Approved by Palo Alto City Council September 17, 2007

Zero Waste Operational Plan

June 2007

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1.0 Introduction

1.1 Overview

The City of Palo Alto (City) reached a 62 percent diversion rate in 2004. Table 1-1 lists the City's generation, disposal and diversion tons for 2004.

Table 1-1 2004 Generation, Disposal and Diversion

Diversion tons	114,158
Disposal tons	70,226
Generation tons	184,384
Diversion rate	62%

In October 2005, the City reached beyond the requirements of AB 939 and established a goal of 73 percent diversion by 2011 and to strive for zero waste by eliminating materials sent to landfills by 2021.

Key to the City's success in achieving its diversion goals will be a focus on changes to "business as usual". Not only must the City's residents, businesses and institutional generators maximize recycling, but in partnership with the City, all will need to reduce the generation of materials by adopting "zero waste" principles.

Zero Waste

- Recognizes that "waste" is not inevitable
- Discarded materials are potentially valuable resources
- Goes beyond "end of pipe" strategies
- Maximizes recycling and composting
- Reduces consumption
- Designs "waste" out of the system

This Zero Waste Operational Plan identifies the policies, programs and facilities that will be needed to reach those goals. Any qualifying projects resulting from the implementation of these policies and programs would be subject to environmental review pursuant to the California Environmental Quality Act. Table 1-2 provides an overview of the Operational Plan for the short, mid and long term.

The recommended policies, programs and facilities are intended to serve as an initial menu of options for implementation. These recommendations are not intended to be exhaustive as it is expected that new opportunities for achieving the City's desired diversion goals will develop over time. Likewise, while this report has provided range of magnitude costs for many of these policies, programs and facilities, it is expected that these costs may change over time and that other programs or services may be able to achieve more cost effective diversion. In addition, while this report generally addresses the key environmental factors of the Chapter 7 action plan, it is expected that some of the recommendations will require further environmental assessment before full implementation. Thus, the action plan in Chapter 7 is intended to be a living document that will be reviewed and revised over time.

Table 1-2 Zero Waste Operational Plan Overview

Year/Term	2004	2008 Short Term	2011 Mid Term	2021 Long Term
Diversion Rate	62%	68%	77%	78 to 90%
Major additional programs and facilities	NA	-Additional C&D debris diversion -Additional staff resources	-New collection contract -Universal roll-out -Regional organics processing -Regional C&D debris processing	-Use of emerging technology or other innovative approaches to materials management
Estimated additional costs	NA	$615,000[1]	$3,991,000[2]	not available
Approximate rate impact	NA	3%[3]	20%[3]	not available

[1] Includes new staff at $450,000 and annual program costs of $165,000

[2] Assumes Net Compost Facility ,C&D Debris Facility and Recycling Drop-Off Center with HHW Facility costs projected to 2011 tonnage levels plus annual cost for new staff and programs

[3]Estimate based on Refuse Fund Customer Sales revenues of $20,641,339.50 for fiscal year 2005-2006

1.2 Zero Waste Strategic Plan

The City's Zero Waste Strategic Plan, adopted in October 2005, identifies the key objectives and strategies needed to reach zero waste including both reducing the creation of waste through policies and incentives designed to eliminate waste at the source and maximizing recycling through expanded collection programs, processing facilities, education, outreach, and technical assistance. Key objectives of the Zero Waste Strategic Plan, carried forward into the Zero Waste Operational Plan are to:

- **Encourage all sectors to implement zero waste**. The programs described in the Zero Waste Operational Plan have been organized around each generator sector including, residential, commercial/multi-family, industrial and self-haul.

- **Develop infrastructure beyond recycling**. The facilities described in the Zero Waste Operational Plan, primarily address maximizing diversion through recycling and composting. The proposed grant or loan program will assist reuse and recycling businesses to locate within the City, as will the designation of a Recycling Market Development Zone through the California Integrated Waste Management Board.

- **Lead by example and advocate zero waste**. The policies described in the Zero Waste Operational Plan include continuing the City's advocacy for zero waste and working with regional partners in support of mutual goals. The City will also lead by example by maximizing diversion at City facilities and providing technical support in waste prevention programs throughout the City departments.

- **Update waste data and develop a Zero Waste Operational Plan**. The Palo Alto Waste Composition Study, dated May 2006 is included in Exhibit A and summarized in Section 1.3.

The Zero Waste Strategic Plan recommended the development of the Zero Waste Operational Plan designed to:

- Develop a waste composition study, comparable to previous studies prepared for the City, to identify the types and amounts of materials remaining in the City's disposed waste stream.
- Recommend the programs that will be needed to meet the service needs identified in the Strategic Plan.
- Recommend the facilities that will be needed in the future and candidate locations for the facilities that will be needed once the City's landfill closes in 2011.
- Identify appropriate policies, incentives and requirements that will be needed to implement the Operational Plan.
- Identify the cost of implementing the Operational Plan.
- Determine the funding and staffing that will be needed to implement the Operational Plan.

1.3 Palo Alto Waste Composition Study

The Palo Alto Waste Composition Study, dated May 2006 is included in Exhibit A. Just as the Zero Waste Strategic Plan established the guiding principles for the Zero Waste Operational Plan, the Waste Composition Study is the organizing tool for the Zero Waste Operational Plan, concentrating the City's effort on the tons of materials that are currently landfilled and how to design them out of the system through waste prevention, reuse, recycling and composting.

Sampling of waste was conducted in November and December 2005 and tons were extrapolated using 2004 total tonnages, since 2005 totals will not be available until late 2006. As shown in Figure 1-1, the sampling results suggest the following key findings regarding disposal trends and recovery potential for the City overall:

- Approximately three quarters (72%, 56,500 tons) of the City's waste examined in this study is reusable, recyclable, or compostable with:
    - Approximately 29% (22,700 tons) of the City's waste is compostable, including food, compostable paper, leaves and grass, prunings and trimmings, branches and stumps, and compostable organics.

  - Recyclable paper comprises about 14% (11,200 tons) of the waste, including material categories such as newspaper, magazines and catalogs, cardboard, white ledger and other office paper.

  - Nearly a third (29%, 22,500 tons) of the City's waste stream consists of recyclables other than paper. By weight, the largest non-paper recyclable material categories are rock, soil and fines, wood-untreated, asphalt roofing, other ferrous metal, gypsum board, and concrete.

- About 3% (2,300 tons) of the City's waste stream is considered potentially recyclable, meaning markets could be developed regionally to process and market these materials.

- A quarter (25%, 19,400 tons) of City waste sampled consists of problem materials. Material categories are considered problem materials if there is no existing processing option for the material. The five largest problem materials, by weight, are remainder/composite construction and demolition debris (C&D debris), wood-treated, other film plastics, diapers, and remainder/composite paper.

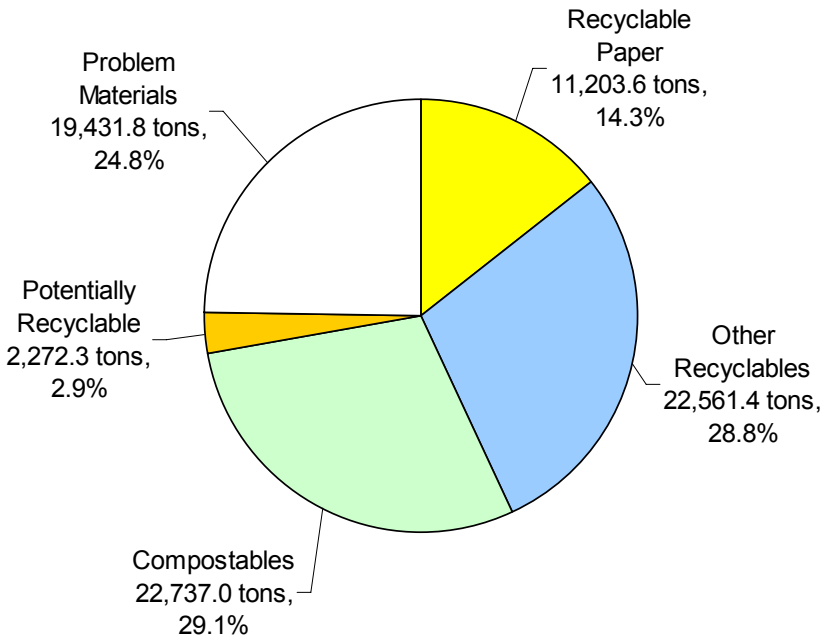
The waste composition study identified the following key opportunities.

- **Focus on residential and commercial paper.** Recyclable paper from residential and commercial waste streams totaled approximately 10,300 tons. Collection, processing, and end markets for recycled paper are well established and could be tapped to increase diversion.

- **Expand organics diversion.** Food waste and compostable paper from single family, multi-family, and commercial sources totaled more than 18,000 tons. Yard waste from all four waste sectors contributes almost 4,500 tons to the City's annual waste stream.

- **Examine opportunities of increased construction and demolition debris reduction/recycling.** Recyclable materials in the industrial and self-haul waste sectors account for nearly 15,200 tons per year, including approximately 864 tons of paper and 14,303 tons of other recyclables. The largest share of this material is construction and demolition debris.

Figure 1-1 Overall City Waste Composition and Recoverability



1.4 Challenges in Achieving Zero Waste

The City will face certain limitations in achieving zero waste by 2021. These include:

- **Problem materials**. Some problem materials, such as "remainder/composite construction and demolition debris" include materials that are potentially divertible (including bricks, tiles, and sinks). However, the majority of problem materials, including treated wood, currently have no viable markets in the Bay Area.

- **Consumer Product Obsolescence**. Reuse and recycling do not address the core problem of increased volumes of waste created by products that have not been designed with end-of-life product management in mind. Product design and manufacturing are beyond the control of the City. However, demands being placed on the City to manage this waste lead to increased recycling and disposal costs. These costs have recently been impacted by the actions of the State Department of Toxic Substances Control, which banned the disposal of toxic products (e.g., "universal waste") from landfills. It is anticipated that more products will be banned from landfills in the future. State and local governments are turning to product manufacturers, retailers, and other potential industry partners through Extended Producer Responsibility (EPR) initiatives to alleviate this burden on local governments and require these industry partners to take increasing responsibility for the end-of-life management of the products they produce.

- **SMaRT Station diversion rate**. Currently, the SMaRT Station operating agreement provides incentives to the operation to achieve 18 percent diversion from solid waste loads delivered to the facility. The SMaRT Station partner cities (Sunnyvale, Mountain View, and Palo Alto) are currently developing a new operating agreement which will increase the diversion incentives to 25 percent. However, further increasing diversion at the SMaRT Station, by sorting compostable materials from solid waste or establishing higher diversion rates, requires the cooperation of all of the partner cities. Sunnyvale and Mountain View are currently not focused on achieving additional diversion rates beyond those required by state law.

- **Capture rate**. The City's ability to divert materials from disposal depends on its ability to "capture" the materials for processing. The City must rely on the public to separate recyclable or compostable material for diversion through collection programs and cannot expect universal participation.

- **City Landfill closure in 2011**. The City operates many diversion activities at the City of Palo Alto Refuse Disposal Site (City Landfill) and these activities will be impacted when the City Landfill closes in 2011. These include**:**

    - Relocation of the Recycling Drop-Off Center

    - Loss of the City Composting Facility located at the Palo Alto Landfill

    - Loss of diverting and recovering recyclables at the City Landfill

- **"Put or pay" requirements at the Kirby Canyon Landfill**. The City's contract with Waste Management Inc. to use the Kirby Canyon Landfill requires that the City deliver a specified number of tons for disposal each year to the landfill or pay for those tons whether the City delivers them or not. If the City is successful in reaching 67.8 percent diversion or more, the City's disposal tons could fall below the tonnage guarantees in the City's agreement with Waste Management Inc. and increase the City's overall system costs. We estimate that this could cost the City between $129,000 to $568,000 per year through 2021, depending on the year and the estimated diversion level. Annual estimates are included in Exhibit B.

- **PASCO contract ends 2009**. The City's agreement with Palo Alto Sanitation Company (PASCO) will expire in July 2009. The City is conducting a competitive procurement for new services. This process could increase opportunities (by attracting numerous vendors to proposed program enhancements and alternatives) but may also increase risks (changes to the service provider or programs could impact the quality of service).

- **Emerging technology**. Emerging technologies, such as anaerobic digestion and hydrolysis could assist the City achieving higher rates of diversion. However, these technologies are unproven for solid waste processing at this time and there are no emerging technology facilities operating in the Bay Area. It is possible that these facilities will be emerging in the next several years and may become more viable in the future.

- **Markets for Recyclable Material**. Markets for recyclable material are currently robust. The City's proximity to the Port of Oakland enhances its ability to sell recyclable paper and plastic to end users in China and other parts of Asia. However, some analysts have predicted that the demand for recyclable paper and plastics in China will be reduced within the next 10 years (as China's domestic infrastructure, markets and supply chains mature). These market fluctuations could impact the City's ability to divert its collected material.

- **Markets for Organics**. In addition, there are currently regional processing opportunities for the City's organics (including food, compostable paper, and yard trimmings). Demand for compost products produced at these regional facilities is high. However, markets for compost products from mixed streams (where organics have not been separated from solid waste) may not be sustainable. Contamination from glass and plastics makes these products less desirable to compost end-users.

- **Breaking New Ground in Waste Prevention**. The City is among a handful of communities that have established goals of maximizing diversion and achieving zero waste. Therefore, research and development in waste prevention, truly designing waste out of the system, has yet to be undertaken.

In planning for zero waste, the City has entered new, uncharted territory outside of the traditional methods of solid waste management. Without significant innovations in waste prevention policy development and new technologies, it may not be possible for the City to reach 90 percent diversion or zero waste in the foreseeable future. This plan identifies proven programs for reaching high levels of diversion. By implementing the policies, programs and facilities identified in this plan, we estimate that the City will reach 77 percent diversion by 2011. We have used aggressive, but realistic, assumptions for program participation and diversion estimates and have targeted the "low hanging fruit", the types of materials by sector that would achieve the highest practical diversion for the least cost to the City and its generators. In order to reach 90 percent diversion and beyond, the City will need to identify and implement new policies and programs in the future. The Zero Waste Action Plan, included in Section 7, should be considered a living document. The Action Plan includes the recommendation that the City keep abreast of the latest technology developments and policy innovations for future consideration and implementation. Working with regional partners and advocating for zero waste policies at the state and national levels create the opportunities for the City to reach its goals.

1.5 Organization of the Report

The Zero Waste Operational Plan has been organized as follows.

Section 1 Introduction. This section provides overview and lists the findings of the Palo Alto Waste Composition Study.

Section 2 Existing Programs and Facilities. The section describes the City's existing programs, facilities and material flows.

Section 3 Programs. This section describes the programs options to reach 73 percent diversion and zero waste.

Section 4 Facilities. This section describes the facility options to reach 73 percent diversion and zero waste.

Section 5 Policies. This section describes the policies and incentives to reach beyond maximum recycling to eliminate waste.

Section 6 Zero Waste System Scenarios. This section describes the two major zero waste system scenarios, the diversion rates anticipated to be achieved by these scenarios and the estimated costs for implementing these scenarios.

Section 7 Recommendation and Action Plan. This section provides the recommended zero waste system scenario and includes zero waste action plan with staffing levels, action steps, and an implementation schedule.

2.0 Existing Programs and Facilities

The City generated approximately 184,384 tons of materials in 2004. Approximately 62 percent of these materials are being diverted from landfill. Although source reduction and private sector recycling programs play a large role in this diversion level, the City's existing programs and facilities provide a substantial role as well as stable contribution to achievement of these diversion rates. Table 2-1 lists the current tonnages generated, diverted and disposed by City generators and how these tons flow through the existing programs and facilities.

Table 2-1 2004 Current System Materials Tonnage Flow by Facility/Function

Facility/Function	Generation	Diversion	Disposal
SMaRT Station/Kirby Canyon Landfill	48,551	8,545	40,006
City Landfill	25,609	4,043	21,566
Other Landfills	7,286	-	7,286
C&D Debris Processors	6,498	5,130	1,368
City Composting Facility	16,716	16,716	-
Recyclables Collected by PASCO	14,123	14,123	-
Recycling Drop-Off Center	1,182	1,182	-
Waste Prevention and Recycling from Other Programs and Service Providers[1]			
Street and sidewalk inert recycling	*29,617*	*29,617*	-
Private sector commercial recyclers	*10,331*	*10,331*	-
Additional business diversion	*645*	*645*	-
Private sector inert solids diversion	*20,290*	*20,290*	-
Source reduction	*3,536*	*3,536*	-
Subtotal	64,419	64,419	-
Totals	184,384	114,158	70,226

[1]Tonnage breakdown for these activities has been estimated using the City's 1997 Waste Generation Study

2.1 Existing Programs

The City manages the following source reduction, recycling and composting programs.

- **Single stream recycling.** This program replaced the previous multiple sort recycling program. Through its contract with PASCO, the City provides single stream recycling services to all single-family residents, multi-family complexes and commercial businesses requesting the service. Single stream collection is provided in blue wheeled carts in a variety of sizes. The single stream program targets mixed paper, steel and aluminum cans, foil wrap and trays, glass bottles and jars, and plastic containers #1-7. Single-family customers may also place other materials along side the wheeled cart for collection such as: small appliances, scrap metal, used motor oil, oil filters and household batteries. The current contract with PASCO is scheduled to expire in July 2009 and the City is conducting a competitive process to procure new services.

- **Yard trimmings collection.** Through its contract with PASCO the City provides yard trimmings collection to all single-family residents and to multi-family complexes and commercial businesses requesting the service that are adjacent to existing residential routes. Yard trimmings collection is provided in green wheeled carts in a variety of sizes. The yard trimmings collection program targets grass and plant clippings and tree trimmings up to two inches in diameter and up to four feet in length.

- **Downtown recycling.** The City provides recycling receptacles for bottles and cans at four downtown locations that receive a high amount of foot traffic.

- **City parks recycling.** The City places receptacles for bottles and cans at City parks throughout the City.

- **Special events recycling.** Recycling is required at all special events held in the City as part of the event permit application process. Up to 20 – 64-gallon wheeled carts are made available through PASCO.

- **C&D debris box recycling.** The City requires that PASCO divert six debris boxes per day that are rich in C&D debris recyclables to a designated C&D debris processor.

- **Shared cardboard bin program.** The City provides cardboard bins at locations throughout the City for small businesses (that may not have room for recycling containers) to share.

- **C&D debris reuse and recycling ordinance.** The City requires all demolition projects and all construction projects valued at $75,000 or more to divert 90 percent of all inerts and 50 percent of all remaining C&D debris as a condition of the building permit. These projects must also make salvageable materials available for reuse.

- **Outreach programs.** The City implements many outreach programs, including:

    - Green Business Certification
    - Residential Green Building workshops, tours and education materials
    - School Assembly Program (reduce, reuse, recycle, buy-recycled education) for grades K-8
    - Tours of the Recycling Center, Compost Facility and Palo Alto Landfill
    - Presentations at Open Space and Science Day Camps on reduce, reuse, recycle and buy-recycled
    - Education and outreach at public and private events
    - Movie theater advertising

- Chamber of Commerce newsletter insert
- Recycling Program website
- Community and Business Recycler newsletters
- Utility bill inserts and announcements
- Biennial garage sale events, and
- Junk mail reduction program.

- **Technical assistance programs.** The City also implements technical assistance programs, including:
  - Backyard and worm composting classes, Bug Buster/ Super Soil Workshops
  - Commercial waste audits and technical assistance
  - City department technical assistance, and
  - Low waste or zero waste public and employee events.

2.2 Existing Facilities

The City currently uses an array of facilities to handle, divert and dispose of materials generated in the City. Each of the existing facilities is described below.

2.2.1 City Owned Facilities

2.2.1.1 City Landfill Operation

The City operates the City Landfill located at 2380 Embarcadero Road in Palo Alto. In addition to disposal, the City Landfill also encompasses several diversion operations including the Recycling Drop-Off Center, composting, and recovery of materials from the City Landfill "face" as described below. The City Landfill disposed of 21,566 tons in 2004.

The City Landfill is to close in 2011. The City plans to relocate the current diversion activities as needed on-site prior to the 2011 closure date, due to planned pre-closure activities. This report outlines potential replacement facilities for those diversion activities that will need to be in-place as early as January 15, 2011.

2.2.1.2 Recycling Drop-Off Center

PASCO operates the City's Recycling Drop-Off Center adjacent to the entrance of the City Landfill. The Drop-Off Center accepts mixed paper, newspaper, metal cans, glass bottles and jars, plastic (#1-#7) containers, plastic bags, milk and juice cartons, corrugated cardboard boxes, magazines, telephone books, hard cover books, scrap metal, blueprints, polystyrene foam, cathode ray tubes (monitors and televisions), grease and cooking oil. Goodwill provides

a trailer on-site for donation of reusable household items and clothing. In 2004 the Drop-Off Center diverted 1,182 tons from the City Landfill.

The Drop-Off Center also collects some materials that are normally associated with Household Hazardous Waste (HHW) operations, including antifreeze, motor oil and containers, used oil filters, household batteries, auto batteries, appliances, tires and fluorescent lights. In fiscal year 2004-2005 (FY 2004-05), 165 tons of these HHW materials were collected at the Drop-Off Center.

In addition, the City in conjunction with the Palo Alto Regional Water Quality Control Plant (PARWQCP) collected an additional 153 tons of HHW materials at the PARWQCP, mostly through monthly collection events.

2.2.1.3 City Composting Facility

The City operates a composting operation at the City Landfill. The compost operation receives yard trimmings from the residential yard trimmings collection program, commercial yard trimmings debris box service, City crews and other "clean" self-haul yard trimmings sources. The City produces compost for sale and sells other landscaping products (such as mulch and wood chips) at its Landscape Yard. In 2004 the compost operation diverted 16,716 tons per year from the City Landfill.

2.2.1.4 City Landfill Recycling

The City also performs other recycling activities at the City Landfill, which include recovering concrete, asphalt, metal, tires, pallets and mattresses at the "working face" for diversion. Not including dirt, this amounted to 4,043 tons diverted from City Landfill in 2004.

2.2.2 Other Facilities

2.2.2.1 SMaRT Station

The City, in partnership with the cities of Mountain View and Sunnyvale utilize the SMART Station. The SMaRT Station receives, processes and diverts waste collected from residents and businesses within the City's jurisdiction by its contract hauler PASCO. A small portion of waste (25 tons in 2004,) is self-hauled to the SMaRT Station from Palo Alto. The SMaRT Station Operator is currently diverting 18 percent (8,545 tons) of the City's incoming materials. The City's partnership with the cities of Mountain View and Sunnyvale to construct and operate the SMaRT Station expires on October 14, 2021.

2.2.2.2 Single Stream Recyclables Processing

The City uses the services of its contract hauler PASCO/Waste Management Inc. for collection and processing of residential and commercial single-stream recyclables. In 2004, prior to citywide single stream recycling collection, PASCO processed 14,123 tons of materials through the Recycling Drop-Off Processing Center. The curbside materials are now processed at Waste Management materials recovery facilities in Castroville or San Leandro.

2.2.2.3 Guadalupe and Zanker C&D Debris Processing

The City uses the services of the Guadalupe Rubbish Disposal Company (Guadalupe) and Zanker Road Materials Processing Facility, both located in San Jose for processing of select loads of C&D debris. Wood, concrete, soil, cardboard, and metal are recycled from these loads. In 2004, 6,498 tons were delivered to Guadalupe (2,528 tons) and Zanker (3,970 tons) for processing. In 2004, 5,130 tons with a diversion rate of about 79 percent were recovered.

2.2.2.4 Kirby Canyon Landfill

The City has a disposal agreement with Waste Management, Inc. to accept the City's processing residues from the SMaRT Station for disposal at the Kirby Canyon Landfill in San Jose. Under the disposal agreement, the City is obligated to deliver at least 75 percent of its tonnage commitment through October 14, 2021 or pay for that tonnage whether delivered or not as a condition of its "put or pay" agreement. The City's tonnage commitment was 52,455 tons in 2004 and this commitment increases to a maximum of 61,507 tons in 2020.

2.2.2.5 Other Landfills

In addition to the City Landfill, self-haulers from Palo Alto dispose of materials at other regional landfills including the Altamont Landfill in Alameda County, the Keller Canyon Landfill in Contra Costa County, the Ox Mountain Landfill in San Mateo County, and the Potrero Hills Landfill in Solano County. According to the California Integrated Waste Management Board (CIWMB) Disposal Reporting System, 7,286 tons of self haul waste from the City of Palo Alto were disposed at other regional landfills in 2004.

2.2.3 Service Providers

Residents and businesses in the City also use a wide variety of reuse, recycling and composting services providers from throughout the San Francisco Bay Area. The City's on-line reuse and recycling resource, the Recyclopedia, lists some of these service providers, and others were identified in the City's Service Needs Analysis conducted as part of the development of the Zero Waste Strategic Plan.

2.3 Current Materials Flow

The Palo Alto Waste Composition Study identified four generator sectors that can be used to classify materials for direction to the most appropriate diversion and disposal programs and facilities. These generator sectors include:

- Single-family residential
- Commercial and multi-family residential
- Industrial (open top debris boxes), and
- Self-haul.

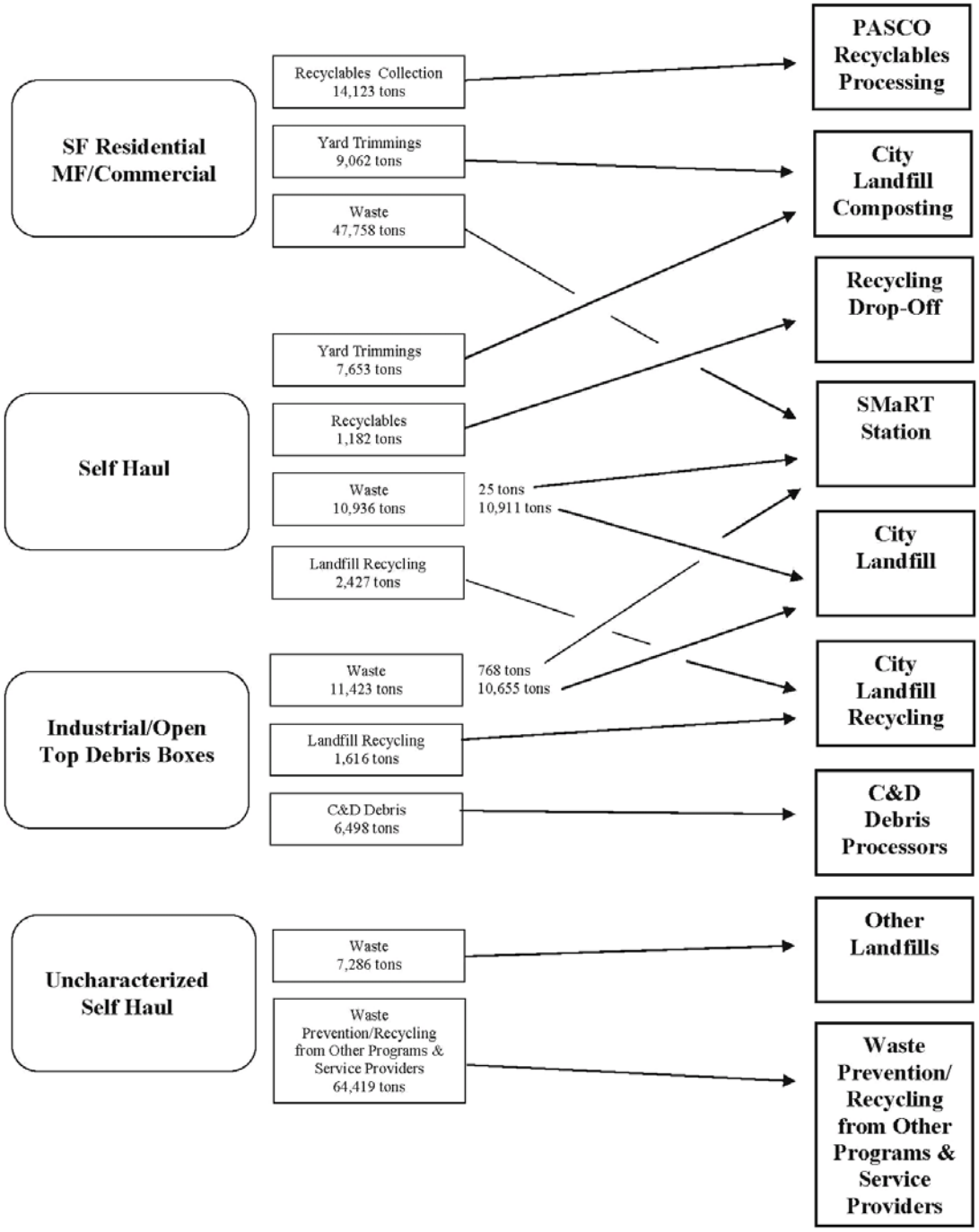
Each of these sectors generates materials that are currently disposed or diverted through existing facilities. Table 2-2 lists the current tonnages generated by each generator sector. Single-family residential, commercial, and multi-family residential sectors currently flow through the existing facilities together. The Palo Alto Waste Composition Study characterized waste brought to the City Landfill by self-haul vehicles. The study did not characterize self-haul waste delivered to other regional landfills. This "uncharacterized self-haul" is shown separately in Table 2-2. With this data, the City can see how much material will need to go elsewhere when the City's local facilities are closed.

Table 2-2 2004 Current System Materials Tonnage Flow by Generator Sector

Generator Sector	2004
Single Family & Commercial and Multi-Family	
Single Family Waste to SMaRT	13,109
Commercial/Multi-Family Waste to SMaRT	34,649
Recyclables Collected by PASCO to PASCO Recyclables Processing Facility	14,123
Yard Trimmings to City Composting	9,062
Self Haul	
Waste to SMaRT	25
Waste to City Landfill	10,911
Yard Trimmings - City Crews to City Composting Facility	4,771
Yard Trimmings – Public to City Composting Facility	2,882
Landfill Recycling/C&D Debris - City Crews	1,645
Landfill Recycling/C&D Debris - Public	782
Recycling Drop-Off	1,182
Industrial Open Top Debris Boxes	
C&D Debris Directed to Regional Processors	6,498
Waste Directed to SMaRT	768
Waste Directed to City Landfill	10,655
Landfill Recycling/C&D Debris diverted at City Landfill	1,616
Uncharacterized Self Haul	
Waste to other Landfills	7,286
Waste Prevention and Recycling from Non-City programs	64,419
Total Generation	184,383

Figure 2-1 below depicts how materials flow from each generator sector to the existing facilities.

Figure 2-1 2004 Materials Flow Diagram



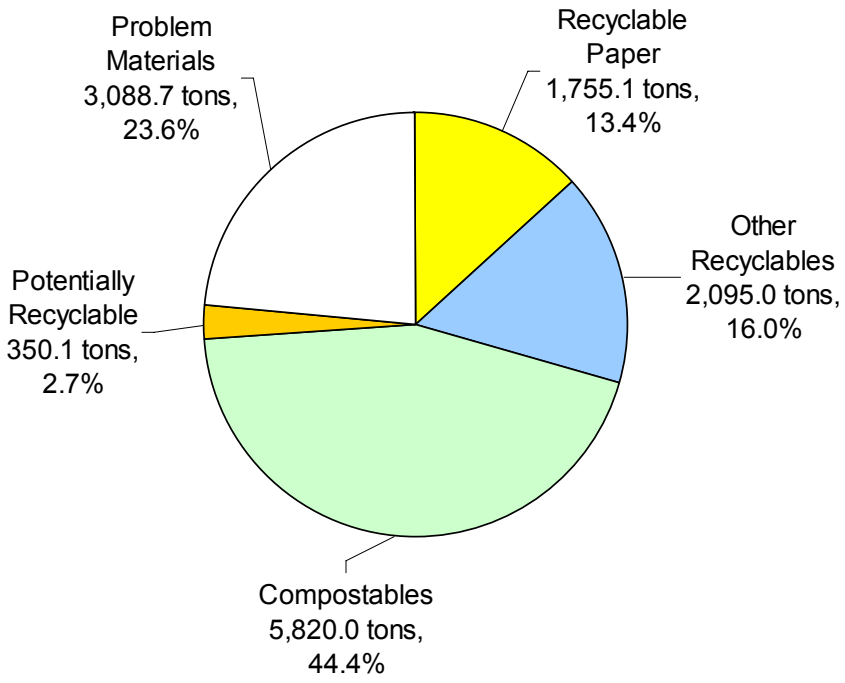
3.0 Programs

This section describes programs that could be implemented to achieve the City's goals of 73 percent diversion by 2011 and 90 percent diversion or zero waste by 2021. The most feasible program components were combined into the zero waste system scenarios that are recommended as part of the Zero Waste Operational Plan for adoption and implementation in Section 7.

3.1 Single-Family

According to the Palo Alto Waste Composition Study, as shown in Figure 3-1, nearly three quarters (74%, 9,700 tons) of the single-family residential sector's waste is recyclable or compostable.

Figure 3-1 Single Family Residential Waste Composition & Recoverability



3.1.1 Organics Diversion

Compostable materials, including food waste, compostable paper, untreated wood and other organics make up the largest segment of the City's single-family residential waste stream (44%, 5,820 tons). The City's single-family yard trimmings collection program is very effective, with only 92 tons of yard trimmings remaining in the single-family waste stream (representing less than 1 percent of the single-family waste stream). However, the most significant opportunity that the City has for diverting large amounts of material is through diverting food scraps, compostable paper, untreated wood and other compostables.

Currently, the City's yard trimmings are composted at the City's composting facility located at the City Landfill. This facility will close by 2011 when the City Landfill is scheduled to close. It is not feasible for the City to obtain permits for this facility to accept food scraps and other compostables for diversion prior to closing. Therefore, we do not recommend adding food scraps and other compostables to the single-family yard trimmings collection program in the short term. We recommend that this service be evaluated further when the City conducts its procurement process for collection services prior to the expiration of the PASCO agreement in July 2009.

Program features of the expanded single-family organics collection program could include:

- Weekly curbside collection of food, compostable paper, untreated wood and other organics using the existing yard trimmings carts
- Distribution of kitchen containers for convenient temporary storage of compostable materials generated in the kitchen
- Outreach and education, especially regarding best management practices for residential management of food and other organics
- Rewards and publicity for effective participation by individual households (based on random checks of set-outs).

3.1.2 Maximizing Recycling

The City has effectively transitioned to single stream recycling for single-family customers. Overall tonnage levels have increased, but recyclable materials that are included in the single stream program are still disposed in large amounts by single-family residents. The most significant improvement that the City and PASCO could make to the single stream collection program would be to increase motivation of residents and businesses to take advantage of the services currently offered and divert more materials from waste to recycling. Significant amounts of materials included in the single stream program are still disposed by residential and commercial generators. Over 13 percent (1,755 tons) is paper and nearly 6 percent (700 tons) consists of plastic containers, glass containers, and aluminum and steel cans. Diversion of these materials could significantly contribute towards the City's 73 percent diversion goals. It should be noted that some of these materials are currently diverted from the disposed waste stream at the SMaRT Station where the materials that end up in the solid waste system are fed through a processing line and sorters pick off recyclable material. The SMaRT Station primarily concentrates on diverting commercial recyclables, particularly mixed paper from disposal. However, there remain key opportunities for the City to increase diversion of single stream materials prior to disposal.

Strategies for increasing diversion include:

- Increase the level of outreach and education provided to single-family residents to maximize participation in the collection programs. This outreach could be conducted in conjunction with the implementation of the new collection services in July 2009 and could either be the responsibility of the contract hauler or City staff. Increased levels of outreach could include the development of an annual outreach campaign with the following elements:
    - Semi-annual newsletters distributed via bulk mail (in addition to bill inserts and community newsletters)
    - Radio advertisements commencing with the implementation of new services and during an annual outreach campaign cycle
    - Videos about the City's program provided to libraries, schools, and local cable access channel updated on an annual outreach campaign cycle
    - Public service announcements and paid advertising distributed to media outlets on an annual outreach campaign cycle, and post short videos that can be downloaded from the City's website
    - "Cash for trash" contests where customers are rewarded with cash prizes if no recyclable materials are found in their solid waste carts and contaminants are not present in recycling carts
    - Bill boards, bus and bus shelter signs, recycling, organics and solid waste truck signs updated on an annual outreach campaign cycle
- Target outreach to the subpopulations who do not currently participate in the recycling programs provided by the City through Community-Based Social Marketing techniques, such as:
    - Conducting surveys to identify those subpopulations who do not currently participate in the recycling program
    - Identifying barriers to participating in recycling
    - Designing a strategy that utilizes behavior change tools,
    - Piloting the strategy with a small segment of a community, and
    - Evaluating the impact of the program once it has been implemented across a community
- Increase the material types that could be accepted in the single-stream wheeled collection cart or along side the wheeled cart, such as textiles, milk and juice containers, plastic bags, expanded polystyrene packaging, expanded polystyrene containers, and hardcover books. These materials account for about 4 percent of the single-family residential waste stream. The

City has recently evaluated the viability of adding these materials to its single-stream recycling program and concluded that the existing markets for diversion and technologies for processing are not adequate to warrant inclusion at this time. We recommend that the City revisit this issue with potential new service providers and processors when it conducts its procurement for new collection services prior to the expiration of the PASCO agreement in July 2009.

3.1.3 Reuse and Recycling Clean-Up Program

Many communities offer bulky item collection programs specifically designed for reuse and recycling. The Central Contra Costa Solid Waste Authority contracts with Pacific Rim Recycling to collect items for resale and reuse through the East Bay Depot for Creative Reuse. San Francisco's Bulky Item Collection Program is an on-call collection program that targets the following items for recycling: scrap metal, green waste, appliances, mattresses, and electronics. According to the Palo Alto Waste Composition Study, 1.4 percent of the City's overall waste stream consists of reusable items. Some of these items could be targeted for a bulky item reuse and recycling program. We recommend that the City implement a bulky item reuse and recycling program with the contract hauler at the commencement of new services in July 2009. We recommend that all single-family, multi-family and commercial customers be eligible to participate in the bulky item reuse and recycling program.

3.1.4 Mandatory Participation

We anticipate that the City will be able to reach 73 percent diversion based on the City's current recycling infrastructure and additional program features. However, to reach 90 percent diversion or zero waste, the City will need to require residents to participate in the recycling and composting collection programs. We recommend that the City implement a mandatory participation requirement which requires customers to place recyclable and compostable materials in the appropriate collection containers and to ban these materials from disposal.

Several communities including, San Diego County and each city in the county, have established mandatory separation requirements in their municipal codes. All residents and businesses must participate in the recycling and yard trimmings collection programs and separate materials into the appropriate containers. According to a survey conducted by San Diego County, 88 percent of county residents say that they support the mandatory recycling ordinance. The City of Stockton has also recently adopted a mandatory separation ordinance for both residents and businesses. New York City requires all commercial businesses to recycle from an establish list of materials or face fines of $25 to $500. The cities of Chicago, Illinois and Portland, Oregon, require participation in recycling programs.

Santa Cruz County has adopted a mandatory recycling ordinance that will be phased in over three years. In the first year, residents and businesses are notified of the requirements; in the second year they are provided with a warning for failure to comply; in the third year they are penalized for non-compliance. All materials that are targeted for recycling or composting in the County's recycling program would be banned from the landfill as well.

In designing its mandatory recycling ordinance, the City of Los Angeles is considering establishing a "recycling school" that would function like "traffic school" for violators of its mandatory recycling ordinance.

The City of Seattle employs one full-time "garbage cop" to enforce its mandatory recycling ordinance for commercial businesses. This code enforcement officer employs several techniques to encourage businesses to recycling including, technical assistance and trouble-shooting, information about service providers and education about the City's requirements, warnings, and citations.

We recommend that the City begin the phase in of mandatory participation in 2010 to coincide with the implementation of a new collection services agreement in July 2009 and the City Landfill closure in 2011.

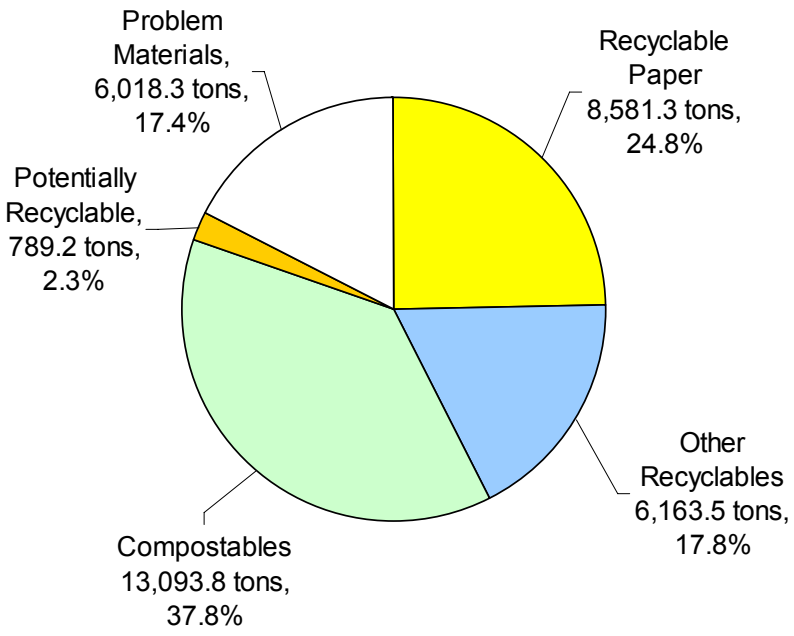
Program elements of the mandatory participation program include:

- Outreach and education to inform customers of the mandatory participation requirements and phase-in schedule (Year 1)
- Notification to customers who fail to separate recyclable and compostable materials from solid waste (Year 2)
- Enforcement of fines or penalties if customers fail to separate recyclable and compostable materials from solid waste (Year 3)

3.2 Commercial/Multi-Family

According to the Palo Alto Waste Composition Study, as shown in Figure 3-2, nearly 80 percent (27,800 tons) of the commercial and multi-family residential sector's waste is recyclable or compostable.

Figure 3-2 Commercial & Multi-Family Residential Waste Composition & Recoverability



3.2.1 Organics Diversion

Compostable materials, including food waste, compostable paper, untreated wood and other organics make up the largest segment of the City's commercial and multi-family residential waste stream (38%, 13,094 tons). Commercial businesses and multi-family complexes can currently subscribe to yard trimmings collection, provided that they are adjacent to a single-family residential collection route. However, since many multi-family complexes and commercial businesses currently do not subscribe to yard trimmings collection, there is a significant amount of yard trimmings remaining in the commercial/multi-family waste stream (941 tons representing nearly 3 percent of the commercial/multi-family waste stream).

The largest single material type disposed in the commercial/multi-family waste stream is food (22%, 7,758 tons) and compostable paper is the second largest single material type (13%, 4,326 tons).

Therefore, we recommend that the City implement commercial and multi-family organics collection in the expanded scope of services when the City conducts its new procurement process for collection services prior to the expiration of the PASCO agreement in July 2009.

Program features of the commercial/multi-family organics collection program could include:

- A substantial (such as 50 percent) differential between the price charged for the collection of compostable organics and the price charged for solid waste collection

service (e.g., if once per week collection of one cubic yard of solid waste is $100 per month, the charge for once per week collection of one cubic yard of organics would be $50 per month)

- Quarterly or periodic notification in customers' bills of the percent amount that some Palo Alto businesses have saved through participation in the program
- Quarterly or periodic notification to customers of the availability of service, along with prominent mention of the differential between the prices charged for the collection of compostable organics and solid waste
- Provision of internal, durable, color-coded (e.g., bright green) containers for compostable organics, with a choice about size and quantities (average of two per participating business)
- Provision of wheeled carts or cubic yard bins for external collection containers, available in multiple sizes as requested by the customer, and color-coded (e.g., bright green), wheeled, lidded (average of two 64 gallon containers per participating business)
- Collection of compostable organics should be available to customers on the same number of days as the collection of solid waste
- For routing efficiency (at the option of the contracted hauler), smaller apartments and businesses using the same size organics carts that residents use could or should be included in residential organics collection route designs (variation: a dedicated commercial organics collection system would be employed, if the City does not simultaneously implement resident organics collection)
- Development of graphic-rich, color-coded instructional posters and decals
- Technical assistance in support of outreach, recruitment, bilingual training, monitoring, troubleshooting, and reporting, by recycling professionals skilled in working with food-service establishments
- Outreach materials and training for homeowners, property managers, landscape designers and maintenance workers in conservation-oriented landscaping techniques, to reduce the generation of landscape trimmings.

A significant amount of food disposed in the commercial/multi-family waste stream was high quality, potentially edible food from restaurants and caterers. Therefore, we recommend that the City provide technical support, and promotion of, non-profit food rescue organizations' efforts to reclaim unused, edible food for food banks and hunger programs. We also recommend that the City provide information to local restaurants and caterers about the "Good Samaritan" law which allows generators to donate edible food without concern for liability.

3.2.2 Maximizing Recycling

Approximately, 50 percent of commercial businesses participate in the City's recycling program. Some of these businesses are located in the downtown area where there are space constraints for recycling containers. Some businesses subscribe to recycling services from third party recyclers. However, some of these commercial customers may be unaware of the recycling options available or may not be motivated to proactively order recycling services.

The City has recently rolled-out recycling collection services to all multi-family complexes in the City in conjunction with its roll-out of single-stream recycling to all single family customers. This approach has been highly successful with all complexes currently participating in the program.

This approach could be extended to all commercial customers in the City. We recommend that the City implement this approach with the commencement of new services in July 2009. To maximize participation for the underserved or unaware commercial customers, without negatively impacting commercial customers who do not need recycling services, the City could provide an opt-out process. During the rollout phase of the new program, all commercial customers would be contacted or sent a notice describing the new services. Customers who do not currently have recycling services and did not respond to the notice would be provided with the same level of service for solid waste and a default level of service for recycling (such as collection of one 96 gallon cart for recycling once per week). The customer would not be required to accept the recycling services if they responded to the initial notice and indicated that they did not want to receive recycling service and they would not be required to keep the recycling container if it was delivered and they did not want to use it.

We recommend that the City roll-out commercial recycling collection services universally to all commercial customers at the time of new program implementation by delivering recycling containers to all commercial customers. This approach:

- Provides recycling services to all customers who do not receive recycling services through the contracted hauler. Approximately 50 percent of the City's commercial solid waste customers do not receive recycling services through PASCO.
- Gives all businesses the opportunity to recycle, which will improve diversion.
- Allows customers to opt-out through response to initial notification or after containers are delivered
- Can create a more efficient collection system.

To enhance recycling in public areas, we recommend that local businesses and institutions (including grocery stores, convenience stores, hospitals and schools) provide recycling containers wherever they provide trash receptacles for use by their customers.

3.2.3 Commercial Technical Assistance

Currently, the City provides commercial technical assistance and waste audits to commercial customers who request the service. City staff conducts comprehensive waste audits for businesses that are applying for certification with the Green Business Program (currently about eight per year).

We recommend that the City enhance its commercial technical assistance program to maximize participation in the City's recycling program by providing more resources and staff support. Technical assistance could be provided by City staff, contractors, or the contract hauler.

Program features of the commercial technical assistance program could include:

- Preparing a commercial technical assistance plan listing all of the tasks to be implemented by the technical assistance staff and include specific goals, milestones, and schedules for implementation.
- Working with the contract hauler to identify the largest solid waste generators, actively marketing these generators to participate in the City's recycling program, identifying diversion opportunities and resources for materials that are not included in the City's recycling program
- Contact 50 commercial businesses annually, with follow-up program implementation assistance
- Provide internal desk side containers or other internal storage bins, as appropriate
- Meeting with janitorial staff to train them on program features
- Provide incentives (e.g., mini-grants, recognition, case studies)
- Provide recycling containers to retail businesses so that customers can recycle while on-site
- Providing model contract language for businesses to include in their custodial contracts to maximize recycling efforts and encourage consumption of recycled-content products in custodial supplies.

3.2.4 Multi-Family Outreach and Education

We recommend that the City enhance its multi-family recycling outreach program by developing outreach and education tools designed to maximize recycling at multi-family complexes. These features could include:

- Provision of "recycling buddies" plastic storage bags for carrying recyclables to the centralized collection containers

- Posters above containers and in central locations describing and visually illustrating materials accepted in the program
- Clear signs on carts and bins
- Contact each complex once every three years
- Require “recycling collection site plans” for buildings over 16 units through City ordinance (where all buildings with over 16 units would be required to submit a recycling collection site plan for City approval)
- Allow property manager to choose between carts and cubic yard bins
- Conduct outreach and education at property management association meetings
- Provide property managers with a toolkit, including a reuse guide for managers, move-in and move-out kits for residents, and sample contract language for new tenants
- Provide reuse and recycling clean-up day programs
- Track apartment rentals and new enrollment at Palo Alto Unified School District in order to provide outreach materials to new multi-family residents in the City.

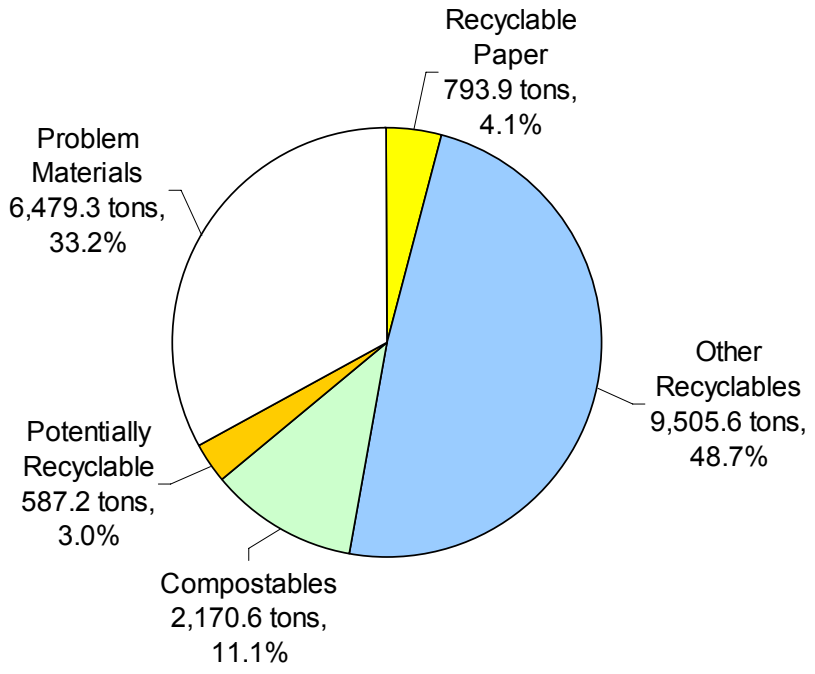
3.2.5 Mandatory Participation

Along with the single-family residential customers as described above, we recommend that the City begin the phase in of mandatory participation for commercial and multi-family customers in 2011 to coincide with the City Landfill closure. Implementation of mandatory participation would have to be carefully monitored and enforced, since it would be difficult to track violators in some multi-tenant office buildings and multi-family complexes.

3.3 Industrial

According to the Palo Alto Waste Composition Study, as shown in Figure 3-3, approximately 64% (12,500 tons) of this industrial waste (defined as open top debris boxes) is recyclable or compostable.

Figure 3-3 Industrial Waste Composition & Recoverability



3.3.1 C&D Debris Diversion

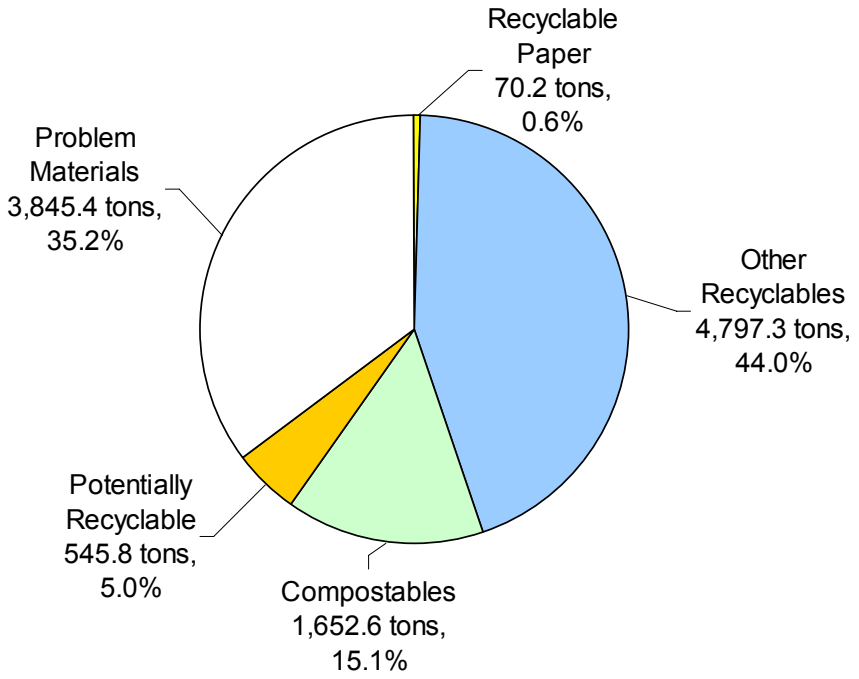
C&D debris, including concrete, asphalt paving and shingles, rocks, soils and fines, and remainder/composite C&D debris make up the largest segment of the City's industrial waste stream (51%, 10,036 tons). Some of these materials are currently diverted from the disposed waste stream by PASCO. Currently, the City directs PASCO to take up to six debris boxes per day of C&D debris to the C&D debris processing facility at Guadalupe in San Jose. However, materials from some open top debris boxes that could be appropriate for processing are currently disposed at the City Landfill or delivered to the SMaRT Station. We recommend that more of the drop boxes hauled by PASCO be taken to Guadalupe or another C&D debris processor for processing. The City's debris box loads are rich in C&D debris with very little putrescible waste. We anticipate that up to 70 percent of the debris box loads that are currently disposed at the City Landfill could be successfully diverted for processing. Once the City Landfill closes in 2011, the remaining 30 percent of loads unsuitable for processing would be directed to the SMaRT Station.

