardous waste	FY07-FY11	Ashbrook, DRS	pounds	source-collected weights, then averaged and extrapolated
lamps	FY08-FY13	Ball, F&S	numbers & weights	source-counted, then equated
landscape waste	FY12	Welch, Grounds	cubic yards	source-estimated, then equated and extrapolated
metal, scrap	FY04-FY12	Osby, WTS	tons	buyer-reported weights
pallets	2011-2013	Osby, WTS	numbers	source-estimated, then equated and extrapolated
paper, mixed	FY04-FY12	Osby, WTS	pounds	buyer-reported weights
plastics - #1 & #2 bottles	FY04-FY12	Osby, WTS	pounds	buyer-reported weights
surplus equipment	n/a	Weaver, Surplus	numbers	item types and numbers should be available from Surplus
textbooks	FY06-FY13	Bolnik, BWB	numbers & weights	recycler-counted and weights estimated
tires	FY12	Varney, F&S	numbers	source-counted, then estimated, equated and extrapolated

note: some data was available in calendar years ("2011-2013"); some was available in fiscal years ("FY04-FY12")

note: "n/a" means no data available at this time

note: "estimated" relates to units; "equated" applies a standard weight to reported units, "extrapolated" applying estimates to additional years

note: "Data years" indicates years that data was actually available, not averaged or extrapolated

## Garbage Collection Data

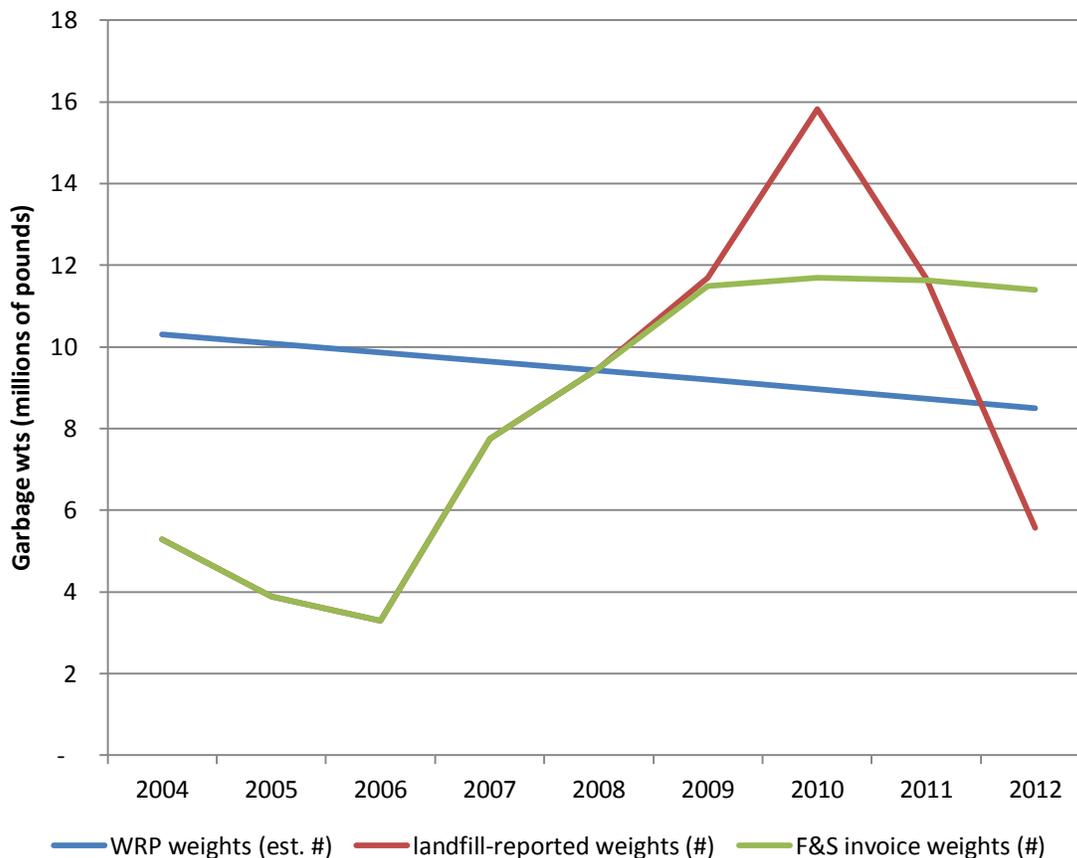


Figure 21. Garbage collection trends

Notes on Figure 21:

- “WRP weights”: estimations of garbage weights; from 2005 and 2010 Waste Reduction Plans (Hoss)
- “Landfill reported weights”: weights of garbage hauled to regional landfills; provided by landfill operators (Coulter [PDC], Grant [ADS])
- “F&S invoice weights”: weights of garbage landfilled; reported on invoices submitted to F&S by landfill operators

Non-C&D, non-post-consumer food waste: included in garbage analysis.

I had assumed that I would be able to obtain the garbage collection data from the WTS, either from them collecting the data themselves on outgoing garbage trailers or from invoice data from the landfills. As previously stated the WTS does not log incoming or outgoing weights on garbage trucks, and they also do not receive invoice data from the landfills; that information is sent directly to F&S Accounting. Therefore, I had to rely on data from the vendors themselves. Upon request, Osby contacted both Republic Services and Area Disposal Services for garbage collection data. Marty Grant (Republic Services) provided data for the fiscal years 2004-2008; Matt Coulter (ADS)

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provided data from 2008-2012 (Table 2).<sup>130</sup> As stated earlier, campus alternates primary hauling contracts between these two haulers approximately every five years. However, according to F&S staff, there are a few months of overlapping hauling activity between the two contracts. The major logistical drawback to the current situation is that Auxiliaries are permitted to utilize any hauler they prefer, requiring me to contact the units to determine which hauler they were utilizing. If I wanted to obtain actual collection data, I would have had to request billing and collection information from each unit; time did not permit this level of collection and analysis. However, in an attempt to overcome this data shortcoming, I contacted the haulers directly and asked them to provide data for all accounts they are servicing on campus, Auxiliary or otherwise. This will allow future data modeling refinements.

Starting with the initial weight data from Coulter and Grant, I noted a tripling of garbage collection from 5.3 million pounds in 2003 to 15.8 million pounds in 2010, and then a decline to the original 5.6 million pounds in 2010. The data is listed in Table 2 (see below) and represented by the red “landfill-reported weights” trendline in Table 1 (see previous page). This is an increase of almost 200% in six years and then a decrease of 65% in two years. Inquiries to various campus staff produced no suggestions or explanations of the reason for the rapid increase and precipitous decrease, including Osby for garbage and recycling and Matt Edmondson regarding capital planning and construction. A review of the DMI information of campus activity including staff and student population shifts and construction activity levels did not provide any obvious explanations for these shifts.<sup>131</sup> Food waste reductions by Housing Division starting in 2009 may be a significant contributor to the later decrease in landfill tonnages but does not explain the initial increase or the magnitude of the decrease.

**Table 2. Garbage collection data**

FY	WRP weights (est. #)	landfill-reported weights (#)	(A) F&S invoice weights (#)	(B) landfilled post-consumer food waste (est. #)	(C) = A-B landfilled non-food waste (est. #)	(D) hazardous waste landfilled (est. #)	(E) = B+C+D annual total landfilled (est. #)
2004	10,300,000	5,294,220	5,294,220	2,564,843	2,729,377		5,294,220
2005		3,884,860	3,884,860	2,564,843	1,320,017		3,884,860
2006		3,288,280	3,288,280	2,564,843	723,437		3,288,280
2007		7,745,920	7,745,920	2,564,843	5,181,077	351,543	8,097,463
2008		9,482,020	9,482,020	2,564,843	6,917,177	368,015	9,850,035
2009	9,200,000	11,695,240	11,491,240	2,564,843	8,926,397	368,958	11,860,198
2010		15,826,300	11,694,280	518,150	11,176,130	395,578	12,089,858
2011		11,670,060	11,625,300	518,150	11,107,150	357,768	11,983,068
2012	8,500,000	5,564,220	11,401,740	518,150	10,883,590	368,372	11,770,112

source: (A) 2005 and 2010 Waste Reduction Plans (WRP), Hoss, WTS

source: (B) ADS and PDC landfill-reported weights

source: Housing-reported estimated post-consumer food waste

<sup>130</sup> Grant, Marty. 2012. Republic Services. Personal and email communications; various dates.

<sup>131</sup> Division of Management Information. 2013. “Campus Profile.” Accessed: September 11, 2012. <http://www.dmi.illinois.edu/cp/default.aspx>.

Comparing the reported weights provided in the campus 2005 and 2010 Waste Reduction Plans (WRP) raised more questions: the 2005 WRP stated that campus landfilled 10.3 million pounds of garbage in 2004 and the 2010 WRP stated that it landfilled 9.2 million pounds in 2009.<sup>132, 133</sup> These estimates show an average 2.1% annual decrease for a total decrease of 10.7% rather than the 120% increase as shown by the landfill invoices received by F&S, indicating some discrepancy not only in weights but also in the general trend. These data are listed in Table 2 and represented by the blue “WRP weights” trendline in Figure 21 (see previous page). Upon inquiry, Hoss was fairly certain that not all of the billing data had not been provided upon request. His recollection that some garbage loads always ended up going to the non-primary hauling contractor highlighted the need to obtain invoices for both haulers for all years from either the haulers themselves or, preferably, from F&S Accounting Services. This led to my eventual direct contact with the haulers.

Marty Grant (Republic Services) notified me that they were currently providing garbage hauling to several Auxiliaries but, because the garbage is commingled with other non-campus customers’ garbage, isolated weights are not available for the Auxiliary or campus collections. They did provide me with a list of collection locations and dumpster sizes. As previously stated, these volumes could be converted to weight estimates and added into the garbage analysis. In addition, Jason Nordvall (Area Disposal Service) stated that ADS could provide regular reports that would include garbage collection weights for their collections from the WTS; this would both ease analysis and eliminate any question about the reliability of future garbage collection data.

After discussing this issue with staff members, Lage secured transactional information from BANNER on past waste hauling bills. This data provides a holistic picture of how much haulers were paid during 2004-2012, although it does not guarantee that these funds were exclusively for garbage hauling, nor does it provide any tonnage information; it merely provides total invoice charges. It did provide a list of waste hauling contractors that submitted invoices which would facilitate future contact of haulers to request waste collection information. In addition, Morgan Johnston is contacting F&S Accounting Services to determine if waste collection data is available for the entire campus from past bills.

The final confirmation of the inaccuracy of the ADS data provided by Coulter was during the review of a copy of an Area Disposal Service Scale Ticket Summary for FY12, provided by Lage who had received it from Osby. This billing summary listed ADS’ three accounts for campus (“MSW-Demo Compactor Loads,” “Bertha,” and “G 30YD OT Trans Station”) and totaled 5,700.87 tons for FY12 compared to the 2,782.11 tons stated by Coulter. I then requested the scale ticket summaries for FY08-FY12 from Jason Nordvall, ADS, in April of 2013.<sup>134</sup> He soon provided data for the period of November, 2008, to June 30, 2012, leaving a six-month gap between the end of FY07 and the beginning of his data; I immediately requested confirmation of whether or not service had been provided during that period or additional information to cover that gap. In the interim, I estimated

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<sup>132</sup> Hoss, Tim. 2005. Waste Reduction Plan – 2005. University of Illinois.

<sup>133</sup> Hoss, Tim. 2010. Waste Reduction Plan – 2010. University of Illinois.

<sup>134</sup> Nordvall, Jason. 2013. Area Disposal Services. Personal and email communications; various dates.

the full FY08 collection based on doubling the second half of FY08 collection weight data. This new data reduced the peak of 2010 from 15.8 million pounds to 11.7 million pounds and a subsequent drop to 11.4 million pounds rather than to 5.6 million pounds (Table 2; green “billed weights” trendline, Figure 21). I chose to use the “billed weights” data for the waste stream analysis (Figure 23). Combining this “landfilled non-food waste” with the “landfilled post-consumer food waste” and the “hazardous waste disposed” yielded the “Annual total disposed” estimates in Table 4 and Figure 22.

Post-consumer food waste data: included in garbage analysis. Selected dining halls were audited for post-consumer food waste in 2007. Subsequent audits in 2010 after the institution of trayless dining in 2009 revealed that post-consumer food waste had dropped from approximately 23.8 oz/student/day to 4.0 oz/student/day.<sup>135</sup> This estimation led to the projection of approximately 2.56 million pounds of post-consumer food waste from approximately 10,000 daily meals during FY05-FY09 likely decreased to 518,150 pounds from FY10-FY12 (Table 2, Figure 23). Again, this is a gross estimate that is not based on a count of actual meals served, let alone an actual measurement of food waste generated or collected. It also does not include pre-consumer food waste generated or collected. During this time, food waste was either sent to the landfill, disposed down kitchen sink garbage disposal units or sent to the SSF during a short composting pilot project. Additional pre- and post-consumer food audits were conducted in January, 2013, and should be included in future waste stream analyses.

Because it is presumed that the majority of post-consumer food waste was disposed into garbage bins, the estimated 2.56 million (pre-2010) or 51,150 pounds (2010-2012) of landfilled post-consumer food waste is subtracted from the total landfill numbers to estimate “landfilled non-food waste.” Future pre- and/or post-consumer food waste may eventually be removed from the landfill stream and may or may not need to be included into the recycling stream. Strohbeck recently notified Johnston that all food waste was being aerobically digested in the kitchens’ Enviropure units. This would remove the food waste from the solid waste/Zero Waste calculations but exclude it from the recycling stream. However, if plans for implementing either aerobic wind-row or vermicomposting or anaerobic digestion are realized, the food waste would be moved from the landfill stream to the recycling stream.

Landfilled C&D waste: not included in garbage analysis. Data is not collected for C&D waste landfilled separately from the general garbage or for C&D waste recycled at C&D recycling stations. Neither contractors nor F&S renovators were weighing any C&D waste being hauled to landfills or the recycling station at MAR. Although the 2005 and 2010 WRPs did include estimates of the C&D waste landfilled and recycled, the lack of any stated methodology convinced me that the numbers could not be relied upon. On several occasions, I observed landfill trailers at the WTS in the staging area that were filled with waste building brick as well as private contractors’ waste trailers at

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<sup>135</sup> Strohbeck, Carol. 2013. Dining Hall food audits. Email communications; January 23 and March 8, 2013.

construction sites throughout campus filled with C&D waste. If future data on landfilled or recycled C&D waste is collected, it should be included in the appropriate waste stream.

