

## Commercial Recycling and Diversion

### Overview

Recycling turns materials that would otherwise become waste into valuable resources. Recycling includes: 1) collecting materials that would otherwise be considered waste; 2) sorting and processing recyclables into raw materials that can be used to produce new products; and, 3) purchasing recycled product. As illustrated by the traditional recycling logo, using the collected material, in whole or in part, in new products is necessary to complete the “recycling” cycle.



The “commercial recycling” options discussed in this paper will generally focus on systems, facilities and programs serving businesses, industry, institutions, and residential multi-family units (three-plexes and greater; apartments), to coincide with LMC 8.32.205, which differentiates the frequency of solid waste collection requirements based on number of dwelling units. For purposes of this paper these will all be referred to as “commercial” recycling, unless examples are applicable to only a limited subset of this group (e.g., multi-family residential recycling).

Multi-family residential units, and business, industry and institutions in the Lincoln and Lancaster County Planning Area (Planning Area) have access to voluntary recycling opportunities but systems, facilities and programs may not always be convenient or may have extra costs, which serve as disincentives.

Opportunities in commercial recycling have the potential to dramatically increase diversion, through increased recycling in the Planning Area. Commercial recycling programs are often associated with old corrugated containers (OCC or cardboard) and office paper because they are easy to collect and have readily identified markets; however, a wide variety of high quality, recyclables (papers, metals, plastics and other materials) can be obtained from commercial, industrial and institutional businesses. The types and quantities of materials that can be diverted from businesses are generally specific to the type of business. The types of materials that could be diverted from multi-family dwelling are similar to those described in the paper on Residential Recycling and Diversion. Food waste is one example of a material that can be collected from a specific businesses type (i.e. restaurants and institutions) and diverted from disposal.. Properly planned and implemented, commercial recycling also has the potential to have a lower cost per ton diverted than a residential collection program. Separate technical papers address materials such as yard waste and food waste composting as well as markets for recyclable materials.

It is important to also note that under the definition of “refuse” in LMC 8.32.010 refuse, specifically excludes recyclables (as defined in LMC 5.41.010) that have been separated out at the source. This distinction is important because it does not subject vehicles involved in collecting source separate recyclables to licensing requirements under LMC 8.32.

As presented in the Residential Recycling and Diversion paper, the USEPA has stated “Recycling materials reduces greenhouse gas emissions.” EPA estimates for example, “by recycling all of its office paper waste for one year, an office building of 7,000 workers could reduce greenhouse gas emissions by 546 MTCE [million metric ton carbon equivalent], when compared to landfilling. This is the equivalent to taking nearly 400 cars off the road that year.”

(Source: <http://www.epa.gov/climatechange/waste/measureghg.html>, retrieved August 17, 2012)

## Current Programs

The Lincoln Recycling Office provides education and outreach for commercial recycling. The City supports and promotes public and private recycling efforts through its website <http://lincoln.ne.gov/city/pworks/waste/sldwaste/> and by providing a wide array of services. The primary public and private services for the commercial sector include but are not limited to:

- Commercial recyclables collection (voluntary/subscription service)
- Buyback and processing centers
- Waste audits (supported through WasteCap of Nebraska)
- Drop-off centers, for residential recycling
- Education
- Partnerships

Commercial recycling occurring in the Planning Area also includes internal corporate recycling and materials exchange. Additional, more specific information on various system, facilities and programs can be found on the City's recycling website <http://lincoln.ne.gov/city/pworks/waste/sldwaste/recycle/> and in the *Lincoln-Lancaster County's Official 2012 Waste Reduction & Recycling Guide*. While these source place emphasis on household diversion opportunities (including multi-family households - apartment complexes), they also include a wide variety of options that are available to business, industry and institutions waste generators. Also, included within these sources is information on a wide array of private and not-for-profit recycling service providers, as well as source reduction opportunities.

The City provided facilities (residential recyclables drop-off centers), education, waste audit and support programs, and yard waste composting, are funded through the Occupation Tax, user fees, material revenues and grants.

Historically, commercial recycling services for source separated office paper, OCC, and other traditional recyclables has been provided by private recyclers in Lincoln or Omaha. Some larger commercial refuse haulers have provided separate cardboard recycling containers at selected retail locations. Recently, some refuse haulers have expanded their waste collection business to include recycling services for both residential and commercial customers. This has resulted in more recycling services available for commercial recycling. Some refuse haulers may also subcontract with recycling firms to provide recycling services to their customers.

Firms providing source separated recyclables collection services are not required to license their (source separated recyclables) collection vehicles and report any information regarding their service areas, type of services provided, type and quantity of material diverted/recycled, or the number of customers they service. As a result, the number of waste haulers providing commercial recycling services and participation levels are not known. Private recycling processing centers operate in the City and collect/accept recyclables from business customers and sort and process them to meet market specifications. These facilities process a wide variety of paper, plastics and metals for shipment to various markets and some offer confidential document shredding and recycling. The capacity to process significantly larger volumes of materials would need to be evaluated if a significant increase of recyclables resulted from an expanded commercial recycling program. Commercial recycling programs are funded by program users through, subscription fees and revenue derived from the collected materials.

There are eight buyback center locations in the City for metal cans and scrap metal; two of the centers only accept metal cans. Two firms have facilities located in the Planning Area, and handle large volumes of scrap from the Planning Area, including automobile and demolition scrap metals. Their local facilities also accepts and recycles materials from other recyclers in

the region. Material quantities recycled through buyback centers or diverted as a result of waste audits are unknown.

The City recently completed a pilot study in four apartment complexes, to evaluate recycling education alternatives specific to multi-family/apartment residents. A summary of information from that pilot study is included in Appendix 1. Some of the key observations and findings from the pilot study are:

1. Residents feel recycling is important, but do not recycle because they do not have space or it is not convenient.
2. Very few residents currently use City drop-off sites.
3. Education alone may not be enough to spur recycling rates; convenience is needed.
4. Residents think they would use on-site recycling services.
5. Residents who don't think recycling is important will still participate if it is highly convenient. Maximize the convenience of the recycling system by mimicking the system currently in place for trash removal.
6. The educational material should be diverse in its content, format and distribution.
7. The use of reusable bags to encourage recycling may be an effective tool.
8. There were multiple examples of enthusiasm from residents who previously recycled. Such enthusiasm could be directed by property managers into "recycling green teams" or "environmental captains" for the apartment complexes to assist with recycling education and monitoring.

The main recommendations resulting from the study that can help guide options for future multi-family recycling programs are:

1. Facilitate discussion and recycling training for property managers as opposed to the individual tenant.
2. Utilize the existing educational materials from the pilot project to create education packets for apartment managers to provide to new residents as a "welcome packet".
3. Examine the issues and opportunities with on-site collection containers. Participation rates would increase with the convenience of on-site containers. Apartment managers may be willing to add recycling to their current waste collection if it is cost effective.

Some of the same observations and recommendations described above could also apply to property managers and owners of business, industry and institutions buildings.

While education is important to encourage, promote and sustain commercial recycling, if an overall recommendation of the Solid Waste Plan 2040 is to significantly increase the quantities of materials recycled from these "commercial" waste generators, then additional or expanded programs will be necessary. As discussed below, these programs may require some form of market regulation or mandated programs; this presumes such services would be provided by private firms, as opposed to municipally operated systems.

### **Generation and Diversion**

An annual City survey of recyclers provides some data on commercial recycling activities and the quantity of recyclables handled by these private-sector efforts. Table 1 summarizes the reported data since 2000 for various recycled materials. The quantities originally reported include metals associated with auto scrap, as well as salvage and demolition activities; quantities of metals in Table 1 were adjusted in an effort to reflect only metals from commercial recycling operations. These quantities exclude materials such as tires, oil, wood pallets, electronics and other miscellaneous materials, because these materials have been inconsistently reported. The

totals in Table 1 also exclude recycled concrete and asphalt materials (construction and demolition waste recycling, which is addressed in a separate technical paper).

**Table 1 – Tons of Materials Recycled Tons<sup>(1)</sup>  
(Reported by Private-Sector)**

Calendar Year	Metals (tons) <sup>(2)</sup>	Paper (tons)	Cardboard (tons)	Glass (tons)	Plastic (tons)	Total Tons
2000	5,967	10,095	12,412	1,899	92	30,465
2001	3,205	9,891	11,260	2,931	74	27,361
2002	5,623	11,343	13,690	2,665	281	33,602
2003	5,188	18,937	11,495	1,633	513	37,766
2004	7,962	14,108	14,464	1,702	276	38,512
2005	9,505	20,277	13,098	1,183	342	44,405
2006	7,434	12,262	20,931	1,696	461	42,784
2007	7,777	16,962	21,673	1,542	399	48,353
2008	9,716	9,227	14,317	316	449	34,025
2009	7,247	9,638	16,017	327	618	33,847
2010	9,618	11,071	15,721	1,004	923	38,337
2011	9,437	8,703	14,801	71	649	33,661

Notes:

- (1) Data prior to 2010 includes recyclables collected through residential curbside recycling collection programs.
- (2) Actual quantities of reported ferrous metals have been adjusted to reflect 3 percent of the waste stream to correspond to the percentages of metals in NDEQ statewide waste composition study. Adjustments were made because the values reported to the City include items such as scrap automobiles and metals from salvage and demolition operations.