In addition to the materials defined as "C&D" in the Palo Alto Waste Composition Study, Guadalupe recovers other recyclable materials, including cardboard (1% of the industrial waste stream), metals (3%), and yard trimmings (10%). The materials defined as "remainder/composite C&D" in the Palo Alto Waste Composition Study include potentially recoverable items such as bricks, ceiling tiles, cement board, and insulation. Some of these "problem materials" are difficult to recover, but can be diverted from disposal by using them as Alternative Daily Cover at the Guadalupe Landfill.

3.4 Self-Haul Delivered to City Landfill

According to the Palo Alto Waste Composition Study, as shown in Figure 3-4, approximately 60% (6,500 tons) of self-haul waste delivered to the City Landfill is recyclable or compostable.

Figure 3-4 Self-Haul Waste Composition & Recoverability



3.4.1 C&D Debris Diversion

C&D debris, including concrete, asphalt paving and shingles, rocks, soils and fines, and remainder/composite C&D debris make up the largest segment of the City's self-haul waste stream (57%, 6,215 tons). The majority of this material would be recoverable if it was directed to a C&D debris processing facility like Zanker or Guadalupe.

The self-haul sector is difficult to regulate or provide with programs. When the City Landfill closes in 2011, self-haul generators will likely take their materials to another landfill, such as the Ox Mountain Landfill or to a processing facility, such as the Shoreway Transfer Station in San Carlos, the SMaRT Station, Zanker or Guadalupe.

The City's C&D debris ordinance has been effective for projects valued at $75,000 or more. It is possible that much of the C&D debris generated by self-haul generators is from building projects that fall below the $75,000 threshold. To encourage these self-haul generators to divert C&D debris from disposal, the City could amend its ordinance to require that all projects requiring a building permit comply with the C&D debris ordinance. The City of Stockton's C&D debris ordinance requires all projects requiring a building permit to comply with the ordinance.

The City's C&D debris ordinance requires that reusable materials from buildings scheduled for demolition be made available for salvaging prior to demolition. However, the City may also wish to consider requiring or encouraging building owners to remodel existing buildings through adaptive reuse, rather than demolishing the building. In an adaptive reuse design, the major building elements of the existing building are kept intact and are incorporated into the new use (e.g., factory buildings converted to condominiums, warehouse building converted to live-work lofts). Once the City has evaluated the success of its existing C&D debris ordinance, we recommend that it consider implementing these additional program enhancements.

3.5 Uncharacterized Self-Haul Delivered to Other Landfills

3.5.1 C&D Debris Diversion

We anticipate that the composition of the uncharacterized self-haul fraction is similar to the self-haul material delivered to the City Landfill. Table 3-1 lists tons delivered by uncharacterized self-haul generators to other landfills in 2004. The majority of these tons are delivered to nearby landfills in San Mateo and Santa Clara counties. Some of the tons listed below include residual waste from industrial open top debris box loads hauled by PASCO to the C&D debris processing facilities at Guadalupe and Zanker. The residual processing wastes from the C&D debris processing facilities (totaling 1,368 tons) are accounted for in the industrial waste category, so we have adjusted the total listed below to compensate for this material which is included in the industrial waste category described above.

Table 3-1 2004 Tons Disposed by Self-Haul Generators at Other Landfills

Facility Name (County)	Tons
Altamont Landfill (Alameda)	111
Vasco Road Sanitary Landfill (Alameda)	26
Keller Canyon Landfill (Contra Costa)	166
Bakersfield Sanitary Landfill (Kern)	5
CWMI – B18 (Kings Waste and Recycling Authority)	63
Azusa Land Reclamation (Los Angeles)	2
Redwood Sanitary Landfill (Marin)	7
Crazy Horse Sanitary Landfill (Monterey)	3
Forward Inc. (San Joaquin)	16
Ox Mountain Sanitary Landfill (San Mateo)	3,616
Hillside Class III Disposal Site (San Mateo)	8
Pacheco Pass Sanitary Landfill (Santa Clara)	2
Newby Island Sanitary Landfill (Santa Clara)	301
B - J Dropbox Sanitary Landfill (Solano)	91
Potrero Hills Landfill (Solano)	1,800
Fink Road Landfill (Stanislaus County Regional Solid Waste Planning Agency)	27
Zanker Material Processing Facility (Santa Clara)	1,940

Facility Name (County)	Tons
Zanker Road Class III Landfill (Santa Clara)	318
Guadalupe Sanitary Landfill (Santa Clara)	153
Total (including 1,369 tons of C&D debris processing residues from PASCO loads delivered to Guadalupe and Zanker)	8,655
Adjusted Total	7,286

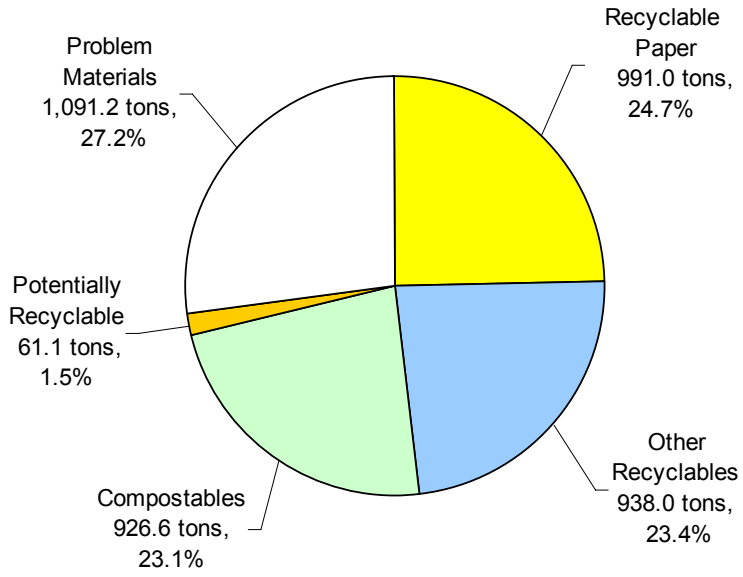
Like the self-haul loads delivered to the City Landfill, some of these uncharacterized self-haul loads are from building projects that fall below the City's threshold of $75,000 in value. These loads are also likely to include processing residues and back-haul from contractors that have performed work in the City and disposed of waste generated by their activities in Palo Alto at landfills close to their base of operations (outside of the City). We recommend that the City amend its C&D debris ordinance to include all projects requiring a building permit in order to increase diversion for a portion of this self-haul material.

3.6 City Operations

To inspire residents and businesses to voluntarily drive for the zero waste goal, the City should continue to set an example in its own operations. Acting as model/leader is strategic to the zero waste path, and required for the zero waste goal, as City government represent the largest generator of recycling and solid waste in the City.

According to the Palo Alto Waste Composition Study, as shown in Figure 3-5, approximately 71% (2,900 tons) of waste disposed by City government operations is recyclable or compostable.

Figure 3-5 City Facilities Waste Composition & Recoverability



3.6.1 Waste Reduction/Recycling Program

To ensure that the City itself sets an example in waste prevention, the City should establish goals and procedures for all city departments to reduce solid waste and increase recycling consistent with the Zero Waste Operational Plan and the Zero Waste Strategic Plan. Goal setting should be done in collaboration with all department heads and those responsible for implementation. The City's program could include:

- Each City department would designate a coordinator to promote waste reduction and recycling
- All City buildings must establish recycling collection services (if not already done), and select waste prevention strategies for implementation
- Providing City employees with technical assistance and training in waste reduction
- Collect data on waste generation, reduction, and recycling to measure the program's success at select City facilities
- Report progress, lessons-learned, and next year's plans for each department to the City Council.

3.6.2 Materials Hauled by City Crews

Currently, materials hauled by City crews from the Parks/Community, Public Works and Utilities departments are brought to the City Landfill. Clean loads of yard trimmings are directed to the City Composting Facility and some C&D debris are diverted from disposal. If the City develops a composting and C&D facility at an alternative site, once the City Landfill closes in 2011, the materials hauled by City crews would be delivered to these facilities. However, if the City implements a regional approach and uses regional composting and C&D facilities, materials hauled by City crews could be collected, consolidated and stored at the City's corporation yard(s) until debris boxes are full. We assumed that once these boxes were full, the City's contract hauler would transport these to the processor. Debris boxes that are completely filled at locations such as parks or projects can be picked-up by the City's contract hauler and directly transported to the processor without using the corporation yard(s).

4.0 Facilities

To achieve the high diversion goals established by the City, including striving for zero waste, the City must either invest in its own zero waste infrastructure or rely on infrastructure provided by others. This section describes the facilities that need to be considered for implementation of the City's Zero Waste Operational Plan. These facilities were identified to: 1) replace existing facilities and their associated diversion levels scheduled for closure as part of the overall City Landfill closure in 2011, and 2) add new diversion capacity to assist the City in meeting its 73 percent diversion and zero waste diversion goals. This section describes the required functions by facility type for City-developed facilities. This zero waste plan assumes that the programs and facilities recommended for implementation will assist the City in meeting 73 percent diversion goal by 2011 and 90 percent diversion by 2021. Many of the programs and facilities included in this plan depend on public participation to reduce disposal by appropriately segregating divertible materials. If from the City's annual monitoring of diversion it appears in about 2016 that the 90 percent diversion rate for 2021 may not be attainable, the City should revaluate and identify other plans to assist it in reaching its goals. One plan discussed in this section to assist the City in capturing additional diversion if needed is implementation of emerging technologies.

The required facility types are integrated into overall system scenarios that are recommended as part of the Zero Waste Operational Plan for adoption and implementation in Section 7.

4.1 Facility Types

The City currently uses six facility types to divert materials from landfill and provide service to the public. These include:

- Materials Recovery Facility (MRF)
- Recyclables Collection and Processing
- Yard Trimmings Composting

- C&D Debris Processing
- Recycling Drop-Off Center
- Landfill Recycling

Several of these functions, including the Recycling Drop-Off Center, Yard Trimmings Composting, and Landfill Recycling are located at the City Landfill. Since the City Landfill will be closing in 2011, these current functions will need to be relocated and potentially modified.

The existing Recycling Drop-Off Center will be temporarily relocated off-site and adjacent to the City Landfill until it closes in 2011. The City is in the process of procuring design services for this temporary relocation until the Landfill closes. After the Landfill closes, the temporary Recycling Drop-Off Center will either terminate or may require relocation elsewhere in Palo Alto. The Recycling Drop-Off Center should also include an HHW Facility to maintain and potentially increase the amounts of these materials diverted from landfill.

The City Composting Facility will need to be relocated or replaced. As discussed previously, we recommend that the City's yard trimmings collection program be expanded to include other organics such as food waste and compostable paper. It is not feasible for the City to obtain permits for this facility to accept food scraps and other compostables for diversion prior to closing.

The current Landfill Recycling operation will discontinue with closure of the City Landfill. This function and the recovery of these materials will need to be addressed though processing at the MRF and C&D Debris Processing facilities. Recognizing these conditions and criteria, each of the required facility types, including the City's specific options to address these functions is described below.

4.1.1 MRF

The City is currently under contract with the SMaRT Station to receive, process and divert materials from landfill at the SMaRT Station through October 14, 2021. The partner cities are in the process of upgrading the SMaRT Station equipment to increase diversion. The partner cities are also in the process of procuring a new operator for the SMaRT Station. In the new operations agreement which is scheduled to begin on January 1, 2008, the operator will be requested and provided incentives to increase diversion consistent with the equipment upgrade. The sliding scale for maximum diversion will be increased by 7 percent of incoming materials. The SMaRT Station is currently diverting approximately 18 percent (currently the upper end of the SMaRT Station operator's sliding scale for diversion) from incoming materials. Under the new SMaRT Station operations contract the City could expect to reach approximately 25 percent diversion of incoming materials in 2008.

When the City's Landfill closes, self-haul generators will deliver loads to other landfills and processing facilities, including the SMaRT Station. The SMaRT Station could also receive recyclables, yard trimmings and limited types of household hazardous waste from self-haul generators. However, the distance to the SMaRT Station may inconvenience and detour most self-haulers, unfortunately resulting in these materials being introduced back into the waste disposal stream through the Shoreway Transfer Station in San Carlos or the Ox Mountain Landfill in San Mateo County. For this reason and the City's need to control these functions if at all possible, options for these City facilities are discussed below.

The SMaRT Station could also handle the City's yard trimmings collected by the contract hauler, however there are no plans by the SMaRT Station to include other organics such as food or compostable paper to its processing operations. To achieve higher diversion rates and move towards zero waste, the City would need to consider other options for organics and yard trimmings as discussed below. The SMaRT Station may be able to assist in diverting some materials currently delivered to the City Landfill that are included in the City Landfill Recycling diversion figures. At the very least, the City will get credit for diversion up to 25 percent (depending on the success of the SMaRT Station Operator) of these materials delivered to the SMaRT Station instead of the City Landfill.

4.1.2 Recyclables Collection and Processing

The City currently uses the services of its contract hauler PASCO for collection and processing of residential and commercial single-stream recyclables. We recommend that the City continue processing these materials at the Waste Management facility and if a new contractor is selected, at the processing facility operated by the new contract hauler.

4.1.3 Organics/Yard Trimmings Composting

The targeted organics/yard trimmings materials for processing includes the current materials composted at the City's Landfill (approximately 16,716 tons in 2004). In addition, other targeted materials are those that are assumed to be captured mostly from disposal in the categories of food, yard trimmings, compostable paper, untreated wood and compostable organics, as identified in the Palo Alto Waste Composition Study.

Organics/Yard Trimmings Composting can be handled either, 1) outside the City at a regional facility; 2) at a City developed site; or 3) decentralized on-site at businesses in the City. Each of these approaches is discussed below.

4.1.3.1 Regional Facility Approach

Under the regional facility approach organics and yard trimmings would be handled and processed at a regional facility. The contract for handling and processing of the materials can be directly executed between the City and the processor or the City could contract for these services as part of its agreement with the contract hauler.

As described in Section 3, organics materials including food, compostable paper and untreated wood, would be added by residents to the yard trimmings containers, and clean loads of

commercial organics would be collected for composting. This approach allows for the possibility of including smaller commercial organics customers in residential collection routes, thus adding to collection efficiency. This approach also would unify the City's organics program parameters; residents who work in the City's food-generating businesses would have their positive behavior reinforced through consistency of messages and materials setout rules at home and at work.

Cleanliness of loads would be emphasized through program planning, outreach, training, and monitoring. This approach to feedstock quality arguably will yield the most sustainable and additive results in terms of product quality, market demand, positive environmental behavior, customer knowledge about the effects of their behavior on environmental quality, and overall customer satisfaction.

After the City Landfill is closed, self-haul "clean" yard trimming materials from the public (mostly landscapers), currently going to the City Landfill will be direct hauled by the public to another facility such as the SMaRT Station where the materials will receive credit for diversion. We assumed that the City's contract hauler would transport all materials collected from the residential and commercial sectors directly to the processor's facility. Clean yard trimmings collected by Palo Alto City crews from the Parks/Community, Public Works and Utilities departments that are currently composted at the City Landfill would be collected, consolidated and stored at the City's corporation yard(s) until debris boxes are full. An area to contain three to five large debris boxes would be sufficient. We assumed that once these boxes were full, the City's contract hauler would transport these to the processor. Debris boxes that are completely filled at locations such as parks or projects can be picked-up by the City's contract hauler and directly transported to the processor without using the corporation yard(s).

There are several regional processing operations within approximately 85 miles (one-way) of the City. These include:

- Grover Landscaping located in Vernalis, approximately 80 miles from the City,
- Jepson Prairie Organics located in Vacaville approximately 85 miles from the City,
- Newby Island Compost located in Milpitas approximately 20 miles from the City,
- Pacheco Pass Landfill/South Valley Organics Composting located in Gilroy, approximately 55 miles from the City,
- West Contra Costa Sanitary Landfill Compost located in Richmond, approximately 50 miles from the City, and
- Z-Best Compost located on Highway 25 near Hollister, approximately 55 miles from the City.

Although most of these processors accept other organics, such as food (West Contra Costa is not currently permitted, but is expected to open in 2007) in addition to yard trimmings, many are currently limited in capacity for accepting these other organic materials. As private industry processors have historically responded to competitive procurements, many of these processors would manage to increase their capacity to respond to the City's request. In addition, the City's capacity could be split between processors if necessary.

4.1.3.2 City Developed Approach

Another approach to composting organics/yard trimmings would be for the City to develop its own facility. As the City has very limited space locally, and needs to mitigate potential environmental concerns, processing operations would need to be handled in enclosed buildings, such that only extremely "size-efficient" enclosed technologies could be considered. Recognizing this, we identified a vertical composting facility manufactured by VCU Technology, Ltd., a New Zealand company for consideration. According to VCU Technology, the entire operation can be constructed on a site of about 2 to 3 acres, much less than other similar technologies.

VCU Technology would employ an in-vessel, aerobic composting system to handle the City's organic materials and yard trimmings. In addition, we understand that their technology can also accept biosolids from wastewater treatment plants. This system includes three (3) buildings/stages:

- Reception building where materials are received and blended if necessary. The organics and yard trimmings will need to be blended to have sufficient structural integrity to allow the passage of air through the waste when it is put into the composting chamber. These wastes are mixed in a large batch mixer before being fed into the chambers by a series of sealed conveyors.

- Compost building where mixed materials are conveyed to modular, insulated, stainless steel-lined composting chambers. These processing chambers operate continuously on a 'plug-flow' principle. As product is removed daily from the base, waste is fed into the top of the chamber. According to VCU Technology, typical retention times to stabilize the materials vary between 7 and 14 days.

- Maturation building where processed materials are cured to maturation prior to being sent to market. The required curing time depends on the desired quality of compost.

Total building square footage for the three structures would be roughly 60,000 square feet. Because of the "smaller size" requirement of this facility, the process could only afford space consistent with shorter curing times and production of a lower grade compost product.

According to VCU Technology, "The VCU's working principle is a re-engineering of the traditional composting process, with air drawn up through the decomposing waste as it moves down through the chamber. Heat is generated by the metabolic activity of microbes at the chamber's lower levels. Rather than let this metabolic heat energy dissipate to atmosphere, it is

harnessed to help create a natural chimney effect that draws in cool air at the open base of the chamber. Due to the rising heat, temperatures vary between 40°C at the base of the chamber and in excess of 70°C at the top. Effectively, daily waste input is heat treated before the degradation process begins. Based on natural principles, this system is very energy-efficient and does not require agitation, bio-filtration, external heating or air injection. With minimal moving components, maintenance and operating costs are very low."

A typical side-view elevation of a VCU Technology facility and their composting chamber are included in Figures 4-1 and 4-2 below.

Figure 4-1 Typical VCU Technology Elevation

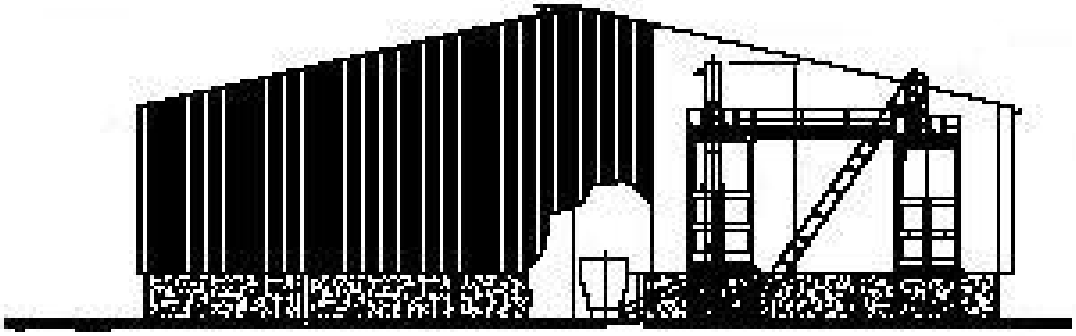
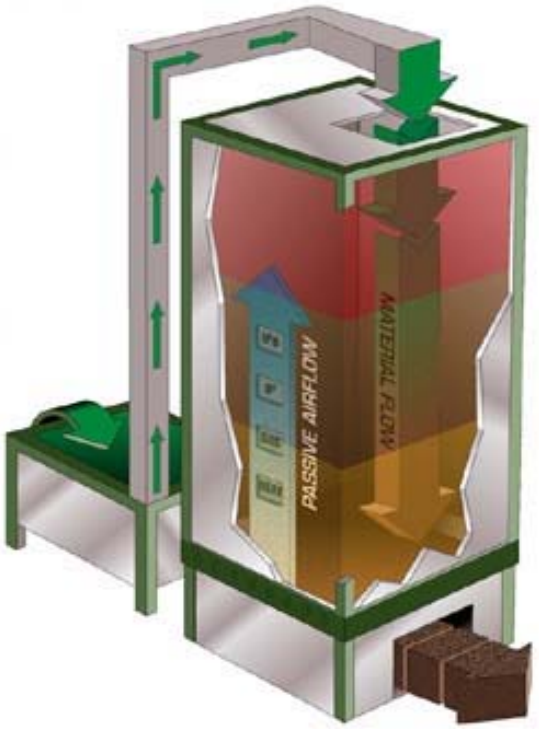


Figure 4-2 - Typical VCU Technology Composting Chamber



This technology is presented only as a representative example methodology for handling the City's organics and yard trimmings. We assume that the City would conduct a competitive procurement and evaluation of proposals and technologies before selection. For example, one possible concern with this technology is the lack of any VCU Technology facilities being developed within the U.S. to date. This concern includes lack of experience with Federal, State and local environmental policies and regulatory constraints. This local lack of knowledge could also impact cost projections identified by the vendor. This example technology was identified on the basis of size constraints, as only those technologies that can fit into the City's small available acreage can be considered. However, as discussed above many other criteria need to be evaluated during a City procurement process.

4.1.3.3 On-Site at Businesses in the City

Another approach to diverting organic materials from large volume business and institutional generators would be for some of these large generators to develop their own compost capacity on-site. A list of on-site equipment is posted at the California Integrated Waste Management Board website at http://www.ciwmb.ca.gov/FoodWaste/Compost/InVessel.htm.

4.1.4 C&D Debris Processing

The C&D debris targeted for processing includes the current materials being delivered to Guadalupe and Zanker, along with those materials currently collected by PASCO in open top debris boxes and disposed at the City's Landfill. C&D debris processing can be handled either, 1) outside the City at a regional facility or 2) at a City developed site. Each of these approaches is discussed below.

4.1.4.1 Regional Facility Approach

This facility option covers C&D debris handling and processing at a regional facility. As in the option above, we assume that the contract for handling and processing of the materials can be directly executed between the City and the processor or the City could contract for these services as part of its agreement with the contract hauler. We assume that the City's contract hauler would supply debris boxes and transport all materials collected from the industrial (debris boxes) waste sector directly to the processor's facility. Similar to the process for consolidation of clean yard trimmings collected by Palo Alto City crews as discussed above, C&D debris collected by City crews from the Parks/Community, Public Works and Utilities departments that are currently handled at the City Landfill would be collected, consolidated and stored at the City's corporation yard(s) until debris boxes are full. As discussed above, we assume that once these boxes are full, the City's contract hauler would transport these to the processor. Debris boxes that are completely filled at locations such as parks or projects can be picked-up by the City's contract hauler and directly transported to the processor without using the corporation yard(s). Public self haul C&D debris currently delivered to the City Landfill for recovery would be redirected to the SMaRT Station.

There are several C&D debris processing operations within 35 miles (one-way) of the City. These include:

- Guadalupe Landfill in San Jose approximately 25 miles from the City,
- Kirby Canyon Landfill in San Jose approximately 35 miles from the City,
- Mission Trails Waste Systems in Santa Clara approximately 15 miles from the City,
- Newby Island Landfill in Milpitas approximately 20 miles from the City,
- Premier Recycling in San Jose approximately 20 miles from the City,
- Valley Recycling in San Jose approximately 20 miles from the City, and
- Zanker Materials Processing Facility in San Jose approximately 15 miles from the City.

Although some of these processors may not currently have capacity to accept all of the City's C&D debris, we have gathered from an informal phone survey with some of these processors that if a competitive procurement was initiated, they would respond. In addition the City's capacity could be split between processors if necessary.

4.1.4.2 City Developed Approach

Another approach to C&D debris processing would be for the City to develop its own facility. C&D debris processing operations would need to be contained inside an approximate 25,000 square foot enclosed building to address the limited availability of space and help mitigate potential environmental concerns. This approach would include a processing line where materials would be recovered from elevated sort conveyors. We assume that this facility would handle the C&D debris currently being processed by Guadalupe and Zanker as well as the materials currently handled as City Landfill Recycling. C&D debris processing operations would include the following:

- An unloading area where arriving materials would be unloaded and consolidated prior to floor sorting activities.
- A track mounted excavator equipped with a grapple attachment. The tracked excavator would be run over the "pre-floor sorted" waste materials prior to mechanical processing. This function will break up the remaining large pieces of wood, green and gypsum board for easier sorting. The grapple would load the track walked materials into the processing in-feed conveyor.
- A screen (vibratory or disc) where dirt, rock, soil, small organics and related "fines" are removed from the waste stream.
- A sorting platform where "overs" are visually inspected by properly trained sorters who extract specific materials. At this time, the materials anticipated for removal include green/wood materials, inerts (concrete, asphalt, rocks, etc.), gypsum board, metals and OCC (old corrugated cardboard). Treated wood materials and waste residues will travel over the sorting area where they would be transferred for disposal.
- A variety of storage areas and bins where extracted materials can be stored for later grinding (green/wood) or trans-loaded for departure to secondary markets.
- A hammer mill tub-type grinder where yard trimmings and untreated wood materials can be ground and then screened into an appropriate size.
- An area for load out of a variety of materials including but not limited to reusable building materials, chipped green/wood, metals, cardboard, concrete/asphalt, gypsum board and any other recyclable materials extracted from the incoming C&D debris loads.

Since the activities would occur in-doors, storm water will not come into contact with the waste materials thus removing the necessity for any oil-water separators. Also, a secondary screen has been included to further classify the "fine" materials in the event such classification is financially beneficial to the marketing of the recovered materials, or necessary to meet the definition of Alternative Daily Cover as preferred by the Local Enforcement Agency overseeing the operations.

4.1.5 Recycling Drop-Off Center with HHW

The City's Municipal Code requires that the City operate and maintain a Recycling Drop-Off Center within the City boundaries for public use. The development of this function will: 1) assist the City in handling its existing collection and diversion functions that are currently in operation at the City Landfill that need to be replaced when the City Landfill closes, and 2) add the capability of a permanent facility to collect, consolidate and store HHW materials (additional HHW materials types to those currently collected at the existing Recycling Drop-Off Center) prior to outbound shipment to appropriate facilities. The existing Recycling Drop-Off Center, accounted for approximately 0.6 percent diversion from the City's total waste generated in 2004. The City needs to continue to be prudent in addressing removal of HHW, including designated electronic (e-waste) and universal (u-waste) from the materials destined for landfill as they can cause a high-level of contamination to the environment.

The components for this function include:

- **HHW Facility.** Replace current HHW collection activities performed at the City's Recycling Drop-Off Center as well as the periodic HHW collection events conducted by Public Works Operations at the PARWQCP. This includes collection of designated e-waste and u-waste waste materials. The City should explore the advantages and disadvantages of accepting HHW regionally, and if the advantages outweigh the disadvantages, then this option could be pursued. This facility could be used regionally by the cities participating in the PARWQCP, (Palo Alto, Mountain View, Los Altos, the Los Altos Hills, Stanford and East Palo Alto) and costs for development and operations could be shared regionally.

- **HHW swap/exchange area.** Will include an area for the public to pick-up products that they need for personal use, many of these new and unopened such as paints, stains, solvents, oil, antifreeze, car wax, etc. Environmental laws may restrict some materials to be offered for reuse such as personal hygiene products, animal care products, medicines, and some pesticides/poisons. In addition, the City may require the participant to sign a waiver of responsibility. Many communities are currently operating this type of swap/exchange area, including Alameda County, San Joaquin County, County of Sonoma, Central Sanitary in Contra Costa County, Last Chance Mercantile in Monterey County, Sacramento, Ventura County, and Orange County. The swap/exchange area is envisioned be located separate but adjacent to the HHW facility with materials held in a HHW storage locker for the public to access during operating hours.

- **Recycling Drop-Off Center.** Replace some of the current Recycling Drop-Off Center activities at the Landfill as described in the existing facilities section above. Equipment that will be required include: an office trailer, two compactors, canopy and tipping slab, concrete moveable barriers, large storage cages, bins (3, 4, 6, 8, 30, and 40 cubic yard sizes), one skip loader and one forklift. Areas needed for storage and processing include: area for appliances, Goodwill trailer, mattresses, CRTs, tires, bale storage, cart

storage for City owned carts, polystyrene and plastic bag storage; the site would require a car counter, information kiosk, fencing, lighting and 220 volt power.

- **Other collection capabilities.** Capability to collect additional materials such as rags/textiles, clean wood, ceramics and plate glass. Ability to accept used building materials and reusable materials not currently accepted in the Goodwill trailer.

- **Zero waste and recycling demonstrations.** These could include displays showing all potential recyclables, methods of diversion, public education, etc.

4.2 Emerging Technologies

This zero waste plan assumes that the programs and facilities recommended for implementation will assist the City in meeting its 73 percent diversion goal by 2011. However, in order to reach 90 percent diversion by 2021 the City will need to rely on new waste prevention strategies and technologies yet to be developed. Many of the programs and facilities included in this plan depend on public participation to reduce disposal by appropriately segregating divertible materials. If from the City's annual monitoring of diversion it appears in about 2016 that the 90 percent diversion rate for 2021 may not be attainable, the City should evaluate additional waste prevention and materials management strategies, and other technologies and facilities as a contingency to reach its goals. Some future potential emerging technologies may have benefit in assisting the City to meet its goals. These may include anaerobic digestion, hydrolysis or other technologies. In addition, as the City's current SMaRT contract reaches the end of its term in 2021, the City will need to evaluate the current or proposed future SMaRT Station diversion strategy to see if it is consistent with the City's goals.

4.3 Consideration for Local Replacement of Facilities

In the process of selecting local sites for City developed facilities, the City should consider the following:

- The Zero Waste Strategic Plan recommends that the City:

    - Maintain one or more Recycling Drop-Off Centers within the City limits once the City's landfill closes in 2011, not on City parklands unless consistent with the Baylands Master Plan

    - Reduce volume and toxicity of waste. This recommendation is consistent with the objective of the City's Household Hazardous Waste Element, which was approved by the City Council on June 6, 1991. This document recommended the creation of a permanent HHW facility by the year 2000.

The City Municipal Code Section 5.20.270, states that the City will maintain within the City's limits a Recycling Drop-Off Center which accepts from residents and non-residents the delivery of recyclable materials.

4.3.1 Identifying Local Sites for City Developed Facilities

In assessing potential local sites, the ability to accommodate the facilities identified in this plan, including the Recycling Drop-Off Center with HHW, Organics/yard Trimmings Composting, and C&D Debris Processing facilities will be examined. Of these facilities, a Recycling Drop-Off Center with HHW is the highest priority to be able to accommodate locally per the City's Municipal Code. Some of the characteristics that will determine site feasibility would be property size, ownership, zoning designations, and access to the property. Should this option be chosen, a detailed site selection study subject to environmental assessment will be conducted.

4.3.2 No New City Developed Replacement Facilities

This option assumes that after the City Landfill is closed in 2011, the existing City facilities would be closed as well. The City would opt not to replace the Recycling Drop-Off Center including handling of certain HHW materials. The Public Works Operations would continue its current periodic HHW collection events at the PARWQCP. In addition all self-haul materials would be directed to the SMaRT Station or other regional facilities. Under this scenario, the City Municipal Code would require modification.

4.4 Conclusions

The City will need five facility types to implement the zero waste plan; these include: MRF, Recyclables Processing, Organics/Yard Trimmings Composting, C&D Debris Processing and Recycling Drop-Off Center with HHW facilities.

We recommend that the City:

- Identify potential sites taking into consideration the Zero Waste Strategic Plan, Household Hazardous Waste Element recommendations and the City Municipal Code requirement for a local Recycling Drop-Off Center prior to selection and development to handle the facility functions.

- Develop a Recycling Drop-Off Center with a permanent HHW facility locally. The City should continue to make it convenient for the community to recycle excess materials, to reduce the toxicity of the disposed waste stream by managing hazardous materials appropriately, and to offer a location to recycle materials that can not be recycled through the City's curbside and commercial collection program.

- Use regional facilities for MRF, Recyclables Processing, Organics/Yard Trimmings Composting and C&D Debris Processing.

5.0 Policies

The programs and facilities identified in the previous sections will assist the City in maximizing diversion. However, to achieve zero waste, the City will need to implement "new rules", policies to change the status quo and encourage or require waste prevention in addition to waste diversion. Waste prevention or "source reduction" is at the top of the integrated waste management hierarchy (and is the "reduce" in "reduce, reuse, recycle"). However, many waste prevention strategies (including manufacturer responsibility and product stewardship) require cooperation and leadership at the regional, state and federal levels. The City is an active participant in developing these strategies, working in partnership with other zero waste communities.

This section describes the priority policies that were identified in the Zero Waste Strategic Plan that could be implemented to achieve the City's diversion goals of 73 percent by 2011 and 90 percent or zero waste by 2021.

5.1 Collection Rate Incentives

The City has established a variable collection rate to encourage customers to reduce the volume of solid waste that they produce. We recommend that the City consider additional rate incentives to maximize recycling and achieve zero waste.

- **Zero Waste Residential Collection Rate**. Currently, low volume generators in the City can subscribe to a 20-gallon mini-can. Additional rate incentives for zero waste generators could include subscription to a 10-gallon mini-can, bi-monthly or monthly solid waste collection services with weekly service of recycling and organics. The zero waste collection rates should include the costs of recycling and organics collection and other programs supported by the collection rates (e.g., outreach and technical assistance, HHW, street sweeping).

- **Bi-weekly Collection of Residential Solid Waste**. Currently, weekly collection of solid waste for residential customers is the default level of service. When the City implements weekly collection of organics, food and other compostables would be placed in the organics cart for collection. Since putrescible materials would no longer be placed in the solid waste carts, the City could consider providing bi-weekly collection of residential solid waste as the norm, with weekly collection of residential solid waste available on a subscription fee basis (intended for the subset of residents who have non-acceptable organics to dispose of regularly, such as disposable diapers or pet waste). The City of Berkeley is currently considering this option and is considering a pilot program on select collection routes. The Town of San Anselmo allows low volume generators to receive bi-weekly or every other week collection of solid waste.

- **Increased Commercial Recycling Collection Frequency.** As the community moves toward Zero Waste, there will be a shift from solid waste collection service needs to increased recycling service needs. To maximize recycling capture rates and comply with mandatory participation requirements, commercial service areas may require more frequent

recycling collection services than the currently offered service of one time per week. Commercial customers, including multi-family residential, with recycling storage restraints and increased participation efforts may need additional collections to meet their needs. Collection of recyclables should be available to customers on the same number of days as the collection of solid waste.

- **Volume Discounts for Commercial Diversion Capacity**. To encourage source reduction and provide an incentive for diversion, the City could consider providing volume discounts. The City and County of San Francisco has recently made changes to its collection rates to have customers pay for overall capacity and then receive a discount on the capacity based on the amount of recycling and organics collection services received. All commercial customers would pay a fixed base rate (5 percent of the volume charge) and a variable rate based on volume. The base rate would cover fixed system costs. The variable rate for the collection of solid waste, recycling and organics, would be based on total service volumes with discounts proportional to the percentage of diversion service volume. For example, if a customer has one 90-gallon cart for solid waste, one for recycling and one for organics, the total diversion service volume is 67 percent. If a customer has 1-cubic yard bin for solid waste and 1-cubic yard bin for recycling, the total diversion service volume is 50 percent. The discounts are applied up to 75 percent of the service volume.

  San Francisco Example:

  Assume solid waste rate is $100 per month for once per week collection of 1 cubic yard container. Customer A subscribes to three 1 - cubic yard containers, one for solid waste, one for recycling and one for organics. Total monthly rate for Customer A is:

  > $100 x 3 one cubic yard containers x 67 percent discount (2 containers are for diversion) = $100.

5.2 Extended Producer Responsibility

The City is a founding member of the Bay Area Zero Waste Communities. This informal group, consisting primarily of cities that have adopted zero waste goals, meets regularly to discuss regional strategies for promoting zero waste policies and initiatives. A current focus of the zero waste communities is:

- Extended Producer Responsibility (EPR). EPR initiatives require manufacturers of products to take responsibility for their ultimate recycling or disposal. Examples of EPR programs include voluntary or mandatory take back programs, advance recycling fees, and designing products for end-of-life recycling.

- Methods for encouraging restaurants and grocery stores to reduce the use of disposable food service containers and utensils and switch to recyclable and compostable alternatives instead.

City staff are also serving on the steering committee of the California Product Stewardship Council, currently being formed using the Northwest Product Stewardship Council (NWPSC) as a model. The NWPSC promotes the idea that by voluntarily adopting product stewardship, U.S. industries can avoid the regulatory approaches implemented in other countries. The City of Seattle, Snohomish County, King County, Washington, Portland Metro, Oregon and other local governments formed the NWPSC. NWPSC projects have included:

- Working with the Washington Retailers Association, state and federal governments and other interested parties, they helped develop support for the recently adopted Washington E-waste Recycling law.

- Working with the numerous retail apparel companies headquartered in the Northwest: Columbia Sportswear, Eddie Bauer, Filson, Hanna Anderson, Nike, Nordstrom, Norm Thompson Outfitters, and Recreational Equipment Inc. These companies are sharing information, reusing in-store fixtures, eliminating polyvinyl chloride plastics (PVC), consideration of alternative fabric sources and textile take backs..

- Engaging the Northwest Tire Dealers Association and working closely with consultants to develop an industry supported approach to the tire problem. The team reviewed tire programs in place elsewhere and was developing a program that will increase the availability of end-of-life options for tires in the region. One initiative focused on designing tires with increased recycled content and reduced environmental impacts.

- Bringing together health care professionals to work on prevention of medical waste from the region's hospitals and biotech laboratories.

The six metro Minnesota counties surrounding Minneapolis/St. Paul offer another example of collaborative efforts to implement EPR. These counties promoted product stewardship for cathode ray tubes (CRTs) and latex paint. Both efforts involved convening task forces of manufacturers, distributors and retailers, with some participation by companies that purchase recycled material. One result of the CRT project conducted was Sony Electronics October 2000 announcement to take back all Sony electronic products in the state.

Other long-term outcomes ranged from manufacturers designing products to facilitate more recovery of electronics with CRTs to CRTs being properly managed at end-of-life. Short-term outcomes ranged from manufacturers using more post-consumer CRT glass in new products to at least one retailer and one manufacturer initiative to collect and recycle CRTs.

The board overseeing the counties' efforts acknowledges that they would not have been effective without the state's support and partnership.

We recommend that the City contribute staff and financial resources to developing and maintaining a California or Bay Area Product Stewardship Council.

5.3 Zero Waste Advocacy

We recommend that the City continue to work with the Bay Area Zero Waste Communities group to develop innovative policies and programs, and to work together to solve common problems. We also recommend that the City collaborate regionally, statewide and nationally in support of policies and legislation such as:

- Take back programs
- Deposit programs
- Advanced recycling fees
- Funding of zero waste initiatives through statewide or regional landfill surcharges and product charges
- Packaging levies (e.g., on plastic bags)
- Minimum recycled content standards for additional products
- Environmental Preferable Purchasing
- Green building guidelines
- New mechanisms for financial assurance for post-post-closure liabilities for private landfills.
- Encourage other communities in the region to adopt similar zero waste goals and create implementation plans. Work with other communities to remove and resolve mutual obstacles to zero waste.
- Involve community in advocacy campaigns, including writing to producers and retailers, and writing to legislators on these policies
- Brief all City departments on zero waste and explore opportunities for collaboration.

5.4 Solutions for the City's Put or Pay Contract

The City's contract with Waste Management Inc. to use the Kirby Canyon Landfill requires that the City deliver a specified number of tons for disposal each year to the landfill or pay for those tons whether the City uses the capacity or not. If the City is successful in reaching 67.8 percent diversion or more, the City's disposal tons could fall below the tonnage guarantees in the City's agreement with Waste Management Inc. to use the Kirby Canyon and increase the City's overall system costs.

City staff has met with the SMaRT Station partner cities to discuss the importance of significantly reducing or eliminating the financial obligations in the current service contracts

that pose a barrier to waste reduction. The SMaRT Station partner cities are in the process of drafting procurement documents to secure the next operator for the SMaRT Station. The cities of Sunnyvale and Mountain View are currently not focused on achieving additional diversion rates in excess of state requirements. In the future, Sunnyvale and Mountain View may want to use waste disposal capacity no longer needed by City for their own disposal needs. Alternatively, the partner cities could provide processing and disposal capacity to other communities if not needed by the partner cities. However, current taxes and fees on waste disposal in San Jose made it economically unattractive for other communities to want to dispose at the Kirby Canyon Landfill at this time.[1]

In the Request for Proposals for new collection services, the City could indicate that it is open to proposals to negotiate out of the disincentives for zero waste in the SMaRT Station agreement and the Disposal Agreement with Waste Management. PASCO (which is a subsidiary of Waste Management) would be in the best position to offer other services (e.g., processing food waste at some new Waste Management facility), or other expanded recycling programs (e.g., expansion of single stream recycling processing) with Waste Management in trade for reducing or eliminating the City's obligations to dispose of wastes at Kirby Canyon Landfill.

However, other service providers may be able to offer significantly better rates for other services as part of the total procurement package. The net effect of this issue on an integrated waste and recycling system therefore may not be significant. Through the procurement process, the City may decide that it is acceptable for the City to continue to pay fees for disposal services at Kirby Canyon that are not used. From a zero waste perspective, the higher the costs for waste disposal, the more incentive there is to eliminate waste at the source, reuse, recycle and compost discarded materials.

5.5 Maintain Open Market Competition for Recyclables

The Zero Waste Strategic Plan called for increasing public and private collection and processing services on an open, competitive basis. We recommend that the City encourage innovative services to be added by the private sector and nonprofit groups so the City does not have to invest in those activities (e.g., building materials reuse yards) and encourage all providers of zero waste services to offer their services in the City on an open, competitive basis.

Currently, recyclers, other than the contract hauler, may provide recyclables collection to commercial generators. Materials collected by third-party recyclers in the City include: office paper, cardboard, renderings, scrap metals, electronic waste and shrink wrap. Large generators often prefer to make their own arrangements for collection of materials from third party recyclers, have national contracts for recycling, receive rebates for recyclables, or have services provided through a management company. The City currently benefits from a third-

[1] The current 2006 total of local, regional and state fees and taxes for waste landfilled in San Jose is $19.42/ton.

party recycling infrastructure because it expands the service options available to commercial generators.

5.6 Environmentally Preferable Purchasing Policy

The City has a Recycled Content Purchasing Policy, setting standards for the City to purchase environmentally preferable recycled content products. We recommend that the City establish standards and incorporate these into applicable bid solicitations and purchasing opportunities. In addition to maximizing post-consumer content, other criteria to be considered include waste reduction, reusability, and recyclability of both the product and packaging.

Source reduction purchasing policies are natural adjuncts of Environmentally Preferable Purchasing (EPP) programs. The U.S. EPA has established an on-line EPP database, with examples of specifications and contract language that can be used:

http://yosemite1.epa.gov/oppt/eppstand2.nsf/Pages/Search.html

The recycled product procurement process in the City has not achieved the goals set out by the policy. For example, although the City's Purchasing Department had arranged for the purchase of 100 percent recycled paper, but after nine months of implementation, this program was discontinued.

It is possible that an overarching EPP policy or ordinance ratified by the City Council could improve interdepartmental implementation and follow-through.

Given the interdepartmental nature of many environmental programs, one way to foster better communications would be to maintain an interdepartmental steering committee for environmental initiatives. The purpose of the steering committee would be to resolve any policy or program issues where more than one department is involved. The steering committee may involve different staff as issues arise and different departments are affected. For example, the San Francisco Department of the Environment convenes meetings of different departments affected by different products or policies, and then works through any issues that arise.

5.7 Grants, Loans and Incentives for Reuse and Recycling Businesses

To create local reuse and recycling opportunities for the community, the City could encourage businesses to locate in the City by providing grants, low interest loans, incentives and promotion. Incentives could include flexible zoning, streamlined local permit processes, reduced taxes and licensing, and increased and consistent supply of recyclable materials for feedstock.

We recommend that the City seek to retain and attract businesses to the City to fill potential service voids, including:

- Building materials reuse and salvage

- Edible food rescue and donation
- Clothing and textile reuse and recycling.

The City could leverage its resources by working with the CIWMB to establish a Recycling Market Development Zone (RMDZ). The RMDZ program combines recycling with economic development to fuel new businesses, expand existing ones, create jobs, and divert waste from landfills.

This program provides low interest loans, technical assistance and free product marketing to businesses that use materials from the waste stream to manufacture their products and are located within a zone. There are 34 RMDZ zones across the state. Several of these zones cover whole counties, multi-county regions and multiple cities. However, some cities, such as the City of Santa Clarita operate their own RMDZs.

The City may wish to consider forming an RMDZ to take advantage of the state support and incentives, but could also administer a grant or loan program without state assistance.

5.8 Greenhouse Gas Emissions Reductions

Achieving the City's zero waste goals will contribute significantly to overall reductions in greenhouse gas emissions. According to the United States Environmental Protection Agency (U.S. EPA), landfills, which create landfill gas consisting principally of carbon dioxide and methane, are the largest human-created source of methane in the United States, accounting for 25 percent of the country's methane emissions. Methane has a more powerful greenhouse effect than carbon dioxide. Over a 100-year period, one ton of methane is estimated by the scientific community to make the same contribution to warming as 23 tons of carbon dioxide. Therefore, by reducing the methane emissions of landfills, through waste prevention and recycling, the City can have a real impact on its overall greenhouse gas emissions.

The U.S. EPA has created the "WAste Reduction Model" (WARM) to calculate greenhouse gas emissions reductions associated with waste prevention and recycling. WARM calculates and totals greenhouse gas emissions of baseline and alternative waste management practices—source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon equivalent (MTCE), metric tons of carbon dioxide equivalent ($MTCO_2E$), and energy units (million BTU) across a wide range of material types commonly found in municipal solid waste. For simplicity, only the carbon equivalent metric tons are presented here. The WARM calculator can be accessed at:

http://yosemite.epa.gov/OAR/globalwarming.nsf/content/ActionsWasteWARM.html

Using the WARM calculator, our preliminary analysis indicates that should the City achieve 76 percent diversion by 2011 (as outlined in this plan), the City would reduce its greenhouse gas emissions by over 29,000 metric tons of carbon equivalent per year. Further, if the City was able to reach 90 percent diversion by 2021 (through programs and facilities yet to be

identified), the City would reduce its greenhouse gas emissions by nearly 59,000 metric tons of carbon equivalent per year. The reductions the City achieves in 2011 would be the equivalent of removing over 23,000 passenger cars from the roadway each year for every year that the reductions are maintained. The further reductions the City achieves in 2021 would be the equivalent of removing over 47,000 passenger cars from the roadway each year for every year that the reductions are maintained. We recommend that the City conduct a greenhouse gas audit to fully measure the impact of its current and planned waste prevention and recycling programs. This measurement can be tracked over time to calculate the ongoing reductions in greenhouse gas emissions resulting from the actions of the City's residents, businesses and City government to reduce waste. Table 5-1 provides our preliminary calculations for the City's anticipated greenhouse gas emissions reductions using the WARM calculator.

Table 5-1 Anticipated Greenhouse Gas Emissions Reductions due to Zero Waste

Year	Commodity	Tons Recycled	Tons Landfilled	Total MTCE	Total Change in GHG Emissions (MTCE)	Passenger Car Removal Equivalents
2004 (Baseline)	Mixed Recyclables	114,157		(90,720)		
	Mixed MSW		70,226	8,120		
2011 (76% diversion)	Mixed Recyclables	147,098		(116,898)	(29,106)	23,100
	Mixed MSW		44,903	5,192		
2021 (90% diversion)	Mixed Recycles	181,980		(144,619)	(59,538)	47,253
	Mixed MSW		21,451	2,480		

Source: U.S. EPA WARM Calculator

6.0 Zero Waste System Scenarios

6.1 Introduction

Previous sections of this report describe program, facility and policy recommendations for meeting the diversion goals of the Zero Waste Operational Plan. Recommendations are combined into two recommended Zero Waste System Scenarios in this section. The Regional Zero Waste System Scenario relies on a regional approach to processing of materials and the City Zero Waste System Scenario relies on the City development of processing facilities.

Both Zero Waste System Scenarios recognize:

- Use of the SMaRT Station for MRF activities
- Recycling collection and processing by the contract hauler (currently PASCO)
- City development of a Recycling Drop-Off Center with HHW
- Implementation of the programs and policies identified in Sections 3 and 5.

The difference between the Zero Waste System Scenarios is the Regional Zero Waste System Scenario incorporates the use of regional facilities for organics/yard trimmings composting and C&D debris processing, while the City Zero Waste System Scenario incorporates these processing activities into City developed facilities. Each of these Zero Waste System Scenarios is discussed below.

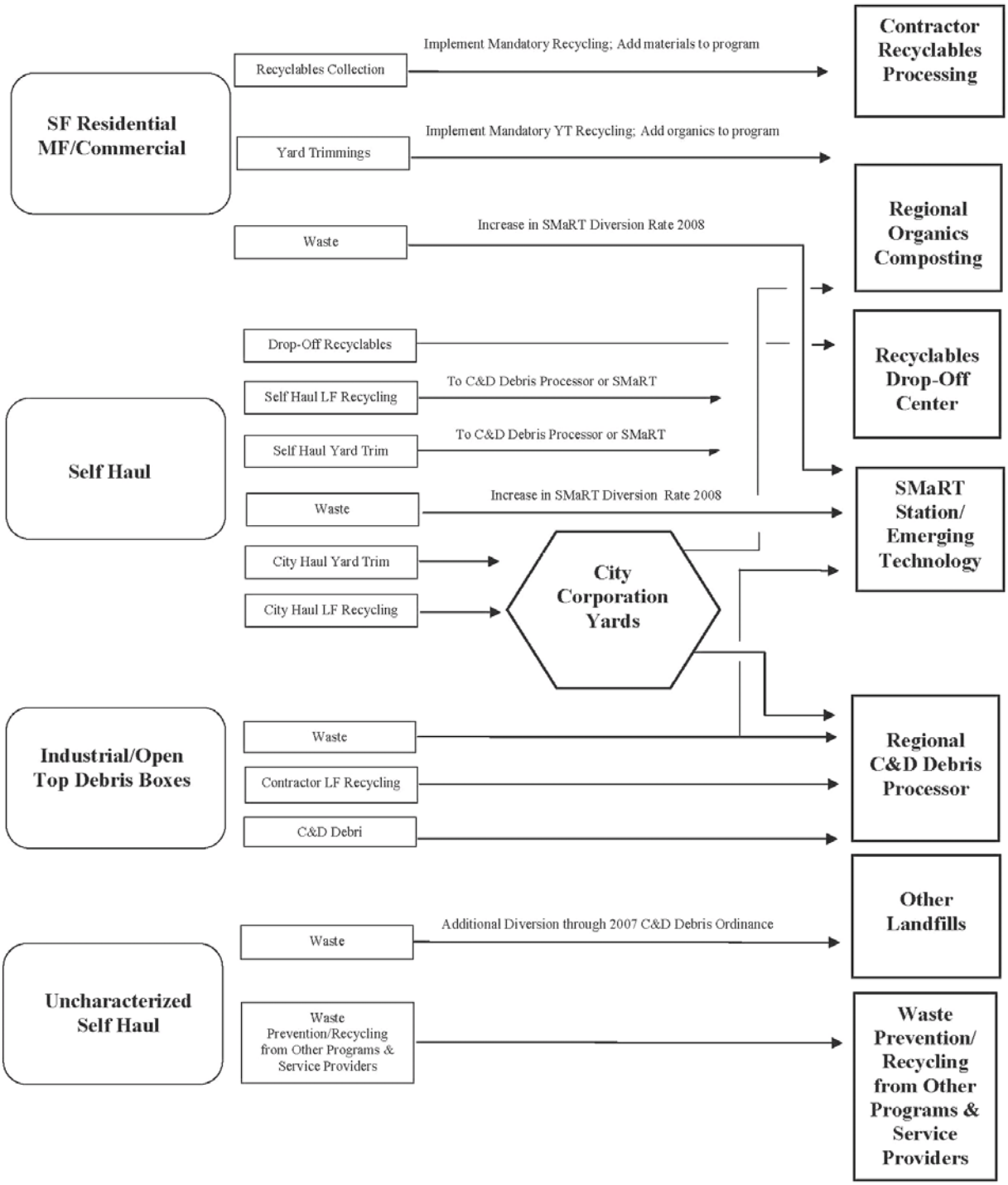
6.2 Regional Zero Waste System Scenario – Regional Facility Approach

A materials flow diagram representing the Regional Facility approach to the Zero Waste Operational Plan is shown in Figure 6-1. This materials flow diagram provides a description of how material generated by each generator sector flows through the system to achieve the diversion levels desired by the City.

6.2.1 Single Family/Multi-Family Residential & Commercial Sector

The combined single family (SF)/multi-family (MF) residential and commercial sector generate materials that are collected directly by the City's contract hauler, PASCO. Three separate materials are generated and collected by this sector including: recyclables, organics/yard trimmings and solid waste.

Figure 6-1 Materials Flow Diagram Future/Post 2011 Regional Facility Approach



- **Recyclables** for this combined sector are currently collected separately and hauled directly to the contract hauler's processing facility. The Zero Waste Operational Plan maintains the current collection and processing approach through the planning period of 2021. The plan anticipates implementation of a mandatory recycling ordinance and addition of materials to the collection program in 2010, as described in Section 3, to increase diversion.

- **Yard Trimmings** are currently collected separately and hauled directly to the City Composting Facility for processing and composting. The plan maintains the current collection and processing approach through the closure of the City Landfill and composting operations in 2011. Under the regional facility approach, the City would need to enter into a contract with an organics processor/compost operator for handling of these materials after the City Landfill closes in 2011. As discussed, potential organics processors located within 85 miles (one way) of the City currently include: Grover Landscaping, Jepson Prairie Organics, Newby Island Compost, Pacheco Pass Landfill, West Contra Costa Sanitary Landfill Compost and Z-Best Compost. After the City Landfill closes, the collection contractor would be directed to deliver these materials to the regional composting facility. As a component of this approach, we anticipate implementation of a mandatory organics/yard trimmings recycling ordinance and addition of organics materials such as food waste to the collection program in 2011 to increase diversion.