## Commodity and Special Recyclables and Waste Collection Data

As previously stated, data on recyclables and reused materials is a mix of both measured weights and estimates. Lage collects much of this data from these sources (Table 1) for regular reports to the Illinois Governor’s office and for the AASHE STARS report. However, it is a difficult and time-consuming process and, as already described, the data itself is neither precise nor accurate, i.e., it typically does not measure the desired parameters nor, if it does, does it actually measure it. Data sources, currency and reliability are listed in Table 1. Special recyclables data are listed in Table 3 and shown in Figure 23; totals are listed in Table 4.

Table 3. Commodity recyclables collection data

Year	aluminum (#)	cardboard (#)	metal, scrap (#)	paper, mixed (#)	pallets (est. #)	plastic, #1 and #2 (#)	Annual total commodity recyclables (est. #)
2004	75,000	1,098,957	n/r	2,382,969	650,000	267,260	4,474,186
2005	-	1,402,267	n/r	2,077,999	650,000	283,585	4,413,851
2006	39,831	1,484,260	602,274	2,537,940	650,000	-	5,314,305
2007	-	1,463,130	934,352	2,231,240	650,000	173,470	5,452,192
2008	82,480	1,280,590	1,126,927	2,397,880	650,000	-	5,537,877
2009	-	1,158,080	1,645,335	2,107,150	650,000	40,800	5,601,365
2010	-	1,069,115	1,052,586	1,911,605	650,000	80,640	4,763,946
2011	-	1,112,125	1,029,915	1,933,694	650,000	43,940	4,769,674
2012	37,387	1,041,920	1,088,825	1,615,880	650,000	42,120	4,476,132

note: "n/r" means no data reported for that year

note: "-" means that commodity was stockpiled until prices called for a sale

### Commodity recyclables data

Although the commodity recyclables are weighed at the WTS prior to shipment to the buyers, Osby considers the weight data provided by the recyclers as the final weights (Table 3, Figure 23). This includes aluminum, cardboard, plastic, paper and scrap metal. Osby does count the pallets at sale but does not weigh them. Because Osby sells the commodities when prices are acceptable, there are significant gaps in sales data for aluminum and plastic, up to two years at a time, resulting in gaps in estimated collection data. I elected to provide actual sales data with the gaps rather than averaging the sales data over the gap period.

Pallet quantity data is also questionable. Osby reported he sold 2,180 pallets to Michael’s over sixteen months for an average of 65,500 lbs/yr. If this is doubled to reflect the heavy-duty shipping pallets (CHEP-compliant) and non-reusable pallets collected but not sold, this totals approximately 130,000 lbs/yr. The 2005 and 2010 WRP’s reported two different volumes of pallets recycled:

“650,000 lbs. /yr” and “[a]pproximately half of all pallets delivered to campus are reused by trucking companies... Since March of 1999, a central Illinois firm back-hauls, at no charge, approximately one trailer load every two weeks from the WTS for reuse.” The 2010 WRP also states that this back-hauling company has been hauling away 1.56 million pounds of reusable pallets per year, over ten times what Osby reported, plus the matching non-sold pallets. It also states that this 1.56 million pounds of backhauler-collected pallets is only half of the pallets that the campus handles; no disposition is listed for the other half of the pallets. This report uses the more conservative 650,000 lbs/yr estimate (Table 3, Figure 23). However, the WRP’s other trailer-based figure equates to roughly 60,000 lbs/trailer based on a volume conversion of 150 yd<sup>3</sup> and an estimation of 400 lbs/yd<sup>3</sup>, totaling 1.56 million lbs/yr of reused pallets.<sup>136,137</sup> This could include both the “good” pallets that are now sold to Michaels and the CHEP pallets that are still back-hauled but would still not include the “non-reusable” pallets. If this is half of the total pallets on campus, the total pallet figure could be over three million pounds. It would also be important to know the disposition of those non-reused pallets: are they ground up for mulch, landfilled, incinerated, used for firewood, or something else?

### Special recyclables and waste data

Special recyclables and waste are listed in Table 5 and shown in Figure 23; totals are listed in Table 4. “Hazardous waste disposed” in landfills or incinerators is listed in Table 2 and included in the “Annual total disposed” entry in Table 4.

Hazardous waste and recyclables data: included in garbage and recyclables analyses. DRS reports data on hazardous waste and recyclables collected and processed on- and off-campus every year.<sup>138</sup> In addition to services provided, data includes biowaste disposed of both on- and off-site, chemicals collected, nonhazardous chemicals disposed of on-site, radioactive waste treated or disposed, and chemicals reclaimed for reuse or redistributed on-campus. The 2011 DRS report provided data for FY07-FY11. This data was averaged and then extrapolated to FY12 (Table 2 and Table 5, Figure 1). According to Director Ashbrook:

In 1999, 73% of campus hazardous chemical waste was disposed via off-site incineration. Another 4% went to special treatment facilities. Recycling accounted for 19% of the waste, primarily due to the reclamation of used oil, which is regulated, but not as a hazardous waste, 4% managed by on-site methods, which included disposal of nonhazardous chemicals via the sanitary sewer (liquids) and ordinary garbage (solids). Some of the on-site handling included redistribution of unwanted chemicals to other campus users. None of our

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<sup>136</sup> YRC Freight. 2013. “Semi-Trailer Dimensions.” Accessed: April 12, 2013. <http://www.yrc.com/shippers/semi-trailer-dimensions.html>.

<sup>137</sup> New Mexico Environment Department. 2013. Accessed: November 11, 2012. [www.nmenv.state.nm.us/swb/doc/Conversiontable.doc](http://www.nmenv.state.nm.us/swb/doc/Conversiontable.doc).

<sup>138</sup> Division of Research Safety. 2011. “Division of Research Safety 2011 Annual Report.” Urbana, IL, 61801.

hazardous waste chemicals went directly to landfill that year. I suspect the proportions of management processes have not changed greatly since 1999.<sup>139</sup>

C&D waste, recycled: not included in recyclables analysis. As previously stated, no data is collected on C&D waste landfilled or recycled. Neither contractors nor F&S renovators were weighing any C&D waste being hauled to landfills or to Mid America Recycling. Although the 2005 and 2010 WRPs did include estimates of the C&D waste landfilled and recycled, the lack of any stated methodology convinced the research staff that the numbers could not be relied upon. If future data on landfilled or recycled C&D waste is collected, it should be included in the appropriate waste stream.

Lamp ballasts: not included in garbage or recyclables analysis. Henry stated that F&S does not weigh the outgoing drums of lamp ballasts. Veolia does provide receipts for the weights of PCB-containing ballasts that are incinerated at their facility but no one reports on the weights of non-PCB-containing ballasts or their disposal method. Future research could include obtaining the receipts for the PCB-containing ballasts and include them in the recyclables analysis. If campus elects to weigh full ballast drums in the future, subtracting the vendor-reported weights of PCB-ballasts from the total drum weights would provide the non-PCB-ballasts weights; determining those ballasts' dispositions would allow including them into the landfill stream or the recycling stream.

Surplus equipment waste, non-electronics: not included in recyclables analysis. Weights for the trailers of surplus equipment sent to CMS Springfield, or for the individual equipment pieces themselves, were not readily available for the recyclables analysis. Weaver stated that he could provide numbers of types of items for previous years. Future research could collect these data and use US EPA weight estimates for various items (bookcases, desks, chairs) to estimate annual surplus equipment recycling weights and include them in the recycling stream.

Animal bedding, carcass, manure and waste feed data: included in recyclables analysis. Agricultural units estimate the animal bedding, feed waste and animal manure generated and collected from an average of the number of animals they typically raise over recent years. Again, these are not actual counts of animals raised every year, let alone actual weights of recyclables or wastes generated or collected. Data was provided only for swine and cattle; no data was provided for horse, sheep, poultry or other animals. Katterhenry and Wolters (Dairy & Beef, ACES) estimated the FY12 cattle herd to include 150-200 dairy breeding cows and 1,000 "animals for feed stock research" which I treated as "beef cattle." I extrapolated these numbers to FY04-FY11 (Table 5, Figure 23).

For calculating manure production, I used an average of 82 lbs/day/cow for 175 dairy cows and 60 lbs/day/steer of manure produced for beef cattle, totaling 27,137,750 lbs/yr of manure generated.<sup>140</sup> Bressner estimated 8,000-10,000 gallons/day of liquid swine manure was generated. At an estimated

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<sup>139</sup> Ashbrook, Peter. 2012. Email communication. September 17, 2012.

<sup>140</sup> Klickitat County Solid Waste, State of Washington. 2013. "Compost Mix Calculator." Accessed: April 30, 2013. <http://www.klickitatcounty.org/solidwaste/>.

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8.3 lbs/gallon (approved by Bressner), this totals 27,265,500 lbs/yr of swine manure.<sup>141</sup> All of this manure is considered to be recycled because it is land-applied to agricultural fields using soil-injection or aerial application. I extrapolated these numbers to FY04-FY11 (Table 5, Figure 23).

To calculate the animal bedding and waste feed estimates, I relied on the 2005 and 2010 WRPs which both stated that 10-11,000 yd<sup>3</sup>/yr of animal bedding are composted (500 tons at 100 lbs/yd<sup>3</sup>).<sup>142, 143</sup> In addition, a 2007 composting feasibility study stated that 38,143 yd<sup>3</sup>/yr of animal bedding and feed waste is generated (35,332 yd<sup>3</sup> from livestock and 2,811 yd<sup>3</sup> from VetMed, yielding 1,907.4 tons at 100 pounds/yd<sup>3</sup>).<sup>144</sup> If the feasibility study's figures are accurate, it appears that campus was composting only one-quarter of the animal bedding and feed waste it produces at these facilities: 500 tons composted (per the WRP) of 1,907 tons produced (per the study). This contradicts the WRP's statement that the "animal bedding is composted on campus." This same composting study stated that VetMed used 26.2 tons/mo of bedding (628,800 lbs./yr) and that the dairy/beef/horse/sheep/poultry used 96.1 cubic yards/day, including 815-1,015 pounds of waste feed/day in 2007. This totals to 4,136,450 lbs/yr, more than four times the figure stated in the WRP. Almost 334,000 pounds of this is waste feed, revealing the need to confirm waste feed weights and incorporate them into waste stream analysis. Due to the lack of any other available data, this research used the WRPs' estimates of 1,000,000 lbs/yr of animal bedding generated and accepted its assertion that it was all composted on-campus. FY04 and FY09 numbers were then applied to FY05-FY12 (Table 5, Figure 23), i.e., I assumed that FY05-FY-08 generated similar amounts as FY05, etc..

To calculate the amount of animal carcasses disposed or recycled, I asked the campus agricultural representatives for the numbers and weights of animals rendered or otherwise disposed. Bressner stated he averaged 480 swine deaths per year and that 90% of those occurred during lactation, implying that they were piglets weighing less than ten pounds which were then rendered. This equated to 4,800 lbs/yr of swine carcasses rendered. Kunkel stated that research animals are often incinerated at on-campus incinerators because they cannot be rendered; no numbers or weights were provided. I applied these numbers to FY04-FY11 (Table 5, Figure 23).

Batteries and battery-powered electronic devices: included in recyclables analysis. Battery Solutions provides receipts for individual shipments of alkaline batteries they receive from campus. These can be aggregated into fiscal years; collection data is available for calendar years 2012-2013 (FY11-FY14, partially). Call2Recycle provides annual calendar-year statements including the weights of non- and rechargeable batteries, cell phones and accessories. Collection data is available for calendar years 2011-2013 (FY10-FY13, partially)I had to estimate monthly averages and aggregate those averages

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<sup>141</sup> Schmitt, Michael and George Rehm. 1992. "Fertilizing Cropland with Swine Manure." Department of Soil Science, University of Minnesota. Technical Report #AG-FO-5879-C.

<sup>142</sup> Hoss, Tim. 2005. Waste Reduction Plan – 2005. University of Illinois.

<sup>143</sup> Hoss, Tim. 2010. Waste Reduction Plan – 2010. University of Illinois.

<sup>144</sup> Turnlund, Candice and Claudia Lardizabal. 2007. "Composting Feasibility Study." University of Illinois at Urbana-Champaign.

into an FY12 estimate. Because these are recently initiatives – 2011 and 2012 – I did not extrapolate data back to FY04-FY11 (Table 5, Figure 23).

Bicycles: included in recyclables analysis. Neptune and Johnston provided numbers of abandoned bicycles recovered and transferred to the Bike Project during FY10-FY12. I used an estimated weight of 30 lbs/bicycle based on an expert opinion from Tom Rinker, owner of The Bicycle Escape bicycle shop.<sup>145</sup> His website includes a database of over 395 bicycle weights by brand, model and size. The non-racing bicycles (356 models) average 29.2 pounds. In a personal contact, Rinker refined this 30-lb average to include the more prevalent department store bicycles that Illinois recovers on campus. This is a new recycling program so I did not extrapolate data back to FY04-FY09 (Table 5, Figure 23).

Clothing and household goods: included in recyclables analysis. Ortiz provided collection weight data on the FY12 Salvage Drives at the residence halls, stating that the most recent drive collected 17 tons of materials. Carol Nunn, Housing Director for the University YMCA, stated that the YMCA Dump and Run collected six semi-trailers of materials this past year and that was comparable to the last nine years.<sup>146</sup> Calculating the Y's collection using the most conservative estimates (20-foot trailer with 75 yd<sup>3</sup> capacity and 80% full with “unbundled clothing” that weighs 225 lbs/yd<sup>3</sup>) reveals that that it collects 81,000 lbs/yr. If the Y uses the larger 53' trailer, the increase in trailer capacity to 150 yd<sup>3</sup> would double the collection amount to 162,000 lbs/yr. The more conservative FY12 collection weight estimates were then extrapolated to FY04-FY11 (Table 5, Figure 23).

Electronics, surplus: included in recyclables analysis. Weaver stated that a full trailer of surplus electronic equipment was sent to CMS Springfield approximately every three weeks. Based on the estimate that sixteen pallets will fit in the most conservative estimate (a 20-foot trailer with 75 yd<sup>3</sup> capacity) and an estimated average of 772 lbs/pallet of computer CPUs, each trailer equates to 11,024 pounds of computers. Seventeen trailers per year would yield 191,082 lbs/yr of e-waste recycled. If Surplus uses the larger 53' trailer, the increase in trailer capacity to 150 yd<sup>3</sup> would double the collection to 382,164 lbs/year. The more conservative FY12 collection weight estimates were then extrapolated to FY04-FY11 (Table 5, Figure 23).