The average amount of commercial materials reported to be recycled since 2000 has been approximately 37,000 tons per year. These quantities have not been verified and it is not known what amounts come from subscription recycling service, buybacks, or other internal corporate recycling programs. Quantities of recyclables imported and exported are also unknown.

Data collected on waste composition, at the Bluff Road Landfill, does not allow a clear distinction between residential and commercial municipal solid waste (MSW); however, the City estimates that approximately one-half of the waste disposed at the Bluff Road Landfill comes from “commercial” sources. Comparing the 33,661 tons in FY2010/2011 with the estimated commercial waste tonnage received at the Bluff Road Landfill in FY 2010/2011 and commercial tonnage exported from county, in FY 2010/2011, would result in a commercial waste recycling/diversion rate of 18 percent.

The NDEQ conducted a series of waste composition studies in 2007 and 2008. The main objectives of these studies were to determine the characteristics of Nebraska’s solid waste stream and to establish a baseline of waste characterization data for the state. NDEQ’s composition study included four seasonal sampling events at the City’s Bluff Road Landfill and separate characterization for commercial and residential waste streams. The figure and tables in Appendix 2 shows the NDEQ composition study results for commercial waste. The NDEQ study reports that the three main components of Bluff Road Landfill’s commercial waste stream (by weight) are paper fibers (49 percent), plastics (19 percent) and food (16 percent).

Based on NDEQ's table comparing the composition of commercial and residential waste, it is reasonable to assume that the majority of the cardboard comes from commercial sources and represent initial materials that would be targeted in an expanded commercial recycling program. Food waste (16 percent of total MSW) is another component of the disposed waste stream that may be more easily captured from select generators of commercial waste (restaurants and institutions) than from residential waste. While estimates of detailed waste composition may be useful in evaluating future waste management systems (including increased diversion opportunities), it is equally important to recognize that waste received at the landfill is a heterogeneous mix and that most of these materials are not currently collected or managed in a form conducive to large volume recovery (e.g., they are all mixed together and cross-contaminated by other waste products). For this reason evaluation of recycling alternatives are principally focused on pre-disposal recovery/recycling options. A processing facility is one option that may provide post-disposal recovery opportunities for loads of waste that include high percentages of relatively clean recyclables.

### **Program (Facility/System) Options**

Commercial recycling program options can take many forms and will need to be tailored to the specific opportunities and needs of a given commercial waste generator. This is one factor that makes the concept of commercial recycling potentially more complex than residential recycling. Commercial recycling programs will need to adapt to the differences in types of business, business infrastructures, participants, program/services, and available/targeted materials.

A key consideration in evaluating options may be how such commercial waste generators currently provide garbage management within their existing facilities. Mimicking such infrastructure may provide the most convenient and cost effective means of consolidating materials for collection and shipping to recycling facilities.

While this infrastructure is vital to a successful diversion program, the focus of this paper is generally on options to collect and manage the recyclable materials from existing facilities. Where new facilities are being constructed there are also options to facilitate efficient infrastructure. New construction recycling space requirements is a topic receiving significant emphasis in many locations in the US. This topic is presented below, along with other program options. A short discussion is also provided on waste audits; while not a major recycling diversion program they can be an effective component in planning or evaluating existing and new program options.

Among the most common approaches for commercial recycling, utilized across the US, are the following:

- New construction (infrastructure) requirements
- Refuse hauler recycling service
- Owner/Operator commercial recycling service
- Processing facility
- Buy-back centers/targeted materials programs
- Waste audits

These methods are typically complimented by education and promotional programs. While increased education (behavior change) may produce some increase in commercial recycling (above the status quo), if major increases in commercial recycling is a goal of the Solid Waste Plan 2040, then some form of market regulation or mandated programs will likely be required.

Product Stewardship and extended producer responsibility, discussed in more detail in a separate paper, can also compliment a comprehensive commercial recycling program.

Expanded commercial recycling programs may need to involve more than one of the options presented below to maximize diversion and address inherent limitations with any one program type.

**New Construction (Infrastructure) Requirements.** One of the challenges with commercial recycling is the lack of space and infrastructure available to accommodate recycling in existing facilities. Many existing commercial establishments and multi-family complexes have limited or no additional space for recycling containers/bins. One approach (emerging policy in some locations) is to require new commercial and multi-family building projects, or major renovations, to include infrastructure (not limited to space) for collection, storage and handling of recyclable materials as part of the design and construction. The owner would need to obtain approval of the recycling infrastructure when submitting their building permit application.

One such concept would dictate that the amount of space to be provided for the storage and collection of recyclable materials must be as large as the amount of space provided for trash, is adequate for the maintenance and servicing of recycling containers, and is designed to accommodate collection and storage containers, consistent with the recyclable materials generated. The recycling area(s) must also be as accessible and convenient to tenants/multi-family residents and collection vehicles as the trash storage and collection area(s). A second concept is to establish minimum space requirement based on building size categories.

Some examples of recycling infrastructure requirements in new and remodeled commercial buildings include:

- City of Broomfield, Colorado requires “all new and significantly remodeled structures where refuse is generated...shall provide adequate space for the collection and storage of refuse and recyclable materials.” Significantly remodeled is defined as 50 percent or greater of structure market value prior to remodel. (Source: [http://www.colocode.com/broomfield/title17.htm#chapter17\\_34](http://www.colocode.com/broomfield/title17.htm#chapter17_34), retrieved on 8/21/2012)
- Municipal code in SeaTac, Washington requires that new construction incorporates the space required for on-site storage of recyclables prior to collection. The recycling space requirements applies to both residential (including multi-family) and non-residential buildings. (Source: <http://www.codepublishing.com/wa/seatac/html/Seatac13/Seatac13250.html>, retrieved on 08/21/2012)
- The state of California requires new commercial and multi-family developments of 5 units or more, or remodels that add 30 percent or more to the existing floor area to include adequate, accessible, and convenient areas for collecting and loading recyclables. Requirements have been incorporated into the California Building Code.

**Refuse Hauler Recycling Service.** This approach is based on market regulation (mandates established by law, regulations or ordinances). Market regulation is described in the technical paper of Residential Recycling and Diversion. Reference should be made to the discussions under the paper on Residential Recycling and Diversion for more detailed discussion on options such as: free market (with minimum level of service); franchising (exclusive or non-exclusive); and contract. The following discussion is generally based on continuing the free market approach to providing refuse collection services. The current commercial recycling system in the Planning Area is totally voluntary and commercial refuse collection is done on a free market basis.

There are two sub-options to this approach:

- The service is offered, but the refuse generator can choose to use the program.
- The service must be provided to all refuse generators.

Under the first sub-option approach all licensed refuse haulers are required to provide (or offer) all commercial customers (businesses, industry, institutions, and multi-family units) a convenient opportunity (minimum level of service) to recycle. A licensing program for source separated recyclables haulers may also be necessary to effectively implement and enforce such an option. Under the continued free market approach to refuse collection, it would be the responsibility of the refuse hauling services to determine how to organize and structure the recyclables collection program (under guidelines provided through ordinance and hauler license requirements). Commercial recycling ordinance(s) can be more complicated than residential ordinances, but would typically define such aspects as materials to be collected and frequency of collection. Refuse haulers could be allowed to subcontract the recycling service to other licensed haulers if they do not wish to provide the service themselves. Haulers would target a minimum number of materials specified in the ordinance and/or based on business classifications. Ordinances can also be established to determine how compensation to the refuse hauler might be structured (see discussion in the paper on Recycling Incentives for discussion on single fee systems and pay-as-you-throw concepts to incentivize recycling).

Commercial collection is often presented to businesses as a two-dumpster concept – one for waste and one for select recyclables; in certain applications food waste collection could be the second cart/dumpster or the third. Under the voluntary participation approach all businesses, industry, institutions, and multi-family units are offered recycling services, along with recycling information, but the residents and business would determine whether or not and to what extent they would participate.

With a hauler required service ordinance (second sub-option), all licensed haulers are required to provide minimum recycling services. This concept is more closely aligned with single service fee provisions (see Recycling Incentives) where refuse haulers would be free to set their own rates. Similar to the existing free market system, businesses, industries, institutions and multi-family residences could choose their service provider, knowing that the fee being set includes a minimum level of recycling service

This option places the burden of recycling services on the private haulers rather than on the businesses; thus a limited number of private haulers are regulated instead of the multitude of businesses, industries, institutions and multi-family residences generating commercial waste.