- **Solid Waste** would continue to be delivered to the SMaRT Station from the contract hauler through the 2021 planning period. The plan anticipates that the recovery rate for received materials at the SMaRT Station will increase from the current approximately 18 percent to 25 percent in January 2008 after facility modifications are complete. In addition, the percentage of materials being delivered to the SMaRT Station may decrease depending on the impact the new mandatory ordinances and other program changes.

6.2.2 Industrial (Open Top Debris Box) Sector

The industrial (open-top debris box) sector generates materials that are collected directly by the City's contract collector, PASCO. Materials generated and collected in open-top debris boxes have historically been handled in three separate manners: 1) rich C&D debris loads sent directly to regional C&D debris facilities, 2) C&D debris currently delivered as waste to the City Landfill and SMaRT Station and 3) materials rich in C&D debris sent to the City Landfill for recycling.

- Rich C&D debris loads would continue to be sent directly to regional C&D debris facilities through the planning period of 2021.

- A large portion, approximately 70 percent of C&D debris loads currently delivered as waste to the City Landfill and SMaRT Station could be captured and diverted to regional C&D debris facility starting in 2007 through the planning period of 2021.

The 30 percent of open top debris boxes not suitable for C&D debris processing would continue to be delivered to the City Landfill (through 2011 and then to the SMaRT Station after 2011) or the SMaRT Station. This approach assumes the City would enter into a contract with a C&D debris processing facility operator. As discussed, potential C&D debris processors located within 35 miles (one way) of the City currently include: Guadalupe Landfill, Kirby Canyon Landfill, Mission Trails Waste Systems, Newby Island Landfill, Premier Recycling, Valley Recycling, and the Zanker Materials Processing Facility.

6.2.3 Self Haul Sector

The self-haul sector includes a variety of generators that currently deliver their materials to either the City Landfill or the SMaRT Station. These generators include public self haul of waste, yard trimmings, landfill recyclables (including C&D debris) and recyclables handled through the Recycling Drop-Off Center. Self-haul generators also include City crews from the Public Works, Utilities and Parks/Community departments. The Zero Waste Operational Plan maintains the current delivery and processing protocol through the City Landfill closure in 2011 (it should be noted, as discussed the City is in the design process for relocation of the Recycling Drop-Off Center that should be available for use prior to 2011). This Recycling Drop-Off Center would be used by self-haul generators for recyclables and HHW materials. Yard trimmings and C&D debris from City Crews would be collected and consolidated into debris boxes in available space at the existing City corporation yards (this is the norm for most cities that do not have landfills). The City's contract hauler would pick-up full debris boxes from the corporation yards and deliver them to the regional processing facilities (regional compost facility and regional C&D debris facility, as described above). Solid waste from self-haul generators would need to be directed to the SMaRT Station or other processing or disposal facilities after the City Landfill closes in 2011.

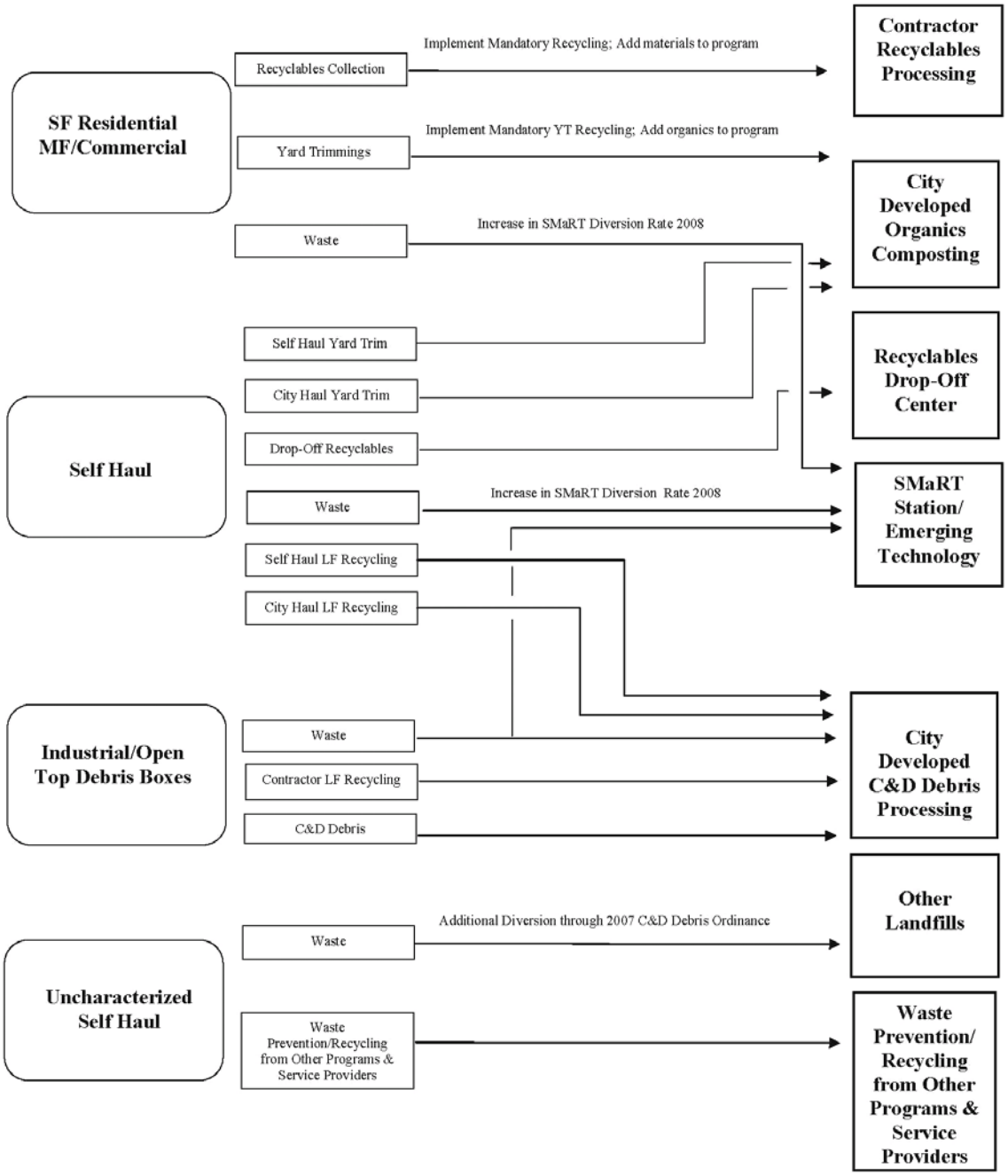
6.2.4 Uncharacterized Self Haul Sector

In 2004 approximately 7,286 tons of materials were disposed by self-haul generators at other regional landfills primarily those nearby in San Mateo and Santa Clara counties. These materials remain uncharacterized and difficult to capture. The proposed amendment to the C&D debris ordinance requiring all projects to comply with the ordinance should help to divert some of these materials from disposal.

6.3 City Zero Waste System Scenario – City Developed Facility Approach

A materials flow diagram representing the City Developed Facility approach to the Zero Waste Operational Plan is shown in Figure 6-2. This materials flow diagram provides a description of how material generated by each generator sector flows through the system to achieve the diversion levels desired by the City.

Figure 6-2 Materials Flow Diagram Future/Post 2011 City Developed Facility Approach



6.3.1 Single Family/Multi-Family Residential & Commercial Sector

The combined SF/MF residential and commercial sector generates materials that are collected directly by the City's contract hauler, PASCO. Three separate materials are generated and collected by this sector including: recyclables, organics/yard trimmings and solid waste.

- **Recyclables** for this combined sector would continue to be collected separately and hauled directly to the contract hauler's processing facility, as in the regional facility approach.

- **Yard Trimmings** are currently collected separately and hauled directly to the City Composting Facility for processing and composting. The plan maintains the current collection and processing approach through the closure of the City Landfill and composting operations in 2011. Under the city developed facility approach, the City would develop a composting facility to replace the City Composting Facility. As with the regional facility approach, we anticipate implementation of a mandatory organics/yard trimmings recycling ordinance and addition of organics materials such as food waste to the collection program in 2011 to increase diversion.

- **Solid Waste** would continue to be delivered to the SMaRT Station from the contract hauler through the 2021 planning period, as in the regional facility approach.

6.3.2 Industrial (Open Top Debris Box) Sector

The industrial (open-top debris box) sector generates materials that are collected directly by the City's contract collector, PASCO. Under the city developed facility approach, the City would develop a C&D debris facility after City Landfill closure in 2011 and the City's contract collector would be directed to deliver these materials to the new City facility.

6.3.3 Self Haul Sector

The self-haul sector includes a variety of generators that currently deliver their materials to either the City Landfill or the SMaRT Station. Under the city developed facility approach, both public self haul generators and City crews would deliver yard trimmings and C&D debris to the composting facility and C&D debris facility developed by the City. Recyclable materials and HHW would be delivered to the new City Recycling Drop-Off Center and HHW facility.

6.3.4 Uncharacterized Self Haul Sector

In 2004 approximately 7,286 tons of materials were disposed by self-haul generators at other regional landfills primarily those nearby in San Mateo and Santa Clara counties. These materials remain uncharacterized and difficult to capture. The proposed amendment to the C&D debris ordinances requiring all projects to comply with the ordinance should help to divert some of these materials from disposal.

6.4 Zero Waste System Scenario Diversion and Cost Comparison

6.4.1 Estimated Diversion Comparison

We prepared a detailed diversion estimation model representing each year from 2004 through 2021 for both Zero Waste System Scenarios. The model was prepared estimating diversion by material generation sector and material type using the programs, facilities, and policies discussed in Sections 3, 4 and 5 of this report. The detailed model is included in Exhibit B. A summary comparing estimated diversions rates for each of the Zero Waste System Scenarios is included in Table 6-1 for selected years when anticipated changes in programs and facilities affected the City's diversion rate. The City developed facility approach results in slightly higher diversion rates from 2011 through 2021, based on the City's ability to capture more of the material generated by the public self-haul sector at the City's developed processing facilities.

Table 6-1 Regional & City Developed Scenario Estimated Diversion Rate Comparisons

Approach/Year	2004	2011	2021
Regional Facility Approach	61.9%	76.6%	77.6%
City Developed Facility Approach	61.9%	77.3%	78.3%

6.4.2 Estimated Cost Comparison

We prepared a detailed cost estimate for the regional facility approach and both the LATP and PARWQCP City developed facility approaches. Although we understand that a more in-depth siting study is needed prior to site selection and development, these two sites were selected as representative for this cost comparison. A comparison of these costs is shown in Table 6-2. Detailed cost estimates are included in Exhibit B.

Table 6-2 Regional & City Developed Scenario Estimated Cost Comparisons

Item[1]	Regional Facility Approach	City Developed Facility Approach LATP Site	City Developed Facility Approach PARWQCP Site
Amortized Capital Cost[2]	$ 810,000	$ 3,920,000	$ 4,020,000
Annual Operating Cost[3]	$ 4,036,000	$ 3,330,000	$ 3,330,000
Total Annual Cost	$ 4,846,000	$ 7,250,000	$ 7,350,000
Estimated Materials Sales[4]	N/A[5]	$ 538,000	$ 538,000
Annual Cost (Net of Material Sales)	$ 4,846,000	$ 6,712,000	$ 6,812,000
Existing Processing Costs[5]	$ 1,470,000	$ 1,470,000	$ 1,470,000
Net Annual Cost	$ 3,376,000	$ 5,242,000	$ 5,342,000
C&D/Compost Diverted Tons[6]	42,600	47,331	47,331
Net Cost per Diverted Ton ($/ton)	$ 79	$ 111	$ 113

[1] Based on 2006 $'s; costs rounded to nearest $1,000, except $/ton (rounded to nearest dollar)
[2] Based on 6% interest, 20 year term, & 5% finance expense
[3] Based on 2011 tonnages
[4] Does not include materials sales from Drop-Off
[5] Material sales already netted out of tipping fee
[6] Based on City's exiting net processing costs (projected materials sales deducted) and projected 2011 tons

6.4.2.1 Regional Zero Waste System Scenario

The cost estimate for the regional approach was developed utilizing current actual tipping fees gathered from local regional organics/yard trimmings composting and C&D debris processing facilities. In addition, transportation costs to each of these facilities was estimated and added to the tipping fees for each facility. The total tipping fees for each organics/yard trimmings composting and C&D debris processing operations were totaled separately and an average tipping fee in 2006 dollars was calculated. The number of tons to be processed in 2011 (first year of City Landfill closure and need for new facilities) was multiplied by the average tipping fee and summed. In addition, the cost to develop, construct and operate a Recycling Drop-Off Center with HHW Facility was added to the total and existing processing costs deducted to calculate the estimated net annual operating cost of $3,376,000.

6.4.2.2 City Zero Waste System Scenario

The cost estimate for the City developed facility approach was estimated for both the LATP and PARWQCP sites. The operations costs for both sites were assumed not to be site dependent and thus equal. The difference in cost between the two sites was due to site size. Site development costs for the LATP site were based on 7.1 acres; site development costs for the PARWQCP site were based on 7.5 acres. The purchase price for the LATP was assumed to be approximately $24 million; the purchase price for the PARWQCP site was assumed to be $25 million according to extrapolation of commercial property pricing on the City of Palo Alto's Economic Development website.

6.4.3 Conclusions

As shown in Table 6-1 above, the difference in diversion rates between the two approaches is minimal at approximately 0.7 percent. In comparing the cost per diverted ton of approximately $79 per diverted ton for the Regional System Scenario to the approximate $111 to $113 per diverted ton estimated for the City System Scenario approaches we recommend that the City pursue the Regional Zero Waste System Scenario. This approach is described in Section 7 Recommendation and Action Plan. It should be noted that although the Regional Zero Waste System Scenario is more favorable from an overall cost standpoint, this approach could be seen as a loss of service for self-haul generators of C&D debris and yard trimmings who have had the convenience of a local landfill and compost facility.

7.0 Recommendation and Action Plan

This section describes the recommendation and action plan that should be implemented by the City to reach 73 percent diversion by 2011 and to strive for zero waste by 2021.

7.1 Recommended Policies, Programs and Facilities

We recommend implementation of the following policies, programs and facilities to contribute to the City's goal of achieving zero waste:

Policies

- Make waste prevention the number one priority. Promote waste prevention through a variety of avenues including legislation, policies, ordinances, outreach and technical assistance.

Top Ten Waste Prevention Priorities for the City

Top 7 Local Priorities

1. Rates: Create incentives to encourage businesses and residents to reduce the total amount of material (e.g., garbage, recycling, and landscape trimmings) placed at the curb/in their bin that needs to be managed.
2. Green Building: Education on techniques and building materials that create less waste during construction and ongoing operation of buildings. Phase-in requirements for public and private projects by working with other departments to integrate and align various departmental programs and goals.
3. Sustainable Landscaping and Gardening: Education on best practices that will reduce maintenance costs and the amount of debris created and transported from their site. Phase-in requirements for public and private projects by working with other departments to integrate and align the various departmental programs and goals.
4. Environmentally Preferred Purchasing: Work interdepartmentally to develop an Environmental Preferable Purchasing Policy and implement it for City facilities. Partner with business associations in a manner that will facilitate businesses in adopting environmentally preferred purchasing practices.
5. Take Back: Develop local business take-back initiative to target specific types of materials that create unfunded mandates for local government (e.g. items currently banned from landfills by the State by EPA/Department of Toxics Substances Control).
6. Disposables: Work collaboratively with local businesses to identify strategies and solutions to reduce the reliance on specific single-use materials in the community (e.g., disposable shopping bags, disposable take-out containers).
7. Reuse: Develop innovative reuse services through City funded grant program, to be added by the private sector and nonprofit groups within the community.

Top 3 Regional Priorities

1. Zero Waste Legislation: Actively assist in the development of and support for
    a. Policies and legislation that support zero waste.
    b. Extended Producer Responsibility and Product Stewardship initiatives.
2. Zero Waste Advocacy: Encourage other communities in the region to adopt similar zero waste goals.
3. Zero Waste Research & Development: Work with a variety of groups, cities or associations to develop cutting edge policies and initiatives for zero waste activities.

- Reduce the amount and toxicity of consumer product waste through measures that place the appropriate level of responsibility on manufacturers for the end-of-life of their

products with the goal of full producer responsibility for reuse, recycling and disposal of all consumer products

- Collaborate with businesses, residents and community organizations to further the City's zero waste efforts
- Contribute staff and financial resources to developing and maintaining a California or Bay Area Product Stewardship Council.
- Continue to work with the Bay Area Zero Waste Communities group to develop innovative policies and programs, and to work together to solve common problems. We also recommend that the City collaborate regionally, statewide and nationally in support of policies and legislation that support zero waste.
- Allow innovative services to be added by the private sector and nonprofit groups so the City does not have to invest in those activities (e.g., building materials reuse yards) and encourage all providers of zero waste services to offer their services in the City on an open, competitive basis.
- Establish standards for environmentally preferable purchasing initiatives and incorporate these into applicable bid solicitations and purchasing opportunities. In addition to maximizing post-consumer content, other criteria to be considered include waste reduction, reusability, and recyclability of both the product and packaging.

Programs

- Conduct a greenhouse gas audit to fully measure the impact of its current and planned waste prevention and recycling programs. This measurement can be tracked over time to calculate the ongoing reductions in greenhouse gas emissions resulting from the actions of the City's residents, businesses and City government to reduce waste.
- Provide technical support, and promotion of, non-profit food rescue organizations' efforts to reclaim unused, edible food for food banks and hunger programs. We also recommend that the City provide information to local restaurants and caterers about the "Good Samaritan" law which allows generators to donate edible food without concern for liability.
- Improve recycling in public areas. We recommend that local businesses and institutions (including grocery stores, convenience stores, hospitals and schools) provide recycling containers wherever they provide trash receptacles for use by their customers.
- Improve the commercial technical assistance program to maximize participation in the City's recycling program by providing more resources and staff support.

- Improve the multi-family recycling outreach program by developing outreach and education tools designed to maximize recycling at multi-family complexes.
- Assist new reuse organizations and businesses to become established in the community through requests for proposals, grants, incentives, and promotion.
- Divert all PASCO debris boxes rich in C&D debris to local C&D debris processors..
- Implement a mandatory participation ordinance, which requires customers to place recyclable and compostable material in the appropriate collection containers. We recommend that the City begin the phase in of mandatory participation in 2010 to coincide with the implementation of a new collection services agreement in July 2009 and the City Landfill closure in 2011.
- Make changes to the refuse rate structure to provide incentives for source reduction and recycling and rewards customers for reaching zero waste goal
- Encourage building owners to remodel existing buildings through adaptive reuse, rather than demolishing the building. In an adaptive reuse design, the major building elements of the existing building are kept intact and are incorporated into the new use (e.g., factory buildings converted to condominiums, warehouse building converted to live-work lofts). Once the City has evaluated the success of its existing C&D debris ordinance, we recommend that it consider implementing these additional program enhancements.
- Amend the C&D debris ordinance to expand current projects requiring a building permit in order to increase diversion for a portion of this self-haul material.
- Have City government lead by example through:
    - Establish recycling collection at all City buildings
    - Collect and compare annual history of waste generation, recycling and recycling activities to measure program success
    - Continue to report progress, lessons-learned and next years' plans to the City Council
    - Increase staff efforts in technical support in waste prevention programs throughout the City departments
- Coordinate the upcoming procurement process for "Solid Waste and Recyclable Materials Handling Services" and include the following additional programs:
    - Divert food scraps, compostable paper, untreated wood and other compostables. Since the City will continue to use its Compost Facility for yard trimmings composting until the landfill closes in 2011, we recommend adding

food scraps and other compostables to the single-family yard trimmings collection program after the Compost Facility closes. We recommend that this service be evaluated further when the City conducts its procurement process for collection services prior to the expiration of the PASCO agreement in July 2009.

- Implement commercial and multi-family organics collection in the expanded scope of services when the City conducts its new procurement process for collection services prior to the expiration of the PASCO agreement in July 2009.

- Expand the types of materials currently accepted. Consider textiles, milk and juice cartons, plastic bags, expanded polystyrene packaging and containers, hard cover books and electronic waste. The City has recently evaluated the viability of adding these materials to its single-stream recycling program and concluded that the existing markets for diversion and technologies for processing are not adequate to warrant inclusion at this time. We recommend that the City revisit this issue with potential new service providers and processors when it conducts its procurement for new collection services prior to the expiration of the PASCO agreement in July 2009.

- Implement reuse and recycling clean-up program. We recommend that the City implement a bulky item reuse and recycling program with the contract hauler at the commencement of new services in July 2009. We recommend that all single-family, multi-family and commercial customers be eligible to participate in the bulky item reuse and recycling program.

- Roll-out recycling services to all commercial customers. We recommend that the City implement this approach with the commencement of new services in July 2009.

Facilities

- Keep a local drop off recycling operation which includes an HHW facility. The facility would not be located on City parklands unless consistent with the Park Dedication Ordinance and the Baylands Master Plan.

- Identify sites taking into consideration the Zero Waste Strategic Plan, Household Hazardous Waste Element recommendations and the City Municipal Code requirement for a local Recycling Drop-Off Center prior to selection and development to handle the facility functions.

- Develop a Recycling Drop-Off Center with a permanent HHW facility locally. The City should continue to make it convenient for the community to recycle excess materials, to reduce the toxicity of the disposed waste stream by managing hazardous materials

appropriately, and to offer a location to recycle materials that can not be recycled through the City's curbside and commercial collection program.

- Use regional facilities for MRF, Recyclables Processing, Organics/Yard Trimmings Composting and C&D Debris Processing.

7.2 Recommended System Scenario

We recommend that the City implement the Regional Zero Waste System Scenario which includes each of the following elements as listed in Table 7-1.

- The regional facility approach provides the City with the programs and facilities needed to reach 73 percent diversion by 2011 and close to zero waste by 2021
- Reliance on regional facilities for composting and C&D debris processing provides the greatest diversion at the lowest price
- The local Recycling Drop-Off Center with a permanent HHW facility will provide a convenient opportunity for residents and business to divert more materials to reuse and recycling and to reduce the toxicity of the disposed waste stream.
- New staff or contractor resources will be needed to provide additional zero waste outreach; technical assistance to commercial businesses, multi-family complexes, and City departments; organics technical assistance; and zero waste policy initiatives
- Additional staff or contractor resources needed amount to 3 full-time equivalent staff or approximately $450,000 annually for salaries and benefits
- Collection infrastructure costs for the new collection services, where recycling and organics routes replace solid waste collection routes will be approximately equal to current infrastructure needs
- Annual increases in processing costs total approximately $3,376,000 (assuming implementation in 2011 when full regional processing is required; in 2006 dollars); this is based on estimated total regional processing costs of $4,846,000 and net existing costs for composting and C&D debris processing of about $1,470,000 (based on current per ton costs and 2011 escalated tonnages)

- One-times costs for internal collection containers (kitchen pails for the residential organics program, internal collection containers for commercial organics, recycling buddies for multi-family residents) total approximately $150,000 and $15,000 annually
- The annual outreach campaign will require $100,000 annually for advertising and materials development
- The grant or loan program for attracting and retaining reuse and recycling businesses will require $50,000 annually.

Table 7-1 Recommended System Scenario – Regional Approach

Scenario Components	Additional Program Staff	Annual Costs	One-Time Costs
Programs			
Single-Family Organics	--	$10,000 annual replacement cost	$4 per kitchen pail $100,000 one-time costs
Single-Family Recycling[1] -Outreach -New materials -Mandatory participation	½ FTE for outreach ½ FTE for enforcement	$100,000 annual outreach campaign	--
Bulky Item Reuse and Recycling[1]	--	--	--
Multi-Family and Commercial Organics[1]	½ to 1 FTE for organics technical assistance	$2,500 annual internal container replacement cost	$25 per internal container $25,000 one-time cost
Multi-Family and Commercial Recycling[1] -Universal Rollout -Mandatory participation	--	--	--
Commercial Technical Assistance	½ to1 FTE for commercial, multi-family and City department technical assistance	--	--
Multi-Family Technical Assistance	Included above	$2,500 annual replacement cost	$2.50 per recycling buddy $25,000 one-time cost
Industrial C&D Debris Diversion -Direct loads to C&D debris facility	--	At current cost for processing & transportation	--
Self-Haul C&D Debris Diversion - Amend C&D debris ordinance	--	--	--
Facilities			
SMaRT Station	--	--	--
Contract Hauler Recyclables Processing	--	--	--
Regional Drop-Off/HHW, Compost & CD Facilities	--	$3,376,000 net annual increase[2]	--
Recycling Drop-Off and HHW	--	n/a[3]	--
Policies			
Collection Rate Incentives	½ FTE for policy implementation	--	--
Extended Producer	Included above	--	--

Scenario Components	Additional Program Staff	Annual Costs	One-Time Costs
Responsibility			
Advocacy for Other Zero Waste Policies	Included above	--	--
Solutions for Put or Pay	Included above	--	--
Maintain Open Markets for Recyclables	Included above	--	--
Environmentally Preferable Purchasing Policy	Included above	--	--
Grants, Loans and Incentives for Reuse and Recycling Businesses	--	$50,000 annually	--
Greenhouse Gas Emissions Reductions	Included above	--	--
Totals	approximately 3 new FTEs	$3,991,000 annual costs[5]	$150,000 one-time costs[4]

[1] Assumes any additional cost for collection of new materials is off-set by cost reductions in collection of disposal materials
[2] Assumes net Compost Facility ,C&D Debris Facility and Recycling Drop-Off Center with HHW Facility cost – see Exhibit B for additional details
[3] Assumes Recycling Drop-off costs at existing levels; HHW costs separate from Zero Waste Operational Plan costs
[4]Assumes costs included in new collection contract
[5]Estimated staff costs of $450,000 added to annual costs for 3 new FTEs

7.3 Zero Waste Action Plan

The following Zero Waste Action Plan lists all of the tasks necessary to undertake the Zero Waste Operational Plan, including the action steps, and an implementation schedule. This action plan and schedule is preliminary and is dependent on City Council approval and action by the City staff.

Table 7-2 Zero Waste Action Plan

Task#	Action Step	Responsibility	Schedule	Year
2007				2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
2007-01	Recommend adoption of Zero Waste Operational Plan	Policy and Services Committee	1-07	√
2007-02	Develop CEQA compliance documentation	Public Works and Planning	1-07	√
2007-03	Adopt Zero Waste Operational Plan	City Council	6-07	√
Programs				
2007-04	Prepare RFP and contract for collection services to include new programs for implementation in 2009 Release RFP	Public Works	7-07	√
	Select Vendor		1-08	√
	Implement new services		7-09	√
Policies				
2007-05	Continue support for regional EPR initiatives	Public Works	Ongoing	■
2007-06	Continue advocacy for other zero waste policies	Public Works	Ongoing	■
2008				
Programs				
2008-01	Develop outreach and education campaign to be implemented on an annual cycle Design campaign	Public Works – new staff resources	4-08	√
	Implement campaign		9-08	√
2008-02	Provide commercial, multi-family and City department technical assistance through increased resources of City staff or contractors	Public Works – new staff resources	6-08	√
2008-03	Phase in addition of public recycling collection containers where appropriate	Public Works/PASCO/Contract Hauler	Commence in 2008 and ongoing	■
2008-04	Amend C&D debris ordinance to require all projects to comply with diversion requirements Prepare amendment	Public Works/Permit Desk/City Council	2-08	√
	Amend ordinance		4-08	√
	Support implementation of C&D debris ordinance amendments		Ongoing	■
2008-05	Direct all appropriate industrial loads to C&D debris processing facilities	Public Works/PASCO	Commence in 2008 and ongoing	■

√ = Task Completed
■ = Ongoing Task

Table 7-2 Zero Waste Action Plan

Task#	Action Step	Responsibility	Schedule	Year
2008				2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
2008-06	Negotiate contract with selected vendor for new services, review transition/implementation plan	Public Works	Complete 7-08	√
2008-07	Implement annual outreach campaign tasks	Public Works	Ongoing	■
2008-08	Provide commercial, multi-family and City department technical assistance	Public Works	Ongoing	■
Facilities				
2008-09	Identify partners for excess disposal capacity at Kirby (SMaRT Station cities, other jurisdictions)	Public Works/SMaRT Cities	1-08	√
2008-10	Relocate Recycling Drop-Off Center	Public Works	10-08	√
Policies				
2008-11	Evaluate alternative rate structures and modify rates to encourage zero waste Commence evaluation	Public Works/City Council	1-08	√
	Amend rates prior to rate year		7-09	√
2008-12	Establish annual grants, loans and incentives for reuse and recycling businesses, investigate formation of RMDZ	Public Works	Ongoing	■
2008-13	Establish baseline greenhouse gas emission levels	Public Works	Commence 1-08	√
2008-14	Develop comprehensive Environmentally Preferable Purchasing (EPP) policies and adopt EPP ordinance Commence development	Public Works/Purchasing/City Council	2-08	√
	Adopt ordinance		10-08	√

Table 7-2 Zero Waste Action Plan

Task#	Action Step	Responsibility	Schedule	Year
2009				2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
2009-01	Rollout new collection services to all customers	Public Works/Contract Hauler	7-09	√
2009-02	Develop mandatory participation ordinance and phase in plan Adopt ordinance	Public Works/City Council	 10-09	√
	Implement ordinance		1-10	√
Policies				
2009-3	Calculate greenhouse gas emissions reductions	Public Works	11-09	√
2010				
Programs				
2010-01	Implement mandatory participation ordinance – Year 1 notification tasks	Public Works/Contract Hauler	1-10	√
Facilities				
2010-02	Prepare RFP for regional processing of organics and C&D debris Release RFP	Public Works	 2-10	√
	Select vendor		10-10	√
	Implement new services		7-11	√
2011				
Programs				
2011-01	Rollout organics collection program to residential and commercial customers	Public Works/Contract Hauler	Commence 7-11	√
2011-02	Provide organics technical assistance with rollout of new services	Public Works/Contract Hauler	Commence 7-11	√
Facilities				
2011-03	Direct contract hauler to new organics and C&D debris processing facilities	Public Works/Contract Hauler	Commence 7-11	√
2011-04	Direct self-haulers to alternative facilities for C&D debris, yard trimmings and solid waste	Public Works	Commence 7-11	√
2011-05	Aggregate City self-haul load at corporation yards, direct full debris box loads to SMaRT or C&D debris facility	Public Works/Contract Hauler	Commence 7-11	√

Table 7-2 Zero Waste Action Plan

Task#	Action Step	Responsibility	Schedule	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2012																		
2012-01	Celebrate achievement of 73 percent diversion goal	Public Works/City Council	7-12						√									
2012-2014																		
2012-02	Maintain existing policies and programs	Public Works	Ongoing						[redacted]									
2015-2017																		
2015-01	Evaluate future need for disposal capacity at Kirby and MRF capacity at SMaRT (SMaRT Station cities, other jurisdictions)	Public Works/SMaRT Cities	2015									√						
2016-01	Evaluate zero waste operational plan and update as appropriate	Public Works/City Council	2016										√					
2017-01	Evaluate collection contract and procure new services if appropriate	Public Works/City Council	2017											√				
2017-02	Evaluate feasibility of emerging technology approaches and new innovative materials management or waste prevention strategies	Public Works	2017											√				
2017-03	Prepare RFP for emerging technology capacity, if needed and available regionally, or pursue other new innovative materials management or waste prevention strategies	Public Works	2017											√				
2018-2021																		
2018-01	Direct loads to emerging technology facility, if appropriate, or implement other new innovative materials management or waste prevention strategies	Public Works	2018												√			
2019-01	Negotiate extension or procure new collection services, as determined by the new procurement process	Public Works/City Council	2019													√		
2020-01	Evaluate zero waste operational plan and update as appropriate	Public Works	2020														√	
2021-01	Calculate greenhouse gas emissions reductions	Public Works	2021															√
2021-02	Celebrate achievement of zero waste	Public Works/City Council	2021															√

EXHIBIT A

PALO ALTO WASTE COMPOSITION STUDY

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Palo Alto
Waste Composition Study

Final Report

REVISED May 2006

Prepared by
Cascadia Consulting Group

Table of Contents

1 Introduction and Summary of Findings

1.1 Purpose and Approach of the Study

In 2005, the Palo Alto City Council adopted a Zero Waste Resolution and Strategic Plan, setting new goals for the community in handling solid waste for the future. This strategy aligns well with the State of California's goal of achieving zero waste statewide by 2025. It also considers local needs: the City of Palo Alto (City) landfill will close in 2011.

To achieve Zero Waste, it is first necessary to understand existing waste streams and identify opportunities for additional waste prevention, reuse, recycling, and composting. Therefore, the City commissioned this study, which had the following objectives:

- Provide detailed waste composition and quantity information for the Sunnyvale Materials Recovery and Transfer (SMaRT) Station residuals and four waste sectors: single-family residential, mixed commercial/multi-family residential, industrial, and self-haul.
- Provide detailed waste composition and quantity information for selected industry groups.
- Identify key opportunities for diversion, recovery, or reuse of specific types of material categories.
- Use a study design that is comparable to that of the previous two Waste Generation Studies (EMCON, 1990 and 1997), so that data may be compared across the studies.

To meet these objectives, the consultant team applied a statistical sampling approach to the City's waste stream, using three characterization methods:

- Hand sorting of single-family residential and mixed commercial/multi-family waste samples;
- Visual characterization of industrial and self-haul waste samples; and
- Computer-based modeling of targeted commercial sectors, including multi-family residential, city facilities, schools, restaurants, and hospitals.

This document presents a statistical analysis of the waste sampling results, and the results of the computer modeling, with an emphasis on recyclable and compostable material categories. The consultant team expects that the findings will help the City design and target its waste reduction, recycling, and composting programs for each waste sector, and make progress toward its goal of Zero Waste.

1.2 Summary of Findings

In 2004, waste collected from the four waste sectors, single-family residential, mixed commercial/multi-family residential, industrial, and self-haul, totaled approximately 78,200 tons. Notable findings and observations about the City's waste stream include the following:

- Approximately three quarters (72%, 56,500 tons) of the Palo Alto waste examined in this study is reusable, recyclable, or compostable.
- Approximately 29% (22,700 tons) of the City's waste is compostable, including food, compostable paper, leaves and grass, prunings and trimmings, branches and stumps, and compostable organics.

- Recyclable paper comprises about 14% (11,200 tons) of the waste, including material categories such as newspaper, magazines and catalogs, cardboard, white ledger and other office paper.
- Nearly a third (29%, 22,500 tons) of the City's waste stream consists of recyclables other than paper. By weight, the largest non-paper recyclable material categories are rock, soil and fines, wood-untreated, asphalt roofing, other ferrous metal, gypsum board, and concrete.
- About 3% (2,200 tons) of the City's waste stream is considered potentially recyclable, meaning markets could be developed regionally to process and market these materials.
- A quarter (25%, 19,400 tons) of City waste sampled consists of problem materials. Material categories are considered problem materials if there is no existing processing option for the material. The five largest problem materials, by weight, are remainder/composite construction and demolition, wood-treated, other film plastics, diapers, and remainder/composite paper.

During sampling, the consultant field team identified materials that could potentially be reused or repaired. Items identified during sampling included a new cell phone with accessories, reusable speakers and window blinds, and a reparable chair, among others.

This study examined the composition of residuals from the SMaRT Station that serves the cities of Palo Alto, Mountain View, and Sunnyvale. Notable findings about the composition of SMaRT Station residuals include:

- Over three-quarters (77%, 30,700 tons) of the SMaRT Station's residuals are reusable, recyclable, or compostable.
- Compostable material categories account for about 36% (14,500 tons) of the SMaRT Station's residuals.
- Recyclable paper accounts for about 17% (7,000 tons) of the residual stream.
- Other recyclables, such as rock, soil, and fines, gypsum board, other ferrous metal, textiles, and miscellaneous plastic containers account for 23% (9,200 tons) of SMaRT Station residuals.

For particular business sectors of interest to City staff, the consultant team modeled waste profiles using existing California composition data. The team examined five business sectors: multi-family residential, city departments, schools, restaurants, and hospitals. Key findings from the modeling exercise include the following:

- More than two thirds (71%, 5,300 tons) of the multi-family residential waste stream is recoverable—compostable material categories account for about 30% (2,300 tons), recyclable paper comprises 20% (1,400 tons), and other recyclables account for 21% (1,600 tons).
- About 71% (2,900 tons) of the city facilities waste stream is recoverable—compostable material categories account for about 23% (900 tons), recyclable paper comprises 25% (1,000 tons), and other recyclables account for 23% (900 tons).
- A large portion (76%, 1,000 tons) of the schools waste stream is recoverable—compostable material categories account for about 48% (600 tons), recyclable paper comprises 19% (200 tons), and other recyclables account for 9% (100 tons).

- More than three quarters (78%, 4,200 tons) of City's restaurant waste is recoverable—compostable material categories account for the largest share, about 58% (3,100 tons), recyclable paper comprises 11% (600 tons), and other recyclables account for 10% (500 tons).
- About half (53%, 2,400 tons) of the hospital waste stream is recoverable—compostable material categories account for about 17% (800 tons), recyclable paper comprises 22% (1,000 tons), and other recyclables account for 14% (600 tons).

1.3 Key Opportunities

The 2005 Waste Composition Study provides a detailed look at the City's overall waste stream, as well as the waste streams of specific waste sectors. This information can help the City target its efforts to increase waste reduction, recycling, and reuse to further its Zero Waste goal. Consistent with the study methodologies used in the City's previous waste composition studies, the data presented reflect tonnages and composition prior to processing at the SMaRT Station and C&D recycling at Guadalupe Landfill. Based on the results of our analyses, the consultant team identified the following key opportunities:

- **Focus on residential and commercial fiber** — Recyclable paper from residential and commercial waste streams totaled approximately 10,300 tons. Collection, processing, and end markets for recycled paper are well established and could be tapped to increase diversion.

- **Expand organics diversion** — Food waste and compostable paper from single family, multi-family, and commercial sources totaled more than 12,000 tons. Yard waste from all four waste sectors contributes almost 4,500 tons to the City's annual waste stream.

- **Examine opportunities of increased C&D waste reduction/recycling** — Recyclable materials in the industrial and self-haul waste sectors account for more than 15,200 tons per year. The largest share of this material is C&D waste.

1.4 Organization of the Report

The remaining portions of this report describe the study methodology and findings. The report is organized as follows:

- **Chapter 2, Summary of Waste Sort Study Methods,** defines the four waste sectors and SMaRT Station residuals and explains the methodology used to design and implement the primary data collection portion of this study. It also briefly describes the data analysis methods.
- **Chapter 3, Quantities of Waste,** shows the distribution of waste tonnages among the four waste sectors and SMaRT Station residuals.
- **Chapter 4, Composition and Recoverability of Waste,** presents waste composition results and key findings for each of the four waste sectors and SMaRT Station residuals.
- **Chapter 5, Waste Modeling,** describes the methods used to model waste generation for specific commercial sectors, and the results of this modeling effort.
- **Chapter 6, Key Opportunities,** identifies material categories and sectors with high potential for additional diversion, recovery, or reuse.
- **Appendices** follow the main body of the report. They provide study details, such as definitions of all waste-sorting categories, a complete explanation of the methodology, tables of waste composition by Zero Waste master category, and a comparison of the 2005 waste-generation results with those from 1990 and 1997.

2 Summary of Waste Sort Study Methods

The consultant team applied a statistical sampling approach to the City's waste and SMaRT Station residuals. During two weeks of on-site field work, the consultant team hand-sorted or visually characterized 156 samples into 84 waste categories.

This chapter summarizes the methodology used to design and implement the study, and analyze the resulting data. Appendix A contains a complete list of waste sort material category definitions. Appendix B contains a complete description of the waste-sort study methodology, and Appendix C describes the data analysis in more detail. Appendix D contains the field forms used during this portion of the study.

2.1 Waste Sectors Defined

The consultant team defined waste sectors in a method consistent with previous Palo Alto waste composition studies conducted in 1990 and 1997. The segmentation of the overall city waste stream also serves to support the design of targeted waste reduction, recycling, and composting programs. In addition to the City waste sectors, residuals were analyzed from the SMaRT Station. The four City waste sectors and the SMaRT Station residuals are defined as follows:

- **Single-family residential** is waste set out for disposal and collected by Palo Alto Sanitation Company (PASCO) from detached single family, duplex, triplex, and four-plex homes.
- **Mixed commercial and multi-family residential** is waste from businesses and multi-family sites that is collected by PASCO in front loader trucks and in compacting drop-boxes.
- **Industrial** is waste collected by PASCO in open-top (loose) drop-boxes.
- **Self-haul** is composed of waste hauled by residents or businesses to the City Landfill in small and large pick-up trucks, or other vehicles (e.g., flatbed trucks, moving vans, etc.).
- **SMaRT Station residuals** are materials off the discharge belt and residual materials from the construction and demolition (C&D) floor sort at the SMaRT Station.

2.2 Allocation of Samples

To maximize the overall number of samples obtained and to provide results consistent with the previous waste characterization studies, different numbers of samples were allocated to the waste sectors. The data collection process for each sector also employed different characterization methods. Single-family residential waste, mixed commercial and multi-family residential waste, and SMaRT Station residuals samples were hand-sorted. Loads of industrial and self-haul waste were visually characterized. Table 2-1 shows the planned sample allocation and the actual number of samples characterized. Variations from the sampling plan included the following:

- One mixed commercial/multi-family residential sample was visually characterized instead of hand-sorted because it contained large amounts of medical waste.
- The landfill received fewer than anticipated industrial (open-top drop-box) loads due to a C&D diversion program. Two additional self-haul loads were sampled to make up for the deficit in industrial samples.

Table 2-1: Planned and Actual Samples by Sector and Sort Type

	Hand-sorted		Visually Characterized		Total	
	Planned	*Actual*	*Planned*	*Actual*	*Planned*	*Actual*
Single-family Residential	15	15	-	-	15	15
Mixed Commercial/Multi-family Residential	30	30	-	1	30	31
Industrial (Open-Top Drop-Boxes)	-	-	40	38	40	38
Self-haul	-	-	40	42	40	42
SMaRT Station Residuals	30	30	-	-	30	30

2.3 Coordination

One month prior to the scheduled field work, the consultant team met with key staff at the City Landfill and the SMaRT Station to arrange permission and to coordinate space requirements and other logistics of the field data collection effort.

The consultant team also coordinated with PASCO, the City's waste hauler, to arrange for the delivery of randomly selected loads of single-family residential waste, mixed commercial and multi-family residential waste, and industrial waste to the City Landfill.

2.4 Classification of Waste

This study assigned material categories into one of 10 material classes: Paper, Plastic, Glass, Metal, E-waste (electronic waste), Yard Waste, Organics, Construction and Demolition, Hazardous Waste, and Special Wastes. Materials within the classes were further sorted into 84 material categories.

To identify additional diversion opportunities, the consultant team classified materials according to their recoverability, using five recoverability groups: recyclable paper (yellow), other recyclables (blue), compostables/potentially compostables (green), potentially recyclable (orange), and problem materials (white). The five recoverability groups are color-coded to make the viewing of the figures and tables clearer. Table 2-2 shows the 84 material categories arranged according to material class and recoverability group.

Table 2-2: Material Categories by Recoverability and Material Class[1]

	Recyclable Paper	Other Recyclables	Compostables / Potentially Compostables	Potentially Recyclable	Problem Materials
Paper	Cardboard Paper Bags/Kraft White Ledger Computer Paper Newspaper Magazines and Catalogs Phone Books & Directories Colored Ledger Other Office Paper Milk & Juice Polycoats Other Misc. Paper Blueprints		Compostable Paper	Hardcover Books	Remainder/Composite Paper
Plastic		HDPE Containers PET Containers Misc. Plastic Containers Plastic Bags Durable Plastic Items EPS Packaging EPS Containers			Other Film Plastics Remainder/Composite Plastic
Glass		Clear Glass Green Glass Brown Glass Flat Glass Other Colored Glass			Remainder/Composite Glass
Metal		Aluminum Cans Other Non-ferrous Metal Tin/Steel Cans Other Ferrous Metal Major Appliances Engines and Motors		Remainder/Composite Metal	
E-Waste		Brown Goods Computer-related Electronics Small Consumer Electronics TVs and Other CRTs			
Yard			Leaves and Grass Prunings and Trimmings Branches and Stumps		
Organics		Tires Wood Pallets Wood-untreated Textiles Leather	Food Agricultural Residues Manure* Compostable Organics	Other Rubber Carpet Carpet Padding	Wood-treated Diapers Remainder/Composite Organics
Construction & Demolition (C&D)		Concrete Asphalt Paving Rock, Soil, and Fines Gypsum Board Asphalt Roofing			Remainder/Composite C&D
Hazardous Waste		Paint Antifreeze Vehicle and Equipment Fluids Used Oil Batteries Auto Batteries Fluorescent Lights R/C HHW			Treated Medical Waste
Special Waste (SW)		Mattresses Box Springs Ash	Sewage Solids* Industrial Sludge*	Other Bulky Items	Hypodermic Needles Pharm. Medications Remainder/Composite SW Mixed Residue

[1] The three material categories manure, sewage solids, and industrial sludge are considered potentially compostable. However, these materials were not found in the City waste streams sampled. Manure was present in one sample of SMaRT Station residuals, but was calculated to represent a small fraction (less than .1%) of the Station's waste overall. For these reasons, the "compostable/potentially compostable" category is referred to as "compostable" throughout the remainder of the report.

2.5 Waste Quantities

To determine the quantity of waste from each waste sector and from the SMaRT Station, the consultant team requested data from the City and from the City's hauler, PASCO. According to the data, the City of Palo Alto collected and/or disposed of about 78,200 tons of waste in 2004. Residuals from the SMaRT Station totaled about 40,000 tons.

2.6 Hand-sort Procedures

For this study, the consultant team hand-sorted 15 samples of single-family residential waste, 30 samples of mixed commercial and multi-family waste, and 30 samples of SMaRT Station residuals. Samples sorted by hand were first placed on top of a sorting table outfitted with a ½ inch screen. Material was sorted from the table into 84 material categories and then weighed. The material falling through the screen was weighed as the material category mixed residue. The crew lead recorded the weight for each sorted material category on the sampling form, reviewed, and later entered the data into a custom database for analysis. The crew lead also assessed medium- and large-sized items for reusability and recorded this anecdotal information on the field form. A full description of the hand-sort procedures is included in Appendix B.

2.7 Visual Characterization Procedures

The consultant team visually characterized 38 samples of industrial waste and 42 samples of self-haul waste. In conjunction with the California Integrated Waste Management Board (CIWMB), the consultant team has developed a reliable method of visually characterizing waste from the self-hauled and industrial waste sectors. The method is especially useful for identifying recoverable materials that may be present in large quantities, characterizing waste loads that contain bulky items, and characterizing waste streams that tend to have substantial composition variation within individual loads (for example, loads that are half dirt and half lumber, separated at opposite ends of the truck). During the study, one sample of commercial waste was estimated visually instead of hand-sorted because it contained large amounts of medical waste.

The first step in visually estimating the composition of selected loads is to measure the volume of the waste. The visual estimator then records the estimated percentage of the load corresponding to each major material class, and next records the estimated percentages for specific material categories within the material classes. The step-by-step procedure that the consultant team used in this study is described fully in Appendix B.

2.8 Data Analysis

Following the on-site data collection, the consultant team entered all data recorded on the field forms into a customized database and reviewed it for data entry errors. The team calculated waste composition estimates using the methods described in Appendix C.

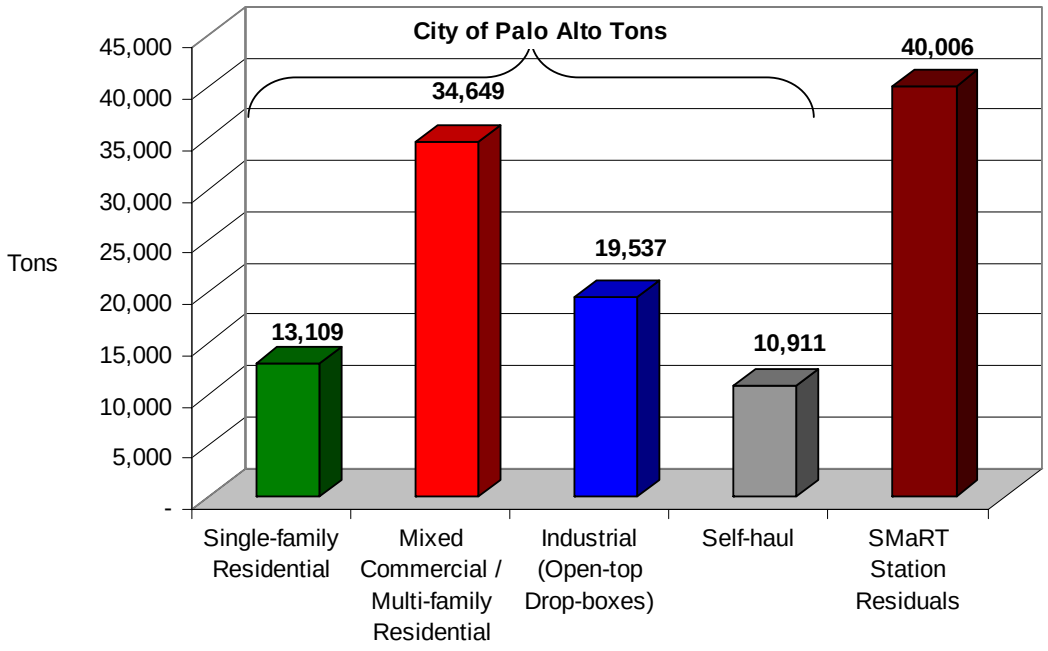
3 Quantities of Waste

This chapter of the report presents data on the total tons of waste for calendar year 2004 from each of the four City waste sectors and from the SMaRT Station.

The City processed or disposed of approximately 78,200 tons of waste in 2004. Of the City waste sectors, the mixed commercial and multi-family residential sector accounts the largest share, contributing over 34,600 tons. The industrial sector totals 19,500 tons, single-family residential waste accounts for 13,100 tons, while self-hauled waste totaled 10,900 tons. Figure 3-1 shows these data graphically.

Residual material from the SMaRT Station totaled 179,400 tons in 2004. While the SMaRT Station serves three cities, Palo Alto, Mountain View, and Sunnyvale, 40,000 tons of residuals is attributed to the City of Palo Alto.

Figure 3-1: 2004 Tons by City Waste Sector and 2004 SMaRT Station Residuals Disposed



4 Composition and Recoverability of Waste

This chapter of the report presents key findings about the composition of the City's waste and the recoverability of certain materials from the waste stream. Waste composition results for the City overall and for each waste sector include a pie chart showing the proportion of recyclable paper, other recyclables, compostables/potentially compostables, potentially recyclable materials, and problem materials. A table showing the composition results for all 84 material categories follows each pie chart.

4.1 Overall Waste Stream

The overall composition of City waste includes waste from the 4 waste sectors:

- Single-family residential
- Mixed commercial and multi-family residential
- Industrial (open-top drop-boxes), and
- Self-haul.

4.1.1 Key Findings

As shown in Figure 4-1, the sampling results suggest the following key findings about recovery potential for the City's waste stream overall:

- About 72% (56,500 tons) of the City waste examined in this study is recyclable or compostable.