Lamps, discarded fluorescent and special: included in recyclables analysis. Ball provided numbers of lamps collected from FY08-FY12. From personal observation of lamp recycling barrels, I ascertained that the primary lamp type collected was a 4' linear fluorescent tube lamp. These count data were equated to estimated collection weights using a conversion factor of 0.625 lbs/lamp.<sup>147</sup> As this was a fairly new recycling program, I did not extrapolate data back to FY04-FY07 (Table 5, Figure 23).

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<sup>145</sup> Rinker, Tom. 2013. Personal communication; May 7, 2013. Accessed: May 6, 2013.

<http://www.thebicyclescape.com/index.html>.

<sup>146</sup> Nunn, Carol. 2013. Personal communication.

<sup>147</sup> King County Solid Waste Division, State of Washington. 2013. “Volume-Weight Conversions.” Accessed: April 12, 2013. <http://your.kingcounty.gov/solidwaste/business/documents/Conversions.pdf>

Landscape waste: included in recyclables analysis. Estimated collection weights were initially taken from the 2005 and 2010 WRPs. Because they were internally contradictory, I obtained collection estimates from Ryan Welch, Superintendent of Grounds. He stated that Grounds collects 5,000-8,000 yds<sup>3</sup>/yr of wood and 4,000-5,000 yd<sup>3</sup>/yr of brush which I averaged to 11,000 yd<sup>3</sup>/yr total landscape waste. The wood is chipped into landscape wood chips, the leaves mulched into compost, and the brush is chipped. I then equated these to weights using a “yard waste, raw, mulched” conversion factor of 350 lbs/yds<sup>3</sup> which yielded 3.15-4.56 million lbs/yr (1,575-2,275 tons/yr).<sup>148</sup> I averaged this to 3.85 million lbs/yr (1,925 tons/yr) of landscape waste recycled and extrapolated it to FY04-FY11 (Table 5, Figure 23).

To further illustrate the data inconsistencies in the WRPs, they stated that 4,000 yds<sup>3</sup> of brush and 4,000 yds<sup>3</sup> of leaves were collected per year, yielding 2.6 million lbs/yr. They also stated that “forty 40-yard dumpsters per year” were collected while another part of the Plan stated 16,000 yds<sup>3</sup> /yr. In addition, a 2010 compost feasibility study included an email from Welch dated September 27, 2011, in which he stated that 1,250-1,800 yds<sup>3</sup>/yr of leaves and wood chips were collected (437,500-630,000 lbs/yr) and that 1,600-2,150 yds<sup>3</sup>/yr of leaf compost and wood chips were used on campus (560,000-752,500 lbs/yr). These numbers are approximately 14% of those Welch provided to me in an email dated November 20, 2012 (Chapter 5: Grounds Operations). Finally, Turnlund and Lardizabal’s 2007 food compost study stated that 265-300 yd<sup>3</sup>/yr of landscape waste was generated, approximately 2.8% of Welch’s FY12 figure.<sup>149</sup> Tracking actual landscape waste collection weights or logging filled trucks and dumpsters would greatly increase the accuracy of this portion of the waste stream analysis, especially due to its significant contribution to the waste stream.

Textbooks: included in recyclables analysis. Bolnik provide a running total of textbooks collected by the Library and various student groups on campus. BWB uses a conversion factor of 1.366 lbs/book. Illinois’ new account executive, Teresa Minnaugh, then provided access to BWB’s online reporting portal which allowed me to query for the individual fiscal years of FY07-FY12.<sup>150, 151</sup> This was a new recycling program so I did not extrapolate data back to FY04-FY06 (Table 5, Figure 23).

Tires: included in recyclables analysis. Varney stated that Branna, Inc., collected about 950 tires from campus in FY12. I used a conversion factor of 45 lbs/tire, averaging different tire conversion factors (car tire – 20 lbs; bus tire – 75 lbs; truck tire – 60-100 lbs) which equated to 42,750 lbs/yr of tires recycled.<sup>152</sup> I then applied these numbers to FY04-FY11 (Table 5, Figure 23).

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<sup>148</sup> New Mexico Environment Department. 2013. Accessed: November 11, 2012. [www.nmenv.state.nm.us/swb/doc/Conversiontable.doc](http://www.nmenv.state.nm.us/swb/doc/Conversiontable.doc).

<sup>149</sup> Turnlund, Candice and Claudia Lardizabal. 2007. “Composting Feasibility Study.” University of Illinois at Urbana-Champaign.

<sup>150</sup> Minnaugh, Teresa. 2013. Personal and email communication. May 7, 2013.

<sup>151</sup> Better World Books. 2013. “Reuse First Internet Service. Accessed: May 7, 2013. <http://rufis.betterworldbooks.com/>. Username – [ricci2@illinois.edu](mailto:ricci2@illinois.edu); password – uau753C.

<sup>152</sup> US EPA. 2006. “Standard Volume-to-Weight Conversion Factors.” Accessed <http://www.epa.gov/wastes/conservation/smm/wastewise/pubs/conversions.pdf>.

## Analysis of Waste Collection Data

Data is available for most, but not all, of the various garbage and recyclable streams at Illinois. There is additional data to be processed and included in the waste stream analysis which will make small changes to the current diversion rate. There is also additional data that can be requested from recyclers and campus units which may change the diversion rate slightly. By compiling the data on garbage disposed and recyclables processed, I determined that Illinois is currently diverting 84.5% of its total waste stream from landfills and incinerators, surpassing its initial goal of diverting 75% of its waste by the year 2020 (Table 4, Figure 22). The collection levels for all items other than landfill-disposed garbage appear relatively unchanging because much of the data is from FY12 being extrapolated back to previous years due to the lack of historical data. For FY12, data is available for almost all waste stream components (Tables 2, 3 and 5; Figure 24).

The primary drivers of this extraordinarily high diversion rate are the land-application of an estimated 100% of animal manure and the composting of an estimated 100% of animal bedding, waste feed and landscape waste. This rate peaked at 95.2% in 2006 when the amount of landfilled garbage dipped to 3.3 million pounds; the rate fell to 84.2% in 2010 when the landfilled garbage rose to 12 million pounds. It is a testament to the law of numbers that a quadrupling of garbage still only reduced the diversion rate by 11%, but it is also a warning that campus must ensure the means by which it can sustainably address its organic waste management.

There are many improvements that can be made to the data collection protocols, many of which have already been mentioned. The vast majority of these improvements simply require campus units to measure and log what waste they are generating by actual weight or by number of bales or dumpsters, how much and by what methods they are managing that waste, and reporting those data to the CSE and/or to the WTS. Many recommendations require that haulers stop at the WTS to weigh their vehicle before and after collecting garbage or recycling prior to transporting the load to its destination, and then reporting those weights to the appropriate campus entity. Other improvements require campus units to obtain data on collection weights from their haulers and recyclers, and then reporting that data to the appropriate campus entity. A few require capital and/or personnel investments such as truck scales, online portals for reporting data, and additional staff to collect and process data.

### Ideas to improve data collection and management

- DCMI 1: Collect campus units' waste management data: see Auxiliaries improvements:
  - Animal waste data: collect animal head, bedding and feed amounts from agricultural units annually; obtain data on horses, sheep, poultry and any other animals.
  - Food waste: obtain number of meals served for all years; confirm disposition of pre- and post-consumer food waste; include recent 2013 food waste audit data into analysis.

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- Aluminum and plastic collection data: count the numbers of bales of bottles and cans processed daily; weigh bales to obtain an average weight; use this data as the aluminum and plastic collection data.
  - Pallet collection data: count all pallets, not just those sold; determine disposition of donated non-reusable pallets, e.g., using an informal clipboard-survey at pick-up site.
  - Tire collection data: obtain historical tire data from Branna, Inc.
  - Battery collection data: request C2R provide data in fiscal years.
  - Ballast collection data: obtain PCB-containing ballast collection data from Veolia, Inc.; weigh drums of ballasts prior to shipment.
  - Trailer size calculations: confirm trailer size with Surplus and University YMCA; recalculate analysis if necessary.
  - Garbage volume re-analysis: incorporate Republic Services garbage collection data and rerun analysis.
  - Garbage collection data reports: establish automatic quarterly reporting from Area Disposal Services on garbage collection weights.
- DCMI 2: Create online waste management data portal and device application: Create online website or modify iCAP Portal to allow campus units to report waste management activities and data. Create iPad or smartphone apps to allow WTS drivers and other to enter data while away from their offices.

Table 4. Annual garbage and recyclable weights and annual diversion rates (FY04-FY12)

Year	Annual total landfilled (est. #)	Annual total commodity recyclables (est. #)	Annual total special recyclables (est. #)	Annual total recyclables (est. #)	Annual diversion rate (%)
2004	5,294,220	4,474,186	59,606,882	64,081,068	92.37%
2005	3,884,860	4,413,851	59,606,882	64,020,733	94.28%
2006	3,288,280	5,314,305	59,607,117	64,921,422	95.18%
2007	8,097,463	5,452,192	59,611,410	65,063,602	88.93%
2008	9,850,035	5,537,877	59,652,270	65,190,147	86.87%
2009	11,860,198	5,601,365	59,714,104	65,315,469	84.63%
2010	12,089,858	4,763,946	59,679,401	64,443,347	84.20%
2011	11,983,068	4,769,674	59,679,836	64,449,510	84.32%
2012	11,770,112	4,476,132	59,682,227	64,158,359	84.50%

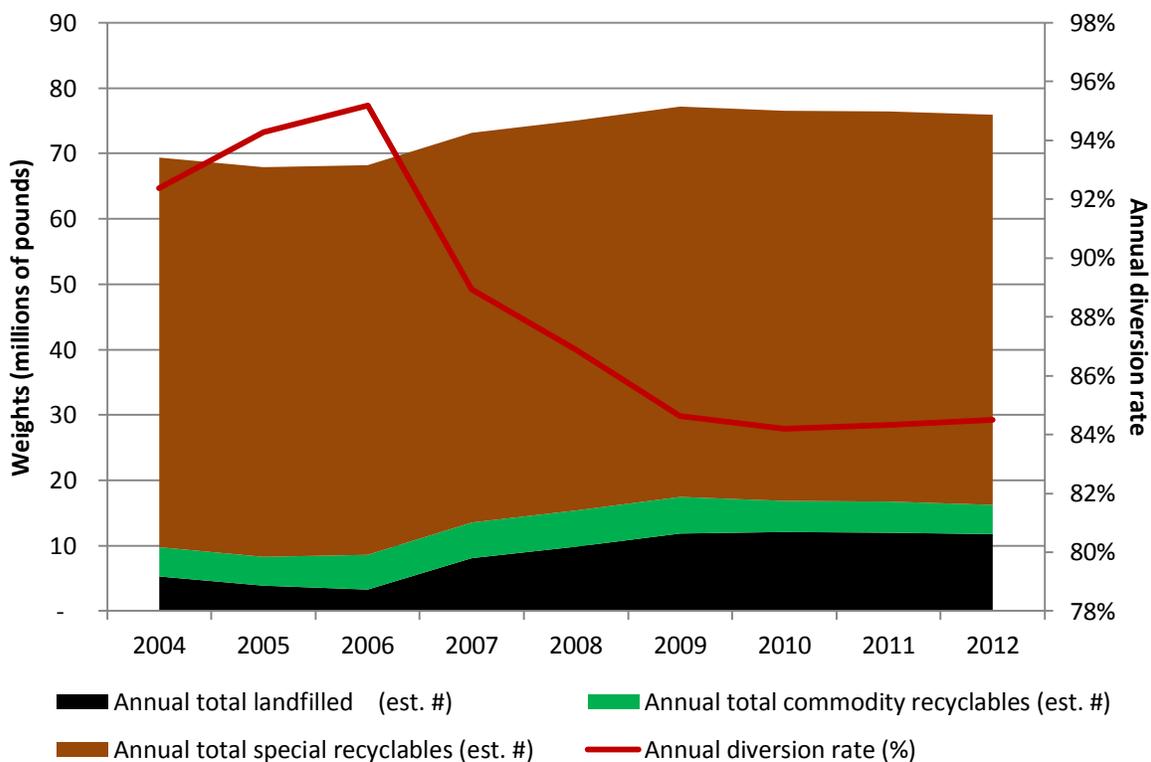


Figure 22. Annual garbage, recycling and diversion rate trends (FY04-FY12)

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Table 5. Special recyclables collection data