Some examples of hauler required commercial recycling service and ordinances include:

- Starting in January 1, 2012, the City of Urbana, Illinois required all haulers operating in Urbana to offer recycling services to their business and commercial customers. Haulers must target specified list of recyclables per the ordinance and set their own recycling collection rates. (Source: <http://urbanaininois.us/residents/recycling-program-ucycle/commercial-recycling>, retrieved on 08/21/2012)
- In Kane County, Illinois, hauler licensing requirements for material separation plans are combined with the commercial establishments' recyclable materials separation requirements for complete generator and hauler participation. (Source: <http://www.countyofkane.org/Documents/Recycling/licenseOrdinance95-157.pdf>, retrieved on 08/21/2012)
- As part of its hauler permitting requirements, all waste haulers in City of Boston must offer recycling collection service to commercial solid waste customers. This includes providing all commercial customers informational and educational materials detailing recycling service. (Source : [http://www.cityofboston.gov/Images\\_Documents/Commercial%20Trash%20Hauler%20Ordinance\\_tcm3-10117.pdf](http://www.cityofboston.gov/Images_Documents/Commercial%20Trash%20Hauler%20Ordinance_tcm3-10117.pdf), retrieved on 08/21/2012)

**Owner/Operator Commercial Recycling Service.** Under an owner/operator commercial recycling service ordinances, all building owners/operators would be required (mandated by law(s)) to provide a minimum level of recycling services for their tenants or residents (multi-family). Owners or operators (property managers) of commercial and multi-family buildings would sign up with licensed refuse or recyclables hauler for recycling services. Participation by the tenants and residents would be voluntary (see discussion under Recycling Incentives on mandatory recycling). Much like the refuse hauler provided recycling option, regulations would typically define such aspects minimum program standards, materials to be collected and frequency of collection.

As the findings from the City's apartment recycling study discovered, multi-family units have unique issues related to commercial recycling. Among the issues are that individual housing units, within multi-family complexes, also have limited space within the apartment unit, which may deter a resident from sorting and storing their recyclables prior to taking it to a recycling storage area.

Waste diversion from institutions can be another area of special focus. Some institutions are characterized as having high percentages of paper and food within their waste streams.

Some examples of voluntary and mandated commercial building recycling plans/programs include:

- In Pittsburg, Pennsylvania, "The operator of every business establishment [and apartment over 6 units] located within the City of Pittsburgh must establish a program to recycle high grade office paper, plastic bottles, corrugated cardboard, aluminum cans and leaf waste, where applicable." (Source: Pittsburgh Public Works, "Recycling," <http://www.city.pittsburgh.pa.us/pw/html/recycling.html> retrieved on 09/10/2009)
- Minneapolis commercial and business property owners are required to offer regular recycling collection (at least twice per month) for targeted recyclable materials, including a written recycling plan (submitted to City) and written information/instructions for tenants and/or employees (Source: City of Minneapolis, Commercial recycling ordinance, <http://www.minneapolismn.gov/regservices/fire/WCMS1P-082517>, retrieved on 08/21/2012)
- Lee County, Florida requires "that all businesses and multi-family properties in unincorporated Lee County must provide sufficient on-site recycling services." Recycling guidelines in the ordinance identify the standards for commercial and multi-family recycling collection, in addition to C&D recycling. (Source: [http://www3.leeqov.com/solidwaste/Autopage\\_T1\\_R89.htm](http://www3.leeqov.com/solidwaste/Autopage_T1_R89.htm), retrieved 08/21/2012)
- Peoria County, Illinois requires all businesses in the county to recycle two of their most quantified recyclables. The ordinance also includes quarterly reporting requirements. (Source: <http://www.peoriacounty.org/recycle/cro/>, retrieved on 08/21/2012)

**Processing Facility.** Post-disposal processing of the entire commercial waste stream has many of the same extensive costs and limitations as processing mixed residential waste. However, by targeting waste loads with concentrated volumes of select recyclable materials, it is possible to more cost effectively process (select loads of) commercial waste. This requires special facilities (material recovery facility(s) or transfer station(s)) which are equipped to handle this type of task; currently no such facilities have obtained a permit to operate in the Planning Area, however a permit application from a local processor has been submitted to NDEQ. Processing could be as simple as sorting on the tipping floor or more mechanized with conveyors, sort stations, and magnets. Such facilities would also need to be sized to process and store the recovered source-separated recyclables and have the ability to ship them to market. Because such facilities would target post-disposal recovery of materials their diversion

rates might not be as high as an efficient source separated program. Convenient location and discounted tip fees and/or buy-back (revenue shares) could be used to encourage waste generators and haulers to use these facilities.

**Buy-Back Centers/Targeted Materials Programs.** Buy-back centers typically pay users for materials brought to the center, based on weight and percentage of commodity market prices. By themselves, these do not achieve high levels of commercial diversion but do provide a financial motivation to divert select materials. Buy-back centers are commonly a retail business that target select materials, such as scrap yard that buys metals by type (e.g., aluminum, brass, ferrous). Buy-back centers have also been reviewed under discussion of Source Reduction, as a means of preventing materials from entering the waste management system.

Waste exchanges and targeted materials diversion programs generally focus on non-traditional materials that are more difficult to collect and/or recycle. Keep Nebraska Beautiful currently operates the Nebraska Materials Exchange Program, which focuses on schools and businesses. Expanding material reuse centers and waste exchanges (public/private partnerships) have generally been discussed in technical paper related to Source Reduction. Targeted commercial programs could include specific materials such as OCC, plastics (bags, film, and manufacturing scrap), wood pallets, foods, and select paper fibers. Targeting greater diversion of foods and fibers (i.e., organics) is further described and evaluated in the Organics Waste Diversion (Composting) paper.

Buy-back centers, material reuse/waste exchanges, and targeted materials programs are not further evaluated in this paper.

**Waste Audits.** The waste audit is often one of the first steps in effectively starting a commercial recycling program within a business. A waste audit is a formal, structured process used to help quantify the amount and types of waste being generated by an organization. There are a number of different ways to conduct a waste audit, such as visual waste audits, waste characterization (actual waste sorts), desktop audits and combinations (i.e. visual and desktop analysis). Information from audits can help businesses (and institutions) identify current waste generation practices and opportunities/strategies for improving their waste management and diversion system; waste audits typically focus on waste (source) reduction, increasing recycling, and reducing quantity of wastes disposed through process changes.

Waste audits can be provided by contract service, non-profits (such as currently provided by WasteCap of Nebraska), public-sponsored programs, or internal self-audits. There have been many resources and guidance documents developed for businesses and institutions on how to conduct their own waste audits.

Waste audits are not further evaluated in this paper.

## **Options Evaluation**

The general issues associated with commercial recycling programs are:

- convenience
- participation and diversion levels
- costs of services and funding
- available processing capacity (affect on existing service providers)
- implementation considerations
- policy and ordinance changes
- enforcement

The policy/ordinance changes, enforcement, and other implementation considerations are of particular relevance for a universal available commercial recycling collection (either, refuse

hauler required or building owner/operator provided), given the current voluntary subscription recycling system and free market refuse collection. The commercial recycling system options vary significantly between businesses, industries, institutions and multi-family residences. Any programs implemented will need to be flexible, recognize the differences between these generators, and obtain business community and institutional support to be successful.

Commercial recycling collection can provide the following benefits:

- Divert large quantities of recyclable materials for relatively low cost per ton.
- Potentially generate positive cash flow for some businesses with large volumes of select recyclables (papers, plastics, metals).

Implementation of commercial recycling programs can face the following challenges:

- Limited space (e.g., for additional dumpsters or carts) and infrastructure to accommodate recycling.
- Initial investment costs are needed to provide the necessary infrastructure.
- Certain commercial waste generators and private haulers may be resistant to change, especially if they have the potential to result in a net increased cost (internal collection, storage, recyclables collection).

Costs of recycling services to commercial, industrial, institutional, and multi-family (apartments) customers are highly variable and a function of the program and materials handled. Cost will need to be a consideration in any recommendation that might include additional commercial recycling programs in the Solid Waste Plan 2040.

Consistent with the guiding evaluation criteria developed for use in the Solid Waste Plan 2040, the commercial recycling options have been further evaluated based on the considerations shown in Table 3. To significantly increase diversion of waste from businesses, industries, institutions and multi-family residences, through recycling, some form of expanded, City-wide, universally available, recycling program would likely be necessary. Such a program(s) would need to be structured to maximize participation, diversion quantities and program effectiveness.