- Approximately 29% (22,700 tons) of the City's waste is compostable, shown in green. The compostable fraction includes the following material categories (see Table 4-1):
  - Food (12,380 tons)
  - Leaves and Grass (3,554 tons)
  - Branches and Stumps (227 tons)
  - Agricultural Crop Residues (2 tons)
  - Compostable Paper (5,360 tons)
  - Prunings and Trimmings (709 tons)
  - Compostable Organics (235 tons)

- More than 43% (33,700 tons) of the waste is recyclable, including recyclable paper (14%, 11,200 tons), shown in yellow, and other recyclables (29%, 22,500 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - Other Misc. Paper (1,990 tons)
  - Magazines and Catalogs (1,819 tons)
  - White Ledger (1,604 tons)
  - Newspaper (1,963 tons)
  - Cardboard (1,769 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Rock, Soil, and Fines (5,757 tons)
  - Asphalt Roofing (2,017 tons)
  - Gypsum Board (1,856 tons)
  - Wood-untreated (2,541 tons)
  - Other Ferrous Metal (1,916 tons)

- About 3% (2,300 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Other Bulky Items (1,039 tons)
  - Carpet (409 tons)
  - Carpet Padding (42 tons)
  - Remainder/Comp. Metal (441 tons)
  - Other Rubber (341 tons)

- One quarter (25%, 19,400 tons) of the City waste sampled consists of problem materials. By weight, the six largest material categories are:
  - Remainder/Comp. C&D (6,567 tons)
  - Other Film Plastics (2,510 tons)
  - Remainder/Comp. Paper (1,098 tons)
  - Wood-treated (4,486 tons)
  - Diapers (1,422 tons)
  - Remainder/Comp. Special Waste, (936 tons)

Figure 4-1. Waste Composition & Recoverability, City Overall

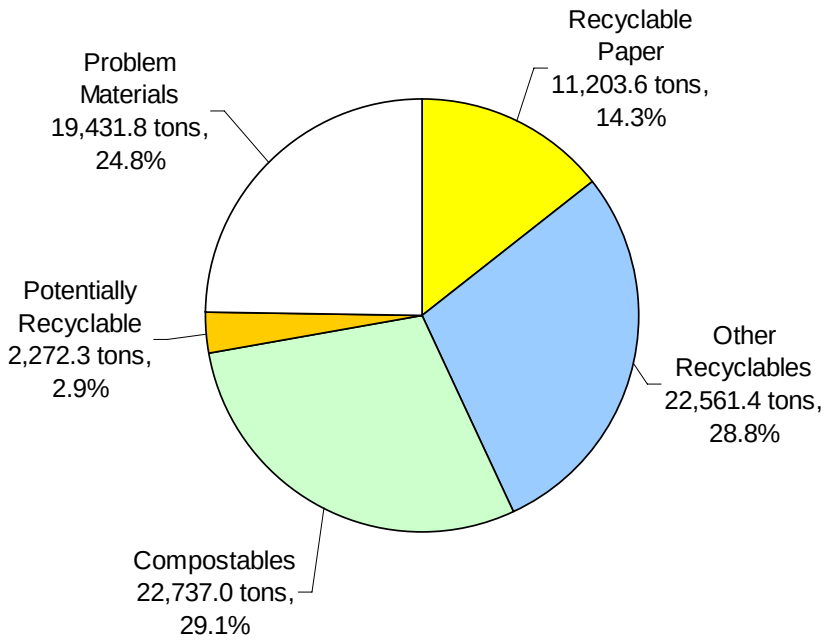


Table 4-1. Detailed Waste Composition, City Overall

	Est. Mean	+/-	Est. Tons
Paper	**22.9%**		**17,931.1**
Uncoated Corrugated Cardboard	2.26%	0.5%	1,769.1
Paper Bags/Kraft	0.57%	0.1%	442.0
White Ledger	2.05%	0.5%	1,604.3
Computer Paper	0.01%	0.0%	7.5
Newspaper	2.51%	0.6%	1,963.1
Magazines and Catalogs	2.33%	0.9%	1,819.4
Phone Books and Directories	0.07%	0.1%	52.2
Colored Ledger	0.13%	0.0%	105.0
Other Office Paper	1.51%	0.4%	1,183.3
Milk & Juice Polycoated Containers	0.34%	0.1%	268.2
Hardcover Books	0.00%	0.0%	0.0
Other Misc. Paper	2.54%	0.5%	1,989.6
Compostable Paper	7.20%	1.0%	5,630.0
Blueprints	0.00%	0.0%	0.0
Remainder/Composite Paper	1.40%	0.5%	1,097.5
Plastic	**7.53%**		**5,890.1**
HDPE Containers	0.55%	0.2%	427.0
PET Containers	0.42%	0.1%	329.3
Misc. Plastic Containers	0.70%	0.1%	548.0
Plastic Bags	0.44%	0.1%	344.7
Other Film Plastics	3.21%	0.6%	2,510.3
Durable Plastic Items	0.93%	0.4%	725.1
Expanded Polystyrene Packaging	0.23%	0.1%	181.2
Expanded Polystyrene Containers	0.39%	0.1%	305.4
Remainder/Composite Plastic	0.66%	0.1%	519.1
Glass	**1.70%**		**1,332.5**
Clear Glass Bottles and Containers	0.82%	0.2%	639.7
Green Glass Bottles and Containers	0.33%	0.3%	259.7
Brown Glass Bottles and Containers	0.23%	0.1%	179.7
Flat Glass	0.27%	0.2%	211.2
Other Colored Bottles & Containers	0.00%	0.0%	0.0
Remainder/Composite Glass	0.05%	0.0%	42.1
Metal	**4.14%**		**3,238.4**
Aluminum Cans	0.16%	0.0%	127.5
Other Non-ferrous Metal	0.40%	0.1%	316.7
Tin/Steel Cans	0.49%	0.2%	384.2
Other Ferrous Metal	2.45%	1.5%	1,916.1
Major Appliances	0.05%	0.1%	41.7
Engines and Motors	0.01%	0.0%	11.1
Remainder/Composite Metal	0.56%	0.4%	441.2
Electronic Waste	**0.59%**		**464.0**
Brown Goods	0.32%	0.2%	247.4
Computer-related Electronics	0.14%	0.2%	106.8
Other Small Consumer Electronics	0.02%	0.0%	18.6
TVs and Other Items with CRTs	0.12%	0.1%	91.2
Yard	**5.74%**		**4,490.7**
Leaves and Grass	4.54%	1.7%	3,554.0
Prunings and Trimmings	0.91%	0.5%	709.3
Branches and Stumps	0.29%	0.3%	227.4

	Est. Mean	+/-	Est. Tons
Organics	**30.52%**		**23,870.7**
Food	15.83%	2.5%	12,380.4
Tires	0.00%	0.0%	0.0
Other Rubber	0.44%	0.3%	341.3
Wood Pallets	0.59%	0.4%	463.7
Wood-untreated	3.25%	1.2%	2,540.9
Wood-treated	5.74%	1.6%	4,485.8
Agricultural Crop Residues	0.00%	0.0%	1.5
Manure	0.00%	0.0%	0.0
Textiles	1.06%	0.3%	829.2
Leather	0.04%	0.0%	29.9
Diapers	1.82%	0.6%	1,422.0
Carpet	0.52%	0.3%	408.9
Carpet Padding	0.05%	0.1%	41.9
Compostable Organics	0.30%	0.2%	234.5
Remainder/Composite Organics	0.88%	0.5%	690.9
Construction & Demolition	**22.70%**		**17,753.6**
Concrete	1.99%	1.2%	1,557.0
Asphalt Paving	0.00%	0.0%	0.0
Rock, Soil, and Fines	7.36%	2.6%	5,756.6
Gypsum Board	2.37%	1.3%	1,855.9
Asphalt Roofing	2.58%	1.6%	2,017.0
Remainder/Composite C&D	8.40%	2.8%	6,567.0
Hazardous Waste	**0.61%**		**475.7**
Paint	0.00%	0.0%	0.0
Antifreeze	0.00%	0.0%	0.0
Vehicle and Equipment Fluids	0.00%	0.0%	0.0
Used Oil	0.00%	0.0%	0.0
Treated Medical Waste	0.52%	0.9%	409.7
Batteries	0.03%	0.0%	21.7
Auto Batteries	0.00%	0.0%	0.0
Fluorescent Lights	0.02%	0.0%	19.4
Remainder/Composite HHW	0.03%	0.0%	24.9
Special Waste	**3.53%**		**2,759.3**
Mattresses	0.03%	0.0%	26.0
Box Springs	0.01%	0.0%	6.9
Other Bulky Items	1.33%	0.8%	1,039.1
Ash	0.00%	0.0%	0.0
Sewage Solids	0.00%	0.0%	0.0
Industrial Sludge	0.00%	0.0%	0.0
Hypodermic Needles	0.00%	0.0%	2.7
Pharmaceutical Medications	0.01%	0.0%	7.8
Remainder/Composite SW	1.20%	1.1%	936.0
Mixed Residue	0.95%	0.3%	740.8
	Samples:		**126**
	2004 Tons:		**78,206.0**

4.2 Single-Family Residential

The consultant team hand-sorted 15 samples of waste from this sector.

4.2.1 Key Findings

As shown in
Figure 4-2, the sampling results suggest the following key findings about disposal trends and recovery potential in this sector:

- Nearly three quarters (74%, 9,700 tons) of the single-family residential sector's waste is recyclable or compostable.

- Approximately 44% (5,800 tons) of this sector's waste is compostable, shown in green. The compostable fraction includes the following material categories (see Table 4-2):
  - Food (4,524 tons)
  - Compostable Paper (1,156 tons)
  - Prunings and Trimmings (65 tons)
  - Compostable Organics (47 tons)
  - Leaves and Grass (27 tons)
  - Agricultural Crop Residue (2 tons)

- Nearly 30% (3,900 tons) of this sector's waste is recyclable, including recyclable paper (13%, 1,800 tons), shown in yellow, and other recyclables (16%, 2,100 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - Magazines and Catalogs (427 tons)
  - Other Misc. Paper (294 tons)
  - Newspaper (276 tons)
  - Other Office Paper (264 tons)
  - White Ledger (145 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Rock, Soil, and Fines (271 tons)
  - Textiles (205 tons)
  - Other Ferrous Metal (195 tons)
  - Durable Plastic Items (186 tons)
  - Misc. Plastic Containers (178 tons)

- About 3% (350 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Composite Metal (260 tons)
  - Carpet (43 tons)
  - Other Rubber (34 tons)
  - Other Bulky Items (13 tons)

- Nearly a quarter (24%, 3,100 tons) of single-family residential waste sampled consists of problem materials. By weight, the five largest material categories are:
  - Diapers (947 tons)
  - Other Film Plastics (636 tons)
  - Mixed Residue (426 tons)
  - Remainder/Composite C&D (248 tons)
  - Remainder/Comp. Organics (241 tons)

- While in the field, the sampling crew observed the following potentially reusable or repairable items in this waste stream:
  - Brand new cell phone with accessories
  - Car seat
  - Reusable window blinds

Figure 4-2. Waste Composition & Recoverability, Single-Family Residential

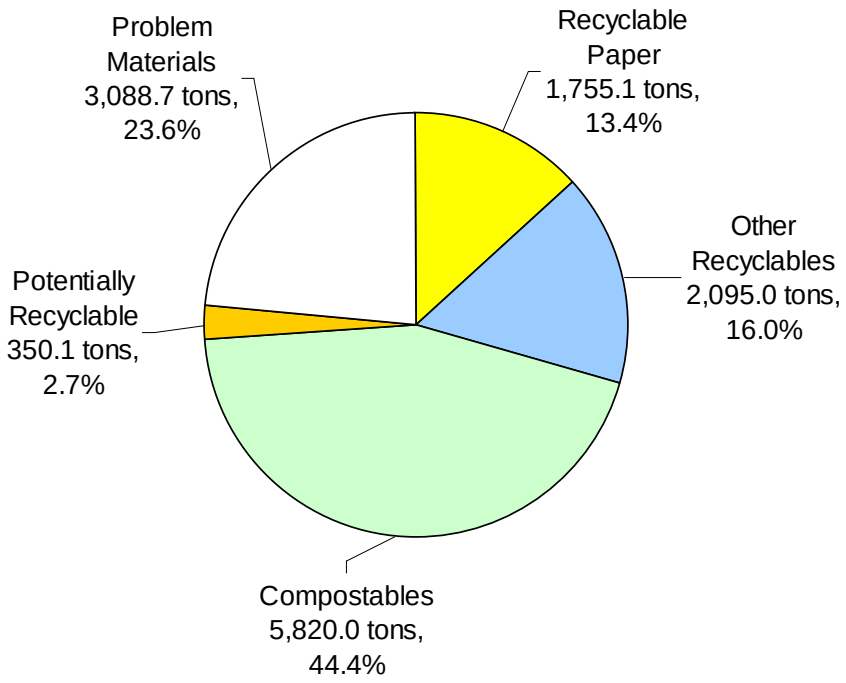


Table 4-2. Detailed Waste Composition, Single-Family Residential

	Est. Mean	+/-	Est. Tons
Paper	**23.8%**		**3,119.6**
Uncoated Corrugated Cardboard	0.6%	0.3%	82.1
Paper Bags/Kraft	1.0%	0.2%	135.1
White Ledger	1.1%	0.3%	145.0
Computer Paper	0.0%	0.0%	0.5
Newspaper	2.1%	0.7%	276.0
Magazines and Catalogs	3.3%	0.9%	426.6
Phone Books and Directories	0.0%	0.0%	0.0
Colored Ledger	0.2%	0.1%	26.4
Other Office Paper	2.0%	0.6%	263.7
Milk & Juice Polycoated Containers	0.8%	0.1%	106.1
Hardcover Books	0.0%	0.0%	0.0
Other Misc. Paper	2.2%	0.4%	293.6
Compostable Paper	8.8%	0.9%	1,155.7
Blueprints	0.0%	0.0%	0.0
Remainder/Composite Paper	1.6%	0.6%	208.8
Plastic	**11.5%**		**1,501.6**
HDPE Containers	0.4%	0.1%	52.3
PET Containers	0.5%	0.1%	68.3
Misc. Plastic Containers	1.4%	0.2%	177.9
Plastic Bags	0.9%	0.3%	119.1
Other Film Plastics	4.9%	0.6%	635.8
Durable Plastic Items	1.4%	0.8%	186.0
Expanded Polystyrene Packaging	0.1%	0.0%	9.0
Expanded Polystyrene Containers	0.6%	0.2%	76.3
Remainder/Composite Plastic	1.4%	0.4%	177.0
Glass	**1.6%**		**214.5**
Clear Glass Bottles and Containers	0.9%	0.3%	123.5
Green Glass Bottles and Containers	0.1%	0.1%	15.5
Brown Glass Bottles and Containers	0.3%	0.3%	36.6
Flat Glass	0.1%	0.1%	10.4
Other Colored Bottles & Containers	0.0%	0.0%	0.0
Remainder/Composite Glass	0.2%	0.1%	28.6
Metal	**5.0%**		**653.0**
Aluminum Cans	0.3%	0.2%	34.4
Other Non-ferrous Metal	0.6%	0.3%	76.8
Tin/Steel Cans	0.7%	0.2%	87.2
Other Ferrous Metal	1.5%	1.7%	194.9
Major Appliances	0.0%	0.0%	0.0
Engines and Motors	0.0%	0.0%	0.0
Remainder/Composite Metal	2.0%	2.6%	259.8
Electronic Waste	**1.2%**		**153.8**
Brown Goods	0.9%	0.7%	117.7
Computer-related Electronics	0.0%	0.0%	0.0
Other Small Consumer Electronics	0.1%	0.2%	17.2
TVs and Other Items with CRTs	0.1%	0.2%	18.9
Yard	**0.7%**		**92.3**
Leaves and Grass	0.2%	0.3%	27.4
Prunings and Trimmings	0.5%	0.3%	64.9
Branches and Stumps	0.0%	0.0%	0.0

	Est. Mean	+/-	Est. Tons
Organics	**48.7%**		**6,379.2**
Food	34.5%	3.3%	4,523.8
Tires	0.0%	0.0%	0.0
Other Rubber	0.3%	0.2%	33.9
Wood Pallets	0.0%	0.0%	0.0
Wood-untreated	1.1%	1.8%	149.2
Wood-treated	1.3%	1.2%	171.2
Agricultural Crop Residues	0.0%	0.0%	1.5
Manure	0.0%	0.0%	0.0
Textiles	1.6%	0.5%	205.3
Leather	0.1%	0.1%	16.9
Diapers	7.2%	2.4%	946.7
Carpet	0.3%	0.3%	43.1
Carpet Padding	0.0%	0.0%	0.0
Compostable Organics	0.4%	0.2%	46.8
Remainder/Composite Organics	1.8%	0.7%	240.9
Construction & Demolition	**4.1%**		**538.9**
Concrete	0.1%	0.2%	19.1
Asphalt Paving	0.0%	0.0%	0.0
Rock, Soil, and Fines	2.1%	1.2%	271.4
Gypsum Board	0.0%	0.0%	0.0
Asphalt Roofing	0.0%	0.0%	0.0
Remainder/Composite C&D	1.9%	2.3%	248.4
Hazardous Waste	**0.1%**		**11.4**
Paint	0.0%	0.0%	0.0
Antifreeze	0.0%	0.0%	0.0
Vehicle and Equipment Fluids	0.0%	0.0%	0.0
Used Oil	0.0%	0.0%	0.0
Treated Medical Waste	0.0%	0.0%	0.0
Batteries	0.1%	0.0%	7.5
Auto Batteries	0.0%	0.0%	0.0
Fluorescent Lights	0.0%	0.0%	1.7
Remainder/Composite HHW	0.0%	0.0%	2.2
Special Waste	**3.4%**		**444.7**
Mattresses	0.0%	0.0%	0.0
Box Springs	0.0%	0.0%	0.0
Other Bulky Items	0.1%	0.2%	13.3
Ash	0.0%	0.0%	0.0
Sewage Solids	0.0%	0.0%	0.0
Industrial Sludge	0.0%	0.0%	0.0
Hypodermic Needles	0.0%	0.0%	0.5
Pharmaceutical Medications	0.0%	0.0%	5.2
Remainder/Composite SW	0.0%	0.0%	0.0
Mixed Residue	3.2%	1.1%	425.7
		Samples:	**15**
		2004 Tons:	**13,109.0**

4.3 Mixed Commercial and Multi-Family Residential

The consultant team hand-sorted 30 samples and visually characterized one sample of waste from this sector.

4.3.1 Key Findings

As shown in Figure 4-3, the sampling results suggest the following key findings about disposal trends and recovery potential in this sector:

- Approximately 80% (27,800 tons) of this sector's waste is compostable or recyclable.
- About 38% (13,100 tons) of this sector's waste is compostable, shown in green. The compostable fraction includes the following material categories (see Table 4-3):
  - Food (7,758 tons)
  - Compostable Paper (4,326 tons)
  - Leaves and Grass (592 tons)
  - Prunings and Trimmings (318 tons)
  - Compostable Organics (68 tons)
  - Branches and Stumps (31 tons)
- About 43% (14,700 tons) of this sector's waste is recyclable, including recyclable paper (25%, 8,600 tons), shown in yellow, and other recyclables (18%, 6,200 tons), shown in blue.
- By weight, the five largest recyclable paper material categories include:
  - Newspaper (1,590 tons)
  - Cardboard (1,483 tons)
  - Other Misc. Paper (1,474 tons)
  - White Ledger (1,392 tons)
  - Magazines and Catalogs (1,358 tons)
- The five largest material categories considered in the grouping "other recyclables" are:
  - Other Ferrous Metal (1,071 tons)
  - Clear Glass (515 tons)
  - Textiles (497 tons)
  - Rock, Soil, and Fines (486 tons)
  - Gypsum Board (375 tons)
- About 2% (800 tons) is potential recyclable. The material categories considered potentially recyclable include:
  - Other Rubber (264 tons)
  - Other Bulky Items (277 tons)
  - Remainder/Composite Metal (151 tons)
  - Carpet (97 tons)
- More than 17% (6,000 tons) of mixed commercial and multi-family residential waste sampled consists of problem materials. By weight, the five largest material categories are:
  - Other Film Plastics (1,575 tons)
  - Wood-treated (1,096 tons)
  - Remainder/Comp. Paper (741 tons)
  - Remainder/Composite SW (735 tons)
  - Diapers (473 tons)

- While in the field, the sampling crew observed the following potentially reusable or reparable items in this waste stream:
  - o Chair
  - o Brand new vacuum
  - o Stereo speakers
  - o Unused trash bags

Figure 4-3. Waste Composition & Recoverability, Mixed Commercial and Multi-Family Residential

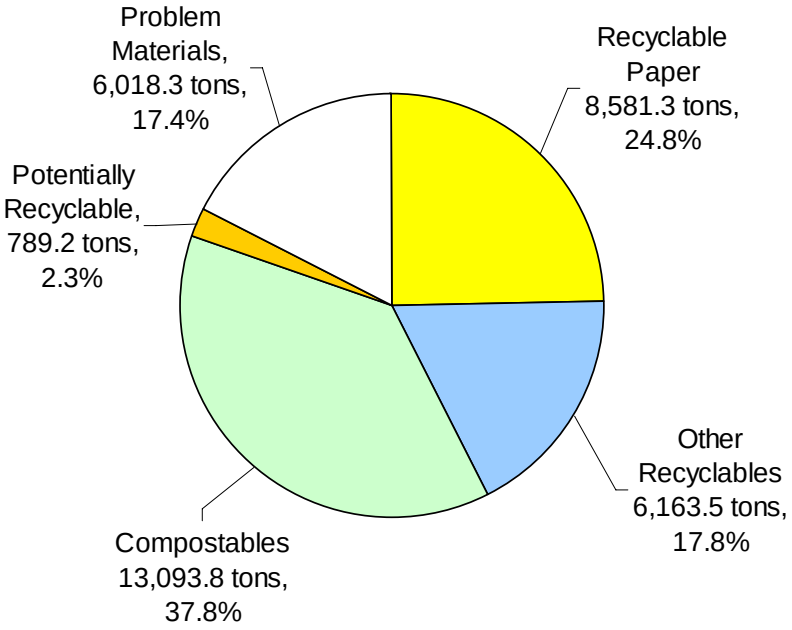


Table 4-3. Detailed Waste Composition, Mixed Commercial and Multi-Family Residential

	Est. Mean	+/-	Est. Tons
Paper	**39.4%**		**13,651.4**
Uncoated Corrugated Cardboard	4.3%	1.1%	1,482.7
Paper Bags/Kraft	0.7%	0.3%	241.7
White Ledger	4.0%	1.2%	1,392.0
Computer Paper	0.0%	0.0%	3.0
Newspaper	4.6%	1.4%	1,590.1
Magazines and Catalogs	3.9%	2.0%	1,358.2
Phone Books and Directories	0.1%	0.2%	46.7
Colored Ledger	0.2%	0.1%	70.2
Other Office Paper	2.2%	0.7%	763.8
Milk & Juice Polycoated Containers	0.5%	0.3%	162.2
Hardcover Books	0.0%	0.0%	0.0
Other Misc. Paper	4.3%	0.9%	1,473.8
Compostable Paper	12.5%	2.1%	4,326.0
Blueprints	0.0%	0.0%	0.0
Remainder/Composite Paper	2.1%	1.1%	741.0
Plastic	**10.8%**		**3,733.4**
HDPE Containers	1.1%	0.5%	368.4
PET Containers	0.8%	0.2%	260.1
Misc. Plastic Containers	1.0%	0.2%	335.6
Plastic Bags	0.6%	0.2%	211.1
Other Film Plastics	4.5%	0.7%	1,575.4
Durable Plastic Items	1.0%	0.7%	360.5
Expanded Polystyrene Packaging	0.2%	0.1%	75.4
Expanded Polystyrene Containers	0.7%	0.3%	228.1
Remainder/Composite Plastic	0.9%	0.2%	318.8
Glass	**2.7%**		**940.6**
Clear Glass Bottles and Containers	1.5%	0.5%	515.5
Green Glass Bottles and Containers	0.7%	0.6%	244.0
Brown Glass Bottles and Containers	0.4%	0.2%	142.9
Flat Glass	0.1%	0.1%	24.6
Other Colored Bottles & Containers	0.0%	0.0%	0.0
Remainder/Composite Glass	0.0%	0.0%	13.6
Metal	**5.2%**		**1,795.2**
Aluminum Cans	0.3%	0.1%	92.8
Other Non-ferrous Metal	0.5%	0.2%	183.6
Tin/Steel Cans	0.9%	0.4%	296.9
Other Ferrous Metal	3.1%	3.3%	1,071.4
Major Appliances	0.0%	0.0%	0.0
Engines and Motors	0.0%	0.0%	0.0
Remainder/Composite Metal	0.4%	0.3%	150.5
Electronic Waste	**0.6%**		**204.4**
Brown Goods	0.4%	0.4%	126.2
Computer-related Electronics	0.2%	0.4%	78.2
Other Small Consumer Electronics	0.0%	0.0%	0.0
TVs and Other Items with CRTs	0.0%	0.0%	0.0
Yard	**2.7%**		**941.1**
Leaves and Grass	1.7%	1.2%	591.9
Prunings and Trimmings	0.9%	0.8%	318.3
Branches and Stumps	0.1%	0.1%	30.9

	Est. Mean	+/-	Est. Tons
Organics	**30.7%**		**10,641.0**
Food	22.4%	5.5%	7,758.2
Tires	0.0%	0.0%	0.0
Other Rubber	0.8%	0.6%	264.2
Wood Pallets	0.0%	0.0%	0.0
Wood-untreated	0.3%	0.3%	119.6
Wood-treated	3.2%	2.5%	1,095.7
Agricultural Crop Residues	0.0%	0.0%	0.0
Manure	0.0%	0.0%	0.0
Textiles	1.4%	0.6%	496.9
Leather	0.0%	0.1%	12.9
Diapers	1.4%	1.0%	472.9
Carpet	0.3%	0.5%	97.2
Carpet Padding	0.0%	0.0%	0.0
Compostable Organics	0.2%	0.1%	68.4
Remainder/Composite Organics	0.7%	0.6%	255.0
Construction & Demolition	**2.8%**		**963.1**
Concrete	0.1%	0.1%	20.8
Asphalt Paving	0.0%	0.0%	0.0
Rock, Soil, and Fines	1.4%	0.7%	485.8
Gypsum Board	1.1%	1.8%	375.1
Asphalt Roofing	0.0%	0.0%	0.0
Remainder/Composite C&D	0.2%	0.2%	81.4
Hazardous Waste	**1.3%**		**446.6**
Paint	0.0%	0.0%	0.0
Antifreeze	0.0%	0.0%	0.0
Vehicle and Equipment Fluids	0.0%	0.0%	0.0
Used Oil	0.0%	0.0%	0.0
Treated Medical Waste	1.2%	2.0%	409.7
Batteries	0.0%	0.0%	14.2
Auto Batteries	0.0%	0.0%	0.0
Fluorescent Lights	0.0%	0.0%	0.0
Remainder/Composite HHW	0.1%	0.1%	22.7
Special Waste	**3.8%**		**1,332.1**
Mattresses	0.0%	0.0%	0.0
Box Springs	0.0%	0.0%	0.0
Other Bulky Items	0.8%	0.9%	277.3
Ash	0.0%	0.0%	0.0
Sewage Solids	0.0%	0.0%	0.0
Industrial Sludge	0.0%	0.0%	0.0
Hypodermic Needles	0.0%	0.0%	2.2
Pharmaceutical Medications	0.0%	0.0%	2.5
Remainder/Composite SW	2.1%	2.2%	734.9
Mixed Residue	0.9%	0.5%	315.2
	Samples:		**31**
	2004 Tons:		**34,649.1**

4.4 Industrial (Open-top Drop-boxes)

The consultant team visually characterized 38 samples of waste from this sector.

4.4.1 Key Findings

As shown in Figure 4-4, the sampling results suggest the following key findings about recovery potential in this sector:

- Approximately 64% (12,500 tons) of this sector's waste is recyclable or compostable.
- About 11% (2,200 tons) of this sector's waste is compostable. Compostable materials in the industrial sector's waste include the following (see Table 4-4):
  - Leaves and Grass (1,570 tons)
  - Prunings and Trimmings (200 tons)
  - Branches and Stumps (134 tons)
  - Compostable Paper (133 tons)
  - Food (71 tons)
  - Compostable Organics (63 tons)
- Over half of this sector's waste (53%, 10,300 tons) is recyclable, including recyclable paper (4%, 800 tons), shown in yellow, and other recyclables (49%, 9,500 tons), shown in blue.
- By weight, the five largest recyclable paper material categories include:
  - Other Misc. Paper (212 tons)
  - Cardboard (173 tons)
  - Other Office Paper (156 tons)
  - Newspaper (96 tons)
  - White Ledger (65 tons)
- The five largest material categories considered in the grouping "other recyclables" are:
  - Rock, Soil, and Fines (3,856 tons)
  - Wood-untreated (1,503 tons)
  - Concrete (961 tons)
  - Gypsum Board (810 tons)
  - Asphalt Roofing (699 tons)
- About 3% (600 tons) is potential recyclable. The material categories considered potentially recyclable include:
  - Other Bulky Items (500 tons)
  - Other Rubber (42 tons)
  - Carpet (27 tons)
  - Remainder/Composite Metal (18 tons)
- One third (33%, 6,500 tons) of industrial sector waste sampled consists of problem materials. By weight, the five largest material categories are:
  - Remainder/Comp. C&D (3,711 tons)
  - Wood-treated (1,911 tons)
  - Other Film Plastics (290 tons)
  - Remainder/Composite SW (201 tons)
  - Remainder/Comp. Organics (195 tons)

- While in the field, the sampling crew observed the following potentially reusable or reparable items in this waste stream:
  - New garbage cans
  - Several loads contained reusable furniture.
  - Several loads contained bricks and soil that, if separated from the rest of the load, could be reused and/or recycled.

Figure 4-4. Waste Composition & Recoverability, Industrial (Open-top Drop-boxes)

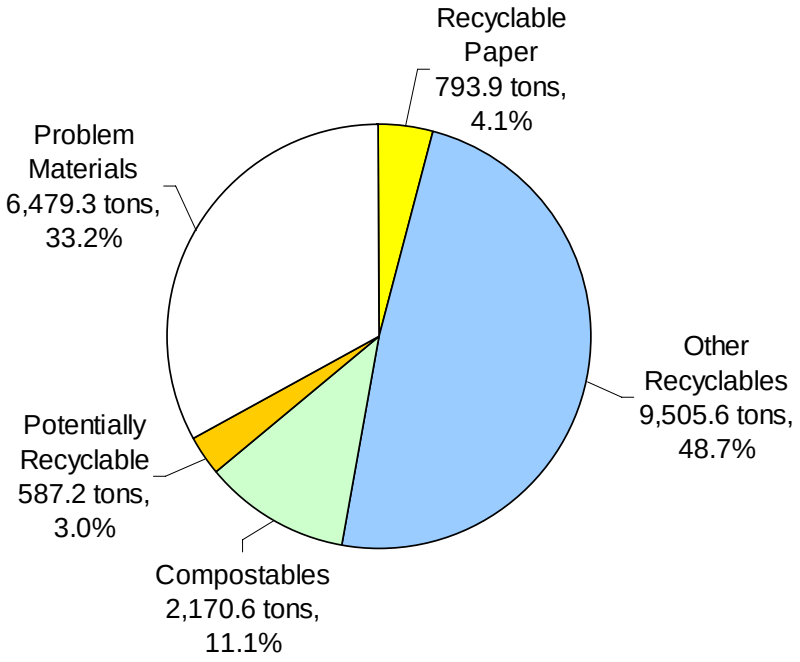


Table 4-4. Detailed Waste Composition, Industrial (Open-top Drop-boxes)

	Est. Mean	+/-	Est. Tons
Paper	**5.5%**		**1,074.1**
Uncoated Corrugated Cardboard	0.9%	0.5%	173.1
Paper Bags/Kraft	0.2%	0.2%	47.1
White Ledger	0.3%	0.3%	64.7
Computer Paper	0.0%	0.0%	4.0
Newspaper	0.5%	0.4%	96.2
Magazines and Catalogs	0.1%	0.2%	29.0
Phone Books and Directories	0.0%	0.0%	3.9
Colored Ledger	0.0%	0.0%	8.3
Other Office Paper	0.8%	0.8%	155.8
Milk & Juice Polycoated Containers	0.0%	0.0%	0.0
Hardcover Books	0.0%	0.0%	0.0
Other Misc. Paper	1.1%	0.9%	211.8
Compostable Paper	0.7%	0.5%	132.6
Blueprints	0.0%	0.0%	0.0
Remainder/Composite Paper	0.8%	0.9%	147.6
Plastic	**3.1%**		**599.4**
HDPE Containers	0.0%	0.0%	6.2
PET Containers	0.0%	0.0%	0.5
Misc. Plastic Containers	0.1%	0.1%	23.2
Plastic Bags	0.1%	0.1%	14.5
Other Film Plastics	1.5%	2.1%	290.0
Durable Plastic Items	0.8%	0.7%	150.9
Expanded Polystyrene Packaging	0.5%	0.3%	91.5
Expanded Polystyrene Containers	0.0%	0.0%	0.9
Remainder/Composite Plastic	0.1%	0.1%	21.7
Glass	**0.7%**		**143.3**
Clear Glass Bottles and Containers	0.0%	0.0%	0.4
Green Glass Bottles and Containers	0.0%	0.0%	0.0
Brown Glass Bottles and Containers	0.0%	0.0%	0.1
Flat Glass	0.7%	0.9%	142.8
Other Colored Bottles & Containers	0.0%	0.0%	0.0
Remainder/Composite Glass	0.0%	0.0%	0.0
Metal	**3.2%**		**619.3**
Aluminum Cans	0.0%	0.0%	0.2
Other Non-ferrous Metal	0.2%	0.2%	38.7
Tin/Steel Cans	0.0%	0.0%	0.2
Other Ferrous Metal	2.6%	1.1%	509.1
Major Appliances	0.2%	0.3%	41.7
Engines and Motors	0.1%	0.1%	11.1
Remainder/Composite Metal	0.1%	0.1%	18.3
Electronic Waste	**0.5%**		**100.6**
Brown Goods	0.0%	0.0%	3.5
Computer-related Electronics	0.1%	0.2%	27.1
Other Small Consumer Electronics	0.0%	0.0%	0.0
TVs and Other Items with CRTs	0.4%	0.5%	70.0
Yard	**9.7%**		**1,904.3**
Leaves and Grass	8.0%	4.4%	1,570.4
Prunings and Trimmings	1.0%	0.9%	200.4
Branches and Stumps	0.7%	0.9%	133.5

	Est. Mean	+/-	Est. Tons
Organics	**22.1%**		**4,311.6**
Food	0.4%	0.2%	70.6
Tires	0.0%	0.0%	0.0
Other Rubber	0.2%	0.2%	41.7
Wood Pallets	2.0%	1.5%	395.1
Wood-untreated	7.7%	3.7%	1,503.0
Wood-treated	9.8%	3.4%	1,910.5
Agricultural Crop Residues	0.0%	0.0%	0.0
Manure	0.0%	0.0%	0.0
Textiles	0.5%	0.4%	103.2
Leather	0.0%	0.0%	0.0
Diapers	0.0%	0.0%	2.3
Carpet	0.1%	0.2%	26.9
Carpet Padding	0.0%	0.0%	0.0
Compostable Organics	0.3%	0.5%	63.1
Remainder/Composite Organics	1.0%	1.4%	195.1
Construction & Demolition	**51.4%**		**10,036.2**
Concrete	4.9%	4.1%	961.0
Asphalt Paving	0.0%	0.0%	0.0
Rock, Soil, and Fines	19.7%	9.6%	3,855.7
Gypsum Board	4.1%	3.0%	809.7
Asphalt Roofing	3.6%	3.2%	698.8
Remainder/Composite C&D	19.0%	8.7%	3,711.1
Hazardous Waste	**0.1%**		**17.7**
Paint	0.0%	0.0%	0.0
Antifreeze	0.0%	0.0%	0.0
Vehicle and Equipment Fluids	0.0%	0.0%	0.0
Used Oil	0.0%	0.0%	0.0
Treated Medical Waste	0.0%	0.0%	0.0
Batteries	0.0%	0.0%	0.0
Auto Batteries	0.0%	0.0%	0.0
Fluorescent Lights	0.1%	0.1%	17.7
Remainder/Composite HHW	0.0%	0.0%	0.0
Special Waste	**3.7%**		**730.2**
Mattresses	0.1%	0.2%	26.0
Box Springs	0.0%	0.0%	2.8
Other Bulky Items	2.6%	2.3%	500.3
Ash	0.0%	0.0%	0.0
Sewage Solids	0.0%	0.0%	0.0
Industrial Sludge	0.0%	0.0%	0.0
Hypodermic Needles	0.0%	0.0%	0.0
Pharmaceutical Medications	0.0%	0.0%	0.0
Remainder/Composite SW	1.0%	1.7%	201.1
Mixed Residue	0.0%	0.0%	0.0
Samples:			**38**
2004 Tons:			**19,536.7**

4.5 Self-haul

The consultant team visually characterized 42 samples of waste from this sector.

4.5.1 Key Findings

As shown in Figure 4-5, the sampling results suggest the following key findings about disposal trends and recovery potential in this sector:

- About 60% (6,500 tons) of this sector's waste is recyclable or compostable.
- Approximately 15% (1,700 tons) of this sector's waste is compostable, shown in green. The compostable fraction includes the following material categories (see Table 4-5):
  - Leaves and Grass (1,364 tons)
  - Pruning and Trimmings (126 tons)
  - Branches and Stumps (63 tons)
  - Compostable Organics (56 tons)
  - Food (28 tons)
  - Compostable Paper (16 tons)
- Approximately 45% (4,900 tons) of this sector's waste is recyclable, including recyclable paper (1%, 70 tons), shown in yellow, and other recyclables (44%, 4,800 tons), shown in blue.
- By weight, the five largest recyclable paper material categories include:
  - Cardboard (31 tons)
  - Paper Bags/Kraft (18 tons)
  - Other Misc. Paper (10 tons)
  - Magazines and Catalogs (6 tons)
  - White Ledger (3 tons)
- The five largest material categories considered in the grouping "other recyclables" are:
  - Asphalt Roofing (1,318 tons)
  - Rock, Soil, and Fines (1,144 tons)
  - Wood-untreated (769 tons)
  - Gypsum Board (671 tons)
  - Concrete (556 tons)
- About 5% (500 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Other Bulky Items (248 tons)
  - Carpet (242 tons)
  - Carpet Padding (42 tons)
  - Remainder/Composite Metal (13 tons)
  - Other Rubber (2 ton)
- More than one third (35%, 3,800 tons) of self-haul sector waste sampled consists of problem materials. By weight, the five largest material categories are:
  - Remainder/Comp. C&D (2,526 tons)
  - Wood-treated (1,308 tons)
  - Other Film Plastics (9 tons)
  - Remainder/Composite Plastic (2 ton)
  - Remainder/Composite Paper (<1 ton)
- The sampling crew did not observe any reusable or repairable items in the self-haul waste steam.

Figure 4-5. Waste Composition & Recoverability, Self-haul

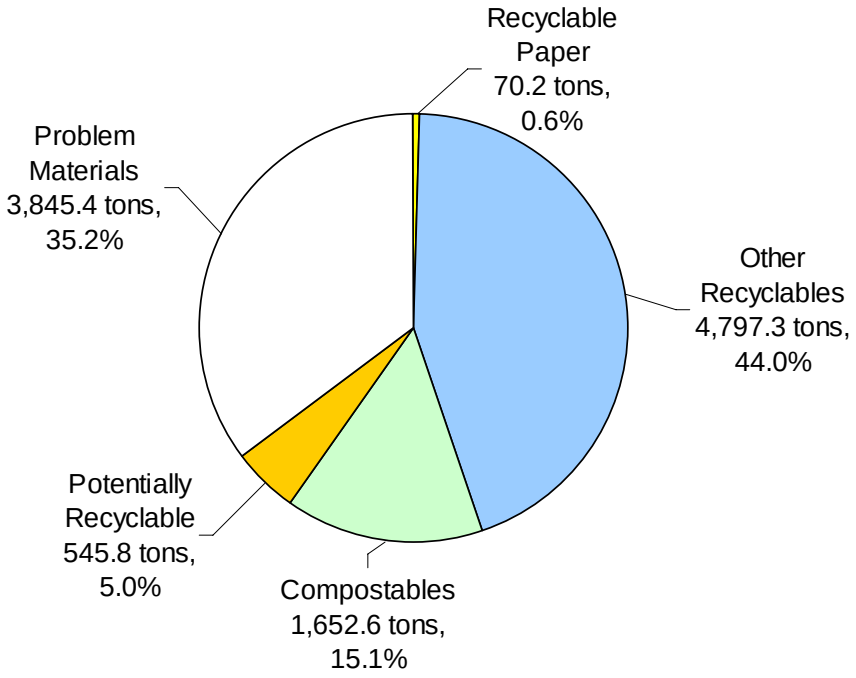


Table 4-5. Detailed Waste Composition, Self-haul

	Est. Mean	+/-	Est. Tons
Paper	**0.8%**		**86.0**
Uncoated Corrugated Cardboard	0.3%	0.2%	31.2
Paper Bags/Kraft	0.2%	0.2%	18.1
White Ledger	0.0%	0.0%	2.6
Computer Paper	0.0%	0.0%	0.0
Newspaper	0.0%	0.0%	0.7
Magazines and Catalogs	0.1%	0.1%	5.6
Phone Books and Directories	0.0%	0.0%	1.6
Colored Ledger	0.0%	0.0%	0.0
Other Office Paper	0.0%	0.0%	0.0
Milk & Juice Polycoated Containers	0.0%	0.0%	0.0
Hardcover Books	0.0%	0.0%	0.0
Other Misc. Paper	0.1%	0.1%	10.4
Compostable Paper	0.1%	0.1%	15.7
Blueprints	0.0%	0.0%	0.0
Remainder/Composite Paper	0.0%	0.0%	0.1
Plastic	**0.5%**		**55.6**
HDPE Containers	0.0%	0.0%	0.1
PET Containers	0.0%	0.0%	0.4
Misc. Plastic Containers	0.1%	0.1%	11.3
Plastic Bags	0.0%	0.0%	0.0
Other Film Plastics	0.1%	0.1%	9.2
Durable Plastic Items	0.3%	0.2%	27.7
Expanded Polystyrene Packaging	0.0%	0.1%	5.3
Expanded Polystyrene Containers	0.0%	0.0%	0.1
Remainder/Composite Plastic	0.0%	0.0%	1.6
Glass	**0.3%**		**34.1**
Clear Glass Bottles and Containers	0.0%	0.0%	0.3
Green Glass Bottles and Containers	0.0%	0.0%	0.2
Brown Glass Bottles and Containers	0.0%	0.0%	0.1
Flat Glass	0.3%	0.4%	33.4
Other Colored Bottles & Containers	0.0%	0.0%	0.0
Remainder/Composite Glass	0.0%	0.0%	0.0
Metal	**1.6%**		**170.9**
Aluminum Cans	0.0%	0.0%	0.1
Other Non-ferrous Metal	0.2%	0.2%	17.6
Tin/Steel Cans	0.0%	0.0%	0.0
Other Ferrous Metal	1.3%	0.7%	140.6
Major Appliances	0.0%	0.0%	0.0
Engines and Motors	0.0%	0.0%	0.0
Remainder/Composite Metal	0.1%	0.1%	12.6
Electronic Waste	**0.0%**		**5.2**
Brown Goods	0.0%	0.0%	0.0
Computer-related Electronics	0.0%	0.0%	1.5
Other Small Consumer Electronics	0.0%	0.0%	1.5
TVs and Other Items with CRTs	0.0%	0.0%	2.3
Yard	**14.2%**		**1,553.0**
Leaves and Grass	12.5%	8.5%	1,364.3
Prunings and Trimmings	1.2%	1.0%	125.6
Branches and Stumps	0.6%	0.6%	63.0

	Est. Mean	+/-	Est. Tons
Organics	**23.3%**		**2,538.9**
Food	0.3%	0.3%	27.7
Tires	0.0%	0.0%	0.0
Other Rubber	0.0%	0.0%	1.5
Wood Pallets	0.6%	1.0%	68.6
Wood-untreated	7.0%	4.5%	769.2
Wood-treated	12.0%	6.1%	1,308.4
Agricultural Crop Residues	0.0%	0.0%	0.0
Manure	0.0%	0.0%	0.0
Textiles	0.2%	0.2%	23.8
Leather	0.0%	0.0%	0.0
Diapers	0.0%	0.0%	0.0
Carpet	2.2%	1.7%	241.7
Carpet Padding	0.4%	0.5%	41.9
Compostable Organics	0.5%	0.9%	56.2
Remainder/Composite Organics	0.0%	0.0%	0.0
Construction & Demolition	**57.0%**		**6,215.3**
Concrete	5.1%	4.1%	556.1
Asphalt Paving	0.0%	0.0%	0.0
Rock, Soil, and Fines	10.5%	6.7%	1,143.7
Gypsum Board	6.2%	4.8%	671.1
Asphalt Roofing	12.1%	10.2%	1,318.3
Remainder/Composite C&D	23.2%	12.0%	2,526.2
Hazardous Waste	**0.0%**		**0.0**
Paint	0.0%	0.0%	0.0
Antifreeze	0.0%	0.0%	0.0
Vehicle and Equipment Fluids	0.0%	0.0%	0.0
Used Oil	0.0%	0.0%	0.0
Treated Medical Waste	0.0%	0.0%	0.0
Batteries	0.0%	0.0%	0.0
Auto Batteries	0.0%	0.0%	0.0
Fluorescent Lights	0.0%	0.0%	0.0
Remainder/Composite HHW	0.0%	0.0%	0.0
Special Waste	**2.3%**		**252.3**
Mattresses	0.0%	0.0%	0.0
Box Springs	0.0%	0.1%	4.1
Other Bulky Items	2.3%	3.3%	248.2
Ash	0.0%	0.0%	0.0
Sewage Solids	0.0%	0.0%	0.0
Industrial Sludge	0.0%	0.0%	0.0
Hypodermic Needles	0.0%	0.0%	0.0
Pharmaceutical Medications	0.0%	0.0%	0.0
Remainder/Composite SW	0.0%	0.0%	0.0
Mixed Residue	0.0%	0.0%	0.0

Samples:	**42**
2004 Tons:	**10,911.2**

4.6 SMaRT Station Residuals

The consultant team hand-sorted 30 samples of waste from the residuals pile at the SMaRT Station.

4.6.1 Key Findings

As shown in Figure 4-6, the sampling results suggest the following key findings about disposal trends and recovery potential for the residuals material stream.

- Over three-quarters (77%, 30,700 tons) of the SMaRT Station's residuals are recyclable or compostable.

- Compostable materials account for about 36% (14,500 tons) of the SMaRT Station's residuals, shown in green. These material categories included the following (Table 4-6):
  - Food (6,061 tons)
  - Leaves and Grass (4,186 tons)
  - Compostable Paper (3,590 tons)
  - Compostable Organics (332 tons)
  - Prunings and Trimmings (161 tons)
  - Branches and Stumps (88 tons)
  - Manure (38 tons)[2]

- About 41% (16,200 tons) of the SMaRT Station residual stream is recyclable, including recyclable paper (17%, 7,000 tons), shown in yellow, and other recyclables (23%, 9,200 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - Newspaper (1,452 tons)
  - Magazines and Catalogs (1,261 tons)
  - Other Misc. Paper (1,190 tons)
  - Cardboard (1,119 tons)
  - White Ledger (717 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Rock, Soil, and Fines (2,177 tons)
  - Gypsum Board (1,129 tons)
  - Other Ferrous Metal (922 tons)
  - Textiles (672 tons)
  - Misc. Plastic Containers (646 tons)

- About 2% (900 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Composite Metal (626 tons)
  - Other Rubber (189 tons)
  - Carpet (118 tons)

- More than a fifth (21%, 8,400 tons) of the SMaRT station residuals sampled consists of problem materials. By weight, the five largest material categories are:
  - Other Film Plastics (2,027 tons)
  - Remainder/Comp. C&D (1,622 tons)
  - Diapers (1,483 tons)
  - Wood-treated (947 tons)
  - Remainder/Composite SW (719 tons)

[2] For this study, the material category "manure" is considered "potentially compostable."

- The sampling crew did not observe any reusable or repairable items in the SMaRT Station residual waste stream.

Figure 4-6. Waste Composition & Recoverability, SMaRT Station Residuals

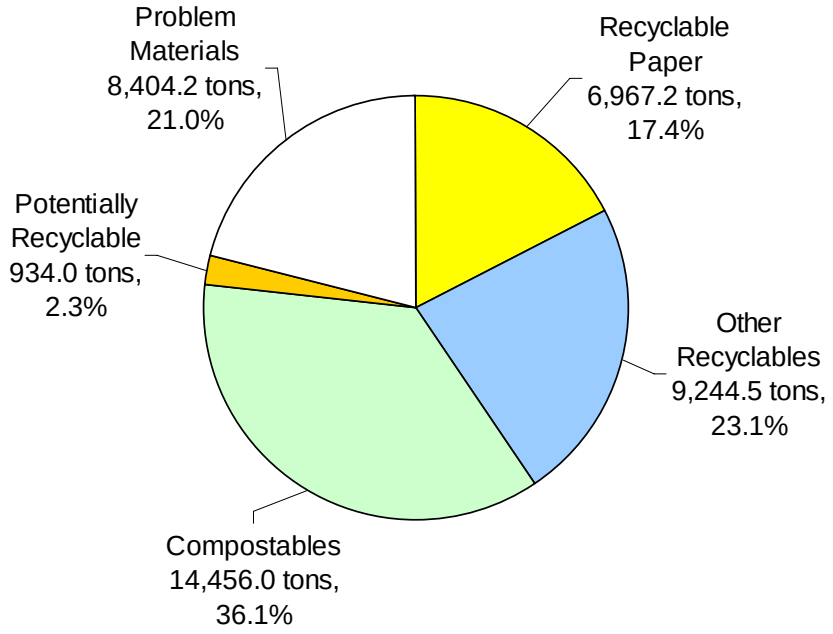


Table 4-6. Detailed Waste Composition, SMaRT Station Residuals

	Est. Mean	+/-	Est. Tons
Paper	**27.4%**		**10,966.7**
Uncoated Corrugated Cardboard	2.8%	0.7%	1,118.9
Paper Bags/Kraft	0.6%	0.2%	251.9
White Ledger	1.8%	0.4%	716.5
Computer Paper	0.0%	0.0%	0.9
Newspaper	3.6%	0.7%	1,452.0
Magazines and Catalogs	3.2%	0.8%	1,260.9
Phone Books and Directories	0.1%	0.1%	51.0
Colored Ledger	0.1%	0.0%	53.7
Other Office Paper	1.7%	0.5%	687.3
Milk & Juice Polycoated Containers	0.4%	0.1%	166.3
Hardcover Books	0.0%	0.0%	12.0
Other Misc. Paper	3.0%	0.5%	1,190.0
Compostable Paper	9.0%	1.5%	3,589.7
Blueprints	0.0%	0.0%	5.8
Remainder/Composite Paper	1.0%	0.3%	409.8
Plastic	**12.3%**		**4,919.3**
HDPE Containers	0.6%	0.2%	227.1
PET Containers	0.5%	0.1%	206.7
Misc. Plastic Containers	1.6%	0.3%	645.9
Plastic Bags	1.5%	0.6%	604.9
Other Film Plastics	5.1%	0.7%	2,027.0
Durable Plastic Items	0.8%	0.2%	325.1
Expanded Polystyrene Packaging	0.4%	0.1%	145.6
Expanded Polystyrene Containers	0.8%	0.3%	310.1
Remainder/Composite Plastic	1.1%	0.3%	426.9
Glass	**1.1%**		**454.6**
Clear Glass Bottles and Containers	0.6%	0.2%	233.7
Green Glass Bottles and Containers	0.2%	0.1%	78.5
Brown Glass Bottles and Containers	0.2%	0.2%	77.2
Flat Glass	0.0%	0.0%	19.5
Other Colored Bottles & Containers	0.0%	0.0%	2.2
Remainder/Composite Glass	0.1%	0.0%	43.5
Metal	**5.3%**		**2,137.3**
Aluminum Cans	0.2%	0.0%	72.7
Other Non-ferrous Metal	0.5%	0.2%	195.7
Tin/Steel Cans	0.8%	0.3%	321.1
Other Ferrous Metal	2.3%	1.9%	921.6
Major Appliances	0.0%	0.0%	0.0
Engines and Motors	0.0%	0.0%	0.0
Remainder/Composite Metal	1.6%	0.9%	626.2
Electronic Waste	**0.1%**		**39.0**
Brown Goods	0.0%	0.0%	0.0
Computer-related Electronics	0.0%	0.0%	2.7
Other Small Consumer Electronics	0.1%	0.1%	31.5
TVs and Other Items with CRTs	0.0%	0.0%	4.9
Yard	**11.1%**		**4,435.0**
Leaves and Grass	10.5%	2.6%	4,185.8
Prunings and Trimmings	0.4%	0.2%	161.4
Branches and Stumps	0.2%	0.4%	87.8

	Est. Mean	+/-	Est. Tons
Organics	**27.5%**		**11,004.3**
Food	15.2%	3.5%	6,061.1
Tires	0.1%	0.2%	47.0
Other Rubber	0.5%	0.2%	189.4
Wood Pallets	0.4%	0.6%	159.2
Wood-untreated	0.9%	0.6%	351.0
Wood-treated	2.4%	1.9%	946.9
Agricultural Crop Residues	0.0%	0.0%	0.0
Manure	0.1%	0.1%	38.1
Textiles	1.7%	0.4%	671.8
Leather	0.1%	0.1%	48.3
Diapers	3.7%	1.2%	1,482.6
Carpet	0.3%	0.2%	118.4
Carpet Padding	0.0%	0.0%	0.0
Compostable Organics	0.8%	1.1%	332.0
Remainder/Composite Organics	1.4%	0.6%	558.4
Construction & Demolition	**12.9%**		**5,146.8**
Concrete	0.3%	0.3%	130.8
Asphalt Paving	0.0%	0.0%	0.0
Rock, Soil, and Fines	5.4%	1.7%	2,177.3
Gypsum Board	2.8%	2.4%	1,129.1
Asphalt Roofing	0.2%	0.2%	87.8
Remainder/Composite C&D	4.1%	2.9%	1,621.7
Hazardous Waste	**0.0%**		**15.5**
Paint	0.0%	0.0%	4.9
Antifreeze	0.0%	0.0%	0.0
Vehicle and Equipment Fluids	0.0%	0.0%	0.0
Used Oil	0.0%	0.0%	0.0
Treated Medical Waste	0.0%	0.0%	0.0
Batteries	0.0%	0.0%	7.5
Auto Batteries	0.0%	0.0%	0.0
Fluorescent Lights	0.0%	0.0%	3.1
Remainder/Composite HHW	0.0%	0.0%	0.0
Special Waste	**2.2%**		**887.4**
Mattresses	0.0%	0.0%	0.0
Box Springs	0.0%	0.0%	0.0
Other Bulky Items	0.0%	0.0%	0.0
Ash	0.0%	0.0%	0.0
Sewage Solids	0.0%	0.0%	0.0
Industrial Sludge	0.0%	0.0%	0.0
Hypodermic Needles	0.0%	0.0%	1.3
Pharmaceutical Medications	0.0%	0.0%	0.9
Remainder/Composite SW	1.8%	2.0%	718.9
Mixed Residue	0.4%	0.3%	166.3
	Samples:		**30**
	2004 Tons:		**40,006.0**

5 Waste Modeling

5.1 Method

Waste quantities and composition profiles were estimated for five groups of businesses and institutions – multi-family residences, city facilities, K-12 schools, restaurants, and major hospitals – that generate of relatively large amounts of municipal solid waste (MSW). Generally, the consultants estimated the quantity of MSW associated with a group by multiplying a per-employee or per-multi-family-unit waste disposal rate with the number of employees or multi-family units that exist in Palo Alto. (In all cases, employment was estimated in terms of full-time equivalents, or FTEs.) After a quantity estimate was calculated, a composition profile (percents associated with materials in the waste stream) was applied to the tonnage estimate. For a detailed methodology of the waste modeling process, including the California waste composition studies used in the analysis, please refer to Appendix E.

5.2 Results

This section presents key findings from the modeling exercise about the waste quantities and composition profiles of the five targeted sectors. Results for each business and institutional sector include a pie chart showing the proportion of recyclable paper, other recyclables, compostables, potentially recyclable materials, and problem materials. Following each pie chart is a table showing the composition results for each material.[3]

[3] The waste modeling process requires the use of data that had been collected through other California studies. These studies did not employ the same list of materials as the Palo Alto waste sorts. For this reason, the list of materials and the detailed composition tables presented in Section 5 of this report differ from those presented in Section 4.

5.2.1 Multi-Family Residential

As shown in Figure 5-1, the modeling results suggest the following key findings about disposal trends and recovery potential for the multi-family residential waste stream:

- More than two thirds (71%, 5,300 tons) of the multi-family residential waste stream are recyclable or compostable.