Year	animal bedding (est. #)	animal carcasses (est. #)	animal manure (est. #)	batteries (#)	bicycles (est. #)	clothing & household (est. #)	electronics (est. #)	hazardous waste recycled (est. #)	lamps (est. #)	landscape waste (est. #)	textbooks (est. #)	tires (#)	Annual total special recyclables (est. #)
2004	1,000,000	4,800	54,403,250		n/p	115,000	191,082	n/r	n/r	3,850,000	n/p	42,750	59,606,882
2005	1,000,000	4,800	54,403,250		n/p	115,000	191,082	n/r	n/r	3,850,000	n/p	42,750	59,606,882
2006	1,000,000	4,800	54,403,250		n/p	115,000	191,082	n/r	n/r	3,850,000	235	42,750	59,607,117
2007	1,000,000	4,800	54,403,250		n/p	115,000	191,082	768	n/r	3,850,000	3,760	42,750	59,611,410
2008	1,000,000	4,800	54,403,250		n/p	115,000	191,082	477	38,676	3,850,000	6,235	42,750	59,652,270
2009	1,000,000	4,800	54,403,250		n/p	115,000	191,082	603	101,696	3,850,000	4,923	42,750	59,714,104
2010	1,000,000	4,800	54,403,250		10,500	115,000	191,082	528	51,591	3,850,000	9,900	42,750	59,679,401
2011	1,000,000	4,800	54,403,250		13,500	115,000	191,082	1,616	50,230	3,850,000	7,608	42,750	59,679,836
2012	1,000,000	4,800	54,403,250	1452	18,000	115,000	191,082	798	45,749	3,850,000	9,346	42,750	59,682,227

note: "n/p" means a new program that had not started

note: "n/r" means no data reported for that year

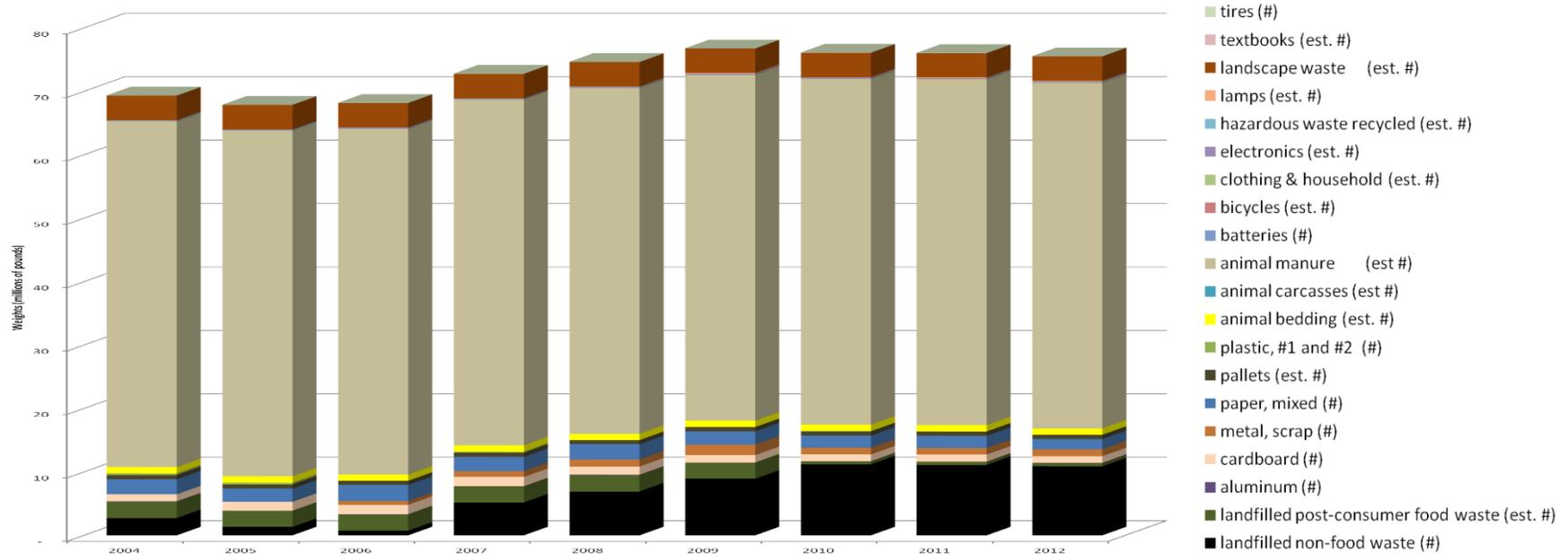


Figure 23. Waste stream components (FY04-FY12)

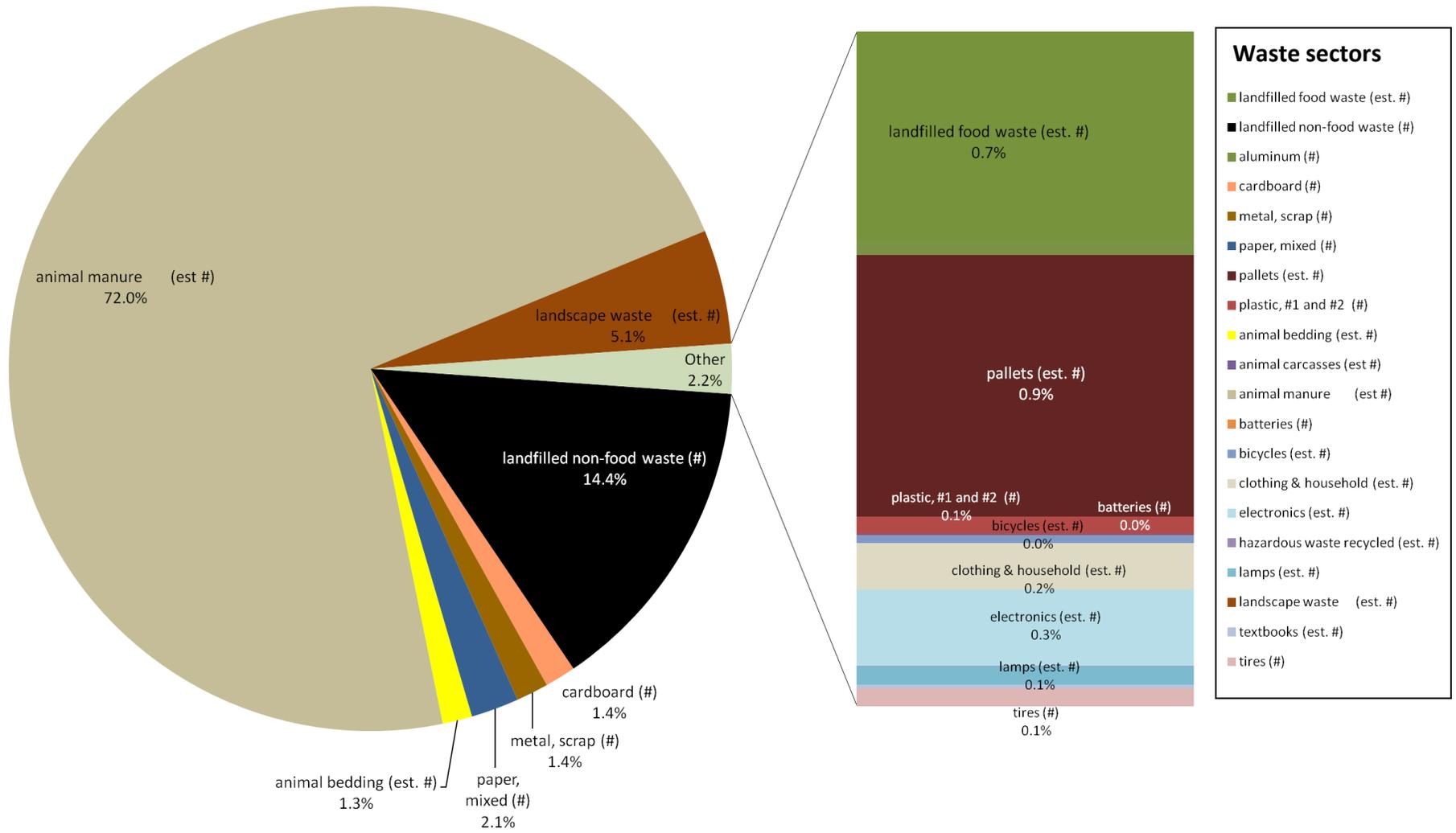


Figure 24. Waste stream composition (FY12)

## CHAPTER 9: ZERO WASTE RECOMMENDATIONS

This section compiles all sixty-seven recommended Action Items discussed in the preceding sections of the Zero Waste Plan, grouping them under the most relevant of the four strategies described in the Executive Summary. The item is followed by an abbreviation of where that Action was first recommended, e.g., “BWMI6” directs the reader to Idea #6 under Building Waste Management. Details of the Actions are listed in Appendix G. Some of the recommendations will accomplish a secondary strategy; these are listed in the Appendix. Many of the recommendations will benefit multiple units: both the section below and the Appendix list the first instance the recommendation was mentioned. The Appendix lists whether a unit is a primary beneficiary, secondary benefit or “n/a” if it does not benefit. Some Action Items were not mentioned by a specific campus unit and were not included in a previous section. They are listed here under the appropriate strategy or the subsequent “Waste Management Policy Recommendations” or “Waste Management Practice Recommendations” strategies.

In Appendix G, Action Items have been tagged with projected timeframe, implementation cost, staff and feasibility ratings. Timeframe ratings of “immediate,” “short-term” and “long-term” are related to action items that should be implemented immediately, within the next five years, and within the next fifteen years, respectively. Cost ratings of “low,” “medium” and “high” are related to action items that can be attained with current staff and equipment, those that require an estimated funding investment of less than \$50,000, and those which require an estimated funding investment of greater than \$50,000, respectively. Staff ratings of “current” and “additional” are related to action items that can likely be achieved with current staff or would likely require additional staff to achieve. Barrier ratings are related to action items for which there are no known feasibility barriers (“none”) or where there are known administrative, facility, legal or other barriers.

### Recommendations to Strengthen Campus Culture of Sustainability

- Brand and detail dumpsters, totes and bins: BWMI6.
- Create recycling stations in common areas: BWMI3.
- Establish Office ReStore: SPAI4.
- Expand sustainability initiative campus-wide: HRHI1.
- Implement "tailgate" recycling program: DIAI5.
- Implement a disposable glove recycling program: MHC10.
- Implement Pilot Zero Waste Game Day event: DIAI6.
- Improve Surplus/Property Accounting surplus materials disposition: HRHI14.
- Increase social media presence: GWMPO1.

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- Initiate special event recycling collections: TMI2.
- Mandate recycling service provision: WTSI4.
- Pass ZW resolution: SCCS1.
- Provide a "sustainable dining kit": HDHI2.
- Pursue ZW Business Certification: SCCS2.
- Reduce number of garbage bins: BWMI5.
- Require or prefer recycled toner cartridge purchase and recycling: DSI18.
- Secure animal and landscape waste stockpiling options: OFI6.

### **Recommendations to Integrate Communication and Coordination**

- Advertise recycling opportunities: ICC1.
- Advertise waste management improvements: KCPA1.
- Create online exchange portal: SPAI2.
- Establish Green Teams: WTSI8.
- Establish Interagency Waste Management Task Force: WTSI14.
- Expand education on Special Waste and Recyclables: DRSI2.
- Install accumulator signage: HDHI3.

### **Recommendations to Improve Data Collection and Reporting**

- Collect campus units' waste management data: AUI3.
- Conduct annual WTS waste audit: WTS11.
- Confirm pallet recycling data: WTSI9.
- Create online waste management data portal and device application: DCM2.
- Implement waste audit research plan: BWMI8.
- Map dumpsters and common-area bins: WTSI7.
- Research remaining Auxiliaries: AUI13.

### **Recommendations to Increase Waste Management Staff**

- Hire Surplus intern: SPAI3.
- Increase WTS funding: WTSI1.

## General Waste Management Policy Recommendations

- Collaborate on creating Zero Waste Plans: ISTCI1.
- Decrease electronics refresh rate: SPAI5.
- Encourage/mandate sustainable purchasing: AUI7.
- Establish bottle fee: WTSI15.
- Expand special recycling programs: FSI1.
- Implement campus waste management standards: WTS12.
- Incentivize waste reduction and recycling increase: DSI21.
- Increase funding for special recycling programs: FSI2.
- Increase return of abandoned bicycles: BMI2.
- Implement initial purchase disposal fee: WTSI2.
- Mandate switch from paper towels to hand-driers: GWMPO1.
- Establish Facebook page and Twitter account for recycling and/or sustainability programs: GWMPO2.
- Mandate use of rechargeable batteries: FSI3.
- Set default duplex printer setting: DSI17.

## General Waste Management Practice Recommendations

- Audit and improve buildings' recycling bins and signage: WTSI3.
- Decrease number of abandoned bicycles: BMI1.
- Expand battery recycling: BWMI4.
- Expand ChemCycle program: DRSI3.
- Explore composting options: IUI1.
- Implement electronic waste recycling: HRHI9.
- Implement household non-/hazardous waste exchange: HRHI10.
- Implement restroom paper-towel composting: GWMPR1.
- Improve bottle/can recycling: WTS13.
- Improve hauling equipment: WTSI5.
- Improve MRF operations: WTSI6.

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- Increase types of plastics collected: ISTCI2.
- Locate vendors of smaller-sized supplies: DSI19.
- Maximize research animal bedding and manure composting/rendering: OFI5.
- Offer recycling bins for resident students' rooms: HRHI6.
- Optimize composting options – AD/AAD, vermin- and wind-row composting: OFI2.
- Reduce prepared food waste: IUI4.
- Secure additional recyclables markets: WTSI10.
- Seek additional land for manure application: OFI1.
- Speed recovery of abandoned bicycles: BMI3.
- Update BSW Manual: GWMPR2.

### Priority Action Items

I recommend that Illinois focus on the following Priority Action Items which I have selected for their high potential to reduce waste and/or landfilling, to increase recycling and/or reuse, and/or to change behaviors to increase conservation and sustainability thought and action. I have noted the items that are currently in progress.

1. Audit and improve buildings' recycling bins and signage: WTSI3. Facilities should be surveyed for actual locations of all garbage and recycling bins. Ensure all common and individual areas have optimal number and placement of commodity recycling bins and that all garbage bins are paired with a recycling bin, including accurate and consistent signage on bins with acceptable and unacceptable items. This action was considered the most important action by sustainability and recycling staff participating in the CURC Zero Waste Workshop at the 2013 AASHE conference: Lin King, Corey Hawkey, and Michelle La.
2. Collect campus units' waste management data (in progress): AUI3. Collect weight or volume data on garbage and recycling collected by private haulers from Auxiliaries and add this data to WTS collection data; this will increase accuracy of landfill diversion and tonnage rates. ISTS is currently under contract to audit four different buildings' waste streams.
3. Conduct annual WTS waste audit: WTS11. Conduct a waste stream analysis at the WTS for an entire week using the sorting belt and staff to analyze all of the garbage and recyclables processed by the WTS.
4. Create online exchange portal: SPAI2. Campus units can post descriptions and photographs of items; units could view items online and request they be moved directly to their location.
5. Create recycling stations in common areas (in progress): BWMI3. Include garbage and recycling bins with graphic-and-text-based signage above bins on wall similar to current signage in Housing, and/or on the bins themselves, indicating (un)acceptable items. A

## Chapter 9: Recommendations for Zero Waste

“Recycling Station” sign should be installed above the bins if on-bin signage is used. At least one station per building should include both types of battery recycling receptacles. Add textbook and clothing recycling bins if approved.

6. Establish Green Teams (in progress): WTSI8. Due to its lead role in campus waste management, the Recycling Coordinator should co-lead the campus Green Team with the Sustainability Coordinator to educate and coordinate unit and topical Green Teams.
7. Implement "tailgate" recycling program: DIAI6. Stencil garbage drums "LANDFILL." Replace half of garbage drums with drums painted blue and stenciled "RECYLING".
8. Implement Pilot Zero Waste Game Day event: DIAI6. Conduct pre-game waste audit; convert waste stations to recycling stations; use Recycling Ambassadors (staff and volunteers) to educate attendees on proper recycling; audit post-game waste and determine diversion rate.
9. Implement waste audit research plan (in progress): BWMI8. Determine buildings’ baseline waste management rates from which future actions’ impacts can be assessed
10. Increase WTS funding (in progress): WTSI1. Hire at least one additional staff member to assess building recycling resources and work with Facility and Building Managers to optimize recycling collection; additional recycling equipment and supplies (bins, signage, NIR recycling sorter); and additional trucking equipment (trucks, truck scales).
11. Initiate special event recycling collections: TMI2. Promote textbook and other special recyclables collection during key environmental events, e.g., RecycleMania, Earth Day and Week, America Recycles Day, Campus Sustainability Day, etc.
12. Reduce number of garbage bins: BWMI5. Remove garbage bins from classrooms and offices and install signs directing users to take garbage and recycling to common-area bins located in all hallways. This will reduce the number of garbage bins needed while increasing the likelihood of recyclables being separated into proper bins.
13. Secure additional recyclables markets: WTSI10. Locate additional buyers for currently-landfilled commodity recyclables or collaborate with cities and local haulers on items they currently accept, e.g., glass and plastics, C&D waste.