**Table 3 – Options Evaluation**

<b>Evaluation Criteria</b>	<b>Refuse Hauler Recycling Service</b>	<b>Owner/Operator Commercial Recycling Service</b>	<b>Processing Facility</b>
<b>Waste Reduction/ Diversion</b>	<p>Opportunities are believed to exist for large volume diversion with significant increases in commercial recycling.</p> <p>Materials diverted can vary by business; traditional material markets (paper fiber and metals) are well established.</p> <p>Participation rates and diversion would increase substantially with convenient, universally-available recyclables collection program.</p>	<p>Opportunities are believed to exist for large volume diversion with significant increases in commercial recycling.</p> <p>Materials diverted can vary by business; traditional material markets (paper fiber and metals) are well established.</p> <p>Participation rates and diversion would increase substantially with convenient, universally-available recyclables collection program.</p>	<p>Can be effective in capturing materials from post-disposal waste stream; however, recovery rates diminish and cost increase as the percentages of available recyclables in the waste decrease.</p> <p>When implemented as a part of a transfer station it could be used to both reduce quantities sent to landfills and reduce exports.</p> <p>As a stand-alone option it would not be anticipated to achieve the same degree of diversion as pre-disposal source separated recycling options.</p>
<b>Technical Requirements</b>	<p>May provide added business opportunities for existing waste and recycling service providers. Under a free market collection system structure haulers would continue to compete for added service opportunities.</p> <p>This will require significant infrastructure at certain businesses, industries, institutions and multi-family residences to provide for added drop-off storage and handling.</p> <p>Ordinance will need to be carefully</p>	<p>May provide added business opportunities for existing waste and recycling service providers. Under a free market collection system structure haulers would continue to compete for added service opportunities.</p> <p>This will require significant infrastructure at certain businesses, industries, institutions and multi-family residences to provide for added drop-off storage and handling.</p> <p>Ordinance will need to be carefully</p>	<p>This may require new construction. Post-disposal processing may not be compatible with existing processing centers and existing transfer station is not designed, equipped or permitted to provide this type of sorting.</p> <p>Can be designed to be compatible with the other program options and flexible in handling select mixed commercial loads.</p> <p>Risk that private haulers will not utilize such a facility(s) unless conveniently located and provides</p>

<b>Evaluation Criteria</b>	<b>Refuse Hauler Recycling Service</b>	<b>Owner/Operator Commercial Recycling Service</b>	<b>Processing Facility</b>
	<p>constructed to be flexible, optimize performance and be compatible with the diversity of businesses, industries, institutions and multi-family residences (minimize risk of program failure).</p> <p>Existing recycling processing capacity will need to be evaluated for ability to process greater quantities.</p> <p>Expanded recycling is viewed as compatible with existing operations.</p> <p>Risks may exist with added costs, resistance to change, and compatibility with existing infrastructure.</p>	<p>constructed to be flexible, optimize performance and be compatible with the diversity of businesses, industries, institutions and multi-family residences (minimize risk of program failure).</p> <p>Existing recycling processing capacity will need to be evaluated for ability to process greater quantities.</p> <p>Expanded recycling is viewed as compatible with existing operations.</p> <p>Risks may exist with added costs, resistance to change, and compatibility with existing infrastructure.</p> <p>New construction standards will increase building construction costs which could meet with resistance for some project developers.</p>	<p>financial incentive (i.e. tip fee competitive with alternate drop-off facilities - landfill).</p>
<b>Environmental Impact</b>	<p>Provides opportunity to significantly divert recyclable materials which conserves resources and reduces greenhouse gas emissions.</p> <p>Would be compatible with other programs targeting environmental protection and reduction in waste toxicity.</p>	<p>Provides opportunity to significantly divert recyclable materials which conserves resources and reduces greenhouse gas emissions.</p> <p>Would be compatible with other programs targeting environmental protection and reduction in waste toxicity.</p> <p>Developing structured recycling plans and designing recycling bin</p>	<p>Provides opportunity to divert recyclable materials which conserves resources and reduces greenhouse gas emissions.</p> <p>Would be compatible with other programs targeting environmental protection and reduction in waste toxicity.</p> <p>Depending upon location, may reduce collection vehicle emissions</p>

Evaluation Criteria	Refuse Hauler Recycling Service	Owner/Operator Commercial Recycling Service	Processing Facility
		space would need to address impacts to water quality, health and safety.	by reducing distance than the drop-off/disposal site.  Does not require significantly more collection vehicles on the streets which can have a health and safety benefit.
<b>Economics</b>	<p>The costs of added commercial recycling would be borne by program participants.</p> <p>Reduction in refuse collection (frequency and/or bin size) may help offset recycling costs.</p> <p>Will require added infrastructure at participating commercial establishments and operating costs to implement and maintain.</p> <p>Increases in material recycling and processing may create some economic development opportunities.</p> <p>Assuming a continuation of existing free market collection systems, it does not rely upon government funding to implement or sustain a program.</p>	<p>The costs of added recycling service would be borne by building tenants/ program participants.</p> <p>Reduction in refuse collection (frequency and/or bin size) may help offset recycling costs.</p> <p>Will require added infrastructure in commercial establishments and operating costs to implement and maintain.</p> <p>Increases in material recycling and processing may create some economic development opportunities.</p> <p>Designing recycling space (bin areas) into new construction has the potential to increase construction costs.</p> <p>Will require more governmental costs than refuse hauler provided systems to review plans, and monitor and enforce.</p> <p>Assuming a continuation of existing</p>	<p>Requires capital investment and funding for land purchase, design, and construction costs. Requires commitment to operating and maintenance costs; processing facility alone is not considered a net revenue generator.</p> <p>Tip fee would need to be competitive with competing options (e.g., haul to and disposal at a landfill).</p> <p>Combing select load processing/recovery with a transfer station may be cost effective, but as a stand-alone option would not optimize diversion.</p> <p>NDEQ grants may be possible funding source for a portion of the capital project associated with recycling.</p>

Evaluation Criteria	Refuse Hauler Recycling Service	Owner/Operator Commercial Recycling Service	Processing Facility
		free market collection systems, it does not rely upon government funding to implement or sustain.	
<b>Implementation Viability</b>	<p>Requires ordinance and changes to LMC, including haulers licensing requirements.</p> <p>Some businesses, industries, institutions and multi-family residences as well as refuse haulers may resist change.</p> <p>Minimum service levels would need to reflect differences in various businesses, industries, institutions and multi-family residences.</p> <p>Will require cooperation of commercial waste generators and refuse haulers to establish a system that is socially/politically acceptable.</p> <p>Policy changes will require time for development and approval. Parties affected will need reasonable time frame for compliance.</p> <p>Land and siting may be a consideration if additional processing capacity is required.</p> <p>Not a new technology and examples of successful implementation are available.</p> <p>Single services fees may need to be</p>	<p>Requires ordinances and change to LMC to mandate owner/operator provided program.</p> <p>Some businesses, industries, institutions and multi-family residences as well as building developers and refuse haulers may resist change.</p> <p>Minimum service levels would need to reflect differences in various businesses, industries, institutions and multi-family residences.</p> <p>Will require cooperation of commercial waste generators and refuse haulers to establish a system that is socially/politically acceptable.</p> <p>Land and siting may be a consideration if additional processing capacity is required.</p> <p>Not all existing buildings may be able to comply, depending upon space and infrastructure available. Exemptions may need to be defined.</p> <p>Policy changes will require time for development and approval. Parties affected will need reasonable time</p>	<p>Suitable and permitable site(s) is required. One option may be co-located near other City facilities. Siting new solid waste facilities can be challenging and sometimes controversial.</p> <p>May require modification to LMC and legal/ financial incentive to direct collected recyclables to new facility.</p> <p>Anticipated to require NDEQ permit.</p> <p>Not a new technology and examples of successful implementation are available.</p>

<b>Evaluation Criteria</b>	<b>Refuse Hauler Recycling Service</b>	<b>Owner/Operator Commercial Recycling Service</b>	<b>Processing Facility</b>
	considered to ensure maximum participation.	frame for compliance. Governmental assistance and enforcement will be necessary to assure successful program.	

## Relationship to Guiding Principles and Goals

The current commercial recycling programs of voluntary subscription recyclables collection, public (residential) drop-off facilities, buyback centers, corporate internal recycling, waste audits and education outreach involves public/private partnerships and provides opportunities to engage the commercial waste generators in diverting materials to recycling. However, the limited extent of such programs suggests that there are greater diversion opportunities available. Businesses, industries, institutions and multi-family residences likely provide the greatest opportunity for diversion of recyclables. As it relates to the Guiding Principles and Goals of the Solid Waste Plan 2040, the possibility of expanding commercial recycling is directly applicable, as further noted below.