- Compostable materials account for about 30% (2,300 tons) of the multi-family residential waste stream, shown in green. These material categories included the following:
  - Food (1,755 tons)
  - Leaves and Grass (394 tons)
  - Prunings and Trimmings (93 tons)
  - Manure (6 tons)
  - Branches and Stumps (4 tons)

- About 41% (3,000 tons) of the multi-family residential stream is recyclable, including recyclable paper (20%, 1,400 tons), shown in yellow, and other recyclables (21%, 1,600 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - Newspaper (458 tons)
  - Other Misc. Paper (374 tons)
  - Cardboard (269 tons)
  - Magazines and Catalogs (128 tons)
  - White Ledger (65 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Clear Glass Bottles (205 tons)
  - Textiles (187 tons)
  - Lumber (175 tons)
  - Other Ferrous Metal (131 tons)
  - Durable Plastic Items (97 tons)

- About 5% (300 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Comp. Metal (210 tons)
  - Bulky Items (135 tons)

- Nearly one quarter (24%, 1,800 tons) of the multi-family residential waste stream consists of problem materials. By weight, the five largest material categories are:
  - Remainder/Comp. Organic (693 tons)
  - Remainder/Comp. Paper (510 tons)
  - Film Plastics (243 tons)
  - Remainder/Comp. Plastic (112 tons)
  - Remainder/Comp. C&D (82 tons)

Figure 5-1. Waste Composition & Recoverability, Multi-Family Residential

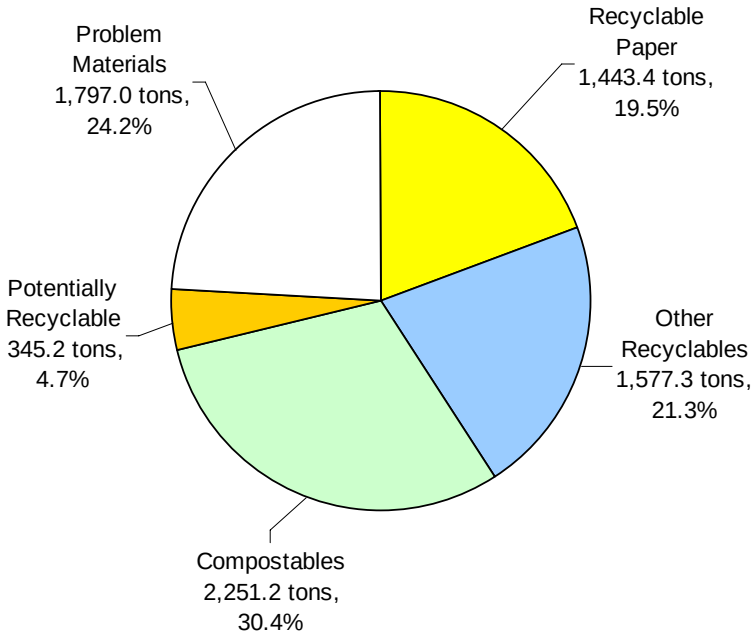


Table 5-1. Detailed Waste Composition, Multi-Family Residential

	Est. Mean	Est. Tons
Paper	**26.3%**	**1,953.5**
Uncoated Corrugated Cardboard	3.6%	269.4
Paper Bags	0.7%	54.3
Newspaper	6.2%	458.1
White Ledger Paper	0.9%	65.4
Colored Ledger Paper	0.1%	4.6
Computer Paper	0.0%	1.9
Other Office Paper	0.6%	45.3
Magazines and Catalogs	1.7%	128.2
Phone Books and Directories	0.6%	42.5
Other Miscellaneous Paper	5.0%	373.7
Remainder/Composite Paper	6.9%	510.1
Plastic	**8.8%**	**654.4**
HDPE Containers	1.2%	89.0
PETE Containers	0.9%	67.5
Miscellaneous Plastic Containers	0.6%	46.8
Film Plastics	3.3%	242.7
Durable Plastic Items	1.3%	96.6
Remainder/Composite Plastic	1.5%	111.8
Glass	**5.4%**	**402.1**
Clear Glass Bottles & Containers	2.8%	204.5
Green Glass Bottles & Containers	1.0%	77.1
Brown Glass Bottles & Containers	1.1%	79.2
Other Colored Bottles & Containers	0.0%	1.6
Flat Glass	0.1%	4.1
Remainder/Composite Glass	0.5%	35.4
Metal	**6.7%**	**496.3**
Tin/Steel Cans	1.3%	95.2
Major Appliances	0.0%	0.0
Other Ferrous Metal	1.8%	131.1
Aluminum Cans	0.6%	42.6
Other Non-Ferrous Metal	0.2%	17.1
Remainder/Composite Metal	2.8%	210.3
Yard		
Leaves & Grass	5.3%	393.9
Prunings & Trimmings	1.3%	93.4
Branches & Stumps	0.0%	3.5

	Est. Mean	Est. Tons
Organics	**35.6%**	**2,640.8**
Food	23.7%	1,754.7
Agricultural Crop Residues	0.0%	0.0
Manures	0.1%	5.6
Textiles	2.5%	187.4
Remainder/Composite Organic	9.3%	693.0
Construction & Demolition	**5.8%**	**433.3**
Concrete	1.1%	81.4
Asphalt Paving	0.0%	0.0
Asphalt Roofing	0.0%	1.2
Lumber	2.4%	174.5
Gypsum Board	0.8%	61.7
Rock, Soil & Fines	0.4%	32.2
Remainder/Composite C&D	1.1%	82.3
Hazardous Waste	**0.4%**	**32.4**
Paint	0.2%	13.3
Vehicle & Equipment Fluids	0.0%	0.0
Used Oil	0.0%	0.1
Batteries	0.1%	6.8
Remainder/Composite HHW	0.2%	12.2
Special Waste	**4.2%**	**310.4**
Ash	0.1%	7.2
Sewage Solids	0.0%	0.0
Industrial Sludge	0.0%	0.0
Treated Medical Waste	0.0%	0.0
Bulky Items	1.8%	134.9
Tires	0.6%	46.7
Remainder/Composite SW	0.6%	47.5
Mixed Residue	1.0%	74.1
Total	**100.0%**	
Estimated Tons	**7,414.0**	

5.2.2 City Facilities

As shown in Figure 5-2, the modeling results suggest the following key findings about disposal trends and recovery potential for the city facilities waste stream:

- More than two thirds (71%, 2,900 tons) of the city facilities waste stream are recyclable or compostable.

- Compostable materials account for about 23% (900 tons) of the city facilities waste stream, shown in green. These material categories included the following:
  - Food (669 tons)
  - Leaves and Grass (188 tons)
  - Prunings and Trimmings (70 tons)

- About 48% (1,900 tons) of the city facilities stream is recyclable, including recyclable paper (25%, 1,000 tons), shown in yellow, and other recyclables (23%, 900 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - White Ledger (230 tons)
  - Newspaper (184 tons)
  - Other Misc. Paper (175 tons)
  - Cardboard (167 tons)
  - Magazines and Catalogs (124 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Lumber (243 tons)
  - Concrete (101 tons)
  - Durable Plastic Items (98 tons)
  - Gypsum Board (85 tons)
  - Other Ferrous Metal (59 tons)

- About 2% (100 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Comp. Metal (61 tons)

- More than one quarter (27%, 1,100 tons) of the city facilities waste stream consists of problem materials. By weight, the five largest material categories are:
  - Remainder/Comp. Paper (573 tons)
  - Film Plastics (201 tons)
  - Remainder/Comp. Plastic (86 tons)
  - Remainder/Comp. C&D (78 tons)
  - Remainder/Comp. Organic (65 tons)

Figure 5-2. Waste Composition & Recoverability, City Facilities

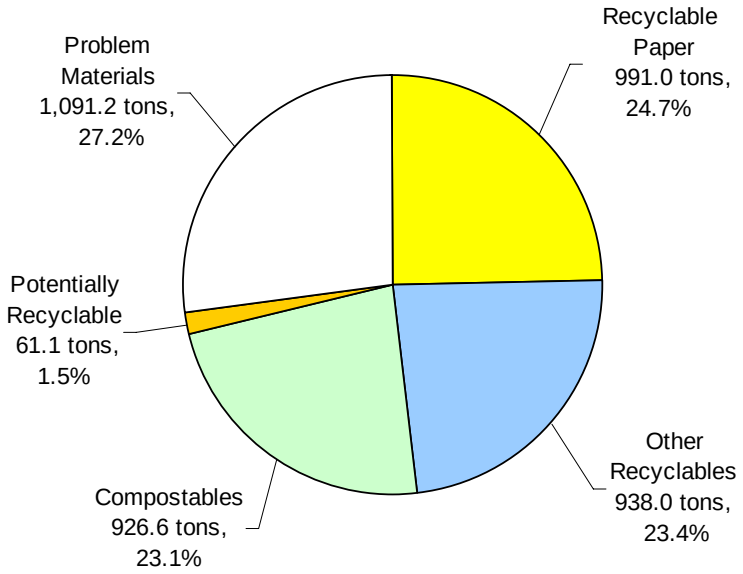


Table 5-2. Detailed Waste Composition, City Facilities

	Est. Mean	Est. Tons
Paper	**39.0%**	**1,564.4**
Uncoated Corrugated Cardboard	4.2%	166.8
Paper Bags	0.5%	20.0
Newspaper	4.6%	184.3
White Ledger Paper	5.7%	229.6
Colored Ledger Paper	0.3%	11.8
Computer Paper	0.2%	7.1
Other Office Paper	1.7%	66.4
Magazines and Catalogs	3.1%	124.3
Phone Books and Directories	0.1%	5.7
Other Miscellaneous Paper	4.4%	175.0
Remainder/Composite Paper	14.3%	573.4
Plastic	**11.4%**	**455.4**
HDPE Containers	0.4%	14.2
PETE Containers	0.7%	28.9
Miscellaneous Plastic Containers	0.7%	28.1
Film Plastics	5.0%	200.5
Durable Plastic Items	2.4%	98.1
Remainder/Composite Plastic	2.1%	85.5
Glass	**4.5%**	**179.4**
Clear Glass Bottles & Containers	1.4%	56.3
Green Glass Bottles & Containers	1.3%	52.7
Brown Glass Bottles & Containers	0.6%	22.4
Other Colored Bottles & Containers	0.0%	0.4
Flat Glass	0.1%	3.1
Remainder/Composite Glass	1.1%	44.5
Metal	**3.9%**	**157.0**
Tin/Steel Cans	0.4%	17.1
Major Appliances	0.0%	0.5
Other Ferrous Metal	1.5%	59.4
Aluminum Cans	0.3%	13.0
Other Non-Ferrous Metal	0.1%	5.9
Remainder/Composite Metal	1.5%	61.1
Yard	**6.4%**	**257.9**
Leaves & Grass	4.7%	187.8
Prunings & Trimmings	1.8%	70.1
Branches & Stumps	0.0%	0.0

	Est. Mean	Est. Tons
Organics	**19.7%**	**788.8**
Food	16.7%	668.7
Agricultural Crop Residues	0.0%	0.0
Manures	0.0%	0.0
Textiles	1.4%	55.5
Remainder/Composite Organic	1.6%	64.7
Construction & Demolition	**13.6%**	**546.2**
Concrete	2.5%	100.8
Asphalt Paving	0.0%	0.0
Asphalt Roofing	0.0%	0.0
Lumber	6.1%	243.3
Gypsum Board	2.1%	84.6
Rock, Soil & Fines	1.0%	39.7
Remainder/Composite C&D	1.9%	77.8
Hazardous Waste	**0.4%**	**14.1**
Paint	0.0%	1.1
Vehicle & Equipment Fluids	0.0%	0.6
Used Oil	0.0%	0.0
Batteries	0.1%	5.9
Remainder/Composite HHW	0.2%	6.6
Special Waste	**1.1%**	**44.8**
Ash	0.0%	0.0
Sewage Solids	0.0%	0.0
Industrial Sludge	0.0%	0.0
Treated Medical Waste	0.0%	0.0
Bulky Items	0.0%	0.0
Tires	0.0%	0.0
Remainder/Composite SW	0.6%	24.1
Mixed Residue	0.5%	20.7
Total	**100.0%**	
Estimated Tons	**4,008.0**	

5.2.3 Schools

As shown in Figure 5-3, the modeling results suggest the following key findings about disposal trends and recovery potential for the schools waste stream:

- More than three quarters (76%, 1,000 tons) of the schools waste stream are recyclable or compostable.

- Compostable materials account for about 48% (600 tons) of the schools waste stream, shown in green. These material categories included the following (Table 5-3):
  - Food (491 tons)
  - Leaves and Grass (102 tons)
  - Prunings and Trimmings (26 tons)

- About 27% (300 tons) of the schools waste stream is recyclable, including recyclable paper (19%, 200 tons), shown in yellow, and other recyclables (9%, 100 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - Other Misc. Paper (73 tons)
  - White Ledger (56 tons)
  - Cardboard (30 tons)
  - Newspaper (24 tons)
  - Other Office Paper (23 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Other Ferrous Metal (24 tons)
  - Durable Plastic Items (15 tons)
  - Misc. Plastic Containers (15 tons)
  - Tin/Steel Cans (12 tons)
  - PETE Containers (10 tons)

- About 1% (20 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Comp. Metal (16 tons)

- Nearly one quarter (23%, 300 tons) of the schools waste stream consists of problem materials. By weight, the five largest material categories are:
  - Remainder/Comp. Paper (166 tons)
  - Film Plastics (65 tons)
  - Remainder/Comp. Organic (31 tons)
  - Remainder/Comp. Plastic (25 tons)
  - Mixed Residue (6 tons)

Figure 5-3. Waste Composition & Recoverability, Schools

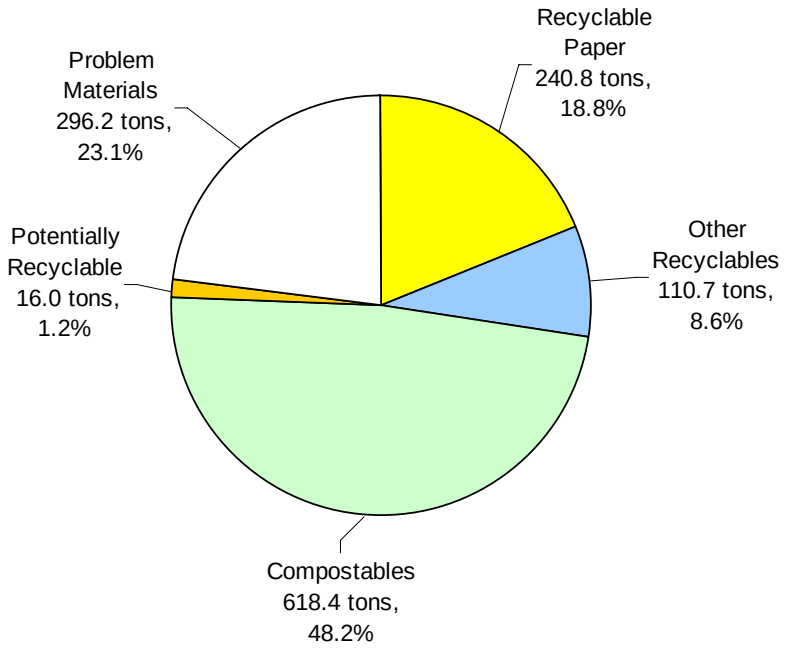


Table 5-3. Detailed Waste Composition, Schools

	Est. Mean	Est. Tons
Paper	**31.7%**	**406.8**
Uncoated Corrugated Cardboard	2.3%	30.1
Paper Bags	0.6%	7.7
Newspaper	1.9%	24.4
White Ledger Paper	4.4%	56.2
Colored Ledger Paper	0.5%	6.6
Computer Paper	0.4%	5.0
Other Office Paper	1.8%	23.0
Magazines and Catalogs	1.1%	13.7
Phone Books and Directories	0.1%	1.3
Other Miscellaneous Paper	5.7%	72.7
Remainder/Composite Paper	13.0%	166.0
Plastic	**10.4%**	**133.8**
HDPE Containers	0.3%	3.9
PETE Containers	0.8%	10.3
Miscellaneous Plastic Containers	1.2%	14.9
Film Plastics	5.0%	64.5
Durable Plastic Items	1.2%	15.1
Remainder/Composite Plastic	2.0%	25.2
Glass	**0.9%**	**11.3**
Clear Glass Bottles & Containers	0.6%	7.9
Green Glass Bottles & Containers	0.1%	1.4
Brown Glass Bottles & Containers	0.1%	1.5
Other Colored Bottles & Containers	0.0%	0.0
Flat Glass	0.0%	0.0
Remainder/Composite Glass	0.0%	0.6
Metal	**4.5%**	**58.3**
Tin/Steel Cans	0.9%	11.9
Major Appliances	0.0%	0.0
Other Ferrous Metal	1.9%	24.1
Aluminum Cans	0.3%	3.3
Other Non-Ferrous Metal	0.2%	3.0
Remainder/Composite Metal	1.2%	16.0
Yard		
Leaves & Grass	7.9%	101.8
Prunings & Trimmings	2.0%	25.5
Branches & Stumps	0.0%	0.0

	Est. Mean	Est. Tons
Organics	**41.1%**	**526.5**
Food	38.3%	491.1
Agricultural Crop Residues	0.0%	0.0
Manures	0.0%	0.0
Textiles	0.4%	4.6
Remainder/Composite Organic	2.4%	30.9
Construction & Demolition	**0.8%**	**10.0**
Concrete	0.1%	1.0
Asphalt Paving	0.1%	1.7
Asphalt Roofing	0.0%	0.0
Lumber	0.2%	3.0
Gypsum Board	0.0%	0.0
Rock, Soil & Fines	0.2%	2.5
Remainder/Composite C&D	0.1%	1.7
Hazardous Waste	**0.1%**	**0.7**
Paint	0.0%	0.1
Vehicle & Equipment Fluids	0.0%	0.0
Used Oil	0.0%	0.1
Batteries	0.0%	0.1
Remainder/Composite HHW	0.0%	0.3
Special Waste	**0.6%**	**7.3**
Ash	0.0%	0.0
Sewage Solids	0.0%	0.0
Industrial Sludge	0.0%	0.0
Treated Medical Waste	0.0%	0.0
Bulky Items	0.0%	0.0
Tires	0.0%	0.0
Remainder/Composite SW	0.1%	1.3
Mixed Residue	0.5%	6.0
Total	**100.0%**	
Estimated Tons	**1,282.0**	

5.2.4 Restaurants

As shown in Figure 5-4, the modeling results suggest the following key findings about disposal trends and recovery potential for the restaurants waste stream:

- More than three quarters (78%, 4,200 tons) of the restaurants waste stream are recyclable or compostable.

- Compostable materials account for about 58% (3,100 tons) of the restaurants waste stream, shown in green. These material categories included the following (Table 5-4):
  - Food (3,127 tons)
  - Prunings and Trimmings (14 tons)
  - Leaves and Grass (4 tons)

- About 20% (1,100 tons) of the restaurants waste stream is recyclable, including recyclable paper (11%, 600 tons), shown in yellow, and other recyclables (10%, 500 tons), shown in blue.

- By weight, the five largest recyclable paper material categories include:
  - Cardboard (259 tons)
  - Newspaper (113 tons)
  - Other Misc. Paper (100 tons)
  - Paper Bags (38 tons)
  - White Ledger (23 tons)

- The five largest material categories considered in the grouping "other recyclables" are:
  - Tin/Steel Cans (110 tons)
  - Asphalt Paving (76 tons)
  - Clear Glass Bottles (69 tons)
  - HDPE Containers (40 tons)
  - Green Glass Bottles (36 tons)

- Less than 1% (20 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Comp. Metal (23 tons)

- Nearly one quarter (22%, 1,200 tons) of the restaurants waste stream consists of problem materials. By weight, the five largest material categories are:
  - Remainder/Comp. Paper (686 tons)
  - Film Plastics (266 tons)
  - Remainder/Comp. C&D (80 tons)
  - Remainder/Comp. Plastic (69 tons)
  - Remainder/Comp. Organic (37 tons)

Figure 5-4. Waste Composition & Recoverability, Restaurants

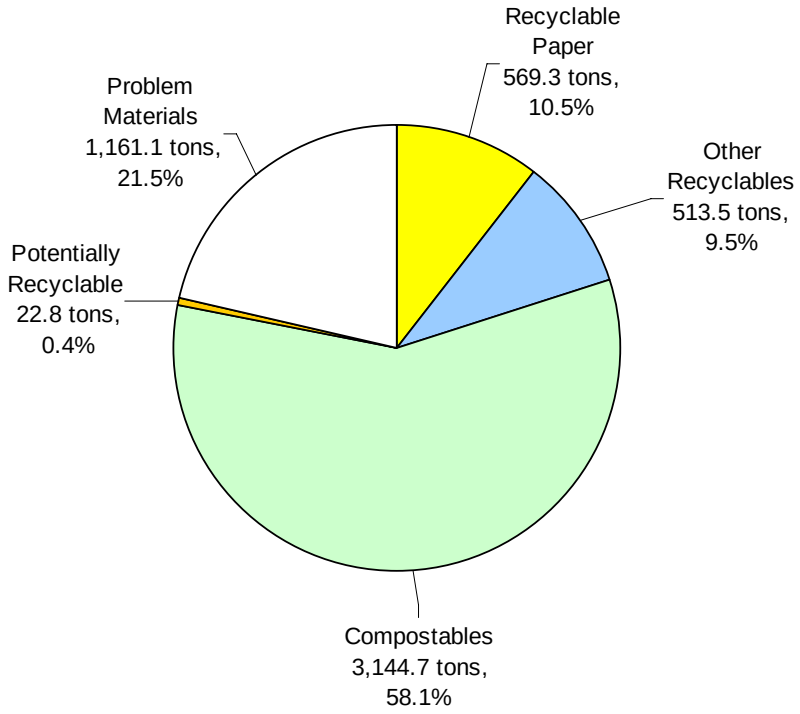


Table 5-4. Detailed Waste Composition, Restaurants

	Est. Mean	Est. Tons
Paper	**23.2%**	**1,255.2**
Uncoated Corrugated Cardboard	4.8%	259.3
Paper Bags	0.7%	37.8
Newspaper	2.1%	112.9
White Ledger Paper	0.4%	23.2
Colored Ledger Paper	0.0%	2.4
Computer Paper	0.1%	7.4
Other Office Paper	0.3%	15.3
Magazines and Catalogs	0.2%	10.5
Phone Books and Directories	0.0%	0.8
Other Miscellaneous Paper	1.8%	99.6
Remainder/Composite Paper	12.7%	685.9
Plastic	**8.1%**	**438.0**
HDPE Containers	0.7%	39.8
PETE Containers	0.2%	10.2
Miscellaneous Plastic Containers	0.5%	25.8
Film Plastics	4.9%	266.1
Durable Plastic Items	0.5%	26.9
Remainder/Composite Plastic	1.3%	69.2
Glass	**2.6%**	**140.3**
Clear Glass Bottles & Containers	1.3%	68.5
Green Glass Bottles & Containers	0.7%	36.1
Brown Glass Bottles & Containers	0.5%	24.8
Other Colored Bottles & Containers	0.0%	1.0
Flat Glass	0.0%	0.0
Remainder/Composite Glass	0.2%	9.9
Metal	**3.2%**	**173.6**
Tin/Steel Cans	2.0%	110.1
Major Appliances	0.2%	10.0
Other Ferrous Metal	0.1%	6.3
Aluminum Cans	0.2%	11.8
Other Non-Ferrous Metal	0.2%	12.6
Remainder/Composite Metal	0.4%	22.8
Yard	**0.3%**	**17.3**
Leaves & Grass	0.1%	3.7
Prunings & Trimmings	0.3%	13.6
Branches & Stumps	0.0%	0.0

	Est. Mean	Est. Tons
Organics	**58.9%**	**3,187.1**
Food	57.8%	3,127.4
Agricultural Crop Residues	0.0%	0.0
Manures	0.0%	0.0
Textiles	0.4%	22.5
Remainder/Composite Organic	0.7%	37.1
Construction & Demolition	**3.4%**	**183.3**
Concrete	0.1%	2.7
Asphalt Paving	1.4%	76.3
Asphalt Roofing	0.0%	0.0
Lumber	0.3%	17.7
Gypsum Board	0.1%	6.4
Rock, Soil & Fines	0.0%	0.0
Remainder/Composite C&D	1.5%	80.2
Hazardous Waste	**0.0%**	**0.1**
Paint	0.0%	0.0
Vehicle & Equipment Fluids	0.0%	0.0
Used Oil	0.0%	0.0
Batteries	0.0%	0.1
Remainder/Composite HHW	0.0%	0.0
Special Waste	**0.3%**	**16.6**
Ash	0.1%	3.8
Sewage Solids	0.0%	0.0
Industrial Sludge	0.0%	0.0
Treated Medical Waste	0.0%	0.0
Bulky Items	0.0%	0.0
Tires	0.0%	0.0
Remainder/Composite SW	0.0%	0.0
Mixed Residue	0.2%	12.8
Total	**100.0%**	
Estimated Tons	**5,411.4**	

5.2.5 Hospitals

As shown in Figure 5-5, the modeling results suggest the following key findings about disposal trends and recovery potential for the hospitals waste stream:

- About half (53%, 2,400 tons) of the hospitals waste stream is recyclable or compostable.
- Compostable materials account for about 17% (800 tons) of the hospitals waste stream, shown in green. These material categories included the following (Table 5-5):
  - Food (792 tons)
  - Leaves and Grass (4 tons)
- About 36% (1,600 tons) of the hospitals waste stream is recyclable, including recyclable paper (22%, 1,000 tons), shown in yellow, and other recyclables (14%, 600 tons), shown in blue.
- By weight, the five largest recyclable paper material categories include:
  - Other Misc. Paper (194 tons)
  - White Ledger (182 tons)
  - Other Office Paper (156 tons)
  - Magazines and Catalogs (151 tons)
  - Cardboard (147 tons)
- The five largest material categories considered in the grouping "other recyclables" are:
  - Remainder/Comp. HHW (210 tons)
  - Paint (123 tons)
  - Durable Plastic Items (77 tons)
  - Tins/Steel Cans (57 tons)
  - Clear Glass Bottles (35 tons)
- About 2% (100 tons) is potentially recyclable. The material categories considered potentially recyclable include:
  - Remainder/Comp. Metal (68 tons)
- Nearly half (46%, 2,100 tons) of the hospitals waste stream consists of problem materials. By weight, the five largest material categories are[4]:
  - Remainder/Comp. Paper (766 tons)
  - Remainder/Comp. Organic (624 tons)
  - Remainder/Comp. SW (330 tons)
  - Film Plastics (233 tons)
  - Remainder/Comp. Plastic (135 tons)

[4] The amount of "problem materials" in the hospital stream is likely under-reported due to Stanford Hospital's unique ability to treat its own medical waste. This model does not accurately capture the tons of treated medical waste Stanford Hospital produces.

Figure 5-5. Waste Composition & Recoverability, Hospitals

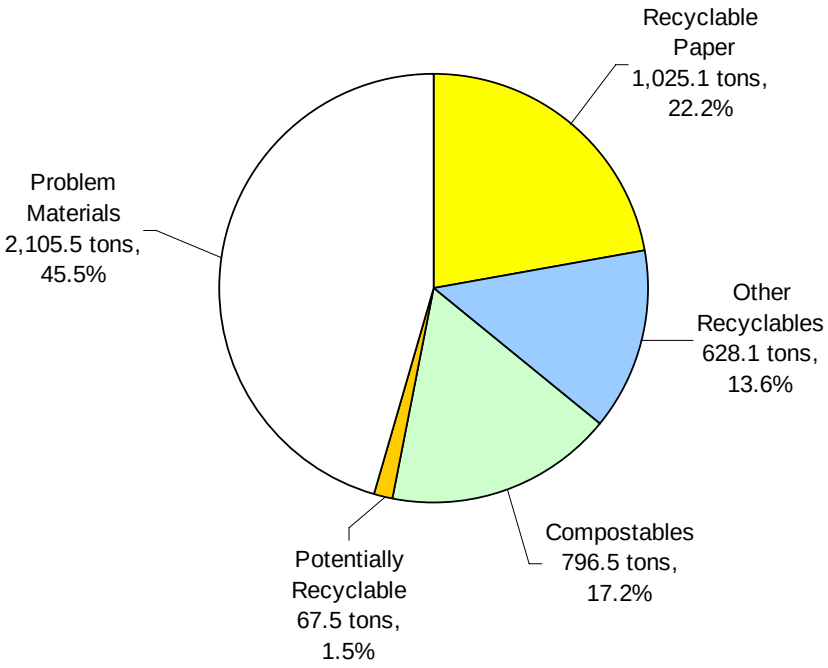


Table 5-5. Detailed Waste Composition, Hospitals

	Est. Mean	Est. Tons
Paper	**38.7%**	**1790.9**
Uncoated Corrugated Cardboard	3.2%	147.2
Paper Bags	0.4%	19.1
Newspaper	2.7%	125.8
White Ledger Paper	3.9%	182.4
Colored Ledger Paper	0.2%	7.0
Computer Paper	0.6%	27.3
Other Office Paper	3.4%	155.8
Magazines and Catalogs	3.3%	150.7
Phone Books and Directories	0.3%	15.3
Other Miscellaneous Paper	4.2%	194.4
Remainder/Composite Paper	16.6%	765.9
Plastic	**10.8%**	**500.8**
HDPE Containers	0.4%	18.8
PETE Containers	0.3%	13.6
Miscellaneous Plastic Containers	0.5%	22.7
Film Plastics	5.0%	233.2
Durable Plastic Items	1.7%	77.1
Remainder/Composite Plastic	2.9%	135.4
Glass	**0.8%**	**35.2**
Clear Glass Bottles & Containers	0.8%	34.7
Green Glass Bottles & Containers	0.0%	0.0
Brown Glass Bottles & Containers	0.0%	0.4
Other Colored Bottles & Containers	0.0%	0.0
Flat Glass	0.0%	0.0
Remainder/Composite Glass	0.0%	0.1
Metal	**3.0%**	**140.5**
Tin/Steel Cans	1.2%	56.5
Major Appliances	0.0%	0.0
Other Ferrous Metal	0.1%	2.7
Aluminum Cans	0.2%	7.0
Other Non-Ferrous Metal	0.1%	6.8
Remainder/Composite Metal	1.5%	67.5
Yard	**0.1%**	**4.3**
Leaves & Grass	0.1%	4.3
Prunings & Trimmings	0.0%	0.0
Branches & Stumps	0.0%	0.0

	Est. Mean	Est. Tons
Organics	**31.2%**	**1442.2**
Food	17.1%	792.2
Agricultural Crop Residues	0.0%	0.0
Manures	0.0%	0.0
Textiles	0.6%	26.2
Remainder/Composite Organic	13.5%	623.8
Construction & Demolition	**0.7%**	**31.7**
Concrete	0.0%	0.0
Asphalt Paving	0.0%	0.0
Asphalt Roofing	0.0%	0.0
Lumber	0.4%	16.8
Gypsum Board	0.0%	0.0
Rock, Soil & Fines	0.1%	5.7
Remainder/Composite C&D	0.2%	9.2
Hazardous Waste	**7.3%**	**339.1**
Paint	2.7%	122.9
Vehicle & Equipment Fluids	0.0%	0.0
Used Oil	0.0%	0.0
Batteries	0.1%	6.5
Remainder/Composite HHW	4.5%	209.7
Special Waste	**7.3%**	**337.9**
Ash	0.0%	0.0
Sewage Solids	0.0%	0.0
Industrial Sludge	0.0%	0.0
Treated Medical Waste	0.0%	0.0
Bulky Items	0.0%	0.0
Tires	0.0%	0.0
Remainder/Composite SW	7.1%	329.7
Mixed Residue	0.2%	8.2
Total	**100.0%**	
Estimated Tons	**4,622.6**	

Appendix A. Waste Sort Material Category Definitions

Paper

1. **Uncoated Corrugated Cardboard** usually has three layers. The center wavy layer is sandwiched between the two outer layers. It does not have any wax coating on the inside or outside. Examples include entire cardboard containers, such as shipping and moving boxes, computer packaging cartons, and sheets and pieces of boxes and cartons. This type does not include chipboard.

2. **Paper Bags/Kraft** means bags and sheets made from Kraft paper. The paper may be brown (unbleached) or white (bleached). Examples include paper grocery bags, fast food bags, department store bags, and heavyweight sheets of Kraft packing paper.

3. **White Ledger** means uncolored bond, rag, or stationary grade paper. It may have colored ink on it. When the paper is torn, the fibers are white. Examples include white photocopy, white laser print, and letter paper.

4. **Computer Paper** means paper used for computer printouts. This type usually has a strip of form feed holes along two edges. If there are no holes, then the edges show tear marks. This type can be white or striped. Examples include computer paper and printouts from continuous feed printers. This type does not include "white ledger" used in laser or impact printers, nor computer paper containing groundwood.

5. **Newspaper** means paper used in newspapers. Examples include newspaper and glossy inserts, and all items made from newsprint, such as free advertising guides, election guides, plain news packing paper, stapled college schedules of classes, and tax instruction booklets.

6. **Magazines and Catalogs** means items made of glossy coated paper. This paper is usually slick, smooth to the touch, and reflects light. Examples include glossy magazines, catalogs, brochures, and pamphlets.

7. **Phone Books and Directories** means thin paper between coated covers. These items are bound along the spine with glue. Examples include whole or damaged telephone books, "yellow pages", real estate listings, and some non-glossy mail order catalogs.

8. **Colored Ledger** means colored bond, rag, or stationery grade paper. When the paper is torn, the fibers are colored throughout. Examples: This subtype includes colored photocopy and letter paper. This subtype does not include fluorescent dyed paper or deep-tone dyed paper such as goldenrod colored paper.

9. **Other Office Paper** means other kinds of paper used in offices. Examples include manila folders, manila envelopes, index cards, white envelopes, white window envelopes, white or colored notebook paper, carbonless forms, and junk mail. This type does not include "white ledger", "colored ledger", or "computer paper".

10. **Milk and Juice Polycoated Containers** means milk and juice cartons made of bleached and unbleached paperboard coated with film. This includes polycoated milk

and juice containers, and aseptic juice containers, including those with plastic spouts attached.

11. **Other Miscellaneous Paper** means items made mostly of paper that do not fit into any of the above types. Paper may be combined with minor amounts of other materials such as wax and glue. This type includes items made of chipboard, groundwood paper, and deep-toned or fluorescent dyed paper. Examples include cereal and cracker boxes, unused paper plates and cups, goldenrod colored paper, school construction paper/butcher paper, unopened junk mail, colored envelopes for greeting cards, pulp paper egg cartons, unused pulp paper plant pots, shredded paper, maps, and softcover books.

12. **Hard Cover Books** means books with an inflexible, hard exterior cover.

13. **Compostable Paper** means paper suitable for composting. Examples include waxed corrugated cardboard, tissues, paper towels, pizza boxes, used paper plates, and other food contaminated paper such as ice cream cartons and frozen food boxes.

14. **Blueprints** means blue lined documents or plans commonly used for drafting building construction plans.

15. **Remainder/Composite Paper** means items made mostly of paper but combined with large amounts of other materials such as plastic, glues, and foil. Examples include non-juice aseptic packages, sepia, onion skin, aluminum lined fast food wrappers, carbon paper, self-adhesive notes, and photographs.

Plastic

16. **HDPE Containers** means natural and colored HDPE (high-density polyethylene) containers. This plastic is usually either cloudy white, allowing light to pass through it (natural) or a solid color, preventing light from passing through it (colored). When marked for identification, it bears the number 2 in the triangular recycling symbol. Examples: This subtype includes milk jugs, water jugs, detergent bottles, some hair-care bottles, narrow and wide mouth food containers (such as for coffee and coffee creamer), some margarine, cottage cheese, and yogurt tubs, 3- and 5-gallon buckets, empty motor oil, empty antifreeze, and other empty vehicle and equipment fluid.

17. **PETE Containers** means clear or colored PETE (polyethylene terephthalate) containers. When marked for identification, it bears the number 1 in the center of the triangular recycling symbol and may also bear the letters PETE or PET. The color is usually clear, transparent green or amber. A PETE container usually has a small dot left from the manufacturing process, not a seam. It does not turn white when bent. Examples include: soft drink, water, and liquor bottles, cooking oil, pastry jars, food jars, black frozen food trays, clear aspirin bottles, food and non-food clamshell packaging.

18. **Miscellaneous Plastic Containers** means plastic containers made of types of plastic other than HDPE (high-density polyethylene) or PETE (polyethylene terephthelate). Items may be made of PVC (polyvinyl chloride), LDPE (low-density polyethylene), PP (polypropylene), PS (rigid polystyrene), or mixed resins. When marked for identification, these items may bear the number 3, 4, 5, 6, or 7 in the triangular recycling symbol. Examples: This subtype includes food containers such as bottles for salad dressings and

vegetable oils, some flexible and brittle yogurt cups, syrup bottles, some margarine tubs, microwave food trays, and clamshell-shaped fast food containers. This subtype also includes some shampoo containers, vitamin bottles, foam egg cartons, and clamshell-like muffin containers.

19. **Plastic Bags** means clean and dry grocery bags, dry-cleaner bags, produce bags, merchandise bags, bread bags, newspaper and magazine bags, bubble wrap, and shrink wrap.

20. **Other Film Plastic** means flexible plastic sheeting. It is made from a variety of plastic resins including high-density polyethylene (HDPE) and low-density polyethylene (LDPE). It can be easily contoured around an object by hand pressure. This type does not include any subtypes. Examples: This type includes plastic garbage bags, mailing pouches, sandwich bags, zipper-recloseable bags, frozen vegetable bags, food wrappers such as candy-bar wrappers, metallized film (wine containers and balloons), food wrap, agricultural film, mulch films, wrap for hay bales, plastic sheeting used as drop cloths and building wrap, and X-ray film. This type does not include rigid bubble packaging.

21. **Durable Plastic Items** means plastic objects other than containers and film plastic. This type also includes plastic objects other than containers or film that bear the numbers 1 through 7 in the triangular recycling symbol. These items are usually made to last for more than one use. Examples: This type includes plastic outdoor furniture, plastic toys and sporting goods, and plastic housewares, such as mop buckets, dishes, cups, and cutlery. This type also includes building materials such as house siding, window sashes and frames, housings for electronics (such as computers, televisions and stereos) if there are no electrical components in the housing, plastic pipes and fittings, CD's, sporting goods, fan blades, and impact-resistance cases (e.g. tool boxes, first aid boxes, tackle boxes, sewing kits, etc.).

22. **Expanded Polystyrene Packaging** means foam material used to insulate fragile goods or to provide insulation. Examples include foam packing blocks, packing peanuts, and blocks of PS insulating foams.

23. **Expanded Polystyrene Containers** means foam drinking cups, produce trays, plates, clamshells, and bowls.

24. **Remainder/Composite Plastic** means plastic that cannot be put in any other type. They are usually recognized by their optical opacity. This type includes items made mostly of plastic but combined with other materials. Examples include auto parts made of plastic attached to metal, plastic drinking straws, plastic strapping, plastic lids, some kitchen ware, toys made of plastic and other materials, new plastic laminate (e.g., Formica), vinyl, linoleum, plastic lumber, non-PS insulating foams, imitation ceramics, handles and knobs, plastic string (such as is used for hay bales), and plastic rigid bubble/foil packaging (as for medications).

Glass

25. **Clear Glass Bottles and Containers** means clear glass beverage and food containers with or without a California Redemption Value (CRV) label. Examples include whole or broken clear soda and beer bottles, fruit juice bottles, peanut butter jars, and mayonnaise jars.

26. **Green Glass Bottles and Containers** means green-colored glass containers with or without a CRV label. Examples include whole or broken green soda and beer bottles, and whole or broken green wine bottles.

27. **Brown Glass Bottles and Containers** means brown-colored glass containers with or without a CRV label. Examples include whole or broken brown soda and beer bottles, and whole or broken brown wine bottles.

28. **Flat Glass** means clear or tinted glass that is flat. Examples include glass windowpanes, doors, and tabletops, flat automotive window glass (side windows), safety glass, and architectural glass. This type does not include windshields, laminated glass, or any curved glass.

29. **Other Colored Glass Bottles and Containers** means colored glass containers and bottles other than green or brown with or without a CRV label. Examples include whole or broken blue or other colored bottles and containers.

30. **Remainder/Composite Glass** means glass that cannot be put in any other type. It includes items made mostly of glass but combined with other materials. Examples include Pyrex, Corningware, crystal and other glass tableware, mirrors, non-fluorescent light bulbs, and auto windshields.

Metal

31. **Aluminum Cans** means any food or beverage container made mainly of aluminum. Examples include aluminum soda or beer cans, and some pet food cans. This type does not include bimetal containers with steel sides and aluminum ends.

32. **Other Non-Ferrous** means any metal item, other than aluminum cans, that is not stainless steel and that is not magnetic. These items may be made of aluminum, copper, brass, bronze, lead, zinc, or other metals. Examples include aluminum window frames, aluminum siding, copper wire, shell casings, brass pipe, and aluminum foil.

33. **Tin/Steel Cans** means rigid containers made mainly of steel. These items will stick to a magnet and may be tin-coated. This type is used to store food, beverages, paint, and a variety of other household and consumer products. Examples include canned food and beverage containers, empty metal paint cans, empty spray paint and other aerosol containers, and bimetal containers with steel sides and aluminum ends.

34. **Other Ferrous** means any iron or steel that is magnetic or any stainless steel item. This type does not include "tin/steel cans". Examples include structural steel beams, metal clothes hangers, metal pipes, stainless steel cookware, security bars, used oil filters, and scrap ferrous items.

35. **Major Appliances** means discarded major appliances of any color. These items are often enamel-coated. Examples include washing machines, clothes dryers, hot water heaters, stoves, and refrigerators. This type does not include electronics, such as televisions and stereos.

36. **Engines & Motors** means auto engines and electric motors often containing and mixture of ferrous and non-ferrous metals.

37. **Remainder/Composite Metal** means metal that cannot be put in any other type. This type includes items made mostly of metal but combined with other materials and items made of both ferrous metals and non-ferrous metal combined. Examples include finished and non-finished products that contain a mixture of metals, or metals and other materials, whose weight is derived significantly from the metal portion of its construction. Includes insulated wire.

Yard Waste

38. **Leaves and Grass** means plant material, except woody material, from any public or private landscapes. Examples include leaves, grass clippings, sea weed, and plants. This type does not include woody material or material from agricultural sources.

39. **Prunings and Trimmings** means woody plant material up to 4 inches in diameter from any public or private landscape. Examples include prunings, shrubs, and small branches with branch diameters that do not exceed 4 inches. This type does not include stumps, tree trunks, or branches exceeding 4 inches in diameter. This type does not include material from agricultural sources.

40. **Branches and Stumps** means woody plant material, branches, and stumps that exceed four inches in diameter from any public or private landscape.

Organics

41. **Food** means food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food. This type includes material from industrial, commercial, or residential sources. Examples include discarded meat scraps, dairy products, egg shells, fruit or vegetable peels, and other food items from homes, stores, and restaurants. This type includes grape pomace and other processed residues or material from canneries, wineries, or other industrial sources.

42. **Tires** means vehicle tires. This type does not include any subtypes. Examples: This type includes tires from trucks, automobiles, motorcycles, heavy equipment, and bicycles.

43. **Other Rubber** means finished products and scrap materials made of rubber but not including rubber tires. Examples include bath mats, inner tubes, rubber hoses, latex gloves, and foam rubber.

44. **Wooded Pallets** means both re-usable and broken wooden pallets used in shipping applications.

45. **Wood-untreated** means non-treated wood for or from building, manufacturing, landscaping, packaging, or demolition activities. Examples include all un-painted, un-stained, and un-treated dimensional lumber, lumber cutoffs, engineered wood such as plywood and particleboard, wood scraps, wood fencing, wood shake roofing, and wood siding.

46. **Wood-treated** means treated wood for or from building, manufacturing, landscaping, packaging, or demolition activities. Examples include all painted, stained, or treated dimensional lumber, lumber cutoffs, engineered wood such as plywood and particleboard, wood scraps, pallets, wood fencing, wood shake roofing, and wood siding.

47. **Agricultural Crop Residues** means plant material from agricultural sources. Examples include orchard and vineyard prunings, vegetable by products from farming, residual fruits, vegetables, and other crop remains after usable crop is harvested. This type does not include processed residues from canneries, wineries, or other industrial sources.

48. **Manures** means manure and soiled bedding materials from domestic, farm, or ranch animals. Examples include manure and soiled bedding from animal production operations, racetracks, riding stables, animal hospitals, and other sources.

49. **Textiles** means items made of thread, yarn, fabric, or cloth. Examples include clothes, fabric trimmings, draperies, and all natural and synthetic cloth fibers. This type does not include cloth-covered furniture, mattresses, leather shoes, leather bags, or leather belts.

50. **Leather** means clothing and non clothing items made of cowhide. Examples include leather jackets, leather saddles, leather purses, and leather baseball gloves.

51. **Diapers** means disposable baby diapers and adult protective undergarments.

52. **Carpet** means flooring applications consisting of various natural or synthetic fibers bonded to some type of backing material. Does not include carpet padding.

53. **Carpet Padding** means flooring applications using as padding and insulation under carpets.

54. **Other Compostable Organics** means organic materials that could be composted. Examples include cork, hemp rope, hair, household wood products (popsicle sticks and toothpicks), and sawdust.

55. **Remainder/Composite Organics** means organic material that cannot be put in any other type or subtype. This type includes items made mostly of organic materials but combined with other materials. Examples include cigarette butts, and animal feces.

Other Waste

56. **Concrete** means a hard material made from sand, gravel, aggregate, cement mix, and water. Examples include pieces of building foundations, concrete paving, and cinder blocks.

57. **Asphalt Paving** means a black or brown, tar-like material mixed with aggregate used as a paving material.

58. **Rock, Soil and Fines** means rock pieces of any size and soil, dirt, and other matter. Examples include rock, stones, sand, clay, soil, and other fines. This type also includes non-hazardous contaminated soil.

59. **Gypsum Board** means interior wall covering made of a sheet of gypsum sandwiched between paper layers. Examples include used or unused, broken or whole sheets of sheetrock, drywall, gypsum board, plasterboard, gypboard, gyproc, and wallboard.

60. **Asphalt Roofing** means composite shingles and other roofing material made with asphalt. Examples include asphalt shingles and attached roofing tar and tar paper.

61. **Paint** means containers with paint in them. Examples include latex paint, oil based paint, and tubes of pigment or fine art paint. This type does not include dried paint, empty paint cans, or empty aerosol containers.

62. **Antifreeze** means fluid used in cars and machinery as a cooling agent.

63. **Vehicle and Equipment Fluids** means containers with fluids used in vehicles or engines, except used oil and antifreeze. Examples include used brake fluid. This type does not include empty vehicle and equipment fluid containers.

64. **Used Oil** means the same as defined in Health and Safety Code section 25250.1(a). Examples include spent lubricating oil such as crankcase and transmission oil, gear oil, and hydraulic oil.

65. **Treated Medical Waste** has the same meaning as treated medical waste in Section 25123.5 of the Health and Safety Code. This type does not include any subtypes.

66. **Batteries** means any type of battery including both dry cell and lead acid. Examples include flashlight, small appliance, watch, and hearing aid batteries.

67. **Auto Batteries** means wet cell batteries commonly found in vehicles.

68. **Fluorescent Lights** means fluorescent light tubes and compact fluorescent bulbs (CFLs).

69. **Remainder/Composite Household Hazardous** means household hazardous material that cannot be put in any other type. This type also includes household hazardous material that is mixed. Examples include household hazardous waste which if improperly put in the solid waste stream may present handling problems or other hazards, such as pesticides, and caustic cleaners.

70. **Remainder/Composite Construction and Demolition** means construction and demolition material that cannot be put in any other type. This type may include items from different categories combined, which would be very hard to separate. Examples include brick, ceramics, tiles, toilets, sinks, dried paint not attached to other materials, and fiberglass insulation. This type may also include demolition debris that is a mixture of items such as plate glass, wood, tiles, gypsum board, and aluminum scrap.

E-Waste

71. **Brown Goods** means generally larger, non-portable electronic goods that have some circuitry. Examples include microwaves, stereos, VCRs, DVD players, radios, audio/visual equipment, and non-CRT televisions (such as LCD televisions).

72. **Computer-related Electronics** means electronics with large circuitry that is computer-related. Examples include processors, mice, keyboards, laptops, disk drives, printers, modems, and fax machines.

73. **Other Small Consumer Electronics** means portable non-computer-related electronics with large circuitry. Examples include personal digital assistants (PDAs), cell phones,

phone systems, phone answering machines, computer games and other electronic toys, portable CD players, camcorders, and digital cameras.

74. **Televisions and Other Items with CRTs**. Examples include televisions, computer monitors, and other items containing a cathode ray tube (CRT).

Special Waste

75. **Mattresses** means the common bedding typically consisting of multiple layers of foams and fibers, along with an innerspring unit used to provide support during sleep.

76. **Box Springs** means the wooden frame, containing springs or some other form of torsion and covered in cloth commonly placed beneath a mattress to provide support.

77. **Other Bulky Items** means large hard to handle items that are not defined separately. Examples include all sizes and types of furniture and base components.

78. **Ash** means a residue from the combustion of any solid or liquid material. Examples include ash from structure fires, fireplaces, incinerators, biomass facilities, waste-to-energy facilities, and barbecues.

79. **Sewage Solids** means residual solids and semi solids from the treatment of domestic waste water or sewage. Examples include biosolids, sludge, grit, screenings, and septage. This type does not include sewage or waste water discharged from the sewage treatment process.

80. **Industrial Sludge** means sludge from factories, manufacturing facilities, and refineries. Examples include paper pulp sludge, and water treatment filter cake sludge.

81. **Hypodermic Needles** means the intravenous needles used to inject medications and/or drugs.

82. **Pharmaceutical Medications** means doctor prescribed solid, liquid, or aerosol medications.

83. **Remainder/Composite Special Waste** means special waste that cannot be put in any other type. Examples include asbestos-containing materials, such as certain types of pipe insulation and floor tiles, auto fluff, auto-bodies, trucks, trailers, truck cabs, untreated medical waste (such as tubing and soiled gowns), and artificial fireplace logs.

84. **Mixed Residue** means material that cannot be put in any other type in the other categories. This type includes mixed residue that cannot be further sorted. Examples include clumping kitty litter and residual material from a materials recovery facility or other sorting process that cannot be put in any of the previous remainder/composite types.

Appendix B. Waste Sort Study Methodology

Purpose

The purpose of this study was to provide statistically significant data on the composition of four waste sectors from the City of Palo Alto (City). This information is essential for the implementation and success of the Zero Waste Operational Plan that Palo Alto City Council directed staff to develop in 2005. The study was also designed so that the data is comparable to the previous Waste Generation Studies conducted by EMCON in 1997 and 1990.

This appendix outlines the sampling methodology for the 2005 study.

Waste Sectors Defined

The consultant team defined waste sectors in a method consistent with previous City waste composition studies conducted in 1990 and 1997. In addition to the City waste sectors, residuals were analyzed from the SMaRT Station. The four City waste sectors and the SMaRT Station residuals are defined as follows:

- **Single-family residential** is waste set out for disposal and collected by PASCO from detached single family, duplex, triplex, and four-plex homes.
- **Mixed commercial and multi-family residential** is waste from businesses and multi-family sites that is collected by PASCO in front loader trucks and in compacting drop-boxes.
- **Industrial** is waste collected by PASCO in open-top (loose) drop-boxes.
- **Self-haul** is composed of waste hauled by residents or businesses to the City Landfill in small and large pick-up trucks, or other vehicles (e.g., flatbed trucks, moving vans, etc.).
- **SMaRT Station residuals** are materials off the discharge belt and residual materials from the construction and demolition (C&D) floor sort at the SMaRT Station.

Allocation of Samples

To maximize the overall number of samples obtained and to provide results consistent with the previous waste characterization studies, different numbers of samples were allocated to the waste sectors. The data collection process for each sector also employed different characterization methods. Single-family residential waste, mixed commercial and multi-family residential waste, and SMaRT Station residuals samples were hand-sorted. Loads of industrial and self-haul waste were visually characterized. Table 2-1 shows the planned sample allocation and the actual number of samples characterized. Variations from the sampling plan included:

- One mixed commercial/multi-family residential sample was visually characterized instead of hand-sorted because it contained large amounts of medical waste.
- The landfill received fewer than anticipated industrial (open-top drop-box) loads due to a C&D diversion program. Two additional self-haul loads were sampled to make up for the deficit in industrial samples.

Table B-1: Planned and Actual Samples by Sector and Sorting Type

	Hand-sorted		Visually Characterized		Total	
	Planned	*Actual*	*Planned*	*Actual*	*Planned*	*Actual*
Single-family Residential	15	15	-	-	15	15
Mixed Commercial/Multi-family Residential	30	30	-	1	30	31
Industrial (Open-Top Drop-Boxes)	-	-	40	38	40	38
Self-haul	-	-	40	42	40	42
SMaRT Station Residuals	30	30	-	-	30	30

Coordination

One month prior to the scheduled field work, the consultant team met with key staff at the City Landfill and the SMaRT Station to arrange permission and to coordinate space requirements and other logistics of the field data collection effort.

The consultant team also coordinated with PASCO, the City's waste hauler, to arrange for the delivery of randomly selected loads of single-family residential waste and mixed commercial and multi-family residential waste to the City Landfill. Loads of material containing waste from these two sectors are normally hauled directly to the SMaRT Station for processing. Since the sampled vehicles are intercepted, it is important to note that the study results reflect composition tonnage's before materials are removed and recycled through processing at the SMaRT Station. This procedure is consistent with the methods used in Palo Alto's previous waste composition study in 1997.

Prior to sampling, arrangements were also made with PASCO to deliver randomly selected loads of open-top (loose) drop-boxes to the landfill. A C&D recovery program in place at the time of the study requires PASCO to deliver six open-top drop boxes containing C&D debris to the Guadalupe Landfill for processing each day. Due to seasonally low demand for open-top drop-box service and potentially due to the C&D recovery program, fewer than anticipated industrial loads were available for sampling during the study. At the request of the City, PASCO diverted as many as six industrial loads originally bound for the C&D recovery program to the City Landfill for sampling. Since these six industrial loads were intercepted, it is important to note that the study results reflect composition tonnage's before materials are removed and recycled through processing at the Guadalupe Landfill. In 2004, the C&D loads taken to Guadalupe resulted in 5,130 tons of material recycled, a 90% recycling rate.