## Implementation Timeline

Phase II of this study should be completed in FY14:

- Obtain missing waste management data and re-analyze the campus waste stream.
- Begin implementing the Priority Action Items.
- Determine the Phase II Zero Waste Per Capita goal and the Phase III Zero Waste Carbon Emissions goal.
- Assess the current Procurement policies and processes.

Phase III of this study should be completed in FY15: develop a detailed and approved Zero Waste Plan including a Zero Waste Policy.

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Appendix B: Zero Waste Philosophy Discussion

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## Appendix A: Glossary of Acronyms and Terms

AAD	anaerobic digesters
AASHE	Association for the Advancement of Sustainability in Higher Education
ACES	College of Agricultural, Consumer and Environmental Sciences
ACUPCC	American College and University Presidents' Climate Commitment
AD	anaerobic digesters
ADS	Area Disposal Service
Allies	non-campus agencies and organizations that collaborate with campus
ARC	Activities and Recreation Center
ASAP	Agroecology and Sustainable Agriculture Program
Auxiliaries	"Auxiliaries under indenture," independent campus units
bottles	#1 PET and #2 HDPE bottle-shaped plastic containers
BS	Battery Solutions
BSW	Building Service Worker
C&D	construction and demolition waste, aka "debris"
C2R	Call2 Recycle
campus	University of Illinois at Urbana-Champaign
cans	aluminum cans
CCWM	Coordinator of Campus Waste Management
CHEP	Commonwealth Handling Equipment Pool, a pallet grading standard
CMS	Central Management Services
CO <sub>2</sub>	carbon dioxide, a GHG
CBS	Campus Bicycle Shop
CRC	Community Recycling Center
CRCE	Campus Recreation Center East
CSE	Center for a Sustainable Environment
CURC	College and University Recycling Coalition
DIA	Division of Intercollegiate Athletics
Dining	Dining Services, a department of Housing
DRS	Division of Research Safety
DSC	Developmental Services Center, the agency which provides staff to the WTS
DWM	Division of Waste Management, F&S
e-waste	electric/electronic waste: computers CPUs and peripherals, televisions, MP3 players, audio/video equipment
FAR	Florida Avenue Residence Hall
F&S	Facilities and Services
garbage	non-recyclable, reusable or compostable portion of waste that is landfilled/incinerated
GHG	greenhouse gases
GPS	Geographic Position System
GRRN	GrassRoots Recycling Network
Hg	mercury
Housing	University Housing
HSC	Housing Sustainability Council
IEPA	Illinois Environmental Protection Agency
ISRL	Import Swine Research Laboratory
ISTC	Illinois Sustainable Technology Center
ISWA	International Solid Waste Alliance
iCAP	Illinois Climate Action Plan
ISR	Illinois Street Residence Hall
KCPA	Krannert Center for Performing Arts

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LAR	Lincoln Avenue Residence Hall
lbs	pounds
LRC	Landscape Recycling Center, Urbana
LEED	Leadership in Energy and Environmental Design
MAR	Mid America Recycling, Lincoln Avenue, Champaign
mixed-waste	garbage mixed with recyclables, aka “commingled waste”
mo	month
MRF	materials recovery facility
MSW	municipal solid waste, aka garbage
Ni-Cd	nickel-cadmium
NIR	near-infrared, the optical system included in an automated sorting machine
O&M	Operations and Maintenance, the predecessor to F&S
OBFS	Office of Business and Financial Services
PAR	Pennsylvania Avenue Residence Hall
Pb	lead
PCB	polychlorinated biphenyls
PDC	Peoria Disposal Company, parent company of ADS
plastic	#1 PET and #2 HDPE bottle-shaped plastic containers
RCRA	Resource Conservation and Recovery Act of 1976
recyclables	commodity recyclables including aluminum, steel and tin cans cardboard, paper, plastic bottles, scrap metal
RSO	Registered Student Organization
SDRP	Student Dining and Residential Programs
SECS	Students for Environmental Concerns
SLLC	Sustainability Living Learning Community
SRC	Swine Research Center
SSC	Student Sustainability Committee
SSF	Student Sustainable Farm
STARS	Sustainability Tracking Assessment & Rating System
Surplus	Property Accounting and Surplus
SWMA	State of Illinois Solid Waste Management Act (1986)
TBP	The Bike Project, of Urbana-Champaign
toters	90-gallon plastic rolling toters for recycling plastic bottles, aluminum cans, or paper
TSCA	Toxic Substances Control Act
TSDF	Treatment Storage and Disposal Facility
Union	Illini Union
UPS	United Parcel Service
USEPA	U.S. Environmental Protection Agency
UWRC	Universal Waste Recycling Center, Building 244, 1386 South Oak Street, Champaign
VetMed	College of Veterinary Medicine
WRP	Waste Reduction Plans, Illinois, 2005 and 2010
WTS	Waste Transfer Station
yd	yard
ZW	Zero Waste
ZWC	Zero Waste Coordinator
ZWIA	Zero Waste International Alliance
ZWP	Zero Waste Plan

## Appendix B: Zero Waste Philosophy Discussion<sup>153</sup>

**Ricci, Marcus Enrico**

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**From:** RECYC-L College and University Recycling Coordinator List [RECYC-L@LISTSERV.BROWN.EDU] on behalf of Lin Tien King [ltkking@BERKELEY.EDU]  
**Sent:** Tuesday, April 09, 2013 3:47 AM  
**To:** RECYC-L@LISTSERV.BROWN.EDU  
**Subject:** \*\*\*The Zero Waste Goal

Hi Folks,

Recently, I have been reading a number of Recyc-l postings on the question of "Should I count this or that?" towards our diversion rate in reaching our Zero Waste Goal. I agree with Roger that details are very important in reporting your numbers. This is the only way for us to compare apples to apples or simply a way for the rest of us to criticize campuses trying to count double sided copying, selling their cars, or incineration (even for energy) as their part of their diversion rate.

I must also agree that the Zero Waste leaders provided Roger and others with skepticism by defining Zero Waste as "90% (or even 99%) diversion = achieving zero waste" since it could lead to possibilities where you count all your concrete, landscape, manure, etc but then not have any other diversion programs. However, if you talk to some of the ZW leaders, they do state that the 90% is used as a way to \*measure\* your success in reaching zero waste but not defining it as zero waste.

On this point, I bring up the need to define zero waste as zero waste to landfill with an absolute zero. One of the main reasons to use an absolute zero waste goal is so that we can start looking more at our waste stream to find what is still in it so we can use our time in finding solutions to get to zero. We need to stop using all of our time trying to get better at counting our diversion rate in order to get to zero waste. We still need to count our diversion for reference but disposal based reporting is much more important.

One of my colleagues sent this article to me on Zero Waste Goals. I highly suggest reading the entire article. <http://m.waste360.com/zero-waste/zero-effect?page=1>

I agree with the issues raised on the failures of zero waste goals but I agree more with the recommended need for "top of pipe" versus "end of pipe" solutions. This year, we got a grant from our campus' The Green Initiative Fund to start a Zero Waste Research Center. In the first year we decided to tackle plastics (partnering with the Plastics Disclosure Project <http://www.plasticdisclosure.org>), furniture, office supplies, stadium concessions, and laboratory supplies. With limited funds and resources we have narrowed down a few items in each of these categories from our waste audits to see if we can come up with upstream solutions.

As the article states, "ZWTl success requires the elimination of problematic materials, and better product design. Therefore, investment and energy need to be directed into these areas. This work will require enormous amounts of specialized skills and coordinated activity, and has the potential to stimulate economic development in places that proactively embrace zero waste thinking."

With the growing number of campuses starting to adopt zero waste goals, I hope we can all better coordinate to seek more upstream solutions. I can see no other entity more suited than colleges and universities to achieve this large undertaking.

Best Regards,

Lin King

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<sup>153</sup> Guzowski, Roger, Lin King, Marcus Ricci. 2013. Email communication; April 9, 2013.

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Campus Recycling and Refuse Manager  
University of California  
11 A Edwards Track, #1386  
Berkeley, CA 94720-1386  
(510) 643-4612 ph  
<http://recycle.berkeley.edu>  
Zero Waste by 2020

**From:** RECYC-L College and University Recycling Coordinator List [mailto:[RECYC-L@LISTSERV.BROWN.EDU](mailto:RECYC-L@LISTSERV.BROWN.EDU)] **On Behalf Of** Roger Guzowski  
**Sent:** Friday, March 22, 2013 2:51 AM  
**To:** [RECYC-L@LISTSERV.BROWN.EDU](mailto:RECYC-L@LISTSERV.BROWN.EDU)  
**Subject:** Re: Agricultural and/or Landscape Waste included in Waste Management Plans?

Hi Marcus,

The definition of solid waste from the EPA website (<http://www.epa.gov/reg3wcmd/solidwastesummary.htm>) is "Solid waste means any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or an air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. Solid waste does not include solid or dissolved materials in domestic sewage, solid or dissolved materials in irrigation return flows, industrial discharges that are point sources subject to permit under 33 U.S.C. 1342, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923)."

As such, I think you could make an argument to include agricultural wastes from campus, or other wastes like the non-hazardous ash residue from an on-campus coal plant. But again, what I think is most key is including that in a separate category.

I would even argue that you might want to keep 2 sets of diversion numbers, one for "routine waste & recycling" (the stuff that the average member of the campus community has some control over the disposal of), and one for "facilities waste & recycling" (the stuff the average member of the campus community has no control over the disposal of including landscape wastes, ag wastes, C&D wastes [you may want to separate actual construction project wastes from the similar materials generated during routine renovation activities by the Facilities folks], surplus furniture, etc.)

Again, this goes to the issue of what do these numbers mean? Take for example the new world in which the zero waste thought leaders have stated "90% diversion = achieving zero waste." If you don't split the numbers so that they have meaning, I would argue that you could have the most wasteful faculty and student body in history, one that consumed at record rates and never recycled a darn thing and still call yourself a "zero waste campus" if you had enough landscape waste, C&D projects, and coal ash to achieve a 90% diversion rate. Is that what we are going for? Are we looking for slogans like "achieve zero waste, burn more coal!"?

I also think you need to ask what we are using the numbers for. Has this just become like the stuff that gets blocked by my spam filter that offers me tricks to make mine bigger and fuller, or do we intend for these numbers to have some value as a benchmarking tool? I would argue the latter. If I am trying to measure whether or not a new office paper recycling program has been successful, I should be able to look at my recycling/diversion rate, or a subset thereof, and see results. Whether or not the cows on the campus farm are constipated should have absolutely no impact on that number, or at least not the subset of that number I am looking at.

Don't get me wrong. I have long advocated for shining light on those other materials that many people on campus don't even realize are generated as waste. I long advocated for looking at Facilities wastes because years ago, I knew a lot of schools that were celebrating the 25 tons of aluminum and steel they were recycling via their can recycling program but ignoring the 100+ tons of aluminum and steel scrap metal that was still being discarded in their Facilities "bulky waste" bin. But even moreso, I think you need to keep those materials as either a subcategory or an entirely different diversion rate number or else you are going to have recycling/diversion/zero waste numbers that are completely meaningless.

Hope this helps.

-Roger Guzowski  
Campus Recycler Emeritus

On Thu, Mar 21, 2013 at 1:01 PM, Ricci, Marcus Enrico <[ricci2@illinois.edu](mailto:ricci2@illinois.edu)> wrote:

You're absolutely correct about the subcategories issue, Roger. Without them, you have no idea what that last remaining percentage of what you are landfilling/incinerating actually is. And you don't have a basis of comparison for changes from year to year.

I do like your categories of "routine trash", "recyclables", "landscape waste" and "facilities waste."

If you were an ag and/or school, where would you put animal bedding and manure – facilities waste? Where do you normally put research lab waste that gets landfilled or incinerated – routine trash?

Thank for any additional info,  
Marcus

Marcus Ricci, M.S., CPESC  
Candidate, Masters of Urban & Regional Planning, Class 2013  
Student Sustainability Commission, Member  
University of Illinois at Urbana-Champaign  
Research Assistant, Office of Sustainability and the Smart Energy Design Assistance Center

[ricci2@illinois.edu](mailto:ricci2@illinois.edu)

"A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise." -- Aldo Leopold

From: RECYC-L College and University Recycling Coordinator List [mailto:[RECYC-L@LISTSERV.BROWN.EDU](mailto:RECYC-L@LISTSERV.BROWN.EDU)] On Behalf Of Roger Guzowski

Sent: Thursday, March 21, 2013 4:41 AM

To: [RECYC-L@LISTSERV.BROWN.EDU](mailto:RECYC-L@LISTSERV.BROWN.EDU)

Subject: Re: Agricultural and/or Landscape Waste included in Waste Management Plans?

Hi Marcus,

What I think is most important is not reporting a singular number without any detail. I think that any diversion number reported should have sub-categories including at a minimum routine trash & recyclables, landscape waste, and bulky "facilities wastes" (scrap metal, furniture, and C&D materials). Doing so is the only way you

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are going to have viable diversion numbers that can be compared and contrasted.

As we discovered when I first developed the CURC standards system more than 15 years ago, if you don't include subcategories, you get horribly skewed numbers. As someone on this list who had just been through I believe the San Bernadino quake at the time had said "my campus is filled with damaged scrap metal and concrete, if I can include it in my recycling numbers, I will have a 99 1/2% recycling rate this year." Is that what we are measuring? As others noted, if you can include landscape waste without any qualifiers, schools in the south will automatically have a major advantage because many have an 11-12 month growing season whereas some schools in the north only have a 7-8 month growing season. Is that what we are measuring? If you don't put that info into a subcategory, are you measuring recycling/diversion/zero waste efforts or are you just measuring climate?