- **Emphasize the waste management hierarchy:** Recycling is one of the most preferred waste management methods in the hierarchy (immediately after reduce and reuse) in that it places maximum emphasis on options to recover materials and recycle them into new products. Current programs are compatible with this hierarchy. To increase recycling above the status quo, the convenience and mandate of a City-wide, universally-provided recycling collection program (through refuse hauler or building owner/operators) should result in significantly higher level of commercial recyclables diversion.
- **Encourage public/private partnerships:** The current system of recycling involves both public and private efforts, including subscription recyclables collection provided by private firms, private recycling processing centers, City provided drop-off centers (for residential recyclables), City provided education and promotional outreach, and private buy-back centers. If City-wide (universally available) commercial recycling collection programs are selected for implementation it is expected that they will be developed with private parties providing collection and processing services. Services by non-profits, privates, and public/private partnership such as strategic multi-material drop-off facilities, buyback centers, special materials take-backs, and waste audits are expected to continue and complement any decision to implement an expanded commercial recycling program.
- **Ensure sufficient system capacity:** System capacity for commercial recycling involves space (infrastructure) at the waste generator facility to accommodate recyclables collection and storage. Some existing apartment complexes, commercial buildings/businesses, and institutions may have limited or insufficient space for expanded recycling bins. New building construction, through ordinances, could be required to provide the space for recycling infrastructure. Available processing capacity may need to be evaluated as part of any program that significantly expands recycling diversion rates (residential or commercial) to determine the need for additional processing capacity and facilities.
- **Engage the community:** Any expanded commercial recyclables collection program would need to engage the residents and businesses to encourage them to divert more recyclables from disposal. Within the Planning Area 21 percent of residents are estimated to live in multi-family dwellings in 2010. The City's recently completed pilot study to evaluate recycling education alternatives, specific to multi-family/apartment residents, suggests residents feel recycling is important, but do not recycle because they do not have space or it is not convenient. Commercial recycling opportunities in the work place and in schools engage the community within all aspects of their life. The City is also home to a large university student population; engaging the student body in

recycling not only increases diversion, but may provide longer lasting behavior changes that can extend beyond the borders of the Planning Area. Development of a commercial recycling program and related ordinances will need to engage the business community and private haulers to develop a viable and enforceable program. To optimize success of an expanded commercial recycling program will also require education (behavior change) to encourage and sustain participation.

- **Embrace sustainable principles:** Maximizing recovery of materials and recycling into new products recognizes that waste is not inevitable and discarded materials are potentially valuable resources.

## Summary

Recycling turns materials that would otherwise become waste into valuable resources. It also reduces greenhouse gas emissions and conserves space in landfills. The City supports and promotes public and private recycling efforts through its website and by providing a wide array of services. Commercial recycling is a largely unregulated business. The number of waste haulers providing commercial recycling services and participation levels are not known; while data is limited on commercial recycling rates, using information voluntarily provided to the City it was estimated that the current level of commercial recycling may be approximately 18 percent.

To significantly increase diversion of commercial waste, through recycling, will likely require some form of market regulation or mandated program (e.g., minimum levels of service through refuse hauler or building owner/operators). Market regulation refers to the establishment of requirements for services or that programs operate under a set of rules (regulations) established by the community.

Focusing on the commercial waste stream for the collection of recyclables can dramatically increase diversion. High quality, source separated recyclables (papers, metals and plastics) can often be obtained from commercial waste generation sources.

Commercial recycling program options can take many forms and will need to be tailored to the specific opportunities and needs of a given commercial waste generator. This is one factor that makes the concept of commercial recycling potentially more complex than residential recycling. Commercial recycling programs will need to adapt to the differences in types of business, business infrastructures, participants, program/services, and available/targeted materials. The preferred method for any given community will be a function of community desires, costs, diversion goals, public and institutional support, and implementation processes. The most significant impediments include the lack of convenience, lack of necessary infrastructure (space) and anticipated higher costs for services.

Among the most common approaches for increasing commercial recycling/diversion rates, utilized by various communities across the U.S., are the following:

- New construction (infrastructure) requirements
- Refuse hauler recycling service
- Owner/Operator commercial recycling service
- Processing facility

These methods are typically complimented by education and promotional programs.

There are many program options available, all of which are essentially consistent with the Solid Waste Plan 2040 guiding principles and the waste management hierarchy. Of the expanded program options available, City-wide (universally available – refuse hauler or building owner/operator provide) programs appear to provide the greatest opportunity to maximize

commercial recycling (rates and quantities) and minimize landfill disposal of solid waste. If the Solid Waste Plan 2040 incorporates universally available, City-wide commercial recycling, the City will need to evaluate minimum levels of service, and how to fund, implement and enforce such services.

## Appendices



## Appendix 1

# Final Report: Apartment Recycling Pilot Project

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June 2012

## Executive Summary

Between mid-March and early June of 2012, The City of Lincoln Recycling Office underwent a pilot study to evaluate recycling education alternatives. The goal of the project was to determine which methods for education improve resident recycling rates and general knowledge about recycling. Letters, posters, brochures, flyers, and postcards were sent to residents detailing the location of drop off sites, what items can be recycled, how to set up a simple and convenient recycling system in an apartment, and the local benefits of recycling.

Four apartment complexes participated in three education and outreach alternatives. As part of Alternative A, residents of Lexington Ridge and Sunridge Apartments received educational material through either emails or hard copies. For Alternative B, residents at The Lodge Apartments were given hard copies of the same educational material as well as re-usable laminate bags. Accompanied by instructions, the bags could be used to sort, store, and transport recycling to the nearest drop-off site. Alternative C examined Holmes Lake Apartments, an apartment building with a recycling room on each floor of the building. Hard copies of educational material were distributed to these residents. To analyze the outcomes of our education effort, pre and post project surveys were distributed to all residents in the study. The post survey had drastically lower participation at all locations and was a major limitation in our study.

The pilot project resulted in many useful observations and recommendations for further analysis. First, educational materials are successful for improving the knowledge of those who already recycle with existing infrastructure. Improving the convenience of recycling services will have a much greater effect than providing educational material alone. The main body of this report also elaborates on observations that 1) residents feel recycling is important 2) few residents use the City drop-off sites, 3) residents would value on-site recycling containers, 4) residents who do not think recycling is important will still recycle if it is sufficiently convenient.

The main recommendations resulting from this project is that there should be an ongoing effort to increase the recycling rate of apartment dwellers. A survey of apartment managers and the Solid Waste Management Plan update planning process are two potential tools. Specific actions are to 1) facilitate discussion and recycling training for property managers as opposed to the individual tenant 2) utilize the existing educational materials from the pilot project to create education packets 3) examine the issues and opportunities with on-site collection containers.

## Appendix 1

### I. Purpose of the Project

Residents of multi family dwelling units typically underuse recycling services. The trend for lower recycling rates occurs in many communities around the US due to a variety of challenges. First, curbside collection is generally not feasible due to the building and site characteristics of multifamily dwelling units. Second, due to space restrictions and inconvenience, very few apartment dwellers will store and transport their recycling to a local drop off site. In Lincoln, apartment dwellers represent a substantial portion of the population. The 2010 Census indicates that renter occupied housing units account for 41.4% of Lincoln's population, or approximately 90,173 people<sup>1</sup>. Educational programs which improve the recycling rates within this population can significantly impact overall waste diversion for the City. As such, long range planning of recycling programs will need to address the needs of apartment dwellers. With grant funding from the Nebraska Department of Environmental Quality, the Recycling Office implemented a pilot program to study a variety of education and outreach alternatives for multi-family dwelling units.

### II. Goals

The overall goal of the project was to evaluate alternative approaches for multi family dwelling unit recycling education.

- 1) Determine which method/s of public education and outreach are most successful for improving recycling rates among apartment dwellers.
- 2) Determine which method/s of public education and outreach improve knowledge of recycling services in community.
- 3) Discover and document any new factors, strengths, or barriers to apartment recycling that can guide future studies or programs pertaining to apartment recycling.

### III. Project Design

The first phase of the project was to review previous research and case studies of multifamily recycling projects. An important source of information came from EPA funded studies including "Multifamily Recycling: A National Study" (2001) and "Complex Recycling Issues: Strategies for Record-Setting Waste Reduction in Multi-Family Dwellings (1999).

Next, a variety of apartment management companies were contacted to gauge their interest in participating in education outreach for their tenants. These initial inquiries resulted in overall positive feedback and a list of possible apartment complexes to include. Four apartment complexes were chosen to participate in the education and outreach study. These apartments were chosen based on the interest of management in participating, proximity to a recycling drop-off site, and number of residents. Others were chosen for their unique qualities such as a database of residents' email addresses, and on-site recycling.

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<sup>1</sup> Apartment units that are duplex, tri-plex and four-plex may have access to recycling services. As such, this figure may be somewhat over-estimated.