Schedule

All sampling and sorting occurred between Thursday, December 1st and Saturday December 10th. Table B-2 shows the schedule of field activities.

Table B-2. Schedule of Field Activities, December 2005

Palo Alto Schedule					
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28	29	30	1 **Sample & Sort:** MRF Residuals	2 **Sample & Sort:** MRF Residuals	3 **Sort:** MRF Residuals
5 **Sample & Sort:** Residential Com/MF Industrial (visuals) Self-haul (visuals)	6 **Sample & Sort:** Residential Com/MF Industrial (visuals) Self-haul (visuals)	7 **Sample & Sort:** Residential Com/MF Industrial (visuals) Self-haul (visuals)	8 **Sample & Sort:** Residential Com/MF Industrial (visuals) Self-haul (visuals)	9 **Sample & Sort:** Residential Com/MF Industrial (visuals) Self-haul (visuals)	10 **Sort:** Residential Com/MF

Note that single-family residential, SMaRT Station residuals, and mixed commercial and multi-family residential loads were hand sorted.

Detailed Hand-sort Protocol

The consultant team hand-sorted 15 samples of single-family residential waste, 30 samples of mixed commercial and multi-family waste, and 30 samples of SMaRT Station residuals. This section provides a step-by-step detail of the hand-sort protocol.

1) **Review methodology and sorting categories with the crew**. Before the sampling phase of the project began, all crewmembers reviewed the material definitions in detail. The material definitions are in Appendix A.

2) **Obtain waste samples from vehicles/residual pile.** From each selected vehicle load or from the residual pile at the pre-determined time, one hand-sort sample was selected using an imaginary 8-cell grid superimposed over the dumped material. The Field Crew Manager identified the pre-determined randomly selected cell to be extracted. Then, a sample consisting of approximately 150-200 pounds of waste was removed by hand and placed into toters for transport to the sorting table.

3) **Sort samples.** Once the sample was placed on the sort table, the material was hand-sorted into the prescribed component categories. Plastic baskets were used to contain the separated components. The sorting crewmembers specialized in groups of material categories, such as papers or plastics, while the Field Crew Manager monitored the homogeneity of the component baskets as they accumulated, rejecting materials, which were improperly classified. Open baskets allow the Field Crew Manager to see the material at all times. The Field Crew Manager verified the purity of each component as it was weighed, before recording data on the Sample Sheet. Medium- and large-sized items also were assessed for reusability.

4) **Record data.** The Field Crew Manager recorded composition weights on the Sample Sheet, a copy of which is in Appendix D. At the conclusion of each day the Field Crew Manager conducted a quality control review of the data recorded.

Detailed Visual Characterization Protocol

One staff member with extensive experience in visual waste characterization assessed each sample of industrial and self-haul waste. The visual assessment is directly entered into a computer with custom-designed entry fields and analysis capabilities. The back-up hard copy field form is included in Appendix D. The visual sampling method is summarized in the following steps:

1) **Obtain net weight of selected loads** using transaction records, tare weights, or net weight cards.

2) **Measure the three dimensions of the load**. Measure the width, length, and height of the load (in inches), and record the values in the computer.

3) **Note which major classes of material are present.** The estimator walks entirely around the load, and indicates all major material classes they identify in the load. (Major material classes include Paper, Plastic, Glass, Metal, E-waste, Yard Waste, Organics, Construction and Demolition, Hazardous Waste, and Special Wastes.)

4) **Estimate composition by volume for each major material class.** Beginning with the largest major material class present by volume, the estimator estimates the percent of the entire load that corresponds to the major material class. The process is repeated for the next most common major material class, and so forth, until the volumetric percentage of every major material class has been estimated. Finally, the totals for this step were calculated, to ensure that they add to 100 percent.

5) **Estimate the composition by volume for each specific material within each major material class.** Considering each major material class separately, the estimator records the percentage of it that is made up of each specific material. This process is repeated for each of the other major material classes and the specific material categories that belong to them.

6) **Check and reconcile percentage data on the sampling form.** Using input verification rules set up in the computer, the estimator then verifies that percentage estimates for the material classes add up to 100 percent and that the percentage estimates for the material categories within each major material class total 100 percent.

Waste Quantities

To determine the quantity of waste from each waste sector and from the SMaRT Station, the consultant team requested the data from the City and from the City's hauler, PASCO. The data requested included tons collected and/or disposed during calendar year 2004, and is as follows:

- Single-family Residential: 13,108.99 tons
- Mixed Commercial / Multi-family Residential: 34,649.14 tons
- Industrial (Open-top Drop-boxes): 19,536.67 tons
- Self-haul: 10,911.24 tons
- SMaRT Station Residuals: 40,006.00 tons

Data Analysis

Following the waste sorts, all data recorded on the field forms was entered into a customized database and reviewed for accuracy. Waste composition estimates were calculated using the methods described in Appendix C.

Composition estimates were applied to the annual tonnage's to produce material-specific quantity estimates for the City overall, for each of the four waste sectors, and for the SMaRT Station residuals. This report contains both composition data and tonnage's that were calculated using these methodologies.

The data from the waste sorting were subjected to a statistical procedure that provided two kinds of information:

- the estimated composition of waste, shown as a percentage by weight associated with each material type, in relation to the total amount; and
- the degree of precision of these estimates.

All estimates of precision were calculated at the 90% confidence level. The equations used in these calculations appear in Appendix C.

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Appendix C. Waste Sort Analytical Procedures

To develop waste characterization and quantity profiles for this study, four main steps were taken. These steps are as follows:

1. Convert volumetric estimates of material categories to weight (for industrial and self-haul visual characterization estimates).
2. Calculate the estimated composition of all samples in a given sector, based on the sample weight.
3. Combine the results for the four individual sectors, using a weighted average procedure, to produce findings for the City Overall.
4. Apply tonnage figures for waste to the composition estimates, to derive tonnage estimates for each material.

Converting Volumes to Weights

The composition calculations rely on the availability of individual material weights for each sample. For industrial and self-haul samples, Cascadia converted volume estimates to weights using accepted waste density conversion factors. These factors are listed in Table C-2 at the end of this appendix, and data sources accompany the table.

Using the volume-to-weight conversion factors and the volume estimates obtained during the characterization of visual samples, individual material weights were calculated using the following formula:

$$c = m \times s \times v \times d$$

where:

m = percentage estimate of the material, as a portion of material class (e.g., the extent to which newspaper constitutes all of the paper in the sample)

s = percentage estimate of the material class, as a portion of all of the material in the sample (e.g., the extent to which paper constitutes all of the material in the sample)

v = total volume of the sample (in cubic yards)

d = density conversion of the material (in pounds/cubic yard)

c = the total weight of the specific material in the sample

Each material weight was than scaled so that the sum of all material weights equaled the actual total sample weight (or net weight of the load).

Composition Calculations

The composition estimates represent the **ratio of the material categories' weight to the total waste** for each noted sector. They are derived by summing each material's weight across all of the selected records and dividing by the sum of the total weight of waste, as shown in the following equation:

$$r_j = \frac{\sum_i c_{ij}}{\sum_i w_i}$$

where:

c = weight of a particular material

w = sum of all material weights

for i = 1 to n

where n = number of selected samples

for j = 1 to m

where m = number of material categories

The confidence interval for this estimate is derived in two steps. First, the variance around the estimate is calculated, accounting for the fact that the ratio includes two random variables (the material and total sample weights). The **variance of the ratio estimator** equation follows:

$$\hat{V}_{r_j} = \left(\frac{1}{n}\right) \cdot \left(\frac{1}{\overline{w}^2}\right) \cdot \left(\frac{\sum_i \left(c_{ij} - r_j w_i\right)^2}{n-1}\right)$$

where:

$$\overline{w} = \frac{\sum_i w_i}{n}$$

Second, **precision levels** at the 90% confidence interval are calculated for a material's mean as follows:

$$r_j \pm \left(t \cdot \sqrt{\hat{V}_{r_j}}\right)$$

where:

t = the value of the t-statistic (1.645) corresponding to a 90% confidence level

For more detail, please refer to Chapter 6 "Ratio, Regression and Difference Estimation" of Elementary Survey Sampling by R.L. Scheaffer, W. Mendenhall and L. Ott (PWS Publishers, 1986).

Weighted Averages

The overall City waste composition estimates were calculated by performing a weighted average across the four waste sectors. The weighting percentages that were used to perform the overall composition calculations are listed in Table C-1 below.

Table C-1. Weighting Percentages: Overall

	Tons	Percentage
Single-family Residential	13,108.99	16.76%
Mixed Commercial / Multi-family Residential	34,649.14	44.30%
Industrial (Open-top Drop-boxes)	19,536.67	24.98%
Self-haul	10,911.24	13.95%
Total City of Palo Alto Waste	78,206.04	100.00%

The **weighted average for an overall composition estimate** is performed as follows:

$$O_j = \left(p_1 * r_{j1}\right) + (p_2 * r_{j2}) + (p_3 * r_{j3}) + \ldots$$

where:

p = the proportion of tonnage contributed by the noted sample group

r = ratio of material weight to total waste weight in the noted sample group

for j = 1 to m

where m = number of material categories

The **variance of the weighted average** is calculated:

$$VarO_j = (p_1^{\,2} * \hat{V}_{r_{j1}}) + (p_2^{\,2} * \hat{V}_{r_{j2}}) + (p_3^{\,2} * \hat{V}_{r_{j3}}) + \ldots$$

Table C-2. Volume to Weight Conversion Factors [5]

ID	Subclass	Conversion Factor	Source	Notes
1	Uncoated Corrugated Cardboard	53.00	CIWMB C&D Study	
2	Paper Bags/Kraft	108.00	San Diego County	
3	White Ledger	158.00	U.S. EPA	
4	Computer Paper	158.00	U.S. EPA	
5	Newspaper	360.00	U.S. EPA	
6	Magazines and Catalogs	364.00	U.S. EPA	
7	Phone Books and Directories	250.00	U.S. EPA	
8	Colored Ledger	158.00	U.S. EPA	
9	Other Office Paper	158.00	U.S. EPA	
10	Milk & Juice Polycoated Containers	56.70	Tellus	
11	Hardcover Books	529.29	Tellus	
12	Other Misc. Paper	158.00	U.S. EPA	
13	Compostable Paper	138.00	Starbucks	
14	Blueprints	158.00	U.S. EPA	
15	Remainer/Composite Paper	158.00	U.S. EPA	
16	HDPE Containers	0.12	Northbridge Environmental	per bottle
17	PET Containers	0.07	Northbridge Environmental	per bottle
18	Misc. Plastic Containers	50.00	U.S. EPA	
19	Plastic Bags	35.00	CIWMB C&D Study	
20	Other Film Plastics	23.00	Tellus	
21	Durable Plastic Items	50.00	U.S. EPA	
22	Expanded Polystyrene Packaging	32.00	CIWMB C&D Study	
23	Expanded Polystyrene Containers	9.62	Tellus	
24	Remainer/Composite Plastic	50.00	U.S. EPA	
25	Leaves & Grass	313.00	U.S. EPA	
26	Prunings and Trimmings	127.00	CIWMB C&D Study	
27	Branches and Stumps	127.00	CIWMB C&D Study	
28	Food	486.00	FEECO and Tellus (EPA)	
29	Tires	200.00	CIWMB	
30	Other Rubber	200.00	CIWMB	
31	Agricultural Crop Residues	313.00	U.S. EPA	
32	Manure	675.00	FEECO	
33	Textiles	225.00	Tellus	
34	Leather	243.00	Tellus	
35	Diapers	540.00	Tellus	
36	Compostable Organics	225.00	CIWMB C&D Study	
37	Remainer/Composite Organics	225.00	CIWMB C&D Study	
38	Aluminum Cans	0.03	Northbridge Environmental	per can
39	Other Non-ferrous Metal	225.00	CIWMB C&D Study	
40	Tin/Steel Cans	0.13	U.S. EPA , Cuyahoga	per bottle
41	Other Ferrous Metal	225.00	CIWMB C&D Study	
42	Major Appliances	145.00	CIWMB C&D Study	
43	Engines and Motors	225.00	CIWMB C&D Study	
44	Remainer/Composite Metal	143.00	CIWMB C&D Study	
45	Clear Glass Bottles and Containers	0.53	Northbridge Environmental	per bottle
46	Green Glass Bottles and Containers	0.53	Northbridge Environmental	per bottle
47	Brown Glass Bottles and Containers	0.53	Northbridge Environmental	per bottle
48	Flat Glass	1,000.00	EPA	
49	Other Colored Bottles & Containers	0.53	Northbridge Environmental	per bottle
50	Remainer/Composite Glass	1,000.00	EPA	

[5] Conversion factors shown are pounds per cubic yard, unless indicated as “per bottle,” “per can,” or per item in the “notes” column.

Table C-2 (Continued). Volume to Weight Conversion Factors

ID	Subclass	Conversion Factor	Source	Notes
51	Carpet	147.00	CIWMB C&D Study	
52	Carpet Padding	62.00	CIWMB C&D Study	
53	Wood Pallets	169.00	CIWMB C&D Study	
54	Wood-untreated	218.00	CIWMB C&D Study	
55	Wood-treated	218.00	CIWMB C&D Study	
56	Concrete	860.00	CIWMB C&D Study	
57	Asphalt Paving	773.00	CIWMB C&D Study	
58	Rock, Soil, and Fines	999.00	CIWMB C&D Study	
59	Gypsum Board	467.00	CIWMB C&D Study	
60	Asphalt Roofing	731.00	CIWMB C&D Study	
61	Remainer/Composite C&D	417.00	CIWMB C&D Study	
62	Brown Goods	50.00	U.S. EPA	
63	Computer-related Electronics	763.00	Tellus	
64	Other Small Consumer Electronics	763.00	Tellus	
65	Televisions and Other Items with CRTs	405.00	CIWMB	
66	Paint	1,836.00	Tellus	
67	Antifreeze	1,653.00	Tellus	
68	Vehicle and Equipment Fluids	1,653.00	Tellus	
69	Used Oil	1,525.00	Tellus	
70	Treated Medical Waste	64.00	CIWMB & Cascadia	
71	Batteries	0.05	Cascadia	per battery
72	Auto Batteries	39.40	U.S EPA	per battery (car)
73	Fluorescent Lights	300.00	Cascadia	
74	Remainer/Composite HHW	1,414.00	EPA Business Guide	
75	Mattresses	55.00	U.S EPA	per mattress
76	Box Springs	44.00	U.S EPA	per box spring
77	Other Bulky Items	80.00	Tellus	
78	Ash	1,013.00	FEECO	
79	Sewage Solids	945.00	FEECO	
80	Industrial Sludge	1,418.00	Tellus	
81	Hypodermic Needles	0.00	Cascadia	per needle
82	Pharmaceutical Medications	0.05	Cascadia	per bottle of meds
83	Remainder/Composite SW	376.50	Tellus	
84	Mixed Residue	999.00	FEECO	

Data Source Abbreviations

Following are descriptions of the sources from which data were gathered for the conversion factors listed Table C-2.

Cascadia refers to direct measurements of representative samples taken by Cascadia staff members for this and other studies.

CIWMB refers to Conducting a Diversion Study - A Guide for California Jurisdictions, California Integrated Waste Management Board, 2001.

CIWMB C&D Study refers to an, as yet, unpublished study of C&D material conversion factors. The report will be published in spring 2006.

FEECO refers to FEECO International, Complete Systems and Equipment Handbook, 9th printing.

San Diego County refers to conversion factors developed and used in the San Diego Waste Composition Study in 2000.

Northbridge Environmental (Kevin Dietly) refers to a consulting firm with expertise on bottle bill initiatives.

Starbucks refers to Starbucks Waste Characterization Study, Cascadia Consulting Group, 2005.

Tellus refers to the Tellus Institute, Boston, Massachusetts**.**

US EPA refers to the Business Waste Prevention Quantification Methodologies - Business Users Guide: Washington, D.C. and Los Angeles: U.S. Environmental Protection Agency, Municipal and Industrial Solid Waste, and University of California at Los Angeles Extension, Recycling and Municipal Solid Waste Management Program: Grant Number CX 824548-01-0, 1996.

Appendix D. Waste Sort Field Forms

The field forms are included in the following order:

1. Visual Sort Form
2. SMaRT Station Field Form
3. Hand Sort Form

Palo Alto Waste Composition Study

Vehicle Nt Wt: _____ Dimensions: _____ x _____ x _____ (inches)

Paper _____ %

	OCC	
	Paper Bags/Kraft	
	White Ledger	
	Computer Paper	
	Newspaper	
	Magazines & Catalogs	
	Phonebooks & Direct.	
	Colored Ledger	
	Other Office Paper	
	Milk & Juice Polycoats	
	Hardcover Books	
	Other Misc. Paper	
	Compostable Paper	
	Blueprints	
	R/C Paper	

Glass _____ %

	Clear Glass	
	Green Glass	
	Brown Glass	
	Flat Glass	
	Other Colored	
	R/C Glass	

Metal _____ %

	Aluminum Cans	
	Other Non-ferrous	
	Tin/Steel Cans	
	Other Ferrous	
	Major Appliances	
	Engines & Motors	
	R/C Metal	

Plastic _____ %

	HDPE Containers	
	PETE Containers	
	Other Containers	
	Clean Film	
	Other Film	
	Durable Plastic Items	
	EPS Packaging	
	EPS Containers	
	R/C Plastic	

E-Waste _____ %

	Brown Goods	
	Comp.-related Elect.	
	Other Sm. Elect.	
	Televisions & CRTs	

Sample ID: _____

Date: _____

Organics _____ %

	Leaves & Grass	
	Prunings & Trim.	
	Branches & Stumps	
	Food	
	Tires	
	Other Rubber	
	Ag.Crop Residues	
	Manure	
	Textiles	
	Leather	
	Diapers	
	Compostable Organ	
	R/C Organics	

C&D _____ %

	Carpet	
	Carpet Padding	
	Wood Pallets	
	Wood-untreated	
	Wood-treated	
	Concrete	
	Asphalt Paving	
	Rock, Soil, & Fines	
	Gypsum Board	
	Asphalt Roofing	
	R/C C&D	

HHW _____ %

	Paint	
	Antifreeze	
	Veh. & Equip. Fluids	
	Used Oil	
	Treated Med. Waste	
	Batteries	
	Auto Batteries	
	Fluorescent Lights	
	R/C HHW	

Special Waste _____ %

	Mattresses	
	Box Springs	
	Other Bulky Items	
	Ash	
	Sewage Solids	
	Industrial Sludge	
	Hypodermic Needles	
	Pharm. Medications	
	R/C Special	
	Mixed Residue	

Visual Backup Form

Palo Alto Waste Composition Study

1	OCC	
2	Paper Bags/Kraft	
3	White Ledger	
4	Computer Paper	
5	Newspaper	
6	Magazines & Catalogs	
7	Phonebooks & Direct.	
8	Colored Ledger	
9	Other Office Paper	
10	Milk & Juice Polycoats	
11	Hardcover Books	
12	Other Misc. Paper	
13	Compostable Paper	
14	Blueprints	
15	R/C Paper	
16	HDPE Natural Bottles	
17	HDPE Colored Bottles	
18	HDPE 5-Gal Buk (food)	
19	HDPE 5-Gal (non-food)	
20	Other HDPE Containers	
21	PETE Bottles	
22	Other PETE Containers	
23	#3-#7 Bottles	
24	#3-#7 Other Containers	
25	Grocery & Merch Bags	
26	Non-bag Pack. Film	
27	Plastic Trash Bags	
28	Film Products	
29	Other Film	
30	Durable Plastic Items	
31	EPS Packaging	
32	EPS Containers	
33	R/C Plastic	
34	Clear Glass	
35	Green Glass	
36	Brown Glass	
37	Flat Glass	
38	Other Colored	
39	R/C Glass	
40	Aluminum Cans	
41	Other Non-ferrous	
42	Tin/Steel Cans	
43	Other Ferrous	
44	Used Oil Filters	
45	Major Appliances	
46	Engines & Motors	
47	R/C Metal	

48	Leaves & Grass	
49	Prunings & Trim.	
50	Branches & Stumps	
51	Food	
52	Tires	
53	Other Rubber	
54	Wood Pallets	
55	Wood-untreated	
56	Wood-treated	
57	Ag.Crop Residues	
58	Manure	
59	Textiles	
60	Leather	
61	Diapers	
62	Carpet	
63	Carpet Padding	
64	Compostable Organ	
65	R/C Organics	
66	Concrete	
67	Asphalt Paving	
68	Rock, Soil, & Fines	
69	Gypsum Board	
70	Asphalt Roofing	
71	Paint	
72	Antifreeze	
73	Veh. & Equip. Fluids	
74	Used Oil	
75	Treated Med. Waste	
76	Batteries	
77	Auto Batteries	
78	Fluorescent Lights	
79	R/C HHW	
80	R/C C&D	
81	Brown Goods	
82	Comp.-related Elect.	
83	Other Sm. Elect.	
84	Televisions & CRTs	
85	Mattresses	
86	Box Springs	
87	Other Bulky Items	
88	Ash	
89	Sewage Solids	
90	Industrial Sludge	
91	Hypodermic Needles	
92	Pharm. Medications	
93	R/C Special	
94	Mixed Residue	

Sample ID: _____ Date: _____ MRF Form

Palo Alto Waste Composition Study

1	OCC		51	Food	
2	Paper Bags/Kraft		52	Tires	
3	White Ledger		53	Other Rubber	
4	Computer Paper		54	Wood Pallets	
5	Newspaper		55	Wood-untreated	
6	Magazines & Catalogs		56	Wood-treated	
7	Phonebooks & Direct.		57	Ag.Crop Residues	
8	Colored Ledger		58	Manure	
9	Other Office Paper		59	Textiles	
10	Milk & Juice Polycoats		60	Leather	
11	Hardcover Books		61	Diapers	
12	Other Misc. Paper		62	Carpet	
13	Compostable Paper		63	Carpet Padding	
14	Blueprints		64	Compostable Organ	
15	R/C Paper		65	R/C Organics	
16-20	HDPE Containers		66	Concrete	
21-22	PETE Containers		67	Asphalt Paving	
23-24	Other Containers		68	Rock, Soil, & Fines	
25	Grocery & Merch Bags		69	Gypsum Board	
26	Non-bag Pack. Film		70	Asphalt Roofing	
27	Plastic Trash Bags		71	Paint	
28	Film Products		72	Antifreeze	
29	Other Film		73	Veh. & Equip. Fluids	
30	Durable Plastic Items		74	Used Oil	
31	EPS Packaging		75	Treated Med. Waste	
32	EPS Containers		76	Batteries	
33	R/C Plastic		77	Auto Batteries	
34	Clear Glass		78	Fluorescent Lights	
35	Green Glass		79	R/C HHW	
36	Brown Glass		80	R/C C&D	
37	Flat Glass		81	Brown Goods	
38	Other Colored		82	Comp.-related Elect.	
39	R/C Glass		83	Other Sm. Elect.	
40	Aluminum Cans		84	Televisions & CRTs	
41	Other Non-ferrous		85	Mattresses	
42	Tin/Steel Cans		86	Box Springs	
43	Other Ferrous		87	Other Bulky Items	
44	Used Oil Filters		88	Ash	
45	Major Appliances		89	Sewage Solids	
46	Engines & Motors		90	Industrial Sludge	
47	R/C Metal		91	Hypodermic Needles	
48	Leaves & Grass		92	Pharm. Medications	
49	Prunings & Trim.		93	R/C Special	
50	Branches & Stumps		94	Mixed Residue	

Sample ID: _____ Date: _____ Res and Com Hand Sort Form

Appendix E. Waste Modeling Detailed Methodology

Waste quantities and composition profiles were estimated for five groups of businesses and institutions – multi-family residences, city facilities, K-12 schools, restaurants, and major hospitals – that dispose of relatively large amounts of MSW. Generally, the quantity of MSW associated with a group was estimated by multiplying a per-employee or per-multi-family-unit waste disposal rate, which was derived from another California study, with the number of employees or multi-family units that exist in the City. (In all cases, employment was estimated in terms of full-time equivalents, or FTEs.) After a quantity estimate was calculated, a composition profile (percents associated with material categories in the waste stream) was applied to the number, based on another California study.

Quantity and composition estimates for the five waste disposal groups were calculated as described below.

Multi-Family

For **multi-family** units, the per-unit disposal figure of 0.99 tons per unit per year was obtained from the Statewide Waste Characterization Study: Results and Final Report, published August 2004 by the California Integrated Waste Management Board (CIWMB). This figure was multiplied by the estimated 7,489 multi-family units that exist in the City. A multi-family unit is a building that contains at least three separate live-in units. The number of multi-family units was supplied by the City Department of Planning and Community Environment. This produced an estimate of 7,414 tons of waste disposed annually from City residents dwelling in multi-family buildings. To this figure was applied the typical waste composition profile for multi-family disposed waste, which was reported in the 2004 CIWMB study cited above.

City Facilities

Waste from city facilities was modeled based on the numbers of employees associated with each of four types of facility, for which waste disposal rates and composition profiles were available from other California studies.

For the City's **office facilities**, the City provided an estimate of 715 employees. This was used in conjunction with quantity and composition estimates obtained by examining records of 50 individual site visits and composition samples that were captured during the Statewide Waste Characterization Study, conducted for the CIWMB in 1999, and Characterization of Municipal Solid Waste for the City of Los Angeles, conducted for the City of Los Angeles Bureau of Sanitation in 2001. The estimated number of employees was multiplied by the calculated average of 1.67 tons per employee per year of disposed waste for this subset of samples.

For the City's **community centers and public spaces** (e.g. libraries, museums, etc.), the City's estimate of 128 employees was applied to records of site visits and waste samples from five similar facilities that were visited as part of the 2001 study for the City of Los Angeles, cited above. The estimated number of employees was multiplied by the calculated average of 1.88 tons per employee per year of disposed waste.

For the City's **public utility facilities and other service facilities**, the City's estimate of 1,075 employees was multiplied by a calculated average of 2.36 tons per employee per year of

disposed waste, based on 26 site visits from the 1999 CIWMB study and the 2001 Los Angeles study cited above. Composition estimates from the same set of visits were applied to that figure.

The estimate of waste disposed by **public parks and recreation facilities** is less certain than the other estimates described here, because it relies on one sample and one disposal estimate, which was obtained from the 2001 Los Angeles study cited above. The City's estimate of 36 employees was combined with the calculated disposal rate of 0.8 tons per employee per year.

Schools

For **K-12 schools**, the figure of 1,602 employees was determined through telephone interviews with the public school district and the nine known elementary, middle, or high schools. This figure was combined with the disposal rate of 0.80 tons per employee per year, which was obtained by examining records of 53 individual visits that were conducted as part of the 1999 CIWMB study and the 2001 Los Angeles study cited above. A disposal profile based on the same set of visits was applied to the figure.

Restaurants and Hospitals

In order to estimate the quantities of **restaurant** and **hospital** waste, the numbers of restaurant employees (4,757) and hospital employees (12,231) in the City were multiplied by per-employee waste disposal rates. Employment figures were obtained from the 2002 Economic Census, and waste disposal rates were based on an examination of the records of site visits at 79 restaurants and 20 hospitals conducted during the 1999 CIWMB study and the 2001 Los Angeles study cited earlier.

The overall number of employees in the City was estimated by the Palo Alto Chamber of Commerce to be 105,000, and this figure was multiplied by an average per-employee disposal rate that was calculated for all urban industry groups except hospitals and restaurants, based on the 2001 Los Angeles study.

The projected tons for hospitals, restaurants, and "all other" industrial sectors were added together, and each part was scaled down such that the total equaled the estimated magnitude of Palo Alto's commercial waste stream as determined by tonnage reports from the solid waste facility.

Appendix F. Zero Waste Composition Tables

One objective of this study was to provide data to support Zero Waste planning initiatives. This appendix presents the composition results grouped by Zero Waste Category. Table F-1 shows how the 84 material categories used in this study are aggregated into twelve Zero Waste Categories. Table F-2 and Figure F-1 show Zero Waste Category composition results for the City Overall. Table F-3 provides Zero Waste Category composition results for the City's four waste sectors, and Table F-4 shows these composition results for the SMaRT Station residuals.

Table F-1: 2005 Material categories and Corresponding Zero Waste Master Categories

2005 Material	Zero Waste Master Category
Uncoated Corrugated Cardboard	Paper
Paper Bags/Kraft	
White Ledger	
Computer Paper	
Newspaper	
Magazines and Catalogs	
Phone Books and Directories	
Colored Ledger	
Other Office Paper	
Milk & Juice Polycoated Containers	
Hardcover Books	
Other Misc. Paper	
Compostable Paper	
Blueprints	
Remainder/Composite Paper	
HDPE Containers	Plastic
PET Containers	
Misc. Plastic Containers	
Plastic Bags	
Other Film Plastics	
Durable Plastic Items	
Expanded Polystyrene Packaging	
Expanded Polystyrene Containers	
Remainer/Composite Plastic	
Tires	
Other Rubber	
Diapers	
Carpet	
Carpet Padding	
Brown Goods	
Computer-related Electronics	
Other Small Consumer Electronics	
Televisions and Other Items with CRTs	
Clear Glass Bottles and Containers	Glass
Green Glass Bottles and Containers	
Brown Glass Bottles and Containers	
Flat Glass	
Other Colored Bottles & Containers	
Remainder/Composite Glass	

2005 Material	Zero Waste Master Category
Aluminum Cans	Metal
Other Non-ferrous Metal	
Tin/Steel Cans	
Other Ferrous Metal	
Major Appliances	
Engines and Motors	
Remainder/Composite Metal	
Leaves & Grass	Plant debris
Prunings and Trimmings	
Agricultural Crop Residues	
Compostable Organics	
Food	Putrescibles
Manure	
Remainer/Composite Organics	
Sewage Solids	
Industrial Sludge	
Mixed Residue	
Branches and Stumps	Wood
Wood Pallets	
Wood-untreated	
Wood-treated	
Textiles	Textiles
Leather	
Concrete	Ceramics
Asphalt Paving	
Asphalt Roofing	
Remainder/Composite C&D	
Rock, Soil, and Fines	Soil
Gypsum Board	
Ash	
Paint	Chemicals
Antifreeze	
Vehicle and Equipment Fluids	
Used Oil	
Treated Medical Waste	
Batteries	
Auto Batteries	
Fluorescent Lights	
Remainer/Composite HHW	
Hypodermic Needles	
Pharmaceutical Medications	
Remainder/Composite SW	
Mattresses	Reusables
Box Springs	
Other Bulky Items	

Table F-2: City Overall Waste Composition
Proportion and Tons by Zero Waste Master Category

	City of Palo Alto Overall	
	Est. %	**Tons**
Paper	22.9%	17,931.1
Plastic	11.0%	8,568.2
Glass	1.7%	1,332.5
Metal	4.1%	3,238.4
Plant debris	5.8%	4,499.2
Putrescibles	17.7%	13,812.1
Wood	9.9%	7,717.8
Textiles	1.1%	859.1
Ceramics	13.0%	10,141.1
Soil	9.7%	7,612.5
Chemicals	1.8%	1,422.1
Reusables	1.4%	1,072.0
Totals	**100.0%**	**78,206.0**

Figure F-1: City Overall Waste Composition
Proportion by Zero Waste Master Category

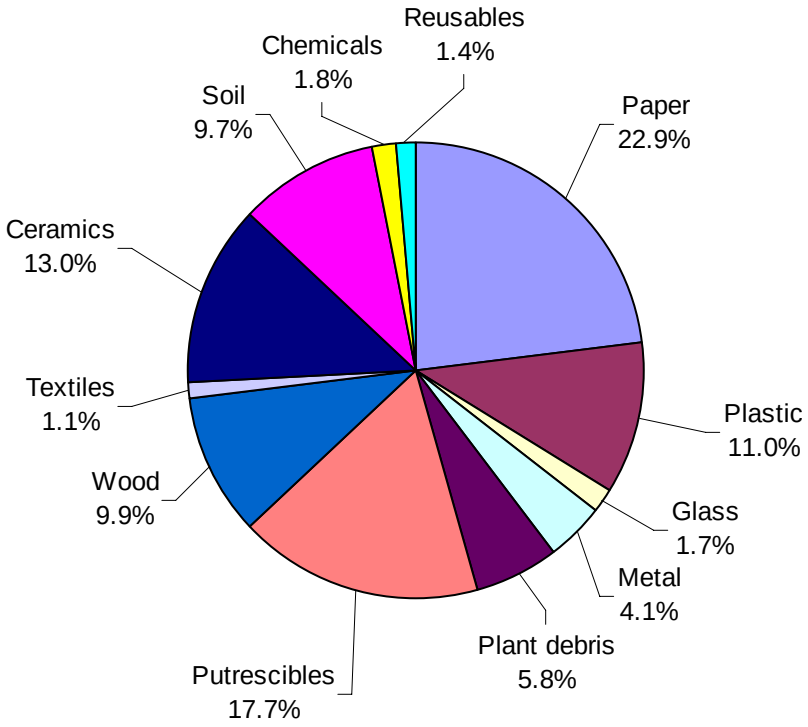

Table F-3: City Waste Sector Composition
Proportion and Tons by Zero Waste Master Category

	Single-family Residential		Mixed Commercial & Multi-family Residential		Industrial (Open-top Roll-off Boxes)		Self-haul	
	Est. %	**Tons**	**Est. %**	**Tons**	**Est. %**	**Tons**	**Est. %**	**Tons**
Paper	23.8%	3,119.6	39.4%	13,651.4	5.5%	1,074.1	0.8%	86.0
Plastic	20.4%	2,679.1	13.8%	4,772.2	3.9%	771.0	3.2%	345.9
Glass	1.6%	214.5	2.7%	940.6	0.7%	143.3	0.3%	34.1
Metal	5.0%	653.0	5.2%	1,795.2	3.2%	619.3	1.6%	170.9
Plant debris	1.1%	140.5	2.8%	978.6	9.4%	1,833.9	14.2%	1,546.1
Putrescibles	39.6%	5,190.4	24.0%	8,328.4	1.4%	265.7	0.3%	27.7
Wood	2.4%	320.3	3.6%	1,246.2	20.2%	3,942.1	20.2%	2,209.2
Textiles	1.7%	222.2	1.5%	509.8	0.5%	103.2	0.2%	23.8
Ceramics	2.0%	267.6	0.3%	102.2	27.5%	5,370.8	40.3%	4,400.6
Soil	2.1%	271.4	2.5%	860.9	23.9%	4,665.4	16.6%	1,814.8
Chemicals	0.1%	17.1	3.4%	1,186.3	1.1%	218.8	0.0%	0.0
Reusables	0.1%	13.3	0.8%	277.3	2.7%	529.1	2.3%	252.3
Totals	**100.0%**	**13,109.0**	**100.0%**	**34,649.1**	**100.0%**	**19,536.7**	**100.0%**	**10,911.2**

Table F-4: SMaRT Station Residuals Composition
Proportion and Tons by Zero Waste Master Category

	SMaRT Station Residuals	
	Est. %	**Tons**
Paper	27.4%	10,966.7
Plastic	17.0%	6,795.7
Glass	1.1%	454.6
Metal	5.3%	2,137.3
Plant debris	11.7%	4,679.2
Putrescibles	17.1%	6,824.0
Wood	3.9%	1,544.9
Textiles	1.8%	720.1
Ceramics	4.6%	1,840.3
Soil	8.3%	3,306.4
Chemicals	1.8%	736.7
Reusables	0.0%	0.0
Totals	**100.0%**	**40,006.0**

Appendix G. Comparison of Waste Composition, 1990, 1997, 2005

The City conducted waste composition studies in 1990, 1997 and 2005. This appendix presents composition estimates by grouping material categories into "base year" or commonly defined material types. Table G-1 shows how the 2005 material categories are grouped into the base-year material types. Table G-2 shows the composition of waste for each waste sector and each study year as a proportion of each sector's total waste. Table G-3 shows the composition of waste in tons.

While these data may imply trends or changes in the City's waste composition, no tests have been conducted to determine the presence of statistical differences from one study period to the next.

Table G-1: 2005 Material categories and Corresponding Base Year Material Types

2005 Material	Base Year Material Type
Uncoated Corrugated Cardboard	Corrugated
Paper Bags/Kraft	
White Ledger	High Grade
Computer Paper	
Newspaper	Newspaper
Magazines and Catalogs	Magazines
Phone Books and Directories	Mixed Paper
Colored Ledger	
Other Office Paper	
Milk & Juice Polycoated Containers	
Hardcover Books	
Other Misc. Paper	Other Paper
Compostable Paper	
Blueprints	
Remainer/Composite Paper	
HDPE Containers	HDPE Containers
PET Containers	PET Containers
Plastic Bags	Film Plastics
Other Film Plastics	
Misc. Plastic Containers	R/C Plastic
Durable Plastic Items	
Expanded Polystyrene Packaging	
Expanded Polystyrene Containers	
Remainer/Composite Plastic	
Computer-related Electronics	
Other Small Consumer Electronics	
Televisions and Other Items with CRTs	
Clear Glass Bottles and Containers	Recyclable Glass
Green Glass Bottles and Containers	
Brown Glass Bottles and Containers	
Flat Glass	R/C Glass
Other Colored Bottles & Containers	
Remainer/Composite Glass	
Aluminum Cans	Aluminum Cans
Other Non-ferrous Metal	Other Non-ferrous
Tin/Steel Cans	Steel Food & Bev Cans
Other Ferrous Metal	Other Ferrous
Engines and Motors	
Remainer/Composite Metal	
Major Appliances	White Goods
Leaves & Grass	Leaves & Grass
Prunings and Trimmings	Branches & Brush
Branches and Stumps	

2005 Material	Base Year Material Type
Food	Food Waste
Tires	Tires/Rubber
Other Rubber	
Wood Pallets	Wood
Wood-untreated	
Wood-treated	
Textiles	Textiles & Leather
Leather	
Diapers	Diapers
Agricultural Crop Residues	Other Organics
Manure	
Carpet	
Carpet Padding	
Compostable Organics	
Remainer/Composite Organics	
Asphalt Roofing	
Remainer/Composite C&D	
Sewage Solids	
Industrial Sludge	
Mixed Residue	
Concrete	Inert Solids
Asphalt Paving	
Rock, Soil, and Fines	
Gypsum Board	
Ash	
Paint	HHW
Antifreeze	
Vehicle and Equipment Fluids	
Used Oil	
Treated Medical Waste	
Batteries	
Auto Batteries	
Fluorescent Lights	
Remainer/Composite HHW	
Hypodermic Needles	
Pharmaceutical Medications	
Remainder/Composite SW	
Brown Goods	Brown Goods
Mattresses	Comp. Bulky Items
Box Springs	
Other Bulky Items	

Table G-2: Waste Composition Proportion 1990, 1997, 2005[6]

	Residential			Mixed Commercial & Multi-family Residential			Industrial (Open-top Roll-off Boxes)			Self-haul		
	1990	1997	2005	1990	1997	2005	1990	1997	2005	1990	1997	2005
Paper	**49%**	**39%**	**24%**	**48%**	**47%**	**39%**	**17%**	**21%**	**5%**	**5%**	**8%**	**1%**
Corrugated	6%	4%	2%	9%	9%	5%	7%	6%	1%	2%	1%	0%
High Grade	3%	4%	1%	9%	9%	4%	1%	1%	0%	0%	1%	0%
Newspaper	5%	4%	2%	5%	5%	5%	1%	0%	0%	0%	1%	0%
Magazines	5%	3%	3%	5%	2%	4%	0%	0%	0%	0%	1%	0%
Mixed Paper	17%	15%	3%	13%	10%	3%	4%	5%	1%	2%	3%	0%
Other Paper	12%	8%	13%	8%	12%	19%	2%	9%	3%	1%	1%	0%
Plastic	**9%**	**10%**	**12%**	**10%**	**17%**	**11%**	**5%**	**8%**	**4%**	**3%**	**4%**	**1%**
HDPE Containers	1%	1%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
PET Containers	1%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Film Plastics	4%	4%	6%	3%	6%	5%	1%	1%	2%	0%	1%	0%
R/C Plastic	4%	4%	5%	6%	10%	4%	4%	7%	2%	3%	3%	0%
Glass	**4%**	**3%**	**2%**	**3%**	**3%**	**3%**	**1%**	**1%**	**1%**	**0%**	**1%**	**0%**
Recyclable Glass	3%	2%	1%	3%	3%	3%	0%	1%	0%	0%	0%	0%
R/C Glass	1%	0%	0%	1%	0%	0%	1%	0%	1%	0%	1%	0%
Metal	**5%**	**2%**	**5%**	**5%**	**3%**	**5%**	**13%**	**9%**	**3%**	**11%**	**3%**	**2%**
Aluminum Cans	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other Non-ferrous	1%	0%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%
Steel Food & Bev Cans	1%	1%	1%	2%	1%	1%	2%	0%	0%	0%	0%	0%
Other Ferrous	2%	1%	3%	3%	2%	4%	11%	9%	3%	11%	2%	1%
White Goods	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Yard Waste	**11%**	**7%**	**1%**	**10%**	**2%**	**3%**	**8%**	**0%**	**10%**	**28%**	**16%**	**14%**
Leaves & Grass	10%	3%	0%	8%	1%	2%	1%	0%	8%	7%	4%	13%
Branches & Brush	1%	4%	0%	2%	0%	1%	6%	0%	2%	21%	12%	2%
Organics	**21%**	**36%**	**54%**	**19%**	**26%**	**32%**	**31%**	**33%**	**45%**	**32%**	**38%**	**59%**
Food Waste	11%	27%	35%	7%	18%	22%	0%	2%	0%	1%	4%	0%
Tires/Rubber	1%	1%	0%	1%	1%	1%	1%	0%	0%	0%	0%	0%
Wood	3%	1%	2%	5%	3%	4%	27%	19%	19%	18%	28%	20%
Textiles & Leather	2%	3%	2%	2%	2%	1%	2%	4%	1%	10%	2%	0%
Diapers	2%	4%	7%	2%	1%	1%	0%	0%	0%	0%	1%	0%
Other Organics	2%	1%	8%	2%	1%	2%	0%	9%	24%	2%	3%	38%
Other Waste	**1%**	**4%**	**3%**	**5%**	**3%**	**7%**	**25%**	**28%**	**33%**	**21%**	**29%**	**24%**
Inert Solids	1%	3%	2%	3%	1%	3%	25%	27%	29%	18%	24%	22%
HHW	0%	1%	0%	0%	1%	3%	0%	0%	1%	0%	0%	0%
Brown Goods	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	1%	0%
Comp. Bulky Items	0%	0%	0%	0%	0%	1%	1%	0%	3%	3%	3%	2%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

[6] The figures presented reflect the composition of waste prior to processing at the SMaRT Station (for residential and mixed commercial and multi-family residential loads) and prior to C&D recovery at Guadalupe Landfill (for industrial loads).

Table G-3: Waste Composition Estimated Tons 1990, 1997, 2005[7]

	Residential			Mixed Commercial & Multi-family Residential			Industrial (Open-top Roll-off Boxes)			Self-haul		
	1990	1997	2005	1990	1997	2005	1990	1997	2005	1990	1997	2005
Paper	**10,273**	**7,355**	**3,120**	**16,712**	**14,594**	**13,651**	**5,376**	**6,075**	**1,074**	**351**	**507**	**86**
Corrugated	1,256	722	217	3,057	2,688	1,724	2,391	1,606	220	140	88	49
High Grade	659	792	146	3,064	2,698	1,395	368	431	69	1	56	3
Newspaper	1,123	828	276	1,631	1,700	1,590	426	38	96	7	43	1
Magazines	1,024	659	427	1,757	574	1,358	39	25	29	1	34	6
Mixed Paper	3,674	2,756	396	4,409	3,287	1,043	1,399	1,478	168	163	204	2
Other Paper	2,537	1,598	1,658	2,795	3,646	6,541	753	2,497	492	40	83	26
Plastic	**1,940**	**1,827**	**1,538**	**3,511**	**5,296**	**3,812**	**1,732**	**2,361**	**697**	**243**	**277**	**61**
HDPE Containers	173	209	52	332	215	368	13	52	6	0	12	0
PET Containers	107	80	68	35	93	260	10	22	0	1	4	0
Film Plastics	780	706	755	1,093	1,915	1,786	465	302	305	18	66	9
R/C Plastic	881	833	662	2,051	3,073	1,397	1,244	1,984	385	224	195	51
Glass	**870**	**491**	**215**	**1,146**	**1,074**	**941**	**226**	**347**	**143**	**9**	**69**	**34**
Recyclable Glass	702	452	176	964	1,006	902	29	234	1	2	31	1
R/C Glass	169	39	39	182	68	38	197	113	143	7	38	33
Metal	**1,148**	**458**	**653**	**1,918**	**947**	**1,795**	**4,355**	**2,486**	**619**	**753**	**173**	**171**
Aluminum Cans	84	66	34	115	118	93	10	8	0	1	3	0
Other Non-ferrous	206	51	77	126	107	184	204	2	39	0	27	18
Steel Food & Bev Cans	308	154	87	657	187	297	527	4	0	1	8	0
Other Ferrous	447	188	455	1,020	534	1,222	3,615	2,471	539	751	134	153
White Goods	103	0	0	0	0	0	0	0	42	0	0	0
Yard Waste	**2,227**	**1,265**	**92**	**3,392**	**492**	**941**	**2,433**	**123**	**1,904**	**1,918**	**1,022**	**1,553**
Leaves & Grass	2,109	535	27	2,865	383	592	401	52	1,570	493	261	1,364
Branches & Brush	118	730	65	527	109	349	2,032	71	334	1,425	761	189
Organics	**4,365**	**6,754**	**7,053**	**6,644**	**8,110**	**11,038**	**10,042**	**9,544**	**8,721**	**2,196**	**2,371**	**6,383**
Food Waste	2,315	5,007	4,524	2,382	5,649	7,758	0	586	71	100	260	28
Tires/Rubber	150	128	34	374	462	264	426	28	42	13	24	1
Wood	634	147	320	1,680	875	1,215	8,727	5,362	3,809	1,252	1,736	2,146
Textiles & Leather	512	492	222	845	629	510	798	1,045	103	704	134	24
Diapers	383	698	947	793	262	473	0	6	2	8	36	0
Other Organics	371	282	1,006	569	232	817	90	2,516	4,695	119	181	4,184
Other Waste	**242**	**715**	**439**	**1,610**	**817**	**2,472**	**8,142**	**8,002**	**6,378**	**1,483**	**1,812**	**2,623**
Inert Solids	160	582	291	1,216	323	882	7,951	7,874	5,626	1,274	1,508	2,371
HHW	78	113	17	14	156	1,186	13	3	219	0	6	0
Brown Goods	4	19	118	381	338	126	3	72	4	0	81	0
Comp. Bulky Items	0	0	13	0	0	277	174	53	529	209	217	252
Total	**21,069**	**18,865**	**13,109**	**34,933**	**31,328**	**34,649**	**32,310**	**28,938**	**19,537**	**6,953**	**6,232**	**10,911**

[7] The figures presented reflect the composition of waste prior to processing at the SMaRT Station (for residential and mixed commercial and multi-family residential loads) and prior to C&D recovery at Guadalupe Landfill (for industrial loads).

Appendix H: California Statewide Composition Tables

For reference purposes, waste composition tables from the 2003 California Statewide Waste Composition Study are provided. It is important to note that the study methodology and waste sectors defined for the City study differ from those employed in the California Statewide study. For example, the California Statewide study obtained samples across two sampling seasons, wet and dry. The City study collected samples during 2 weeks in December. Also, the commercial sector in the California Statewide study excludes multi-family residential. In the City, the most comparable sector, mixed commercial and multi-family residential, includes these residences.