I am a firm believer that we should measure everything because I think there is an important story all those data points tell - but I think it is even more important to measure them in a way that you have subcategories. If you want to measure the impact of a change in how you recycle your routine wastes (from school to school or at the same school over different time periods) you need to be able to readily look at just routine wastes. Conversely, if you want to track whether you are recycling during facilities renovations, you need to be able to quickly look at just that subcategory.

Without subcategories, a diversion number is completely meaningless. 20% or 70% could be the same number depending on what you are including or excluding.

Hope this helps.

-Roger Guzowski

Campus Recycler Emeritus

On Tue, Mar 19, 2013 at 5:06 PM, Ricci, Marcus Enrico <[ricci2@illinois.edu](mailto:ricci2@illinois.edu)> wrote:

Good afternoon, all.

In researching our Zero Waste policy, I am including as much information as possible about both landscape waste (leaves, brush, stumps) and agricultural waste (manure, bedding, waste feed, carcasses) – or “scraps” if you prefer (smile). Do any of you other schools – especially the land grant institutions – include either landscape and/or agricultural waste in your plans?

As we were already composting all of our landscape waste, accounting for its non-landfilling was a bit of a bump to our diversion rate, which was nice. Similarly, because we were composting a lot of our animals waste, that increased our diversion rate metric as well. However, adding those components to the waste management discussion *did* increase our overall waste level, which means that any pound of non-recycled animal or landscape waste would push us farther away from the zero waste metric.

If you either exclude or include either ag or landscape waste from your waste management plan, please let me know either off-list or on-list, as well as whether you are using a “diversion-rate” metric or a “zero-waste” metric. After a couple weeks, I will be glad to report back to the list with my findings.

Regards,  
Marcus

Marcus Ricci, M.S., CPESC  
Master of Urban Planning Program, Class of 2013  
University of Illinois at Urbana-Champaign  
Research Assistant, Center for a Sustainable Environment - Zero Waste Policy

## Appendix C: Zero Waste Definition, Business and Community Principles

### ZERO WASTE DEFINITION:<sup>154</sup>

The only peer-reviewed internationally accepted definition of Zero Waste is that adopted by the Zero Waste International Alliance:

“Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health.” [4]

“Zero Waste involves moving from the back end of waste disposal to the front end of resource management. “If a product can’t be reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then it should be restricted, redesigned, or removed from production.”[5]

### ZERO WASTE BUSINESS PRINCIPLES:<sup>155</sup>

The Planning Group of the Zero Waste International Alliance adopted the following Principles on April 5, 2005 to guide and evaluate current and future Zero Waste policies and programs established by businesses. These Zero Waste Business Principles will be the basis for evaluating the commitment of companies to achieve Zero Waste. These Principles will also enable workers, investors, customers, suppliers, policymakers and the public in general to better evaluate the resource efficiency of companies. For examples of businesses that have succeeded in diverting over 90% of their waste from landfills and incinerators, go to:

<http://www.earthresource.org/zerowaste.html>

or <http://www.grrn.org/zerowaste/business/profiles.php>

1. Commitment to the triple bottom line – We ensure that social, environmental and economic performance standards are met together. We maintain clear accounting and reporting systems and operate with the highest ethical standards for our investors and our customers. We produce annual environmental or sustainability reports that document how we implement these policies. We inform workers, customers and the community about Life Cycle environmental impacts of our production, products or services.
2. Use Precautionary Principle – We apply the precautionary principle before introducing new products and processes, to avoid products and practices that are wasteful or toxic.

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<sup>154</sup> Zero Waste International Alliance (ZWIA). 2012. Definitions, Business Principles, Business Recognition, Community Principles. Accessed November 15, 2012. <http://zwia.org/>.

<sup>155</sup> ZWIA Business Principles. 2012. Accessed November 15, 2012. <http://zwia.org/standards/zw-business-principles/>

3. Zero Waste to landfill or incineration – We divert more than 90% of the solid wastes we generate from Landfill from all of our facilities. No more than 10% of our discards are landfilled. No solid wastes are processed in facilities that operate above ambient biological temperatures (more than 200 degrees F.) to recover energy or materials.
4. Responsibility: Takeback products & packaging – We take financial and/or physical responsibility for all the products and packaging we produce and/or market under our brand(s), and require our suppliers to do so as well. We support and work with existing reuse, recycling and composting operators to productively use our products and packaging, or arrange for new systems to bring those back to our manufacturing facilities. We include the reuse, reparability, sustainable recycling or composting of our products as a design criteria for all new products.
5. Buy reused, recycled & composted – We use recycled content and compost products in all aspects of our operations, including production facilities, offices and in the construction of new facilities. We use LEED-certified [ 1 ] or equivalent architects to design new and remodeled facilities as Green Buildings. We buy reused products where they are available, and make our excess inventory of equipment and products available for reuse by others. We label our products and packaging with the amount of post-consumer recycled content and for papers, we label if chlorine-free and forest-friendly materials are used. Labels are printed with non-toxic inks – no heavy metals are used.
6. Prevent pollution and reduce waste – We redesign our supply, production and distribution systems to reduce the use of natural resources and eliminate waste. We prevent pollution and the waste of materials by continual assessment of our systems and revising procedures, policies and payment policies. To the extent our products contain materials with known or suspected adverse human health or negative environmental impacts, we notify consumers of their content and how to safely manage the products at the end of their useful life according to the take-back systems we have established, and shall endeavor to design them out of the process.
7. Highest and best use – We continuously evaluate our markets and direct our discarded products and packaging to recover the highest value according to the following hierarchy: reuse of the product for its original purpose; reuse of the product for an alternate purpose; reuse of its parts; reuse of the materials; sustainable recycling of inorganic materials in closed loop systems; sustainable recycling of inorganic materials in single-use applications; composting of organic materials to sustain soils and avoid use of chemical fertilizers; and composting or mulching of organic materials to reduce erosion and litter and retain moisture.
8. Economic incentives for customers, workers and suppliers – We encourage our customers, workers and suppliers to eliminate waste and maximize the reuse, recycling and composting of discarded materials through economic incentives and a holistic systems analysis. We lease our products to customers and provide bonuses or other rewards to workers, suppliers and other stakeholders that eliminate waste. We use financial incentives to encourage our suppliers to adhere to Zero Waste principles. We evaluate our discards to determine how to develop other productive business opportunities from these assets, or to design them out of the process in the event they cannot be sustainably re-manufactured.
9. Products or services sold are not wasteful or toxic – We evaluate our products and services regularly to determine if they are wasteful or toxic and develop alternatives to eliminate those products which we find are wasteful or toxic. We do not use products with persistent organic pollutants (POPs), PVC or polystyrene. We evaluate all our products and offer them as services if we can do so by our own company. We design products to be easily

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disassembled to encourage reuse and repair. We design our products to be durable, to last as long as the technology is in practice. We phase out the use of unsustainable materials, and develop the technology to do so. Our products can easily be re-made into the original product.

10. Use non-toxic production, reuse and recycling processes – We eliminate the use of hazardous materials in our production, reuse and recycling processes, particularly persistent bioaccumulative toxics. We eliminate the environmental, health and safety risks to our employees and the communities in which we operate. Any materials exported to other countries with lower environmental standards are managed according to the Best International Practice as recommended by ZWIA.

These Zero Waste Business Principles are intended to be a living document. Comments and suggestions are welcome. Please email Gary Liss at [gary@garyliss.com](mailto:gary@garyliss.com) with any comments or suggestions.

### Sources

1. Leadership in Energy and Environmental Design program of the U.S. Green Building Council, [www.usgbc.org](http://www.usgbc.org)

## ZERO WASTE COMMUNITY PRINCIPLES:<sup>156</sup>

### Global Principles For Zero waste Communities [3]

This document outlines the principles and some of the practical steps being taken around the world in both large urban communities and small rural communities in the pursuit of Zero Waste. Zero Waste programs are the fastest and most cost effective ways that local governments can contribute to reducing climate change, protect health, create green jobs, and promote local sustainability.

There are three overarching goals needed for sustainable resource management.

1. Producer responsibility at the front end of the problem: industrial production and design.
2. Community responsibility at the back end of the problem: consumption, discard use and disposal.
3. Political responsibility to bring both community and industrial responsibility together in a harmonious whole.

Zero Waste is a critical stepping-stone to other necessary steps in the efforts to protect health, improve equity and reach sustainability. Zero Waste can be linked to sustainable agriculture, architecture, energy, industrial, economic and community development. Every single person in the world makes waste and as such is part of a non-sustainable society. However, with good political leadership, everyone could be engaged in the necessary shift towards a sustainable society.

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<sup>156</sup> ZWIA Community Principles. 2012. Accessed November 15, 2012. <http://zwia.org/standards/zw-community-principles/> Conference, New York, April 2005.

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Good political leadership in this matter involves treating citizens as key allies to protect human health and the environment and in making the transition to a sustainable future. Governments need to “govern” rather than attempt to “manage” this change to sustainable resource conservation practices. This includes a significant investment in public outreach and education so that citizens can help communities make the most informed choices.

### Principles and Practical steps towards Zero Waste.

We encourage **ALL** communities to:

1. **Adopt the Zero Waste definition of the Zero Waste International Alliance:** “Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health.”[ 1 ]
2. **Establish benchmarks and a timeline** to meet goals for measuring success and monitoring accomplishments. Communities should aim to make significant strides within five years and to invest local resources and leadership in achieving tangible and visible accomplishments that demonstrate to the public this new direction as quickly as possible. Some communities have adopted as a goal diverting at least 90% of waste generated from landfills and incinerators within 10-15 years of adoption of a plan. Others have adopted longer timelines such as the goal in the Urban Environmental Accords of achieving Zero Waste by 2040.[2] A key part of the planning process is establishing what is a reasonable goal for your community while recognizing the urgency of moving quickly to address climate change.
3. **Engage the whole community.** It is important not to leave Zero Waste to “waste experts.” Many different skills need to be deployed in the movement towards Zero Waste and sustainability. Everyone has a role to play. Citizens or communities need to take the leadership role in organizing meetings to engage all sectors of the community. All organizations (nongovernmental organizations, grassroots movements, business and governmental) that provide waste reduction, takeback, reuse, recycling and composting services should be involved in order to achieve Zero Waste. All of these groups and individuals should be challenged to pursue Zero Waste at home, at school, at university, at work and at play, while their communities develop longer term policies and programs for the entire community. Existing service providers should be asked to adopt Zero Waste as a goal and seize the opportunities to reduce waste, provide takeback services to local manufacturers and retailers, and to help communities and businesses get to Zero Waste. The communication with all sectors of the community should be permanent, in all planning and implementation phases of the Zero Waste plan.
4. **Demand decision makers manage resources not waste.** Existing incinerators must be closed down and no new ones built. Landfill practices must be reformed to prevent all pollution of air and water including pre-processing all residues at landfills before burial to stabilize the organic fraction and prevent methane generation and the use of Residual Separation and Research Facilities ([see #8 below](#)). However, facilities such as these should

not be used to pre-process discarded materials before going to incinerators or any thermal treatment technologies. Landfills are a major source of greenhouse gases (particularly methane, which warms the atmosphere 23-72 times more quickly than carbon dioxide [iv] as well as ground contamination. Incinerators and other burning and thermal treatment technologies such as biomass burners, gasification, pyrolysis, plasma arc, cement kilns and power plants using waste as fuel, are a direct and indirect source of greenhouse gases to the atmosphere and turn resources that should be reduced or recovered into toxic ashes that need to be disposed of safely. Neither landfills nor incinerators are an appropriate response to the challenge of peak oil, which will make any new incinerator impractical within its lifetime, as embedded energy and oil within products will become too costly to replace. **More energy can be saved, and global warming impacts decreased, by reducing waste, reusing products, recycling and composting than can be produced from burning discards or recovering landfill gases.** Communities should fight any effort to introduce new incinerators, in any guise, and replace existing landfills and incinerators, with Zero Waste policies and programs, including EPR, resource recovery parks, reuse, recycling and composting facilities.

5. **Use economic stimulus funds and fees levied on tons of waste hauled or landfilled** to fund programs to educate and train Resource Managers to use a Zero Waste approach, to develop programs for handling community discards, and to create green jobs and to enforce environmental rules.
6. **Educate residents, businesses and visitors.** Zero Waste is a strategy not a technology. As such, it aims for better organization, better education and better industrial design. To achieve the cultural change needed to get to Zero Waste, communities must establish programs to educate and train residents, school children, college students, businesses, and visitors about new rules and programs.
7. **Perform Zero Waste Assessments.** Communities should conduct a waste audit to find out the amount and type of waste being produced in their community. Data can be collected locally or obtained from comparable communities if funding is not available. These audits should be used as a baseline to identify recovery and employment opportunities, cost savings and measure the success of the reduction and recovery program. Evaluate what additional source reduction, take-back, reuse, recycling and composting programs and facilities are needed to make those services more convenient to users than mixed material collection and disposal services.
8. **Build Residual Separation and Research Facilities.** In the interim phase, residuals should be sent to Residual Separation and Research Facilities before the remaining inerts are allowed to be buried in a landfill designed to have no air or water emissions. These facilities should act as a way of linking community responsibility to industrial responsibility. If the community can't reuse it, recycle it or compost it, industry should take it back itself for reuse, recycling or composting, or design it out of use. Costly incinerators attempt to make these residuals "disappear." In a Zero Waste program, the residuals need to be made very visible, since they represent either bad industrial design or bad purchasing habits, both which have to be changed through a dedicated research and educational effort.
9. **Develop New Rules and Incentives to move towards Zero Waste** – Communities can significantly change what is "economic" in the local marketplace with new policies, new rules and new incentives. Communities should restructure contracts and policies to make the avoided costs of collection and disposal a key engine for moving towards Zero Waste.
10. **Enact Extended Producer Responsibility (EPR) Rules.** Communities need to help and encourage local businesses to take back products and packaging at their stores and

factories from consumers. They should also advocate for state and national EPR policies and programs for brand-owners and producers. As much as possible, discard management costs for products and packaging that are difficult to reuse, recycle or compost in most local programs should be shifted from local government to the producers of the product. This gives producers the financial incentive to redesign products to make them less toxic and easier to reuse and recycle. Products and packages that cannot be reused, recycled or composted locally or are toxic should be required to be taken back at the point of sale or facilities set up by producers to conveniently receive those products at no cost from the public. All products and packaging taken back need to be properly reused, recycled or composted. EPR policies should not allow producers to export harm to countries with lower environmental standards. EPR policies should foster collaborative programs to be developed with support of small, local businesses and nonprofits, and not just rely on a single entity for reuse, recycling and composting.