## Appendix 1

The educational materials were designed to communicate a variety of important issues for apartment dwellers:

- What items can be recycled
- How to set up a simple and convenient recycling system in an apartment
- Directions to the nearest drop-off site
- The importance of recycling to support the local environment and economy

These messages were distributed through the use of letters, flyers, brochures and postcards<sup>2</sup>. The recycling office worked with a graphic designer at the Citizen Information Center to design interesting and visually appealing products.

Three alternative for recycling education and outreach were implemented.

**Alternative A: Lexington Ridge and Sunridge Apartments.** Distribute the series of educational material to residents of two different apartment complexes. One group will receive the information through e-mail, the other will receive hard copies delivered to their door.

**Alternative B: The Lodge Apartments.** Distribute the same educational materials with the added incentive of re-usable laminate bags. The bags are ideal for storing recyclables conveniently with limited space and can also be used to transport the material to the nearest drop-off site. Each unit will receive three bags labeled “Plastic Containers #1-#5,” “Cans and Glass Bottles,” and “Cardboard & Newspaper.” In addition to the bags, residents were given instructions and tips on how to use the bags.

**Alternative C: Holmes Lake Apartments.** Preliminary research indicated that some apartment buildings in Lincoln already have an established on-site recycling system. At Holmes Lake Apartments, each floor of the building has a designated garbage/recycling room with a separate chute for trash, paper, plastic, and cans. This type of building was included in the study to see how education and outreach affects residents with highly convenient recycling options. The apartment building with an existing recycling infrastructure will receive similar educational materials as those in Alternative A&B; however, will put a stronger emphasis on the items that their system collects, and less of an emphasis on the community drop off locations.

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<sup>2</sup> An example of the educational materials used in this project can be found at the end of this document.

## Appendix 1

Figure 1. Pilot Study Participants

Apartment	Address	# of Units	Alternative
Lexington Ridge Apartments	8600 Lexington Ave Lincoln, NE 68505	216	A) Education- Emails
Sun Ridge Apartments	8311 Sunridge Road Lincoln, NE 68505	156	A) Education- Door to Door (City Staff)
The Lodge Apartment	4600 Briarpark Drive Lincoln, NE 68516	304	B) Education and Bags Door to Door (Apartment Managers)
Holmes Lake Apartments	7100 Holmes Park Road Lincoln, NE 68506	144	C) Education/Existing Recycling Door to Door (Apartment Managers)

### IV. Methods to Analyze Outcomes

#### Pre and Post Surveys

Pre and post surveys attached to informational letters were used to obtain information about apartment recycling demographics and the effectiveness of the various elements of our education projects. There were some limitations with this approach recognized from the onset. First, that a lack of participation would make analysis difficult. Second, residents who are already recycling may be more likely to respond which may skew the results of the sample.

It was important to provide a return process that was simple and easy for residents, depending on the apartment characteristics. At Lexington Ridge Apartments, surveys were delivered by email using Survey Monkey ®. At Sunridge Apartments, residents were instructed to return the completed survey to an envelope hanging on a bulletin in the foyer of their building. At the Lodge Apartments and Holmes Lake Apartments residents were instructed to return surveys to the main office or the afterhours drop box.

#### Visual Observations of Waste Stream

As a supplement to the surveys, attempts were made to track changes in the waste streams at each of the apartment buildings. Verbal agreements were made with each of the waste haulers at the different apartments to record the amount of waste in each of the containers intermittently throughout the project. One week worth of samples would be collected before the project, during the project, and after the project. Waste haulers were given worksheets which listed container numbers on the route and the extent to which they were full (quarter, half, three quarter, or full). We anticipated that this effort may be ineffective due to waste hauler participation, length of

## Appendix 1

study, and number of samples taken. However, this method was attempted to not only observe potential changes in the waste stream but to establish some data that may be useful for the apartment managers in the future.

### Results

#### Survey

The table below represents the overall themes and observations from the pre and post surveys. The pre-survey provided an acceptable response rate at three of the four apartment complexes. However, due to a collection of surveys that were lost in the mail at The Lodge, there were an insufficient number of returned surveys. In addition, the collected responses from the post survey were drastically reduced at all apartment complexes. For this reason the outcomes and recommendations are not based on statistically significant data but general observations. Original data from the pre and post surveys can be found at the end of this document.

Figure 2. Overview of Pre Survey Results

Sunridge	Lexington Ridge	The Lodge	Holmes Lake
<ul style="list-style-type: none"> <li>• 25% response rate</li> <li>• Most think recycling is important</li> <li>• 56% do not recycle, mostly because they do not have space or it isn't convenient</li> <li>• 80% of respondents between ages 18-35</li> </ul>	<ul style="list-style-type: none"> <li>• 17 % response rate</li> <li>• More than half think recycling is very important</li> <li>• 58% do not recycle, mostly because it isn't convenient or they do not have space</li> <li>• 83% of respondents are ages 18-35</li> </ul>	<ul style="list-style-type: none"> <li>• Due to lost surveys, results may not be relevant</li> <li>• Majority thinks recycling is very important</li> <li>• 73 % do not recycle mostly because of lack of space or it isn't convenient</li> <li>• Ages are equally distributed across the sample</li> </ul>	<ul style="list-style-type: none"> <li>• 42% response rate</li> <li>• Majority thinks recycling is very important</li> <li>• Those who do not think it is important are recyclers</li> <li>• 98% recycle on site</li> <li>• 85% of respondents are ages 50+</li> </ul>

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Figure 3. Overview of Post Survey Results

Sunridge	Lexinton Ridge	The Lodge	Holmes Lake
<ul style="list-style-type: none"> <li>• 2.5% response rate, drastic reduction from the pre-survey</li> <li>• 3 of the 4 respondents recycled prior to the project, knowledge was only somewhat improved</li> <li>• 3 out of 4 feels our project demonstrated that recycling is simple/convenient</li> <li>• All indicated they would recycle if there were containers on site</li> <li>• All respondents were female.</li> </ul>	<ul style="list-style-type: none"> <li>• 2% response rate</li> <li>• Respondents think recycling is important</li> <li>• The most useful types of information was the location of drop off sites</li> <li>• Most felt the project demonstrated that recycling is simple/convenient</li> <li>• Two respondents will recycle using the drop-off sites who did not recycle prior to the project</li> <li>• All would recycle if there were containers located on site</li> </ul>	<ul style="list-style-type: none"> <li>• 2.6 % response rate</li> <li>• Most think recycling is important</li> <li>• Half did not have better knowledge of recycling</li> <li>• Most thought the project demonstrated recycling is simple convenient</li> <li>• 75% will use the on-site container, many of which were previous recyclers</li> <li>• Most would not recycle if it were not available on-site</li> <li>• 63% used the three bag system</li> </ul>	<ul style="list-style-type: none"> <li>• 19% response rate, drastically reduced from the pre-survey</li> <li>• Majority still thinks recycling is very important</li> <li>• 70% now have a better knowledge of recycling</li> <li>• Most useful information was “what items are recyclable” and “how recycling affects our local environment and economy.”</li> <li>• 98% recycle on site</li> <li>• 41% would be highly unlikely to recycle if it were not available on-site</li> <li>• 93% of respondents are ages 50+</li> </ul>

### Waste Stream Assessments

We were unable to make substantial observations about changes in waste stream.<sup>3</sup> First, it was difficult to get the waste haulers to provide the data. In addition, as explained by one waste hauler, apartment dwellers represent a “migratory” population of people meaning that they create

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<sup>3</sup> The waste hauler at Lexington Ridge and Sunridge Apartments failed to provide any samples. At Holmes Lake the hauler claimed to have taken samples but they have not been received. In any case, with an incredible high recycling rate among residents at the start of the project, we expect that there were little to no changes in the waste stream to be observed. The hauler at The Lodge provided consistent tracking of waste containers; however, it is difficult to see any clear patterns over such short time duration of the project.

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high amounts of waste during their transitions in and out of apartments. This is especially true during the months of April, May, and June.

### V. Observations

One of the most useful outcomes of this project is that it created a baseline set of educational materials including brochures, flyers, postcards, posters, and letters that can be reused in the future with slight alteration. There were approximately 820 apartment units who were each contacted on five occasions with educational materials about recycling.