Figure H-1: Overview of California's Overall Disposed Waste Stream

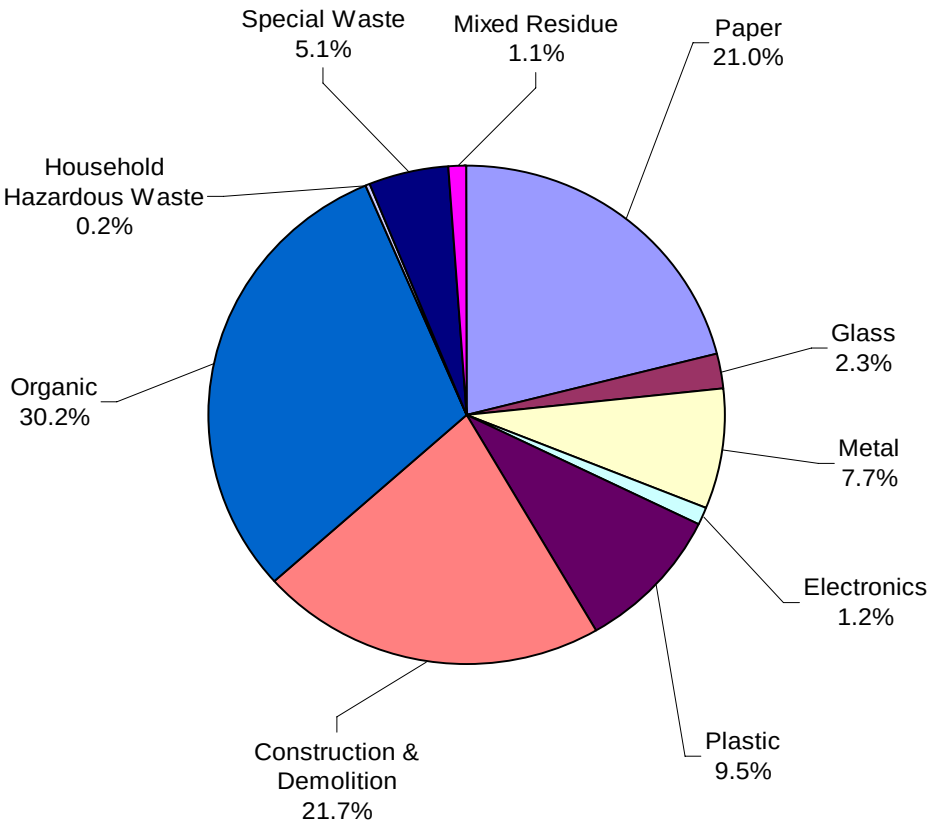

Table H-1: Composition of California's Overall Disposed Waste Stream, 2003

	Est. Pct.	+ / -	Est. Tons
Paper	**21.0%**		**8,445,989**
Uncoated Corrugated Cardboard	5.7%	1.2%	2,312,147
Paper Bags	1.0%	0.5%	386,097
Newspaper	2.2%	0.4%	887,091
White Ledger	1.1%	0.3%	447,516
Colored Ledger	0.1%	0.0%	20,583
Computer Paper	0.1%	0.0%	20,845
Other Office Paper	0.7%	0.2%	296,203
Magazines and Catalogs	0.8%	0.2%	311,143
Phone Books and Directories	0.2%	0.1%	89,403
Other Miscellaneous Paper	3.5%	0.6%	1,400,526
Remainder/Composite Paper	5.7%	0.7%	2,274,433
Glass	**2.3%**		**934,926**
Clear Glass Bottles and Containers	0.9%	0.1%	356,467
Green Glass Bottles and Containers	0.4%	0.1%	180,570
Brown Glass Bottles and Containers	0.3%	0.0%	104,568
Other Colored Glass Bottles and Containers	0.0%	0.0%	3,106
Flat Glass	0.4%	0.4%	151,344
Remainder/Composite Glass	0.3%	0.1%	138,870
Metal	**7.7%**		**3,115,357**
Tin/Steel Cans	0.8%	0.2%	323,540
Major Appliances	1.5%	2.1%	616,663
Used Oil Filters	0.0%	0.0%	1,376
Other Ferrous	2.4%	0.5%	969,676
Aluminum Cans	0.2%	0.0%	74,851
Other Non-Ferrous	0.3%	0.1%	111,008
Remainder/Composite Metal	2.5%	0.6%	1,018,242
Electronics	**1.2%**		**481,353**
Brown Goods	0.1%	0.0%	41,394
Computer-related Electronics	0.3%	0.2%	119,917
Other Small Consumer Electronics	0.2%	0.1%	93,273
Television and Other Items with CRTs	0.6%	0.5%	226,769
Plastic	**9.5%**		**3,809,699**
PETE Containers	0.5%	0.1%	216,134
HDPE Containers	0.5%	0.1%	189,549
Miscellaneous Plastic Containers	0.5%	0.1%	206,470
Plastic Trash Bags	1.0%	0.2%	390,460
Plastic Grocery and Other Merchandise Bags	0.4%	0.0%	147,038
Non-Bag Commercial and Industrial Packaging Film	0.7%	0.3%	290,331
Film Products	0.2%	0.2%	93,073
Other Film	2.1%	0.6%	826,757
Durable Plastic Items	1.4%	0.2%	561,543
Remainder/Composite Plastic	2.2%	0.3%	888,343

	Est. Pct.	+ / -	Est. Tons
Organic	**30.2%**		**12,166,452**
Food	14.6%	2.6%	5,854,352
Leaves and Grass	4.2%	1.0%	1,696,022
Prunings and Trimmings	2.3%	0.6%	920,356
Branches and Stumps	0.3%	0.2%	119,754
Agricultural Crop Residues	0.0%	0.0%	0
Manures	0.1%	0.0%	36,506
Textiles	2.4%	1.3%	947,789
Carpet	2.1%	0.7%	838,869
Remainder/Composite Organics	4.4%	0.8%	1,752,803
Construction & Demolition	**21.7%**		**8,732,074**
Concrete	2.4%	0.9%	966,607
Asphalt Paving	0.0%	0.0%	10,414
Asphalt Roofing	1.9%	1.0%	767,981
Lumber	9.6%	1.4%	3,881,214
Gypsum Board	1.7%	0.8%	676,430
Rock, Soil, and Fines	2.4%	1.0%	977,419
Remainder/Composite Construction and Demolition	3.6%	0.8%	1,452,009
Household Hazardous Waste	**0.2%**		**73,599**
Paint	0.0%	0.0%	19,203
Vehicle and Equipment Fluids	0.0%	0.0%	1,000
Used Oil	0.0%	0.0%	548
Batteries	0.1%	0.0%	34,021
Remainder/Composite Household Hazardous	0.0%	0.0%	18,827
Special Waste	**5.1%**		**2,038,431**
Ash	0.1%	0.1%	60,160
Sewage Solids	0.0%	0.0%	0
Industrial Sludge	0.0%	0.0%	0
Treated Medical Waste	0.0%	0.0%	15,367
Bulky Items	3.4%	1.2%	1,348,224
Tires	0.3%	0.2%	126,633
Remainder/Composite Special Waste	1.2%	1.6%	488,047
Mixed Residue	**1.1%**	0.3%	**437,448**
Totals	**100.0%**		**40,235,328**
Sample count:	**550**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Figure H-2: Overview of Commercial Disposed Waste

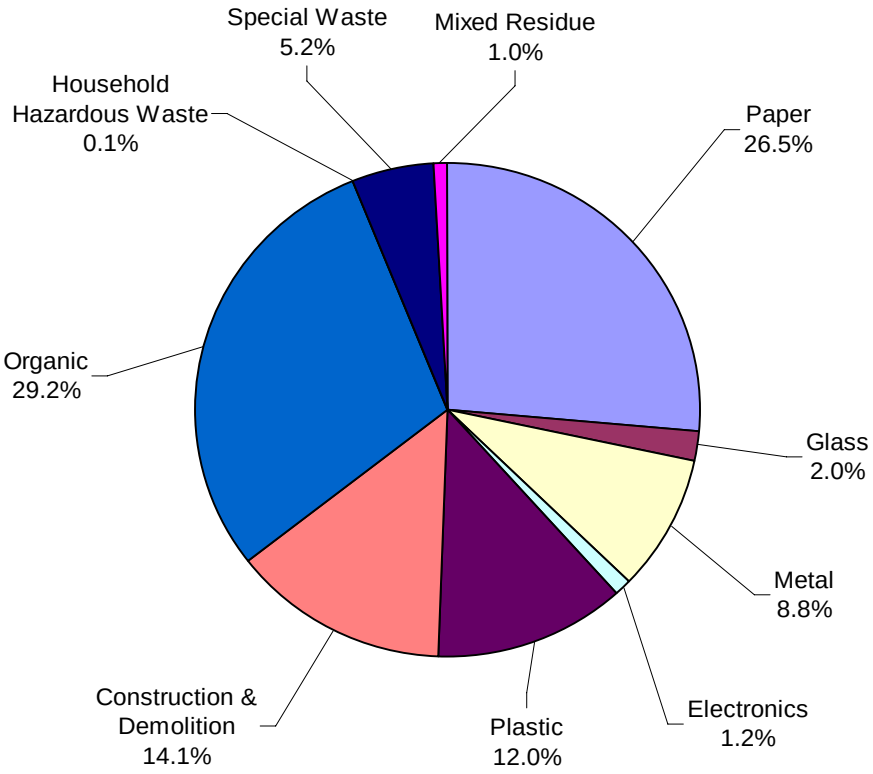

Table H-2: Composition of Commercial Disposed Waste

	Est. Pct.	+ / -	Est. Tons
Paper	**26.5%**		**5,010,261**
Uncoated Corrugated Cardboard	8.3%	2.3%	1,565,842
Paper Bags	1.5%	1.0%	281,423
Newspaper	2.1%	0.7%	401,257
White Ledger	1.2%	0.5%	234,511
Colored Ledger	0.1%	0.0%	11,616
Computer Paper	0.1%	0.1%	17,679
Other Office Paper	1.0%	0.4%	187,577
Magazines and Catalogs	0.7%	0.3%	138,555
Phone Books and Directories	0.2%	0.1%	29,586
Other Miscellaneous Paper	4.3%	1.2%	822,247
Remainder/Composite Paper	7.0%	1.5%	1,319,968
Glass	**2.0%**		**370,098**
Clear Glass Bottles and Containers	0.6%	0.2%	117,439
Green Glass Bottles and Containers	0.3%	0.2%	57,410
Brown Glass Bottles and Containers	0.1%	0.0%	10,684
Other Colored Glass Bottles and Containers	0.0%	0.0%	67
Flat Glass	0.7%	0.9%	137,827
Remainder/Composite Glass	0.2%	0.2%	46,671
Metal	**8.8%**		**1,656,648**
Tin/Steel Cans	0.9%	0.3%	169,014
Major Appliances	2.8%	4.5%	534,565
Used Oil Filters	0.0%	0.0%	0
Other Ferrous	2.4%	0.8%	452,411
Aluminum Cans	0.1%	0.0%	24,993
Other Non-Ferrous	0.3%	0.2%	63,525
Remainder/Composite Metal	2.2%	1.0%	412,140
Electronics	**1.2%**		**236,190**
Brown Goods	0.0%	0.0%	6,344
Computer-related Electronics	0.3%	0.3%	62,884
Other Small Consumer Electronics	0.2%	0.2%	38,039
Television and Other Items with CRTs	0.7%	0.9%	128,923
Plastic	**12.0%**		**2,272,432**
PETE Containers	0.5%	0.1%	96,945
HDPE Containers	0.4%	0.1%	78,641
Miscellaneous Plastic Containers	0.6%	0.3%	117,921
Plastic Trash Bags	1.4%	0.4%	269,352
Plastic Grocery and Other Merchandise Bags	0.2%	0.1%	38,930
Non-Bag Commercial and Industrial Packaging Film	1.0%	0.5%	188,833
Film Products	0.4%	0.4%	72,077
Other Film	3.2%	1.4%	611,527
Durable Plastic Items	1.5%	0.5%	287,135
Remainder/Composite Plastic	2.7%	0.7%	511,069

	Est. Pct.	+ / -	Est. Tons
Organic	**29.2%**		**5,531,661**
Food	18.8%	5.4%	3,565,086
Leaves and Grass	2.4%	1.3%	456,781
Prunings and Trimmings	0.7%	0.3%	139,999
Branches and Stumps	0.2%	0.3%	35,316
Agricultural Crop Residues	0.0%	0.0%	0
Manures	0.0%	0.0%	973
Textiles	2.3%	2.5%	433,989
Carpet	1.5%	0.9%	281,252
Remainder/Composite Organics	3.3%	1.4%	618,265
Construction & Demolition	**14.1%**		**2,670,504**
Concrete	1.8%	1.0%	344,379
Asphalt Paving	0.0%	0.0%	7,030
Asphalt Roofing	0.8%	0.9%	153,859
Lumber	7.9%	1.8%	1,498,863
Gypsum Board	0.4%	0.3%	70,779
Rock, Soil, and Fines	1.1%	0.9%	209,758
Remainder/Composite Construction and Demolition	2.0%	0.7%	385,835
Household Hazardous Waste	**0.1%**		**21,000**
Paint	0.0%	0.0%	7,052
Vehicle and Equipment Fluids	0.0%	0.0%	0
Used Oil	0.0%	0.0%	0
Batteries	0.0%	0.0%	8,040
Remainder/Composite Household Hazardous	0.0%	0.0%	5,908
Special Waste	**5.2%**		**975,182**
Ash	0.1%	0.2%	25,894
Sewage Solids	0.0%	0.0%	0
Industrial Sludge	0.0%	0.0%	0
Treated Medical Waste	0.1%	0.1%	14,926
Bulky Items	1.8%	1.2%	348,301
Tires	0.6%	0.4%	107,920
Remainder/Composite Special Waste	2.5%	3.5%	478,141
Mixed Residue	**1.0%**	0.5%	**180,083**
Totals	**100.0%**		**18,924,058**
Sample count:	**200**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Figure H-3: Overview of Overall Residential Disposed Waste

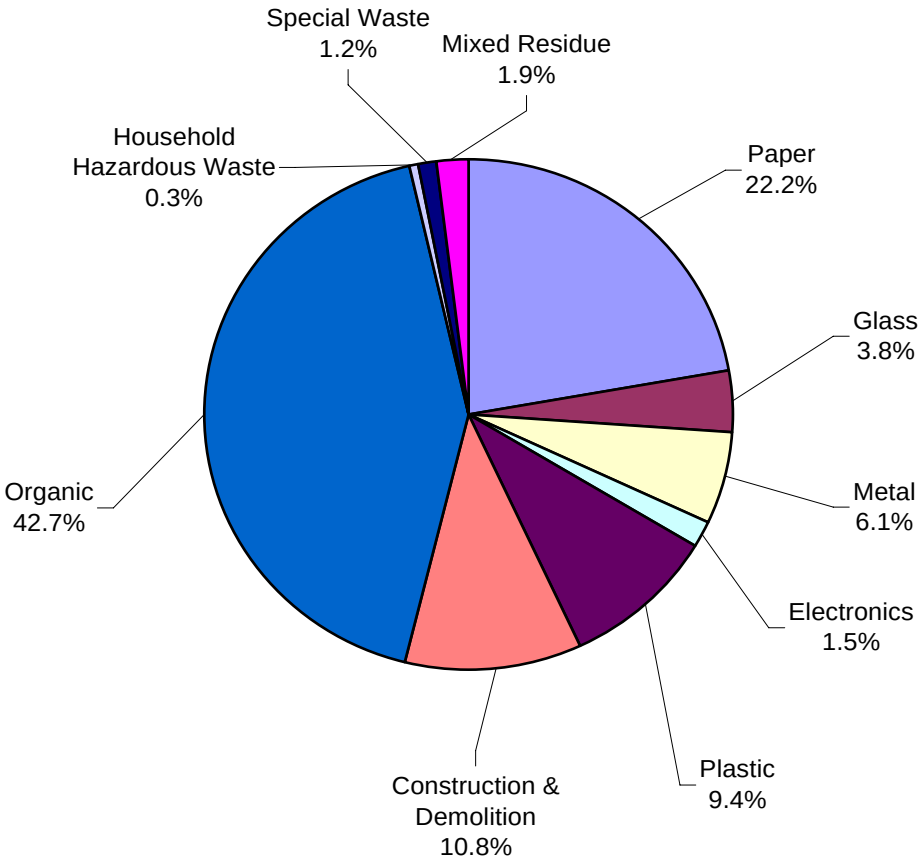

Table H-3: Composition of Overall Residential Disposed Waste

	Est. Pct.	+ / -	Est. Tons
Paper	**22.2%**		**2,825,640**
Uncoated Corrugated Cardboard	3.6%	0.7%	459,622
Paper Bags	0.7%	0.1%	95,320
Newspaper	3.7%	0.5%	464,919
White Ledger	1.2%	0.3%	158,781
Colored Ledger	0.1%	0.0%	7,595
Computer Paper	0.0%	0.0%	2,457
Other Office Paper	0.7%	0.1%	84,767
Magazines and Catalogs	1.2%	0.2%	151,465
Phone Books and Directories	0.4%	0.2%	51,047
Other Miscellaneous Paper	3.9%	0.4%	495,245
Remainder/Composite Paper	6.7%	0.6%	854,422
Glass	**3.8%**		**478,692**
Clear Glass Bottles and Containers	1.6%	0.3%	208,314
Green Glass Bottles and Containers	0.9%	0.2%	116,732
Brown Glass Bottles and Containers	0.7%	0.1%	91,309
Other Colored Glass Bottles and Containers	0.0%	0.0%	1,766
Flat Glass	0.1%	0.1%	10,243
Remainder/Composite Glass	0.4%	0.1%	50,328
Metal	**6.1%**		**770,009**
Tin/Steel Cans	1.0%	0.1%	130,196
Major Appliances	0.0%	0.0%	0
Used Oil Filters	0.0%	0.0%	1,376
Other Ferrous Metal	1.6%	0.4%	203,679
Aluminum Cans	0.4%	0.1%	47,280
Other Non-Ferrous Metal	0.2%	0.0%	28,127
Remainder/Composite Metal	2.8%	0.9%	359,351
Electronics	**1.5%**		**195,171**
Brown Goods	0.2%	0.1%	27,019
Computer-related Electronics	0.3%	0.5%	43,640
Other Small Consumer Electronics	0.2%	0.3%	26,834
Television and Other Items with CRTs	0.8%	1.1%	97,678
Plastic	**9.4%**		**1,201,588**
PETE Containers	0.9%	0.1%	110,004
HDPE Containers	0.8%	0.1%	104,480
Miscellaneous Plastic Containers	0.7%	0.1%	85,276
Plastic Trash Bags	0.9%	0.1%	112,668
Plastic Grocery and Other Merchandise Bags	0.8%	0.1%	104,895
Non-Bag Commercial and Industrial Packaging Film	0.0%	0.0%	2,684
Film Products	0.1%	0.1%	16,420
Other Film	1.6%	0.2%	199,769
Durable Plastic Items	1.3%	0.2%	166,402
Remainder/Composite Plastic	2.4%	0.3%	298,992

	Est. Pct.	+ / -	Est. Tons
Organic	**42.7%**		**5,433,236**
Food	17.3%	1.4%	2,199,406
Leaves and Grass	7.8%	1.9%	996,295
Prunings and Trimmings	5.3%	1.6%	673,405
Branches and Stumps	0.1%	0.1%	16,428
Agricultural Crop Residues	0.0%	0.0%	0
Manures	0.3%	0.1%	35,534
Textiles	3.5%	1.3%	446,522
Carpet	1.4%	0.8%	173,427
Remainder/Composite Organics	7.0%	0.8%	892,219
Construction & Demolition	**10.8%**		**1,374,362**
Concrete	0.7%	0.9%	92,642
Asphalt Paving	0.0%	0.0%	0
Asphalt Roofing	0.1%	0.0%	7,305
Lumber	4.2%	1.3%	532,179
Gypsum Board	1.2%	0.8%	153,826
Rock, Soil, and Fines	2.7%	1.5%	338,515
Remainder/Composite Construction and Demolition	2.0%	0.8%	249,895
Household Hazardous Waste	**0.3%**		**43,975**
Paint	0.1%	0.1%	10,856
Vehicle and Equipment Fluids	0.0%	0.0%	0
Used Oil	0.0%	0.0%	466
Batteries	0.2%	0.1%	23,684
Remainder/Composite Household Hazardous	0.1%	0.0%	8,968
Special Waste	**1.2%**		**156,330**
Ash	0.1%	0.1%	8,463
Sewage Solids	0.0%	0.0%	0
Industrial Sludge	0.0%	0.0%	0
Treated Medical Waste	0.0%	0.0%	441
Bulky Items	1.0%	0.9%	122,730
Tires	0.1%	0.1%	16,125
Remainder/Composite Special Waste	0.1%	0.0%	8,570
Mixed Residue	**1.9%**	0.4%	**242,051**
Totals	**100.0%**		**12,721,055**
Sample count:	**150**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Figure H-4: Overview of Single-Family Residential Disposed Waste

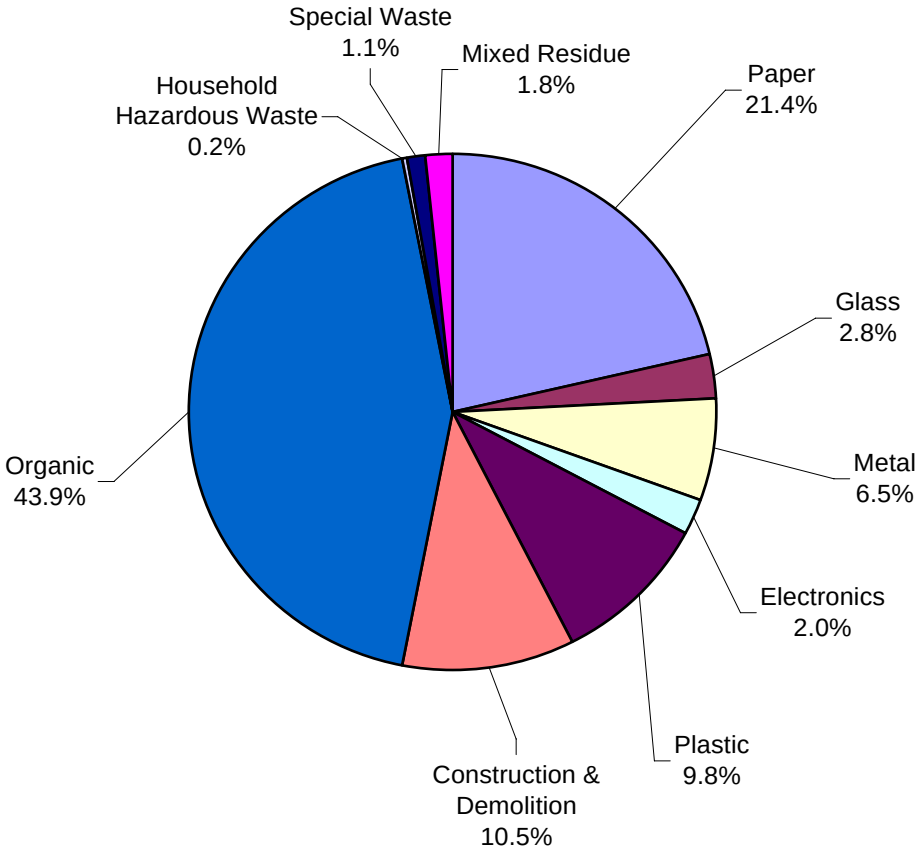

Table H-4: Composition of Single-Family Residential Disposed Waste

	Est. Pct.	+ / -	Est. Tons
Paper	**21.4%**		**2,009,837**
Uncoated Corrugated Cardboard	3.5%	0.8%	332,741
Paper Bags	0.7%	0.2%	68,649
Newspaper	3.3%	0.7%	305,842
White Ledger	0.7%	0.2%	66,523
Colored Ledger	0.1%	0.0%	4,965
Computer Paper	0.0%	0.0%	2,296
Other Office Paper	0.7%	0.1%	65,706
Magazines and Catalogs	1.1%	0.2%	100,196
Phone Books and Directories	0.4%	0.2%	35,940
Other Miscellaneous Paper	4.1%	0.5%	386,864
Remainder/Composite Paper	6.8%	0.7%	640,114
Glass	**2.8%**		**262,194**
Clear Glass Bottles and Containers	1.3%	0.3%	120,644
Green Glass Bottles and Containers	0.6%	0.2%	54,305
Brown Glass Bottles and Containers	0.5%	0.1%	45,689
Other Colored Glass Bottles and Containers	0.0%	0.0%	1,534
Flat Glass	0.1%	0.1%	9,612
Remainder/Composite Glass	0.3%	0.1%	30,411
Metal	**6.5%**		**608,582**
Tin/Steel Cans	1.0%	0.1%	98,416
Major Appliances	0.0%	0.0%	0
Used Oil Filters	0.0%	0.0%	1,376
Other Ferrous	1.9%	0.6%	179,212
Aluminum Cans	0.3%	0.1%	29,868
Other Non-Ferrous	0.3%	0.1%	25,690
Remainder/Composite Metal	2.9%	1.2%	274,020
Electronics	**2.0%**		**191,348**
Brown Goods	0.3%	0.2%	26,511
Computer-related Electronics	0.4%	0.6%	41,145
Other Small Consumer Electronics	0.3%	0.4%	26,034
Television and Other Items with CRTs	1.0%	1.5%	97,658
Plastic	**9.8%**		**920,623**
PETE Containers	0.8%	0.1%	72,861
HDPE Containers	0.7%	0.1%	66,170
Miscellaneous Plastic Containers	0.7%	0.1%	65,143
Plastic Trash Bags	0.9%	0.1%	80,808
Plastic Grocery and Other Merchandise Bags	0.9%	0.1%	81,309
Non-Bag Commercial and Industrial Packaging Film	0.0%	0.0%	2,408
Film Products	0.2%	0.1%	16,415
Other Film	1.7%	0.2%	164,475
Durable Plastic Items	1.3%	0.3%	126,312
Remainder/Composite Plastic	2.6%	0.4%	244,724

	Est. Pct.	+ / -	Est. Tons
Organic	**43.9%**		**4,130,370**
Food	16.7%	1.7%	1,571,798
Leaves and Grass	9.4%	2.5%	885,995
Prunings and Trimmings	5.1%	2.0%	481,751
Branches and Stumps	0.1%	0.1%	8,703
Agricultural Crop Residues	0.0%	0.0%	0
Manures	0.0%	0.0%	2,253
Textiles	3.8%	1.8%	354,676
Carpet	1.6%	1.1%	151,276
Remainder/Composite Organics	7.2%	1.1%	673,917
Construction & Demolition	**10.5%**		**992,024**
Concrete	0.4%	0.3%	33,676
Asphalt Paving	0.0%	0.0%	0
Asphalt Roofing	0.1%	0.0%	5,388
Lumber	3.9%	1.7%	366,957
Gypsum Board	1.2%	0.8%	109,226
Rock, Soil, and Fines	3.6%	2.0%	336,371
Remainder/Composite Construction and Demolition	1.5%	0.9%	140,406
Household Hazardous Waste	**0.2%**		**22,750**
Paint	0.1%	0.1%	8,748
Vehicle and Equipment Fluids	0.0%	0.0%	0
Used Oil	0.0%	0.0%	466
Batteries	0.1%	0.1%	10,861
Remainder/Composite Household Hazardous	0.0%	0.0%	2,676
Special Waste	**1.1%**		**98,975**
Ash	0.1%	0.1%	8,459
Sewage Solids	0.0%	0.0%	0
Industrial Sludge	0.0%	0.0%	0
Treated Medical Waste	0.0%	0.0%	373
Bulky Items	0.7%	0.5%	66,546
Tires	0.2%	0.2%	15,620
Remainder/Composite Special Waste	0.1%	0.1%	7,977
Mixed Residue	**1.8%**	0.5%	**166,801**
Totals	**100.0%**		**9,403,504**
Sample count:	**110**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Figure H-5: Overview of Multifamily Residential Disposed Waste

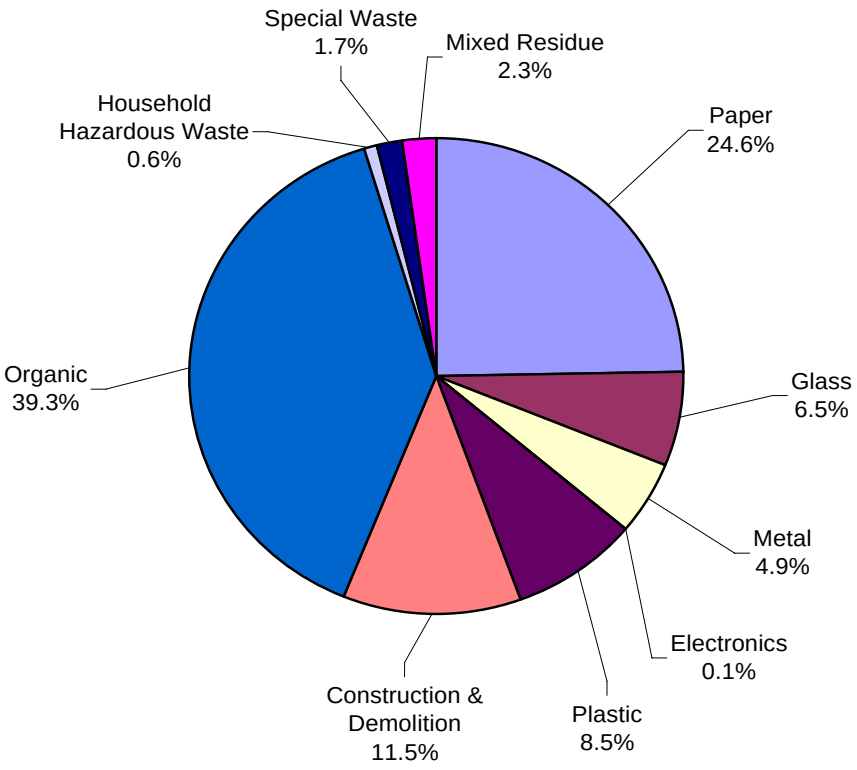

Table H-5: Composition of Multifamily Residential Disposed Waste

	Est. Pct.	+ / -	Est. Tons
Paper	**24.6%**		**815,803**
Uncoated Corrugated Cardboard	3.8%	1.1%	126,881
Paper Bags	0.8%	0.2%	26,671
Newspaper	4.8%	0.5%	159,077
White Ledger	2.8%	0.8%	92,258
Colored Ledger	0.1%	0.0%	2,629
Computer Paper	0.0%	0.0%	162
Other Office Paper	0.6%	0.1%	19,061
Magazines and Catalogs	1.5%	0.5%	51,269
Phone Books and Directories	0.5%	0.5%	15,107
Other Miscellaneous Paper	3.3%	0.2%	108,381
Remainder/Composite Paper	6.5%	0.9%	214,308
Glass	**6.5%**		**216,498**
Clear Glass Bottles and Containers	2.6%	0.7%	87,670
Green Glass Bottles and Containers	1.9%	0.5%	62,427
Brown Glass Bottles and Containers	1.4%	0.4%	45,620
Other Colored Glass Bottles and Containers	0.0%	0.0%	232
Flat Glass	0.0%	0.0%	631
Remainder/Composite Glass	0.6%	0.2%	19,918
Metal	**4.9%**		**161,427**
Tin/Steel Cans	1.0%	0.2%	31,779
Major Appliances	0.0%	0.0%	0
Used Oil Filters	0.0%	0.0%	0
Other Ferrous Metal	0.7%	0.4%	24,467
Aluminum Cans	0.5%	0.1%	17,413
Other Non-Ferrous Metal	0.1%	0.0%	2,437
Remainder/Composite Metal	2.6%	0.8%	85,331
Electronics	**0.1%**		**3,824**
Brown Goods	0.0%	0.0%	508
Computer-related Electronics	0.1%	0.1%	2,495
Other Small Consumer Electronics	0.0%	0.0%	800
Television and Other Items with CRTs	0.0%	0.0%	20
Plastic	**8.5%**		**280,965**
PETE Containers	1.1%	0.3%	37,144
HDPE Containers	1.2%	0.2%	38,310
Miscellaneous Plastic Containers	0.6%	0.1%	20,133
Plastic Trash Bags	1.0%	0.2%	31,859
Plastic Grocery and Other Merchandise Bags	0.7%	0.1%	23,586
Non-Bag Com. and Indus. Packaging Film	0.0%	0.0%	275
Film Products	0.0%	0.0%	5
Other Film	1.1%	0.2%	35,294
Durable Plastic Items	1.2%	0.2%	40,090
Remainder/Composite Plastic	1.6%	0.1%	54,268

	Est. Pct.	+ / -	Est. Tons
Organic	**39.3%**		**1,302,866**
Food	18.9%	2.0%	627,608
Leaves and Grass	3.3%	1.4%	110,300
Prunings and Trimmings	5.8%	2.6%	191,654
Branches and Stumps	0.2%	0.2%	7,725
Agricultural Crop Residues	0.0%	0.0%	0
Manures	1.0%	0.4%	33,280
Textiles	2.8%	0.8%	91,845
Carpet	0.7%	0.7%	22,151
Remainder/Composite Organics	6.6%	0.7%	218,302
Construction & Demolition	**11.5%**		**382,338**
Concrete	1.8%	3.3%	58,966
Asphalt Paving	0.0%	0.0%	0
Asphalt Roofing	0.1%	0.1%	1,917
Lumber	5.0%	1.3%	165,222
Gypsum Board	1.3%	1.8%	44,600
Rock, Soil, and Fines	0.1%	0.1%	2,144
Remainder/Composite Construction and Demolition	3.3%	1.4%	109,488
Household Hazardous Waste	**0.6%**		**21,224**
Paint	0.1%	0.1%	2,108
Vehicle and Equipment Fluids	0.0%	0.0%	0
Used Oil	0.0%	0.0%	0
Batteries	0.4%	0.2%	12,824
Remainder/Composite Household Hazardous	0.2%	0.1%	6,293
Special Waste	**1.7%**		**57,354**
Ash	0.0%	0.0%	4
Sewage Solids	0.0%	0.0%	0
Industrial Sludge	0.0%	0.0%	0
Treated Medical Waste	0.0%	0.0%	68
Bulky Items	1.7%	2.9%	56,184
Tires	0.0%	0.0%	505
Remainder/Composite Special Waste	0.0%	0.0%	593
Mixed Residue	**2.3%**	0.9%	**75,251**
Totals	**100.0%**		**3,317,551**
Sample count:	**40**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Figure H-6: Overview of Overall Self-Hauled Disposed Waste

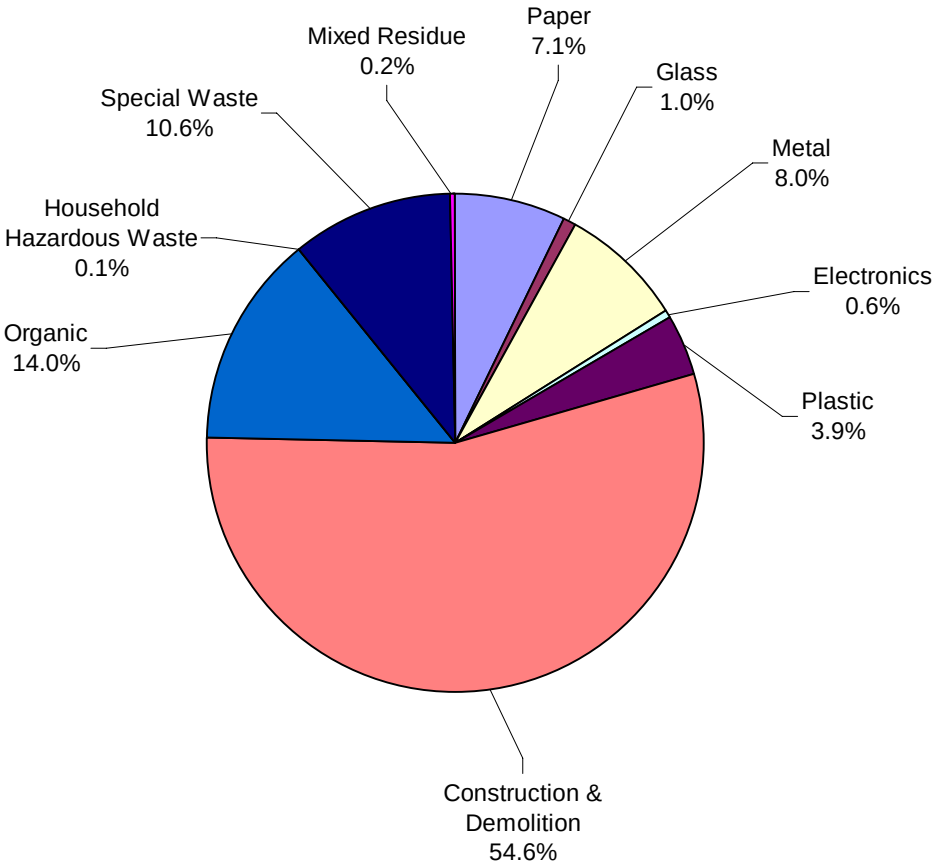

Table H-6: Composition of Overall Self-Hauled Disposed Waste

	Est. Pct.	+ / -	Est. Tons
Paper	**7.1%**		**610,088**
Uncoated Corrugated Cardboard	3.3%	1.2%	286,683
Paper Bags	0.1%	0.0%	9,353
Newspaper	0.2%	0.1%	20,915
White Ledger	0.6%	0.8%	54,224
Colored Ledger	0.0%	0.0%	1,373
Computer Paper	0.0%	0.0%	709
Other Office Paper	0.3%	0.2%	23,860
Magazines and Catalogs	0.2%	0.2%	21,123
Phone Books and Directories	0.1%	0.1%	8,771
Other Miscellaneous Paper	1.0%	0.4%	83,035
Remainder/Composite Paper	1.2%	0.5%	100,043
Glass	**1.0%**		**86,136**
Clear Glass Bottles and Containers	0.4%	0.2%	30,713
Green Glass Bottles and Containers	0.1%	0.1%	6,428
Brown Glass Bottles and Containers	0.0%	0.0%	2,576
Other Colored Glass Bottles and Containers	0.0%	0.0%	1,273
Flat Glass	0.0%	0.0%	3,275
Remainder/Composite Glass	0.5%	0.5%	41,871
Metal	**8.0%**		**688,699**
Tin/Steel Cans	0.3%	0.3%	24,331
Major Appliances	1.0%	0.8%	82,098
Used Oil Filters	0.0%	0.0%	0
Other Ferrous	3.7%	1.6%	313,585
Aluminum Cans	0.0%	0.0%	2,578
Other Non-Ferrous	0.2%	0.1%	19,357
Remainder/Composite Metal	2.9%	1.0%	246,751
Electronics	**0.6%**		**49,992**
Brown Goods	0.1%	0.1%	8,031
Computer-related Electronics	0.2%	0.2%	13,393
Other Small Consumer Electronics	0.3%	0.2%	28,400
Television and Other Items with CRTs	0.0%	0.0%	168
Plastic	**3.9%**		**335,679**
PETE Containers	0.1%	0.1%	9,185
HDPE Containers	0.1%	0.0%	6,428
Miscellaneous Plastic Containers	0.0%	0.0%	3,273
Plastic Trash Bags	0.1%	0.1%	8,440
Plastic Grocery and Other Merchandise Bags	0.0%	0.0%	3,213
Non-Bag Commercial and Industrial Packaging Film	1.2%	1.2%	98,813
Film Products	0.1%	0.0%	4,576
Other Film	0.2%	0.1%	15,461
Durable Plastic Items	1.3%	0.5%	108,007
Remainder/Composite Plastic	0.9%	0.3%	78,282

	Est. Pct.	+ / -	Est. Tons
Organic	**14.0%**		**1,201,555**
Food	1.0%	0.8%	89,860
Leaves and Grass	2.8%	2.6%	242,946
Prunings and Trimmings	1.2%	0.7%	106,952
Branches and Stumps	0.8%	0.8%	68,009
Agricultural Crop Residues	0.0%	0.0%	0
Manures	0.0%	0.0%	0
Textiles	0.8%	0.4%	67,278
Carpet	4.5%	2.5%	384,190
Remainder/Composite Organics	2.8%	1.6%	242,319
Construction & Demolition	**54.6%**		**4,687,209**
Concrete	6.2%	3.2%	529,586
Asphalt Paving	0.0%	0.1%	3,384
Asphalt Roofing	7.1%	4.3%	606,817
Lumber	21.5%	4.6%	1,850,171
Gypsum Board	5.3%	3.5%	451,825
Rock, Soil, and Fines	5.0%	3.7%	429,146
Remainder/Composite Construction and Demolition	9.5%	3.4%	816,279
Household Hazardous Waste	**0.1%**		**8,625**
Paint	0.0%	0.0%	1,294
Vehicle and Equipment Fluids	0.0%	0.0%	1,000
Used Oil	0.0%	0.0%	82
Batteries	0.0%	0.0%	2,298
Remainder/Composite Household Hazardous	0.0%	0.0%	3,951
Special Waste	**10.6%**		**906,920**
Ash	0.3%	0.4%	25,802
Sewage Solids	0.0%	0.0%	0
Industrial Sludge	0.0%	0.0%	0
Treated Medical Waste	0.0%	0.0%	0
Bulky Items	10.2%	4.7%	877,193
Tires	0.0%	0.0%	2,589
Remainder/Composite Special Waste	0.0%	0.0%	1,336
Mixed Residue	**0.2%**	0.2%	**15,314**
Totals	**100.0%**		**8,590,215**
Sample count:	**200**		

Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

Appendix I: Remainder/Composite Material Categories

	Definition	Examples observed during field work:	What makes them unrecoverable?
Remainder/Composite Paper	R/C Paper means items made mostly of paper but combined with large amounts of other materials such as plastic, glues, and foil. Examples include non-juice aseptic packages, sepia, onion skin, aluminum lined fast food wrappers, carbon paper, self-adhesive notes, and photographs.	aluminum lined fast food wrappers, self-adhesive notes, photos, 3-ring binders	The different material components are difficult to separate. Paper is attached to other materials (glue/foil/plastic/metal)
Remainder/Composite Plastic	R/C Plastic means plastic that cannot be put in any other type. They are usually recognized by their optical opacity. This type includes items made mostly of plastic but combined with other materials. Examples include auto parts made of plastic attached to metal, plastic drinking straws, plastic strapping, plastic lids, some kitchen ware, toys made of plastic and other materials, new plastic laminate (e.g., Formica), vinyl, linoleum, plastic lumber, non-PS insulating foams, imitation ceramics, handles and knobs, plastic string (such as is used for hay bales), and plastic rigid bubble/foil packaging (as for medications).	drinking straws, single-use cutlery, soda lids, toys, hangers, plastic strapping, bubble/foil packaging, fridge door, tarps w/ metal attached	Mixed resin products are typically difficult to recycle, plastic toys are difficult to repair.
Remainder/Composite Glass	R/C Glass means glass that cannot be put in any other type. It includes items made mostly of glass but combined with other materials. Examples include Pyrex, Corningware, crystal and other glass tableware, mirrors, non-fluorescent light bulbs, and auto windshields.	glass cups, jars with some candle wax, light bulbs	The different material components are difficult to separate.
Remainder/Composite Metal	R/C Metal means metal that cannot be put in any other type. This type includes items made mostly of metal but combined with other materials and items made of both ferrous metals and non-ferrous metal combined. Examples include finished and non-finished products that contain a mixture of metals, or metals and other materials, whose weight is derived significantly from the metal portion of its construction. Includes insulated wire.	insulated wiring, power cords, pots and pans (with handles attached), ironing board with covering attached, fan, bbq grill (with rubber wheels and wooden side panels	The different material components are difficult to separate.
Remainder/Composite Organics	R/C Organics means organic material that cannot be put in any other type or subtype. This type includes items made mostly of organic materials but combined with other materials. Examples include cigarette butts, and animal feces.	animal feces, air filters	The different material components are difficult to separate. Pathogen concerns with animal feces.
Remainder/Composite HHW	R/C HHW means material that cannot be put in any other type. This type also includes household hazardous material that is mixed. Examples include household hazardous waste which if improperly put in the solid waste stream may present handling problems or other hazards, such as pesticides, and caustic cleaners.	cleaning fluid, other products with caution/warning/danger caution words on product label	Cost.
Remainder/Composite C&D	R/C C&D means construction and demolition material that cannot be put in any other type. This type may include items from different categories combined, which would be very hard to separate. Examples include brick, ceramics, tiles, toilets, sinks, dried paint not attached to other materials, and fiberglass insulation. This type may also include demolition debris that is a mixture of items such as plate glass, wood, tiles, gypsum board, and aluminum scrap.	bricks, household ceramics, fiberglass insulation, ceiling tiles, cement board, tar paper, gypsum stuck to other materials such as wood	Some RC C&D may be recoverable, depending on markets (i.e. bricks). With demo material, the different material components are difficult to separate. If buildings are deconstructed versus demo, more effective to recycle
Remainder/Composite Special Waste	R/C Special Waste means special waste that cannot be put in any other type. Examples include asbestos-containing materials, such as certain types of pipe insulation and floor tiles, auto fluff, auto-bodies, trucks, trailers, truck cabs, untreated medical waste (such as tubing and soiled gowns), and artificial fireplace logs.	primarily medical waste	Bio hazard makes recycling med waste difficult.

EXHIBIT B

DIVERSION AND COST ESTIMATE DETAILS

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ECONOMIC ANALYSIS – DETAILED INFORMATION

Regional Zero Waste System Scenario Economics

Regional Organics Processing Facility

	Tipping Fee 2006 ($/ton)[a]	RT Distance (miles)	Total Time (hours)[b]	Transport Cost ($/hour)[c]	Transport Cost ($/load)[d]	Vehicle Capacity (tons/load)[e]	Transport Cost 2006 ($/ton)[f]	Total Cost 2006 ($/ton)[g]
Grover Landscaping	$ 26.00	160	3.45	$ 80	$ 276	7	$ 39.43	$ 65.43
Jepson Prairie Organics	$ 37.00	170	3.65	$ 80	$ 292	7	$ 41.71	$ 78.71
Newby Island Compost	$ 50.00	40	1.05	$ 80	$ 84	7	$ 12.00	$ 62.00
Z-Best Compost	$ 47.50	110	2.45	$ 80	$ 196	7	$ 28.00	$ 75.50

Average Cost $ 70.41 per ton
Assumed Diversion Rate 90%

[a] Based on 2006 "Compost Facility Capacity in the Bay Area" Report from Alameda County Waste Management Authority
[b] Based on 50 mph speed, 15 minute unloading time
[c] Based on 2006 industry average haul cost
[d] Based on multiplying $/hr by total hours per load to calculate $/load
[e] Based on ave capacity in collection vehicle
[f] Based on dividing $/load by tons/load to calculate $/ton for transport
[g] Based on suming tipping fee and transport cost

Regional C&D Processing Facility

	Tipping Fee 2006 ($/ton)[a]	RT Distance (miles)	Total Time (hours)[b]	Transport Cost ($/hour)[c]	Total Transport Cost ($/load)[d]	Vehicle Capacity (tons/load)[e]	Transport Cost 2006 ($/ton)[f]	Total Cost 2006 ($/ton)[g]
Kirby Canyon Landfill	$ 35.00	70	1.65	$ 80	$ 132	5.5	$ 24.00	$ 59.00
Guadalupe Rubbish	$ 35.00	50	1.25	$ 80	$ 100	5.5	$ 18.18	$ 53.18
Valley Recycling	$ 56.00	40	1.05	$ 80	$ 84	5.5	$ 15.27	$ 71.27
Zanker Recycling	$ 44.25	30	0.85	$ 80	$ 68	5.5	$ 12.36	$ 56.61

Average Cost $ 60.02 per ton
Assumed Diversion Rate 78.9%

[a] Based on 2006 Phone Survey
[b] Based on 50 mph speed, 15 minute unloading time
[c] Based on 2006 industry average haul cost
[d] Based on multiplying $/hr by total hours per load to calculate $/load
[e] Based on ave capacity in collection vehicle
[f] Based on dividing $/load by tons/load to calculate $/ton for transport
[g] Based on suming tipping fee and transport cost

Annual Cost Calculations

Organics Processing Facility

Total Diverted 2011 Tons		27,406
Diversion Rate		90%
Total Incoming Tons 2011		30,451
Cost/Ton	$	70.41
Total Cost[a]	**$**	**2,144,000**

C&D Debris Processing Facility

Total Diverted 2011 Tons		13,970
Diversion Rate		78.9%
Total Incoming Tons 2011		17,696
Cost/Ton	$	60.02
Total Cost[a]	**$**	**1,062,000**

Drop-Off with HHW Facility

Amortized Capital[b]	$	810,000
Operations Cost	$	830,000
Total Cost[a]	**$**	**1,640,000**

Total Annual Cost[a] **$ 4,846,000**

Existing Costs[a]		**Totals**	**$/ton**[c]	**2011 Tons**
Composting	$	117,000	$ 4.27	27,406
C&D Processing	$	1,353,000	$ 96.87	13,970
	$	**1,470,000**		

Net Additional Cost[a] **$ 3,380,000**

[a] Figures rounded to nearest $1,000
[b] Capital cost of $4,915,446 amortized at 6% over 20 year term, with 5% finance charge
[c] Based on 2006 costs; compost netting out marketed materials; C&D including transportation

CAPITAL COST ESTIMATE - DROP-OFF & HHW

Item	Cost (in US $'s)[a]
CAPITAL COSTS	
Site improvements and buildings	$928,000
Stationary equipment (installation)	$25,000
Spare parts inventory	$13,000
Subtotal	$966,000
Design & Engineering (7%)	$67,000
Permitting	$150,000
Construction management (5%)	$48,000
Subtotal	$1,231,000
Contingency (15%)	$185,000
Land[b]	7,000,000
Stationary equip. (not incl. installation)	$250,000
Rolling stock	$150,000
Total	**$8,816,000**

[a] Rounded to nearest $1,000

[b] Land costs based on extrapolation of commercial property pricing on the City of Palo Alto's Economic Development website

Site Improvements & Buildings

Cost Category	Unit	Unit Price	Quantity	Cost
Clear and grub	acre	$3,225	2.2	$7,095
Excavate & Fill (1 cy depth)	CY	$12.12	10,648	$129,054
Final grading	SY	$3.14	10,648	$33,435
Gravel area (3")	SY	$3.83	5,324	$20,391
Asphalt paved areas (binder & wear courses)	SY	$16.70	5,324	$88,911
Chain-link fence (6')	LF	$17.75	1,300	$23,075
Fence gates(6' with 20ft opening)	EA	$1,450	2	$2,900
Canopy	EA	$12,059.58	1	$12,060
Slab on Grade	SF	$5.89	1,500	$8,828
HHW Facility				
Slab on grade	SF	$5.89	2,400	$14,125
Building	SF	$135.82	2,400	$325,961
Canopy	EA	$12,059.58	1	$12,060
Utilities				
Electrical	acre	$21,225	2.2	$46,695
Water (domestic and fire)	acre	$6,628	2.2	$14,582
Sanitary (includes septic system)	acre	$6,325	2.2	$13,915
Storm water	acre	$8,250	2.2	$18,150
Landscaping	M.S.F.	$766	24	$18,352
Subtotal				**$789,587**
Adjustment - City Cost Index for Palo Alto (means pg 636)		114.1%		$900,919
Total Site Construction Costs - Inflation to 2006 at 3%		103%		**$927,946**

* All "means" references from "2005 RSMeans Building Construction Cost Data", except for HHW Facility costs escalated from April 1999 BVA Report entitled "Recycling & Transfer Station Conceptual Design & Cost-Benefit Analysis. Costs escalated using Bureau of Labor Statistics CPI for All Urban Consumers, San Francisco-Oakland-San Jose, CA from April 1999 to August 2006.

General Assumptions

Site Size	2.2	acres
Site Perimeter	1,300	lf
HHW Building	2,400	sf

Regional Drop- Off/HHW Equipment

Stationary	
Two (2) compactors[a]	$72,000
Office Trailer	$35,000
HHW Equipment	$100,000
Misc. - cages, concrete barriers	$20,000
Boxes & bins	$23,000
Total	**$250,000**
Rolling Stock	
Skip Loader	$75,000
Forklift	$75,000
Total	**$150,000**

[a] Based on quote from Marathon Equipment for 2 Ramjet RJ-325's, installed

REGIONAL DROP-OFF/HHW ANNUAL OPERATING COST ESTIMATE

Item	Cost (in US $'s)[a]
Labor	$ 367,000
Facilities maintenance	$ 10,000
Equipment maintenance	$ 22,000
Equipment replacement costs	$ 74,000
Utilities	$ 30,000
Fuel	$ 65,000
General & administration/legal,/accnt.	$ 20,000
Overhead & profit (10%)	$ 59,000
Insurance	$ 75,000
Property taxes	$ -
Subtotal	$ 722,000
Contingency (15%)	$ 108,000
Total O&M costs	$ 830,000

[a] Rounded to nearest $1,000

General Assumptions

HHW Operations	
Operating Days/Year	260
Hours per day	8
Drop-Off Operations	
Operating Days/Year	360
Hours per day	8

Regional Drop-Off/HWW Maintenance & Fuel

Item		
OPS HRS per WEEK	**Availability**	**Hours[a]**
Roll-off truck	0%	0
Wheeled Loaders	0%	0
Track Loader	0%	0
Forklifts	75%	42
Skip Loaders	75%	42
ANNUAL MAINTENANCE COSTS	**$/hr**	**Cost**
Roll-off truck	$4.00	$0
Wheeled Loaders	$10.00	$0
Track Loader	$12.00	$0
Forklifts	$5.00	$10,800
Skip Loaders	$5.00	$10,800
Total Maintenance Costs		$21,600
ANNUAL FUEL COSTS (a)	**gal/hr**	**Cost**
Roll-off truck	4.0	$0
Wheeled Loaders	10.0	$0
Track Loader	12.0	$0
Forklifts	5.0	$32,400
Skip Loaders	5.0	$32,400
Total Fuel Costs		$64,800

Assumptions:
Fuel costs ($/gal) $ 3.00

[a] Based on 360 days/yr, 8 hrs/day operation; figures rounded

Regional Drop-Off/HHW Labor (Assumes Private Operation)

Personnel	Hourly Rate w/o Benefits	Hourly Rate w/ Benefits	Hours per Shift	Number of Shifts	Number of Personnel	Annual Cost
Scalehouse						
Attendants	$15.00	$20.25	8	1	0	$0
HHW Operations						
Environmental Specialist	$35.00	$47.25	8	1	1	$98,280
Engineering Tech	$25.00	$33.75	8	1	1	$70,200
Laborers	$12.00	$16.20	8	1	0	$0
Drop Off Operations						
Operations manager	$35.00	$47.25	8	1	1	$136,080
Equipment operators	$16.00	$21.60	8	1	1	$62,208
Laborers	$12.00	$16.20	8	1	0	$0
Vehicle and Equipment Maintenance						
Mechanics	$21.00	$28.35	8	1	0	$0
Mechanics helper	$17.00	$22.95	8	1	0	$0
Administration						
Facility manager	$50.00	$67.50	8	1	0	$0
Operations manager	$35.00	$47.25	8	1	0	$0
Accounting/personnel manager	$35.00	$47.25	8	1	0	$0
Marketing manager	$35.00	$47.25	8	1	0	$0
Secretary/receptionist	$17.00	$22.95	8	1	0	$0
Clerk	$15.00	$20.25	8	1	0	$0
Total Personnel					4	$ 366,768

(a) Labor rates include 35 percent for overhead, benefits. and worker's compensation.
(b) Facility personnel costs include no overtime.
(c) Adminstration staff works 260 days per year, 8 hours per day.

ASSUMPTIONS:

Overhead and benefits	1.35
Administration Days/Year	260

City Zero Waste System Scenario Economics

CAPITAL COST ESTIMATE - LATP SITE

Item	Cost (in US $'s)[a]
CAPITAL COSTS	
Site improvements and buildings	$8,088,000
Office building	included above
Employee facility	included above
Maintenance facility	included above
Household hazardous waste locker	included above
Scalehouse	$50,000
Stationary equipment (installation)	$530,000
Spare parts inventory	$265,000
Subtotal	$8,933,000
Design & Engineering (7%)	$607,000
Permitting	$500,000
Construction management (5%)	$447,000
Subtotal	$10,487,000
Contingency (15%)	$1,573,000
Land[b]	24,000,000
Stationary equip. (not incl. installation)	$5,300,000
Rolling stock	$1,445,000
Total[c]	**$42,805,000**

[a] Rounded to nearest $1,000

[b] Land costs based on extrapolation of commercial property pricing on the City of Palo Alto's Economic Development website

[c] Does not include off-site improvements, wetlands development, mitigation &curing cost

General Assumptions

Site Size	7.1	acres
Site Perimeter	2,700	lf
C&D Processing Building	25,000	sf
Compost Buildings	60,000	sf
Maintenance Building	6,000	sf

Site Improvements & Buildings

Cost Category	Unit	Unit Price	Quantity	Cost
Clear and grub	acre	$3,225	7.1	$22,898
Excavate & Fill (1 cy depth)	CY	$12.12	34,364	$416,492
Final grading	SY	$3.14	34,364	$107,903
Gravel area (3")	SY	$3.83	17,182	$65,807
Asphalt paved areas (binder & wear courses)	SY	$16.70	17,182	$286,939
Chain-link fence (6')	LF	$17.75	2,700	$47,925
Fence gates(6' with 20ft opening)	EA	$1,450	2	$2,900
Concrete - Slab & Misc.				
Slab (8")	SF	$3.39	101,000	$342,390
Precast concrete barriers	LF	$72	250	$17,875
Concrete curb	LF	$7.90	2,500	$19,750
Canopy	EA	$12,059.58	1	$12,060
Metal buildings w/office incl. plumbing, electrical & HVAC	SF	$52.50	91,000	$4,777,500
Doors				
Roll-up doors (24' x 14')	EA	$4,325	10	$43,250
Man doors (3' x 7')	EA	$250	12	$3,000
HHW Facility				
Slab on grade	SF	$5.89	2,400	$14,125
Building	SF	$135.82	2,400	$325,961
Canopy	EA	$12,059.58	1	$12,060
Diesel tank and containment area	LS	$28,000	1	$28,000
Hazardous waste storage locker	EA	$20,000	1	$20,000
Utilities				
Electrical	acre	$21,225	7.1	$150,698
Water (domestic and fire)	acre	$6,628	7.1	$47,059
Sanitary (includes septic system)	acre	$6,325		$0
Storm water	acre	$8,250	7.1	$58,575
Landscaping	M.S.F.	$766	77	$59,226
Subtotal				**$6,882,391**
Adjustment - City Cost Index for Palo Alto (means pg 636)		114.1%		$7,852,809
Total Site Construction Costs - Inflation to 2006 at 3%		103%		**$8,088,393**

* All "means" references from "2005 RSMeans Building Construction Cost Data", except for HHW Facility costs escalated from April 1999 BVA Report entitled "Recycling & Transfer Station Conceptual Design & Cost-Benefit Analysis. Costs escalated using Bureau of Labor Statistics CPI for All Urban Consumers, San Francisco-Oakland-San Jose, CA from April 1999 to August 2006.