11. **Remove government subsidies for wasting** – Governments, particularly in the US, have adopted many tax incentives to encourage mining and timber harvesting, which are no longer needed and subsidize the wasting of resources. Governments have also subsidized incinerators under the guise of “Energy from Waste” when in fact such facilities waste energy. Government regulations of landfills have also inadequately addressed leachate, methane generation and perpetual long-term care, which is an indirect subsidy for wasting. Community adopted garbage rate structures have also made it cheaper to waste than recycle, rather than adopting Pay As You Throw incentives [ 7 ] Communities should remove the subsidies for wasting in its control, and call for the removal of all these other subsidies.
12. **Support Zero Waste Procurement** – Local governments should adopt the Precautionary Principle for municipal purchasing to eliminate toxic products and services; purchase Zero Waste products and services; avoid single use products and packaging; return to vendors any wasteful packaging; reduce packaging and buy in larger units; use reusable shipping containers; purchase reused, recycled and compost products; buy remanufactured equipment; lease, rent and share equipment; buy durables (using life-cycle cost analyses); and encourage businesses and institutions to follow these practices as well.[8]
13. **Expand Zero Waste Infrastructure**
  1. **Zero Waste Infrastructure** – Local governments and stakeholders should be involved in developing locations for reuse, recycling and composting businesses to collect and process materials, manufacture products, and sell products to the public, including Resource Recovery Parks.
  2. **Support Reuse Businesses, NGOs and citizens groups** – Identify, help expand and help promote reuse businesses, non-governmental organizations (NGOs) and citizens groups. Focus on the *value* of reusables, not just the tonnage of products in that stream. Establish efficient repair and reuse programs to retain the form and functions of products. Help reuse products for their original intended use as a priority.
  3. **Get Compostable Organics out of Landfills and back to the soil** (including garden clippings, food scraps, food-soiled paper and clean wood waste) – Organic materials produce methane and other landfill gasses. Communities should adopt policies and programs to achieve this goal by 2012. [ 9 ] Encourage Planning Departments to support farming over subdivisions and consider composting a crop. Where possible small local composting operations should be preferred to large centralized facilities. Compost should be used locally to grow food and restore the soils to enhance food security, local self-reliance and sustainability. By sequestering

carbon in soils and decreasing use of irrigation, pesticides and fertilizers, composting further helps to reduce the emission of global warming gases.

4. **Support Zero Waste practices at businesses and institutions** – Communities should require all businesses and institutions to subscribe to Zero Waste services, require that recycling and separate hauling services are provided universally to all of them, and require that discarded materials are source separated to retain the highest and best use of those materials.
  5. **Construction, Demolition, Landclearing and Remodeling (C&D)** – Adopt deconstruction, reuse and recycling policies citywide (including requiring all contractors to submit plans and deposits to meet community targets), and implement programs and facilities needed to achieve Zero Waste. Work with Green Building programs to prioritize deconstruction and reuse, and to require all new buildings to provide space for recycling containers.
  6. **Locally owned and operated local enterprises.** Wherever possible communities should support locally owned and operated community enterprises, to manage and use local discards sustainably and create jobs and training opportunities in the local community.
14. **Challenge Businesses to lead the way to Zero Waste** – Thousands of Zero Waste Businesses already divert over 90% of their wastes from landfill and incineration around the world. [ 10 ] Zero Waste Businesses are reducing their costs of managing resources and discards, increasing their operating efficiency, decreasing their carbon footprint (including energy use) and decreasing their long-term liability. Identify, recognize and promote Zero Waste Businesses locally and challenge others to follow.

### Sources:

1. See <http://www.zwia.org/standards.html>
2. See [http://sfenvironment.org/our\\_policies/overview.html?ssi=15](http://sfenvironment.org/our_policies/overview.html?ssi=15)
3. Drafted for the Zero Waste International Alliance. This is a living document. If you have comments and edits, please send to Gary Liss at [gary@garyliss.com](mailto:gary@garyliss.com) and Richard Anthony at [ricanthony@aol.com](mailto:ricanthony@aol.com)
4. See: [ZWIA Zero Waste Definition](#)
5. Quote from Martin Bourque, Berkeley Ecology Center, at GRRN Zero Waste Conference, New York, April 2005.
6. 23 times over 100 years, which is the time frame over which most climate change calculations are done; 72 times over the next 20 years, which may be the “tipping point” for major climate change impacts.
7. For more info on this policies, go to: <http://www.epa.gov/payt/>
8. Based on list from Green Purchasing Institute.
9. See [www.COOL2012.org](http://www.COOL2012.org)
10. See: <http://www.grn.org/zerowaste/business/profiles.php>

## Appendix D: Model Zero Waste Resolution

### WHEREAS

- ◆The placement of materials in waste disposal facilities, such as landfills and incinerators, causes damage to human health, wastes natural resources and/or wrongly transfers liabilities to future generations, and
- ◆The elimination of specified types of waste for disposal, also known as disposal bans, will protect states from waste importation from other states and nations, and
- ◆Consumers are currently forced to assume the high financial cost of collecting, recycling, and disposing of materials, and
- ◆Tax subsidies for waste and virgin materials send the wrong economic signals to both consumers and producers, and
- ◆A resource recovery based economy will create and sustain more productive and meaningful jobs, and
- ◆Increasingly, U.S. and international governments and organizations are adopting the policy that the financial responsibility of collecting, recycling, and disposing of materials belongs with producers, and
- ◆Producers should design products to ensure that they can be safely recycled back into the marketplace or nature, and
- ◆Most types of waste streams can be easily eliminated through across-the-board minimum recycling content laws, the use of non-toxic alternatives in product design, and local composting facilities, and
- ◆Recognizing that some materials are necessary for the public health and national security, in which case, storage is the only safe alternative, and
- ◆Recognizing that voluntary recycling goals have not achieved waste elimination, and
- ◆Government is ultimately responsible for establishing criteria needed to eliminate waste, so that manufacturers produce and businesses sell materials that can be safely recycled or composted,

### THEREFORE, BE IT RESOLVED THAT

The University of Illinois at Urbana-Champaign supports the creation of a Zero Waste Plan in order to eliminate waste and pollution in the manufacture, use, storage, and recycling of materials.

## Appendix E: Auxiliary and Allied Organization collections

Auxiliary Units garbage and recycling collection:<sup>157</sup>

- Assembly Hall: collection services unknown; contact: Kevin Ulestad.
- Division of Campus Recreation: Activities and Recreation Center (ARC) – garbage, cardboard; Campus Recreation Center East (CRCE) – garbage; contact: Gary Miller.
- Conference Center in the iHotel, campus-owned, privately operated: bottles/cans, cardboard, paper; garbage collected by private hauler; contact: Dawn Aubrey.
- Division of Housing (Housing) dining and residence halls including Busey-Evans, Florida Avenue (FAR), Illinois Street (ISR), Lincoln Avenue (LAR), Pennsylvania Avenue (PAR), and the Student Dining and Residential Programs (SDRP) building: garbage, bottles/cans, cardboard, paper; contacts: Dawn Aubrey and Vonne Ortiz.
- Illini Union: garbage – Area Disposal Service (ADS); WTS – bottles/cans, cardboard, paper contact: David Guth.
- Division of Intercollegiate Athletics (DIA): Memorial Stadium – garbage; bottles/cans, cardboard and paper (indoor only); other facilities range from no service to full service; contact: Rosalie Lard.
- McKinley Health Center: garbage, bottles/cans, cardboard, paper; contact: Brandon Boyd.
- Parking Department: garbage, cardboard.
- Student Services Building: paper.

Allied organizations – no collection, unless otherwise noted:

○ Government Organizations

- Construction Engineering Research Laboratory (CERL): garbage
- Illinois Department of Public Health
- United States Geological Survey (USGS)
- Illinois Department of Human Services
- Illinois Environmental Protection Agency
- Illinois State Police
- Military Education Council
- Federal Aviation Administration
- Federal Bureau of Investigation (FBI)
- State Universities Civil Service System (SUCSS)
- State Universities Retirement Systems (SURS)
- United States Department of Agriculture (USDA)

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<sup>157</sup> Recycling route sheets list only dumpsters or totes collected; cardboard, plastic and can recyclables may still be collected if cardboard is placed in any dumpster and plastic bottles and aluminum cans are bagged in blue can liners and placed in any dumpster.

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- Professional/Technical/Public Service Organizations
  - American Oil Chemists' Society
  - Illini Media Company
  - ASPCA American Society for the Prevention of Cruelty to Animals
  - National Council of Teachers of English
  - China Training Program
  - Council on Teacher Education
  - School of Social Work - Field Education
  - Champaign County Sustainability Network (CCNet)
  - U of I Employees Credit Union (UIECU)
  - Labor and Employment Relations Association
  - The Illinois Club (formerly Women's Club)
  - Illinois Crop Improvement Association, Inc.
- Research Park Organizations
  - Forbes Natural History Building, formerly known as the “iBuilding”: garbage, bottles/cans, cardboard, paper
  - Robert Evers Lab: garbage
  - Enterprise Works: garbage

## Appendix F: Unit Interview Questions

1. Are there any policies or practices in place in your unit regarding procurement or waste management?
2. What are your perceptions of campus's waste management system and how does your unit fit into it?
3. What are the waste management system's strengths and weaknesses as it relates to your unit?
4. What are your unit's greatest contributors to the waste stream?
5. Where are the greatest potentials in your unit for increasing waste reduction and diversion?
6. What are the biggest obstacles in your unit to improving the system?

## Appendix G: Zero Waste Plan Action Items

Priority Action	Name	Initial	Description	Strategy	Secondary Strategy	Timeframe	Cost	Staff	Barriers
X	Collect campus units' waste management data	AUI03	Collect weight or volume data on garbage and recycling collected by private haulers from Auxiliaries and add this data to WTS collection data; this will increase accuracy of landfill diversion and tonnage rates.	improve data collection and reporting		Immediate	Low	Current	None
	Encourage/mandate sustainable purchasing	AUI07	Expand campus iBuy purchasing website and change the current "green alternative" items to the default item, requiring buyer to actively select a less sustainable option.	general waste management policy		Immediate	Medium	Current	Administrative
	Research remaining Auxiliaries	AUI13	Interview staff and audit facilities of remaining Auxiliaries: Division of Campus Recreation, Conference Center, Parking Department, and Student Services.	improve data collection and reporting		Immediate	Low	Additional	None
	Decrease number of abandoned bicycles	BMI01	Install covered bicycle parking, install parking in sheltered areas and establish short- and long-term bicycle storage to decrease damage due weather exposure damage and associated abandonment.	general waste management practice		Immediate/Short-term	Low-High	Current/Additional	None/Space
	Increase return of abandoned bicycles	BMI02	Institute a sticker-based registration process to more easily identify unregistered bicycles and return abandoned bicycles; enforce bicycle registration regulations to decrease numbers of abandoned bicycles unable to be returned.	general waste management policy		Immediate/Short-term	Low-Medium	Current/Additional	None/Administrative ; Legal; Space
	Speed recovery of abandoned bicycles	BMI03	Institute more frequent tagging and removal of abandoned bicycles to reduce damage due to exposure and increase reusability of salvaged bicycles; consider using volunteers provided by student RSOs and bicycle cooperatives	general waste management practice		Immediate	Low	Additional	Administrative ; Legal
X	Create recycling stations in common areas	BWMI03	Include garbage and recycling bins with graphic-and-text-based signage above bins on wall similar to current signage in Housing, and/or on the bins themselves, indicating (un)acceptable items. A "Recycling Station" sign should be installed above the bins if on-bin signage is used. At least one station per building should include both types of battery recycling receptacles. Add textbook and clothing recycling bins if approved.	strengthen campus culture of sustainability		Immediate	Low	Current	None
	Expand battery recycling	BWMI04	Implement both battery recycling programs in at least one recycling station in each building. Stations without battery recycling should direct building users to the closest station with battery recycling.	general waste management practice		Immediate	Low	Current	None
X	Reduce number of garbage bins	BWMI05	Remove garbage bins from classrooms and offices and install signs directing users to take garbage and recycling to common-area bins located in all hallways. This will reduce the number of garbage bins needed while increasing the likelihood of recyclables being separated into proper bins.	strengthen campus culture of sustainability		Short-term	Low	Current	None
	Brand and detail dumpsters, totes and bins	BWMI06	Paint and stencil existing and new dumpsters, totes and bins to quickly indicate what items are accepted, e.g. Housing and other units use white-painted dumpsters for cardboard. Add a painted or laminated list of un/acceptable items on each receptacle.	strengthen campus culture of sustainability		Immediate	High	Additional	None

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Priority Action	Name	Initial	Description	Strategy	Secondary Strategy	Timeframe	Cost	Staff	Barriers
X	Implement waste audit research plan	BWMI08	Determine buildings' baseline waste management rates from which future actions' impacts can be assessed	improve data collection and reporting	increase waste management staff	Immediate/ Short-term/ Long-term	High	Additional	None
	Create online waste management data portal and device application	DCM02	Create online website or modify iCAP Portal to allow campus units to report waste management activities and data. Create iPad or smartphone apps to allow WTS drivers and other to enter data while away from their offices.	improve data collection and reporting		Short-term	Medium	Additional	None
X	Implement "tailgate" recycling program	DAI05	Stencil garbage drums with "LANDFILL." Replace half of garbage drums with recycling drums painted blue and stenciled "RECYCLABLES".	strengthen campus culture of sustainability		Short-term	Medium	Additional	None
X	Implement Pilot Zero Waste Game Day event	DAI06	Conduct pre-game waste audit; convert waste stations to recycling stations; use Recycling Ambassadors (staff and volunteers) to educate attendees on proper recycling; audit post-game waste and determine diversion rate.	strengthen campus culture of sustainability		Short-term	Medium	Additional	None
	Expand education on Special Waste and Recyclables	DRSI02	Ashbrook volunteered to write an article for the CSE E-newsletter; update the 1990s waste guide using graphics to clearly explain (un)acceptable items and direct readers to additional resources and managers	integrate communication and coordination		Immediate/ Short-term	Low	Current/ Additional	None
	Expand ChemCycle program	DRSI03	Expand program to all campus units that use chemicals and other hazardous materials including but not limited to physics, biology, geology, art, theatre, natural resources, agriculture, etc. Allow for submission of opened and partially-used containers for those units that are less concerned about chain-of-custody and purity issues.	general waste management practice		Immediate/Short-term	Low	Current	Administrative
	Set default duplex printer setting	DSI17	Have CITES and departments set computers to default duplex (two-sided) printing and require Administrator authority to change default, but allow for manual set to one-sided printing for individual printouts	general waste management policy		Short-term	Low	Current	Administrative
	Require or prefer recycled toner cartridge purchase and recycling	DSI18	Encourage or require the purchase, use and recycling of recycled/refurbished toner cartridges unless granted a waiver	strengthen campus culture of sustainability		Short-term	Medium	Current	Administrative
	Locate vendors of smaller-sized supplies	DSI19	Find vendors that sell solvents and other chemicals in containers smaller than 55 gallons	general waste management practice		Immediate	Low	Current	Administrative
	Incentivize waste reduction and recycling increase	DSI21	Charge all campus units – not just Auxiliaries and those requiring extraordinary service – for garbage collection; charge less or nothing for recycling collection. To make change cost-neutral, provide units with additional budget line-item funding equal to the amount they would be charged for their current level of service. Reductions in garbage hauling would result in the unit having additional funds to spend on other goods and services	general waste management policy		Short-Term/ Long-term	Low-High	Current	Administrative ; Legal
	Expand special recycling programs	FSI01	Work with unit Green Teams and Facility Managers to determine need for and implement recycling programs (lamp, ballast, battery, etc.)	general waste management policy	general waste management practice	Immediate	Low-Medium	Current	None