1. **Residents feel recycling is important.** Though some of the respondents previously recycled, many did not even though they thought it was important. This may suggest baseline attentiveness to recycling issues that can be further developed to increase the recycling rate of apartment dwellers. The key factor to accomplish this will be through making recycling more convenient.
2. **Very few residents currently use City drop-off sites.** At the apartment complexes that don't have on-site containers, recycling participation of the sample was between 27% and 42%. It is not likely that this is indicative of the entire population. More likely than not, those who already recycle were more likely to take the survey than those who don't. If our surveys captured a high number of those who already recycle, then true participation rates are likely lower.
3. **Education alone may not be enough to spur recycling rates.** Our study showed that most residents don't recycle because they think it is inconvenient. Many residents felt that our educational material communicated the convenience and ease of recycling but many others disagreed. This suggests that educational material can improve recycling habits and knowledge; however, education alone is not enough to spur new recycling. Educational materials may be more effective to supplement a recycling program that is viewed as convenient.
4. **Residents think they would use on-site recycling services.** There was a strong feeling among the pre survey comments that on-site containers would be valuable. Residents that returned the post survey all indicated that they would use on-site recycling containers. These containers address the convenience and space issue because recyclables can be conveniently deposited daily. During the course of the project, the Lodge Apartments installed a centrally located recycling container. According to the waste hauler, it has been mostly full on collection days.
5. **Residents who don't think recycling is important will still participate if it is highly convenient.** This was the case at Holmes Lake apartments, where residents have access to a trash/recycling room on each floor of the building. For these residents, the same amount of effort is required to remove trash as to remove recyclables. Apartment buildings can maximize the convenience of the recycling system by mimicking the system currently in place for trash removal.

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6. **The educational material should be diverse in its content, format, and distribution.** The educational material addressed a wide range of topics. There lacked a consensus among the surveys as to which information was the most useful. As such, educational materials should be broad in the types of information they convey. Apartment buildings lacking access to on-site containers found the locations to be useful information; however, they also marked that how to sort and store, the local effects of recycling, and information from the web were also useful. This project tried two different approaches for distribution. The use of emails over hard copies returned similar survey response rates but it is unclear if one method over the other was a more successful campaign tool. Using different layouts for educational materials may have been effective for reaching a broader audience. For residents who will not take the time to read a brochure cover to cover a small postcard can be a more effective tool. Distribution was an important component of the education aspect. Our project functioned as a campaign to broadcast the recycling message. It is possible that the number of materials sent in the time frame became bothersome to residents. A long term education project should aim to accommodate resident turnover without overwhelming the inboxes/doorways of residents.
7. **The use of bags to encourage recycling may be an effective tool.** Due to a small sample it is difficult to determine the effect that the use of bags had to increase recycling rates. The survey response rate was comparable to those complexes that did not receive reusable bags. The apartment complex that received reusable bags for recycling did contract with a their waste hauler to provide an on-site recycling station for their tenants. Property managers who offer on-site recycling may have some incentive to provide bags and instructions as part of move-in packets. The use of bags could help to keep units more organized and clean, and increase the volume of recyclables collected on site.
8. **There were multiple examples of enthusiasm from residents who previously recycled.** We received positive feedback about the need for recycling education from those residents who already recycled. There were also comments about the possibility of residents talking with their neighbors about how to recycle. This suggests that apartment managers may have some success with “recycling green teams” or “environmental captains” at their apartment complexes to assist with recycling education and monitoring on site.

## VI. Recommendations

There should be an ongoing effort to increase the recycling rate of apartment dwellers. The current planning effort to update the Solid Waste Management Plan represents an opportunity to assess a variety of issues, opportunities, and alternatives for apartment recycling. The pilot project has provided some data and background that may inform future progress towards apartment project recycling.

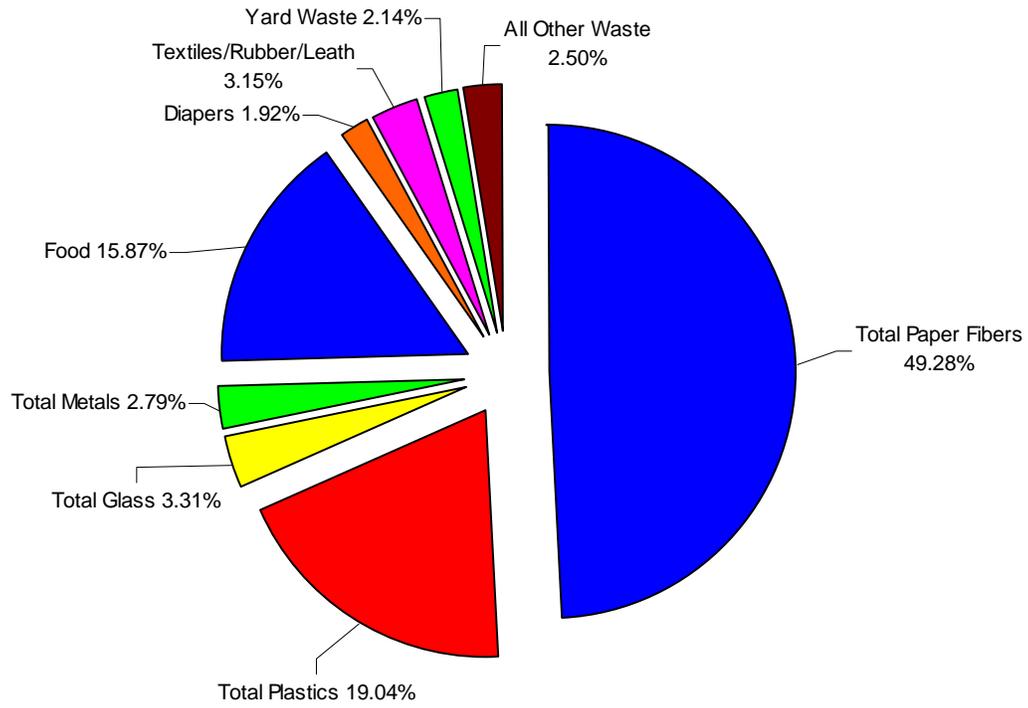
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1. **Facilitate discussion and recycling training for property managers as opposed to the individual tenant.** A survey that identifies the thoughts and concerns of property managers regarding recycling would be a useful tool. For example: Do they know if their current waste hauler offers recycling pick up? Is recycling a cost effective waste management option for them? Would the geographic layout of their buildings be conducive to an efficient drop/off pick up routine for recycling? Do their residents view access to recycling as an important amenity?
2. **Utilize the existing educational materials from the pilot project to create education packets.** For example, a template “resident welcome packet” could be provided to apartment managers. It would include a map of the recycling sites, lists of recyclable material, instructions on how to recycle in an apartment, and tips on why recycling benefits the community. These materials would be customized, printed, and distributed by apartment managers at their discretion.
3. **Examine the issues and opportunities with on-site collection containers.** A central observation from the project is that residents would like to use on-site containers. This approach improves convenience for residents without the large costs and renovation required to establish a recycling chute in the building. Apartment managers, such as those at the Lodge Apartments, may be willing to add recycling to their current waste collection if it is cost effective. Many communities have established ordinances which require apartment complexes over a certain number of units to provide recycling services to tenants. Further analysis should consider the feasibility of education and/or policy which results in on-site recycling containers at apartments.