Equipment[a]

Stationary - C&D Facility	
Primary Screen	$175,000
Secondary Screen	$100,000
Multiple Conveyor System	$150,000
Portable Sort Line	$100,000
Debris Boxes	$25,000
Hammermil Grinder	$300,000
Power / Controls	$50,000
Stationary-Drop-Off HHW	
Two (2) compactors[b]	$72,000
Office Trailer	$35,000
HHW Equipment	$100,000
Misc. - cages, concrete barriers	$20,000
Boxes & bins	$23,000
Stationary - Compost Facility	
All-In Quote from VCU	$4,000,000
General Site - Scales	$150,000
Total	**$5,300,000**
Rolling Stock - C&D Facility	
Wheeled Loader	$250,000
Skip Loader	$75,000
Roll-off truck	$110,000
Track Loader	$250,000
Rolling Stock-Drop-Off HHW	
Skip Loader	$75,000
Forklift	$75,000
Rolling Stock - Compost Facility	
Wheeled Loader	$250,000
Roll-off truck	$110,000
Track Loader	$250,000
Total	**$1,445,000**

[a] Equipment costs from vendor quotes & similar project estimates; rounded to nearest $1,000

[b] Based on quote from Marathon Equipment for 2 Ramjet RJ-325's, installed

CAPITAL COST ESTIMATE - PARWQCP SITE

Item	Cost (in US $'s)[a]
CAPITAL COSTS	
Site improvements and buildings	$8,143,845
Office building	included above
Employee facility	included above
Maintenance facility	included above
Household hazardous waste locker	included above
Scalehouse	$50,000
Stationary equipment (installation)	$530,000
Spare parts inventory	$265,000
Subtotal	$8,988,845
Design & Engineering (7%)	$611,000
Permitting	$500,000
Construction management (5%)	$449,000
Subtotal	$10,548,845
Contingency (15%)	$1,582,000
Land[b]	25,000,000
Stationary equip. (not incl. installation)	$5,300,000
Rolling stock	$1,445,000
Total[c]	**$43,875,845**

[a] Rounded to nearest $1,000

[b] Land costs based on extrapolation of commercial property pricing on the City of Palo Alto's Economic Development website

[c] Does not include off-site improvements

General Assumptions

Site Size	7.5	acres
Site Perimeter	1,500	lf
C&D Processing Building	25,000	sf
Compost Buildings	60,000	sf
Maintenance Building	6,000	sf

Site Improvements & Buildings

Cost Category	Unit	Unit Price	Quantity	Cost
Clear and grub	acre	$3,225	7.5	$24,188
Excavate & Fill (1 cy depth)	CY	$12.12	36,300	$439,956
Final grading	SY	$3.14	36,300	$113,982
Gravel area (3")	SY	$3.83	18,150	$69,515
Asphalt paved areas (binder & wear courses)	SY	$16.70	18,150	$303,105
Chain-link fence (6')	LF	$17.75	1,500	$26,625
Fence gates(6' with 20ft opening)	EA	$1,450	2	$2,900
Concrete - Slab & Misc.				
Slab (8")	SF	$3.39	101,000	$342,390
Precast concrete barriers	LF	$72	250	$17,875
Concrete curb	LF	$7.90	2,500	$19,750
Canopy	EA	$12,059.58	1	$12,060
Metal buildings w/office incl. plumbing, electrical & HVAC	SF	$52.50	91,000	$4,777,500
Doors				
Roll-up doors (24' x 14')	EA	$4,325	10	$43,250
Man doors (3' x 7')	EA	$250	12	$3,000
HHW Facility				
Slab on grade	SF	$5.89	2,400	$14,125
Building	SF	$135.82	2,400	$325,961
Canopy	EA	$12,059.58	1	$12,060
Diesel tank and containment area	LS	$28,000	1	$28,000
Hazardous waste storage locker	EA	$20,000	1	$20,000
Utilities				
Electrical	acre	$21,225	7.5	$159,188
Water (domestic and fire)	acre	$6,628	7.5	$49,710
Sanitary (includes septic system)	acre	$6,325		$0
Storm water	acre	$8,250	7.5	$61,875
Landscaping	M.S.F.	$766	82	$62,563
Subtotal				**$6,929,576**
Adjustment - City Cost Index for Palo Alto (means pg 636)		114.1%		$7,906,646
Total Site Construction Costs - Inflation to 2006 at 3%		103%		**$8,143,845**

* All "means" references from "2005 RSMeans Building Construction Cost Data", except for HHW Facility costs escalated from April 1999 BVA Report entitled "Recycling & Transfer Station Conceptual Design & Cost-Benefit Analysis. Costs escalated using Bureau of Labor Statistics CPI for All Urban Consumers, San Francisco-Oakland-San Jose, CA from April 1999 to August 2006.

Equipment[a]

Stationary - C&D Facility	
Primary Screen	$175,000
Secondary Screen	$100,000
Multiple Conveyor System	$150,000
Portable Sort Line	$100,000
Debris Boxes	$25,000
Hammermil Grinder	$300,000
Power / Controls	$50,000
Stationary-Drop-Off HHW	
Two (2) compactors[b]	$72,000
Office Trailer	$35,000
HHW Equipment	$100,000
Misc. - cages, concrete barriers	$20,000
Boxes & bins	$23,000
Stationary - Compost Facility	
All-In Quote from VCU	$4,000,000
General Site - Scales	$150,000
Total	**$5,300,000**
Rolling Stock - C&D Facility	
Wheeled Loader	$250,000
Skip Loader	$75,000
Roll-off truck	$110,000
Track Loader	$250,000
Rolling Stock-Drop-Off HHW	
Skip Loader	$75,000
Forklift	$75,000
Rolling Stock - Compost Facility	
Wheeled Loader	$250,000
Roll-off truck	$110,000
Track Loader	$250,000
Total	**$1,445,000**

[a] Equipment costs from vendor quotes & similar project estimates; rounded to nearest $1,000

[b] Based on quote from Marathon Equipment for 2 Ramjet RJ-325's, installed

ANNUAL OPERATING COST ESTIMATE - LATP

Item	Cost (in US $'s)[a]
Labor	$ 1,526,000
Facilities maintenance	$ 80,000
Equipment maintenance	$ 132,000
Equipment replacement costs	$ 268,000
Utilities	$ 90,000
Fuel	$ 320,000
General & administration/legal,/accnt.	$ 80,000
Overhead & profit (10%)	$ 250,000
Insurance	$ 150,000
Property taxes	$ -
Subtotal	$ 2,896,000
Contingency (15%)	$ 434,000
Total O&M costs	$ 3,330,000

[a] Rounded to nearest $1,000

General Assumptions

C&D Operation	
Operating Days/Year	260
Hours per day	8
Compost Operation	
Operating Days/Year	260
Hours per day	8

ANNUAL OPERATING COST ESTIMATE - PARWQCP

Item	Cost (in US $'s)
Labor	$ 1,526,000
Facilities maintenance	$ 80,000
Equipment maintenance	$ 132,000
Equipment replacement costs	$ 268,000
Utilities	$ 90,000
Fuel	$ 320,000
General & administration/legal,/accnt.	$ 80,000
Overhead & profit (10%)	$ 250,000
Insurance	$ 150,000
Property taxes	$ -
Subtotal	$ 2,896,000
Contingency (15%)	$ 434,000
Total O&M costs	$ 3,330,000

General Assumptions

C&D Operation	
Operating Days/Year	260
Hours per day	8
Compost Operation	
Operating Days/Year	260
Hours per day	8

Maintenance & Fuel

Item		C&D	Compost	Drop-Off
OPS HRS per WEEK	**Availability**	**Hours[a]**	**Hours[a]**	**Hours[b]**
Roll-off truck	25%	10	10	0
Wheeled Loaders	80%	32	32	0
Track Loader	80%	32	32	0
Forklifts	65%	0	0	42
Skip Loaders	75%	30	0	42
ANNUAL MAINTENANCE COSTS	**$/hr**	**Cost**	**Cost**	**Cost**
Roll-off truck	$4.00	$2,080	$2,080	$0
Wheeled Loaders	$10.00	$16,640	$16,640	$0
Track Loader	$12.00	$19,968	$19,968	$0
Forklifts	$5.00	$0	$0	$10,800
Skip Loaders	$5.00	$7,800	$0	$10,800
Total Maintenance Costs		$46,488	$38,688	$21,600
ANNUAL FUEL COSTS (a)	**gal/hr**	**Cost**	**Cost**	**Cost**
Roll-off truck	4.0	$6,240	$6,240	$0
Wheeled Loaders	10.0	$49,920	$49,920	$0
Track Loader	12.0	$59,904	$59,904	$0
Forklifts	5.0	$0	$0	$32,400
Skip Loaders	5.0	$23,400	$0	$32,400
Total Fuel Costs		$139,464	$116,064	$64,800

Assumptions:

Fuel costs ($/gal) $ 3.00

[a] Based on 260 days/yr, 8 hrs/day operation; figures rounded

[b] Based on 360 days/yr, 8 hrs/day operation; figures rounded

Labor (Assumes Private Operation)

Personnel	Hourly Rate w/o Benefits	Hourly Rate w/ Benefits	Hours per Shift	Number of Shifts	Number of Personnel	Annual Cost
Scalehouse						
Attendants	$15.00	$20.25	8	1	2	$84,240
C&D Operations						
Supervisor	$20.00	$27.00	8	1	1	$56,160
Equipment operators	$16.00	$21.60	8	1	3	$134,784
Laborers	$12.00	$16.20	8	1	3	$101,088
Drop-Off HHW						
Environmental Specialist	$35.00	$47.25	8	1	1	$98,280
Engineering Tech	$25.00	$33.75	8	1	1	$70,200
Operations manager	$35.00	$47.25	8	1	1	$136,080
Equipment operators	$16.00	$21.60	8	1	1	$62,208
Compost Operations						
Supervisor	$20.00	$27.00	8	1	1	$56,160
Equipment operators	$16.00	$21.60	8	1	3	$134,784
Laborers	$12.00	$16.20	8	1	3	$101,088
Vehicle and Equipment Maintenance						
Mechanics	$21.00	$28.35	8	1	1	$58,968
Mechanics helper	$17.00	$22.95	8	1	1	$47,736
Administration						
Facility manager	$50.00	$67.50	8	1	1	$140,400
Operations manager	$35.00	$47.25	8	1	0	$0
Accounting/personnel manager	$35.00	$47.25	8	1	1	$98,280
Marketing manager	$35.00	$47.25	8	1	1	$98,280
Secretary/receptionist	$17.00	$22.95	8	1	1	$47,736
Clerk	$15.00	$20.25	8	1	0	$0
Total Personnel					26	$ 1,526,472

(a) Labor rates include 35 percent for overhead, benefits. and worker's compensation.
(b) Facility personnel costs include no overtime.
(c) Adminstration staff works 260 days per year, 8 hours per day.

ASSUMPTIONS:

Overhead and benefits	1.35
Administration Days/Year	260

Regional Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

Generation by Source (Current Levels Projected):	2004	2005	2006	2007	2008	2009	2010	2011	2012
SF /MF Residential & Commercial									
SF Residential Waste	13,109	13,185	13,261	13,338	13,416	13,494	13,572	13,651	13,730
Commercial/Multi-Family Waste	34,649	34,850	35,052	35,256	35,460	35,666	35,873	36,081	36,290
Recyclables from Collection	14,123	14,205	14,287	14,370	14,454	14,537	14,622	14,706	14,792
Yard Trimmings	9,062	9,115	9,167	9,221	9,274	9,328	9,382	9,436	9,491
Self Haul									
Waste to SMaRT	25	25	25	25	26	26	26	26	26
Waste to City Landfill	10,911	10,975	11,038	11,102	11,167	11,231	11,296	11,362	11,428
Yard Trimmings - City Crews[a]	4,771	4,799	4,827	4,854	4,883	4,911	4,939	4,968	4,997
Yard Trimmings - Public[b]	2,882	2,899	2,916	2,932	2,949	2,967	2,984	3,001	3,018
Landfill Recycling/C&D - City Crews	1,645	1,655	1,664	1,674	1,684	1,693	1,703	1,713	1,723
Landfill Recycling/C&D - Public	782	786	791	795	800	805	809	814	819
Recyclables Drop-Off	1,182	1,189	1,196	1,203	1,210	1,217	1,224	1,231	1,238
Industrial Open Top Debris Boxes									
C&D Directed to Regional Processors	6,498	6,536	6,574	6,612	6,650	6,689	6,727	6,766	6,806
Waste Directed to SMaRT	768	772	777	781	786	790	795	800	804
Waste Directed to City Landfill[c]	10,655	10,717	10,779	10,841	10,904	10,967	11,031	11,095	11,159
Landfill Recycling/C&D	1,616	1,625	1,635	1,644	1,654	1,663	1,673	1,683	1,693
Uncharacterized Self Haul									
Other Landfill	7,286	7,328	7,371	7,414	7,457	7,500	7,543	7,587	7,631
Non-City Diversion	64,419	64,793	65,168	65,546	65,927	66,309	66,694	67,080	67,469
Total Generation	**184,383**	**185,452**	**186,528**	**187,610**	**188,698**	**189,792**	**190,893**	**192,000**	**193,114**
SF /MF Residential & Commercial									
Yard Trimmings Diversion (Current Levels Projected):	9,062	9,115	9,167	9,221	9,274	9,328	9,382	9,436	9,491
Adding Food Scraps/Other Compostables to Yard Trimmings									
Add'l New Percent of Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.7%	14.7%
Add'l New Percent of Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	12.5%
Additional Diversion	-	-	-	-	-	-	-	6,501	6,538
Phase in Mandatory Separation for Yard Trimmings									
Add'l New Percent of YT Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.7%	14.7%
Add'l New Percent of YT Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	12.5%
Additional Diversion	-	-	-	-	-	-	-	6,501	6,538
Total Yard Trimmings Diversion	**9,062**	**9,115**	**9,167**	**9,221**	**9,274**	**9,328**	**9,382**	**22,438**	**22,568**
Collected Recyclables Diversion (Current Levels Projected):	14,123	14,205	14,287	14,370	14,454	14,537	14,622	14,706	14,792
Adding Materials to Recyclables Collection									
Add'l New Percent of Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	4.5%
Add'l New Percent of Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%
Additional Diversion	-	-	-	-	-	-	-	2,418	2,432
Phase in Mandatory Separation for Recyclables Collection									
Add'l New Percent of Recyclables Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	4.5%
Add'l New Percent of Recyclables Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%
Additional Diversion	-	-	-	-	-	-	-	2,418	2,432
Total Collected Recyclables Diversion	**14,123**	**14,205**	**14,287**	**14,370**	**14,454**	**14,537**	**14,622**	**19,542**	**19,656**
Waste Remaining after Program Implementation:									
Delivered to SMaRT	47,758	48,035	48,314	48,594	48,876	49,159	49,444	31,894	32,079
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**8,405**	**8,454**	**8,503**	**6,657**	**12,219**	**12,290**	**12,361**	**7,973**	**8,020**
Total SF /MF Residential & Commercial Diversion	**31,590**	**31,774**	**31,958**	**30,248**	**35,947**	**36,155**	**36,365**	**49,954**	**50,243**
Self Haul									
Waste (Current Levels Projected):									
Percent Redirected from City Landfill to SMaRT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Amount to City Landfill	10,911	10,975	11,038	11,102	11,167	11,231	11,296	-	-
Amount to SMaRT	25	25	25	25	26	26	26	11,388	11,454
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**4**	**4**	**4**	**3**	**6**	**6**	**6**	**2,847**	**2,864**
Drop-Off Recyclables Diversion (Current Levels Projected):	**1,182**	**1,189**	**1,196**	**1,203**	**1,210**	**1,217**	**1,224**	**1,231**	**1,238**
Yard Trimmings - Public Haul (Current Levels Projected):	2,882	2,899	2,916	2,932	2,949	2,967	2,984	3,001	3,018
Percent Redirected from City Composting to Processor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Amount to Processor	-	-	-	-	-	-	-	3,001	3,018
Recovery at Processor	-	-	-	-	-	-	-	3,001	3,018
Recovery from City Composting[b]	2,882	2,899	2,916	2,932	2,949	2,967	2,984	-	-
Total Diversion	**2,882**	**2,899**	**2,916**	**2,932**	**2,949**	**2,967**	**2,984**	**3,001**	**3,018**
Yard Trimmings - City Haul Diversion (Current Levels Projected)[a]:	**4,771**	**4,799**	**4,827**	**4,854**	**4,883**	**4,911**	**4,939**	**4,968**	**4,997**

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 in 2004; eight years at an average of 0.58% per year

Regional Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Self Haul (continued)									
Landfill Recycling/C&D - Public Haul (Current Levels Projected):	1,645	1,655	1,664	1,674	1,684	1,693	1,703	1,713	1,723
Percent Redirected from City C&D Recycling to SMaRT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Amount to SMaRT	-	-	-	-	-	-	-	1,713	1,723
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Recovery from SMaRT	-	-	-	-	-	-	-	428	431
Recovery from City Landfill	1,645	1,655	1,664	1,674	1,684	1,693	1,703	-	-
Total Diversion	**1,645**	**1,655**	**1,664**	**1,674**	**1,684**	**1,693**	**1,703**	**428**	**431**
Landfill Recycling/C&D - City Haul Diversion (Current Levels Projected):	**782**	**786**	**791**	**795**	**800**	**805**	**809**	**814**	**819**
Total Self Haul Diversion	**11,266**	**11,332**	**11,397**	**11,463**	**11,532**	**11,599**	**11,666**	**13,289**	**13,366**
Industrial - Open Top Debris Boxes									
C&D Directed to Regional Processors (Current Levels Projected):	6,498	6,536	6,574	6,612	6,650	6,689	6,727	6,766	6,806
Percent Redirected from C&D Processors to City Developed Facility	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
To City Developed Facility	-	-	-	-	-	-	-	-	-
To C&D Regional Processor	6,498	6,536	6,574	6,612	6,650	6,689	6,727	6,766	6,806
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**5,130**	**5,160**	**5,190**	**5,220**	**5,250**	**5,281**	**5,311**	**5,342**	**5,373**
Waste (Current Levels Projected):									
Waste Directed to SMaRT	768	772	777	781	786	790	795	800	804
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**135**	**136**	**137**	**107**	**196**	**198**	**199**	**200**	**201**
Waste Directed to City Landfill[c]	10,655	10,717	10,779	10,841	10,904	10,967	11,031	11,095	11,159
Percent Redirected from Landfill to C&D Processing	0.0%	0.0%	0.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**-**	**-**	**-**	**5,991**	**6,026**	**6,061**	**6,096**	**6,131**	**6,167**
Landfill Recycling/C&D (Current Levels Projected):	**1,616**	**1,625**	**1,635**	**1,644**	**1,654**	**1,663**	**1,673**	**1,683**	**1,693**
Total Industrial Diversion	**6,881**	**6,921**	**6,961**	**12,962**	**13,126**	**13,202**	**13,279**	**13,356**	**13,434**
Uncharacterized Self Haul									
SF/MF/Commercial	7,286	7,328	7,371	7,414	7,457	7,500	7,543	7,587	7,631
C&D Ordinance - Diversion Rate[e]	0.0%	0.0%	0.0%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%
Total Uncharacterized Self Haul Diversion	**-**	**-**	**-**	**1,464**	**1,473**	**1,481**	**1,490**	**1,498**	**1,507**
Source: Conversion Technology									
Percent to Conversion Technology	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SMaRT Input to Conversion Technology	40,006	40,238	40,471	42,633	37,265	37,482	37,699	34,346	34,545
Conversion Technology Diversion Rate	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Diversion Summary									
Total SF /MF Residential & Commercial Diversion	31,590	31,774	31,958	30,248	35,947	36,155	36,365	49,954	50,243
Total Self Haul Diversion	11,266	11,332	11,397	11,463	11,532	11,599	11,666	13,289	13,366
Total Industrial Diversion	6,881	6,921	6,961	12,962	13,126	13,202	13,279	13,356	13,434
Total Uncharacterized Self Haul Diversion	-	-	-	1,464	1,473	1,481	1,490	1,498	1,507
Total Non-City Diversion	64,419	64,793	65,168	65,546	65,927	66,309	66,694	67,080	67,469
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Sub-Total Diversion	**114,157**	**114,819**	**115,485**	**121,684**	**128,004**	**128,746**	**129,493**	**145,178**	**146,020**
Additional Diversion from Source Reduction	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%
Additional Diverted Tons	-	-	-	-	-	-	1,909	1,920	1,931
Total Diversion	**114,157**	**114,819**	**115,485**	**121,684**	**128,004**	**128,746**	**131,402**	**147,098**	**147,951**
Total Disposal	**70,226**	**70,633**	**71,043**	**65,926**	**60,694**	**61,046**	**59,491**	**44,903**	**45,163**
Diversion Rate	**61.9%**	**61.9%**	**61.9%**	**64.9%**	**67.8%**	**67.8%**	**68.8%**	**76.6%**	**76.6%**
Kirby Canyon Put or Pay Summary									
Total tonnage to SMaRT	48,551	48,833	49,116	49,401	49,687	49,975	50,265	45,795	46,060
Total tonnage to Kirby Canyon Landfill	40,006	40,238	40,471	42,633	37,265	37,482	37,699	34,346	34,545
Kirby Canyon Put or Pay Commitment	39,341	39,734	40,132	40,533	40,939	41,348	41,762	42,179	42,601
Tonnage Difference	665	504	340	2,100	(3,673)	(3,866)	(4,063)	(7,833)	(8,056)
Cost per ton ($/ton)	$ 31.30	$ 32.24	$ 33.21	$ 34.21	$ 35.23	$ 36.29	$ 37.38	$ 38.50	$ 39.65
Total Cost make-up ($)	$ -	$ -	$ -	$ -	$ (129,421)	$ (140,293)	$ (151,851)	$ (301,579)	$ (319,441)
Annual Waste Escalation Rate[f]	0.58%								

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year

Regional Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

Generation by Source (Current Levels Projected):	2013	2014	2015	2016	2017	2018	2019	2020	2021
SF /MF Residential & Commercial									
SF Residential Waste	13,809	13,889	13,970	14,051	14,133	14,215	14,297	14,380	14,463
Commercial/Multi-Family Waste	36,500	36,712	36,925	37,139	37,355	37,571	37,789	38,008	38,229
Recyclables from Collection	14,878	14,964	15,051	15,138	15,226	15,314	15,403	15,492	15,582
Yard Trimmings	9,546	9,602	9,657	9,713	9,770	9,826	9,883	9,941	9,998
Self Haul									
Waste to SMaRT	26	26	27	27	27	27	27	27	28
Waste to City Landfill	11,494	11,561	11,628	11,695	11,763	11,831	11,900	11,969	12,038
Yard Trimmings - City Crews[a]	5,026	5,055	5,084	5,114	5,144	5,173	5,203	5,234	5,264
Yard Trimmings - Public[b]	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Landfill Recycling/C&D - City Crews	1,733	1,743	1,753	1,763	1,774	1,784	1,794	1,805	1,815
Landfill Recycling/C&D - Public	824	828	833	838	843	848	853	858	863
Recyclables Drop-Off	1,245	1,252	1,260	1,267	1,274	1,282	1,289	1,297	1,304
Industrial Open Top Debris Boxes									
C&D Directed to Regional Processors	6,845	6,885	6,925	6,965	7,005	7,046	7,087	7,128	7,169
Waste Directed to SMaRT	809	814	818	823	828	833	837	842	847
Waste Directed to City Landfill[c]	11,224	11,289	11,355	11,420	11,487	11,553	11,620	11,688	11,756
Landfill Recycling/C&D	1,702	1,712	1,722	1,732	1,742	1,752	1,762	1,773	1,783
Uncharacterized Self Haul									
Other Landfill	7,675	7,720	7,765	7,810	7,855	7,900	7,946	7,992	8,039
Non-City Diversion	67,861	68,254	68,650	69,048	69,449	69,852	70,257	70,664	71,074
Total Generation	**194,234**	**195,361**	**196,494**	**197,633**	**198,780**	**199,933**	**201,092**	**202,259**	**203,432**
SF /MF Residential & Commercial									
Yard Trimmings Diversion (Current Levels Projected):	9,546	9,602	9,657	9,713	9,770	9,826	9,883	9,941	9,998
Adding Food Scraps/Other Compostables to Yard Trimmings									
Add'l New Percent of Diversion - SF	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
Add'l New Percent of Diversion - MF/Comm	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Additional Diversion	6,576	6,615	6,653	6,691	6,730	6,769	6,809	6,848	6,888
Phase in Mandatory Separation for Yard Trimmings									
Add'l New Percent of YT Diversion - SF	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
Add'l New Percent of YT Diversion - MF/Comm	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Additional Diversion	6,576	6,615	6,653	6,691	6,730	6,769	6,809	6,848	6,888
Total Yard Trimmings Diversion	**22,699**	**22,831**	**22,963**	**23,096**	**23,230**	**23,365**	**23,500**	**23,637**	**23,774**
Collected Recyclables Diversion (Current Levels Projected):	14,878	14,964	15,051	15,138	15,226	15,314	15,403	15,492	15,582
Adding Materials to Recyclables Collection									
Add'l New Percent of Diversion - SF	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Add'l New Percent of Diversion - MF/Comm	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Additional Diversion	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,547	2,562
Phase in Mandatory Separation for Recyclables Collection									
Add'l New Percent of Recyclables Diversion - SF	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Add'l New Percent of Recyclables Diversion - MF/Comm	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Additional Diversion	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,547	2,562
Total Collected Recyclables Diversion	**19,770**	**19,884**	**20,000**	**20,116**	**20,232**	**20,350**	**20,468**	**20,586**	**20,706**
Waste Remaining after Program Implementation:									
Delivered to SMaRT	32,265	32,452	32,640	32,829	33,020	33,211	33,404	33,598	33,793
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**8,066**	**8,113**	**8,160**	**8,207**	**8,255**	**8,303**	**8,351**	**8,399**	**8,448**
Total SF /MF Residential & Commercial Diversion	**50,535**	**50,828**	**51,123**	**51,419**	**51,718**	**52,017**	**52,319**	**52,623**	**52,928**
Self Haul									
Waste (Current Levels Projected):									
Percent Redirected from City Landfill to SMaRT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Amount to City Landfill	-	-	-	-	-	-	-	-	-
Amount to SMaRT	11,521	11,587	11,655	11,722	11,790	11,859	11,927	11,996	12,066
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**2,880**	**2,897**	**2,914**	**2,931**	**2,948**	**2,965**	**2,982**	**2,999**	**3,017**
Drop-Off Recyclables Diversion (Current Levels Projected):	**1,245**	**1,252**	**1,260**	**1,267**	**1,274**	**1,282**	**1,289**	**1,297**	**1,304**
Yard Trimmings - Public Haul (Current Levels Projected):	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Percent Redirected from City Composting to Processor	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Amount to Processor	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Recovery at Processor	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Recovery from City Composting[b]	-	-	-	-	-	-	-	-	-
Total Diversion	**3,036**	**3,054**	**3,071**	**3,089**	**3,107**	**3,125**	**3,143**	**3,161**	**3,180**
Yard Trimmings - City Haul Diversion (Current Levels Projected)[a]:	**5,026**	**5,055**	**5,084**	**5,114**	**5,144**	**5,173**	**5,203**	**5,234**	**5,264**

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year

Regional Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Self Haul (continued)									
Landfill Recycling/C&D - Public Haul (Current Levels Projected):	1,733	1,743	1,753	1,763	1,774	1,784	1,794	1,805	1,815
Percent Redirected from City C&D Recycling to SMaRT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Amount to SMaRT	1,733	1,743	1,753	1,763	1,774	1,784	1,794	1,805	1,815
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Recovery from SMaRT	433	436	438	441	443	446	449	451	454
Recovery from City Landfill	-	-	-	-	-	-	-	-	-
Total Diversion	**433**	**436**	**438**	**441**	**443**	**446**	**449**	**451**	**454**
Landfill Recycling/C&D - City Haul Diversion (Current Levels Projected):	**824**	**828**	**833**	**838**	**843**	**848**	**853**	**858**	**863**
Total Self Haul Diversion	**13,444**	**13,522**	**13,600**	**13,679**	**13,759**	**13,838**	**13,919**	**13,999**	**14,081**
Industrial - Open Top Debris Boxes									
C&D Directed to Regional Processors (Current Levels Projected):	6,845	6,885	6,925	6,965	7,005	7,046	7,087	7,128	7,169
Percent Redirected from C&D Processors to City Developed Facility	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
To City Developed Facility	-	-	-	-	-	-	-	-	-
To C&D Regional Processor	6,845	6,885	6,925	6,965	7,005	7,046	7,087	7,128	7,169
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**5,404**	**5,435**	**5,467**	**5,499**	**5,531**	**5,563**	**5,595**	**5,627**	**5,660**
Waste (Current Levels Projected):									
Waste Directed to SMaRT	809	814	818	823	828	833	837	842	847
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**202**	**203**	**205**	**206**	**207**	**208**	**209**	**211**	**212**
Waste Directed to City Landfill[c]	11,224	11,289	11,355	11,420	11,487	11,553	11,620	11,688	11,756
Percent Redirected from Landfill to C&D Processing	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**6,203**	**6,239**	**6,275**	**6,311**	**6,348**	**6,385**	**6,422**	**6,459**	**6,496**
Landfill Recycling/C&D (Current Levels Projected):	**1,702**	**1,712**	**1,722**	**1,732**	**1,742**	**1,752**	**1,762**	**1,773**	**1,783**
Total Industrial Diversion	**13,511**	**13,590**	**13,669**	**13,748**	**13,828**	**13,908**	**13,989**	**14,070**	**14,151**
Uncharacterized Self Haul									
SF/MF/Commercial	7,675	7,720	7,765	7,810	7,855	7,900	7,946	7,992	8,039
C&D Ordinance - Diversion Rate[e]	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%
Total Uncharacterized Self Haul Diversion	**1,516**	**1,525**	**1,534**	**1,542**	**1,551**	**1,560**	**1,569**	**1,578**	**1,588**
Source: Conversion Technology									
Percent to Conversion Technology	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SMaRT Input to Conversion Technology	34,745	34,947	35,150	35,354	35,559	35,765	35,972	36,181	36,391
Conversion Technology Diversion Rate	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Diversion Summary									
Total SF /MF Residential & Commercial Diversion	50,535	50,828	51,123	51,419	51,718	52,017	52,319	52,623	52,928
Total Self Haul Diversion	13,444	13,522	13,600	13,679	13,759	13,838	13,919	13,999	14,081
Total Industrial Diversion	13,511	13,590	13,669	13,748	13,828	13,908	13,989	14,070	14,151
Total Uncharacterized Self Haul Diversion	1,516	1,525	1,534	1,542	1,551	1,560	1,569	1,578	1,588
Total Non-City Diversion	67,861	68,254	68,650	69,048	69,449	69,852	70,257	70,664	71,074
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Sub-Total Diversion	**146,867**	**147,719**	**148,575**	**149,437**	**150,304**	**151,176**	**152,053**	**152,934**	**153,821**
Additional Diversion from Source Reduction	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Additional Diverted Tons	1,942	1,954	3,930	3,953	3,976	3,999	4,022	4,045	4,069
Total Diversion	**148,809**	**149,672**	**152,505**	**153,390**	**154,280**	**155,174**	**156,074**	**156,980**	**157,890**
Total Disposal	**45,425**	**45,688**	**43,988**	**44,244**	**44,500**	**44,758**	**45,018**	**45,279**	**45,542**
Diversion Rate	**76.6%**	**76.6%**	**77.6%**	**77.6%**	**77.6%**	**77.6%**	**77.6%**	**77.6%**	**77.6%**
Kirby Canyon Put or Pay Summary									
Total tonnage to SMaRT	46,327	46,596	46,866	47,138	47,412	47,686	47,963	48,241	48,521
Total tonnage to Kirby Canyon Landfill	34,745	34,947	35,150	35,354	35,559	35,765	35,972	36,181	36,391
Kirby Canyon Put or Pay Commitment	43,027	43,457	43,892	44,330	44,774	45,221	45,674	46,130	34,944
Tonnage Difference	(8,281)	(8,510)	(8,742)	(8,977)	(9,215)	(9,456)	(9,701)	(9,949)	1,447
Cost per ton ($/ton)	$ 40.84	$ 42.07	$ 43.33	$ 44.63	$ 45.97	$ 47.35	$ 48.77	$ 50.23	$ 51.74
Total Cost make-up ($)	$ (338,241)	$ (358,021)	$ (378,795)	$ (400,642)	$ (423,612)	$ (447,755)	$ (473,128)	$ (499,785)	$ -
Annual Waste Escalation Rate[f]									

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year

City Developed Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

Generation by Source (Current Levels Projected):	2004	2005	2006	2007	2008	2009	2010	2011	2012
SF /MF Residential & Commercial									
SF Residential Waste	13,109	13,185	13,261	13,338	13,416	13,494	13,572	13,651	13,730
Commercial/Multi-Family Waste	34,649	34,850	35,052	35,256	35,460	35,666	35,873	36,081	36,290
Recyclables from Collection	14,123	14,205	14,287	14,370	14,454	14,537	14,622	14,706	14,792
Yard Trimmings	9,062	9,115	9,167	9,221	9,274	9,328	9,382	9,436	9,491
Self Haul									
Waste to SMaRT	25	25	25	25	26	26	26	26	26
Waste to City Landfill	10,911	10,975	11,038	11,102	11,167	11,231	11,296	11,362	11,428
Yard Trimmings - City Crews[a]	4,771	4,799	4,827	4,854	4,883	4,911	4,939	4,968	4,997
Yard Trimmings - Public[b]	2,882	2,899	2,916	2,932	2,949	2,967	2,984	3,001	3,018
Landfill Recycling/C&D - City Crews	1,645	1,655	1,664	1,674	1,684	1,693	1,703	1,713	1,723
Landfill Recycling/C&D - Public	782	786	791	795	800	805	809	814	819
Recyclables Drop-Off	1,182	1,189	1,196	1,203	1,210	1,217	1,224	1,231	1,238
Industrial Open Top Debris Boxes									
C&D Directed to Regional Processors	6,498	6,536	6,574	6,612	6,650	6,689	6,727	6,766	6,806
Waste Directed to SMaRT	768	772	777	781	786	790	795	800	804
Waste Directed to City Landfill[c]	10,655	10,717	10,779	10,841	10,904	10,967	11,031	11,095	11,159
Landfill Recycling/C&D	1,616	1,625	1,635	1,644	1,654	1,663	1,673	1,683	1,693
Uncharacterized Self Haul									
Other Landfill	7,286	7,328	7,371	7,414	7,457	7,500	7,543	7,587	7,631
Non-City Diversion	64,419	64,793	65,168	65,546	65,927	66,309	66,694	67,080	67,469
Total Generation	**184,383**	**185,452**	**186,528**	**187,610**	**188,698**	**189,792**	**190,893**	**192,000**	**193,114**
SF /MF Residential & Commercial									
Yard Trimmings Diversion (Current Levels Projected):	9,062	9,115	9,167	9,221	9,274	9,328	9,382	9,436	9,491
Adding Food Scraps/Other Compostables to Yard Trimmings									
Add'l New Percent of Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.7%	14.7%
Add'l New Percent of Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	12.5%
Additional Diversion	-	-	-	-	-	-	-	6,501	6,538
Phase in Mandatory Separation for Yard Trimmings									
Add'l New Percent of YT Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.7%	14.7%
Add'l New Percent of YT Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	12.5%
Additional Diversion	-	-	-	-	-	-	-	6,501	6,538
Total Yard Trimmings Diversion	**9,062**	**9,115**	**9,167**	**9,221**	**9,274**	**9,328**	**9,382**	**22,438**	**22,568**
Collected Recyclables Diversion (Current Levels Projected):	14,123	14,205	14,287	14,370	14,454	14,537	14,622	14,706	14,792
Adding Materials to Recyclables Collection									
Add'l New Percent of Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	4.5%
Add'l New Percent of Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%
Additional Diversion	-	-	-	-	-	-	-	2,418	2,432
Phase in Mandatory Separation for Recyclables Collection									
Add'l New Percent of Recyclables Diversion - SF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	4.5%
Add'l New Percent of Recyclables Diversion - MF/Comm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.0%	5.0%
Additional Diversion	-	-	-	-	-	-	-	2,418	2,432
Total Collected Recyclables Diversion	**14,123**	**14,205**	**14,287**	**14,370**	**14,454**	**14,537**	**14,622**	**19,542**	**19,656**
Waste Remaining after Program Implementation:									
Delivered to SMaRT	47,758	48,035	48,314	48,594	48,876	49,159	49,444	31,894	32,079
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**8,405**	**8,454**	**8,503**	**6,657**	**12,219**	**12,290**	**12,361**	**7,973**	**8,020**
Total SF /MF Residential & Commercial Diversion	**31,590**	**31,774**	**31,958**	**30,248**	**35,947**	**36,155**	**36,365**	**49,954**	**50,243**
Self Haul									
Waste (Current Levels Projected):									
Percent Redirected from City Landfill to SMaRT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Amount to City Landfill	10,911	10,975	11,038	11,102	11,167	11,231	11,296	-	-
Amount to SMaRT	25	25	25	25	26	26	26	11,388	11,454
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**4**	**4**	**4**	**3**	**6**	**6**	**6**	**2,847**	**2,864**
Drop-Off Recyclables Diversion (Current Levels Projected):	**1,182**	**1,189**	**1,196**	**1,203**	**1,210**	**1,217**	**1,224**	**1,231**	**1,238**
Yard Trimmings - Public Haul (Current Levels Projected):	2,882	2,899	2,916	2,932	2,949	2,967	2,984	3,001	3,018
Percent Redirected from City Composting to Processor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Amount to Processor	-	-	-	-	-	-	-	-	-
Recovery at Processor	-	-	-	-	-	-	-	-	-
Recovery from City Composting[b]	2,882	2,899	2,916	2,932	2,949	2,967	2,984	3,001	3,018
Total Diversion	**2,882**	**2,899**	**2,916**	**2,932**	**2,949**	**2,967**	**2,984**	**3,001**	**3,018**
Yard Trimmings - City Haul Diversion (Current Levels Projected)[a]:	**4,771**	**4,799**	**4,827**	**4,854**	**4,883**	**4,911**	**4,939**	**4,968**	**4,997**

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year

City Developed Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
Self Haul (continued)									
Landfill Recycling/C&D - Public Haul (Current Levels Projected):	1,645	1,655	1,664	1,674	1,684	1,693	1,703	1,713	1,723
Percent Redirected from City C&D Recycling to SMaRT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Amount to SMaRT	-	-	-	-	-	-	-	-	-
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Recovery from SMaRT	-	-	-	-	-	-	-	-	-
Recovery from City Landfill	1,645	1,655	1,664	1,674	1,684	1,693	1,703	1,713	1,723
Total Diversion	**1,645**	**1,655**	**1,664**	**1,674**	**1,684**	**1,693**	**1,703**	**1,713**	**1,723**
Landfill Recycling/C&D - City Haul Diversion (Current Levels Projected):	**782**	**786**	**791**	**795**	**800**	**805**	**809**	**814**	**819**
Total Self Haul Diversion	**11,266**	**11,332**	**11,397**	**11,463**	**11,532**	**11,599**	**11,666**	**14,574**	**14,659**
Industrial - Open Top Debris Boxes									
C&D Directed to Regional Processors (Current Levels Projected):	6,498	6,536	6,574	6,612	6,650	6,689	6,727	6,766	6,806
Percent Redirected from C&D Processors to City Developed Facility	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
To City Developed Facility	-	-	-	-	-	-	-	6,766	6,806
To C&D Regional Processor	6,498	6,536	6,574	6,612	6,650	6,689	6,727	-	-
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**5,130**	**5,160**	**5,190**	**5,220**	**5,250**	**5,281**	**5,311**	**5,342**	**5,373**
Waste (Current Levels Projected):									
Waste Directed to SMaRT	768	772	777	781	786	790	795	800	804
SMaRT Recovery Rate[d]	17.6%	17.6%	17.6%	13.7%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**135**	**136**	**137**	**107**	**196**	**198**	**199**	**200**	**201**
Waste Directed to City Landfill[c]	10,655	10,717	10,779	10,841	10,904	10,967	11,031	11,095	11,159
Percent Redirected from Landfill to C&D Processing	0.0%	0.0%	0.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**-**	**-**	**-**	**5,991**	**6,026**	**6,061**	**6,096**	**6,131**	**6,167**
Landfill Recycling/C&D (Current Levels Projected):	**1,616**	**1,625**	**1,635**	**1,644**	**1,654**	**1,663**	**1,673**	**1,683**	**1,693**
Total Industrial Diversion	**6,881**	**6,921**	**6,961**	**12,962**	**13,126**	**13,202**	**13,279**	**13,356**	**13,434**
Uncharacterized Self Haul									
SF/MF/Commercial	7,286	7,328	7,371	7,414	7,457	7,500	7,543	7,587	7,631
C&D Ordinance - Diversion Rate[e]	0.0%	0.0%	0.0%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%
Total Uncharacterized Self Haul Diversion	**-**	**-**	**-**	**1,464**	**1,473**	**1,481**	**1,490**	**1,498**	**1,507**
Source: Conversion Technology									
Percent to Conversion Technology	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SMaRT Input to Conversion Technology	40,006	40,238	40,471	42,633	37,265	37,482	37,699	33,061	33,253
Conversion Technology Diversion Rate	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Diversion Summary									
Total SF /MF Residential & Commercial Diversion	31,590	31,774	31,958	30,248	35,947	36,155	36,365	49,954	50,243
Total Self Haul Diversion	11,266	11,332	11,397	11,463	11,532	11,599	11,666	14,574	14,659
Total Industrial Diversion	6,881	6,921	6,961	12,962	13,126	13,202	13,279	13,356	13,434
Total Uncharacterized Self Haul Diversion	-	-	-	1,464	1,473	1,481	1,490	1,498	1,507
Total Non-City Diversion	64,419	64,793	65,168	65,546	65,927	66,309	66,694	67,080	67,469
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Sub-Total Diversion	**114,157**	**114,819**	**115,485**	**121,684**	**128,004**	**128,746**	**129,493**	**146,463**	**147,312**
Additional Diversion from Source Reduction	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	1.0%
Additional Diverted Tons	-	-	-	-	-	-	1,909	1,920	1,931
Total Diversion	**114,157**	**114,819**	**115,485**	**121,684**	**128,004**	**128,746**	**131,402**	**148,383**	**149,243**
Total Disposal	**70,226**	**70,633**	**71,043**	**65,926**	**60,694**	**61,046**	**59,491**	**43,618**	**43,871**
Diversion Rate	**61.9%**	**61.9%**	**61.9%**	**64.9%**	**67.8%**	**67.8%**	**68.8%**	**77.3%**	**77.3%**
Kirby Canyon Put or Pay Summary									
Total tonnage to SMaRT	48,551	48,833	49,116	49,401	49,687	49,975	50,265	44,081	44,337
Total tonnage to Kirby Canyon Landfill	40,006	40,238	40,471	42,633	37,265	37,482	37,699	33,061	33,253
Kirby Canyon Put or Pay Commitment	39,341	39,734	40,132	40,533	40,939	41,348	41,762	42,179	42,601
Tonnage Difference	665	504	340	2,100	(3,673)	(3,866)	(4,063)	(9,118)	(9,348)
Cost per ton ($/ton)	$ 31.30	$ 32.24	$ 33.21	$ 34.21	$ 35.23	$ 36.29	$ 37.38	$ 38.50	$ 39.65
Total Cost make-up ($)	$ -	$ -	$ -	$ -	$ (129,421)	$ (140,293)	$ (151,851)	$ (351,046)	$ (370,688)
Annual Waste Escalation Rate[f]	0.58%								

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year

City Developed Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

Generation by Source (Current Levels Projected):	2013	2014	2015	2016	2017	2018	2019	2020	2021
SF /MF Residential & Commercial									
SF Residential Waste	13,809	13,889	13,970	14,051	14,133	14,215	14,297	14,380	14,463
Commercial/Multi-Family Waste	36,500	36,712	36,925	37,139	37,355	37,571	37,789	38,008	38,229
Recyclables from Collection	14,878	14,964	15,051	15,138	15,226	15,314	15,403	15,492	15,582
Yard Trimmings	9,546	9,602	9,657	9,713	9,770	9,826	9,883	9,941	9,998
Self Haul									
Waste to SMaRT	26	26	27	27	27	27	27	27	28
Waste to City Landfill	11,494	11,561	11,628	11,695	11,763	11,831	11,900	11,969	12,038
Yard Trimmings - City Crews[a]	5,026	5,055	5,084	5,114	5,144	5,173	5,203	5,234	5,264
Yard Trimmings - Public[b]	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Landfill Recycling/C&D - City Crews	1,733	1,743	1,753	1,763	1,774	1,784	1,794	1,805	1,815
Landfill Recycling/C&D - Public	824	828	833	838	843	848	853	858	863
Recyclables Drop-Off	1,245	1,252	1,260	1,267	1,274	1,282	1,289	1,297	1,304
Industrial Open Top Debris Boxes									
C&D Directed to Regional Processors	6,845	6,885	6,925	6,965	7,005	7,046	7,087	7,128	7,169
Waste Directed to SMaRT	809	814	818	823	828	833	837	842	847
Waste Directed to City Landfill[c]	11,224	11,289	11,355	11,420	11,487	11,553	11,620	11,688	11,756
Landfill Recycling/C&D	1,702	1,712	1,722	1,732	1,742	1,752	1,762	1,773	1,783
Uncharacterized Self Haul									
Other Landfill	7,675	7,720	7,765	7,810	7,855	7,900	7,946	7,992	8,039
Non-City Diversion	67,861	68,254	68,650	69,048	69,449	69,852	70,257	70,664	71,074
Total Generation	**194,234**	**195,361**	**196,494**	**197,633**	**198,780**	**199,933**	**201,092**	**202,259**	**203,432**
SF /MF Residential & Commercial									
Yard Trimmings Diversion (Current Levels Projected):	9,546	9,602	9,657	9,713	9,770	9,826	9,883	9,941	9,998
Adding Food Scraps/Other Compostables to Yard Trimmings									
Add'l New Percent of Diversion - SF	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
Add'l New Percent of Diversion - MF/Comm	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Additional Diversion	6,576	6,615	6,653	6,691	6,730	6,769	6,809	6,848	6,888
Phase in Mandatory Separation for Yard Trimmings									
Add'l New Percent of YT Diversion - SF	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
Add'l New Percent of YT Diversion - MF/Comm	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Additional Diversion	6,576	6,615	6,653	6,691	6,730	6,769	6,809	6,848	6,888
Total Yard Trimmings Diversion	**22,699**	**22,831**	**22,963**	**23,096**	**23,230**	**23,365**	**23,500**	**23,637**	**23,774**
Collected Recyclables Diversion (Current Levels Projected):	14,878	14,964	15,051	15,138	15,226	15,314	15,403	15,492	15,582
Adding Materials to Recyclables Collection									
Add'l New Percent of Diversion - SF	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Add'l New Percent of Diversion - MF/Comm	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Additional Diversion	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,547	2,562
Phase in Mandatory Separation for Recyclables Collection									
Add'l New Percent of Recyclables Diversion - SF	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Add'l New Percent of Recyclables Diversion - MF/Comm	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Additional Diversion	2,446	2,460	2,475	2,489	2,503	2,518	2,532	2,547	2,562
Total Collected Recyclables Diversion	**19,770**	**19,884**	**20,000**	**20,116**	**20,232**	**20,350**	**20,468**	**20,586**	**20,706**
Waste Remaining after Program Implementation:									
Delivered to SMaRT	32,265	32,452	32,640	32,829	33,020	33,211	33,404	33,598	33,793
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**8,066**	**8,113**	**8,160**	**8,207**	**8,255**	**8,303**	**8,351**	**8,399**	**8,448**
Total SF /MF Residential & Commercial Diversion	**50,535**	**50,828**	**51,123**	**51,419**	**51,718**	**52,017**	**52,319**	**52,623**	**52,928**
Self Haul									
Waste (Current Levels Projected):									
Percent Redirected from City Landfill to SMaRT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Amount to City Landfill	-	-	-	-	-	-	-	-	-
Amount to SMaRT	11,521	11,587	11,655	11,722	11,790	11,859	11,927	11,996	12,066
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**2,880**	**2,897**	**2,914**	**2,931**	**2,948**	**2,965**	**2,982**	**2,999**	**3,017**
Drop-Off Recyclables Diversion (Current Levels Projected):	**1,245**	**1,252**	**1,260**	**1,267**	**1,274**	**1,282**	**1,289**	**1,297**	**1,304**
Yard Trimmings - Public Haul (Current Levels Projected):	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Percent Redirected from City Composting to Processor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Amount to Processor	-	-	-	-	-	-	-	-	-
Recovery at Processor	-	-	-	-	-	-	-	-	-
Recovery from City Composting[b]	3,036	3,054	3,071	3,089	3,107	3,125	3,143	3,161	3,180
Total Diversion	**3,036**	**3,054**	**3,071**	**3,089**	**3,107**	**3,125**	**3,143**	**3,161**	**3,180**
Yard Trimmings - City Haul Diversion (Current Levels Projected)[a]:	**5,026**	**5,055**	**5,084**	**5,114**	**5,144**	**5,173**	**5,203**	**5,234**	**5,264**

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study
[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons
[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation
[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%
[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year

City Developed Facility Approach Diversion Model
(All figures in tons per year, except those denoted with $ or %)

	2013	2014	2015	2016	2017	2018	2019	2020	2021
Self Haul (continued)									
Landfill Recycling/C&D - Public Haul (Current Levels Projected):	1,733	1,743	1,753	1,763	1,774	1,784	1,794	1,805	1,815
Percent Redirected from City C&D Recycling to SMaRT	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Amount to SMaRT	-	-	-	-	-	-	-	-	-
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Recovery from SMaRT	-	-	-	-	-	-	-	-	-
Recovery from City Landfill	1,733	1,743	1,753	1,763	1,774	1,784	1,794	1,805	1,815
Total Diversion	**1,733**	**1,743**	**1,753**	**1,763**	**1,774**	**1,784**	**1,794**	**1,805**	**1,815**
Landfill Recycling/C&D - City Haul Diversion (Current Levels Projected):	**824**	**828**	**833**	**838**	**843**	**848**	**853**	**858**	**863**
Total Self Haul Diversion	**14,744**	**14,829**	**14,915**	**15,002**	**15,089**	**15,176**	**15,264**	**15,353**	**15,442**
Industrial - Open Top Debris Boxes									
C&D Directed to Regional Processors (Current Levels Projected):	6,845	6,885	6,925	6,965	7,005	7,046	7,087	7,128	7,169
Percent Redirected from C&D Processors to City Developed Facility	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
To City Developed Facility	6,845	6,885	6,925	6,965	7,005	7,046	7,087	7,128	7,169
To C&D Regional Processor	-	-	-	-	-	-	-	-	-
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**5,404**	**5,435**	**5,467**	**5,499**	**5,531**	**5,563**	**5,595**	**5,627**	**5,660**
Waste (Current Levels Projected):									
Waste Directed to SMaRT	809	814	818	823	828	833	837	842	847
SMaRT Recovery Rate[d]	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Diversion	**202**	**203**	**205**	**206**	**207**	**208**	**209**	**211**	**212**
Waste Directed to City Landfill[c]	11,224	11,289	11,355	11,420	11,487	11,553	11,620	11,688	11,756
Percent Redirected from Landfill to C&D Processing	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
C&D Recovery Rate	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%	78.9%
Total Diversion	**6,203**	**6,239**	**6,275**	**6,311**	**6,348**	**6,385**	**6,422**	**6,459**	**6,496**
Landfill Recycling/C&D (Current Levels Projected):	**1,702**	**1,712**	**1,722**	**1,732**	**1,742**	**1,752**	**1,762**	**1,773**	**1,783**
Total Industrial Diversion	**13,511**	**13,590**	**13,669**	**13,748**	**13,828**	**13,908**	**13,989**	**14,070**	**14,151**
Uncharacterized Self Haul									
SF/MF/Commercial	7,675	7,720	7,765	7,810	7,855	7,900	7,946	7,992	8,039
C&D Ordinance - Diversion Rate[e]	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%	19.8%
Total Uncharacterized Self Haul Diversion	**1,516**	**1,525**	**1,534**	**1,542**	**1,551**	**1,560**	**1,569**	**1,578**	**1,588**
Source: Conversion Technology									
Percent to Conversion Technology	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SMaRT Input to Conversion Technology	33,446	33,640	33,835	34,031	34,228	34,427	34,627	34,827	35,029
Conversion Technology Diversion Rate	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Diversion Summary									
Total SF /MF Residential & Commercial Diversion	50,535	50,828	51,123	51,419	51,718	52,017	52,319	52,623	52,928
Total Self Haul Diversion	14,744	14,829	14,915	15,002	15,089	15,176	15,264	15,353	15,442
Total Industrial Diversion	13,511	13,590	13,669	13,748	13,828	13,908	13,989	14,070	14,151
Total Uncharacterized Self Haul Diversion	1,516	1,525	1,534	1,542	1,551	1,560	1,569	1,578	1,588
Total Non-City Diversion	67,861	68,254	68,650	69,048	69,449	69,852	70,257	70,664	71,074
Total Conversion Technology Diversion	-	-	-	-	-	-	-	-	-
Sub-Total Diversion	**148,167**	**149,026**	**149,890**	**150,760**	**151,634**	**152,514**	**153,398**	**154,288**	**155,183**
Additional Diversion from Source Reduction	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Additional Diverted Tons	1,942	1,954	3,930	3,953	3,976	3,999	4,022	4,045	4,069
Total Diversion	**150,109**	**150,980**	**153,820**	**154,712**	**155,610**	**156,512**	**157,420**	**158,333**	**159,251**
Total Disposal	**44,125**	**44,381**	**42,673**	**42,921**	**43,170**	**43,420**	**43,672**	**43,925**	**44,180**
Diversion Rate	**77.3%**	**77.3%**	**78.3%**	**78.3%**	**78.3%**	**78.3%**	**78.3%**	**78.3%**	**78.3%**
Kirby Canyon Put or Pay Summary									
Total tonnage to SMaRT	44,594	44,853	45,113	45,375	45,638	45,903	46,169	46,437	46,706
Total tonnage to Kirby Canyon Landfill	33,446	33,640	33,835	34,031	34,228	34,427	34,627	34,827	35,029
Kirby Canyon Put or Pay Commitment	43,027	43,457	43,892	44,330	44,774	45,221	45,674	46,130	34,944
Tonnage Difference	(9,581)	(9,818)	(10,057)	(10,299)	(10,545)	(10,794)	(11,047)	(11,303)	85
Cost per ton ($/ton)	$ 40.84	$ 42.07	$ 43.33	$ 44.63	$ 45.97	$ 47.35	$ 48.77	$ 50.23	$ 51.74
Total Cost make-up ($)	$ (391,331)	$ (413,021)	$ (435,774)	$ (459,670)	$ (484,763)	$ (511,107)	$ (538,758)	$ (567,776)	$ -

[a] 4,771 tons of diverted yard trimmings from City Crews for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study

[b] 2,882 tons of diverted yard trimmings from Self Haul for 2004 per City records; this amount is in addition to the potential divertable yard trimmings discussed in the Waste Composition Study

[c] Total Industrial/Open Top-Drop Box tons for 2004 equals 19,537 tons; portion hauled to the City Landfill by PASCO per City records was 10,655 tons

[d] In 2007 SMART plans to operate July 1st through December 31st at a reduced recovery rate of 9.8% due to equipment installation

[e] Diversion rate of 19.8% assumes a capture rate of 25% and a recovery rate of approximately 79%

[f] Assumes growth rate based on 176,033 tons in 1996 increasing to 184,384 tons in 2004; eight years at an average of 0.58% per year