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Priority Action	Name	Initial	Description	Strategy	Secondary Strategy	Timeframe	Cost	Staff	Barriers
	Increase funding for special recycling programs	FSI02	Secure SSC and other funding to increase number/area of battery collection sites; secure funding for a new truck for collecting batteries, lamps and ballasts.	general waste management policy	general waste management practice	Immediate/ Short-term/ Long-term	Low-High	Current/ Additional	Administrative
	Mandate use of rechargeable batteries	FSI03	Establish a campus policy to require use of rechargeable batteries whenever possible.	general waste management policy		Short-term	Medium	Current	Administrative
	Mandate switch from paper towels to hand-driers.	GWMP001	Require all campus units to switch from paper towels to electric hand driers in restrooms, laboratories, kitchens and other areas	general waste management policy		Long-term	High	Additional	Administrative
	Increase social media presence	GWMP002	Establish Facebook page and Twitter account for recycling and/or sustainability programs	strengthen campus culture of sustainability	integrate communication and coordination	Immediate/ Short-term	Low	Current	None
	Implement restroom paper-towel composting	GWMPR01	Compost paper towels after campus has implemented composting program	general waste management practice		Long-term	Low	Current/ Additional	Facility
	Update BSW Manual	GWMPR02	Update BSW Manual to include modern waste management procedures (recycling, hazardous waste)	general waste management practice		Immediate	Low	Current	Administrative
	Provide a "sustainable dining kit"	HDHI02	Provide all new students and staff a reusable clamshell, mug, glass and shopping bag; offer diners a discount for using the mug and glass; require diners to use clamshell for dining carry-outs; returned clamshells get washed and reused.	strengthen campus culture of sustainability		Short-term	Medium	Additional	Administrative ; Legal
	Install accumulator signage	HDHI03	In order to reduce unintended recycling behavior shifts, install prominent signage at dish accumulator explaining that the mixed-waste stream handling at the accumulator is a unique situation and thanking diners for continuing to recycle throughout campus.	integrate communication and coordination		Immediate	Low	Current	None
	Expand sustainability initiative campus-wide	HRHI01	Expand existing Illinois "Orange and Blue Go Green" Sustainability Week theme into a campus-wide, year-round sustainability initiative, including a Zero Waste program.	strengthen campus culture of sustainability		Immediate	Low-High	Additional	Administrative
	Offer recycling bins for resident students' rooms	HRHI06	Inform residents they may request a room recycling bin and that it is their responsibility to sort recyclables into common-area recycling bins located in the hallway outside their room.	general waste management practice		Immediate	Low	Current	None
	Implement electronic waste recycling	HRHI09	Provide a drop-off point for students and employees to donate used electronics for donation to local organizations; investigate if Surplus/Property Accounting can accept personal items	general waste management practice		Immediate	Low	Additional	None
	Implement household non-/hazardous waste exchange	HRHI10	Provide a space where students can bring unused/unwanted cleaning supplies, household chemicals, etc.; other students can take these items as desired; investigate if DRS can collect items left at end of semester and dispose of properly, or divert to county household hazardous waste collection events.	general waste management practice		Short-term	Medium	Additional	Administrative ; Legal

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Priority Action	Name	Initial	Description	Strategy	Secondary Strategy	Timeframe	Cost	Staff	Barriers
	Improve Surplus/Property Accounting surplus materials disposition	HRHI14	Work with Legal and Procurement departments to change campus and university regulations and state administrative regulations to allow donation or sale of food scraps for compost and waste food oil for biodiesel conversion, and any other added-value materials/byproducts.	strengthen campus culture of sustainability		Immediate	Low	Current	Administrative ; Legal
	Advertise recycling opportunities	ICCO1	Advertise recycling facilities, programs and events on Eco-Point Re-TRAC website ( <a href="https://connect.re-trac.com/register/ecopoint">https://connect.re-trac.com/register/ecopoint</a> ).	integrate communication and coordination		Immediate	Low	Current	None
	Collaborate on creating Zero Waste Plans	ISTCIO1	Rients and Ricci created a Zero Waste Plan Box.net account for research and reference materials and a Zero Waste UIUC Google Group for group communications.	general waste management policy	integrate communication and coordination	Immediate	Low	Current/ Additional	None
	Increase types of plastics collected	ISTCIO2	Campus should be able to recycle all #1 and #2 plastics, regardless of form, as long as it is "rigid" and not "soft"; soft is anything that melts under 200°F. This may require upgrading of the sorting equipment and process at the WTS.	general waste management practice		Short-Term/ Long-term	Low-High	Current/ Additional	Administrative
	Explore composting options	IUI01	Begin discussions with Housing and food vendors to institute food waste composting after campus implements composting program.	general waste management practice		Immediate/ Long-term	Low-High	Current/ Additional	Administrative ; Legal
	Reduce prepared food waste	IUI04	Encourage private food vendors to participate in Zero Percent program	general waste management practice		Immediate	Low	Current	None
	Advertise waste management improvements	KCPA01	Immediately discontinue the "mixed-waste" collection process; re-label the existing bins for landfill waste and provide office and common-area collection bins for bottles/cans and paper. Provide common-area bins for cardboard. Install prominent signage informing patrons and users of the "new green recycling program" and ask them to initiate separating and sorting their own waste and directing them to recycling stations.	integrate communication and coordination		Immediate	Low	Current	None
	Implement a disposable glove recycling program	MHC10	Implement a disposable glove recycling program: the Illinois Sustainable Technology Center is researching the possibility to convert from gloves that can only be landfilled to using gloves manufactured by Kimberly-Clark that can be recycled through Terracycle.	strengthen campus culture of sustainability		Short-term	Low-Medium	Current	None
	Seek additional land for manure application	OFI01	ACES should inventory land acreage currently available to apply manure or compost – Animal Science currently has 1,200 acres available – and solicit additional land from all campus units including Pollinatorium and Tree Research Arboretum, and solicit lands from local farmers	general waste management practice		Immediate/ Short-term/ Long-term	Low-High	Additional	Administrative
	Optimize composting options – AD/AAD, vermicomposting, wind-row composting	OFI02	AAD is simpler, easier to maintain and produces renewable energy; an estimated ½ megawatt of electricity could be produced from the animal manure produced on campus. Consider installing an AD which would secure future animal manure processing. Implement vermicomposting. Synergize composting activities: optimize aerobic composting and digesting: animal waste/manure + food waste + Miscanthus + bedding + landscape waste.	general waste management practice		Short-Term/ Long-term	Low-Medium	Current/ Additional	None

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	Maximize research animal bedding & manure composting/rendering	OFI05	Determine if bedding, manure and carcasses from research animals can be composted and/or rendered versus landfilling and incinerating.	general waste management practice		Immediate	Low	Current	Administrative ; Legal
	Secure animal and landscape waste stockpiling options	OFI06	Ensure there is enough land and proper facilities to stockpile animal manure, bedding and waste feed and landscape waste for times when land application of manure and/or animal bedding and waste feed composting is not possible	strengthen campus culture of sustainability		Short-Term/ Long-term	Low-High	Current	Administrative
	Pass ZW resolution	SCCS01	Pass a Zero Waste Resolution and a Zero Waste Week Resolution using the ZWIA or GRRN templates	strengthen campus culture of sustainability		Immediate	Low	Current	Administrative
	Pursue ZW Business Certification	SCCS02	Pursue Zero Waste Business Certification through the ZWIA, National Underwriters Laboratory or local Illinois Green Business Association	strengthen campus culture of sustainability		Short-term	Low	Additional	Administrative
X	Create online exchange portal	SPAI02	Campus units can post descriptions and photographs of items; other units could view items online and request they be moved directly to their location.	integrate communication and coordination		Immediate/ Short-term	Low	Additional	Administrative
	Hire Surplus intern	SPAI03	An un/paid intern would assist with daily tracking of surplus equipment, staff the office supplies ReStore, manage the Surplus Exchange Portal and find recipients for surplus equipment.	increase waste management staff		Short-term	Low	Additional	None
	Establish Office ReStore	SPAI04	Establish a drop-off/pick-up site for surplus office supplies that would be managed by Surplus or some other office (CSE, F&S, or some unit with space and staffed on regular daily basis.	strengthen campus culture of sustainability		Immediate	Low-Medium	Additional	Space
	Decrease electronics refresh rate	SPAI05	Determine how Illinois compares to other campuses in its computer equipment upgrade rate and increase retention time if appropriate	general waste management policy		Immediate/ Short-term	Low	Current	Administrative
X	Initiate special event recycling collections	TMI02	Promote textbook and other special recyclables collection during key environmental events, e.g., RecycleMania, Earth Day and Week, America Recycles Day, Campus Sustainability Day, etc.	strengthen campus culture of sustainability	increase waste management staff	Immediate	Low-Medium	Additional	None
X	Increase WTS funding	WTSI01	Hire at least one additional staff member to assess building recycling resources and work with Facility and Building Managers to optimize recycling collection; additional recycling equipment and supplies (bins, signage, NIR recycling sorter); and additional trucking equipment (trucks, truck scales).	increase waste management staff		Immediate	Medium	Additional	None
	Initial purchase disposal fee	WTSI02	This fee would be assessed on major/all items purchased for campus; these funds would subsidize the eventual landfilling, incinerating, repurposing or recycling of these items, including funding the operations of the WTS and other campus recycling programming	general waste management policy		Short-term	Low	Additional	Administrative
X	Audit and improve buildings' recycling bins and signage	WTSI03	Facilities should be surveyed for actual locations of all garbage and recycling bins. Ensure all common and individual areas have optimal number and placement of commodity recycling bins and that all garbage bins are paired with a recycling bin, including accurate and consistent signage on bins with acceptable and unacceptable items.	general waste management practice	integrate communication and coordination	Immediate	Medium	Additional	None

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	Mandate recycling service provision	WTSI04	Require all campus units, Auxiliaries, Allies, and tenants provide recycling services to their residents. This would comply with General Services Administration (GSA) guidelines.	strengthen campus culture of sustainability		Immediate	Low	None	Administrative
	Improve hauling equipment	WTSI05	Consider equipping trucks and/or dumpsters with weight scales, truck scales may cost around \$10,000 each. Data could be taken manually or with data loggers.	general waste management practice		Short-term	High	Current	None
	Improve MRF operations	WTSI06	Research options for increasing MRF handling and sorting capacity and recycling recovery rates: increasing bay size to allow for increased garbage stockpiling to increase garbage sorting capacity; query the Illinois EPA regarding requirements to increase stockpiling; install a NIR sorter to allow for the sorting and collecting of plastics, glass and other recyclables.	general waste management practice		Short-term	High	Additional	Legal
	Map dumpsters and common-area bins	WTSI07	Field-locate existing garbage and recycling dumpsters and indoor bins using Geographic Position Systems (GPS) and map them. Analysis will reveal areas which may need dumpsters. Dumpster maps will enable drivers and other staff to easily locate dumpsters and bin maps can be posted in buildings, allowing users to quickly locate bins.	improve data collection and reporting	integrate communication and coordination	Immediate	Low	Additional	None
X	Establish Green Teams	WTSI08	Due to its lead role in campus waste management, the Recycling Coordinator should co-lead the campus Green Team with the Sustainability Coordinator to educate and coordinate unit and topical Green Teams.	integrate communication and coordination	strengthen campus culture of sustainability	Immediate	Low	Current	None
	Confirm pallet recycling data	WTSI09	Osby's reported pallet sales do not reflect donated pallets and conflicts with 2005 and 2010 WRP numbers.	improve data collection and reporting		Immediate	Low	Current	None
X	Secure additional recyclables markets	WTSI10	Locate additional buyers for currently-landfilled commodity recyclables or collaborate with cities and local haulers on items they currently accept, e.g., glass and plastics, C&D waste.	general waste management practice		Immediate	Low	Additional	None
X	Conduct annual WTS waste audit	WTSI11	Conduct a waste stream analysis for an entire week using the sorting belt and staff to analyze all of the garbage and recyclables collected from all units at the WTS.	improve data collection and reporting		Short-Term/ Long-term	Medium	Additional	None
	Implement campus waste management standards	WTSI12	Design, implement and enforce minimum waste reduction, recycling, and energy conservation standards that would also apply to campus units, Auxiliaries, vendors and contractors.	general waste management policy		Immediate	Low-High	Additional	None
	Improve bottle/can recycling	WTSI13	Ensure that all bottle/can recycling bins use blue can liners. In addition, bottle/can totes should be used for collecting liners of bottles/cans to reduce loss due to bags tearing in dumpsters or liners being completely missed at the WTS.	general waste management practice		Immediate	Low	Current	None
	Establish Interagency Waste Management Task Force	WTSI14	Provide a forum for regional state, city, county, private, not-for-profit and community members to discuss waste management issues.	integrate communication and coordination		Immediate/ Short-term	Low	Additional	None

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	Establish bottle fee	WTSI15	Collect a fee (not a deposit) on all bottles and cans – aluminum, glass, plastic – sold on campus. Collected funds would be used to support recycling operations and programming.	general waste management policy		Short-term	Low	Current	Administrative