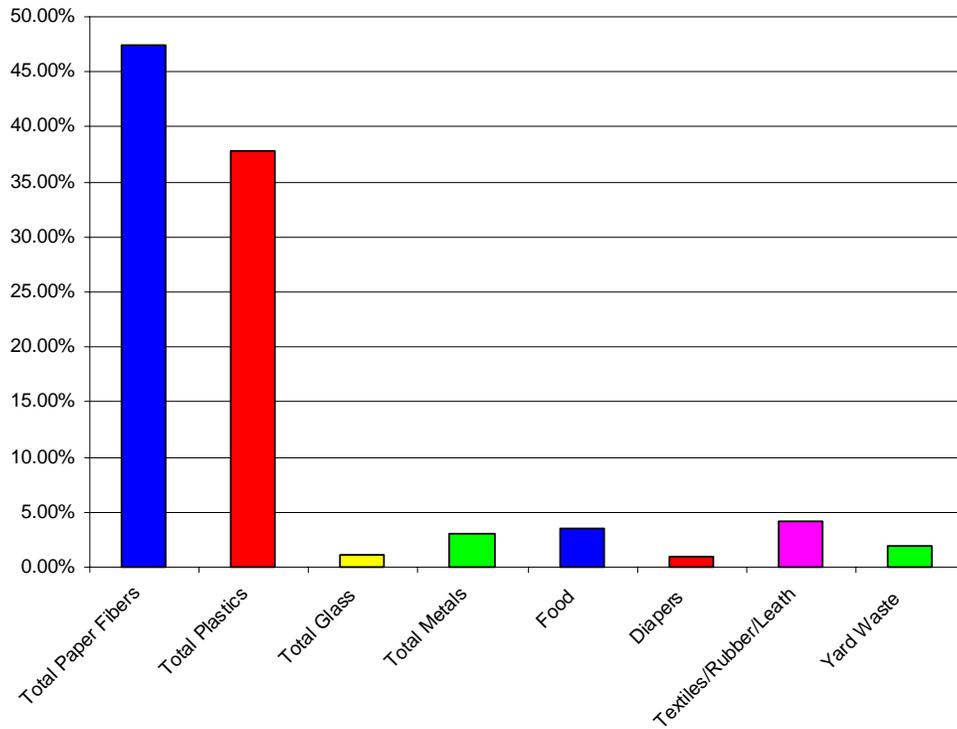
# APPENDIX 2

TABLE B.21  
COMMERCIAL WEIGHT DATA SUMMARY FOR THE BLUFF ROAD LANDFILL

Material Category/Component	Net Weight (pounds)	% of Material Category	% of Sorted Sample
Cardboard	3,407.96	31.91%	15.73%
Office Paper	1,188.83	11.13%	5.49%
Newsprint	839.80	7.86%	3.88%
Magazines	614.69	5.76%	2.84%
Paperboard/Liner Board	871.27	8.16%	4.02%
Mixed Paper	3,756.33	35.18%	17.34%
<b>TOTAL PAPER FIBERS</b>	<b>10,678.88</b>		<b>49.28%</b>
PET #1	656.19	15.90%	3.03%
HDPE #2	268.50	6.51%	1.24%
Other Numbered Containers	707.82	17.15%	3.27%
Plastic Film/Wrap/Bags	1,664.85	40.35%	7.68%
Other Plastics	828.81	20.09%	3.83%
<b>TOTAL PLASTICS</b>	<b>4,126.17</b>		<b>19.04%</b>
Clear Glass Containers	373.54	52.08%	1.72%
Brown Glass Containers	238.89	33.31%	1.10%
Green Glass Containers	73.83	10.29%	0.34%
Blue Glass Containers	4.24	0.59%	0.02%
Other Glass	26.74	3.73%	0.12%
<b>TOTAL GLASS</b>	<b>717.24</b>		<b>3.31%</b>
Aluminum Cans	192.38	31.81%	0.89%
Tin Cans	283.09	46.80%	1.31%
Other Aluminum	60.30	9.97%	0.28%
Other Tin	31.10	5.14%	0.14%
Other Mixed Metals	37.96	6.28%	0.18%
<b>TOTAL METALS</b>	<b>604.83</b>		<b>2.79%</b>
Food	3,437.95		15.87%
Diapers	415.67		1.92%
Textiles/Rubber/Leather	681.78		3.15%
Yard Waste	464.60		2.14%
Household Hazardous Waste	2.63		0.01%
Electronic Waste	78.40		0.36%
Dry-Cell Batteries	11.05		0.05%
Misc. C/D Waste	62.81		0.29%
Wood	53.54		0.25%
Empty Aerosol Cans	32.77		0.15%
Non-Distinct Waste	160.06		0.74%
Other Misc. Wastes	139.58		0.64%
<b>TOTAL WEIGHT OF SORTED SAMPLE</b>	<b>21,667.96</b>		<b>100.00%</b>



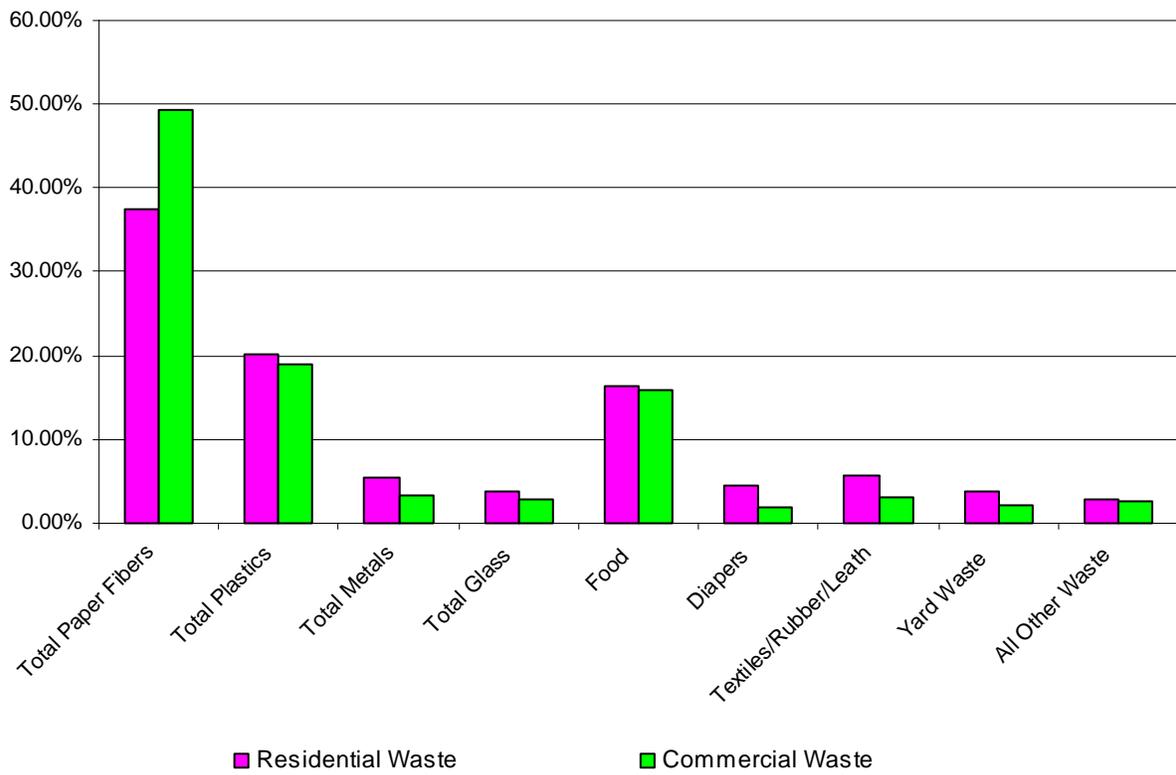
**CHART B.5**  
**DISTRIBUTION OF THE CONSOLIDATED COMMERCIAL**  
**WEIGHT DATA FOR BLUFF ROAD LANDFILL**



**CHART B.6**  
**DISTRIBUTION OF THE CONSOLIDATED COMMERCIAL**  
**VOLUME DATA FOR BLUFF ROAD LANDFILL**

**TABLE B.23  
COMPARISON OF THE CONSOLIDATED WEIGHT DATA FOR  
RESIDENTIAL AND COMMERCIAL SAMPLES AT THE BLUFF ROAD LANDFILL**

<b>CONSOLIDATED FIELD SORTING EVENTS (FALL 2007, WINTER 2008, SPRING 2008, AND SUMMER 2008)</b>		
<b>Material Category/Component</b>	<b>Percentage of the Net Weight of the Sorted Samples</b>	
	<b>Residential Waste Stream</b>	<b>Commercial Waste Stream</b>
Cardboard	1.50%	15.73%
Office Paper	3.99%	5.49%
Newsprint	6.72%	3.88%
Magazines	5.17%	2.84%
Paperboard/Liner Board	5.83%	4.02%
Mixed Paper	14.19%	17.34%
<b>TOTAL PAPER FIBERS</b>	<b>37.39%</b>	<b>49.28%</b>
PET #1	2.85%	3.03%
HDPE #2	1.88%	1.24%
Other Numbered Containers	3.00%	3.27%
Plastic Film/Wrap/Bags	7.71%	7.68%
Other Plastics	4.62%	3.83%
<b>TOTAL PLASTICS</b>	<b>20.06%</b>	<b>19.04%</b>
Clear Glass Containers	3.13%	1.72%
Brown Glass Containers	1.33%	1.10%
Green Glass Containers	0.68%	0.34%
Blue Glass Containers	0.01%	0.02%
Other Glass	0.20%	0.12%
<b>TOTAL GLASS</b>	<b>5.34%</b>	<b>3.31%</b>
Aluminum Cans	1.15%	0.89%
Tin Cans	1.85%	1.31%
Other Aluminum	0.31%	0.28%
Other Tin	0.15%	0.14%
Other Mixed Metals	0.28%	0.18%
<b>TOTAL METALS</b>	<b>3.74%</b>	<b>2.79%</b>
Food	16.38%	15.87%
Diapers	4.56%	1.92%
Textiles/Rubber/Leather	5.74%	3.15%
Yard Waste	3.85%	2.14%
Household Hazardous Waste	0.02%	0.01%
Electronic Waste	0.47%	0.36%
Dry-Cell Batteries	0.12%	0.05%
Misc. C/D Waste	0.01%	0.29%
Wood	0.39%	0.25%
Empty Aerosol Cans	0.20%	0.15%
Non-Distinct Waste	1.67%	0.74%
Other Misc. Wastes	0.03%	0.64%



**CHART B.7  
DISTRIBUTION OF CONSOLIDATED WEIGHT DATA FOR  
RESIDENTIAL AND COMMERCIAL SAMPLES AT THE BLUFF ROAD LANDFILL**